# LITEON®

# EVO 6000 Series

## Ultra Compact Vector Drive

## User Manual

# Table of Contents

# Chapter 1 │ Safety

## 1.1 General Safety

Safety Information:

Caution:  Identifies information about practices or circumstances that can cause personal injury or equipment damage.

Warning: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

### 1.1.1 Usage

| Caution |
|---|
| ■　The drive is used to control the speed of 3 phase synchronous and asynchronous motors, which must not be used for single phase or other purposes. Failure to comply could cause drive damage or serious injury by fire. |
| ■　The drive must not be used in any medical equipment in which human life may involve. |
| ■　The drive is manufactured according to strict quality control standard. However, bypass the safety protection in case the drive failure causes death or serious injury. |

### 1.1.2 Receiving

| Warning |
|---|
| ■　Do not install damaged drive or any drive without complete components inside. Failure to comply could result in accident. |
| ■　The product must be complete, including packaging, instruction and accessories. |
| ■　New or updated information, please refer to the following link: http://www.liteon-ia.com/TW/download.php |

### 1.1.3 Installation

| Warning |
|---|
| ■　Carry the drive by the bottom as carrying by the front cover may cause injury and damage from the main body of the drive falling. |
| ■　Attach the drive to metal or other nonflammable materials. Keep away from heat and flammable items. |

- A control panel must have cooling fans, air vents and room for ventilation when the drive is installed inside.

- The mounting surface in contact with the heat sink should be made of metal, which provides good thermal conductivity and prevents flammability

- Please check the dust-proof and moisture-proof conditions to avoid the external environment affecting the inverter function.

## 1.1.4 Wiring

| **Caution** |
| --- |
| ■ Allow only qualified electrical engineers to install the drive. Failure to comply could cause electrical shocks to personnel or damage to the drive. |
| ■ Ensure the power supply is off when connecting. Failure to comply could cause electrical shocks. |
| ■ Ensure the ground terminal PE is properly wired. Failure to comply could cause electrical shocks from the drive cover. Therefore ground the drive and motor for personnel safety. |
| ■ Do not touch the main circuit terminal. Keep the main circuit off drive cover to avoid electrical shocks. |
| ■ The terminal for braking resistor is B1 and B2. Do not connect it to any other terminals. Failure to comply could cause a fire. |
| **Warning** |
| ■ Do not connect three-phase power supply to terminals U, V and W. Failure to comply could damage the drive. |
| ■ An output reactor is recommended when the cable connecting between the drive and motor is over 100 meters. Failure to comply could result in drive damage with overcurrent caused by over-distributed capacitance. |
| ■ Never connect the output terminals to capacitors or unapproved LC/RC filters. Failure to comply could damage the drive components. |
| ■ Separate the drive main circuit cables and control circuit cables. Failure to comply could cause interference to the control signals |
| ■ Ensure the phase of power supply and rated voltage match the label on the drive. Failure to comply could drive damage. |

## 1.1.5 Operation

| Caution |
| --- |
| <ul><li>Connect the power after completion of wiring and closing the front cover. Opening the front cover when the power is on could cause an electrical shock.</li><li>Keep other personnel off the equipment when setting the drive fault restart and momentary power loss restart functions. Failure to comply could cause damage to the personnel and equipment.</li><li>Once the drive is powered, the terminals are live even when drive is not in operation. Touching the terminals could cause electrical shocks.</li><li>Cancel run command before resetting the alarm and fault. Failure to comply could cause physical injury.</li></ul> |

| Warning |
| --- |
| <ul><li>Do not start or stop the drive by connection or disconnection the power supply. Failure to comply could cause drive damage.</li><li>Ensure the motor and equipment are in proper use before operation. Failure to; comply could damage the equipment.</li><li>The temperature of the braking resistor and heatsink could be very high during operation. Do not touch it or it could result in scald.</li><li>For lift applications, please install mechanical brakes.</li><li>Adjust a few parameters only if necessary as the defaults are optimum settings for most of applications. Editing parameters indiscriminately could cause equipment abnormal operation.</li><li>Interlock the electricity supply with AC drive supply when both are available to a motor.</li></ul> |

## 1.1.6 Maintenance

| Caution |
| --- |
| <ul><li>Do not touch the main circuit of the drive when power is on. Failure to comply could cause electrical shocks.</li><li>Disconnect the power supply before opening the front cover of the drive.</li><li>Maintain the drive only when the CHARGE indicator light is off or 5 minutes after turning off power supply, so as to avoid charged capacitors causing physical injury.</li><li>Allow only qualified electric engineers and electrician to maintain, repair and replace the AC drive modules.</li></ul> |

| Warning |
| --- |

- The release of breaker on the AC drive primary side could be caused by incorrect wiring, short circuit and damaged drive components. Investigate and remove the problem before reconnecting the breaker.
- Do not use a megger (insulation resistor) to test the drive control circuit. Failure to comply could cause drive damage.

Notice:

All the instruction photographs and diagrams of opened drive in this manual are only for illustration. Do not attempt to operate any AC drives with the cover opened.

## 1.2 Warning Label

The warning label is on the front of the drive. Please read it carefully and follow the instructions.

- Read the user manual before operation.
- Risk of electrical shock. Shut off main power and wait for 5 minutes before servicing.
- Hot surface. Risk of burn.

Warning Label
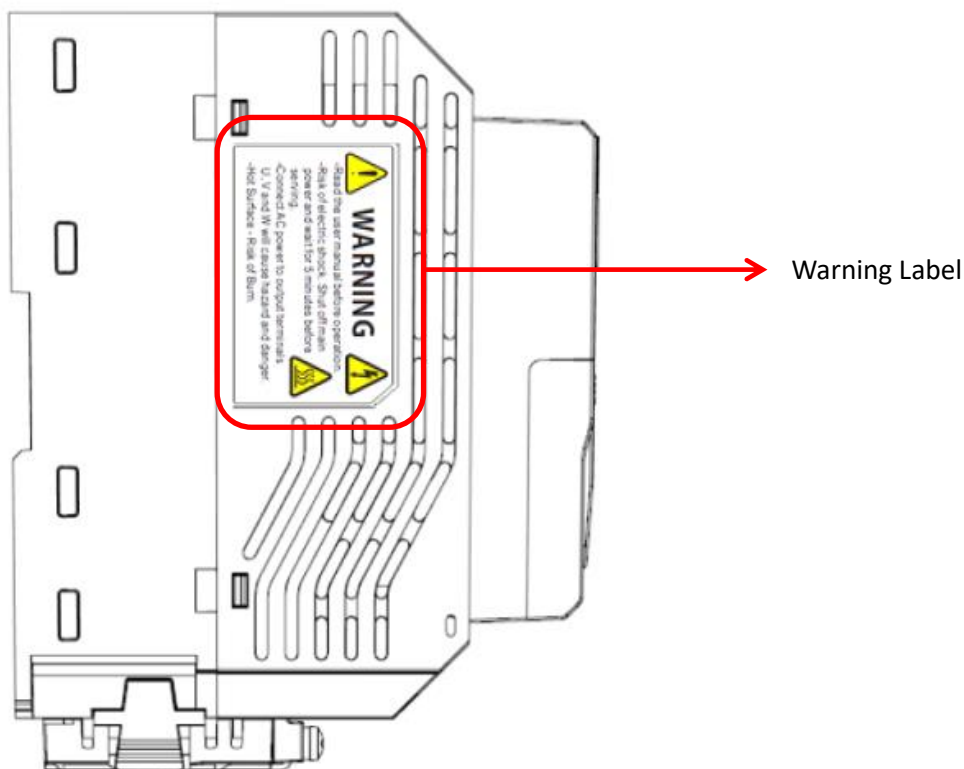
# 1.3 AC Drive Application Precautions

## 1.3.1 AC Drive Selection

### 1.3.1.1 Drive Capacity

Before driving motors, ensure the motor rated current is lower than the drive rated output. In addition, when a single AC drive is driving more than 1 motor in parallel, make sure the drive capacity is higher than 110% of total motor rated current.

### 1.3.1.2 Starting Torque

The motor characteristics at start and during acceleration are limited by the drive overcurrent. If higher starting torque is needed, use a higher rating drive or increase capacity of both motor and drive.

### 1.3.1.3 Emergency Stop

When a drive fault occurs, protection function will be automatically triggered to shut off the output but the motor may not stop immediately. Therefore please install mechanical brake if immediate stop is necessary.

## 1.3.2 Settings

### 1.3.2.1 Upper Limits

The maximum output frequency of the drive is 400Hz. If the upper limit is set incorrectly, the motor will run at higher than its rated speed and cause danger. Please set the limit of output frequency in Frequency Upper Limit parameter. The default setting of the rated output frequency is 60Hz.

### 1.3.2.2 DC Braking

Excessive DC braking current and duration could cause motor overheat.

### 1.3.2.3 Acceleration /Deceleration Time (Acc./Dec. Time)

Acceleration and deceleration time is determined by the motor torque, load torque and load inertia. Set a longer Acc./Dec. time after Stall Prevention function is triggered. In addition, the acceleration and deceleration time will be extended depending on the Stall Prevention duration. If

faster acceleration and deceleration are required, install proper braking options or use a higher rating motor and AC drive.

## 1.3.3 General Handling

### 1.3.3.1 Wiring

Connecting power supply to output terminals U/T1, V/T2 and W/T3 will damage the drive. Check all the connections and wiring sequence before turning on the power. Failure to comply could cause drive damage.

### 1.3.3.2 Maintenance

Capacitors in the drive may still be charged for a short time after shutting off the power. Wait for the amount of time specified on the drive before any maintenance. Failure to comply could cause electrical shocks to personnel. Besides, do not touch the heatsink which can be very hot during operation. Replace the cooling fan only when the heatsink has cooled down after shutting off the power. In addition, when a synchronous motor is coasting to stop, it regenerates voltage to keep the drive terminals live even when the drive power is off. Wait until the motor is fully stopped before drive maintenance. Failure to comply could cause electrical shocks to personnel.

### 1.3.3.3 Wiring Tools

Use only the tools suggested by the terminal supplier during drive maintenance.

### 1.3.3.4 Transportation and installation

Do not explore the drive to the environment containing the halogens or DOP gas during transportation or installation.

## 1.4 Warranty

### 1.4.1 Warranty Period

Contact local distributor for details.

### 1.4.2 Warranty Restrictions

Warranty is not applicable when the drive is not properly used according to the manual regardless warranty period.

# Chapter 2│Product

## 2.1 Component Names

This section describes the structure of EVO6000. ( The fan and fan cover are only for force air-cooled type.)
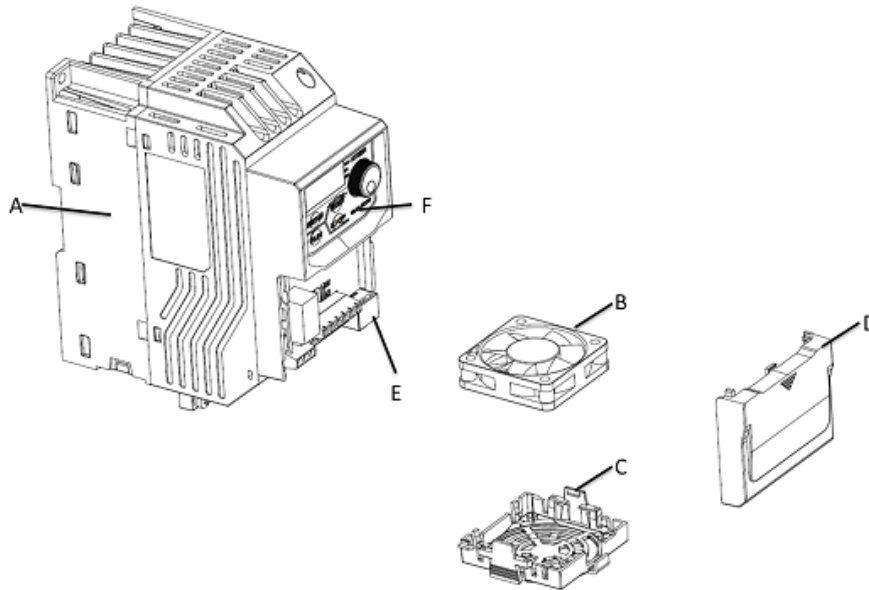


A — Heatsink

B — Cooling fan

C olFan guard

D — Conduit bracket

E n RJ45 port

F 4Keypad

## 2.2 Receiving Checklist

Check the following when receiving the drive:

| | |
|---|---|
| 1. | Is the packaging box in good condition? Any damage or damp ? If so, contact the distributor or local Lite-On representative. |
| 2. | Is the model label on the box same as what you purchased? If not, contact the distributor or local Lite-On representative. |
| 3. | After opening the box, is there any damp mark inside the box? Any damage or crack on the drive enclosure? If so, contact the distributor or local Lite-On representative. |
| 4. | Does the drive nameplate show the same model number as the carton label? If not, contact the distributor or local Lite-On representative. |
| 5. | Is the manual included in the carton?    If not, contact the distributor or local Lite-On representative. |

## 2.3 Nameplate

MODEL: EVO600021S0D2E20F

MODEL Number
Applicable motor rating → MOTOR RATING: 0.2kW/0.25HP
Input power supply → INPUT: AC1PH 200-240V 50/60Hz 3.6A
Output power supply → OUTPUT: AC3PH 0-240V 0-400Hz 1.6A

120D22115331D10000170001
IP20

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IND. CONT. EQ.
E466871

CE

LITEON
LiteON ELECTRONICS, INC.

MADE IN TAIWAN
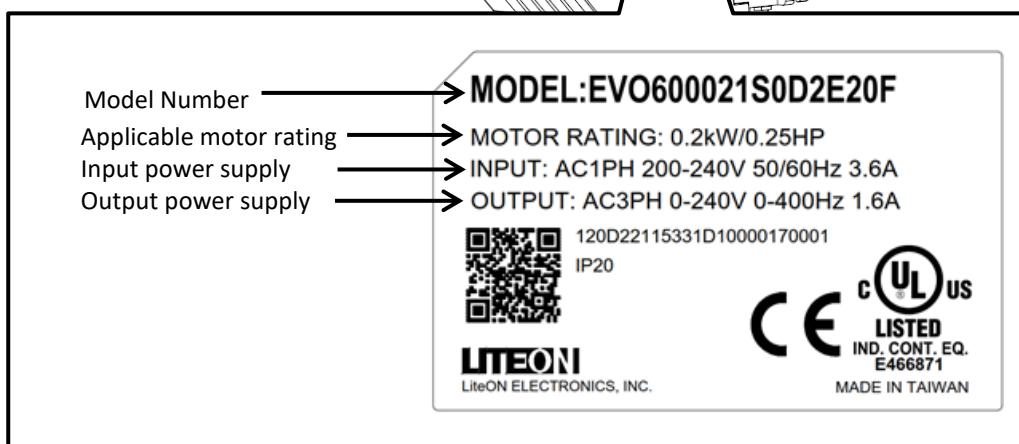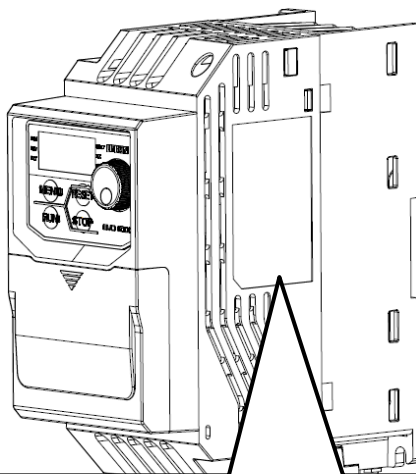
## 2.4 Model Number Definition

EVO - 6000 ☐☐ S ☐☐☐ E 20 F

**Product Series:**
EVO: Lite-On AC Drive

**Series Name**

**Voltage Class:**
21: AC 220V 1Phase
23: AC 220V 3 Phases
43: AC 440V 3 Phases

**Version:**
S: Standard

**Power Ratings:**
0D2: 0.2kW
0D4: 0.4kW
D75: 0.75kW
1D5: 1.5kW
2D2: 2.2Kw
3D7: 3.7kW

**Keypad Type:**
E: LED

**Enclosure:**
20: IP20

**Filter:**
☐: No Filter
F: Filter Built-In
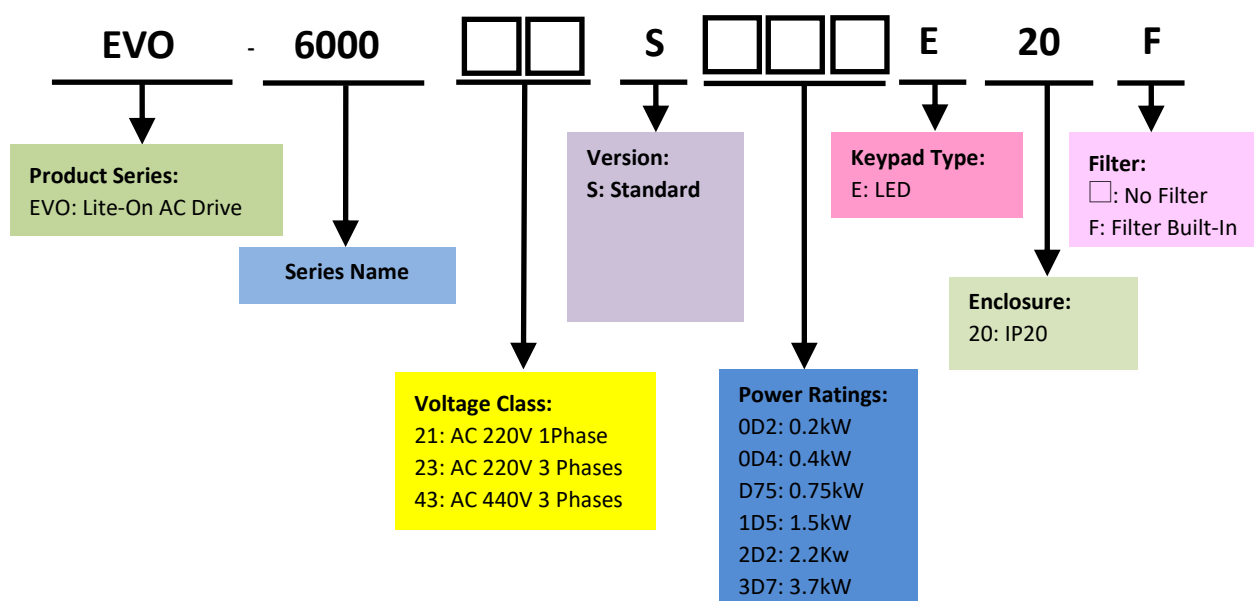
## 2.5 Power Ratings

| 200V Class Single Phase | | | | | | |
|---|---|---|---|---|---|---|
| Model No. | EVO600021S | 0D2 | 0D4 | D75 | 1D5 | 2D2 |
| Max. Motor Capacity | HP | 0.25 | 0.5 | 1 | 2 | 3 |
| | kW | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 |
| Rated Input | Voltage (V) / Frequency (Hz) | Single Phases, 200 ~220 V,-15% ~ +20% , 50/60Hz | | | | |
| | Current(A) | 3.6 | 7.4 | 13.5 | 24 | 33 |
| Rated Output | Current(A) | 1.6 | 2.5 | 4.2 | 7.5 | 11 |
| | Output Frequency(Hz) | 0 to 400 Hz | | | | |
| | Carrier Frequency (kHz) | 2 to 12kHz | | | | |
| Cooling Method | | Fanless | | Fan | | |
| Frame Size | | 1 | | 2 | | |
| Weight | | 1.1kg | | 1.6kg | | |

| 200V Class Three Phase | | | | | | | |
|---|---|---|---|---|---|---|---|
| Model No. | EVO600023S | 0D2 | 0D4 | D75 | 1D5 | 2D2 | 3D7 |
| Max. Motor Capacity | HP | 0.25 | 0.5 | 1 | 2 | 3 | 5 |
| | kW | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 |
| Rated Input | Voltage (V) / Frequency (Hz) | Three Phases, 200 ~220 V,-15% ~ +20% , 50/60Hz | | | | | |
| | Current(A) | 2.2 | 3.7 | 6.6 | 10.5 | 14.8 | 21.5 |
| Rated Output | Current(A) | 1.6 | 2.5 | 4.2 | 7.5 | 11 | 17 |
| | Output Frequency(Hz) | 0 to 400 Hz | | | | | |
| | Carrier Frequency (kHz) | 2 to 12kHz | | | | | |
| Cooling Method | | Fanless | | Fan | | | |
| Frame Size | | 1 | | | 2 | | |
| Weight | | 1.1kg | | | 1.6 kg | | |

| 400V Three Phase | | | | | | |
|---|---|---|---|---|---|---|
| Model No. | EVO600043S | 0D4 | D75 | 1D5 | 2D2 | 3D7 |
| Max. Motor Capacity | HP | 0.5 | 1 | 2 | 3 | 5 |
| | kW | 0.4 | 0.75 | 1.5 | 2.2 | 3.7 |
| Rated Input | Voltage (V) / Frequency (Hz) | Three Phases, 380 ~480 V,-15% ~ +20% , 50/60Hz | | | | |
| | Current(A) | 2.7 | 4.4 | 6.7 | 9.3 | 12.9 |
| Rated Output | Current(A) | 1.5 | 2.5 | 4.2 | 5.5 | 8.2 |
| | Output Frequency(Hz) | 0 to 400 Hz | | | | |
| | Carrier Frequency (kHz) | 2 to 12kHz | | | | |
| Cooling Method | | Fanless | | Fan | | |
| Frame Size | | 1 | | 2 | | |
| Weight | | 1.1kg | | 1.6kg | | |

## 2.6 Common Specifications

| Item | | Specification |
|---|---|---|
| Control Characteristic | Control Method | V/F Control, Sensorless Voltage Vector Control（SVVC） |
| | Ouput Frequency | 0~400 Hz |
| | Frequency Accuracy | Digital Input: within ±0.01% of the Max. output freqeuncy |
| | | Analog Input: within ±0.1% of max. output frequency(-10℃ ~ +50℃) |
| | Frequency Setting Resolution | Digital input: 0.01Hz |
| | | Analog Output: 1/1000 of max. frequency |
| | Starting Torque | 150% / 3Hz (V/F) 150% / 1Hz (SVVC) |
| | Speed Control Range | 1: 40 (V/F) 1: 100 (SVVC ) |
| | Acc./Dec. Time | 0.0 to 3600.0 |
| | Braking Torque | approx. 20% |
| | V/F Pattern | 15 fixed and 1 programmable |
| | Overload Capacity | 150% for 1 min. within every 10 min. |

| | | |
|---|---|---|
| | Parameter Function | Over torque/torque shortage detection, multi-speed operation, acceleration/deceleration switching, instantaneous power failure restart, speed search, S-curve acceleration/deceleration, 3-wire sequential control, motor parameter automatic detection, cooling fan ON/OFF function, sliding Differential compensation, torque compensation, frequency jump, frequency command upper and lower limit setting, DC braking at start/stop, PID control, fault retry, automatic voltage adjustment. |
| Operating Environment | Area of Use | Indoor without corrosive gas/liquid or flammable gas/liquid/oil mist/dust |
| | Ambient Temperature | -10℃ to +50℃, below 90% RH without froze or condensation |
| | Storage Temperature | -20℃ to +60℃ |
| | Altitude | Up to 1000 meters |
| | Shock | Below 9.8 m/s$^2$ (10 to 20Hz), below 5.9 m/s$^2$ (20 to 55Hz) |
| | Enclosure | IP20 |
| I/O | Analog Input (AI) | 1 point (AI: 0 to 5V, 0 to 10V (12 bits),  0 or 4 to 20mA(11 bits)) |
| | Digital Input (DI) | 6 points |
| | Analog Output (AO) | 1 point (FM: 0 to 10V (10bits)) |
| | Digital Output (DO) | 0 |
| | Relay Output (RO) | 1 point |
| Communications | | Modbus (RS-485 port) |
| Option Card | | Profibus-DP, CANopen, DeviceNet |
| Short-Circuit Current | | The drive is suitable for use in a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 480 Volts Maximum. |
| Certificate | | UL 508C, CSA C22.2 no .274, IEC 61800-5-1, IEC 61800-3 |

*1. Results tested in labs

## 2.7 Product Dimensions

Frame Size 1

200V:

EVO600021S0D2E20F, EVO600021S0D4E20F, EVO600021SD75E20F, EVO600023S0D2E20, EVO600023S0D4E20, EVO600023SD75E20, EVO600023S1D5E20

400V:

EVO600043S0D4E20F, EVO600043SD75E20F, EVO600043S1D5E20F

Frame Size 2
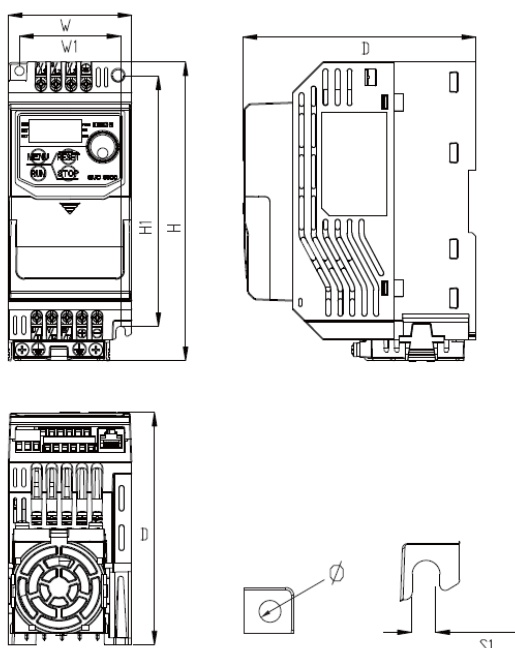
200V:

EVO600021S1D5E20F, EVO600021S2D2E20F, EVO600023S2D2E20, EVO600023S3D7E20

400V:

EVO600043S2D2E20F, EVO600043S3D7E20F

Frame Size 1                                                    Frame Size 2
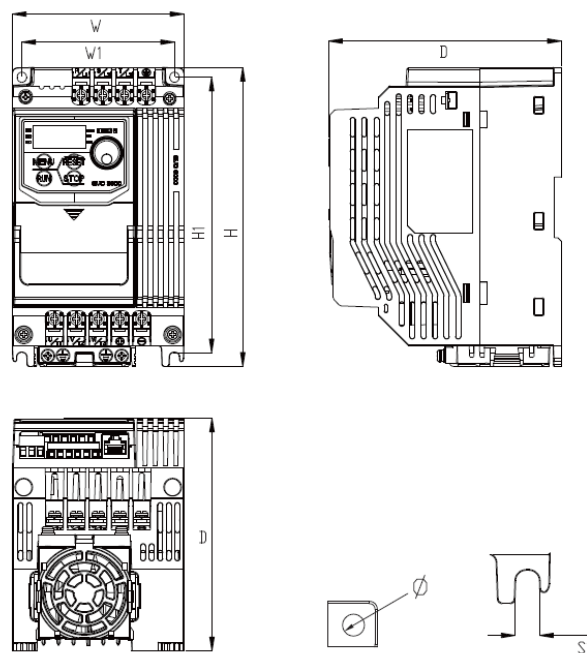


Unit: mm/inch

| Series | Frame | W | W1 | H | H1 | D | S1 | Φ |
|--------|-------|---|----|----|----|---|----|---|
| EVO6000 | 1 | 72[2.83] | 59[2.32] | 174.2[6.86] | 151.6[5.97] | 135.6[5.34] | 13.8[0.54] | 5.4[0.21] |
| | 2 | 100[3.94] | 89[3.50] | 174.2[6.86] | 162.6[6.41] | 135.6[5.34] | 10.8[0.43] | 5.4[0.21] |

# 2.8 Accessories

## 2.8.1 Accessories

| EVO6000 Series Accessories | | |
|---|---|---|
| Name | Model Name | Description |
| Copy Uint | EVO-KIT-CU | Allows parameter uploads/downloads and comparison |
| Communication converter | EVO-KIT-DON | USB to RS485 |
| Braking unit | EVO6-DBU-4 □□ | Connects AC drive terminal DC+, DC- to significantly improve braking.Please ensure braking resistor is properly installed.(□□indicates 1D5 or 3D7 model ) |
| Din Rail | EVO6-KIT-DR □ | Accessory for DIN rail installation (□ indicates frame 1 or 2) |
| Remote keypad | EVO6-KIT-RK □ | Connects remote keypad for remote setting and monitoring(□ indicates Blank,D: Horizontal) |

# Chapter 3│Drive Installation

## 3.1 Installation Environment

To ensure the optimum drive performance, install the AC drive in a proper environment specified below.

| Environment | Conditions |
|---|---|
| Area of Use | Indoors |
| Ambient Temperature | ■ -10ient Temperatureum drive perfo<br>■ Do not install the drive in environments with wide temperature fluctuations so as to ensure the drive reliability.<br>■ When the drive is installed in an enclosure cabinet, make sure the cooling works properly to keep the temperature within the specified levels.<br>■ Do not allow the drive to freeze.<br>■ When drives are installed side-by-side in a cabinet, follow the instruction illustrated in Figure 3.2 to ensure the air flow. |
| Humidity | ■ Under 90% RH<br>■ Free of condensation |
| Storage Temperature | -20rage Tempera |
| Surrounding Area | ■ Free from water, oil, metal shavings or other foreign materials.<br>■ Free from flammable materials (e.g., wood)<br>■ Free from harmful gases and liquids<br>■ Free from direct sunlight<br>■ Free from oil mist, corrosive gas, flammable gas or dust.<br>■ Free from radioactive material<br>■ Green Class 2 or above |
| Altitude | Up to 1000 m without derating. Up to 2000 meters with 1% rated current derated for every 100 m counted from 1000 m. |
| Vibration | ■ 10 to 20 Hz at 9.8 m/s2<br>■ 20 to 55 Hz at 5.9 m/s2 |
| Enclosure | IP20 |

# 3.2 Installation Direction and Spacing

## 3.2.1 Installation Direction

Install the AC drive upright for better cooling.

