

User Guide

IS650P & ISMG Series AC Servo Drive and Motor

Pulse & Analog Reference

20-bit Incremental Encoder



A00

Data code: 19010459

Contents

| | |
|--|----|
| Safety Information and Precautions | 3 |
| Chapter 1 Product Information | 5 |
| 1.1 Servo Drive | 5 |
| 1.1.1 Designation Rules and Nameplate | 5 |
| 1.2 Servo Motor | 6 |
| 1.2.1 Designation Rules and Nameplate | 6 |
| 1.3 Servo System Configuration | 7 |
| 1.4 Specifications of Regenerative Resistor | 7 |
| 1.5 Motor Dimensions | 8 |
| 1.6 Physical Appearance and Mounting Dimensions of Servo Drive | 9 |
| Chapter 2 Wiring | 10 |
| 2.1 Servo System Wiring | 10 |
| 2.2 Wiring in Different Modes | 11 |
| 2.3 Terminals of Servo Drive | 15 |
| 2.3.1 Main Circuit Terminals | 16 |
| 2.3.2 Control Signal Terminal Connector CN1 | 17 |
| 2.3.3 Communication Signal Terminal Connectors CN3/CN4 | 19 |
| 2.3.4 Analog Monitoring Signal Terminal Connector CN5 | 20 |
| 2.4 Cables and Options | 20 |
| 2.4.1 Cable Model | 20 |
| 2.4.2 Cable Connectors | 21 |
| Chapter 3 Operation and Display | 24 |
| 3.1 Introduction to Keypad | 24 |
| 3.2 Keypad Display | 25 |
| 3.2.1 Display Switchover | 25 |
| 3.3 Parameter Setting | 26 |
| 3.4 User Password | 26 |
| Chapter 4 Quick Setup | 28 |
| Chapter 5 Troubleshooting | 33 |
| 5.1 During Startup | 33 |
| 5.1.1 Position Control | 33 |
| 5.1.2 Speed Control | 35 |
| 5.1.3 Torque Control | 39 |
| 5.2 During Running | 41 |
| 5.2.1 Troubleshooting of Faults | 41 |
| 5.2.2 Troubleshooting of Warnings | 58 |
| 5.2.3 Internal Faults | 63 |

| | |
|--|-----|
| Chapter 6 Parameter Table | 64 |
| Group H00: Servo Motor Parameters | 64 |
| Group H01: Servo Drive Parameters | 65 |
| Group H02: Basic Control Parameters | 65 |
| Group H03: Input Terminal Parameters | 67 |
| Group H04: Output Terminal Parameters | 69 |
| Group H05: Position Control Parameters | 70 |
| Group H06: Speed Control Parameters | 74 |
| Group H07: Torque Control Parameters | 74 |
| Group H08: Gain Parameters | 76 |
| Group H09: Automatic Gain Tuning Parameters | 77 |
| Group H0A: Fault and Protection Parameters | 78 |
| Group H0B: Monitoring Parameters | 79 |
| Group H0C: Communication Parameters | 81 |
| Group H0D: Auxiliary Function Parameters | 82 |
| Group H0F: Full Closed-Loop Parameters | 82 |
| Group H11: Multi-Position Function Parameters | 83 |
| Group H12: Multi-Speed Function Parameters | 86 |
| Group H17: VDI/VDO Parameters | 89 |
| Group H30: Servo Variables Read by Communication | 91 |
| Group H31: Servo Variables Set via Communication | 91 |
| DI/DO Function Definitions | 92 |
| Revision History | 100 |

Safety Information and Precautions

This User Guide is packaged together with the IS620P Servo Drive. It contains basic information for quick start of the drive. For safety and more information, please refer to the IS620P Advanced User Guide, which can be downloaded on the website <http://www.inovance.cn>.

■ Electrical Safety

Extreme care must be taken at all times when working with the Servo Drive or within the area of the Servo Drive. The voltages used in the Servo Drive can cause severe electrical shock or burns and is potentially lethal. Only authorized and qualified personnel should be allowed to work on Servo Drives.

■ Machine/System Design and Safety of Personnel

Machine/system design, installation, commissioning startups and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and the contents of this manual. If incorrectly installed, the Servo Drive may present a safety hazard.

The Servo Drive uses high voltages and currents (including DC), carries a high level of stored electrical energy in the DC bus capacitors even after power OFF. These high voltages are potentially lethal.

The Servo Drive is NOT intended to be used for safety related applications/functions. The electronic "STOP & START" control circuits within the Servo Drive must not be relied upon for the safety of personnel. Such control circuits isolates mains power voltages from the output of the Servo Drive. The mains power supply must be disconnected by an electrical safety isolation device before accessing the internal parts of the Servo Drive.

Safety risk assessments of the machine or process system which uses a Servo Drive must be undertaken by the user and or by their systems integrator/designer. In particular the safety assessment/design must take into consideration the consequences of the Servo Drive failing or tripping out during normal operation and whether this leads to a safe stop position without damaging machine, adjacent equipment and machine operators/users. This responsibility lies with the user or their machine/process system integrator.

System integrator/designer must ensure the complete system is safe and designed according to the relevant safety standards. Inovance Technology and Authorized Distributors can provide recommendations related to the Servo Drive to ensure long term safe operation.

The installer of the Servo Drive is responsible for complying with all relevant regulations for wiring, circuit fuse protection, earthing, accident prevention and electromagnetic (EMC regulations). In particular fault discrimination for preventing fire risk and solid earthing practices must be adhered to for electrical safety (also for good EMC practice). Within the European Union, all machinery in which this product is used must comply with required directives.

■ Electrical Installation - Safety

Electrical shock risk is always present within a Servo Drive including the output cable leading to the motor terminals. Where dynamic brake resistors are fitted external to the Servo Drive, care must be taken with regards to live contact with the brake resistors, terminals which are at high DC voltage and potentially lethal. Cables from the Servo Drive to the dynamic brake resistors should be double insulated as DC voltages are typically 600 to 700 VDC.

Mains power supply isolation switch should be fitted to the Servo Drive. The mains power supply must be disconnected via the isolation switch before any cover of the Servo Drive can be removed or before any servicing work is undertaken stored charge in the DC bus capacitors of the PWM inverter is potentially lethal after the AC supply has been disconnected. The AC supply must be isolated at least 10 minutes before any work can be undertaken as the stored charge will have been discharged through the internal bleed resistor fitted across the DC bus capacitors.

Whenever possible, it is good practice to check DC bus voltage with a VDC meter before accessing the inverter bridge. Where the Servo Drive input is connected to the mains supply with a plug and socket, then upon disconnecting the plug and socket, be aware that the plug pins may be exposed and internally connected to DC bus capacitors (via the internal bridge rectifier in reversed bias). Wait 10 minutes to allow stored charge in the DC bus capacitors to be dissipated by the bleed resistors before commencing work on the Servo Drive.

■ **Electrical Shock Hazard**

Ensure the protective earthing conductor complies with technical standards and local safety regulations. Because the leakage current exceeds 3.5 mA in all models, IEC 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm² (Cu) or 16 mm² (Al) must be used. Failure to comply may result in death or serious injury.




When using an earth leakage circuit breaker, use a residual current operated protective device (RCD) of type B (breaker which can detect both AC and DC). Leakage current can cause unprotected components to operate incorrectly. If this is a problem, lower the carrier frequency, replace the components in question with parts protected against harmonic current, or increase the sensitivity amperage of the leakage breaker to at least 200 mA per drive.

Factors in determining leakage current:

- Size of the Servo Drive
- Servo drive carrier frequency
- Motor cable type and length
- EMI/RFI filter

■ **Approvals**

Certification marks on the product nameplate indicate compliance with the corresponding certificates and standards.

| Certification | Mark | Directives | | Standard | |
|---------------|---|-----------------|------------|----------------|-------------------------------|
| CE |  | EMC directives | 2014/30/EU | AC servo drive | EN 61800-3 |
| | | | | AC servo motor | EN 60034-1 |
| | | LVD directives | 2014/35/EU | AC servo drive | EN 61800-5-1 |
| | | | | AC servo motor | EN 60034-1 |
| | | RoHS directives | 2011/65/EU | EN 50581 | |
| TUV |  | - | | AC servo drive | EN 61800-5-1 |
| | | | | AC servo motor | EN 60034-1 |
| UL |  | - | | AC servo drive | UL61800-5-1 C22.2 No.14-13 |
| | | | | AC servo motor | UL1004 C22.2 No.100 |

Note

- The above EMC directives are complied with only when the EMC electric installation requirements are strictly observed.
- Machines and devices used in combination with this drive must also be CE certified and marked. The integrator who integrates the drive with the CE mark into other devices has the responsibility of ensuring compliance with CE standards and verifying that conditions meet European standards.
- The installer of the drive is responsible for complying with all relevant regulations for wiring, circuit fuse protection, earthing, accident prevention and electromagnetic (EMC) regulations). In particular fault discrimination for preventing fire risk and solid earthing practices must be adhered to for electrical safety (also for good EMC practice).
- For more information on certification, consult our distributor or sales representative.

Chapter 1 Product Information

1.1 Servo Drive

1.1.1 Designation Rules and Nameplate

Figure 1-1 Designation rules and nameplate of servo drive

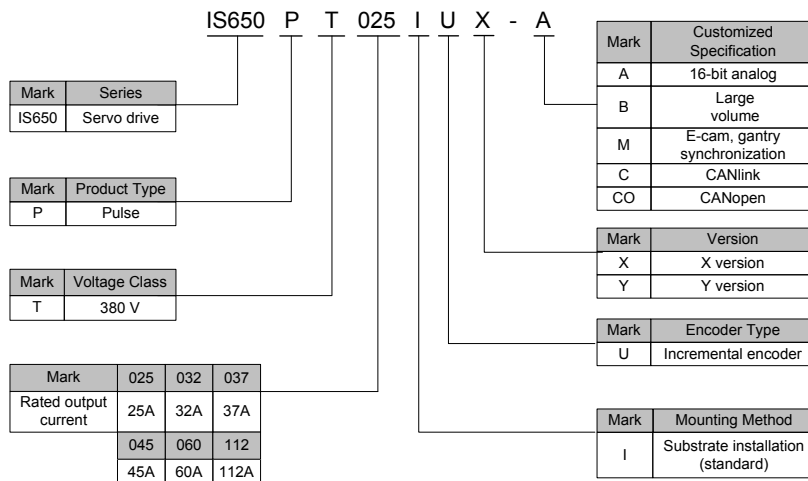


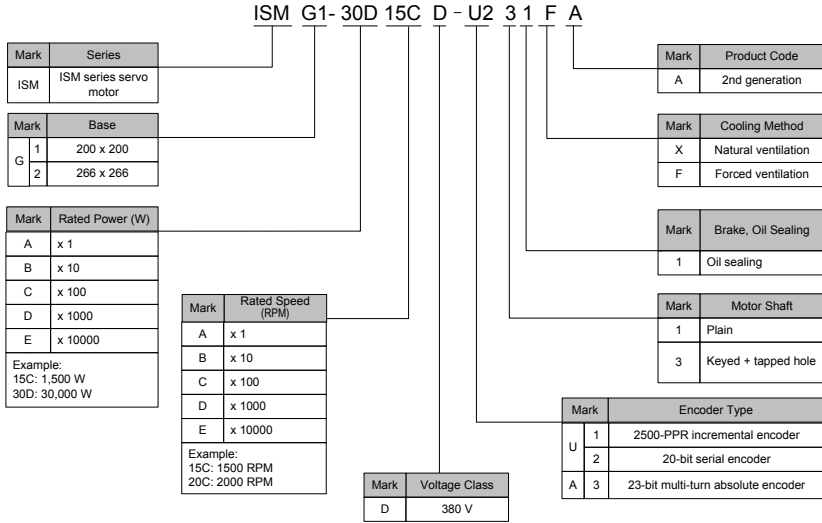
Table 1-1 IS650P rated current

| Drive Model IS650P□□□IUX | | Rated Input Current (A) | Rated Output Current (A) | Max. Output Current (A) |
|-----------------------------|------|-------------------------|--------------------------|-------------------------|
| SIZE-G | T025 | 20 | 25 | 46.75 |
| | T032 | 24 | 32 | 59.84 |
| | T037 | 30 | 37 | 69.19 |
| | T045 | 36 | 45 | 84.15 |
| SIZE-H | T060 | 48 | 60 | 112.2 |
| SIZE-I | T075 | 63 | 75 | 140.25 |
| | T091 | 76 | 91 | 170.17 |
| | T112 | 95 | 112 | 209.44 |

1.2 Servo Motor

1.2.1 Designation Rules and Nameplate

Figure 1-2 Designation rules and nameplate of servo motor



Note

The standard motor model is -U231*, and other models need to be booked in advance.

Table 1-2 Specifications of servo motor

| Servo Motor Model | Rated Output (kW) | Rated Torque (N·m) | Instan. Max. Torque (N·m) | Rated Current (Arms) | Instan. Max. Current (Arms) | Rated Speed (min ⁻¹) | Max. Speed (min ⁻¹) | Torque Para. (Nm/Arms) | Rotor Inertia (kg·m ² ·10 ⁻³) | Voltage (V) |
|--|-------------------|--------------------|---------------------------|----------------------|-----------------------------|----------------------------------|---------------------------------|------------------------|--|-------------|
| ISMG1-95C15CD-U***FA ISMG1-95C15CD-A3**FA | 7.9 | 50 | 135 | 15.4 | 45.9 | 1500 | 1800 | 3.24 | 7.5 | 380 |
| ISMG1-12D20CD-U***FA ISMG1-12D20CD-A3**FA | 10.5 | 50 | 135.5 | 21.6 | 64.6 | 2000 | 2400 | 2.31 | 7.5 | 380 |
| ISMG1-14D15CD-U***FA ISMG1-14D15CD-A3**FA | 11.8 | 75 | 201.8 | 24.4 | 75.6 | 1500 | 1800 | 3.08 | 9 | 380 |
| ISMG1-17D15CD-U***FA ISMG1-17D15CD-A3**FA | 14.5 | 92 | 248.4 | 29.9 | 93 | 1500 | 1800 | 3.1 | 10.5 | 380 |
| ISMG1-22D15CD-U***FA ISMG1-22D15CD-A3**FA | 18.1 | 115 | 310.5 | 35.5 | 106.1 | 1500 | 1800 | 3.24 | 12 | 380 |
| ISMG1-30D15CD-U***FA ISMG1-30D15CD-A3**FA | 23.6 | 150 | 405 | 48.7 | 149.5 | 1500 | 1800 | 3.08 | 15 | 380 |

| Servo Motor Model | Rated Output (kW) | Rated Torque (N·m) | Instan. Max. Torque (N·m) | Rated Current (Arms) | Instan. Max. Current (Arms) | Rated Speed (min ⁻¹) | Max. Speed (min ⁻¹) | Torque Para. (Nm/Arms) | Rotor Inertia (kg·m ² ·10 ⁻³) | Voltage (V) |
|--|-------------------|--------------------|---------------------------|----------------------|-----------------------------|----------------------------------|---------------------------------|------------------------|--|-------------|
| ISMG2-42D15CD-U***FA ISMG2-42D15CD-A3**FA | 36.1 | 230 | 492.2 | 74.7 | 166.5 | 1500 | 1800 | 3.03 | 36.8 | 380 |
| ISMG2-57D20CD-U***FA ISMG2-57D20CD-A3**FA | 48.2 | 230 | 495 | 87.8 | 207.8 | 2000 | 2400 | 2.06 | 36.8 | 380 |

Note

The standard motor model is -U231*. If you require other models, contact Inovance.
Instan. = Instantaneous

1.3 Servo System Configuration

Table 1-3 Servo motor and drive matching configuration

| Rated Speed (RPM) | Max. Speed (RPM) | Capacity (kW) | Servo Motor Model | | Cooling Method | Motor Frame | Servo Drive Model | Drive Size | Drive SN (H01-02) | Motor SN (H00-00) | | | | | |
|-------------------|------------------|---------------|-------------------|--|-------------------|-------------|--|------------|-------------------|-------------------|-----------------|-------|---------------|-------|-------|
| | | | ISMG□-□□□□□□□□ | ISMG□-□□□□□□□□ | | | IS650P□□□□□□□□ | | | | | | | | |
| 1500 | 1800 | 7.9 | G1 | ISMG1-95C15CD-U***FA ISMG1-95C15CD-A3**FA | Force ventilation | 200 | Three-phase 380 VAC | G | 20001 | 14020 | | | | | |
| 2000 | 2400 | 10.5 | | ISMG1-12D20CD-U***FA ISMG1-12D20CD-A3**FA | | | | | | | IS650PT025IUX-B | 20002 | 14020 | | |
| 1500 | 1800 | 11.8 | | ISMG1-14D15CD-U***FA ISMG1-14D15CD-A3**FA | | | IS650PT032IUX-B | 20003 | 14020 | | | | | | |
| 1500 | 1800 | 14.5 | | ISMG1-17D15CD-U***FA ISMG1-17D15CD-A3**FA | | | IS650PT037IUX | 20004 | 14020 | | | | | | |
| 1500 | 1800 | 18.1 | | ISMG1-22D15CD-U***FA ISMG1-22D15CD-A3**FA | | | IS650PT045IUX | 20005 | 14020 | | | | | | |
| 1500 | 1800 | 23.6 | | ISMG1-30D15CD-U***FA ISMG1-30D15CD-A3**FA | | | IS650PT060IUX | 20008 | 14020 | | | | | | |
| 1500 | 1800 | 36.1 | | G2 | | | ISMG2-42D15CD-U***FA ISMG2-42D15CD-A3**FA | 266 | IS650PT112IUX | I | 20008 | 14020 | | | |
| 1500 | 1800 | 48.2 | | | | | ISMG2-57D20CD-U***FA ISMG2-57D20CD-A3**FA | | | | | | IS650PT112IUX | 20008 | 14020 |

1.4 Specifications of Regenerative Resistor

Table 1-4 Recommendation of regenerative resistor

| Drive Model | Regenerative Resistor Specifications | |
|-----------------|--------------------------------------|------------|
| | Resistance (Ω) | Power (kW) |
| IS650PT025IUX-B | 43 | 1.3 |
| IS650PT032IUX-B | 32 | 1.3 |
| IS650PT037IUX | 25 | 1.3 |
| IS650PT045IUX | 20 | 2 |

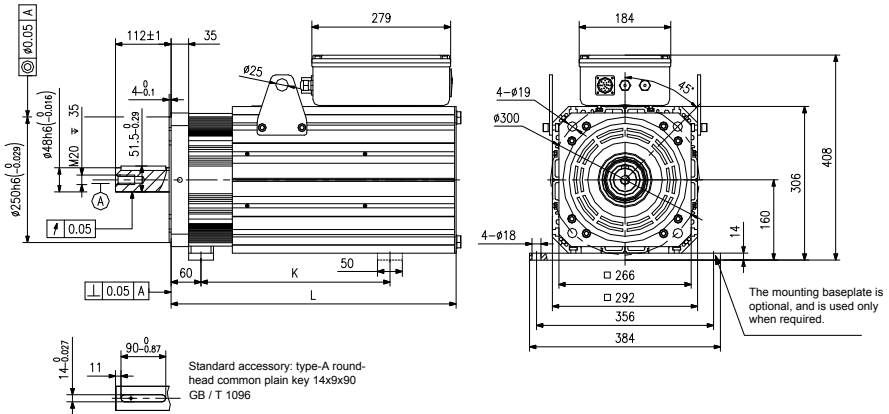
| Drive Model | Regenerative Resistor Specifications | |
|---------------|--------------------------------------|------------|
| | Resistance (Ω) | Power (kW) |
| IS650PT060IUX | 16 | 2 |
| IS650PT075IUX | 8 | 5.5 |
| IS650PT091IUX | | |
| IS650PT112IUX | | |

More descriptions of the table are as follows:

- The preceding table lists the typical reference data. Selection of the regenerative resistor is related the actual motor power, and also the system inertia, deceleration time, and energy of the potential energy load.
The larger the system inertia, the shorter the deceleration time, and the more frequent the braking is. In this case, you need to select a regenerative resistor of larger power and smaller resistance. Select the appropriate resistance and power based on actual conditions; for details on how to make calculation, contact Inovance.
- The resistance and power must not be lower than the recommended value.
- Set the parameters of the regenerative resistor in H02-25, H02-26, H02-27 based on actual conditions. Otherwise, a fault will be tripped.

1.5 Motor Dimensions

1. Solid shaft, forced ventilation motor (ISMG2)



| Connector | Encoder Side |
|----------------|---------------------------------|
| Military spec. | MIL-DTL-5015 series 3102E20-29P |

| Motor Model | L (mm) | K (mm) | Weight (kg) |
|---|--------|--------|-------------|
| ISMG2-42D20CD-U***FA ISMG2-42D20CD-A3***FA | 575 | 360 | 127 |
| ISMG2-57D20CD-U***FA ISMG2-57D20CD-A3***FA | 625 | 370 | 158.4 |

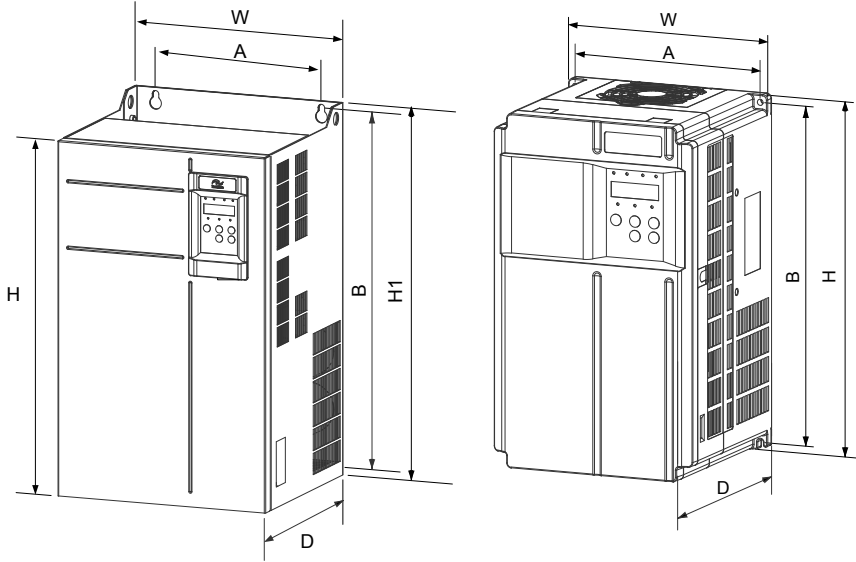
Note

The standard is U2 series. If you require R1, U1, or A3 series, contact Inovance for customization.

The mounting baseplate is optional, and used only when required.

1.6 Physical Appearance and Mounting Dimensions of Servo Drive

Figure 1-3 Physical appearance and mounting dimensions of servo drive



a. Plastic structure

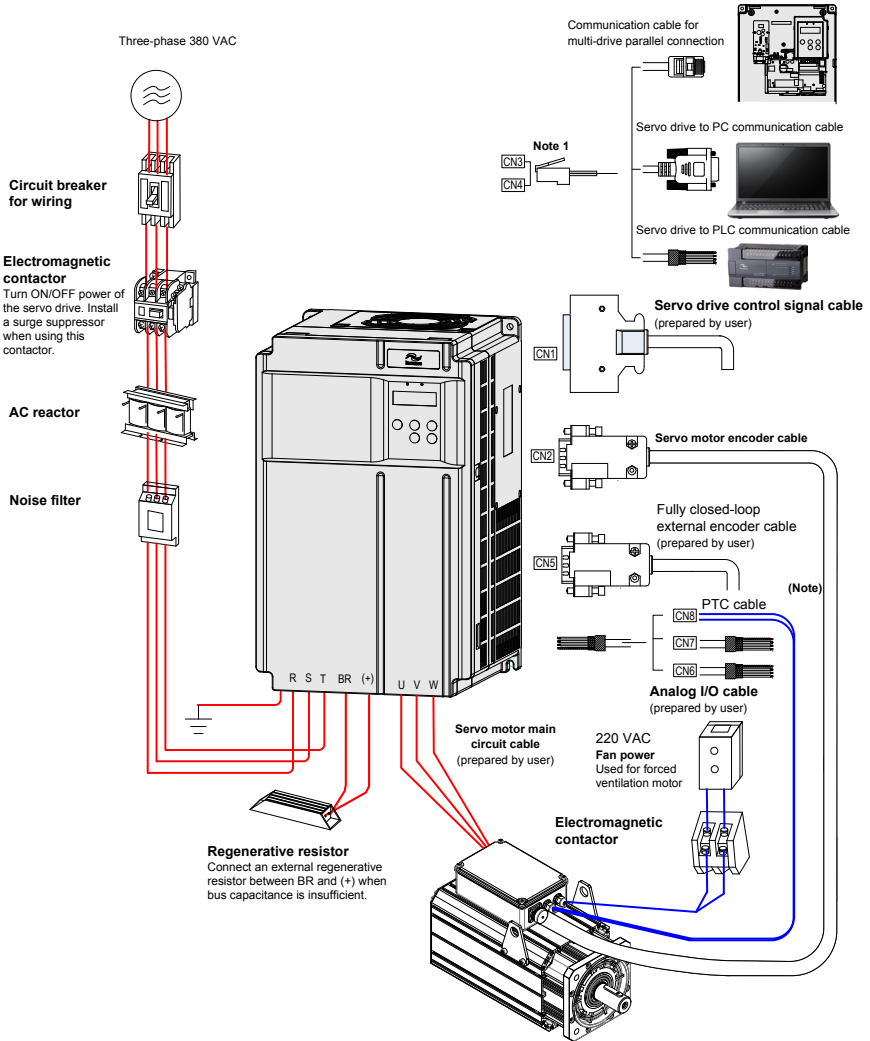
b. Sheet metal structure

| Drive Model | Mounting Hole (mm) | | Physical Dimensions (mm) | | | | Hole Diameter (mm) | Weight (kg) | Structure |
|-----------------|--------------------|-----|--------------------------|-----|-----|-----|--------------------|-------------|-------------|
| | A | B | H | H1 | W | D | | | |
| IS650PT025IUX-B | 195 | 335 | 350 | / | 210 | 192 | Ø6 | 9.1 | Plastic |
| IS650PT032IUX-B | | | | | | | | | |
| IS650PT037IUX | | | | | | | | | |
| IS650PT045IUX | | | | | | | | | |
| IS650PT060IUX | 230 | 380 | 400 | / | 250 | 220 | Ø7 | 17 | Plastic |
| IS650PT075IUX | 245 | 523 | 523 | 540 | 300 | 275 | Ø10 | 35 | Sheet metal |
| IS650PT091IUX | | | | | | | | | |
| IS650PT112IUX | | | | | | | | | |

Chapter 2 Wiring

2.1 Servo System Wiring

Figure 2-1 IS650P system wiring example



(Note): NEVER connect the PTC to the power supply.

