



WARNING

Electrical Shock Prevention

1. Do not remove the front cover when input power is applied. Doing so can result in electric shock.
2. Do not operate the inverter with the front cover removed. Electric shock can occur due to the exposed high voltage terminals and capacitor.
3. Do not remove the cover except for routine inspections or wiring, even if the input power is not applied. The capacitor will remain charged for a long time even when the power is not applied.
4. Wiring and routine checkups should be performed 10 minutes after disconnecting the input power and after checking to see whether the DC voltage is discharged with a tester. (Below DC 30V)
5. Do not use a higher grounding method than the Type 3 grounding method.
6. Only authorized personnel may perform wiring and inspections.
7. Wire the inverter after the inverter installation.
8. Do not operate the switches with wet hands. Doing so may result in electrical shock.
9. Electrical shock may occur if the cable insulation is damaged. Insure proper mounting of equipment to minimize excess stress on power cables.



CAUTION

Fire Prevention

1. Install the inverter on a non-combustible surface. Installing the inverter on or near combustible materials can result in fire.
2. Disconnect the inverter when the inverter is damaged. Failure to do so could lead to a secondary accident and fire.
3. Do not connect a resistance directly between the DC terminals P . N. Doing so can result in fire.

Damage Prevention

1. Do not apply voltages higher than the values specified in this manual to the terminals. Doing so can damage the inverter.
2. Incorrect terminal connection may damage the inverter.
3. Incorrectly connecting the polarity (+/-) of the terminals can damage the inverter.
4. After disconnecting, the inverter may still be hot. Use caution to prevent the possibility of personal injury.

Other Important Precautions

Pay attention to the following items. Failure to do so can result in damage of inverter and/or electrical shock.

■ Handling and installation

1. Handle according to the weight of product. Failure to do so can result in damage to product.
2. Do not stack inverters beyond listed specifications.
3. Install according to specifications listed within this manual.
4. Do not apply power to a damaged inverter or to an inverter with missing components.
5. Do not open front cover while carrying inverter.
6. Do not place heavy items on inverter.
7. Installation orientation must follow specifications listed within this manual.
8. Do not allow conducted material such as screws, metal objects, water, or oil to enter interior of inverter.
9. Do not drop or inflict intense impact to inverter.
10. Install and operate inverter only under specified conditions.

■ Wiring

1. Do not connect Power Factor capacitors, surge suppressors, or RFI filters to output circuits.
2. Connect the output terminals (U, V, W) according to specifications.

■ Operation

1. CAUTION: When the retry function is selected the inverter restarts after an alarm stop.
2. Stop key on keypad can only be used when stop key function is set. Install separate emergency stop switch if required.
3. When run signal is received, inverter restarts only when alarm contents have been reset. Verify run signal before resetting alarm.
4. Do not start or stop inverter using

electromagnetic switch installed in power input circuit.

5. Do not modify or alter anything inside inverter.
6. CAUTION: Motor might not be protected by electronic thermal function of inverter.
7. Install noise filter to minimize potential noise interference on equipment installed near inverter.
8. In case of input voltage unbalance, install AC reactor. Power Factor capacitors and generators may become overheated and damaged due to potential high frequency noise transmitted from inverter.
9. Use an insulation-rectified motor or take measures to suppress the micro surge voltage when driving 400V class motor with inverter. A micro surge voltage attributable to wiring constant is generated at motor terminals, and may deteriorate insulation and damage motor
10. Before operating unit and prior to user programming, reset user parameters to default settings
11. Inverter can easily be set to high-speed operations, Verify capability of motor or machinery prior to operating unit.
12. Stopping torque is not produced when using the DC-Break function. Install separate equipment when stopping torque is needed.
13. "Not provided with over speed protection."

■ Fault Prevention Precautions

Install additional safety equipment, such as emergency brakes, to prevent uncontrolled machine operation from a damaged inverter.

■ Maintenance, Inspection, and Exchanging Components

1. Do not conduct megger test (insulation resistance measurement) of control circuitry in inverter.
2. Refer to [Chapter 6](#) for routine inspection methods.

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USER SELECTION GUIDE (IG5 SPECIFICATIONS)

230V Class (0.5 ~ 5HP)

| Inverter Type (SVxxxiG5-x) | | 004-1 | 008-1 | 015-1 | 004-2 | 008-2 | 015-2 | 022-2 | 037-2 | 040-2 |
|-------------------------------|------------------------------|--|-------|-------|---------------------------------|-------|-------|-------|-------|-------|
| Motor Rating ¹ | HP | 0.5 | 1 | 2 | 0.5 | 1 | 2 | 3 | 5 | 5.4 |
| | kW | 0.37 | 0.75 | 1.5 | 0.37 | 0.75 | 1.5 | 2.2 | 3.7 | 4.0 |
| Output Ratings | Capacity ² [kVA] | 1.1 | 1.9 | 3.0 | 1.1 | 1.9 | 3.0 | 4.5 | 6.1 | 6.5 |
| | FLA [A] | 3 | 5 | 8 | 3 | 5 | 8 | 12 | 16 | 17 |
| | Frequency | 0.1 ~ 400 Hz | | | | | | | | |
| | Voltage | 200 ~ 230 V ³ | | | | | | | | |
| Input Ratings | Voltage | 1 Phase 200 ~ 230 V (± 10 %) | | | 3 Phase 200 ~ 230 V (± 10 %) | | | | | |
| | Frequency | 50 ~ 60 Hz (±5 %) | | | | | | | | |
| Dynamic Braking | Braking Circuit | On Board | | | | | | | | |
| | Average Braking Torque | 20 % (Optional External DB Resistor: 100%, 150%) | | | | | | | | |
| | Max. Continuous Braking Time | 15 seconds | | | | | | | | |
| | Duty | 0 ~ 30 % ED | | | | | | | | |
| Weight [lbs] | | 2.65 | 3.97 | 4.63 | 2.65 | 2.65 | 3.97 | 4.63 | 4.85 | 4.85 |

460V Class (0.5 ~ 5HP)

| Inverter Type (SVxxxiG5-x) | | 004-4 | 008-4 | 015-4 | 022-4 | 037-4 | 040-4 |
|-------------------------------|------------------------------|--|-------|-------|-------|-------|-------|
| Motor Rating ¹ | HP | 0.5 | 1 | 2 | 3 | 5 | 5.4 |
| | kW | 0.37 | 0.75 | 1.5 | 2.2 | 3.7 | 4.0 |
| Output Ratings | Capacity ² [kVA] | 1.1 | 1.9 | 3.0 | 4.5 | 6.1 | 6.5 |
| | FLA [A] | 1.5 | 2.5 | 4 | 6 | 8 | 9 |
| | Frequency | 0.1 ~ 400 Hz | | | | | |
| | Voltage | 380 ~ 460 V ³ | | | | | |
| Input Ratings | Voltage | 3 Phase, 380 ~ 460 V (± 10 %) | | | | | |
| | Frequency | 50 ~ 60 Hz (±5 %) | | | | | |
| Dynamic Braking | Braking Circuit | On Board | | | | | |
| | Average Braking Torque | 20 % (Optional External DB Resistor: 100%, 150%) | | | | | |
| | Max. Continuous Braking Time | 15 seconds | | | | | |
| | Duty | 0 ~ 30 % ED | | | | | |
| Weight [lbs] | | 3.75 | 3.75 | 3.97 | 4.63 | 4.85 | 4.85 |

¹ Indicates the maximum applicable capacity when using a 4 pole motor.

² Rated capacity ($3 \times V \times I$) is based on 220V for 200V class and 440V for 400V class.

³ Maximum output voltage will not be greater than input voltage. Output voltage less than input voltage may be programmed.

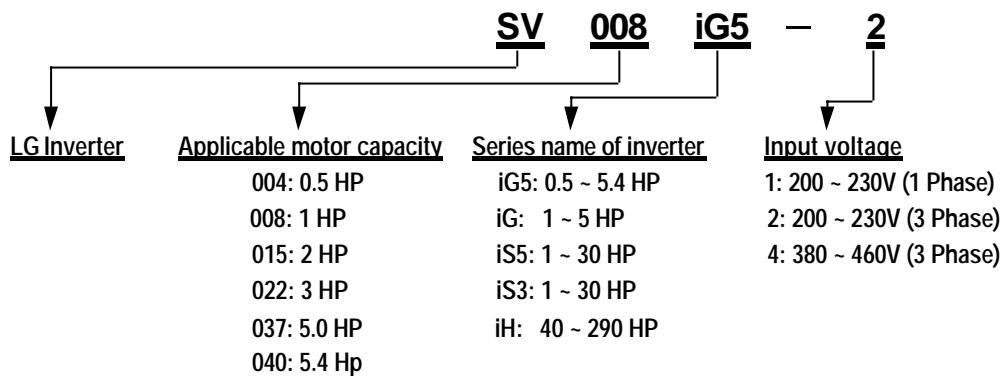
| | | | | |
|--------------------|------------------------------|---|---|--|
| CONTROL | Control Method | | V/F Control | |
| | Frequency Setting Resolution | | Digital Reference: 0.01 Hz (Below 100 Hz), 0.1 Hz (Over 100 Hz) Analog Reference: 0.03 Hz / 50 Hz | |
| | Frequency Accuracy | | Digital: 0.01 % of Max. Output Frequency, Analog: 0.1 % of Max. Output Frequency | |
| | V/F Ratio | | Linear, Square Patter, User V/F | |
| | Overload Capacity | | 150 % of Rated Current for 1 Min. (Characteristic is inversely Proportional to Time) | |
| | Torque Boost | | Manual Torque Boost (0 ~ 15 %), Auto Torque Boost | |
| OPERATION | Input Signal | Operation Method | | Key / Terminal / Communication Operation |
| | | Frequency Setting | | Analog: 0 ~ 10V / 4 ~ 20 mA Digital: Keypad |
| | | Start Signal | | Forward, Reverse |
| | | Multi-Step Speed | | Up to 8 Speeds Can Be Set (Use Multi-Function Terminal) |
| | | Multi Step Accel/Decel Time | | 0 ~ 9,999 sec, Up to 4 Types Can Be Set and Selected for Each Setting (Use Multi-Function Terminal), Accel/Decel Pattern: Linear Pattern, U Pattern, S Pattern |
| | | Emergency Stop | | Interrupts the Output of Inverter |
| | | Jog | | Jog Operation |
| | | Fault Reset | | Reset Faults When Protective Function is Active |
| | Output Signal | Operating Status | | Frequency Level Detection, Overload Alarm, Stalling, Over Voltage, Under Voltage, Inverter Overheating, Running, Stop, Constant Speed, Speed Searching |
| | | Fault Output | | Contact Output (30A, 30C, 30B) – AC250V 1A, DC30V 1A |
| | | Indicator | | Choose One From Output Frequency, Output Current, Output Voltage, DC Voltage (Output Voltage: 0 ~ 10V) |
| Operation Function | | DC Braking, Frequency Limit, Frequency Jump, Second Function, Slip Compensation, Reverse Rotation Prevention, Auto Restart, PID Control | | |
| Protection | Inverter Trip | | Over Voltage, Under Voltage, Over Current, Inverter Overheating, Motor Over heating, Input/Output Phase Loss, Input/Output Wiring Errors, Overload Protection, Communication Error, Loss of Speed Command, Hardware Fault | |
| | Inverter Alarm | | Stall Prevention, Overload Alarm | |
| | Momentary Power Loss | | Less than 15 msec: Continuous Operation, More than 15 msec: Auto Restart (Programmable) | |
| Display | Keypad | Operation Information | | Output Frequency, Output Current, Output Voltage, Frequency Value Setting, Operating Speed, DC Voltage |
| | | Trip Information | | Indicates Fault when Protection Function Activated, Memorizes Up to 5 Faults |
| Environment | Ambient Temperature | | -10 °C ~ 40 °C (14 °F ~ 104 °F), <i>CE Certification: 41 °F ~ 104 °F (5 °C ~ 40 °C)</i> | |
| | Storage Temperature | | -20 °C ~ 65 °C (-4 °F ~ 149 °F) | |
| | Ambient Humidity | | Less Than 90 % RH Max. (Non-Condensing), <i>CE Certification: 5 ~ 85% (Non-Condensing)</i> | |
| | Altitude / Vibration | | Below 1,000 m · Below 5.9m/sec ² (=0.6g) | |
| | Application Site | | No Corrosive Gas, Combustible Gas, Oil Mist, or Dust | |
| | Atmospheric Pressure | | 86 ~ 106kPa | |
| Cooling Method | | Forced Air Cooling ⁴ | | |

⁴ ' Self-cooling' for model SV008IG5-4.

CHAPTER 1 - INSTALLATION

1.1 Inspection

- ✓ Inspect the inverter for any damage that may have occurred during shipping.
- ✓ Check the nameplate on the iG5 inverter. Verify the inverter unit is the correct one for the application. The numbering system of the inverter is as shown below.

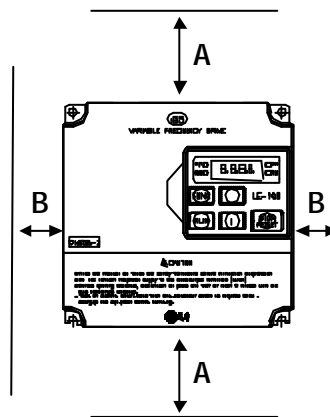


1.2 Environmental Conditions

- ✓ Verify the ambient condition for the mounting location.
 - Ambient temperature should not be below 14° F (-10° C) or exceed 104° F (40° C).
 - Relative humidity should be less than 90% (non-condensing).
 - Altitude should be below 3,300ft (1,000m).
- ✓ Do not mount the inverter in direct sunlight and isolate it from excessive vibration.
- ✓ If the inverter is going to be installed in an environment with high probability of penetration of dust, it must be located inside watertight electrical boxes, in order to get the suitable IP degree.

1.3 Mounting

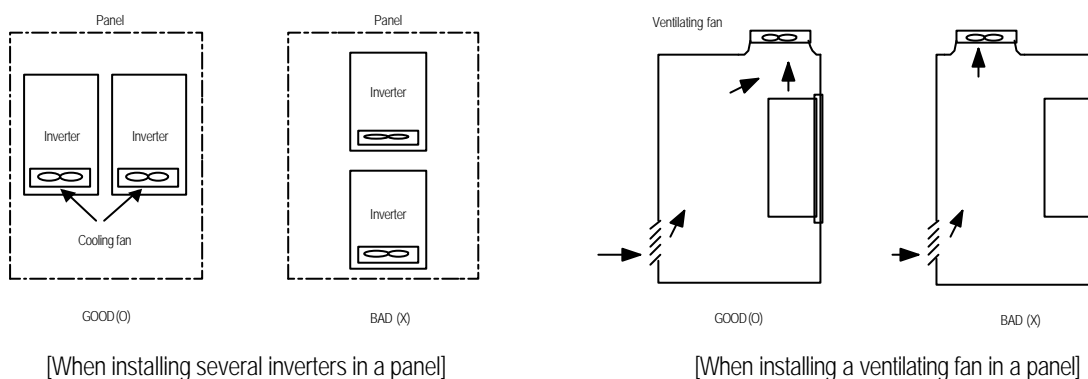
- ✓ The inverter must be mounted vertically with sufficient horizontal and vertical space between adjacent equipment (A= Over 6" (150mm), B= Over 2" (50mm)).



Chapter 1 - Installation

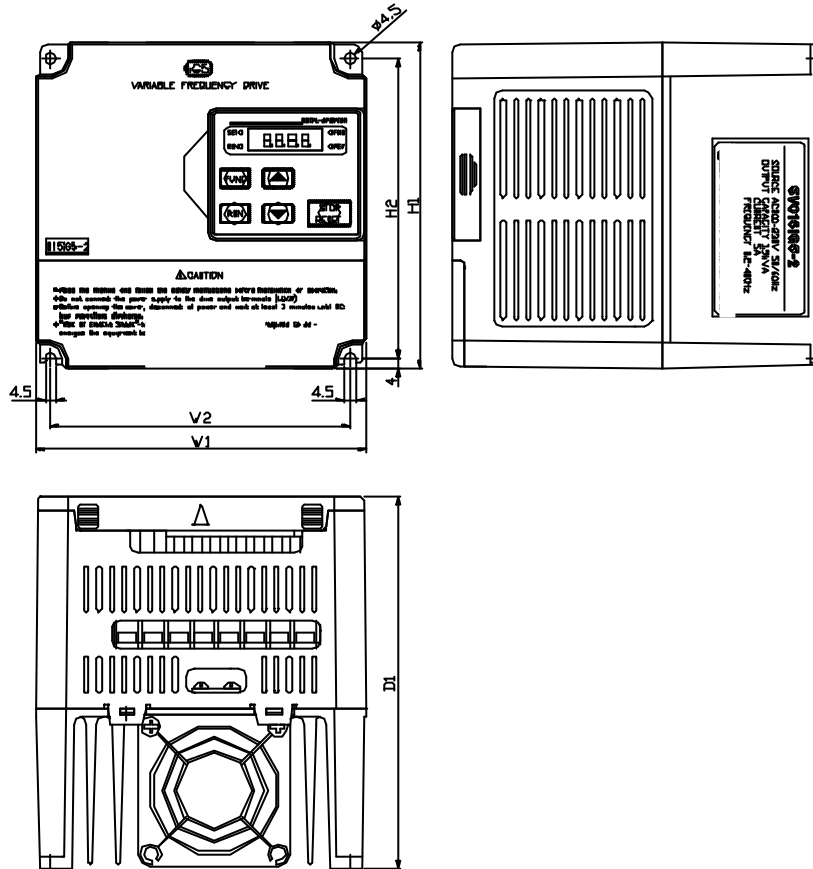
1.4 Other Precautions

- ✓ Do not carry the inverter by the front cover.
- ✓ Do not install the inverter in a location where excessive vibration is present. Be cautious when installing on presses or moving equipment.
- ✓ The life span of the inverter is greatly affected by the ambient temperature. Install in a location where temperature are within permissible limits (-10 ~ 40° C) (14~104° F).
- ✓ The inverter operates at high-temperatures - install on a non-combustible surface.
- ✓ Do not install the inverter in high-temperature or high-humidity locations.
- ✓ Do not install the inverter in a location where oil mist, combustible gas, or dust is present. Install the inverter in a clean location or in an enclosed panel, free of foreign substance.
- ✓ When installing the inverter inside a panel with multiple inverters or a ventilation fan, use caution. If installed incorrectly, the ambient temperature may exceed specified limits.