OK                          NG                          NG
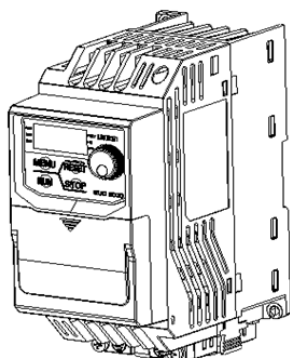


Upright installation        Horizontal installation        Transverse installation
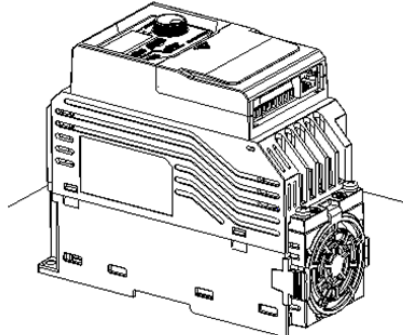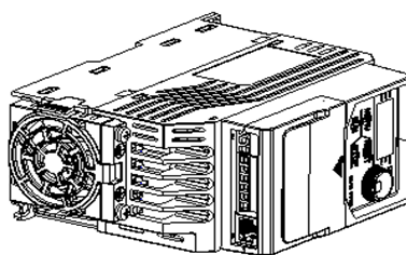
**Figure 3.1 Installation Direction**

## 3.2.2 Installation Spacing

Install the AC drive as illustrated below to ensure the required space for airflow and wiring.
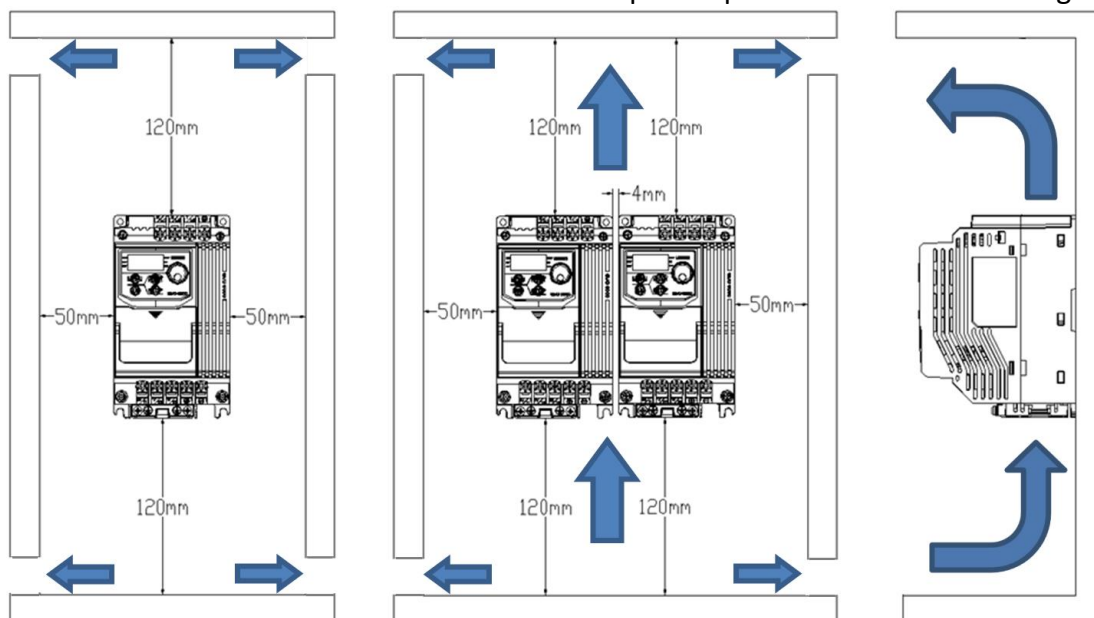


**Figure 3.2 Installation Spacing Single**

Note: When installing drives of different sizes, align the tops of the drives for easier cooling fan replacement.

# 3.3 Keypad and Terminal Cover Installation

It is not necessary to remove the keypad before wiring. You just need to loosen the terminal cover screw and remove the terminal cover. After wiring, affix the terminal cover back in position and tighten the screw. For wiring instructions and screw tightening torque please refer to Chapter 4.
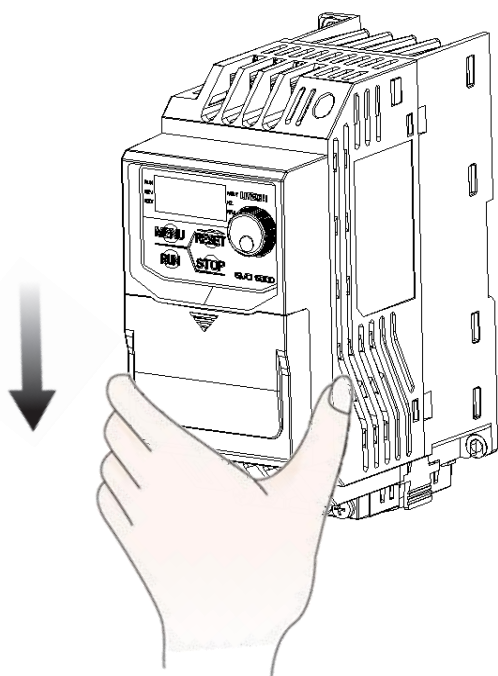
**Step 1: Slide the terminal cover down**          **Step 2: Remove the terminal cover**
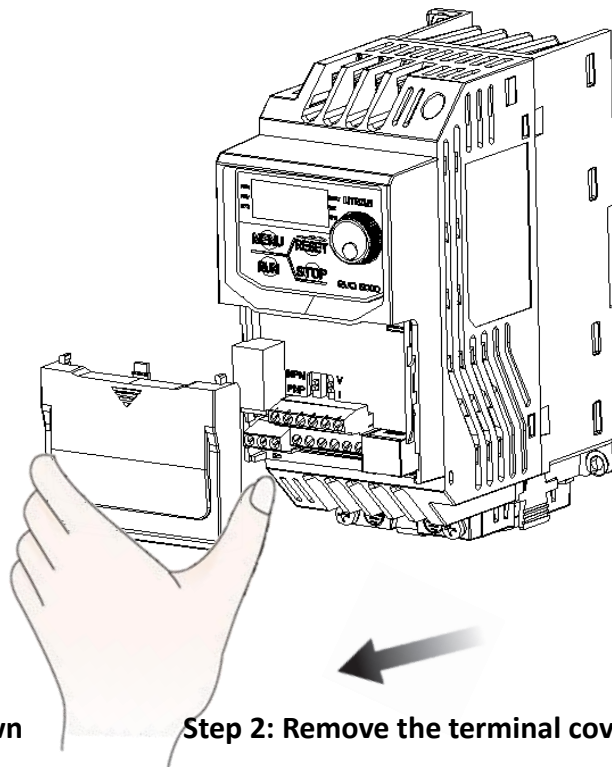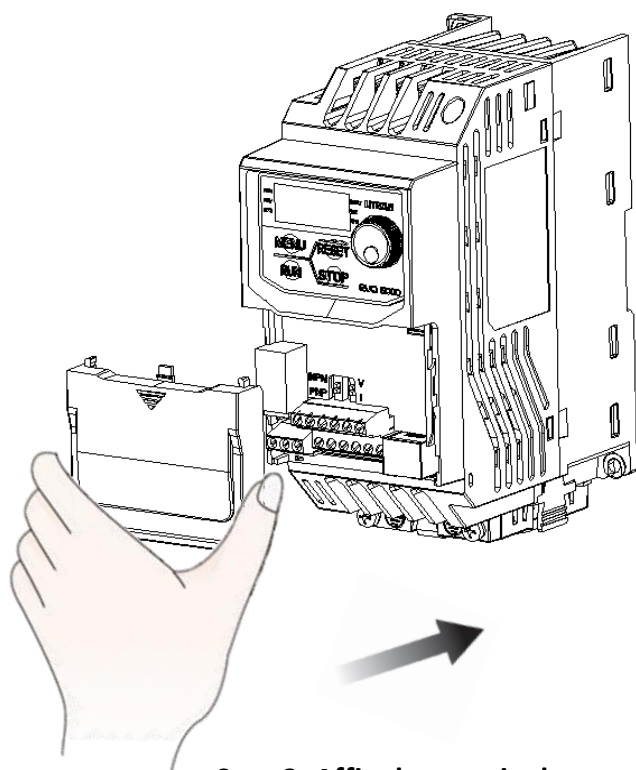
**Step 3: Affix the terminal cover after wiring**          **Step 4: Slide the terminal up**
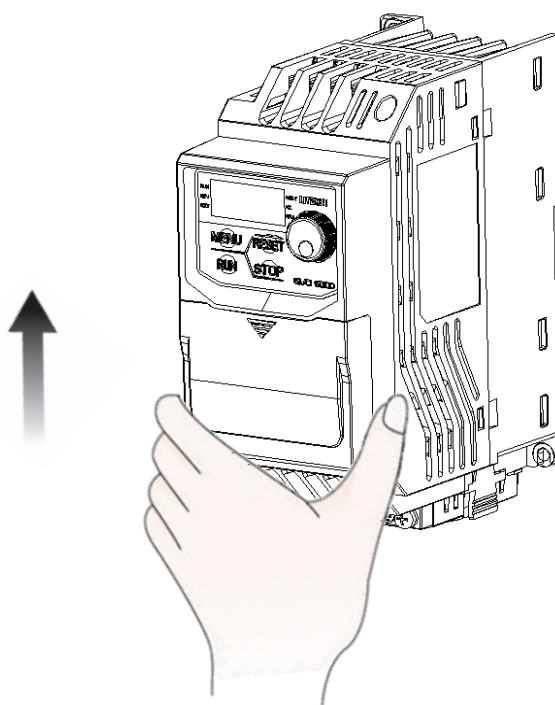
# 3.4 Wiring Protection

## 3.4.1 Drive and Input Cable Protection for Short-Circuit Situations

Protect the drive and input power cable by using fuse in case potential short-circuit situations cause overheat. Please refer to the following figure for proper wiring.
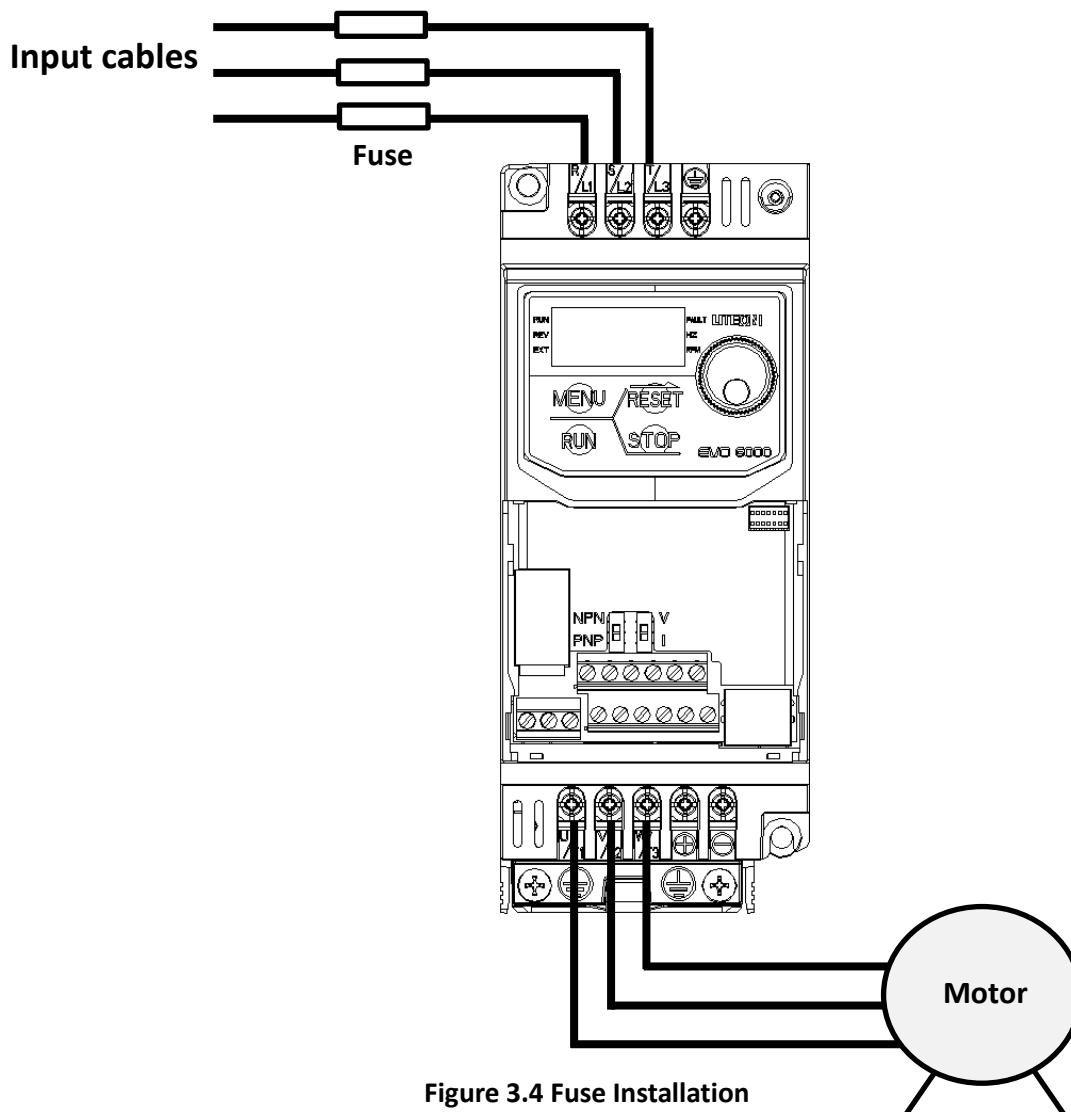
**Figure 3.4 Fuse Installation**

## 3.4.2 Motors and Output Cable Protection for Short-Circuit Situations

If the output cables are properly selected according to the drive rated current, the drive itself is fully capable of protecting the motor and output cables in case of short-circuit situations.

Note: If a single drive runs more than 1 motor, a separate thermal overload switch or a circuit breaker is required.

# Chapter 4│Wiring

## 4.1 Wiring Safety

| Caution |
|---|
| ■ Turn off all the power to the equipment before wiring. Wiring during power on could cause electrical shocks to personnel. <br> ■ Allow only qualified personnel for installation, wiring, repairing and parts replacement. <br> ■ Capacitors in the drive may still be charged for a short time after shutting off the power. Wait for the amount of time specified on the drive before any maintenance. <br> ■　Never touch input or output power cables. Do not connect any circuit to drive enclosure. |

| Warning |
|---|
| ■ Properly connect the motor ground terminal. Contacts between the motor ground terminal and motor enclosure could cause electrical shocks or a fire. <br> ■ Ensure terminal screws are all tightened. Loose connection to the main circuit could cause overheat or a fire. <br> ■ Verify if the rated voltage of the drive matches the voltage of the incoming power supply before applying power. <br> ■ Perform all wiring as specified in the wiring diagrams provided when installing braking unit. Failure to comply could result in drive, braking unit or resistor damage on fire. <br> ■ Do not disconnect the motor from the drive while the drive is outputting voltage. <br> ■ Do not use unshielded cable for control circuit wiring. Failure to comply could cause abnormal operation of drive. <br> ■ Use shielded twisted-pair cables and connect the shield to ground terminal of the drive. <br> ■ Do not modify the drive circuits. Failure to comply could cause drive damage. <br> ■ Ensure all connections are correct after connecting the drive with other devices. |

## 4.2 Main Circuit



Note

*1.  The RJ45 communication port support the build-in RS485 communication. The EVO6000P support RS485 communication terminal only.

*2.  Multi-function analog input S1~S6 can be switched between Sink(NPN) or Source(PNP) mode. Default: NPN mode.

*3.  A1 is used to set analog input as voltage input or current input.

*4.  AC is common terminal of analog signal (Analog Common).

*5.  Analog output is used to connect frequency meter, current meter, voltage meter and power meter.

*6.  This manual includes the blueprint of our products in the future. For more precise specifications, please refer to the user manual that alongside with our products. If you have any question, please contact our authorized distributors or LITE-ON.

*7.  The EVO6000P only has CE certifications.

## 4.2.1 Main Circuit Terminal



Braking Unit (option)

MCCB MC

R — R/L 1    U/T 1

S — S/L 2    V/T 2   IM

T — T/L 3    W/T 3

Fast Acting Fuse    E
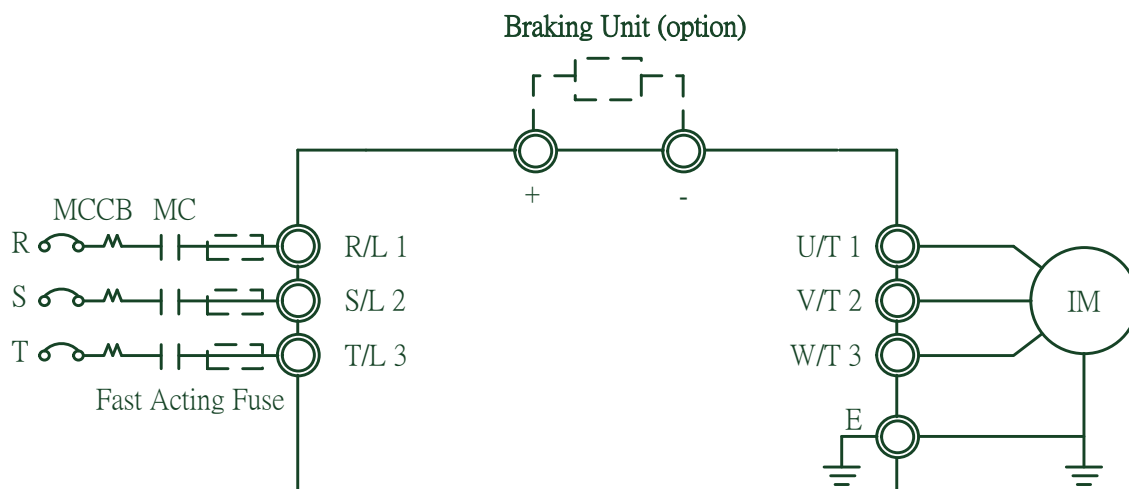
**Table 4.2.1 Main Circuit Terminals**

| Terminal Name | Terminal Description |
|---|---|
| R/L1, S/L2, T/L3 | Power input terminal |
| U/T1, V/T2, W/T3 | Power output terminal |
| +, - | Braking unit terminal. Select option as per the specifications. |
| E | Ground terminal |

## 4.2.2 Main Circuit Wiring

### 4.2.2.1 Power Input Terminal

■ Install a molded case circuit breaker (MCCB) between three phase AC input power and main circuit terminals R/L1, S/L2 and T/L3. A magnetic contactor (MC) in series connection is also suggested so as to shut off the power by drive protection functions. Install a R-C varistor on both ends of the MC.

■ Ensure main circuit terminal screws are tightened to avoid vibration loosening the screws which could cause electric sparks.

### 4.2.2.2 Power Output Terminal

■ When connecting a noise filter at AC drive output terminals U/T1, V/T2 and W/T3, always use an inductive L-filter. Do not install any power capacitor, L-C or R-C filter.

■ Connect AC drive output terminals U/T1, V/T2 and W/T3 to motor input terminals U, V and W respectively. Ensure the motor and drive terminals are in same phase sequence or the motor will rotate reversely.

■ Do not connect power cable to output terminals of the drive. Failure to comply could cause

drive damage and a fire.

## 4.2.2.3 Braking Unit Terminal:

■ If the drive is used in a high-frequency or heavy duty application which requires frequent braking or shorter deceleration time, install an optional braking unit to increase the braking torque.
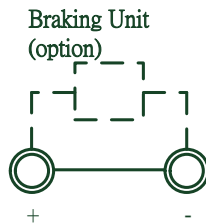


■ Please refer to the wiring diagram when installing braking unit.

## 4.2.2.4 Ground Terminal

■ Use grounding cables of dimensions regulated by electrical equipment standard. Shrink wiring distance to prevent leakage current resulting unstable electrical potential at the terminal distant from grounding terminal.

■ Do not use share the same grounding cable with welding machines or any device requiring large current. Failure to comply could cause drive or equipment malfunction.

■ Do not wind the grounding cable when multiple drives are installed. Failure to comply could cause drive or equipment malfunction.

■ Ensure the neutral of the input side and drive terminal " ⊕ " are grounded according to the local electrician regulations. 3WYE (e.g. TN and TT) system are suggested for the drive primary side.

## 4.2.2.5 Jumper

■ EVO6000 complies with the European LVD standard EN 61800-5-1 (2007) reducing the touch current to below 10mA DC under testing condition regulated by IEC 60990 (1999).

■ Follow the instructions below to remove the jumper if an even lower current leakage to a even lower level.

■ Removing the jumper may increase the signal interference.

1. **Front right corner of the machine, remove the screw using a screwdriver.**
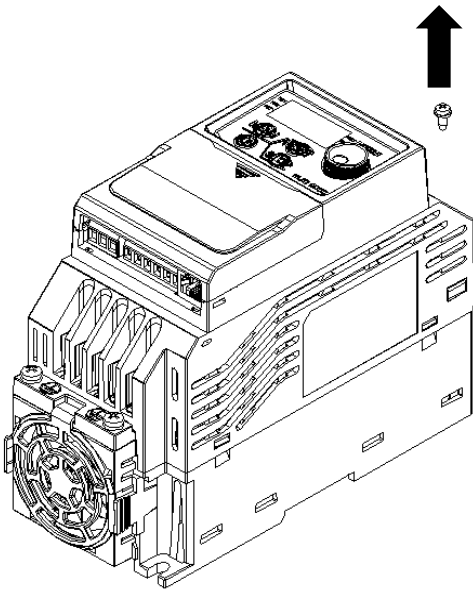
2. **Remove the top right corner of the right side of the ground blade screw and save.**
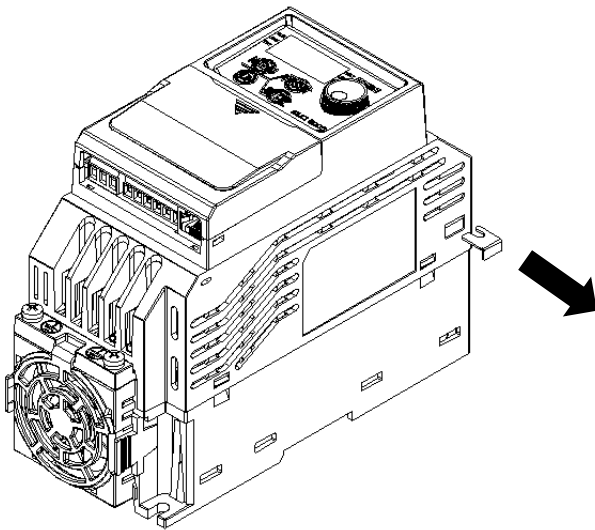
## 4.2.3 Main Circuit Cable Size and Tightening Torque

Select the cables and crimp terminals according to Table 4.2.2.

1. The recommended cables(copper conductors) are 600 V vinyl-sheathed cables which has continuous temperature tolerance up to 75leakage to a even lower level. equipment malfunction.use drive or equipment malfunction.

2. Terminal + and - are only for connecting DC reactor and braking resistor options. Do not connect it to other devices.

3. Consider the amount of voltage drop when selecting cable sizes. Increase the cable size when the voltage drop exceeds 2% of the motor rated voltage. The amount of voltage drop can be calculated

using the following formula:

Line drop voltage (V) = 3 a:ltage drop when selecting cable sizes. Increase the cable siz$^{-3}$

**Table 4.2.2 Cable Size and Tightening Torque (Three-phase 400V & single phase 200V)**

| Drive Frame | Terminal | USA | | Europe & Asia | | Terminal Screw Thread | kgf-cm (in-lbf) |
|---|---|---|---|---|---|---|---|
| | | Suggested Cable Size AWG, kcmil | Applicable Cable Size AWG, kcmil | Suggested Cable Size mm2 | Applicable Cable Size mm2 | | |
| Frame 1 | R, S, T, U, V, W, PE | 12 | 12 to 18 | 3.3 | 3.3 to 0.8 | M3 | 16.1 (14) |
| Frame 2 | R, S, T, U, V, W, PE | 8 | 8 to 18 | 8.4 | 8.4 to 0.8 | M4 | 18.3 (15.9) |

Torque conversion (Note 1)

1 lbf.in (pound force inch) = 1.152 kgf.cm (kilogram force centimeter)

1 N.m (newton meter) = 10.2 kgf.cm (kilogram force centimeter)

Wire diameter unit (according to UL758 specifications) (Note 2)

AWG (American wire gauge) The smaller the AWG number, the thicker the total conductor diameter

Mm2 (stranded conductor cross-sectional area unit) (Note 3)

Kcmil (cross-sectional area, 1000 times Circular Mil with MCM)

■ Please note the following items and be sure to follow the instructions:

1. The above torque and wire diameter are tested and certified by UL Safety Laboratory in the safe use range (UL certification force is 10% of the above table strength), if the screw is damaged due to excessive locking torque We apologize for the warranty of the company.

