# Emotron VSB

## AC Drive

0.4kW to 3.7kW / 0.54Hp to 5Hp

## Instruction manual

English

Thank you for choosing **Emotron VSB Series General Purpose AC Motor Drives** from CG Drives & Automation. This user manual presents a detailed description of Emotron VSB series with respect to product features, structural characteristics, functions, installation, parameter setting, troubleshooting, commissioning and daily maintenance, etc. Be sure to carefully read through the safety precautions before use, and use this product on the premise that personnel and equipment safety is ensured.

**IMPORTANT NOTES**

- Please assure the intactness of product enclosure and all safety covers before installation .Operation must conform to the requirements of this manual and local industrial safety regulations and/or electrical codes.
- Contents of this manual may be subject to appropriate modification as a result of product upgrade, specification change and update of the manual.
- In the event of damage or loss of user manual, users may ask local distributors, offices or our Technical Service Department for a new one.
- If any item as stated in this manual is not clear, please contact our Technical Service Department.
- If any anomaly occurs after power up or during the operation, it is essential to stop the machine and identify the fault or seek technical services as soon as possible.

# Emotron VSB

Instruction manual - English

400V: Software type/version: 50101/08.01.0085 (main drive and control board)

50201/08.01.0086 (Aux terminal control board)

230V: Software type/version: 50101/08.01.0087 (main drive and control board)

50201/08.01.0088 (Aux terminal control board)

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# Chapter 1 Safety Precautions

### Safety Precautions

Safety signs in this manual:

⚠ **WARNING**: indicates the situation in which the failure to follow operating requirements may result in fire or serious personal injury or even death.

⚠ **ATTENTION**: indicates the situation in which the failure to follow operating requirements may cause moderate or slight injury and damage to equipment.

Users are requested to read this chapter carefully when installing, commissioning and repairing this product and perform the operation according to safety precautions as set forth in this chapter without fail. CG Drives & Automation will bear no responsibility for any injury and loss as a result of any violation operation.

## 1.1 Safety Considerations

### 1.1.1 Prior to Installation

| ⚠ WARNING |
|---|
| ➢ Do not touch control terminals, circuit boards and any other electronic parts and components with bare hands.<br>➢ Do not use the drive whose component(s) is/are missing or damaged. Failure to comply with may result in more faults and/or personal injury even death. |

| ⚠ ATTENTION |
|---|
| ➢ Check if the product information indicated on the nameplate is consistent with the order requirements. If not, do not install it.<br>➢ Do not install the drive in the event that the packing list does not match with real equipment. |

### 1.1.2 Installation

**WARNING**

- Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation. Failure to comply may result in equipment damage and/or personnel injury even death.
- This equipment must be mounted on metal or other flame retardant objects. Failure to comply may result in fire.
- This equipment must be mounted in an area which is away from combustibles and heat sources. Failure to comply may result in fire.
- This equipment must in no case be mounted in the environment exposed to explosive gases. Failure to comply may result in explosion.
- Never adjust mounting bolts of this equipment, especially the ones with red markers. Failure to comply may result in equipment damage.

**ATTENTION**

- Handle the equipment gently and take hold of its sole plate so as to avoid foot injury or equipment damage.
- Mount the equipment where its weight can be withstood. Failure to comply may result in equipment damage and/or personnel injury if falling happens.
- Make sure the installation environment conforms to the requirements as stated in Section 2.4. If not, de-rating is necessary. Failure to comply may result in equipment damage.
- Prevent drilling residues, wire ends and screws from falling into the equipment during installation. Failure to comply may result in faults or equipment damage.
- When mounted in a cabinet, this equipment should be provided with appropriate heat dissipation. Failure to comply may result in faults or equipment damage.

### 1.1.3 Wiring

**⚠ WARNING**

- Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the wiring. Failure to comply may result in personnel injury and/or equipment damage.
- Wiring must strictly conform to this manual. Failure to comply may result in personnel injury and/or equipment damage.
- Make sure the input power supply has been completely disconnected before wiring. Failure to comply may result in personnel injury and/or equipment damage.
- All wiring operations must comply with EMC and safety regulations and/or electrical codes, and the conductor diameter should conform to recommendations of this manual. Failure to comply may result in personnel injury and/or equipment damage.
- Since overall leakage current of this equipment may be bigger than 3.5mA, for safety's sake, this equipment and its associated motor must be well grounded so as to avoid risk of electric shock.
- Be sure to implement wiring in strict accordance with the marks on this equipment's terminals. Never connect three-phase power supply to output terminals U/T1, V/T2 and W/T3. Failure to comply may result in equipment damage.
- Install braking resistors at terminals ⊕/B1 and B2 only. Failure to comply may result in equipment damage.
- Wiring screws and bolts for main circuit terminals must be screwed tightly. Failure to comply may result in equipment damage.
- AC 220V signal is prohibited from connecting to other terminals than control terminals RA, RB and RC. Failure to comply may result in equipment damage.

**ATTENTION**

- Since all adjustable frequency AC drives from CG Drives & Automation have been subjected to hi-pot test before delivery, users are prohibited from implementing such a test on this equipment. Failure to comply may result in equipment damage.
- Signal wires should to the best of the possibility be away from main power lines. If this cannot be ensured, vertical cross-arrangement shall be implemented, otherwise interference noise to control signal may occur.
- If motor cables are longer than 100m, it is recommended output AC reactor be used. Failure to comply may result in faults.

### 1.1.4 Running

**WARNING**

- Drives which have been stored for more than 2 years should be used with voltage regulator to gradually boost the voltage when applying power to the drives. Failure to comply may result in equipment damage.
- Be sure to confirm the completion and correctness of the drive wiring and close the cover before applying power to the drive. Do not open the cover after applying power. Failure to comply may result in electric shock hazard.
- After applying the power, never touch the drive and peripheral circuits no matter what state the drive is under, otherwise there will be electric shock hazard.
- Prior to the running of the drive, check there is no person in surrounding area who can reach the motor so as to prevent personal injury.
- Only qualified technicians familiar with adjustable frequency AC drives are allowed to perform signal test during operation. Failure to comply may result in equipment damage and/or personal injury.
- Never change the drive parameters at will. Failure to comply may result in equipment damage.

**ATTENTION**

- Make sure the number of phases of power supply and rated voltage are consistent with product nameplate. If not, contact the seller or CG Drives & Automation.
- Check there are no short circuits in peripheral circuits connected with the drive, and make sure the connection is tight. Failure to comply may result in equipment damage.
- Make sure the motor and associated machinery are within allowable range of service prior to operation. Failure to comply may result in equipment damage.
- Never touch fans, heat sink and braking resistor with bare hands. Failure to comply may result in equipment damage and/or personal injury.
- It is not allowed to start & stop the driver frequently via direct switching power on or off. Failure to comply may result in equipment damage.
- Make sure the drive is in a non-output status before switch-on/switch-off of the drive output and/or contactor. Failure to comply may result in equipment damage.

### 1.1.5 Maintenance

**WARNING**

- Only qualified technicians are allowed to implement the maintenance, and troubleshooting.
- Never implement the maintenance, and troubleshooting before power supply has been turned off and discharged completely. Failure to comply may result in equipment damage and/or personal injury.
- To avoid an electric shock hazard, wait at least 10 minutes after the power has been turned off and make sure the residual voltage of the bus capacitors has discharged to 0V before performing any work on the drive.
- After the replacement of the drive, be sure to perform the same procedures in strict accordance with above-noted rules.

**ATTENTION**

- Do not touch the electric components with bare hands during maintenance, and troubleshooting. Failure to do this may result in component damage due to ESD.
- All pluggable components can be inserted or pulled out only when power has been turned off.

## 1.2 Other Considerations

### 1.2.1 Input Power Supply

This series of drives are not applicable to applications out the range of operating voltage as set forth in this manual. If necessary, please use booster to rise or drop the voltage to regulated voltage range.

### 1.2.2 Surge Protection

This series of drives are furnished with surge suppressor that has certain resistance to lightning induction. However, users in areas with frequent occurrence of lightning need to mount an external surge suppressor in front of the drive power input side.

### 1.2.3 Operation of Contactor

As to the configuration of peripheral devices recommended by this manual, it is necessary to mount a contactor between the power supply and this drive input side. Such a contactor should not be used as a control device for start and stop of the drive, as frequent charging & discharging shall reduce the service life of internal electrolytic capacitors.

When it is necessary to mount a contactor between the drive output and the motor, it should be ensured the drive is in a non-output status before switch-on/switch-off of such a contactor. Failure to comply may result in drive damage.

### 1.2.4 Output Filter

Since the drive output is PWM high frequency chopping voltage, mounting filter devices such as an output filter and an output AC reactor between the motor and the drive shall effectively reduce output noise, avoiding interference to other surrounding equipments.

If the length of cable between the drive and the motor exceeds 100m, an output AC reactor is recommended to use with the purpose of preventing drive fault as a result of overcurrent caused by excessive distributed capacitance. An output filter is optional depending on field requirements.

Be sure not to mount phase-shifting capacitor or surge absorber at output side of the drive since this may result in drive damage as a result of over-temperature.

### 1.2.5 Insulation of the motor

In view of the fact that the drive output is PWM high frequency chopping voltage accompanied by higher harmonics, the noise, temperature rise and vibration of the motor is higher compared with sinusoidal voltage. Particularly this debases motor insulation. Therefore, the motor should be subjected to insulation inspection before initial use or reuse after being stored for a long

period of time. The motor in regular service should also be subjected to regular insulation inspection so as to avoid the drive damage as a result of motor insulation damage.

### 1.2.6 Derating

Due to the thin air in high-altitude areas, the radiating performance of the drive with forced air cooling may degrade while the electrolyte of electrolytic capacitors is more volatile, which can result in reduction in product life. Drive should be derated when used in an area at the altitude above 1000 meters. It is recommended to derate 1% for every 100m when the altitude is above 1000 meters.

# Chapter 2 Product Information

## 2.1 Model Explanation

Model shown on product nameplate indicates the series name, applicable type of power supply, power class and hardware, etc. via the combination of numbers, symbols and letters.

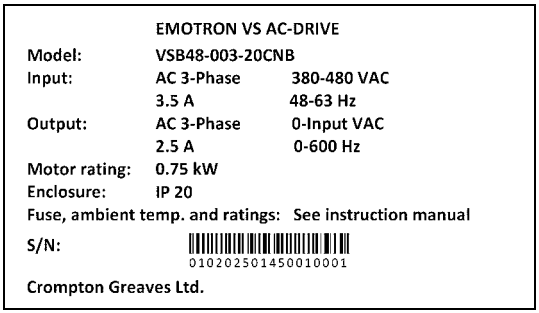



Fig. 2-1 Nameplate information

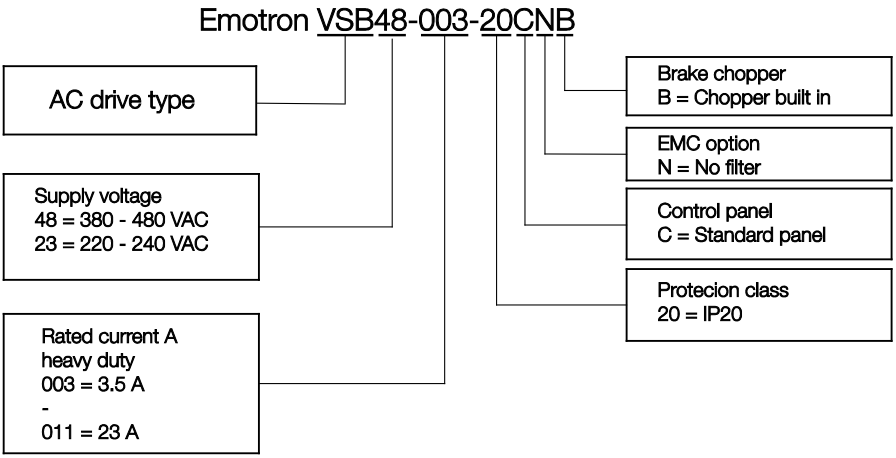



Fig. 2-2 Product model explanation

## 2.3 Information of Product Model

**Table 2-1 Product model and technical data Emoton VSB23**

| Drive model | Heavy Duty 150% 1 min. every 10 min. | | | Light Duty 120% 1 min. | Max input Fuse A | Brake unit Ω |
|---|---|---|---|---|---|---|
| | Rated output current A | Rated input current 1-phase/ 3-phase A | Typical motor kW* | Rated output current A | | |
| VSB23-003-20CNB | 2.6 | 5.5/3.2 | 0.4 | ** | 16 | ≥200 |
| VSB23-005-20CNB | 4.5 | 9.2/6.3 | 0.75 | | 25 | ≥200 |
| VSB23-008-20CNB | 7.5 | 14.5/9 | 1.5 | | 32 | ≥100 |
| VSB23-011-20CNB | 11 | 23/15 | 2.2 | | 40 | ≥75 |

Note: The models VSB23-### can be used for either 1-phase or 3-phase.

* Power at 230V **= Contact CG for information.

**Table 2-2 Product model and technical data Emotron VSB48**

| Drive model | Heavy Duty 150% 1 min. every 10 min. | | | Light Duty 120% 1 min | Max input Fuse A | Brake unit Ω |
|---|---|---|---|---|---|---|
| | Rated output current A | Rated input current A | Typical motor kW* | Rated output current A | | |
| VSU48-003-20CNB | 2.5 | 3.5 | 0.75 | ** | 16 | >150 |
| VSU48-004-20CNB | 3.8 | 6.2 | 1.5 | | 16 | ≥100 |
| VSU48-006-20CNB | 5.5 | 9.2 | 2.2 | | 16 | ≥75 |
| VSU48-009-20CNB | 9 | 14.9 | 3.7 | | 40 | ≥75 |

* Power at 400 - 415V. ** = Contact CG for information

## 2.4 Technical Features of Emotron VSB

**Table 2-3 Technical Features of Emotron VSB**

| | | |
|---|---|---|
| Power input | Rated input voltage | 3-phase<br>AC208V/AC220V/AC230V/AC240V/AC380V/AC400V/AC415V/AC440V/AC460V/AC480V<br>1-phase<br>AC220V/AC230V/AC240V |
| | Rated input current | See Section 2.3 |
| | Frequency | 50Hz/60Hz, tolerance ±5% |
| | Allowable range of voltage | Continuous voltage fluctuation ±10%, short fluctuation -15% to +10%, i.e. 323V - 528V; Voltage out-of-balance rate <3%, distortion rate as per the requirements of IEC61800-2 |
| Power output | Standard applicable motor (kW) | See Section 2.3 |
| | Rated current (A) | See Section 2.3 |
| | Output voltage (V) | 3-phase: 0 - rated input voltage, error < ±3% |
| | Output frequency (Hz) | 0.00 - 600.00Hz; unit: 0.01Hz |
| | Overload capacity | 150% - 1min; 180% - 10s; 200% - 0.5s |
| Control characteristics | V/f patterns | V/f control<br>Sensor-less vector control 1 |
| | Range of speed regulation | 1:100 ( V/f control, sensor-less vector control 1) |
| | Speed accuracy | ±0.5% (V/f control)<br>±0.2% (sensor-less vector control 1) |
| | Speed fluctuation | ±0.3% (sensor-less vector control 1) |
| | Torque response | < 10ms (sensor-less vector control 1) |
| | Starting torque | 0.5Hz: 180% (V/f control, sensor-less vector control 1) |

| | | |
|---|---|---|
| Basic functions | Start frequency | 0.00 - 600.00Hz |
| | Accel/Decel time | 0.00 - 60000s |
| | Carrier frequency | 0.7kHz - 12kHz |
| | Frequency setting sources | Digital setting + keypad ∧ / ∨<br>Digital setting + terminal UP/DOWN<br>Potentiometer<br>Communication<br>Analogue setting (AI) |
| | Motor started methods | Started from starting frequency<br>DC braking and then started |
| | Motor stopped methods | Ramp to stop<br>Coast to stop<br>Ramp stop + DC brake |
| Basic functions | Dynamic braking capacity | Brake unit threshold voltage:<br>400V input: 650V~750V<br>200V input: 325V～375V<br>service time: 0.0~100.0s |
| | DC braking capacity | DC braking start frequency: 0.00 - 600.00Hz<br>DC braking current: 0.0 - 100.0%<br>DC braking time: 0.0 - 30.00s |
| | Input terminals | 4 digital inputs<br>1 analog, current/voltage type selectable |
| | Output terminals | 1 digital output<br>1 relay output |
| | | 1 analog output, voltage/current output selectable; can output signals such as setting frequency, or output frequency, etc |

| | | |
|---|---|---|
| Featured functions | various master & auxiliary commands and their switch, a variety of Accel/Decel curves optional, analog auto correction, 8-step speed programmable, three faults history, over excitation brake, over voltage stall protection, under voltage stall protection, restart upon power loss, skip frequency, frequency binding, four kinds of Accel/Decel time, process PID, autotuning, field-weakening control | |
| Protection functions | Refer to Chapter 7- Troubleshooting | |
| Environment | Place of operation | Indoors, no direct sunlight, free from dust, corrosive gases, flammable gases, oil mist, water vapor, water drop or salt, etc. |
| | Altitude | 0 - 2000m<br>De-rate 1% for every 100m when the altitude is above 1000 meters |
| | Ambient temperature | -10°C - 50°C |
| | Relative humidity | 0 - 95%, no condensation |
| | Vibration | Less than 5.9m/s$^2$ (0.6g) |
| | Storage temperature | -40°C to +70°C |
| Others | Efficiency at rated Amps | At rated Amps ≥93% |
| | Installation | Wall-mounted, DIN-rail |
| | IP grade | IP20 |
| | Cooling method | Forced air cooling |

## 2.5 Parts Drawing

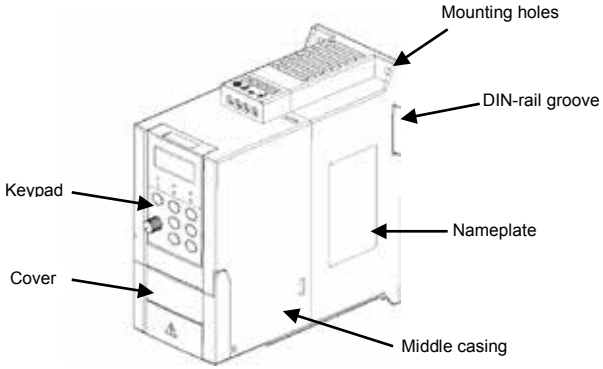



Fig. 2-3 Parts explanation

## 2.6 Appearance, Mounting Dimensions and Weight

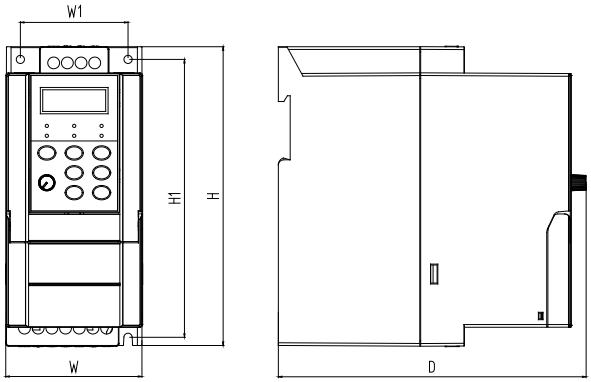



Fig. 2-4 External dimensions

**Table 2-4 Appearance, mounting dimensions and weight for Emotron VSB23**

| Model | External and installation dimensions (mm) | | | | | | Weight (kg) |
|---|---|---|---|---|---|---|---|
| | W | H | D | W1 | H1 | Mounting hole dia. d | |
| VSU23-003-20CNB | 75 | 166 | 168 | 59 | 154 | 4.5 | 1.4 |
| VSU23-005-20CNB | | | | | | | |
| VSU23-008-20CNB | 85 | 188 | 172 | 69 | 175 | | 2.0 |
| VSU23-011-20CNB | | | | | | | |

**Table 2-5 Appearance, mounting dimensions and weight for Emotron VSB48**

| Model | External and installation dimensions (mm) | | | | | | Weight (kg) |
|---|---|---|---|---|---|---|---|
| | W | H | D | W1 | H1 | Mounting hole dia. d | |
| VSU48-003-20CNB | 75 | 166 | 168 | 59 | 154 | 4.5 | 1.4 |
| VSU48-004-20CNB | | | | | | | |
| VSU48-006-20CNB | 85 | 188 | 172 | 69 | 175 | | 2.0 |
| VSU48-009-20CNB | | | | | | | |

## 2.7 External Dimensions of Keypad

Keypad model of general purpose Emotron VSB series AC motor drive is KBU-BX2 whose appearance and external dimensions are shown in Fig. 2-5.

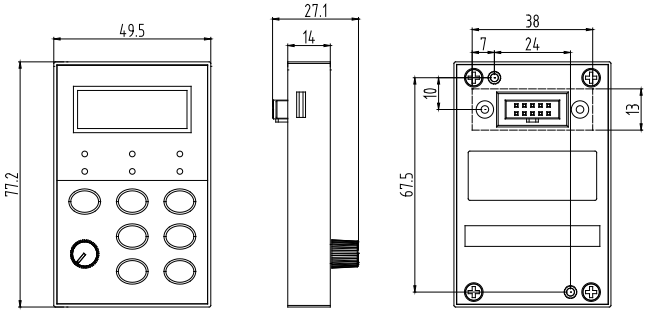



Fig. 2-5 External dimensions of KBU-BX2

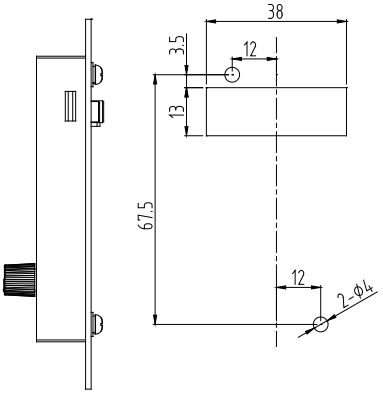



Fig. 2-6 Cabinet hole dimensions when remote keypad mounting required

# Chapter 3 Installation and Wiring

## 3.1 Installation Environment

1） Ambient temperature is in the range of -10°C - 50°C.
2） Drive should be installed on surface of flame retardant object, with adequate surrounding space for heat dissipation.
3） Installation should be performed where vibration is less than 5.9m/s$^2$ (0.6g).
4） Protect from moisture and direct sunlight.
5） Do not install in areas with grease dirt, dust, metal particles, or salty substances
6） Do not expose to an atmosphere with flammable gases, corrosive gases, explosive gases or other harmful gases.

## 3.2 Minimum Mounting Clearances

To ensure favorable heat dissipation, mount the drive upright on a flat, vertical and level surface as per Fig. 3.1.
Emotron VSB series can be wall-mounted or DIN-rail mounted. When installation is performed inside cabinet, the product shall be mounted side by side to the greatest extent while adequate surrounding space shall be preserved for favorable heat dissipation.

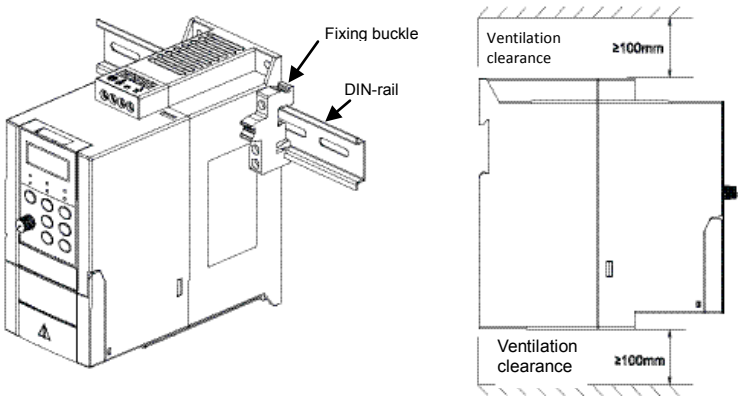



Fig. 3-1 Minimum mounting clearances

**ATTENTION:**

If a number of drives are mounted in one cabinet, parallel side-by-side mounting is recommended

## 3.3 Remove & Mount Keypad and Cover

### 3.3.1 Remove and Mount Keypad

- **Remove keypad**
  Press the buckle of keypad as indicated by number "1" in Fig. 3-2, then pull the keypad out to release as indicated by "2".
- **Mount keypad**
  Slightly slant the keypad in the direction as indicated by number "1" in Fig. 3-3 and align it to clamping port at lower part of keypad bracket, then press it in as indicated by "2". When a "click" sound heard, it indicates clamping has been properly made.

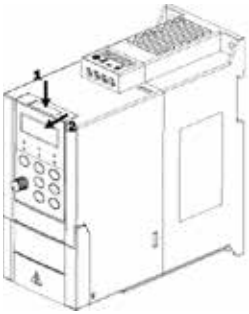



Fig. 3-2 Remove keypad

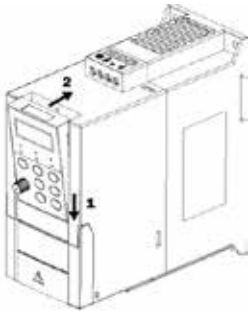
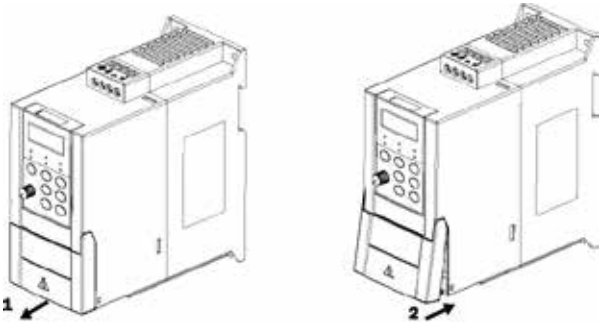



Fig. 3-3 Mount keypad

### 3.3.2 Open & Close Cover

- **Open the cover**
  Pull out as indicated by "1" in Fig. 3-4 a) with thumb.
- **Close the cover**
  After the completion of wiring, press the cover as indicated by "1" in Fig. 3-4 b). When there is a "click" sound, it indicates clamping has been well completed.




a) open the cover b) close the cover

Fig. 3-4 Open and close the cover

## 3.4 Selection of Peripheral Devices

**Table 3-1 Selection of peripheral devices**

| Model | Breaker（A） | Contactor（A） | Brake unit | |
|---|---|---|---|---|
| | | | Power（W） | Resistor（Ω） |
| VSU23-003-20CNB | 16 | 10 | 70 | ≥200 |
| VSU23-005-20CNB | 25 | 16 | 70 | ≥200 |
| VSU23-008-20CNB | 32 | 25 | 260 | ≥100 |
| VSU23-011-20CNB | 40 | 32 | 260 | ≥75 |
| VSU48-003-20CNB | 16 | 10 | 300 | ≥150 |
| VSU48-004-20CNB | 16 | 10 | 450 | ≥100 |
| VSU48-006-20CNB | 16 | 10 | 600 | ≥75 |
| VSU48-009-20CNB | 40 | 32 | 600 | ≥75 |

* All models have inbuilt brake unit, and brake resistors should be sourced. Strictly conform to the requirement in the form. Failure to comply may result in equipment damage.

## 3.5 Terminal Configuration

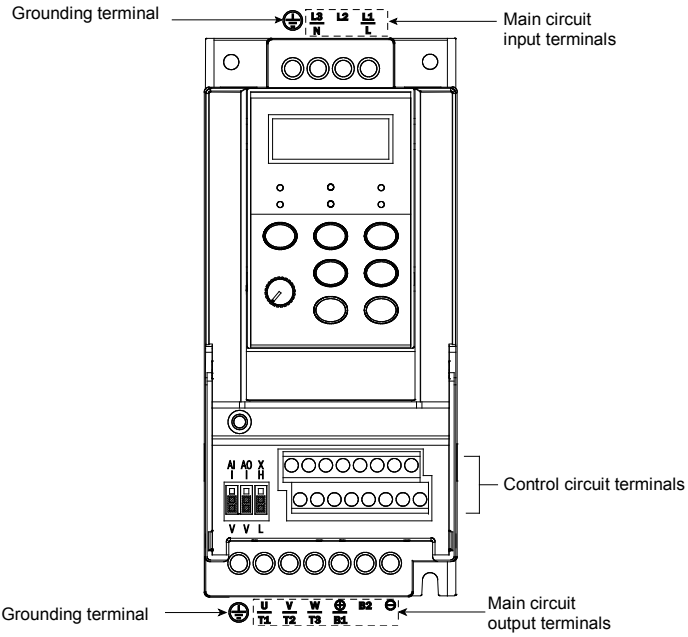



Fig. 3-5 Terminal configuration.

## 3.6 Main Circuit Terminals and Wiring

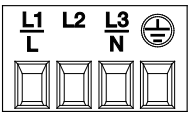
**WARNING**

- Only qualified personnel familiar with AC motor drives are allowed to implement wiring. Failure to comply may result in equipment damage and/or personnel injury even death.
- Wiring should be in strict accordance with this manual, otherwise hazard of electric shock or equipment damage exists.
- Make sure input power supply has been completely disconnected before wiring operation. Failure to comply will result in personnel injury even death.
- All wiring operations and lines should comply with EMC and national and local industrial safety regulations and/or electrical codes. The conductor diameter should be in accordance with recommendations of this manual. Otherwise, hazard of equipment damage, fire, and/or personnel injury exists.
- Since leakage current of the drive may exceed 3.5mA, for safety's sake, the drive and the motor must be grounded so as to avoid hazard of electric shock.
- Be sure to perform wiring in strict accordance with the drive terminal marks. Never connect three-phase power supply to output terminals U/T1, V/T2 and W/T3. Failure to comply will result in equipment damage.
- Only mount braking resistors at terminals ⊕ /B1and B2.
- Wiring screws and bolts for main circuit terminals must be screwed tightly. Failure to comply may result in faults and/or equipment damage.

**ATTENTION**

- Signal wires should to the best of possibility be away from main power lines. In the event that this cannot be ensured, vertical cross arrangement should be adopted, reducing EMI interference to the signal wires as much as possible.
- In case the motor cable exceeds 100m, an appropriate output reactor should be mounted.

### 3.6.1 Main Circuit Terminals



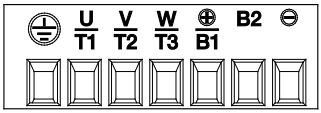




Fig. 3-6 Main circuit terminals

| Terminal marks | Designation and function of terminals |
|---|---|
| L1/L、L2、L3/N | Uniphase/Triphase AC power supply input (connect L1/L, L3/N when the input is uniphase) |
| ⊕ /B1、B2 | Brake resistor wiring terminals |
| ⊕ /B1⊖ | DC power supply input terminals |
| U/T1、V/T2、W/T3 | Triphase AC output terminals |
| ⏚ | Ground terminal PE |

### 3.6.4 Terminal Screws and Wiring Requirement

**Table 3-2 Terminal screws and wiring requirement**

| Drive model | Power terminal | | | Ground terminal | | |
|---|---|---|---|---|---|---|
| | Cable requirement $mm^2$ | Screw | Torque Nm/Lb-In | Cable requirement $mm^2$ | Screw | Torque Nm/Lb-In |
| VSB23-003-20CNB | 2.5 | M3.5 | 0.8 ±0.05/ 7 ±0.5 | 2.5 | M3.5 | 0.8 ±0.05/ 7 ±0.5 |
| VSB23-005-20CNB | 2.5 | M3.5 | | 2.5 | M3.5 | |
| VSB23-008-20CNB | 4 | M3.5 | | 2.5 | M3.5 | |
| VSB23-011-20CNB | 6 | M3.5 | | 4 | M3.5 | |
| VSB48-003-20CNB | 2.5 | M3.5 | | 2.5 | M3.5 | |
| VSB48-004-20CNB | 4 | M3.5 | | 4 | M3.5 | |
| VSB48-006-20CNB | 6 | M3.5 | | 6 | M3.5 | |
| VSB48-009-20CNB | 6 | M3.5 | | 6 | M3.5 | |

## 3.7 Control Terminal Wiring

**WARNING**

- Only qualified personnel familiar with AC motor drives are allowed to implement wiring. Failure to comply may result in equipment damage and/or personnel injury even death.
- Wiring should be in strict accordance with this manual, otherwise hazard of electric shock or equipment damage exists.
- Make sure input power supply has been completely disconnected before wiring operation. Failure to comply will result in personnel injury even death.
- All wiring operations and lines should comply with EMC and national and local industrial safety regulations and/or electrical codes. The conductor diameter should be in accordance with recommendations of this manual. Otherwise, hazard of equipment damage, fire, and/or personnel injury exists.
- Screws or bolts for terminal wiring must be screwed tightly.
- AC 220V signal is prohibited from connecting to other terminals than control terminals RA, RB and RC.