- ✓ Install the inverter using screws or bolts to insure the inverter is firmly fastened.
- ✓ **If Carrier Frequency (FU2-39) must be set higher than 3 kHz, derate the load current by 5% per 1 kHz.**

1.5 Dimensions

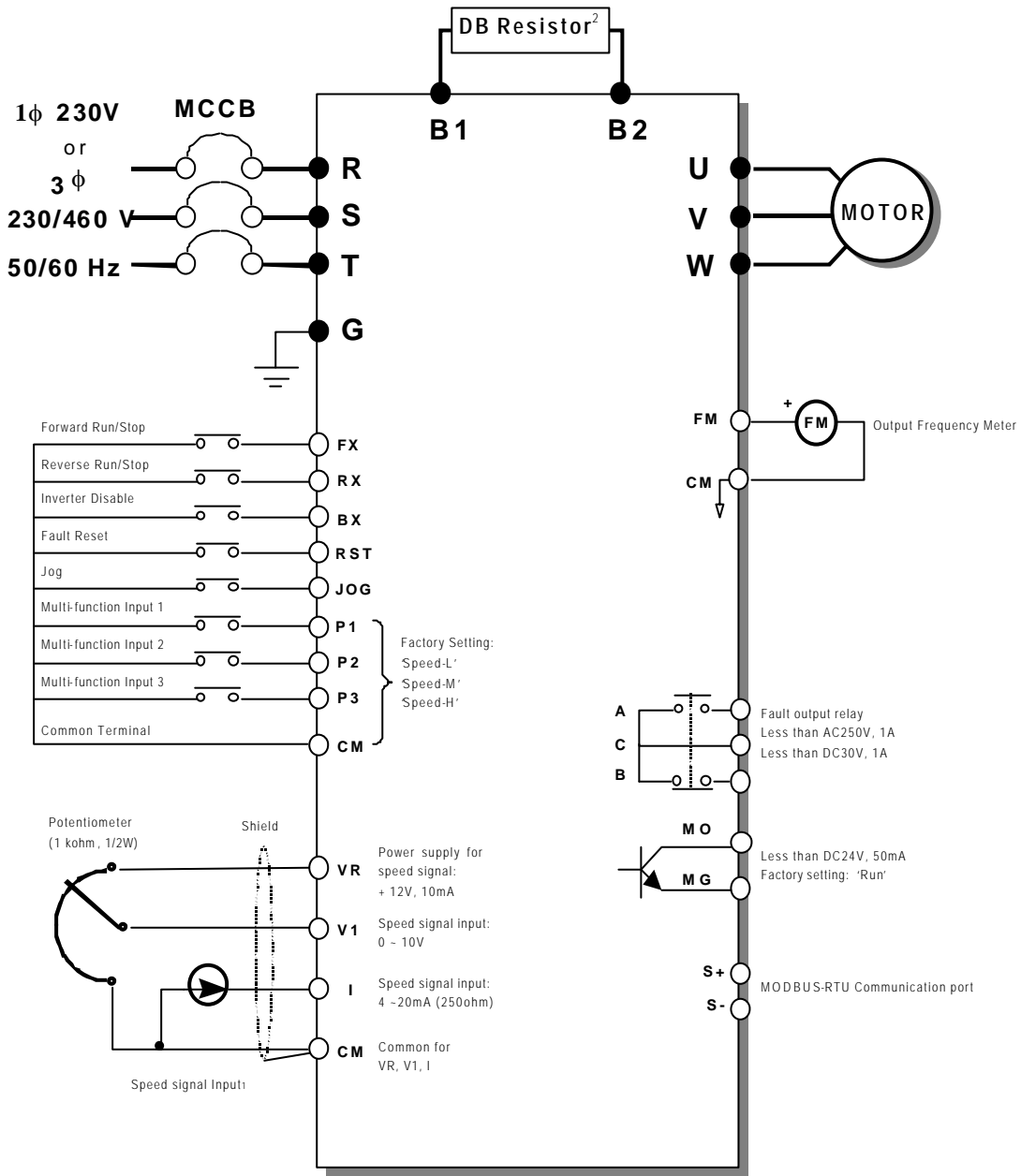


Unit: mm (inch)

| Inverter | HP | W1 | W2 | H1 | H2 | D1 |
|------------|-----|------------|------------|------------|--------------|--------------|
| SV004iG5-1 | 0.5 | 100 (3.94) | 88 (3.46) | 128 (5.04) | 117.5 (4.63) | 130.9 (5.15) |
| SV004iG5-2 | 0.5 | 100 (3.94) | 88 (3.46) | 128 (5.04) | 117.5 (4.63) | 130.9 (5.15) |
| SV008iG5-1 | 1 | 130 (5.12) | 118 (4.65) | 128 (5.04) | 117.5 (4.63) | 150.9 (5.94) |
| SV008iG5-2 | 1 | 100 (3.94) | 88 (3.46) | 128 (5.04) | 117.5 (4.63) | 130.9 (5.15) |
| SV015iG5-1 | 2 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |
| SV015iG5-2 | 2 | 130 (5.12) | 118 (4.65) | 128 (5.04) | 117.5 (4.63) | 150.9 (5.94) |
| SV022iG5-2 | 3 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |
| SV037iG5-2 | 5.0 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |
| SV040iG5-2 | 5.4 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |
| SV004iG5-4 | 0.5 | 130 (5.12) | 118 (4.65) | 128 (5.04) | 117.5 (4.63) | 150.9 (5.94) |
| SV008iG5-4 | 1 | 130 (5.12) | 118 (4.65) | 128 (5.04) | 117.5 (4.63) | 150.9 (5.94) |
| SV015iG5-4 | 2 | 130 (5.12) | 118 (4.65) | 128 (5.04) | 117.5 (4.63) | 150.9 (5.94) |
| SV022iG5-4 | 3 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |
| SV037iG5-4 | 5.0 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |
| SV040iG5-4 | 5.4 | 150 (5.90) | 138 (5.43) | 128 (5.04) | 117.5 (4.63) | 155 (6.10) |

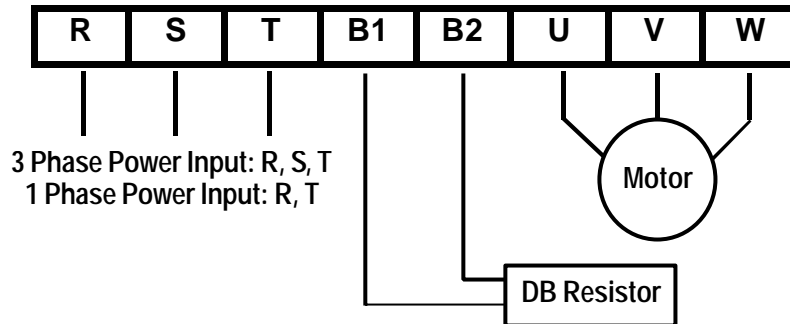
Chapter 1 - Installation

1.6 Basic Wiring



- Note) ●display main circuit terminals, ○display control circuit terminals.
1. Analog speed command can be set by Voltage, Current and both of them.
 2. DB resistor is optional.

1.7 Power Terminals



| Symbols | Functions |
|------------------------|--|
| R | AC Line Input Terminals |
| S | 3(1) phase, 200 ~ 230V AC for 200V Class Units and 380 ~ 460V AC for 400V Class Units. |
| T | 1 Phase Input Terminals: R and T |
| U | 3 Phase Output Terminals to Motor (3 Phase, 200 ~ 230VAC or 380 ~ 460VAC) |
| V | |
| W | |
| B1 B2 | Dynamic Braking Resistor Connection Terminals |

" Suitable for use on a circuit capable of delivering not more than 10,000 rms symmetrical amperes, 240 volts maximum for 230V class models and 480 volts maximum for 460V class models."

WARNING

Normal stray capacitance between the inverter chassis and the power devices inside the inverter and AC line can provide a high impedance shock hazard. Do not apply power to the inverter if the inverter frame (Power terminal G) is not grounded.

1.7.1 Wiring Power Terminals

■ Precautions on Wiring

- ✓ The internal circuits of the inverter will be damaged if the incoming power is connected and applied to output terminals (U, V, W).
- ✓ Use ring terminals with insulated caps when wiring the input power and motor wiring.
- ✓ Do not leave wire fragments inside the inverter. Wire fragments can cause faults, breakdowns, and malfunctions.

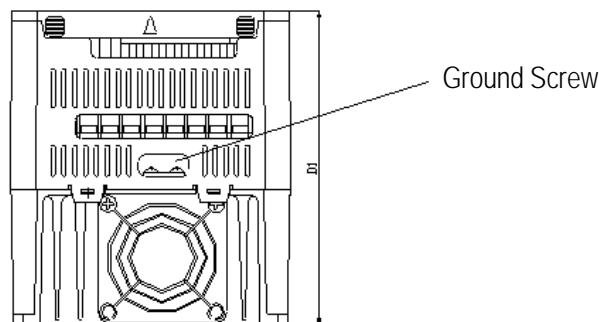
Chapter 1 - Installation

- ✓ For input and output, use wires with sufficient size to ensure voltage drop of less than 2%. Motor torque may drop if operating at low frequencies and a long wire run between inverter and motor.
- ✓ When more than one motor is connected to one inverter, total wiring length should be less than 500m (1,640ft). Do not use a 3-wire cable for long distances. Due to increased leakage capacitance between wires, over-current protective feature may operate or equipment connected to the output side may malfunction.
- ✓ Connect only recommended braking resistor between the B1 and B2 terminals. **Never short B1 and B2 terminals. Shorting terminals may cause internal damage to inverter.**
- ✓ The main circuit of the inverter contains high frequency noise, and can hinder communication equipment near the inverter. To reduce noise, install RFI filters or line noise filters on the input side of the inverter.
- ✓ Do not use power factor capacitor, surge suppressors, or RFI filters on the output side of the inverter. Doing so may damage these components.
- ✓ Always insure the LED and charge lamp for the power terminal are OFF before wiring terminals. The charge capacitor may hold high-voltage even after the power is disconnected. Use caution to prevent the possibility of personal injury.

■ Grounding

- ✓ The inverter is a high switching device, and leakage current may flow. Ground the inverter to avoid electrical shock. Use caution to prevent the possibility of personal injury.
- ✓ Connect only to the dedicated ground terminal on the inverter. Do not use the enclosure or a chassis screw for grounding.
- ✓ The protective earth conductor must be the first one in being connected and the last one in being disconnected.
- ✓ As a minimum, grounding wire should meet the specifications listed below. Grounding wire should be as short as possible and should be connected to the ground point as near as possible to the inverter.

| Motor Capacity | Grounding Wire Sizes, AWG (mm ²) | |
|----------------|--|------------|
| | 200V class | 400V class |
| 0.5 ~ 5.4 HP | 12 (3.5) | 14 (2) |

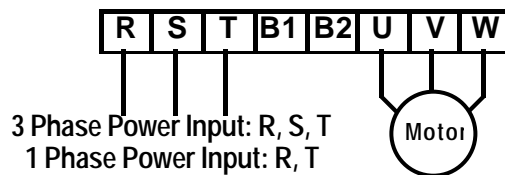


■ **Wires and Terminal Lugs**

Refer to the following table for wires, terminal lugs and screws used to connect the inverter power input (R, S, T) and output (U, V, W).

| Inverter | | Terminal Screw Size | Screw Torque ⁵ (Kgf.cm)/lb-in | Ring Terminals | | Wire ⁶ | | | |
|----------------------|--------------|---------------------|--|----------------|-------|-------------------|-------|-------|-------|
| | | | | | | mm ² | | AWG | |
| | | | | R,S,T | U,V,W | R,S,T | U,V,W | R,S,T | U,V,W |
| 200V Class (1 Phase) | 0.5 HP | M 3.5 | 10 / 7 | 2-3.5 | 2-3.5 | 2 | 2 | 14 | 14 |
| | 1 ~ 2 HP | M 4.0 | 15 / 10 | 2-4 | 2-4 | 2 | 2 | 14 | 14 |
| 200V Class (3 Phase) | 0.5 ~ 1 HP | M 3.5 | 10 / 7 | 2-3.5 | 2-3.5 | 2 | 2 | 14 | 14 |
| | 2 ~ 3 HP | M 4.0 | 15 / 10 | 2-4 | 2-4 | 2 | 2 | 14 | 14 |
| | 5 ~ 5.4 HP | M 4.0 | 15 / 10 | 5.5-4 | 5.5-4 | 3.5 | 3.5 | 12 | 12 |
| 400V Class (3 Phase) | 0.5 ~ 5.4 HP | M 4.0 | 15 / 10 | 2-4 | 2-4 | 2 | 2 | 14 | 14 |

■ **Power and Motor Connection**



⚠ Power supply must be connected to the R, S, and T Terminals.
 Connecting it to the U, V, W terminals causes internal damages to the inverter. Arranging the phase sequence is not necessary.

⚠ Motor should be connected to the U, V, and W Terminals.
 If the forward command (FX) is on, the motor should rotate counter clockwise when viewed from the load side of the motor. If the motor rotates in the reverse, switch the U and V terminals.

⁵ Apply the rated torque to terminal screws. Loosen screws can cause of short circuit and malfunction. Tightening the screws too much can damage the terminals and cause short circuit and malfunction.

⁶ Use copper wires only with 600V, 75 ratings for wiring.

Chapter 1 - Installation

1.8 Control Terminals

| | | |
|-----|-----|-----|
| 30A | 30C | 30B |
|-----|-----|-----|

| | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|-----|-----|----|----|----|----|----|----|----|---|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| MO | MG | CM | FX | RX | CM | BX | JOG | RST | CM | P1 | P2 | P3 | VR | V1 | CM | I | FM | S+ | S- |

| Terminal Name | Terminal Screw Size | Screw Torque (Kgf-cm/lb-in) | Wire Size | | Stripped Length (mm) |
|-------------------------|---------------------|-----------------------------|-------------------------------|----------------------------------|----------------------|
| | | | Solid Wire (mm ²) | Stranded Wire (mm ²) | |
| 30A, 30C, 30B | M3 | 5 / 3.6 | 2.5 | 1.5 | 7 |
| MO, MG, CM, FX, RX ~ S- | M2 | 4 / 2.9 | 1.5 | 1.0 | 5.5 |

| Type | Symbol | Name | Description |
|---------------|----------------------------------|-----------------------------------|---|
| Input signal | Starting Contact Function Select | P1, P2, P3 | Multi-Function Input 1, 2, 3 |
| | | FX | Forward Run Command |
| | | RX | Reverse Run Command |
| | | JOG | Jog Frequency Reference |
| | | BX | Emergency Stop |
| | | RST | Fault Reset |
| | | CM | Sequence Common |
| | Analog frequency setting | VR | Frequency Setting Power (+10V) |
| | | V1 | Frequency Reference (Voltage) |
| | | I | Frequency Reference (Current) |
| CM | | Frequency Setting Common Terminal | |
| Output signal | Analog | FM-CM | Analog Output (For External Monitoring) |
| | Contact | 30A 30C 30B | Fault Contact Output |
| | | MO - MG | Multi-Function Output (Open Collector Output) |
| RS-485 | S+, S- | Communication Port | Communication Port for MODBUS-RTU Communication |

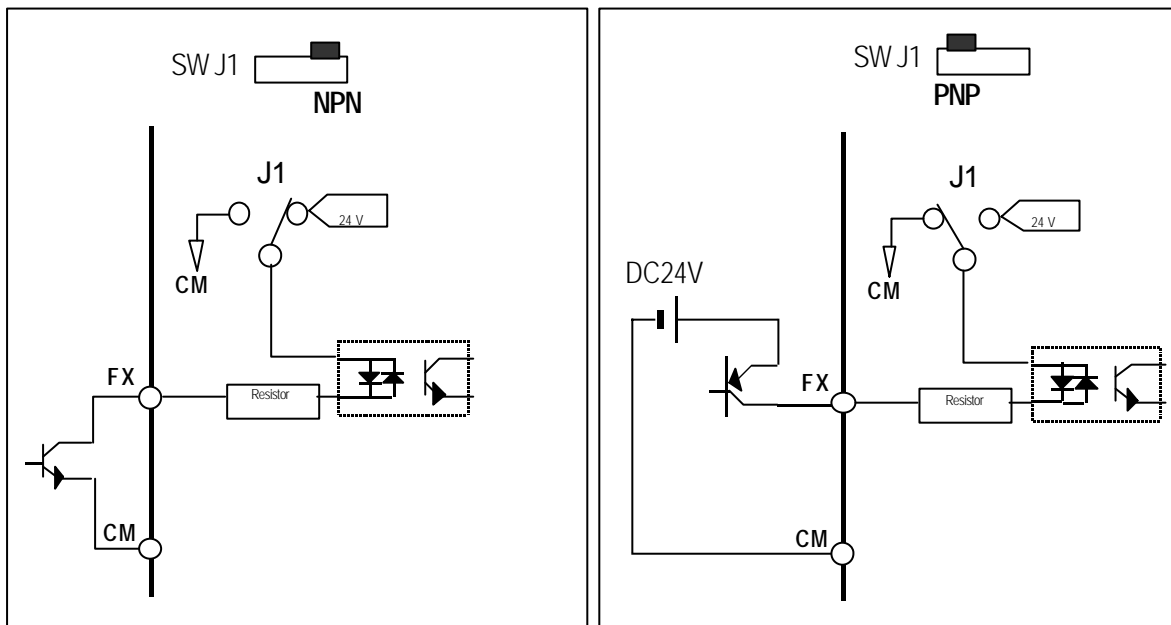
1.8.1 Wiring Control Terminals

■ **Precautions on Wiring**

- ✓ Use shielded wires or twisted wires for control circuit wiring, and separate these wires from the main power circuits and other high voltage circuits.

■ **Control Circuit Terminal**

- ✓ The input terminals can be selected for either NPN or PNP type logic by changing switch J1. CM terminal is the common terminal for the input signals.



⚠ CAUTION

Do not apply voltage to any control input terminals (FX, RX, P1, P2, P3, JOG, BX, CM, Etc).