2. For all locking tools for locking terminal screws (screwdrivers and screwdrivers), please use the tools that meet the screw size specifications. If the screw cross hole damage does not work due to the tool not meeting the specifications, it is not covered by the warranty of the company. Forgive me.

3. All wiring specifications need to use copper wire with temperature resistance above 90 °C and meet the requirements of UL safety laboratory certification. If the machine is damaged due to the use of wire that does not meet the specifications and the safety concerns of use, the company cannot guarantee any matter.

4. Wire and product connection parts It is recommended to install and use the relevant wire diameter ring terminal to enhance the stability of wire use, to avoid the wire is not completely detached, resulting in safety concerns.

5. The end of the wire is connected with the ring terminal and the bare wire. If there is exposed wire at the wiring position, it is recommended to use UL safety laboratory certified withstand voltage gauge.The insulated heat shrinkable sleeve of the 600V YDPU2 covers the exposed copper wire part to avoid the danger of direct contact with the human body and increase the safety of use.

6. After the terminal is completed, please check whether the wire ends and the wire ends are installed correctly. Do not touch the wires across the distance to avoid the occurrence of machine damage. Human damage is not covered by the company's warranty, please forgive me.

7. Terminals UL Safety Laboratory Certification Number USA (XCFR2) and Canda (XCFR8) as part of the number E163737/E163040/E355499.

You can check the UL certification website at the following address:

http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.html

# 4.3 Control Circuit



Note

*1.  The RJ45 communication port support the build-in RS485 communication. The EVO6000P support RS485 communication terminal only.

*2.  Multi-function analog input S1~S6 can be switched between Sink(NPN) or Source(PNP) mode. Default: NPN mode.

*3.   A1 is used to set analog input as voltage input or current input.

*4.   AC is common terminal of analog signal (Analog Common).

*5.   Analog output is used to connect frequency meter, current meter, voltage meter and power meter.

*6.  This manual includes the blueprint of our products in the future. For more precise specifications, please refer to the user manual that alongside with our products. If you have any question, please contact our authorized distributors or LITE-ON.

*7.   The EVO6000P only has CE certifications.

# 4.3.1 Control Circuit Terminals
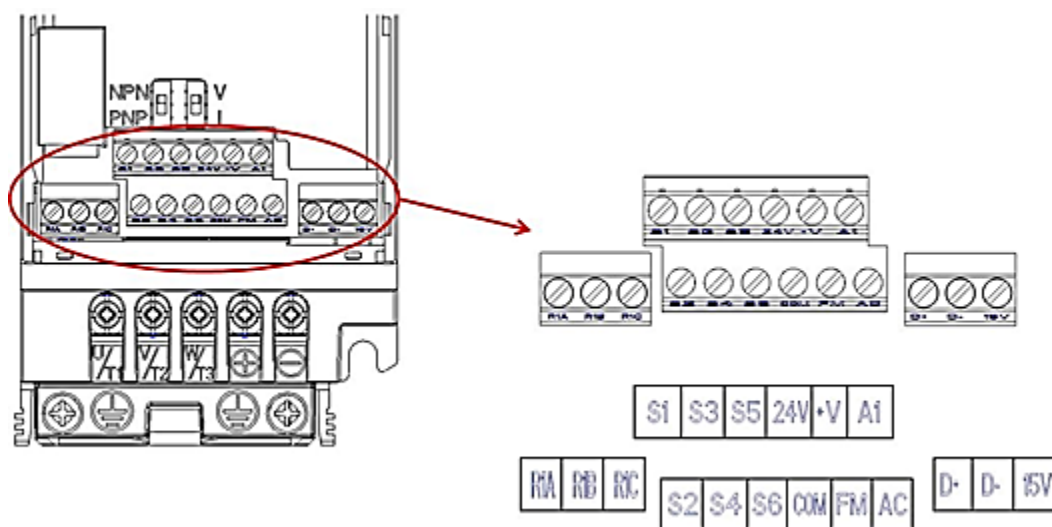


## 4.3.1.1 Input Terminals

Table 4.3.1.1 Control Circuit Input Terminal

| Terminal Type | Terminal Code | Terminal Name | Terminal Description |
|---|---|---|---|
| Multi-Function Digital Inputs | S1 | Digital input terminal 1 (forward/stop) | Photocoupler, 24 V, 8 mA. Use NPN/PNP switch to select multi-function digital input type. The default is NPN mode. |
| | S2 | Digital input terminal 2 (reverse/stop) | |
| | S3 | Digital input terminal 3 (external fault 1) | |
| | S4 | Digital input terminal 4 (fault reset) | |
| | S5 | Digital input terminal 5 (Jog) | |
| | S6 | Digital input terminal 6 (Baseblock) | |
| | 24V | +24V auxiliary power terminal for analog input | +24V 25mA |
| | COM | Digital input common terminal for NPN/PNP mode switch. Select the mode correctly when connecting. | |
| Multi-Function Analog Inputs | +V | Auxiliary power terminal +10V | Analog input power+10V |
| | A1 | Analog input terminal 1 (main frequency command) | Voltage input: 0 to 5V or 0 to 10V Impedance value: 32KΩ Current input: 0 or 4 to 20mA Impedance value: 250Ω |
| | PE | Ground terminal | The ground terminal for control signals to avoid interference. Use shielded cables only. |
| | AC | Common terminal for analog signals | |

## 4.3.1.2 Output Terminals

**Table 4.3.1.2 Control Circuit Output Terminals**

| Terminal Type | Terminal Code | Terminal Name | Terminal Description |
|---|---|---|---|
| Multi-Function Relay Output | R1A | Relay 1 normal open | Relay output: DC 30 V, 1 A AC 250 V, 5 A |
| | R1B | Relay 1 normal closed | |
| | R1C | Relay 1 common | |
| Multi-Function Analog Output | FM | Programmable analog output terminal (output frequency) | Voltage Output: 0 to 10V Impedance value: 20KΩ |
| | AC | Analog common terminal | |

<1> Do not assign frequent switching functions such as ON/OFF to terminals R, which may shorten the relay terminal life.

## 4.3.2 Control Circuit Wiring

The applicable functions in parameter Group E can be assigned to multi-function digital inputs (S1 to S6), multi-function relay outputs (R1), multi-function analog input (A1) and multi-function analog output (FM). The default settings are listed in Figure 4.3.1.1 and Figure 4.3.1.2.

- For safety, always check the emergency stop operation after wiring. Emergency stop circuit is necessary to stop the drive immediately in a safe manner to prevent any injuries.

- Do not remove the drive covers or touch the circuit boards when the power is on. Failure to comply could cause electrical shocks to personnel.

- Separate control circuit wiring from main circuit wiring and other power lines. Failure to comply could cause drive malfunction.

- Insulate shielded cable with tape to avoid contact with equipment and other signal lines. Improper insulation could cause drive or equipment malfunction.

- Always use shielded twisted-pair cables to prevent drive and equipment malfunction cause by electrical interference.

- Ground the shield to the ground terminal of drive. Failure to comply could cause erroneous operation or damage to the drive and equipment. Wire ground terminal and main circuit terminals before wiring control circuit terminals.

## 4.3.3 Control Circuit Cable Size and Tightening Torque

Select the cable according to Table 4.3.3.1. Use crimp ferrules on the cable ends for simpler and more reliable wiring.

**Table 4.3.3.1 Cable Size and Tightening Torque**

| Terminal | Bare Cable | | Ferrule-Type Terminal | | kgf-cm(in-lbf) | Cable Type |
| --- | --- | --- | --- | --- | --- | --- |
| | Suggested Size mm2 ( AWG) | Applicable Size mm2 ( AWG) | Suggested Size mm2 ( AWG) | Applicable Size mm2 ( AWG) | | |
| S1, S2, S3, S4, S5, S6, COM, 24V, +V,A1, AC, FM, PE | 0.26 ~ 1.31 (23 ~ 16) | 0.13 ~ 2.08 (26 ~ 14) | 0.41 ~ 1 (17 ~ 21) | 1.3 ~ 0.3 (22 ~ 16) | 5.1-8.1 (4.4-7in-lbf) | Shielded cable, etc. |
| R1A, R1B, R1C | 0.26 ~ 1.65 (23 ~ 15) | 0.13 ~ 3.31 (26 ~ 12) | 3.31 (12) | 0.13 ~ 3.31 (26~12) | 5.1-8.1 (4.4-7in-lbf) | Shielded cable, etc. |

## 4.3.4 Ferrule-Type Terminals

Always use ferrule-type terminals with insulated sleeves. Refer to Table 4.3.3.2. for dimensions. In addition, crimping tool CRIMPFOXZA-3 manufactured by Phoenix Contact is recommended.
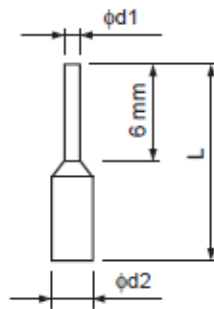


**Table 4.3.3.2 Ferrule-Type Terminal Models and Sizes**

| Cable Size mm2 ( AWG) | Type | L ( mm) | d1 ( mm) | d2 ( mm) | Manufacturer |
| --- | --- | --- | --- | --- | --- |
| 0.25 （24） | AI 0.25-6YE | 10.5 | 0.8 | 2 | Phoenix Contact |
| 0.34 （22） | AI 0.34-6TQ | 10.5 | 0.8 | 2 | Phoenix Contact |
| 0.5 （20） | AI 0.56-WH | 14 | 1.1 | 2.5 | Phoenix Contact |

# 4.4 I/O Connections

## 4.4.1 NPN and PNP Mode Selection

Use Sink/Source DIP switch on the control board to set NPN/PNP (Sink/ Source) mode for multi-function digital inputs S1 to S6. (Default: NPN mode)
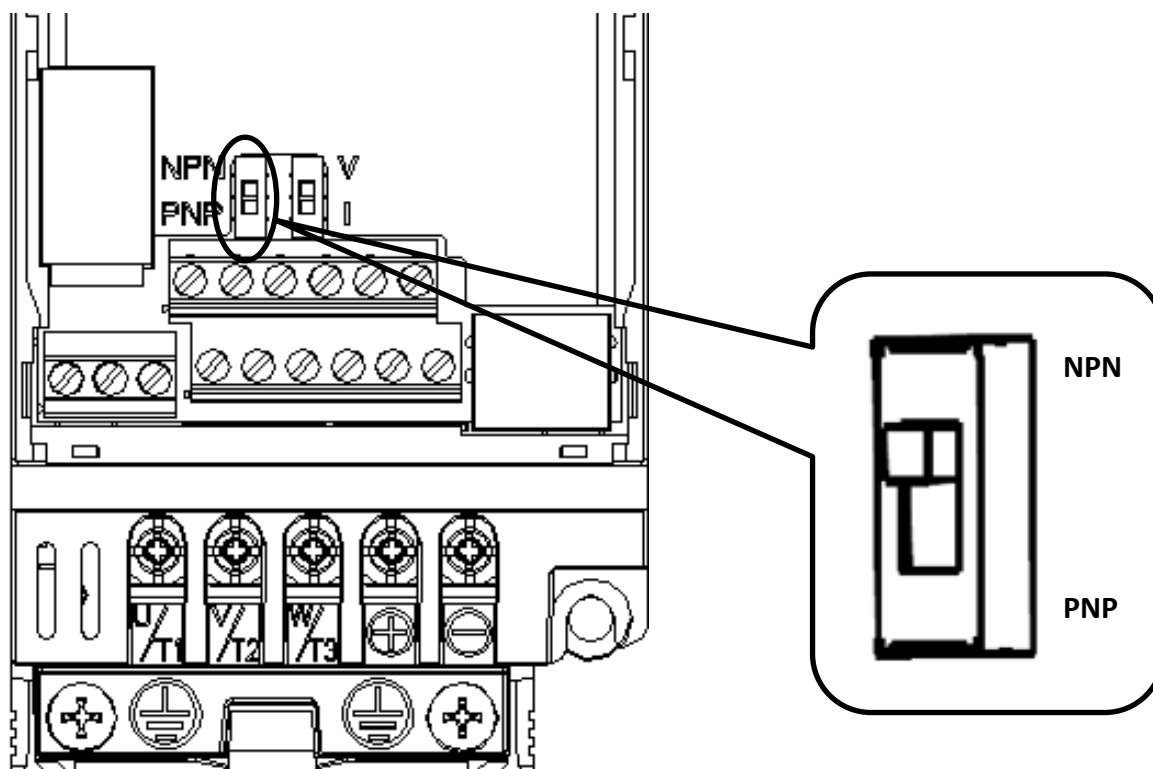


**Figure 4.4.1 NPN/PNP (Sink/Source) DIP Switch**

## 4.4.2 Terminal A1 Voltage/Current Input Selection

Select voltage or current input at terminal A1
- To select current as the input type, set DIP switch A1 to I and set parameter E3-00 to 0 (0 to 20 mA) or 1 (4 to 20 mA).
- To select voltage as the input type, set DIP switch A1 to V and set parameter E3-00 to 2 (0 to 10 V) or 3 (0 to 5 V).
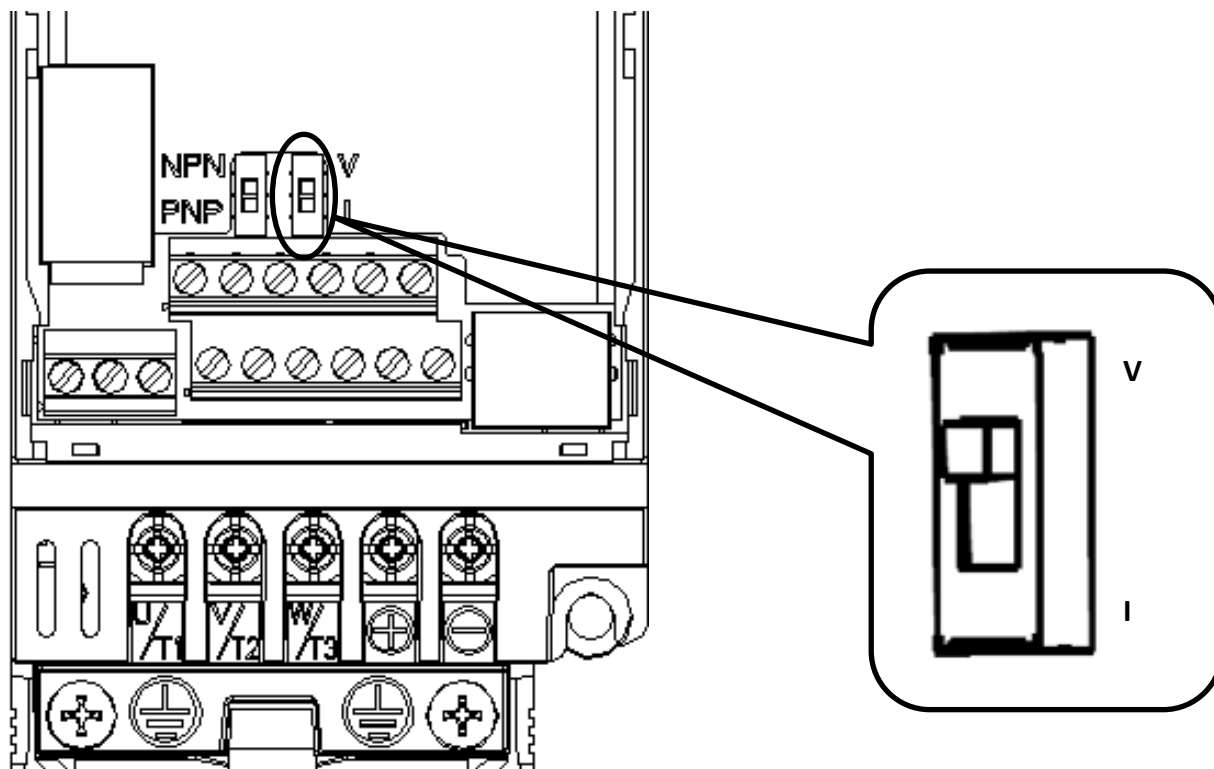


**Figure 4.4.2 DIP Switch A1**

**Table 4.4.1 DIP Switch A1 Settings (Terminal A1)**

| Setting | Description |
|---------|-------------|
| V | Voltage input (0 to 10 V (default) or 0 to 5 V) |
| I | Current input (4 to 20 mA or 0 to 20 mA) |

# 4.5 Wiring Checklist

**Table 4.6 Wiring Checklist**

| ☐ | No. | Item | Page |
|---|-----|------|------|
| | | Power Supply Voltage and Output Voltage | |
| ☐ | 1 | Power supply voltage is within the voltage range of specified drive input. | |
| ☐ | 2 | The motor voltage matches the drive output specifications. | |
| ☐ | 3 | The drive rating matches the motor rating. | |
| | | Main Circuit Wiring | |
| ☐ | 4 | An MCCB of proper specifications is connected between the drive and motor. | |
| ☐ | 5 | Power cables are correctly connected to drive input terminals R/L1, S/L2 and T/L3. | |
| ☐ | 6 | Motor terminals and drive terminals U/T1, V/T2 and W/T3 are in same phase sequence. (Otherwise the motor will rotate reversely) | |
| ☐ | 7 | Power supply and motor power cable complies with electrician regulations. | |
| ☐ | 8 | The drive is properly grounded. | |
| ☐ | 9 | Drive terminal screws of the main circuit and ground are tightened. | |
| ☐ | 10 | An MC is installed for each motor if a single drive runs more than on motor.  Note: Set MC1 to MCn OFF before operating the drive. Do not switch MC1 to MCn ON or OFF during run. | |
| ☐ | 11 | When using a braking resistor or braking unit, an MC is installed on the drive input side and able to shut off the power to drive when overloaded. | |
| | | Control Circuit Wiring | |
| ☐ | 12 | Twisted-pair cables are used for all drive control circuit wiring. | |
| ☐ | 13 | Shielded cables are connected to the terminals. | |
| ☐ | 14 | Options (if any) are properly installed. | |
| ☐ | 15 | No wiring mistakes. | |
| ☐ | 16 | Do not use a buzzer to check wiring. | |
| ☐ | 17 | The control circuit terminal screws are tightened. | |
| ☐ | 18 | No cable clippings or screws are left inside the drive enclosure. | |
| ☐ | 19 | Control circuit wiring and main circuit wiring are separated. | |

# Chapter 5│Keypad and Parameters

## 5.1 Keypad

Use the keypad to enter RUN and STOP commands, display data, fault, alarm and set parameters.

## 5.1.1 Keys and Displays



**Figure 5.3.1.1 Keypad**

**Table 5.1.1.2 Keypad Keys and Displays**

| No | Display | Name | Function |
|---|---|---|---|
| 1 | MENU | MENU Key | ■Enters or exits the parameter group<br>■Switches the displayed menu |
| 2 | RUN | RUN Key | Forward/reverse selection |
| 3 | STOP | STOP Key | Stops the drive. Refer to Table 5.1.2.2 |
| 4 | RESET | RESET Key | ■Moves the cursor to the right<br>Resets the drive to clear a fault situation |
| 5 | | Non-Slip Setting Dial | Press it as "ENTER" key:<br>■Enters parameter value, parameter and setting<br>■Enters parameter setting menu.<br>■Confirms the frequency set by the dial<br>Press it as "Dial"key:<br>Increases or decreases parameter numbers, setting value and frequency |
| 6 | RUN | RUN Light | Refer to Table 5.1.2.2 |
| 7 | REV | REV Light | Refer to Table 5.1.2.2 |
| 8 | EXT | EXT Light | Refer to Table 5.1.2.2 |
| 9 | FAULT | Fault Light | Refer to Table 5.1.2.2 |
| 10 | HZ | Hz Light | Refer to Table 5.1.2.2 |
| 11 | RPM | RPM Light | Refer to Table 5.1.2.2 |

# 5.1.2 Keypad Display

## 5.1.2.1 LED Display

**Table 5.1.2.1 LED Display**

| Number/Letter | LED Display | Number/Letter | LED Display | Number/Letter | LED Display | Number/Letter | LED Display |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 9 | 9 | i | i | r | r |
| 1 | 1 | A | A | J | J | S | S |
| 2 | 2 | b | b | K | Nil | t | t |
| 3 | 3 | c | C | L | L | U | U |
| 4 | 4 | d | d | M | Nil | v | u |
| 5 | 5 | E | E | n | n | W | Nil |
| 6 | 6 | F | F | o | o | X | Nil |
| 7 | 7 | G | G | P | P | y | Nil |
| 8 | 8 | H | H | q | Nil | Z | Nil |

## 5.1.2.2 LED Indication

**Table 5.1.2.2 LED Indication**

| Indicator Light | Lit | Blinking | Off |
|---|---|---|---|
| RUN | Drive in operation | ■ Drive in deceleration<br>■ Output frequency below the minimum frequency | Drive not in operation |
| REV | Rotating reversely | Nil | Nil |
| EXT | Allows Run commands only from a remote source | Nil | Nil |
| FAULT | During fault | Nil | Normal operation |
| HZ | Displaying output frequency | Nil | Nil |
| RPM | Displaying output speed | Nil | Nil |

## 5.1.3 Keypad Programming

■ Keypad Display Menu Structure

A. Standard setting mode: Press MENU to switch among monitor group, A1-00 parameter group and A2-00 user-defined parameter group. Press ENTER, MENU, Non-slip setting dial, and RESET to monitor and edit settings.

B. Holding MENU for 3 seconds for entering User Parameter A2-00

C. During-operation setting mode: Durirng operation in Local mode, use the non-slip setting dial to change the drive output frequency.

D. Holding Non-slip setting dial for 3 seconds in menu level can enter forward and reverse switching page, for more detail please refer to parameter b1-13.



U1-03 (Output Current)

U1-06 (Main Circuit DC Voltage)

U1-05 (Output Voltage)

U1-04 (Motor Speed)

AI1 (Percentage)

Para. Setting

User Para.

Monitor Para.
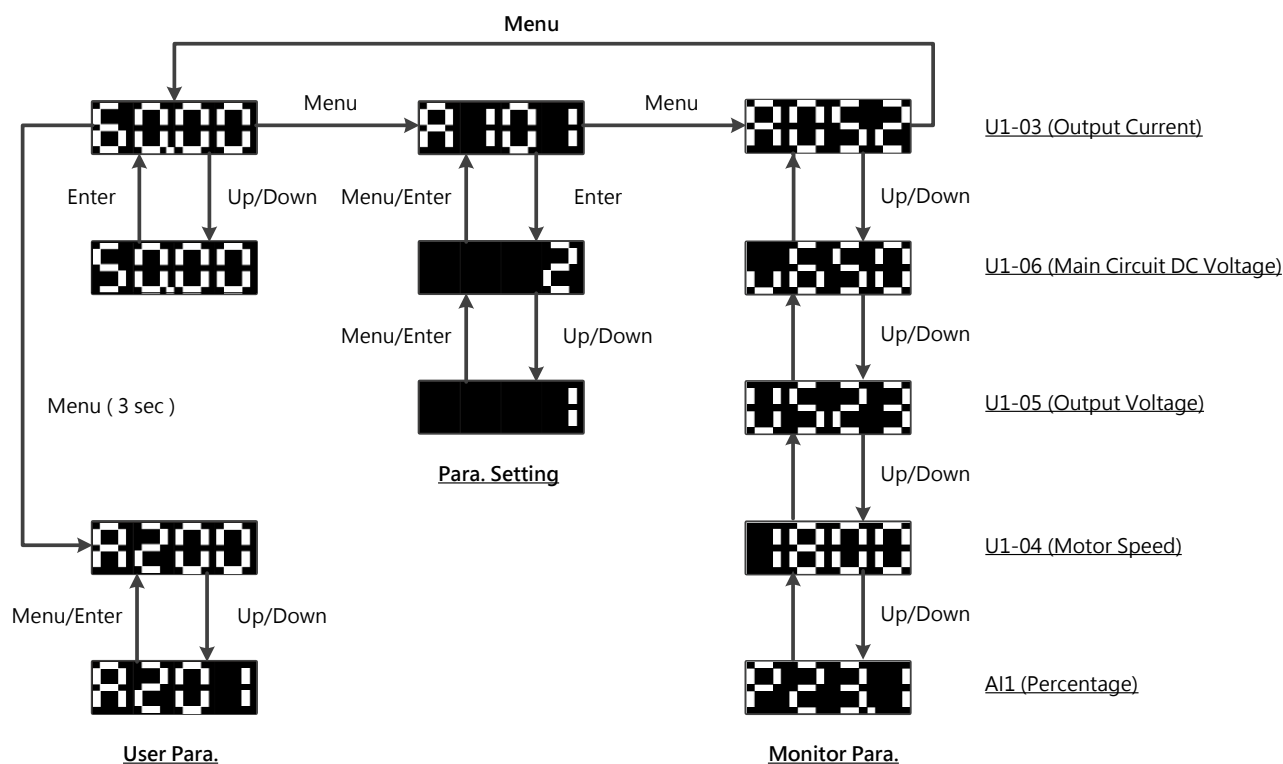
# 5.2 Parameter List

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| **Group A, Initialization** | | | |
| A1: Basic Settings | | | |
| A1-01 <4> | Access Level Selection | Selects access level ( edit /view)<br>0: View Only<br>  Access to only parameter A1-01.<br>1: User-Defined Parameter Access<br>  Access to only parameter A1-01 and A2-00 to A2-15.<br>2: All Parameter Access<br>  All parameters can be edited and viewed | Default: 2<br>Min.: 0<br>Max.: 2 |
| A1-02 | Control Method Selection | 0: Open-Loop V/F Control<br>1: Sensorless Voltage Vector Control (SVVC) (Open-Loop) | Default: 0<br>Range: 0, 1 |
| A1-03 | Reset | 0: No initialization<br>2520: Resets 2-Wire Sequence / 50Hz / 200V<br>2522: Resets 2-Wire Sequence / 50Hz / 220V<br>2523: Resets 2-Wire Sequence / 50Hz / 230V<br>2620: Resets 2-Wire Sequence / 60Hz / 200V<br>2622: Resets 2-Wire Sequence / 60Hz / 220V<br>2623: Resets 2-Wire Sequence / 60Hz / 230V<br>3520: Resets 3-Wire Sequence / 50Hz / 200V<br>3522: Resets 3-Wire Sequence / 50Hz / 220V<br>3523: Resets 3-Wire Sequence / 50Hz / 230V<br>3620: Resets 3-Wire Sequence / 60Hz / 200V<br>3622: Resets 3-Wire Sequence / 60Hz / 220V<br>3623: Resets 3-Wire Sequence / 60Hz / 230V<br>2538: Resets 2-Wire Sequence / 50Hz / 380V<br>2541: Resets 2-Wire Sequence / 50Hz / 415V<br>2544: Resets 2-Wire Sequence / 50Hz / 440V<br>2546: Resets 2-Wire Sequence / 50Hz / 460V<br>2638: Resets 2-Wire Sequence / 60Hz / 380V<br>2641: Resets 2-Wire Sequence / 60Hz / 415V<br>2644: Resets 2-Wire Sequence / 60Hz / 440V<br>2646: Resets 2-Wire Sequence / 60Hz / 460V<br>3538: Resets 3-Wire Sequence / 50Hz / 380V<br>3541: Resets 3-Wire Sequence / 50Hz / 415V<br>3544: Resets 3-Wire Sequence / 50Hz / 440V | Default: 0<br>Range: 0~9999 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | 3546: Resets 3-Wire Sequence / 50Hz / 460V<br>3638: Resets 3-Wire Sequence / 60Hz / 380V<br>3641: Resets 3-Wire Sequence / 60Hz / 415V<br>3644: Resets 3-Wire Sequence / 60Hz / 440V<br>3646: Resets 3-Wire Sequence / 60Hz / 460V | |
| A1-04 | Password | Set password to parameter A1-05 and enter the password to parameter A1-04 to unlock it. | Default: 0000<br>Min.: 0000<br>Max.: 9999 |
| A1-05 | Password Setting | Parameters A1-01 to A1-03, A1-06, A2-01 to A2-15 cannot be edited until correct password is entered to A1-04 | |
| A1-07<br><10> | Pump mode enable selection | Set whether the pump mode is ON<br>0: Standard mode<br>1: Pump mode (single pump)<8><br>Only FW version 1.53 or later is supported | Default: 0<br>Min.: 0<br>Max.: 1<br>Unit: - |
| A2: User-Defined Parameters | | | |
| A2-00 to A2-15 | User-Defined Parameters 1 to 16 | Selects up to 16 parameters and assigns them to parameter A2-00 to A2-15. Saved parameters can be viewed in User-Defined Parameter Access. To assign specific parameters to A2-00 to A2-15, set parameter A1-01 to 2. The saved parameters A2-00 to A2-15 can only be viewed if A1-01 is set to 1<br>**Can be modified during running period**<br><br>| Parameter | Default | Name |<br>\|---\|---\|---\|<br>\| A2-00 \| b1-00 \| Frequency command selection \|<br>\| A2-01 \| b1-01 \| Operation command selection \|<br>\| A2-02 \| C1-00 \| Acceleration time 1 \|<br>\| A2-03 \| C1-01 \| Deceleration time 1 \|<br>\| A2-04 \| C3-00 \| Torque compensation gain \|<br>\| A2-05 \| d1-02 \| Maximum output frequency \|<br>\| A2-06 \| d1-03 \| Maximum output voltage \|<br>\| A2-07 \| d1-04 \| Basic motor frequency \| | Range: A1-00 to F1-25 |