The servo drive is directly connected to an industrial power supply, with no isolation such as transformer. In this case, a fuse or circuit breaker must be connected on the input power supply to prevent cross electric accidents in the servo system. The servo drive is not configured with the built-in protective grounding circuit. Thus, connect a RCD against both overload and short-circuit or a specialized RCD combined with protective grounding.

It is forbidden to run or stop the motor by using the electromagnetic contactor. As a high-inductance device, the motor generates instantaneous high voltage, which may damage the contactor.

Note

1. CN3 and CN4 are identical communication ports with the same pin definition, and either can be used.
2. Do not start and stop the servo drive frequently by switching the contactor on and off (less than twice per 10 minutes) nor use it to directly start the servo drive.

2.2 Wiring in Different Modes

The following are the notices for the wiring diagrams in three different modes:

- Use the shielded twisted-pair as the AI/AO circuit cables, with both ends of the shield tied to PE.
- Internal +24V power supply, voltage range: 20–28 V, maximum output current: 200 mA
- DI8 and DI9 are high-speed DIs. Use them according to their functions allocated.
- Use the shielded twisted-pair as the cables of the high-speed/low-speed pulse terminals, with both ends of the shield tied to PE. Connect GND and signal ground of the host controller reliably.
- Use the shielded twisted-pair as the encoder frequency-division cables, with both ends of the shield tied to PE. Connect GND and signal ground of the host controller reliably.
- Customers need to prepare the power supply for DOs, with voltage range 5–24 V. The DO terminals support 30 VDC voltage and 50 mA current to the maximum.
- The internal +5 V power supply supports a maximum of 200 mA current.

Figure 2-2 Wiring of the position control mode

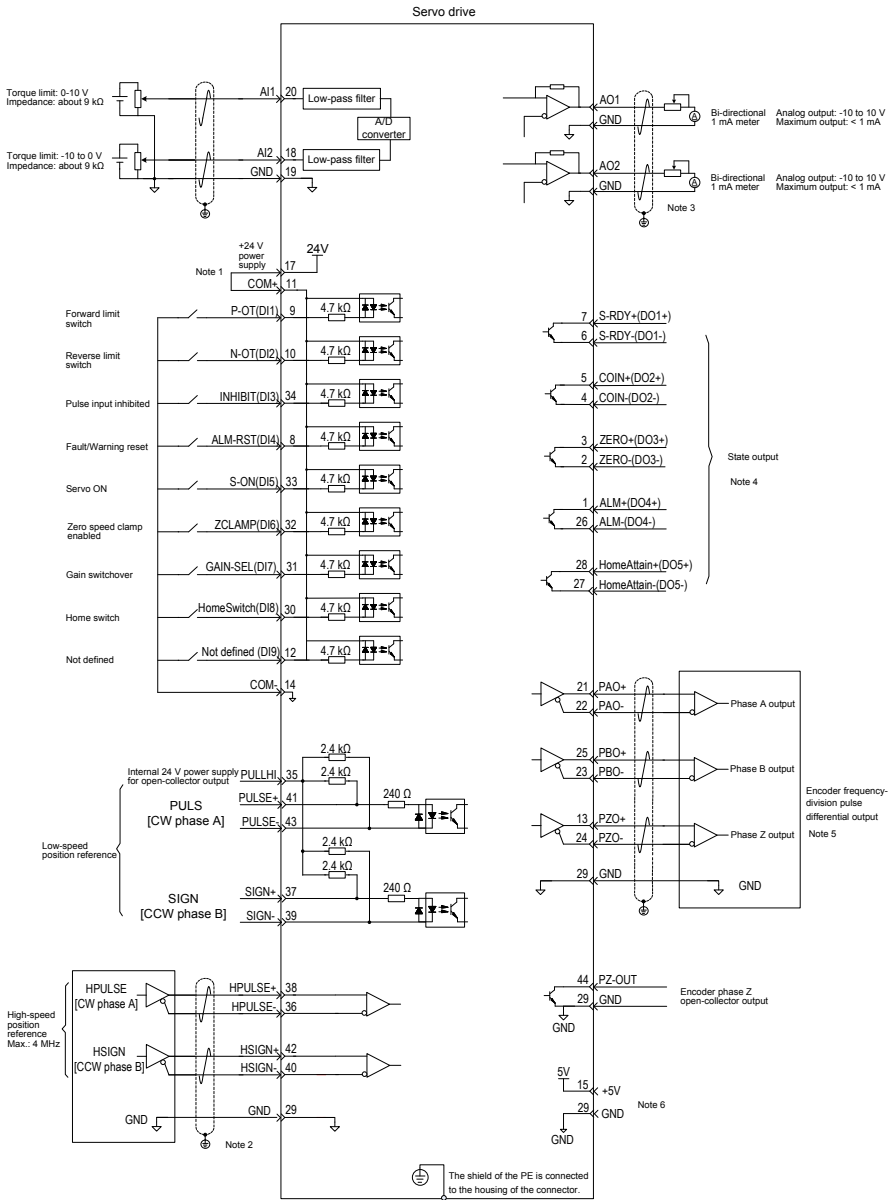


Figure 2-3 Wiring of the speed control mode

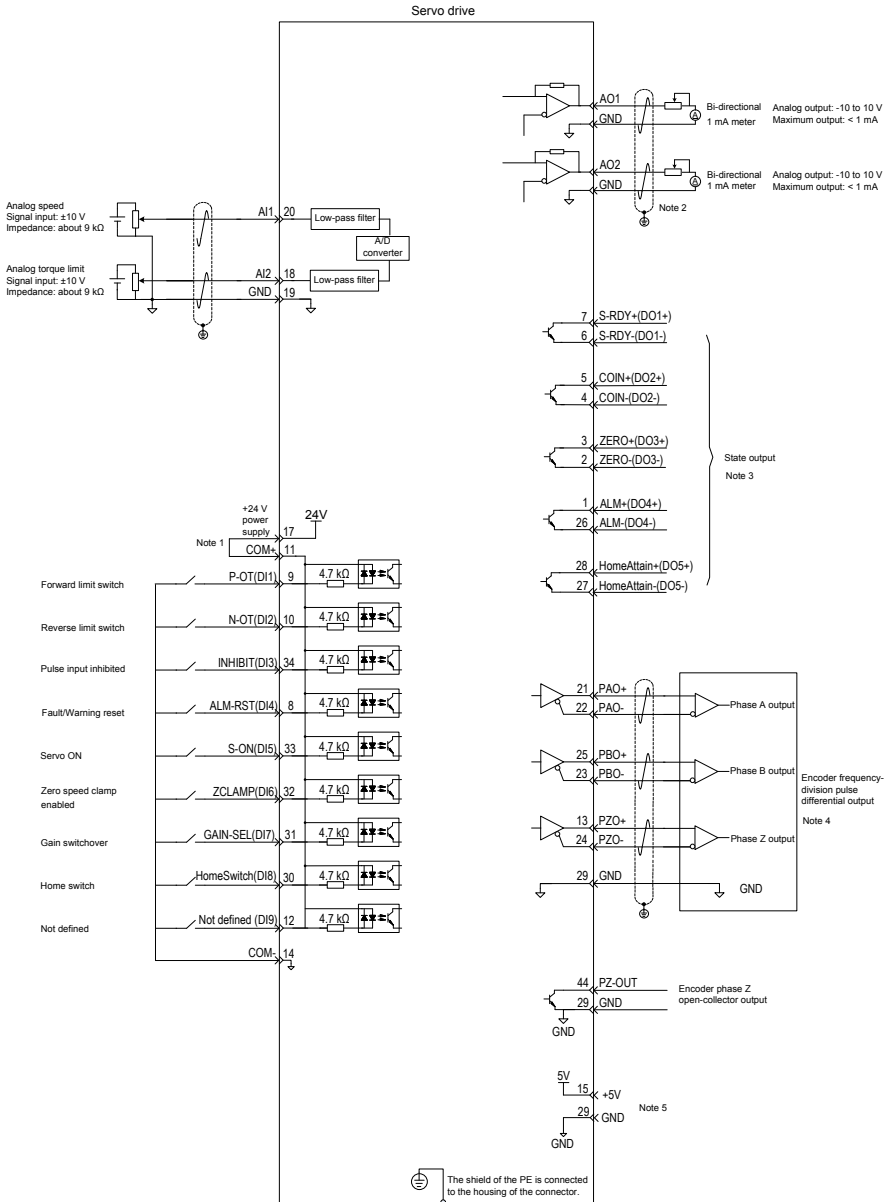
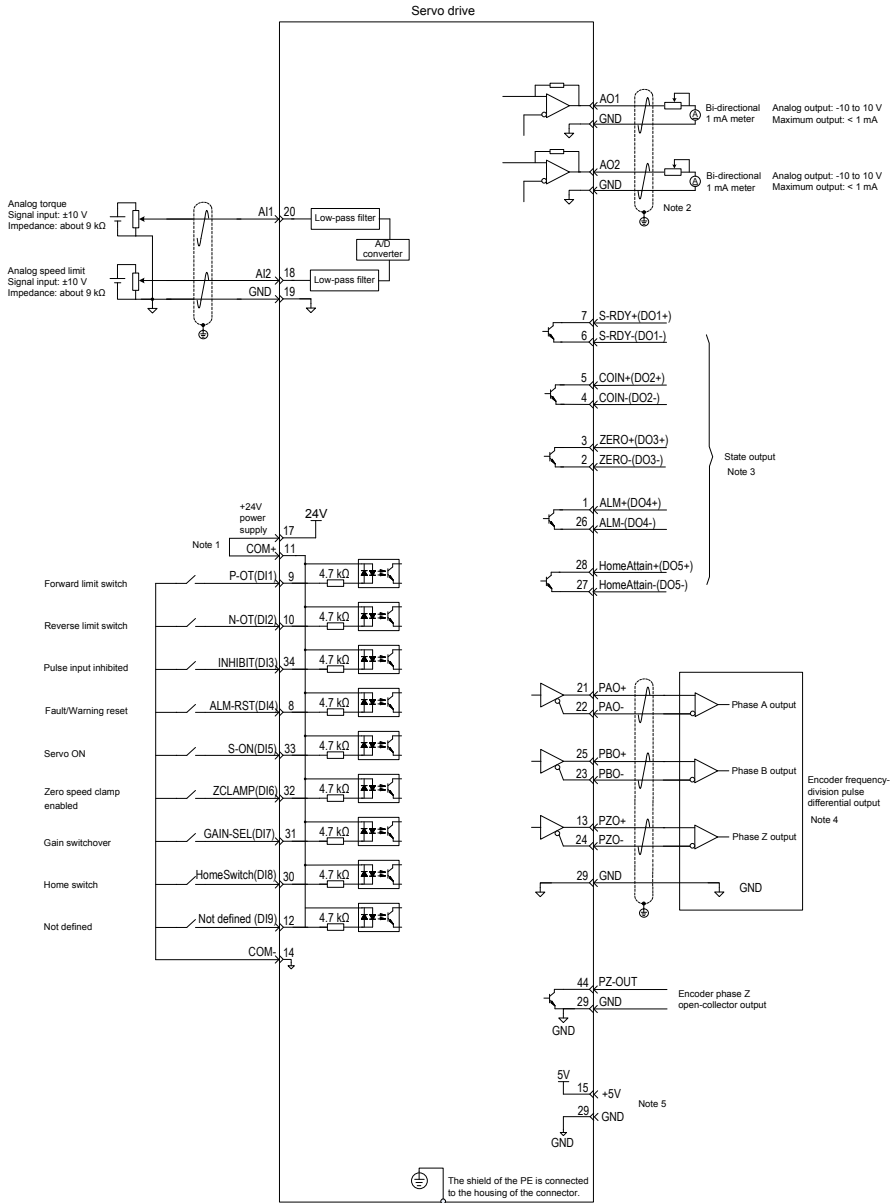


Figure 2-4 Wiring of the torque control mode



2.3.1 Main Circuit Terminals

Figure 2-6 Terminal block arrangement of IS650P

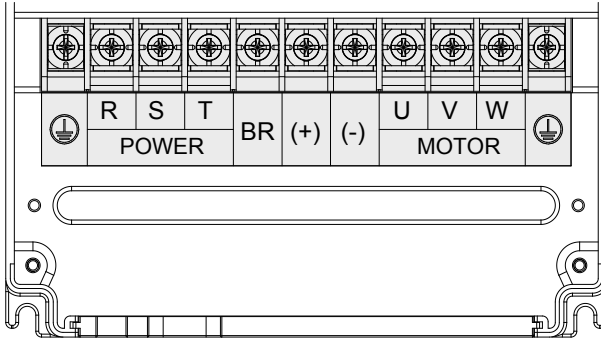



Table 2-1 Names and functions of main circuit terminals

| Terminal Symbol | Terminal Name | Terminal Function |
|---|---|--|
| R, S, T | Power input terminals | Three-phase 380 V power input |
| BR, (+) | Terminals for connecting external regenerative resistor | Connect to external regenerative resistor. |
| (+), (-) | Common DC bus terminal | They are used for common DC bus connection when multiple servo drives are used in parallel. |
| U, V, W | Servo motor connection terminals | Connect to U, V and W phases of the servo motor. |
|  | Ground | Two grounding terminals of the servo drive are respectively connected to those of the power supply and the servo motor. The entire system must be grounded. |

2.3.2 Control Signal Terminal Connector CN1

Figure 2-7 Pin layout of control circuit terminal connector of servo drive

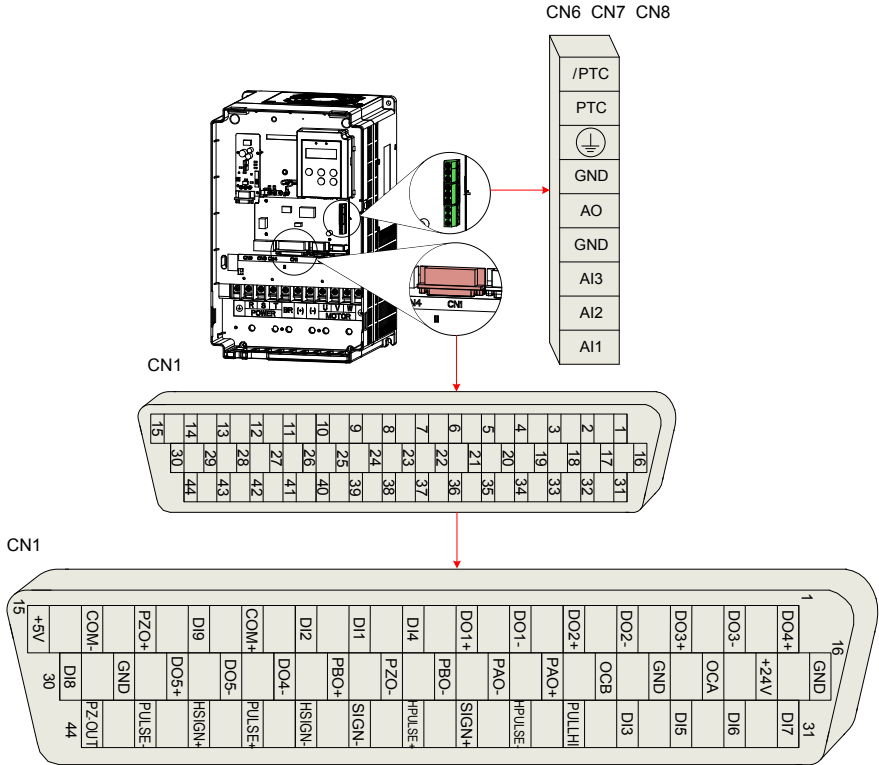


Table 2-2 Pulse position reference input signals

| Signal | | Pin No. | Function Description | |
|--------------------|---------|---------|---------------------------------------|--|
| Position reference | PULSE+ | 41 | Low-speed pulse input mode | Pulse input format: Direction + Pulse |
| | PULSE- | 43 | | |
| | SIGN+ | 37 | Differential drive mode | Phase A + B quadrature pulse |
| | SIGN- | 39 | | |
| Position reference | HPULSE+ | 38 | High-speed reference pulse input | CW/CCW pulse |
| | HPULSE- | 36 | | |
| | HSIGN+ | 42 | High-speed position reference symbols | External power input terminal of reference pulse |
| | HSIGN- | 40 | | |
| | PULLHI | 35 | | |
| | GND | 29 | | Signal ground |

DI/DO Signals

| Signal | Default Function | Pin No. | Function Description | |
|---------|------------------|-------------|----------------------|---|
| General | DI1 | P-OT | 9 | Forward limit switch |
| | DI2 | N-OT | 10 | Reverse limit switch |
| | DI3 | INHIBIT | 34 | Pulse input inhibited |
| | DI4 | ALM-RST | 8 | Alarm reset (edge valid) |
| | DI5 | S-ON | 33 | Servo ON |
| | DI6 | ZCLAMP | 32 | Zero speed clamp |
| | DI7 | GAIN-SEL | 31 | Gain switchover |
| | DI8 | HomeSwitch | 30 | Home switch |
| | DI9 | Reserved | 12 | - |
| | | +24V | 17 | Internal 24 V power supply, voltage range: 20 to 28 V, maximum output current: 200 mA |
| | | COM- | 14 | |
| | | COM+ | 11 | Power input (12 to 24 V) |
| | DO1+ | S-RDY+ | 7 | Servo ready |
| | DO1- | S-RDY- | 6 | |
| DO2+ | COIN+ | 5 | Position reached | |
| DO2- | COIN- | 4 | | |
| DO3+ | ZERO+ | 3 | Zero speed | |
| DO3- | ZERO- | 2 | | |
| General | DO4+ | ALM+ | 1 | Fault output |
| | DO4- | ALM- | 26 | |
| | DO5+ | HomeAttain+ | 28 | Homing completed |
| | DO5- | HomeAttain- | 27 | |

AI/AO Signals

| Signal | Default Function | Pin No. | Function Description |
|--------|------------------|---------|---|
| CN6 | /PTC | 1 | Moto temperature protection (PTC) input signal, regardless of positive or negative |
| | PTC | 2 | |
| | PE | 3 | Earth for the servo drive, used to connect to the shield of the signal |
| | GND | 4 | Analog monitoring output signals, including: 00: Motor speed, 01: Speed reference, 02: Torque reference, 03: Position deviation, 04: Position amplifier deviation, 05: Position reference speed, 06: Positioning completed reference, 07: Speed feedforward (H04-50/H04-53) |
| | AO | 5 | |
| | GND | 6 | Analog input reference ground |
| | AI3 | 7 | Analog input signals Resolution: 12-bit (16-bit optional) Input voltage: maximum $\pm 12V$ |
| | AI2 | 8 | Analog input signals Resolution: 12 bit Input voltage: maximum $\pm 12V$ |
| | AI1 | 9 | |

Encoder Frequency-Division Output Signal

Table 2-3 Encoder frequency-division output signal specifications

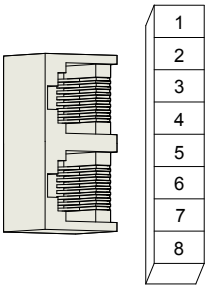
| Signal | Default Function | Pin No. | Function Description | |
|---------|------------------|---------|---|---|
| General | PAO+ | 21 | Phase A output signal | Phases A+B quadrature pulse output signal |
| | PAO- | 22 | | |
| | PBO+ | 25 | Phase B output signal | |
| | PBO- | 23 | | |
| | PZO+ | 13 | Phase Z output signal | Home pulse output signal |
| | PZO- | 24 | | |
| | PZ-OUT | 44 | Phase Z output signal | Home pulse OC output signal |
| | GND | 29 | Home pulse OC output signal ground | |
| | +5V | 15 | 5 V internal power supply Maximum output current: 200 mA | |
| GND | 16 | | | |
| PE | Housing | | | |

The encoder frequency-division output circuit outputs OC signals via the differential drive. Generally, it provides feedback signals to the host controller in the closed-loop position control system. A differential or optocoupler circuit shall be used in the host controller to receive feedback signals. The maximum output current is 20 mA.

2.3.3 Communication Signal Terminal Connectors CN3/CN4

The CN3/CN4 terminals of the servo drive are used for communication connection between the servo drive and the PC, PLC, and other servo drives. The following table describes the pin definitions of the CN3/CN4 terminals.

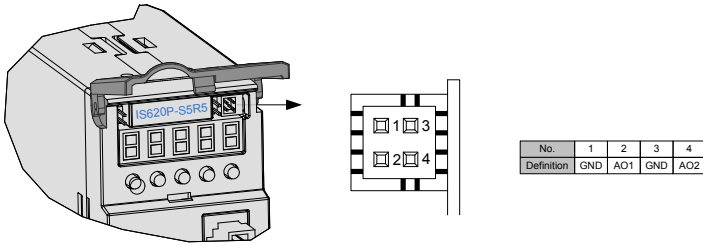
Table 2-4 Pin definition of communication signal terminal connectors

| Pin No. | Pin | Description | Pin Layout |
|---------|-----------|---|--|
| 1 | CANH | CAN communication port |  |
| 2 | CANL | | |
| 3 | CGND | CAN communication ground | |
| 4 | RS485+ | RS485 communication port | |
| 5 | RS485- | | |
| 6 | RS232-TXD | RS232 transmitting end, connected to the receiving end of the host controller | |
| 7 | RS232-RXD | RS232 transmitting end, connected to the sending end of the host controller | |
| 8 | GND | Ground | |
| Housing | PE | Shield | |

2.3.4 Analog Monitoring Signal Terminal Connector CN5

The following figure shows pin layout of the analog monitoring signal terminal connector CN5.

Figure 2-8 Analog monitoring signal terminal connector



Corresponding interface circuit:

Analog output: -10 to +10 V

Maximum output current: 1 mA

2.4 Cables and Options

2.4.1 Cable Model

Table 2-5 Servo motor cables

| Servo Motor Model | Encoder Cable | | | Connector Kit | | Optional Battery Kit for Absolute Encoder Motor |
|----------------------|---------------|--------------|---------------|----------------|------------------------------|---|
| | L = 3.0 m | L = 5.0 m | L = 10.0 m | Standard Motor | | |
| ISMG1(G2)-*****-U*** | S6-L-P01-3.0 | S6-L-P01-5.0 | S6-L-P01-10.0 | S6-C5 | CN1 connector | S6-C4 (battery, battery box, size G, H) S6-C9 (battery, battery box, size I) |
| | | | | | CN2 connector | |
| | | | | | 20-29 military spec. (elbow) | |
| ISMG1(G2)-*****-A3** | S6-L-P21-3.0 | S6-L-P21-5.0 | S6-L-P21-10.0 | S6-C6 | CN5 connector | |

Note

The encoder cable package of the servo motor includes the CN1 connector.

S6-C6 is DB15 connector kit including CN5 connector, and is used for fully closed-loop input.

If fully closed-loop is not required, only S6-C5 is necessary; if fully closed-loop is required, both S6-C5 and S6-C6 need to be purchased.

Table 2-6 Communication cables

| Model | Description |
|--------------|---|
| S6-L-T00-3.0 | Servo drive to PC communication cable |
| S6-L-T01-1.0 | Communication cable for multi-drive parallel connection |
| S6-L-T02-2.0 | Servo drive to PLC communication cable |
| S6-L-T03-0.0 | Plug for termination resistor for servo drive communication |

Table 2-7 Mounting options

| Model | Description |
|--------------|---|
| ISMG1-B01 | Mounting bracket for ISMG1 natural ventilation motor |
| ISMG2-B01 | Mounting bracket for ISMG2 natural ventilation motor |
| ISMG1-B02 | Mounting bracket for ISMG1 forced air ventilation motor |
| ISMG2-B02 | Mounting bracket for ISMG2 forced air ventilation motor |
| MD500-AZJ-T5 | Through-hole mounting bracket for SIZE-G servo drive |
| MD500-AZJ-T6 | Through-hole mounting bracket for SIZE-H servo drive |
| MD500-AZJ-T7 | Through-hole mounting bracket for SIZE-I servo drive |

2.4.2 Cable Connectors

Cables of Serial Incremental Encoder

Table 2-8 Connectors of 20-bit encoder cables on servo drive side

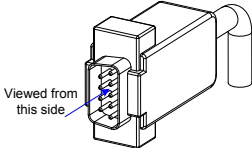
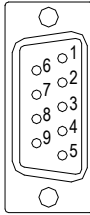
| Connector Appearance | Pin Layout | | | | | | | | | | | | |
|---|--|---------|--------|---|-----|---|-----|---|-----|---|-----|---------|----|
|  |  <table border="1" data-bbox="660 694 890 885"> <thead> <tr> <th>Pin No.</th> <th>Signal</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>PS+</td> </tr> <tr> <td>2</td> <td>PS-</td> </tr> <tr> <td>7</td> <td>+5V</td> </tr> <tr> <td>8</td> <td>GND</td> </tr> <tr> <td>Housing</td> <td>PE</td> </tr> </tbody> </table> <p>Recommendation: Plastic housing of plug on cable side: DB9P (SZTDK), black housing Core: DB9P soldering plug (SZTDK), blue glue</p> | Pin No. | Signal | 1 | PS+ | 2 | PS- | 7 | +5V | 8 | GND | Housing | PE |
| Pin No. | Signal | | | | | | | | | | | | |
| 1 | PS+ | | | | | | | | | | | | |
| 2 | PS- | | | | | | | | | | | | |
| 7 | +5V | | | | | | | | | | | | |
| 8 | GND | | | | | | | | | | | | |
| Housing | PE | | | | | | | | | | | | |

Table 2-9 Connectors of 20-bit encoder cables (MIL-DTL-5015 series 3108E20-29S military spec. plug)

| Connector Appearance and Pin Layout | | Frame Size of Matching Motor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------|----------------------------------|--------------|--------|--|---|-----|--------------|---|-----|---|-----|---|-----|---|----------|--|--|---------|--------|-------|--|---|-----|--------|--------------|---|-----|------|---|-----|-----|---|-----|-------|---|----------|--|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Pin No.</th> <th>Signal</th> <th></th> </tr> </thead> <tbody> <tr> <td>A</td> <td>PS+</td> <td rowspan="4">Twisted-pair</td> </tr> <tr> <td>B</td> <td>PS-</td> </tr> <tr> <td>G</td> <td>+5V</td> </tr> <tr> <td>H</td> <td>GND</td> </tr> <tr> <td>J</td> <td>Shielded</td> <td></td> </tr> </tbody> </table> | | Pin No. | | Signal | | A | PS+ | Twisted-pair | B | PS- | G | +5V | H | GND | J | Shielded | | <table border="1"> <thead> <tr> <th>Pin No.</th> <th>Signal</th> <th>Color</th> <th></th> </tr> </thead> <tbody> <tr> <td>A</td> <td>PS+</td> <td>Yellow</td> <td rowspan="4">Twisted-pair</td> </tr> <tr> <td>B</td> <td>PS-</td> <td>Blue</td> </tr> <tr> <td>G</td> <td>+5V</td> <td>Red</td> </tr> <tr> <td>H</td> <td>GND</td> <td>White</td> </tr> <tr> <td>J</td> <td>Shielded</td> <td></td> <td></td> </tr> </tbody> </table> | Pin No. | Signal | Color | | A | PS+ | Yellow | Twisted-pair | B | PS- | Blue | G | +5V | Red | H | GND | White | J | Shielded | |
| Pin No. | Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | PS+ | Twisted-pair | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | PS- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| G | +5V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H | GND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| J | Shielded | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pin No. | Signal | Color | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | PS+ | Yellow | Twisted-pair | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | PS- | Blue | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| G | +5V | Red | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H | GND | White | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| J | Shielded | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <p>100</p> <p>130</p> <p>180</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Note

rame size of motor: indicates the width of motor flange.