Chapter 1 - Installation

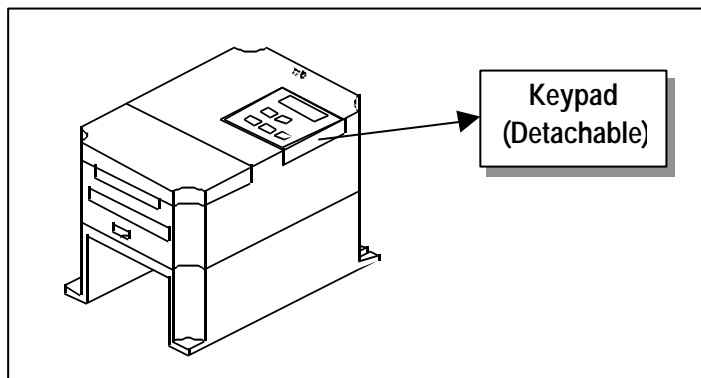
1.8.2 Keypad

■ Wiring the Keypad

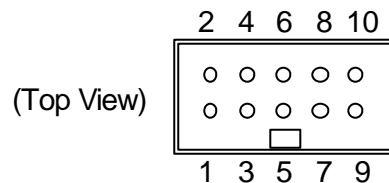
Keypad is installed before shipping for standard type models as shown below. When using an optional remote cable, install the buffer cover and connect the remote cable. If the keypad is not connected properly, the letters will not be displayed.

Note: Do not connect the keypad and remote cable while the inverter is under power.

Note: Do not touch the live part of the keypad connector. Doing this may cause an electric shock or personal injury.



■ Keypad Connector Pin Configuration (Inverter Side)



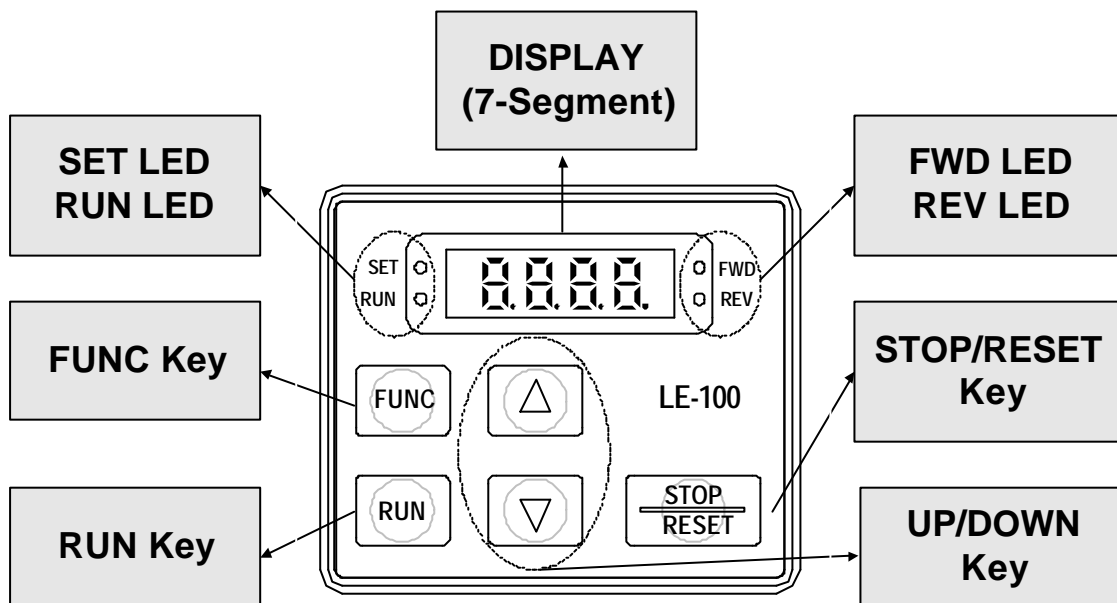
| Pin No. | Pin Name | Keypad | Description |
|---------|----------|----------|--|
| 1 | 5V | Used | 5V DC Power Supply (Isolated from VR, V1, I of Control Terminal) |
| 2 | GND | Used | 5V DC Power Ground (Isolated from CM of Control Terminal) |
| 3 | RES | Used | Used for Writing Flash ROM Inside Inverter. |
| 4 | VPP | Used | |
| 5 | LAT | Used | Latch Signal for Transmitting/Receiving |
| 6 | TXD | Used | Transmitting Signal Pin |
| 7 | CLK | Used | Clock Signal Pin |
| 8 | RXD | Used | Receiving Signal Pin |
| 9 | | Not Used | |
| 10 | | Not Used | |

CHAPTER 2 - OPERATION

2.1 Keypad and Parameter Group Setting

2.1.1 Keypad Description

7-Segment keypad displays up to 4 letters and numbers, and the user can directly check various settings of the inverter. The following is an illustration of the keypad and the functions of each part.



| Class | Display | Name | Description |
|-------|------------|---------------------|---|
| Key | FUNC | Program Key | Press to Change Parameter Setting. |
| | (Up) | Up Key | Press to Move Through Codes or T o Increase Parameter Values. |
| | (Down) | Down Key | Press to Move Through Codes or T o Decrease Parameter Values. |
| | RUN | Run Key | Use to Operate Inverter. |
| | STOP/RESET | STOP/RESET Key | Press to Stop Inverter During Operation. Press to Reset When a Fault Has Occurred. |
| LED | REV | Reverse Run Display | Lit During Reverse Run. |
| | FWD | Forward Run Display | Lit During Forward Run. |
| | SET | Setting | Lit When User is Setting Parameters Using FUNC Key |
| | RUN | Operating | Lit When at Constant Speed and Blinks When Accelerating or Decelerating. |

Chapter 2 - Operation

2.2 Parameter Setting and Change

Numerous parameters are built into the inverter. The keypad allows the operator to operate the inverter by setting the required parameters, and enter the proper value according to the load and operating conditions. Refer to Chapter 4 'PARAMETER DESCRIPTION' for detailed description of the functions.

■ Procedures

First move to the group code that needs changing.

Press [FUNC] key. The keypad LED (SET) will turn ON.

Use the [(Up)], [(Down)] keys to set the data to the desired value.

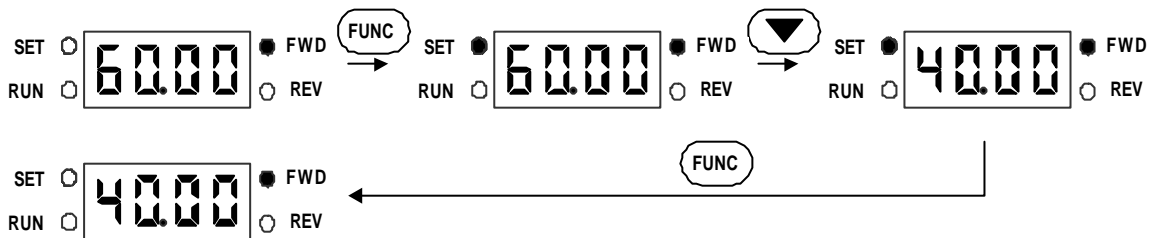
Press [FUNC] key again. The data display will blink and the data will be stored in the inverter.

Note: If the data does not change, determine if:

- Inverter is running (Refer to the function table in Chapter 3)
- Function is locked in H 94 [Parameter Lock]

■ Setting the DRV Group Data

Example) Change the acceleration time from 60 sec to 40 sec.



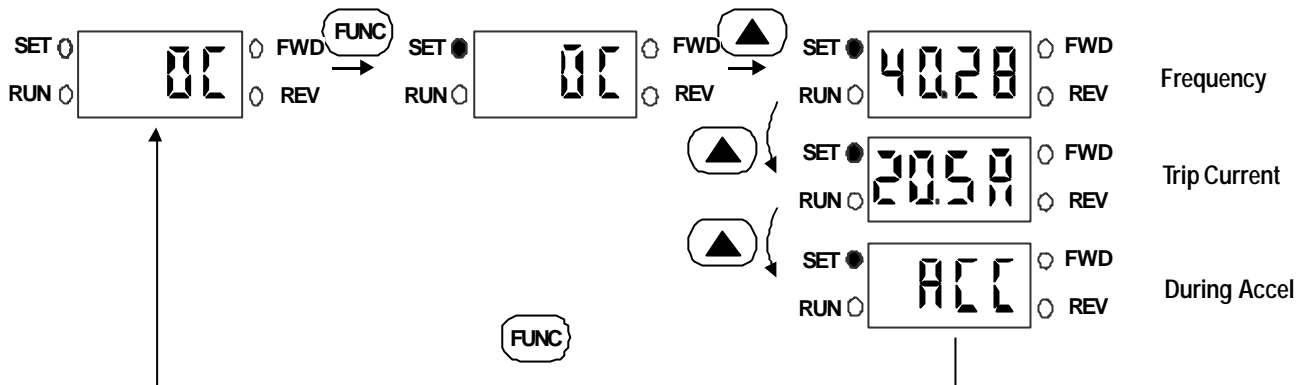
Data will blink when the data setting is finished. Indicates data programming is complete.

■ To Monitor Current Output from the DRV Group

Example) Monitor current output from inverter (Data cannot be set).



■ To Monitor Fault Type when a Fault Occurs (Data cannot be set)



The fault type is displayed on the DRV group when a fault occurs. Frequency, current and operating status (accelerating, decelerating, in constant speeds) may be monitored by using the UP, DOWN arrow key.

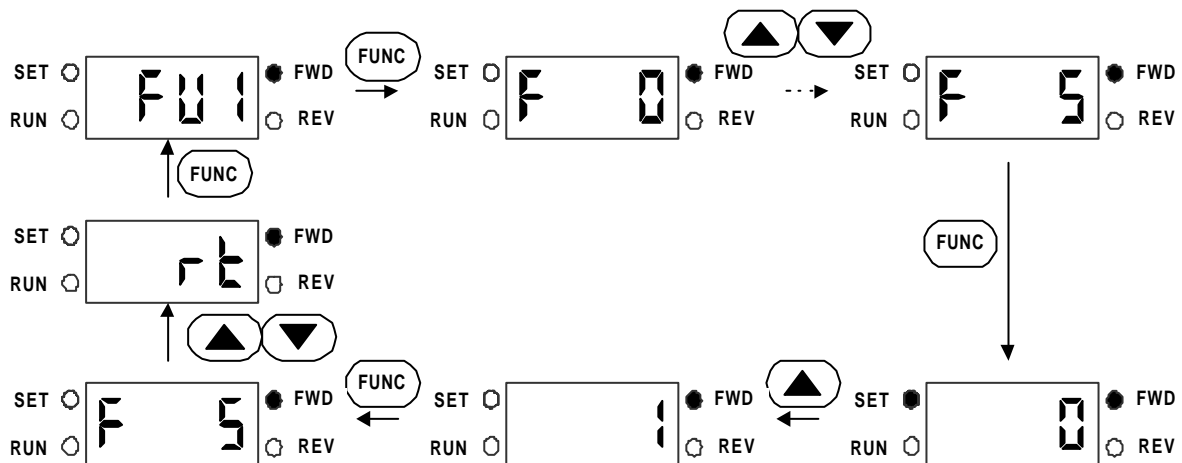
(Ex: Fault occurred when the inverter was accelerating at 40.28 Hz, 20.5A) 4 LED is blinking in this situation.

Fault status can be removed by using the STOP/RESET Key, and the LED turns OFF.

(The inverter must be turned OFF and turned ON again to remove HW fault status.)

■ Adjusting Function and I/O Group Data

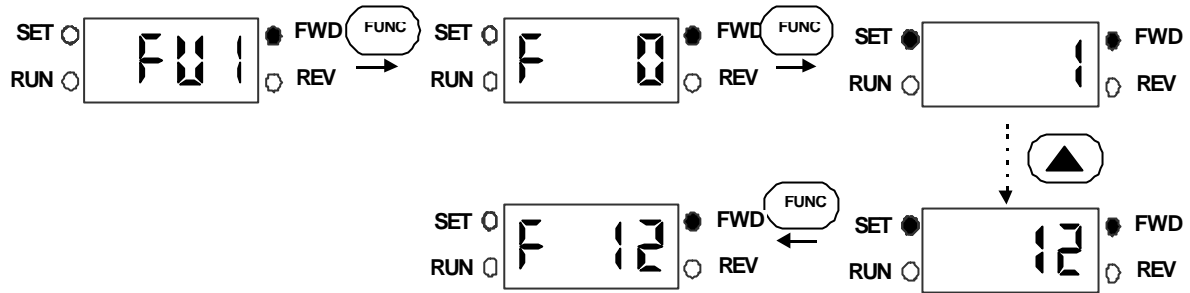
Example) Changing the F5 data to 1.



Chapter 2 - Operation

■ Setting Jump Code in Function Group

Example) Jump to code FU1-12 from FU1-0 (F 0).



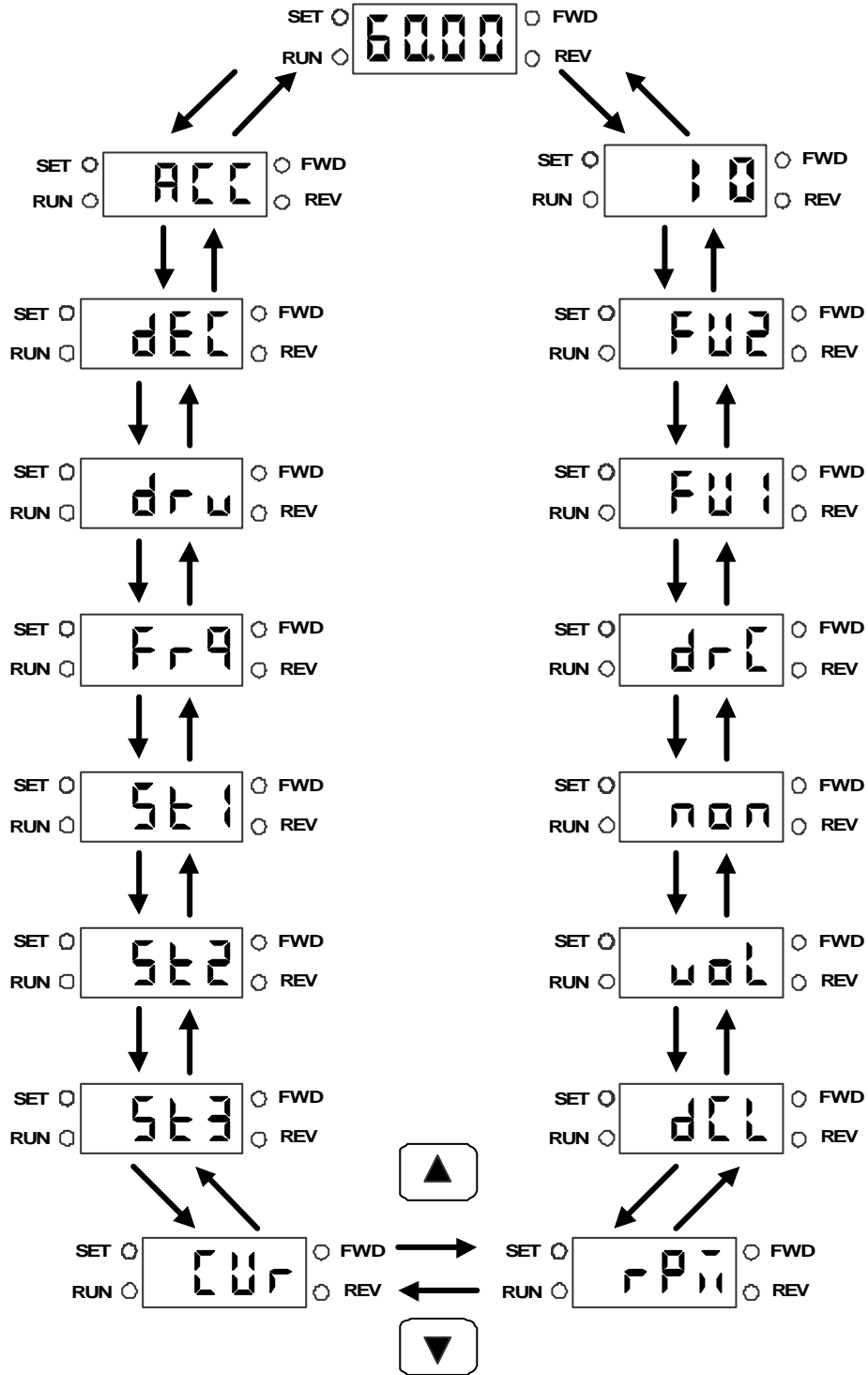
2.3 Parameter Group

The iG5 series offers a 7-segment (LED) keypad for the user. Parameters are separated into 4 function groups according to their application fields. The groups' names and the descriptions are as follows.

| Group Name | Description |
|--------------------|---|
| Drive group | Basic Parameters: Command Frequency, Accel/Decel Time, etc. |
| Function 1 group | Basic Parameters: Max. Frequency, Torque Boost, etc. |
| Function 2 Group | Application Parameters: Frequency Jump, Frequency Limit, etc. |
| Input/Output group | Multi-Function Terminal Setting and Sequence Operation Parameters |

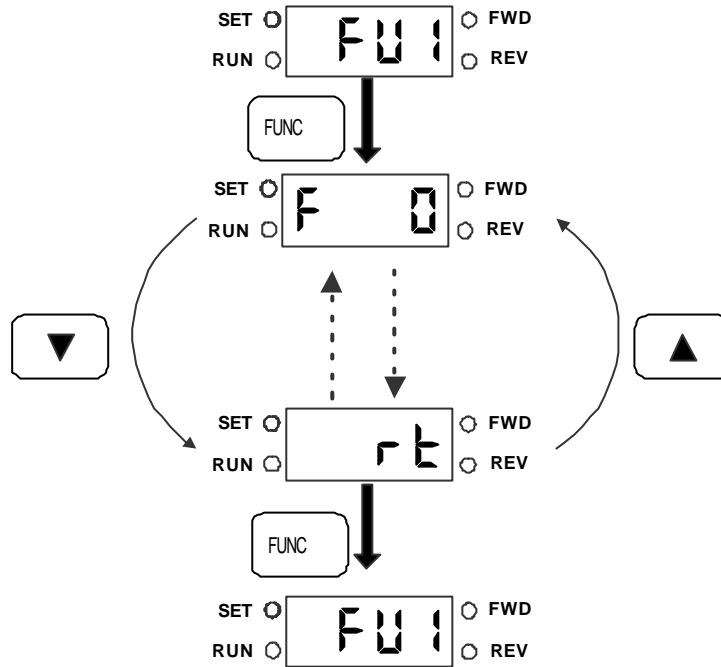
Refer to the parameter description in Chapter 4 for detailed description of each group.