The nested sub-table:

| Parameter | Default | Name |
|---|---|---|
| A2-00 | b1-00 | Frequency command selection |
| A2-01 | b1-01 | Operation command selection |
| A2-02 | C1-00 | Acceleration time 1 |
| A2-03 | C1-01 | Deceleration time 1 |
| A2-04 | C3-00 | Torque compensation gain |
| A2-05 | d1-02 | Maximum output frequency |
| A2-06 | d1-03 | Maximum output voltage |
| A2-07 | d1-04 | Basic motor frequency |

| Parameter | Name | Description | | | Setting Range |
|---|---|---|---|---|---|
| | | A2-08 | d1-05 | Basic motor voltage | |
| | | A2-09 | o2-06 | Motor running direction | |
| | | A2-10 | b1-10 | Power ON/OFF selection | |
| | | A2-11 | E2-00 | Relay1 function selection | |
| | | A2-12 | E3-00 | Analog A1 input level | |
| | | A2-13 | E3-01 | Analog A1 function | |
| | | A2-14 | - | | |
| | | A2-15 | - | | |
| A2-32 | User-Defined Parameter Automatic Save | Saves the most recently edited parameters. <br> 0: Do not save list of recently edited parameters <br> 1: A2-08~A2-15 automatic registration is valid (At this time, A2-08 ~ A2-15 cannot be set manually) It can be modified during operation. | | | Default: 0 <br> Range: 0, 1 |
| **Group b, Application** | | | | | |
| b1: Operation Mode Selection | | | | | |
| b1-00 | Frequency Command Selection 1 | 0: Keypad <br> 1: Control Circuit Terminal (Analog Input) <br> 2: Terminal Up/Down <br> 3: Modbus Communication | | | Default: 0 <br> Min.: 0 <br> Max.: 3 |
| b1-01 | Run Command Selection 1 | 0: Keypad <br> 1: Control Circuit Terminal (Sequence Control Input) <br> 2: Modbus Communication | | | Default: 0 <br> Min.: 0 <br> Max.: 2 |
| b1-02 | Stopping Method Selection | 0: Ramp to Stop <br> 1: Coast to Stop <br> 2: DC Braking to Stop <br> 3: Coast to Stop with Timer | | | Default: 0 <br> Min.: 0 <br> Max.: 3 |
| b1-03 | Reverse Rotation Selection | 0: Reverse Rotation Enabled <br>   Drive accepts a run command of both <br>   forward and reverse directions <br> 1: Reverse Rotation disabled <br>   Drive can accept only run command of <br>   forward direction | | | Default: 0 <br> Range: 0, 1 |
| b1-05 | Run Command Action after Switch | 0: Ignore Active Run Command at the New Source | | | Default: 0 <br> Min.: 0 <br> Max.: 1 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | If a Run command at the new source is active, the drive will not start or the drive will stop operation if it was running when switching from the old source to the new source. The drive can start only when the Run command is removed and given again.<br>1: Accept Active Run Command at the New Source<br>If a run command at the new source is active, the drive will accept it and run the motor immediately right after switching from the old source to the new source. | |
| b1-06 | Run Command Selection during Programming | 0: Run command disabled during Programming<br>1: Run command enabled during Programming<br>2: Prohibit programming during run<br>The programming mode cannot be displayed during run except for monitoring parameter Group U. | Default: 0<br>Min.: 0<br>Max.: 2 |
| b1-07 <7> | Frequency Command Selection 2 | 0: Keypad<br>1: Control Circuit Terminal (Analog Input)<br>2: Terminal Up/Down<br>3: Modbus Communication | Default: 0<br>Min.: 0<br>Max.: 3 |
| b1-09 <7> | Frequency superposition Selection | 0 : Disabled<br>1 : Enabled | Default: 0<br>Range: 0, 1 |
| b1-10 | Run Command at Power up | Determines to accept or ignore an active Run command from Remote during power up.<br>0: Ignore<br>Drive ignores an active run command during power up<br>1: Accept<br>Drive accepts an active run command at power up and runs the motor immediately. | Default: 0<br>Min.: 0<br>Max.: 1 |
| b1-11 | Retained | | |
| b1-12 | Local/ Remote switching Enable during Operating | 0 :Disabled<br>1 :Enabled | Default: 0<br>Range: 0, 1 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| b1-13 | Forward and Reverse Selection from Keypad | 0 :Disabled<br>1 :Enabled | Default: 0<br>Range: 0, 1 |
| | | b2: DC Braking | |
| b2-00 | Zero Speed Holding (DC Braking) Start Level | Sets the start frequency for Zero Speed Holding (DC braking). Enabled when b1-02 (Stopping Method Selection) is set to 0 (Ramp to Stop) | Default: 0.5Hz<br>Min.: 0.0 Hz<br>Max.: d1-02 |
| b2-01 | DC Braking Current | Sets the DC braking current as a percentage of the drive rated current | Default: 0%<br>Min.: 0%<br>Max.: 100% |
| b2-02 | DC Braking Time at Start | Sets the DC braking time at start to stop a coasting motor before restarting it or to apply braking torque at start when high starting torque is needed.<br>Disabled when set to 0.00. | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 99.99 s |
| b2-03 | DC Braking Time at Stop | Sets the DC braking time at stop to stop a motor rotating with high inertia.<br>Disabled when set to 0.00. | Default: 0.00s<br>Min.: 0.00 s<br>Max.: 99.99 s |
| | | b3: Speed Search | |
| b3-00 | Speed Search Setting | 0 :Disabled<br>1 :Enabled and searched from the highest frequency<br>2 : Enabled and searched from the frequency command | Default: 0<br>Min.: 0<br>Max.: 2 |
| b3-01 | Speed Search Operating Current | Sets the current level as a percentage of the drive rated current below which Speed Search is deactivated. | Default: 120%<br>Min.: 30 %<br>Max.: 140% |
| b3-02 <7> | Voltage Rocevery Time | Sets the search speed in the output voltage restoring to the time set v / f voltage curve required | Default: 0.6s<br>Min.: 0.3s<br>Max.: 5.0s |
| b3-04 <7> | Speed search deceleration time | Sets the search speed in the deceleration time (The maximum output frequency to the minimum output frequency deceleration time) | Default: 2.0s<br>Min.: 0.1s<br>Max.: 10.0s |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| b3-05 <7> | Search speed in V / f | In order to reduce the speed of search output current by the V / f curve calculated by multiplying the voltage set value b3-05 by adjusting the setting, the speed can be suppressed search output current. | Default: 100%<br>Min.: 10 %<br>Max.: 100% |
| | | b4：Timer Function | |
| b4- 00 <7> | Timer Function On-Delay Time | Sets the on-delay and off-delay time to switch on/off the timer output. | Default: 0.1 s<br>Min.: 0.1 s<br>Max.: 3000.0 s |
| b4- 01 <7> | Timer Function Off-Delay Time | | Default: 0.1 s<br>Min.: 0.1 s<br>Max.: 3000.0 s |
| | | b5: PID Control | |
| b5-00 | PID Control Setting | 0：PID Control Disabled<br>1：PID Control Enabled (D Control for Deviation Signal U4-01)<br>2：PID Control Enabled (D Control for Feedback Signal U4-05)<br>3：PID Control Enabled (Frequency Command + PID Output from D Controlled Deviation)<br>4：PID Control Enabled (Frequency Command + PID Output from D Controlled Feedback)<br>5：PID Control Disabled，but b5-14/b5-15 (PID Sleep) and b5-29/b5-30(PID Wake-up) Enabled | Default: 0<br>Min.: 0<br>Max.: 5 |
| b5-01 | Proportional Gain Setting (P) | Sets the P gain for PID input. | Default: 1.00<br>Min.: 0.00<br>Max.: 25.00 |
| b5-02 <4> | Integral Time Setting (I) | Deviation appears between PID target value and feedback value when using only proportional control. To reduce the deviation, set integral time (I). | Default: 1.0 s<br>Min.: 0.0 s<br>Max.: 360.0 s |
| b5-03 <4> | Integral Time (I) Limit Setting | Sets the maximum output from the I (integral) control as a percentage of the maximum frequency (d1-02) | Default: 100.0%<br>Min.: 0.0%<br>Max.: 100.0% |
| b5-04 <4> | Derivative Time (D) | Sets derivative time for D control. | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 10.00 s |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| b5-05 <4> | PID Output Limit | Sets the maximum output from PID control as a percentage of the maximum frequency. | Default: 100.0%<br>Min.: 0.0%<br>Max.: 100.0% |
| b5-06 <4> | PID Bias Voltage Adjustment | Sets the PID bias voltage adjustment as a percentage of the maximum frequency to add to the PID control output. | Default: 0.0%<br>Min.: -100%<br>Max.: 100.0% |
| b5-07 <4> | PID Primary Delay Time | Sets the delay time for the PID output filter. | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 10.00 s |
| b5-08 | PID Output Selection | 0 : Normal PID Output<br>1 : Reverse PID Output<br>   Reverses the +/- sign of the PID output | Default: 0<br>Min.: 0<br>Max.: 1 |
| b5-09 | PID Output Gain | Sets a PID output gain | Default: 1.00<br>Min.: 0.00<br>Max.: 25.00 |
| b5-10 | PID Output Reverse Selection | Determines whether or not a negative PID output reverses the drive rotating direction.<br>0 : Reverse Disabled<br>1 : Reverse Enabled | Default: 0<br>Min.: 0<br>Max.: 1 |
| b5-11 | PID Feedback Low /High Detection Selection | 0 : Multi-Function Output Only<br>1 : Feedback Low /High Alarm<br>   The drive continues operation when an<br>   alarm is displayed)<br>2 : Feedback Low /High Fault<br>   A fault will cause the drive to stop the<br>   motor.<br>3 : Multi-Function Output only when PID is<br>   Disabled<br>   Same action as b5-11=0.<br>4 : Feedback Low /High Alarm (detection<br>   disabled when PID is disabled)<br>5 : Feedback Low /High Fault (detection<br>   disabled when PID is disabled)<br>6 : Multi-Function Output (Keep running<br>   without an alarm displayed)<br>7 : Multi-Function Output Only (detection<br>   working when drive running or not) | Min: 0<br>Min.: 0<br>Max: 7 |
| b5-12 | PID Feedback Low Detection Level | Sets the PID feedback level used for detection. When the PID feedback falls below this level for longer than the time set to b5-13, PID feedback loss will be detected. | Default: 0%<br>Min.: 0%<br>Max.: 100% |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| b5-13 | PID Feedback Low Detection Time | Sets the PID feedback time used for detection. When the PID feedback falls below the level set to b5-12 for longer than this time, PID feedback loss will be detected. | Default: 1.0 s<br>Min.: 0.0 s<br>Max.: 25.5 s |
| b5-14 | PID Sleep Start Level | Sets the PID level to trigger the drive to sleep. | Default: 0.0Hz<br>Min.: 0.0 Hz<br>Max.: <5> |
| b5-15 | PID Sleep Delay Time | Sets the delay time used to activate/deactivate the PID Sleep function. | Default: 0.0 s<br>Min.: 0.0 s<br>Max.: 25.5 s |
| b5-16 | PID Command Acc./Dec. Time | Sets the PID command acceleration /deceleration time used for PID target. | Default: 0.0 s<br>Min.: 0.0 s<br>Max.: 20.0 s |
| b5-17 | PID Target Selection | 0 :PID Target Disabled<br>1 :PID Target Enabled | Default: 0<br>Range: 0, 1 |
| b5-18 | PID Target Value | Sets the PID target value as a percentage of the maximum output frequency when b5-17 is set to 1. Disabled when b5-17=0 | Default: 0.00%<br>Min.: 0.00%<br>Max.: 99.99% |
| b5-19 | PID Target Value Units | 0 : 0.01Hz<br>1 : 0.01% (Maximum Frequency is 100%)<br>2 : r/min. (Number of Motor Poles must be set)<br>3 : User Defined (Defined by b5-24 and b5-25) | Default: 1<br>Min.: 0<br>Max.: 3 |
| b5-20<br><br><7> | PID Output Min. | Sets the lower limit as a percentage of the maximum output frequency set in d1-02 for PID output. | Default: 0.0%<br>Min.: -100%<br>Max.: 100.0% |
| b5-21<br><br><7> | PID Input Limit | The higher PID Input value is, the higher PID output value will be. Sets this parameter to limit the PID input value. | Default: 1000%<br>Min.: 0.0%<br>Max.: 1000% |
| b5-22<br><7> | PID Feedback High Detection Level | Sets the PID feedback to exceed the detected value with the highest output frequency of 100%. | Default: 100%<br>Min.: 0%<br>Max.: 100% |
| b5-23 | PID Feedback High Detection Time | Sets the time for PID feedback high detection. PID feedback high will be detected when the feedback exceeds the level set in b5-22 for longer than the time set in b5-23. | Default: 1.0 s<br>Min.: 0.0 s<br>Max.: 25.5 s |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| b5-24 | PID Target Display Value | Sets a value to display to U4-00 and U4-03 when the drive runs at the maximum output frequency | Determined by b5-19<br>Min.: 1<br>Max.: 9999 |
| b5-25 | PID Target Display Digits | Sets the number of decimal places to display.<br>0 : No Decimal Places<br>1 : 1 Decimal Place<br>2 : 2 Decimal Places<br>3 : 3 Decimal Places | Determined by b5-19<br>Min.: 0<br>Max.: 3 |
| b5-26 <7> | Frequency Command Display During PID | 0 : Displays frequency command after the PID compensation<br>1 : Displays frequency command before the PID compensation. | Default: 0<br>Min.: 0<br>Max.: 1 |
| b5-27 <7> | PID Output Direction | Sets the direction when PID output value is minus.<br>0 : Reverse is not allowed<br>1 : Reverse is allowed | Default: 1<br>Min.: 0<br>Max.: 1 |
| b5-28 | PID Disconnection Output Frequency | When a PID feedback disconnection alarm occurs, the drive will run at the frequency set to b5-28, and return to PID control when disconnection alarm is reset. | Default: 30.0 Hz<br>Min.:0.0Hz<br>Max.: <5> |
| b5-29 <7> | PID Wake-up Level | Sets the PID Wake-up level | Default:0.0 Hz<br>Min.:0.0 Hz<br>Max.:<5> |
| b5-30 <7> | PID Wake-up deley time | Sets the PID Wake-up delay time | Default: 0.0 s<br>Min.: 0.0 s<br>Max.: 25.5 s |
| | b9 : Zero speed DC brake function | | |
| b9-02 | Zero speed DC braking enabled | 0: off<br>1: open | Default: 0<br>Min.: 0<br>Max.: 1<br>Unit: - |
| b9-03 | Zero speed DC braking time | Set the zero speed DC function actuation time | Default: 0.1 s<br>Min.:0 s<br>Max.:99.99 s<br>Unit:0.01 s |
| | **Group C, Tuning** | | |
| | C1: Acc./Dec. Time | | |
| C1-00 <4> | Acceleration | Sets the time that the drive accelerates from | Default: 10.0 s |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | Time 1 | 0Hz to the maximum output. | Min.: 0.0 s |
| C1-01 <4> | Deceleration Time 1 | Sets the time that the drive decelerates from the maximum output to 0Hz. | Max.: 3600 s |
| C1-02 <4> | Acceleration Time 2 | Sets the time that the drive accelerates from 0Hz to the maximum output. | |
| C1-03 <4> | Deceleration Time 2 | Sets the time that the drive decelerates from the maximum output to 0Hz. | |
| C1-08 | Fast Stop Time | Sets the time to stop the drive faster. | |
| C1-11 | Jog Acc. Time | Sets the time to accelerate from 0 Hz to Jog Frequency Command (L1-16). | Default: 10.0 s<br>Min.: 0.0 s<br>Max.: 3600 s |
| C1-12 | Jog Dec. Time | Sets the time to decelerate from Jog Frequency Command (L1-16) to 0 Hz. | Default: 10.0 s<br>Min.: 0.0 s<br>Max.: 3600 s |
| C2: S-Curve Characteristics | | |
| C2-00 | S-Curve Characteristic at Acc. Start | Sets S-curve times for each acceleration or deceleration.<br><br>Actual Acceleration Time= Determined Acc. Time+(C2-00+C2-01)/ 2<br>Actual Deceleration Time= Determined Dec. Time+(C2-02+C2-03) / 2 | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 10.00 s |
| C2-01 | S-Curve Characteristic at Acc. End | | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 10.00 s |
| C2-02 | S-Curve Characteristic at Dec. Start | | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 10.00 s |
| C2-03 | S-Curve Characteristic at Dec. End | | Default: 0.00 s<br>Min.: 0.00 s<br>Max.: 10.00 s |
| C3: Torque Compensation | | |
| C3-00 | Torque Compensation Gain | Sets the gain for the motor 1 Torque compensation | Default: 0.50<br>Min.:0.00<br>Max.:2.50 |
| C3-02 | Torque Compensation Primary Delay Time | Sets the Torque compensation primary delay time. | Default: 0.010 s<br>Min.:0.000 s<br>Max.: 9.999 s |
| C5: Slip Compensation | | |
| C5-00 | Slip Compensation | Sets the slip compensation gain to improve the speed accuracy for heavy loads. | Default: 0.0<br>Min.: 0.0 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | Gain | | Max.: 2.5 |
| C5-01 | Slip Compensation Primary Delay Time | Sets the slip compensation primary delay time to stabilize the motor speed or to improve the speed response. | Default: 100 ms<br>Min.: 0 ms<br>Max.:9999ms |
| C6: Carrier Frequency | | | |
| C6-00 | Carrier Frequency Selection | Sets the switching frequency of the drive output transistors. Adjust this setting to reduce audible noise and leakage current.<br>2: 2.0 kHz<br>3: 3.0 kHz<br>4: 4.0 kHz<br>5: 5.0 kHz<br>6: 6.0 kHz<br>7: 7.0 kHz<br>8: 8.0 kHz<br>9: 9.0 kHz<br>10: 10.0 kHz<br>11: 11.0 kHz<br>12: 12.0 kHz | Default: 8<br>Range: 2-12<br>Min.: 2 |
| C7 : SVVC (Sensorless Voltage Vector Control) | | | |
| C7-00 | SVVC Proportional Gain | According to application feature to set this gain, if the load is heavy increase the value, and vice versa to reduce this value. Recommend to adjust 10% roughly and then adjust 1% minute. | Default: 40 %<br>Min.: 0 %<br>Max. : 250 %<br><7> |
| C7-01 | SVVC mode slip adjustment | If the slip compensation is not obvious or there is too much current at low speed, the parameter can be adjusted to improve (low speed SVVC compensation constant correction) | Default: 100<br>Min.:0<br>Max. :250<br>Unit: 1 |
| **Group L, Frequency Command** | | | |
| L1: Frequency Command | | | |
| L1-00 <4> | Frequency Command 1 | To use speed commands for each multi-step speed, set E1-much current at lo8 (multi-step speed command 1, 2, 3, 4). Sets E1- E1- et E1-much current at low spee | Default:5.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-01 <4> | Frequency Command 2 | | Default: 8.00 Hz<br>Min.: 0.00 Hz |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
|  |  | The upper limit is determined by d1-02 and L2-00.<br><br>When L2-00 (Frequency Upper Limit) is adjusted, the exceeded frequency in L1-00 to L1-15 will be automatically set to the upper limit determined in L2-00. | Max.: <5> |
| L1-02 <4> | Frequency Command 3 |  | Default: 10.00Hz<br>Min.: 0.00 Hz<br>Max.: <5> |
| L1-03 <4> | Frequency Command 4 |  | Default: 12.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-04 <4> | Frequency Command 5 |  | Default: 15.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-05 <4> | Frequency Command 6 |  | Default: 20.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-06 <4> | Frequency Command 7 |  | Default: 25.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-07 <4> | Frequency Command 8 |  | Default: 30.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-08 <4> | Frequency Command 9 |  | Default: 35.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-09 <4> | Frequency Command 10 |  | Default: 40.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-10 <4> | Frequency Command 11 |  | Default: 42.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-11 <4> | Frequency Command 12 |  | Default: 45.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-12 <4> | Frequency Command 13 |  | Default: 50.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-13 <4> | Frequency Command 14 |  | Default: 50.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-14 <4> | Frequency Command 15 |  | Default: 50.00Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L1-15 <4> | Frequency |  | Default: 50.00Hz |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | Command 16 | | Min.: 0.00Hz<br>Max.: <5> |
| L1-16 <4> | Jog Frequency Command | Sets the Jog frequency command. | Default: 6.00 Hz<br>Min.: 0.00Hz<br>Max.: <5> |
| L2: Frequency Upper/ Lower Limit | | | |
| L2-00 | Frequency Command Upper Limit | Sets the upper limit as a percentage of the maximum output frequency | Default: determed by d1-02<br>Min.: 0.0 Hz<br>Max.: determed by d1-02 |
| L2-01 | Frequency Command Lower Limit | Sets the lower limit as a percentage of the maximum output frequency | Default: 0.0 Hz<br>Min.: 0.0 Hz<br>Max.: determed by d1-02 |
| L3: Jump Frequency | | | |
| L3-00 | Jump Frequency 1 | Sets the Jump frequency range to avoid operation at the speed causing resonance in the machinery.<br>Set L3-00, L3-01 and L3-03 to 0.0 Hz to disable Jump frequency.<br>When setting more than 1 Jump frequency, follow the condition below.<br>L3-00 $\leqq$ L3-01 | Default: 0.0 Hz<br>Min.: 0.0 Hz<br>Max.: <5> |
| L3-01 | Jump Frequency 2 | | |
| L3-03 | Jump Frequency Range | Sets the Jump frequency range to avoid. | Default: 1.0 Hz<br>Min.: 0.0 Hz<br>Max.: 20.0 Hz |
| L4: Frequency Command Hold and Up/Down 2 Command | | | |
| L4-00 | Frequency Command Hold | Determines whether or not to save the frequency command or the frequency bias (Up/Down 2) value when the Stop command is entered or the power supply is shut off.<br>0：Clear the Up/Down frequency at stop<br>1：Save the Up/Down frequency at stop<br>2：Accept the Up/Down frequency at stop | Default: 0<br>Range: 0, 1, 2 |
| L4-01 <4> | Frequency Command Bias (Up/Down 2) | Sets the bias used to add to or subtract from the frequency command by Up/Down 2. | Default:0.00 Hz<br>Min.: 0.00 Hz<br>Max.: 99.99 Hz |
| L4-02 <4> | Frequency | Sets the acceleration/deceleration times to | Default: 0 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| L4-02 <4> | Command Acc./Dec Setting (UP2 / DOWN 2) | increase or decrease the frequency command bias for Up/Down 2.<br>0： Current Acc./Dec. Time<br>1： Non-Current Acc./Dec. Time | Range: 0, 1 |
| L4-03 <4> | Up/Down Frequency Command Save | Saves the frequency command from Up/Down 1 or Up/Down 2 | Default: 0.00Hz<br>Min.: 0.00 Hz<br>Max.: <5> |
| L4-04 | Frequency Command Save | 0: Disabled<br>1: Enabled | Default: 0<br>Range 0, 1 |
| | | L6 Offest Frequency | |
| L6-00 <4><7> | Offset Frequency 1 | As the correction value of the speed, the three kinds of bias frequencies can be added and subtracted to the frequency command. Select the offset frequency in E1-□□= 53, 54 and 55 (Offset Frequency 1 to 3). | Default: 0.0%<br>Min.: -100%<br>Max.: 100.0% |
| L6-01 <4><7> | Offest Frequency 2 | As the correction value of the speed, the three kinds of bias frequencies can be added and subtracted to the frequency command. Select the offset frequency in E1-ed, the three kinds of bias frequencies can | Default: 0.0%<br>Min.: -100%<br>Max.: 100.0% |
| L6-02 <4><7> | Offest Frequency 3 | As the correction value of the speed, the three kinds of bias frequencies can be added and subtracted to the frequency command. Select the offset frequency in E1-ed, the three kinds of bias frequencies can | Default: 0.0%<br>Min.: -100%<br>Max.: 100.0% |
| | | **Group d, Motor Parameters** | |
| | | d1: V/F Characteristics | |
| d1-00 | Input Voltage Setting | Sets the input voltage of the drive.<br>Always set the input voltage of the drive (not motor) to this parameter d1-00 (input voltage) | Default : 400<br>Min.: 155 V<br>Max.: 255V <3> |
| d1-01 | V/F Pattern Selection | 0：50 Hz (Constant Torque Characteristic 1)<br>1：60 Hz (Constant Torque Characteristic 2)<br>2：60 Hz (Constant Torque Characteristic 3), 50 Hz base<br>3：72 Hz (Constant Torque Characteristic 4), 60 Hz base<br>4：50 Hz (Derated Torque Characteristic 1) | Default: F<br>Range: 0 to 9; A to F |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | 5：50 Hz (Derated Torque Characteristic 2)<br>6：60 Hz (Derated Torque Characteristic 3)<br>7：60 Hz (Derated Torque Characteristic 4)<br>8：50 Hz (High Starting Torque Characteristic 1)<br>9：50 Hz (High Starting Torque Characteristic 2)<br>A：60 Hz(High Starting Torque Characteristic 3)<br>B：60 Hz(High Starting Torque Characteristic 4)<br>C：90 Hz, 60 Hz base<br>D：120 Hz, 60 Hz base<br>E：180 Hz, 60 Hz base<br>F：60Hz (Constant Torque Characteristic)<br>　(Default) | |
| d1-02 | Maximum Output Frequency | When d1-01 ≦ E, parameters d1-02 to d1-11 can be used to monitor the V/F pattern.<br>When d1-01 = F, parameters d1-02 to d1-11 can be used to create a V/F pattern. | Default: <1><br>Min.: 25.0 Hz<br>Max.: 400.0 Hz |
| d1-03 | Maximum Voltage | | Default: <1><br>Min.: 0.0 V<br>Max.: 255.0 V <3> |
| d1-04 | Base Frequency | | Default: <1><br>Min.: 0.0 Hz<br>Max.: Defined by d1-02 |
| d1-05 | Base Voltage | | Default: <1><br>Min.: 0.0 V<br>Max.: 255.0 V <3> |
| d1-06 | Middle Output Frequency | | Default: <1><br>Min.: 0.0 Hz<br>Max.: Defined by d1-02 |
| d1-07 | Middle Output Frequency Voltage | | Default: <1><br>Min.: 0.0 V<br>Max.: 255.0 V <3> |
| d1-08 | Minimum Output Frequency | When d1-01 ≦ E, parameters d1-02 to d1-11 can be used to monitor the V/F pattern.<br>When d1-01 = F, parameters d1-02 to d1-11 can be used to create a V/F pattern. | Default: <1><br>Min.: 0.0 Hz<br>Max.: Defined by d1-02 |
| d1-09 | Minimum | | Default:<1> |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
|  | Output Frequency Voltage |  | Min.: 0.0 V<br>Max.: 255.0 V <3> |
| d1-15 | Motor 2 Base Frequency | Set the motor 2 V/F pattern | Default: <1><br>Min.: 0.0 Hz<br>Max.: Defined by d1-02 |
| d1-20 | Motor 2 Minimum Output Frequency Voltage |  | Default: <1><br>Min.: 0.0 V<br>Max.: 255.0 <3> |
| d2: Motor Parameters | | | |
| d2-00 | Motor Rated Current | Sets the motor rated current. This will be set automatically during Auto-Tuning. | Default: o2-03 (A)<br>Min.: 10% of drive rated current (A)<br>Max.: 200% of drive rated current (A) |
| d2-01 | Motor Rated Speed | Sets the motor rated speed. This will be set automatically during Auto-Tuning. | Default: o2-03<br>Min.: 0.00 Hz<br>Max.: 40.00 Hz |
| d2-02 | Motor No-Load Current | Sets the motor no-load current. This will be set automatically during Auto-Tuning. | Default: o2-03<br>Min.: 0 A<br>Max.: d2-00 |
| d2-03 | Number of Motor Poles | Sets the number of motor poles. This will be set automatically during Auto-Tuning. | Default: 4<br>Min.: 2<br>Max.: 48 |
| d2-04 | Motor Line-to-Line Resistance | Sets the line-to-line resistance. This will be set automatically during Auto-Tuning. | Default: o2-03<br>Min.: 0.000 Ω<br>MMax.:65.00 Ω |
| d2-05 | Motor Leakage Inductance | Sets the voltage drop caused by the motor leakage inductance relative to the motor rated frequency and current. This will be set automatically during Auto-Tuning. | Default: o2-03<br>Min.: 0.00 mH<br>Max.:650.0 mH |
| d2-06<br>d2-06 | Motor Rotor Resistance | Sets the motor rotor resistance. This will be set automatically during Auto-Tuning. | Default: o2-03<br>Min.: 0.000 Ω<br>Max.:65.00 Ω |
| d2-07 | Motor Mutual Inductance | Sets the motor mutual inductance. This will be set automatically during Auto-Tuning. | Default: o2-03<br>Min.: 0.0 mH<br>Max.:6500 mH |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| d2-10 | Motor Rated Capacity | Sets the motor rated capacity. This will be set automatically during Auto-Tuning. (1HP = 0.746 kW) | Default: o2-03<br>Min.: 0.00 kW<br>Max.: 650.0kW |
| **Group E, Multi-Function Terminals** | | | |
| E1: Multi-Function Digital Inputs | | | |
| E1-00 | Terminal S1 Function Selection | 0 : 2-Wire Sequence Control (Forward/Stop) / 3-Wire Sequence Control (Stop)<br>1 : 2-Wire Sequence Control (Reverse/Stop) / | Default : 0<br>Min.: 0<br>Max.: 0~73/100~173 |
| E1-01 | Terminal S2 Function Selection | 3-Wire Sequence Control (Stop)<br>2 : 3-Wire Sequence<br>3 : Local/Remote Selection | Default : 1<br>Min.: 0<br>Max.: 0~73/100~173 |
| E1-02 | Terminal S3 Function Selection | 5 to 8: Multi-Step Speed Command 1 to 4<br>9 : Jog Frequency<br>10 : Up Command | Default : 23<br>Min.: 0<br>Max.: 0~73/100~173 |
| E1-03 | Terminal S4 Function Selection | 11: Down Command<br>12: Up 2 Command<br>13: Down 2 Command | Default : 39<br>Min.: 0<br>Max.: 0~73/100~173 |
| E1-04 | Terminal S5 Function Selection | 14, 15: FJOG/RJOG Command<br>16: Acc./Dec. Time Selection 1<br>18: Acc./Dec. Ramp Hold | Default : 9<br>Min.: 0<br>Max.: 0~73/100~173 |
| E1-05 | Terminal S6 Function Selection | 19: Baseblock Command (Normal Open)<br>20: Retain<br>21: Fast Stop (Normal Open)<br>22: Fast Stop<br>23 to 38 : External Fault<br>39: Fault Reset<br>40 : oH2 (AC drive Overheat Alarm)<br>45: Communication Mode<br>46: PID Disable<br>47: PID Integral Reset<br>48: PID Integral Hold<br>49: PID Soft-Start On/Off<br>50: PID Input Characteristics Switch<br>52: Timer Input<br>53, 54, 55: Offset Frequency 1/ 2/ 3<br>58/59: Retain<br>60: Program Lockout<br>61: Analog Frequency Command Hold<br>62: Retain | Default : 19<br>Min.: 0<br>Max.: 0~73/100~173 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | 65: DC Braking<br>69 : Drive Enabled<br>(Note) 0xx/1xx are anti-logic | |
| E1-08 | 2/3-wire control switch | 0:2/3 line control mode 1<br>1:2/3 line control mode 2 | Default: 0<br>Min.: 0<br>Max.: 1 |
| E1-09 | DI terminal delay time | Used to set the delay time of the inverter for the change when the status of the DI terminal changes. | Default: 0 ms<br>Min.: 0<br>Max.: 500 ms |
| E2: Multi-Function Digital Output | | | |
| E2-00 | Relay 1 Function Selection | 0 : During Run<br>1 : Zero Speed Holding<br>2 : Frequency (Speed) Agree<br>3 :User-Defined Frequency (Speed ) Agree<br>4 : Drive Ready<br>5 : Uv (Undervoltage) Detection<br>6 : During Baseblock<br>8 : Frequency Command Source<br>9 : Frequency Command Loss<br>10: Run Command Source<br>11 : Fault<br>12 : Communication Mode<br>13 : Alarm<br>14 : Fault Restart<br>15 : Timer Outpu<br>16 : Frequency (FOUT) Detection 1<br>17 : Frequency (FOUT) Detection 2<br>18: Overvoltage/ Undervoltage Detection 1<br>    (normal open)<br>22 : During Reverse<br>24: During Regeneration<br>25 : During Restart<br>26 : Motor Overload Pre-Alarm (oL1)<br>27 : Drive Overheat Pre-Alarm (oH)<br>35: During Frequency Output<br>36: Drive Enabled<br>38 : Local/Remote Mode<br>39 : During Speed Search<br>40 :PID Feedback Low<br>41 :PID Feedback High<br>44 : During Fast Stop | Default: 11<br>Range: 0 to 49 / 100 to 149 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | 49 : Brake Control (Desired frequency attained<br>52: Timer Input<br>100 to 149: 0 to 49 with Inverse Output | |
| | | E3: Multi-Function Analog Input | |
| E3-00 | Terminal A1 Signal Level Selection | 0: 0 to 20 mA<br>1: 4 to 20 mV<br>2: 0 to 10 V<br>3: 0 to 5 V | Default: 2<br>Range: 0 to 3 |
| E3-01 | Terminal A1 Function Selection | 0 : Main Frequency Command<br>2 : Output Frequency Lower Limit<br>3 : Auxiliary Frequency Command<br>4 : Output Voltage Bias<br>5 : Acc./Dec. Time Gain (Decrease Only)<br>6 : DC Braking (DB) Current<br>7 : Stall Prevention Level During Run<br>8 : PID Feedback<br>9 : PID Target<br>11 : Overtorque/ Undertorque Detection<br>18: Communication Mode 1<br>19 : Communication Mode 2<br>21 : Retain<7> | Default: 0<br>Range: 0 to 21 |
| E3-02 <4> | Terminal A1 Input Gain | Sets the terminal A1 input gain as a percentage when inputting 10V | Default: 100.0 %<br>Min.: -999 %<br>Max.: 999.9 % |
| E3-03 <4> | Terminal A1 Input Voltage Bias | Sets the terminal A1 input voltage bias as a percentage when inputting 0V | Default: 0.0 %<br>Min.: -999 %<br>Max.: 999.9 % |
| E3-04 <7> | Terminal A1 (4-20mA) lost choice | 0 : no disconnection selection<br>1 : Operate according to P4-03 frequency setting and display ANL<br>2 : Speed to 0Hz and display ANL<br>3 : Stop immediately and display ACE | Default: 0<br>Range: 0 to 3 |
| E3-05 | Terminal A1 Input Filter Time | Sets the terminal A1 primary delay filter time, which can eliminate the interference | Default: 0.05 s <7><br>Min.: 0.00 s<br>Max.: 2.00 s |
| E3-13 | AI minimum input | AI minimum input.<br>When the AI original signal is less than E3-13, it will be limited to E3-13. | Default: 0<br>Min.: 0<br>Max.: 9.9<br>Unit: - |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | E4: Multi-Function Analog Output | |
| E4-01 | Terminal FM Monitor Selection | Selects the terminal FM monitor.<br>0 : Frequency Command<br>1 : Output Frequency<br>2 : Output Current<br>3 : Motor Speed<br>4 : Output Voltage<br>5 : DC Voltage<br>6 : Output Power<br>8 : AI1 Input<br>10 : Soft Starter Output Frequency<br>12 : Retain <7> | Default: 1<br>Range: 0 to 12 |
| E4-02 <4> | Terminal FM Monitor Gain | Sets the terminal FM monitor gain. | Default: 100.0 %<br>Min.: -999 %<br>Max.: 999.9 % |
| E4-03 <4> | Terminal FM Monitor Voltage Bias | Sets the terminal FM voltage bias. | Default: 0.0 %<br>Min.: -999 %<br>Max.: 999.9 % |
| | | E6: Optional Communication Card Settings | |
| E6-06 | Drive Station Address | Sets the drive station address. | Default: 1<br>Range: 1 to 31 |
| E6-07 | RS-485 Communication Baud Rate Setting | Sets the baud rate for terminals SG(+) and SG(-) of RS-485 communication.<br>0: 1200 bps (bit/sec)<br>1: 2400 bps<br>2: 4800 bps<br>3: 9600 bps<br>4: 19200 bps<br>5: 38400 bps | Default: 3<br>Range: 0 to 5 |
| E6-08 | RS-485 Communication Parity Selection | Selects the communication parity for terminals SG(+) and SG(-) of RS-485 communication.<br>0: 8, N, 2 (Modbus RTU)<br>1: 8, N, 1 (Modbus RTU)<br>2: 8, E, 1 (Modbus RTU)<br>3: 8, O, 1 (Modbus RTU)<br>4: 8, N, 2 (MODBUS ASCII)<br>5: 8, N, 1 (MODBUS ASCII)<br>6: 8, E, 1 (MODBUS ASCII)<br>7: 8, 0, 1 (MODBUS ASCII) | Default: 1<br>Min.: 0<br>Max.:11 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | 8: 7, N, 2 (MODBUS ASCII) <br> 9: 7, N, 1 (MODBUS ASCII) <br> 10: 7, E, 1 (MODBUS ASCII) <br> 11: 7, 0, 1(MODBUS ASCII) | |
| E6-09 | Communication Fault Detection Time | Sets the detection time for communication fault. <br> 0: Disabled | Default: 0.0 s <br> Range: 0.0 to 10.0 s |
| E6-10 | Transmit Wait Time | Sets the wait time between sending and receiving data. | Default: 5ms <br> Range: 0 to 65 ms |
| E6-11 | Drive Operation During Communication Failure | 0 : Display CE Alarm Only. Drive continues operation. <br> 1 : Display CE Fault. Drive coasts to stop. | Default: 0 <br> Range: 0, 1 |
| E6-12 | Frequency command memory function | 0 : Disable <br> 1 : Frequency command is memorized when power turn off | Default: 1 <br> Range: 0, 1 |
| E6-13 | Value of frequency command | Sets the frequency command | Default: 0.00Hz <br> Range: 0.00 to 400.00 Hz |
| **Group P, Protections** | | | |
| P1: Motor Protection Function | | | |
| P1-00 | Motor Protection Function Selection | 0 : Disabled <br>   (Motor Overload Protection Disabled) <br> 1 : General-Purpose Motor (Standard Motor) <br> 2* : Drive Dedicated Motor <br>   (Constant Torque Range 1 : 10) <br> 3 : Vector Motor (Constant Torque Range 1 : 100) | Default:   0 <br> Range: 0 to 3 |
| P1-01 | Motor Overload Protection Time | Sets the time for the drive to shut down on motor overload. | Default: 1.0 minute <br> Min.: 0.1 minutes <br> Max.: 5.0 minutes |
| P1-05 | Retained | | |
| P2: Momentary Power Loss | | | |
| P2-00 | Momentary Power Loss Operation Selection | 0 : Disabled (Default) <br> 1 : Recover if CPU Has Power | Default: 0 <br> Range: 0, 1 |