Table 2-10 Pin connection relation of IS650P series 20-bit encoder cables

| DB9 on Servo Drive Side | | Function Description | Motor Side | |
|-------------------------|---------|-------------------------------|---------------|------------------------------|
| Signal | Pin No. | | 9-pin Pin No. | 20-29 Military Spec. Pin No. |
| PS+ | 1 | Serial communication signal + | 3 | A |
| PS- | 2 | Serial communication signal - | 6 | B |
| +5V | 7 | Encoder +5V power supply | 9 | G |
| GND | 8 | Encoder +5V power ground | 8 | H |
| PE | Housing | Shield | 7 | J |

Observe the following precautions when wiring the encoder:

- Ground the servo drive and shielded layer of the servo motor reliably. Otherwise, the servo drive will report a false alarm.
- Do not connect cables to the reserved pins.
- To determine the length of the encoder cable, consider voltage drop caused by the cable resistance and signal attenuation caused by the distributed capacitance. It is recommended to use twisted-pair cable of size 26AWG or above (as per UL2464 standard) and with a length within 10 m.

Table 2-11 Recommended cable sizes

| Cable Size | Ω/km | Allowed Cable Length (m) |
|-------------------------------|--------------------|--------------------------|
| 26AWG (0.13 mm ²) | 143 | 10.0 |
| 25AWG (0.15 mm ²) | 89.4 | 16.0 |
| 24AWG (0.21 mm ²) | 79.6 | 18.0 |
| 23AWG (0.26 mm ²) | 68.5 | 20.9 |
| 22AWG (0.32 mm ²) | 54.3 | 26.4 |

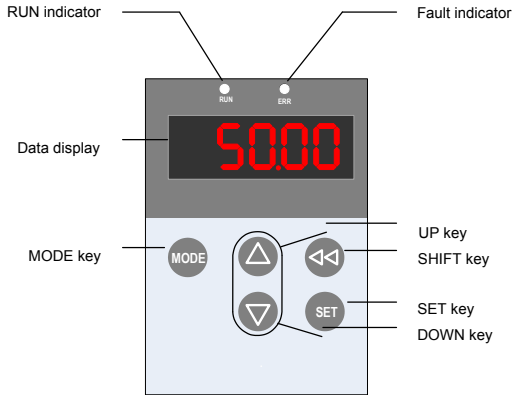
Note

If the cables of above 22AWG are required, contact Inovance.

Chapter 3 Operation and Display

3.1 Introduction to Keypad

Figure 3-1 Diagram of the keypad



The keypad on the servo drive consists of the 5-digit 7-segment LEDs and keys. The keypad is used for display, parameter setting, user password setting and general functions operations. When the keypad is used for parameter setting, the functions of the keys are described as follows.

Table 3-1 Functions of keys on the keypad

| Key Name | Function Description |
|----------|---|
| MODE | Switch between all modes. Return to the upper-level menu. |
| UP | Increase the number indicated by the blinking digit. |
| DOWN | Decrease the number indicated by the blinking digit. |
| SHIFT | Shift the blinking digit. View the high digits of the number consisting of more than 5 digits. |
| SET | Switch to the next-level menu. Execute commands such as storing parameter setting value. |

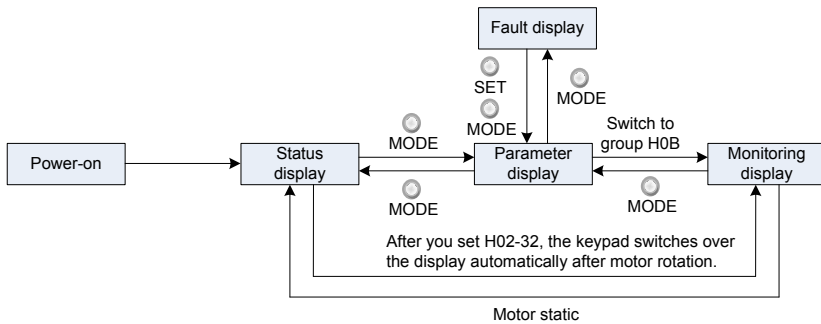
3.2 Keypad Display

The keypad can display the running status, parameter, faults, and monitored information during running of the servo drive.

- Status display: Displays the current servo drive status, such as servo ready or running.
- Parameter display: Displays function codes and their values.
- Fault display: Displays the fault and warnings occurring in the servo drive.
- Monitoring display: Displays the current running parameters of the servo drive.

3.2.1 Display Switchover

Figure 3-2 Switching between different display

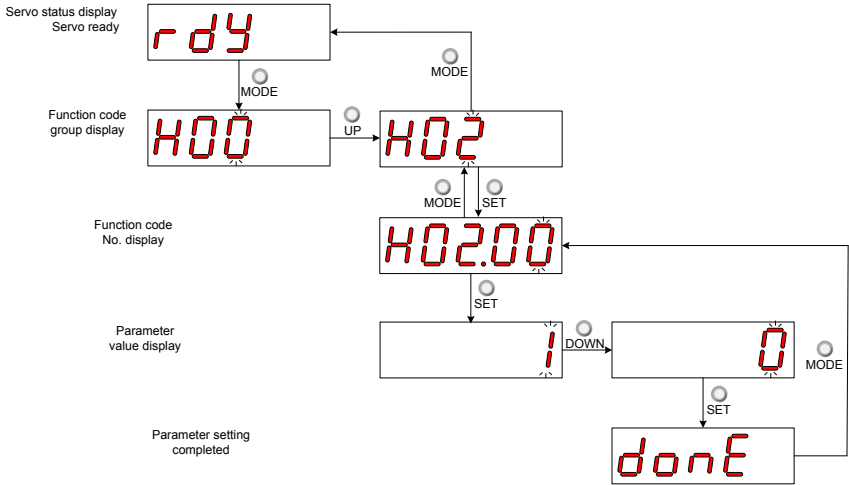


- After the power is on, the keypad enters the status display mode.
- Press key MODE to switch over between different modes, as shown in the preceding figure.
- In status display mode, set H02-32 and select the monitored parameters. When the motor rotates, the keypad automatically switches over to monitoring display. After the motor becomes stopped, the keypad automatically restores to status display.
- In parameter display mode, set group H0B and select the parameters to be monitored, and the keypad switches over to the monitoring display mode.
- Once a fault occurs, the keypad immediately enters the fault display mode, and all 5-digit LEDs blink. Press key SET to stop blinking, and then press key MODE to switch over to the parameter display mode.

3.3 Parameter Setting

Parameter setting can be performed on the keypad. For details on the parameters, refer to the IS650P User Manual. The following figure shows the keypad operation of switching the position control mode to the speed control mode after the power is on.

Figure 3-3 Keypad operation of parameter setting



- **MODE:** Switch the display mode and return to the upper-level menu.
- **UP/DOWN:** Increase or decrease the value of the current blinking digit.
- **SHIFT:** Shifting the blinking digit.
- **SET:** Store the current setting value or switch to the next-level menu.

After parameter setting is completed, that is, "Done" is displayed, press key **MODE** to return to the parameter group display (H02-00).

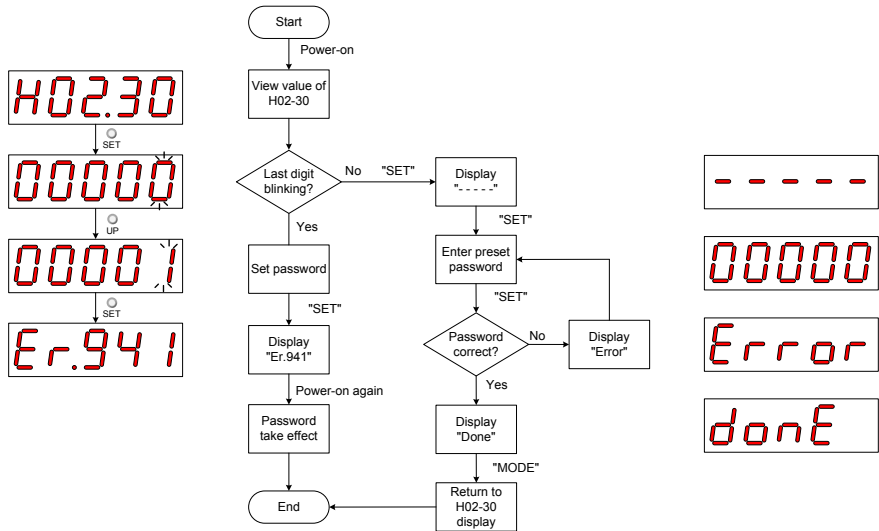
3.4 User Password

After the user password function (H02-30) is enabled, only the authorized user has the parameter setting rights; other operations can only view the parameters.

Setting User Password

The following figure shows the operation procedure of setting the password to "00001".

Figure 3-4 Keypad operation of user password setting

**Note**

*1: If the last digit does not blink, password protection is enabled. If the last digit blinks, password protection is disabled or the correct password has been entered.

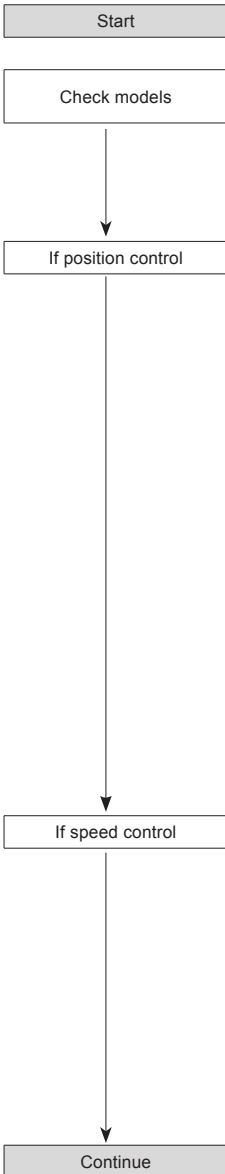
When modifying the user password, enter the correct password so that you have the rights of parameter setting. Enter H02-30 again, and you can set a new password according to the method described in the preceding figure.

Canceling User Password

Enter the existing user password, and set H02-30 to "00000". Then, the user password is cancelled.

Chapter 4 Quick Setup

The following part shows the quick setup flowchart.



| Para. | Parameter Name | Default | Commissioning |
|--------|--|-----------------|-----------------|
| H01-02 | Servo drive SN | Model dependent | Model dependent |
| H00-00 | Motor SN | 14000 | Model dependent |
| H02-00 | Control mode selection | 1 | |
| | 0: Speed mode 1: Position mode 2: Torque mode 3: Torque mode/Speed mode 4: Speed mode/Position mode 5: Torque mode/Position mode 6: Torque mode/Speed mode/Position mode | | |
| H05-00 | Position reference source | 0 | |
| | 0: Pulse input 1: Step setting 2: Multi-position reference | | |
| H05-01 | Pulse input terminal selection | 0 | |
| | 0: Low-speed terminals 1: High-speed terminals | | |
| H05-15 | Pulse input format | 0 | |
| | 0: Pulse + direction, positive logic 1: Pulse + direction, negative logic 2: Phase A + phase B quadrature pulse, 4-frequency multiplication 3: CW + CCW | | |
| H05-02 | Pulses per one motor revolution | 0 | |
| H02-00 | Control mode selection | 1 | 0 |
| | 0: Speed mode 1: Position mode 2: Torque mode 3: Torque mode/Speed mode 4: Speed mode/Position mode 5: Torque mode/Position mode 6: Torque mode/Speed mode/Position mode | | |
| H06-00 | Main speed reference A source | 0 | |
| | 0: Digital setting (H06-03) 1: AI1 2: AI2 | | |
| Para. | Parameter Name | Default | Commissioning |

4

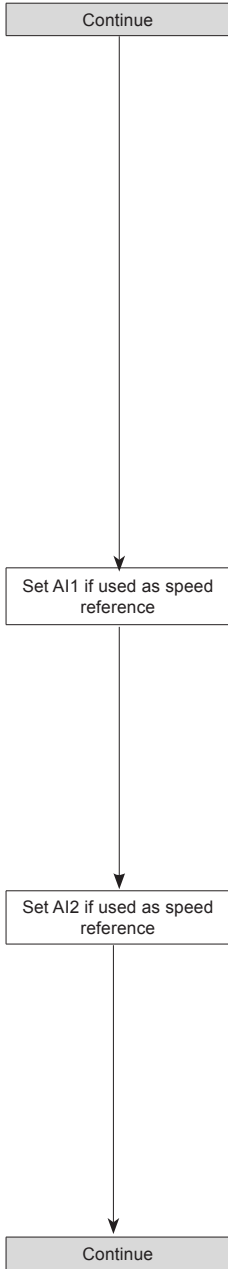
Continue

| Para. | Parameter Name | Default | Commissioning |
|--------|--|---------|---------------|
| H06-07 | Maximum speed limit | 6000 | |
| H02-00 | Control mode selection 0: Speed mode 1: Position mode 2: Torque mode 3: Torque mode/Speed mode 4: Speed mode/Position mode 5: Torque mode/Position mode 6: Torque mode/Speed mode/Position mode | 1 | 2 |
| H07-00 | Main torque reference A source 0: Digital setting (H07-03) 1: AI1 2: AI2 | 0 | |
| H07-19 | Positive speed limit/1st speed limit in torque control | 3000 | |
| H07-20 | Negative speed limit/2nd speed limit in torque control | 3000 | |
| H03-02 | DI1 function selection 14: P-OT (Forward limit switch) | 14 | |
| H03-03 | DI1 logic selection 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | 0 | |
| H03-04 | DI2 function selection 15: P-OT (Reverse limit switch) | 15 | |
| H03-05 | DI2 logic selection | 0 | |
| H03-06 | DI3 function selection 13: INHIBIT (Position reference inhibited) | 13 | |
| H03-07 | DI3 logic selection | 0 | |
| H03-08 | DI4 function selection 2: ALM-RST (Fault and warning reset) | 2 | |
| Para. | Parameter Name | Default | Commissioning |

If torque control

Set DI if DI used

Continue



| Para. | Parameter Name | Default | Commissioning |
|--------|------------------------------|---------|---------------|
| H03-09 | DI4 logic selection | 0 | |
| | 1: S-ON (Servo ON) | | |
| H03-10 | DI5 function selection | 1 | |
| H03-11 | DI5 logic selection | 0 | |
| | | | |
| H03-16 | DI8 function selection | 31 | |
| | 31: HomeSwitch (Home switch) | | |
| H03-17 | DI8 logic selection | 0 | |
| H03-18 | DI9 function selection | 0 | |
| | 0: No function | | |
| H03-19 | DI9 logic selection | 0 | |
| H03-80 | Speed corresponding to 10 V | 3000 | |
| | 0 to 6000 RPM | | |
| H03-54 | AI1 zero drift | 0 | |
| H03-53 | AI1 dead zone | 10 | |
| H03-51 | AI1 filter time constant | 10 | |
| H03-80 | Speed corresponding to 10 V | 3000 | |
| | 0 to 6000 RPM | | |
| H03-59 | AI2 zero drift | 0 | |
| H03-58 | AI2 dead zone | 10 | |
| H03-56 | AI2 filter time constant | 10 | |

4

Continue

Set AI1 if used as torque reference



Set AI2 if used as torque reference

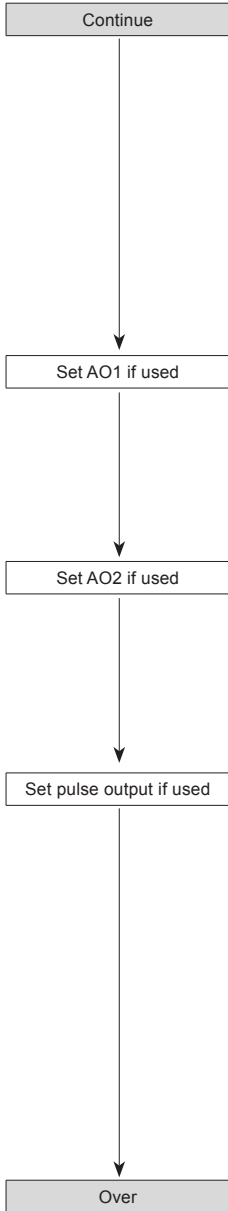


Set DO if DO used



Continue

| Para. | Parameter Name | Default | Commissioning |
|--------|---|---------|---------------|
| H03-81 | Torque corresponding to 10 V 1.0 to 8.0 times of rated torque | 1 | |
| H03-54 | AI1 zero drift | 0 | |
| H03-53 | AI1 dead zone | 10 | |
| H03-51 | AI1 filter time constant | 10 | |
| H03-81 | Torque corresponding to 10 V 1.0 to 8.0 times of rated torque | 1 | |
| H03-59 | AI2 zero drift | 0 | |
| H03-58 | AI2 dead zone | 10 | |
| H03-56 | AI2 filter time constant | 10 | |
| H04-01 | DO1 function selection 1: S-RDY (Servo ready) | 1 | |
| H04-02 | DO1 logic selection 0: Output low level when valid (optocoupler ON) 1: Output high level when valid (optocoupler OFF) | 0 | |
| H04-03 | DO2 function selection 5: COIN (Positioning completed) | 5 | |
| H04-04 | DO2 logic selection | 0 | |
| H04-05 | DO3 function selection 3: ZERO (Zero speed signal) | 3 | |
| H04-06 | DO3 logic selection | 0 | |
| Para. | Parameter Name | Default | Commissioning |



| Para. | Parameter Name | Default | Commissioning |
|--------|---|--|---------------|
| H04-07 | DO4 function selection | 11 | |
| | 11: ALM (Fault output) | | |
| H04-08 | DO4 logic selection | 0 | |
| | | | |
| H04-09 | DO5 function selection | 16 | |
| | 16: Home Attain (Home attaining output) | | |
| H04-10 | DO5 logic selection | 0 | |
| | | | |
| H04-50 | AO1 signal selection | 0 | |
| | 0: Motor speed | | |
| H04-51 | AO1 offset voltage | 5000 | |
| H04-52 | AO1 multiplying factor | 1 | |
| | | | |
| H04-53 | AO2 signal selection | 1 | |
| | 1: Speed reference | | |
| H04-54 | AO2 offset voltage | 5000 | |
| H04-55 | AO2 multiplying factor | 1 | |
| | | | |
| H05-38 | Servo pulse output source | 0 | 0 or 1 |
| H05-17 | Encoder frequency-division output | 0: Encoder frequency-division output 1: Pulse synchronous output 2: Frequency-division or synchronous output inhibited | |
| | Encoder frequency-division pulses | 2500 p/r | |
| H02-03 | Output pulse phase | 0 | |
| | 0: CCW direction as forward direction (phase A advancing phase B) 1: CW direction as forward direction (phase A lagging phase B) | | |
| H05-41 | Output polarity of Z pulse | 0 | |
| | 0: Positive (high level when pulse Z is valid) 1: Negative (low level when pulse Z is valid) | | |
| | | | |

Chapter 5 Troubleshooting

5.1 During Startup

5.1.1 Position Control

| During Startup | Fault Symptom | Cause | Confirming Methods |
|---|--|---|---|
| Connect control power L1C/L2C and main power L1/L2 and R/S/T. | The LED display is not on or does not display "rdy". | 1. The control power voltage is abnormal. | After disconnecting CN1, CN2, CN3 and CN4, the fault persists. Measure AC voltage between L1C and L2C. |
| | | 2. The main power voltage is abnormal. | For single-phase 220 V model, measure AC voltage between L1 and L2. When DC bus voltage amplitude (voltage between P_0 and \ominus) is lower than 200 V, "nrd" is displayed. For three-phase 220/380 V model, measure AC voltage between R, S and T. When DC bus voltage amplitude (voltage between P_0 and \ominus) is lower than 460 V, "nrd" is displayed. |
| | | 3. The program burning terminal is shorted. | Check whether the program burning terminal is shorted. |
| | | 4. The servo drive is faulty. | - |
| | The operation panel displays "Er. xxx". | Remove the fault. | After the preceding causes are removed, the operation panel should display "rdy". |
| Set the S-ON signal to ON. | The operation panel displays "Er. xxx". | Remove the fault. | |
| | Shaft of the servo motor is in free running status. | 1. The S-ON signal is invalid. | Set operation panel to servo status display and view whether the operation panel displays "rdy" rather than "run". Check whether any parameter in groups H03 and H17 is set for FunIN1(S-ON). If yes, check that the corresponding DI is set to ON. If not, allocate the function and set the corresponding DI to ON. See group H03 in Chapter 7 for details on setting of input terminal parameters. If a parameter in group H03 has been set for FunIN1(S-ON) and corresponding DI is ON, but the operation panel still displays "rdy". In this case, check whether the DI terminal is connected correctly by referring to Chapter 3 in the IS650P User Manual. |
| | | 2. Selection of control mode is incorrect. | Check whether H02-00 is set to 1. If it is set to 2 (torque mode), motor shaft must be in free running status because default torque reference is 0. |
| After the preceding causes are removed, the operation panel should display "run". | | | |

| During Startup | Fault Symptom | Cause | Confirming Methods |
|--|---|---|--|
| Input position reference. | Servo motor does not rotate. | Input reference pulse counter (H0B-13) is 0. | <p>High/low-speed pulse input terminal is wired incorrectly.</p> <p>When H05-00 = 0 (pulse is main position reference source), check whether high/low-speed pulse input terminal is wired correctly by referring to Chapter 3 in the IS650P User Manual. Meanwhile, check whether the setting of H05-01(reference pulse selection) is matched.</p> <p>Position reference is not input.</p> <ol style="list-style-type: none"> 1. Check whether FunIN.13: INHIBIT (pulse input forbidden) or FunIN.37: PulseInhibit (pulse forbidden) is used. 2. When H05-00 = 0 (pulse is main position reference source), host computer or other pulse generator does not output pulses. Check whether there are pulses into high/low-speed pulse input terminal. Please refer to the IS650P User Manual. 3. When H05-00 = 1 (step reference is main position reference source), check whether H05-05 (step amount) is 0. If not, check whether FunIN.20: PosStep (DI position step reference) has been allocated and whether logic of corresponding terminal is valid. <p>When H05-00 = 2 (multi-position reference is main position reference source), check whether parameters in group H11 are set correctly. If yes, , check whether FunIN.28: PosInSen (internal multi-position enable) has been allocated and whether logic of corresponding terminal is valid.</p> <ol style="list-style-type: none"> 5. If position change on fly is used, check whether H05-29 (position change on fly unlock) is set to 1(enabled). If yes, check whether FunIN.29: XintFree (position change on fly unlocked) is used. |
| | Servo motor rotates in reverse direction. | Input reference pulse counter (H0B-13) is negative. | <p>When H05-00 = 0 (pulse is main position reference source), check whether the setting of H05-15 (reference pulse form) is consistent with actual pulse input. If not, it indicates that H05-15 is set incorrectly or terminal wiring is incorrect.</p> <p>When H05-00 = 1 (step reference is main position reference source), check whether H05-05 (step amount) is positive or negative.</p> <p>When H05-00 = 2 (multi-position reference is main position reference source), check whether each displacement is positive or negative.</p> <p>When H05-00 = 2 (multi-position reference is main position reference source), check whether each displacement is positive or negative.</p> <p>Check whether H02-02 (rotation direction selection) is set correctly.</p> |
| Servo motor can rotate after preceding fault is removed. | | | |

| During Startup | Fault Symptom | Cause | Confirming Methods |
|-----------------------------------|---|---|--|
| Servo motor jitters at low speed. | Motor speed is not steady. | The gain is set improperly. | Perform automatic gain tuning. |
| | Motor shaft vibrates left and right. | The load inertia ratio (H08-15) is too large. | If servo motor can run safely, perform inertia auto-tuning and perform automatic gain tuning. |
| | After preceding causes are removed, servo motor can operate normally. | | |
| Servo system runs normally. | Positioning inaccurate | Unsatisfactory position deviation is generated. | Confirm input reference pulse counter (H0B-13), feedback pulse counter (H0B-17) and mechanical stop position according to the following steps. |