■ Moving Through DRV Group Codes

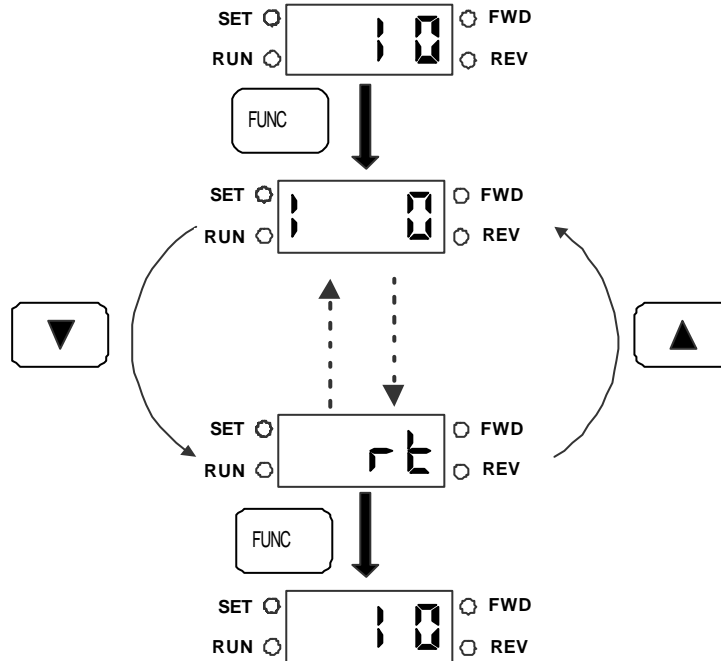


Chapter 2 - Operation

■ Moving Through Function Group Codes



■ Moving Through I/O Group Codes



2.4 Operation

2.4.1 Operation From Keypad and Control Terminal

When the operation reference signal is given to the control terminal and the frequency setpoint is given by the keypad, set the DRV-03 (**drv**) to **1** (Fx/Rx-1), and set the DRV-04 (**Frq**) to **0** (Keypad-1).

The frequency reference signal is set from the control terminal, and the forward, reverse, stop key of the keypad is invalid.

1. Turn the power ON and set the operation and the frequency parameters.
2. Set the DRV-03 (**drv**) to **1** (Fx/Rx-1), and the DRV-04 (**Frq**) to **0** (Keypad-1).
3. Turn ON the operation reference signal FX (or RX). Keypad LED (FWD key or REV key) will turn ON.
4. Set the operating frequency with the keypad. Use the FUNC, (Up), FUNC keys and set the frequency to 50.00Hz. The motor will rotate at 50Hz. The LED (RUN) of the keypad will blink when the inverter is accelerating or decelerating.
5. Turn the operation reference signal FX (or RX) OFF. The LED (FWD of REV) of the keypad will turn **OFF**.

Note: The user may also operate the inverter by setting the operation reference signal from the Keypad, and setting the frequency reference signal to the control terminal. (Set DRV-03 (**drv**) to **0** (Keypad), and the DRV-04 (**Frq**) to **2** (V1)).

2.4.2 Operation From Control Terminal

1. Turn the power ON and set the operation and the frequency reference to the control terminal mode.
2. Set the DRV-03 (**drv**) to **1** (Fx/Rx-1), and the DRV-04 (**Frq**) to **2** (V1).
3. Set the analog frequency reference by turning the potentiometer (frequency reference) slowly to the right. The keypad will display the output frequency (50.00 Hz).
4. Slowly turning the potentiometer (frequency reference) to the left will decrease the output frequency. The inverter will stop operating and the motor will come to a halt when the frequency reaches 0.00Hz.
5. Turn OFF the operation reference signal FX (or RX).

Note: FU1-20, FU1-21, FU1-25, FU1-36, FU2-54, FU2-83, I/O-05, I/O-10 are set at 50Hz for Standard (EU) types and 60Hz for US types.

Chapter 2 - Operation

2.4.3 Operation From Keypad

1. Turn the power ON and set the operation and frequency reference to ' keypad operating mode' .
2. Set the DRV-03 (drv) to 0 (Keypad), and the Frq [Frequency Reference Source Selection] to Keypad-1.
3. Use FUNC, (Up), keys to set the operating frequency to 50.00Hz. When the inverter is not running the command frequency is displayed.
4. Press the RUN key. The motor will rotate and the keypad will display the output frequency.
5. Press the STOP/RESET key. The motor will decelerate and come to a halt, and the keypad will display the command frequency.

CHAPTER 3 - PARAMETER LIST

3.1 Drive Group [DRV]

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|-----------|--|----------------|--------------------------------|-------|-----------------|-----------------|------|
| DRV-00 | Output Frequency during running, Reference Frequency during stop | 0.00 | 0.00 to (FU1-20) | 0.01 | 00.00 [Hz] | Yes | 33 |
| DRV-01 | Acceleration Time | ACC | 0.0 to 999.9 [sec] | 0.1 | 10.0 [sec] | Yes | 33 |
| DRV-02 | Deceleration Time | DEC | 0.0 to 999.9 [sec] | 0.1 | 20.0 [sec] | Yes | 33 |
| DRV-03 | Drive Mode (Run/Stop Method) | Drv | 0 (Keypad) | - | Fx/Rx-1 1 | No | 34 |
| | | | 1 (Fx/Rx-1) | | | | |
| | | | 2 (Fx/Rx-2) | | | | |
| | | | 3 (RS485) | | | | |
| DRV-04 | Frequency Mode (Freq. Setting Method) | Frq | 0 [Keypad-1] | - | (Keypad-1) 0 | No | 34 |
| | | | 1 (Keypad-2) | | | | |
| | | | 2 (V1) | | | | |
| | | | 3 (I) | | | | |
| | | | 4 (V1+) | | | | |
| 5 (RS485) | | | | | | | |
| DRV-05 | Step Frequency 1 | St1 | 0.00 to (FU1-20) | 0.01 | 10.00 [Hz] | Yes | 35 |
| DRV-06 | Step Frequency 2 | St2 | | | 20.00 [Hz] | | |
| DRV-07 | Step Frequency 3 | St3 | | | 30.00 [Hz] | | |
| DRV-08 | Output Current | Cur | * [A] | - | - [A] | - | 35 |
| DRV-09 | Motor Speed | RPM | * [rpm] | - | - [rpm] | - | 35 |
| DRV-10 | DC link Voltage | DCL | * [V] | - | - [V] | - | 36 |
| DRV-11 | User Display Selection | vOL, Por, tOr | Selected in FU2-73 (User disp) | - | - | - | 36 |
| DRV-12 | Fault Display | nOn | - | - | None nOn | - | 36 |
| DRV-13 | Motor Direction Set | drc | F (Forward) | - | F | Yes | 36 |
| | | | r (Reverse) | | | | |
| DRV-20 | FU1 Group Selection | FU1 | | | | | 37 |
| DRV-21 | FU2 Group Selection | FU2 | | | | | 37 |
| DRV-22 | I/O Group Selection | I O | | | | | 37 |

Chapter 3 - Parameter List

3.2 Function Group 1 [FU1]

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|---------------------|---------------------------------------|----------------|----------------------|-------|-----------------|-----------------|------|
| FU1-00 | Jump to Desired Code # | F 0 | 1 to 99 | 1 | 3 | Yes | 38 |
| FU1-03 | Run Prevention | F 3 | 0 (None) | - | None 0 | No | 38 |
| | | | 1 (Forward Prev) | | | | |
| | | | 2 (Reverse Prev) | | | | |
| FU1-05 | Acceleration Pattern | F 5 | 0 (Linear) | - | Linear 0 | No | 38 |
| | | | 1 (S-Curve) | | | | |
| | | | 2 (U-Curve) | | | | |
| | | | 3 (Minimum) | | | | |
| | | | 4 (Optimum) | | | | |
| FU1-06 | Deceleration Pattern | F 6 | 0 (Linear) | - | Linear 0 | No | 38 |
| | | | 1 (S-Curve) | | | | |
| | | | 2 (U-Curve) | | | | |
| | | | 3 (Minimum) | | | | |
| | | | 4 (Optimum) | | | | |
| FU1-07 | Stop Mode | F 7 | 0 (Decel) | - | Decel 0 | No | 39 |
| | | | 1 (DC-Brake) | | | | |
| | | | 2 (Free-Run) | | | | |
| FU1-08 ⁷ | DC Injection Braking Frequency | F 8 | (FU1-22) to 50 [Hz] | 0.01 | 5.00 [Hz] | No | 40 |
| FU1-09 | DC Injection Braking On-delay Time | F 9 | 0 to 60 [sec] | 0.01 | 0.10 [sec] | No | |
| FU1-10 | DC Injection Braking Voltage | F 10 | 0 to 200 [%] | 1 | 50 [%] | No | |
| FU1-11 | DC Injection Braking Time | F 11 | 0 to 60 [sec] | 0.1 | 1.0 [sec] | No | |
| FU1-12 | Starting DC Injection Braking Voltage | F 12 | 0 to 200 [%] | 1 | 50 [%] | No | 40 |
| FU1-13 | Starting DC Injection Braking Time | F 13 | 0.0 to 60.0 [sec] | 0.1 | 0.0 [sec] | No | |
| FU1-20 | Maximum Frequency | F 20 | 40.00 to 400.00 [Hz] | 0.01 | 50.00 [Hz] | No | 41 |
| FU1-21 | Base Frequency | F 21 | 30.00 to (FU1-20) | 0.01 | 50.00 [Hz] | No | |
| FU1-22 | Starting Frequency | F 22 | 0.10 to 10.00 [Hz] | 0.01 | 0.10 [Hz] | No | |
| FU1-23 | Frequency Limit Selection | F 23 | 0 (No) | - | No 0 | No | 41 |
| | | | 1 (Yes) | | | | |
| FU1-24 ⁸ | Low Limit Frequency | F 24 | 0.00 to (FU1-25) | 0.01 | 0.00 [Hz] | No | |
| FU1-25 | High Limit Frequency | F 25 | (FU1-24) to (FU1-20) | 0.01 | 50.00 [Hz] | No | |
| FU1-26 | Manual/Auto Torque Boost Selection | F 26 | 0 (Manual) | - | Manual 0 | No | 42 |
| | | | 1 (Auto) | | | | |
| FU1-27 | Torque Boost in Forward Direction | F 27 | 0.0 to 15.0 [%] | 0.1 | 2.0 [%] | No | |
| FU1-28 | Torque Boost in Reverse Direction | F 28 | | 0.1 | 2.0 [%] | No | |

⁷ Code FU1-08 through FU1-11 appears only when FU1-07 is set to 'DC-brake'.

⁸ Code FU1-24 through FU1-25 appears only when FU1-23 is set to 'Yes'.

Chapter 3 - Parameter List

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page | |
|----------------------|--|----------------|---|-------|-----------------|-----------------|------|----|
| FU1-29 | Volts/Hz Pattern | F 29 | 0 (Linear) | - | Linear 0 | No | 43 | |
| | | | 1 (Square) | | | | | |
| | | | 2 (User V/F) | | | | | |
| FU1-30 ⁹ | User V/F – Frequency 1 | F 30 | 0.00 to (FU1-32) | 0.01 | 12.50 [Hz] | No | 43 | |
| FU1-31 | User V/F – Voltage 1 | F 31 | 0 to 100 [%] | 1 | 25 [%] | No | | |
| FU1-32 | User V/F – Frequency 2 | F 32 | (FU1-30) to (FU1-34) | 0.01 | 25.00 [Hz] | No | | |
| FU1-33 | User V/F – Voltage 2 | F 33 | 0 to 100 [%] | 1 | 50 [%] | No | | |
| FU1-34 | User V/F – Frequency 3 | F 34 | (FU1-32) to (FU1-36) | 0.01 | 37.50 [Hz] | No | | |
| FU1-35 | User V/F – Voltage 3 | F 35 | 0 to 100 [%] | 1 | 75 [%] | No | | |
| FU1-36 | User V/F – Frequency 4 | F 36 | (FU1-34) to (FU1-20) | 0.01 | 50.00 [Hz] | No | | |
| FU1-37 | User V/F – Voltage 4 | F 37 | 0 to 100 [%] | 1 | 100 [%] | No | | |
| FU1-38 | Output Voltage Adjustment | F 38 | 40 to 110 [%] | 0.1 | 100.0 [%] | No | 44 | |
| FU1-39 | Energy Save Level | F 39 | 0 to 30 [%] | 1 | 0 [%] | Yes | 44 | |
| FU1-50 | Electronic Thermal Selection | F 50 | 0 (No) | - | No 0 | Yes | 45 | |
| | | | 1 (Yes) | | | | | |
| FU1-51 ¹⁰ | Electronic Thermal Level for 1 Minute | F 51 | FU1-52 to 250 [%] | 1 | 180 [%] | Yes | | |
| FU1-52 | Electronic Thermal Level for Continuous | F 52 | 50 to FU1-51 | 1 | 120 [%] | Yes | | |
| FU1-53 | Electronic Thermal Characteristic Selection (Motor type) | F 53 | 0 (Self-cool) | - | Self-cool 0 | Yes | | |
| | | | 1 (Forced-cool) | | | | | |
| FU1-54 | Overload Warning Level | F 54 | 30 to 250 [%] | 1 | 150 [%] | Yes | | 46 |
| FU1-55 | Overload Warning Hold Time | F 55 | 0 to 30 [sec] | 0.1 | 10.0 [sec] | Yes | | |
| FU1-56 | Overload Trip Selection | F 56 | 0 (No) | - | Yes 1 | Yes | 46 | |
| | | | 1 (Yes) | | | | | |
| FU1-57 | Overload Trip Level | F 57 | 30 to 250 [%] | 1 | 200 [%] | Yes | | |
| FU1-58 | Overload Trip Delay Time | F 58 | 0 to 60 [sec] | 1 | 60.0 [sec] | Yes | | |
| FU1-59 | Stall Prevention Mode Selection | F 59 | 000 – 111 (bit set) Bit 0: during Accel. Bit 1: during Steady speed Bit 2: during Decel. | bit | 000 | No | 47 | |
| FU1-60 | Stall Prevention Level | F 60 | 30 to 250 [%] | 1 | 200 [%] | No | | |
| FU1-99 | Return Code | rt | | - | - | - | 48 | |

⁹ Code FU1-30 through FU1-37 appears only when FU1-29 is set to ' User V/F' .

¹⁰ Code FU1-51 through FU1-53 appears only when FU1-50 is set to ' Yes' .

Chapter 3 - Parameter List

3.3 Function Group 2 [FU2]

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|----------------------|---|----------------|--|---------------|-----------------|-----------------|------|
| FU2-00 | Jump to Desired Code # | H 0 | 1 to 99 | 1 | 30 | Yes | 49 |
| FU2-01 | Previous Fault History 1 | H 1 | | - | None 0 | - | 49 |
| FU2-02 | Previous Fault History 2 | H 2 | | | | | |
| FU2-03 | Previous Fault History 3 | H 3 | | | | | |
| FU2-04 | Previous Fault History 4 | H 4 | | | | | |
| FU2-05 | Previous Fault History 5 | H 5 | | | | | |
| FU2-06 | Erase Fault History | H 6 | 0 (No) 1 (Yes) | - | No 0 | Yes | 49 |
| FU2-07 | Dwell Frequency | H 7 | 0 to FU1-20 | 0.01 | 5.00 [Hz] | No | |
| FU2-08 | Dwell Time | H 8 | 0 to 10 [sec] | 0.1 | 0.0 [sec] | No | 49 |
| FU2-10 | Frequency Jump Selection | H 10 | 0 (No) 1 (Yes) | - | No 0 | No | 50 |
| FU2-11 ¹¹ | Jump Frequency 1 Low | H 11 | 0.00 to (FU2-12) | 0.01 | 0.00 [Hz] | No | |
| FU2-12 | Jump Frequency 1 High | H 12 | (FU2-11) to (FU1-20) | 0.01 | 0.00 [Hz] | No | |
| FU2-13 | Jump Frequency 2 Low | H 13 | 0.00 to (FU2-14) | 0.01 | 0.00 [Hz] | No | |
| FU2-14 | Jump Frequency 2 High | H 14 | (FU2-13) to (FU1-20) | 0.01 | 0.00 [Hz] | No | |
| FU2-15 | Jump Frequency 3 Low | H 15 | 0.00 to (FU2-16) | 0.01 | 0.00 [Hz] | No | |
| FU2-16 | Jump Frequency 3 High | H 16 | (FU2-15) to (FU1-20) | 0.01 | 0.00 [Hz] | No | |
| FU2-19 | Input/Output Phase Loss Protection | H 19 | 00 – 11 (bit set) Bit 0: Output Phase Loss Protection Bit 1: Input Phase Loss Protection | - | 00 | Yes | 50 |
| FU2-20 | Power ON Start Selection | H 20 | 0 (No) 1 (Yes) | - | No 0 | Yes | 51 |
| FU2-21 | Restart after Fault Reset | H 21 | 0 (No) 1 (Yes) | - | No 0 | Yes | 51 |
| FU2-22 | Speed Search Selection | H 22 | 0000 – 1111 (bit set) Bit 0: During Accel. Bit 1: After Fault reset Bit 2: After Instant Power Failure restart Bit 3: When FU2-20 is set to 1 (Yes). | - | 0000 | No | 52 |
| FU2-23 | Current Limit Level During Speed Search | H 23 | | 80 to 250 [%] | 1 | 180 [%] | Yes |

¹¹ Code FU2-11 through FU2-16 appears only when FU2-10 is set to 'Yes'.

Chapter 3 - Parameter List

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|----------------------|---|----------------|--|-------|-----------------|-----------------|------|
| FU2-24 | P Gain During Speed Search | H 24 | 0 to 9999 | 1 | 100 | Yes | 52 |
| FU2-25 | I Gain During speed search | H 25 | 0 to 9999 | 1 | 5000 | Yes | 52 |
| FU2-26 | Number of Auto Restart Attempt | H 26 | 0 to 10 | 1 | 0 | Yes | 53 |
| FU2-27 | Delay Time before Auto Restart | H 27 | 0 to 60 [sec] | 0.1 | 1.0 [sec] | Yes | |
| FU2-30 | Rated Motor Selection | H 30 | 0.4 (0.37kW) 0.8 (0.75kW) 1.5 (1.5kW) 2.2 (2.2kW) 3.7 (3.7kW) 4.0 (4.0kW) | - | 12 | No | 53 |
| FU2-31 | Number of Motor Pole | H 31 | 2 to 12 | 1 | 4 | No | 53 |
| FU2-32 ¹⁴ | Rated Motor Slip | H 32 | 0 to 10 [Hz] | 0.01 | 13 | No | |
| FU2-33 | Rated Motor Current in RMS | H 33 | 0.1 to 99.9 [A] | 1 | | No | |
| FU2-34 ¹⁴ | No Load Motor Current in RMS | H 34 | 0.1 to 99.9 [A] | 1 | | No | |
| FU2-36 | Motor Efficiency | H 36 | 50 to 100 [%] | 1 | | No | |
| FU2-37 | Load Inertia | H 37 | 0 to 2 | 1 | | 0 | No |
| FU2-39 | Carrier Frequency | H 39 | 1 to 10 [kHz] | 1 | 3 [kHz] | Yes | 54 |
| FU2-40 | Control Mode Selection | H 40 | 0 (V/F) 1 (Slip Compen) 2 (PID) | - | V/F 0 | No | 55 |
| FU2-50 ¹⁵ | PID Feedback Signal Selection | H 50 | 0 (I) 1 (V) | - | I 0 | No | 55 |
| FU2-51 | P Gain for PID Control | H 51 | 0 to 9999 | 1 | 3000 | Yes | |
| FU2-52 | I Gain for PID Control | H 52 | 0 to 9999 | 1 | 300 | Yes | |
| FU2-53 | D Gain for PID Control | H 53 | 0 to 9999 | 1 | 0 | Yes | |
| FU2-54 | Limit Frequency for PID Control | H 54 | 0 to FU1-20 | 0.01 | 50.00 [Hz] | Yes | |
| FU2-70 | Reference Frequency for Accel and Decel | H 70 | 0 (Max Freq) 1 (Delta Freq) | - | Max frq 0 | No | 56 |
| FU2-71 | Accel/Decel Time Scale | H 71 | 0 (0.01 sec) 1 (0.1 sec) 2 (1 sec) | - | 0.1[sec] 1 | Yes | 57 |
| FU2-72 | Power On Display | H 72 | 0 (Cmd. Freq) 1 (Acc. Time) 2 (Dec. Time) | 1 | 0 | Yes | 57 |

¹² The rated motor is automatically set according to the inverter model number. If a different motor is used, set the correct motor parameters.