| Parameter | Name | Description | Setting Range |
|-----------|------|-------------|---------------|
| P2-01 | Minimum Baseblock (bb) Time | Sets the minimum baseblock time when power is restored right after a momentary power loss. This determines the time the drive waits for the residual voltage in the motor to dissipate.<br>Increase this value if overcurrent or overvoltage occurs at the beginning of Speed Search and DC Braking | Default: o2-03<br>Min.: 0.1 s<br>Max.: 5.0 s |
| P2-02 | Uv (Undervoltage) Detection Delay Time | Sets the Delay time of undervoltage detection. | Default: 15 ms<br>Min.: 0 ms<br>Max.: 1000 ms |
| P2-03 | Uv Detection Level | Sets the voltage level of undervoltage detection. | Default: Determined by d1-00, o2-03<br>Min.: 150V<br>Max.: 210V <3> |
| P2-05 | Acceleration Time after Uv (Undervoltage ) | Sets the time to reaccelerate to the set frequency command after power loss.<br>When set to 0.0 s, the drive will accelerate to the previously active frequency according to the active acceleration time set by either of C1-00, C1-02 | Default: 0.3 s<br>Min.: 0.0 s<br>Max.: 6000 s |
| P2-10 | Automatic voltage regulation (AVR) | 0 : AVR is disabled<br>1 : AVR is enabled<br>2 : Cancel AVR when decelerating | Default: 1<br>Min.: 0<br>Max.: 2 |
| P3: Stall Prevention | | | |
| P3-00 | Stall Prevention during Acceleration | 0：Disabled<br>1：Enabled the value set in P3-01.<br>  Acceleration stops when the output current exceeds the value set in P3-01. Acceleration continues when the output current drops 15% below the value set in P3-01. | Default: 1<br>Range: 0, 1 |
| P3-01 | Stall Prevention Level during Acceleration | Sets the output current level to activate the Stall Prevention function during acceleration. | Default: 150%<br>Min.: 0%<br>Max.: 180 |
| P3-02 | Stall Prevention Limit during Acceleration | Sets the lower limit of Stall Prevention in the constant power range as a percentage of the drive rated output current. | Default: 50%<br>Min.: 0 %<br>Max.: 100 % |
| P3-03 | Stall Prevention | The drive decelerates according to the set | Default: 1 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | during Deceleration | deceleration time<br>0 : Disabled<br>1 : Enabled (Without Braking Resistor)<br>2 : Overexcitation deceleration but no stall prevention<br>3 : Overexcitation deceleration includes stall prevention | Range: 0 to 3 |
| P3-04 | Stall Prevention Level during Deceleration | Sets the voltage level to activate the Stall Prevention function during deceleration. | Default: 395V<br>Min.: 330V<br>Max.: 410V <3> |
| P3-05 | Stall Prevention during Run | 0 : Disabled<br>1 : Enabled (Deceleration Time 1)<br>2 : Enabled (Deceleration Time 2) | Default: 1<br>Range: 0, 1, 2 |
| P3-06 | Stall Prevention Level during Run | Sets the current level to activate the Stall Prevention function during run. | Default: 150%<br>Min.: 30%<br>Max.: 180% |
| P3-07 ~ P3-10 | Retained | | |
| | | P4: Frequency Detection | |
| P4-00 | Frequency Detection Level | Sets the detection level and width for the multi-function output terminal. | Default: 30.0 Hz<br>Min.: 0.0 Hz<br>Max.: <5> |
| P4-01 | Frequency Detection Width | | Default: 2.0 Hz<br>Min.: 0.1 Hz<br>Max.: 25.5 Hz |
| P4-02 | Frequency Command Loss Detection Selection | Sets the drive operation when a frequency command loss is detected.<br>0: Drive Stop<br>1: Continue operation according to the setting in P4-03. | Default: 0<br>Range: 0, 1 |
| P4-03 | Frequency Command at Frequency Command Loss | Sets the frequency command level at which the drive runs when detecting a frequency command loss and when L4-02 is set to 1. Sets the value as a percentage of the maximum output frequency set in d1-02. | Default: 80%<br>Min.: 0.0 %<br>Max.: 100.0 % |
| P4-04 | Frequency Command Loss Detection Time | When the frequency command falls below 90% of the command within this detection time, the frequency command loss will be detected. | Default: 20ms<br>Min.: 20 ms<br>Max.: 400 ms |
| P4-05 | Mechanical brake release | Set the mechanical brake release frequency | Default: 0 Hz<br>Min.: 0.0 Hz |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | frequency | | Max.: 20.00 Hz |
| P4-06 | Mechanical braking frequency | Set the mechanical braking frequency | Default: 0 Hz<br>Min.: 0.0 Hz<br>Max.: 20.00 Hz |
| | | **P5: Fault Restart** | |
| P5-00 | Number of Auto Restart Attempts | Sets the number of times to automatically attempt to restart the drive when detecting GF, OVA, OVD, OVC, OCA, OCD, OCC, OH, OL1, OL2, OT1, OT2, PF and LF1. | Default: 0<br>Min.: 0<br>Max.: 10 |
| P5-01 | Auto Restart Fault Output Operation | 0 : Fault Output Disabled<br>1 : Fault Output Enabled | Default: 0<br>Range: 0, 1 |
| P5-02 | Fault Restart Interval Time | Sets the amount of time between restart attempts. | Default: 10.0 s<br>Min.: 0.5 s<br>Max.: 3600.0 s |
| | | **P6: Overtorque / Undertorque Detection** | |
| P6-00 | Overtorque / Undertorque Detection Selection 1 | Sets the operation when the motor current or torque exceeds the P6-01 level for longer than the time set to P6-02.<br>0 : Disabled<br>1 : Overtorque Alarm at Speed Agree<br>2 : Overtorque Alarm at Run<br>3 : Overtorque Fault at Speed Agree<br>4 : Overtorque Fault at Run<br>5 : Undertorque Alarm at Speed Agree<br>6 : Undertorque Alarm at Run<br>7 : Undertorque Fault at Speed Agree<br>8 : Undertorque Fault at Run | Default: 0<br>Range: 0 to 8 |
| P6-01 | Overtorque / Undertorque Detection Level 1 | Sets the level for overtorque/undertorque detection 1. | Default: 150%<br>Min.: 0 %<br>Max.: 300 % |
| P6-02 | Overtorque / Undertorque Detection Time 1 | Sets the time for overtorque/undertorque detection 1. | Default: 0.1 s<br>Min.: 0.0 s<br>Max.: 10.0 s |
| | | **P7: Drive Protection** | |
| P7-00 | Input Phase Loss Protection | Enables or disables the input phase loss detection. | Default: 1<br>Range: 0, 1 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | | 0 : Disabled<br>1 : Enabled | |
| P7-01 | Output Phase Loss Protection | Sets the output phase loss detection.<br>0 : Disabled<br>1 : Enabled when One Phase is Lost<br>2 : Enabled when Two Phases are Lost | Default: 0<br>Range: 0 to 1 |
| P7-02 | Retained | | |
| P7-03 | Heatsink Cooling Fan Operation <6> | Sets the heatsink cooling fan operation.<br>0 : Enabled when drive is running<br>1 : Enabled when power supply is On<br>2 : Enabled when the heatsink temperature reaches the limit. | Default: 0<br>Range: 0, 1, 2 |
| P7-04 | Heatsink Cooling Fan Off-Delay Time | When P7-04=0, sets the cooling fan off-delay time that the drive waits to disabled the cooling fan after run command is released. | Default: 60 s<br>Min.: 0 s<br>Max.: 300 s |
| P7-07 | Retained | | |
| P7-09 | Selection OL Decline curve | P7-09 sets the OL2 decrement time to shorten the function (the power will be stored and will be initialized).<br>0: Regression from 100% to 0% takes 4 minutes (preset value).<br>1:100%, 400V is 7 minutes, 200V is 10 minutes: 0 ~ 90%, linear processing (according to 8000 OL2 decreasing curve). | Default:1<br>Range:0,1 |
| P7-11 | High Current Alarm Setting | Sets the High Current Alarm (HCA) when the output current is too high<br>0 : Disabled (No Alarm)<br>1 : Enabled (Alarm) | Default: 0<br>Range: 0, 1 |
| P7-13 | Retained | | |
| P7-14 | Standby precharge | Turn on/off standby precharge<br>0 : Close<br>1 : Open | Default: 0<br>Range: 0 to 1 |
| **Group n, Special adjustment function group** | | | |
| n1 : Special Adjustment | | | |
| n1-00 | Oscillation suppression (DEHUNTTING) enables | 0 : Turn Run<br>1 : Turn Off | Default: 1<br>Min.: 0<br>Max.: 1<br>Unit:- |
| n1-01 | Oscillation | Oscillation suppression gain during speed- | Default: 2.00 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | suppression (DEHUNTTING) gain value setting | search | Min.: 0.00 Max.: 5.00 |
| | | **n3 : Excessive Deceleration** | |
| n3-04 | Overexcitation gain | Set the gain applied to V / F mode during overexcitation deceleration (P3-03 = 2, 3) | Default: 1.10 Min.: 1.00 Max.: 2.50 |
| n3-06 | Overexcitation suppression current value | Setting the drive will begin to reduce the output current level of the overexcitation gain to prevent excessive motor slip during overexcitation deceleration. Set to the percentage of the rated current of the inverter | Default: 100 Min.: 0 Max.: 150 |
| | | **Group o, Keypad Function Settings** | |
| | | o1: Display Setting | |
| o1-00 | Frequency Command Setting/Display Unit | 0 : Use units of 0.01 Hz 1 : Use units of 0.01% (100% as maximum output frequency) 2 : Use units of rpm 3 : Any unit (details are set by o1-02, o1-03) | Default: 0 Range: 0 to 3 |
| o1-01<7> | Retained | | |
| o1-02 | User-Defined Frequency Command Setting/Display | 1 ~ 9999 | Default: o1-00 Min.: 1 Max.: 9999 |
| o1-03 | Frequency Command Setting/Display Decimal Places | 0 ~ 3 | Default:o1-00 Min.: 0 Max.: 3 |
| o1-04 | Main screen display selection | 0: frequency command 1: output current 2: DCbus voltage 3: output voltage 4: Motor speed 5: AI1 (Percentage) | Default: 0 Min.: 0 Max.: 5 Unit: - |
| | | o2: Multi-Function Selection | |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| o2-01 | STOP Key Function Selection | Enables or disables the STOP key on the keypad when the drive is controlled from a remote source.<br>0：Disabled<br>1：Enabled<br>　The STOP key always stops drive operation even if the command source is not set to the keypad. | Default: 1<br>Range: 0, 1 |
| o2-02 | Retained | | |
| o2-03 | Drive Capacity Selection <2> | Set this parameter after replacing the terminal block or drive modules. | Default: <2><br>Determined by drive capacity |
| o2-04 | ENTER Key Function During Frequency Command Setting | 0：ENTER Key Required<br>1：ENTER Key Not Required<br>2：ENTER Key Not Required | Default: 0<br>Range: 0 ~ 2 |
| o2-05 | Retaind | | |
| o2-06 | Operation Direction at Power Up when Using Keypad | 0：Forward<br>1：Reverse<br>This parameter is enabled only when the keypad is selected as the Run command source. | Default: 0<br>Min.:0<br>Max.:1 |
| o4: Maintenance Settings | | | |
| o4-00 | Cumulative Operation Time Setting | Sets the initial value by 1 hours to start keeping track of cumulative operation time. | Default: 0 h<br>Min.: 0<br>Max.: 9999 |
| o4-06 | U2 Reset Setting | Resets the data for U2-ax.: 9999 Information) as these data will not be reset by A1-03 (Reset).<br>0：Disabled<br>1：Enabled | Default: 0<br>Range: 0, 1 |
| **Group t, Auto-Tuning** | | | |
| t1: IM Motor Auto-Tuning | | | |
| t1-01 | Auto-Tuning Method | 0：Rotational Auto-Tuning<br>1：Stationary Auto-Tuning | Default：0<br>Min.: 0 |