**ATTENTION**

- Signal wires should to the best of possibility be away from main power lines. If this cannot be ensured, vertical cross arrangement should be adopted, reducing EMI interference to the signal wires as much as possible.

### 3.7.2 Wiring Diagram

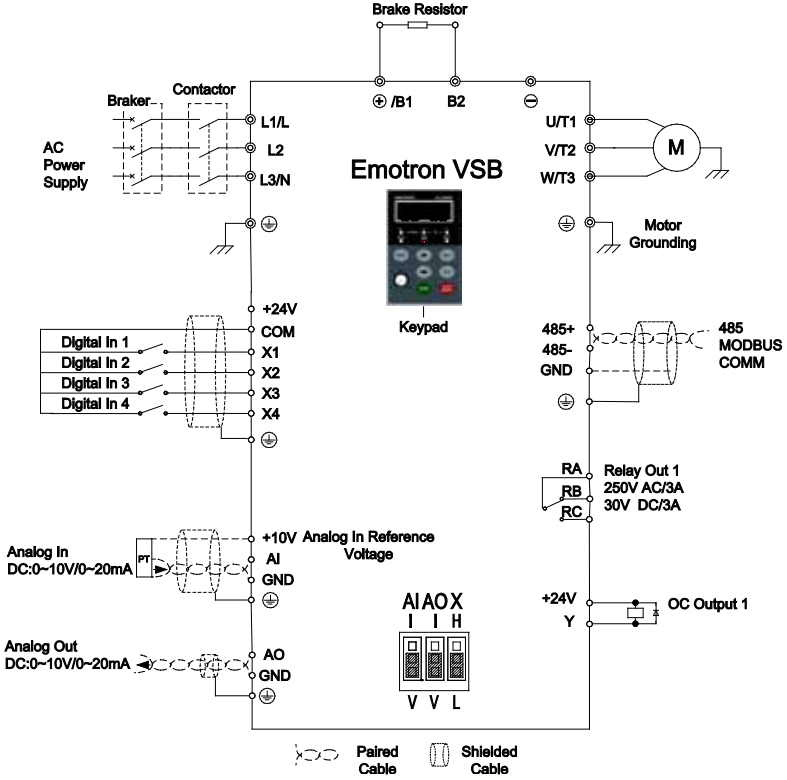



Fig. 3-7 Wiring diagram.

## 3.8 Control Terminal Specification

**Table 3-3 Control terminal specification**

| Category | Terminal | Terminal designation | Specification |
|---|---|---|---|
| Analog input | +10V | Analog input reference voltage | 10.3V ±3% |
| | | | Maximum output current 25mA<br>The resistance of external potentiometer should be larger than 400Ω |
| | GND | Analog ground | Connect with GND interiorly |
| | AI | Analog input | 0~20mA: input impedance - 500Ω, maximum input current - 25mA |
| | | | 0~10V: input impedance - 100kΩ, maximum input voltage - 12.5V |
| | | | Can be jumped between 0~20mA and 0~10V, factory default: 0~10V |
| Analog output | AO | Analog output | 0~20mA: impedance - 200Ω-500Ω |
| | | | 0~10V: impedance- 10kΩ |
| | | | Can be jumped between 0~20 mA and 0～10V, factory default: 0～10V |
| | GND | Analog ground | Connect with GND interiorly |
| Digital input | +24V | +24V | 24V±10% |
| | | | Maximal load 100mA |
| | COM | +24V ground | Connect with COM interiorly |
| | X1~X4 | Digital input Terminal 1~4 | Input: 24VDC, 5mA |
| | | | Freq range: 0～200Hz |
| | | | Voltage range: 22V～26V |
| Digital output | Y | Open collector output | Voltage range: 0~24V |
| | | | Current voltage: 0～50mA |
| Relay output | RA/RB/RC | Control board relay output | RA-RB: NC; RA-RC: NO |
| | | | Contact capacity: 250VAC/3A, 30VDC/3A |
| Terminal RS485 Interface | 485+ | RS485 differential signal + | Rate: 4800/9600/19200/38400/57600/115200bps |
| | 485− | RS485 differential signal - | Maximum distance - 500m (standard network cable used) |
| | GND | RS485 communication shileded grounding | Connected with GND interiorly |

| Category | Terminal | Terminal designation | Specification |
|---|---|---|---|
| | | | |
| Keypad interface | GND | 485 communication shield grounding | Isolated from COM interiorly |
| | CN4 | Keypad interface | Maximum communication distance is 5m when connected to Keypad |
| | GND | 485 communication shield grounding | Use GTAKE dedicated cable |

## 3.9 Control Terminal Usage

### 3.9.1 Lay-out of Control Terminals

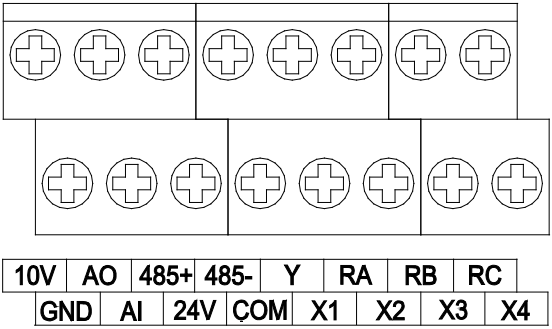



Fig. 3-8 Lay-out of control terminals

### 3.9.2 Control Terminal Screw and Wiring Requirement

**Table 3-4 Terminal screw and wiring specification**

| Cable type | Cable requirement ($mm^2$) | Screw | Torque (Nm/Lb-In) |
|---|---|---|---|
| Shielded cable | 1.0 | M3 | 0.5 / 4.3 |

### 3.9.3 Instructions of Analogue Input/Output Terminals

Being particularly vulnerable to noise, analog input & output signals cables should be as short as possible, shielded, and their shielded layers should be properly grounded close to the side of drive. The cables should not exceed 20m.

Control cables shall be kept no less than 20cm away from main circuit and strong current

lines (e.g. power lines, motor lines, relay lines and contactor lines) and should not be arranged in parallel with strong current lines. In case it is inevitable to intersect strong current line, vertical wiring is recommended to avoid drive faults as a result of noise.

Where analog input & output signals are severely interfered, the side of analog signal source should be provided with filter capacitor or ferrite core.

### 3.9.4 Instructions of Digital Input/Output Terminals

Digital input & output signals cables should be as short as possible, shielded, and their shielded layers should be properly grounded close to the side of drive. The cables should not exceed 20m. When active drive is selected, take necessary filtering measures against power crosstalk, for which dry contact control is recommended.

Control cables shall be kept no less than 20cm away from main circuit and strong current lines (e.g. power lines, motor lines, relay lines and contactor lines) and should not be arranged in parallel with strong current lines. In case it is inevitable to intersect strong current line, vertical wiring is recommended to avoid drive faults as a result of noise. Operating instructions for switching value input terminal

- **Instructions of digital input terminal**
  - **Dry contact**

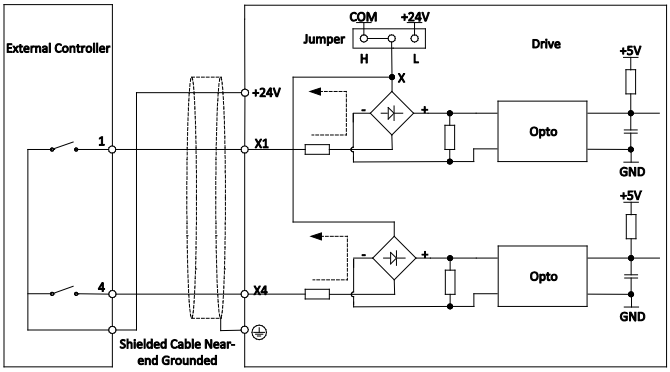



Fig. 3-9 X terminal high activated

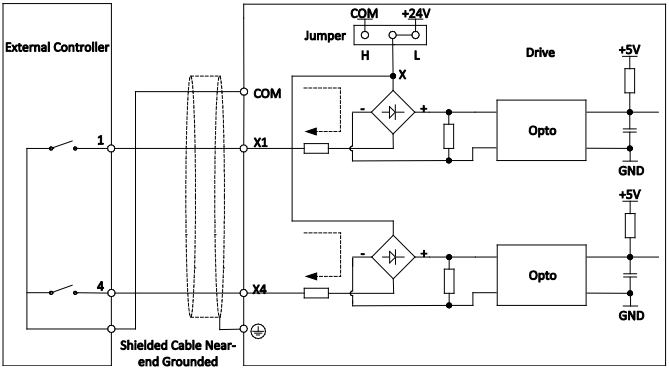



Fig. 3-10 X terminal low activated

◆ **Open collector**

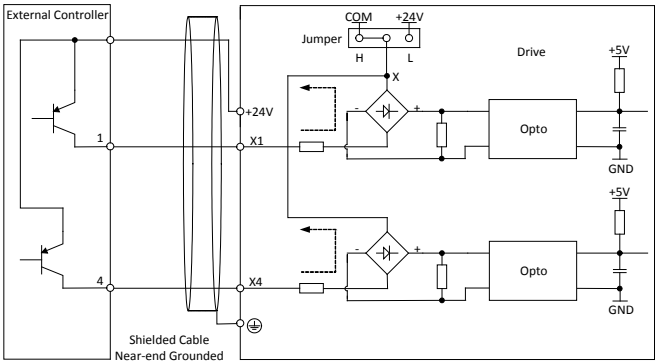



Fig. 3-11 Open collector PNP wiring

**ATTENTION:**

When selecting OC PNP wiring, dip switch should be switched to H terminal.

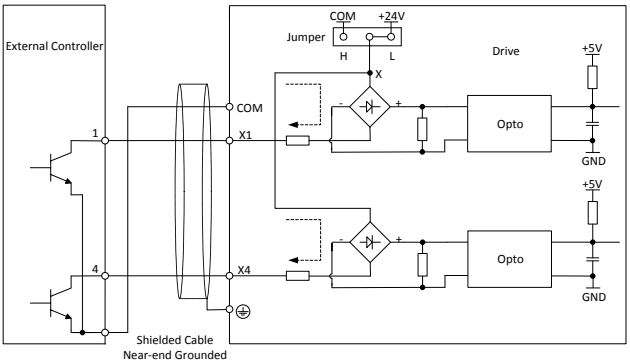


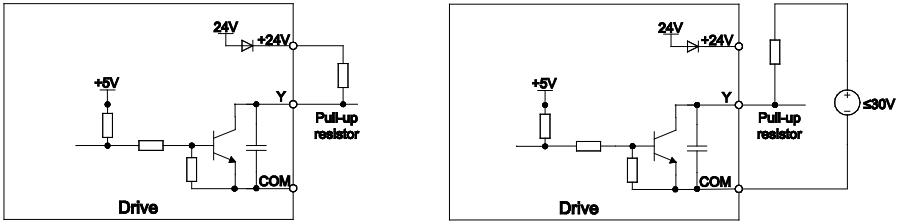

Fig. 3-12 Open collector PNP wiring

**ATTENTION:**

When selecting OC NPN wiring, dip switch should be switched to L terminal.

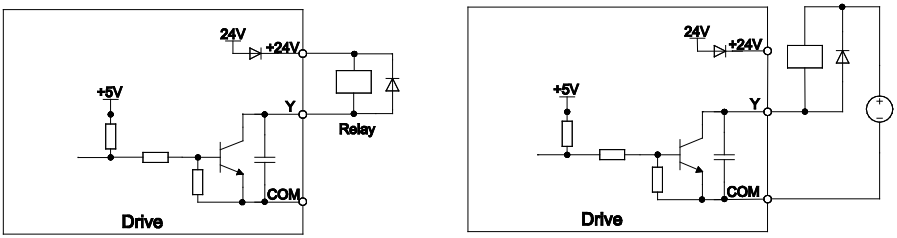
➢ **Instructions of digital output terminal**

◆ **Instructions of Y output terminal**




a) Internal power supply b) External power supply

Fig. 3-13 Wiring when Y output with pull-up resistor




a) Internal power supply b) External power supply

Fig. 3-14 Wiring when Y output drive relay

**ATTENTION:**

When relay coil voltage is lower than 24V, a resistor as voltage divider selected based on coil impedance should be mounted between relay and output terminal,.

◆ **Wiring instruction of relay output terminal**

RA/RB/RC are relay contacts. RA and RB are normally closed, while RA and RC are normally open. See parameter C1-02 for details.

**ATTENTION:**

In case inductive load (e.g. electromagnetic relay or contactor) is to be driven, a surge voltage absorbing circuit such as RC absorbing circuit, piezoresistor or fly-wheel diode etc. shall be mounted. Absorbing devices should be mounted close to the end of relay or contactor.

### 3.10 Instruction of Signal Switches

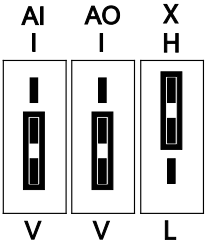



Fig. 3-15 Jumper diagram of signal switching

| Designation | Function | Default setting |
|---|---|---|
| AI | I: current input (0 - 20mA); V: voltage input (0 - 10V) | 0 - 10V |
| AO | I: current output (0 - 20mA); V: voltage output (0 - 10V) | 0 - 10V |
| X | H means X terminal high input activated, while L low activated | H |

### 3.11 EMI Solutions

Due to its working principle, the drive will inevitably produce certain noise that may influence and disturb other equipment. Moreover, since the internal weak electric signal of drive is also susceptible to the interference of drive itself and other equipment, EMI problems shall be inevitable. In order to reduce or avoid the interference of drive to external environment and protect drive against interference from external environment, this section makes a brief description of noise abatement, ground handling, leakage current suppression and the application of power line filters.

#### 3.11.1 Noise Abatement

- When peripheral equipment and drive share the power supply of one system, noise from drive may be transmitted to other equipment in this system via power lines and result in misoperation and/or faults. In such a case, the following measures could be taken:
  1) Mount input noise filter at input terminal of the drive;
  2) Mount power supply filter at power input terminal of affected equipment;
  3) Use isolation transformer to isolate the noise transmission path between other equipment and the drive.
- As the wiring of peripheral equipment and drive constitutes a circuit, the unavoidable earthing leakage current of inverter will cause equipment misoperation and/or faults.

Disconnect the grounding connection of equipment may avoid this misoperation and/or faults

- Sensitive equipment and signal lines shall be mounted as far away from drive as possible.
- Signal lines should be provided with shielded layer and reliably grounded. Alternatively, signal cable could be put into metallic conduits between which the distance shall be no less than 20cm, and shall be kept as far away from drive and its peripheral devices, cables as possible. Never make signal lines in parallel with power lines or bundle them up.
- Signal lines must orthogonally cross power lines if this cross inevitable.
- Motor cables shall be placed in thick protective screen like more than 2mm-thick pipelines or buried cement groove, also, power lines can be put into metallic conduit and grounded well with shielded cables.
- Use 4-core motor cables of which one is grounded at close side of the drive and the other side is connected to motor enclosure.
- Input and output terminals of drive are respectively equipped with radio noise filter and linear noise filter. For example, ferrite common mode choke can restrain radiation noise of power lines.

### 3.11.2 Grounding

Recommended ground electrode is shown in the figure below:

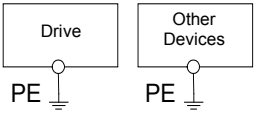



Fig. 3-16 Ground

- Use to the fullest extent the maximum standard size of grounding cables to reduce the impedance of grounding system;
- Grounding wires should be as short as possible;
- Grounding point shall be as close to the drive as possible;
- One wire of 4-core motor cables shall be grounded at the drive side and connected to grounding terminal of motor at the other side. Better effect will be achieved if motor and drive are provided with dedicated ground electrodes;
- When grounding terminals of various parts of system are linked together, leakage current turns into a noise source that may influence other equipment in the system, thus, grounding terminals of the drive and other vulnerable equipment should be separated.
- Grounding cable shall be kept away from inlet & output of noise-sensitive equipment.

### 3.11.3 Leakage Current Suppression

Leakage current passes through the line-to-line and ground distributed capacitors at input & output sides of drive, and its size is associated with the capacitance of distributed capacitor and

the carrier frequency. Leakage current is classified into ground leakage current and line-to-line leakage current.

- Ground leakage current not only circulates inside drive system, but may also influence other equipment via ground loop. Such a leakage current may result in malfunction of RCD and other equipment. The higher the carrier frequency of drive is, the bigger the ground leakage current would be. The longer the motor cables and the bigger the parasitic capacitance are, the bigger the ground leakage current would be. Therefore, the most immediate and effective method for suppression of ground leakage current is to reduce carrier frequency and minimize the length of motor cables.
- The higher harmonics of line-to-line leakage current that passes through between cables at output side of drive will Accel the aging of cables and may bring about malfunction of other equipment. The higher the carrier frequency of drive is, the bigger the line-to-line leakage current would be. The longer the motor cables and the bigger the parasitic capacitance are, the bigger the line-to-line leakage current would be. Therefore, the most immediate and effective method for suppression of ground leakage current is to reduce carrier frequency and minimize the length of motor cable. Line-to-line leakage current can also be effectively suppressed by mounting additional output reactors.

### 3.11.4 Use of Power Supply Filter

Since AC drives may generate strong interference and are also sensitive to outside interference, power supply filters are recommended. Pay close attention to the following instructions during the use:

- Enclosure of the filter needs to be reliably grounded;
- Input lines of the filter shall be kept as far away from output lines as possible so as to avoid mutual coupling;
- Filter shall be as close to the drive side as possible;
- Filter and drive must be connected to the same common ground.

# Chapter 4 Operation and Run Instructions

## 4.1 Operation of Keypad

As a human-machine interface, keypad is the main part for the drive to receive command and display parameters.


Fig. 4-1 Keypad

### 4.1.1 Key Functions on Keypad

On keypad there are 7 keys and 1 knob whose functions are as shown in Table 4-1.

**Table 4-1 Key functions on keypad**

| Symbol | Key name | Meaning |
|---|---|---|
|  | Enter key | 1) Parameter code edition enter<br>2) Confirmation of parameter value settings |
|  | Escape key | 1) Return<br>2) Invalidate parameter editing value |
|  | Up key | 1) Increment of selected digital of parameter code<br>2) Increment of selected digital of parameter value<br>3) Increment of set frequency |
|  | Down key | 1) Decrement of selected digital of parameter code<br>2) Decrement of selected digital of parameter value<br>3) Decrement of set frequency |
|  | Shift key | 1) Selection of parameter code serial digital<br>2) Selection of parameter value edited digital<br>3) Selection of stop/run-status displayed parameters<br>4) Fault status switched to parameter displayed status |
|  | Run key | Run |
|  | Stop/reset key | 1) Stop<br>2) Fault reset |
|  | Potentiometer | 1) Frequency command source<br>2) Process PID setting |

### 4.1.2 Keypad Indicators

Keypad is furnished with 6 indicators whose descriptions are as stated below

**Table 4-2 Description of indicators**

| Indicator | Designation | Meaning |
|---|---|---|
| Hz | Frequency indicator | ON: currently displayed parameter is run frequency or the unit of current parameter is frequency<br>Flash: currently displayed parameter is set frequency |
| A | Current indicator | ON: currently displayed parameter is current |
| V | Voltage indicator | ON: currently displayed parameter is voltage |
| Hz+A | Run speed indicator | ON: currently displayed parameter is run speed<br>Flash: currently displayed parameter is set speed |
| A+V | Percentage indicator | ON: currently displayed parameter is percentage |
| All OFF | No unit | No unit |
| RUN | Run status indicator | ON: Run<br>OFF: Stopped<br>Flash: Stopping |
| FWD | Forward indicator | ON: If the drive in stop status, forward command enabled. If the drive in run status, the drive is running forward<br>Flash: Forward is switching to reverse |
| REV | Reverse indicator | ON: If the drive in stop status, reverse command enabled. If the drive in run status, the drive is running reversely.<br>Flash: Reverse is switching to forward |

## 4.2 Potentiometer Setting

Potentiometer could be frequency setting source or process PID setting programmed by related parameters. When b0-01 is set to 3, potentiometer is source of master frequency command. When b0-03 is set to 4, potentiometer is source of auxiliary frequency command. When unit's place, decade, or hundreds' place of b1-01 is set to 4, potentiometer would be working as frequency setting source of corresponding run command source.

## 4.3 Prompt Message Status

Prompt message status shall be displayed at the completion of some certain operations. For instance, "dEFt2" would be displayed upon the completion of "restore to factory default (motor parameters inclusive)

**Table 4-3 Prompt messages**

| Characters | Meaning | Characters | Meaning |
|---|---|---|---|
| LoC-1 | Keypad locked 1 (full locked) | P-SEt | Password has been set |
| LoC-2 | Keypad locked 2<br>(all locked except RUN, STOP/RESET) | P-CLr | Password cleared |
| LoC-3 | Keypad locked 3<br>(all locked except STOP/RESET) | TUNE | Autotuning |
| LoC-4 | Keypad locked 4<br>(all locked except shift key) | CLr-F | Clear fault record |
| PrtCt | Keypad protection | dEFt1 | Restore to factory default (motor parameters exclusive) |
| UnLoC | Unlock keypad | dEFt2 | Restore to factory default (motor parameter inclusive) |
| LoU | Drive undervoltage | | |

Table 4-3 shows meanings of the characters displayed on Keypad.

## 4.4 Parameter Setting

### 4.4.1 Parameter System

Emotron VSB series drive parameter group: A0, b0~b2, C0~C4, d0~d2, E0~E1, F0~F1, H0, L0~L1, U0~U1. Each parameter group contains a number of parameters. Parameter codes are identified by the combination "parameter group character + parameter subgroup number + parameter number". For instance, "F1-07" indicates the seventh parameter code at subgroup 1, group F.

### 4.4.2 Parameter Displayed Structure

Parameters and the parameter values are subject to a two-tier structure. Parameters correspond to first-tier display, while parameter values correspond to second-tier display.
The first-tier display is as shown in Fig. 4-2, while the second-tier as Fig. 4-3:


Fig. 4-2 First-tier parameter display


Fig. 4-3 Second-tier parameter display ("3" is the value of b0-00)

## 4.5 Initial Power up

Perform wiring in strict accordance with technical requirements as set forth in Chapter 3 - Installation and Wiring.

### 4.5.1 Examples for Quick setup

The following are examples for Quick setup with wiring and parameter settings. For more detailed information, see “Chapter 6 Specification of parameters”.

#### 4.5.1.1 Analogue speed reference 0-10V to AI

1. Set Signal switch AI to V see chapter 3.10 Instruction of Signal Switches.
2. Connect analogue reference signal + to AI and - to GND. If manual potentiometer (10kOhm) is used connect the mid point to AI and ends to +10V and GND. see Fig 4.4.
3. Connect start signals: RunFWD to DigitalIn1 and Run REV to DigitalIn2. If none or both DigIn1 and DigIn2 are activated = Stop

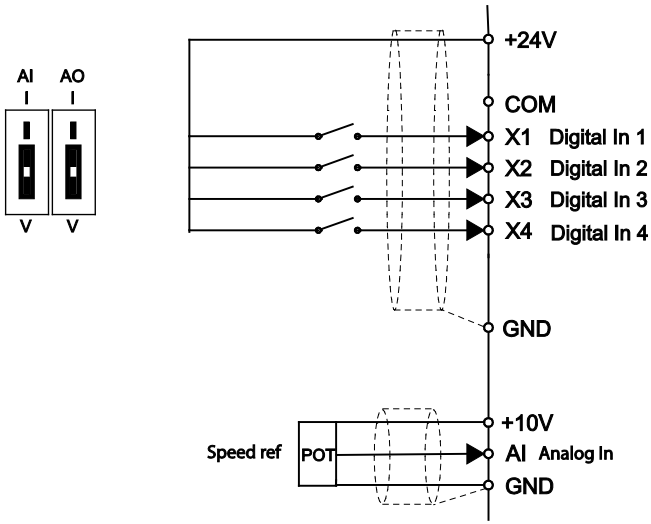



Fig 4-4 Connect pot. to +10V, GND and AI terminal

**Application parameter settings as below.**

**Table 4-4**

| Parameter | Designation | Set Value | Comment |
|---|---|---|---|
| b0-01 | Master frequency reference source | 2: AI | |
| b0-08 | Maximum frequency | set value | 50Hz * |
| b0-10 | Minimum frequency | set value | 0Hz * |
| b1-00 | Run command source | 1: Terminal control | Digital inputs |
| b2-01 | Acceleration time 1 | set value | 6s * |
| b2-02 | Deceleration time 1 | set value | 6s * |
| C0-01 | Digital input X1 function | 3: FWD | |
| C0-02 | Digital input X2 function | 4: REV | |
| C2-00 | Analogue input curve | 00 * | AI curve 1 (2 point curve) |
| C2-01 | Maximum input of curve 1 | 100% * | |
| C2-02 | Set value(reference) corresponding to maximum input of curve 1 | 100% * | |
| C2-03 | Minimum input of curve 1 | 0% * | |
| C2-04 | Set value (reference) corresponding to minimum input of curve 1 | 0% * | |

* = default value

#### 4.5.1.2 Analogue speed reference 4-20 mA to AI

1. Set Signal switch A0 to I, see chapter 3.10 Instruction of Signal Switches.
2. Connect analogue reference signal: + to AI and - to GND
3. Connect start signals: Run FWD to DigitalIn1and Run REV to DigitalIn2. If none or both DigIn1 and DigIn2 are activated = Stop.

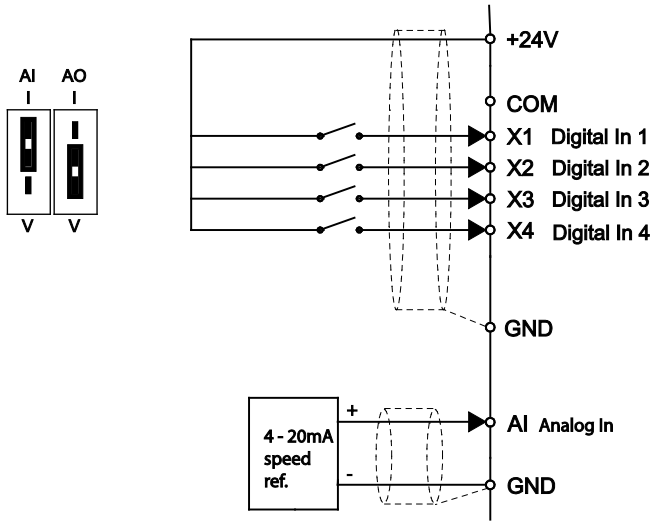



Fig 4-5. Connection for Analogue speed reference 4-20mA to AI

**Application parameter settings as below.**

**Table 4-5**

| Parameter | Designation | Set Value | Comment |
|---|---|---|---|
| b0-01 | Master frequency reference source | 2: AI | |
| b0-08 | Maximum frequency | set value | 50Hz * |
| b0-10 | Minimum frequency | set value | 0Hz * |
| b1-00 | Run command source | 1: Terminal control | Digital inputs |
| b2-01 | Acceleration time 1 | set value | 6s * |
| b2-02 | Deceleration time 1 | set value | 6s * |
| C0-01 | Digital input X1 function | 3: FWD | |
| C0-02 | Digital input X2 function | 4: REV | |
| C2-00 | Analogue input curve | 00 * | AI curve 1 (2 point curve) |
| C2-01 | Maximum input of curve 1 | 100% * | 20mA |
| C2-02 | Set value corresponding to maximum input of curve 1 | 100% * | |
| C2-03 | Minimum input of curve 1 | 20% * | =4/20 |
| C2-04 | Set value corresponding to minimum input of curve 1 | 0% * | |

* = default value

#### 4.5.1.3 4 preset speeds and Start/Stop by Digital Inputs

1. Connect RUN contact SB2 between +24V and Digital Input 1.
2. Connect REVERSE selection contact between +24V and Digital Input 2.
3. Connect Preset bit0 contact between +24V and Digital Input 3.
4. Connect Preset bit1 contact between +24V and Digital Input 4.

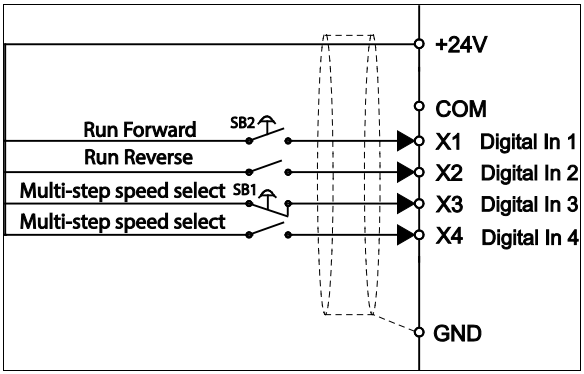



Fig. 4-6. Connection for 4 preset speeds and start/stop by DI

**Application parameter settings as below.**

**Table 4-6**

| Parameter | Designation | Set Value | Comment |
|---|---|---|---|
| b0-01 | Master frequency reference source | 8: Multi-step speed | Preset speeds |
| b0-08 | Maximum frequency | set value | 50Hz * |
| b0-10 | Minimum frequency | set value | 0Hz * |
| b1-00 | Run command source | 1: Terminal control | Digital inputs |
| b2-01 | Acceleration time 1 | set value | 6s * |
| b2-02 | Deceleration time 1 | set value | 6s * |
| C0-01 | Digital input X1 function | 3: FWD | Start button SB2 |
| C0-02 | Digital input X2 function | 4: REW | Reverse direcion |
| C0-03 | Digital input X3 function | 5: Multi-step | Bit 0, speed selection |
| C0-04 | Digital input X4 function | 15:Multi-step | Bit 1, speed selection |
| C0-19 | FWD/REV terminal control mode | 3: Two-wire mode 2 | |
| F1-00 | Source for Preset frequency 0 | 0*: Digital setting F1-02 | |
| F1-01 | Source for Preset frequency 1 | 0*: Digital setting F1-03 | |
| F1-02 | Preset frequency 0 | Set <Speed 0> | Bit1=0, Bit0=0 |
| F1-03 | Preset frequency 1 | Set <Speed 1> | Bit1=0, Bit0=1 |
| F1-04 | Preset frequency 2 | Set <Speed 2> | Bit1=1, Bit0=0 |
| F1-05 | Preset frequency 3 | Set <Speed 3> | Bit1=1, Bit0=1 |

* = default value

# Chapter 5 List of Parameters

Emotron VS parameter groups are listed below:

| Category | Parameter group | Related pages |
|---|---|---|
| Group A: system parameter | A0: system parameters | P- 48 -; P- 70 - |
| Group b: setting of running parameters | b0: frequency command | P- 48 -; P- 71 - |
| | b1: start/stop control | P- 50 -; P- 84 - |
| | b2: Accel/Decel parameters | P- 51 -; P- 89 - |
| Group C: input and output terminals | C0: digital input | P- 52 -; P- 95 - |
| | C1: digital output | P- 54 -; P- 95 - |
| | C2: analog input | P- 55 -; P- 102 - |
| | C3: analog output | P- 56 -; P- 107 - |
| | C4: automatic correction of analog input | P- 56 -; P- 109 - |
| Group d: motor and control parameters | d0: motor parameter | P- 57 -; P- 111 - |
| | d1: motor V/f control parameters | P- 58 -; P- 115 - |
| | d2: motor vector control parameters | P- 59 -; P- 120 - |
| Group E: enhanced function and protection parameters | E0: enhanced function | P- 59 -; P- 124 - |
| | E1: protection parameters | P- 60 -; P- 126 - |
| Group F: application | F0: process PID | P- 61 -; P- 131 - |
| | F1: multi-step frequency | P- 62 -; P- 136 - |
| Group H: communication parameters | H0: MODBUS communication parameters | P- 63 -; P- 138 - |
| Group L: keypad keys and display | L0: keypad keys | P- 64 -; P- 140 - |
| | L1: LED display setting | P- 65 -; P- 141 - |
| Group U: monitoring | U0: status monitoring | P- 66 -; P- 143 - |
| | U1: fault history | P- 67 -; P- 146 - |

**ATTENTION:**

**Change attribute:**

"△" means the value of this parameter can be modified in stop and running status of drive;

"×" means the value of this parameter cannot be modified when drive is running;

"■" means this parameter is a measured value that cannot be modified;

**Factory default value:** The value when restored to factory default. Neither measured parameter value nor recorded value will be restored.