¹³ This value is automatically entered according to the rated motor set in FU2-30. If different, set the correct motor parameters.

¹⁴ Code FU2-32 and FU2-34 appear only when FU2-40 is set to 'Slip comp'.

¹⁵ Code FU2-50 through FU2-54 appears only when FU2-40 is set to 'PID'.

Chapter 3 - Parameter List

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|----------------------|---|----------------|----------------------|-------|-----------------|-----------------|------|
| | | | 3 (Drv Mode) | | | | |
| | | | 4 (Freq Mode) | | | | |
| | | | 5 (Step Freq 1) | | | | |
| | | | 6 (Step Freq 2) | | | | |
| | | | 7 (Step Freq 3) | | | | |
| | | | 8 (Current) | | | | |
| | | | 9 (Speed) | | | | |
| | | | 10 (DC Link Vtg) | | | | |
| | | | 11 (User Display) | | | | |
| | | | 12 (Fault Display) | | | | |
| | | | 13 (Motor Direction) | | | | |
| FU2-73 | User Display Selection | H 73 | 0 (Voltage) | - | Voltage 0 | Yes | 57 |
| | | | 1 (Watt) | | | | |
| | | | 2 (Torque) | | | | |
| FU2-74 | Gain for Motor Speed Display | H 74 | 1 to 1000 [%] | 1 | 100 [%] | Yes | 57 |
| FU2-75 | DB (Dynamic Braking) Resistor Mode Selection | H 75 | 0 (None) | - | 2 | Yes | 58 |
| | | | 1 (None) | | | | |
| | | | 2 (Ext. DB-R) | | | | |
| FU2-76 | Duty of Dynamic Braking Resistor | H 76 | 0 to 30 [%] | 1 | 10 [%] | Yes | 58 |
| FU2-79 | Software Version | H 79 | . | - | . | - | 58 |
| FU2-81 ¹⁶ | 2 nd Acceleration Time | H 81 | 0.0 to 999.9 [sec] | 0.1 | 5.0 [sec] | Yes | 58 |
| FU2-82 | 2 nd Deceleration Time | H 82 | 0.0 to 999.9 [sec] | 0.1 | 10.0 [sec] | Yes | |
| FU2-83 | 2 nd Base Frequency | H 83 | 30 to FU1-20 | 0.01 | 50.00 [Hz] | No | |
| FU2-84 | 2 nd V/F Pattern | H 84 | 0 (Linear) | - | Linear 0 | No | |
| | | | 1 (Square) | | | | |
| | | | 2 (User V/F) | | | | |
| FU2-85 | 2 nd Forward Torque Boost | H 85 | 0 to 15 [%] | 0.1 | 2.0 [%] | No | |
| FU2-86 | 2 nd Reverse Torque Boost | H 86 | 0 to 15 [%] | 0.1 | 2.0 [%] | No | |
| FU2-87 | 2 nd Stall Prevention Level | H 87 | 30 to 250 [%] | 1 | 200 [%] | No | |
| FU2-88 | 2 nd Electronic Thermal Level for 1 Minute | H 88 | FU2-89 to 250 [%] | 1 | 180 [%] | Yes | |
| FU2-89 | 2 nd Electronic Thermal Level for Continuous | H 89 | 50 to (FU2-88) | 1 | 120 [%] | Yes | |
| FU2-90 | 2 nd Rated Motor Current | H 90 | 0.1 to 99.9 [A] | 0.1 | 1.8 [A] | No | |
| FU2-91 | Read Parameters into Keypad from Inverter | H 91 | 0 (No) | - | No 0 | No | 59 |
| | | | 1 (Yes) | | | | |
| FU2-92 | Write Parameters to Inverter from Keypad | H 92 | 0 (No) | - | No 0 | No | |
| | | | 1 (Yes) | | | | |

¹⁶ Code FU2-81 through FU2-90 appears only when one of I/O-12 ~ I/O-14 is set to '2nd function'.

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|--------|----------------------------|----------------|------------------------|-------|-----------------|-----------------|------|
| FU2-93 | Initialize Parameters | H 93 | 0 (No) | - | No 0 | No | 59 |
| | | | 1 (All Groups) | | | | |
| | | | 2 (DRV) | | | | |
| | | | 3 (FU1) | | | | |
| | | | 4 (FU2) | | | | |
| | | | 5 (I/O) | | | | |
| FU2-94 | Parameter Write Protection | H 94 | 0 to 255 ¹⁷ | 1 | 0 | Yes | 59 |
| FU2-99 | Return Code | rt | | - | 1 | Yes | 59 |

3.4 Input/Output Group [I/O]

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|--------|---|----------------|-----------------------|-------|-----------------|-----------------|------|
| I/O-00 | Jump to Desired Code # | I 0 | 1 to 99 | 1 | 1 | Yes | 61 |
| I/O-01 | Filtering Time Constant for V1 Signal Input | I 1 | 0 to 9999 [ms] | 1 | 100 [ms] | Yes | 61 |
| I/O-02 | V1 Input Minimum Voltage | I 2 | 0 to I/O-04 | 0.01 | 0.00 [V] | Yes | |
| I/O-03 | Frequency corresponding to V1 Input Minimum Voltage | I 3 | 0 to FU1-20 | 0.01 | 0.00 [Hz] | Yes | |
| I/O-04 | V1 Input Maximum Voltage | I 4 | (I/O-02) to 12.00 [V] | 0.01 | 10.00 [V] | Yes | |
| I/O-05 | Frequency corresponding to V1 Input Maximum Voltage | I 5 | 0.00 to (FU1-20) | 0.01 | 50.00 [Hz] | Yes | |
| I/O-06 | Filtering Time Constant for I Signal Input | I 6 | 0 to 9,999 [ms] | 1 | 100 [ms] | Yes | 61 |
| I/O-07 | I Input Minimum Current | I 7 | 0.00 to (I/O-09) | 0.01 | 4.00 [mA] | Yes | |
| I/O-08 | Frequency corresponding to I Input Minimum Current | I 8 | 0.00 to (FU1-20) | 0.01 | 0.00 [Hz] | Yes | |
| I/O-09 | I Input Maximum Current | I 9 | (I/O-07) to 24.00[mA] | 0.01 | 20.00 [mA] | Yes | |
| I/O-10 | Frequency corresponding to I Input Maximum Current | I 10 | 0.00 to (FU1-20) | 0.01 | 50.00 [Hz] | Yes | |
| I/O-11 | Criteria for Analog Input Signal Loss | I 11 | 0 (None) | - | None 0 | Yes | 62 |
| | | | 1 (Half of x1) | | | | |
| | | | 2 (Below x1) | | | | |
| I/O-12 | Multi-function Input Terminal ' P1 ' Define | I 12 | 0 (Speed-L) | - | Speed-L 0 | NO | 63 |
| | | | 1 (Speed-M) | | | | |
| | | | 2 (Speed-H) | | | | |

¹⁷ This function is used to lock the parameters from being changed. When the parameters are locked, the display arrow changes from solid to dotted line. The lock and unlock code is ' 12' .

Chapter 3 - Parameter List

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|--------|--|----------------|----------------------------------|-------|-----------------|-----------------|------|
| | 8,9, 15, 17, 20, 21, 22, 23, 24, 25, 26 (-Reserved-) | | 3 (XCEL-L) | | | | |
| | | | 4 (XCEL-M) | | | | |
| | | | 5 (XCEL-H) | | | | |
| | | | 6 (Dc-brake) | | | | |
| | | | 7 (2nd Func) | | | | |
| | | | 10 (Up) | | | | |
| | | | 11 (Down) | | | | |
| | | | 12 (3-Wire) | | | | |
| | | | 13 (Ext Trip-A) | | | | |
| | | | 14 (Ext Trip-B) | | | | |
| | | | 16 (Open-Loop) | | | | |
| | | | 18 (Analog Hold) | | | | |
| | | | 19 (XCEL Stop) | | | | |
| I/O-13 | Multi-function Input Terminal ' P2' Define | I 13 | Same as above | - | Speed-M 1 | NO | 63 |
| I/O-14 | Multi-function Input Terminal ' P3' Define | I 14 | Same as above | - | Speed-H 2 | NO | |
| I/O-15 | Terminal Input Status | I 15 | 00000000 – 11111111 (bit set) | - | - | - | 66 |
| I/O-16 | Terminal Output Status | I 16 | 0 – 1 (bit set) | - | - | - | |
| I/O-17 | Filtering Time Constant for Multi- function Input Terminals | I 17 | 2 to 50 | 1 | 2 | Yes | 66 |
| I/O-20 | Jog Frequency Setting | I 20 | 0.00 to (FU1-20) | 0.01 | 10.00 [Hz] | Yes | 66 |
| I/O-21 | Step Frequency 4 | I 21 | 0.00 to (FU1-20) | | 40.00 [Hz] | Yes | |
| I/O-22 | Step Frequency 5 | I 22 | 0.00 to (FU1-20) | | 50.00 [Hz] | Yes | |
| I/O-23 | Step Frequency 6 | I 23 | 0.00 to (FU1-20) | | 40.00 [Hz] | Yes | |
| I/O-24 | Step Frequency 7 | I 24 | 0.00 to (FU1-20) | | 30.00 [Hz] | Yes | |
| I/O-25 | Acceleration Time 1 for Step Frequency | I 25 | 0.0 to 999.9 [sec] | 0.1 | 20.0 [sec] | Yes | 67 |
| I/O-26 | Deceleration Time 1 for Step Frequency | I 26 | 0.0 to 999.9 [sec] | 0.1 | 20.0 [sec] | Yes | |
| I/O-27 | Acceleration Time 2 | I 27 | 0.0 to 999.9 [sec] | 0.1 | 30.0 [sec] | Yes | |
| I/O-28 | Deceleration Time 2 | I 28 | 0.0 to 999.9 [sec] | 0.1 | 30.0 [sec] | Yes | |
| I/O-29 | Acceleration Time 3 | I 29 | 0.0 to 999.9 [sec] | 0.1 | 40.0 [sec] | Yes | |
| I/O-30 | Deceleration Time 3 | I 30 | 0.0 to 999.9 [sec] | 0.1 | 40.0 [sec] | Yes | |
| I/O-31 | Acceleration Time 4 | I 31 | 0.0 to 999.9 [sec] | 0.1 | 50.0 [sec] | Yes | |
| I/O-32 | Deceleration Time 4 | I 32 | 0.0 to 999.9 [sec] | 0.1 | 50.0 [sec] | Yes | |
| I/O-33 | Acceleration Time 5 | I 33 | 0.0 to 999.9 [sec] | 0.1 | 40.0 [sec] | Yes | |
| I/O-34 | Deceleration Time 5 | I 34 | 0.0 to 999.9 [sec] | 0.1 | 40.0 [sec] | Yes | |
| I/O-35 | Acceleration Time 6 | I 35 | 0.0 to 999.9 [sec] | 0.1 | 30.0 [sec] | Yes | |

Chapter 3 - Parameter List

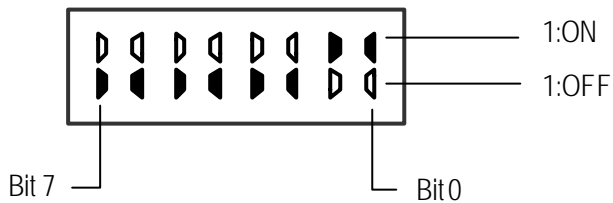
| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|-------------|---|----------------|--|-------|-----------------|-----------------|------|
| I/O-36 | Deceleration Time 6 | I 36 | 0.0 to 999.9 [sec] | 0.1 | 30.0 [sec] | Yes | |
| I/O-37 | Acceleration Time 7 | I 37 | 0.0 to 999.9 [sec] | 0.1 | 20.0 [sec] | Yes | |
| I/O-38 | Deceleration Time 7 | I 38 | 0.0 to 999.9 [sec] | 0.1 | 20.0 [sec] | Yes | |
| I/O-40 | FM (Frequency Meter) Output Selection | I 40 | 0 (Frequency) | - | Frequency 0 | Yes | 67 |
| | | | 1 (Current) | | | | |
| | | | 2 (Voltage) | | | | |
| | | | 3 (DC Link Vtg) | | | | |
| I/O-41 | FM Output Adjustment | I 41 | 10 to 200 [%] | 1 | 100 [%] | Yes | |
| I/O-42 | Frequency Detection Level | I 42 | 0 to FU1-20 | 0.01 | 30.00 [Hz] | Yes | 68 |
| I/O-43 | Frequency Detection Bandwidth | I 43 | 0 to FU1-20 | 0.01 | 10.00 [Hz] | Yes | |
| I/O-44 | Multi-function Output Define (MO) 15, 16, 18, 19, 20 (-Reserved-) | I 44 | 0 (FDT -1) | - | Run 12 | Yes | 68 |
| | | | 1 (FDT -2) | | | | |
| | | | 2 (FDT -3) | | | | |
| | | | 3 (FDT -4) | | | | |
| | | | 4 (FDT -5) | | | | |
| | | | 5 (OL) | | | | |
| | | | 6 (IOL) | | | | |
| | | | 7 (Stall) | | | | |
| | | | 8 (OV) | | | | |
| | | | 9 (LV) | | | | |
| | | | 10 (OH) | | | | |
| | | | 11 (Lost Command) | | | | |
| | | | 12 (Run) | | | | |
| | | | 13 (Stop) | | | | |
| 14 (Steady) | | | | | | | |
| 17 (Search) | | | | | | | |
| I/O-45 | Fault Output Relay Setting (30A, 30B, 30C) | I 45 | 000 – 111 (bit set) Bit 0: LV Bit 1: All Trip Bit 2: Auto Retry | - | 010 | Yes | 71 |
| I/O-46 | Inverter Number | I 46 | 1 to 32 | 1 | 1 | Yes | |
| I/O-47 | Baud Rate | I 47 | 0 (1200 bps) | - | 9600 bps 3 | Yes | 71 |
| | | | 1 (2400 bps) | | | | |
| | | | 2 (4800 bps) | | | | |
| | | | 3 (9600 bps) | | | | |
| | | | 4 (19200 bps) | | | | |
| I/O-48 | Operating selection at Loss of Freq. Reference | I 48 | 0 (None) | - | None 0 | Yes | 72 |
| | | | 1 (Free Run) | | | | |
| | | | 2 (Stop) | | | | |

Chapter 3 - Parameter List

| Code | Description | Keypad Display | Setting Range | Units | Factory Default | Adj. During Run | Page |
|--------|--|----------------|--------------------|-------|-------------------|-----------------|------|
| I/O-49 | Waiting Time after Loss of Freq. Reference | I 49 | 0.1 to 120.0 [sec] | 0.1 | 1.0 [sec] | Yes | |
| I/O-50 | Communication Protocol Selection | I 50 | 0 (LG- BUS) | | 7 (Modbus RTU) | No | 72 |
| | | | 7 (Modbus-RTU) | | | | |
| I/O-99 | Return Code | rt | | - | 1 | Yes | 72 |

Note: Parameters that are set by a bit are ON (1) when the upper LED is lit as shown below.
(F59, H19, H22, I15, I16, I45 are the parameters that are set by bit.)

Example) when the keypad displays ' 00000011 '



Note: FU1-20, FU1-21, FU1-25, FU1-36, FU2-54, FU2-83, I/O-05, I/O-10 are set at 50Hz for Standard (EU) types and 60Hz for US types.

CHAPTER 4 - PARAMETER DESCRIPTION

4.1 Drive Group [DRV]

DRV-00: Output Frequency

5000

This code gives information regarding motor direction set in DRV-13, and output or reference frequency.

You can set the command frequency by pressing [FUNC] key in this code.

Related Functions: DRV-04 [Freq Mode]
FU1-20 [Max Freq]
I/O-01 to I/O-10 [Analog Reference Inputs]

- DRV-04: Select the frequency setting method. [Keypad-1, Keypad-2, V1, I, V1+I]
- FU1-20: Set the maximum frequency that the inverter can output.
- I/O-01 to I/O-10: Scaling the analog input signals (V1 and I) for frequency reference.

DRV-01: Acceleration Time

ACC

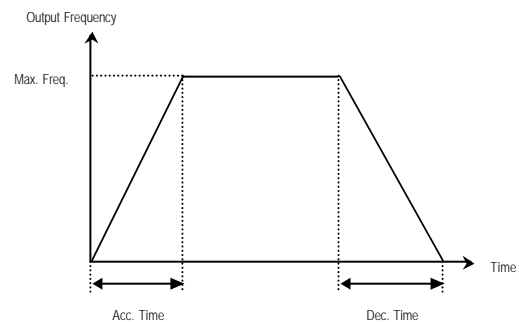
DRV-02: Deceleration Time

DEC

The inverter targets the FU2-70 [Ref. Freq. for Accel/Decel] when accelerating or decelerating. When the FU2-70 is set to "Maximum Frequency", the acceleration time is the time taken by the motor to reach FU1-20 [Maximum Frequency] from 0 Hz. The deceleration time is the time taken by the motor to reach 0 Hz from FU1-20.