| Parameter | Name | Description | Setting Range |
|---|---|---|---|
| | Selection | | Max.: 1 |
| t1-02 | Motor Output Power | Sets the motor rated output power in kW units.<br>Note: 1HP (Horse Power) = 0.746kW | Default: Determined by o2-03<br>Min.: 0.00 kW<br>Max.: 650.00 kW |
| t1-03 | Motor Rated Voltage | Sets the motor rated voltage according to the motor nameplate. | Default: 200.0 V<br>Min.: 0.0 V<br>Max.: 255.0 V <3> |
| t1-04 | Motor Rated Current | Sets the motor rated current according to the motor nameplate. | Default: <2><br>Min.: 10% of drive rated current<br>Max.:200% of drive rated current |
| t1-05 | Motor Base Frequency | Sets the motor base frequency according to the motor nameplate. | Default: 50.0 Hz<br>Min.: 0.0 Hz<br>Max.: 400.0 Hz |
| t1-06 | Number of Motor Poles | Sets the number of motor poles according to the motor nameplate. | Default: 4<br>Min.: 2<br>Max.: 48 |
| t1-07 | Motor Base Speed | Sets the motor base speed according to the motor nameplate. | Default: 145 (x10 rpm)<br>Min.: 0 rpm (x10rpm )<br>Max.: 2400 (x10 rpm) |
| t1-09 | Motor No-Load Current (Stationary Auto-Tuning) | Sets the no-load current for the motor.<br>After the motor output power and rated current are set in t1-02 and t1-04, this parameter will automatically display the no-load current of a standard motor. The no-load current must be entered according to the motor test report. | Default: Determined by o2-03<br>Min.: 0.0 A<br>Max.: t1-04 |
| t1-12 | Motor Auto-Tuning Setting | Enables or disables Auto-Tuning when A1-02=0 to 3<br>0 : Disabled<br>1 : Enabled | Default: 0<br>Min.: 0<br>Max.: 1 |

| | | **Group F, Optional Function Group** | |
|---|---|---|---|
| | | F1: Pump function | |
| Parameter | Name | Description | Unit |
| F1-00 | User pressure sensor specification setting | According to the pressure sensor specification (max. feedback voltage or pressure value corresponding to feedback current) | Default: 10.0<br>Min.: 0.0<br>Max.: 10.0<br>Unit: 0.1bar (kg/cm2) |
| F1-01 <9> | (Switch mode) pressure operation | In the switch mode, the inverter automatically controls the pump to start or stop according to the set value.<br>*When the set value is greater than the target value, the stop level is the target pressure, and the starting level is 0. | Default: 5<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-02 | (Switch mode) detection time setting | Set the percentage of time and calculate the detection time to determine whether to enter the switch mode.<br>Set value 0: Switch mode function is OFF. | Default: 40<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-03 <9> | (Water detection) pressure rise level | Raise a specified pressure level to detect if water is currently being used. | Default: 5<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-04 | (Water detection) pressure rise time "limit" | Set the lifting time "limit" of F1-03 (pressure rise level) to detect whether water is currently used.<br>Set value 0: This function is OFF | Default: 0<br>Min.: 0<br>Max.: 25<br>Unit: 0.1 sec |
| F1-05 | (Water detection) pressure rise interval | Set the time interval of F1-03 (pressure rise level) to detect whether water is currently used.<br>Set value 0: Water detection function is OFF | Default: 35<br>Min.: 0<br>Max.: 250<br>Unit: sec |
| F1-06 | (Water detection) inverter standby (sleep) level | When the inverter running frequency is lower than the set value, it will automatically decelerate to 0 Hz and enter the standby (sleep) state. | Default: 5Hz<br>Min.: 0<br>Max.: 60<br>Unit: 1Hz |

| | | | |
|---|---|---|---|
| F1-07 <9> | PID control recovery level setting | When the inverter is in the standby (sleep) state, when the pressure drops to the recovery level, the inverter starts and enters the PID control mode.<br>Recovery level: Set pressure (SV) F1-07 set value.<br>*When the set value is greater than the target pressure, the recovery level is 0 Hz. | Default: 15<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-08 <9> | PID steady state tolerance | Provide error range to determine whether PID control has reached stability. | Default: 5<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-09 | (Water shortage detection) pressure level | 100% is the target pressure, set value 0 is OFF. | Default: 10<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-10 | (Water shortage detection) current level | Set the current level to detect if the pump is in a water shortage state.<br>100% is the rated current of the motor, set value 0 is OFF. | Default: 0<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-11 | (Water shortage detection) detection time | Set F1-09 pressure and F1-10 current detection time. | Default: 60<br>Min.: 0<br>Max.: 300<br>Unit: 1 sec |
| F1-12 | (Fault restart) downtime interval | Shutdown time of the pump in the absence of water. | Default: 3600.0<br>Min.: 0.5<br>Max.: 3600.0<br>Unit: 0.1 sec |
| F1-13 | (Fault restart) restart function selection | The way the pump is started again in the absence of water:<br>0: FBPL warning flashes, does not jump off<br>1: FBPL fault trips stop, press RESET to restart<br>2: FBPL fault trips stop, re-power and restart<br>3: FBPL fault trip stop, waiting F1-12 sets the interval time, it automatically restarts. After the restart is completed, you must re-power on the reply. | Default: 3<br>Min.: 0<br>Max.: 3<br>Unit: - |

| F1-14 | Constant pressure hold time | After the feedback pressure reaches the constant pressure setting (feedback pressure> = target pressure-F1-08%), wait for the F1-14 time count to reach the water detection and sleep directly. | Default: 15<br>Min.: 0<br>Max.: 300<br>Unit: 1 sec |
|---|---|---|---|
| F1-15 | F1-14 time counting mode | 0: Accumulation mode<br>1: Continuous mode | Default: 1<br>Min.: 0<br>Max.: 1<br>Unit: - |
| F1-16 <9> | Feedback pressure change | This parameter is valid only when both F1-16 and F1-17 are greater than 0. | Default: 15<br>Min.: 0<br>Max.: 100<br>Unit: 1% |
| F1-17 | Feedback pressure change detection time | F1-16 Feedback pressure change detection time setting | Default: 3.0<br>Min.: 0.0<br>Max.: 10.0<br>Unit: 0.1s |
| F1-18 | Pressure unit selection | This parameter adjusts the unit and display mode of F1-01, F1-03, F1-07, F1-08, F1-16.<br>0: expressed as% of target pressure<br>1: The unit is bar <9> | Default: 0<br>Min.: 0<br>Max.: 1<br>Unit: - |
| F1-19 | Select F1-09 water pressure setting | This parameter switches the setting of F1-09 pressure level.<br>0:% of target pressure<br>1:% of Pressure Sensor F1-00 | Default: 0<br>Min.: 0<br>Max.: 1<br>Unit: - |
| **Group U, Monitor Settings** | | | |
| U1: Status Monitors | | | |
| U1-00 | Control Method | 0：Open-Loop V/F Control<br>2：Sensorloess Voltage Vector Control (SVVC ) (Open-Loop) | - |
| U1-01 | Frequency Command | Displays the frequency command. (Display units are defined by o1-00) | - |
| U1-02 | Output Frequency | Displays the output frequency. (Display units are defined by o1-00) | - |
| U1-03 | Output Current | Displays output current. | 0.01A |
| U1-04 | Motor Speed | Displays the motor speed. | - |
| U1-05 | Output Voltage Command | Displays the drive output voltage command. | 0.1V |

| U1-06 | Main circuit DC Voltage | Displays the main circuit DC voltage. | 0.1V |
|---|---|---|---|
| U1-07 | Output Power | Displays the internal output power calculated by the drive. | 0.001kW |
| U1-08 | (water pump function) display feedback/set pressure at the same time | display feedback/set pressure | 0.1bar/0.1bar |
| U1-09 | Input Terminal Status | Displays the status of the input terminal.<br>U1-09=C111111:<br>The following indicate each digit from right to left.<br>1:Digital Input 1 (S1 enabled )<br>1:Digital Input 2 (S2 enabled )<br>1:Digital Input 3 (S3 enabled )<br>1:Digital Input 4 (S4 enabled )<br>1:Digital Input 5 (S5 enabled )<br>1:Digital Input 6 (S6 enabled ) | - |
| U1-10 | Output Terminal Status | Displays the status of the output terminal.<br>U1-10=1<br>Multi-Function Terminal Output (terminal R1A/R1B-R1C) | - |
| U1-11 | Drive Operation Status | Displays the status of the drive operation.<br>U1-11=11111111<br>The following indicate each digit from right to left.<br>1:During Run<br>1:During Zero Speed Holding<br>1:During Reverse<br>1:During Fault Reset Signal Input<br>1:During Speed Agree<br>1:Drive Ready<br>1:During Alarm Detection<br>1:During Fault Detection | - |
| U1-12 | Terminal A1 Input Voltage | Displays the terminal A1 input voltage. | 0.1% |
| U1-16 | Software Version | Displays the software version. | - |
| U1-17 | | Display the datecode | - |
| U1-19 <7> | Communication card software version | Communication card software version | - |

| U1-20 | (water pump function) display setting pressure | Display the feedback pressure | 0.1bar |
|-------|------|------|------|
| U1-21 | (water pump function) display setting pressure | Display the setting pressure | 0.1bar |
| U2: Fault Information | | | |
| U2-00 | Current Fault | Displays the current fault. | - |
| U2-01 | 1st Most Recent Fault | Displays the first most recent fault. | - |
| U2-02 | 2nd Most Recent Fault | Displays the second most recent fault. | - |
| U2-03 | 3rd Most Recent Fault | Displays the third most recent fault. | - |
| U2-04 | 4th Most Recent Fault | Displays the fourth most recent fault. | - |
| U2-05 | Frequency Command at 1st Most Recent Fault | Displays the frequency command at the first most recent fault. | - |
| U2-06 | Output Frequency at 1st Most Recent Fault | Displays the output frequency at the first most recent fault. | - |
| U2-07 | Output Current at 1st Most Recent Fault | Displays the output current at the first most recent fault. | 0.01A |
| U2-08 | Motor Speed at 1st Most Recent Fault | Displays the motor speed at the first most recent fault. | - |
| U2-09 | Output Voltage command at 1st Most Recent Fault | Displays the output voltage command at the first most recent fault. | 0.1V |
| U2-10 | Main Circuit DC Voltage at 1st Most Recent Fault | Displays the main circuit DC voltage at the first most recent fault. | 0.1V |
| U2-13 | Input Terminal Status at 1st Most Recent Fault | Displays the input terminal status at the first most recent fault. (Same status display as U1-09) | - |
| U2-14 | Output Terminal Status at 1st Most Recent Fault | Displays the output terminal status at the first most recent fault. (Same status display as U1-10) | - |
| U2-15 | Operation Status at 1st Most Recent | Displays the operation status at the first most recent fault. | - |

| | | Fault | (Same status display as U1-11) | |
|---|---|---|---|---|
| U2-17 | Cumulative Operation Time at 1st Fault | | Displays the cumulative operation time when the first fault occurred | 1h |
| U2-18 | Cumulative Running Time at 1st Fault | | Displays the cumulative running time when the first fault occurred | 1h |
| U2-19 | Frequency Command at 2nd Most Recent Fault | | Displays the frequency command at the second most recent fault. | - |
| U2-20 | Output Frequency at 2nd Most Recent Fault | | Displays the output frequency at the second most recent fault. | - |
| U2-21 | Output Current at 2nd Most Recent Fault 2nd | | Displays the output current at the second most recent fault. | 0.01A |
| U2-22 | Motor Speed at 2nd Most Recent Fault | | Displays the motor speed at the second most recent fault. | 0.1 rpm |
| U2-23 | Output Voltage command at 2nd Most Recent Fault | | Displays the output voltage command at the second most recent fault. | 0.1V |
| U2-24 | Main Circuit DC Voltage at 2nd Most Recent Fault | | Displays the main circuit DC voltage at the second most recent fault. | 0.1V |
| U2-27 | Input Terminal Status at 2nd Most Recent Fault | | Displays the input terminal status at the second most recent fault. (Same status display as U1-09) | - |
| U2-28 | Output Terminal Status at 2nd Most Recent Fault | | Displays the output terminal status at the second most recent fault. (Same status display as U1-10) | - |
| U2-29 | Operation Status at 2nd Most Recent Fault | | Displays the operation status at the second most recent fault. (Same status display as U1-11) | - |
| U2-31 | Cumulative Power On Time at 2nd Fault | | Displays the cumulative Power On Time when the second fault occurred | 1h |
| U2-32 | Cumulative Operation Time at 2nd Fault | | Displays the cumulative operation time when the second fault occurred | 1h |
| U2-33 | Current Alarm | | Displays the current alarm. | - |
| U2-34 | 1st Most Recent Alarm | | Displays the first most recent alarm. | - |

| U2-35 | 2nd Most Recent Alarm | Displays the second most recent alarm. | - |
|---|---|---|---|
| U2-36 | 3rd Most Recent Alarm | Displays the third most recent alarm. | - |
| U2-37 | 4th Most Recent Alarm | Displays the fourth most recent alarm. | - |
| U3: Maintenance Monitors | | | |
| U3-00 | Cumulative Drive Operation Time | Displays the cumulative operation time for the drive. | 1h |
| U3-02 | Cumulative Drive Operation Time | Displays the cumulative operation time for the drive. The initial value is determined by o4-00. Keeping track of time from run or power up is determined by o4-01. The maximum number displayed is 9999, after which the value will be counted from 0. | 1h |
| U3-06 | Heatsink temperature | Display the temperature of heatsink | 1℃ |
| U3-07 | LED Check | Lights all segments of the LED to verify that the display is working properly | - |
| U3-10 | Peak Hold Current | Displays the peak current value during operation | 0.01A |
| U3-11 | Peak Hold Output Frequency | Displays the output frequency when the peak current displayed in U3-10 occurred. | - |
| U3-12 | Motor Overload Estimate (oL1) | Displays the value of the motor overload detection accumulator. An oL1 will be triggered when reaching 100%. | 1% |
| U3-13 | Frequency Command Source Selection | Displays the source for the frequency command as XY-nn.<br>X: Command Used<br>  1: Command 1<br>Y-nn: Frequency Command Source<br>  0-01: Keypad<br>  1-01: Analog input (Terminal AI 1)<br>  2-02 to 2-16: Multi-step speed command<br>  2-17: Jog frequency command<br>  3-01: PID frequency command<br>  4-01: Terminal UP/ DOWN<br>  5-01: Modbus communication | - |

| U3-14 | Run Command Source Selection | Displays the source for the frequency command as XY-nn.<br>XY-nn=00-00: Local<br>X: Command Used<br> 1: Command 1<br>Y-nn: Command Source<br> 0-00: Keypad<br> 1-00: Control Circuit Terminal (Sequence Control Input)<br> 2-00: Modbus communication | - |
|---|---|---|---|
| U3-17 | Drive Overload Estimate (oL2) | Displays the value of the drive overload detection accumulator. An oL2 will be triggered when reaching 100%. | 1% |
| U4: PID Monitors | | | |
| U4-00 | PID Feedback | Displays the PID feedback value as a percentage of the maximum output frequency. | 0.01% |
| U4-01 | PID Input | Displays the PID input value as a percentage of the maximum output frequency. | 0.01% |
| U4-02 | PID Output | Displays the PID output value as a percentage of the maximum output frequency. | 0.01% |
| U4-03 | PID Target | Displays the PID target value as a percentage of the maximum output frequency. | 0.01% |
| U4-08 | PID Output 2 | Displays the PID output 2 value as a percentage of the maximum output frequency. | 0.01% |

<1> The default is determined by the drive capacity and control method.

<2> Refer to user manual for details. http://www.liteon-ia.com.tw/ENG/download.php

<3> Double the value for 440V class AC drives.

<4> The parameter can be set during run.

<5> The upper limit is determined by d1-02 and L2-00 settings.

<6> Contact the local distributor for any malfunction.

<7> This functional software version V1.40 open.

<8> When A1-07 = 1, the preset values of the following parameters will be modified

| Parameter | Name | Drscription |
|---|---|---|
| B1-01 | Operation command selection 1 | 1 control circuit terminal (sequence control input) |
| B5-01 | Proportional gain(P) | 3.00 |
| B5-02 | Integration time (I) | 0.4s |
| C1-00 | Acceleration time 1 | 5.0s |
| C1-01 | Deceleration time 1 | 5.0s |
| E3-00 | Terminal A1 signal level selection | 1 (4~20mA) |
| P3-01 | Stall prevention value during acceleration | 100% |
| P3-06 | Stall prevention value during operation | 100% |
| P5-02 | Fault retry interval timing | 3600.0s |

<9> When F1-18 = 1, the factory settings, upper and lower limits and units of some parameters will be changed as follows

| Parameter | Name | Default | Min. | Max. | Unit |
|---|---|---|---|---|---|
| F1-01 | (Switch mode) pressure operation interval | 0.3 | 0.1 | 10.0 | 0.1bar (kg/cm2) |
| F1-03 | (Water detection) Pressure raise level | 0.2 | 0.0 | 5.0 | 0.1bar (kg/cm2) |
| F1-07 | PID control recovery level setting | 0.3 | 0.0 | 10.0 | 0.1bar (kg/cm2) |
| F1-08 | PID steady-state allowable error | 0.1 | 0.0 | 5.0 | 0.1bar (kg/cm2) |
| F1-16 | Feedback pressure change | 0.5 | 0.0 | 5.0 | 0.1bar (kg/cm2) |

<10> When A1-03 is initialized, this parameter will not be restored to factory settings.

*means under development.

# Chapter 6│Troubleshooting

## 6.1 Alarm and Fault Displays

**Table 6.1 Alarm and Fault Displays, Causes, and Possible Solutions**

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| EF0 | Retain | | |
| EF1 to EF6 | External Fault ( Input Terminal S1 to S6 ) | 1. An external device tripped an alarm 2. Incorrect wiring 3. Multi-function input wiring is not correct | 1. Remove the cause of the external fault then reset the multi-function input. 2. Confirm if the signal lines is properly connected to the terminals assigned for external fault detection (E1-□□= 23 to 38) 3. Confirm if E1-□□=23 to 38 is set to the unused terminals. |
| FbH | PID Feedback High PID feedback input is greater than the detection level set to b5-22 for longer than the detection time set to b5-23 | 1. b5-22 andb5-23 inappropriate setting 2. PID feedback wiring incorrect 3. Feedback sensor malfunction 4. Feedback input circuit malfunction | 1. Confirm b5-22 and b5-23 settings 2. Correct the wiring 3. Replace the sensor if it is damaged 4. Replace the PCB or drive.    Contact the local distributor. |
| FbL | PID Feedback Low When the PID feedback detection is enabled in b5-11, a FbL will be triggered while the PID feedback falls below the level set to b5-12 for longer than the time set to b5-13. | 1. Inappropriate setting in b5-12 and b5-13 2. Incorrect PID feedback wiring 3. Feedback sensor malfunction 4. Incorrect feedback input circuit | 1. Correct b5-12 and b5-13 settings 2. Correct the wiring 3. Replace the sensor if it is damaged 4. Contact the local distributor to replace the board or the drive. |
| oH | Heatsink Overheat | 1. Ambient | 1.Check the temperature surrounding the drive |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | Heatsink temperature over 95°C | temperature is too high<br>2. Internal cooling fan stopped operating<br>3. Bad air flow due to insufficient room. | a. Improve the air flow inside the enclosure panel<br>b. Install an air conditioner or fan to cool the environment<br>c. Remove any possible source of heat<br>2. Measure the output current<br>a. Reduce the load<br>b. Lower setting in C6-00　( Carrier Frequency Option )<br>3.Replace the cooling fan |
| oH1 | Motor Overheat<br><br>The temperature signal from motor temperature sensor via the multi-funtion analog input (E3-01=20) exceeded the overheat detection level of the drive. | 1. Fault on the machinery (e.g., machinery is locked up)<br>2. Motor overheat | 1. Check the machinery status<br>2. Check the load, acceleration / deceleration time and cycle time<br>a. Reduce the load.<br>b. Increase the C1-00 to C1-07 (Acc./Dec. Time) settings<br>c. Adjust d1-02 to d1-11 (V/F Characteristics) |
| ot1 | Overtorque Detection 1<br><br>The current has exceeded the torque level set to P6-01 for longer than the time set to P6-02 | 1. Incorrect parameter settings<br>2. Malfunction on machinery | 1. Reset P6-01 and P6-02<br>2. Check machinery and load status |
| ov | Overvoltage<br><br>Voltage in the DC bus exceeded the overvoltage detection level<br>1.200 V class: 410 V<br>2.400 V class: 820 V( 740 V when d1-01 < 400 ) | 1. Drive input power has surge voltage entering<br>2. Machinery output short circuit<br>3. Ground fault in the output circuit causes the DC bus capacitor to overcharge<br>4. Electrical signal | 1. Install a DC link choke<br>Voltage surge can result from a thyristor convertor and phase advancing capacitor using the same input power supply<br>2. Check the motor power cable, relay terminals and motor terminal box<br>3. Correct grounding shorts and reapply power<br>4. Check the solutions for interference suppression<br>»Check the control circuit lines, main circuit lines and grounding wiring. |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | interference causes drive malfunction | »If the MC is the source of interference, connect a suppressor to it.<br>5. Reconnect the cable<br>6. Correct the wiring |
| Uv | Undervoltage<br><br>1.Voltage in the DC bus fell below the undervoltage detection level (P2-03)<br>2.200 V class: 190 V<br>3.400 V class: 380 V ( 350 V when d1-01 < 400 ) | 1. Input power phase loss<br>2. Loose wiring terminals of drive input power<br>3. Problem with the voltage from the drive input power<br>4. The drive main circuit capacitors are weakened.<br>5. The contactor or relay on the soft-charge bypass circuit is damaged | 1. Correct the drive input power wiring<br>2. Tighten the terminals<br>3. Check the voltage<br>a. Adjust the voltage according to the drive input power specifications<br>b. Check the main circuit magnetic contactor if there is no problem with the power supply<br>4&5. Turn on and turn off the power to see if any problem occurs<br>Replace either the entire drive or the control board if the problem continues to occur. Contact the local distributor for more information. |
| Ut1 | Undertorque Detection 1<br><br>The current has dropped below the torque detection level set to P6-01 for longer than the time set to P6-02 | 1. Incorrect parameter settings<br>2.Malfunction on machinery side. Ex, the machinery is locked up | 1. Reset P6-01 and P6-02<br>2. Ensure there is no problem on the machinery side. |
| bb | Baseblock<br><br>Drive output interrupted by an external baseblock signal | An external baseblock signal was input via one of the multi-function input terminals (S1 to S6) | Check baseblock signal input timing and external sequence |
| oH2 | Drive Overheat Warning<br><br>Drive Overheat Warning input via a multi-function input terminal (S1to S6 ) | An overheat warning in the drive was triggered by an external device | 1. Search the device which caused the overheat warning. Remove the cause of the problem.<br>2. Reset Drive Overheat Warning input at the assigned multi-function input terminal (S1 to S6) |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | when E1-□□= 40 | | |
| HCA | Current Alarm<br><br>Drive current exceeded the level of over current warning (150% of the rated current) | 1. The load is too heavy<br>2. Deceleration and acceleration times are too short<br>3.The drive is attempting to run a motor greater than the maximum allowable capacity, or a special-purpose motor is being used<br>4.The current level went up because of Speed Search while attempting to perform a fault restart or after a momentary power loss | 1. Reduce the load or use a drive of higher rating<br>2. Calculate the torque required during acceleration and the inertia<br>»Take the following steps if the torque level is not right for the load<br>· Increase the settings for acceleration and deceleration time (C1-00 to C1-03)<br>· Use a drive of higher rating<br>3. Check the motor capacity<br>· Make sure the motor capacity is right for the drive rating.<br>4. During a momentary power loss or an attempt to reset a fault, the alarm is displayed. However, there is no need to take any action because the fault display will disappear shortly |
| DNE | Driver Enable | 1. Multi-function contact input is set to 69/169, but the contact input status is incorrect<br>2. The multi-function contact input is incorrect | 1. Multi-function contact input is set to 69 and switched on.<br>2. Multi-function contact input is set to 169 and switched off |
| AnL | Simulation A2 input signal is lost | 1. Simulation A2 input signal is lost | 1. Check the simulation signal wiring<br>2. Check the E3-10 parameter settings |
| ES | Emergency Stop | 1. Emergency stop is turned on (P2-11) before the power off,  when the DC | 1. Turn off the emergency stop function P2-11, or adjust P2-06 settings Level<br>2. Confirm the multi-function contact input function set and terminal status |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | bus voltage is lower than P2-06<br>2. Multi-function contact input is set to 21/121, but the contact input is switched on | |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| EF0 | Retain | | |
| EF1 to EF6 | External Fault ( Input Terminal S1 to S6 ) | 1. An external device tripped an alarm<br>2. Incorrect wiring<br>3. Multi-function input wiring is not correct | 1. Remove the cause of the external fault then reset the multi-function input.<br>2. Confirm if the signal lines is properly connected to the terminals assigned for external fault detection (E1-□□= 23 to 38)<br>3. Confirm if E1-□□=23 to 38 is set to the unused terminals. |
| FbH | PID Feedback High<br><br>PID feedback input is greater than the detection level set to b5-22 for longer than the detection time set to b5-23 | 1. b5-22 andb5-23 inappropriate setting<br>2. PID feedback wiring incorrect<br>3. Feedback sensor malfunction<br>4. Feedback input circuit malfunction | 1. Confirm b5-22 and b5-23 settings<br>2. Correct the wiring<br>3. Replace the sensor if it is damaged<br>4. Replace the PCB or drive.    Contact the local distributor. |
| FbL | PID Feedback Low<br><br>When the PID feedback detection is enabled in b5-11, a FbL will be triggered while the PID feedback falls below the level set to b5-12 for longer than the time set to b5-13. | 1. Inappropriate setting in b5-12 and b5-13<br>2. Incorrect PID feedback wiring<br>3. Feedback sensor malfunction<br>4. Incorrect feedback input circuit | 1. Correct b5-12 and b5-13 settings<br>2. Correct the wiring<br>3. Replace the sensor if it is damaged<br>4. Contact the local distributor to replace the board or the drive. |
| oH | Heatsink Overheat | 1. Ambient | 1.Check the temperature surrounding the drive |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | Heatsink temperature over 95°C | temperature is too high<br>2. Internal cooling fan stopped operating<br>3. Bad air flow due to insufficient room. | a. Improve the air flow inside the enclosure panel<br>b. Install an air conditioner or fan to cool the environment<br>c. Remove any possible source of heat<br>2. Measure the output current<br>a. Reduce the load<br>b. Lower setting in C6-00 ( Carrier Frequency Option )<br>3.Replace the cooling fan |
| oH1 | Motor Overheat<br><br>The temperature signal from motor temperature sensor via the multi-funtion analog input (E3-01=20) exceeded the overheat detection level of the drive. | 1. Fault on the machinery (e.g., machinery is locked up)<br>2. Motor overheat | 1. Check the machinery status<br>2. Check the load, acceleration / deceleration time and cycle time<br>a. Reduce the load.<br>b. Increase the C1-00 to C1-07 (Acc./Dec. Time) settings<br>c. Adjust d1-02 to d1-11 (V/F Characteristics) |
| ot1 | Overtorque Detection 1<br><br>The current has exceeded the torque level set to P6-01 for longer than the time set to P6-02 | 1. Incorrect parameter settings<br>2. Malfunction on machinery | 1. Reset P6-01 and P6-02<br>2. Check machinery and load status |
| ov | Overvoltage<br><br>Voltage in the DC bus exceeded the overvoltage detection level<br>1.200 V class: 410 V<br>2.400 V class: 820 V( 740 V when d1-01 < 400 ) | 1. Drive input power has surge voltage entering<br>2. Machinery output short circuit<br>3. Ground fault in the output circuit causes the DC bus capacitor to overcharge<br>4. Electrical signal | 1. Install a DC link choke<br>Voltage surge can result from a thyristor convertor and phase advancing capacitor using the same input power supply<br>2. Check the motor power cable, relay terminals and motor terminal box<br>3. Correct grounding shorts and reapply power<br>4. Check the solutions for interference suppression<br>»Check the control circuit lines, main circuit lines and grounding wiring. |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | interference causes drive malfunction | »If the MC is the source of interference, connect a suppressor to it.<br>5. Reconnect the cable<br>6. Correct the wiring |
| Uv | Undervoltage<br><br>1.Voltage in the DC bus fell below the undervoltage detection level (P2-03)<br>2.200 V class: 190 V<br>3.400 V class: 380 V<br>  ( 350 V when d1-01 < 400 ) | 1. Input power phase loss<br>2. Loose wiring terminals of drive input power<br>3. Problem with the voltage from the drive input power<br>4. The drive main circuit capacitors are weakened.<br>5. The contactor or relay on the soft-charge bypass circuit is damaged | 1. Correct the drive input power wiring<br>2. Tighten the terminals<br>3. Check the voltage<br>a. Adjust the voltage according to the drive input power specifications<br>b. Check the main circuit magnetic contactor if there is no problem with the power supply<br>4&5. Turn on and turn off the power to see if any problem occurs<br>Replace either the entire drive or the control board if the problem continues to occur. Contact the local distributor for more information. |
| Ut1 | Undertorque Detection 1<br><br>The current has dropped below the torque detection level set to P6-01 for longer than the time set to P6-02 | 1. Incorrect parameter settings<br>2.Malfunction on machinery side. Ex, the machinery is locked up | 1. Reset P6-01 and P6-02<br>2. Ensure there is no problem on the machinery side. |
| bb | Baseblock<br><br>Drive output interrupted by an external baseblock signal | An external baseblock signal was input via one of the multi-function input terminals (S1 to S6) | Check baseblock signal input timing and external sequence |
| oH2 | Drive Overheat Warning<br><br>Drive Overheat Warning input via a multi-function input terminal (S1to S6 ) | An overheat warning in the drive was triggered by an external device | 1. Search the device which caused the overheat warning. Remove the cause of the problem.<br>2. Reset Drive Overheat Warning input at the assigned multi-function input terminal (S1 to S6) |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | when E1-□□= 40 | | |
| HCA | Current Alarm<br><br>Drive current exceeded the level of over current warning (150% of the rated current) | 1. The load is too heavy<br>2. Deceleration and acceleration times are too short<br>3.The drive is attempting to run a motor greater than the maximum allowable capacity, or a special-purpose motor is being used<br>4.The current level went up because of Speed Search while attempting to perform a fault restart or after a momentary power loss | 1. Reduce the load or use a drive of higher rating<br>2. Calculate the torque required during acceleration and the inertia<br>»Take the following steps if the torque level is not right for the load<br>· Increase the settings for acceleration and deceleration time (C1-00 to C1-03)<br>· Use a drive of higher rating<br>3. Check the motor capacity<br>· Make sure the motor capacity is right for the drive rating.<br>4. During a momentary power loss or an attempt to reset a fault, the alarm is displayed. However, there is no need to take any action because the fault display will disappear shortly |
| DNE | Driver Enable | 1. Multi-function contact input is set to 69/169, but the contact input status is incorrect<br>2. The multi-function contact input is incorrect | 1. Multi-function contact input is set to 69 and switched on.<br>2. Multi-function contact input is set to 169 and switched off |
| AnL | Simulation A2 input signal is lost | 1. Simulation A2 input signal is lost | 1. Check the simulation signal wiring<br>2. Check the E3-10 parameter settings |
| ES | Emergency Stop | 1. Emergency stop is turned on (P2-11) before the power off,   when the DC | 1. Turn off the emergency stop function P2-11, or adjust P2-06 settings Level<br>2. Confirm the multi-function contact input function set and terminal status |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | bus voltage is lower than P2-06 2. Multi-function contact input is set to 21/121, but the contact input is switched on | |
| FBPL | (Water pump function) Water shortage warning | 1. The feedback pressure is less than the water shortage detection value (F1-09) and for a period of time (F1-11) 2. The output current is less than the water shortage detection value (F1-10) and continue for a period of time (F1-11) | 1. Water shortage / water shortage 2. Judging that the level value is too large 3. Detection time is too short |