**Scope:** the scope of setting and display of parameters

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| Group A: System Parameter | | | | |
| Group A0: System Parameter | | | | |
| A0-00 | Setting of user password | 0~FFFF | 0000 | △ |
| A0-02 | Parameter protection | 0: All parameter programming allowed<br>1: Only A0-00 and this parameter programming allowed | 0 | × |
| A0-03 | Parameter initialization | 0: No operation<br>1: Clear fault history<br>2: Restore all parameters to factory default (motor parameters exclusive)<br>3: Restore all parameters to factory default (motor parameters inclusive) | 0 | × |
| A0-09 | Motor control technique | 0: V/f control<br>1: Sensor-less vector control | 0 | × |
| Group b Setting of Run Parameters | | | | |
| Group b0 Frequency Command | | | | |
| b0-00 | Frequency command pattern | 0: Master frequency command<br>1: Master & auxiliary computation result<br>2: Switch between master and auxiliary command<br>3: Switch between master frequency command, and master & auxiliary computation result<br>4: Switch between auxiliary frequency command, and master & auxiliary computation result | 0 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| b0-01 | Master frequency command source | 0: Digital setting (b0-02) + adjustment on keypad<br>1: Digital setting (b0-02) + terminal UP/DOWN adjustment<br>2: Analog input AI<br>3: Potentiometer<br>6: Process PID output<br>8: Multi-step speed<br>9: Communication | 3 | × |
| b0-02 | Digital setting of master frequency | Lower limit frequency ~ upper limit frequency | 50.00Hz | △ |
| b0-03 | Auxiliary frequency command source | 0: No command<br>1: Digital setting (b0-04) + ∧/∨ adjustment on keypad<br>2: Digital setting (b0-04) + terminal UP/DOWN adjustment<br>3: Analog input AI<br>4: Keypad potentiometer input<br>7: Process PID output<br>9: Multi-step speed<br>10: Communication | 0 | × |
| b0-04 | Digital setting of auxiliary frequency | Lower limit frequency ~ upper limit frequency | 0.00Hz | △ |
| b0-05 | Range of auxiliary frequency | 0: Relative to maximum frequency<br>1: Relative to master frequency | 0 | × |
| b0-06 | Coeff of auxiliary frequency | 0.0%~100.0% | 100.0% | × |
| b0-07 | Computation of master and auxiliary frequency | 0: Master + auxiliary<br>1: Master - auxiliary<br>2: Max {master, auxiliary}<br>3: Min {master, auxiliary} | 0 | × |
| b0-08 | Maximum frequency | Upper limit frequency ~600.00Hz | 50.00Hz | × |
| b0-09 | Upper limit frequency | Lower limit frequency ~ maximum frequency | 50.00Hz | × |
| b0-10 | Lower limit frequency | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b0-11 | Operation when command frequency lower than lower limit frequency | 0: Run at lower limit frequency<br>1: Run at 0 Hz<br>2: Stop | 0 | × |
| b0-12 | Time-delay of stop when command frequency lower than lower limit frequency | 0.0s ~ 6553.5s | 0.0s | × |
| b0-13 | Lower limit of skip frequency band 1 | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b0-14 | Upper limit of skip frequency band 1 | 0.00Hz~upper limit frequency | 0.00Hz | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| b0-15 | Lower limit of skip frequency band 2 | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b0-16 | Upper limit of skip frequency band 2 | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b0-17 | Lower limit of skip frequency band 3 | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b0-18 | Upper limit of skip frequency band 3 | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b0-19 | Jog frequency | 0.00Hz~upper limit frequency | 5.00Hz | △ |
| Group b1 Start/Stop Control | | | | |
| b1-00 | Run command | 0: Keypad control<br>1: Terminal control<br>2: Communication control | 0 | × |
| b1-01 | Binding of run command and frequency command | Unit's place: frequency command source bundled under keypad control:<br>0: No binding<br>1: Digital setting (b0-02) + Λ/V adjustment on keypad<br>2: Digital setting (b0-02) + terminal UP/DOWN adjustment<br>3: Analog input AI<br>4: Keypad potentiometer input<br>7: Process PID output<br>9: Multi-step frequency<br>A: Communication input<br>Decade: frequency command source bundled under terminal control (same as unit's place)<br>Hundreds place: frequency command source bundled under communication control (same as unit's place) | 000 | × |
| b1-02 | Run direction | 0: Forward<br>1: Reverse | 0 | △ |
| b1-03 | Reverse disabled | 0: Reverse enabled<br>1: Reverse disabled | 0 | × |
| b1-04 | Dead time of forward and reverse | 0.0s~3600.0s | 0.0s | △ |
| b1-05 | Start method | 0: From start frequency<br>1: DC injection brake then start<br>3: Flying start (Spin start) | 0 | × |
| b1-06 | Start frequency | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b1-07 | Holding time of start frequency | 0.0s~3600.0s | 0.0s | △ |
| b1-08 | DC brake current at start | 0.0%~100.0% | 0.0% | △ |
| b1-09 | DC brake time at start | 0.00s~30.00s | 0.00s | △ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| b1-10 | Flying start current | 0.0% - 200.0% | 100% | △ |
| B1-11 | Flying start time | 0.1s – 20.0s | 2.0s | △ |
| b1-13 | Stop method | 0: Ramp to stop<br>1: Coast to stop<br>2: Ramp to stop + DC brake | 0 | × |
| b1-14 | Start frequency of DC brake stop | 0.00Hz~upper limit frequency | 0.00Hz | × |
| b1-15 | Brake current | 0.0%~100.0% | 0.0% | △ |
| b1-16 | Brake time | 0.00s~30.00s | 0.00s | △ |
| b1-17 | Overexcitation brake | 0: Disabled<br>1: Enabled | 1 | × |
| b1-18 | Dynamic brake | 0: Disabled<br>1: Enabled | 0 | × |
| b1-19 | Dynamic brake threshold voltage | 200V: 325V~375V, default: 375V<br>400V: 650V~750V, default: 720V | Model defined | × |
| b1-20 | Auto restart when power up again after power loss | 0: Disabled<br>1: Enabled | 0 | × |
| b1-21 | Waiting time of auto restart when power up again | 0.0s~10.0s | 0.0s | △ |
| Group b2 Accel/Decel Parameters | | | | |
| b2-00 | Accel/Decel time resolution | 0: 0.01s<br>1: 0.1s<br>2: 1s | 1 | × |
| b2-01 | Accel time 1 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-02 | Decel time 1 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-03 | Accel time 2 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-04 | Decel time 2 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-05 | Accel time 3 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-06 | Decel time 3 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-07 | Accel time 4 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-08 | Decel time 4 | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-09 | Decel time when emergency stop enabled | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-10 | Jog Accel time | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-11 | Jog Decel time | 0s~600.00s/6000.0s/60000s | 6.0s | △ |
| b2-12 | Accel/Decele curve selection | 0: Linear Accel/Decel<br>1: Broken-line Accel/Decel<br>2: S-curve Accel/Decel | 0 | × |
| b2-13 | Accel time switching frequency of broken-line Accel/Decel | 0.00Hz~upper limit frequency | 0.00Hz | △ |
| b2-14 | Decel time switching frequency of | 0.00Hz~upper limit frequency | 0.00Hz | △ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | broken-line Accel/Decel | | | |
| b2-15 | Time of first segment of Accel S-curve | 0.00s~60.00s | 0.20s | Δ |
| b2-16 | Time of last segment of Accel S-curve | 0.00s~60.00s | 0.20s | Δ |
| b2-17 | Time of first segment of Decel S-curve | 0.00s~60.00s | 0.20s | Δ |
| b2-18 | Time of last segment of Decel S-curve | 0.00s~60.00s | 0.20s | Δ |
| Group C Input and Output Terminals | | | | |
| Group C0 Digital Input | | | | |
| C0-00 | Enabled condition of run command terminals when power up | 0: Trigger edge detected + ON detected<br>1: ON detected | 0 | × |
| C0-01 | Function of terminal X1 | 0: No function<br>1: JOG forward<br>2: JOG reverse<br>3: Run forward (FWD)<br>4: Run reverse (REV)<br>5: Three-wire control<br>6: Run suspended<br>7: External stop<br>8: Emergency stop<br>9: Stop command + DC brake<br>10: DC brake stop<br>11: Coast to stop<br>12: Terminal UP<br>13: Terminal DOWN<br>14: Clear UP/DOWN (including keypad ∧/∨) adjustment<br>15: Multi-step frequency terminal 1<br>16: Multi-step frequency terminal 2<br>17: Multi-step frequency terminal 3<br>19: Accel/Decel time determinant 1<br>20: Accel/Decel time determinant 2<br>21: Accel/Decel disabled(ramp stop not inclusive)<br>22: External fault input<br>23: Fault reset (RESET)<br>27: Run command switched to keypad control<br>28: Run command switched to | 3 | × |
| C0-02 | Function of terminal X2 | | 4 | × |
| C0-03 | Function of terminal X3 | | 1 | × |
| C0-04 | Function of terminal X4 | | 23 | × |
| C0-08 | Function of terminal AI (Digital enabled) | | 0 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | terminal control<br>29: Run command switched to communication control<br>30: Frequency command pattern shift<br>31: Master frequency command switched to digital setting b0-02<br>32: Auxiliary frequency command switched to digital setting b0-04<br>33: PID adjustment direction<br>34: PID paused<br>35: PID integration paused<br>36: PID parameter switch<br>68: Run prohibited<br>69: DC brake in running | | |
| C0-09 | Run or not when drive restored | 0: Run if trig edge +ON<br>1: Run as long as Run terminal is ON | 0 | x |
| C0-11 | Filtering time of digital input terminal | 0.000s~1.000s | 0.010s | Δ |
| C0-12 | Delay time of terminal X1 | 0.0s~3600.0s | 0.0s | Δ |
| C0-13 | Delay time of terminal X2 | 0.0s~3600.0s | 0.0s | Δ |
| C0-14 | Digital input terminal enabled status setting 1 | Unit's place: X1<br>0: Negative logic<br>1: Positive logic<br>Decade: X2 (same as unit's place)<br>Hundreds place: X3 (same as unit's place)<br>Thousands place: X4 (same as unit's place) | 1111 | × |
| C0-16 | Digital input terminal enabled status setting 2 | Unit's place: AI<br>0: Positive logic<br>1: Negative logic | 0 | × |
| C0-17 | Terminal UP/DOWN frequency adjustment treatment | Unit's place: action when stop<br>0: Clear<br>1: Holding<br>Decade: action on power loss<br>0: Clear<br>1: Holding<br>Hundreds place: integral function<br>0: No integral function<br>1: Integral function enabled<br>Thousands place: run direction<br>0: run direction can not be changed | 0100 | Δ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | 1: run direction can be changed | | |
| C0-18 | Terminal UP/DOWN frequency adjustment step size | 0.00Hz/s~100.00Hz/s | 0.10 Hz/s | △ |
| C0-19 | FWD/REV terminal control mode | 0: Two-wire mode 1<br>1: Two-wire mode 2<br>2: Three-wire mode 1<br>3: Three-wire mode 2 | 0 | × |
| C0-20 | Option of virtual input terminal | 000~10F<br>0: Actual terminal in effect<br>1: Virtual terminal in effect<br>Unit's place: BIT0~BIT3: X1~X4<br>Decade: Reserved<br>Hundreds place: AI | 000 | × |
| Group C1 Digital Output | | | | |
| C1-00 | Y output function | 0: No output | 0 | △ |
| C1-02 | Control board relay output function | 1: Drive undervoltage<br>2: Drive running preparation completed<br>3: Drive is running<br>4: Drive in 0Hz running (no output at stop)<br>5: Drive in 0Hz running (output at stop)<br>6: Run direction<br>7: Frequency attained<br>8: Upper limit frequency attained<br>9: Lower limit frequency attained<br>10: Frequency higher than FDT 1<br>11: Frequency higher than FDT 2<br>12: Reserved<br>13: Torque limited<br>14: Fault output<br>15: Alarm output<br>16: Drive (motor) overloaded prealarm<br>17: Drive overtemperature prealarm<br>18: Zero current detection<br>19: X1<br>20: X2<br>25: Consecutive running time attained | 14 | △ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | 26: Accumulative running time attained | | |
| C1-04 | Y output time delay | 0.0s~3600.0s | 0.0s | Δ |
| C1-06 | Relay output time delay | 0.0s~3600.0s | 0.0s | Δ |
| C1-08 | Enabled state of digital output | Unit's place: Y<br>0: Positive logic<br>1: Negative logic<br>Decade: Reserved<br>Hundreds place: control board relay output (same as unit's place) | 000 | × |
| C1-09 | Detective object of frequency doubling technology(FDT) | Unit's place: FDT1 detective object<br>0: Set value of speed (frequency after Accel/Decel)<br>1: Detected speed value<br>Decade: FDT2 detective object<br>0: Set value of speed (frequency after Accel/Decel)<br>1: Detected speed value | 00 | Δ |
| C1-10 | FDT1 upper bound | 0.00Hz~maximum frequency | 50.00Hz | Δ |
| C1-11 | FDT1 lower bound | 0.00Hz~maximum frequency | 49.00Hz | Δ |
| C1-12 | FDT2 upper bound | 0.00Hz~maximum frequency | 25.00Hz | Δ |
| C1-13 | FDT2 lower bound | 0.00Hz~maximum frequency | 24.00Hz | Δ |
| C1-14 | Detection width of frequency attained | 0.00Hz~maximum frequency | 2.50Hz | Δ |
| C1-15 | Zero current detection level | 0.0%~50.0% | 5.0% | Δ |
| C1-16 | Zero current detection time | 0.01s~50.00s | 0.50s | Δ |
| Group C2 Analog Input | | | | |
| C2-00 | Analog input curve selection | Unit's place: AI input curve<br>0: Curve 1 (2 points)<br>1: Curve 2 (4 points)<br>Decade: Potentiometer input curve (same as unit's place) | 00 | × |
| C2-01 | Maximum input of curve 1 | Minimum input of curve 1 ~ 110.0% | 100.0% | × |
| C2-02 | Corresponding set value of curve 1 maximum input | -100.0%~100.0% | 100.0% | × |
| C2-03 | Minimum input of curve 1 | -110.0% ~ maximum input of curve 1 | 0.0% | × |
| C2-04 | Corresponding set value of curve 1 minimum input | -100.0%~100.0% | 0.0% | × |
| C2-05 | Curve 2 maximum input | Range: Inflection point A input of curve 2~110.0% | 100.0% | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| C2-06 | Corresponding set value of curve 2 maximum input | Range: -100.0%~100.0% | 100.0% | × |
| C2-07 | Curve 2 inflection point A input | Curve 2 inflection point B input ~ curve 2 maximum input | 0.0% | × |
| C2-08 | Corresponding set value of curve 2 inflection point A input | Range: -100.0%~100.0% | 0.0% | × |
| C2-09 | Curve 2 inflection point B input | Range: Curve 2 minimum input ~ curve 2 inflection point A input | 0.0% | × |
| C2-10 | Corresponding set value of curve 2 inflection point B input | Range: -100.0%~100.0% | 0.0% | × |
| C2-11 | Curve 2 minimum input | Range: -110.0%~ curve 2 inflection point B input | 0.0% | × |
| C2-12 | Corresponding set value of curve 2 minimum input | Range: -100.0%~100.0% | 0.0% | × |
| C2-20 | AI out of –limit detection time | 0.00s – 100.00s | 0.50s | △ |
| C2-21 | AI input filtering time | 0.000s~10.000s | 0.01s | △ |
| C2-22 | Potentiometer input filtering time | 0.000s~10.000s | 0.01s | △ |
| Group C3 Analog Output | | | | |
| C3-00 | AO output function | 0: No output<br>1: Command frequency<br>2: Output frequency<br>3: Output current<br>4: Output torque<br>5: Output voltage<br>6: Output power<br>7: Bus voltage<br>9: Torque current<br>10: Magnetic flux current<br>11:AI<br>16:Communication input percentage<br>17: Output frequency before compensation | 2 | △ |
| C3-03 | AO offset | -100.0%~100.0% | 0.0% | × |
| C3-04 | AO gain | -2.000~2.000 | 1.000 | × |
| C3-05 | AO filtering time | 0.0s~10.0s | 0.0s | △ |
| Group C4 Automatic Correction of Analog Input | | | | |
| C4-00 | Analog corrected channel | 0: No correction<br>1:Correct AI<br>2:Correct potentiometer | 0 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| C4-01 | Sampling value of AI calibration point 1 | Range: 0.00V~10.00V | 1.00V | ■ |
| C4-02 | Input value of AI calibration point 1 | Range: 0.00V~10.00V | 1.00V | × |
| C4-03 | Sampling value of AI calibration point 2 | Range: 0.00V~10.00V | 9.00V | ■ |
| C4-04 | Input value of AI calibration point 2 | Range: 0.00V~10.00V | 9.00V | × |
| C4-05 | Sampling value of potentiometer calibration point 1 | Range: 0.00V~10.00V | 1.00V | ■ |
| C4-06 | Input value of potentiometer calibration point 1 | Range: 0.00V~10.00V | 1.00V | × |
| C4-07 | Sampling value of potentiometer calibration point 2 | Range: 0.00V~10.00V | 9.00V | ■ |
| C4-08 | Input value of potentiometer calibration point 2 | Range: 0.00V~10.00V | 9.00V | × |
| Group d Motor and Control Parameters | | | | |
| Group d0 Motor parameters | | | | |
| d0-00 | Motor type | 0: Ordinary motor<br>1: Variable frequency motor | 0 | × |
| d0-01 | Motor power rating | 0.4kW~6553.5kW | Model defined | × |
| d0-02 | Motor rated voltage | 200V: 0V～260V default: 220V<br>400V: 0V～480V default: 380V | Model defined | × |
| d0-03 | Motor rated current | 0.0A~6553.5A | Model defined | × |
| d0-04 | Motor rated frequency | 0.00Hz~maximum frequency | 50.00Hz | × |
| d0-05 | Motor pole number | 1~80 | 4 | × |
| d0-06 | Motor rated speed | 0~65535r/min | Model defined | × |
| d0-07 | Motor stator resistance R1 | 0.001Ω~65.535Ω | Model defined | × |
| d0-08 | Motor leakage inductance L1 | 0.1mH~6553.5mH | Model defined | × |
| d0-09 | Motor rotor resistance R2 | 0.001Ω~65.535Ω | Model defined | × |
| d0-10 | Motor mutual inductance L2 | 0.1mH~6553.5mH | Model defined | × |
| d0-11 | Motor no-load current | 0.0A~6553.5A | Model defined | × |
| d0-12 | Motor flux weakening coeff 1 | 0.0000~1.0000 | Model | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | | defined | |
| d0-13 | Motor flux weakening coeff 2 | 0.0000~1.0000 | Model defined | × |
| d0-14 | Motor flux weakening coeff 3 | 0.0000~1.0000 | Model defined | × |
| d0-22 | Motor parameter autotune | 0: No autotune<br>1: Static autotune<br>2: Rotating autotune | 0 | × |
| d0-23 | Motor overload protection mode | 0: No protection<br>1: Judged from motor current | 1 | × |
| d0-24 | Motor overload protection detection time | 0.1min~15.0min | 5.0min | × |
| d0-27 | Flying start Kp | 0.00 – 655.35 | 0 | × |
| d0-28 | Flying start Ki | 0.00 – 655.35 | 2.00 | × |
| Group d1 Motor V/f Control Parameters | | | | |
| d1-00 | V/f curve setting | 0: Linear V/f<br>1: Multi-stage V/f (d1-01~d1-08) | 0 | × |
| d1-01 | V/f frequency value f3 | 0.00Hz~motor rated frequency | 50.00Hz | × |
| d1-02 | V/f voltage value V3 | 0.0%~100.0% | 100.0% | × |
| d1-03 | V/f frequency value f2 | d1-05~d1-01 | 0.00Hz | × |
| d1-04 | V/f voltage value V2 | 0.0%~100.0% | 0.0% | × |
| d1-05 | V/f frequency value f1 | d1-07~d1-03 | 0.00Hz | × |
| d1-06 | V/f voltage value V1 | 0.0%~100.0% | 0.0% | × |
| d1-07 | V/f frequency value f0 | 0.00Hz~d1-05 | 0.00Hz | × |
| d1-08 | V/f voltage value V0 | 0.0%~100.0% | 0.0% | × |
| d1-09 | Torque boost | 0.0%~30.0% | 0.0% | △ |
| d1-10 | Slip compensation gain | 0.0%~400.0% | 100.0% | △ |
| d1-12 | Current limited source | 0: Disabled<br>1: Set by d1-13<br>2: Set by AI | 1 | × |
| d1-13 | Digital setting of current limited value | 20.0%~200.0% | 160.0% | × |
| d1-14 | Current limited coeff at flux weakening | 0.001~1.000 | 0.500 | △ |
| d1-15 | Energy saving percentage | 0%~40.0% | 0.0% | △ |
| d1-16 | V/f oscillation suppression gain 1 | 0~3000 | 8 | △ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| d1-17 | V/f oscillation suppression gain 2 | 0~3000 | 10 | Δ |
| Group d2 Motor Vector Control Parameters | | | | |
| d2-01 | ASR high-speed proportional gain Kp1 | 0.0~20.0 | 2.0 | Δ |
| d2-02 | ASR high-speed integration time Ti1 | 0.000s~8.000s | 0.500 | Δ |
| d2-03 | ASR low-speed proportional gain Kp2 | 0.0~20.0 | 2.0 | Δ |
| d2-04 | ASR low-speed integration time Ti2 | 0.000s~8.000s | 0.500 | Δ |
| d2-05 | ASR switch frequency 1 | 0.00Hz~d2-06 | 5.00Hz | Δ |
| d2-06 | ASR switch frequency 2 | d2-05~upper limit frequency | 10.00Hz | Δ |
| d2-07 | ASR input filtering time | 0.0ms~500.0ms | 0.3ms | Δ |
| d2-08 | ASR output filtering time | 0.0ms~500.0ms | 0.3ms | Δ |
| d2-09 | ACR proportion coeff Kp | 0.000~4.000 | 1.000 | Δ |
| d2-10 | ACR integration coeff Ki | 0.000~4.000 | 1.000 | Δ |
| d2-11 | Pre-excitation time | 0.000s~5.000s | 0.200s | Δ |
| d2-12 | Electric-driven torque limited source | 0: d2-14 digital setting<br>1: AI<br>5: Communication | 0 | × |
| d2-13 | Brake torque limited source | 0: d2-15 digital setting<br>1: AI<br>5: Communication | 0 | × |
| d2-14 | Digital setting of electric-driven torque | 0.0%~200.0% | 180.0% | Δ |
| d2-15 | Digital setting of brake torque | 0.0%~200.0% | 180.0% | Δ |
| d2-16 | Torque limited coeff in flux weakening | 0.0%~100.0% | 50.0% | Δ |
| d2-17 | Electric-driven slip compensation gain | 10.0%~300.0% | 100.0% | Δ |
| d2-18 | Brake slip compensation gain | 10.0%~300.0% | 100.0% | Δ |
| Group E Enhanced Function and Protection Parameters | | | | |
| Group E0 Enhanced Function | | | | |
| E0-00 | Carrier frequency | 0.7kHz~12.0kHz | 8.0kHz | △ |
| E0-01 | PWM optimization | Unit's place: carrier frequency adjusted with temperature<br>0: Auto-adjusted<br>1: Not adjusted<br>Decade: PWM modulation mode<br>0: Five-segment and seven-segment auto-shift<br>1: Five-segment mode | 020 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | 2: Seven-segment mode<br>Hundreds place: over-modulation adjustment<br>0: Disabled<br>1: Enabled | | |
| E0-02 | Selection when run time attained | Unit's place: selection when consecutive running time attained:<br>0: Continue to run<br>1: Stop and fault alarm<br>Decade: selection when accumulative run time attained:<br>0: Continue to run<br>1: Stop and fault alarm<br>Hundreds place: unit of run time<br>0: Second<br>1: Hour | 000 | × |
| E0-03 | Consecutive run time setting | 0.0s(h)~6000.0s(h) | 0.0 | × |
| E0-04 | Accumulative running time setting | 0.0s(h)~6000.0s(h) | 0.0 | × |
| Group E1 Protection Parameters | | | | |
| E1-00 | Overvoltage stall | 0: Prohibited<br>1: Allowed | 1 | × |
| E1-01 | Overvoltage stall protection voltage | 200V: 100%~120% default: 116%<br>400V: 120%~150% default: 135% | Model Defined | × |
| E1-02 | Undervoltage stall | 0: Disabled<br>1: Enabled | 0 | × |
| E1-03 | Overload prealarm | Unit's place: detection option:<br>0: Always detect<br>1: Detect at constant speed only<br>Decade: compared object:<br>0: Motor rated current<br>1: Drive rated current<br>Hundreds place: alarm option<br>0: Continue to run<br>1: Protection enabled and coast to stop | 000 | × |
| E1-04 | Overload prealarm threshold | 20.0%~200.0% | 180.0% | △ |
| E1-05 | Overload prealarm detected time | 0.1s~60.0s | 5.0s | △ |
| E1-06 | Protected action 1 | Unit's place: reserved<br>Decade: temperature sampling disconnection action:<br>0: Protection enabled and coast stop<br>1: Continue to run | 0000 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | Hundreds place: reserved<br>Thousands place: abnormal terminal communication:<br>0: Protection enabled and coast stop<br>1: Continue to run | | |
| E1-07 | Protected action 2 | Unit's place: reserved<br>Decad: current detection circuit failed<br>0: Protection enabled and coast stop<br>1: Continue to run<br>Hundreds place: reserved<br>Thousands place: output phase loss:<br>0: Protection enabled and coast stop<br>1: Continue to run | 0000 | × |
| E1-08 | Fault memorized at power loss | 0: Not memorized at power loss<br>1: Memorized at power loss | 0 | × |
| E1-09 | Times of automatic reset | 0~20 | 0 | × |
| E1-10 | Interval of automatic reset | 2.0s~20.0s | 2.0s | × |
| E1-11 | Relay action on drive fault | Unit's place: when undervoltage fault occurs<br>0: No action<br>1: Action enabled<br>Decade: when fault locked<br>0: No action<br>1: Action enabled<br>Hundreds place: interval of automatic reset<br>0: No action<br>1: Action enabled | 010 | × |
| E1-13 | Drive overtemperature prealarm threshold | 0.0 °C ~100.0 °C | 80.0 °C | △ |
| Group F Application | | | | |
| Group F0 Process PID | | | | |
| F0-00 | PID setting | 0: F0-01 digital setting<br>1: AI<br>2: Potentiometer<br>5: Communication | 0 | × |
| F0-01 | PID digital setting | 0.0%~100.0% | 50.0% | △ |
| F0-02 | PID feedback | 0: AI<br>8: Communication | 0 | × |
| F0-03 | PID adjustment | Unit's place: output frequency<br>0: Must be the same direction as setting run direction | 10 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | 1: Opposite direction allowed<br>Decade: integration selection<br>0: Integral continued when frequency attains upper/lower frequency<br>1: Integral stopped when frequency attains upper/lower limit | | |
| F0-04 | PID positive and negative adjustment | 0: Positive adjustment<br>1: Negative adjustment | 0 | × |
| F0-05 | Filtering time of PID setting | 0.00s~60.00s | 0.00s | △ |
| F0-06 | Filtering time of PID feedback | 0.00s~60.00s | 0.00s | △ |
| F0-07 | Filtering time of PID output | 0.00s~60.00s | 0.00s | △ |
| F0-08 | Proportional gain Kp1 | 0.0~100.0 | 50.0 | △ |
| F0-09 | Integration time Ti1 | 0.001s～50.000s | 0.500s | △ |
| F0-10 | Differential time Td1 | 0.0s~100.0s | 0.0s | △ |
| F0-11 | Proportional gain Kp2 | 0.0~100.0 | 50.0 | △ |
| F0-12 | Integration time Ti2 | 0.001s～50.000s | 0.500s | △ |
| F0-13 | Differential time Td2 | 0.0s~100.0s | 0.0s | △ |
| F0-14 | PID parameter switch selection | 0: No switch, determined by parameters Kp1, Ti1 and Td1<br>1: Auto switch on the basis of input offset<br>2: Switched by terminal | 0 | × |
| F0-15 | PID auto-switch Input offset | 0.0%~100.0% | 20.0% | △ |
| F0-16 | Sampling period T | 0.006s～50.000s | 0.008s | △ |
| F0-17 | PID offset limit | 0.0%~100.0% | 0.0% | △ |
| F0-18 | PID differential limit | 0.0%~100.0% | 0.5% | △ |
| F0-19 | PID initial value | 0.0%~100.0% | 0.0% | × |
| F0-20 | Holding time of PID initial value | 0.0s~3600.0s | 0.0s | △ |
| F0-21 | PID feedback loss detection value | 0.0%~100.0% | 0.0% | △ |
| F0-22 | PID feedback loss detection time | 0.0s~30.0s | 1.0s | △ |
| F0-23 | Maximum frequency when opposite to command run direction | 0.00Hz~mximum frequency | 50.00Hz | △ |
| F0-24 | PID computation option | 0: No computation in stop status<br>1: Computation continued in stop status | 0 | △ |
| Group F1 Multi-step Frequency | | | | |
| F1-00 | Frequency command source of multi-step 0 | 0: Digital setting F1-02<br>1: Digital setting b0-02 + keypad ∧/∨ adjustment<br>2: Digital setting b0-02 + terminal | 0 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | UP/DOWN adjustment<br>3: AI<br>7: Process PID output<br>8: Communication | | |
| F1-01 | Frequency command source of multi-step 1 | 0: Digital setting F1-03<br>1: Digital setting b0-04 + keypad ∧/∨ adjustment<br>2: Digital setting b0-04 + terminal UP/DOWN<br>3: AI<br>7: Process PID output<br>8: Communication | 0 | × |
| F1-02 | Multi-step frequency 0 | Lower limit frequency ~ upper limit frequency | 0.00Hz | △ |
| F1-03 | Multi-step frequency 1 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| F1-04 | Multi-step frequency 2 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| F1-05 | Multi-step frequency 3 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| F1-06 | Multi-step frequency 4 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| F1-07 | Multi-step frequency 5 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| F1-08 | Multi-step frequency 6 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| F1-09 | Multi-step frequency 7 | Lower limit frequency ~ upper limit frequency | 0.00 Hz | △ |
| Group H Communication Parameters | | | | |
| Group H0 MODBUS Communication Parameters | | | | |
| H0-01 | RS-485 port communication configuration | Unit's place: baud rate<br>0: 4800bps<br>1: 9600bps<br>2: 19200bps<br>3: 38400bps<br>4: 57600bps<br>Decade: data format<br>0: 1-8-2-N format, RTU<br>1: 1-8-1-E format, RTU<br>2: 1-8-1-O Format, RTU<br>3: 1-7-2-N format, ASCII<br>4: 1-7-1-E format, ASCII | 0002 | × |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | 5: 1-7-1-O format, ASCII<br>Hundreds place: connection type<br>0: Direct cable connection (232/485)<br>1: MODEM (232)<br>Thousands place: storage<br>0: Not stored at power loss<br>1: Stored at power loss | | |
| H0-02 | RS-485 communication address | 0~247, 0 is broadcast address | 1 | × |
| H0-03 | Time out detection | 0.0s~1000.0s | 0.0s | × |
| H0-04 | Communication time delay | 0ms~1000ms | 0ms | × |
| H0-05 | Master/Slave option | 0: Independently used<br>1: As master<br>2: As slave | 0 | × |
| H0-06 | Parameter storage address | 0:b0-02<br>1:F0-01 | 0 | × |
| H0-07 | Proportional factor of received frequency | 0.0%~1000.0% | 100.0% | △ |
| Group L Keys and Display of Keypad | | | | |
| Group L0 Keys of Keypad | | | | |
| L0-01 | Keys locked selection | 0: Not locked<br>1: Full locked<br>2: Keys locked other than RUN, STOP/RESET<br>3: Keys locked other than STOP/RESET<br>4: Keys locked other than >> | 0 | △ |
| L0-02 | Function of STOP key | 0: STOP key valid only when under keypad control<br>1: STOP key valid under any run command source | 0 | △ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| L0-03 | ∧/∨ frequency adjustment | Unit's place: selection on stop<br>0: Clear on stop<br>1: Holding on stop<br>Decade: selection on power loss<br>0: Clear on power loss<br>1: Holding on power loss<br>Hundreds place: integral selection<br>0: Integral disabled<br>1: Integral enabled<br>Thousands place: run direction<br>0: Run direction not allowed to change<br>1: Run direction allowed to change | 0100 | △ |
| L0-04 | Step size of ∧/∨frequency adjustment | 0.00Hz/s~10.00Hz/s | 0.10 Hz/s | △ |
| Group L1 LED Display Setting | | | | |
| L1-00 | LED displayed parameter settings on running status | Setting of binary system:<br>0: Display disabled<br>1: Display enabled<br>Unit's place:<br>BIT0: Running frequency (Hz)<br>BIT1: Command frequency (Hz)<br>BIT2: Bus voltage (V)<br>BIT3: Output current (A)<br>Decade:<br>BIT0: Output torque (%)<br>BIT1: Output power (kW)<br>BIT2: Output voltage (V)<br>BIT3: Motor speed (r/min)<br>Hundreds place:<br>BIT0: AI (V)<br>BIT1: Potentiometer (V)<br>BIT2: Input terminal status<br>BIT3: Output terminal status<br>Thousands place:<br>BIT0: PID setting (%)<br>BIT1: PID feedback (%)<br>BIT2: Reversed<br>BIT3: Reserved<br>Note: when this parameter is set to 0000, running frequency (Hz) would | 000F | △ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | be displayed as default | | |
| L1-02 | LED displayed parameter settings on stop status | Setting of binary system:<br>0: Display disabled<br>1: Display enabled<br>Unit's place:<br>BIT0: Command frequency (Hz)<br>BIT1: Bus voltage (V)<br>BIT2: Input terminal status<br>BIT3: Output terminal status<br>Decade:<br>BIT0: AI (V)<br>BIT1: Potentiometer (V)<br>BIT2: Reserved<br>BIT3: Reserved<br>Hundreds place:<br>BIT0: PID setting (%)<br>BIT1: PID feedback (%)<br>BIT2: Reserved<br>BIT3: Reserved<br>Thousands place: Reserved<br><br>Note: when this parameter is set to 0000, the set frequency would be displayed as default (Hz) | 0003 | △ |
| Group U Monitoring | | | | |
| Group U0 Status Monitoring | | | | |
| U0-00 | Run frequency | 0.00Hz~600.00Hz | 0.00Hz | ■ |
| U0-01 | Set frequency | 0.00Hz~600.00Hz | 0.00Hz | ■ |
| U0-02 | Bus voltage | 0V~65535V | 0V | ■ |
| U0-03 | Output voltage | 0V~65535V | 0V | ■ |
| U0-04 | Output current | 0.0A~6553.5A | 0.0A | ■ |
| U0-05 | Output torque | 0.0%~300.0% | 0.0% | ■ |
| U0-06 | Output power | 0.0%~300.0% | 0.0% | ■ |
| U0-09 | Master frequency setting | 0.00Hz~600.00Hz | 0.00Hz | ■ |
| U0-10 | Auxiliary frequency setting | 0.00Hz~600.00Hz | 0.00Hz | ■ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| U0-11 | Drive status | Unit's place: run status<br>0: Accelerating<br>1: Decelerating<br>2: Constant speed running<br>Decade: drive status<br>0: Stop<br>1: Run status<br>2: Autotuning | 00 | ■ |
| U0-12 | AI input voltage | 0.00V~10.00V | 0.00V | ■ |
| U0-13 | Potentiometer input voltage | 0.00V~10.00V | 0.00V | ■ |
| U0-15 | AO output | 0.0%~100.0% | 0.0% | ■ |
| U0-18 | Status of digital input terminal | 0~F | 0 | ■ |
| U0-19 | Status of digital output terminal | 0~5 | 0 | ■ |
| U0-20 | PID set | 0.0%~100.0% | 0.0% | ■ |
| U0-21 | PID feedback | 0.0%~100.0% | 0.0% | ■ |
| U0-22 | PID input offset | -100.0%~100.0% | 0.0% | ■ |
| U0-30 | Cumulative power-up time | 0h~65535h | 0h | ■ |
| U0-31 | Cumulative run time | 0h~65535h | 0h | ■ |
| U0-33 | IGBT temperature | -40.0 °C ~100.0 °C | 0.0 °C | ■ |
| U0-36 | Run command record at LoU | 0~1 | 0 | ■ |
| U0-37 | Fault code record at LoU | 0~100 | 0 | ■ |
| U0-39 | Current detection fault source | 0: No fault source<br>1: IU<br>2: IV<br>3: IW | 0 | ■ |
| U0-42 | Higher of keypad ∧/∨ stored value | 0,- | 0 | ■ |
| U0-43 | Lower of keypad ∧/∨ stored value | -999.9Hz～600.0Hz | 0.00Hz | ■ |
| U0-44 | Higher of terminal UP/DOWN stored value | 0,- | 0 | ■ |
| U0-45 | Lower of terminal UP/DOWN stored value | -999.9Hz～600.0Hz | 0.00Hz | ■ |
| Group U1 Fault History | | | | |
| U1-00 | Fault 1 code(latest) | 0: No fault<br>1: Accel overcurrent<br>2: Constant-speed overcurrent<br>3: Decel overcurrent<br>4: Accel overvoltage<br>5: Constant-speed overvoltage | 0 | ■ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| | | 6: Decel overvoltage<br>7: Module protection<br>8: Autotuning failed<br>9: Drive overloaded<br>10: Motor overloaded<br>11: Current detection abnormal<br>12: Ground short-circuit protection at output side<br>13: Input power source abnormal<br>14: Phase loss at output side<br>16: Heat sink overtemperature protection<br>18: Module temperature detection disconnection<br>24: External equipment malfunction<br>26: Consecutive run time attained<br>27: Accumulative run time attained<br>28: Power supply abnormal in running<br>31: Port communication abnormal<br>37: Reference protection<br>38: 5V power supply out-of-limit<br>40: AI input out-of-limit<br>41: Undervoltage protection<br>45: PID feedback loss<br>46: Interior communication abnormal | | |
| U1-01 | Fault 1 run frequency | 0.00Hz~600.00Hz | 0.00Hz | ■ |
| U1-02 | Fault 1 output current | 0.0A~6553.5A | 0.0A | ■ |
| U1-03 | Fault 1 bus voltage | 0V~10000V | 0V | ■ |
| U1-05 | Fault 1 IGBT temperature | -40.0 °C ~100.0 °C | 0.0 °C | ■ |
| U1-06 | Fault 1 input terminal status | 0~FFFF | 0000 | ■ |
| U1-07 | Fault 1 output terminal status | 0~FFFF | 0000 | ■ |
| U1-08 | Fault 1cumulative run time | 0h~65535h | 0h | ■ |
| U1-09 | Fault 2 code | Same as U1-00 | 0 | ■ |
| U1-10 | Fault 2 run frequency | 0.00Hz~600.00Hz | 0.00Hz | ■ |
| U1-11 | Fault 2 output current | 0.0A~6553.5A | 0.0A | ■ |
| U1-12 | Fault 2 bus voltage | 0V~10000V | 0V | ■ |
| U1-14 | Fault 2 IGBT temperature | -40.0 °C ~100.0 °C | 0.0 °C | ■ |
| U1-15 | Fault 2 input terminal status | 0~FFFF | 0000 | ■ |
| U1-16 | Fault 2 output terminal status | 0~FFFF | 0000 | ■ |
| U1-17 | Fault 2 cumulative run time | 0h~65535h | 0h | ■ |

