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# IS580 Series AC Drive

## Closed Loop Pressure and Flow Control

## User Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19010395A06

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# Safety Information and Precautions

This guide is packaged together with the product. It contains basic information for quick start of the drive. For safety and more information, please refer to IS580 Servo Drive Advanced User Guide, which can be Downloaded on 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 do not isolate 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 an 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 AC 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 an 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 servo drive 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 servo drive 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 $mm^2$ (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 AC drive
- AC 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 | CE | EMC directives | 2014/30/EU | EN 61800-3 |
| | | LVD directives | 2014/35/EU | EN 61800-5-1 |
| | | RoHS directives | 2011/65/EU | EN 50581 |
| UL | c UL us LISTED | - | | UL508C/UL61800-5-1 |
| | | | | C22.2 No.14-13 |

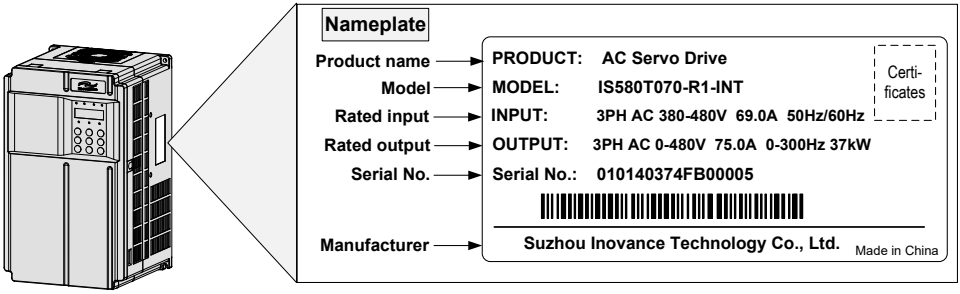
| Note | |
|---|---|
| | · The above EMC directives are complied with only when the EMC electric installation requirements are strictly observed.<br>· Machines and devices used in combination with this drive must also be CE certified and marked. The integrator who integrates the drive with the CE mark into other devices has the responsibility of ensuring compliance with CE standards and verifying that conditions meet European standards.<br>· 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).<br>· For more information on certification, consult our distributor or sales representative. |

## ■ Motor Thermal Protection

Motor thermal protection is not assessed by UL.

# 1. Product Information

## 1.1 Nameplate and Designation Rule




**IS580** — IS580 series hydraulic servo drive

**T**

| Mark | Voltage Class |
|---|---|
| T | Three-phase 380 to 480 V |
| -2T | Three-phase 220 V |

**070**

| Mark | 20 | 30 | 35 | … | 300 | … |
|---|---|---|---|---|---|---|
| Rated output current(A) | 25 | 32 | 37 | … | 304 | … |

**-R1**

| Mark | Type of PG card |
|---|---|
| -R1 | Resolver (S58-PG-B1) |
| -D | Differential ABZ encoder (MD38PGMD) |

**-INT**

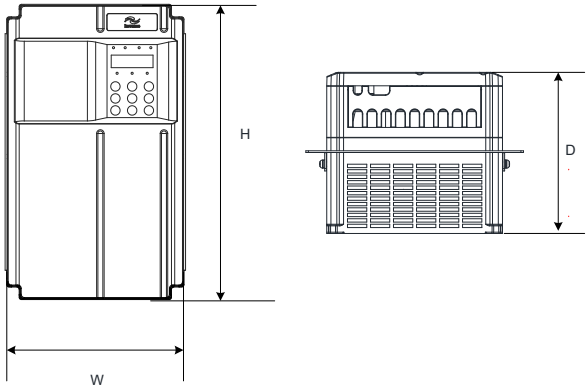
| Mark | Version |
|---|---|
| -INT | International |
| -(a) | Other variants |

Note (a): The model number may include a suffix "XXXXXXXXXX", Where "XXXXXXXXXX" can be blank or combination of any alphanumeric and/or symbols that represents customer identity.

## 1.2 General Specifications

| Voltage class | | | Three-phase 380 to 480 VAC | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model: IS580Txxx | | | 020 | 030 | 035 | 040 | 050 | 070 | 080 | 100 | 140 | 170 | 210 | 250 | 300 |
| Frame size | | | T5 | | | | T6 | | T7 | | T8 | | | T9 | |
| Dimension(1) | | Height<br>Width<br>Depth | [H]: 350 mm<br>[W]: 210 mm<br>[D]: 192 mm | | | | [H]: 400 mm<br>[W]: 250 mm<br>[D]: 220 mm | | [H]: 540 mm<br>[W]: 300 mm<br>[D]: 275 mm | | [H]: 580 mm<br>[W]: 338 mm<br>[D]: 320 mm | | | [H]: 915 MM<br>[W]: 400 MM<br>[D]: 320 MM | |
| Drive Output | Rated power, [kW] | | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 75 | 90 | 110 | 132 | 160 |
| | Rated output current, [A] | | 25 | 32 | 37 | 45 | 60 | 75 | 91 | 112 | 150 | 176 | 210 | 253 | 304 |
| | Default carrier frequency, [kHz] | | 6 | 6 | 4 | 4 | 4 | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 |
| | Carrier frequency range, [kHz] | | 1 to 8 | | | | | | | | | | | | |
| | Overload capacity | | 150% for 60 sec & 180% for 2 sec | | | | | | | | | | | | |
| | Max. output voltage | | Three-phase 380 to 480 VAC (proportional to input voltage) | | | | | | | | | | | | |
| | Max. output frequency | | 300 Hz | | | | | | | | | | | | |
| Drive Input | Rated input voltage | | Three-phase 380 to 480v, -15% to +10% | | | | | | | | | | | | |
| | Rated input current, [A] | | 36.3 | 45.1 | 49.5 | 59 | 57 | 69 | 89 | 106 | 139 | 164 | 196 | 240 | 287 |
| | Rated input frequency | | 50/60 Hz, ±5% | | | | | | | | | | | | |
| Power capacity, [kVA] | | | 30 | 39 | 45 | 54 | 52 | 63 | 81 | 97 | 127 | 150 | 179 | 220 | 263 |
| Braking Resistor | Recommended power, [kW] | | 0.8 | 1 | 1.3 | 1.5 | 2.5 | 3.7 | 4.5 | 5.5 | 7.5 | 9 | 5.5 x 2 | 6.5 x 2 | 16 |
| | Min. Resistance, [Ω] | | 43 | 32 | 25 | 22 | 16 | 16 | 16 | 16 | 12 | 8 | 12 x 2 | 8 x 2 | 2.5 |
| Enclosure | | | IP20 | | | | | | | | | | | | |

(1) the dimensions are shown below.



| Voltage class | | | Three-phase 220 VAC | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model: IS580-2Txxx | | | 020 | 030 | 040 | 050 | 070 | 080 | 100 | 140 | 170 | 210 | 300 |
| Frame size | | | T5 | | | T6 | | T7 | | T8 | | | T9 |
| Dimension[1] | | Height<br>Width<br>Depth | [[H]: 350 MM<br>[W]: 210 MM<br>[D]: 192 MM | | | [H]: 400 MM<br>[W]: 250 MM<br>[D]: 220 MM | | [H]: 540 MM<br>[W]: 300 MM<br>[D]: 275 MM | | [H]: 580 MM<br>[W]: 338 MM<br>[D]: 315 MM | | | [H]: 915 MM<br>[W]: 400 MM<br>[D]: 320 MM |
| Drive Output | Rated power, [kW] | | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 | 80 |
| | Rated output current, [A] | | 25 | 32 | 45 | 60 | 75 | 91 | 112 | 150 | 176 | 210 | 304 |
| | Default carrier frequency, [kHz] | | 6 | 6 | 4 | 4 | 4 | 4 | 4 | 3 | 2 | 2 | 2 |
| | Carrier frequency range, [kHz] | | 1 to 8 | | | | | | | | | | |
| | Overload capacity | | 150% for 60 sec & 180% for 2 sec | | | | | | | | | | |
| | Max. output voltage | | Three-phase 220 VAC (proportional to input voltage) | | | | | | | | | | |
| | Max. output frequency | | 300 Hz | | | | | | | | | | |
| Drive Input | Rated input voltage | | Three-phase 380 to 480v, -15% to +10% | | | | | | | | | | |
| | Rated input current, [A] | | 36.3 | 45.1 | 59 | 57 | 69 | 89 | 106 | 139 | 164 | 196 | 287 |
| | Rated input frequency | | 50/60 Hz, ±5% rated input frequency | | | | | | | | | | |
| Power capacity, [kVA] | | | 30 | 39 | 54 | 52 | 63 | 81 | 97 | 127 | 150 | 179 | 263 |
| Braking Resistor | Recommended power, [kW] | | 0.8 | 1.0 | 1.5 | 2.5 | 3.7 | 4.5 | 5.5 | 7.5 | 9 | 11 | 8 x 2 |
| | Min. Resistance, [Ω] | | 22 | 16 | 11 | 8 | 8 | 8 | 6 | 6 | 4 | 4 | 6 x 2 |
| Enclosure | | | IP20 | | | | | | | | | | |

# 2 Wiring

## 2.1 Terminal Description

■ Terminals of Main circuit

Figure 2-1 Terminals of IS580T020 to IS580T040, and IS580-2T020 to IS580-2T040

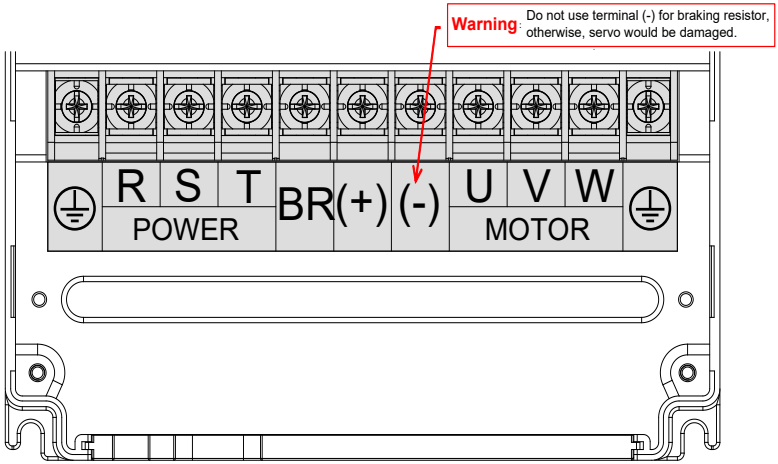



Figure 2-2 Terminals of IS580T050 and IS580T070, and IS580-2T050 to IS580-2T070

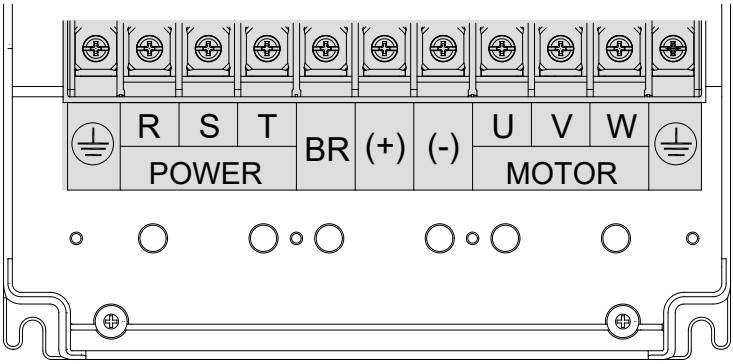


Figure 2-3 Terminals of IS580T080 and IS580T100, and IS580-2T080 and IS580-2T100

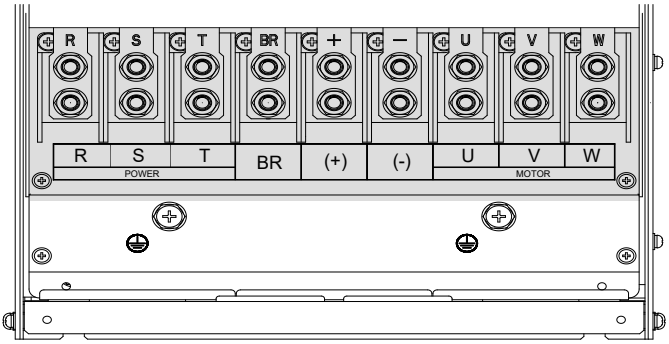
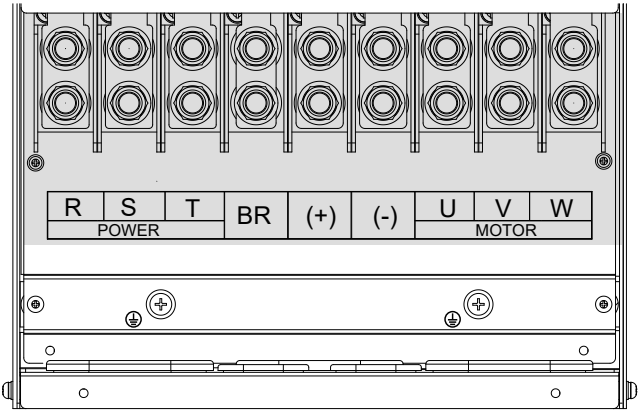
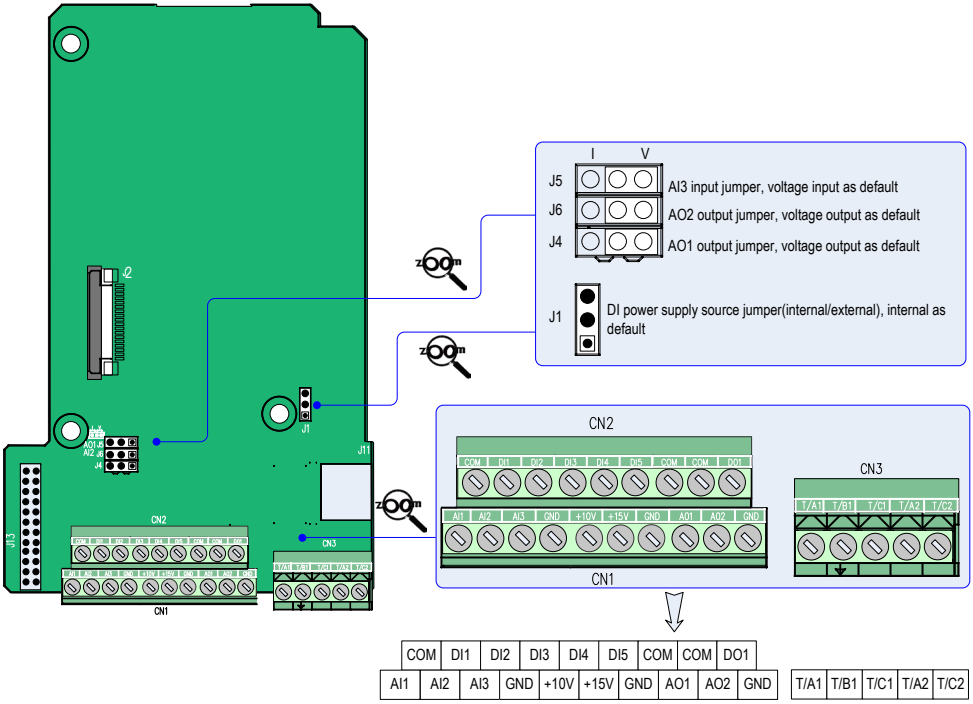



Figure 2-4 Terminals of IS580T140 to IS580T210, and IS580-2T140 to IS580-2T210




| Terminal | Terminal name | Description |
|---|---|---|
| R, S, T | Three-phase supply input | Connect to the three-phase ac power supply. |
| (-), (+) | DC bus terminals | Connected to external braking unit (MDBUN) with servo drive units of 90 kW and above. |
| BR, (+) | Braking resistor connection | Connected to external braking resistor for servo drive units of 75 kW and below. |
| U, V, W | Output terminals | Connect to a three-phase motor. |
| ⏚ | Ground (PE) | Grounding connection. |

■ Terminals of Main Control Board




| Terminal | Terminal name | Description |
|---|---|---|
| +10V-GND | +10 VDC power supply | Internal 10 VDC power supply |
| +15V-GND | +15 VDC power supply | Internal 15 VDC power supply can be used for pressure sensor<br>Max. Output current: 10 mA |
| AI1-GND | Analog input 1 | 1. Input voltage range: 0 to 10 VDC<br>2. Input impedance: 22 kΩ |
| AI2-GND | Analog input 2 | |
| AI3-GND | Analog input 3 | 1. Input voltage range: 0 to 10 VDC/0 to 20 mA, selected by J5 jumper<br>2. Input impedance: 22 kΩ (voltage input), 500 Ω (current input) |
| DI1- COM | Digital input 1 | 1. Optically-coupled isolation compatible with dual-polarity inputs, input frequency less than 100 Hz<br>2. Power supply source determined by jumper J1<br>3. Input impedance: 1.39 kΩ<br>4. Voltage range for inputs: 9 to 30 V |
| DI2- COM | Digital input 2 | |
| DI3- COM | Digital input 3 | |
| DI4- COM | Digital input 4 | |
| DI5- COM | Digital input 5 | |
| AO1-GND | Analogue output 1 | 1. Either a voltage or a current output, Determined by jumper J4.<br>2. Max. Load resistance: 500 Ω<br>3. Output voltage range: 0 to 10 V<br>4. Output current range: 0 to 20 mA. |
| AO2-GND | Analogue output 1 | 1. Either a voltage or a current output, determined by jumper J6.<br>2. Max. Load resistance: 500 Ω<br>3. Output voltage range: 0 to 10 V<br>4. Output current range: 0 to 20 mA. |

| Terminal | Terminal name | Description |
|---|---|---|
| DO1-COM | Digital output 1 | 1. Optically-coupled isolation, dual-polarity open-collector output<br>2. Output voltage range: 0 to 24 V<br>3. Output current range: 0 to 50 mA.<br>4. DO1 can only be driven by external power supply |
| T/A1-T/B1 | Relay(normally closed) | 250 VAC, 3 A, COSØ = 0.4<br>30 VDC, 1 A |
| T/A1-T/C1 | Relay(normally open) | |
| T/A2-T/C2 | Relay(normally open) | |
| J13 | Extension card interface | 28-pin connector , to connect with extension cards (I/O, plc card, bus communication cards) |
| J2 | PG card interface | PG card interface |
| J11 | External keypad interface | External keypad interface |
| J1 | Jumper | DC power supply source selection |
| J4 | Jumper | Voltage/current selection |
| J6 | Jumper | Voltage/current selection |
| J5 | Jumper | Voltage/current selection |

## 2.2 Terminals of PG Card and Speed Sensor Cable

■ Resolver PG Card S58-PG-B1

Table 2-1 Terminal Function Description of S58-PG-B1

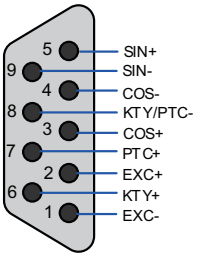
| Terminal | Pin No. | Pin Definition | Function Description | Terminal Arrangement |
|---|---|---|---|---|
| J3 | 1 | EXC- | Resolver excitation negative |  |
| | 2 | EXC+ | Resolver excitation positive | |
| | 3 | COS+ | Resolver feedback COS positive | |
| | 4 | COS- | Resolver feedback COS negative | |
| | 5 | SIN+ | Resolver feedback SIN positive | |
| | 6 | KTY-M | KTY resistor positive | |
| | 7 | PTC-M | PTC resistor positive | |
| | 8 | KTY-N/PTC-N | KTY or PTC resistor negative | |
| | 9 | SIN- | Resolver feedback SIN negative | |
| CN1 | 18-pin FFC interface, connecting J2 of control board of the drive | | | |



Table 2-2 Description of S58-PG-B1 indicator status

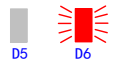
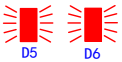
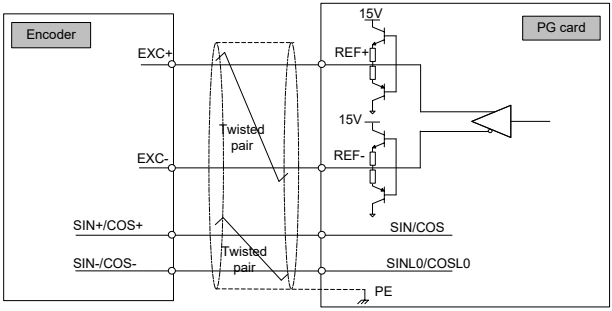
| Indicator | S58-PG-B1 Status | Possible Causes and Solutions |
|---|---|---|
|  | Normal | - |
|  | Phase-locked loop failure | Generally, it is caused by too large lag in phase of resolver selected. |
|  | Signal SIN/COS amplitude exceeding upper limit | Generally, it is caused by interference.<br>In this case, ground the motor well and connect the grounding point of the PG card to the PE terminal of the drive. |
|  | Signal SIN/COS amplitude too small. | Generally, this is because DB9 connector is not connected, is wrongly connected or even wire breaking occurs.<br>If the conditions described here does not occur, check whether the resolver selected matches S58-PG-B1. |