When the FU2-70 is set to 'Delta Frequency', the acceleration and deceleration time is the taken to reach a targeted frequency (instead the maximum frequency) from a frequency.

The acceleration and deceleration time can be changed to a preset transient time via multi-function inputs. By setting the multi-function inputs (P1, P2, P3) to 'XCEL-L', 'XCEL-M', 'XCEL-H' respectively, the Accel and Decel time set in I/O-25 to I/O-38 are applied according to the binary inputs of the P1, P2, P3.



Related Functions: FU1-20 [Max Freq]
FU2-70 [Reference Freq. for Accel/Decel]
FU2-71 [Accel/Decel Time Scale]
I/O-12 to I/O-14 [Multi-Function Input Terminal P1, P2, P3]
I/O-25 to I/O-38 [Acc/Dec Time for Step Frequency]

- FU2-70: Select the frequency to be targeted for acceleration and deceleration. [Max Freq, Delta Freq]
- FU2-71: Select the time scale. [0.01, 0.2, 1]
- I/O-12 to I/O-14: Set the terminal function of P1, P2, P3 terminal inputs.
- I/O-25 to I/O-38: Preset the Accel/Decel time activated via multifunction inputs (P1, P2, P3)

Chapter 4 - Parameter Description [DRV]

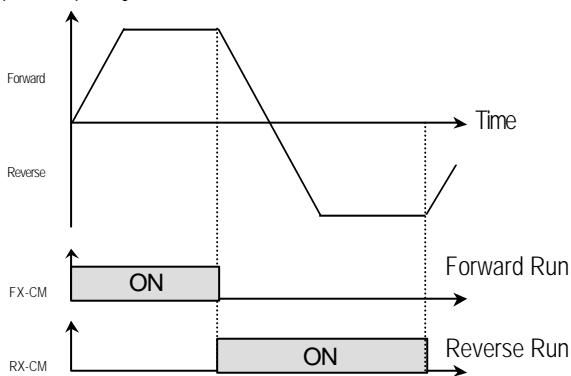
DRV-03: Drive Mode (Run/stop Method)

drv

Select the source of Run/Stop command.

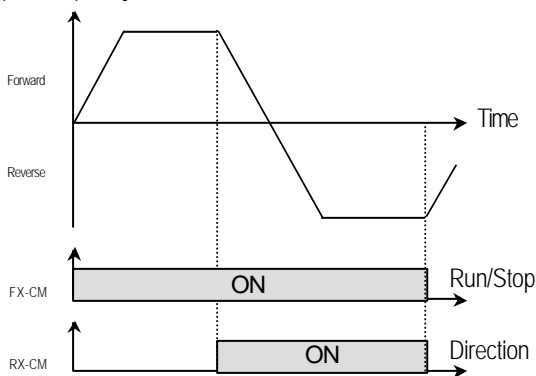
| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| Keypad | 0 | Run/stop is controlled by Keypad. |
| Fx/Rx-1 | 1 | Control Terminals FX, RX and CM control Run/Stop. (Method 1) |
| Fx/Rx-2 | 2 | Control Terminals FX, RX and CM control Run/Stop. (Method 2) |
| MODBUS-RTU | 3 | Run/stop is controlled by Serial Communication (MODBUS-RTU) Refer to Chapter 5. |

Output Frequency



[Drive Mode: ' Fx/Rx-1']

Output Frequency



[Drive Mode: ' Fx/Rx-2']

DRV-04: Frequency Mode (Frequency Setting Method)

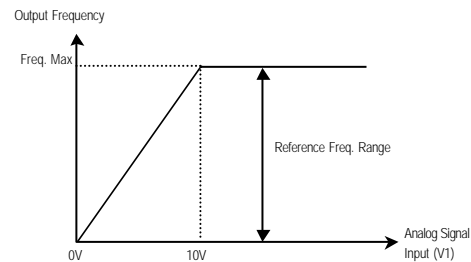
F,9

Select the source of frequency setting.

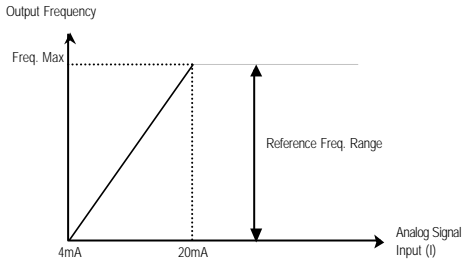
| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| Keypad-1 | 0 | Frequency is set at DRV-00. The frequency is changed by pressing [FUNC] key and entered by pressing [FUNC] key. The inverter does not output the changed frequency until the [FUNC] key is pressed. |
| Keypad-2 | 1 | Frequency is set at DRV-00. Press [FUNC] key and then by pressing the [,] key, the inverter immediately outputs the changed frequency. Pressing the [FUNC] key saves the changed frequency. |
| V1 | 2 | Input the frequency reference (0-10V) to the "V1" control terminal. Refer to the I/O-01 to I/O-05 for scaling the signal. |
| I | 3 | Input the frequency reference (4-20mA) to the "I" control terminal. Refer to the I/O-06 to I/O-10 for scaling the signal. |
| V1+I | 4 | Input the frequency reference (0-10V, 4-20mA) to the "V1", "I" control terminals. The 'V1' signal overrides the 'I' signal. |
| MODBUS-RTU | 5 | Frequency is set by Serial Communication (MODBUS-RTU) Refer to Chapter 5. |

Related Functions: I/O-01 to I/O-10 [Reference Inputs]

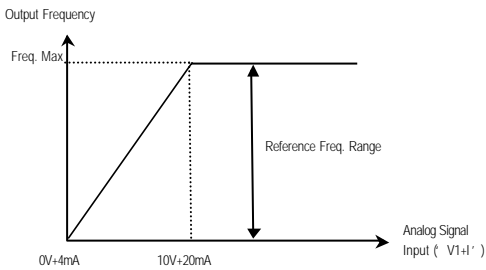
- I/O-01 to I/O-10: Scaling analog input signals (V1 and I) for frequency reference.



[Freq Mode: ' V1']



[Freq Mode: ' I']



[Freq Mode: V1+' I']

DRV-05 ~ DRV-07: Step Frequency 1 ~ 3

521

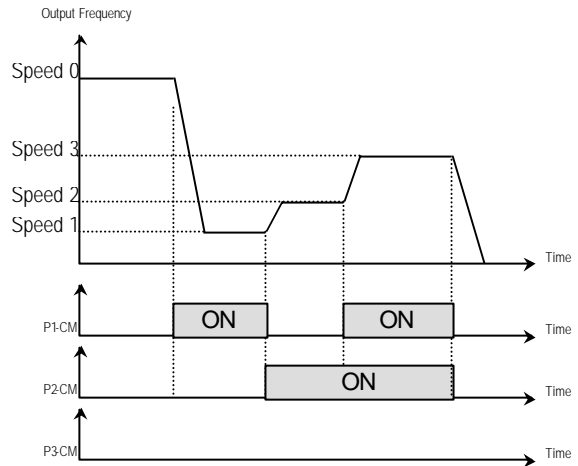
522

523

The inverter outputs preset frequencies set in these codes according to the multi-function input terminals configured as ' Speed-L' , ' Speed-M' and ' Speed-H' . The output frequencies are determined by the binary combination of P1, P2, P3 configured in I/O-12 to I/O-17. Refer to the following table for the preset frequency outputs.

| Binary Combination of P1, P2, P3 | | | Output Frequency | Step Speed |
|----------------------------------|---------|---------|------------------|------------|
| Speed-L | Speed-M | Speed-H | | |
| 0 | 0 | 0 | DRV-00 | Speed 0 |
| 1 | 0 | 0 | DRV-05 | Speed 1 |
| 0 | 1 | 0 | DRV-06 | Speed 2 |
| 1 | 1 | 0 | DRV-07 | Speed 3 |

0: ON, 1: OFF



[Step Frequency Output]

Related Functions: I/O-12 to I/O-14 [Reference Inputs] I/O-17 [Filtering Time Constant]

- I/O-12 to I/O-14: Set the terminal function of P1, P2, P3 terminal inputs.
- I/O-17: Adjust response sensibility of input terminal b eliminate contact noise.

DRV-08: Output Current

CUr

This code displays the output current of the inverter in RMS.

DRV-09: Motor Speed

rPn

Chapter 4 - Parameter Description [DRV]

This code display the motor speed in RPM during the motor is running.

Use the following equation to scale the mechanical speed using FU2-74 [Gain for Motor Speed display] if you want to change the motor speed display to rotation speed (r/min) or mechanical speed (m/min).

$$\text{Motor Speed} = 120 * (F/P) * \text{FU2-74}$$

Where, F: output frequency and P: the number of motor poles

DRV-10: DC Link Voltage



This code displays the DC link voltage inside the inverter.

DRV-11: User Display Selection



This code display the parameter selected in FU2-73 [User Display]. There are 3 types of parameters in FU2-73 (Voltage, Watt and Torque).

DRV-12: Fault Display



This code displays the current fault (trip) status of the inverter. Use the [FUNC], [] and [] key to check for fault content(s), output frequency, output current, or whether the inverter was accelerating, decelerating, or in constant speed at the time the fault occurred. Press the [FUNC] key to exit. The fault content will be stored in FU2-01

to FU2-05 when the [RESET] key is pressed.

[Fault Contents]

| Fault (Trip) | Keypad Display |
|---|----------------|
| | Display |
| Over-Current | OC |
| Over-Voltage | OV |
| Emergency Stop (Not latched) | BX |
| Low-Voltage | LV |
| Overheat on Heat Sink | OH |
| Electronic Thermal Trip | ETH |
| Overload Trip | OLT |
| Inverter HW Fault - EEP Error - FAN Lock - CPU Error - Wiring Error - Ground Fault - NTC Wire Trouble | HW |
| Output Phase Loss | PO |
| Inverter Overload | IOLT |
| Input Phase Open | COL |

Note: The inverter will not reset when HW fault occurs.

Repair the fault before turning on the power.

Note: when multiple faults occur, only the highest-level fault will be displayed.

Related Functions: FU2-01 to FU2-05 [Previous Fault History]
FU2-06 [Erase Fault History]

- FU2-01 to FU2-05: Up to 5 faults are saved.
- FU2-06: Erases faults saved in FU2-01 to FU2-05.

DRV-13: Motor Direction Set



This code sets the motor direction.

| 7-Segment Display | Description |
|-------------------|-----------------------|
| F | Run Forward Direction |
| r | Run Reverse Direction |

DRV-20: FU1 Group selection



FU1

DRV-21: FU2 Group selection



FU2

DRV-22: I/O Group selection



I/O

Select the desired group and press the [FUNC] key to move to the desired group. The parameter in the group may be read or written after moving to the desired group.

Chapter 4 - Parameter Description [FU1]

4.2 Function 1 Group [FU1]

FU1-00: Jump to Desired Code

F 0

Jumping directly to any parameter code can be accomplished by entering the desired code number.

FU1-03: Run Prevention

F 3

This function prevents reverse operation of the motor. This function may be used for loads that rotate only in one direction such as fans and pumps.

| Setting Range | | Description |
|--------------------|---------|---------------------------------------|
| Select | Display | |
| None | 0 | Forward and reverse run is available. |
| Forward Prevention | 1 | Forward run is prevented. |
| Reverse Prevention | 2 | Reverse run is prevented. |

FU1-05: Acceleration Pattern

FU1-06: Deceleration Pattern

F 5

F 6

Different combinations of acceleration and deceleration patterns can be selected according to your application.

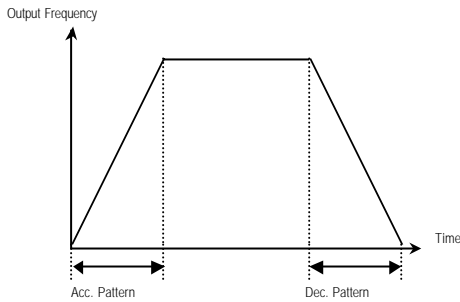
| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| Linear | 0 | This is a general pattern for constant torque applications. |
| S-Curve | 1 | This pattern allows the motor to accelerate and decelerate smoothly. The actual acceleration and deceleration time takes longer- about 40% than the time set in DRV-01 and DRV-02. This setting prevents shock during acceleration and deceleration, and prevents objects from swinging on conveyors or other moving equipment. |
| U-Curve | 2 | This pattern provides more efficient control of acceleration and deceleration in typical winding machine applications. |
| Minimum | 3 | The inverter makes shorten the acceleration time by accelerating with a current rate of about 150% of its rated current and reduces the deceleration time by decelerating with a DC voltage rate of 95% of its over-voltage trip level. <i>Appropriate application:</i> When the maximum capability of the inverter and the motor are required. <i>Inappropriate application:</i> The current limit function may operate for a long period of time for loads that have high inertia such as fans. |
| Optimum | 4 | The inverter accelerates with a current rate of about 120% of its rated current and decelerates with a DC voltage rate of 93% of its over-voltage trip level. |

Note: In case of selecting the ' Minimum' or ' Optimum' , the DRV-01 [Accel Time] and DRV-02 [Decel Time] is ignored.

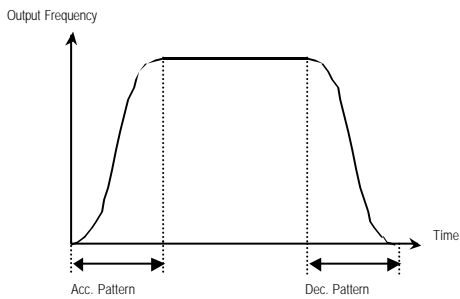
Note: ' Minimum' and ' Optimum' functions operate normally when the load inertia is less than 10 times compared to the motor inertia. (FU2-37)

Note: ' Optimum' is useful when the motor capacity is smaller than the inverter capacity.

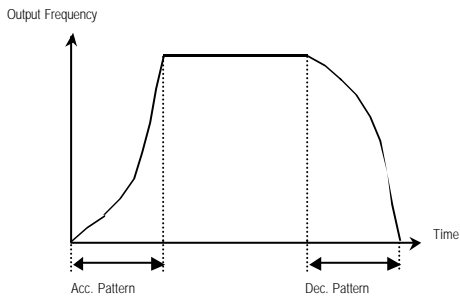
Note: ' Minimum' and ' Optimum' functions are not appropriate for down operation in an elevator application.



[Accel/Decel Pattern: 'Linear']



[Accel/Decel Pattern: 'S-Curve']



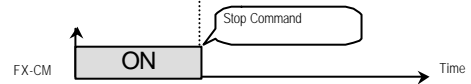
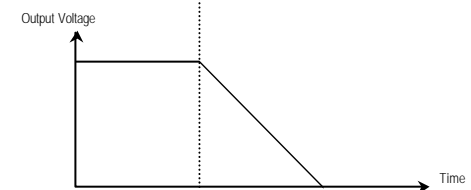
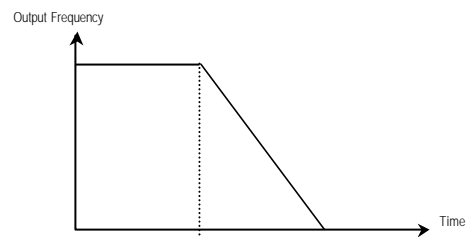
[Accel/Decel Pattern: 'U-Curve']

FU1-07: Stop Mode

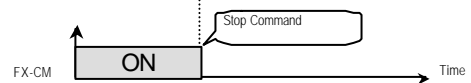
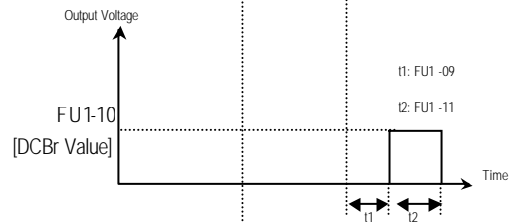
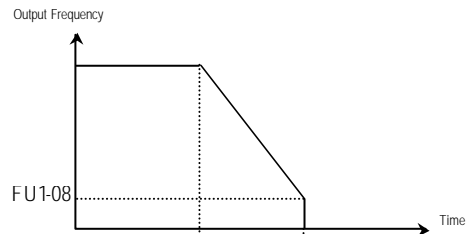


Selects the stopping method for the inverter.

| Setting Range | | Description |
|--------------------------|---------|--|
| Select | Display | |
| Decel | 0 | Inverter stops by the deceleration pattern. |
| DC-Brake | 1 | Inverter stops with DC injection braking. Inverter outputs DC voltage when the frequency reached the DC injection braking frequency set in FU1-08 during decelerating. |
| Free-Run (Coast to stop) | 2 | Inverter cuts off its output immediately when the stop signal is entered. |

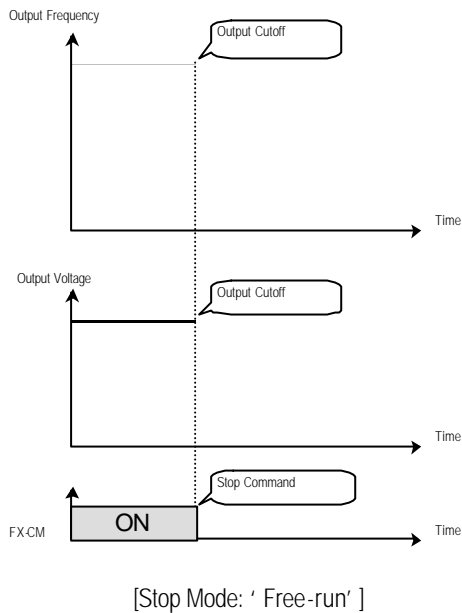


[Stop Mode: 'Decel']



[Stop Mode: 'DC-Brake']

Chapter 4 - Parameter Description [FU1]



FU1-08: DC Injection Braking Frequency
FU1-09: DC Injection Braking On-delay Time
FU1-10: DC Injection Braking Voltage
FU1-11: DC Injection Braking Time

F 8

F 9

F 10

F 11

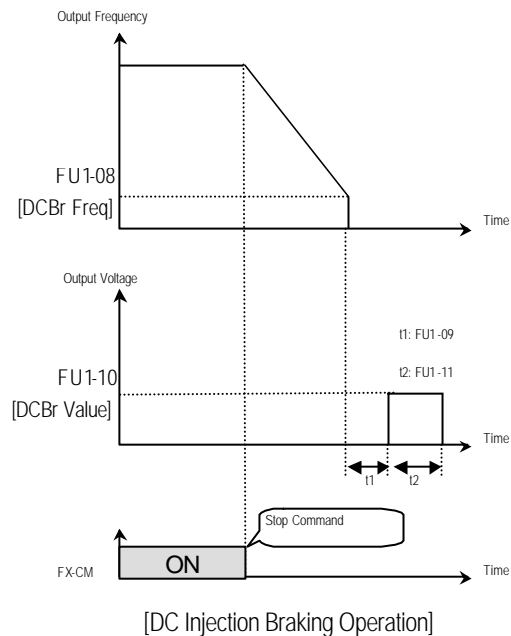
This function stops the motor immediately by introducing DC voltage to the motor windings. Selecting ' DC-Brake' in FU1-07 activates FU1-08 through FU1-11.