| Param | Designation | Range | Factory default | Attr |
|---|---|---|---|---|
| U1-18 | Fault 3 code | Same as U1-00 | 0 | ■ |
| U1-19 | Fault 3 run frequency | 0.00Hz~600.00Hz | 0.00Hz | ■ |
| U1-20 | Fault 3 output current | 0.0A~6553.5A | 0.0A | ■ |
| U1-21 | Fault 3 bus voltage | 0V~1000V | 0V | ■ |
| U1-23 | Fault 3 IGBT temperature | -40.0 °C ~100.0 °C | 0.0 °C | ■ |
| U1-24 | Fault 3 input terminal status | 0~FFFF | 0000 | ■ |
| U1-25 | Fault 3 output terminal status | 0~FFFF | 0000 | ■ |
| U1-26 | Fault 3 cumulative run time | 0h~65535h | 0h | ■ |

# Chapter 6 Specification of Parameters

## Group A System Parameter and Parameter Management

### Group A0 System Parameters

| | | | |
|---|---|---|---|
| A0-00 | Setting of user password | Range: 0 - FFFF | Factory default: 0000 |

**Setting of password:**

A non-zero four-digital number could be set as a user password by entering this password into A0-00 and pressing ENT key to confirm once, then reenter and reconfirm it once again within 10 seconds. Once this password has been successfully set, the word "P-SEt" would be displayed. The password setting will take effect as long as there is no operation on keypad within 5 minutes, or cutting the power off and power up again .

**Change password:**

Access A0-00 after entering the original four-digit password (at this point, A0-00 displays 0000) and set the new password following the above-noted procedure.

**Password clearance:**

Access A0-00 after entering the original four-digit password (at this point, A0-00 displays 0000), enter 0000 twice and press ENT key to make confirmation. In this way, password is successfully cleared and the word "P-CLr" is displayed.

| | | | |
|---|---|---|---|
| A0-02 | Parameter protection | Range: 0 - 1 | Factory default: 0 |

0: All parameter programming allowed

1: Only A0-00 and this parameter programming allowed

When this parameter is set to 1, all parameters other than A0-00 and A0-02 are not allowed to modify. Set A0-02 to 0 before the modification of other parameters.

| | | | |
|---|---|---|---|
| A0-09 | Motor control technique | Range: 0 - 1 | Factory default: 0 |

◆ **control technique of motor**

0: V/f control

Constant Volt/Hertz ratio control: Applicable to such cases in which the performance requirement to the drive is not rigorous, or using one drive to drive several motors, or it is

difficult to identify motor parameters correctly, etc. When motor under V/f control is selected, need to set related parameters group d1 well.

1: Sensor-less vector control 1

This helps achieve high-performance control without encoder and provides strong adaptability of load. Under this selection, please correctly set motor parameters of Group d0 and vector control parameters of Group d2.

## Group b Setting of Running Parameters

### Group b0 Frequency Command

Frequency command is set by parameter Group b0. See Fig. 6-1 for logical relation of frequency command.

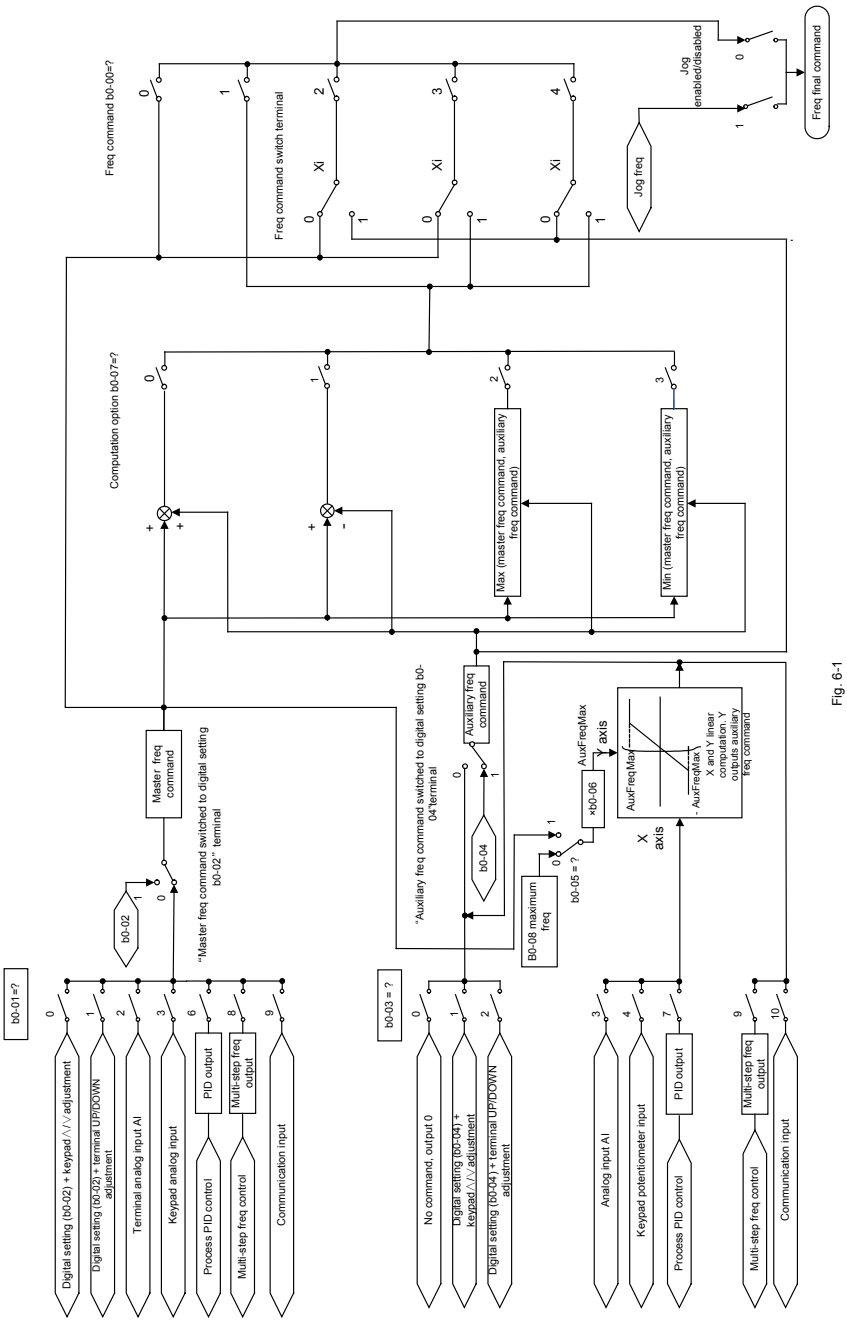

b0-01=?
Digital setting (b0-02) + keypad ∧/∨ adjustment
Digital setting (b0-02) + terminal UP/DOWN adjustment
Terminal analog input AI
Keypad analog input
Process PID control
Multi-step freq control
Communication input
PID output
Multi-step freq output
b0-02
"Master freq command switched to digital setting b0-02" terminal
Master freq command
b0-03 = ?
No command, output 0
Digital setting (b0-04) + keypad ∧/∨ adjustment
Digital setting (b0-04) + terminal UP/DOWN adjustment
Analog input AI
Keypad potentiometer input
Process PID control
Multi-step freq control
Communication input
PID output
Multi-step freq output
"Auxiliary freq command switched to digital setting b0-04"terminal
b0-04
Auxiliary freq command
B0-08 maximum freq
b0-05 = ?
X axis
x b0-06
AuxFreqMax
Y axis
AuxFreqMax
- AuxFreqMax
X and Y linear computation, Y outputs auxiliary freq command
Computation option b0-07=?
Max (master freq command, auxiliary freq command)
Min (master freq command, auxiliary freq command)
Freq command b0-00=?
Freq command switch terminal
Xi
Jog freq
Jog enabled/disabled
Freq final command

Fig. 6-1

| b0-00 | Frequency command pattern | Range: 0 - 4 | Factory default: 0 |
|---|---|---|---|

0: Master frequency command
Output frequency of drive is determined by master frequency command source b0-01. Refer to parameters b0-01 and b0-02 for further information.

1: Master & auxiliary computation result
Frequency command is the result of master & auxiliary computation. The master & auxiliary computation relation is determined by b0-07. Main command is set by b0-01, while auxiliary is set by b0-03.

2: Switch between master frequency command, and auxiliary frequency command
When b0-00 is set to 2, the switch between master frequency command, and master & auxiliary computation result can be realized through digital input terminal "frequency command switchover". When terminal "frequency command switchover" is invalid, command frequency of the drive will be determined by b0-01. When terminal "frequency command switchover" is valid, command frequency of the drive will be determined by b0-03 (Auxiliary frequency command source).

3: Switch between master frequency command, and master & auxiliary computation result
When b0-00 is set to 3, command frequency will de determined by master frequency command, or master & auxiliary computation result through digital input terminal "frequency command switchover". When terminal "frequency command switchover" is invalid, command frequency is determined by b0-01 (master frequency command source). When terminal "frequency command switchover" is valid, command frequency is determined by master & auxiliary computation result. The master & auxiliary computation relation is determined by b0-07.

4: Switch between auxiliary frequency command, and master & auxiliary computation result
When b0-00 is set to 4, command frequency will de determined by auxiliary frequency command, or master & auxiliary computation result through digital input terminal “frequency command switchover”. When terminal "frequency command switchover" is invalid, command frequency is determined by b0-03 (auxiliary frequency command source). When terminal "frequency command switchover" is valid, command frequency is determined by master & auxiliary computation result. The master & auxiliary computation relation is determined by b0-07.

| b0-01 | Master frequency command source | Range: 0 - 9 | Factory default: 0 |
|---|---|---|---|

0: Digital setting (b0-02) + ∧ / ∨ adjustment on keypad
When the drive is powered up, the value of b0-02 is taken as the master frequency command which can be adjusted through ∧ / ∨ keys on keypad no matter the drive is running or in stop.

**ATTENTION:**

Frequency adjustment via ∧ / ∨ on keypad can be cleared through terminal "UP/DOWN (including ∧ / ∨ key) adjustment clear " . Refer to C0-01 - C0-08 for details.

1: Digital setting (b0-02) + terminal UP/DOWN adjustment

When the drive is powered up, the value of b0-02 is taken as the master frequency command. This frequency can be adjusted via “terminal UP” and “terminal DOWN” no matter the drive is running or in stop.

When this parameter value is selected, following parameter setting should be performed:

1) Set the two digital input terminals to "terminal UP" and "terminal DOWN" respectively. Refer to C0-01 - C0-08 for further information.
2) Set terminal UP/DOWN frequency change step size (C0-18).
3) Set C0-17 (terminal UP/DOWN frequency adjustment treatment).

**ATTENTION:**

Frequency adjustment via terminal UP and DOWN can be cleared through terminal "UP/DOWN (including ∧ / ∨ key) adjustment clear" . Refer to C0-01 - C0-08 for details.

2: Analogue input AI

(0 - 10V) voltage input and (0 - 20mA) current input are optional for AI, which can be selected using toggle switch AI on control board.

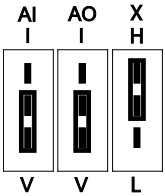



Fig. 6-2

Refer to specification of C2-00 - C2-12 for corresponding relation between analogue input and output frequency.

See parameter Group C4 for automatic correction of analogue quantity input.

3: Keypad potentiometer input

Keypad potentiometer input is 0~5V input.

Refer to detailed description of C2-00~C2-20 for corresponding relation between analog value and frequency.

See parameter group C4 for automatic correction of analog input

6: Process PID output

Command frequency is determined by process closed-loop PID computation result. See parameter Group F0 for details.

8: Multi-step speed

A total of 8-step speed settings can be realized through status combination of "multi-step frequency terminal 1 - 3". See the table below for details. Command frequency can be switched via different combination of multi-step frequency terminals no matter in running or in stop.

**Table 6-1**

| Multi-step frequency terminal 3 | Multi-step frequency terminal 2 | Multi-step frequency terminal 1 | Command Frequency |
|---|---|---|---|
| OFF | OFF | OFF | Multi-step frequency 0 (F1-00) |
| OFF | OFF | ON | Multi-step frequency 1 (F1-01) |
| OFF | ON | OFF | Multi-step frequency 2 (F1-04) |
| OFF | ON | ON | Multi-step frequency 3 (F1-05) |
| ON | OFF | OFF | Multi-step frequency 4 (F1-06) |
| ON | OFF | ON | Multi-step frequency 5 (F1-07) |
| ON | ON | OFF | Multi-step frequency 6 (F1-08) |
| ON | ON | ON | Multi-step frequency 7 (F1-09) |

9: Communication

Upper computer is the master frequency command source of the drive through standard RS485 communication interface on the drive..

refer to Group H0 and appendix on this manual for further information about communication protocol, and programming, etc.

**ATTENTION:**

Master frequency command can be forcibly switched to b0-02 via terminal "master frequency command switched to digital setting b0-02". When this terminal is disabled, master frequency command is determined by b0-01. When terminal is enabled, master frequency command shall be the value of b0-02.

| | | | |
|---|---|---|---|
| b0-02 | Digital setting of master frequency | Range: lower limit frequency - upper limit frequency | Factory default: 50.00Hz |

When master frequency command source b0-01 is set to either 0 or 1, this parameter value will be the initial value of master frequency command.

| | | | |
|---|---|---|---|
| b0-03 | Auxiliary frequency command source | Range: 0 - 10 | Factory default: 0 |

0: No command

Auxiliary frequency command is disabled, and auxiliary frequency is 0.

1: Digital setting (b0-04) + ∧∨ adjustment onkeypad

When the drive is powered up, the value of b0-04 is auxiliary frequency command, also can be adjusted through ∧ / ∨ on keypad no matter the drive is running or in stop status.

**ATTENTION:**

When master frequency command involves ∧ / ∨ adjustment on keypad, ∧ / ∨ involving auxiliary frequency command shall be disabled.

2: digital setting (b0-04) + terminal UP/DOWN adjustment

When the drive is powered up, the value of b0-04 is current auxiliary frequency command. Whether the drive is running or stopped, current auxiliary frequency setting can be adjusted through digital input terminals "UP" and "DOWN". Just set “terminal UP/DOWN frequency adjustment treatment” and “terminal UP/DOWN frequency change step size” through C0-17 and C0-18.

**ATTENTION:**

When master frequency command involves terminal UP/DOWN adjustment, UP/DOWN adjustment involving auxiliary frequency command shall be disabled.

3: Analogue input AI4: Keypad potentiometer input

7: Process PID output

Auxiliary frequency command is determined by process PID computation result. See parameter Group F0 for details.

**ATTENTION:**

- In case PID output is also set for master frequency command, the process PID output for auxiliary frequency command would be disabled.
- See b0-05 and b0-06 for information about frequency relation that corresponds to maximum value of process PID output for auxiliary frequency command.

9: Multi-step speed

A total of 8-step speed settings can be realized through status combination of "multi-step frequency terminal 1 - 3". Command frequency can be switched via different combination of multi-step frequency terminals no matter in running or in stop.

**ATTENTION:**

In case master frequency command is also set to multi-step speed, the multi-step speed output for auxiliary frequency setting would be disabled.

10: Communication

Upper computer is the auxiliary frequency command source of the drive through standard RS485 communication interface on the drive. Refer to Group H0 and appendix on this manual for further information about communication protocol, and programming, etc.

**ATTENTION:**

Auxiliary frequency command can be forcibly switched to b0-04 via terminal "auxiliary frequency command switched to digital setting b0-04". When this terminal is disabled, master frequency command is determined by b0-03. When terminal is enabled, master frequency command shall be the value of b0-04.

| | | | |
|---|---|---|---|
| b0-04 | Digital setting of auxiliary frequency | Range: lower limit frequency - upper limit frequency | Factory default: 0.00Hz |

When auxiliary frequency command is set to either 1 or 2, this parameter value should be the initial value of auxiliary frequency command.

| | | | |
|---|---|---|---|
| b0-05 | Range of auxiliary frequency | Range: 0 - 1 | Factory default: 0 |

0: Relative to maximum frequency

1: Relative to master frequency

See b0-06 specification for details.

| | | | |
|---|---|---|---|
| b0-06 | Coeff of auxiliary frequency command | Range: 0.0% - 100.0% | Factory default: 100.0% |

When b0-03 selects AI, keypad potentiometer input, or process PID output as auxiliary frequency command sources, b0-05 and b0-06 will determine the final output value of auxiliary frequency command.

When b0-05 is set to 0 (relative to maximum frequency):

When AI or keypad potentiometer input is selected for auxiliary frequency command, the frequency that corresponds to maximum value of the source should be (b0-08×b0-06).

**Example:**

Select AI as auxiliary frequency command source (set b0-03 to 3) and set AI to curve 1 (unit's place of C2-00 is 0) as shown in Fig. 6-5. In such a case, the frequency that corresponds to the maximum input of curve 1 should be: (C2-02) × [(b0-08) × (b0-06)].

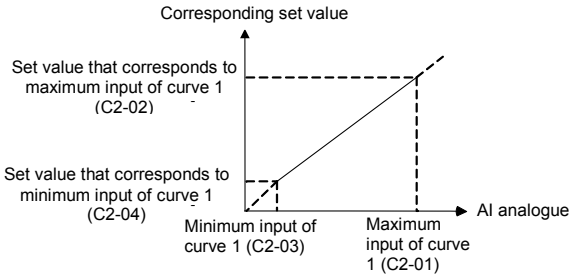



Fig. 6-3

When X6/DI pulse input is selected as auxiliary frequency command (set b0-03 to 6), the frequency that corresponds to maximum DI input should be: (C2-25) × [(b0-08) × (b0-06)].

When PID is selected for auxiliary frequency command, the frequency that corresponds to maximum value of PID output should be (b0-08) × (b0-06).

PID output diagrammatic sketch is as shown in Fig. 6-4.

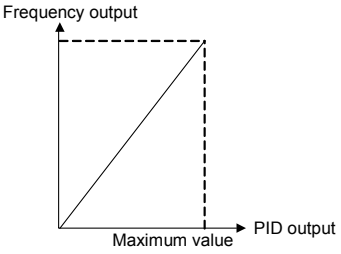



Fig. 6-4

When b0-05 is set to 1 (relative to master frequency):

When AI, AI2, EAI, or X6/DI pulse input is selected for auxiliary frequency command source, the frequency that corresponds to maximum value of these sources should be: [master frequency × (b0-06)].

**Example:**

When selecting AI as auxiliary frequency command source (set b0-03 to 3) and setting AI to curve 1 (unit's place of C2-00 is 0), the frequency that corresponds to maximum input of curve 1 should be: (C2-02) × [master frequency × (b0-06)].

When X6/DI pulse input is selected as auxiliary frequency command source (set b0-03 to 6), the frequency that corresponds to maximum DI input should be: (C2-25) × [master frequency × (b0-06)].

When PID is selected for auxiliary frequency command, the frequency that corresponds to maximum value of PID output should be [master frequency × (b0-06)].

PID output diagram is as shown in Fig. 6-5.

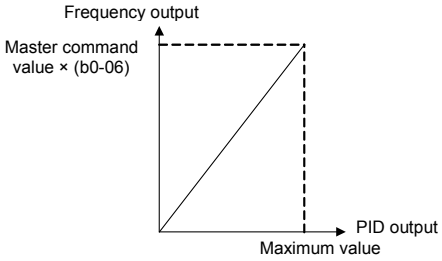



Fig. 6-5

| b0-07 | Computation of master and auxiliary frequency | Range: 0 - 3 | Factory default: 0 |
|---|---|---|---|

0: Master + auxiliary

The sum of master and auxiliary frequency is taken as frequency command. Output result is subject to limitation of upper and lower limit frequency.

1: Master - auxiliary

The difference between master and auxiliary frequency is taken as frequency command. Output result is subject to limitation of upper and lower limit frequency.

2: Max {master, auxiliary}

Master frequency or auxiliary frequency (whichever has a larger absolute value) is taken as frequency command. Output result is subject to limitation of upper and lower limit frequency.

3: Min {master, auxiliary}

Master frequency or auxiliary frequency (whichever has a smaller absolute value) is taken as frequency command. Output result is subject to limitation of upper and lower limit frequency.

| | | | |
|---|---|---|---|
| b0-08 | Maximum frequency | Range: Upper limit frequency - 600.00Hz | Factory default: 50.00Hz |
| b0-09 | Upper limit frequency | Range: Lower limit frequency - maximum frequency | Factory default: 50.00Hz |
| b0-10 | Lower limit frequency | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |

Maximum frequency of b0-08 is the maximum allowable output frequency of drive and is indicated by fmax in the figure.

B0-09 upper limit frequency is the user-defined maximum allowable running frequency and represented by fH in Fig. 6-8.

B0-10 lower limit frequency is user-defined minimum allowable running frequency and marked with fL in Fig. 6-8.

In Fig. 6-8, fN represents rated frequency of motor while VN means the rated voltage of motor.

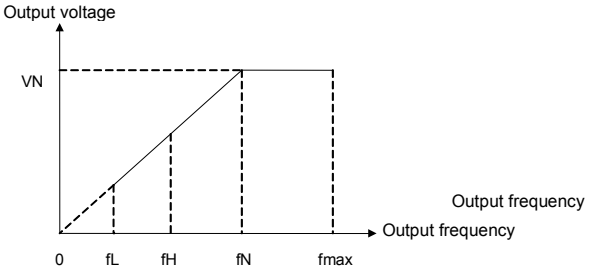



Fig. 6-6

**ATTENTION:**

- Maximum frequency, upper limit frequency and lower limit frequency should be set with care in accordance with nameplate parameters of motor and operation requirements.
- Jog and motor parameter identification is free from limitations of upper and lower limit frequency.
- In addition to limitation of upper limit frequency and lower limit frequency, the output frequency is also subject to limitations of starting frequency, stop DC brake initial frequency, skip frequency and other parameter settings.
- The rank relation between maximum frequency, upper limit frequency and lower limit frequency is shown as Fig. 6-8.
- Upper and lower limit frequencies restrict actual output frequency to motor. If command frequency is higher than upper limit frequency, the running would be at upper limit frequency. In case command frequency is lower than lower limit frequency, the running should be in accordance with the setting of b0-11.

| | | | |
|---|---|---|---|
| b0-11 | Operation when command frequency lower than lower limit frequency | Range: 0 - 2 | Factory default: 0 |

0: Run at lower limit frequency

In case command frequency is lower than lower limit frequency, the running should be at lower limit frequency.