5.1.2 Speed Control

| During Startup | Fault Symptom | Cause | Confirming Methods |
|---|---|---|--|
| Connect control power L1C/L2C and main power L1/L2 and R/S/T. | The LED display is not on or does not display "rdy". | 1. Control power voltage is abnormal. | After disconnecting CN1, CN2, CN3 and CN4, the fault persists. Measure AC voltage between L1C and L2C. |
| | | 2. Main power voltage is abnormal. | For single-phase 220 V mode, measure AC voltage between L1 and L2. When DC bus voltage amplitude (voltage between P_{\oplus} and \ominus) is lower than 200 V, "nrd" is displayed. For three-phase 220/380 V model, measure AC voltage between R, S and T. When DC bus voltage amplitude (voltage between P_{\oplus} and \ominus) is lower than 460V, "nrd" is displayed. |
| | | 3. The program burning terminal is shorted. | Check whether the program burning terminal is shorted. |
| | | 4. The servo drive is faulty. | - |
| | The operation panel displays "Er. xxx". | Remove the fault. | |
| | After the preceding causes are removed, the operation panel should display "rdy". | | |

| During Startup | Fault Symptom | Cause | Confirming Methods |
|----------------------------|---|--|--|
| Set the S-ON signal to ON. | The operation panel displays "Er. xxx". | Remove the fault. | |
| | Shaft of the servo motor is in free running status. | 1. The S-ON signal is invalid. | <p>Set operation panel to servo status display and view whether the operation panel displays "rdy" rather than "run".</p> <p>Check whether any parameter in groups H03 and H17 is set for FunIN1(S-ON). If yes, check that the corresponding DI is set to ON. If not, allocate the function and set the corresponding DI to ON. See group H03 in Chapter 7 for details on setting of input terminal parameters.</p> <p>If a parameter in group H03 has been set for FunIN1(S-ON) and logic of corresponding DI is logic, but the operation panel still displays "rdy". In this case, check whether the DI terminal is connected correctly by referring to Chapter 3 in the IS650P User Manual.</p> |
| | | 2. Selection of control mode is incorrect. | Check whether H02-00 is set to 0. If it is set to 2 (torque mode), motor shaft must be in free running status because default torque reference is 0. |
| | After the preceding causes are removed, the operation panel should display "run". | | |

| During Startup | Fault Symptom | Cause | Confirming Methods |
|-----------------------|---|--------------------------------|---|
| Input speed reference | Servo motor does not rotate or the motor speed is abnormal. | Speed reference (H0B-01) is 0. | <p>AI wiring is incorrect.</p> <p>When speed reference is input from AI, check whether the analog input channel is selected correctly and check whether the selected AI terminal is wired correctly by referring to Chapter 3 in the IS650P User Manual.</p> <p>Speed reference selection is incorrect.</p> <p>Check whether H06-02 (speed reference selection) is set correctly.</p> <p>Speed reference is not input or is abnormal.</p> <ol style="list-style-type: none"> 1. When AI is selected to input speed reference, check whether AI related parameters in group H03 are set correctly first. Then check whether input voltage is correct by observing voltage on oscilloscope or viewing AI sampling voltage in H0B-21 or H0B-22. 2. When digital setting is used to set speed reference, check whether H06-03 (keypad setting value of speed reference) is set correctly. 3. When multi-speed is used to set speed reference, check whether the parameters in group H12 are set correctly. 4. When serial comms. is used to set speed reference, check whether H31-09 (speed reference set via communication) is set correctly. 5. When jog speed reference is used to set speed reference, check whether H06-04 (jog speed setting value) is set correctly, whether DI functions FunIN.18: JOGCMD+ (forward jog) and FunIN.19: JOGCMD- (reverse jog) have been allocated and whether logic of corresponding DIs is valid. 6. Check whether H06-05 (acceleration ramp time constant of speed reference) and H06-06 (deceleration ramp time constant of speed reference) are set correctly. 7. Check whether the DI function FunIN.12: ZCLAMP (zero speed clamp function) is misallocated and whether valid logic of corresponding DI is corrected. |

| During Startup | Fault Symptom | Cause | Confirming Methods |
|-----------------------------------|--|---|--|
| Input speed reference | Servo motor rotates in reverse direction. | Speed reference (H0B-01) is negative. | <p>1. When AI is selected to input speed reference, check whether polarity of input signal is reverse.</p> <p>2. When digital setting is used to set speed reference, check whether H06-03 (keypad setting value of speed reference) is smaller than 0.</p> <p>3. When multi-speed is used to set speed reference, check whether speed references in group H12 are positive or negative.</p> <p>4. When serial comms. is used to set speed reference, check whether H31-09 (speed reference set via communication) is smaller than 0.</p> <p>When jog speed reference is used to set speed reference, check value of H06-04 (jog speed setting value). Then check whether effective logic of DI functions FunIN.18: JOGCMD+ (forward jog) and FunIN.19: JOGCMD- (reverse jog) matches the predicted rotating direction.</p> <p>Check whether DI function FunIN.26: SpdDirSel (speed reference direction) has been allocated and whether logic of corresponding DI is valid.</p> <p>Check whether H02-02 (rotation direction selection) is set correctly.</p> |
| | Servo motor can rotate after preceding fault is removed. | | |
| Servo motor jitters at low speed. | Motor speed is not steady. | The gain is set unreasonably. | Perform automatic gain tuning. |
| | Motor shaft vibrates left and right. | The load inertia ratio (H08-15) is too large. | If servo motor can run safely, perform inertia auto-tuning and perform automatic gain tuning. |

5.1.3 Torque Control

| During Startup | Fault Symptom | Cause | Confirming Methods | |
|---|---|---|---|--|
| Connect control power L1C/L2C and main power L1/L2 and R/S/T. | The LED display is not on or does not display Rdy. | 1. The control power voltage is abnormal. | After disconnecting CN1, CN2, CN3 and CN4, the fault persists. Measure AC voltage between L1C and L2C. | |
| | | 2. The main power voltage is abnormal. | For single-phase 220 V mode, measure AC voltage between L1 and L2. When DC bus voltage amplitude (voltage between P ₊ and ⊖) is lower than 200 V, "nrd" is displayed. For three-phase 220/380 V model, measure AC voltage between R, S and T. When DC bus voltage amplitude (voltage between P ₊ and ⊖) is lower than 460V, "nrd" is displayed. | |
| | | 3. The program burning terminal is shorted. | Check whether the program burning terminal is shorted. | |
| | | 4. The servo drive is faulty. | - | |
| | The operation panel displays "Er. xxx". | Remove the fault. | After the preceding causes are removed, the operation panel should display "rdy". | |
| Set the S-ON to ON. | The operation panel displays "Er. xxx". | Remove the fault. | | |
| | Shaft of the servo motor is in free running status. | 1. The S-ON signal is invalid. | Set operation panel to servo status display and view whether the operation panel displays "rdy" rather than "run". Check whether any parameter in groups H03 and H17 is set for FunIN1(S-ON). If yes, check that the corresponding DI is set to ON. If not, allocate the function and set the corresponding DI to ON. See group H03 in Chapter 7 for details on setting of input terminal parameters. If a parameter in group H03 has been set for FunIN1(S-ON) and logic of corresponding DI is logic, but the operation panel still displays "rdy". In this case, check whether the DI terminal is connected correctly by referring to Chapter 3 in the IS650P User Manual. | |
| | | | After the preceding causes are removed, the operation panel should display "run". | |

| During Startup | Fault Symptom | Cause | Confirming Methods |
|-----------------------------------|--|---|--|
| Input torque reference | Servo motor does not rotate. | Internal torque reference (H0B-02) is 0. | <p>AI wiring is incorrect.</p> <p>When AI is selected to input torque reference, check whether polarity of input signal is reverse.</p> <p>Selection of torque reference is incorrect.</p> <p>Check whether H07-02 (torque reference source) is set correctly.</p> <p>Torque reference is not input.</p> <ol style="list-style-type: none"> When AI is selected to input torque reference, check whether AI related parameters in group H03 are set correctly first. Then check whether input voltage is correct by observing voltage on oscilloscope or reading the value of H0B-21 or H0B-22. When digital setting is used to set torque reference, check whether H07-03 (keypad setting value of torque reference) is set correctly. When serial comms. is used to set torque reference, check whether H31-11 (torque reference set via communication) is set correctly. |
| | Servo motor rotates in reverse direction. | Internal torque reference (H0B-02) is negative. | <ol style="list-style-type: none"> When AI is selected to input torque reference, check whether polarity of external voltage input signal is reverse. You can confirm it by using an oscilloscope or viewing H0B-21 or H0B-22. When digital setting is used to set torque reference, check whether H07-03 (keypad setting value of torque reference) is smaller than 0. When serial comms. is used to set torque reference, check whether H31-11 (torque reference set via communication) is smaller than 0. Check whether DI function FunIN.25: ToqDirSel (torque reference direction) has been allocated and whether logic of corresponding DI is valid. Check whether H02-02 (rotation direction selection) is set correctly. |
| | Servo motor can rotate after preceding fault is removed. | | |
| Servo motor jitters at low speed. | Motor speed is not steady. | The gain is set unreasonably. | Perform automatic gain tuning. |
| | Motor shaft vibrates left and right. | The load inertia ratio (H08-15) is too large. | If servo motor can run safely, perform inertia auto-tuning and perform automatic gain tuning. |

5.2 During Running

5.2.1 Troubleshooting of Faults

Er.101: Groups H02 and above parameters abnormal

| Cause | Confirming Methods | Corrective Action |
|--|---|---|
| 1. The control power voltage drops instantaneously. | Check whether it is in the process of cutting off control power (L1C, L2C) or whether instantaneous power failure occurs. | Restore default setting (H02-31 = 1), and write the parameters again. |
| | Measure whether the control power voltage on the non-drive side is within the following specifications: 220 V AC drive: Valid value: 220 to 240 V Allowed error: -10% to 10% (198 to 264 V) 380V AC drive: Valid value 380 to 480 V Allowed error: -10% to 10% (342 to 528 V) | Increase power capacity or replace with large-capacitance power supply, restore default setting (H02-31 = 1), and write the parameters again. |
| 2. Instantaneous power failure occurs during parameter storage. | Check whether instantaneous power failure occurs during parameter storage. | Re-power on the system, restore default setting (H02-31 = 1), and write the parameters again. |
| 3. The times of parameter writing within a certain period exceeds the limit. | Check whether parameter update is performed frequently from the host controller. | Change parameter writing method and write parameters again. If servo drive is faulty, replace it |
| 4. The software is upgraded. | Check whether software is upgraded. | Set servo drive model and servo motor model again, and restore default setting (H02-31 = 1). |
| 5. The servo drive is faulty. | If the fault persists after you power on servo drive several times and restore default setting, it indicates that the servo drive is faulty. | Replace the servo drive. |

Er.102: Programmable logic configuration fault

| Cause | Confirming Methods | Corrective Action |
|---|---|---|
| 1. The FPGA software version and the MCU software version do not match. | View the MCU software version (H1-00) and the FPGA software version (H1-01) via operating panel or drive debugging platform of Inovance. Check whether the non-zero numbers of the most significant bit of the versions are consistent. | Contact Inovance for technical support. Update matching FPGA or MCU software. |
| 2. The FPGA is faulty. | The fault persists after you power on the servo drive several times. | Replace the servo drive. |

Er.104: Programmable logic interruption

| Cause | Confirming Methods | Corrective Action |
|---|--|--------------------------|
| 1. The FPGA is faulty (E4.104). | The fault persists after you power on the servo drive several times. | Replace the servo drive. |
| 2. The communication between the FPGA and the MCU is abnormal (Er.100). | | |
| 3. The drive internal operation times out (Er.940). | | |

Er.105: Internal program abnormal

| Cause | Confirming Methods | Corrective Action |
|-------------------------------|--|---|
| 1. An EEPROM fault occurs. | Check causes according to the method of Er.101. | Restore default setting (H02-31 = 1), and power on the servo drive again. |
| 2. The servo drive is faulty. | The fault persists after you power on servo drive several times. | Replace the servo drive. |

Er.108: Parameter storage fault

| Cause | Confirming Methods | Corrective Action |
|--------------------------------|--|---|
| 1. EEPROM writing is abnormal. | Modify a parameter, power on servo drive again, and check whether modification is saved. | If modification is not saved and the fault persists after servo drive is powered on several times, replace the servo drive. |
| 2. EEPROM reading is abnormal. | | |

Er.120: Product model matching fault

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| 1. Product (motor or servo drive) SN does not exist. | View servo drive and servo motor nameplates to check that the equipment you are using is IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance. Meanwhile, check whether H00-00 (Motor SN) is 14000. | Servo motor SN does not exist. If you use IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance, ensure that H00-00 = 14000. |
| | View servo drive SN (H01-02) and check whether servo drive SN exists. | Servo drive SN does not exist. Set servo drive SN correctly. |
| Power class of servo motor and servo drive does not match. | Check whether servo drive SN (H01-02) and serial encoder motor SN (H00-05) match. | Replace unmatched product. |

5

Er.121: S-ON signal invalid

| Cause | Confirming Methods | Corrective Action |
|--|--|---|
| When servo drive is enabled internally, external S-ON signal is valid. | Check whether auxiliary functions (H0D-02, H0D-03, H0D-12) are used and whether DI function FunIN.1: S-ON is ON. | Set DI function FunIN.1: S-ON (both hardware DI and virtual DI) to OFF. |

Er.122: Product matching fault in absolute position mode

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| The motor in absolute position mode does not match or motor SN is set incorrectly. | Check whether motor nameplate is multi-turn absolute encoder motor. Check whether H00-00 (motor SN) is correct. | Set H00-00 correctly or replace matching motor according to motor nameplate. |

Er.130: Different DIs allocated with the same function

| Cause | Confirming Methods | Corrective Action |
|--|---|---|
| 1. The same function is allocated to different DIs. | Check whether parameters in groups H03 (H03-02 to H03-20) and H17 (H17-00 to H17-30) are set for the same non-zero DI function. | Re-allocate the parameters that have been allocated with the same non-zero DI function with different DI functions. Then re-connect control power to make modification take effect. Or set the S-ON signal to OFF and give the reset signal to make modification take effect. |
| 2. The DI function No. exceeds the number of DI functions. | Check whether MCU program is updated. | Restore default setting (H02-31 = 1), and power on the servo drive again. |

Er.131: Number of DO functions exceeding the limit

| Cause | Confirming Methods | Corrective Action |
|--|---------------------------------------|---|
| 1. The DO function No. exceeds the number of DO functions. | Check whether MCU program is updated. | Restore default setting (H02-31 = 1), and power on the servo drive again. |

Er.136: Data check error or no parameter stored in the motor ROM

| Cause | Confirming Methods | Corrective Action |
|---|---|---|
| 1. Servo drive model and servo motor model do not match. | View servo drive and servo motor nameplates to check that the equipment you are using is IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance. | Replace matched servo drive and servo motor and power on the system again. If you use IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance, ensure that H00-00 = 14000. |
| 2. A parameter check error occurs or no parameter is stored in the serial encoder ROM memory. | Check whether encoder cable you use is standard configuration of Inovance. For cable specification, refer to Chapter 3 in the IS650P User Manual. The cable must not scratch, break or be in poor contact. The cable must be connected reliably. Measure signals PS+, PS-, +5V and GND at both ends of encoder cable and observe whether signals at both ends are consistent. For definition of signals, refer to Chapter 3 in the IS650P User Manual. | Ensure that encoder cable you use is configured by Inovance as standard. Ensure that the cable is connected to the motor securely and tighten the screw on the drive side. If necessary, use a new encoder cable. Never bundle encoder cable and power cables (RST, UVW) together. |
| 3. Servo drive faulty. | The fault persists after servo drive is powered on again. | Replace the servo drive. |

Er.201: Overcurrent 2

| Cause | Confirming Methods | Corrective Action |
|--|---|---|
| 1. References are input simultaneously at servo startup or reference input is too quick. | Check whether an reference is input before the keypad displays "rdy". | The time sequence is: after the keypad displays "rdy", set the S-ON signal (S-ON) to ON and then input reference. If allowed, add reference filter time constant or increase acceleration/deceleration time. |

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| 2. The regenerative resistor is too small or short circuited. | <p>If internal regenerative resistor is used (H02-25 = 0), check whether R_b and D are connected with a cable reliably. If yes, measure resistance between C and D.</p> <p>If external regenerative resistor is used (H02-25 = 1/2), measure resistance between R_b and C.</p> <p>For regenerative resistor specification, refer to Chapter 1.</p> | <p>If internal regenerative resistor is used and the resistance is 0, use external regenerative resistor (H02-25 = 1/2) and remove cable between R_b and D. select external regenerative resistor of the same resistance and power as internal regenerative resistor.</p> <p>If external regenerative resistor is used and the resistance is smaller than H02-21 (allowed minimum value of regenerative resistor), connect a new regenerative resistor between R_b and C.</p> <p>Make H02-26 (power of external regenerative resistor) and H02-27 (resistance of external regenerative resistor) consistent with external regenerative resistor specification.</p> |
| 3. Motor cables are in poor contact. | Check whether power cables of servo drive and motor UVW cables are loose. | Fasten the cables that become loose or are disconnected. |
| 4. Motor cables are grounded. | After ensuring power cables of servo drive and motor cables are connected securely, measure insulation resistance between UVW of servo drive and ground cable (PE) and check whether insulation resistance is MΩ-level. | Replace motor if insulation is poor. |
| 5. Motor UVW cables are short circuited. | Disconnect motor cables and check whether motor cables (U, V, W) are short circuited and whether burrs exist. | Connect motor cables correctly. |
| 6. Motor is damaged. | Disconnect motor cables and measure whether resistance between motor cables UVW is balanced. | Replace motor if resistance is unbalanced. |
| 7. The gain setting is improper and motor oscillates | Check whether motor oscillates or generates a shrill noise during motor startup and running. You can view current feedback by using the drive Inovance servo commissioning software. | Adjust the gain. |
| 8. Encoder cable is incorrectly wired, corrosive, or connected loosely. | <p>Check whether encoder cable you use is standard configuration of Inovance. check whether cable is aging, corrosive or is connected loosely.</p> <p>Set the S-ON signal to OFF and rotate motor shaft manually. Check whether H0B-10 (electric angle) changes as motor rotates.</p> | Re-weld, fasten or replace encoder cable. |
| 9. Servo drive faulty. | The fault persists after motor cables are disconnected and servo drive is powered on again. | Replace the servo drive. |

Er.207: Shaft D/Q current overflow

| Cause | Confirming Methods | Corrective Action |
|---------------------------------|--|--------------------------|
| 1. Shaft D/Q current overflows. | If the fault persists after you power on servo drive several times and restore default setting, it indicates that the servo drive is faulty. | Replace the servo drive. |

Er.208: FPGA system sampling operation timeout

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| 1. MCU communication times out. | Internal fault code H0B-45 = 1208. Internal chip is damaged. | Replace the servo drive. |
| 2. Communication with encoder times out. | Internal fault code H0B-45 = 2208. Encoder wiring is incorrect. Encoder cable becomes loose. Encoder cable is too long. Communication with encoder is interrupted. The encoder is faulty. | Use encoder cable that is configured as standard by Inovance. If not, check whether encoder cable comply with specification and whether it is shielded twisted pair cable. Check whether plugs at both ends of encoder are in good contact and whether any pin retracts. Contact the manufacturer. Do not bundle motor cables and encoder cables together. Ensure servo motor and servo drive are well grounded. Replace servo motor. |
| 3. Current sampling times out. | Internal fault code H0B-45 = 3208. Check whether there is large equipment generating interference on site and whether there are multiple interference sources in the cabinet. Internal current sampling chip is damaged. | Separate heavy current from light current and do not bundle them together. Replace the servo drive. |
| 4. High-accuracy AD conversion times out. | Internal fault code H0B-45 = 4208. Interference exists in high-accuracy AI channel. Check AI wiring according to correct wiring diagram. | Use shielded twisted pair cable and shorten cable length. |
| 5. FPGA operation times out. | Internal fault code H0B-45 = 0208. Remove the cause according to preceding 1/2/3/4. | Perform corrective action according to preceding 1/2/3/4. |

Er.210: Output short-circuit to ground

| Cause | Confirming Methods | Corrective Action |
|--|---|--|
| 1. Power output cables (UVW) of servo drive are short-circuited to ground. | Disconnect Uvw cables from motor, and measure whether motor Uvw cables are short-circuited to ground. | Re-connect these cables or replace them. |
| 2. Motor is short-circuited to ground. | After ensuring power cables of servo drive and motor cables are connected securely, measure insulation resistance between Uvw of servo drive and ground cable (PE) and check whether insulation resistance is MΩ-level. | Replace servo motor. |
| 3. Servo drive faulty. | Remove power cables from servo drive. The fault persists after the drive is powered on several times. | Replace the servo drive. |

Er.220: Phase sequence incorrect

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| 1. The UVW phase sequence of the drive is inconsistent with that of the motor. | Carry out power-off and power-on for several times, and Er.220 persists after auto-tuning. | Perform the wiring again and then angle auto-tuning. |

Er.234: Runaway

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| 1. UVW phase sequence is incorrect. | Check whether UVW phase sequence on servo drive is consistent with that on motor side. | Connect UVW cables according to correct phase sequence. |
| Motor rotor initial phase detection is incorrect due to interference at power-on. | UVW phase sequence is correct. But Er.234 occurs once servo drive is enabled. | Re-power on the servo system. |
| 3. Encoder type is set incorrectly or wiring is incorrect. | View servo drive and servo motor nameplates to check that the equipment you are using is IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance. | Replace matching servo drive and servo motor. If you use IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance, ensure that H00-00 = 14000. Re-confirm motor model, encoder type and encoder wiring. |
| 4. Encoder cable is incorrectly wired, corrosive, or connected loosely. | Check whether encoder cable you use is standard configuration of Inovance. Check whether cable is aging, corrosive or is connected loosely. Set the S-ON signal to OFF and rotate motor shaft manually. Check whether H0B-10 (electric angle) changes as motor rotates. | Re-weld, fasten or replace encoder cable. |
| 5. When controlling a vertical shaft, gravity load is too large. | Check whether load of vertical shaft is too large. Adjust brake parameters H02-09 to H02-12 and then see whether the fault is removed. | Reduce load of vertical shaft, improve rigidity or shield this fault on the prerequisite of not affecting safety and use. |

**CAUTION**

On working condition of controlling a vertical shaft or one motor dragging the other, set H0A-12 = 0 to shield the runaway fault.

Er.400: Main circuit overvoltage

| Cause | Confirming Methods | Corrective Action |
|--|---|---|
| 1. Main circuit input voltage is too high | Check power input specification of servo drive. Measure RST input voltage on servo drive side and check whether input voltage complies with the following specification. 220 V AC drive: Valid value: 220 to 240 V Allowed error: -10% to 10% (198 to 264 V) 380V AC drive: Valid value: 380 to 480 V Allowed error: -10% to 10% (342 to 528 V) | Replace power supply or adjust power voltage according to specification on the left. |
| 2. Power supply is instable or affected by the lightning strike. | Check whether power supply is instable, affected by lightning strike or satisfies preceding specification. | Connect a surge suppressor and then connect power supply. If the fault persists, replace the servo drive. |

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| 3. The regenerative resistor fails. | <p>If internal regenerative resistor is used (H02-25 = 0), check whether P_b and D are connected with a cable reliably. If yes, measure resistance between C and D.</p> <p>If external regenerative resistor is used (H02-25 = 1/2), measure resistance between P_b and C.</p> <p>For regenerative resistor specification, refer to Chapter 1.</p> | <p>If resistance is ∞, wire breaking occurs.</p> <p>If internal regenerative resistor is used and resistance is 0, use external regenerative resistor (H02-25 = 1/2) and remove cable between P_b and D. Select external regenerative resistor of the same resistance and power as internal regenerative resistor.</p> <p>If external regenerative resistor is used, connect a new regenerative resistor between P_b and C.</p> <p>Make H02-26 (power of external regenerative resistor) and H02-27 (resistance of external regenerative resistor) consistent with external regenerative resistor specification.</p> |
| Resistance of the regenerative resistor is too large, and energy absorption during braking is insufficient. | <p>Measure resistance of the external regenerative resistor between P_b and C. Compare the measured value with the recommended value.</p> | <p>Connect a new external regenerative resistor of recommended resistance between P_b and C.</p> <p>Make H02-26 (power of external regenerative resistor) and H02-27 (resistance of external regenerative resistor) consistent with external regenerative resistor specification.</p> |
| Motor is in abrupt acceleration/ deceleration status. Maximum braking energy exceeds energy absorption value. | <p>Confirm acceleration/deceleration time during running and measure DC bus voltage between P_b and \ominus. Check whether voltage exceeds fault level during deceleration.</p> | <p>First, ensure that input voltage of main circuit is within specification. Then increase/decrease acceleration/deceleration time in allowed range.</p> |
| Bus voltage sampling value has a large deviation from the measured value | <p>Check whether H0B-26 (bus voltage) is within the following specification: 220 V drive: H0B-26 > 420 V 380 V drive: H0B-26 > 760V</p> <p>Measure the DC bus voltage between P_b and \ominus. Check whether the DC bus voltage is normal and smaller than H0B-26.</p> | <p>Contact Inovance for technical support.</p> |
| 7. The servo drive is faulty. | <p>The fault persists after main circuit is powered on several times.</p> | <p>Replace the servo drive.</p> |

Er.410: Main circuit undervoltage

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| 1. The main power is unstable or fails. | Check power input specification of servo drive. Measure RST input voltage on servo drive side and check whether input voltage complies with the following specification. 220 V AC drive: Valid value: 220 to 240 V | Increase power capacity. For details, refer to Chapter 1 in the IS650P User Manual. |
| 2. Instantaneous power down occurs. | Allowed error: -10% to 10% (198 to 264 V) 380V AC drive: Valid value: 380 to 480 V Allowed error: -10% to 10% (342 to 528 V) All the three phases must be measured. | |
| 3. Voltage dip occurs during running. | Check power input voltage and check whether main power is applied to other devices, resulting insufficient power capacity and voltage dip. | |
| 4. Phase loss exists: Single-phase power is applied to three-phase servo drive. | Check whether main circuit RST wiring is correct and reliable, and whether phase loss fault detection (H0A-00) is shielded. | Replace cables and connect main circuit correctly. Three phases: R, S, T Single-phase: L1, L2 |
| 5. The servo drive is faulty. | Check whether H0B-26 (bus voltage) is within the following specification: 220V drive: H0B-26 < 200 V 380 V drive: H0B-26 < 380 V The fault persists after main circuit is powered on several times. | Replace the servo drive. |

Er.420: Power cable phase loss

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| The RST cables are not connected well. | Check whether RST cables on servo drive side and non-servo drive side are in good condition and connected securely. | Replace cables and connect main circuit correctly. |
| 2. Single-phase power is applied to three-phase servo drive. | Confirm power input specification and actual input voltage. Check whether input voltage of each phase of main circuit satisfies the following specification: 220 V AC drive: Valid value: 220 to 240 V Allowed error: -10% to 10% (198 to 264 V) | For servo drive of 0.75 kW (H01-02 = 5), it can be applied by single-phase power supply. If input voltage satisfies specification on the left, set H0A-00 = 2 (forbid faults and warnings). If input voltage does not satisfy specification on the left, replace or adjust power capacity. |
| 3. Three-phase voltage is unbalanced or voltages of all three phases are too low. | 380V AC drive: Valid value: 380 to 480 V Allowed error: -10% to 10% (342 to 528 V) All the three phases must be measured.. | |
| 4. The servo drive is faulty. | The fault persists after main circuit (R, S, T) is powered on several times. | Replace the servo drive. |

Er.430: Control power undervoltage

| Cause | Confirming Methods | Corrective Action |
|--|---|--|
| 1. The control power is unstable or fails. | Check whether it is in the process of cutting off the control power (L1C, L2C) or instantaneous power failure occurs. | Re-power on the servo drive. If the fault is abnormal power failure, keep power supply stable. |
| | Check whether input voltage of control cables satisfies the following specification: 220 V AC drive: Valid value: 220 to 240 V Allowed error: -10% to 10% (198 to 264 V) 380V AC drive: Valid value: 380 to 480 V Allowed error: -10% to 10% (342 to 528 V) | Increase power capacity. |
| 2. The control power cables are in poor contact. | Check whether control cables are well connected and whether voltage of control cables (L1C, L2C) satisfies preceding specification. | Re-connect or replace control power cables. |

Er.500: Overspeed

Cause:

Actual speed of servo motor exceeds overspeed level.