Figure 2-5 S58-PG-B1 interface circuit

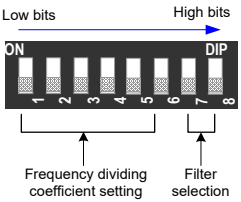



## ■ Differential ABZ PG card MD38PGMD

The following figure describes terminals of MD38PGMD

| Terminal | | Function Description |
|---|---|---|
| CN2 | A+ | Encoder output signal A positive |
| | A- | Encoder output signal A negative |
| | B+ | Encoder output signal B positive |
| | B- | Encoder output signal B negative |
| | Z+ | Encoder output signal Z positive |
| | Z- | Encoder output signal Z negative |
| | 5V/15V | Encoder 5V/15V power supply |
| | COM | Encoder power ground |
| | PE | Shield connecting point |
| J7 | OA+ | Differential frequency dividing output signal A positive |
| | OA- | Differential frequency dividing output signal A negative |
| | OB+ | Differential frequency dividing output signal B positive |
| | OB- | Differential frequency dividing output signal B negative |
| | OZ+ | Differential frequency dividing output signal Z positive |
| | OZ- | Differential frequency dividing output signal Z negative |
| | GND | Frequency dividing output reference ground |
| | OA | Open-collector frequency dividing output signal A |
| | OB | Open-collector frequency dividing output signal B |
| | OZ | Open-collector frequency dividing output signal Z |
| CN1 | 18-pin FFC interface, connecting to J4 on the control board of the AC drive | |

· DIP switch setting

| Filter Selection | | Definition | Address Setting | | | | | | Value | Frequency Dividing Coefficient | DIP Switch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 7 | | 6 | 5 | 4 | 3 | 2 | 1 | | | |
| 0 | 0 | Non-self-adaptive filter | 0 | 0 | 0 | 0 | 0 | 0 | Reserved | No output |  |
| | | | 0 | 0 | 0 | 0 | 0 | 1 | 1 | Frequency divided by 1 | |
| 0 | 1 | Self-adaptive filter | 0 | 0 | 0 | 0 | 1 | 0 | 2 | Frequency divided by 2 | |
| | | | 0 | 0 | 0 | 0 | 1 | 1 | 3 | Frequency divided by 3 | |
| 1 | 0 | Fixed inter-lock | ... | | | | | | | | |
| | | | 1 | 1 | 1 | 1 | 0 | 1 | 61 | Frequency divided by 61 | |
| 1 | 1 | Automatic inter-lock | 1 | 1 | 1 | 1 | 1 | 0 | 62 | Frequency divided by 62 | |
| | | | 1 | 1 | 1 | 1 | 1 | 1 | 63 | Frequency divided by 63 | |



· Indicators

| Indicator | Indication | State | Description |
|---|---|---|---|
| D1/D2/D3 | Encoder input signal indicator | ON or flash | The encoder has signal input. |
| | | OFF | The encoder does not have signal input. |
| D6 | Power indicator | ON | Normal. |
| | | OFF | Power is not connected. |
| LED1 | Encoder input signal quality indicator | ON | Input signal is slightly instable, which occurs when motor accelerates/ decelerates or encoder signal input suffers slight interference. |
| | | OFF | Input signal is normal, speed is stable and there is no interference. |
| | | Flash slowly | Input signal is moderately instable, which occurs when motor accelerates/ decelerates or encoder signal input suffers moderate interference. |
| | | Flash quickly | Input signal is seriously instable, which occurs when motor accelerates/ decelerates quickly or encoder signal input suffers severe interference. |
| LED2 | Signal processing quality indicator | ON | Signal is slightly instable, which occurs when motor accelerates/decelerates or interference during signal input is not completely filtered (The number of interference pulses that are not filtered is less than 10 per time unit). |
| | | OFF | Signal processing is normal, speed is stable and there is no interference. |
| | | Flash slowly | Signal is moderately instable, which occurs when motor accelerates/ decelerates or interference during signal input is not completely filtered (The number of interference pulses that are not filtered is less than 30 per time unit). |
| | | Flash quickly | Signal is seriously instable, which occurs when motor accelerates/decelerates or interference during signal input is not completely filtered (The number of interference pulses that are not filtered is more than 30 per time unit). |
| LED3 | Inter-lock state indicator | ON | Inter-lock enabled. |
| | | OFF | Inter-lock disabled. |
| LED4 | System state indicator | ON | Normal. |
| | | OFF | The system is not operating or abnormal. |
| | | Flash | The encoder cable breaks. |

## ■ Cable Connector of ISMG Motor

Figure 2-6 Wiring with military spec. (applicable to the second generation ISMG motor)

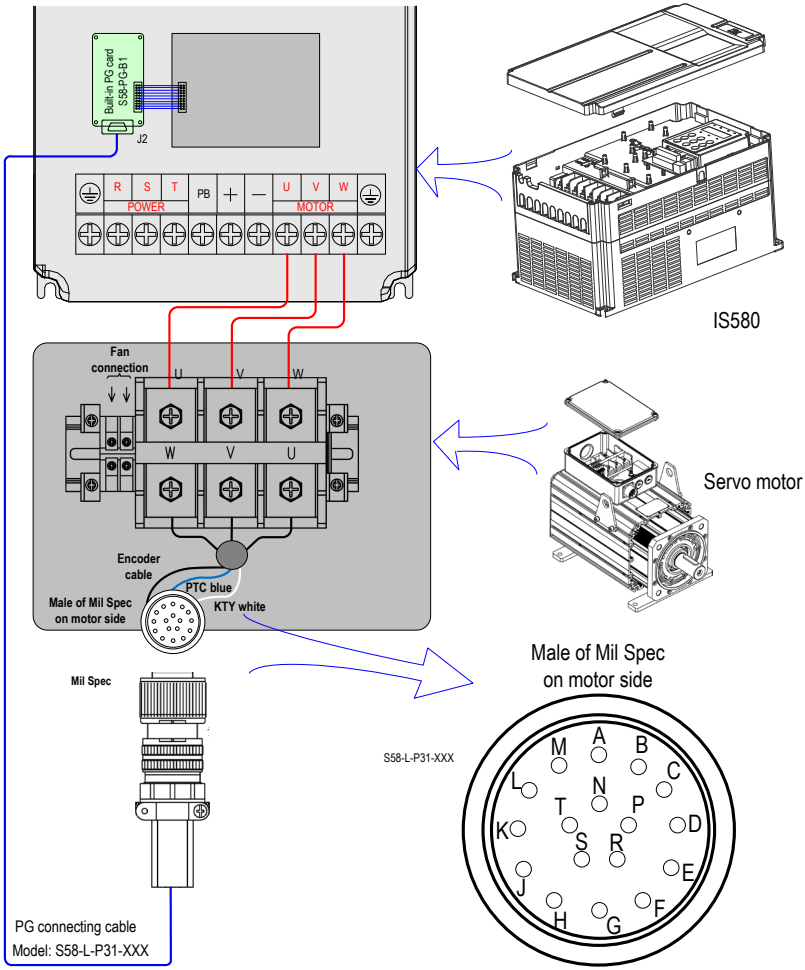



Table 2-4 Pin colour definition with military spec. (applicable to the second generation ISMG motor)

| 17P Mil Spec. | A | B | C | D | E | F | G | H | L | K | J |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D-type Connector 9-pin | 1 | 2 | 3 | 4 | 5 | 9 | 7 | 8 | | 6 | Housing |
| Signal Definition | REF+ | REF- | Cos+ | Cos- | Sin+ | Sin- | PTC-M | KTY-N | PTC-N | KTY-M | Shielding |
| Wire Colour | Yellow/White | Red/White | Red | Black | Yellow | Blue | Brown | Orange | | Grey | Shielding |
| Remark | One pair | | One pair | | One pair | | | KTY, PTC common | | | |

Figure 2-7 Wiring without military spec. (applicable to the first generation ISMG motor)

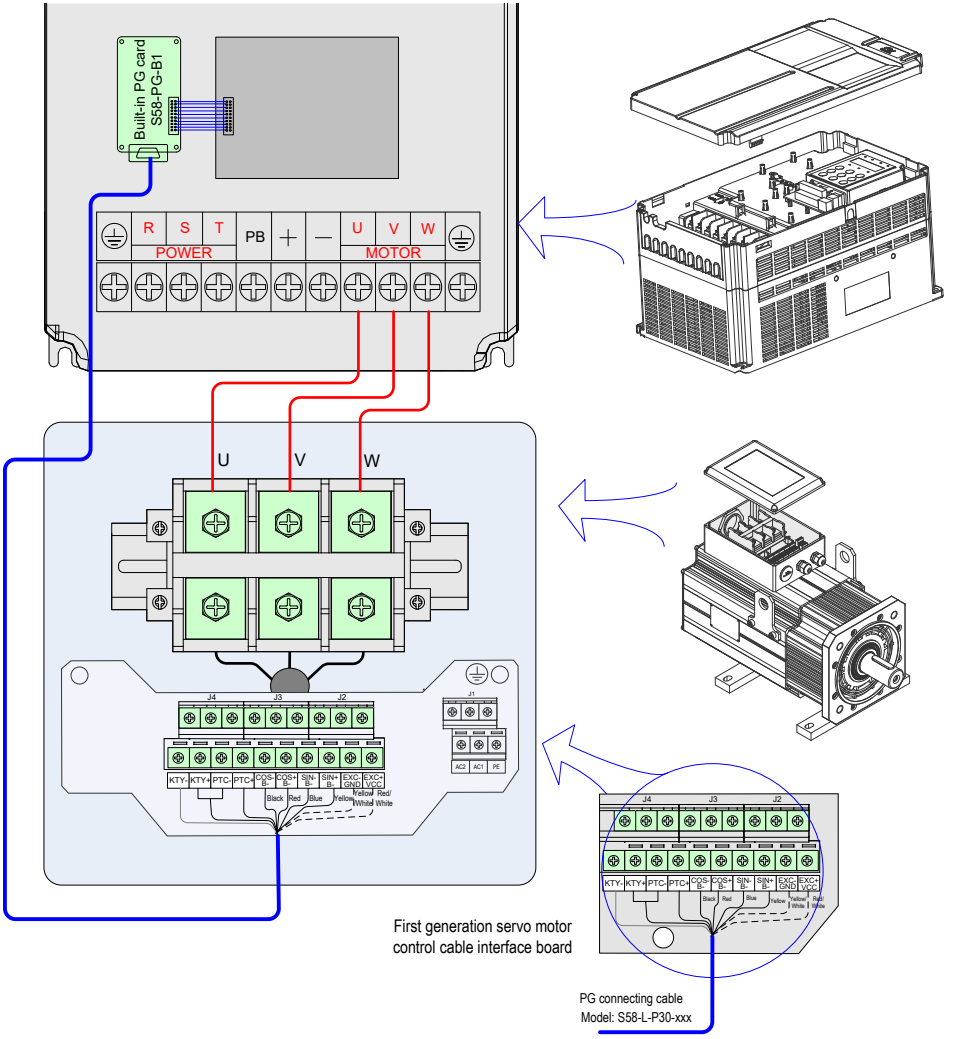



Table 2-5 Pin colour definition without military spec. (applicable to the first generation ISMG motor)

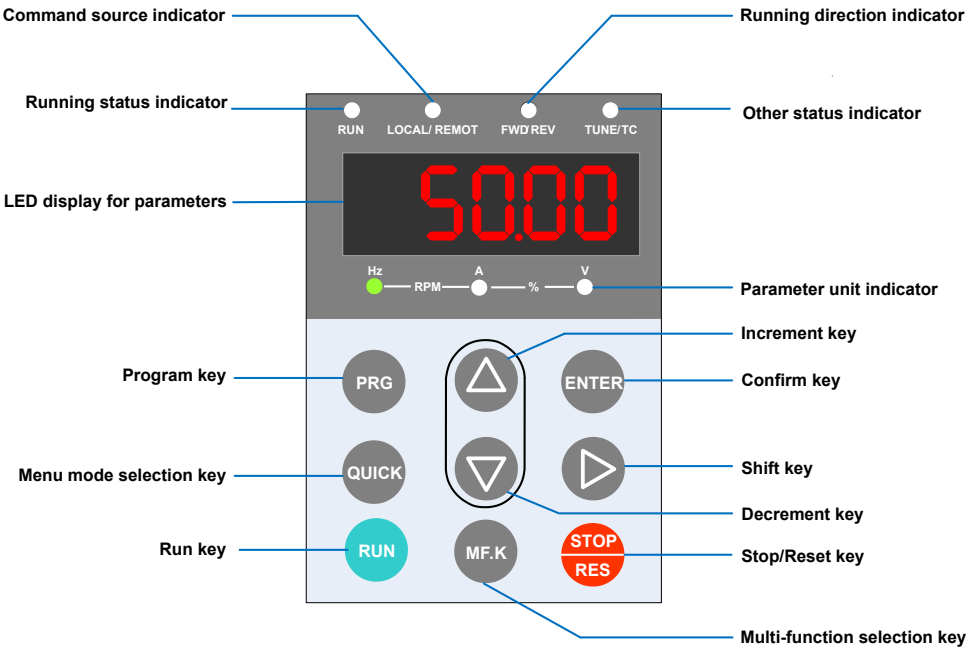
| D-type Connector 9-pin | 1 | 2 | 3 | 4 | 5 | 9 | 7 | 8 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Signal Definition | REF- | REF+ | Cos+ | Cos- | Sin+ | Sin- | PTC-M | KTY-N/PTC-N | KTY-M |
| Wire Colour | Yellow/White | Red/White | Red | Black | Yellow | Blue | Brown | Orange | Grey |
| Remark | One pair | | One pair | | One pair | | - | KTY, PTC common | - |

## 2.3 Wiring

Please refer to the fold-out at the end of this chapter.

# 3. Operating Panel (Keypad & Display)

## 3.1 Overview

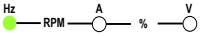
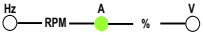
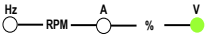
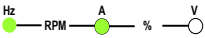



■ Status Indicators

There are four red led status Indicators at the top of the operating panel.

| Indicator | Indication |
|---|---|
| ○ RUN | Off indication the stop status. |
| | On indication the running status. |
| ○ LOCAL/REMOT | Off indication under operating panel control. |
| | On indication under terminal control. |
| | Flashing indication under serial communication control. |
| ○ FWD/REV | Off indication reverse motor rotation. |
| | On indication forward motor rotation. |
| ○ TUNE/TC | On indication torque control mode. |
| | Flashing slowly (once a second) indication auto-tuning status. |
| | Flashing quickly (four times a second) indication a fault condition. |

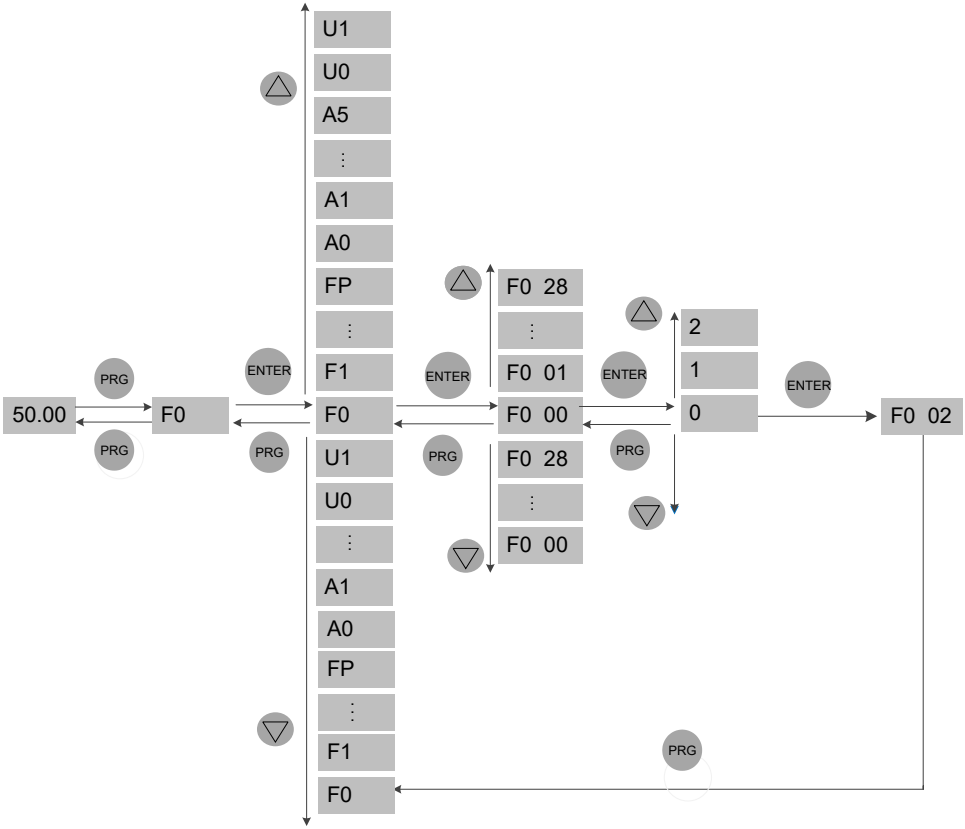
## ■ Parameter Unit Indicator

| Indicator appearance | Meaning |
|---|---|
|  | Hz for frequency |
|  | A for current |
|  | V for voltage |
|  | Rpm for motor speed |
|  | Percentage |

## ■ Keys on Operation Panel

| Key | Key name | Function |
|---|---|---|
| PRG | Programming | Enter or exit level i menu.<br>Return to the previous menu. |
| ENTER | Confirm | Enter each level of menu interface.<br>Confirm displayed parameter setting. |
| △ | Increment | When navigating a menu, it moves the selection up through the screens available.<br>When editing a parameter value, it increases the displayed value.<br>When the servo drive is in run mode, it increases the speed. |
| ▽ | Decrement | When navigating a menu, it moves the selection down through the screens available.<br>When editing a parameter value, it decreases the displayed value.<br>When the servo drive is in running mode, it decreases the speed. |
| ▷ | Shift | Select the displayed parameter in the stop or running status.<br>Select the digit to be modified when modifying a parameter value |
| RUN | Run | Start the servo drive when using the operating panel control mode.<br>It is inactive when using the terminal or communication control mode. |
| STOP RES | Stop/reset | Stop the servo drive when the drive is in the running status.<br>Perform a reset operation when the drive is in the fault status. Note: the functions of this key can be restricted by using function F7-02. |
| MF.K | Multifunction | Perform a function switchover as defined by the setting of F7-01, for<br>Example to quickly switch command source or direction. |
| QUICK | Menu mode selection | Press it to switch over between menu modes as defined by the setting of FP-03. |

## 3.2 Operations of Parameters

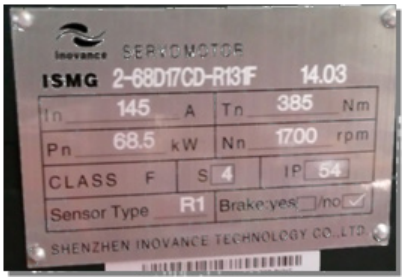



■ Parameter arrangement

| Function Code Group | Description |
|---|---|
| F0 to FF | Basic control parameters |
| A0 to A5 | Hydraulic control parameters |
| U0 to U1 | Status monitoring |