1: Run at 0Hz

In case the frequency command is lower than lower limit frequency, the running should be at 0Hz.

2: Stop

If frequency command is lower than lower limit frequency, stop would be activated after the time delay set by b0-12. When lower limit frequency is 0, this limitation is invalid.

**ATTENTION:**

This parameter is disabled under PID control mode.

| | | | |
|---|---|---|---|
| b0-12 | Time-delay of stop when command frequency lower than lower limit frequency | Range: 0.0s - 6553.5s | Factory default: 0.0s |

When b0-11 is set to 2, and command frequency is lower than lower limit frequency, the drive will stop running after this parameter value.

| | | | |
|---|---|---|---|
| b0-13 | Lower limit of skip frequency band 1 | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |
| b0-14 | Upper limit of skip frequency band 1 | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |
| b0-15 | Lower limit of skip frequency band 2 | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |
| b0-16 | Upper limit of skip frequency band 2 | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |
| b0-17 | Lower limit of skip frequency band 3 | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |
| b0-18 | Upper limit of skip frequency band 3 | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |

Skip frequency is a function designed to prevent the drive running at resonance zone of mechanical system.

At most 3 skip zones can be defined. See Fig. 6-7.

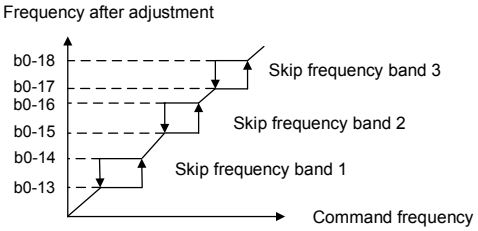



Fig. 6-7

Once parameters of skip zones are set, the output frequency of the drive would automatically get out of these skip zones even if the command frequency is within these zones.

**ATTENTION:**

Output frequency of drive can normally pass through skip zones during Accel and Decel.

| | | | |
|---|---|---|---|
| b0-19 | Jog frequency | Range: 0.00Hz - upper limit frequency | Factory default: 5.00Hz |

This parameter sets the running frequency during jog. Jog Accel time is set by parameter b2-10 while its Decel time by parameter b2-11.

Jog run command control could be performed through keypad, control terminals or communication input.

Multifunction MF key can be set as forward jog or reverse jog key through parameter L0-00.

Jog can be realized using "forward jog terminal" and "reverse jog terminal" of DI.

Jog can be realized via communication input. See drive communication protocol for further information.

See Jog diagrammatic sketch 6-8.

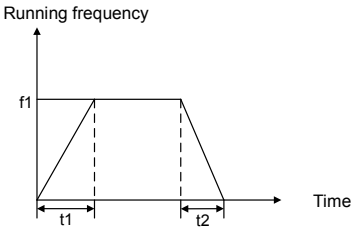



Fig. 6-8

Thereof:

f1 is jog frequency b0-19

t1 represents the ACC time from zero to jog frequency; t1 = (b2-10) × f1/(b0-08); b0-08 is the maximum frequency.

t2 is the DEC time from jog frequency to 0; t2 = (b2-11) × f1/(b0-08).

**ATTENTION:**

- Set value of jog frequency is free from limitations of upper and lower limit frequency.
- Jog is started from starting frequency and its start is not subject to limitation by b1-05.

## Group b1 Start/Stop Control

| b1-00 | Run command | Range: 0 - 2 | Factory default: 0 |
|---|---|---|---|

This parameter sets run command source. Run commands include "start, stop, forward and reverse", etc.

0: Keypad control

Control run command through RUN, STOP/RESET and MF keys on keypad (set multifunction key MF to JOG by L0-00). Refer to Chapter 4 about the operation of keypad.

1: Terminal control

Control run command via DI terminals. Perform FORWARD and REVERSE by DI terminals. The control mode are two-wire mode and three-wire mode selectable. See Group C0 for details of designation and wiring regulation of DI terminals.

2: Communication control

Master device is able to control run command through built-in RS485 serial communication interface of drive. Refer to parameters Group H0 and appendix for further information about programming.

Run command from keypad, terminals and communication can be switched by terminals "run command switched to keypad control", "run command switched to terminal control" and "run command switched to communication control".

Multifunction key MF can be set to "run command sources shifted" key through parameter L0-00. When MF key is pressed under this setting, run command will be shifted during keypad control, terminal control and communication control circularly.

| b1-01 | Binding of run command and frequency command | Range: 000 - AAA | Factory default: 000 |
|---|---|---|---|

This parameter defines the bundled combination of three run command sources and frequency command sources with the purpose of facilitating simultaneous switching.

For example: frequency command source AI (unit's place of b1-01 is set to 3) bundled with keypad control, while the frequency command source X6/DI pulse input (ten's place of b1-01 is set to 6) bundled with terminal control. In such a case, when run command is controlled by keypad, frequency command source would be AI, while when run command is controlled via terminals, frequency command source will be automatically switched to X6/DI pulse input.

◆ Unit's place: frequency command source bundled under keypad control

0: No binding

1: Digital setting (b0-02) + ∧ / ∨ adjustment on keypad

2: Digital setting (b0-02) + terminal UP/DOWN adjustment

3: Analogue input AI

4: Keypad potentiometer

7: Process PID output

9: Multi-step frequency

A: Communication input

Refer to parameter b0-01 for details regarding above-mentioned sources of frequency command.

◆ Decade: frequency command source bundled under terminal control (same as unit's place)

◆ Hundreds place: frequency command source bundled under communication control (same as unit's place)

**ATTENTION:**

- Different run command sources can be bundled with the same frequency command source.
- The priority of frequency command sources bundled with run command overrides Group b0.

| b1-02 | Running direction | Range: 0 - 1 | Factory default: 0 |
|---|---|---|---|

This parameter applies to run command controlled by keypad, and disabled under terminal and communication control.

0: Forward

1: Reverse

| b1-03 | Reverse disabled | Range: 0 - 1 | Factory default: 0 |
|---|---|---|---|

0: Reverse enabled

1: Reverse disabled

In some applications, reverse is likely to result in equipment damage. This parameter is used to prevent reverse running

.

| b1-04 | Dead time of forward and reverse | Range: 0.0s - 3600.0s | Factory default: 0.0s |
|---|---|---|---|

The dead time with 0Hz output during the transition from forward to reverse, or from reverse to forward is indicated by letter "t" in Fig. 6-9.

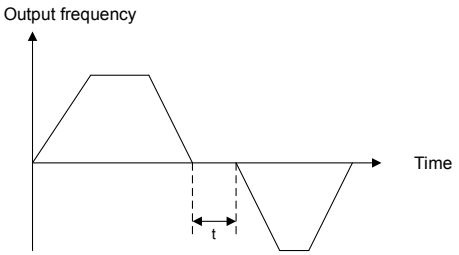



Fig. 6-9 Dead time between forward and reverse

| b1-05 | Start method | Range: 0 - 3 | Factory default: 0 |
|---|---|---|---|

This parameter takes effect during the process of transition from stop status to running status.

0: From start frequency

When drive starts to run from stop status, it starts from start frequency (b1-06) and keeps this frequency for a period of time set by b1-07, and then accelerated to command frequency in accordance with the Accel method and time.

1: DC braking then start

To make the motor stop completely, the drive will perform DC braking with a certain period of time, as specified by b1-08 and b1-09, then start from start frequency (b1-06), keeping a period of time as specified by b1-07, and then Accelerate to command frequency.

3: Flying start

Trace the actual speed of motor that is rotating and perform smooth start from the traced speed. This start method is applicable to restart on momentary power loss. To make sure the accuracy of flying start speed, please correctly set motor parameters, and b1-10~b1-11.

| b1-06 | Start frequency | Range: 0.00Hz - upper limit frequency | Factory default: 0.00Hz |
|---|---|---|---|
| b1-07 | Holding time of start frequency | Range: 0.0s - 3600.0s | Factory default: 0.0s |

Start frequency is initial output frequency of drive start from stop status. Start frequency holding time is the continuous running time with start frequency. After this holding time, the drive will Accelerate to command frequency. Usually appropriate start frequency and holding time assure the starting torque of heavy-duty load.

**ATTENTION:**

Provided that command frequency is lower than start frequency, drive output frequency is 0 Hz. Start frequency also works on the transition of forward and reverse, but starting frequency

holding time is disabled during transition between forward and reverse. Accel time of Group b2 excludes holding time of start frequency.

| | | | |
|---|---|---|---|
| b1-08 | DC braking current when start | Range: 0.0% - 100.0% | Factory default: 0.0% |
| b1-09 | DC braking time when start | Range: 0.00s - 30.00s | Factory default: 0.00s |

When the motor is started by the method "DC braking then start", it is essential to set the these two parameters.100% corresponds to rated current of drive. If braking time is set to 0.0s, DC braking when start shall be disabled.

| | | | |
|---|---|---|---|
| b1-10 | Flying start current | 0.0%~200.0% | Factory default: 100.0% |

Sets flying start current. 100% corresponds to drive rated current.

| | | | |
|---|---|---|---|
| b1-11 | Flying start deceleration time | 0.1s~20.0s | Factory default: 2.0s |

Sets flying start output frequency deceleration time, the time from maximum frequency to 0Hz. The shorter the time is, the faster the flying start operation will be. But shorter flying start deceleration time will cause unsmoother flying start.

| | | | |
|---|---|---|---|
| b1-13 | Stop method | Range: 0 - 2 | Factory default: 0 |

0: Ramp to stop

Upon the receipt of stop command, drive will gradually decrease output frequency according to the set Decel time, and stop when frequency attains 0.

1: Coast to stop

Upon the receipt of stop command, drive will immediately lock the output and the motor will stop with its mechanical inertia.

2: Ramp to stop + DC brake

Upon the receipt of stop command, drive will decrease output frequency in accordance with the rate of Decel time setting. Once the output frequency attains set value of b1-14, DC braking will be enabled, and the drive will stop after the finish of DC braking.

| | | | |
|---|---|---|---|
| b1-14 | Start frequency of DC brake stop | Range: 0.00Hz - upper limiting frequency | Factory default: 0.00Hz |

| | | | |
|---|---|---|---|
| b1-15 | DC brake current | Range: 0.0% - 100.0% | Factory default: 0.0% |
| b1-16 | DC brake time | Range: 0.00s - 30.00s | Factory default: 0.00s |

During the process “ramp to stop + DC braking", DC brake would be started when output frequency attains set value of b1-14. b1-15 defines brake level, in amps, applied to the motor. 100% corresponds to rated current of drive. B1-16 sets the length of time that DC brake current is “injected” into the motor when b1-13 is set to 2. In case brake time is set to 0.0s, DC brake shall be disabled.

If "DC brake stop" terminal enabled, time length of this terminal or b1-16 set time (whichever is longer) would be taken as stop brake time.

| | | | |
|---|---|---|---|
| b1-17 | Overexcitation brake | Range: 0 - 1 | Factory default: 1 |

0: Disabled

1: Enabled

When overexcitation brake is enabled in case of stop by Decel, the motor shall transform the electric energy generated during Decel into heat energy by increasing magnetic flux so as to attain rapid stop. If this parameter is enabled, the Decel time will be shortened. If overexcitation brake is disabled, the Decel current of motor will decrease and the Decel time will be lengthened.

| | | | |
|---|---|---|---|
| b1-18 | Dynamic brake | Range: 0 - 1 | Factory default: 0 |

0: Disabled

1: Enabled

When dynamic brake is enabled, the electric energy generated during Decel shall be converted into heat energy consumed by brake resistor, so as to attain rapid Decel. This brake method applies to brake of high-inertia load or the situations that require quick stop. In such a case, it is necessary to select appropriate dynamic brake resistor and brake unit.

| | | | |
|---|---|---|---|
| b1-19 | Dynamic brake threshold voltage (230V) | Range: 325V~375V | Factory default: 375V |
| | Dynamic brake threshold voltage (400V) | Range: 650V~750V | Factory default: 720V |

When b1-18 is set to 1, when the bus voltage reaches the value set by b1-19, the energy will be consumed by externally-mounted brake resistor, to guarantee the fast stop. This parameter is for brake effect setting, according to application requirement.

| | | | |
|---|---|---|---|
| b1-20 | Auto restart when power up again after power loss | Range: 0 - 1 | Factory default: 0 |

Defines the drive status when power up again after power loss during running

0: Disabled

The drive will not run automatically when power is up after power loss.

1: Enabled.

When run command is controlled by keypad or communication, the drive will run automatically when power is up again after power loss. When run command is controlled by terminals, the drive will run automatically only if ON signal from run command terminal is detected

**ATTENTION:**

Enable this parameter with caution for safety consideration.

| | | | |
|---|---|---|---|
| b1-21 | Waiting time of auto restart when power up again | Range: 0.0s - 10.0s | Factory default: 0.0s |

This time setting is on the basis of work restoration time of relative devices in the system when power is up again after power loss, if b1-20 is set to 1.

### Group b2 Accel/Decel Parameters

| | | | |
|---|---|---|---|
| b2-00 | Accel/Decel time resolution | Range: 0 - 2 | Factory default: 1 |

0: 0.01s; the setting range of Accel/Decel time is 0.00s - 600.00s

1: 0.1s; the setting range of Accel/Decel time is 0.0s - 6000.0s

2: 1s; the setting range of Accel/Decel time is 0s - 60000s

Accel/Decel time resolution takes effect on b2-01 - b2-11.

| | | | |
|---|---|---|---|
| b2-01 | Accel time 1 | Range: 0s - 60000s | Factory default: 6.0s |
| b2-02 | Decel time 1 | Range: 0s - 60000s | Factory default: 6.0s |
| b2-03 | Accel time 2 | Range: 0s - 60000s | Factory default: 6.0s |
| b2-04 | Decel time 2 | Range: 0s - 60000s | Factory default: 6.0s |
| b2-05 | Accel time 3 | Range: 0s - 60000s | Factory default: 6.0s |

| | | | |
|---|---|---|---|
| b2-06 | Decel time 3 | Range: 0s - 60000s | Factory default: 6.0s |
| b2-07 | Accel time 4 | Range: 0s - 60000s | Factory default: 6.0s |
| b2-08 | Decel time 4 | Range: 0s - 60000s | Factory default: 6.0s |

These parameters b2-01 - b2-08 set the rate of Accel/Decel for speed increase/decrease.

**Maximum Freq (b0-08) / Accel time X = Accel Rate X**

**Maximum Freq (b0-08) / Decel time X = Decel Rate X**

As the formula sets forth above, Accel time means required time for drive to Accelerate to maximum frequency b0-08 from zero frequency, while Decel time refers to the time required for drive to Decelerate to zero frequency from maximum frequency b0-08.

These four types of Accel/Decel time can be selected through the ON/OFF combination of DI terminals" Accel/Decel time determinant 1" and " Accel/Decel time determinant 2". See Table 6-5.

**Table 6-5**

| Accel/Decel time determinant 2 | Accel/Decel time determinant 1 | Accel/Decel time |
|---|---|---|
| OFF | OFF | Accel/Decel time 1(b2-01, b2-02) |
| OFF | ON | Accel/Decel time 2(b2-03, b2-04) |
| ON | OFF | Accel/Decel time 3(b2-05, b2-06) |
| ON | ON | Accel/Decel time 4(b2-07, b2-08) |

**ATTENTION:**

- When the drive is running under simple PLC, the Accel time and Decel time are determined by simple PLC related parameters, not by the DI terminals. See Group F2 for details.
- When Accel/Decel of broken-line style is selected, Accel/Decel time is automatically switched to Accel/Decel time 1 and 2 according to switching frequency (b2-13 and b2-14). Under this circumstance, Accel/Decel time selection terminals are disabled.

| | | | |
|---|---|---|---|
| b2-09 | Decel time for emergency stop | Range: 0s - 60000s | Factory default: 6.0s |

In case of emergency stop via multifunction MF key on keypad (MF key has been set to emergency stop 1 through parameter L0-00), or via DI terminal "emergency stop", Decel is conducted according to this time. This parameter sets the rate of Decel for speed decrease, similar with b2-01 - b2-08.

| | | | |
|---|---|---|---|
| b2-10 | Jog Accel time | Range: 0s - 60000s | Factory default: 6.0s |
| b2-11 | Jog Decel time | Range: 0s - 60000s | Factory default: 6.0s |

b2-10 and b2-11 set the rate of Accel/Decel of Jog, similar with b2-01 - b2-08.

| | | | |
|---|---|---|---|
| b2-12 | Accel/Decele curve | Range: 0 - 2 | Factory default: 0 |

0: Linear Accel/Decel

Outputs frequency increases or decreases with a constant rate as shown in Fig. 6-10.

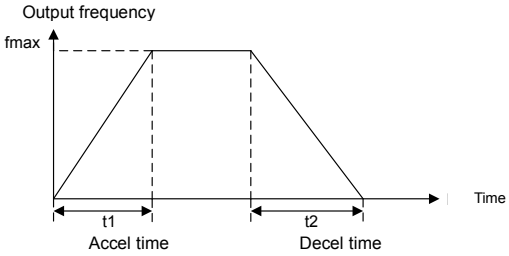



Fig. 6-10

fmax is maximum frequency b0-08.

1: Broken-line Accel/Decel

Accel/Decel time is shifted based on output frequency during Accel/Decel.

When output frequency during Accel is higher than or equal to b2-13 (Accel time switching frequency of broken-line Accel/Decel), b2-01 (Accel time 1) is enabled. When lower than b2-13, b2-03 (Accel time 2) will be enabled.

When output frequency during Decel is higher than or equal to b2-14 (Decel time switching frequency of broken-line Accel/Decel), b2-02 (Decel time 1) is enabled. When lower than b2-14, b2-04 (Decel time 2) will be enabled.

**ATTENTION:**

When broken-line Accel/Decel is enabled, " Accel/Decel time determinant 1" and " Accel/Decel time determinant 2" will be disabled.

Broken-line Accel/Decel is as shown in Fig. 6-11.

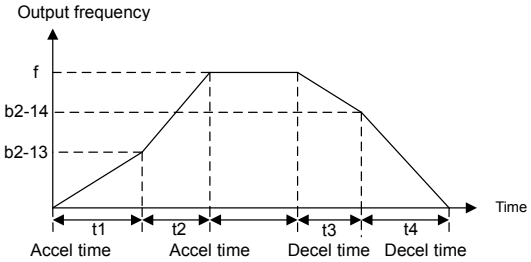



Fig. 6-11

t1 = (b2-03)×(b2-13)/(b0-08) t2 =(b2-01)×[f-(b2-13)]/(b0-08)

t3 = (b2-02)×[f-(b2-14)]/(b0-08) t4 = (b2-04)×(b2-14)/(b0-08)

f is current frequency command, and b0-08 is maximum frequency.

2: S-curve Accel/Decel

By adding a period of S-curve time to the initial and ending segments of Accel/Decel, it can improve the smoothness of start/stop and prevent mechanical impact. See Fig. 6-12:

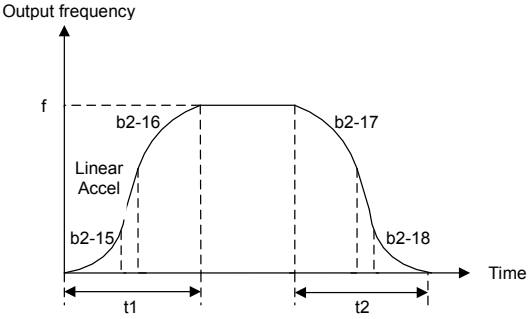



Fig. 6-12

Accel/Decel rate changes gradually at the initial and ending segments of S-curve time. At the middle segment of S-curve, it is linear Accel/Decel rate, which is determined by enabled Accel/Decel time 1 - 4. Therefore, the actual Accel/Decel time is longer than linear Accel/Decel

if this parameter value is selected.

**Actual Accel time = linear Accel time + (Time of initial segment of Accel S-curve + Time of last segment of Accel S-curve)/2**

**Actual Decel time = linear Decel time + (Time of initial segment of Decel S-curve + Time of last segment of Decel S-curve)/2**

**Example:**

Assuming that the maximum frequency b0-08 is 50Hz and the Accel time set is 6s, the linear Accel time from initial status 10Hz to 40Hz = 6s × (40Hz-10Hz)/50Hz = 3.6s

Assuming b2-15 = 0.20s and b2-16 = 0.40s, the actual Accel time under "S-curve Accel/Decel " = 3.6s + (0.20s + 0.40s)/2 = 3.9s.

**ATTENTION:**

Provided the above-noted calculated linear Accel time is less than (Time of initial segment of Accel S-curve + Time of last segment of Accel S-curve)/2, there will not be linear part. Decel is the same as above.

| | | | |
|---|---|---|---|
| b2-13 | Accel time switching frequency of broken-line Accel/Decel | Range: 0.00Hz - maximum frequency | Factory default: 0.00Hz |
| b2-14 | Decel time switching frequency of broken-line Accel/Decel | Range: 0.00Hz - maximum frequency | Factory default: 0.00Hz |

When b2-12 is set to 1:

b2-01 (Accel time 1) is enabled when output frequency during Accel is more than or equal to set value of b2-13, while b2-03 (Accel time 2) is enabled when output frequency during Accel is less than set value of b2-13.

b2- 02 (Decel time 1) is enabled when output frequency during Decel is more than or equal to set value of b2-14, while b2-04 (Decel time 2) is enabled when output frequency during Accel is less than set value of b2-14.

**ATTENTION:**

When broken-line Accel/Decel is selected, terminals "Accel/Decel time determinant 1" and "Accel/Decel time determinant 2" will be disabled.

| | | | |
|---|---|---|---|
| b2-15 | Time of initial segment of Accel S-curve | Range: 0.00s - 60.00s | Factory default: 0.20s |
| b2-16 | Time of last segment of Accel S-curve | Range: 0.00s - 60.00s | Factory default: 0.20s |
| b2-17 | Time of initial segment of Decel S-curve | Range: 0.00s - 60.00s | Factory default: 0.20s |
| b2-18 | Time of last segment of Decel S-curve | Range: 0.00s - 60.00s | Factory default: 0.20s |

## Group C Input and Output Terminals

### Group C0 Digital Input

| | | | |
|---|---|---|---|
| C0-00 | Enabled condition of run command terminals when power up | Range: 0 - 1 | Factory default: 0 |

This parameter is only for digital terminals with parameter value 1 - 4 (forward/reverse jog, and forward/reverse running), and also is only for initial running after power up.

0: Trigger edge detected + ON detected

When run command is controlled by terminals, the drive will start to run when it detects that the terminal jumps from OFF to ON and is kept ON after power up.

If run command terminal is in ON state before power up, the drive will not run after power up. Under this circumstance, only when the ON state is shifted to OFF and then ON again, and maintain ON, the drive will start running.

1: ON detected

When run command is controlled by terminals, the drive will start to run when detecting the command terminal at ON state after power up.

**ATTENTION:**

When "1: ON detected" selected, the drive will start to run after power up as long as ON of run command terminal detected. Make sure of the safety of personnel and equipment before this setting.

| | | | |
|---|---|---|---|
| C0-01 | Function of terminal X1 | Range: 0 - 99 | Factory default: 3 |
| C0-02 | Function of terminal X2 | Range: 0 - 99 | Factory default: 4 |
| C0-03 | Function of terminal X3 | Range: 0 - 99 | Factory default: 1 |
| C0-04 | Function of terminal X4 | Range: 0 - 99 | Factory default: 23 |
| C0-08 | Function of terminal AI (Digital enabled) | Range: 0 - 99 | Factory default: 0 |

Analogue input terminal AI, can also be used as digital input terminals set by C0-08. When AI is used as analogue input, C0-08 shall be set to 0.

**Table 6-2**

| Multi-step frequency terminal 3 | Multi-step frequency terminal 2 | Multi-step frequency terminal 1 | Command frequency |
|---|---|---|---|
| OFF | OFF | OFF | Multi-step frequency 0 (F1-00) |
| OFF | OFF | ON | Multi-step frequency 1 (F1-01) |
| OFF | ON | OFF | Multi-step frequency 2 (F1-04) |
| OFF | ON | ON | Multi-step frequency 3 (F1-05) |
| ON | OFF | OFF | Multi-step frequency 4 (F1-06) |
| ON | OFF | ON | Multi-step frequency 5 (F1-07) |
| ON | ON | OFF | Multi-step frequency 6 (F1-08) |
| ON | ON | ON | Multi-step frequency 7 (F1-09) |

| | | | |
|---|---|---|---|
| C0-09 | Run or not when drive restored | 0: Run if trig edge +ON<br>1: Run as long as Run terminal is ON | Factory default: 0 |

This parameter works only when Run command is given by terminal.

0: Run if trig edge +ON

When the drive has been restored from fault, external stop, coast stop, emergency stop, etc., the drive will start to run when trig edge and ON are both detected.

1: Run as long as Run terminal is ON

When the drive has been restored from fault, external stop, coast stop, emergency stop, etc., the drive will start to run as long as the Run terminal is ON.

| | | | |
|---|---|---|---|
| C0-11 | Filtering time of digital input terminal | Range: 0.000s - 1.000s | Factory default: 0.010s |

Set the filtering time of X1~X4, and AI (when used as digital input terminal). Interference immunity of digital input terminals can be improved by appropriate filtering time. However, the response time of digital input terminal will become slower when filtering time is increased.

**ATTENTION:**

Terminal delay time and C0-11 filtering time can be used at the same time. X1 and X2 terminal signals first go through filtering time, then through delay time set by C0-12 and C0-13. However there is no delay time set for X3 and X4..

| | | | |
|---|---|---|---|
| C0-12 | Delay time of terminal X1 | Range: 0.0s - 3600.0s | Factory default: 0.0s |
| C0-13 | Delay time of terminal X2 | Range: 0.0s - 3600.0s | Factory default: 0.0s |

The delayed response time of digital input terminals X1 and X2 is set by these two parameters.

**ATTENTION:**

Terminal delay time and C0-11 filtering time can be used at the same time. X1 and X2 terminal signals first go through filtering time, then through delay time set by C0-12 and C0-13. However there is no delay time set for X3 and X4.

| | | | |
|---|---|---|---|
| C0-14 | Digital input terminal enabled status setting 1 | Range: 0000~1111 | Factory default: 1111 |

◆ Unit's place: X1

0: Positive logic; ON when current passes through

1: Negative logic; ON when no current passes through

◆ Decade: X2 (same as X1)

◆ Hundreds place: X3 (same as X1)

◆ Thousands place: X4 (same as X1)

| | | | |
|---|---|---|---|
| C0-16 | Digital input terminal enabled status setting 3 | Range: 0 - 1 | Factory default: 0 |

This parameter sets the enabled condition of AI as digital input terminal (need to be defined by C0-08).

◆ Unit's place: AI

0: Positive logic; < 3V, ON; > 7V, OFF

1: Negative logic; < 3V, OFF; > 7V, ON

| | | | |
|---|---|---|---|
| C0-17 | Terminal UP/DOWN frequency adjustment setting | Range: 0000 - 1111 | Factory default: 0100 |

◆ Unit's place: action when stop

0: Clear

Terminal UP/DOWN frequency adjustment value is cleared when the drive stops.

1: Holding

Terminal UP/DOWN frequency adjustment value is maintained when the drive stops.

◆ Decade: action on power loss

0: Clear

Terminal UP/DOWN frequency adjustment value is cleared in case of power loss.

1: Holding

Terminal UP/DOWN frequency adjustment value is saved in case of power loss.

◆ Hundreds place: integral function

0: No integral function

Adjustment step size is kept constant during terminal UP/DOWN adjustment, in compliance with C0-18.

1: Integral function enabled

When frequency is adjusted through terminal UP/DOWN, initial step size is set by C0-18. With the effective lasting time of the terminals, adjustment step size will increase gradually.

◆ Thousands place: UP/DOWN REV setting

0: FWD/REV switch not allowed for UP/DOWM adjustment

UP/DOWN adjustment couldn't change the run direction

1: FWD/REV switch allowed for UP/DOWM adjustment

UP/DOWN adjustment can change the run direction

| C0-18 | Terminal UP/DOWN frequency change step size | Range: 0.00Hz/s - 100.00Hz/s | Factory default: 0.10Hz/s |
|---|---|---|---|

When frequency command is "digital setting + terminal UP/DOWN adjustment", this parameter is used to set the step size of frequency adjustment UP/DOWN. The step size is defined as frequency change per second, and the smallest step size is 0.01 Hz/s.

| C0-20 | Option of virtual input terminal | Range: 000 - 10F | Factory default: 000 |
|---|---|---|---|

This parameter is a 9-bit binary numeral. The terminals that correspond respectively to bit8 (the highest bit of binary system) through bit0 (the lowest bit of binary system) are as follows:

**Table 6-3**

| Hundreds place | Decade | | | | Unit's place | | | |
|---|---|---|---|---|---|---|---|---|
| bit8 | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| AI | Reserved | | | | X4 | X3 | X2 | X1 |

◆ Unit's place: bit0 - bit3 : X1 - X4

0: Actual terminal takes effect

1: Virtual terminal takes effect

◆ Decade:reserved

◆ Hundreds place: bit8 : AI

0: Actual terminal takes effect

1: Virtual terminal takes effect

Virtual terminals simulate actual terminals via communication. Each bit represents one terminal. When selecting virtual terminal, corresponding bit should be set to 1 in C0-20.

### Group C1 Digital Output

| | | | |
|---|---|---|---|
| C1-00 | Y output function | Range: 0 - 99 | Factory default: 0 |
| C1-02 | Control panel relay output function | Range: 0 - 99 | Factory default: 14 |

These two parameters define the function of digital output terminal and control panel relay output

| | | | |
|---|---|---|---|
| C1-04 | Y output delay time | Range: 0.0s - 3600.0s | Factory default: 0.0s |
| C1-06 | Control board relay output delay time | Range: 0.0s - 3600.0s | Factory default: 0.0s |

These two parameters define the time delay of Y output terminal and control board relay output.

| | | | |
|---|---|---|---|
| C1-08 | Enabled state of digital output | Range: 000 - 101 | Factory default: 000 |

◆ Unit's place: Y

0: Positive logic; ON when current passes through

1: Negative logic; ON when no current passes through

◆ Decade: Reversed

◆ Hundreds place: control board relay output

0: Positive logic; ON when there is coil excitation

1: Negative logic; ON when there is no coil excitation

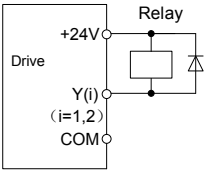



**Fig. 6-13**

| | | | |
|---|---|---|---|
| C1-09 | Detected object of frequency doubling technology(FDT) | Range: 00 - 11 | Factory default: 00 |

◆ Unit's place: FDT1 detective object

0: Set value of speed (frequency after Accel/Decel)

FDT1 output frequency is the command frequency after Accel/Decel.

1: Detected speed value

FDT1 output frequency is actually detected or identified frequency. If the drive is under V/f pattern, it should be output frequency.

◆ Decade: FDT2 detective object

0: Set value of speed (frequency after Accel/Decel)

FDT2 output frequency is the command frequency after Accel/Decel.