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| 1. UVW phase sequence is incorrect. | Check whether UVW phase sequence on servo drive is consistent with that on motor side. | Connect UVW cables according to correct phase sequence. |
| 2. The setting of H0A-08 is incorrect. | Check whether overspeed level is smaller actual maximum motor speed. Overspeed level = 1.2 times of maximum motor speed (H0A-08 = 0) Overspeed level = H0A-08 (H0A-08 ≠ 0, and H0A-08 < 1.2 times of maximum motor speed) | Reset overspeed level according to actual mechanical requirement. |
| 3 Input reference is higher than overspeed level. | Check whether motor speed corresponding to input reference exceeds overspeed level. When the reference source is pulse in the position control mode: Motor speed (RPM) = $\frac{\text{Input pulse frequency (Hz)}}{\text{Encoder resolution}} \times \text{Electronic gear ratio} \times 60$ For IS650P servo drive, the encoder resolution is 1048576P/r. For IS600P servo drive, the encoder resolution is 10000 P/r. | In position control: When reference source is pulse, reduce pulse frequency in the prerequisite of ensuring accurate positioning or decrease the electronic gear ratio if motor speed allows. In speed control: View speed reference and speed limit (H06-06 to H06-09) and confirm that they are within the overspeed level. In torque control: Set speed limit within the overspeed level. For speed limit in torque control, refer to the IS650P User Manual. |
| 4. Motor speed overshoots. | Check whether speed feedback exceeds overspeed level through the drive debugging platform of Inovance. | Adjust the gain or adjust mechanical condition. |
| 5. The servo drive is faulty. | The fault persists after servo drive is re-powered on. | Replace the servo drive. |

Er.510: Pulse output overspeed

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| Output pulse frequency exceeds frequency upper limit allowed by hardware (2 MHz). | When H05-38 = 0 (encoder frequency-division output), calculate pulse frequency corresponding to motor speed at occurrence of fault and check whether the pulse frequency exceeds limit. Output pulse frequency (Hz) = $\frac{\text{Motor speed (rpm)}}{60} \times \text{H05-17}$ | Decrease H05-17(Encoder frequency-division pulses), making output pulse frequency below frequency upper limit allowed by hardware in the speed range required by mechanical condition. |
| Output pulse frequency exceeds frequency upper limit allowed by hardware (2 MHz). | When H05-38 = 1 (reference pulse synchronous output), input pulse frequency exceeds 2 MHz or interference exists on pulse input pin. Low-speed pulse input pin: Differential input terminals, PULSE+, PULSE-, SIGN+, SIGN- Max. pulse frequency: 500 kpps Open-collector input terminals, PULLHI, PULSE+, PULSE-, SIGN+, SIGN- Max. pulse frequency: 200 kbps High-speed pulse input pin: Differential input terminals: HPULSE+, HPULSE-, HSIGN+, HSIGN- Max. pulse frequency: 2 Mpps | Decrease input pulse frequency to within frequency upper limit allowed by hardware. In this case, if you do not modify electronic gear ratio, motor speed will slow down. If input pulse frequency is very high but is still within frequency upper limit allowed by hardware, take anti-interference measures (use STP cable for pulse input and set pin filter parameters H0A-24 or H0A-30), which prevents interference pulse adding to pulse and resulting in fault misreported. |

Er.602: Angle auto-tuning failure

Er.610: Servo drive overload

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| 1. Parameter setting is incorrect. | Check whether H01-02 (drive SN) is set correctly. Check whether the gain parameters (group H08) or the stiffness (H09-00 and H09-01) are set correctly. | Set H01-02 according to the actual drive SN. Adjust the parameters based on the current feedback effect. |
| The servo drive load ratio is too large (load inertia excessive). | Check whether H0B-12 (average load ratio) is excessive (over 80%) and then whether the inertia is excessive through inertia auto-tuning. | Use a drive model of higher power. |
| 3. The servo drive load ratio is too large (mechanical stuck) | Check whether H0B-12 (average load ratio) is excessive (over 80%) and then whether stuck occurs during load running. | Eliminate the mechanical stuck problem. |
| 4. Locked rotor occurs in the motor. | Check whether H0A-33 (locked rotor over-temperature protection) is 0. If yes, the drive trips Er.610 when locked rotor occurs. | Take actions for Er.630. |

Er.620: Motor overload

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| 1. Wiring of motor and encoder is incorrect or poor. | Check wirings between servo drive, servo motor and encoder according to correct wiring diagram. | Connect wirings based on correct wiring diagram. Prefer to use the cable configured by Inovance as standard. When self-made cable is used, make and connect wirings according to hardware wiring guidance. |
| 2. The load is too heavy. The motor keeps output of effective torque higher than rated torque for a long time. | Confirm overload characteristic of servo drive or servo motor. Check whether average load rate (H0B-12) is greater than 100.0% for long time. | Replace a large servo drive and matching servo motor. Reduce the load and increase acceleration/deceleration time. |
| 3. Acceleration/ deceleration is too frequent or the load inertia is too large. | Calculate the load inertia ratio or perform the load inertia ratio auto-tuning. Then view H08-15 (load inertia ratio). Conform single running cycle when servo motor runs in circular. | Increase acceleration/deceleration time during single running. |
| 4. The gain is improper, causing too high rigidity. | Observe whether motor vibrates and generates noise during running. | Adjust the gain. |
| 5. The servo drive or motor model is set incorrectly. | For IS650P series products, view serial encoder motor model in H00-05 and servo drive model in H01-02. | View servo drive nameplate and set servo drive model (H01-02) correctly and replace matching servo motor according to the IS650P User Manual. |
| 6. Locked-rotor occurs due to mechanical factors, resulting in very heavy load during running. | Check running reference and motor speed (H0B-00) by using the drive Inovance servo commissioning software or keypad. Running reference in position control: H0B-13 (input reference pulse counter) Running reference in speed control: H0B-01 (speed reference) Running reference in torque control: H0B-02 (internal torque reference) Check running reference in corresponding mode is not 0 but the motor speed is 0. | Eliminate mechanical factors. |
| 7. The servo drive is faulty. | The fault persists after servo drive is powered on again. | Replace the servo drive. |

**CAUTION**

You can clear the fault or re-power on the system 30s after overload occurs.

Er.625: Brake applied abnormally

| Cause | Confirming Methods | Corrective Action |
|-------------------------------------|---|--|
| 1. The motor brake is not released. | Check whether the motor brake signal is active and whether the brake switch is damaged. | Perform the wiring again or replace the motor. |

Er.626: Brake released abnormally

| Cause | Confirming Methods | Corrective Action |
|---------------------------------|---|--|
| 1. The motor brake is released. | Check whether the motor brake signal is active and whether the brake switch is damaged. | Perform the wiring again or replace the motor. |

Er.630: Overheat protection of locked-rotor motor

| Cause | Confirming Methods | Corrective Action |
|---|---|---|
| 1. Power output phase (UVW) loss or incorrect phase sequence occurs on servo drive. | Perform motor trial running when there is no load and check motor wirings. | Connect motor cables correctly again or replace them. |
| 2. UVW cable or encoder cable breaks. | Check wirings. | Connect wirings correctly again or replace them. |
| 3. Motor rotor is locked due to mechanical factors. | Check running reference and motor speed (H0B-00) by using the drive debugging platform of Inovance or operating panel. Running reference in the position control mode: H0B-13 (input reference pulse counter) Running reference in speed control: H0B-01 (speed reference) Running reference in torque control: H0B-02 (internal torque reference) Check running reference in corresponding mode is not 0 but the motor speed is 0. | Eliminate mechanical factors. |

Er.650: Heatsink overheat

| Cause | Confirming Methods | Corrective Action |
|--|---|--|
| 1. Ambient temperature is too high. | Measure ambient temperature. | Improve cooling conditions to reduce ambient temperature. |
| 2. Servo drive is powered off to reset overload fault. | View the fault records (set H0B-33 and view H0B-34) and check whether overload fault (Er.610, Er.620, Er.630, Er.650, Er.909, Er.920, Er.922) occurs. | Change fault reset method. After overload occurs, wait 30s and then perform reset operation. Increase capacity of servo drive and servo motor, increase acceleration/deceleration time, and reduce load. |
| 3. The fan is damaged. | Observe whether the fan rotates during running. | Replace the servo drive. |
| 4. Installation direction and clearance of the servo drive are improper. | Check whether installation of servo drive is proper. | Install servo drive according to mounting requirements. |
| 5. The servo drive is faulty. | The fault persists after restart 5 minutes after power-off. | Replace the servo drive. |

Er.731: Encoder battery failure

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| The battery is not connected during power-off. | Check whether battery is connected during power-off. | Set H0D-20 = 1 to remove the fault. |
| The encoder battery voltage is too low. | Measure the battery voltage. | Replace a new battery with matching voltage. |

Er.733: Encoder multi-turn counting error

| Cause | Confirming Methods | Corrective Action |
|------------------------|---|----------------------|
| The encoder is faulty. | Set H0D-20 = 1 to remove the fault. Er.733 persists after power-on again. | Replace servo motor. |

Er.735: Encoder multi-turn counting overflow

| Cause | Confirming Methods | Corrective Action |
|---|--------------------|---|
| Encoder multi-turn counting overflow is detected when H02-01 = 1. | - | Set H0D-20 = 1 and power on the system again. |

Er.740: Encoder interference

| Cause | Confirming Methods | Corrective Action |
|--|---|---|
| 1. Encoder wiring is incorrect. | Check encoder wiring. | Re-connect the encoder according to correct wiring diagram. |
| 2. Encoder cable becomes loose. | Check whether on-site vibration is too large, which loosens encoder cable and even damages the encoder. | Re-connect encoder cable securely. |
| 3. The encoder Z signal suffers interference | <p>Check on-site wirings:</p> <p>Check whether there is large equipment generating interference around servo system or whether there are several variable-frequency power devices inside the cabinet.</p> <p>Make servo drive in "rdy" status and rotate motor shaft counterclockwise (CCW) manually and observe whether H0B-10 (rotation angle/electrical angle) increases/decreases smoothly. Turning one circle corresponds to five 0-360° (for Z series motor). For X series motor, turning one circle corresponds to four 0-360°.</p> <p>If H0B-10 changes abnormally during rotation, it indicates that a fault occurs on encoder.</p> <p>If there is no alarm during rotation but the system alarms during servo running, it is extremely possible that interference exists.</p> | <p>Prefer to use the cable configured by Inovance as standard.</p> <p>If non-standard cable is used, check whether the cable meets requirements and is STP cable.</p> <p>Do not bundle motor cables and encoder cables together. Ensure servo motor and servo drive are well grounded.</p> <p>Check whether plugs at both ends of encoder are in good contact and whether any pin retracts.</p> |
| 4. The encoder is faulty. | <p>Replace a new encoder cable. If the fault no longer occurs after replacement, it indicates that the original encoder is damaged</p> <p>Place motor at the same position, power on the system several times and observe change of H0B-10. The electrical angle must be within $\pm 30^\circ$</p> | <p>Replace a new encoder cable.</p> <p>If not, it indicates that the encoder is damaged. You need to replace servo motor.</p> |

5

Er.834: AD sampling overvoltage

| Cause | Confirming Methods | Corrective Action |
|----------------------------|--|--|
| 1. AI voltage is too high. | Measure voltage input from AI and check whether AI sampling voltage (H0B-21 or H0B-22) is greater than 11.5 V. | Adjust AI input voltage and view AI sampling voltage until AI sampling voltage does not exceed 11.5 V. |

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| 2. AI wiring is incorrect or interference exists. | Check AI wiring according to correct wiring diagram. | Use shielded twisted pair cable and shorten cable length. Increase AI filter time constant: AI1 filter time constant: H03-51 AI2 filter time constant: H03-56 |

Er.835: High-accuracy AD sampling fault

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| 1. Interference exists on high-accuracy AI. | Check AI wiring according to correct wiring diagram. | Use shielded twisted pair cable and shorten cable length. |

Er.A33: Encoder data abnormal

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| 1. The serial encoder cable breaks or becomes loose. | Check wirings. | Check connection of encoder cable to see whether incorrect connection, wire breaking, or poor contact exists. If motor cables and encoder cable are bundled together, separate them. |
| 2. Serial encoder parameters read-write is abnormal. | If the fault persists after you power on servo drive several times, it indicates that the encoder is faulty. | Replace servo motor. |

Er.A34: Encoder communication check abnormal

| Cause | Confirming Methods | Corrective Action |
|--|--|---|
| 1. Servo drive model and servo motor model do not match. | View servo drive and servo motor nameplates to check that the equipment you are using is IS650P series servo drive and 20-bit servo motor (-U2***) of Inovance. Meanwhile, check whether H00-00 (Motor SN) is 14000. | Replace matching servo drive and servo motor. |
| 2. Encoder cable breaks. | Check whether encoder cable breaks and whether connection of servo drive and connection of servo motor are secure. | Replace a new encoder cable and secure wirings. |

Er.A35: Z signal lost

| Cause | Confirming Methods | Corrective Action |
|--|---|--|
| 1. Z signal gets lost because of encoder fault. | Use a new encoder cable and connect wirings correctly. Then rotate motor shaft manually and check whether the fault persists. | Replace servo motor. |
| Poor contact or incorrect connection results in Z signal lost. | Rotate motor shaft manually and check whether the fault persists. | Check whether encoder cable is in good contact. Re-connect wirings or replace encoder cable. |

Er.B00: Position deviation being large

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| 1. Power output phase (UVW) loss or incorrect phase sequence occurs on servo drive. | Perform motor trial running when there is no load and check motor wirings. | Connect wirings correctly again or replace them. |

| Cause | Confirming Methods | Corrective Action |
|--|--|---|
| 2. UVW cable or encoder cable breaks. | Check wirings. | Reconnect the UVW cable. Power cables of servo motor and power cables UVW of servo drive must be one-to-one correspondence. If necessary, replace a new cable and ensure reliable connection. |
| 3. Motor rotor is locked due to mechanical factors. | <p>Check running reference and motor speed (H0B-00) by using the drive debugging platform of Inovance or operating panel.</p> <p>Running reference in the position control mode: H0B-13 (input reference pulse counter)</p> <p>Running reference in speed control: H0B-01 (speed reference)</p> <p>Running reference in torque control: H0B-02 (internal torque reference)</p> <p>Check running reference in corresponding mode is not 0 but the motor speed is 0.</p> | Eliminate mechanical factors. |
| 4. Servo drive gain is low. | <p>Check servo drive position loop gain and speed loop gain.</p> <p>1st gain: H08-00 to H08-02</p> <p>2nd gain: H08-03 to H08-05</p> | Adjust gain manually or perform automatic gain auto-tuning according to Chapter 6 in the IS650P User Manual. |
| 5. Input pulse frequency is high. | <p>Check whether input pulse frequency is too high if position reference source is pulse.</p> <p>Acceleration/deceleration time is 0 or too small.</p> | <p>Reduce position reference frequency or decrease electronic gear ratio.</p> <p>When host computer is used to output position pulses, set acceleration/deceleration time in host computer.</p> <p>If host computer is not allowed to set acceleration/deceleration time, increase parameters H05-04 and H05-06 to smoothen position reference.</p> |
| 6. Relative to running condition, H0A-10 (threshold of position deviation fault) is too small. | Check whether the setting of H0A-10 is too small. | Increase the setting of H0A-10. |
| 7. The servo drive/motor is faulty. | <p>Monitor running curve on the drive debugging platform of Inovance:</p> <p>Position reference, position feedback, speed reference, torque reference</p> | If position reference is not 0, but position feedback is always 0, replace servo drive/motor. |

Er.B01: Pulse input abnormal

| Cause | Confirming Methods | Corrective Action |
|---|---|---|
| 1. Input pulse frequency is greater than H0A-09 (Maximum position pulse frequency). | Check whether H0A-09 is smaller than maximum input pulse frequency required by normal machine running. | Reset H0A-09 correctly according to the actual requirement. If output pulse frequency of host computer is larger than 4 MHz, decrease it. |
| 2. Input pulse suffers interference. | Check whether position reference increases abruptly or whether H0B-13 (input reference pulse counter) is larger than the number of pulses output by host computer through oscilloscope. Then check grounding situation of connecting cables. | First, use an STP cable for pulse input and separate pulse input cable from servo drive power cables. Then, when differential input is selected on the condition of using low-speed pulse input terminal (H05-01 = 0), ground of host computer must be connected to GND of servo drive reliably. If open-collector input is selected, ground of host computer must be connected to COM of servo drive reliably. Only differential input can be selected on the condition of using high-speed pulse input terminal (H05-01 = 1), ground of host computer must be connected to GND of servo drive reliably. Finally, according to selected hardware input terminal, increase pin filter time of pulse input terminal in H0A-24 or H0A-30. |

Er.B02: Position deviation being too large in full closed-loop

| Cause | Confirming Methods | Corrective Action |
|---|---|---|
| 1. Power output phase (UVW) loss or incorrect phase sequence occurs on servo drive. | Perform motor trial running when there is no load and check motor wirings. | Connect wirings correctly again or replace them. |
| 2. UVW cable or internal/external encoder cable breaks. | Check wirings. | Reconnect the UVW cable. Power cables of servo motor and power cables UVW of servo drive must be one-to-one correspondence. If necessary, replace a new cable and ensure reliable connection. |
| 3. Motor rotor is locked due to mechanical factors. | Check running reference and motor speed (H0B-00) by using the drive debugging platform of Inovance or operating panel. Running reference in the position control mode: H0B-13 (input reference pulse counter) Running reference in speed control: H0B-01 (speed reference) Running reference in torque control: H0B-02 (internal torque reference) Check running reference in corresponding mode is not 0 but the motor speed is 0. | Eliminate mechanical factors. |
| 4. Servo drive gain is low. | Check servo drive position loop gain and speed loop gain. First gain: H08-00 to H08-02 Second gain: H08-03 to H08-05 | Adjust gain manually or perform automatic gain auto-tuning according to Chapter 6 in the IS650P User Manual. |

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| 5. Input pulse frequency is high. | Check whether input pulse frequency is too high if position reference source is pulse. Acceleration/deceleration time is 0 or too small. | Reduce position reference frequency or decrease electronic gear ratio. When host computer is used to output position pulses, set acceleration/deceleration time in host computer. If host computer is not allowed to set acceleration/deceleration time, increase parameters H05-04 and H05-06 to smoothen position reference. |
| 6. Relative to running condition, H0F-08 (full closed-loop position deviation too large threshold) is too small. | Check whether full closed-loop position deviation too large threshold (H0F-08) is too small. | Increase the setting of H0F-08. |
| 7. The servo drive/motor is faulty. | Monitor running curve on the drive debugging platform of Inovance: Position reference, position feedback, speed reference, torque reference | If position reference is not 0, but position feedback is always 0, replace servo drive/motor. |

Er.B03: Electronic gear ratio setting exceeding limit

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| Electronic gear ratio setting exceeds preceding limit. | If H05-02 = 0, check the ratios of H05-07/H05-09 and H05-11/H05-13 If H05-02 > 0, check the ratios of encoder resolution/H05-02, H05-07/H05-09 and H05-11/H05-13. | The ratios of encoder resolution /H05-02, H05-07/H05-09, and H05-11/H05-13 must be within preceding limit. |
| Parameter modification sequence is unreasonable. | When modifying electronic gear ration related parameters H05-02, H05-07/H05-09, and H05-11/H05-13, modifying sequence is unreasonable, which results in electronic gear ratio exceeding limit during calculation of electronic gear ratio. | Reset the fault or re-power on the system. |

Er.B04: Fully closed-loop function parameter setting error

| Cause | Confirming Methods | Corrective Action |
|--|---|--|
| In full closed-loop mode, position reference source is internal position reference but internal encoder feedback and external encoder feedback is switched over. | Check whether H0F-00 = 2. Check whether position reference source is internal position reference: multi-position and position change on fly. | In full closed-loop mode, when position reference source is internal position reference, only external encoder feedback can be used. That is, H0F-00 can be set to 1 only. |

Er.D03: CAN communication interrupted

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| CAN communication is interrupted. The slave station is offline. | Check the CAN communication card indicator status of the master PLC. The ERR indicator of master PLC flashes at frequency 1 Hz and the ERR indicator of some slave PLCs keeps ON for a long period. (When using PLC background software, you can monitor D78xx in component monitoring table of the master. xx indicates station No. in decimal. If corresponding D78xx of some configured stations is 5, it indicates that a fault occurs on the slave PLC.) | Check communication cable connection between the slave with ERR indicator ON for long time and master. Check communication baud rate (H0C-08) of the slave with ERR indicator ON for long time and adjust baud rate the same as that of the master. |
| CAN communication is interrupted. The master station is offline. | Check the CAN communication card indicator status of the master PLC. The ERR indicator of all slave PLCs keeps ON for a long period. (When using PLC background software, you can monitor D78xx in the component monitoring table of the master. xx indicates station No. in decimal. If corresponding D78xx of all configured stations is 5, it indicates that a fault occurs on the master PLC.) | Check wirings of the master PLC. |

5.2.2 Troubleshooting of Warnings

Er.110: Setting error of frequency-division pulse output

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| The number of frequency-division pulses of encoder does not conform to the specification. | For incremental encoder, the number of frequency-division pulses cannot exceed encoder resolution. Resolution of 20-bit serial incremental encoder is 1048576 P/r. Resolution of 2500-PPR serial incremental encoder is 10000 P/r. For absolute encoder, the number of frequency-division pulses cannot exceed one fourth of encoder resolution. | Reset H05-17 (Encoder frequency-division pulses) correctly according to the specification. |

Er.601: Homing timeout

| Cause | Confirming Methods | Corrective Action |
|----------------------------------|---|--|
| 1. The home switch fails. | There is only high-speed searching and no low-speed searching during operation of returning to home. After high-speed searching of returning to home, the drive keeps reverse low-speed searching. | If hardware DI is used, check whether DI function FunIN.31: HomeSwitch (home switch) has been allocated to a DI and then check wiring of the DI. Make logic of the DI change manually and observe whether servo drive receives level change of the DI through H0B-03. If not, wiring of the DI is incorrect. If yes, a fault occurs during operation of returning to home. Please use the returning to home function correctly. If a virtual DI is used, check whether VDI is used correctly according to the IS650P User Manual. |
| 2. The search time is too short. | Check whether time for homing set in H05-35 is too short. | Increase H05-35. |

| Cause | Confirming Methods | Corrective Action |
|---|---|-------------------|
| 3. Speed of high-speed searching home switch signal is too small. | Check distance from initial position of returning to home to home switch. Then check whether H5-32 (speed of home switch signal at high-speed searching) is too small, resulting in too long time of finding home switch. | Increase H05-32. |

Er.730: Encoder battery warning

| Cause | Confirming Methods | Corrective Action |
|--|--------------------------|--|
| Battery voltage of absolute encoder is lower than 3.0 V. | Measure battery voltage. | Replace a new battery with matching voltage. |

Er.831: AI zero drift too large

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| 1. AI wiring is incorrect or interference exists. | Check wiring by referring to correct wiring diagram. | Use shielded twisted pair cable and shorten cable length. Increase AI filter time constant: AI1 filter time constant: H03-51 AI2 filter time constant: H03-56 |
| 2. The servo drive is faulty. | Disconnect AI cable (input voltage is 0). Check whether AI sampling value in group H0B exceeds 500 mV. | If AI sampling value in group H0B exceeds 500 mV, replace the servo drive. |

Er.900: DI emergency braking

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| DI function FunIN.34: EmergencyStop is triggered. | Check whether logic of DI set for FunIN.34: EmergencyStop is valid. | Check the running mode and clear DI braking valid signal on the prerequisite of ensuring safety. |