# 6.2 Fault Detection

**Table 6.2 Fault Displays, Causes, and Possible Solution**

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| GF | Ground Fault | Output power cable is damaged | Check and replace output power cable |
| oVA 、 oVd 、 oVC 、 oVAH 、 oVdH 、 ovCH | Overvoltage (Acceleration, Deceleration and Constant Speed)<br><br>The main circuit DC voltage exceeded the overvoltage detection level<br>200V class: 410V<br>400 V class: 820 V | 1. Regenerative energy is flowing from the motor into the drive because the deceleration time is too short<br>2. The motor overshoot the speed reference because the acceleration time is too short<br>3. Excessive braking load<br>4. Surge voltage entering from the drive input power<br>5. Motor short-circuited Ground fault current charges the drive main circuit capacitor.<br>6. Improper parameter settings for Speed Search (including Speed Search after a fault restart and after a momentary power loss)<br>7. Drive input voltage is too high<br>8. The braking transistor or braking resistor are wired incorrectly<br>9. PG cable is disconnected<br>10. PG cable wiring is incorrect<br>11. PG encoder wiring has interference of electrical signal<br>12. Electrical signal interference causes the drive malfunction<br>13. Incorrect inertia setting of the load<br>14.Motor hunting occurs | 1. Increase the deceleration time settings (C1-01 and C1-03)<br>»Install a braking unit<br>»Set P3-03 (Stall Prevention during Deceleration) to 1 (Enabled)(default is 1)<br>2. Confirm if overvoltage alarm oVA or oVC was triggered during sudden drive acceleration.<br>»Increase the acceleration time<br>»Use S-curve deceleration and acceleration times and increase the value set to C2-01 ( S-curve at acceleration end )<br>3.Thyristor convertor and phase advancing capacitor using the same input power supply might cause a voltage surge<br>4. Check the motor power cable, relay terminals and motor terminal box<br>» Correct grounding shorts and reapply power<br>5. Adjust parameter settings for Speed Search (group b3)<br>»Proceed Auto-Tuning for line-to-line resistance<br>6. Check the voltage<br>»Lower drive input power voltage within the range listed in the drive specifications<br>7. Check the wiring of the braking resistor and braking unit<br>»Correct the wiring |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | | 8. Tighten the terminal or replace the damaged cable<br>9. Correct the wiring<br>10. Check the solutions for interference suppression |
| oCA, oCd, oCC | Overcurrent (Acceleration, Deceleration and Constant Speed) | 1. The motor insulation is damaged or the motor is overheated<br>2. Grounding problem caused by damaged motor cable<br>3.The drive is damaged<br>4.The load is too heavy<br>5. Settings for acceleration or deceleration time is too short<br>6.The drive is running a special purpose motor or a motor larger than the drive rated capacity<br>7. A magnetic contactor (MC) on the output side of the drive has turned on or off<br>8. V/F set incorrectly<br>9. Excessive torque compensation | 1. Check the insulation resistance<br>2. Check the motor power cable<br>3. Check the resistance between the cable and the terminal.<br>4. Short circuit on drive output side or grounding causes register damage.<br>5. Measure the current flowing into the motor<br><br>5. Check the motor capacity<br>6. Calculate the torque required during acceleration according to the load inertia and acceleration time. If the required torque is insufficient, check the motor capacity.<br>7. Install a sequence controller to ensure the MC does not open or close when the drive is outputting voltage.<br>8. Check the ratios between the frequency and voltage set by V/F. |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | 10. Electrical signal interference causes drive malfunction<br>11. Overexcitation gain is set too high<br>12. Run command was applied while motor was coasting<br>13. Incorrect motor code<br>14. The motor does not match the drive control method<br>15. The motor cable is too long | 9. Adjust d1-02 to d1-11 (or d1-13 to d1-22 for motor 2)<br>10.Check the amount of torque compensation<br>11. Find out possible solutions to suppress the electrical signal interference<br>11. Check if the fault occurs frequently with overexcitation function operation<br>12. Enable Speed Search via multi-function input terminal<br>14. Check the control method (A1-02)<br>15. Use a larger drive |
| SC 、<br>SC1 、<br>SC2 、<br>SC3 | IGBT Fault or Output Short Circuit | 1. Motor has been damaged due to the motor insulation weakened or overheat<br>2. The cable is damaged<br>3. Hardware fault<br>4. The drive is damaged | 1. Replace the motor or check the motor insulation resistance<br>2. Repair any short circuits and check the motor power cable |
| EF0 | Retain | | |
| EF1 to EF6 | External Fault<br>（Input Terminal S1 to S6） | 1. An external device tripped an alarm<br>2. Incorrect wiring<br>3. Multi-function input wiring is not correct | 1. Remove the cause of the external fault then reset the multi-function input.<br>2. Confirm if the signal lines is properly connected to the terminals assigned for external fault detection (E1-□□= 23 to 38)<br>3. Confirm if E1-□□=23 to 38 is set to the unused terminals. |
| O(P)E17 | Improper setting of motor rated speed | Motor rated speed setting over than motor synchronous speed | 1. Correctly set the motor base frequency and motor number<br>2. Correctly set the rated motor speed<br>Motor synchronous speed = 120 base frequency / motor pole count |
| oH | Heatsink Overheat<br><br>Heatsink temperature over 95 ℃ | 1. Ambient temperature is too high<br>2. Internal cooling fan stopped operating | 1. Check the temperature surrounding the drive<br>a. Improve the air flow inside the enclosure panel |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | 3. Bad air flow due to insufficient room. | b. Install an air conditioner or fan to cool the environment<br>c. Remove any possible source of heat<br>2. Measure the output current<br>a. Reduce the load<br>b. Lower setting in C6-00 ( Carrier Frequency Option )<br>3.Replace the cooling fan |
| oH1 | Motor Overheat 1<br><br>The temperature signal from motor temperature sensor via analog input terminal A1 (E3-01=20) exceeded the overheat detection level of the drive. | 1. Incorrect motor temperature input (terminal MT) wiring<br>2. Fault on the machinery (e.g., machinery is locked up)<br>3. Motor overheat | 1. Check the load, acceleration / deceleration time and cycle time<br>a. Reduce the load<br>b. Increase C1-00 to C1-03 (Acc./Dec. Time) settings<br>2. Adjust d1-02 to d1-09 (V/F Characteristics)<br>Note: If the d1-02 and d1-09 are set too low, the tolerance at low speed will be reduced.<br>3.a. Check the setting for motor rated current. Set d1-00 as per the data written on the motor plate.<br>b. Check if the motor cooling is working properly. |
| oL1 | Motor Overload | 1. The load is too heavy<br>2. The acceleration and deceleration times are too short<br>3. The motor is driven below the rated speed with a high load<br>4. Incorrect setting in P1-00 (Motor Protection Function Selection) when running a special motor<br>5. The voltage determined by the V/F is too high<br>6. d2-00 (Motor Rated Current ) setting incorrect<br>7. The base frequency is set too low | 1. Check loading capacity<br>» Reduce the load<br>2. Confirm acceleration and deceleration times<br>»Increase C1-00 to C1-03 parameter settings<br>3. »Reduce the load<br>» Increase the speed<br>» Either increase the motor capacity or use a special-purpose motor if the motor needs to operate at low speeds<br>4. Set P1-00 to 2.<br>5. Adjust d1-02 to d1-09 settings (V/F Characteristics)<br>Note: If d1-02 to d1-09 settings are too low, load tolerance at low |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | 8. Use one drive to run multiple motors<br>9. The electrical thermal protection characteristics do not match the motor overload characteristics.<br>10. The electrical thermal relay operates at the wrong level<br>11. Motor overheated by overexcitation operations<br>12. Speed Search related parameters are set incorrectly<br>13. Power supply phase loss causes output current oscillation. | speeds will be reduced<br>6.Confirm the motor rated current<br>» Set d2-00 (Motor Rated Current ) according to the motor nameplate<br>7. Confirm the rated frequency showed on the motor nameplate<br>»Set d1-04 (Base Frequency) according to the motor nameplate<br>8. Set P1-00 (Motor Protection Function Selection) to 0 (Disabled) and install a thermal relay to each motor<br>9. Confirm characteristics of the motor<br>»Set P1-00 (Motor Protection Function Selection) correctly<br>»Install an external thermal relay<br>10. Set the the motor rated current according to the motor plate.<br>11. Adjust parameters related to Speed Search<br>»Adjust the b3-01 (Speed Search Operation Current ) setting<br>12. Check the power supply for phase loss |
| oL2 | Drive Overload | 1. The load is too heavy<br>2. The acceleration and deceleration times are too short<br>3. The voltage determined by the V/F is too high<br>4. The drive capacity is too small<br>5. The motor is driven below the rated speed with a high load<br>6. Torque compensation is too high | 1. Check loading capacity<br>» Reduce the load<br>2. Confirm acceleration and deceleration times<br>»Increase C1-00 to C1-03 parameter settings<br>3. Adjust d1-02 to d1-09 settings (V/F Characteristics)<br>Note: If d1-02 to d1-09 settings are too low, load tolerance at low speeds will be reduced<br>4. Use a larger drive<br>5. »Reduce the load at low speed<br>» Use a larger drive |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | 7. Speed Search related parameters are set incorrectly<br>8. Power supply phase loss causes output current oscillation | » Set a lower value to C6-00 (Carrier Frequency)<br>6. Check the torque compensation<br>» Set a lower value to C3-00 (Torque Compensation Gain) until the current is decreased and the motor does not stall.<br>7. Adjust parameters related to Speed Search<br>» Adjust b3-03<br>8. Check the power supply for phase loss |
| ot1 | Overtorque Detection 1<br><br>The current has exceeded the torque level set to P6-01 for longer than the time set to P6-02 | 1. Incorrect parameter settings<br>2. Malfunction on the machinery side | 1. Reset P6-01 and P6-02<br>2. Check machinery and load status |
| Ut1 | Undertorque Detection 1<br><br>The current has dropped below the torque detection level set to P6-01 for longer than the time set to P6-02 | 1. Incorrect parameter settings<br>2.Malfunction on the machinery side | 1. Reset P6-01 and P6-02<br>2. Ensure there is no problem on the machinery side. |
| Uv1 | Undervoltage Detection 1<br><br>Voltage in the DC bus fell below the undervoltage detection level (P2-03) during run.<br>· 200 V class: 190 V<br>· 400 V class: 380 V | 1. Input power phase loss<br>2. Loose wiring terminals of drive input power<br>3. Problem with the voltage from the drive input power<br>4. The drive main circuit capacitors are weakened.<br>5. The contactor or relay on the soft-charge bypass circuit is damaged | 1. Correct the drive input power wiring<br>2. Tighten the terminals<br>3. Check the voltage<br>a. Adjust the voltage according to the drive input power specifications<br>b. Check the main circuit magnetic contactor if there is no problem with the power supply<br>4. Turn on and turn off the power to see if any problem occurs |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | | a. Replace either the entire drive or the control board if the problem continues to occur. Contact the local distributor for more information. |
| Uv2 | Retain | | |
| PF | Input Phase Loss<br><br>Drive input power has a large imbalance of voltage between phases or has an open phase<br>(Detected when P7-00=1) | 1. Phase loss in the drive input power<br>2. Drive input power terminals has a loose wiring<br>3. Drive input power voltage has an excessive fluctuation<br>4. The main circuit capacitors are impaired | 1. Check wiring for errors in the main circuit drive input power<br>»Correct wiring<br>2. Make sure the terminals are tightened correctly<br>»Apply the tightening torque as showed in the manual<br>3. Confirm the voltage from the drive input power<br>»Apply possible solutions for drive input power stabilization<br>4. Check drive input power. If drive input power seems normal but the alarm continues to occur, replace either the entire drive or the control board. Contact the local distributor for more information. |
| LF1 | Output Phase Loss<br><br>Phase loss on the drive output side | 1. The output cable is not connected<br>2. The motor winding is impaired<br>3. The output terminal is loose<br>4. The rated current of the motor being used is 5% less than the drive rated current<br>5. An output transistor is impaired<br>6. A single phase motor is activating | 1.Check the errors for wiring then properly connect the output cable<br>»Correct the wiring<br>2.Check the resistance which located between motor lines<br>»If the winding is impaired, replace the motor<br>3.Use tightening torque which showed in the manual in order to fasten the terminal<br>4.Check motor capacities and the drive<br>5.The drive cannot run a single phase motor |
| FbH | PID Feedback High | 1. Incorrect parameter settings | 1. Reset b5-22 and b5-23<br>2. Correct the wiring |

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| | | 2. Incorrect PID feedback wiring<br>3. Feedback sensor malfunction | 3. Check the sensor |
| FbL | PID Feedback Low | 1. Incorrect parameter settings<br>2. Incorrect PID feedback wiring<br>3. Feedback sensor malfunction | 1. Reset b5-12 and b5-13<br>2. Correct the wiring<br>3. Check the sensor |
| bUS | Retain | | |
| CE | Modbus Communication Error | 1. Incorrect wiring<br>2. Communication data error caused by noise | 1. Correct the wiring<br>»Check short circuits and disconnected cables, repair if necessary<br>2. Check possible solution to suppress the noise |
| CF | Retain | | |
| Err | Retain | | |
| JoGE | FJOG/ RJOG Input Error | A FJOG and RJOG Run commands are received at the same time | Check the Run command from the external source for Fjog/Rjog |
| ACE | A1 Input signal is missing | 1. A1 Input signal is missing | 1. Check the analog signal wiring<br>2. Confirm the E3-04 parameter setting |
| FBPL | (water pump function) water shortage failure | 1. The feedback pressure is less than the water shortage detection value (F1-09) and lasts for a period of time (F1-11)<br>2. The output current is less than the water shortage detection value (F1-10) and lasts for a while (F1-11) | 1. Insufficient water / water shortage<br>2. Judging the level value is too large<br>3. Detection time is too short |
| EF0 | External fault input from communication | Register (send) an external failure of the host device with the communication data. (2401H.BIT 2 = 1) | Troubleshoot external causes Cancel the external fault input of the host device |

# 6.3 Operation Errors

**Table 6.3 Error Displays, Causes, and Possible Solutions**

| Keypad Display | Error Name | Cause | Possible Solution |
|---|---|---|---|
| oE02 | Parameter Range Setting Error | Parameters are set outside of the possible setting range | 1. Set the parameters to the proper values<br>2. Reset the drive |
| oE03 | Multi-Function Input Selection Error | 1. Either of Up command and Down command is not set (E1-□□= 10 or 11 )<br>2. Either of Up command 2 and Down command 2 is not set (E1-□□=12 or 13) | Properly assign both of the UP and Down commands to the multi-function input terminal. |
| oE04 | 3-Wire Sequence Control Setting Error | Multi-Function input terminals S1 and S2 are assigned to E1-□□= 2 (3-Wire Sequence) | Do not assign multi-function input terminals S1 and S2 to E1-□□= 2 (3 − Wire Sequence) |
| oE05 | Communication Error | | |
| oE09 | PID Control Selection Fault (When b5-00 (PID Control Setting)= 1 to 4) | 1. Contradictory settings<br>· b5-14 (PID Sleep Start Level) is not set to 0.0<br>· b1-02 (Stopping Method Selection) is set to 2 (DC Braking to Stop) or 3 (Coast to Stop with Timer)<br>2. L2-01 (Frequency Command Lower Limit)≠0 when b5-00 = 1 or 2 (PID Control Enabled)<br>3. b5-10 (PID Output Reverse Selection) = 1 (Reverse Enabled)    when b5-00 = 1 or 2<br>4. L2-01 ≠ 0 when b5-00 = 3 or 4 | 1. Correct the parameter setting.<br>2. Correct the parameter setting.<br>3. Correct the parameter setting.<br>4. Correct the parameter setting. |
| oE10 | V/F Data Setting Error<br><br>Incorrect d1-02, d1-04, d1-06, d1-08, d1-09    settings | V/F parameters setting incorrect | Correct the setting in d1-02, d1-04, d1-06, d1-08 and d1-09. |

| Keypad Display | Error Name | Cause | Possible Solution |
|---|---|---|---|
| oE11 | Carrier Frequency Setting Error | 1. Contradictory settings<br>· C6-03 (Carrier Frequency Proportional Gain) > 6<br>· C6-02 (Minimum Carrier Frequency) > C6-01 (Maximum Carrier Frequency)<br>Note: If C6-03 ≤ 6 , the drive operates at C6-01<br>2. The upper and lower limit set in C6-00 to C6-03 are contradictory. | Correct the parameter setting. |
| oE17 | Improper setting of motor rated speed | 1. The following is also set.<br>· C6-03 (carrier frequency proportional gain) >6<br>· C6-02 > C6-01 (lower carrier frequency > upper carrier frequency)<br>(Note) When C6-03 ≤ 6, press the fixed value of C6-01<br>2. The upper and lower limits of C6-00~-03 are set incorrectly. | Correct the parameter setting. |

# 6.4 Auto-Tuning Fault Detection

**Table 6.4 Auto-Tuning Codes, Causes, and Possible Solution**

| Keypad Display | Fault Name | Cause | Possible Solution |
|---|---|---|---|
| TF00 | Auto-Tuning Stop | User presses STOP key during Auto-Tuning | Do not press STOP key during Auto-Tuning |
| TF01 | Line-to Line Resistance Error | The line-to-line resistance in Auto-Tuning is negative or limited by the upper the lower limit | Check and correct motor wiring |
| TF07 | Motor Data Error | t5-05 and t1-07 setting incorrect | Make sure the data entered to t1-05 and t1-07 is the same as the information showed on the motor nameplate. Reset the parameters. |

# Chapter 7 │ Communction Protocol

## 7.1 MODBUS Communction Specification

Modbus Communction Specification:

| Item | Specification |
|---|---|
| Interface | RS-485 |
| Synchronoously | Asynchronous |
| Communication Parameters | Serial transmission rate |
| | Data length |
| | Parity check: even parity / odd parity / no |
| | Stop bit |
| Communication Protocol | MODBUS Standard |
| How many machines can be connected | Max. 31 |

## 7.2 How to connect with controller/ PLC/ HMI

### 7.2.1 Connection of communication cable

1. Connect the communication cable between the device/PLC/human interface and the inverter with the power OFF. The connection terminal of the MODBUS communication cable is RJ45 port.



Pin 1:15v
Pin 2:5v
Pin 3,6:SGND
Pin 4:SG-
Pin 5:SG+
RS-485
Pin 7, 8 :Retain
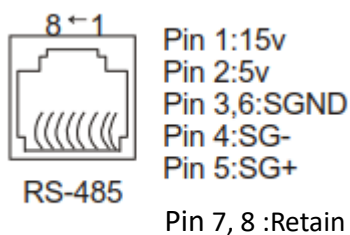
(Note) When wiring for communication, separate the main circuit wiring from other power lines and power lines. The communication wiring uses a mask wire, and the mask wire is covered and connected to the ground terminal of the inverter, and the other end is not connected and subjected to end processing, which has the effect of preventing malfunction and causing malfunction.

2. Turn on the power.

3. Use the operator to set the parameters required for communication (E6 - 06 to E6 - 10).

4. Turn off the power and check that the display of the operator disappears.

5. Turn the power on again.

6. Communicate with the device/PLC/human interface.

# 7.3 Information format

## 7.3.1 Slave site

Set the slave station address of the inverter. Please set the value from 0 to 0x1F (Hex). When the slave station address is set to 0, the master station sends an instruction to all slave stations. (broadcast transmission)

For broadcast transmission, the slave does not send a response message to the primary station.

00H: All drive broadcasts (Broadcast)

01H: For the 01th address driver

0FH: drive to the 15th address

10H: For the 16th address driver, and so on....., up to 31 (1FH).

7.3.2 Function code

Is the code used to specify the instruction. There are four types of function codes.

Function Code and Data Characters

03H : Read the contents of the scratchpad

06H : Write a WORD to the scratchpad (scratchpad write)

08H : Loop test

10H : Write multiple data to the scratchpad (multiple register write)

7.4 MODBUS Data List

The MODBUS data list is as follows. The types of materials include instruction materials, surveillance materials, and broadcast transmission materials.