1: Detected speed value

FDT2 output frequency is actually detected or identified frequency. If the drive is under V/f pattern, it should be output frequency.

| | | | |
|---|---|---|---|
| C1-10 | FDT1 upper bound | Range: 0.00Hz - maximum FREQ | Factory default: 50.00Hz |
| C1-11 | FDT1 lower bound | Range: 0.00Hz - maximum FREQ | Factory default: 49.00Hz |
| C1-12 | FDT2 upper bound | Range: 0.00Hz - maximum FREQ | Factory default: 25.00Hz |
| C1-13 | FDT2 lower bound | Range: 0.00Hz - maximum FREQ | Factory default: 24.00Hz |

These parameters should be set with digital output terminals "FDT1" and "FDT2".

Take FDT1 for example, the drive outputs ON signal when output frequency exceeds upper bound of FDT1 and will not output OFF signal unless output frequency drops to below lower bound of FDT1. Please set C1-10 to be larger to some certain extent than C1-11, avoiding status change frequently. See Fig. 6-14:

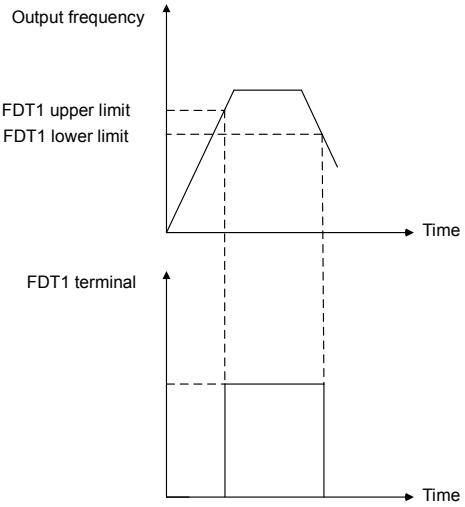



Fig. 6-14

| | | | |
|---|---|---|---|
| C1-14 | Detection width of frequency attained | Range: 0.00Hz - maximum FREQ | Factory default: 2.50Hz |

This parameter should be set with digital output terminal "frequency attained". When the difference between output frequency and command frequency is less than this value, terminal "frequency attained" aoutputs ON. See Fig. 6-15:

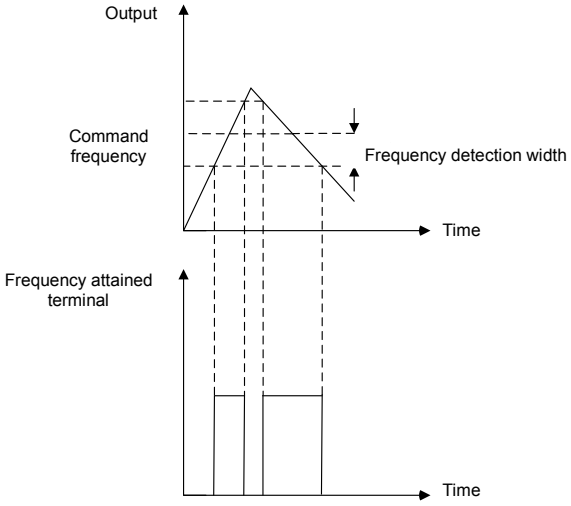



Fig. 6-15

| | | | |
|---|---|---|---|
| C1-15 | Zero current detection level | Range: 0.0% - 50.0% | Factory default: 5.0% |
| C1-16 | Zero current detection time | Range: 0.01s - 50.00s | Factory default: 0.50s |

The two parameters should be set with digital output terminal "zero current detection". When the drive output current is less than C1-15 and its lasting time attains the value of C1-16, terminal "zero current detection" outputs ON signal. See Fig. 6-16:

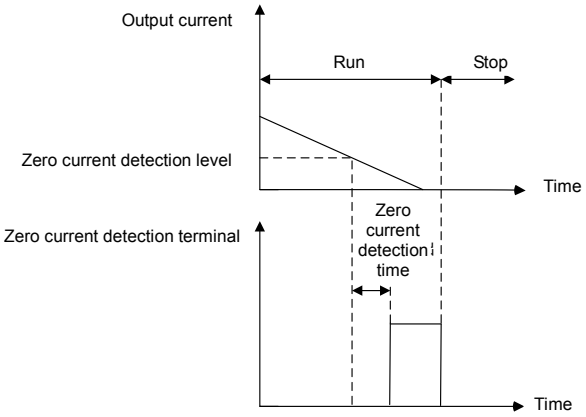



Fig. 6-16

## Group C2 Analogue and Pulse Input

| | | | |
|---|---|---|---|
| C2-00 | Analogue input curve | Range: 00 - 11 | Factory default: 00 |

Curves of analogue input AI is selected by this parameter.

◆ Unit's place: AI input curve

0: Curve 1 (2 points)
Defined by C2-01 - C2-04.

1: Curve 2 (4 points)
Defined by C2-05 - C2-12.

◆ Decade: Potentiometer input curve
Same as AI above.

| | | | |
|---|---|---|---|
| C2-01 | Maximum input of curve 1 | Range: minimum input of curve 1 - 110.0% | Factory default: 100.0% |
| C2-02 | Set value corresponding to maximum input of curve 1 | Range: -100.0% to 100.0% | Factory default: 100.0% |
| C2-03 | Minimum input of curve 1 | Range: -110.0% to maximum input of curve 1 | Factory default: 0.0% |
| C2-04 | Set value corresponding to minimum input of curve 1 | Range: -100.0% to 100.0% | Factory default: 0.0% |

Curve 1 is defined by above-noted 4 parameters.

Input values C2-01 and C2-03:

AI can select 0~10V voltage input or 0~20mA current input by jumper.

If 0~10V is selected: 0V corresponds to 0%, while 10V corresponds to 100%.

If 0~20mA is selected: 0mA corresponds to 0%, while 20mA corresponds to 100%.

Keypad potentiometer only support 0~5V, 0V corresponds to 0%, 5V corresponds to 100%.

Corresponding set values C2-02 and C2-04:

When the corresponding set value is frequency: 100% is the maximum frequency, while -100% is the maximum negative frequency.

When the corresponding set value is current: 100% means 2 times the rated current of drive while "less than or equal to 0%" corresponds to zero current.

When corresponding set value is torque: 100% means 2 times the rated torque, while -100% means negative "2 times the rated torque".

When the corresponding set value is output voltage (e.g. the voltage setting in case of V/f separated pattern): 100% corresponds to rated voltage of motor. "Less than or equal to 0%" corresponds to 0V voltage.

Curve diagram is shown as below:

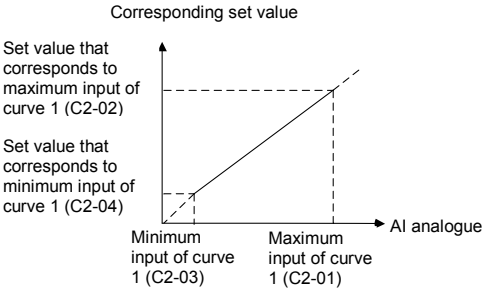



Fig. 6-17

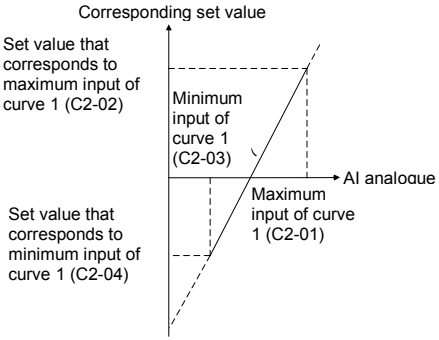



Fig. 6-18

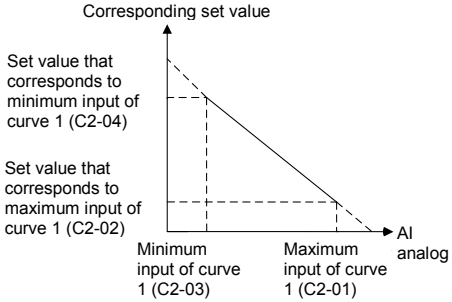



Fig. 6-19

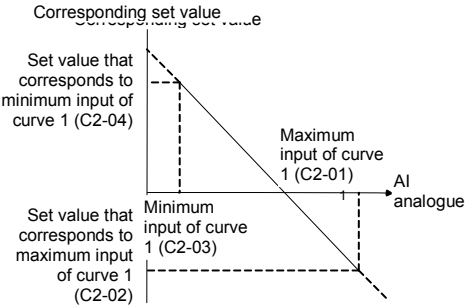



Fig. 6-20

| | | | |
|---|---|---|---|
| C2-05 | Maximum input of curve 2 | Range: input of inflection point A of curve 2 - 110.0% | Factory default: 100.0% |
| C2-06 | Set value corresponding to maximum input of curve 2 | Range: -100.0% to 100.0% | Factory default: 100.0% |
| C2-07 | Input of inflection point A of curve 2 | Input of inflection point B of curve 2 - maximum input of curve 2 | Factory default: 0.0% |
| C2-08 | Set value corresponding to input of inflection point A of curve 2 | Range: -100.0% to 100.0% | Factory default: 0.0% |
| C2-09 | Input of inflection point B of curve 2 | Range: minimum input of curve 2 - Input of inflection point A of curve 2 | Factory default: 0.0% |
| C2-10 | Set value corresponding to input of inflection point B of curve 2 | Range: -100.0% to 100.0% | Factory default: 0.0% |
| C2-11 | Minimum input of curve 2 | Range: -110.0% to input of inflection point B of curve 2 | Factory default: 0.0% |
| C2-12 | Set value corresponding to minimum input of curve 2 | Range: -100.0% to 100.0% | Factory default: 0.0% |

Description of input value of curve 2: Voltage input:

1) With regard to AI, 0% corresponds to 0V or 0mA, while 100% corresponds to 10V or 20mA.
2) Regarding to keypad potentiometer, 0% corresponds to 0V, while 100% corresponds to 5V.

Curve 2 is defined by C2-05~C2-12. The input of curve 2 and the definition of corresponding set value is the same as AI. The difference is that curve 1 is a straight line while curve 2 is a broken line with two inflection points. Diagram of curve 2 is shown as below:

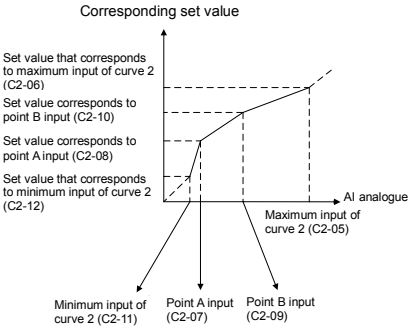



Fig. 6-21

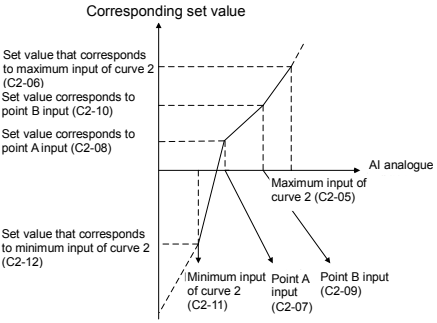



Fig. 6-22

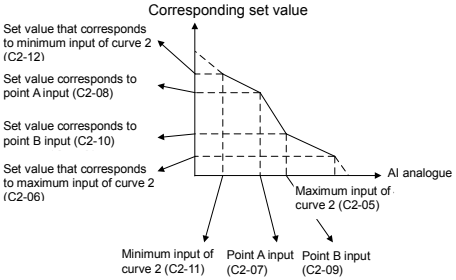



Fig. 6-23

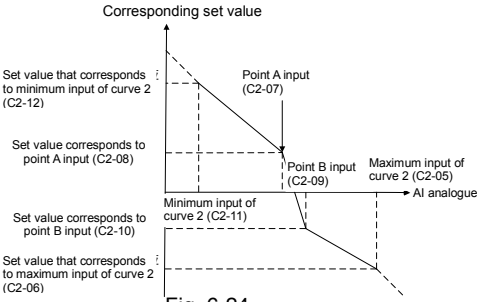



Fig. 6-24

.

| C2-20 | Interrupt detection time | Range: 0.00s - 100.00s | Factory default: 0.50s |
|---|---|---|---|

When this parameter value is set to 0.00z it means no interrupt line detection (means no alarm even out of MIN-MAX).

### Group C3 Analogue and Pulse Output

| C3-00 | AO output function | Range: 0 - 99 | Factory default: 2 |
|---|---|---|---|

AO is analog output terminal, whose voltage/current output type can be selected by dip switch AI. The output is 0~10V as illustrated in Fig. 6-25.

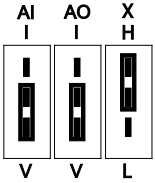



Fig. 6-25

Output range of DO pulse frequency is 0 - C3-09 (maximum output pulse frequency).
The ranges of corresponding digital output of AO, EAO and DO are as shown in the table 6-4.

**Table 6-4**

| Parameter value | Function | Range |
|---|---|---|
| 0 | No output | No output |
| 1 | Command frequency | 0 - maximum power |
| 2 | Output frequency | 0 - maximum frequency |
| 3 | Output current | 0 - 2 times the rated current of inverter |
| 4 | Output torque | 0 - 2 times the rated torque |
| 5 | Output voltage | 0 - 2 times the rated voltage of motor |
| 6 | Output power | 0 - 2 times the rated power |
| 7 | Bus voltage | 0 - 1000V |
| 9 | Torque current | 0 - 2 times the rated current of motor |
| 10 | Magnetic flux current | 0 - 2 times the rated current of motor |
| 11 | AI | 0 - 10V/0 - 20mA |
| 16 | Communication input percentage | 0 - 65535 |
| 17 | Output frequency before compensation | 0 - maximum frequency |
| 18 - 99 | Reserved | |

| | | | |
|---|---|---|---|
| C3-03 | AO offset | Range: -100.0% to 100.0% | Factory default: 0.0% |
| C3-04 | AO gain | Range: -2.000 to 2.000 | Factory default: 1.000 |

When users need to chang AO measurement range or correct the error of the meter, it can be realized by setting of C3-03 and C3-04. If using factory default, 0~10V (or 0~20mA) of AO corresponds to “0~maximun”. See table 6-4 for details. By expressing standard output of AO as x, the adjusted AO1 output as y, the gain as k, and the offset as b (100% of offset corresponds to 10V or 20mA), there is the equation: y=kx+b

**Example:**

C3-00 is set to 2: output frequency. Standard AO output: AO outputs 0V when output frequency is 0, and outputs 10V when output frequency is the maximum frequency. If AO is requested to output 2V when output frequency is 0Hz, and to output 8V when output frequency is the maximum frequency.

There is: 2=k×0+b; 8=k×10+b. Through these two equations, we obtain: k = 0.6, b = 2V, i.e. C3-03 is set to 20.0% while C3-04 is set to 0.600.

**Additional examples are shown as below:**

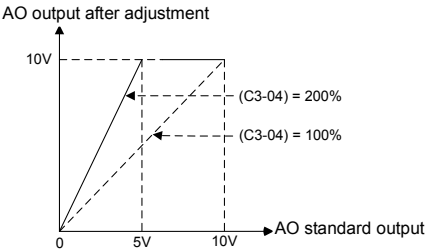



Fig. 6-26 AO gain influence on output

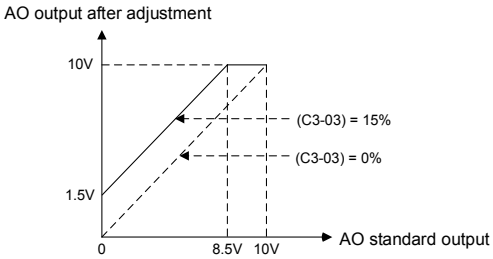



Fig. 6-27 AO offset influence on output

| | | | |
|---|---|---|---|
| C3-05 | AO filtering time | Range: 0.0s - 10.0s | Factory default: 0.0s |

Define output filtering time of AO terminal.

### Group C4 Automatic Correction of Analogue Input

Parameter Group C4 is used to perform automatic correction of analogue input channels, obtaining the gain and offset of corresponding channel automatically. They can automatically modify the measuring range of corresponding channel or correct meter error.

| | | | |
|---|---|---|---|
| C4-00 | Analogue corrected channel | Range: 0 - 2 | Factory default: 0 |

0: No correction
No correction to any channels.
1: Correct AI
Automatically correct analogue AI channel.
2: Correct AI2
Automatically correct analogue AI2 channel.

| | | | |
|---|---|---|---|
| C4-01 | Sampling value of calibration point 1 of AI | Range: 0.00V - 10.00V | Factory default: 1.00V |
| C4-02 | Input value of calibration point 1 of AI | Range: 0.00V - 10.00V | Factory default: 1.00V |
| C4-03 | Sampling value of calibration point 2 of AI | Range: 0.00V - 10.00V | Factory default: 9.00V |
| C4-04 | Input value of calibration point 2 of AI | Range: 0.00V - 10.00V | Factory default: 9.00V |
| C4-05 | Sampling value of calibration point 1 of Potentiometer | Range: -10.00V to 10.00V | Factory default: 1.00V |
| C4-06 | Input value of calibration point 1 of Potentiometer | Range: -10.00V to 10.00V | Factory default: 1.00V |
| C4-07 | Sampling value of calibration point 2 of Potentiometer | Range: -10.00V to 10.00V | Factory default: 9.00V |
| C4-08 | Input value of calibration point 2 of Potentiometer | Range: -10.00V to 10.00V | Factory default: 9.00V |

Take keypad potentiometer for example, automatic correction is as follows

1) Set C4-00 to 2 in stop status and press ENT key to confirm. In this way, keypad potentiometer is selected as correction channel.
2) Input a relatively low analog voltage (e.g. about 1V) via potentiometer, and input the theoretical value of this analog voltage by C4-06 after the stabilization of this voltage input, and then press ENT key to confirm.
3) Input a relatively high analog voltage (e.g. about 5V) via potentiometer, and input the theoretical value of this analog voltage by C4-08 after the stabilization of this voltage input, and then press ENT key to confirm.
4) Upon the successful correction, C4-00 parameter will be restored to zero.

**ATTENTION:**

- Set the theoretical value or actual value of analog voltage in C4-06 and C4-08. This value can be either the set value of analog output of peripheral equipment, or the actual voltage value of analog input measured by a multimeter or other instruments.
- C4-05 and C4-07 are the sampling values of analog input voltage. These values is for reference only. Do not write the value of C4-05 directly into C4-06, or write the value of C4-07 directly into C4-08.

# Group d Motor and Control Parameters

## Group d0 Parameters of Motor

When motor is selected as current load motor, please set motor parameters in Group d0.

| | | | |
|---|---|---|---|
| d0-00 | Type of motor | Range: 0 - 1 | Factory default: 0 |

0: Ordinary motor

1: Variable frequency motor

The major difference between ordinary motor and variable frequency motor lies in the handling of motor overload protection. Under low speed running, ordinary motor has poor heat dissipation, so motor overload protection shall be derated at low speed. Since fan-based heat dissipation of variable frequency motor is not affected by motor speed, low-speed overload protection is not necessarily derated. Therefore, please set d0-00 to 0 when driving ordinary asynchronous motor so as to protect the motor reliably.

| | | | |
|---|---|---|---|
| d0-01 | Power rating of motor | Range: 0.4kW - 6553.5kW | Factory default: model defined |
| d0-02 | Motor rated voltage (220V) | Range: 0V~260V | Factory default: 220V |
| | Motor rated voltage (380V) | Range: 0~480V | Factory default: 380V |
| d0-03 | Rated current of motor | Range: 0.0A - 6553.5A | Factory default: model defined |
| d0-04 | Rated frequency of motor | Range: 0.00Hz - 600.00Hz | Factory default: 50.00Hz |
| d0-05 | Number of poles of motor | Range: 1 - 80 | Factory default: 4 |
| d0-06 | Rated speed of motor | Range: 0 - 65535 r/min | Factory default: model defined |

Above-noted motor parameters must be correctly set according to motor nameplate. Please select the motor that suits the power class of the drive, or the control performance of the drive will drop dramatically.

| | | | |
|---|---|---|---|
| d0-07 | Stator resistance R1 of motor | Range: 0.001Ω - 65.535Ω | Factory default: model defined |
| d0-08 | Leakage inductance L1 of motor | Range: 0.1mH - 6553.5mH | Factory default: model defined |
| d0-09 | Rotor resistance R2 of motor | Range: 0.001Ω - 65.535Ω | Factory default: model defined |
| d0-10 | Mutual inductance L2 of motor | Range: 0.1mH - 6553.5mH | Factory default: model defined |
| d0-11 | No-load current of motor | Range: 0.0A - 6553.5A | Factory default: model defined |
| d0-12 | Flux weakening coeff 1 of motor | Range: 0.0000 - 1.0000 | Factory default: model defined |
| d0-13 | Flux weakening coeff 2 of motor | Range: 0.0000 - 1.0000 | Factory default: model defined |
| d0-14 | Flux weakening coeff 3 of motor | Range: 0.0000 - 1.0000 | Factory default: model defined |

The drive needs above-noted paramters to control its matching motor. If the parameters of motor is known, just write the actual value into d0-07 - d0-14 correspondingly.

After the identification of parameters of motor, above-noted parameters are automatically updated and saved. Parameters d0-07 - d0-09 are obtained through static identification, and parameters d0-07 - d0-14 are obtained through rotation identification. If above-noted parameters are unknown and it is not allowed to perform motor parameter identification, please input the parameters manually by referring to parameters of like motors.

If motor power rating d0-01 is changed, d0-02 - d0-14 will be automatically restored to default setting of the standard motor.

| | | | |
|---|---|---|---|
| d0-22 | Parameter identification of motor | Range: 0 - 2 | Factory default: 0 |

Parameters for controlling the motor performance are automatically obtained through parameter identification, and the result will be automatically saved upon the completion of identification.

Be sure to correctly input motor parameters d0-01 - d0-06 before parameter identification.

0: No action

1: Static identification

Static identification applies to the cases where rotating identification cannot be favorably performed due to the fact that it is impossible to disengage the motor from its load. After d0-22 is set to 1 and confirmed, press the key **RUN** to start static identification. d0-22 will be restored to 0 upon the successful completion of identification. In this way, parameters d0-07 - d0-09 are obtained.

2: Rotating identification

To perform rotation identification, it is essential to disengage the motor from its load. Identification is prohibited when motor is loaded. After d0-22 is set to 2 and confirmed, press **RUN** to perform static identification, upon the completion of which, the motor would accelerate to a fixed frequency in the set ramp-up time, maintaining a period of time, and then stop by ramp down according to the set ramp down time. In this way, the identification comes to an end, and d0-22 will be restored to 0. Parameters d0-07 - d0-14 have be obtained after the successful completion of rotating identification. To perform rotating identification, please set appropriate ramp-up and ramp-down time (i.e. Accel/Decel time. If overcurrent or overvoltage fault occurs during identification, please prolong Accel/Decel time accordingly.

**ATTENTION:**

- Please make sure the motor is in a stationary state before the identification, or parameter identification cannot be performed normally.
- Keypad displays "TUNE" and RUN indicator light is on during identification. RUN indicator light is off upon the completion of parameter identification.
- Once parameter identification fails, the fault code "tUN" shall be displayed.

| d0-23 | Overload protection mode of motor | Range: 0 - 1 | Factory default: 1 |
|---|---|---|---|

This parameter determines motor overload protection mode.

0: No protection

Once 0 is selected, it would be impossible to perform motor overload protection. Please take care.

1: Judged from motor current

Provide overload protection judged from output current and its lasting time. Overload protection detection time is set by d0-24..

| d0-24 | Overload protection detection time of motor | Range: 0.1min - 15.0min | Factory default: 5.0min |
|---|---|---|---|

When d0-23 is set to "1: judged from motor current", overload protection time is determined by this parameter on the basis of the running current being 150% of motor rated current. An alarm of motor overload fault "oL2" shall be displayed once the lasting time exceeds this parameter value. Protection time when the running current is other value is automatically calculated according to inverse time lag characteristic curve. See Fig. 6-28.

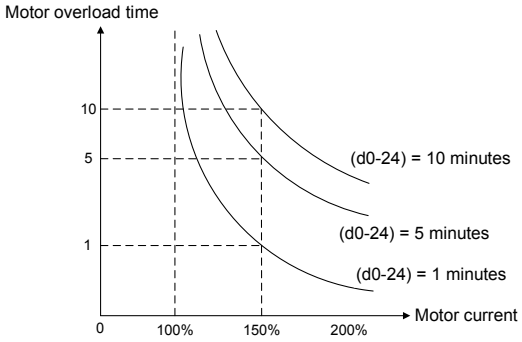



Fig. 6-28 Motor protection curve for ordinary motor running at 50Hz

Overload protection is performed for variable frequency motor according to the curve as shown in Fig. 6-28 at either high or low rotation speed. Due to the fact that fan-based heat dissipation of ordinary motors become poor at low speed, the protection is derated at low speed.

**Example:** when d0-24 is set to 10.0 minutes, and the motor is running at 10Hz input, motor overload fault "oL2" shall be displayed when the running current is 150% of the motor rated current with lasting time 4 minutes.

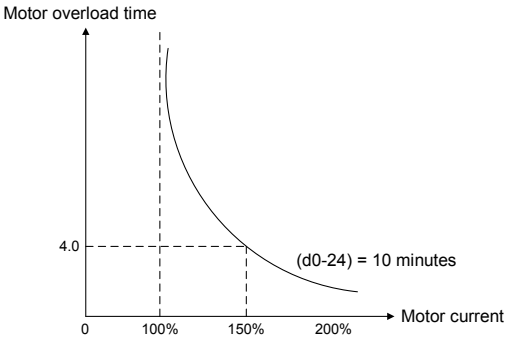



Fig. 6-29 Overload protection curve for ordinary motor running at 10Hz

| | | | |
|---|---|---|---|
| d0-27 | Flying start Kp | Range: 0.00~655.35 | Factory default: 0 |
| d0-28 | Flying start Ki | Range: 0.00~655.35 | Factory default: 2.00 |

d0-27 and d0-28 are PI parameters for software-based flying start. Appropriate parameter values should be set according to real application for a decent flying start.

### Group d1 V/f Control Parameters of Motor

Set control parameters in Group d1 when motor is selected as current load motor on which V/f control is performed.

| | | | |
|---|---|---|---|
| d1-00 | V/f curve setting | Range: 0 - 1 | Factory default: 0 |

Set the relation between output voltage and output frequency of the drive when the motor is under V/f control.

0: Linear V/f

Applies to general constant-torque load. When drive output frequency is 0, output voltage will be 0, while when output frequency is rated frequency of motor, the output voltage would be rated voltage of motor.

1: Broken line V/f (determined by d1-01 - d1-08)

Applies to spin drier, centrifuge, industrial washing machine and other special loads. When drive output frequency is 0, output voltage will be 0, while when output frequency is rated frequency of motor, the output voltage would be rated voltage of motor. What is different is this pattern can set 4 inflection points by d1-01 - d1-08. See Fig. 6-30.

V0, V1, V2, V3 and f0, f1, f2 and f3 in the figure are voltage value and frequency value set by parameters d1-01 - d1-08.

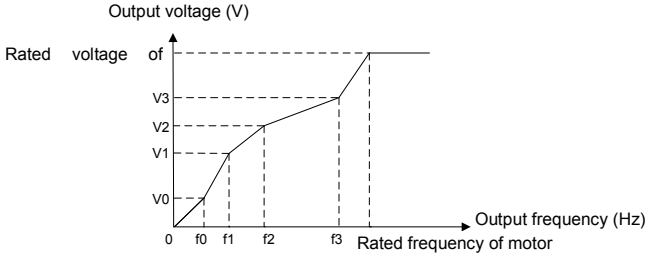



Fig. 6-30 User-defined segmented V/f curve

Parameter values 2 - 6 apply to torque-dropped loads such as fans and water pumps. See Fig. 6-31.

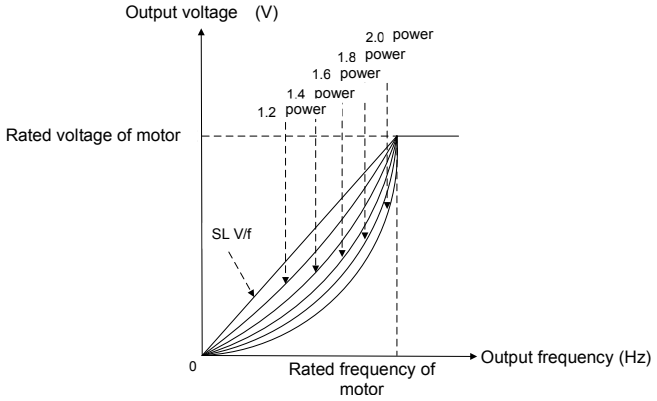



Fig. 6-31 1.2 - 2.0 power V/f curve

| | | | |
|---|---|---|---|
| d1-01 | V/f frequency value f3 | Range: 0.00Hz - rated frequency of motor | Factory default: 50.00Hz |
| d1-02 | V/f voltage value V3 | Range: 0.0% - 100.0% | Factory default: 100.0% |
| d1-03 | V/f frequency value f2 | Range: d1-05 - d1-01 | Factory default: 0.00Hz |
| d1-04 | V/f voltage value V2 | Range: 0.0% - 100.0% | Factory default: 0.0% |
| d1-05 | V/f frequency value f1 | Range: d1-07 - d1-03 | Factory default: 0.00Hz |
| d1-06 | V/f voltage value V1 | Range: 0.0% - 100.0% | Factory default: 0.0% |
| d1-07 | V/f frequency value f0 | Range: 0.00Hz - d1-05 | Factory default: 0.00Hz |
| d1-08 | V/f voltage value V0 | Range: 0.0% - 100.0% | Factory default: 0.0% |

d1-01 - d1-08 is used for broken line V/f mode. Voltage value 100% corresponds to rated voltage of motor. Please rationally set the values of frequency and voltage at knees on the basis of characteristics of motor and load. Improper setting may rise output current even burn

the motor.

| d1-09 | Torque boost | Range: 0.0% - 30.0% | Factory default: 0.0% |
|---|---|---|---|

Under V/f pattern, output voltage at low frequency can be compensated by this parameter, improving the torque output. 0.0% corresponds to automatic torque boost, and drive output voltage is automatically compensated via detection of load current. Automatic torque boost is valid only for linear V/f pattern.

100% of torque boost corresponds to rated voltage of motor. A non-zero value means the output voltage rises on the basis of V/f curve and this takes effect at parameter values 0 - 6 of d1-00. It is suggested this parameter value be gradually increased from zero until the starting requirement is met. Boost value is not suggested to be set to a relatively big one, as it is likely to bring about a bigger drive current and higher motor temperature.

Torque boost diagram is shown in Fig. 6-32:

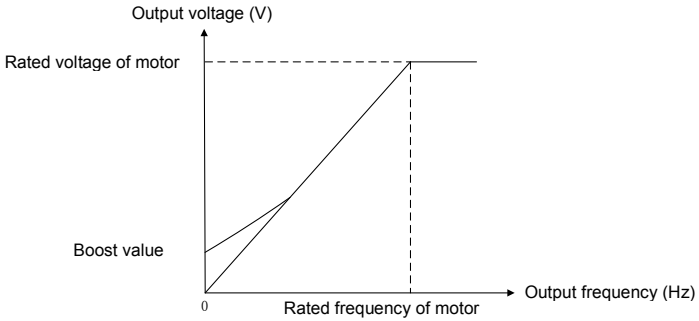



Fig. 6-32

| d1-10 | Slip compensation gain | Range: 0.0% - 400.0% | Factory default: 100.0% |
|---|---|---|---|

Used under V/f control. When the motor is driving an electric-driven load, motor speed drops with the increase of load. When the motor is driving a power generating load, motor speed will increase with the increase of load. Appropriate slip compensation gain can maintain constant motor speed when the motor load is changing.