Er.909: Motor overload warning

| Cause | Confirming Methods | Corrective Action |
|--|---|--|
| 1. Wiring of motor and encoder is incorrect or poor. | Check wirings between servo drive, servo motor and encoder according to correct wiring diagram. | Connect wirings based on correct wiring diagram. Prefer to use the cable configured by Inovance as standard. When self-made cable is used, make and connect wirings according to hardware wiring guidance. |
| 2. The load is too heavy. The motor keeps output of effective torque higher than rated torque for a long time. | Confirm overload characteristic of servo drive or servo motor. Check whether average load rate (H0B-12) is greater than 100.0% for long time. | Replace a large servo drive and matching servo motor. Reduce the load and increase acceleration/deceleration time. |
| 3. Acceleration/deceleration is too frequent or load inertia is too large. | Calculate load inertia ratio or perform load inertia ratio auto-tuning. Then view H08-15 (load inertia ratio). Conform single running cycle when servo motor runs in circular. | Increase acceleration/deceleration time. |
| 4. The gain is improper, causing too high rigidity. | Observe whether motor vibrates and generates noise during running. | Adjust the gain. |

| Cause | Confirming Methods | Corrective Action |
|--|--|---|
| 5. The servo drive or motor model is set incorrectly. | For IS650P series products, view serial encoder motor model in H00-05 and servo drive model in H01-02. | View servo drive nameplate and set servo drive model (H01-02) correctly and replace matching servo motor according to the IS650P User Manual. |
| 6. Locked-rotor occurs due to mechanical factors, resulting in very heavy load during running. | <p>Check running reference and motor speed (H0B-00) by using the drive debugging platform of Inovance or operating panel.</p> <p>Running reference in the position control mode: H0B-13 (input reference pulse counter)</p> <p>Running reference in speed control: H0B-01 (speed reference)</p> <p>Running reference in torque control: H0B-02 (internal torque reference)</p> <p>Check running reference in corresponding mode is not 0 but the motor speed is 0.</p> | Eliminate mechanical factors. |
| 7. The servo drive is faulty. | Power off the servo drive and then power it on again. | If the fault persists after re-power-on, replace the servo drive. |

Er.920: Regenerative resistor overload

| Cause | Confirming Methods | Corrective Action |
|--|---|---|
| 1. Wiring of external regenerative resistor is in poor connection, becomes loose or breaks. | Disconnect external regenerative resistor and measure whether resistance of the resistor is ∞ . Measure whether resistance between P_{Φ} and C is ∞ . | Replace a new external regenerative resistor and measure its resistance. If the resistance is consistent with nominal value, connect it between P_{Φ} and C. |
| | | Select a new cable and connect it between P_{Φ} and C. |
| 2. Jumper across terminals P Φ and D is shorted or disconnected when the internal regenerative resistor is used. | Measure whether resistance between P_{Φ} and D is ∞ . | Select a new cable and connect it between P_{Φ} and D. |
| 3. Setting of H02-25 is incorrect when external regenerative resistor is used. | View setting value of H02-25. Measure resistance of external regenerative resistor connected between P_{Φ} and C. Check whether the resistance is too large by comparing it with the regenerative resistor specification table in the IS650P User Manual. | Set H02-25 correctly according to the IS650P User Manual. H02-25 = 1 (external regenerative resistor used, naturally ventilated) H02-25 = 2 (external regenerative resistor used, forcible cooling) |
| | | Select a proper regenerative resistor according to the IS650P User Manual. |
| 4. Resistance of the used external regenerative resistor is too large. | | |
| 5. H02-27 (resistance of external regenerative resistor) is larger than resistance of the used external regenerative resistor. | Check whether setting value of H02-27 is greater than resistance of external regenerative resistor connected between P_{Φ} and C. | Set H02-27 (resistance of external regenerative resistor) consistent with the resistance of the selected external regenerative resistor. |

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| 6. Input voltage of main circuit exceeds specification. | Check whether input voltage of main circuit on servo drive side satisfies the following specification: 220 V AC drive: Valid value: 220 to 240 V Allowed error: -10% to 10% (198 to 264 V) 380V AC drive: Valid value: 380 to 480 V Allowed error: -10% to 10% (342 to 528 V) | Replace power supply or adjust power voltage according to specification on the left. |
| 7. The load inertia is too large. | Perform inertia auto-tuning according to the IS650P User Manual or calculate total inertia of machine according to mechanical parameters. Check whether actual load inertia ratio exceeds 30. | Select a large external regenerative resistor and set H02-26 (power of external regenerative resistor) consistent with actual value. |
| 8. Speed is too high, and deceleration is not completed within required time. The regenerative resistor is in continuous deceleration status. | View speed curve of motor for cycle running and check whether motor is in deceleration status for a long period. | Select a large servo drive. If allowed, reduce the load. If allowed, increase acceleration/ deceleration time. |
| 9. Capacity of servo drive or regenerative resistor is insufficient. | View single cycle speed curve of motor and calculate whether maximum braking energy can be absorbed completely. | If allowed, increase motor running cycle. |
| 10. The servo drive is faulty. | - | Replace a new servo drive. |

Er.922: Resistance of external braking resistor too small

| Cause | Confirming Methods | Corrective Action |
|---|--|--|
| When an external regenerative resistor is used (H02-25 = 1 or 2), resistance of the external regenerative resistor is smaller than minimum value required by servo drive. | Measure resistance of the external regenerative resistor between P_b and C and check whether it is smaller than H02-21 (allowed minimum value of regenerative resistor). | If yes, connect an external regenerative resistor matching servo drive between P_b and C and set H02-27 (resistance of external regenerative resistor) to resistance of the selected regenerative resistor. If not, set H02-27 to resistance of the selected regenerative resistor. |

5

Er.939: Motor power cable breaking

| Cause | Confirming Methods | Corrective Action |
|----------------------------|---|--|
| Motor power cable breaking | Check whether difference between H0B-24 (phase current valid value) and H0B-02 (internal torque reference) reaches over 500%. Meanwhile, H0B-00 (actual motor speed) is smaller than one fourth of rated motor speed. | Check the motor power cable connection and reconnect wirings. If necessary, replace a new cable. |

Er.941: Parameter modification taking effect only after re-power-on

Cause:

Modification of some parameters takes effect only after servo drive is powered on again. After these parameters are modified, servo drive reminds of re-power-on.

| Cause | Confirming Methods | Corrective Action |
|--|--|-------------------------------|
| Modify parameters, whose modification takes effect only after re-power-on. | Check whether you modify parameters, whose modification takes effect only after re-power-on. | Re-power on the servo system. |

Er.942: Parameter storage too frequent

| Cause | Confirming Methods | Corrective Action |
|---|---|--|
| A great number of parameters are modified and stored frequently to EEPROM (H0C-13 = 1). | Check whether host controller performs frequent and fast parameter modification on servo drive. | Check the running mode. For the parameters that need not be stored in EEPROM, set H0C-13 to 0 before writing operation of host controller. |

Er.950: Forward limit switch warning

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| Logic of DI set for FunIN.14: P-OT (forward limit switch) is valid. | Check whether a parameter in group H03 is set for FunIN14 (P-OT). Check whether logic of corresponding DI is valid in H0B-03 (monitored DI states). | Check the running mode. Send a reverse reference or rotate motor on the prerequisite of ensuring safety to make logic of the forward overshoot switch terminal invalid. |

Er.952: Reverse limit switch warning

| Cause | Confirming Methods | Corrective Action |
|---|--|---|
| Logic of DI set for FunIN.15: N-OT (reverse limit switch) is valid. | Check whether a parameter in group H03 is set for FunIN15 (N-OT). Check whether logic of corresponding DI is valid in H0B-03 (monitored DI states). | Check the running mode. Send a reverse reference or rotate motor on the prerequisite of ensuring safety to make logic of the reverse overshoot switch terminal invalid. |

Er.980: Encoder internal fault

| Cause | Confirming Methods | Corrective Action |
|-------------------------------|--|----------------------|
| It is encoder internal fault. | If the fault persists after you power on servo drive several times, it indicates that the encoder is faulty. | Replace servo motor. |

Er.990: Power input phase loss warning

| Cause | Confirming Methods | Corrective Action |
|--|--|--|
| When H0A-00 = 1 (allow faults and warnings at power input phase loss protection), three-phase servo drive (0.75 kW) (H01-02 = 5) can run under single-phase power. When single-phase power is connected, this warning is reported. | Check whether it is a three-phase servo drive allowed to run under single-phase power. | If the warning persists when a three-phase servo drive is connected to three-phase power, troubleshoot it as Er.420 (power cable phase loss). If the warning persists when a three-phase servo drive is connected to single-phase power, set H0A-00 to 0. |

Er.994: CAN address conflict

| Cause | Confirming Methods | Corrective Action |
|------------------------------|---|--|
| CAN address conflict occurs. | Check whether H0C-00 (servo shaft address) is allocated repeatedly. | Allocate servo shaft address of salves and ensure that allocation of H0C-00 is not repeated. |

5.2.3 Internal Faults

When any of the following fault occurs, contact Inovance for technical support.

Er.602: Angle auto-tuning failure

Er.220: Phase sequence incorrect

Er.A40: Motor auto-tuning failure

Er.111: Servo internal parameters abnormal

Chapter 6 Parameter Table

The abbreviations in the parameter table are described as follows:

| Type | Abbreviation | Meaning |
|-----------------------|--------------|---|
| Property ("Pro") | Ru | It is possible to modify the parameter with the drive in the Running status. |
| | St | It is not possible to modify the parameter with the drive in the Stop status. |
| | Dp | The parameter is the actual measured value and can only be Displayed. |
| Effective time ("ET") | Im | Modification on the parameter takes effect Immediately. |
| | Po | Modification on the parameter takes effect upon Power-on again. |
| | St | Modification on the parameter takes effect upon Stop. |

Control mode: CM; Reference unit: Ref; Enc: Enc

Group H00: Servo Motor Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|-------------------------------------|---|-------------------|---------|----|-----|-----|
| H00-00 | Motor SN | 14000: Inovance 20-bit incremental encoder motor 14101: Inovance 23-bit absolute encoder motor | - | 14000 | Po | St | ALL |
| H00-02 | Customized firmware version | - | - | - | - | Dp | - |
| H00-04 | Encoder version | - | - | - | - | Dp | - |
| H00-05 | Serial encoder motor SN | - | - | - | - | Dp | - |
| H00-09 | Rated voltage | 0: 220; 1: 380 | V | - | Po | St | - |
| H00-10 | Rated power | 0.01 to 655.35 | kW | - | Po | St | - |
| H00-11 | Rated current | 0.01 to 655.35 | A | - | Po | St | - |
| H00-12 | Rated torque | 0.01 to 655.35 | Nm | - | Po | St | - |
| H00-13 | Max. torque | 0.10 to 655.35 | Nm | - | Po | St | - |
| H00-14 | Rated motor speed | 100 to 6000 | RPM | - | Po | St | - |
| H00-15 | Max. motor speed | 100 to 6000 | RPM | - | Po | St | - |
| H00-16 | Rotor inertia Jm | 0.01 to 655.35 | kgcm ² | - | Po | St | - |
| H00-17 | Number of pole pairs of PMSM | 2 to 360 | Pole-pair | - | Po | St | - |
| H00-18 | Stator resistance | 0.001 to 65.535 | Ω | - | Po | St | - |
| H00-19 | Stator inductance Lq | 0.01 to 655.35 | mH | - | Po | St | - |
| H00-20 | Stator inductance Ld | 0.01 to 655.35 | mH | - | Po | St | - |
| H00-21 | Linear back EMF coefficient | 0.01 to 655.35 | mV/RPM | - | Po | St | - |
| H00-22 | Torque coefficient Kt | 0.01 to 655.35 | Nm/Arms | - | Po | St | - |
| H00-23 | Electrical constant Te | 0.01 to 655.35 | ms | - | Po | St | - |
| H00-24 | Mechanical constant Tm | 0.01 to 655.35 | ms | - | Po | St | - |
| H00-28 | Position offset of absolute encoder | 0 to 1073741824 | P/r | - | Po | St | - |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---------------------------------------|--|------|---------|----|-----|----|
| H00-30 | Encoder selection (Hex) | 0x000: Common incremental encoder (UVW-ABZ) 0x013: Inovance 20-bit serial encoder | 1 | 0x013 | Po | St | - |
| H00-31 | PPR of encoder | 0 to 1073741824 | P/r | 1048576 | Po | St | - |
| H00-33 | Electrical angle of signal Z | 0.0 to 360 | ° | 180 | Po | St | - |
| H00-34 | Electrical angle of phase U rise edge | 0.0 to 360 | ° | 180 | Po | St | - |

Group H01: Servo Drive Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|-----------------------|---------------|------|---------|----|-----|----|
| H01-00 | MCU firmware version | 0 to 65535 | - | - | - | Dp | - |
| H01-01 | FPGA firmware version | 0 to 65535 | - | - | - | Dp | - |
| H01-02 | Servo drive SN | 0 to 65535 | - | - | Po | St | - |

Group H02: Basic Control Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|------------------------------|--|------|---------|----|-----|-----|
| H02-00 | Control mode selection | 0: Speed mode 1: Position mode 2: Torque mode 3: Torque mode/Speed mode 4: Speed mode/Position mode 5: Torque mode/Position mode 6: Torque mode/Speed mode/Position mode | - | 1 | Im | St | - |
| H02-01 | Absolute system selection | 0: Incremental position mode 1: Absolute position linear mode 2: Absolute position rotating mode | - | 0 | Po | St | ALL |
| H02-02 | Rotating direction selection | 0: CCW direction as forward direction (phase A advancing phase B) 1: CW direction as forward direction (phase A lagging phase B) | - | 0 | Po | St | PST |
| H02-03 | Output pulse phase | 0: CCW direction as forward direction (phase A advancing phase B) 1: CW direction as forward direction (phase A lagging phase B) | - | 0 | Po | St | PST |
| H02-05 | Stop mode at S-ON off | 0: Coast to stop, keeping de-energized state 1: Emergency stop, keeping de-energized state | - | 0 | Im | St | PST |
| H02-06 | Stop mode at NO.2 fault | 0: Coast to stop, keeping de-energized state 1: Emergency stop, keeping de-energized state | - | 0 | Im | St | PST |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|------|---------|----|-----|-----|
| H02-07 | Stop mode at limit switch signal | 0: Coast to stop, keeping de-energized state 1: Emergency stop, keeping position locking state 2: Emergency stop, keeping de-energized state | - | 1 | Im | St | PST |
| H02-08 | Stop mode at NO.1 fault | 0: Coast to stop, keeping de-energized state | - | 0 | Im | St | PST |
| H02-09 | Delay from brake output ON to command received | 0 to 500 | ms | 250 | Im | Ru | PS |
| H02-10 | Delay from brake output OFF to motor de-energized in static state | 1 to 1000 | ms | 150 | Im | Ru | PS |
| H02-11 | Motor speed threshold at brake output OFF in rotating state | 0 to 3000 | RPM | 30 | Im | Ru | PS |
| H02-12 | Delay from brake output OFF to motor de-energized in rotating state | 1 to 1000 | ms | 500 | Im | Ru | PS |
| H02-15 | Warning display on keypad | 0: Output warning information immediately 1: Not output warning information | - | 0 | Im | St | PST |
| H02-18 | Filter time of S-ON signal | 0 to 64 | ms | 0 | Im | St | PST |
| H02-21 | Permissible minimum resistance of regenerative resistor | - | Ω | - | - | Dp | PST |
| H02-22 | Power of built-in regenerative resistor | - | W | - | - | Dp | PST |
| H02-23 | Resistance of built-in regenerative resistor | - | Ω | - | - | Dp | PST |
| H02-24 | Resistor heat dissipation coefficient | 10 to 100 | % | 30 | Im | St | PST |
| H02-25 | Regenerative resistor type | 0: Built-in 1: External, naturally ventilated 2: External, forcible cooling 3: No resistor, using only capacitor | - | 0 | Im | St | PST |
| H02-26 | Power of external regenerative resistor | 1 to 65535 | W | - | Im | St | PST |
| H02-27 | Resistance of external regenerative resistor | 1 to 1000 | Ω | - | Im | St | PST |
| H02-30 | User password | 0 to 65535 | - | 0 | Po | St | PST |
| H02-31 | Parameter initialization | 0: No operation 1: Restore default setting (except the parameters in groups H00 and H01.) 2: Clear fault records | - | 0 | Im | St | PST |
| H02-32 | Default keypad display | 0 to 99 | - | 50 | Im | Ru | - |
| H02-33 | EtherCAT software version | - | - | - | - | Dp | - |
| H02-34 | CAN firmware version | - | - | - | - | Dp | - |
| H02-38 | Braking time at short-circuit | 0 to 30000 | ms | 5000 | Im | St | S |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---------------|------|---------|----|-----|----|
| H02-39 | Maximum braking current at short-circuit | 0 to 3000 | 0.1% | 1000 | Im | St | S |

Group H03: Input Terminal Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|----|
| H03-00 | DI function (active after power-on) allocation 1 | 0–0xFFFF Bit0: FunIN.1; Bit1: FunIN.2Bit15: FunIN.16 | - | 0 | Po | Ru | - |
| H03-01 | DI function (active after power-on) allocation 2 | 0–0xFFFF Bit0: FunIN.17; Bit1: FunIN.18Bit15: FunIN.32 | - | 0 | Po | Ru | - |
| H03-02 | DI1 function selection | 0 to 37 | - | 14 | St | Ru | - |
| H03-03 | DI1 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-04 | DI2 function selection | 0 to 37 | - | 15 | St | Ru | - |
| H03-05 | DI2 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-06 | DI3 function selection | 0 to 37 | - | 13 | St | Ru | - |
| H03-07 | DI3 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-08 | DI4 function selection | 0 to 37 | - | 2 | St | Ru | - |
| H03-09 | DI4 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-10 | DI5 function selection | 0 to 37 | - | 1 | St | Ru | - |
| H03-11 | DI5 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-12 | DI6 function selection | 0 to 37 | - | 12 | St | Ru | - |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|----------|----|-----|----|
| H03-13 | DI6 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-14 | DI7 function selection | 0 to 37 | - | 3 | St | Ru | - |
| H03-15 | DI7 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-16 | DI8 function selection | 0 to 37 | - | 31 | St | Ru | - |
| H03-17 | DI8 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-18 | DI9 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H03-19 | DI9 logic selection | Input polarity: 0 to 4 0: Low level valid 1: High level valid 2: Rising edge valid 3: Falling edge valid 4: Rising edge and falling edge both valid | - | 0 | St | Ru | - |
| H03-34 | DI function (active after power-on) allocation 3 | 0 to 0xFFFF Bit0: FunIN.33; Bit1: FunIN.34Bit15: FunIN.48 | - | 0 | Po | Ru | - |
| H03-35 | DI function (active after power-on) allocation 4 | 0 to 0xFFFF Bit0: FunIN.49; Bit1: FunIN.50Bit15: FunIN.64 | - | 0 | Po | Ru | - |
| H03-50 | AI1 offset | -5000 to 5000 | mV | 0 | Im | Ru | - |
| H03-51 | AI1 filter time constant | 0 to 655.35 | ms | 2.00 | Im | Ru | - |
| H03-53 | AI1 dead zone | 0 to 1000.0 | mV | 10.0 | Im | Ru | - |
| H03-54 | AI1 zero drift | -500.0 to 500.0 | mV | 0.0 | Im | Ru | - |
| H03-55 | AI2 offset | -5000 to 5000 | mV | 0 | Im | Ru | - |
| H03-56 | AI2 filter time constant | 0 to 655.35 | ms | 2.00 | Im | Ru | - |
| H03-58 | AI2 dead zone | 0 to 1000.0 | mV | 10.0 | Im | Ru | - |
| H03-59 | AI2 zero drift | -500.0 to 500.0 | mV | 0.0 | Im | Ru | - |
| H03-80 | Speed corresponding to 10 V | 0 to 9000 | RPM | 3000 RPM | Im | St | - |
| H03-81 | Torque corresponding to 10 V | 1.00 to 8.00 times of rated torque | 1.00 | 1.00 | Im | St | - |

Group H04: Output Terminal Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|------------------------|---|-------|---------|----|-----|----|
| H04-00 | DO1 function selection | 0 to 22 | - | 1 | St | Ru | - |
| H04-01 | DO1 logic selection | 0: Output low level when valid (optocoupler ON) 1: Output high level when valid (optocoupler OFF) | - | 0 | St | Ru | - |
| H04-02 | DO2 function selection | 0 to 22 | - | 5 | St | Ru | - |
| H04-03 | DO2 logic selection | 0: Output low level when valid (optocoupler ON) 1: Output high level when valid (optocoupler OFF) | - | 0 | St | Ru | - |
| H04-04 | DO3 function selection | 0 to 22 | - | 3 | St | Ru | - |
| H04-05 | DO3 logic selection | 0: Output low level when valid (optocoupler ON) 1: Output high level when valid (optocoupler OFF) | - | 0 | St | Ru | - |
| H04-06 | DO4 function selection | 0 to 22 | - | 11 | St | Ru | - |
| H04-07 | DO4 logic selection | 0: Output low level when valid (optocoupler ON) 1: Output high level when valid (optocoupler OFF) | - | 0 | St | Ru | - |
| H04-08 | DO5 function selection | 0 to 22 | - | 16 | St | Ru | - |
| H04-09 | DO5 logic selection | 0: Output low level when valid (optocoupler ON) 1: Output high level when valid (optocoupler OFF) | - | 0 | St | Ru | - |
| H04-22 | DO source | 0 to 31 | - | 0 | Im | St | - |
| H04-50 | AO1 signal selection | 00: Motor speed (1 V/1000 RPM) 01: Speed reference (1 V/1000 RPM) 02: Torque reference (1 V/1 time of rated motor torque) 03: Position deviation (0.05 V/1 reference unit) 04: Position deviation (0.05 V/Enc) 05: Position reference speed (1 V/1000 RPM) 06: Positioning completed (positioning completed: 5 V, positioning not completed: 0 V) 07: Speed feedforward (1 V/1000 RPM) 08: AI1 voltage 09: AI2 voltage | - | 0 | Im | Ru | - |
| H04-51 | AO1 offset voltage | -10000 to 10000 | mV | 5000 | Im | Ru | - |
| H04-52 | AO1 multiplying factor | -99.99 to 99.99 | times | 1.00 | Im | Ru | - |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|------------------------|---|-------|---------|----|-----|----|
| H04-53 | AO2 signal selection | 00: Motor speed (1 V/1000 RPM) 01: Speed reference (1 V/1000 RPM) 02: Torque reference (1 V/1 time of rated motor torque) 03: Position deviation (0.05 V/1 reference unit) 04: Position deviation (0.05 V/Enc) 05: Position reference speed (1 V/1000 RPM) 06: Positioning completed (positioning completed: 5 V, positioning not completed: 0 V) 07: Speed feedforward (1 V/1000 RPM) 08: AI1 voltage 09: AI2 voltage | - | 0 | Im | Ru | - |
| H04-54 | AO2 offset voltage | -10000 to 10000 | mV | 5000 | Im | Ru | - |
| H04-55 | AO2 multiplying factor | -99.99 to 99.99 | times | 1.00 | Im | Ru | - |