# 4. Quick Setup

## 4.1 Hydraulic Application Setup Flowchart

| Start | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|
| Disable servo drive | | | | |
| | Note: usually if any DI is set as forward or reverse run and the signal is active, then some operations cannot succeed, such as restoring parameters, changing command source, which are necessary steps for setup. So it's seriously recommended to disable servo drive at the beginning of commissioning. | | | |
| Restore parameters | FP-01 | Parameter operation | 0 | 1 |
| | 0: no operation<br>1: restore factory parameters<br>Note: usually users have no idea what parameters have been changed, so it's seriously recommended to restore parameters to default at the beginning of commissioning. | | | |
| Set motor parameters | | Motor nameplate | | |
| |  | | | |
| | F1-01 | Rated motor power | Model dependent | |
| | Unit: kW | | | |
| | F1-02 | Rated motor voltage | Model dependent | |
| | Unit: V<br>Note: please follow motor technical specifications to set this parameter, otherwise motor would probably run with vibration. | | | |
| | F1-03 | Rated motor current | Model dependent | |
| | Unit: A | | | |
| | F1-04 | Rated motor frequency | Model dependent | |
| | Unit: Hz<br>Note: please follow motor nameplate to set this parameter, otherwise motor auto-tuning would fail and get E45. Here is the formula for motor frequency:<br>Frequency = number of motor poles * speed (rpm) / 120. | | | |
| | F1-05 | Rated motor speed | Model dependent | |
| | Unit: rpm. | | | |

| Continued | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|

| Continued | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|
| Select command source | F0-02 | Command source selection | 0 | 0 |
| | | 0: operation panel control (Indicator 'local/remote' off)<br>1: terminal control (Indicator 'local/remote' on)<br>2: communication control (Indicator 'local/remote' blinking) | | |
| Perform motor auto tuning | F1-16 | Auto-tuning selection | 0 | 1 |
| | | 0: no auto-tuning<br>1: static auto-tuning 1 (runs at very low speed)<br>2: complete dynamic auto-tuning (runs very fast)<br>Note: when user Doesn't know back EMF of motor, this auto-tuning method is necessary. Bear in mind that better DO it without load, if with load, please confirm that valves are set correctly and motor running does not hurt hydraulic pump.<br>3: static auto-tuning 2 (runs at very low speed)<br>Auto-tuning steps: set F1-16 = 1 and press RUN and ENTER, then auto-tuning starts, the whole process will take about 1 minute. | | |
| Set IS580 as hydraulic controller | A3-00 | Hydraulic control mode selection | 0 | 2 |
| | | 0: non-hydraulic control mode<br>1: hydraulic control mode (can commands used)<br>2: hydraulic control mode(AI commands used)<br>3: can hydraulic control mode (customized-can-control mode)<br>4: reserved<br>Note: as a result of setting A3-00 as 2, some parameters are set automatically by firmware. Here is the list: | | |

| | | |
|---|---|---|
| F0-02 | Command source selection | 1: Terminal control |
| F0-03 | Main frequency source X selection | If A3-00 = 2, set F0-03 to 3 (AI2). If A3-00 = 1 or 3, set F0-03 to 9 (Communication setting). |
| F0-17 | Acceleration time1 | 0.0s |
| F0-18 | Deceleration time1 | 0.0s |
| F1-00 | Motor type | 2: PMSM |
| F4-00 | DI1 function selection | 1: Forward RUN (FWD, pump enabled) |
| F4-01 | DI2 function selection | 48: Servo pump PID selection terminal 1 |
| F4-02 | DI3 function selection | 53: Slave pump address selection terminal 1 |
| F4-03 | DI4 function selection | 9: Fault reset (RESET) |
| F4-04 | DI5 function selection | 50: CAN communication enabled |
| F5-01 | Control board relay (T/A1-T/B1-T/C1) function selection | 2: Fault output |
| F5-02 | Control board relay (T/A2-T/C2) function selection | 23: Double-discharge plunger pump sloping switchover (NO) |
| F5-03 | Control board relay (T/A3-T/C3) function selection | 24: Hydraulic control NC output |

| Continued | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|

| Continued | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|
| Set speed command upper limit | A3-01 | Maximum rotational speed | 2000 | |
| ↓ | | Unit: rpm;<br>Note: for hydraulic control mode, A3-01 is seen as 100% speed command, and now F0-10 has nothing to DO with speed command. | | |
| Set pressure command upper limit | A3-02 | System hydraulic pressure | 175.0 | |
| ↓ | | Unit: kg/cm$^2$; range from 0.0 to maximum hydraulic pressure (A3-03).<br>Note: A3-02 is maximum pressure of press machine, for example, 1000ton press is 265.0 kg/cm$^2$.<br>Also bear in mind A3-02 is seen as 100% pressure command. | | |
| Set pressure feedback upper limit | A3-03 | Maximum hydraulic pressure | 250.0 | |
| ↓ | | Unit: kg/cm$^2$; range from 0.0 to 500.0 kg/cm$^2$.<br>Note: A3-03 is maximum pressure of press sensor feedback. | | |
| Set DI function | F4-00 | DI1 function selection | 1 | |
| ↓ | | 0: no function<br>1: forward run (FWD)<br>2: reverse run (REV)<br>4: forward jog (FJOG)<br>5: reverse jog (RJOG)<br>9: fault reset (reset)<br>11: external fault normally open (NO) input<br>33: external fault normally closed (NC) input<br>Setting range: 0 to 59; | | |
| | F4-01 | DI2 function selection | 0 | |
| | | Setting range same as DI1; | | |
| | F4-02 | DI3 function selection | 0 | |
| | | Setting range same as DI1 | | |
| | F4-03 | DI4 function selection | 9 | |
| | | Setting range same as DI1. | | |
| | F4-04 | DI5 function selection | 0 | |
| | | Setting range same as DI1; | | |

| Continued | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|

Continued

| Para. | Parameter name | Default | Commissioning |
|---|---|---|---|
| | **Set AI1 range: pressure command** | | |
| F4-18 | AI curve 1 minimum input | 0.00 | 0.00 |
| | -11.00 to11.00 v; | | |
| F4-19 | Corresponding setting of AI1minimum input | 0.0 | 0.0 |
| | -100.0% to 100.0%<br>Note: 0v pressure command is designed by press plc to represent 0% pressure. | | |
| F4-20 | AI1 maximum input | 10.00 | 5.00 |
| | -11.00 to 11.00 v | | |
| F4-21 | Corresponding setting of AI1maximum input | 100.0 | 100.0 |
| | -100.0% to 100.0% | | |
| | **Set AI2 range: flow command** | | |
| F4-23 | AI curve 2 minimum input | 0.00 | 0.00 |
| | -11.00 to11.00 v; | | |
| F4-24 | Corresponding setting of AI2 minimum input | 0.0 | 0.0 |
| | -100.0% to 100.0% | | |
| F4-25 | AI2 maximum input | 10.00 | 10.00 |
| | -11.00 to 11.00 v | | |
| F4-26 | Corresponding setting of AI2 maximum input | 100.0 | 100.0 |
| | -100.0% to 100.0% | | |
| | **Set AI3 range: pressure feedback** | | |
| F4-28 | AI curve 3 minimum input | 0.00 | 0.00 |
| | -11.00 to11.00 v; | | |
| F4-29 | Corresponding setting of AI3minimum input | 0.0 | 0.0 |
| | -100.0% to 100.0% | | |
| F4-30 | AI3 maximum input | 10.00 | 10.00 |
| | -11.00 to 11.00 v | | |
| F4-31 | Corresponding setting of AI3maximum input | 100.0 | 100.0 |
| | -100.0% to 100.0%<br>Note: 10v pressure feedback represents 100% pressure feedback. This is related to A3-03. | | |

Note: AI 1 is fixed as pressure command input, AI2 is fixed as speed/flow command input, and AI3 is fixed as pressure sensor feedback input. This configuration can't be changed!

Continued

| Para. | Parameter name | Default | Commissioning |
|---|---|---|---|

| Continued | Para. | Parameter name | Default | Commissioning |
|---|---|---|---|---|
| other hydraulic basic settings | A3-08 | Maximum reverse motor speed | 20.0 | |
| | | Range from 0.0% to 100.0%. | | |
| | A3-09 | Minimum flow | 0.5 | |
| | | Range from 0.0 to 50.0%.<br>Note: both A3-09 and A3-10 are for keeping hydraulic circuit some pressure, even if pressure or flow command is zero, because usually there is oil leakage which leads to air penetration which causes running noise and pressure vibration. But if user thinks it unnecessary, then set it 0. | | |
| | A3-10 | Minimum pressure | 0.5 | |
| | | Range from 0.0 to 50.0 kg/cm$^2$.<br>Note: both A3-09 and A3-10 are for keeping hydraulic circuit some pressure, even if pressure or flow command is zero, because usually there is oil leakage which leads to air penetration which causes running noise and pressure vibration. But if user thinks it unnecessary, then set it 0. | | |
| pressure response commissioning | A3-05 | Hydraulic pressure control proportional gain kp1 | 210.0 | |
| | | Range from 0.0 to 800.0.<br>Note: the larger the kp1, the shorter the rise time of pressure, at the same time, large kp1 may cause too large overshoot. | | |
| | A3-06 | Hydraulic pressure control integral time ti1 | 0.100 | |
| | | Range from 0.001 to 10.000sec.<br>Note: the smaller the ti1, the smaller the static error of pressure, at the same time, small ti1 may cause too large overshoot.<br>Static error means the difference between command and feedback when feedback reaches steady state. | | |
| | A3-07 | Hydraulic pressure control derivative time td1 | 0.000 | |
| | | Range from 0.000 to 1.000sec.<br>Note: the larger the td1, the smaller the overshoot and the shorter the adjusting time. At the beginning of pressure response commissioning, A3-07 is unnecessary, only when overshoot is not easy to overcome by adjusting kp1 and ti1. | | |
| Backup user's parameters | FP-05 | User's parameter backup operation | 0 | |
| | | 0: no operation<br>1: backup user's parameters<br>Note: every time when finish this quick setup, please use FP-05 to back up the above parameters, which is useful especially when it is not sure what parameter changes have happened. Besides, it's easy to restore user's parameters by setting FP-01=3. | | |
| OVER | | | | |

# 5. Parameter List

## 5.1 Introduction

Groups F and A include basic and hydraulic function parameters. Group U includes the monitoring function parameters and extension card communication parameters.

The parameter description tables in this chapter use the following symbols. The symbols in the parameter table are described as follows:

| Symbol | Meaning |
|---|---|
| ☆ | It is possible to modify the parameter with the drive in the stop or in the run status. |
| ★ | It is not possible to modify the parameter with the drive in the run status. |
| • | The parameter is the actual measured value and cannot be modified. |
| * | The parameter is a factory parameter and can be set only by the manufacturer. |