To ensure the performance of slip compensation gain, setting motor rated speed d0-06 is essential. The difference between d0-06 and the motor running speed without load is the rated slip. Through real-time detection of motor load, slip compensation automatically adjusts the drive output frequency on the basis of rated slip and motor load, reducing the impact of changing load on motor speed.

Gain adjustment method: please make the adjustment around 100%. When motor is driving an electric-driven load: if motor speed is relatively lower, the gain should be appropriately increased; if motor speed is relatively higher, reduce the gain appropriately. When motor is driving a power generating load: if motor speed is relatively lower, the gain should be decreased; if motor speed is relatively higher, increase the gain appropriately.

Diagram of slip compensation gain is shown as Fig. 6-33 and 6-34.

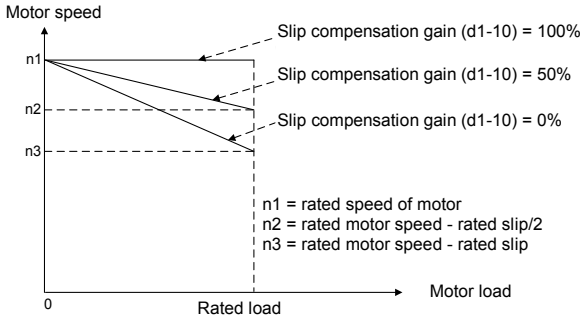



Fig. 6-33 Diagram of slip compensation on electric driven load

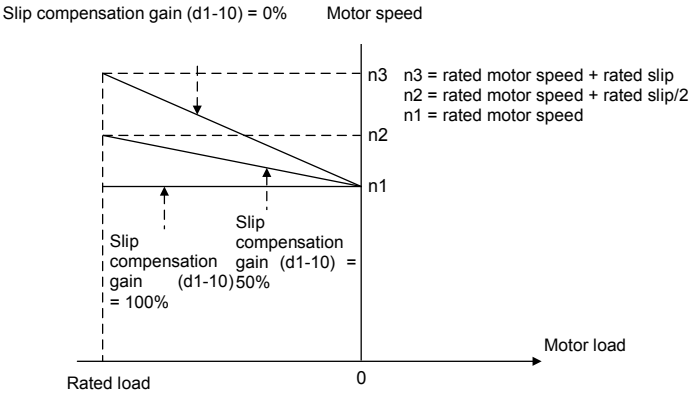



Fig. 6-34 Diagram of slip compensation on power generating load

| d1-12 | Current limitation source | Range: 0 - 2 | Factory default: 1 |
|---|---|---|---|

0: Disabled
1: Set by d1-13
2: Set by AI

When a non-zero value is set by d1-12, the current limitation is enabled. When output current rises dramatically because of sharp change of load, instant adjustment of output frequency will keep the output frequency below the set limitation. When the load is reduced, output frequency will recover promptly. If the setting speed or motor load change dramatically, this function can effectively reduce over-current fault.

When current limitation is enabled, the output frequency at constant speed may change at times and the Accel/Decel time may probably be automatically prolonged. Therefore, this function should not be used where output frequency or Accel/Decel time is not allowed to change.

| d1-13 | Digital setting of current limit value | Range: 20.0% - 200.0% | Factory default: 160.0% |
|---|---|---|---|

When d1-12 is set to "1: set by d1-13", the drive keeps output current less than this current limit value through instantaneous adjustment of output frequency. 100% current limit value corresponds to rated current of the drive. If this parameter value is set to a relatively big one, it will increase the chances of over-current. If this parameter value is set to a relatively small one, it will affect the loaded capability of the drive.

| d1-14 | Current limit coeff on flux weakening | Range: 0.001 - 1.000 | Factory default: 0.500 |
|---|---|---|---|

When the drive runs at the frequency higher than rated frequency of motor, Accel/Decel characteristic and output torque can be effectively improved by setting this parameter appropriately.

| d1-15 | Energy saving percentage | Range: 0% - 40.0% | Factory default: 0.0% |
|---|---|---|---|

During no-load or light-load application, load current is detected so as to appropriately reduce output voltage, reducing the copper loss and iron loss of motor with the purpose of energy saving. The larger the energy-saving percentage is, the better the energy-saving effect will be, but the response will be slower. This parameter is applicable to loads such as fan and pump or light-load for a long time. Where rapid change is required, this parameter is suggested to be default set 0.0%.

| | | | |
|---|---|---|---|
| d1-16 | V/f oscillation suppression gain 1 | Range: 0 - 3000 | Factory default: 8 |
| d1-17 | V/f oscillation suppression gain 2 | Range: 0 - 3000 | Factory default: 10 |

Under V/f control, speed and current oscillation is likely to occur due to load vibration, and may lead to system failure even over current protection. This is particularly obvious during no-load or light-load applications. The appropriate setting of parameter values of d1-16 and d1-17 would effectively suppress speed and current oscillation. In many case it is not necessary to modify the default setting. Please make progressive change around default setting, since excessive setting will influence V/f control performance.

### Group d2 Vector Control Parameters of Motor

Set control parameters in Group d2 when motor is selected as current load motor on which sensor-less vector control is performed.

| | | | |
|---|---|---|---|
| d2-00 | Reserved | Reserved | Reserved |
| d2-01 | ASR high-speed proportional gain Kp1 | Range: 0.0 - 20.0 | Factory default: 2.0 |
| d2-02 | ASR high-speed integration time Ti1 | Range: 0.000s - 8.000s | Factory default: 0.500 |
| d2-03 | ASR low-speed proportional gain Kp2 | Range: 0.0 - 20.0 | Factory default: 2.0 |
| d2-04 | ASR low-speed integration time Ti2 | Range: 0.000s - 8.000s | Factory default: 0.500 |
| d2-05 | ASR switching frequency 1 | Range: 0.00Hz - d2-06 | Factory default: 5.00Hz |
| d2-06 | ASR switching frequency 2 | Range: d2-05 - upper limiting frequency | Factory default: 10.00Hz |

Under sensor-less vector control (SVC), motor speed is kept at set value by automatic speed regulator (ASR). ASR parameters should be set in d2-01 - d2-06.

The proportional gain Kp and integration time Ti of ASR can be set through d2-01 - d2-04 so as to change the speed response characteristic under SVC.

Increment of proportional gain Kp can bring in fast response of the system. However, bigger Kp value will bring about larger system oscillation.

Reduction of integration time Ti can also quicken response time, but small Ti value will result in big system overshooting and may easily bring about oscillation.

Principle for adjustment of proportional gain Kp and integration time Ti: proportional gain Kp is usually adjusted prior, maximizing Kp at the premise of ensuring the system is subject to no oscillation, and then adjust integration time Ti to provide the system with both instant

response characteristic and less overshooting.

d2-01 - d2-02 are the proportional gain and integration time of the drive at high speed.

d2-03 - d2-04 are the proportional gain and integration time of the drive at low speed.

Distinction between high speed and low speed is determined by d2-05 - d2-06. The diagram is as shown in Fig. 6-35.

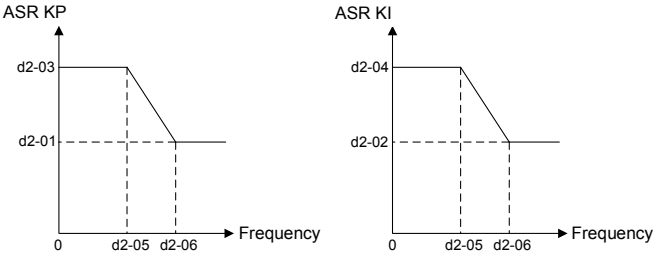



Fig. 6-35

ASR parameters are normally adjusted in the following order: select appropriate switching frequency. Adjust proportional gain d2 -01 and integration time d2-02 at high speed, ensuring the system has no oscillation and meets the requirements of dynamic response characteristics. Adjust proportional gain d2-03 and integration time d2-04 at low speed, ensuring there is no oscillation at low speed and requirements of dynamic response characteristics are met.

**ATTENTION:**

Inappropriate parameters of Kp, Ti may bring about overcurrent or overvoltage faults. Usually, fine adjustment should be performed close to factory default parameter.

| | | | |
|---|---|---|---|
| d2-07 | ASR input filtering time | Range: 0.0ms - 500.0ms | Factory default: 0.3ms |

Sets the input filtering time of ASR. No need to modify its default setting if there is no special requirement.

| | | | |
|---|---|---|---|
| d2-08 | ASR output filtering time | Range: 0.0ms - 500.0ms | Factory default: 0.3ms |

Sets the output filtering time of ASR. No need to modify its default setting if there is no special requirement.

| | | | |
|---|---|---|---|
| d2-09 | ACR proportion coefficient Kp | Range: 0.000 - 4.000 | Factory default: 1.000 |
| d2-10 | ACR integration coefficient Ki | Range: 0.000 - 4.000 | Factory default: 1.000 |

These two parameters determine the characteristics of automatic current regulator (ACR) under SVC pattern. Increment of proportion coefficient and/or integration coefficient can shorten torque response time. Reduction of proportion coefficient an/or integration coefficient can increase the stability of the system. Inappropriate setting may bring about system oscillation. Factory default is not needed to be changed in most cases.

| | | | |
|---|---|---|---|
| d2-11 | Pre-excitation time | Range: 0.000s - 5.000s | Factory default: 0.200s |

Applies to asynchronous motor. To attain quick start, it is necessary to perform pre-excitation before the running of motor, and the pre-excitation time is set by this parameter. Properly establish stable flux prior and then ramp up quickly. The set value of 0.000s means "no pre-excitation" and ramp up at the moment of the receipt of run command. Pre-excitation time is not included in Accel/Decel time. Factory default is suggested to maintain in most cases.

| | | | |
|---|---|---|---|
| d2-12 | Electric-driven torque limitation source | Range: 0 - 5 | Factory default: 0 |

Under the pattern of SVC speed control, and when the motor is driving an electric-driven load, it usually needs to restrict the output torque of the motor. This parameter sets the limitation command source.

0: d2-14 digital setting

Restrict output torque through digital set parameter d2-14. 100% corresponds to motor rated torque.

1: Analogue input AI

5: Communication

A superior device sets the limitation value of the output torque through standard RS485 communication interface at the drive. Refer to parameter Group H0 and appendix for details of communication.

| | | | |
|---|---|---|---|
| d2-13 | Brake torque limitation source | Range: 0 - 5 | Factory default: 0 |

Under the pattern of SVC speed control, and when the motor is driving a power generating load, it needs to restrict the output brake torque of the motor. This parameter sets the limitation command source.

0: d2-15 digital setting

Restrict output brake torque through digital set parameter d2-15. 100% corresponds to rated torque of the motor.

1: Analogue input AI
5: Communication
A superior device sets the limitation value of the output torque through standard RS485 communication interface at the drive. Refer to parameter Group H0 and appendix for details of communication.

| | | | |
|---|---|---|---|
| d2-14 | Digital setting of electric-driven torque | Range: 0.0% - 200.0% | Factory default: 180.0% |

When 0 is selected for d2-12, this parameter value limits the maximum output electric-driven torque. 100% corresponds to rated torque of the motor.

| | | | |
|---|---|---|---|
| d2-15 | Digital setting of brake torque | Range: 0.0% - 200.0% | Factory default: 180.0% |

When 0 is selected for d2-13, this parameter value limits the maximum output brake torque. 100% corresponds to rated torque of the motor.

| | | | |
|---|---|---|---|
| d2-16 | Torque limit coefficient in flux weakening | Range: 0.0% - 100.0% | Factory default: 50.0% |

Under the pattern of SVC speed control, and when the drive is running at frequency higher than rated frequency (flux weakening zone), appropriate torque limit coefficient can effectively improve the performance of output torque and Accel/Decel characteristics.

| | | | |
|---|---|---|---|
| d2-17 | Electric-driven slip compensation gain | Range: 10.0% - 300.0% | Factory default: 100.0% |

Under SVC pattern, adjustment of this parameter value can improve the speed accuracy when driving electric-driven load. If the load is becoming heavier and the motor speed is relatively lower, set a bigger value, while the motor speed is relatively higher, set a smaller value.

| | | | |
|---|---|---|---|
| d2-18 | Brake slip compensation gain | Range: 10.0% - 300.0% | Factory default: 100.0% |

Under SVC pattern, adjustment of this parameter value can improve the speed accuracy when driving power generating load. If the load is becoming heavier and the motor speed is relatively higher, set a bigger value, while the motor speed is relatively lower, set a smaller value.

# Group E Enhancement Function and Protection Parameters

## Group E0 Enhancement Function

| | | | |
|---|---|---|---|
| E0-00 | Carrier frequency | Range: 0.7 - 12.0kHz | Model defined |

With lower carrier frequency, output current of the drive produces higher harmonics, motor loss increases, and temperature and motor noise rise, but drive temperature, drive leakage current, and drive interference to external devices are lower or less.

with higher carrier frequency, drive temperature will rise, drive leakage current is bigger, and drive interference to external devices is bigger. However, motor loss and noise will be lower, and motor temperature will drop.

The table below specifies the setting range and factory default of PWM carrier frequency of the drives at different power ratings:

**Table 6-5**

| Power rating of the drive | Setting Range | Factory Default |
|---|---|---|
| ≤12kW | 0.7kHz - 12kHz | 8kHz |

PWM carrier frequency setting method:

1) When the motor line is too long, reduce carrier frequency.
2) When torque at low speed is unstable, reduce carrier frequency.
3) If the drive produces severe interference to surrounding equipment, reduce carrier frequency.
4) Leakage current of the drive is big, reduce carrier frequency.
5) Drive temperature rise is relatively high, reduce carrier frequency.
6) Motor temperature rise is relatively high, increase carrier frequency.
7) Motor noise is relatively big, increase carrier frequency.

| | | | |
|---|---|---|---|
| E0-01 | PWM optimization | Range: 000 - 021 | Factory default: 020 |

◆ Unit's place: PWM carrier frequency adjusted with temperature

0: Auto-adjust

1: No adjustment

When automatic adjustment of PWM carrier frequency is selected, the drive will automatically reduce carrier frequency with the temperature rise, protecting itself against overtemperature. Set to 1 where PWM carrier frequency change is not allowed.

◆ Decade: PWM modulation mode

0: five-segment and seven-segment automatic switchover

1: five-segment mode

2: seven-segment mode

This selection is valid only for V/f control. When five-segment mode is selected, the drive has low temperature rise but relatively higher output current harmonic. Under seven-segment mode, it has relatively higher temperature rise but lower output current harmonic. Under vector control mode pattern, PWM is seven-segment mode.

◆ Hundreds place: over-modulation adjustment

0: Disabled

1: Enabled

At low grid voltage or long-term heavy-duty operation, over-modulation can improve the voltage utilization and enhance the maximum voltage output capacity of the drive. This parameter takes effect only for V/f control, while over-modulation is enabled all the time under vector control pattern.

| E0-02 | Command when running time attained | Range: 000 - 111 | Factory default: 000 |
|---|---|---|---|

◆ Unit's place: command when consecutive running time attained

0: Continue to run

When consecutive running time of the drive attains the set value of E0-03, the drive will continue to run.

1: Stop and fault alarm

When consecutive running time of the drive attains the set value of E0-03, the drive will display fault code "to2" and coast to stop. Digital output terminal "consecutive running time attained" will output ON. When E0-03 is set to 0, this parameter value is enabled.

◆ Decade: command when accumulative running time reached

0: Continue to run

When accumulative running time of the drive attains the set value of E0-04, the drive will continue to run.

1: Stop and fault alarm

When the accumulative running time of the drive attains the set value of E0-04, the drive will display fault code "to3" and coast to stop. Digital output terminal "accumulative running time attained" will output ON. When E0-04 is set to 0, this parameter value is enabled.

◆ Hundreds place: unit of running time:

0: Second

1: Hour

Sets the unit of E0-03 consecutive running time and E0-04 accumulative running time.

| | | | |
|---|---|---|---|
| E0-03 | Consecutive running time | Range: 0.0 - 6000.0s(h) | Factory default: 0.0 s(h) |

When consecutive running time attains this set value, the drive will perform the action set by unit's place of E0-02. Time unit is set at hundreds place of E0-02. When this parameter value is set to 0, this function is enabled.

| | | | |
|---|---|---|---|
| E0-04 | Accumulative running time | Range: 0.0 - 6000.0s(h) | Factory default: 0.0 s(h) |

When accumulative running time of attains this set value, the drive will perform the action set by decade of E0-02. Time unit is set at hundreds place of E0-02. When this parameter value is set to 0, this function is enabled.

### Group E1 Protection Parameters

| | | | |
|---|---|---|---|
| E1-00 | Overvoltage stall | Range: 0 - 1 | Factory default: 1 |

0: Prohibited

1: Allowed

When the motor is decelerating with a high-inertia load or short-term regenerative braking occurs during the running, the energy feedback to the drive may raise DC bus voltage, and thus resulting in overvoltage protection.

When this parameter value is set to 1, the drive will detect its bus voltage and compare with parameter set by E1-01. If the bus voltage exceeds value of E1-01, drive output frequency shall be adjusted instantaneously and the deceleration time shall be automatically prolonged, to maintain the stability of DC bus voltage. Set this parameter to 0 if frequency fluctuation or Decel time prolonging is not allowed.

| | | | |
|---|---|---|---|
| E1-01 | Overvoltage stall protection voltage (220V) | Range: 100%~120% | Factory default: 116% |
| | Overvoltage stall protection voltage (380V) | Range: 120%~150% | Factory default: 135% |

When E1-00 is set to 1, if DC bus voltage exceeds this parameter value, it will dynamically adjust output frequency, prolong deceleration time. This value is a percentage value compared to standard DC bus voltage.

| | | | |
|---|---|---|---|
| E1-02 | Undervoltage stall | Range: 0 - 1 | Factory default: 0 |

0: Disabled

1: Enabled

Under momentary voltage drop or momentary power loss, the drive will accordingly drop output frequency, and compensate the voltage drop via the energy feedback from load, so as to maintain consecutive running, no trip. This function applies to fans and centrifugal pumps and such.

| | | | |
|---|---|---|---|
| E1-03 | Overload alarm | Range: 000 - 111 | Factory default: 000 |

◆ Unit's place: detection option

0: Always detect

Overload alarm works all the time during drive running.

1: Detect at constant speed only

Overload pre-alarm only works during constant-speed running of inverter.

◆ Decade: compared object

0: Rated current of motor

Compared object is the rated current relative to motor, and display "oL2" when the alarm is given under this setting

1: Rated current of drive

Compared object is the rated current of drive, and display "oL1" when the alarm is given under this setting.

◆ Hundreds place: alarm option

0: Alarm and continue to run

When drive output current exceeds the level set by E1-04 and the lasting time attains parameter value of E1-05, the drive will alarm but continue its running.

1: Protection enabled and coast to stop

When drive output current exceeds the level set by E1-04 and the lasting time attains parameter value of E1-05, the drive will display overload fault and coast to stop.

| | | | |
|---|---|---|---|
| E1-04 | Overload alarm threshold | Range: 20.0% - 200.0% | Factory default: 130.0% |

When 0 is set at decade of E1-03, this set value is a percentage compared to rated current of motor. When 1 is set of that, this set value is a percentage compared to rated current of drive.

| | | | |
|---|---|---|---|
| E1-05 | Overload alarm activated time | Range: 0.1s - 60.0s | Factory default: 5.0s |

Sets the lasting time that overload alarm is activated when output current of drive is bigger than the threshold set by E1-04.

| | | | |
|---|---|---|---|
| E1-06 | Protection action 1 | Range: 0000 - 1010 | Factory default: 0000 |
| E1-07 | Protection action 2 | Range: 0000 - 1010 | Factory default: 0000 |

These two parameters set the drive protection action in the following abnormal status.

**Specification of E1-06:**

- Unit's place: reserved
- Decade: temperature sampling disconnection action

0: Protection enabled and coast to stop

1: Continue to run

- Hundreds place: reversed
- Thousands place: abnormal terminal communication

0: Protection enabled and coast to stop

1: Continue to run

**Specification of E1- 07:**

- Unit's place: reserved
- Decade: current detection circuit failed

0: Protection enabled and coast to stop

1: Continue to run

- Hundreds place: reversed
- Thousands place: output phase loss

0: Protection enabled and coast to stop

1: Continue to run

**ATTENTION:**

Please set "protection action" with caution since inappropriate setting may extend the fault

| | | | |
|---|---|---|---|
| E1-08 | Fault memory after power loss | Range: 0 - 1 | Factory default: 0 |

Determine whether or not the previous fault code is to be memorized and displayed upon the power up of the drive after power loss.

0: Not memorized after power loss

1: Memorized after power loss

**ATTENTION:**

Undervoltage fault "LoU" is not memorized after power loss.

| | | | |
|---|---|---|---|
| E1-09 | Times of automatic reset | Range: 0 - 20 | Factory default: 0 |
| E1-10 | Interval of automatic reset | Range: 2.0s - 20.0s | Factory default: 2.0s |

When a fault occurs during the running, the drive will run at 0Hz with the time set by E1-10, and then the fault will be reset and the drive continues to run. Times of automatic reset is set by E1-09. Automatic reset is prohibited and fault protection shall be executed immediately when E1-09 is set to 0.

**ATTENTION:**

1) Automatic fault reset is not performed at the following types of faults:
   Module protection "FAL"
   Parameter identification failed "tUN"
   Current detection abnormal "CtC"
   Ground short circuit protection at output side "GdP"
   Analog terminal function conflict “TEr”
   External equipment error "PEr"
   Consecutive run time attained "to2"
   Accumulative run time attained "to3"
   Reference protection "oCr"
   5V power supply out-of-limit "SP1"
   Low voltage protection “LoU”
   PID detection out of limit “Plo”
2） Please use automatic fault reset function with caution, or fault expansion may occur.

| E1-11 | Relay action on drive fault | Range: 000 - 111 | Factory default: 010 |
|---|---|---|---|

◆ Unit's place: when undervoltage fault occurs

0: No action

1: Action enabled

Set whether or not fault relay acts when undervoltage occurs.

◆ Decade: when fault locked

0: No action

1: Action enabled

Set whether or not the relay acts when the fault locked at latest power loss after power up.

◆ Hundred's place: time of automatic reset

0: No action

1: Action enabled

Set whether or not the relay is to operate when fault occurs in automatic reset status.

| E1-13 | Drive thermal alarm threshold | Range: 0.0 °C - 100.0 °C | Factory default: 80.0 °C |
|---|---|---|---|

Sets the threshold of drive thermal alarm. When the maximum internal temperature of drive is higher than this value, the drive displays thermal alarm code "oH1", but won't influence the running.

# Group F Application

## Group F0 Process PID

The purpose of process PID control is to make feedback value consistent with the set value. PID control diagram is as shown in Fig. 6-36.

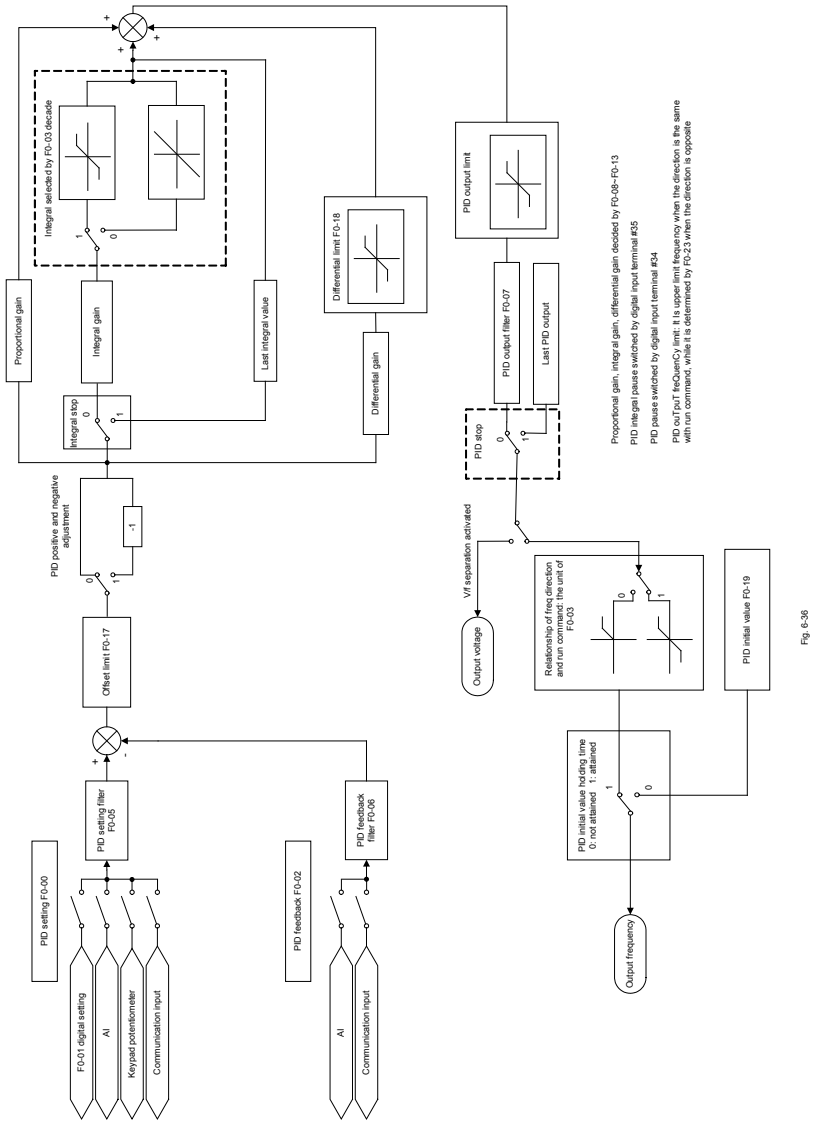



Fig. 6-36

| F0-00 | PID setting | Range: 0 - 5 | Factory default: 0 |
|---|---|---|---|

Select the setting source of PID control.
0: F0-01 digital setting
1:AI
2:Potentiometer
5: Communication

| F0-01 | PID digital setting | Range: 0.0% - 100.0% | Factory default: 50.0% |
|---|---|---|---|

When F0-00 is set to 0, this parameter value is taken as set value of PID.

| F0-02 | PID feedback | Range: 0 - 8 | Factory default: 0 |
|---|---|---|---|

Select the feedback source of PID control.
0:AI
8: Communication

| F0-03 | PID adjustment | Range: 00 - 11 | Factory default: 10 |
|---|---|---|---|

◆ Unit's place: output frequency

0: Must be the same direction as setting running direction
When PID frequency output direction is opposite to run command direction, PID output is 0.

1: Opposite direction allowed
PID frequency output direction can be opposite to run command direction, and PID output performs normally.

◆ Decade: integration selection

0: Integral continued when frequency attains upper/lower frequency
Under PID control, when output frequency attains upper/lower limit of frequency or parameter value of F0-23 (maximum frequency if it is opposite to command running direction), PID integral continues. This mode requires longer time of quitting saturation.

1: Integral stopped when frequency attains upper/lower limit
Under PID control, when output frequency attains upper/lower limit of frequency or parameter value of F0-23 (maximum frequency if it is opposite to command running direction), PID integral will cease. This mode can quit integral saturation status rapidly.

| | | | |
|---|---|---|---|
| F0-04 | PID positive and negative adjustment | Range: 0 - 1 | Factory default: 0 |

0: Positive adjustment

1: Negative adjustment

This parameter can be used with digital input terminal "PID adjustment direction" to select positive or negative adjustment of PID.

**Table 6-6**

| F0-04 | PID adjustment direction terminal | Adjustment |
|---|---|---|
| 0 | OFF | Positive |
| 0 | ON | Negative |
| 1 | OFF | Negative |
| 1 | ON | Positive |

Positive adjustment: when feedback signal is smaller than PID setting, output frequency of the drive will rise to reach PID balance.
when feedback signal is bigger than PID setting, output frequency of the drive will drop to reach PID balance.

Negative adjustment: when feedback signal is smaller than PID setting, output frequency of the drive will drop to reach PID balance.
when feedback signal is bigger than PID setting, output frequency of the drive will rise to reach PID balance.

| | | | |
|---|---|---|---|
| F0-05 | Filtering time of PID setting | Range: 0.00s - 60.00s | Factory default: 0.00s |
| F0-06 | Filtering time of PID feedback | Range: 0.00s - 60.00s | Factory default: 0.00s |
| F0-07 | Filtering time of PID output | Range: 0.00s - 60.00s | Factory default: 0.00s |

Set the filtering time of PID setting, feedback and output.

| | | | |
|---|---|---|---|
| F0-08 | Proportional gain Kp1 | Range: 0.0 - 100.0 | Factory default: 50.0 |
| F0-09 | Integration time Ti1 | Range: 0.001s - 50.000s | Factory default: 0.500s |
| F0-10 | Differential time Td1 | Range: 0.0s - 100.0s | Factory default: 0.0s |

Process PID is provided with two groups of proportion, integral and differential parameters set by F0-14. F0-08~F0-10 are the first group of parameters.

Proportional gain Kp: dynamic response of the system can be quickened by increasing proportional gain Kp. However, excessive Kp value would bring about system oscillation. Only proportional gain control cannot eliminate steady state error.

Integration time: dynamic response of the system can be quickened by reducing integration time Ti. However, excessively small Ti value would result in serious system overshooting and may easily bring about oscillation. Integral control can be used to eliminate steady state error but is unable to control sharp changes.

Differential time Td: it can predict the change trend of offset and thus can rapidly respond to the change, improving dynamic performance. However, this is vulnerable to interference. Please use differential control with caution.

| | | | |
|---|---|---|---|
| F0-11 | Proportional gain Kp2 | Range: 0.0 - 100.0 | Factory default: 50.0 |
| F0-12 | Integration time Ti2 | Range: 0.001s - 50.000s | Factory default: 0.500s |
| F0-13 | Differential time Td2 | Range: 0.0s - 100.0s | Factory default: 0.0s |

Process PID is provided with two groups of proportion, integral and differential parameters set by F0-14. F0-11 - F0-13 are the second group of parameters.

| | | | |
|---|---|---|---|
| F0-14 | PID parameter switchover | Range: 0 - 2 | Factory default: 0 |

Process PID is provided with two groups of proportional, integral and differential parameters, which is set by this parameter.

0: No switch, determined by parameters Kp1, Ti1 and Td1

Always determined by Kp1, Ti1 and Td1 set at F0-08 - F0-10.

1: Auto switched on the basis of input offset

When the offset between setting and feedback is less than the set value of F0-15, PID adjustment is determined by Kp1, Ti1 and Td1. When the offset between setting and feedback is bigger than the set value of F0-15, PID adjustment is determined by Kp2, Ti2 and Td2 set at F0-11 - F0-13.

2: Switched by terminal

When digital input terminal "PID parameters switch" is OFF, it is determined by Kp1, Ti1 and Td1. When "PID parameters switch" is ON, it is determined by Kp2, Ti2 and Td2

| | | | |
|---|---|---|---|
| F0-15 | Input offset under PID auto switch | Range: 0.0% - 100.0% | Factory default: 20.0% |

When F0-14 is set to 1, this parameter sets the switching point of the two groups of PID

parameters.

When the offset between setting and feedback is less than this set value, it is determined by Kp1, Ti1 and Td1.