FU1-08 [DC Injection Braking Frequency] is the frequency at which the inverter starts to output DC voltage during deceleration.

FU1-09 [DC Injection Braking On-delay Time] is the inverter output blocking time before DC injection braking.

FU1-10 [DC Injection Braking Voltage] is the DC voltage applied to the motor and is based on FU2-33 [Rated Current of Motor].

FU1-11 [DC Injection Braking Time] is the time the DC current is applied to the motor.

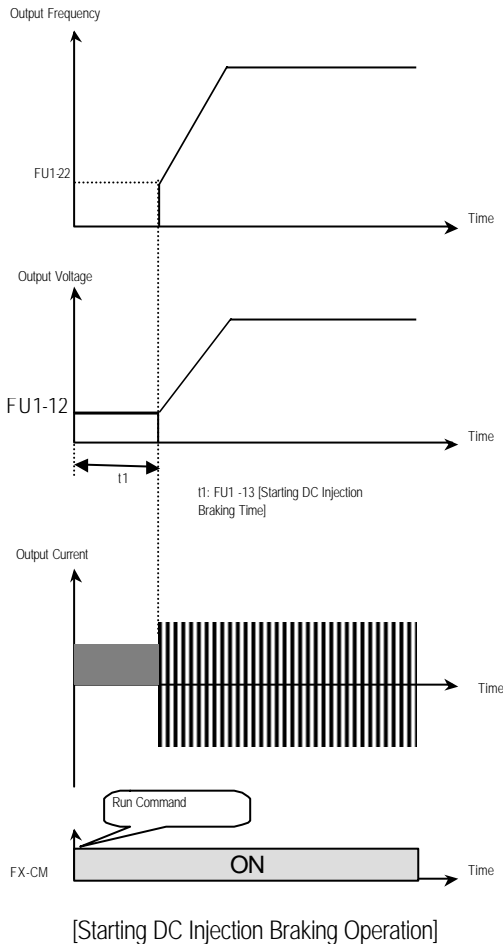


FU1-12: Starting DC Injection Braking Voltage
FU1-13: Starting DC Injection Braking Time

F 12

F 13

Inverter holds the starting frequency for Starting DC Injection Braking Time. The inverter outputs DC voltage to the motor for FU1-13 [Starting DC Injection Braking Time] with the FU1-12 [Starting DC Injection Braking Voltage] before accelerating.



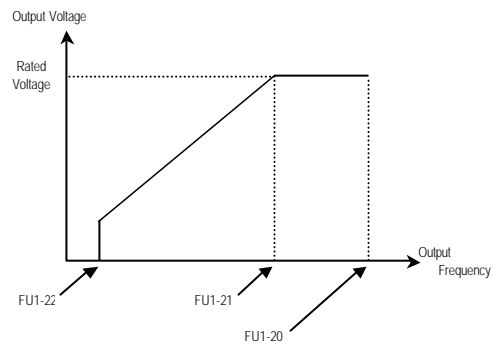
Related Functions: FU2-33 [Rated Current of Motor]
 ■ FU2-33: The DC current is limited by this parameter.

Note: The DC injection braking parameter does not function when either FU1-12 or FU1-13 is set to "0".
Note: FU1-12 [Starting DC Injection Braking Voltage] is also used as the DC Injection Braking Voltage for the multifunction input when the multifunction input is set to "DC Braking".

FU1-20: Maximum Frequency
 FU1-21: Base Frequency
 FU1-22: Starting Frequency



FU1-20 [Maximum Frequency] is the maximum output frequency of the inverter. Make sure this maximum frequency does not exceed the rated speed of motor.
FU1-21 [Base Frequency] is the frequency where the inverter outputs its rated voltage. In case of using a 50Hz motor, set this to 50Hz.
FU1-22 [Starting Frequency] is the frequency where the inverter starts to output its voltage.



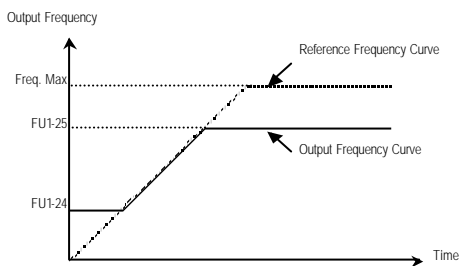
Note: If the command frequency set point is set lower than the starting frequency, inverter will not output voltage.

FU1-23: Frequency Limit Selection
 FU1-24: Low Limit Frequency
 FU1-25: High Limit Frequency



Chapter 4 - Parameter Description [FU1]

FU1-23 selects the limits for the inverter operating frequency. If FU1-23 is set to 'Yes', inverter operates within the upper and lower limit setting. The inverter operates at the upper or the lower limit when the frequency reference is outside the frequency limit range.



[Freq. limit: 'Yes']

Note: Frequency limit does not work during acceleration and deceleration.

FU1-26: Manual/Auto Boost Selection

FU1-27: Torque Boost in Forward Direction

FU1-28: Torque Boost in Reverse Direction

F 26

F 27

F 28

This function is used to increase the starting torque at low speed by increasing the output voltage of the inverter. If the boost value is set higher than required, it may cause the motor flux to saturate, causing over-current trip. Increase the boost value when there is excessive distance between inverter and motor.

[Manual Torque Boost]: The forward and reverse torque boost is set separately in FU1-27

and FU1-28.

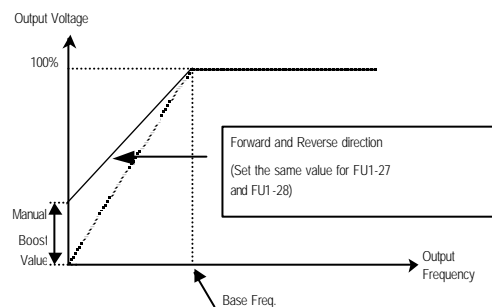
Note: The torque boost value is the percentage of inverter rated voltage.

Note: When FU1-29 [Volts/Hz Pattern] is set to 'User V/F', this function does not work.

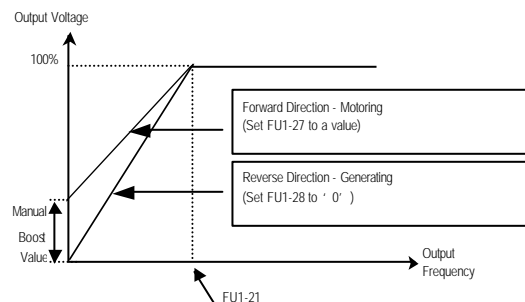
[Auto Torque Boost]: Inverter outputs high starting torque by automatically boosting according to the load.

Note: Auto torque boost is only available for the 1st motor. For multiple motors, manual torque boost must be used.

Note: The auto torque boost value is added to the manual torque boost value.



[Constant Torque Loads: Conveyor, Moving Equip. etc.]



[Ascending and Descending Loads: Parking, Hoist etc.]

Related Functions: FU1-29 [V/F Pattern]

FU1-29: Volts/Hz Pattern

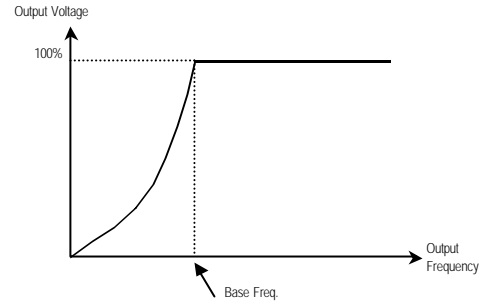
F 29

This is the pattern of voltage/frequency ratio. Select the proper V/F pattern according to the load. The motor torque is dependent on this V/F pattern.

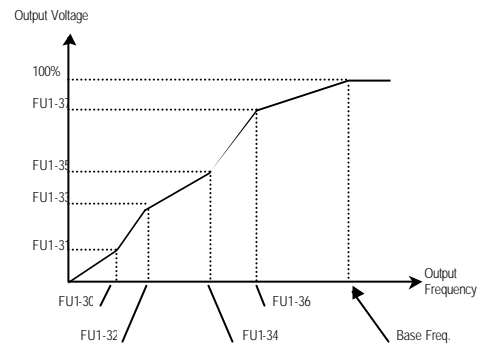
[Linear] pattern is used where constant torque is required. This pattern maintains a linear volts/frequency ratio from zero to base frequency. This pattern is appropriate for constant torque applications.

[Square] pattern is used where variable torque is required. This pattern maintains squared volts/hertz ratio. This pattern is appropriate for fans, pumps, etc.

[User V/F] pattern is used for special applications. Users can adjust the volts/frequency ratio according to the application. This is accomplished by setting the voltage and frequency, respectively, at four points between starting frequency and base frequency. The four points of voltage and frequency are set in FU1-30 through FU1-37.

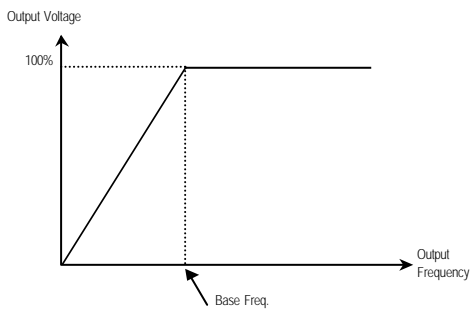


[V/F Pattern: ' Square']



[V/F Pattern: ' User V/F']

FU1-30 ~ FU1-37: User V/F Frequency and Voltage



[V/F Pattern: ' Linear']

F 30

F 31

F 32

F 33

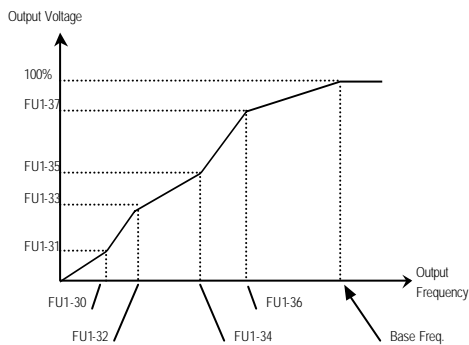
F 34

Chapter 4 - Parameter Description [FU1]

F 35

F 36

These functions are available only when 'User V/F' is selected in FU1-29 [V/F Pattern]. Users can make the custom V/F pattern by setting four points between FU1-22 [Starting Frequency] and FU1-21 [Base Frequency].



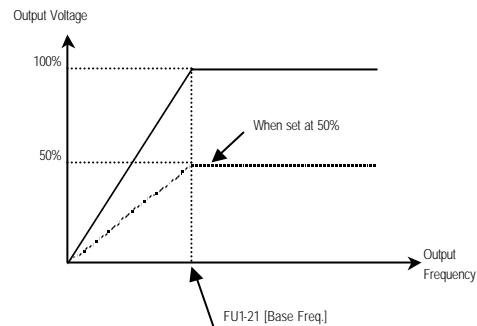
[User V/F]

Note: When the 'User V/F' is selected, the torque boost of FU1-26 through FU1-28 is ignored.

FU1-38: Output Voltage Adjustment

F 38

This function is used to adjust the output voltage of the inverter. This is useful when using a motor that has a lower rated voltage than the main input voltage. When this is set at 100%, inverter outputs its rated voltage.

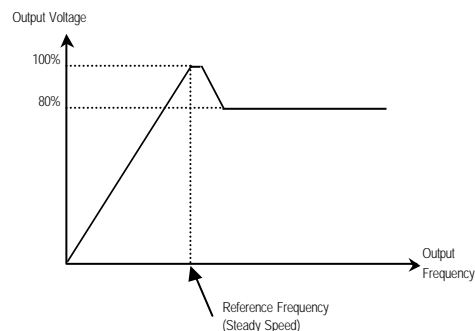


Note: The inverter output voltage does not exceed the main input voltage, even though FU1-38 is set at 110%.

FU1-39: Energy Save Level

F 39

This function is used to reduce the output voltage in applications that do not require high torque and current at its steady speed. The inverter reduces its output voltage after accelerating to the reference frequency (steady speed). This function may cause over-current trip due to the lack of output torque in a fluctuating load. This function does not work with 0% set point value.



[When Energy Save Level is set at 20%]

Note: This function is not recommended for a large load or for an application that need frequent acceleration and deceleration.

FU1-50: Electronic Thermal (Motor i^2t) Selection
 FU1-51: Electronic Thermal Level for 1 Minute
 FU1-52: Electronic Thermal Level for Continuous
 FU1-53: Electronic Thermal Characteristic (Motor type) Selection

These functions are to protect the motor from overheating without using additional thermal overload relay. Inverter calculates the temperature rise of the motor using several parameters and determines whether or not the motor is overheating. Inverter will turn off its output and display a trip message when the electronic thermal feature is activated.

F 50

This function activates the ETH parameters by setting 'Yes'.

F 51

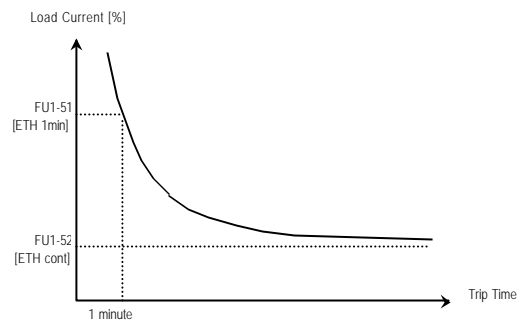
This is the reference current when the inverter determines the motor has overheated. Inverter trips in 1 minute when 150% of rated motor current established in FU2-33 flows for 1 minute.

Note: The set value is the percentage of FU2-33 [Rated Motor Current].

F 52

This is the current at which the motor can run continuously. Generally, this value is set to '100%' and which means the rated motor current set in FU2-33. This value must be set less than FU1-51 [ETH 1min].

Note: The set value is the percentage of FU2-33 [Rated Motor Current].



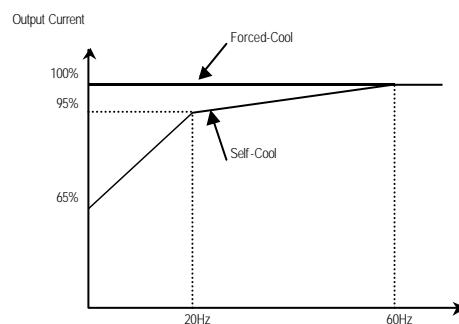
[Motor i^2t Characteristic Curve]

F 53

To make the ETH function (Motor i^2t) work correctly, the motor cooling method must be selected correctly according to the motor.

[Self-cool] is a motor that has a cooling fan connected directly to the shaft of the motor. Cooling effects of a self-cooled motor decrease when a motor is running at low speeds. The motor current is derated as the motor speed decreases.

[Forced-cool] is a motor that uses a separate motor to power a cooling fan. As the motor speed changes, the cooling effect does not change.



[Load Current Derating Curve]

Note: Despite the motor current changing frequently due to load fluctuation or acceleration and deceleration, the inverter calculates the i^2t and accumulates the value to protect the motor.

Chapter 4 - Parameter Description [FU1]

Related Functions: FU2-33 [Rated Motor Current]

FU1-54: Overload Warning Level
FU1-55: Overload Warning Time

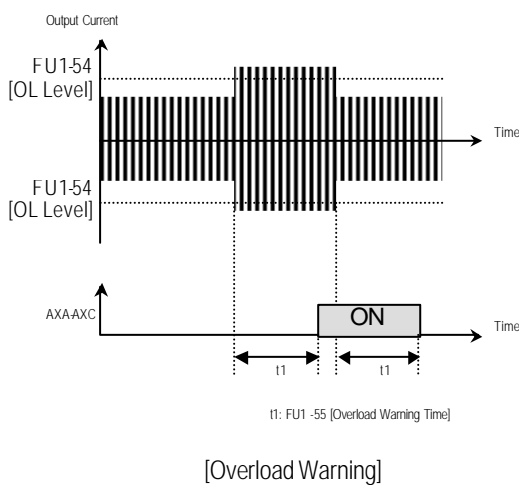
F 54
F 55

The inverter generates an alarm signal when the output current has reached the FU1-54 [Overload Warning Level] for the FU1-55 [Overload Warning Time]. The alarm signal persists for the FU1-55 even if the current has become the level below the FU1-54.

Multi-function output terminal (AXA-AXC) is used as the alarm signal output. To output the alarm signal, set I/O 44 [Multifunction Auxiliary Contact Output] to 'OL'.

Note: Inverter is not tripped by this function.

Note: The set value is the percentage of FU2-33 [Rated Motor Current].



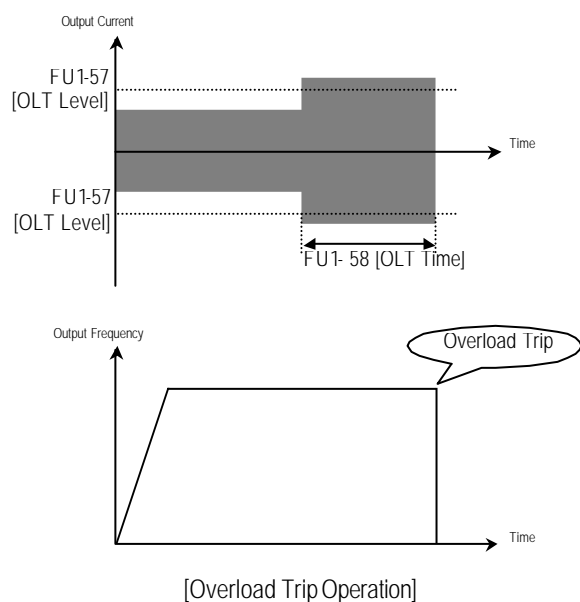
Related Functions: FU2-33 [Rated Motor Current]
I/O-44 [Multi-function Auxiliary Contact Output]

FU1-56: Overload Trip Selection
FU1-57: Overload Trip Level
FU1-58: Overload Trip Delay Time

F 56
F 57
F 58

Inverter cuts off its output and displays fault message when the output current persists over the FU1-57 [Overload Trip Level] for the time of FU1-58 [Overload Trip Time]. This function protects the inverter and motor from abnormal load conditions.

Note: The set value is the percentage of FU2-33 [Rated Motor Current].