## 5.2 Hydraulic Control and Basic Control Parameter List

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| Group A0: Flux Weakening Control | | | | | |
| A0-00 | Flux weakening method selection | 0: by calculation<br>1: auto adjusted | 1 | 1 | ★ |
| A0-01 | Flux weakening current factor | 0 to 500 | 1 | 5 | ☆ |
| A0-02 | Pm motor flux weakening depth | 0 to 50 | % | 5 | ☆ |
| A0-03 | Factor of pm motor max. output torque | 20 to 300 | % | 100 | ☆ |
| A0-04 | Factor of pm motor field current | 40 to 200 | % | 100 | ☆ |
| Group A1: PG Card | | | | | |
| A1-00 | PG card type selection | 0: resolver<br>1: reserved<br>2: ABZ encoder | 1 | 0 | ★ |
| A1-02 | Encoder installation angle | 0.0 to 359.9 | ° | 0 | ☆ |
| A1-03 | Speed feedback direction | 0: same<br>1: reverse | 1 | - | ★ |
| A1-04 | Number of resolver pole-pairs | 1 to 50 | 1 | Model dependent | ★ |
| A1-05 | Resolver fault detection time | 0.000 to 60.000 | Sec | 2.000 | ☆ |
| A1-06 | Encoder resolution | 0 to 65535 | 1 | 1024 | ★ |
| A1-08 | Speed sensor interference counts | 0 to 60000 | 1 | 0 | ☆ |
| Group A2: CAN Communication | | | | | |
| A2-00 | Baud rate | 0: 20<br>1: 50<br>2: 125<br>3: 250<br>4: 500<br>5: 1024 | kHz | 4 | ☆ |
| A2-01 | CANLink address | 1 to 64 | 1 | 1 | ☆ |
| A2-02 | CANLink continuous communication time | 0.1 to 600.0 | sec | 0.3 | ☆ |
| A2-03 | CANLink multi-pump mode selection | 0: broadcast<br>1: multi masters | 1 | 0 | ☆ |
| A2-04 | CANLink slave address 1 | 0 to 65535 | 1 | 0 | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| A2-05 | CANLink slave address 2 | 0 to 65535 | 1 | 0 | ☆ |
| A2-06 | CANLink slave address 3 | 0 to 65535 | 1 | 0 | ☆ |
| A2-07 | CANLink slave address 4 | 0 to 65535 | 1 | 0 | ☆ |
| A2-09 | Can protocol selection in speed control mode | 0: original<br>1: CANOpen<br>2: CANLink | 1 | 0 | ★ |
| Group A3: Basic Hydraulic Control | | | | | |
| A3-00 | Pressure control mode | 0: non-hydraulic<br>1: hydraulic control mode 1 by can<br>2: hydraulic control mode 2 by AI<br>3: can hydraulic control mode<br>4: EST mode(original)<br>5: EST mode(new)<br>6: CANOpen mode<br>7: CANLink3.0 mode | 1 | 0 | ★ |
| A3-01 | Max. Motor speed | 1 to 30000 | rpm | 2000 | ★ |
| A3-02 | System pressure | 0.0 to A3-03 | kg/cm$^2$ | 175.0 | ☆ |
| A3-03 | Max. Pressure | A3-02 to 500.0 | kg/cm$^2$ | 250.0 | ☆ |
| A3-04 | Pressure command acceleration time 1 | 0 to 2000 | ms | 20 | ☆ |
| A3-05 | Pressure loop proportional gain kp 1 | 0.0 to 800.0 | | 210.0 | ☆ |
| A3-06 | Pressure loop integral time ti 1 | 0.001 to 10.000 | S | 0.100 | ☆ |
| A3-07 | Pressure loop differential time td 1 | 0.000 to 1.000 | S | 0.000 | ☆ |
| A3-08 | Max. Reverse motor speed | 0.0 to 100.0 | % | 10.0 | ☆ |
| A3-09 | Minimum flow | 0.0% to 50.0% | % | 0.5 | ☆ |
| A3-10 | Minimum pressure | 0.0 to 50.0 kg/cm$^2$ | kg/cm$^2$ | 0.5 | ☆ |
| A3-11 | Pressure loop proportional gain kp 2 | 0.0 to 800.0 | 0.1 | 210.0 | ☆ |
| A3-12 | Pressure loop integral time ti 2 | 0.001s to 10.000s | S | 0.100 | ☆ |
| A3-13 | Pressure loop differential time td 2 | 0.000s to 1.000s | S | 0.000 | ☆ |
| A3-14 | Pressure loop proportional gain kp 3 | 0.0 to 800.0 | 0.1 | 210.0 | ☆ |
| A3-15 | Pressure loop integral time ti 3 | 0.001s to 10.000s | S | 0.100 | ☆ |
| A3-16 | Pressure loop differential time td 3 | 0.000s to 1.000s | 0.001s | 0.000 | ☆ |
| A3-17 | Pressure loop proportional gain kp 4 | 0.0 to 800.0 | 0.1 | 210.0 | ☆ |
| A3-18 | Pressure loop integral time ti 4 | 0.001s to 10.000s | 0.001s | 0.100 | ☆ |
| A3-19 | Pressure loop differential time td 4 | 0.000s to 1.000s | 0.001s | 0.000 | ★ |
| A3-20 | AI zero drift self-adjusting enable | 0: disable<br>1: enable | 1 | 0 | ☆ |
| A3-21 | Pressure sensor fault detection time | 0.001s to 60.000s | 0.001s | 0.500 | ☆ |
| A3-22 | Max. flow in pressure control state | 0.0% to 100.0% | 0.1% | 10.0 | ☆ |
| A3-23 | Min. Pressure in pressure control state | 0.0% to 100.0% | 0.1% | 60.0 | ☆ |
| A3-24 | Output delay in pressure control state | 0.001s to 10.000s | 0.001s | 0.100s | ☆ |
| A3-25 | Pressure command s-curve acceleration filter time 1 | 0.001s to 1.000s | 0.001s | 0.030s | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| A3-26 | Pressure command s-curve deceleration filter time 1 | 0.001s to 1.000s | 0.001s | 0.030s | ☆ |
| A3-27 | Overshoot suppression detection factor 1 | 0 to 2000 | 1 | 200 | ☆ |
| A3-28 | Overshoot suppression factor 1 | 0 to 3.000 | 0.001 | 0.200 | ☆ |
| A3-29 | Pressure loop gain factor | 0.20 to 5.00 | 0.01 | 1.00 | ☆ |
| A3-30 | Max. torque during switch from pressure control to flow control state | 50.0% to 250.0% | 0.1% | 160.0% | ☆ |
| A3-31 | Pressure command delay time 1 | 0.000s to 0.500s | 0.001s | 0.000s | ☆ |
| A3-32 | Slave drive min. Input | 0.0% to A3-34 | 0.1% | 0.0% | ☆ |
| A3-33 | Slave drive min. Input frequency. | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| A3-34 | Slave drive mid-point input | A3-32 to A3-36 | 0.1% | 0.0% | ☆ |
| A3-35 | Slave drive mid-point input frequency. | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| A3-36 | Slave drive max. Input | A3-34 to 100.0% | 0.1% | 100.0% | ☆ |
| A3-37 | Slave drive max. Input frequency. | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| A3-38 | Multi-pump host check whether to enable slave pump | 0: slave enable forbidden<br>1: slave enable permitted | 1 | 0 | ☆ |
| A3-39 | Multi-pump confluence mode pressure holding gain | 20 to 800 | 1 | 100 | ☆ |
| A3-40 | Multi-pump injection state acceptable pressure error during gain decrease | 0.0 to 50.0 kg | 0.1kg | 5.0kg | ☆ |
| A3-41 | Multi-pump injection state acceptable min. Flow during gain decrease | 0 to 30000 rpm | 1 rpm | 0 rpm | ☆ |
| A3-42 | Multi-pump injection state flow detection time during gain decrease | 0.200 to 2.000s | 0.001s | 0.400s | ☆ |
| A3-43 | Multi-pump CANLink state pressure error threshold to Disable slave pump | 0 to 50.0 kg | 0.1 kg | 5.0 kg | ☆ |
| A3-44 | Multi-pump CANLink state min. flow to Disable slave pump | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| A3-45 | Withdrew speed command slave pump delays to stop | 0.100 to 5.000s | 0.001s | 1.000s | ☆ |
| A3-46 | Withdrew speed command slave pump deceleration time | 0.001 to 5.000s | 0.001s | 0.200s | ☆ |
| A3-47 | Valve decompression enable delay | 0.001 to 5.000s | 0.001s | 0.100s | ☆ |
| A3-48 | Valve decompression Disable delay | 0.001 to 5.000s | 0.001s | 0.100s | ☆ |
| A3-49 | Pressure error lower threshold for valve decompression enable | 0.0 to A3-02 (system pressure) | 0.1 kg | 0.0 kg | ☆ |
| A3-50 | Pressure command lower threshold for valve decompression enable | 0.0 to A3-02 (system pressure) | 0.1 kg | 0.0 kg | ☆ |
| A3-51 | Current lower threshold for pressure sensor fault detection | 20 to 300% | 1% | 100% | ☆ |
| A3-52 | Speed upper threshold for pressure sensor fault detection | 20 to 100% | 1% | 50.0% | ☆ |
| A3-53 | Deceleration time of second set high flow | 0.000 to 5.000s | 0.001s | 0.100s | ☆ |
| A3-54 | Threshold of second set high flow | 0 to 100.0% | 0.1% | 100.0% | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| A3-55 | Pressure difference of stop valve pressure relief | 0.0 to A3-02 | 0.1 V | 0.0 | ☆ |
| A3-56 | Torque lower limit in zero torque mode | 0.0 to 250.0 | 0.1 | 0.0 | ☆ |
| A3-57 | Upper threshold of pressure sensor fault | A3-58 to 11.000 V | 0.001 V | 10.000 V | ☆ |
| A3-58 | Lower threshold of pressure sensor fault | 0.000 V to A3-57 | 0.001 V | 0 V | ☆ |
| A3-59 | Judging time of voltage exceeding limit of pressure sensor | 0.000s to 60.000s | 0.001s | 0s | ☆ |
| A3-60 | Output signal selection of pressure sensor | 0: 0 to 10 V/4 to 20 mA (need check the jumper)<br>1: 1 to 5 V<br>2: 1 to 6 V<br>3: 1 to 10 V<br>4: 0.25 to 10.25 V | 1 | 0 | ☆ |
| Group A4: Hydraulic Advanced | | | | | |
| A4-00 | Current filter | 0.000s to 5.000s | 0.001s | 0.005s | ☆ |
| A4-01 | Speed filter | 0.000s to 5.000s | 0.001s | 0.010s | ☆ |
| A4-02 | Pressure command deceleration time 1 | 0.001s to 2.000s | 0.001s | 0.020s | ☆ |
| A4-03 | Flow command acceleration time 1 | 0 to 5.000s | 0.001s | 0.100 | ☆ |
| A4-04 | Flow command deceleration time 1 | 0 to 5.000s | 0.001s | 0.100 | ☆ |
| A4-06 | Flow leakage compensation | 0.0% to 50.0% | 0.1% | 0.0% | ☆ |
| A4-08 | Reverse decompression min. pressure | 0.0 $kg/cm^2$ to A3-02 | 0.1 $kg/cm^2$ | 0.0 $kg/cm^2$ | ☆ |
| A4-09 | Reverse decompression protection time | 0.0s to 500.0s | 0.1s | 0.000s | ☆ |
| A4-10 | Pressure command s-curve acceleration filter time 2 | 0.001s to 1.000s | 0.001s | 0.030s | ☆ |
| A4-11 | Pressure command s-curve deceleration filter time 2 | 0.001s to 1.000s | 0.001s | 0.030s | ☆ |
| A4-12 | Flow command acceleration time 2 | 0.001 to 5.000s | 0.001s | 0.100 | ☆ |
| A4-13 | Flow command deceleration time 2 | 0.001 to 5.000s | 0.001s | 0.100 | ☆ |
| A4-14 | Pressure command acceleration time 2 | 0.001 to 2.000s | 0.001s | 0.020s | ☆ |
| A4-15 | Pressure command deceleration time 2 | 0.001 to 2.000s | 0.001s | 0.020s | ☆ |
| A4-16 | Overshoot suppression detection factor 2 | 1 to 2000 | 1 | 200 | ☆ |
| A4-17 | Overshoot suppression factor 2 | 0.001 to 3.000s | 0.001s | 0.200s | ☆ |
| A4-18 | Pressure command delay time 2 | 0.000s to 0.500s | 0.001s | 0.000s | ☆ |
| A4-22 | Pressure error threshold for pressure suppression Disabling | 0 to A3-02 | 0.1 kg | 10.0 kg | ☆ |
| A4-23 | Pressure error threshold for integral limitation | 0 to A3-02 | 0.1 kg | 45.0 kg | ☆ |
| A4-24 | Integral limitation mode selection | 0 to 1 | 1 | 0 | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| A4-25 | Increase of pressure loop max. Output | 0 to 50.0 | 0.1s | 2. 0 | ☆ |
| A4-26 | Pressure control PID switching mode selection | 0: original algorithm<br>1: algorithm 1<br>2: algorithm 2<br>3: algorithm 3 | 1 | 3 | ★ |
| A4-33 | Integral factor 1 of algorithm 3 | 0 to 1.00 | 0.01 | 0.08 | ☆ |
| A4-34 | Integral factor 2 of algorithm 3 | 0 to 1.00 | 0.01 | 0.08 | ☆ |
| A4-35 | Integral factor 3 of algorithm 3 | 0 to 1.00 | 0.01 | 0.08 | ☆ |
| A4-36 | Integral factor 4 of algorithm 3 | 0 to 1.00 | 0.01 | 0.08 | ☆ |
| Group F0: Basic Control | | | | | |
| F0-00 | G/p selection | 1: g<br>2: p | 1 | 1 | • |
| F0-01 | Control mode | 0: SVC<br>1: Closed loop vector control<br>2: V/F | 1 | 1 | ★ |
| F0-02 | Command source selection | 0: keypad<br>1: terminals<br>2: communication | 1 | 0 | ☆ |
| F0-03 | Main frequency source x selection | 0: Digital setting (non-retentive at power down)<br>1: Digital setting (retentive at power down)<br>2: AI1<br>3: AI2<br>4: AI3<br>5 to 8: reserved<br>9: communication | 1 | 0 | ★ |
| F0-08 | Preset frequency | 0.00 to F0-10 | 0.01 Hz | 50.00 Hz | ☆ |
| F0-09 | Running direction | 0: same<br>1: reverse | 1 | 0 | ★ |
| F0-10 | Max. frequency | 50.00 to 300.00 Hz | 0.01 Hz | 200.00 Hz | ★ |
| F0-11 | Frequency upper limit source | 0: F0-12<br>1: AI1<br>2: AI2<br>3: AI3<br>4: reserve<br>5: communication | 1 | 0 | ★ |
| F0-12 | Frequency upper limit | F0-14 to F0-10 | Hz | 200.00 | ☆ |
| F0-13 | Frequency upper limit offset | 0.00 to F0-10 | Hz | 0.00 | ☆ |
| F0-14 | Frequency lower limit | 0.00 to F0-12 | Hz | 0.00 | ☆ |
| F0-15 | Carrier frequency | 1 to 8.0 | kHz | Model dependent | ☆ |
| F0-16 | Carrier frequency auto adjusting selection | 0: Disable<br>1: enable | 1 | 1 | ☆ |
| F0-17 | Acceleration time 1 | 0.0s to 6500.0s | 0.1s | 20.0s | ☆ |
| F0-18 | Deceleration time 1 | 0.0s to 6500.0s | 0.1s | 20.0s | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| Group F1: Motor Parameters | | | | | |
| F1-00 | Motor type selection | 0: induction motor<br>1: frequency variable induction motor<br>2: PMSM | 1 | 2 | ★ |
| F1-01 | Rated power | 0.4 to 1000.0 kW | 0.1 kW | Model dependent | ★ |
| F1-02 | Rated voltage | 0 to 480 V | 1 V | Model dependent | ★ |
| F1-03 | Rated current | 0.0 to 6500.0 A | 0.1 A | Model dependent | ★ |
| F1-04 | Rated frequency | 0.00 Hz to F0-10 | 0.01 Hz | Model dependent | ★ |
| F1-05 | Rated rotating speed | 0 to 30000 rpm | 1 rmp | Model dependent | ★ |
| F1-11 | D-axis inductance | 0 to 65.535 mH | 0.001 mh | Model dependent | ★ |
| F1-12 | Q-axis inductance | 0 to 65.535 mG | 0.001 mh | Model dependent | ★ |
| F1-13 | Stator resistance | 0 to 65.535 | 0.001 Ω | Model dependent | ★ |
| F1-14 | Motor manufacturer selection | 0: none 1: manual motor angle input (A1-02)<br>2: reserved<br>3: Inovance motor<br>4: PHASE motor<br>5: HAI TIAN motor | 1 | 0 | ☆ |
| F1-15 | Back-EMF | 0 to 65535 V | 1 V | Model dependent | ★ |
| F1-16 | Motor auto-tuning method selection | 0: no auto-tuning<br>1: no-load static<br>2: no-load dynamic, reverse running fast<br>3: with-load static<br>4: with-load dynamic, reverse running fast<br>5: no-load dynamic, forward running fast<br>6: no-load dynamic and short time, forward running fast | 1 | 0 | ★ |
| Group F2: Vector Control | | | | | |
| F2-00 | Speed loop proportional gain kp1 | 1 to 400 | 1 | 60 | ☆ |
| F2-01 | Speed loop integral gain ki1 | 0.01s to 10.00s | 0.01s | 0.3s | ☆ |
| F2-02 | Switching frequency 1 for speed loop gains | 0.00 Hz to F2-05 | 0.01 Hz | 5.00 Hz | ☆ |
| F2-03 | Speed loop proportional gain kp2 | 1 to 400 | 1 | 60 | ☆ |
| F2-04 | Speed loop integral gain ki1 | 0.01s to 10.00s | 0.01s | 0.3s | ☆ |
| F2-05 | Switching frequency 2 for speed loop gains | F2-02 to F0-10 | 0.01 Hz | 10.00 Hz | ☆ |
| F2-07 | Speed loop filter time | 0.5 to 10.0 ms | 0.1 ms | 1.0 ms | ☆ |
| F2-08 | Torque upper limit enable | 0: speed control<br>1: torque control | 0 | 0 | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| F2-09 | Torque upper limit source selection | 0: F2-10<br>1: AI1<br>2: AI2<br>3: AI3<br>4: reserved<br>5: communication | 0 | 0 | ☆ |
| F2-10 | Torque upper limit | 0.0% to 250.0% | 0.1% | 200.0% | ☆ |
| F2-29 | Back EMF compensation | 0: disable<br>1: enable | 1 | 0 | ★ |
| Group F3: V/F Control | | | | | |
| F3-00 | V/F curve setting | 0: linear V/F<br>1: multi-point V/F<br>2: square V/F<br>3: 1.2-power V/F<br>4: 1.4-power V/F<br>6: 1.6-power V/F<br>8: 1.8-power V/F<br>9: reserved<br>10: V/F complete separation<br>11: V/F half separation | 0 | 0 | ★ |
| F3-01 | Torque boost | 0.0% to 30.0% | 0.1% | 1.0% | ☆ |
| F3-02 | Cut-off frequency of torque boost | 0.00 Hz to F0-10 | 0.01 Hz | 50.00 Hz | ★ |
| F3-03 | Multi-point V/F frequency 1 | 0.00 Hz to F3-05 | 0.01 Hz | 0.00 Hz | ★ |
| F3-04 | Multi-point V/F voltage 1 | 0.0% to 100.0% | 0.1% | 0.0% | ★ |
| F3-05 | Multi-point V/F frequency 2 | 0.00 Hz to F3-07 | 0.01 Hz | 0.00 Hz | ★ |
| F3-06 | Multi-point V/F voltage 2 | 0.0% to 100.0% | 0.1% | 0.0% | ★ |
| F3-07 | Multi-point V/F frequency 3 | 0.00 Hz to F1-04 | 0.01 Hz | 0.00 Hz | ★ |
| F3-08 | Multi-point V/F voltage 3 | 0.0% to 100.0% | 0.1% | 0.0% | ★ |
| F3-09 | V/F slip compensation | 0.0% to 200.0% | 0.1% | 0.0% | ☆ |
| F3-10 | V/F over-excitation gain | 0 to 200 | 1 | 64 | ☆ |
| F3-11 | V/F oscillation suppression gain | 0 to 100 | 1 | 40 | ☆ |
| F3-12 | V/F oscillation suppression mode selection | 0 to 3 | 1 | 3 | ★ |
| F3-13 | Voltage source for V/F separation | 0 to 8 | 1 | 0 | ★ |
| F3-14 | Digital setting of voltage for V/F separation | 0 to F1-02 | 0 | 0 | ★ |
| F3-15 | Voltage rise time of V/F separation | 0 to 1000.0 | 0.1 | 0 | ☆ |
| F3-16 | Voltage decline time of V/F separation | 0 to 1000.0 | 0.1 | 0 | ★ |
| F3-17 | Stop mode selection for V/F separation | 0 to 1 | 1 | 0 | ★ |
| F3-18 | Current limit level | 0 to 200 | 1 | 130 | ★ |
| F3-19 | Current limit selection | 0 to 1 | 1 | 1 | ☆ |
| F3-20 | Current limit gain | 0 to 100 | 1 | 20 | ☆ |
| F3-21 | Compensation factor of speed multiplying current limit level | 50 to 200 | 1 | 50 | ★ |
| F3-22 | Voltage limit | 650.0 to 800.0 V | 0.1 V | 780.0 V | ★ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| F3-23 | Voltage limit selection | 0 to 1 | 1 | 1 | ★ |
| F3-24 | Frequency gain for voltage limit | 0 to 100 | 1 | 30 | ☆ |
| F3-25 | Voltage gain for voltage limit | 0 to 100 | 1 | 30 | ☆ |
| F3-26 | Frequency rise threshold during voltage limit | 0 to 50 | 1 | 5 | ★ |
| F3-27 | Slip compensation time constant | 0.1 to 10.0 | 0.1 | 0.5 | ☆ |
| F3-28 | Auto frequency boost enable | 0 to 1 | 1 | 0 | ★ |
| F3-29 | Minimum torque current | 10 to 100 | 1 | 50 | ★ |
| F3-30 | Maximum torque current | 10 to 100 | 1 | 20 | ★ |
| F3-31 | Auto frequency boost kp | 0 to 100 | 1 | 50 | ☆ |
| F3-32 | Auto frequency boost kp | 0 to 100 | 1 | 50 | ☆ |
| F3-33 | Online torque compensation gain | 80 to 150 | 1 | 100 | ★ |
| Group F4: Input Terminals | | | | | |
| F4-00 | DI1 function selection | 0: no function<br>1: Forward run (FWD) (oil pump enable)<br>2: Reverse run (REV)<br>3: 3 wire control<br>4: jog forward<br>5: jog reverse<br>6 to 7: reserved<br>8: coast to stop<br>9: fault reset<br>10: reserved<br>11: external fault(normally open)<br>12 to 17: reserved<br>18 frequency source switch<br>19 to 32: reserved<br>33: external fault(normally closed)<br>34 to 38: reserved<br>39: switch from frequency source x to preset frequency<br>40: switch from frequency source y to preset frequency<br>41 to 47: reserved<br>48: PID selection 1<br>49: PID selection 2<br>50: can communication enable<br>51: slave pump enable<br>52: switch from pressure mode to speed mode (torque upper limit = AI1/max. voltage x A3-30)<br>53: slave pump address selection 1<br>54: slave pump address selection 2<br>55: switch from injection to pressure holding<br>56: error reset(except overcurrent) 57: switch from pressure mode to speed mode (torque upper limit = F2-10) | 1 | 1 | ★ |
| F4-01 | DI2 function selection | | 1 | 48 | ★ |
| F4-02 | DI3 function selection | | 1 | 53 | ★ |
| F4-03 | DI4 function selection | | 1 | 9 | ★ |
| F4-04 | DI5 function selection | | 1 | 50 | ★ |
| F4-05 | Reserved | | 1 | 0 | ★ |
| F4-06 | Reserved | | 1 | 0 | ★ |
| F4-07 | Reserved | | 1 | 0 | ★ |
| F4-15 | DI filter time | 1 to 10 | 1 | 4 | ☆ |
| F4-18 | AI1 min. Input | -11.00 to 11.00 V | 0.01 V | 0.02 V | ☆ |
| F4-19 | AI1 min. Input frequency | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| F4-20 | AI1 max. Input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| F4-21 | AI1 max. Input frequency | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| F4-22 | AI1 filter time | 0.000s to 10.000s | 0.001s | 0.01s | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| F4-23 | AI2 min. Input | -11.00 to 11.00 V | 0.01 V | 0.02 V | ☆ |
| F4-24 | AI2 min. Inp frequency | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| F4-25 | AI2 max. Input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| F4-26 | AI2 max. Input frequency | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| F4-27 | AI2 filter time | 0.000s to 10.000s | 0.001s | 0.005s | ☆ |
| F4-28 | AI3 min. Input | -11.00 to 11.00 V | 0.01 V | 0.02 V | ☆ |
| F4-29 | AI3 min. Input frequency | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| F4-30 | AI3 max. Input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| F4-31 | AI3 max. Input frequency | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| F4-32 | AI3 filter time | 0.000s to 10.000s | 0.001s | 0.000s | ☆ |
| F4-43 | AI1 Display value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F4-44 | AI1 measured value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F4-45 | AI1 Display value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F4-46 | AI1 measured value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F4-47 | AI2 Display value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F4-48 | AI2 measured value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F4-49 | AI2 Display value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F4-50 | AI2 measured value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F4-51 | AI3 Display value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F4-52 | AI3 measured value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F4-53 | AI3 Display value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F4-54 | AI3 measured value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| Group F5: Output Terminals | | | | | |
| F5-01 | T/a1-t/b1-t/c1 function selection | 0: no function<br>1: drive is running<br>2: fault output<br>3 to 5: reserved<br>6: motor overload warning<br>7: drive overload warning<br>8 to 11: reserved<br>12: time is out<br>13 to 14: reserved<br>15: drive is ready<br>16: abs AI1 value is bigger than abs AI2 value after correction<br>17 to 19: reserved<br>20: communication control<br>21 to 22: reserved<br>23: Displacement switch of dual displacements piston pump (normally open)<br>24: pressure control (normally close)<br>25: slave pump warning<br>26: Displacement switch of dual Displacements piston pump (normally open)<br>27: DC bus voltage established<br>28: business preset running time out<br>29: business preset running time less than 24 hours<br>30: maximum reverse speed<br>31: warning<br>32: KTY temperature reached | 1 | 2 | ☆ |
| F5-02 | T/a2-t/c2 function selection | | 1 | 23 | ☆ |
| F5-03 | DO1 function selection | | 1 | 24 | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| F5-10 | AO1 function selection | 0: running frequency<br>1: frequency reference<br>2: output current<br>3: output torque<br>4: output power<br>5: output voltage<br>6: reserved<br>7: AI1<br>8: AI2<br>9: AI3<br>10: feedback speed<br>11: feedback pressure<br>14: by communication control<br>12 to 16: reserved | 1 | 10 | ☆ |
| F5-11 | AO2 function selection | | 1 | 11 | ☆ |
| F5-14 | AO1 offset factor | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| F5-15 | AO1 gain | -10.00 to 10.00 | 0.01 | 1.00 | ☆ |
| F5-16 | AO2 offset factor | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| F5-17 | AO2 gain | -10.00 to 10.00 | 0.01 | 1.00 | ☆ |
| F5-23 | AO1 measured value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F5-24 | AO1 calculated value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F5-25 | AO1 measured value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F5-26 | AO1 calculated value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F5-27 | AO2 measured value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F5-28 | AO2 calculated value 1 | -9.999 to 9.999 V | 0.001 V | 2.000 V | ☆ |
| F5-29 | AO2 measured value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| F5-30 | AO2 calculated value 2 | -9.999 to 9.999 V | 0.001 V | 8.000 V | ☆ |
| Group F6: Stopping | | | | | |
| F6-10 | Stopping mode | 0: deceleration to stop<br>1: coast to stop | 1 | 0 | ☆ |
| Group F7: Keypad and Display | | | | | |
| F7-02 | The function of stop/reset key on keypad | 0: only the key can stop motor<br>1: in terminal control, the key can stop motor<br>2.in terminal control, the key can reset fault<br>3: in terminal control, the key can stop motor and reset fault | 1 | 2 | ☆ |
| F7-06 | Load linear speed display factor | 0.0001 to 6.5000 | 0.0001 | 1.0000 | ☆ |
| F7-07 | IGBT temperature | -1000°C to 1000°C | 1°C | | ● |
| F7-09 | Total running time | 0 to 65535 h | 1 h | - | ● |
| F7-10 | Firmware version 1 | - | - | - | ● |
| F7-11 | Firmware version 2 | - | - | - | ● |
| F7-12 | Temporary firmware version 1 | - | - | - | ● |
| F7-13 | Temporary firmware version 2 | - | - | - | ● |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| Group F8: Auxiliary Functions | | | | | |
| F8-17 | Preset running time | 0 to 65000 h | 1 h | 0 h | ☆ |
| F8-18 | Protection enable upon startup | 0: Disable<br>1: enable | 1 | 0 | ☆ |
| F8-22 | Ground fault detection enable upon power on | 0: Disable<br>1: enable | 1 | 1 | ☆ |
| F8-23 | Selection for reactions of preset running time out | 0: Disable<br>1: enable | 1 | 0 | ☆ |
| F8-24 | Undervoltage level(the voltage of input) | 148.5 to 321.7 V | 0.1 V | 247.5 V | ☆ |
| F8-25 | Braking operation duration limit | 0.0s to 3600.0s | 0.1s | 5.0s | ☆ |
| F8-26 | Braking resistor protection | 0: Disable<br>1: enable | 1 | 1 | ☆ |
| F8-27 | Output ground fault protection upon starting | 0: Disable<br>1: enable | 1 | 0 | ☆ |
| F8-28 | Output phase loss protection upon starting | 0: Disable<br>1: enable | 1 | 1 | ☆ |
| F8-29 | Braking resistor overload protection | 0: Disable<br>1: enable | 0 to 1 | 1 | ☆ |
| Group F9: Protection and Fault | | | | | |
| F9-00 | Motor overload protection | 0: disable<br>1: enable | 1 | 0 | ☆ |
| F9-01 | Motor overload protection factor | 0.20 to 10.00 | 0.01 | 2.00 | ☆ |
| F9-08 | Braking level | 700 to 800 V | 1 V | 750 V | ☆ |
| F9-12 | Input phase loss detection enable | 0: disable<br>1: enable | 1 | 1 | ☆ |
| F9-13 | Output phase loss detection enable | 0: Disable<br>1: enable | 1 | 1 | ☆ |
| F9-14 | Speed error protection threshold | 0.50 to 50.00 Hz | 0.01 Hz | 10.00 Hz | ☆ |
| F9-15 | Speed error protection time | 0.0s to 20.0s | 0.1s | 10.0s | ☆ |
| F9-16 | Motor temperature protection enable | 0: Disable<br>1: enable | 1 | 1 | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| F9-18 | The third last fault | 0: no fault<br>1: reserved<br>2: overcurrent (E02)<br>3: overcurrent (E03)<br>4: overcurrent (E04)<br>5: overvoltage (E05)<br>6: overvoltage (E06)<br>7: overvoltage (E07)<br>8: reserved<br>9: undervoltage (E09)<br>10: drive overload (E10)<br>12: input phase loss (E12)<br>13: output phase loss (E13)<br>14: heatsink overheat (E14)<br>15: external fault (E15)<br>16: modbus fault (E16)<br>17: contactor fault (E17)<br>18: current sensing fault (E18)<br>19: motor tuning fault (E19)<br>20: reserved (E20)<br>21: EEPROM fault (E21)<br>22: reserved (E22)<br>23: ground fault (E23)<br>24 to 25: reserved<br>26: time is out (E26)<br>27: bussiness time is out (E27)<br>28 to 39: reserved 40: multi times overcurrent (E40)<br>41: reserved<br>42: can communication fault (E42)<br>43: resolver tuning fault (E43)<br>44: speed error protection fault (E44)<br>45: motor overheat (E45)<br>46: pump sensor fault (E46)<br>47: slave fault warning (E47)<br>48: can address conficting (E48)<br>49: resolver loose wiring (E49)<br>52: multi masters fault (E52) 58: user parameter restore fault (E58)<br>59: back EMF error (E59)<br>61: braking overtime (E61)<br>62: braking IGBT fault (E62)<br>63: reverse running time out (E63) 66: braking resistor fault (E66) 67: function code initialization fault (E67) | 1 | - | ● |
| F9-19 | The second last fault | | 1 | - | ● |
| F9-20 | The last fault | | 1 | - | ● |
| F9-21 | Frequency upon the last fault | - | - | - | ● |
| F9-22 | Current upon the last fault | - | - | - | ● |
| F9-23 | Bus voltage upon the last fault | - | - | - | ● |
| F9-24 | DI status upon the last fault | - | - | - | ● |
| F9-25 | DO status upon the last fault | - | - | - | ● |
| F9-26 | The subtype of the last fault | - | - | - | ● |
| F9-30 | Frequency upon the second last fault | - | - | - | ● |
| F9-31 | Current upon the second last fault | - | - | - | ● |
| F9-32 | Bus voltage upon the second last fault | - | - | - | ● |
| F9-33 | DI status upon the second last fault | - | - | - | ● |
| F9-34 | DO status upon the second last fault | - | - | - | ● |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| F9-35 | The subtype of the second last fault | - | - | - | ● |
| F9-39 | Frequency upon the third last fault | - | - | - | ● |
| F9-40 | Current upon the third last fault | - | - | - | ● |
| F9-41 | Bus voltage upon the third last fault | - | - | - | ● |
| F9-42 | DI status upon the third last fault | - | - | - | ● |
| F9-43 | DO status upon the third last fault | - | - | - | ● |
| F9-44 | The subtype of the third last fault | - | - | - | ● |
| F9-48 | KTY temperature reached | 0 to 300.0 | 0.1 | 0 | ☆ |
| F9-58 | KTY temperature | -40.0 to 300.0 | 0.1 | - | ● |
| F9-59 | KTY overheat fault threshold | -40.0 to 300.0 | 0.1 | 130.0 | ☆ |
| Group FA: Business Countdown Function | | | | | |
| FA-00 | Password of first countdown setting | 0 to 65535 | 1 | 0 | ☆ |
| FA-01 | First countdown | 0 to 65535 h | 1 h | 0 | ☆ |
| FA-02 | Password of second countdown setting | 0 to 65535 | 1 | 0 | ☆ |
| FA-03 | Second countdown | 0 to 65535 h | 1 h | 0 | ☆ |
| FA-04 | Password of third countdown setting | 0 to 65535 | 1 | 0 | ☆ |
| FA-05 | Third countdown | 0 to 65535 h | 1 h | 0 | ☆ |
| FA-06 | Password of forth countdown setting | 0 to 65535 | 1 | 0 | ☆ |
| FA-07 | Forth countdown | 0 to 65535 h | 1 h | 0 | ☆ |
| FA-08 | Business running time in total(hour) | 0 to 65535 h | 1 h | 0 | ● |
| FA-09 | Business running time in total(second) | 0s to 3600s | 1s | 0 | ● |
| Group FB Optimization | | | | | |
| FB-04 | Overcurrent prevention enable | 0: Disable<br>1: enable | 1 | 1 | ★ |
| Group FC: Multi-point Calibration | | | | | |
| FC-00 | Multi-point AI calibration enable | 0: no calibration<br>1: AI1 enable<br>2: AI2 enable<br>3: AI1 and AI2 enable | 0 | 0 | ★ |
| FC-01 | Minimum AI1 input | -11.00 to 11.00 V | 0.01 V | 0.02 V | ☆ |
| FC-02 | Correspondent value of minimum AI1 input | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| FC-03 | AI1 point 1 input | -11.00 to 11.00 V | 0.01 V | 1.00 V | ☆ |
| FC-04 | Correspondent value of AI1 point 1 input | -100.0% to 100.0% | 0.1% | 10.0% | ☆ |
| FC-05 | AI1 point 2 input | -11.00 to 11.00 V | 0.01 V | 2.00 V | ☆ |
| FC-06 | Correspondent value of AI1 point 2 input | -100.0% to 100.0% | 0.1% | 20.0% | ☆ |
| FC-07 | AI1 point 3 input | -11.00 to 11.00 V | 0.01 V | 3.00 V | ☆ |
| FC-08 | Correspondent value of AI1 point 3 input | -100.0% to 100.0% | 0.1% | 30.0% | ☆ |
| FC-09 | AI1 point 4 input | -11.00 to 11.00 V | 0.01 V | 4.00 V | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| FC-10 | Correspondent value of AI1 point 4 input | -100.0% to 100.0% | 0.1% | 40.0% | ☆ |
| FC-11 | AI1 point 5 input | -11.00 to 11.00 V | 0.01 V | 5.00 V | ☆ |
| FC-12 | Correspondent value of AI1 point 5 input | -100.0% to 100.0% | 0.1% | 50.0% | ☆ |
| FC-13 | AI1 point 6 input | -11.00 to 11.00 V | 0.01 V | 6.00 V | ☆ |
| FC-14 | Correspondent value of AI1 point 6 input | -100.0% to 100.0% | 0.1% | 60.0% | ☆ |
| FC-15 | AI1 point 7 input | -11.00 to 11.00 V | 0.01 V | 7.00 V | ☆ |
| FC-16 | Correspondent value of AI1 point 7 input | -100.0% to 100.0% | 0.1% | 70.0% | ☆ |
| FC-17 | AI1 point 8 input | -11.00 to 11.00 V | 0.01 V | 8.00 V | ☆ |
| FC-18 | Correspondent value of AI1 point 8 input | -100.0% to 100.0% | 0.1% | 80.0% | ☆ |
| FC-19 | AI1 point 9 input | -11.00 to 11.00 V | 0.01 V | 9.00 V | ☆ |
| FC-20 | Correspondent value of AI1 point 9 input | -100.0% to 100.0% | 0.1% | 90.0% | ☆ |
| FC-21 | AI1 point 10 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-22 | Correspondent value of AI1 point 10 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-23 | AI1 point 11 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-24 | Correspondent value of AI1 point 11 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-25 | AI1 point 12 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-26 | Correspondent value of AI1 point 12 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-27 | AI1 point 13 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-28 | Correspondent value of AI1 point 13 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-29 | AI1 point 14 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-30 | Correspondent value of AI1 point 14 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-31 | AI1 point 15 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-32 | Correspondent value of AI1 point 15 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-33 | AI1 point 16 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-34 | Correspondent value of AI1 point 16 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-35 | AI1 point 17 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-36 | Correspondent value of AI1 point 17 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-37 | Maximum AI1 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-38 | Correspondent value of maximum AI1 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| FC-39 | Minimum AI1 input | -11.00 to 11.00 V | 0.01 V | 0.02v | ☆ |
| FC-40 | Correspondent value of minimum AI2 input | -100.0% to 100.0% | 0.1% | 0.0% | ☆ |
| FC-41 | AI2 point 1 input | -11.00 to 11.00 V | 0.01 V | 1.00v | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| FC-42 | Correspondent value of AI2 point 1 input | -100.0% to 100.0% | 0.1% | 10.0% | ☆ |
| FC-43 | AI2 point 2 input | -11.00 to 11.00 V | 0.01 V | 2.00v | ☆ |
| FC-44 | Correspondent value of AI2 point 2 input | -100.0% to 100.0% | 0.1% | 20.0% | ☆ |
| FC-45 | AI2 point 3 input | -11.00 to 11.00 V | 0.01 V | 3.00v | ☆ |
| FC-46 | Correspondent value of AI2 point 3 input | -100.0% to 100.0% | 0.1% | 30.0% | ☆ |
| FC-47 | AI2 point 4 input | -11.00 to 11.00 V | 0.01 V | 4.00v | ☆ |
| FC-48 | Correspondent value of AI2 point 4 input | -100.0% to 100.0% | 0.1% | 40.0% | ☆ |
| FC-49 | AI2 point 5 input | -11.00 to 11.00 V | 0.01 V | 5.00v | ☆ |
| FC-50 | Correspondent value of AI2 point 5 input | -100.0% to 100.0% | 0.1% | 50.0% | ☆ |
| FC-51 | AI2 point 6 input | -11.00 to 11.00 V | 0.01 V | 6.00v | ☆ |
| FC-52 | Correspondent value of AI2 point 6 input | -100.0% to 100.0% | 0.1% | 60.0% | ☆ |
| FC-53 | AI2 point 7 input | -11.00 to 11.00 V | 0.01 V | 7.00v | ☆ |
| FC-54 | Correspondent value of AI2 point 7 input | -100.0% to 100.0% | 0.1% | 70.0% | ☆ |
| FC-55 | AI2 point 8 input | -11.00 to 11.00 V | 0.01 V | 8.00v | ☆ |
| FC-56 | Correspondent value of AI2 point 8 input | -100.0% to 100.0% | 0.1% | 80.0% | ☆ |
| FC-57 | AI2 point 9 input | -11.00 to 11.00 V | 0.01 V | 9.00v | ☆ |
| FC-58 | Correspondent value of AI2 point 9 input | -100.0% to 100.0% | 0.1% | 90.0% | ☆ |
| FC-59 | Maximum AI2 input | -11.00 to 11.00 V | 0.01 V | 10.00 V | ☆ |
| FC-60 | Correspondent value of maximum AI2 input | -100.0% to 100.0% | 0.1% | 100.0% | ☆ |
| Group FD: Bus communication and PC Software Setting | | | | | |
| FD-00 | Baud rate | 0: 300 bps<br>1: 600 bps<br>2: 1200 bps<br>3: 2400 bps<br>4: 4800 bps<br>5: 9600 bps<br>6: 19200 bps<br>7: 38400 bps<br>8: 57600 bps<br>9: 115200 bps | 1 | 5 | ☆ |
| FD-01 | Data format symbol | 0: no parity check (8-n-2)<br>1: even parity check<br>2: odd parity check<br>3: no parity check (8-n-1) | 1 | 0 | ☆ |
| FD-02 | Local address | 0 to 247 | 1 | 1 | ☆ |
| FD-03 | Response delay | 0 to 20 ms | 1 ms | 2 ms | ☆ |
| FD-04 | Communication timeout | 0.0s to 60.0s | 0.1s | 0.0s | ☆ |
| FD-30 | PC software communication enable | 0: Disable<br>1: enable | 1 | 0.0 | ☆ |
| FD-31 | Channel 1 selection | 0 to 999 | 1 | 10 | ☆ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| FD-32 | Channel 1 selection | 0 to 999 | 1 | 10 | ☆ |
| FD-33 | Channel 1 selection | 0 to 999 | 1 | 10 | ☆ |
| FD-34 | Channel 1 selection | 0 to 999 | 1 | 10 | ☆ |
| FD-35 | Sampling period | 0 to 65535 | 1 | 1 | ☆ |
| FD-36 | Object of trigger a | 0 to 999 | 1 | 1 | ☆ |
| FD-37 | Condition of trigger a | 0 to 2 | 1 | 0 | ☆ |
| FD-38 | Level of trigger a | 0 to 65535 | 1 | 0 | ☆ |
| FD-39 | Object of trigger b | 0 to 999 | 1 | 1 | ☆ |
| FD-40 | Condition of trigger b | 0 to 2 | 1 | 0 | ☆ |
| FD-41 | Level of trigger b | 0 to 65535 | 1 | 0 | ☆ |
| FD-42 | Switch of trigger a/b | 0: a<br>1: b | 1 | 0 | ☆ |
| FD-43 | Carrier period of data saving | 0 to 65535 | 1 | 0 | ★ |
| FD-44 | Fault code | 0 to 65535 | 1 | 0 | ★ |
| FD-45 | Setting value of data saving | 0 to 2 | 1 | 0 | ☆ |
| FD-46 | Data retrieve area selection | 0: ram<br>1: flash | 1 | 0 | ☆ |
| FD-47 | Flash rewritten selection | 0 to 1 | 1 | 1 | ☆ |
| Group FE: User-defined Parameters | | | | | |
| FE-00 | User-defined parameter 0 | F0.00 to FP.xx<br>A0.00 to A4.xx<br>U0.00 to U1.xx | - | - | ☆ |
| FE-01 | User-defined parameter 1 | | - | - | ☆ |
| FE-02 | User-defined parameter 2 | | - | - | ☆ |
| FE-03 | User-defined parameter 3 | | - | - | ☆ |
| FE-04 | User-defined parameter 4 | | - | - | ☆ |
| FE-05 | User-defined parameter 5 | | - | - | ☆ |
| FE-06 | User-defined parameter 6 | | - | - | ☆ |
| FE-07 | User-defined parameter 7 | | - | - | ☆ |
| FE-08 | User-defined parameter 8 | | - | - | ☆ |
| FE-09 | User-defined parameter 9 | | - | - | ☆ |
| FE-10 | User-defined parameter 10 | | - | - | ☆ |
| FE-11 | User-defined parameter 11 | | - | - | ☆ |
| FE-12 | User-defined parameter 12 | | - | - | ☆ |
| FE-13 | User-defined parameter 13 | | - | - | ☆ |
| FE-14 | User-defined parameter 14 | | - | - | ☆ |
| FE-15 | User-defined parameter 15 | | - | - | ☆ |
| Group FP: Password and Parameter Operation | | | | | |
| FP-00 | User password | 0 to 65535 | 1 | 0 | ☆ |
| FP-01 | Parameter initialization | 0: no operation<br>1: restore factory parameters<br>2: clear records<br>3: restore back-up user parameter<br>4: restore factory parameters except A2-01<br>5: restore factory parameters except FA and FP | 1 | 0 | ★ |