**Command DATA (can be read and written)**

| Loc. | definition | |
|---|---|---|
| 2400H | Retain | |
| 2401H | Operation Command | |
| | BIT 0 | Stop/Run (0: Stop, 1: Run) |
| | BIT 1 | Forward/reverse (0: forward, 1: reverse) |
| | BIT 2 | External fault EF0 |
| | BIT 3 | Failure return |
| | BIT 4 | Retain |
| | BIT 5 | Retain |
| | BIT 6 | Retain |
| | BIT 7 | Retain |
| | BIT 8 | Multi-function terminal 1 (1: ON) |
| | BIT 9 | Multi-function terminal 2 (1: ON) |

| BIT 10 | Multi-function terminal 3 (1: ON) |
|---|---|
| BIT 11 | Multi-function terminal 4 (1: ON) |
| BIT 12 | Multi-function terminal 5 (1: ON) |
| BIT 13 | Multi-function terminal 6 (1: ON) |
| 2402H Frequency command (unit: 0.01Hz) | |
| 2404H Multi-function output instruction | |
| BIT 0 | 1: Relay1 ON (only valid when E2-00 is set to 12 communication mode) |

**Monitor DATA (read only)**

| Loc. | Definition | |
|---|---|---|
| 2420H | Retain | |
| 2421H | Operational state | |
| | BIT 0 | 1: In operation |
| | BIT 1 | 1: Reverse running |
| | BIT 2 | 1: Zero speed |
| | BIT 3 | 1: malfunction |
| | BIT 4 | 1: Warning |
| | BIT 5 | 1: Consistent frequency |
| | BIT 6 | 1: The inverter is ready to run. |
| | BIT 7 | 1: Frequency provided by communication |
| | BIT 8 | 1: Operation provided by communication |
| | BIT 11~15 | Retain |
| 2422H | Frequency command (Unit 0.01Hz) | |
| 2423H | Output frequency (Unit 0.01Hz) | |
| 2424H | Output current (Unit 0.1A) | |
| 2425H | Output voltage (Unit 0.1V) | |
| 2426H | DC voltage (Unit 0.1V) | |
| 2427H | Warning Description | |
| 2428H | Malfunction Description | |
| 2429H | Multi-function input and output status | |
| | BIT 0 | 1: Multi-function terminal 1 ON |
| | BIT 1 | 1: Multi-function terminal 2 ON |
| | BIT 2 | 1: Multi-function terminal 3 ON |
| | BIT 3 | 1: Multi-function terminal 4 ON |
| | BIT 4 | 1: Multi-function terminal 5 ON |
| | BIT 5 | 1: Multi-function terminal 6 ON |
| | BIT 8~10 | Retain |
| | BIT 12 | 1: Relay1 ON |
| | BIT 14 | 1: PH1 ON |
| | BIT 15 | Retain |
| 242AH | AI1 Input(0 correspond 0V or 0mA, 1000 correspond 10V or 20mA) | |

| 242CH | Retain |
|---|---|
| 242DH | AO1 Input (0　correspond 0V, 1000 correspond 10V) |

**Warning Description (2427H)**

| Value | Content | Value | Content | Value | Content |
|---|---|---|---|---|---|
| 0 | No warning | 13 | Retain | 26 | UT1 (Motor low torque1) |
| 1 | EF0 (Communication error) | 14 | Retain | 27 | Retain |
| 2 | EF1 (external warning 1) | 15 | Retain | 28 | Retain |
| 3 | EF2 (external warning2) | 16 | Retain | 29 | Retain |
| 4 | EF3 (external warning 3) | 17 | Retain | 30 | Retain |
| 5 | EF4 (external warning 4) | 18 | FbH (PID feedback is too high) | 31 | BB (Output shutoff) |
| 6 | EF5 (external warning 5) | 19 | FbL (PID feedback is too low) | 32 | OH2 (Inverter OH2 warning |
| 7 | EF6 (external warning 6) | 20 | OH (Inverter overheating) | 33 | HCA(Overcurrent) |
| 8 | Retain | 21 | Retain | 34 | DNE (Drive is invalid) |
| 9 | Retain | 22 | OT1 (Motor over torque 1) | 35 | Retain |
| 10 | Retain | 23 | Retain | 36 | CE (MODBUS communication is abnormal) |
| 11 | Retain | 24 | OV (Overvoltage warning) | 37 | Retain |
| 12 | Retain | 25 | UV (Low voltage warning) | 38 | Retain |

**Fault description (2428H)**

| Value | Content | Value | Content | Value | Content |
|---|---|---|---|---|---|
| 0 | functional | 31 | Retain | 62 | Retain |
| 1 | GF (ground short circuit) | 32 | Retain | 63 | SEr (speed search is abnormal) |
| 2 | OVA (Accelerated overvoltage) | 33 | OH (Inverter overheating) | 64 | Retain |
| 3 | OVd (Deceleration over voltage) | 34 | Retain | 34 | OH1 (motor overheated) |
| 4 | OVC (fixed speed overvoltage) | 35 | Retain | 66 | CPF02 |
| 5 | OCA(acceleration overcurrent) | 36 | OL1 (motor overload) | 67 | CPF03 |
| 6 | OCd (deceleration over current) | 37 | OL2 (Inverter overload) | 68 | CPF04 |
| 7 | OCC (overcurrent during operation) | 38 | Retain | 69 | CPF05 |
| 8 | EF(overcurrent during operation) | 39 | OT1 (motor over torque 1) | 70 | CPF06 |
| 9 | SC (short circuit) | 40 | Retain | 71 | CPF07 |
| 10 | Retain | 41 | UT1 (motor low torque 1) | 72 | Retain |
| 11 | Retain | 42 | Retain | 73 | JOGE (FJOG, RJOG At the same time) |
| 12 | Retain | 43 | Retain | 74 | -OFF- |
| 13 | Retain | 44 | UV1(DC voltage is too low | 75 | Retain |
| 14 | Retain | 45 | UV2 | 76 | Retain |
| 15 | Retain | 46 | PF (input phase) | 77 | Retain |
| 16 | Retain | 47 | LF1 (output phase loss) | 78 | Retain |
| 17 | EF0 (communication exception) | 48 | Retain | 79 | Retain |
| 18 | EF1 (external fault 1) | 49 | Retain | 80 | Retain |
| 19 | EF2 (external fault2) | 50 | Retain | 81 | Retain |
| 20 | EF3 (external fault 3) | 51 | Retain | 82 | Retain |

| 21 | EF4 (external fault 4) | 52 | Retain | 83 | Retain |
|---|---|---|---|---|---|
| 22 | EF5 (external fault 5) | 53 | Retain | 84 | Retain |
| 23 | EF6 (external fault 6) | 54 | FbH (PID feedback is too high) | 85 | Retain |
| 24 | Retain | 55 | FbL (PID feedback is too low) | 86 | Retain |
| 25 | Retain | 56 | bUS (Communication card is abnormal) | 87 | Retain |
| 26 | Retain | 57 | CE (communication error) | 88 | Retain |
| 27 | Retain | 58 | CF (control fault) | 89 | Retain |
| 28 | Retain | 59 | Err (EEPROM error) | 90 | Retain |
| 29 | Retain | 60 | Retain | 91 | Retain |
| 30 | Retain | 61 | Retain | | |

Mod The parameter Modbus address corresponding to the inverter is as follows

| Parameter | Address | Parameter | Addess | Parameter | Address |
|---|---|---|---|---|---|
| A1-00 | 0x0000 | A2-00 | 0x0080 | A2-11 | 0x008B |
| A1-01 | 0x0001 | A2-01 | 0x0081 | A2-12 | 0x008C |
| A1-02 | 0x0002 | A2-02 | 0x0082 | A2-13 | 0x008D |
| A1-03 | 0x0003 | A2-03 | 0x0083 | A2-14 | 0x008E |
| A1-04 | 0x0004 | A2-04 | 0x0084 | A2-15 | 0x008F |
| A1-05 | 0x0005 | A2-05 | 0x0085 | A2-32 | 0x00A0 |
| A1-07 | 0x0007 | A2-06 | 0x0086 | | |
| | | A2-07 | 0x0087 | | |
| | | A2-08 | 0x0088 | | |
| | | A2-09 | 0x0089 | | |
| | | A2-10 | 0x008A | | |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| B1-00 | 0x0100 | B2-00 | 0x0180 | B3-00 | 0x0200 |
| B1-01 | 0x0101 | B2-01 | 0x0181 | B3-01 | 0x0201 |
| B1-02 | 0x0102 | B2-02 | 0x0182 | B3-02 | 0x0202 |
| B1-03 | 0x0103 | B2-03 | 0x0183 | B3-03 | 0x0203 |
| B1-05 | 0x0105 | | | B3-04 | 0x0204 |
| B1-06 | 0x0106 | | | B3-05 | 0x0205 |
| B1-07 | 0x0107 | | | | |
| B1-09 | 0x0109 | | | | |
| B1-10 | 0x010A | | | B4-00 | 0x0280 |
| B1-12 | 0x010C | | | B4-01 | 0x0281 |
| B1-13 | 0x010D | | | | |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| B5-00 | 0x0300 | B5-21 | 0x0315 | B9-02 | 0x0502 |
| B5-01 | 0x0301 | B5-22 | 0x0316 | | |
| B5-02 | 0x0302 | B5-23 | 0x0317 | | |
| B5-03 | 0x0303 | B5-24 | 0x0318 | | |
| B5-04 | 0x0304 | B5-25 | 0x0319 | | |
| B5-05 | 0x0305 | B5-26 | 0x031A | | |
| B5-06 | 0x0306 | B5-27 | 0x031B | | |
| B5-07 | 0x0307 | B5-28 | 0x031C | | |
| B5-08 | 0x0308 | B5-29 | 0x031D | | |
| B5-09 | 0x0309 | B5-30 | 0x031E | | |
| B5-10 | 0x030A | | | | |
| B5-11 | 0x030B | | | | |
| B5-12 | 0x030C | | | | |

| Parameter | Address |  |  |  |  |
|-----------|---------|--|--|--|--|
| B5-13 | 0x030D |  |  |  |  |
| B5-14 | 0x030E |  |  |  |  |
| B5-15 | 0x030F |  |  |  |  |
| B5-16 | 0x0310 |  |  |  |  |
| B5-17 | 0x0311 |  |  |  |  |
| B5-18 | 0x0312 |  |  |  |  |
| B5-19 | 0x0313 |  |  |  |  |
| B5-20 | 0x0314 |  |  |  |  |

| Parameter | Address | Parameter | Address | Parameter | Address |
|-----------|---------|-----------|---------|-----------|---------|
| C1-00 | 0x0580 | C2-00 | 0x0600 | C3-00 | 0x0680 |
| C1-01 | 0x0581 | C2-01 | 0x0601 | C3-02 | 0x0682 |
| C1-02 | 0x0582 | C2-02 | 0x0602 |  |  |
| C1-03 | 0x0583 | C2-03 | 0x0603 | C5-00 | 0x0780 |
| C1-08 | 0x0588 |  |  | C5-01 | 0x0781 |
| C1-11 | 0x058B |  |  |  |  |
| C1-12 | 0x058C |  |  | C6-00 | 0x0800 |

| Parameter | Address | Parameter | Address | Parameter | Address |
|-----------|---------|-----------|---------|-----------|---------|
| L1-00 | 0x0880 | L1-13 | 0x088D | L4-00 | 0x0A00 |
| L1-01 | 0x0881 | L1-14 | 0x088E | L4-01 | 0x0A01 |
| L1-02 | 0x0882 | L1-15 | 0x088F | L4-02 | 0x0A02 |
| L1-03 | 0x0883 | L1-16 | 0x0890 | L4-03 | 0x0A03 |
| L1-04 | 0x0884 |  |  | L4-04 | 0x0A04 |
| L1-05 | 0x0885 | L2-00 | 0x0900 |  |  |
| L1-06 | 0x0886 | L2-01 | 0x0901 | L6-00 | 0x0B00 |
| L1-07 | 0x0887 |  |  | L6-01 | 0x0B01 |
| L1-08 | 0x0888 | L3-00 | 0x0980 | L6-02 | 0x0B02 |
| L1-09 | 0x0889 | L3-01 | 0x0981 |  |  |
| L1-10 | 0x088A | L3-02 | 0x0982 |  |  |
| L1-11 | 0x088B | L3-03 | 0x0983 |  |  |

| Parameter | Address | Parameter | Address | Parameter | Address |
|-----------|---------|-----------|---------|-----------|---------|
| D1-00 | 0x0B80 | D2-00 | 0x0C00 | E1-00 | 0x0D00 |
| D1-01 | 0x0B81 | D2-01 | 0x0C01 | E1-01 | 0x0D01 |
| D1-02 | 0x0B82 | D2-02 | 0x0C02 | E1-02 | 0x0D02 |
| D1-03 | 0x0B83 | D2-03 | 0x0C03 | E1-03 | 0x0D03 |
| D1-04 | 0x0B84 | D2-04 | 0x0C04 | E1-04 | 0x0D04 |
| D1-05 | 0x0B85 | D2-05 | 0x0C05 | E1-05 | 0x0D05 |
| D1-06 | 0x0B86 | D2-06 | 0x0C06 | E1-08 | 0x0D08 |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| D1-07 | 0x0B87 | D2-07 | 0x0C07 | E1-09 | 0x0D09 |
| D1-08 | 0x0B88 | D2-10 | 0x0C0A | E2-00 | 0x0D80 |
| D1-09 | 0x0B89 | | | E3-00 | 0x0E00 |
| D1-15 | 0x0B8F | | | E3-01 | 0x0E01 |
| D1-20 | 0x0B94 | | | E3-02 | 0x0E02 |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| E3-03 | 0x0E03 | E4-03 | 0x0E83 | E6-09 | 0x0F89 |
| E3-05 | 0x0E05 | E6-05 | 0x0F85 | E6-10 | 0x0F8A |
| E3-13 | 0x0E0D | E6-06 | 0x0F86 | E6-11 | 0x0F8B |
| E4-01 | 0x0E81 | E6-07 | 0x0F87 | E6-12 | 0x0F8C |
| E4-02 | 0x0E82 | E6-08 | 0x0F88 | E6-13 | 0x0F8D |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| P1-00 | 0x1000 | P2-00 | 0x1080 | P3-00 | 0x1100 |
| P1-01 | 0x1001 | P2-01 | 0x1081 | P3-01 | 0x1101 |
| P1-05 | 0x1005 | P2-03 | 0x1083 | P3-02 | 0x1102 |
| | | P2-05 | 0x1085 | P3-03 | 0x1103 |
| | | P2-10 | 0x108A | P3-04 | 0x1104 |
| | | | | P3-05 | 0x1105 |
| | | | | P3-06 | 0x1106 |
| | | | | P3-07 | 0x1107 |
| | | | | P3-08 | 0x1108 |
| | | | | P3-09 | 0x1109 |
| | | | | P3-10 | 0x110A |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| P4-00 | 0x1180 | P5-00 | 0x1200 | P6-00 | 0x1280 |
| P4-01 | 0x1181 | P5-01 | 0x1201 | P6-01 | 0x1281 |
| P4-02 | 0x1182 | P5-02 | 0x1202 | P6-02 | 0x1282 |
| P4-03 | 0x1183 | | | | |
| P4-04 | 0x1184 | | | | |
| P4-05 | 0x1185 | | | | |
| P4-06 | 0x1186 | | | | |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| P7-00 | 0x1300 | N1-00 | 0x1380 | T1-07 | 0x1887 |
| P7-01 | 0x1301 | N1-01 | 0x1381 | T1-09 | 0x1889 |
| P7-02 | 0x1302 | N3-04 | 0x1484 | T1-12 | 0x188C |
| P7-03 | 0x1303 | N3-06 | 0x1486 | | |
| P7-04 | 0x1304 | T1-01 | 0x1881 | | |

| | | | | | |
|---|---|---|---|---|---|
| P7-07 | 0x1307 | T1-02 | 0x1882 | | |
| P7-09 | 0x1309 | T1-03 | 0x1883 | | |
| P7-10 | 0x130A | T1-04 | 0x1884 | | |
| P7-11 | 0x130B | T1-05 | 0x1885 | | |
| P7-14 | 0x130E | T1-06 | 0x1886 | | |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| O1-00 | 0x1680 | O2-01 | 0x1701 | O4-00 | 0x1800 |
| O1-02 | 0x1682 | O2-02 | 0x1702 | O4-06 | 0x1806 |
| O1-03 | 0x1683 | O2-03 | 0x1703 | | |
| O1-04 | 0x1684 | O2-04 | 0x1704 | | |
| | | O2-05 | 0x1705 | | |
| | | O2-06 | 0x1706 | | |

| Parameter | Address | Parameter | Address | Parameter | Address |
|---|---|---|---|---|---|
| U1-00 | 0x1D00 | U2-09 | 0x1D89 | U3-08 | 0x1E08 |
| U1-01 | 0x1D01 | U2-10 | 0x1D8A | U3-09 | 0x1E09 |
| U1-02 | 0x1D02 | U2-13 | 0x1D8D | U3-10 | 0x1E0A |
| U1-03 | 0x1D03 | U2-14 | 0x1D8E | U3-11 | 0x1E0B |
| U1-04 | 0x1D04 | U2-15 | 0x1D8F | U3-12 | 0x1E0C |
| U1-05 | 0x1D05 | U2-17 | 0x1D91 | U3-13 | 0x1E0D |
| U1-06 | 0x1D06 | U2-18 | 0x1D92 | U3-14 | 0x1E0E |
| U1-07 | 0x1D07 | U2-19 | 0x1D93 | U3-15 | 0x1E0F |
| U1-08 | 0x1D08 | U2-20 | 0x1D94 | U3-17 | 0x1E11 |
| U1-09 | 0x1D09 | U2-21 | 0x1D95 | U4-00 | 0x1E80 |
| U1-10 | 0x1D0A | U2-22 | 0x1D96 | U4-01 | 0x1E81 |
| U1-11 | 0x1D0B | U2-23 | 0x1D97 | U4-02 | 0x1E82 |
| U1-12 | 0x1D0C | U2-24 | 0x1D98 | U4-03 | 0x1E83 |
| U1-16 | 0x1D10 | U2-27 | 0x1D9B | U4-08 | 0x1E88 |
| U1-17 | 0x1D11 | U2-28 | 0x1D9C | | |
| U1-19 | 0x1D13 | U2-29 | 0x1D9D | | |
| U1-20 | 0x1D14 | U2-31 | 0x1D9F | | |
| U1-21 | 0x1D15 | U2-32 | 0x1DA0 | | |
| U2-00 | 0x1D80 | U2-33 | 0x1DA1 | | |
| U2-01 | 0x1D81 | U2-34 | 0x1DA4 | | |
| U2-02 | 0x1D82 | U2-35 | 0x1DA5 | | |
| U2-03 | 0x1D83 | U2-36 | 0x1DA6 | | |
| U2-04 | 0x1D84 | U2-37 | 0x1DA7 | | |
| U2-05 | 0x1D85 | U3-00 | 0x1E00 | | |
| U2-06 | 0x1D86 | U3-02 | 0x1E02 | | |
| U2-07 | 0x1D87 | U3-06 | 0x1E06 | | |
| U2-08 | 0x1D88 | U3-07 | 0x1E07 | | |

| Parameter | Edit Date | | Parameter | Edit Date | |
|---|---|---|---|---|---|
| A1-00 | | | b3-04 | | |
| A1-01 | | | b3-05 | | |
| A1-02 | | | b5-00 | | |
| A1-03 | | | b5-01 | | |
| A1-04 | | | b5-02 | | |
| A1-05 | | | b5-03 | | |
| A2-00 | | | b5-04 | | |
| A2-01 | | | b5-05 | | |
| A2-02 | | | b5-06 | | |
| A2-03 | | | b5-07 | | |
| A2-04 | | | b5-08 | | |
| A2-05 | | | b5-09 | | |
| A2-06 | | | b5-10 | | |
| A2-07 | | | b5-11 | | |
| A2-08 | | | b5-12 | | |
| A2-09 | | | b5-13 | | |
| A2-10 | | | b5-14 | | |
| A2-11 | | | b5-15 | | |
| A2-12 | | | b5-16 | | |
| A2-13 | | | b5-17 | | |
| A2-14 | | | b5-18 | | |
| A2-15 | | | b5-19 | | |
| A2-32 | | | b5-20 | | |
| b1-00 | | | b5-21 | | |
| b1-01 | | | b5-22 | | |
| b1-02 | | | b5-23 | | |
| b1-03 | | | b5-24 | | |
| b1-05 | | | b5-25 | | |
| b1-06 | | | b5-26 | | |
| b1-09 | | | b5-27 | | |
| b1-10 | | | b5-28 | | |
| b1-11 | | | b8-00 | | |
| b2-00 | | | C1-00 | | |
| b2-01 | | | C1-01 | | |
| b2-02 | | | C1-02 | | |
| b2-03 | | | C1-03 | | |
| b3-00 | | | C1-08 | | |
| b3-01 | | | C2-00 | | |
| b3-02 | | | C2-01 | | |
| b3-03 | | | C2-02 | | |

| Parameter | Edit Date | | Parameter | Edit Date | |
|---|---|---|---|---|---|
| C2-03 | | | d1-05 | | |
| C3-00 | | | d1-06 | | |
| C5-00 | | | d1-07 | | |
| C5-01 | | | d1-08 | | |
| C6-00 | | | d1-09 | | |
| C6-01 | | | d2-00 | | |
| C6-02 | | | d2-01 | | |
| C6-03 | | | d2-02 | | |
| L1-00 | | | d2-03 | | |
| L1-01 | | | d2-04 | | |
| L1-02 | | | E1-00 | | |
| L1-03 | | | E1-01 | | |
| L1-04 | | | E1-02 | | |
| L1-05 | | | E1-03 | | |
| L1-06 | | | E1-04 | | |
| L1-07 | | | E1-05 | | |
| L1-08 | | | E2-00 | | |
| L1-09 | | | E3-00 | | |
| L1-10 | | | E3-01 | | |
| L1-11 | | | E3-02 | | |
| L1-12 | | | E3-03 | | |
| L1-13 | | | E3-05 | | |
| L1-14 | | | E4-00 | | |
| L1-15 | | | E4-01 | | |
| L1-16 | | | E4-02 | | |
| L2-00 | | | E4-03 | | |
| L2-01 | | | E6-00 | | |
| L3-00 | | | E6-01 | | |
| L3-01 | | | E6-02 | | |
| L3-03 | | | E6-03 | | |
| L4-00 | | | E6-04 | | |
| L4-01 | | | E6-05 | | |
| L4-02 | | | E6-06 | | |
| L4-03 | | | E6-07 | | |
| L4-04 | | | E6-08 | | |
| d1-00 | | | P1-00 | | |
| d1-01 | | | P1-01 | | |
| d1-02 | | | P1-05 | | |
| d1-03 | | | P2-00 | | |
| d1-04 | | | P2-01 | | |

| Parameter / Edit Date | | | Parameter / Edit Date | | |
|---|---|---|---|---|---|
| P2-02 | | | o4-01 | | |
| P2-03 | | | o4-06 | | |
| P2-05 | | | o4-07 | | |
| P3-00 | | | o4-08 | | |
| P3-01 | | | t1-02 | | |
| P3-02 | | | t1-03 | | |
| P3-03 | | | t1-04 | | |
| P3-05 | | | t1-05 | | |
| P3-06 | | | t1-06 | | |
| P3-07 | | | t1-07 | | |
| P3-08 | | | t1-10 | | |
| P3-11 | | | t1-12 | | |
| P4-00 | | | | | |
| P4-01 | | | | | |
| P4-02 | | | | | |
| P4-03 | | | | | |
| P4-04 | | | | | |
| P5-00 | | | | | |
| P5-01 | | | | | |
| P5-02 | | | | | |
| P6-00 | | | | | |
| P6-01 | | | | | |
| P6-02 | | | | | |
| P7-00 | | | | | |
| P7-01 | | | | | |
| P7-02 | | | | | |
| P7-03 | | | | | |
| P7-04 | | | | | |
| P7-05 | | | | | |
| P7-09 | | | | | |
| P7-12 | | | | | |
| o1-00 | | | | | |
| o2-01 | | | | | |
| o2-02 | | | | | |
| o2-03 | | | | | |
| o2-05 | | | | | |
| o2-06 | | | | | |
| o3-00 | | | | | |
| o3-01 | | | | | |
| o4-00 | | | | | |

# Appendix UL Description

1) "Maximum surrounding air temperature rating of 50°C"
2) "The drive is suitable for use in a circuit capable of delivering not more than 5,000 rms symmetrical amperes, Maximum, 220 V for 200 V three-phase, 240 V for 200 V single-phase, 480 V for 400 V three-phase. "
These devices are only intended to be installed with the following branch circuit fuse.

| 400V 3Φ | Input Current  I (A) | Line Fuse | |
|---|---|---|---|
| | | I (A) | Bussmann P/N |
| 0.4kW (0.5 HP) | 2.7 | 10 | FRS-R-10 |
| 0.75kW (1 HP) | 4.4 | 10 | FRS-R-10 |
| 1.5kW (2 HP) | 6.7 | 10 | FRS-R-10 |
| 2.2kW (3 HP) | 9.3 | 15 | FRS-R-15 |
| 3.7kW (5 HP) | 12.9 | 20 | FRS-R-20 |
| 200V 1Φ | Input Current  I (A) | Line Fuse | |
| | | I (A) | Bussmann P/N |
| 0.2kW (0.25 HP) | 3.6 | 6 | FRS-R-6 |
| 0.4kW (0.5 HP) | 7.4 | 10 | FRS-R-10 |
| 0.75kW (1 HP) | 13.5 | 20 | FRS-R-20 |
| 1.5kW (2 HP) | 24 | 30 | FRS-R-30 |
| 2.2kW (3 HP) | 33 | 50 | FRS-R-50 |
| 200V 3Φ | Input Current  I (A) | Line Fuse | |
| | | I (A) | Bussmann P/N |
| 0.2kW (0.25 HP) | 2.2 | 5 | FRS-R-5 |
| 0.4kW (0.5 HP) | 3.7 | 5 | FRS-R-5 |
| 0.75kW (1 HP) | 6.6 | 10 | FRS-R-10 |
| 1.5kW (2 HP) | 10.5 | 15 | FRS-R-15 |
| 2.2kW (3 HP) | 14.8 | 20 | FRS-R-20 |
| 3.7kW (5 HP) | 21.5 | 30 | FRS-R-30 |

3) "The drive must be installed in a Pollution 2 environment with clean air according to enclosure classification. Cooling air must be clean, free from corrosive materials and electrically conductive dust."
4) "Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes", or the equivalent.
5) "Solid State motor overload protection level in percent of full-load current (150% FLA)."
6) "Overtemperature protection is not provided by the drive."
7) Use Copper Conductors rated 60/75°C.
8) Type of electrical supply system (3WYE) to which the drive shall be connected

(Olny for three phase series)

1) COURANT NOMINAL DE COURT-CIRCUIT, 5000 A SYMÉTRIQUES EFF. MAXIMUM, 220 V POUR 200 V TRIPHASÉ, 240 V POUR 200 V MONOPHASÉ, 480 V POUR 400 V TRIPHASÉ.

2) CONVIENT AUX CIRCUITS NON SUSCEPTIBLES DE DE DÉLIVRER PLUS DE 5000 AMPÉRES SYMÉTRIQUES EFF. MAXIMUM, 220 V POUR 200 V TRIPHASÉ, 240 V POUR 200 V MONOPHASÉ, 480 V POUR 400 V TRIPHASÉ.

3) AVEC UNE PROTECTION PAR DES FUSIBLES CLASSE RK5 DE CALIBRE NOMINAL MAXIMAL DE V, A, VÉRIFIEZ LE TABLEAU SUIVANT.

4) AVEC PROTECTION PAR DES FUSIBLES DE CALIBRE RK5, VÉRIFIEZ LE TABLEAU SUIVANT.

5) LA PROTECTION INTÉGRÉE CONTRE LES COURTS-CIRCUITS N'ASSURE PAS LA PROTECTION DE LA DÉRIVATION. LA PROTECTION DE LA DÉRIVATION DOIT ÊTRE EXÉCUTÉE CONFORMÉMENT AU CODE CANADIEN DE L'ÉLECTRICITÉ, PREMIÉRE PARTIE.

6) AVERTISSEMENT : RISQUE DU CHOC ÉLECTRIQUE. UNE TENSION DANGEREUSE PEUT ÊTRE PRÉSENTÉE JUSQU'À 5 MINUTES APRÉS AVOIR COUPÉ L'ALIMENTATION.

| Model No. | Branch Circuit Fuses |
|---|---|
| EVO600043S0D4 | Class RK5, rated 600 V ac, 10 A, Interrupting Current 200 kA |
| EVO600043SD75 | |
| EVO600043S1D5 | |
| EVO600043S2D2 | Class RK5, rated 600 V ac, 15 A, Interrupting Current 200 kA |
| EVO600043S3D7 | Class RK5, rated 600 V ac, 20 A, Interrupting Current 200 kA |

| Model No. | Maximum Branch Circuit Fuses |
|---|---|
| EVO600021S0D2 | Class RK5, rated 300/600 V ac, 6 A, Interrupting Current 200 kA |
| EVO600021S0D4 | Class RK5, rated 300/600 V ac, 10 A, Interrupting Current 200 kA |
| EVO600021SD75 | Class RK5, rated 300/600 V ac, 20 A, Interrupting Current 200 kA |
| EVO600021S1D5 | Class RK5, rated 300/600 V ac, 30 A, Interrupting Current 200 kA |
| EVO600021S2D2 | Class RK5, rated 300/600 V ac, 50 A, Interrupting Current 200 kA |

| Model No. | Branch Circuit Fuses |
|---|---|
| EVO600023S0D2 | Class RK5, rated 240 V ac or higher, 5 A |
| EVO600023S0D4 | |
| EVO600023SD75 | Class RK5, rated 240 V ac or higher, 10 A |
| EVO600023S1D5 | Class RK5, rated 240 V ac or higher, 15 A |
| EVO600023S2D2 | Class RK5, rated 240 V ac or higher, 20 A |
| EVO600023S3D7 | Class RK5, rated 240 V ac or higher, 30 A |

# EVOlution Series

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