Group H05: Position Control Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|----|
| H05-00 | Position reference source | 0: Pulse input 1: Step setting 2: Multi-position reference | - | 0 | Im | St | P |
| H05-01 | Pulse input terminal selection | 0: Low-speed terminals 1: High-speed terminals | - | 0 | Im | St | P |
| H05-02 | Pulses per one motor revolution | 0 to 1048576 | P/r | 0 | Po | St | P |
| H05-04 | Time constant of first-order low-pass filter | 0 to 6553.5 | ms | 0.0 | Im | St | P |
| H05-05 | Step amount | -9999 to 9999 | Ref | 50 | Im | St | P |
| H05-06 | Time constant of moving average filter | 0.0 to 128.0 | ms | 0.0 | Im | St | P |
| H05-07 | Electronic gear ratio 1 (numerator) | 1 to 1073741824 | - | 1048576 | Im | Ru | P |
| H05-09 | Electronic gear ratio 1 (denominator) | 1 to 1073741824 | - | 10000 | Im | Ru | P |
| H05-11 | Electronic gear ratio 2 (numerator) | 1 to 1073741824 | - | 1048576 | Im | Ru | P |
| H05-13 | Electronic gear ratio 2 (denominator) | 1 to 1073741824 | - | 10000 | Im | Ru | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|---------|---------|----|-----|----|
| H05-15 | Pulse input format | 0: Pulse + direction, positive logic 1: Pulse + direction, negative logic 2: Phase A + phase B quadrature pulse, 4-frequency multiplication 3: CW + CCW | - | 0 | Po | St | P |
| H05-16 | Clear action | 0: Clear position deviation when S-ON is turned off or a fault occurs 1: Clear position deviation pulses when S-ON is turned off or a fault occurs 2: Clear position deviation when S-ON is turned off and the ClrPosErr signal is input from DI | - | 0 | Im | St | P |
| H05-17 | Encoder frequency-division pulses | 35 to 32767 | P/r | 2500 | Po | St | - |
| H05-19 | Speed feedforward control selection | 0: No speed feedforward 1: Internal 2: AI1 3: AI2 | - | 1 | Im | St | P |
| H05-20 | Output condition of positioning completed/near signal (COIN) | 0: Absolute value of position deviation is smaller than setting of H05-21/H05-22 1: Absolute value of position deviation is smaller than setting of H05-21/H05-22 and position reference after filter is 0 2: Absolute value of position deviation is smaller than setting of H05-21/H05-22 and position reference before filter is 0 3: Absolute value of position deviation is smaller than setting of H05-21/H05-22 and position reference is 0, positioning completed/near signal holding time determined by H05-60 | - | 0 | Im | Ru | P |
| H05-21 | Position deviation threshold of positioning completed | 1 to 65535 | Enc/Ref | 734 | Im | Ru | P |
| H05-22 | Position deviation threshold of positioning near | 1 to 65535 | Enc/Ref | 65535 | Im | Ru | P |
| H05-23 | Position change on fly | 0: Disabled 1: Enabled | - | 0 | Po | St | P |
| H05-24 | Displacement of position change on fly | 0 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H05-26 | Constant speed for position change on fly | 0 to 6000 | RPM | 200 | Im | Ru | P |
| H05-27 | Acceleration/Deceleration time of position change on fly | 0 to 1000 | ms | 10 | Im | Ru | P |
| H05-29 | Position change on fly unlock | 0: Disabled 1: Enabled | - | 1 | Im | Ru | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---|------|---------|----|-----|----|
| H05-30 | Homing enabling method | 0: Disabled 1: Input HomingStart signal from DI to enable homing 2: Input HomingStart signal from DI to enable electrical home attaining 3: Start homing immediately upon power-on 4: Perform homing immediately 5: Start electrical home attaining 6: Take current position as the home | - | 0 | Im | Ru | P |
| H05-31 | Homing mode | 0: Forward direction, deceleration point and home being home switch signal 1: Reverse direction, deceleration point and home being home switch signal 2: Forward direction, deceleration point and home being motor Z signal 3: Reverse direction, deceleration point and home being motor Z signal 4: Forward direction, deceleration point being home switch signal and home being motor Z signal 5: Reverse direction, deceleration point being home switch signal and home being motor Z signal 6: Forward direction, deceleration point and home being forward limit switch signal 7: Reverse direction, deceleration point and home being reverse limit switch signal 8: Forward direction, deceleration point being forward limit switch signal and home being motor Z signal 9: Reverse direction, deceleration point being reverse limit switch signal and home being motor Z signal (to be continued) | - | 0 | Im | St | P |
| H05-31 | Homing mode | 10: Forward direction, deceleration point being mechanical final limit position and home being mechanical final limit position 11: Reverse direction, deceleration point being mechanical final limit position and home being mechanical final limit position 12: Forward direction, deceleration point being mechanical final limit position and home being motor Z signal 13: Reverse direction, Mechanical final limit position and home being motor Z signal | - | 0 | Im | St | P |
| H05-32 | Low speed of homing | 0 to 3000 | RPM | 100 | Im | Ru | P |
| H05-33 | High speed of homing | 0 to 1000 | RPM | 10 | Im | Ru | P |
| H05-34 | Acceleration/ Deceleration time of homing | 0 to 1000 | ms | 1000 | Im | St | P |
| H05-35 | Duration limit of homing | 0 to 65535 | ms | 10000 | Im | St | P |
| H05-36 | Mechanical home offset | -1073741824 to 1073741824 | Ref | 0 | Im | St | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|-----|
| H05-38 | Servo pulse output source | 0: Encoder frequency-division output 1: Pulse synchronous output 2: Frequency-division or synchronous output inhibited | - | 0 | Po | St | P |
| H05-39 | Electronic gear ratio switchover condition | 0: Switchover if position reference (reference unit) = 0 and the duration reaches 2.5 ms 1: Real-time switchover | - | 0 | Im | St | P |
| H05-40 | Mechanical home offset and action after reaching limit switch | 0: H05-36 as coordinate for homing, trigger homing and find home reversely after reaching limit switch 1: H05-36 as relative offset for homing, trigger homing and find home reversely after reaching limit switch 2: H05-36 as coordinate for homing, automatically find zero position reversely after reaching limit switch 3: H05-36 as relative offset for homing, automatically find zero position reversely after reaching limit switch | - | 0 | Im | St | P |
| H05-41 | Output polarity of Z pulse | 0: Positive (high level when pulse Z is valid) 1: Negative (low level when pulse Z is valid) | - | 1 | Po | St | P |
| H05-46 | Position offset in absolute position linear mode (low 32 bits) | -2147483648 to 2147483647 | Enc | 0 | Po | St | PST |
| H05-48 | Position offset in absolute position linear mode (high 32 bits) | -2147483648 to 2147483647 | Enc | 0 | Po | St | PST |
| H05-50 | Mechanical gear ratio in absolute position rotating mode (numerator) | 1 to 65535 | 1 | 65535 | Im | St | ALL |
| H05-51 | Mechanical gear ratio in absolute position rotating mode (denominator) | 1 to 65535 | 1 | 1 | Im | St | ALL |
| H05-52 | Pulses within one revolution of load in absolute position rotating mode (low 32 bits) | 0 to 4294967295 | Enc | 0 | Im | St | ALL |
| H05-54 | Pulses within one revolution of load in absolute position rotating mode (high 32 bits) | 0 to 127 | Enc | 0 | Im | St | ALL |
| H05-56 | Judgment threshold of homing with hit & stop | 0 to 1000 | RPM | 2 | Im | Ru | P |
| H05-58 | Torque limit of homing with hit & stop | 0 to 300.0 | % | 100.0 | Im | Ru | P |
| H05-59 | Time threshold of positioning completed | 1 to 30000 | ms | 0 | Im | Ru | P |
| H05-60 | Positioning completed holding time | 1 to 30000 | ms | 1 | Im | Ru | P |
| H05-61 | Encoder frequency-division pulses (32-bit) | 0 to 262143 | P/r | 0 | Po | Ru | - |

Group H06: Speed Control Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|----|
| H06-00 | Main speed reference A source | 0: Digital setting (H06-03) 1: AI1 2: AI2 | - | 0 | Im | St | S |
| H06-01 | Auxiliary speed reference B source | 0: Digital setting (H06-03) 1: AI1 2: AI2 3: 0 (invalid) 4: 0 (invalid) 5: Multi-speed reference | - | 1 | Im | St | S |
| H06-02 | Speed reference source selection | 0: Main speed reference A source 1: Auxiliary speed reference B source 2: A + B 3: A/B switchover 4: Communication setting | - | 0 | Im | St | S |
| H06-03 | Keypad setting value of speed reference | -6000 to 6000 | RPM | 200 | Im | Ru | S |
| H06-04 | Jog speed setting value | 0 to 6000 | RPM | 100 | Im | Ru | S |
| H06-05 | Acceleration ramp time constant of speed reference | 0 to 65535 | ms | 0 | Im | Ru | S |
| H06-06 | Deceleration ramp time constant of speed reference | 0 to 65535 | ms | 0 | Im | Ru | S |
| H06-07 | Maximum speed limit | 0 to 6000 | RPM | 6000 | Im | Ru | S |
| H06-08 | Positive speed limit | 0 to 6000 | RPM | 6000 | Im | Ru | S |
| H06-09 | Reverse speed limit | 0 to 6000 | RPM | 6000 | Im | Ru | S |
| H06-11 | Torque feedforward control selection | 0: No torque feedforward 1: Internal torque feedforward | - | 1 | Im | Ru | PS |
| H06-15 | Speed threshold for zero speed clamp | 0 to 6000 | RPM | 10 | Im | Ru | S |
| H06-16 | Speed threshold of motor rotation signal | 0 to 1000 | RPM | 20 | Im | Ru | S |
| H06-17 | Threshold of speed consistent signal | 0 to 100 | RPM | 10 | Im | Ru | S |
| H06-18 | Threshold of speed reached signal | 10 to 6000 | RPM | 1000 | Im | Ru | S |
| H06-19 | Threshold of zero speed output signal | 1 to 6000 | RPM | 10 | Im | Ru | S |

6

Group H07: Torque Control Parameters

Torque reference 100% corresponds to rated motor torque.

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--------------------------------|---|------|---------|----|-----|----|
| H07-00 | Main torque reference A source | 0: Digital setting (H07-03) 1: AI1 2: AI2 | - | 0 | Im | St | T |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|-----|
| H07-01 | Auxiliary torque reference B source | 0: Digital setting (H07-03) 1: AI1 2: AI2 | - | 1 | Im | St | T |
| H07-02 | Torque reference source | 0: Main torque reference A source 1: Auxiliary torque reference B source 2: A + B 3: A/B switchover 4: Communication setting | - | 0 | Im | St | T |
| H07-03 | Keypad setting value of torque reference | -300.0 to 300.0 | % | 0 | Im | Ru | T |
| H07-05 | Time constant of torque reference filter | 0 to 30.00 | ms | 0.79 | Im | Ru | PST |
| H07-06 | 2nd time constant of torque reference filter | 0 to 30.00 | ms | 0.79 | Im | Ru | PST |
| H07-07 | Torque limit source | 0: Internal positive/negative torque limit 1: External positive/negative torque limit (via P-CL, N-CL) 2: T-LMT as external torque limit 3: Minimum of external positive/negative torque and external T-LMT as torque limit (via P-CL, N-CL) 4: Switchover between internal positive/negative torque limit and T-LMT torque limit (via P-CL, N-CL) | - | 0 | Im | St | PST |
| H07-08 | T-LMT selection | 1: AI1 2: AI2 | - | 2 | Im | St | PST |
| H07-09 | Internal positive torque limit | 0.0 to 300.0 | % | 300.0 | Im | Ru | PST |
| H07-10 | Internal negative torque limit | 0.0 to 300.0 | % | 300.0 | Im | Ru | PST |
| H07-11 | External positive torque limit | 0.0 to 300.0 | % | 300.0 | Im | Ru | PST |
| H07-12 | External negative torque limit | 0.0 to 300.0 | % | 300.0 | Im | Ru | PST |
| H07-17 | Speed limit source | 0: Internal speed limit (in torque control) 1: V-LMT as external speed limit 2: Speed limit selected via DI | - | 0 | Im | Ru | T |
| H07-18 | V-LMT selection | 1: AI1 2: AI2 | - | 1 | Im | Ru | T |
| H07-19 | Positive speed limit/1st speed limit in torque control | 0 to 6000 | RPM | 3000 | Im | Ru | T |
| H07-20 | Negative speed limit/2nd speed limit in torque control | 0 to 6000 | RPM | 3000 | Im | Ru | T |
| H07-21 | Base value for torque reached | 0.0 to 300.0 | % | 0.0 | Im | Ru | PST |
| H07-22 | Threshold of torque reached valid | 0.0 to 300.0 | % | 20.0 | Im | Ru | PST |
| H07-23 | Threshold of torque reached invalid | 0.0 to 300.0 | % | 10.0 | Im | Ru | PST |
| H07-40 | Speed limit window in the torque control mode | 0.5 to 30.0 | ms | 1.0 | Im | Ru | T |

Group H08: Gain Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|-------|---------|----|-----|-----|
| H08-00 | Speed loop gain | 0.1 to 2000.0 | Hz | 25.0 | Im | Ru | PS |
| H08-01 | Time constant of speed loop integration | 0.15 to 512.00 | ms | 31.83 | Im | Ru | PS |
| H08-02 | Position loop gain | 0.0 to 2000.0 | Hz | 40.0 | Im | Ru | P |
| H08-03 | 2nd gain of speed loop | 0.1 to 2000.0 | Hz | 40.0 | Im | Ru | PS |
| H08-04 | 2nd time constant of speed loop integration | 0.15 to 512.00 | ms | 40.00 | Im | Ru | PS |
| H08-05 | 2nd gain of position loop | 0.0 to 2000.0 | Hz | 64.0 | Im | Ru | P |
| H08-08 | 2nd gain mode setting | 0: Always use the first gain, P/PI switched over via DI 1: First gain and second gain switched over according to the setting of H08-09 | - | 1 | Im | Ru | PST |
| H08-09 | Gain switchover condition | 0: Fixed at 1st gain (PS) 1: Switched over via DI (PS) 2: Torque reference being large (PS) 3: Speed reference being large (PS) 4: Speed reference change rate being large (PS) 5: Speed reference high-speed low-speed thresholds (PS) 6: Position deviation being large (P) 7: Position reference available (P) 8: Positioning completed (P) 9: Motor speed being large (P) 10: Position reference available + motor speed (P) | - | 0 | Im | Ru | PST |
| H08-10 | Gain switchover delay | 0.0 to 1000.0 | ms | 5.0 | Im | Ru | PST |
| H08-11 | Gain switchover level | 0 to 20000 | * | 50 | Im | Ru | PST |
| H08-12 | Gain switchover hysteresis | 0 to 20000 | * | 30 | Im | Ru | PST |
| H08-13 | Position gain switchover time | 0.0 to 1000.0 | ms | 3.0 | Im | Ru | P |
| H08-15 | Load inertia ratio | 0.00 to 120.00 | Times | 1.00 | Im | Ru | PST |
| H08-18 | Time constant of speed feedforward filter | 0.00 to 64.00 | ms | 0.50 | Im | Ru | P |
| H08-19 | Speed feedforward gain | 0.0 to 100.0 | % | 0.0 | Im | Ru | P |
| H08-20 | Time constant of torque feedforward filter | 0.00 to 64.00 | ms | 0.50 | Im | St | PS |
| H08-21 | Torque feedforward gain | 0.0 to 200.0 | % | 0.0 | Im | Ru | PS |
| H08-22 | Speed feedback filter | 0: Disabled 1: Mean filter of 2 speed feedbacks 2: Mean filter of 4 speed feedbacks 3: Mean filter of 8 speed feedbacks 4: Mean filter of 16 speed feedbacks | - | 0 | Im | St | PS |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---------------|------|---------|----|-----|----|
| H08-23 | Cutoff frequency of speed feedback low-pass filter | 100 to 4000 | Hz | 4000 | Im | Ru | PS |
| H08-24 | PDF control coefficient | 0.0 to 100.0 | - | 100.0 | Im | Ru | PS |

*: Based on switchover condition

Group H09: Automatic Gain Tuning Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|------|---------|----|-----|-----|
| H09-00 | Automatic gain tuning mode selection | 0: Disabled, gain parameters are set manually 1: Automatic gain tuning mode, gain parameters tuned automatically based on stiffness table 2: Positioning mode, gain parameters tuned automatically based on stiffness table | - | 0 | Im | Ru | PST |
| H09-01 | Stiffness level selection | 0 to 31 | - | 12 | Im | Ru | PST |
| H09-02 | Mode selection of adaptive notch | 0: Parameters not updated 1: Only one notch (3rd notch) valid, parameters updated in real time 2: Both notches (3rd and 4th notches) valid, parameters updated in real time 3: Only detect resonance frequency (displayed in H09-24) 4: Clear 3rd and 4th notches, restore parameters to default setting | - | 0 | Im | Ru | PST |
| H09-03 | Online inertia auto-tuning mode | 0: Disabled 1: Enabled, update slowly 2: Enabled, always update 3: Enabled, update quickly | - | 0 | Im | Ru | RST |
| H09-04 | Suppression mode of low-frequency resonance | 0: Manually set parameters of low-frequency resonance suppression filter (H09-38 and H09-39) 1: Automatically set parameters of low-frequency resonance suppression filter (H09-38 and H09-39) | - | 0 | Im | Ru | P |
| H09-05 | Offline inertia auto-tuning mode | 0: Positive and negative triangular wave mode 1: Jog mode | - | 0 | Im | St | PST |
| H09-06 | Maximum speed for inertia auto-tuning | 100 to 1000 | RPM | 500 | Im | St | PST |
| H09-07 | Time constant of accelerating to max. speed for inertia auto-tuning | 20 to 800 | ms | 125 | Im | St | PST |
| H09-08 | Interval after an inertia auto-tuning | 50 to 10000 | ms | 800 | Im | St | PST |
| H09-09 | Motor revolutions for an inertia auto-tuning | 0.00 to 2.00 | r | - | - | D | PST |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|---------------|------|---------|----|-----|----|
| H09-12 | 1st notch frequency | 50 to 4000 | Hz | 4000 | Im | Ru | PS |
| H09-13 | 1st notch width level | 0 to 20 | - | 2 | Im | Ru | PS |
| H09-14 | 1st notch depth level | 0 to 99 | - | 0 | Im | Ru | PS |
| H09-15 | 2nd notch frequency | 50 to 4000 | Hz | 4000 | Im | Ru | PS |
| H09-16 | 2nd notch width level | 0 to 20 | - | 2 | Im | Ru | PS |
| H09-17 | 2nd notch depth level | 0 to 99 | - | 0 | Im | Ru | PS |
| H09-18 | 3rd notch frequency | 50 to 4000 | Hz | 4000 | Im | Ru | PS |
| H09-19 | 3rd notch width level | 0 to 20 | - | 2 | Im | Ru | PS |
| H09-20 | 3rd notch depth level | 0 to 99 | - | 0 | Im | Ru | PS |
| H09-21 | 4th notch frequency | 50 to 4000 | Hz | 4000 | Im | Ru | PS |
| H09-22 | 4th notch width level | 0 to 20 | - | 2 | Im | Ru | PS |
| H09-23 | 4th notch depth level | 0 to 99 | - | 0 | Im | Ru | PS |
| H09-24 | Obtained resonance frequency | 0 to 2 | Hz | 0 | - | D | PS |
| H09-30 | Torque disturbance compensation gain | 0.0 to 100.0 | % | 0.0 | Im | Ru | PS |
| H09-31 | Time constant of torque disturbance observer filter | 0.00 to 25.00 | ms | 0.50 | Im | Ru | PS |
| H09-38 | Frequency of low-frequency resonance | 1.0 to 100.0 | Hz | 100.0 | Im | Ru | P |
| H09-39 | Filter setting of low-frequency resonance | 0 to 10 | - | 2 | Im | Ru | P |

Group H0A: Fault and Protection Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|-------------|---------|----|-----|-----|
| H0A-00 | Power input phase loss protection | 0: Enable faults and inhibit warnings 1: Enable faults and warnings 2: Inhibit faults and warnings | - | 0 | Im | Ru | - |
| H0A-03 | Retentive at power failure | 0: Disabled 1: Enabled | - | 0 | Im | Ru | - |
| H0A-04 | Motor overload protection gain | 50 to 300 | % | 100 | Im | St | - |
| H0A-08 | Overspeed threshold | 0 to 10000 | RPM | 0 | Im | Ru | PST |
| H0A-09 | Maximum position pulse frequency | 100 to 4000 | kHz | 4000 | Im | St | P |
| H0A-10 | Threshold of position deviation excess | 1 to 1073741824 | Enc/ Ref | 3145728 | Im | Ru | P |
| H0A-12 | Runaway protection function | 0: Disabled 1: Enabled | - | 1 | Im | Ru | PST |
| H0A-16 | Position deviation threshold for low-frequency resonance suppression | 1 to 1000 | Enc | 5 | Im | Ru | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|-------|-------------|----|-----|-----|
| H0A-17 | Position setting unit | 0: Encoder unit 1: Reference unit | - | 0 | Im | St | P |
| H0A-19 | DI8 filter time constant | 0 to 255 | 25 ns | 80 | Po | St | - |
| H0A-20 | DI9 filter time constant | 0 to 255 | 25 ns | 80 | Po | St | - |
| H0A-24 | Filter time constant of low-speed pulse input terminal | 0 to 255 | 25 ns | 30 | Po | St | P |
| H0A-25 | Filter time constant of speed feedback display | 0 to 5000 | ms | 50 | Im | St | - |
| H0A-26 | Motor overload shielding | 0: Motor overload detection enabled 1: Detection of motor overload warning (Er.909) and fault (Er.620) disabled | - | 0 | Im | St | - |
| H0A-27 | Filter time constant of speed DO | 0 to 5000 | ms | 10 | Im | St | - |
| H0A-28 | Filter time constant of quadrature encoder | 0 to 255 | 25 ns | 30 | Po | St | - |
| H0A-30 | Filter time constant of high-speed pulse input terminal | 0 to 255 | 25ns | 3 | Po | St | P |
| H0A-32 | Time threshold for locked rotor over-temperature protection | 10 to 65535 | ms | 200 | Im | Ru | - |
| H0A-33 | Locked rotor over-temperature protection | 0: Shield detection (Er.630) 1: Enable detection (Er.630) | - | 1 | Im | Ru | - |
| H0A-36 | Encoder multi-turn overflow fault selection | 0: Not shield fault 1: Shield fault | - | 0 | Im | St | ALL |
| H0A-40 | Soft limit function | 0: Disabled 1: Enabled immediately after power-on 2: Enabled after homing | 1 | 0 | Im | St | PST |
| H0A-41 | Soft limit maximum value | -2147483648 to 2147483647 | Ref | 2147483647 | Im | St | PST |
| H0A-43 | Soft limit minimum value | -2147483648 to 2147483647 | Ref | -2147483648 | Im | St | PST |
| H0A-47 | Brake protection detection function | 0: Disabled 1: Enabled | - | 0 | Im | Ru | ALL |
| H0A-48 | Gravity load detection value | 0 to 300.0 | % | 30.0 | Im | Ru | ALL |

Group H0B: Monitoring Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---------------------------|---------------|------|---------|----|-----|-----|
| H0B-00 | Actual motor speed | - | RPM | - | - | Dp | PST |
| H0B-01 | Speed reference | - | RPM | - | - | Dp | PS |
| H0B-02 | Internal torque reference | - | % | - | - | Dp | PST |
| H0B-03 | Monitored DI states | - | - | - | - | Dp | PST |
| H0B-05 | Monitored DO states | - | - | - | - | Dp | PST |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|-----|
| H0B-07 | Absolute position counter | - | Ref | - | - | Dp | PST |
| H0B-09 | Mechanical angle | - | Enc | - | - | Dp | PST |
| H0B-10 | Electric angle | - | ° | - | - | Dp | PST |
| H0B-11 | Speed corresponding to input position reference | - | RPM | - | - | Dp | P |
| H0B-12 | Average load ratio | - | % | - | - | Dp | PST |
| H0B-13 | Input position reference counter | - | Ref | - | - | Dp | P |
| H0B-15 | Encoder position deviation counter | - | Enc | - | - | Dp | P |
| H0B-17 | Feedback pulse counter | - | Enc | - | - | Dp | PST |
| H0B-19 | Total power-on time | - | s | - | - | Dp | PST |
| H0B-21 | AI1 sampling voltage | - | V | - | - | Dp | PST |
| H0B-22 | AI2 sampling voltage | - | V | - | - | Dp | PST |
| H0B-24 | Phase current effective value | - | A | - | - | Dp | PST |
| H0B-26 | Bus voltage | - | V | - | - | Dp | PST |
| H0B-27 | Module temperature | - | °C | - | - | Dp | PST |
| H0B-33 | Fault record | 0: Current fault 1: Latest fault 2: Last 2nd fault 9: Last 9nd fault | - | 0 | Im | Ru | PST |
| H0B-34 | Fault code of selected fault record | - | - | - | - | Dp | PST |
| H0B-35 | Time stamp upon displayed fault | - | s | - | - | Dp | PST |
| H0B-37 | Motor speed upon displayed fault | - | RPM | - | - | Dp | PST |
| H0B-38 | Motor phase U current upon displayed fault | - | A | - | - | Dp | PST |
| H0B-39 | Motor phase V current upon displayed fault | - | A | - | - | Dp | PST |
| H0B-40 | Bus voltage upon displayed fault | - | V | - | - | Dp | PST |
| H0B-41 | Input terminal state upon displayed fault | - | - | - | - | Dp | PST |
| H0B-42 | Output terminal state upon displayed fault | - | - | - | - | Dp | PST |
| H0B-53 | Position deviation counter | - | Ref | - | - | Dp | P |
| H0B-55 | Actual motor speed | - | RPM | - | - | Dp | PST |
| H0B-58 | Mechanical absolute position (low 32 bits) | - | Enc | 0 | - | Dp | ALL |
| H0B-60 | Mechanical absolute position (high 32 bits) | - | Enc | 0 | - | Dp | ALL |
| H0B-64 | Real-time input position reference counter | - | Ref | - | - | Dp | PST |
| H0B-70 | Number of absolute encoder turns | - | r | 0 | - | Dp | ALL |
| H0B-71 | Position of absolute encoder within one turn | - | Enc | 0 | - | Dp | ALL |
| H0B-77 | Absolute position (low 32 bits) of absolute encoder) | - | Enc | 0 | - | Dp | ALL |
| H0B-79 | Absolute position (high 32 bits) of absolute encoder | - | Enc | 0 | - | Dp | ALL |
| H0B-81 | Rotating load single-turn position (low 32 bits) | - | Enc | 0 | - | Dp | ALL |
| H0B-83 | Rotating load single-turn position (high 32 bits) | - | Enc | 0 | - | Dp | ALL |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|------------------------------------|---------------|------|---------|----|-----|-----|
| H0B-85 | Rotating load single-turn position | - | Enc | 0 | - | Dp | ALL |

Group H0C: Communication Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|------|---------|----|-----|-----|
| H0C-00 | Servo axis address | 0: Broadcast address 1 to 247 | - | 1 | Im | Ru | PST |
| H0C-02 | Serial baud rate | 0: 2400 Kbps; 1: 4800 Kbps 2: 9600 Kbps; 3: 19200 Kbps 4: 38400 Kbps; 5: 57600 Kbps | - | 5 | Im | Ru | PST |
| H0C-03 | Modbus data format | 0: No check, 2 stop bits 1: Even parity check, 1 stop bit 2: Odd parity check, 1 stop bit 3: No check, 1 stop bit | - | 0 | Im | Ru | PST |
| H0C-08 | CAN communication rate | 0: 20 K; 1: 50 K; 2: 100 K; 3: 125 K; 4: 250 K; 5: 500 K; 6: 1 M; 7: 1 M | - | 5 | Im | Ru | PST |
| H0C-09 | Communication VDI | 0: Disabled; 1: Enabled | - | 0 | Im | St | PST |
| H0C-10 | VDI default value after power-on | Bit0: VDI1 default value Bit15: VDI16 default value | - | 0 | Po | Ru | PST |
| H0C-11 | Communication VDO | 0: Disabled; 1: Enabled | - | 0 | Im | St | PST |
| H0C-12 | Default level of VDO allocated with function 0 | Bit0: VDO1 default valueBit15: VDO16 default value | - | 0 | Im | St | PST |
| H0C-13 | Update function code values written via communication to EEPROM | 0: Not update the function codes written via communication to EEPROM 1: Update the function codes written via communication, except groups H0B and H0D to EEPROM | - | 1 | Im | Ru | PST |
| H0C-14 | Modbus error code | New protocol: 0x0001: Illegal command code 0x0002: Illegal data address 0x0003: Illegal data 0x0004: Slave device fault Old protocol: 0x0002: Command code not being 0x03/0x06/0x10 0x0004: CRC checksum received and calculated by servo different from checksum in data frame 0x0008: Accessed function code not exist 0x0010: Written function code value exceed limits 0x0080: Written function code modifiable only in stop state but servo being in running state | 1 | - | - | Dp | - |
| H0C-25 | Modbus response delay | 0 to 5000 | ms | 1 | Im | Ru | PST |
| H0C-26 | Modbus communication data sequence | 0: High 16 bits before low 16 bits 1: Low 16 bits before high 16 bits | 1 | 1 | Im | Ru | PST |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---------------------------|---|------|---------|----|-----|-----|
| H0C-30 | Modbus error frame format | 0: Old protocol; 1: New protocol (standard) | 1 | 1 | Im | Ru | PST |