| Para. No. | Para. Name | Setting Range | Unit | Default | Property |
|---|---|---|---|---|---|
| FP-02 | Motor model number | 0 to 65535 | 1 | 0 | ★ |
| FP-04 | User parameter password | 0 to 65535 | 1 | 0 | ☆ |
| FP-05 | Back up user parameters | 0: no operation<br>1: back up | 1 | 0 | ★ |
| FP-06 | Bilingual (EN/CH) HMI specification | 0 to 65535 | 1 | 0 | ☆ |
| Group AF: Communication Process Data (Visible onlu in CANopen) | | | | | |
| AF-00 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-02 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-04 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-06 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-08 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-10 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-12 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-14 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-16 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-18 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-20 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-22 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-24 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-26 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-28 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-30 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-32 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-34 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-36 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-38 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-40 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-42 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-44 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-46 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-48 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-50 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-52 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-54 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-56 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-58 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-60 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |
| AF-62 | Communication process data | 0 to 0xffffffff | 1 | H.0000 | ☆ |

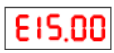
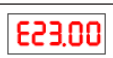
## 5.3 Monitoring Parameter List

| Para. No. | Para. Name | Setting range | Unit |
|---|---|---|---|
| Group U0: Drive Status Monitoring | | | |
| U0-00 | Running frequency | -650.00 to 650.00 | 0.01 Hz |
| U0-01 | Frequency reference | -650.00 to 650.00 | 0.01 Hz |
| U0-02 | DC bus voltage | 0.0 to 1000.0 V | 0.1 V |
| U0-03 | Output voltage | 0 V to F02.03 | 1 V |
| U0-04 | Output current | 0.1 to 6553.5 A | 0.1 A |
| U0-05 | Output power | 0.4 to 1000.0 kW | 0.1 kW |
| U0-06 | Output torque | 0% to 200% | 0.1 |
| U0-07 | Basic DI/DO status | - | - |
| U0-08 | Extended DI/DO status | - | - |
| U0-09 | AI1 voltage(after correction) | -10.00 to 10.000 V | 0.001 V |
| U0-10 | AI2 voltage(after correction) | -10.00 to 10.000 V | 0.001 V |
| U0-11 | AI3 voltage(after correction) | -10.00 to 10.000 V | 0.001 V |
| U0-12 | Resolver mechanical angle | 1 to 4096 | 1 |
| U0-13 | Reserved | - | - |
| U0-14 | Motor speed | -9999 to 32767 rpm | 1 |
| U0-15 to U0-18 | Reserved | - | - |
| U0-19 | Speed reference | -9999 to 32767 rpm | 1rmp |
| U0-20 | Frequency feedback of motor (q15 format) | 0 to 65535 | 1 |
| U0-21 to U0-24 | Reserved | - | - |
| U0-25 | Overload value in total | 0 to 36000 | 1.0 |
| U0-28 | Current upon overcurrent fault | 0.01 to 655.35 A | 0.01 A |
| U0-29 | Overcurrent fault type | 1: hardware<br>2: firmware | 1 |
| U0-30 | AI1 voltage(before correction) | -10.000 to 10.000 V | 0.001 V |
| U0-31 | AI2 voltage(before correction) | -10.000 to 10.000 V | 0.001 V |
| U0-32 | AI3 voltage(before correction) | -10.000 to 10.000 V | 0.001 V |
| U0-33 | Reserved | - | - |
| U0-34 | AO1 voltage | 0.000 to 10.000 V | 0.001 V |
| U0-35 | AO2 voltage | 0.000 to 10.000 V | 0.001 V |
| U0-36 | Motor e-angle | 0.0° to 359.9° | 0.1° |
| U0-37 | Pressure command | 0.0 $kg/cm^2$ to A3-02 | 0.1 $kg/cm^2$ |
| U0-38 | Pressure feedback | 0.0 $kg/cm^2$ to A3-02 | 0.1$kg/cm^2$ |
| U0-39 | Speed command | -9999 to 30000 rpm | 1 rmp |
| U0-40 | Speed feedback | -9999 to 30000 rpm | 1 rmp |
| U0-41 | Motor speed feedback | 0 to 65535 | 1 |
| U0-42 | Resolver interference status | 0 to 65535 | 1 |
| U0-43 | Reserved | - | - |
| U0-44 | Reserved | - | - |
| U0-45 | Motor KTY temperature | -40.0°C to 200.0 °C | - |
| U0-46 | Received can frames | 0 to 65535 | 1 |
| U0-47 | Faulty frames of can sending | 0 to 65535 | 1 |
| U0-48 | Faulty frames of can receiving | 0 to 65535 | 1 |

| Para. No. | Para. Name | Setting range | Unit |
|---|---|---|---|
| U0-49 | Off-line times of can bus | 0 to 65535 | 1 |
| U0-55 | Extension card type | 0 to 65535 | 1 |
| U0-56 | Extension card firmware version | 0 to 65535 | 1 |
| Group U1: Hydraulic Pressure Monitoring | | | |
| U1-00 | Electrical angle | 0.0° to 359.9° | 0.1° |
| U1-01 | Pressure command | 0.0 kg/cm$^2$ to A3-02 | 0.1 |
| U1-02 | Pressure feedback | 0.0 kg/cm$^2$ to A3-02 | 0.1 |
| U1-03 | Motor speed feedback | -9999 to 30000 rpm | 1 rmp |
| U1-04 | AI1 voltage | -9.999 to 9.999 V | 0.001 V |
| U1-05 | AI2 voltage | -9.999 to 9.999 V | 0.001 V |
| U1-06 | AI3 voltage | -9.999 to 9.999 V | 0.001 V |
| U1-07 | AI1 zero drift | -9.99 to 9.99 V | 0.01 V |
| U1-08 | AI2 zero drift | -9.99 to 9.99 V | 0.01 V |
| U1-09 | AI3 zero drift | -9.99 to 9.99 V | 0.01 V |
| U1-10 | Flow command | 0.00 Hz to F0-10 | 0.01 Hz |
| U1-11 | Resolver signal interference extent | 0 to 1000 (off-line) | 1 |
| U1-12 | Pressure command from host computer | 0.0 kg/cm$^2$ to A3-02 | 0.1 |
| U1-13 | CANLink communication interference extent | 0 to 128 (off-line) | 1 |