When the offset between setting and feedback is bigger than this set value, it is determined by Kp2, Ti2 and Td2.

| | | | |
|---|---|---|---|
| F0-16 | Sampling period T | Range: 0.006s - 50.000s | Factory default: 0.008s |

Sampling period aims at feedback. PID controller performs the sampling and compute once in each sampling period. The longer the sampling period T is, the slower the response time will be.

| | | | |
|---|---|---|---|
| F0-17 | PID offset limit | Range: 0.0% - 100.0% | Factory default: 0.0% |

If the offset between PID feedback and setting is more than this set value, PID regulator will implement regulation. If the offset between PID feedback and setting is less than this set value, PID will stop the regulation and the PID controller output will be kept unchanged. This function can improve the stability of PID performance.

| | | | |
|---|---|---|---|
| F0-18 | PID differential limit | Range: 0.0% - 100.0% | Factory default: 0.5% |

Sets differential output limit of PID control.

| | | | |
|---|---|---|---|
| F0-19 | PID initial value | Range: 0.0% - 100.0% | Factory default: 0.0% |
| F0-20 | Holding time of PID initial value | Range: 0.0s - 3600.0s | Factory default: 0.0s |

PID does not make adjustment when the drive starts its running, but outputs the value set by F0-19 and maintains the holding time set by F0-20, then starts PID adjustment. When F0-20 is set to 0, PID initial value is disabled. This function makes PID adjustment get into stable status fast.

| | | | |
|---|---|---|---|
| F0-21 | PID feedback loss detection value | Range: 0.0% - 100.0% | Factory default: 0.0% |
| F0-22 | PID feedback loss detection time | Range: 0.0s - 30.0s | Factory default: 1.0s |

When offset between feedback and setting of PID is bigger than set value of F0-21 and the lasting time attains the set time of F0-22, the drive reports fault "Plo". If F0-22 is set to 0, feedback loss detection is disabled.

| | | | |
|---|---|---|---|
| F0-23 | Maximum FREQ when opposite to command direction | Range: 0.00Hz - maximum frequency | Factory default: 50.00Hz |

When run command direction is forward, while PID output is reverse, the maximum reverse frequency will be determined by F0-23.

When run command direction is reverse, while PID output is forward, the maximum forward frequency will be determined by F0-23.

| | | | |
|---|---|---|---|
| F0-24 | PID computation option | Range: 0 - 1 | Factory default: 0 |

0: No computation in stop status

1: Computation continued in stop status

### Group F1 Multi-step Frequency

| | | | |
|---|---|---|---|
| F1-00 | Frequency command source of multi-step 0 | Range: 0 - 8 | Factory default: 0 |

0: Digital setting F1-02

1: Digital setting b0-02 + keypad ∧ / ∨ adjustment

2: Digital setting b0-02 + terminal UP/DOWN adjustment

3:AI

7: Process PID output

8: Communication

At most 8-step of frequency can be set through the combination of "multi-step frequency terminals 1 - 3" of digital input. Multi-step frequency 2 - 7 are only digital setting while a number of setting sources can be selected for multi-step frequency 0 - 1. Parameter value of F1-00 determines command source of step 0.

| | | | |
|---|---|---|---|
| F1-01 | Frequency command source of multi-step 1 | Range: 0 - 8 | Factory default: 0 |

0: Digital setting F1-03

1: Digital setting b0-04 + keypad ∧ / ∨ adjustment

2: Digital setting b0-04 + terminal UP/DOWN adjustment

3:AI

7: Process PID output

8: Communication

At most 8-step of frequency can be set through the combination of "multi-step frequency terminals 1 - 3" of digital input. Multi-step frequency 2 - 7 are only digital setting while a number of setting sources can be selected for multi-step frequency 0 - 1. Parameter value of F1-01 determines command source of step 1.

| | | | |
|---|---|---|---|
| F1-02 | Multi-step frequency 0 | Lower limit frequency - upper limit frequency | Factory default: 0.00Hz |
| F1-03 | Multi-step frequency 1 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |
| F1-04 | Multi-step frequency 2 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |
| F1-05 | Multi-step frequency 3 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |
| F1-06 | Multi-step frequency 4 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |
| F1-07 | Multi-step frequency 5 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |
| F1-08 | Multi-step frequency 6 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |
| F1-09 | Multi-step frequency 7 | Lower limit frequency - upper limit frequency | Factory default: 0.00 Hz |

At most 8 steps of multi-step frequency can be set by different status combinations of "multi-step frequency terminals 1 - 4" of digital input, as shown in Table 6-7.

**Table 6-7**

| Multi-step terminal 4 | Multi-step terminal 3 | Multi-step terminal 2 | Multi-step terminal 1 | Command frequency |
|---|---|---|---|---|
| OFF | OFF | OFF | OFF | Multi-step frequency 0(F1-00) |
| OFF | OFF | OFF | ON | Multi-step frequency 1(F1-01) |
| OFF | OFF | ON | OFF | Multi-step frequency 2(F1-04) |
| OFF | OFF | ON | ON | Multi-step frequency 3(F1-05) |
| OFF | ON | OFF | OFF | Multi-step frequency 4(F1-06) |
| OFF | ON | OFF | ON | Multi-step frequency 5(F1-07) |
| OFF | ON | ON | OFF | Multi-step frequency 6(F1-08) |
| OFF | ON | ON | ON | Multi-step frequency 7(F1-09) |

# Group H Communication Parameters

## Group H0 MODBUS Communication Parameters

Support universal Modbus protocol. Please refer to appendix for detailed description of communication protocol.

| | | | |
|---|---|---|---|
| H0-01 | RS-485 port communication configuration | Range: 0000 - 1154 | Factory default: 0002 |

◆ Unit's place: baud rate
0: 4800bps
1: 9600bps
2: 19200bps
3: 38400bps
4: 57600bps
◆ Decade: data format
0: 1-8-2-N format, RTU
1: 1-8-1-E format, RTU
2: 1-8-1-O format, RTU
3: 1-7-2-N format, ASCII
4: 1-7-1-E format, ASCII
5: 1-7-1-O format, ASCII
◆ Hundreds place: connection type
0: Direct cable connection (232/485)
1: MODEM (232) (reserved)
◆ Thousands place: save type
0: Not saved at power loss
1: Saved at power loss

| | | | |
|---|---|---|---|
| H0-02 | RS-485 communication address | Range: 0 - 247 | Factory default: 1 |

Sets this drive address. 0 is broadcast address, while available addresses are 1 - 247.

| | | | |
|---|---|---|---|
| H0-03 | Time out detection | Range: 0.0s - 1000.0s | Factory default: 0.0s |

This parameter sets communication error detection time. When it's set to 0, no communication error will be reported.

| H0-04 | Communication time delay | Range: 0ms - 1000ms | Factory default: 0ms |
|---|---|---|---|

Sets response time delay of this drive to the master.

| H0-05 | Master/Slave option | Range: 0 - 2 | Factory default: 0 |
|---|---|---|---|

0: PC controls the drive

PC as master controls the drive. This supports all communication protocols.

1: As master

This drive as master sends current running frequency data through RS-485 port. Data cannot be received but sent, and the sending data is only running frequency.

2: As slave

Put the received data into b0-02 (digital setting of master frequency) or F0-01 (PID digital setting) through communication. b0-02/F0-01 is selected by parameter H0-06. Other communication data addresses are not supported. As slave, this drive can only receive the data.

| H0-06 | Parameter store address | Range: 0 - 1 | Factory default: 0 |
|---|---|---|---|

0: b0-02

1: F0-01

Enabled when H0-05 is set to 2. This parameter sets the store address of received data when it works as slave.

| H0-07 | Proportional factor of received frequency | Range: 0.0% - 100.0% | Factory default: 100.0% |
|---|---|---|---|

Enabled when H0-05 is set to 2. Received data is multiplied by H0-07 and then put the result into the address set by H0-06. This parameter setting is very useful when a master drive control a number of slave drives and needs to allocate the frequency.

# Group L Keys and Display of Keypad

## Group L0 Keys of Keypad

| L0-01 | Keys locked option | Range: 0 - 4 | Factory default: 0 |
|---|---|---|---|

0: Not locked
1: Full locked
2: Keys locked other than RUN, STOP/RESET
3: Keys locked other than STOP/RESET
4: Keys locked other than >>
Please refer to Chapter 4 for locking operation of keys.

| L0-02 | Function of STOP key | Range: 0 - 1 | Factory default: 0 |
|---|---|---|---|

0: STOP key valid only when under keypad control
1: STOP key valid under any run command source

| L0-03 | Frequency adjustment through keys ∧ / ∨ | Range: 0000 - 1111 | Factory default: 0100 |
|---|---|---|---|

◆ Unit's place: option on stop
0: Clear on stop
Keys ∧ / ∨frequency adjustment step size is cleared at the stop of drive.
1: Holding on stop
Keys ∧ / ∨frequency adjustment step size is held at the stop of drive.
◆ Decade: option on power loss
0: Clear on power loss
Keys ∧ / ∨ frequency adjustment step size is cleared at power loss.
1: Holding on power loss
Keys ∧ / ∨frequency adjustment step size is saved on power loss.
◆ Hundreds place: integrating option
0: Integrating disabled
Adjustment step size is kept constant when frequency is adjusted by keys ∧ / ∨, and the adjustment will be performed always with the step size set by L0-04.
1: Integrating enabled
When frequency is adjusted by keys ∧ / ∨, the initial step size is the set value of L0-04. With the press increase of ∧ / ∨, adjustment step size shows cumulative integrating effect and will increase gradually.
◆ Thousands place: run direction
0: Run direction not allowed to change
1: Run direction allowed to change

| | | | |
|---|---|---|---|
| L0-04 | Step size of frequency adjustment through keys ∧ / ∨ | Range: 0.00Hz/s - 10.00Hz/s | Factory default: 0.10 Hz/s |

When frequency command pattern is "digital setting + keypad ∧ / ∨ adjustment", progressive increase and decrease of command frequency is realized through ∧ ∨ keypad. This parameter is used to set the step size of frequency adjustment through ∧ / ∨. The step size is defined as frequency variation per second, and the smallest step size is 0.01 Hz/s.

### Group L1 LED Display Setting

| | | | |
|---|---|---|---|
| L1-00 | LED displayed parameters setting 1 on running status | Range: 0000 – 3FFF | Factory default: 000F |

Sets LED displayed parameters on running status. When a number of parameters are selected to be displayed, skim-through could be performed using key >> on keypad.

0: Display disabled

1: Display enabled

◆ Unit's place

BIT0: Running frequency (Hz)

BIT1: Command frequency (Hz)

BIT2: Bus voltage (V)

BIT3: Output current (A)

◆ Decade

BIT0: Output torque (%)

BIT1: Output power (kW)

BIT2: Output voltage (V)

BIT3: Motor speed (r/min)

◆ Hundreds place

BIT0: AI (V)

BIT1: Keypad Potentiometer (V)

BIT2: Input terminal status

BIT3: Output terminal status

◆ Thousands place

BIT0: PID setting (%)

BIT1: PID feedback (%)

BIT2: Reserved

BIT3: Reserved

**ATTENTION:**

When this parameter is set to 0000, running frequency (Hz) is displayed as default.

**Example:**

To display running frequency, output current, motor speed and AI sampled value, L1-00 should be: 0000 0001 1000 1001, i.e. set L1-00 to 0189.

| L1-02 | LED displayed setting on stop status | Range: 0000 - 033F | Factory default: 0003 |
|---|---|---|---|

Sets LED displayed parameters on stop status. When a number of parameters are selected, skim-through could be realized via key >> on keypad.

0: Displayed disabled

1: Displayed enabled

◆ Unit's place

BIT0: Command frequency (Hz)

BIT1: Bus voltage (V)

BIT2: Input terminal status

BIT3: Output terminal status

◆ Decade

BIT0: AI (V)

BIT1: Keypad potentiometer (V)

BIT2: Reserved

BIT3: Reserved

◆ Hundreds place

BIT0: PID setting (%)

BIT1: PID feedback (%)

BIT2: Reserved

BIT3: Reserved

◆ Thousands place

BIT0: Reserved

BIT1: Reserved

BIT2: Reserved

BIT3: Reserved

Note: when this function code is set to 0000, the set frequency would be displayed as default (Hz).

**Example:**

To display command frequency, bus voltage, AI sampled value, L1-02 should be: 0000 0000 0001 0011, i.e. set L1-02 to 0013.

# Group U Monitoring

## Group U0 Status Monitoring

All parameters of Group U0 are for display purpose only and can't be set.

| | | | |
|---|---|---|---|
| U0-00 | Running frequency | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |
| U0-01 | Set frequency | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |
| U0-02 | Bus voltage | Range: 0V - 65535V | Factory default: 0V |
| U0-03 | Output voltage | Range: 0V - 65535V | Factory default: 0V |
| U0-04 | Output current | Range: 0.0A - 6553.5A | Factory default: 0.0A |
| U0-05 | Output torque | Range: 0.0% - 300.0% | Factory default: 0.0% |
| U0-06 | Output power | Range: 0.0% - 300.0% | Factory default: 0.0% |
| U0-09 | Master frequency setting | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |
| U0-10 | Auxiliary frequency setting | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |

| | | | |
|---|---|---|---|
| U0-11 | Drive status | Range: 0 - 22 | Factory default: 00 |

◆ Unit's place: Running status

0: Accelerating

1: Decelerating

2: Constant speed running

◆ Decade: drive status

0: Stop

1: Running status

2: Auto tuning

| | | | |
|---|---|---|---|
| U0-12 | AI input voltage | Range: 0.00V - 10.00V | Factory default: 0.00V |
| U0-13 | Potentiometer input voltage | Range: -10.00V - 10.00V | Factory default: 0.00V |
| U0-15 | AO output | Range: 0.0% - 100.0% | Factory default: 0.0% |

| | | | |
|---|---|---|---|
| U0-18 | Status of digital input terminal | Range: 0 - 7F | Factory default: 0 |

Digital input terminals that correspond to the bits of U0-18 are as shown in Table 6-8:

**Table 6-8**

| Unit's place | | | |
|---|---|---|---|
| bit3 | bit2 | bit1 | bit0 |
| X4 | X3 | X2 | X1 |

0 means terminal input status is OFF, while 1 means terminal input status is ON.

**For example:**

If 3 (i.e. 0011) is displayed at U0-18, it means the input status of terminals X1 and X2 is ON and that of the other terminals is OFF.

If 5 (i.e. 0101) is displayed at U0-18, it means the input status of terminals X1 and X3 is ON, while that of the other terminals is OFF.

| | | | |
|---|---|---|---|
| U0-19 | Status of digital output terminal | Range: 0 - 5 | Factory default: 0 |

Corresponding relationship between digital output terminals and the bits of U0-19 is shown in Table 6-9:

**Table 6-9**

| bit2 | bit1 | bit0 |
|---|---|---|
| Control board relay | Reserved | Y |

0 means terminal output status is OFF, while 1 means terminal output status is ON.

**For example:**

If 4 (i.e. 100) is displayed at U0-19, it means control board relay output is ON while that of the other terminals is OFF.

| | | | |
|---|---|---|---|
| U0-20 | PID set | Range: 0.0% - 100.0% | Factory default: 0.0% |

| | | | |
|---|---|---|---|
| U0-21 | PID feedback | Range: 0.0% - 100.0% | Factory default: 0.0% |
| U0-22 | PID input offset | Range: -100.0% to 100.0% | Factory default: 0.0% |
| U0-30 | Cumulative power-up time | Range: 0h - 65535h | Factory default: 0h |
| U0-31 | Cumulative running time | Range: 0h - 65535h | Factory default: 0h |
| U0-33 | Inverter bridge temperature | Range: -40.0 °C to 100.0 °C | Factory default: 0.0 °C |

| | | | |
|---|---|---|---|
| U0-36 | Run command record at LoU | Range: 0 - 1 | Factory default: 0 |
| U0-37 | Fault code record at LoU | Range: 0 - 100 | Factory default: 0 |
| U0-39 | Current detection fault source | Range: 0 - 3 | Factory default: 0 |

0: No fault source
1: IU
2: IV
3: IW

| | | | |
|---|---|---|---|
| U0-42 | Higher-place numeric of keypad ∧ / ∨ stored value | Range:0, - | Factory default: 0 |
| U0-43 | Lower-place numeric of keypad ∧ / ∨ stored value | Range: -999.9 - 600.0Hz | Factory default: 0.0Hz |
| U0-44 | Higher-place numeric of terminal UP/DOWN stored value | Range:0, - | Factory default: 0 |
| U0-45 | Lower-place numeric of terminal UP/DOWN stored value | Range: -999.9 - 600.0Hz | Factory default: 0.0Hz |

### Group U1 Fault Record

| | | | |
|---|---|---|---|
| U1-00 | Code of fault 1 | Range: 0 - 46 | Factory default: 0 |
| U1-01 | Running frequency when the latest fault occurred | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |
| U1-02 | Output current when the latest fault occurred | Range: 0.0A - 6553.5A | Factory default: 0.0A |
| U1-03 | Bus voltage when the latest fault occurred | Range: 0V - 10000V | Factory default: 0V |
| U1-05 | Inverter bridge temperature when the latest fault occurred | Range: -40.0 °C to 100.0 °C | Factory default: 0.0 °C |
| U1-06 | Status of input terminal when the latest fault occurred | Range: 0000 - FFFF | Factory default: 0000 |
| U1-07 | Status of output terminal when the latest fault occurred | Range: 0000 - FFFF | Factory default: 0000 |
| U1-08 | Cumulative running time when the latest fault occurred | Range: 0h - 65535h | Factory default: 0h |

Check the information of the latest fault. See Chapter 7 for details of fault codes.

| | | | |
|---|---|---|---|
| U1-09 | Code of fault 2 | Range: 0 - 46 | Factory default: 0 |
| U1-10 | Running frequency when previous fault occurred | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |
| U1-11 | Output current when previous fault occurred | Range: 0.0A - 6553.5A | Factory default: 0.0A |
| U1-12 | Bus voltage when previous fault occurred | Range: 0V - 10000V | Factory default: 0V |
| U1-14 | Inverter bridge temperature when previous fault occurred | Range: -40.0 °C to 100.0 °C | Factory default: 0.0 °C |
| U1-15 | Status of input terminal when previous fault occurred | Range: 0000 - FFFF | Factory default: 0000 |
| U1-16 | Status of output terminal when previous fault occurred | Range: 0000 - FFFF | Factory default: 0000 |
| U1-17 | Cumulative running time when previous fault occurred | Range: 0h - 65535h | Factory default: 0h |

Check the information of previous fault. See Chapter 7 for details of fault codes.

| | | | |
|---|---|---|---|
| U1-18 | Code of fault 3 | Range: 0 - 46 | Factory default: 0 |
| U1-19 | Running frequency when before-previous fault occurred | Range: 0.00Hz - 600.00Hz | Factory default: 0.00Hz |
| U1-20 | Output current when before-previous fault occurred | Range: 0.0A - 6553.5A | Factory default: 0.0A |
| U1-21 | Bus voltage when before-previous fault occurred | Range: 0V - 10000V | Factory default: 0V |
| U1-23 | Inverter bridge temperature when before-previous fault occurred | Range: -40.0 °C to 100.0 °C | Factory default: 0.0 °C |
| U1-24 | Status of input terminal when before-previous fault occurred | Range: 0000 - FFFF | Factory default: 0000 |
| U1-25 | Status of output terminal when before-previous fault occurred | Range: 0000 - FFFF | Factory default: 0000 |
| U1-26 | Cumulative running time when before-previous fault occurred | Range: 0h - 65535h | Factory default: 0h |

Check the information of before-previous fault (the fault sequence: before-previous fault, previous fault, latest fault). See Chapter 7 for details of fault codes

# Chapter 7 Troubleshooting

## 7.1 Fault Causes and Troubleshooting

Once drive fault occurs, please identify the causes of fault carefully and make a detailed record of fault symptom. To seek services, please contact the dealer.

Parameters U1-00, U1-09 and U1-18 are used to view the fault history of fault 1 (fault 1 = the most recent fault), fault 2 (fault 2 = the second most recent fault), and fault 3 (fault 3 = the third most recent fault). Faults are recorded with numeric codes (0~46), while the fault information that corresponds to each numeric fault code is specified in the table below.

**ATTENTION:**

When a fault occurs, please identify the causes and seek solutions according the guidance in the table. If the fault fails to be solved, do not apply power to the drive again. Contact the supplier for service in time

**Table of Fault Codes**

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| 1 | oC1 | Accel overcurrent | Torque boost is too big under V/f control | Reduce torque boost value |
| | | | Starting frequency is too high | Drop starting frequency |
| | | | Accel time is too short | Prolong the Accel time |
| | | | Motor parameters are improperly set | Set the parameters correctly according to motor nameplate |
| | | | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| | | | Overload is too heavy | Reduce the load |
| | | | Inappropriate V/f curve under V/f control | Set V/f curve correctly |
| | | | Restart the rotating motor | Reduce current limited value or start through speed search |

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| 2 | oC2 | Constant-speed overcurrent | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| | | | Overload is too heavy | Reduce the load |
| | | | Power rating of the drive is relatively small | Select appropriate drive power rating |
| | | | Input voltage is too low | Check power grid voltage |
| 3 | oC3 | Decel overcurrent | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| | | | Load inertia is too big | Use dynamic brake |
| | | | Decel time is too short | Prolong the Decel time |
| | | | Input voltage is too low | Check power grid voltage |
| 4 | ov1 | Accel overvoltage | Load inertia is too big | Use dynamic brake |
| | | | Abnormal input voltage | Check power grid voltage |
| | | | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| 5 | ov2 | Constant-speed overvoltage | Load variation is too big | Check the load |
| | | | Abnormal input voltage | Check power grid voltage |
| | | | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| | | | Improper parameter setting of regulator under SVC control | Properly set regulator parameters |
| 6 | ov3 | Decel overvoltage | Load inertia is too big | Use dynamic braking |
| | | | Abnormal input voltage | Check power grid voltage |

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| | | | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| | | | Improper parameter setting of regulator under SVC control | Properly set regulator parameters |
| | | | Decel time is too short | Prolong the Decel time |
| 7 | FAL | Module protection | Output short circuit (phase-to-phase short circuit or output ground short circuit) | Check motor connection and output ground impedance |
| | | | Fan damaged or air duct blocked | Clear the air duct or replace the fan |
| | | | Direct connection of inverter module | Seek services |
| | | | Switching power supply damaged | Seek services |
| | | | Control board abnormal | Seek services |
| | | | Ambient temperature is too high | Reduce ambient temperature |
| | | | Loose connection of control board | Pull out and reinsert the cables of control board |
| | | | Overvoltage or overcurrent | Handle it with the solutions of overvoltage or overcurrent |
| 8 | tUN | Parameter identification failed | Bad motor connection | Check motor connection |
| | | | Identification during rotation of the motor | Identification in stationary status of the motor |
| | | | Bias between motor parameters and their setting is too big | Set the parameters correctly according to motor nameplate |
| 9 | oL1 | Drive overloaded | Torque boost is too big under V/f control | Reduce torque boost value |
| | | | Starting frequency is too high | Drop starting frequency |

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| | | | Accel/Decel time is too short | Prolong the Accel/Decel time |
| | | | Motor parameters are improperly set | Set the parameters correctly according to motor nameplate |
| | | | Output short circuit (phase-to-phase short circuit and output ground short circuit) | Check motor connection and output ground impedance |
| | | | Load is too heavy | Reduce the load |
| | | | Inappropriate V/f curve under V/f control | Set V/f curve correctly |
| | | | Restart the rotating motor | Reduce current limited value or start through speed search |
| 10 | oL2 | Motor overloaded | Torque boost is too big under V/f control | Reduce torque boost value |
| | | | Inappropriate V/f curve under V/f control | Set V/f curve correctly |
| | | | Motor parameters are improperly set | Set the parameters correctly according to motor nameplate |
| | | | Improper setting of motor overloaded protection time | Properly set the motor overloaded protection time |
| | | | Motor stalled or sharp variation of load | Identify the causes of motor stalling or check the load condition |
| | | | Long-term running of ordinary motor at low speed with heavy load | Select variable frequency motor |
| 11 | CtC | Current detection abnormal | Abnormal connection of control board | Seek services |
| | | | Switching power supply damaged | Seek services |
| | | | Hall device damaged | Seek services |
| | | | Output ground leakage | Seek services |

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| | | | current is too big | |
| 12 | GdP | Output ground short-circuit protection | Output connection ground short circuit | Check motor connection and output ground impedance |
| | | | Motor insulation abnormal | Check the motor |
| | | | Inverter module abnormal | Seek services |
| | | | Output ground leakage current is too big | Seek services |
| 13 | ISF | Input power supply abnormal | Serious voltage imbalance among three phases of power supply | Check power grid voltage |
| | | | Abnormal bus capacitance | Seek services |
| | | | Abnormal input wiring of power supply | Check power supply input wiring |
| 14 | oPL | Output phase loss | Motor cable connection abnormal | Check motor connection |
| | | | Imbalance among motor three phases | Check or replace the motor |
| | | | Incorrect setting of vector control parameters | Correctly set vector control parameters |
| 16 | oH1 | Heat sink thermal protection | Ambient temperature is too high | Drop ambient temperature |
| | | | Fan damaged | Replace the fan |
| | | | Air duct blocked | Clear air duct |
| | | | Temperature sensor abnormal | Seek services |
| | | | Inverter module abnormal | Seek services |
| 18 | oH3 | Module temperature detection undisconnected | Module detection circuit damaged | Seek services |
| | | | Thermistor damaged | Seek services |
| | | | Ambient temperature is | Raise ambient |

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| | | | too low | temperature |
| 24 | PEr | External equipment error | External fault terminal is enabled | Check the status of external fault terminal |
| | | | Stall condition lasts too long | Check if the load is abnormal |
| 26 | to2 | Consecutive running time attained | "Consecutive running time attained" enabled | See specification of Group E0 |
| 27 | to3 | Cumulative running time attained | "Cumulative running time attained" enabled | See specification of Group E0 |
| 31 | TrC | Port communication abnormal | Improper setting of baud rate | Set properly |
| | | | Communication port disconnection | Reconnect |
| | | | Upper computer/device does not work | Make upper computer/device work |
| | | | Drive communication parameter error | Set properly |
| 37 | oCr | Benchmark protection | Switching power supply damaged | Seek services |
| | | | Control board damaged | Seek services |
| 38 | SP1 | 5V power supply out-of-limit | Switching power supply damaged | Seek services |
| | | | Control board damaged | Seek services |
| 40 | AIP | AI input out-of-limit | Control board damaged | Seek services |
| | | | AI input is too high or low | Set AI input within correct range |
| 41 | LoU | Undervoltage protection | Input voltage abnormal | Check input power grid voltage |
| | | | Switching power supply abnormal | Seek services |
| 45 | Plo | PID detection out-of-limit | PID feedback channel abnormal | Check the feedback channel |
| | | | Inappropriate setting of PID parameters | Set properly |

| Fault code | Fault Display | Fault description | Causes | Solutions |
|---|---|---|---|---|
| 46 | ICF | Inside communication fault | Drive chip abnormal | Seek services |
| | | | Severe noise on site | Take corresponding countermeasures to the noise or seek service |

# Chapter 8 Maintenance

Ambient temperature, humidity, salt mist, dust, vibration, aging and wear of internal components may result in drive faults. Routine maintenance shall be performed during the use and storage.

**ATTENTION:**

Please make sure the power supply of the drive has been cut off, and DC bus voltage has discharged to 0V before the maintenance.

## 8.1 Routine Inspection

Please use the drive in the environment recommended by this manual, and perform routine inspection in accordance with the table below.

| Inspection items | Inspection aspects | Inspection methods | Criteria |
|---|---|---|---|
| Operating environment | Temperature | Thermometer | -10 °C to 50 °C |
| | Humidity | Hygrometer | 5% - 95%, condensation not allowed |
| | Dust, oil stains, moisture and water-drop | Visual inspection | No filthy mud, oil stains and water drop |
| | Vibration | Observation | Smooth running. No abnormal vibration |
| | Gas | Smell, visual inspection | No peculiar smell and abnormal smoke |
| Drive | Noise | Listen | No abnormal noise |
| | Gas | Smell, visual inspection | No peculiar smell and abnormal smoke |
| | Appearance | Visual inspection | No defect and deformation |
| | Heat dissipation and temperature rise | Visual inspection | No dust and/or fiber particles in air duct, normal working of fans, normal air speed and volume, no abnormal temperature rise |

| Inspection items | Inspection aspects | Inspection methods | Criteria |
|---|---|---|---|
| Motor | Thermal status | Smell | No abnormal heating and scorching smell |
| | Noise | Listen | No abnormal noise |
| | Vibration | Observe, listen | No abnormal vibration and sound |
| Running status parameters | Power supply input current | Ammeter | In the range of requirement |
| | Power supply input voltage | Voltmeter | In the range of requirement |
| | Drive output current | Ammeter | In the range of requirement |
| | Drive output voltage | Voltmeter | In the range of requirement |
| | Temperature | Thermometer | The difference between U0-33 displayed temperature and ambient temperature does not exceed 40 °C |

## 8.2 Regular Maintenance

Users should perform regular inspection of the drive every 3 - 6 months, so as to eliminate the potential faults.

**ATTENTION:**

- Please make sure power supply of the drive has been cut off, and DC bus voltage has been discharged to 0V prior to maintenance.
- Never leave screws, gaskets, conductors, tools and other metal articles inside the drive. Failure to comply may result in equipment damage.
- Never modify the interior components of the drive in any condition. Failure to comply may result in equipment damage.

| Inspection items | Measures |
|---|---|
| Check if control terminal screws are loose | Tighten |
| Check if main circuit terminal screws are loose | Tighten |
| Check if ground terminal screws are loose | Tighten |
| Check if copper bar screws are loose | Tighten |
| Check if drive mounting screws are loose | Tighten |

| Inspection items | Measures |
|---|---|
| Check if there are damage on power cables and control cables | Replace the damaged cables |
| Check if there is dust on circuit board | Clear it up |
| Check if air duct is blocked | Clear it up |
| Check if drive insulation is damaged | Test the ground terminal with 500V megameter after all input and output terminals are short-circuited via conductors. Ground test on individual terminals is strictly prohibited since this may cause damage to inverter. |
| Check if motor insulation is damaged | Remove input terminals U/V/W of motor from drive and test the motor alone with 500V megameter. Failure to comply may result in drive damage. |
| Check if the storage period of the drive is over two years | Carry out power-on test, during which, the voltage should be boosted to rated value gradually using a voltage regulator; be sure to run at no load for more than 5 hours. |

## 8.3 Replacement of Vulnerable Parts

Vulnerable parts of drive include cooling fan, electrolytic capacitor, relay or contactor etc. The service lives of these parts are subject to environment and working conditions. To maintain a favorable operating environment is conducive to improving the service life of parts and components; routine inspection and maintenance also contributes to effective improvement of parts' service life. To prolong the service life of entire drive, the cooling fan, electrolytic capacitor, relay or contactor and other vulnerable parts should be subjected to routine inspection according to the table below. Please replace the abnormal parts (if any) in time.

| Vulnerable parts | Service life | Cause of damage | Criteria |
|---|---|---|---|
| Fan | 30,000 - 40,000h | Wear of bearing and aging of blade | Check if fan blades have cracks<br>Check if there is abnormal vibration and noise on working |

## 8.4 Storage

Storage environment should meet the requirements as set forth in the table below.

| Items | Requirements | Recommended storage method and environment |
|---|---|---|
| Storage temperature | -40 to +70 °C | In case of long-term storage, areas with an ambient temperature of less than 30 °C are recommended<br>Avoid the storage in areas where temperature shock may result in condensation and freezing |
| Storage humidity | 5 - 95% | Product could be sealed with plastic film and dessicant |
| Storage environment | A space with low vibration and low content of salt where there is no direct exposure to sunlight, dust, no corrosive or flammable gas, oil stain, vapor and water drop | Product could be sealed with plastic film and dessicant |

**ATTENTION:**

Since long-term storage may lead to the deterioration of electrolytic capacitor, the inverter must be powered on once in case storage period exceeds 2 years. During the power-on, input voltage must be boosted to rated value gradually using a voltage regulator, and be sure to have the inverter operate at no load for more than 5 hours.

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