Group H0D: Auxiliary Function Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|------------------------------------|--|------|---------|----|-----|-----|
| H0D-00 | Software reset | 0: Disabled; 1: Enabled | - | 0 | Im | St | - |
| H0D-01 | Fault reset | 0: Disabled; 1: Enabled | - | 0 | Im | St | - |
| H0D-02 | Offline inertia auto-tuning enable | - | - | - | Im | Ru | - |
| H0D-03 | Reserved parameter | - | - | - | - | - | - |
| H0D-05 | Emergency stop | 0: Disabled 1: Enabled, stop mode determined in H02-05 | - | 0 | Im | Ru | - |
| H0D-10 | Analog automatic adjustment | 0: Disabled; 1: AI1 adjustment; 2: AI2 adjustment | - | 0 | Im | St | - |
| H0D-11 | Jog function | With filter | - | - | - | - | - |
| H0D-17 | Forced DI/DO setting | 0: Disabled 1: Forced DI enabled, forced DO disabled 2: Forced DO enabled, forced DI disabled 3: Forced DI and DO enabled | - | 0 | Im | Ru | - |
| H0D-18 | Forced DI level | 0 to 0x01FF | - | 0x01FF | Im | Ru | - |
| H0D-19 | Forced DO setting | 0 to 0x001F | - | 0 | Im | Ru | - |
| H0D-20 | Absolute encoder reset function | 0: Disabled; 1: Reset faults; 2: Reset faults and multi-turn data | - | 0 | Im | Dp | ALL |
| H0D-24 | Gravity load auto-tuning | 0 to 1 | - | 0 | Im | Ru | |

Group H0F: Full Closed-Loop Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---|---------|---------|----|-----|----|
| H0F-00 | Encoder feedback mode | 0: Internal encoder feedback 1: External encoder feedback 2: Internal/External switchover at electronic gear ratio switchover | - | 0 | Im | St | P |
| H0F-01 | Running direction of external encoder | 0: Standard running direction 1: Reverse running direction | - | 0 | Im | St | P |
| H0F-04 | External encoder pulses per one motor revolution | 0 to 1073741824 | Ext enc | 10000 | Po | St | P |
| H0F-08 | Full closed-loop position deviation excess threshold | 0 to 1073741824 | Ext enc | 10000 | Im | Ru | P |
| H0F-10 | Full closed-loop position deviation clear setting | 0 to 100 | r | 0 | Im | Ru | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---------------------------|---------|---------|----|-----|----|
| H0F-13 | Filter time constant of hybrid vibration suppression | 0 to 6553.5 | ms | 0 | Im | Ru | P |
| H0F-16 | Full closed-loop position deviation counter | -1073741824 to 1073741824 | Ext enc | 0 | - | D | P |
| H0F-18 | Feedback pulse counter of internal encoder | -1073741824 to 1073741824 | Int enc | 0 | - | D | P |
| H0F-20 | Feedback pulse counter of external encoder | -1073741824 to 1073741824 | Ext enc | 0 | - | D | P |

Group H11: Multi-Position Function Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|--------|---------|----|-----|----|
| H11-00 | Multi-position running mode | 0: Stop after running single cycle 1: Cyclic running 2: DI switchover 3: Sequential running | - | 1 | Im | St | P |
| H11-01 | Number of position reference profile | 1 to 16 | - | 1 | Im | St | P |
| H11-02 | Margin processing method | 0: Complete the remaining distance 1: Start running again from 1st position | - | 0 | Im | St | P |
| H11-03 | Time unit | 0: ms; 1: s | - | 0 | Im | St | P |
| H11-04 | Displacement reference type | 0: Relative displacement reference 1: Absolute displacement reference | - | 0 | Im | St | P |
| H11-05 | Start position of sequential running | 0 to 16 | - | 0 | Im | St | P |
| H11-12 | 1st displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-14 | Maximum running speed of 1st displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-15 | Acceleration/Deceleration time of 1st displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-16 | Waiting time after 1st displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-17 | 2nd displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-19 | Maximum running speed of 2nd displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-20 | Acceleration/Deceleration time of 2nd displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-21 | Waiting time after 2nd displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-22 | 3rd displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-24 | Maximum running speed of 3rd displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |

6 Parameter Table

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---------------------------|--------|---------|----|-----|----|
| H11-25 | Acceleration/Deceleration time of 3rd displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-26 | Waiting time after 3rddisplacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-27 | 4th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-29 | Maximum running speed of 4th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-30 | Acceleration/Deceleration time of 4th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-31 | Waiting time after 4th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-32 | 5th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-34 | Maximum running speed of 5th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-35 | Acceleration/Deceleration time of 5th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-36 | Waiting time after 5th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-37 | 6th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-39 | Maximum running speed of 6th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-40 | Acceleration/Deceleration time of 6th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-41 | Waiting time after 6th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-42 | 7th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-44 | Maximum running speed of 7th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-45 | Acceleration/Deceleration time of 7th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-46 | Waiting time after 7th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-47 | 8th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-49 | Maximum running speed of 8th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-50 | Acceleration/Deceleration time of 8th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-51 | Waiting time after 8th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-52 | 9th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-54 | Maximum running speed of 9th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-55 | Acceleration/Deceleration time of 9th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-56 | Waiting time after 9th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|---------------------------|--------|---------|----|-----|----|
| H11-57 | 10th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-59 | Maximum running speed of 10th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-60 | Acceleration/Deceleration time of 10th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-61 | Waiting time after 10th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-62 | 11th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-64 | Maximum running speed of 11th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-65 | Acceleration/Deceleration time of 11th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-66 | Waiting time after 11th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-67 | 12th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-69 | Maximum running speed of 12th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-70 | Acceleration/Deceleration time of 12th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-71 | Waiting time after 12th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-72 | 13th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-74 | Maximum running speed of 13th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-75 | Acceleration/Deceleration time of 13th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-76 | Waiting time after 13th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-77 | 14th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-79 | Maximum running speed of 14th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-80 | Acceleration/Deceleration time of 14th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-81 | Waiting time after 14th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-82 | 15th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-84 | Maximum running speed of 15th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |
| H11-85 | Acceleration/Deceleration time of 15th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-86 | Waiting time after 15th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |
| H11-87 | 16th displacement | -1073741824 to 1073741824 | Ref | 10000 | Im | Ru | P |
| H11-89 | Maximum running speed of 16th displacement | 1 to 6000 | RPM | 200 | Im | Ru | P |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|---------------|--------|---------|----|-----|----|
| H11-90 | Acceleration/Deceleration time of 16th displacement | 0 to 65535 | ms (s) | 10 | Im | Ru | P |
| H11-91 | Waiting time after 16th displacement | 0 to 10000 | ms (s) | 10 | Im | Ru | P |

Group H12: Multi-Speed Function Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|-------------------|---------|----|-----|----|
| H12-00 | Multi-speed running mode | 0: Stop after running single cycle 1: Cyclic running 2: DI switchover | - | 1 | Im | St | S |
| H12-01 | Number of speed reference profile | 1 to 16 | - | 16 | Im | St | S |
| H12-02 | Time unit | 0: sec; 1: min | - | 0 | Im | St | S |
| H12-03 | Acceleration time 1 | 0 to 65535 | ms | 10 | Im | St | S |
| H12-04 | Deceleration time 1 | 0 to 65535 | ms | 10 | Im | St | S |
| H12-05 | Acceleration time 2 | 0 to 65535 | ms | 50 | Im | St | S |
| H12-06 | Deceleration time 2 | 0 to 65535 | ms | 50 | Im | St | S |
| H12-07 | Acceleration time 3 | 0 to 65535 | ms | 100 | Im | St | S |
| H12-08 | Deceleration time 3 | 0 to 65535 | ms | 100 | Im | St | S |
| H12-09 | Acceleration time 4 | 0 to 65535 | ms | 150 | Im | St | S |
| H12-10 | Deceleration time 4 | 0 to 65535 | ms | 150 | Im | St | S |
| H12-20 | 1st speed reference | -6000 to 6000 | RPM | 0 | Im | St | S |
| H12-21 | Running time of 1st speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-22 | Acceleration/deceleration time of 1st speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-23 | 2nd speed reference | -6000 to 6000 | RPM | 100 | Im | St | S |
| H12-24 | Running time of 2nd speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-25 | Acceleration/deceleration time of 2nd speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-26 | 3rd speed reference | -6000 to 6000 | RPM | 300 | Im | St | S |
| H12-27 | Running time of 3rd speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-28 | Acceleration/deceleration time of 3rd speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-29 | 4th speed reference | -6000 to 6000 | RPM | 500 | Im | St | S |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|--|------------|---------|----|-----|----|
| H12-30 | Running time of 4th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |
| H12-31 | Acceleration/deceleration time of 4th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-32 | 5th speed reference | -6000 to 6000 | RPM | 700 | Im | St | S |
| H12-33 | Running time of 5th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |
| H12-34 | Acceleration/deceleration time of 5th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-35 | 6th speed reference | -6000 to 6000 | RPM | 900 | Im | St | S |
| H12-36 | Running time of 6th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |
| H12-37 | Acceleration/deceleration time of 6th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-38 | 7th speed reference | -6000 to 6000 | RPM | 600 | Im | St | S |
| H12-39 | Running time of 7th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |
| H12-40 | Acceleration/deceleration time of 7th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-41 | 8th speed reference | -6000 to 6000 | RPM | 300 | Im | St | S |
| H12-42 | Running time of 8th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |
| H12-43 | Acceleration/deceleration time of 8th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-44 | 9th speed reference | -6000 to 6000 | RPM | 100 | Im | St | S |
| H12-45 | Running time of 9th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |
| H12-46 | Acceleration/deceleration time of 9th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-47 | 10th speed reference | -6000 to 6000 | RPM | -100 | Im | St | S |
| H12-48 | Running time of 10th speed reference | 0 to 6553.5 | s (min) | 5.0 | Im | St | S |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|-------------------|---------|----|-----|----|
| H12-49 | Acceleration/deceleration time of 10th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-50 | 11th speed reference | -6000 to 6000 | RPM | -300 | Im | St | S |
| H12-51 | Running time of 11th speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-52 | Acceleration/deceleration time of 11th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-53 | 12th speed reference | -6000 to 6000 | RPM | -500 | Im | St | S |
| H12-54 | Running time of 12th speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-55 | Acceleration/deceleration time of 12th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-56 | 13th speed reference | -6000 to 6000 | RPM | -700 | Im | St | S |
| H12-57 | Running time of 13th speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-58 | Acceleration/deceleration time of 13th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-59 | 14th speed reference | -6000 to 6000 | RPM | -900 | Im | St | S |
| H12-60 | Running time of 14th speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-61 | Acceleration/deceleration time of 14th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-62 | 15th speed reference | -6000 to 6000 | RPM | -600 | Im | St | S |
| H12-63 | Running time of 15th speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |
| H12-64 | Acceleration/deceleration time of 15th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |
| H12-65 | 16th speed reference | -6000 to 6000 | RPM | -300 | Im | St | S |
| H12-66 | Running time of 16th speed reference | 0 to 6553.5 | $\frac{s}{(min)}$ | 5.0 | Im | St | S |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|--|------|---------|----|-----|----|
| H12-67 | Acceleration/deceleration time of 16th speed reference | 0: No acceleration/deceleration time 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4 | - | 0 | Im | St | S |

Group H17: VDI/VDO Parameters

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--------------------------|---|------|---------|----|-----|----|
| H17-00 | VDI1 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-01 | VDI1 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-02 | VDI2 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-03 | VDI2 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-04 | VDI3 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-05 | VDI3 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-06 | VDI4 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-07 | VDI4 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-08 | VDI5 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-09 | VDI5 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-10 | VDI6 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-11 | VDI6 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-12 | VDI7 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-13 | VDI7 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-14 | VDI8 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-15 | VDI8 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-16 | VDI9 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-17 | VDI9 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-18 | VDI10 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-19 | VDI10 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-20 | VDI11 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-21 | VDI11 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-22 | VDI12 function selection | 0 to 37 | - | 0 | St | Ru | - |

6 Parameter Table

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--------------------------|---|------|---------|----|-----|----|
| H17-23 | VDI12 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-24 | VDI13 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-25 | VDI13 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-26 | VDI14 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-27 | VDI14 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-28 | VDI15 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-29 | VDI15 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-30 | VDI16 function selection | 0 to 37 | - | 0 | St | Ru | - |
| H17-31 | VDI16 logic selection | 0: Valid when logic is 1 1: Valid when logic changes from 0 to 1 | - | 0 | St | Ru | - |
| H17-32 | VDO virtual level | - | - | - | - | D | - |
| H17-33 | VDO1 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-34 | VDO1 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-35 | VDO2 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-36 | VDO2 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-37 | VDO3 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-38 | VDO3 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-39 | VDO4 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-40 | VDO4 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-41 | VDO5 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-42 | VDO5 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-43 | VDO6 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-44 | VDO6 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-45 | VDO7 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-46 | VDO7 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-47 | VDO8 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-48 | VDO8 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-49 | VDO9 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-50 | VDO9 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-51 | VDO10 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-52 | VDO10 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--------------------------|--|------|---------|----|-----|----|
| H17-53 | VDO11 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-54 | VDO11 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-55 | VDO12 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-56 | VDO12 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-57 | VDO13 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-58 | VDO13 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-59 | VDO14 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-60 | VDO14 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-61 | VDO15 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-62 | VDO15 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |
| H17-63 | VDO16 function selection | 0 to 22 | - | 0 | St | Ru | - |
| H17-64 | VDO16 logic selection | 0: Output 1 when function valid 1: Output 0 when function valid | - | 0 | St | Ru | - |

Group H30: Servo Variables Read via Communication

(Invisible on operation panel)

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|--|---------------|------|---------|----|-----|-----|
| H30-00 | Servo state read by communication | - | - | - | - | Dp | PST |
| H30-01 | DO function state 1 read via communication | - | - | - | - | Dp | PST |
| H30-02 | DO function state 2 read via communication | - | - | - | - | Dp | PST |
| H30-03 | Input pulse signal sampling read via communication | - | - | - | - | D | PST |

Group H31: Servo Variables Set via Communication

(Invisible on operation panel)

| Function Code | Parameter Name | Setting Range | Unit | Default | ET | Pro | CM |
|---------------|---|-----------------------|------|---------|----|-----|-----|
| H31-00 | VDI virtual level set via communication | 0 to 65535 | - | 0 | Im | Ru | PST |
| H31-04 | DO state set via communication | 0 to 31 | - | 0 | Im | Ru | PST |
| H31-09 | Speed reference set via communication | -6000.000 to 6000.000 | RPM | 0 | Im | Ru | S |
| H31-11 | Torque reference set via communication | -100.000 to 100.000 | % | 0 | Im | Ru | T |

DI/DO Function Definitions

| No. | Function Symbol | Function Name | Description | Remarks |
|----------------------------|-----------------|--------------------------------------|---|--|
| Input Function Description | | | | |
| FunIN.1 | S-ON | Servo ON | Invalid: Servo motor disabled Valid: Servo motor enabled | The logic of the corresponding terminal needs to be set to level valid. The change of the corresponding DI or VDI or terminal logic takes effect only after power-on again. |
| FunIN.2 | ALM-RST | Fault and warning reset (edge valid) | Invalid: Disabled Valid: Enabled | This DI function is edge valid rather than high/low level valid. The servo drive can continue to operate after fault/warning reset. When this function is allocated to a low-speed DI and logic of the ID is level valid, the servo drive will forcibly changes it to edge logic. The valid level change must last for more than 3 ms; otherwise, the fault reset function becomes invalid. Do not allocate this function to high-speed DI. Otherwise, fault/warning reset will be invalid. |
| FunIN.3 | GAIN-SEL | Gain switchover | H08-09 = 1: Invalid: Speed control loop being PI control Invalid: Speed control loop being P control H08-09 = 2: Invalid: Fixed at 1st gain Valid: Fixed at 2nd gain | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.4 | CMD-SEL | Main/Auxiliary reference switchover | Valid: Current running reference being A Invalid: Current running reference being B | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.5 | DIR-SEL | Multi-reference direction | Invalid: Default reference direction Valid: Reverse to reference direction | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.6 | CMD1 | Multi-reference switchover 1 | Used to select one from the 16 references | It is recommended that the logic of the corresponding terminal be set to level valid. |

| No. | Function Symbol | Function Name | Description | Remarks |
|----------|-----------------|------------------------------|--|--|
| FunIN.7 | CMD2 | Multi-reference switchover 2 | Used to select one from the 16 references | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.8 | CMD3 | Multi-reference switchover 3 | Used to select one from the 16 references | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.9 | CMD4 | Multi-reference switchover 4 | Used to select one from the 16 references | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.10 | M1-SEL | Mode switchover 1 | Used to perform switchover between speed control, position control, and torque control based on the selected control mode (H02-00 = 3/4/5). | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.11 | M2-SEL | Mode switchover 2 | Used to perform switchover between speed control, position control, and torque control based on the selected control mode (H02-00 = 6). | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.12 | ZCLAMP | Zero speed clamp | Valid: Zero speed clamp enabled Invalid: Zero speed clamp disabled | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.13 | INHIBIT | Position reference inhibited | Invalid: The servo drive responds to position references in position control mode. Valid: The servo drive does not respond to any internal or external position reference in position control mode. | The position references include internal and external position references. It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.14 | P-OT | Forward limit switch | Valid: Forward drive inhibited Invalid: Forward drive permitted | When the mechanical movement is outside the movable range, the servo drive implements the function of preventing the motor from sensing the limit switch. It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.15 | N-OT | Reverse limit switch | Valid: Reverse drive inhibited Invalid: Reverse drive permitted | |

| No. | Function Symbol | Function Name | Description | Remarks |
|----------|-----------------|--------------------------------|--|---|
| FunIN.16 | P-CL | External positive torque limit | <p>The torque limit source is switched over based on the setting of H07-07.</p> <p>H07-07 = 1: Valid: External positive torque limit enabled Invalid: Internal positive torque limit enabled</p> <p>H07-07 = 3 and AI limit larger than external positive limit Valid: External positive torque limit enabled Invalid: AI torque limit enabled</p> <p>H07-07 = 4: Valid: AI torque limit enabled Invalid: Internal positive torque limit enabled</p> | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.17 | N-CL | External negative torque limit | <p>The torque limit source is switched over based on the setting of H07-07.</p> <p>H07-07 = 1: Valid: External negative torque limit enabled Invalid: Internal negative torque limit enabled</p> <p>H07-07 = 3 and AI limit larger than external negative limit Valid: External negative torque limit enabled Invalid: AI torque limit enabled</p> <p>H07-07 = 4: Valid: AI torque limit enabled Invalid: Internal negative torque limit enabled</p> | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.18 | JOGCMD+ | Forward jog | <p>Valid: Execute reference input Invalid: Not receive reference input</p> | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.19 | JOGCMD- | Reverse jog | <p>Valid: Input reverse to reference direction Invalid: Reference input stopped</p> | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.20 | POSSTEP | Step reference | <p>In servo running state Valid: Execute step reference set in H05-05, servo motor running Invalid: Servo motor in locked state</p> | It is recommended that the logic of the corresponding terminal be set to level valid. |

| No. | Function Symbol | Function Name | Description | Remarks |
|----------|-----------------|--|--|---|
| FunIN.21 | HX1 | Handwheel multiplying factor signal 1 | HX1 valid, HX2 invalid: X10 HX1 invalid, HX2 valid: X100 Other: X1 | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.22 | HX2 | Handwheel multiplying factor signal 2 | | |
| FunIN.23 | HX_EN | Handwheel signal | Invalid: Handwheel disabled Valid: Handwheel enabled | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.24 | GEAR_SEL | Electronic gear ratio switchover | Invalid: Electronic gear ratio 1 Valid: Electronic gear ratio 2 | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.25 | TOQDirSel | Torque reference direction selection | Valid: Forward direction Invalid: Reverse direction | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.26 | SPDDirSel | Speed reference direction selection | Valid: Forward direction Invalid: Reverse direction | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.27 | POSDirSel | Position reference direction selection | Valid: Actual position reference direction same as given position reference direction Invalid: Actual position reference direction opposite to given position reference direction | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.28 | PosInSen | Multi-position reference enable (edge valid) | Invalid: Disabled, servo motor in locked state Valid: Enabled | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.29 | XintFree | Position change on fly unlock | Valid: The position change on fly state is unlocked, and the servo drive can respond to other position references. Invalid: The position change on fly signal is retained, and the servo drive does not respond to other position references. | It is recommended that the logic of the corresponding terminal be set to edge valid. |

| No. | Function Symbol | Function Name | Description | Remarks |
|----------|-----------------|----------------------------------|--|---|
| FunIN.31 | HomeSwitch | Home switch | Invalid: Not triggered Valid: Triggered, current position being home | The logic of the corresponding terminal needs to be set to level valid. Allocate this function to the high-speed DI terminal. If the logic is set to 2 (rising edge valid), the servo drive forcibly changes it to 1 (high level valid). If the logic is set to 3 (falling edge valid), the servo drive forcibly changes it to 0 (low level valid). If the logic is set to 4 (both rising edge and falling edge valid), the servo drive forcibly changes it to 0 (low level valid). |
| FunIN.32 | HomingStart | Homing function | Valid: Enabled (the function cannot be enabled repeatedly when running) Invalid: Disabled | It is recommended that the logic of the corresponding terminal be set to edge valid. |
| FunIN.33 | XintInhibit | Position change on fly inhibited | Valid: Position change on fly inhibited Invalid: Position change on fly permitted | The logic of the corresponding terminal needs to be set to level valid. If the logic is set to 2 (rising edge valid), the servo drive forcibly changes it to 1 (high level valid). If the logic is set to 3 (falling edge valid), the servo drive forcibly changes it to 0 (low level valid). If the logic is set to 4 (both rising edge and falling edge valid), the servo drive forcibly changes it to 0 (low level valid). |
| FunIN.34 | EmergencyStop | Emergency stop | Valid: Position lock after emergency stop Invalid: Current running state unaffected | It is recommended that the logic of the corresponding terminal be set to level valid. |
| FunIN.35 | ClrPosErr | Position deviation cleared | Valid: Position deviation cleared Invalid: Position deviation not cleared | It is recommended that the logic of the corresponding terminal be set to edge valid. It is recommended that this function be allocated to DI8 or DI9. |
| FunIN.36 | V_LmtSel | Internal speed limit source | Valid: H07-20 as internal speed limit (H07-17 = 2) Valid: H07-19 as internal speed limit (H07-17 = 2) | It is recommended that the logic of the corresponding terminal be set to level valid. |

| No. | Function Symbol | Function Name | Description | Remarks |
|-----------------------------|-----------------|-----------------------|---|---|
| FunIN.37 | PulseInhibit | Pulse input inhibited | When the position reference source is pulse input (H05-00 = 0) in the position control mode: Invalid: Respond to pulse input Valid: Not respond to pulse input | It is recommended that the logic of the corresponding terminal be set to level valid. |
| Output Function Description | | | | |
| FunOUT.1 | S-RDY | Servo ready | The servo drive is in ready state and can receive the S-ON signal. Valid: Servo drive ready Invalid: Servo drive not ready | Servo not ready: A No. 1 or 2 fault occurs in the servo drive, or the DI emergency stop signal is active. |
| FunOUT.2 | TGON | Motor rotation output | Valid: Motor speed absolute value after filter smaller than H06-16 Invalid: Motor speed absolute value after filter equal to or larger than H06-16 | - |
| FunOUT.3 | ZERO | Zero speed signal | Invalid: The absolute deviation between the motor speed feedback and the speed reference is larger than the setting of H06-19. Valid: The absolute deviation between the motor speed feedback and the speed reference is smaller than or equal to the setting of H06-19. | - |
| FunOUT.4 | V-CMP | Speed consistent | In the speed control mode, when the absolute value of the deviation between the motor speed and the speed reference is smaller than the value of H06-17, this signal is active. | - |
| FunOUT.5 | COIN | Positioning completed | In the position control mode, when the position deviation pulses reach the value of H05-21, this signal is active. | - |
| FunOUT.6 | NEAR | Positioning near | In the position control mode, when the position deviation pulses reach the value of H05-22, this signal is active. | - |
| FunOUT.7 | C-LT | Torque limit | Confirming torque limit: Valid: Motor torque limited Invalid: Motor torque not limited | - |

| No. | Function Symbol | Function Name | Description | Remarks |
|-----------|-----------------|----------------------------------|--|---------|
| FunOUT.8 | V-LT | Speed limit | Confirming speed limit in torque control: Invalid: Motor speed not reaching the speed limit Valid: Motor speed reaching the speed limit and speed loop built internally based on the speed limit | - |
| FunOUT.9 | BK | Brake output | Brake output: Invalid: The power is on, the brake is applied, and the motor is in position lock state. Valid: The power is off, the brake is released, and the motor can rotate. | - |
| FunOUT.10 | WARN | Warning output | The warning output is active (conducted). | - |
| FunOUT.11 | ALM | Fault output | This signal is valid when a fault occurs. | - |
| FunOUT.12 | ALMO1 | 3-digit fault code output | A 3-digit fault code is output. | - |
| FunOUT.13 | ALMO2 | 3-digit fault code output | A 3-digit fault code is output. | - |
| FunOUT.14 | ALMO3 | 3-digit fault code output | A 3-digit fault code is output. | - |
| FunOUT.15 | Xintcoin | Position change on fly completed | Valid: Position change on fly completed Invalid: Position change on fly not completed | - |
| FunOUT.16 | HomeAttain | Home attaining output | Home attaining state: Valid: Home attaining completed Invalid: Home attaining not completed | - |
| FunOUT.17 | ElecHomeAttain | Electrical home attaining output | Electric home attaining state: Valid: Electrical home attaining completed Invalid: Electrical home attaining not completed | - |
| FunOUT.18 | ToqReach | Torque reached | Valid: Absolute value of torque reference reaching setting value Invalid: Absolute value of torque reference smaller than setting value | - |
| FunOUT.19 | V-Arr | Speed reached | Valid: Speed feedback reaches setting value Invalid: Speed feedback smaller than setting value | - |

| No. | Function Symbol | Function Name | Description | Remarks |
|-----------|-----------------|---------------------------|--|---------|
| FunOUT.20 | AngIntRdy | Angle auto-tuning output | Valid: Angle auto-tuning completed Invalid: Angle auto-tuning not completed | - |
| FunOUT.21 | DB | DB braking output | Valid: Dynamic braking relay open Invalid: Dynamic braking relay close | - |
| FunOUT.22 | CmdOk | Internal reference output | Valid: Internal reference completed Invalid: Internal reference not completed | - |

Revision History

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|------------|---------|--------------------|
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