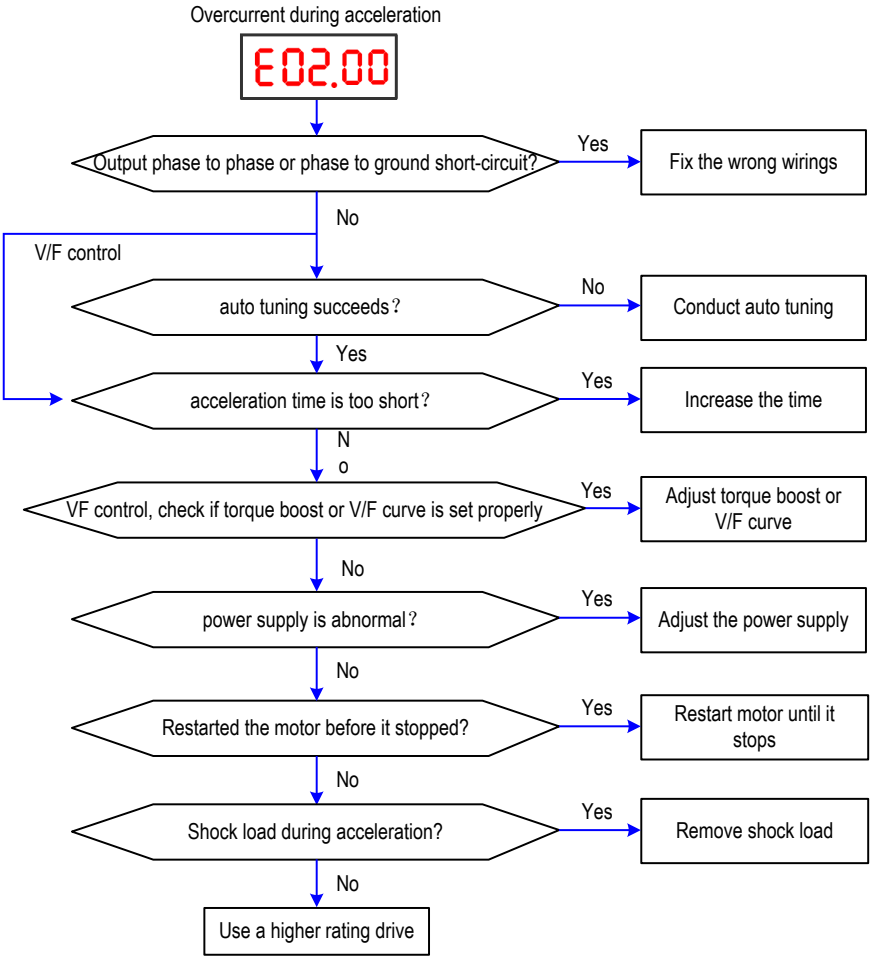
# 6 Troubleshooting

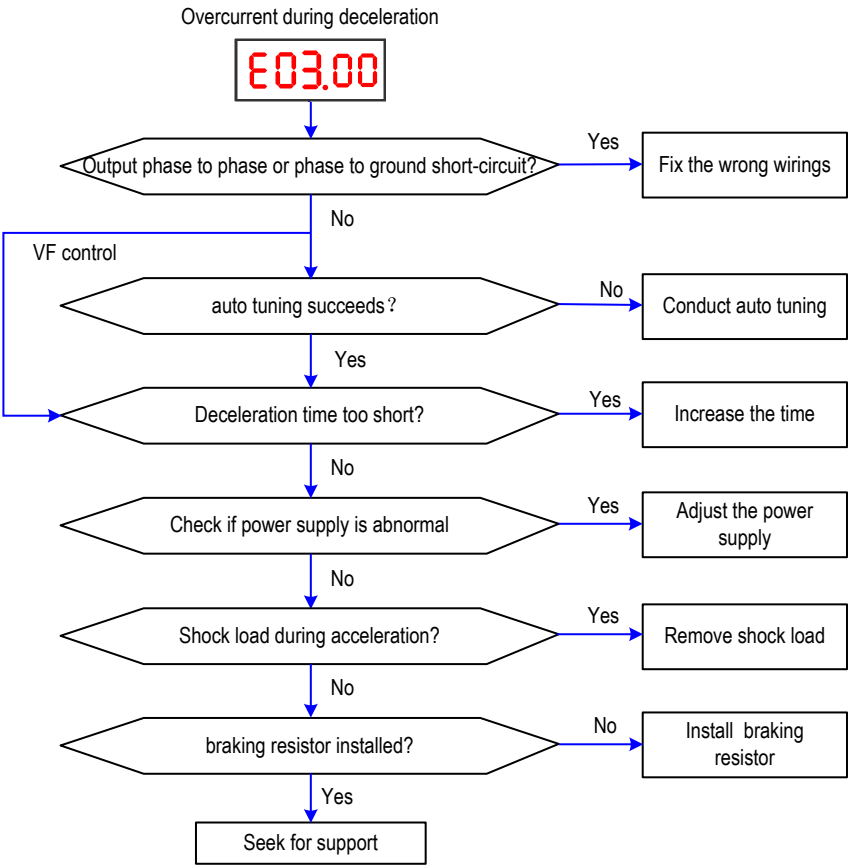
## 6.1 Servo Fault Codes and Solutions

| Fault name | Display | Reasons | Solutions |
|---|---|---|---|
| Overcurrent during acceleration |  | Output current exceeds hardware limit | Please refer to following diagram |
| Overcurrent during deceleration |  | Output current exceeds hardware limit | Please refer to following diagram |
| Overcurrent during constant speed |  | Output current exceeds hardware limit | Please refer to following diagram |
| Overvoltage during acceleration |  | DC BUS voltage exceeds overvoltage level | Please refer to following diagram |
| Overvoltage during deceleration |  | DC BUS voltage exceeds overvoltage level | Please refer to following diagram |
| Overvoltage during constant speed |  | DC BUS voltage exceeds overvoltage level | Please refer to following diagram |
| Pre-charge resistor fault |  | Pre-charge resistor works more than once in short period | disconnect power supply and seek for maintenance |
| Undervoltage |  | DC BUS voltage lower than undervoltage level | Please refer to following diagram |
| Drive overload |  | Drive is overloaded | Please refer to following diagram |
| |  | Speed sensor is faulty | Set A1-05=2s and start speed sensor self check |
| Input phase loss |  | RST power supply loses one phase or is unbalance | Please refer to following diagram |
| Output phase loss |  | Output phases lost upon starting | Please refer to following diagram |
| IGBT overheat |  | IGBT overheat | Please refer to following diagram |
| External fault |  | External fault input(through DI) | Please refer to following diagram |
| Communication fault |  | MODBUS communication fault | Please refer to following diagram |
| Pre-charge relay fault |  | Pre-charge relay fault | Disconnect power supply and seek for maintenance |
| Current sensing fault |  | Current sensing is abnormal | Disconnect power supply and seek for maintenance |
| Motor auto tuning overtime |  | Auto tuning is overtime | Please refer to following diagram |
| Auto tuning speed feedback fault |  | Auto tuning speed feedback fault | Please refer to following diagram |
| EEPROM fault |  | EEPROM is broken | Disconnect power supply and seek for maintenance |
| Motor ground fault |  | Overcurrent during power on | 1.check if motor winding is short-circuit to ground, consider change motor cable or even motor.<br>2.disconnect power supply and seek for maintenance |

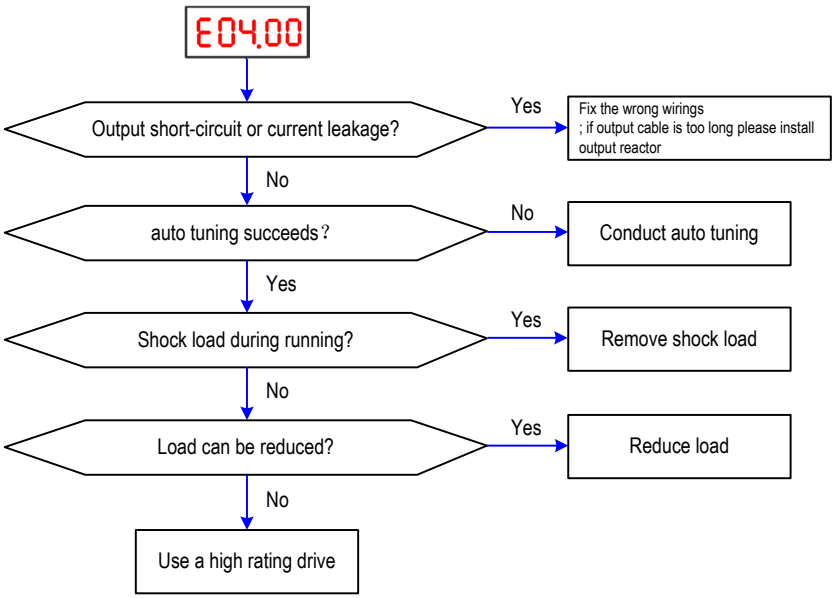
| Fault name | Display | Reasons | Solutions |
|---|---|---|---|
| Motor ground fault |  | Motor runs fast during power on | Do not connect power supply until motor stops |
| Output phase to phase short-circuit fault |  | Output phase to phase is short-circuited | Please check the outputs |
| Time out |  | Time is out | Please refer to following diagram |
| Business time out |  | Business setting time is out | Please refer to following diagram |
| Overcurrent multi prevention fault |  | Overcurrent multi prevention fault | Please refer to following diagram |
| CAN communication fault |  | Communication gets interrupted | 1. check if BUS wirings have loose connection or wrong connection<br>2.check if BUS shielding is well connected, or if BUS cable is longer than limit |
| |  | Commnunication gets interfered | |
| |  | The communication never gets online | 1.check if A2-00.A2-01 are setting correctly<br>2.check if BUS wirings have loose connection or wrong connection |
| |  | BUS card fault | Disconnect power supply and seek for maintenance |
| |  | Canlink address conflicts | Set address A2-01 correctly |
| |  | Canlink address setting fault | Set address A2-01 correctly |
| |  | Canopen fault | Sisconnect power supply and seek for maintenance |
| Speed sensor fault during motor auto-tuning |  | Speed sensor fault during motor auto tuning | Please refer to following diagram |
| Speed error fault |  | Speed error exceeds limit | Please refer to following diagram |
| |  | Drive parameter setting fault | Increase F2-10 |
| |  | Speed sensor fault | Disconnect power supply and seek for maintenance |
| |  | Drive parameter setting fault and speed sensor fault | 1.Increase F2-10<br>2.Disconnect power supply and seek for maintenance |
| Motor temperature fault |  | Motor PTC overheat | Please refer to following diagram |
| |  | Temperature sensor disconnected | Check if motor temperature sensor is connected |
| |  | PG card flat cable fault | 1.check if PG card flat cable is well connected<br>2.check if motor temperature sensor is short-circuit |
| |  | Motor KTY overheat | Please refer to following diagram |

| Fault name | Display | Reasons | Solutions |
|---|---|---|---|
| Pressure sensor fault |  | Pressure sensor is faulty | Please refer to following diagram |
| |  | Motor rotor gets locked or pump gets stuck | 1.check if rotor can be turned by hand<br>2.check if F2-10 sets properly<br>3.check if auto tuning can be conducted |
| |  | Pressure sensor calibration fault | 1.check if pressure feedback is around zero<br>2.check if pressure sensor is well connected<br>3.check if F4-28 to 31 are set properly |
| |  | Pressure sensor output is beyond setting range | Pressure sensor output is beyond setting range [A3-55, A3-56], please check the sensor |
| Slave fault |  | Slave fault | Refer to <multi pumps solution> in User manual |
| Communication address conflict |  | Communication address conflict | Refer to <multi pumps solution> in User manual |
| Speed sensor fault |  | Speed sensor disconnected | Please refer to following diagram |
| |  | Speed sensor interfered | |
| Multi-master fault |  | Multi masters | Refer to <multi pumps solution> in User manual |
| User parameter restoring fault |  | Restore without saving user parameters | Please refer to following diagram |
| Back EMF fault during auto tuning |  | From dynamic tuning, back EMF is smaller than lower limit | Please refer to following diagram |
| Braking IGBT works overtime |  | Braking IGBT works overtime | Please refer to following diagram |
| |  | Braking resistor disconnected | Check if braking resistor is well connected, and set F8-26 to start self check |
| Braking IGBT overload |  | Braking IGBT short-circuit | Disconnect power supply and seek for maintenance |
| |  | Braking IGBT gets overloaded | 1. check if braking resistor is shirt-circuit, and if the resistance is proper □<br>2. Check if DC BUS voltage is normal□<br>3. Disconnect power supply and seek for maintenance |
| Reverse running time out |  | Reverse running time reaches A4-09 | Please refer to following diagram |
| Braking resistor fault |  | Braking resistor disconnected | 1. Check wirings<br>2. If braking resistor is unnecessary, then set F8-26 = 0 |
| |  | Braking resistor resistance smaller than minimum | 1.replace with a proper resistor |
| Parameter initialization fault |  | Parameter initialization fault | Disconnect power supply and seek for maintenance |

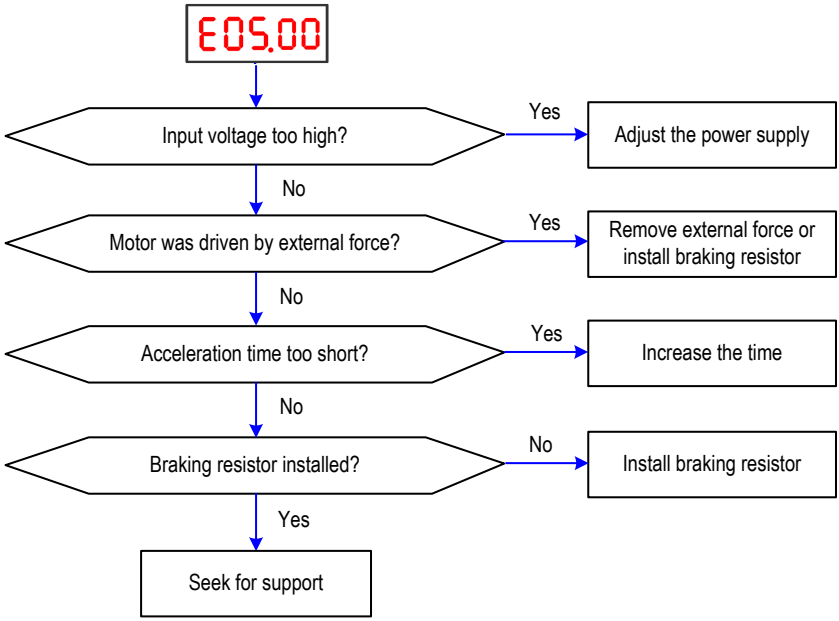

Overcurrent during acceleration
E02.00
Output phase to phase or phase to ground short-circuit?
Yes
Fix the wrong wirings
No
V/F control
auto tuning succeeds?
No
Conduct auto tuning
Yes
acceleration time is too short?
Yes
Increase the time
N
o
VF control, check if torque boost or V/F curve is set properly
Yes
Adjust torque boost or V/F curve
No
power supply is abnormal?
Yes
Adjust the power supply
No
Restarted the motor before it stopped?
Yes
Restart motor until it stops
No
Shock load during acceleration?
Yes
Remove shock load
No
Use a higher rating drive

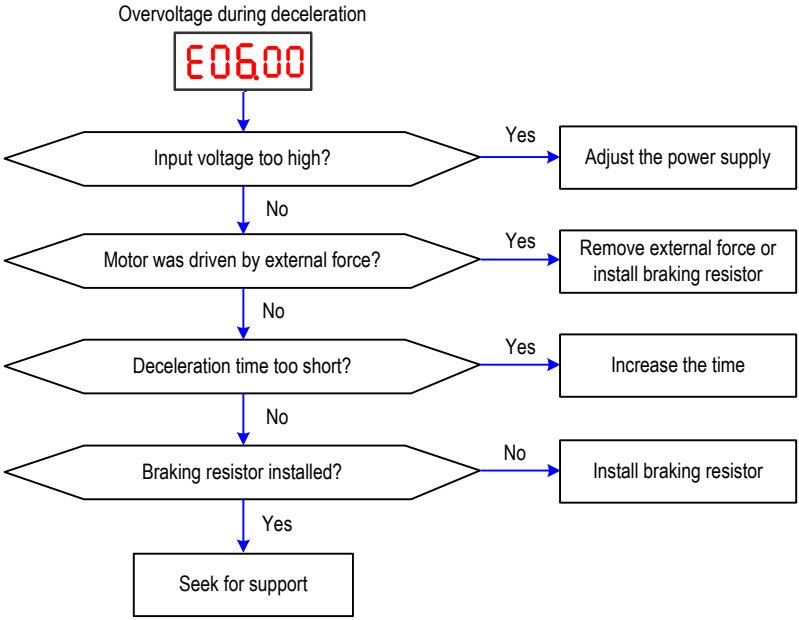

Overcurrent during deceleration
E03.00
Output phase to phase or phase to ground short-circuit?
Yes
Fix the wrong wirings
No
VF control
auto tuning succeeds?
No
Conduct auto tuning
Yes
Deceleration time too short?
Yes
Increase the time
No
Check if power supply is abnormal
Yes
Adjust the power supply
No
Shock load during acceleration?
Yes
Remove shock load
No
braking resistor installed?
No
Install braking resistor
Yes
Seek for support

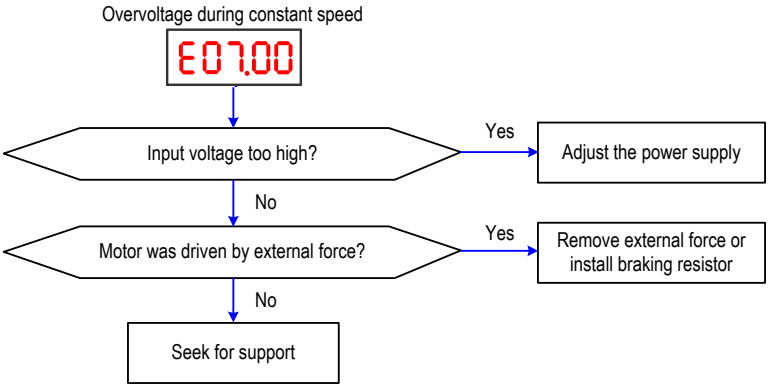
Overcurrent during constant speed

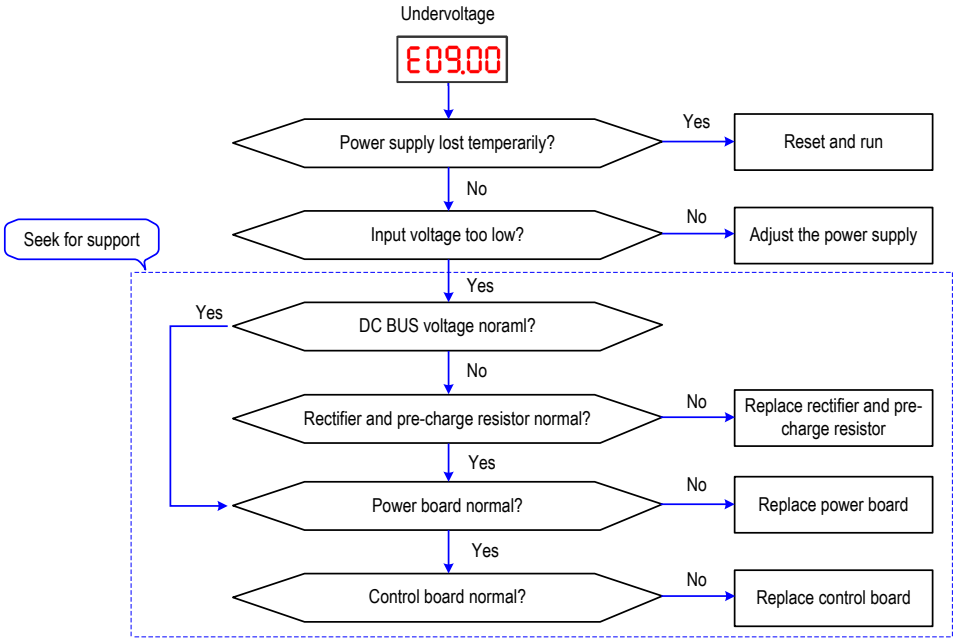


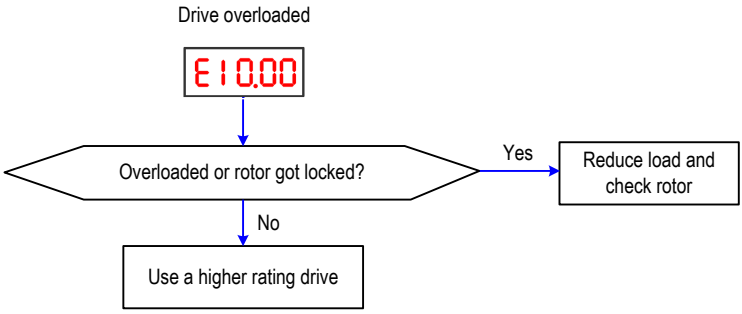

Overvoltage during acceleration

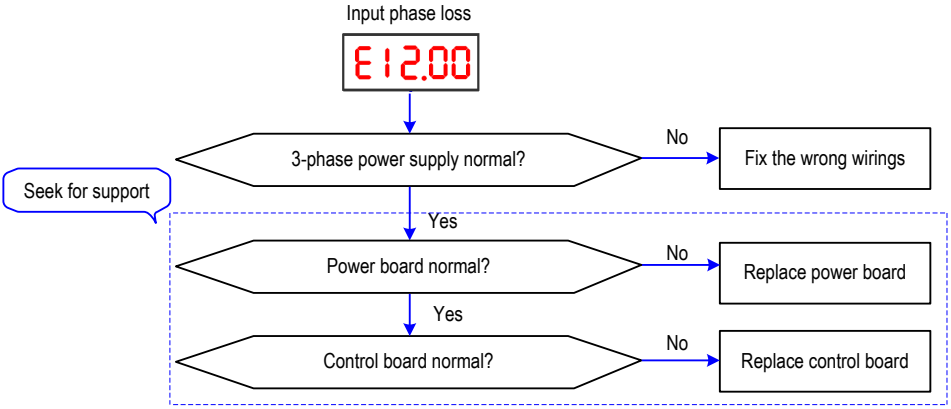


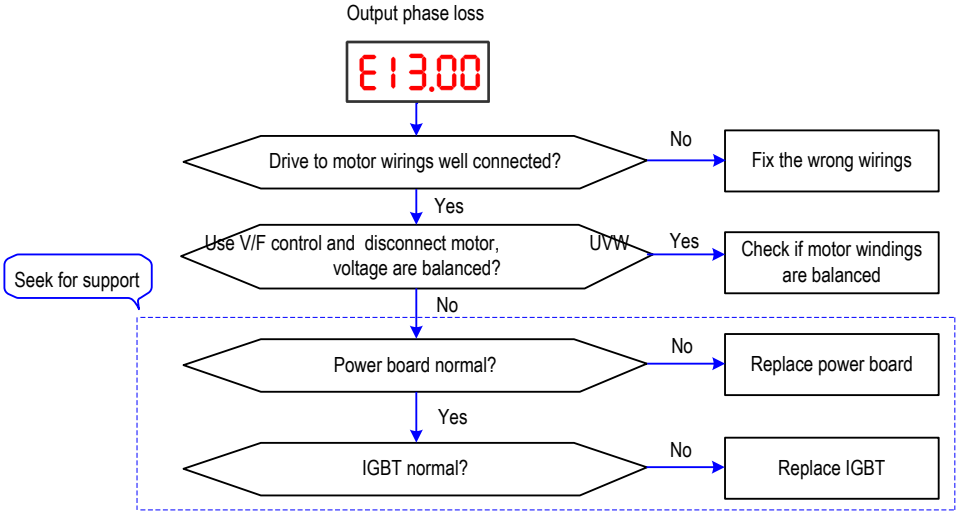

Overvoltage during deceleration
E06.00
Input voltage too high?
Yes
Adjust the power supply
No
Motor was driven by external force?
Yes
Remove external force or install braking resistor
No
Deceleration time too short?
Yes
Increase the time
No
Braking resistor installed?
No
Install braking resistor
Yes
Seek for support

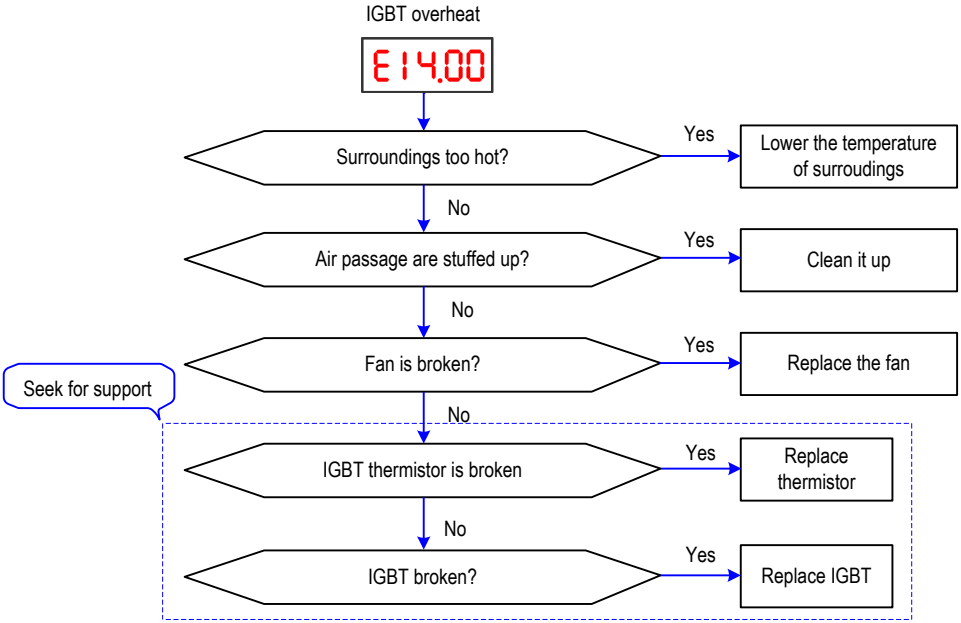

Overvoltage during constant speed
E07.00
Input voltage too high?
Yes
Adjust the power supply
No
Motor was driven by external force?
Yes
Remove external force or install braking resistor
No
Seek for support

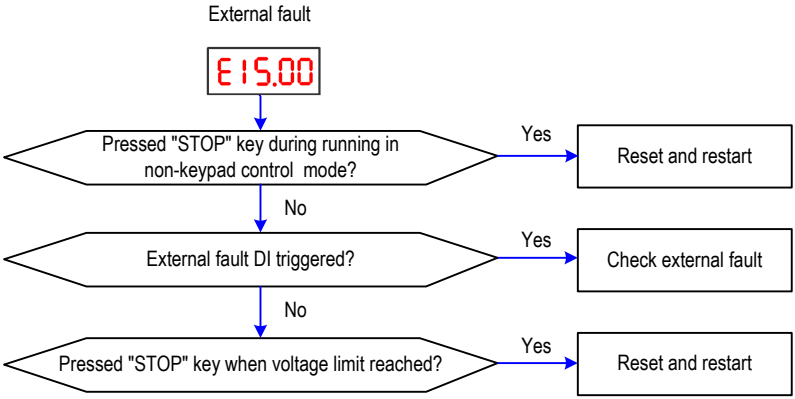

Undervoltage
E09.00
Power supply lost temperarily?
Yes
Reset and run
No
Input voltage too low?
No
Adjust the power supply
Seek for support
Yes
DC BUS voltage noraml?
Yes
No
Rectifier and pre-charge resistor normal?
No
Replace rectifier and pre-charge resistor
Yes
Power board normal?
No
Replace power board
Yes
Control board normal?
No
Replace control board


Drive overloaded
E10.00
Overloaded or rotor got locked?
Yes
Reduce load and check rotor
No
Use a higher rating drive

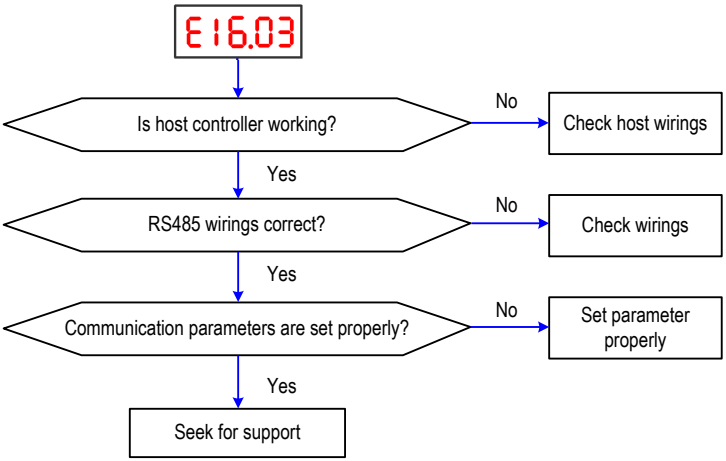

Input phase loss
E12.00
3-phase power supply normal?
No
Fix the wrong wirings
Seek for support
Yes
Power board normal?
No
Replace power board
Yes
Control board normal?
No
Replace control board


Output phase loss
E13.00
Drive to motor wirings well connected?
No
Fix the wrong wirings
Yes
Use V/F control and disconnect motor, voltage are balanced?
UVW
Yes
Check if motor windings are balanced
Seek for support
No
Power board normal?
No
Replace power board
Yes
IGBT normal?
No
Replace IGBT

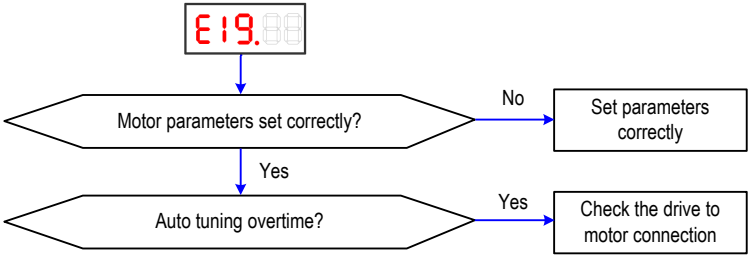

IGBT overheat
E14.00
Surroundings too hot?
Yes
Lower the temperature of surroudings
No
Air passage are stuffed up?
Yes
Clean it up
No
Fan is broken?
Yes
Replace the fan
Seek for support
No
IGBT thermistor is broken
Yes
Replace thermistor
No
IGBT broken?
Yes
Replace IGBT


External fault
E15.00
Pressed "STOP" key during running in non-keypad control mode?
Yes
Reset and restart
No
External fault DI triggered?
Yes
Check external fault
No
Pressed "STOP" key when voltage limit reached?
Yes
Reset and restart

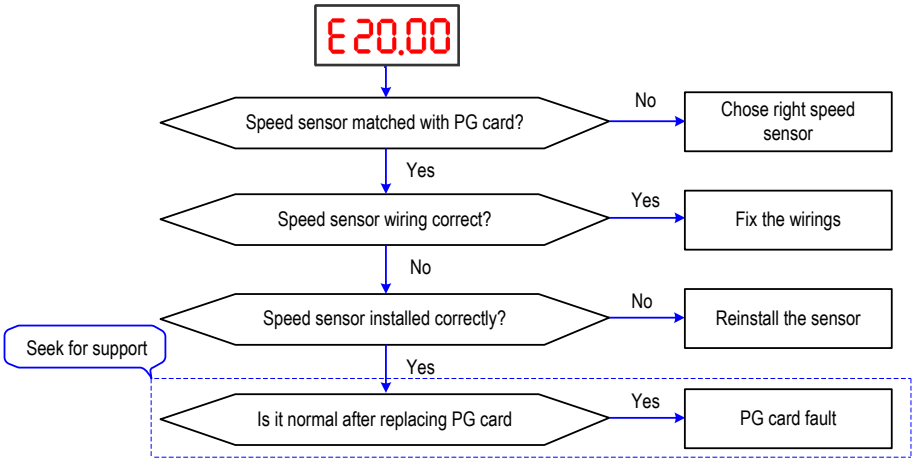
RS485 fault

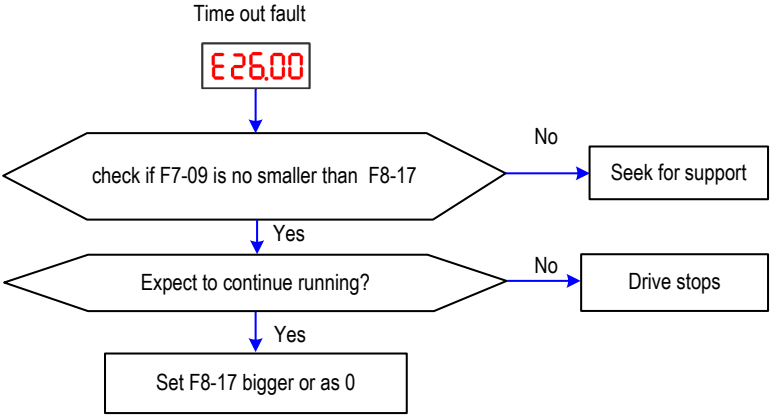


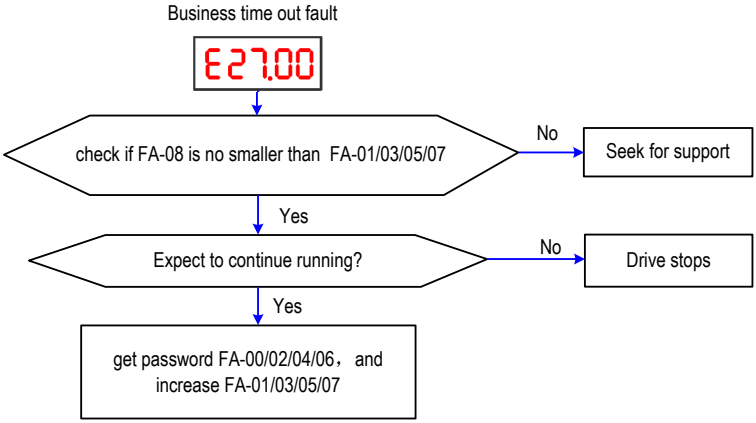

Auto tuning fault

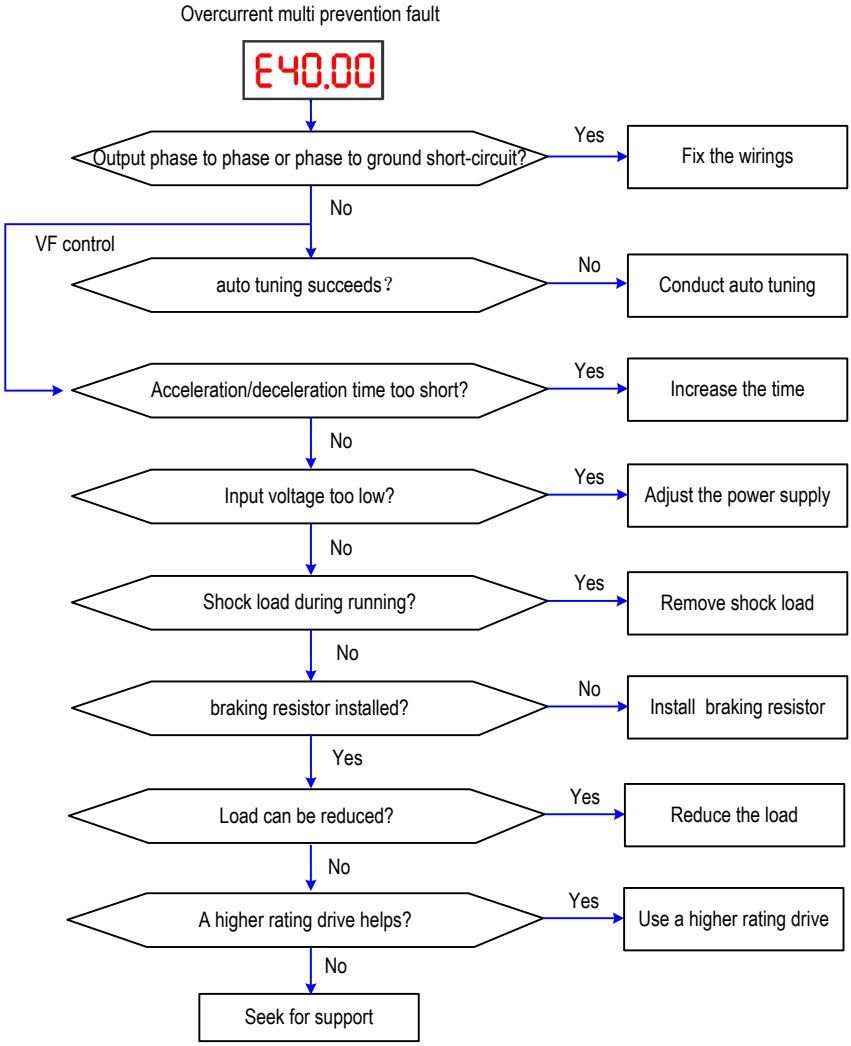



Auto tuning speed feedback fault

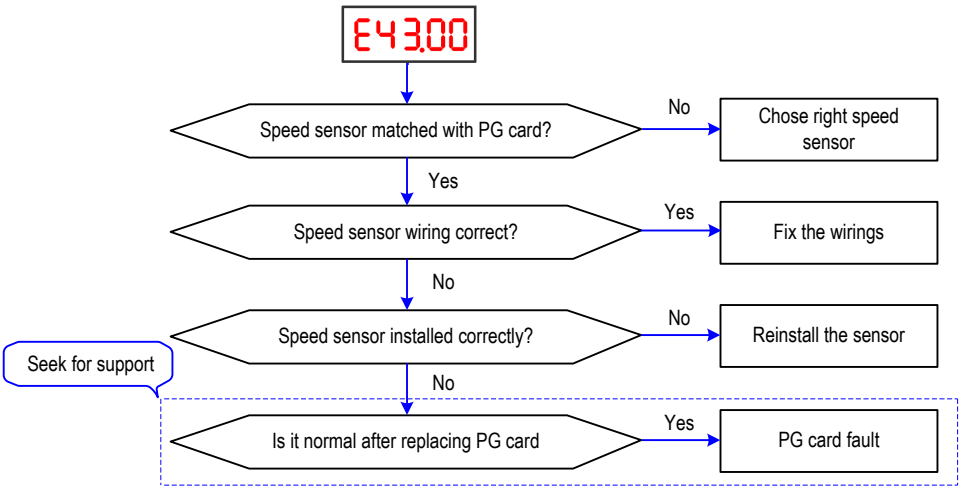



Time out fault
E26.00
check if F7-09 is no smaller than F8-17
No
Seek for support
Yes
Expect to continue running?
No
Drive stops
Yes
Set F8-17 bigger or as 0

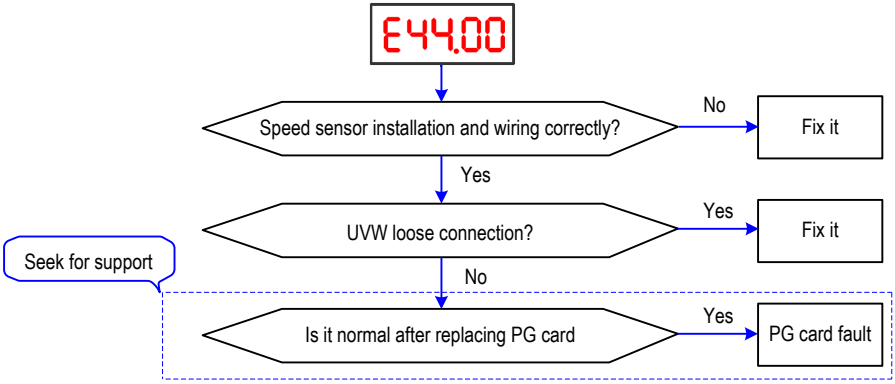

Business time out fault
E27.00
check if FA-08 is no smaller than FA-01/03/05/07
No
Seek for support
Yes
Expect to continue running?
No
Drive stops
Yes
get password FA-00/02/04/06， and
increase FA-01/03/05/07

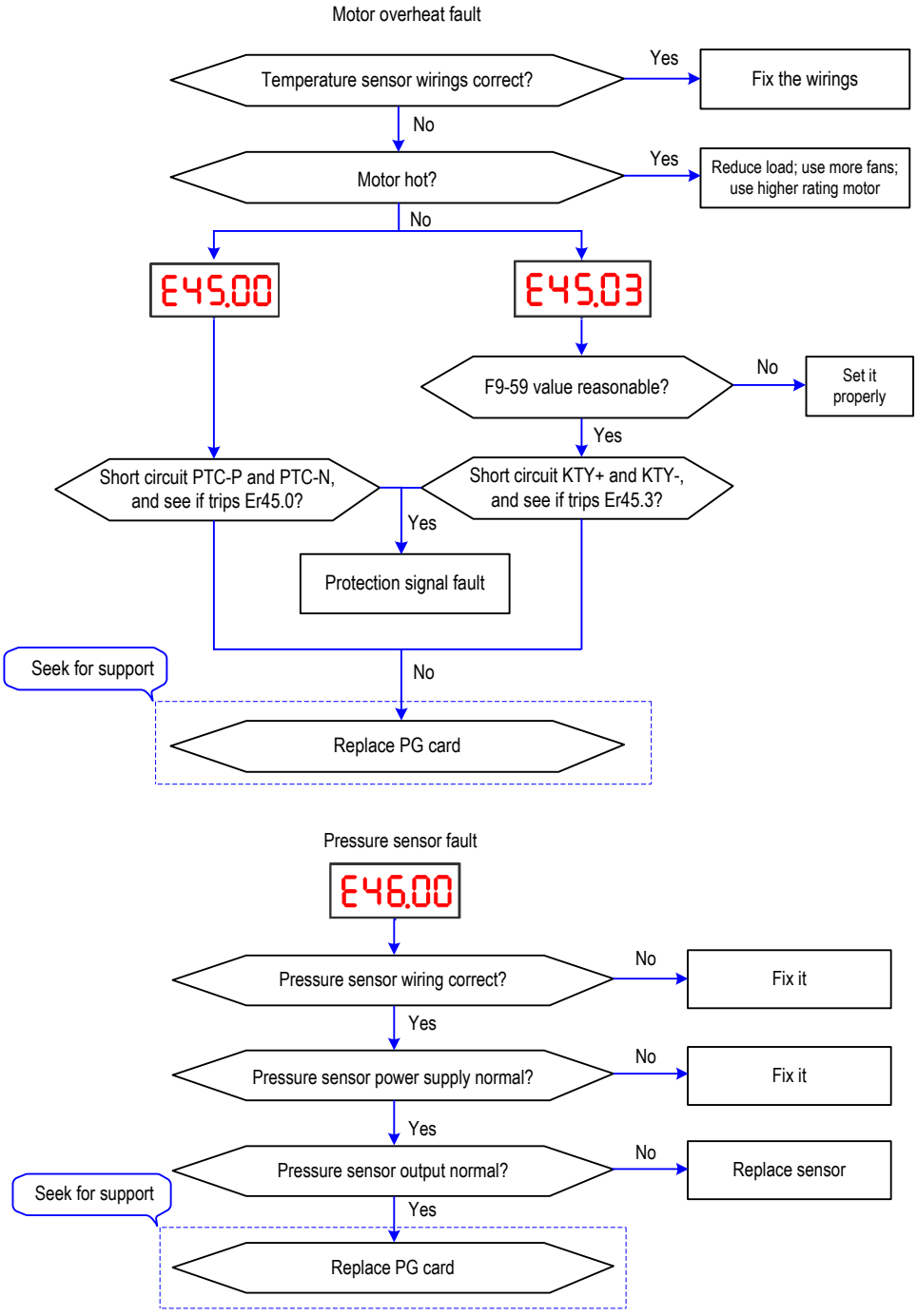

Overcurrent multi prevention fault
E40.00
Output phase to phase or phase to ground short-circuit?
Yes
Fix the wirings
No
VF control
auto tuning succeeds?
No
Conduct auto tuning
Acceleration/deceleration time too short?
Yes
Increase the time
No
Input voltage too low?
Yes
Adjust the power supply
No
Shock load during running?
Yes
Remove shock load
No
braking resistor installed?
No
Install braking resistor
Yes
Load can be reduced?
Yes
Reduce the load
No
A higher rating drive helps?
Yes
Use a higher rating drive
No
Seek for support

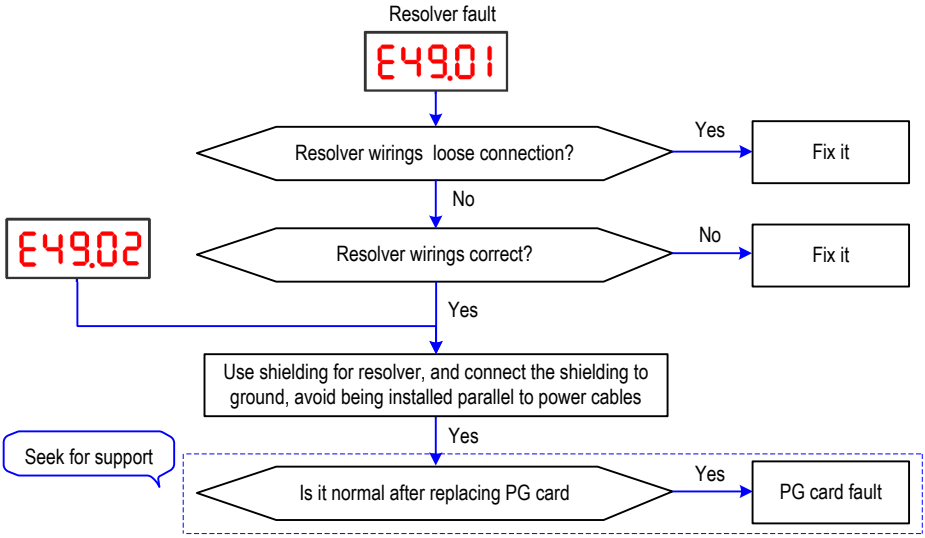
Speed sensor fault during auto tuning

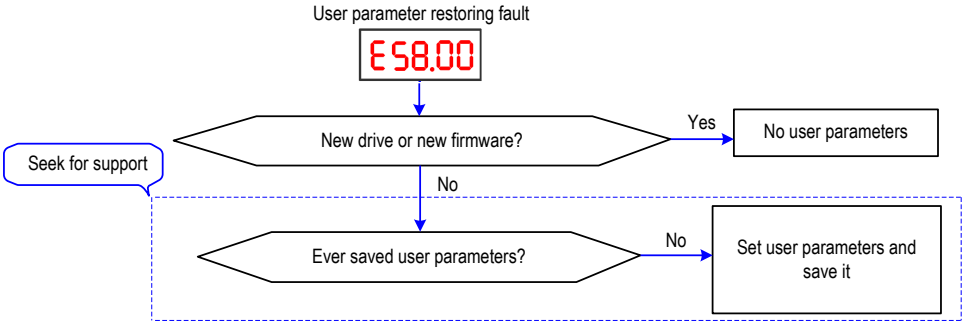


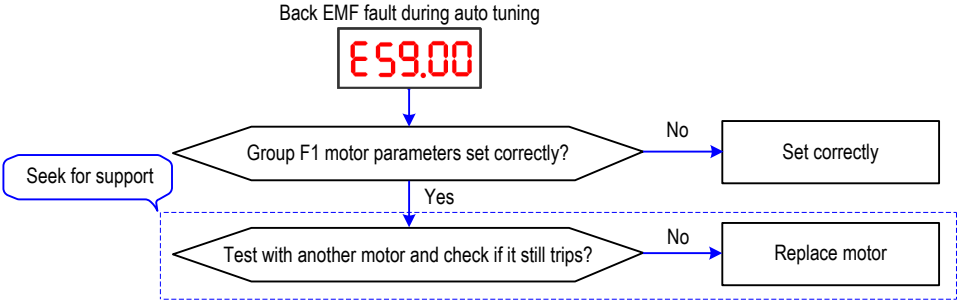

Speed error exceeds limit

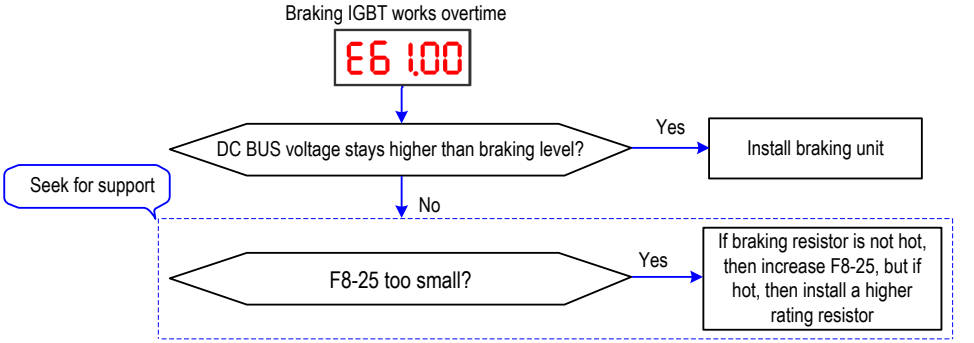


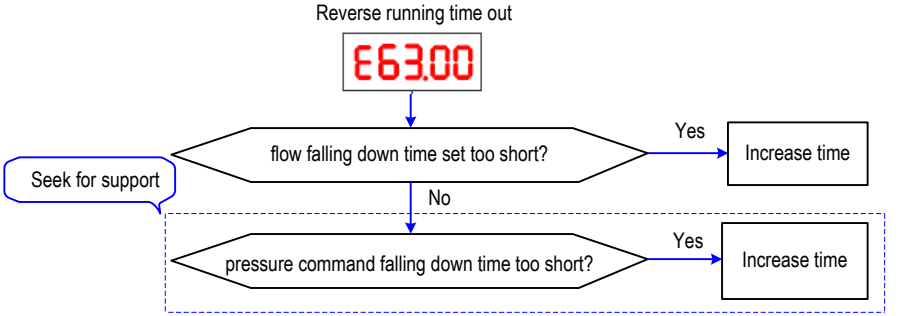

Motor overheat fault
Temperature sensor wirings correct?
Yes
Fix the wirings
No
Motor hot?
Yes
Reduce load; use more fans; use higher rating motor
No
E45.00
E45.03
F9-59 value reasonable?
No
Set it properly
Yes
Short circuit PTC-P and PTC-N, and see if trips Er45.0?
Short circuit KTY+ and KTY-, and see if trips Er45.3?
Yes
Protection signal fault
Seek for support
No
Replace PG card
Pressure sensor fault
E46.00
Pressure sensor wiring correct?
No
Fix it
Yes
Pressure sensor power supply normal?
No
Fix it
Yes
Pressure sensor output normal?
No
Replace sensor
Seek for support
Yes
Replace PG card


Resolver fault
E49.01
Resolver wirings loose connection?
Yes
Fix it
No
E49.02
Resolver wirings correct?
No
Fix it
Yes
Use shielding for resolver, and connect the shielding to ground, avoid being installed parallel to power cables
Yes
Seek for support
Is it normal after replacing PG card
Yes
PG card fault


User parameter restoring fault
E58.00
New drive or new firmware?
Yes
No user parameters
Seek for support
No
Ever saved user parameters?
No
Set user parameters and save it


Back EMF fault during auto tuning
E59.00
Group F1 motor parameters set correctly?
No
Set correctly
Seek for support
Yes
Test with another motor and check if it still trips?
No
Replace motor




| | |
|---|---|
| ***Note*** | E47 and E48 are multi-pump related faults, please refer to <multi pumps solution> User Manual. |

## 6.2 Servo Common Symptoms and Diagnostics

| Fault Name | Possible Causes | Solutions |
|---|---|---|
| There is no display at power-on. | The Mains voltage is not input or too low. | Check the power supply. |
| | The switching power supply on drive board of the servo drive is faulty. | Check bus voltage.<br>Check that the 24v output and +10v output on the control board are normal. |
| | Wires between control board and drive board and between control board and operating panel break. | Re-connect the 8-pin wire and 40-pin wire. |
| | Pre-charge resistor of the servo drive is damaged. | Contact Inovance. |
| | Control board or operating panel is faulty. | |
| | Rectifier bridge is damaged. | |
| HC is displayed at power-on. | Wire between drive board and control board is in poor contact. | Re-connect the 8-pin wire and 28-pin wire. |
| | Related components on control board are damaged | Contact Inovance. |
| | The motor or motor cable is short circuited to ground. | |
| | The hall is damaged. | |
| | The Mains voltage is too low. | |
| The display is normal upon power-on, but HC is displayed after start and the motor stops immediately. | The cooling fan is damaged or locked-rotor occurs. | Replace the fan. |
| | Short circuit exists in wiring of control terminals. | Eliminate short circuit fault in control circuit wiring. |
| The motor does not rotate after the servo drive runs. | It is motor or motor cable problem. | Check that wiring between servo drive and motor is normal. |
| | Related servo drive and motor parameters are set improperly. | Restore the factory parameters and re-set the following parameters properly:<br>· Encoder parameters<br>· Motor ratings, such as rate motor frequency and rated motor speed<br>· Motor 1 control mode (F0-01) and command source selection (F0-02)<br>· F3-01 (torque boost) in V/F control under heavy-load start. |
| | Cable connection between drive board and control board is in poor contact. | Re-connect wirings and ensure secure connection. |
| | The drive board is faulty. | Contact Inovance. |
| The DI terminals are Disabled. | Related parameters are set incorrectly. | Check and set parameters in group f4 again. |
| | External signals are incorrect. | Re-connect external signal cables. |
| | Jumper across op and +24 v becomes loose. | Re-confirm the jumper bar across op and +24 v. |
| | The control board is faulty. | Contact Inovance. |
| Motor speed Does not rise in FVC control. | Encoder is faulty. | Replace encoder and re-confirm cable connection. |
| | Encoder connection is incorrect or in poor contact. | Reconnect the encoder to ensure in good contact. |
| | PG card is faulty. | Replace the PG card. |
| | Drive board is faulty. | Contact Inovance. |
| The servo drive detects overcurrent and overvoltage frequently. | Motor parameters are set improperly. | Set motor parameters or perform motor auto-tuning again. |
| | Acceleration/deceleration time is improper. | Set proper acceleration/deceleration time. |
| | Load fluctuates. | Contact Inovance. |

# 7. ISMG Servo Motor

## 7.1 Designation Rules

ISM G1-30D 15C D-R1 3 1 F A

| Mark | Series No. |
|---|---|
| ISM | ISM Series servo motor |

| Mark | Features |
|---|---|
| G1 | 200 x 200 base |
| G2 | 266 x 266 base |

| Mark | Rated Power |
|---|---|
| 2 digits + 1 letter | |
| A | x 1 |
| B | x 10 |
| C | x 100 |
| D | x 1000 |
| E | x 10000 |
| Example:<br>15C: 1500 W<br>30D: 30000 W | |

| Mark | Rated Speed |
|---|---|
| 2 digits + 1 letter | |
| A | x 1 |
| B | x 10 |
| C | x 100 |
| D | x 1000 |
| E | x 10000 |
| Example:<br>15C: 1500 RPM<br>20C: 2000 RPM | |

| Mark | Voltage Class |
|---|---|
| D | 380 V |

| Mark | Encoder Type |
|---|---|
| R1 | Resolver |

| Mark | Shaft Connection |
|---|---|
| 1 | Plain shaft |
| 3 | Keyed + tapped hole |
| 6 | Taper shaft |
| A | Salient-pole motor |

| Mark | Brake, Gear, Oil Seal |
|---|---|
| 1 | Oil seal |

| Mark | Customized Feature |
|---|---|
| X | Naturally ventilated |
| F | Force ventilated |

| Mark | Version |
|---|---|

| **Note** | Motor duty types indicate the load that the motor drives, with sequential operations, involving startup, electric braking, no-load running, power-off and stop.<br>· S1: Continuous duty<br>The operation of a motor at a rated load may take an unspecified time period to reach thermal equilibrium.<br>· S4: Intermittent periodic duty with start<br>This is a sequence of identical duty cycles, each consisting load for a period, an operation at constant load period, followed by a stationary and de-energized period. This cycle has a great impact on temperature rise. |
|---|---|

## 7.2 Physical Appearance and Mounting Dimensions

### 7.2.1 ISMG1 (200 x 200 Base/Force Ventilated)

Figure 7-1 Physical appearance and mounting dimensions of the ISMG1 (200 x 200 base/force ventilated)

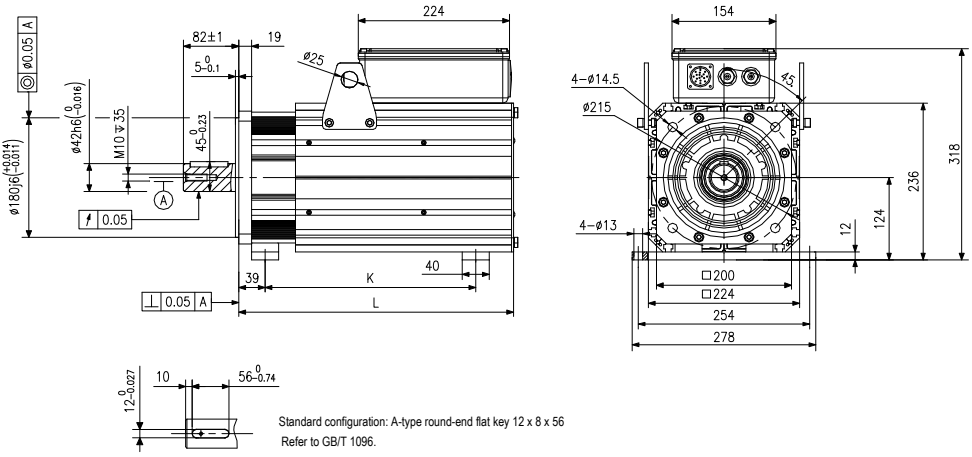



Table 7-1 Mounting dimensions of ISMG1 (200 x 200 base/force ventilated)

| Servo Motor Model | ISMG1-95C15CD-R131FA | ISMG1-14D15CD-R131FA | ISMG1-17D15CD-R131FA | ISMG1-22D15CD-R131FA | ISMG1-30D15CD-R131FA |
|---|---|---|---|---|---|
| | ISMG1-11D17CD-R131FA | ISMG1-16D17CD-R131FA | ISMG1-20D17CD-R131FA | ISMG1-24D17CD-R131FA | ISMG1-34D17CD-R131FA |
| | ISMG1-12D20CD-R131FA | ISMG1-18D20CD-R131FA | ISMG1-23D20CD-R131FA | ISMG1-28D20CD-R131FA | ISMG1-41D20CD-R131FA |
| K | 285 | 312 | 354 | 396 | 471 |
| L | 375 | 410 | 445 | 480 | 550 |

## 7.2.2 ISMG2 (266 x 266 Base/Force Ventilated)

Figure 7-2 Physical appearance and mounting dimensions of ISMG2 (266 x 266 base/force ventilated)

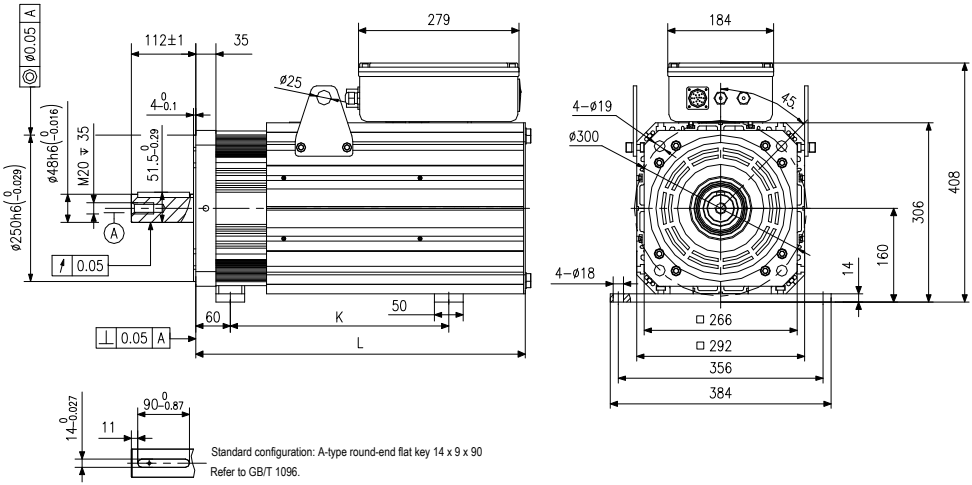


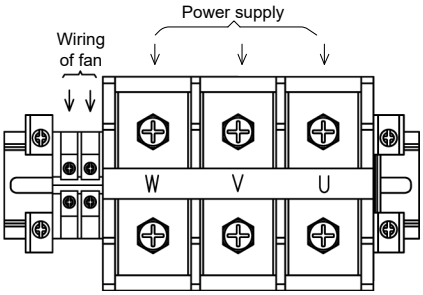

Table 7-2 Mounting dimensions of ISMG2 (266 x 266 base/force ventilated)

| Servo Motor Model | ISMG2-31D15CD-R131FA | ISMG2-42D15CD-R131FA | ISMG2-60D15CD-R131FA | ISMG2-80D15CD-R1A1FA | ISMG1-30D15CD-R131FA |
|---|---|---|---|---|---|
| | ISMG2-36D17CD-R131FA | ISMG2-48D17CD-R131FA | ISMG2-68D17CD-R131FA | ISMG2-91D17CD-R1A1FA | ISMG1-34D17CD-R131FA |
| | ISMG2-42D20CD-R131FA | ISMG2-57D20CD-R131FA | ISMG2-80D20CD-R1A1FA | ISMG2-11E20CD-R1A1FA | ISMG1-41D20CD-R131FA |
| K | 360 | 370 | 476 | 583 | 471 |
| L | 525 | 575 | 675 | 780 | 550 |

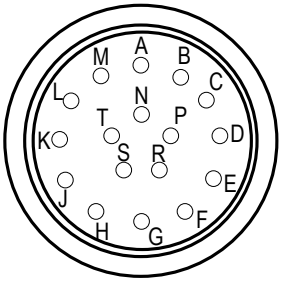
## 7.3 Wiring of ISMG Servo Motor

### 7.3.1 Layout and Wiring Description of Junction Box

Terminals of main circuit




Military spec.




Definition of IS580 supporting signal lines and military spec. pins is shown in the following table.

| 17P Military Spec. | A | B | C | D | E | F | G | H | L | K | J |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DB9 Connector | 1 | 2 | 3 | 4 | 5 | 9 | 7 | 8 | | 6 | Housing |
| Signal Definition | REF+ | REF- | Cos+ | Cos- | Sin+ | Sin- | PTC-M | KTY-N | PTC-N | KTY-M | Shield |
| Wire Colour | Yellow/White | Red/White | Red | Black | Yellow | Blue | Brown | Orange | | Grey | Shield |
| Remark | One pair | | One pair | | One pair | | - | KTY, PTC common | | - | - |

■ Precautions on Wiring Servo Motor Main Circuit Terminals

When wiring main circuit terminals, ensure phase sequence conform to the terminal symbols. Connect PE terminal to the fixed screw with a special mark in the junction box.

| ***Note*** | · PTC, KTY, and resolver signal cable cannot connect to the 220 V power supply. Otherwise, the motor will be damaged.<br>· The motor has passed the IP54 experiment. At wiring, protection measures must still be taken at the cabling holes to prevent foreign matters from falling into the motor.<br>· Sticky dust in the working environment will weaken heat dissipation of the motor. Refer to section 10.5 to clean the cooling fan. |
|---|---|

For detailed wiring diagrams, see Figure 2-6 and Figure 2-7.

## Revision History

| Date | Version | Change Description |
|---|---|---|
| Jan. 2016 | V0.0 | Related firmware version. |
| Jul. 2016 | A01 | Add data on three-phase 220 VAC models.<br>Add the ISMG servo motor chapter.<br>Related firmware version: F7-10 = 1.06 |
| Aug. 2016 | A02 | Add CE certifications.<br>Related firmware version: F7-10 = 1.06 |
| Nov. 2016 | A03 | Modified Approvals, designation rule and nameplate. |
| Jun. 2019 | A04 | Updated Inovance's logo. |
| Oct. 2020 | A05 | Added the barcode on the back cover, and deleted the service hotline. |
| Aug.2023 | A06 | Made minor corrections. |

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