Related Functions: FU2-33 [Rated Motor Current]

FU1-59: Stall Prevention Mode Selection (Bit set)
FU1-60: Stall Prevention Level

F 59

This bit set parameter follows the conventions used in I/O-15 and I/O-16 to show the ON (bit set) status.

F 60

This function is used to prevent the motor from stalling by reducing the inverter output frequency until the motor current decreases below the stall prevention level. This function can be selected for each mode of acceleration, steady speed, and deceleration via bit combination.

Note: The set value is the percentage of FU2-33 [Rated Motor Current].

FU1-59 [Stall Prevention Mode Selection]

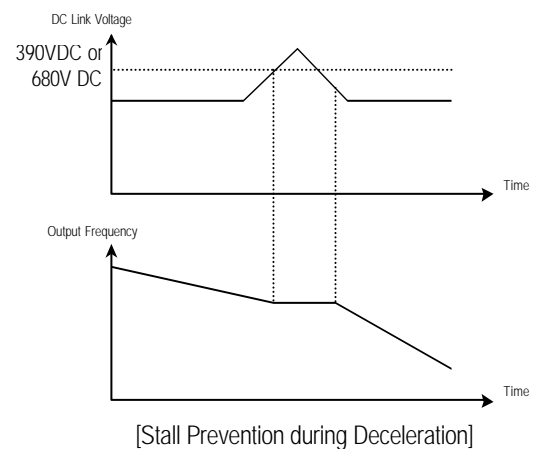
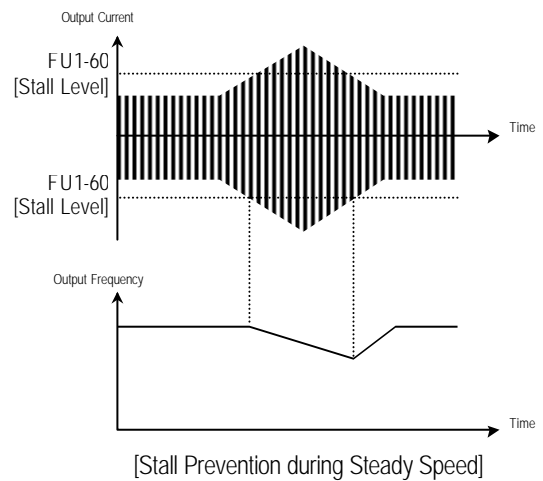
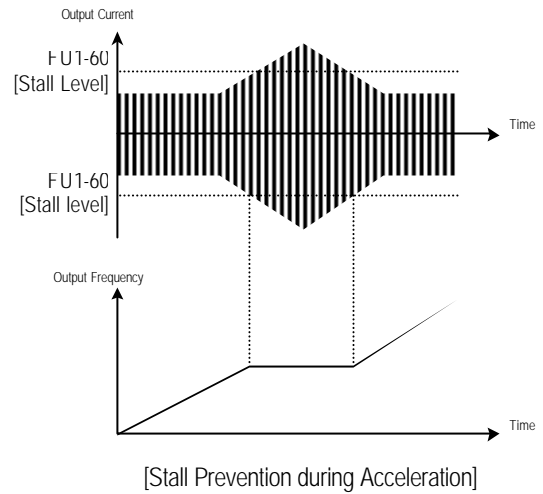
| Setting Range | | | FU1-59 | Description |
|---------------------|---------------------|---------------------|--------|--------------------------------------|
| 3 rd bit | 2 nd bit | 1 st bit | | |
| 0 | 0 | 1 | 001 | Stall Prevention during Acceleration |
| 0 | 1 | 0 | 010 | Stall Prevention during Steady Speed |
| 1 | 0 | 0 | 100 | Stall Prevention during Deceleration |

When FU1-59 is set to '111', stall prevention works during accelerating, steady speed and decelerating.

Note: The acceleration and deceleration time may take longer than the time set in DRV-01, DRV-02 when Stall Prevention is selected.

Note: If stall prevention status persists, inverter may stop during acceleration.

Related Functions: FU2-33 [Rated Motor Current]



Chapter 4 - Parameter Description [FU1]

FU1-99: Return Code



This code is used to exit a group. Press [FUNC] key to exit.

Related Functions: FU2-99 [Return Code]
I/O-99 [Return Code]

4.3 Function 2 Group [FU2]

FU2-00: Jump to Desired Code #



Jumping directly to any parameter code can be accomplished by entering the desired code number.

- FU2-01: Previous Fault History 1
- FU2-02: Previous Fault History 2
- FU2-03: Previous Fault History 3
- FU2-04: Previous Fault History 4
- FU2-05: Previous Fault History 5
- FU2-06: Erase Fault History



This code displays up to five previous fault (trip) status of the inverter. Use the [FUNC], [] and [] key before pressing the [RESET] key to check the fault content(s), output frequency, output current, and whether the inverter was accelerating, decelerating, or in constant speed at the time of the fault occurred. Press the [FUNC] key to exit. The fault content will be stored in FU2-01 through FU2-05 when the [RESET] key is pressed. For more detail, please refer to Chapter 7.

[Fault Contents]

| Fault (Trip) | Keypad Display |
|------------------------------|----------------|
| Over-Current 1 | OC |
| Over-Voltage | OV |
| Emergency Stop (Not Latched) | BX |
| Low-Voltage | LV |
| Ground Fault | GF |
| Over-Heat on Heat sink | OH |
| Electronic Thermal Trip | ETH |
| Over-Load Trip | OLT |
| Inverter H/W Fault | HW |
| Output Phase Loss | OPO |
| Input Phase Loss | COL |
| Inverter Over-Load | IOLT |

Note: There is Fan error, EEP error, Wiring error, CPU2 error, Ground fault and NTC error for the inverter Hardware Fault. The inverter will not reset when H/W fault occurs. Repair the fault before turning on the power.

Note: When multiple faults occur, only the highest-level fault will be displayed.

Related Functions: DRV-12 [Fault Display] displays current fault status.



This function erases all fault histories of FU2-01 to FU-05 from the memory.

FU2-07: Dwell Frequency
FU2-08: Dwell Time

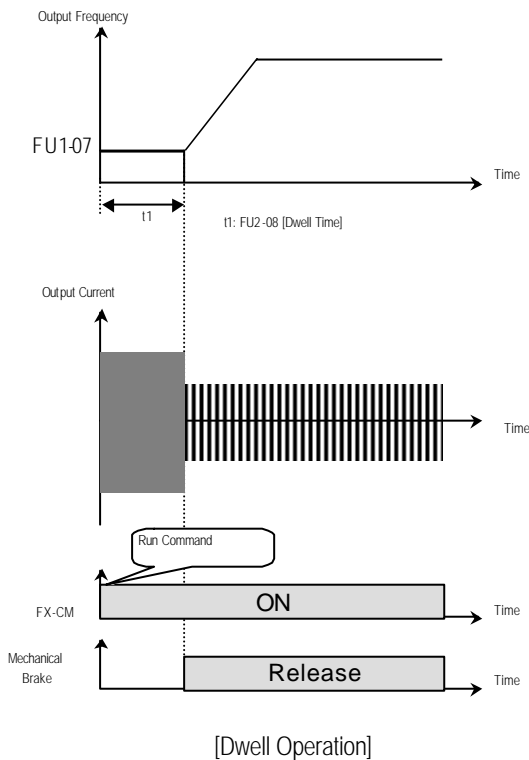


This function is used to output torque in an intended direction. It is useful in hoisting applications to get enough torque before a

Chapter 4 - Parameter Description [FU2]

releasing mechanical brake. If the dwell time is set at '0', this function is not available. In dwell operation, the inverter outputs AC voltage not a DC voltage.

Note: DC Injection Braking does not output torque to an intended direction. It is just to hold the motor.



FU2-10 ~ FU2-16: Frequency Jump

H 10

H 11

H 12

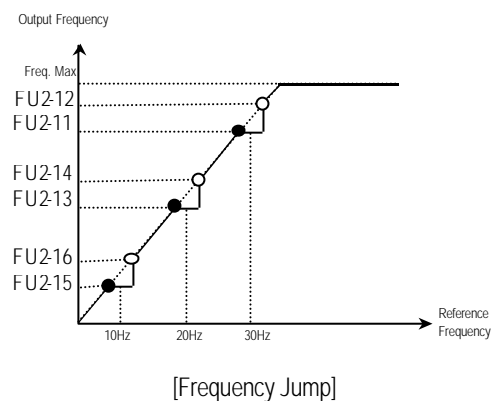
H 13

H 14

H 15

H 16

To prevent undesirable resonance and vibration on the structure of the machine, this function locks out the potential resonance frequency from occurring. Three different jump frequency ranges may be set. This avoidance of frequencies does not occur during accelerating or decelerating. It only occurs during continuous operation.



Note: When the reference frequency is set inside the jump frequency, the output frequency goes to the frequency marked by "●" symbol.

Note: If one frequency jump range is required, set all ranges to the same range.

FU2-19: Input/Output Phase Loss Protection (Bit Set)

H 19

This function is used to cut the inverter output off in case of phase loss in either input power or inverter output.

FU2-19 [Phase Loss Protection Select]

| Setting Range | | FU2-19 | Description |
|---------------------|---------------------|--------|---|
| 2 nd bit | 1 st bit | | |
| 0 | 0 | 00 | Phase loss protection does not work |
| 0 | 1 | 01 | Protect inverter from output phase loss |
| 1 | 0 | 10 | Protect inverter from input phase loss |
| 1 | 1 | 11 | Protect inverter from input and output phase loss |

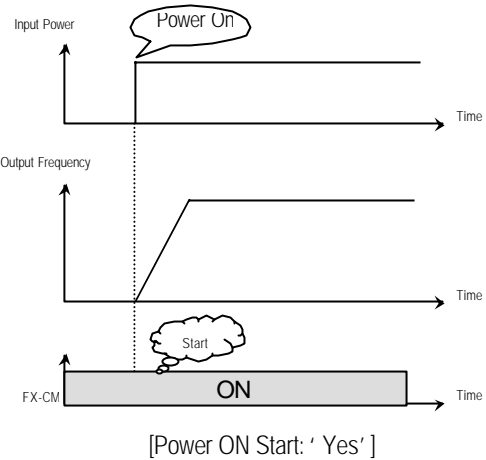
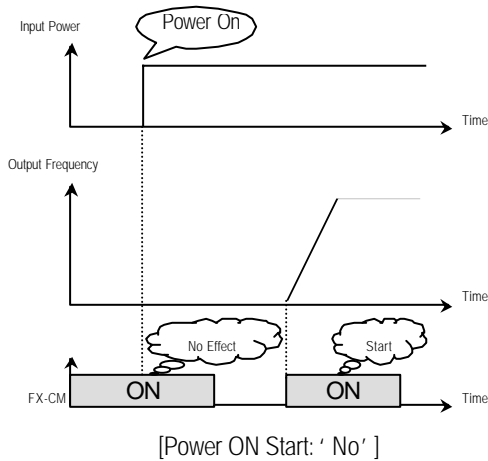
Related Functions: FU2-22 to FU2-25 [Speed Search]

FU2-20: Power ON Start Selection



If FUN-20 is set to 'No', restart the inverter by cycling the FX or RX terminal to CM terminal after power has been restored.

If FUN-20 is set to 'Yes', the inverter will restart after power is restored. If the motor is rotating by inertia at the time power is restored, the inverter may trip. To avoid this trip, use 'Speed Search' function by setting FU2-22 to '1xxx'.



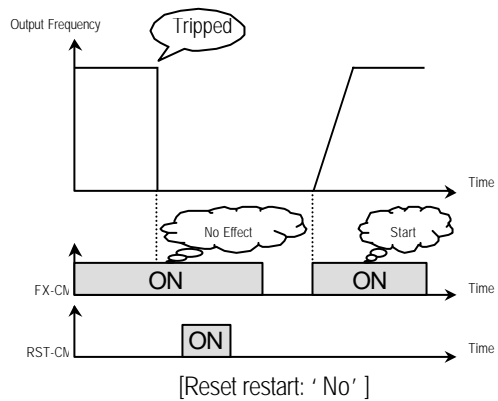
Note: In case of using 'Power ON Start' to 'Yes', make sure to utilize appropriate warning notices to minimize the potential for injury or equipment damage.

Related Functions: FU2-22 ~ FU2-25 [Speed Search]

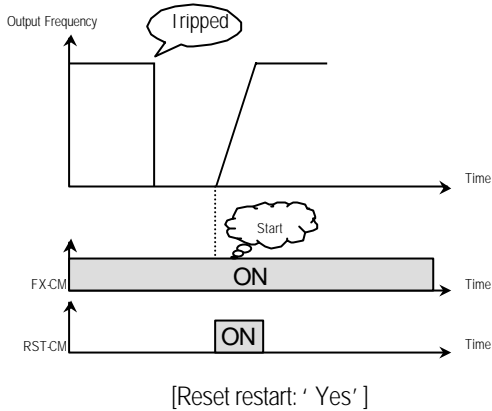
FU2-21: Restart After Fault Reset



If FU2-21 is set to 'Yes', inverter will restart after the RST (reset) terminal has been reset a fault. If FU2-21 is set to 'No', restart the inverter by cycling the FX or RX terminal to CM terminal after the fault has been reset. If the motor is rotating by inertia at the time power is restored, the inverter may trip. To avoid this trip, use 'Speed Search' function by setting FU2-22 to 'xx1x'.



Chapter 4 - Parameter Description [FU2]



Note: In case of using 'Reset Restart' to 'Yes', make sure to utilize appropriate warning notices to minimize the potential for injury or equipment damage.

Related Functions: FU2-22 ~ FU2-25 [Speed Search]

FU2-22: Speed Search Selection (Bit Set)
 FU2-23: Current Limit Level During Speed Search
 FU2-24: P Gain During Speed Search
 FU2-25: I Gain During Speed Search

H 22

H 23

H 24

H 25

This function is used to permit automatic restarting after Power ON, Fault Reset, and Instant Power Failure without waiting for the motor to stop.

The speed search gain should be set after considering the inertia moment (GD^2) and magnitude of torque of the load. FU2-37 [Load

Inertia] must be set at the correct value to make this function operate correctly.

FU2-22 [Speed Search Select]

| Setting Range | | | | Description |
|---------------------|---------------------|---------------------|---------------------|--|
| 4 th bit | 3 rd bit | 2 nd bit | 1 st bit | |
| 0 | 0 | 0 | 0 | Speed search function does not work |
| 0 | 0 | 0 | 1 | Speed search during Accelerating |
| 0 | 0 | 1 | 0 | Speed search during a Fault Reset restarting (FU2-21) and Auto restarting (FU2-26) |
| 0 | 1 | 0 | 0 | Speed search during Instant Power Failure restarting. |
| 1 | 0 | 0 | 0 | Speed search during Power ON starting (FU2-20) |

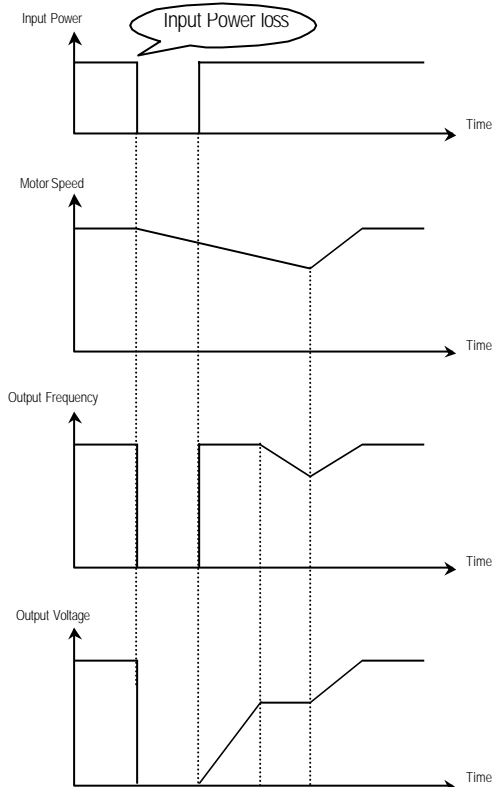
When FU2-22 is set to '1111', Speed Search works for all conditions.

FU2-22 [Speed Search Selection] selects the speed search function.

FU2-23 [Current Limit Level] is the current that the inverter limits its current rise during speed searching. (The set value is the percentage of FU2-33 [Rated Motor Current])

FU2-24 [P Gain] is the proportional gain used for speed search. Set this value according to load inertia set in FU2-37.

FU2-25 [I Gain] is the Integral gain used for speed search. Set this value according to load inertia set in FU2-37.



[Speed Search Operation]

Related Functions: FU2-20 [Power ON Start]
 FU2-21 [Restart after Fault Reset]
 FU2-26 ~ FU2-27 [Auto Restart]
 FU2-30 ~ FU2-37 [Motor Parameters]

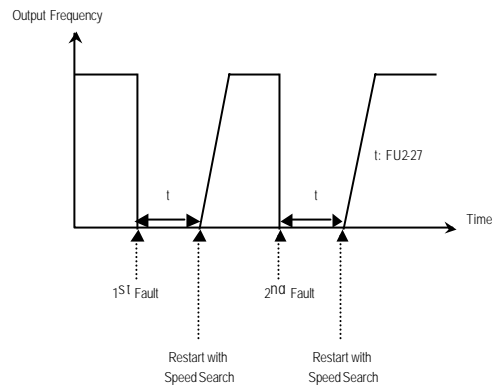
FU2-26: Number of Auto Restart Attempt
FU2-27: Delay Time Before Auto Restart

H 26

H 27

This function is used to allow the inverter to reset itself for a selected number of times after a fault has occurred. The inverter can restart itself automatically when a fault occurs. To use the

speed search function during auto restarting set FU2-22 to 'xx1x'. See FU2-22 ~ FU2-25. When an under voltage (LV) fault, inverter disable (BX) or Arm short occurs, the drive does not restart automatically.



Note: Inverter decreases the retry number by one as a fault occurs. When restarted without a fault during 30 seconds, the inverter increases the retry number by one.

FU2-30: Rated Motor Selection
FU2-31: Number of Motor Pole
FU2-32: Rated Motor Slip
FU2-33: Rated Motor Current
FU2-34: No Load Motor Current
FU2-36: Motor Efficiency
FU2-37: Load Inertia

If you do not set these values, inverter will use its default values.

H 30

This parameter sets the motor capacity. Other motor related parameters are changed automatically according to motor capacity. The motor related parameters are FU2-32 [Rated Motor Slip], FU2-33 [Rated Motor Current], FU2-34 [No Load Motor Current], FU2-42 [Stator Resistance], FU2-43 [Rotor Resistance], and

Chapter 4 - Parameter Description [FU2]

FU2-44 [Leakage Inductance].

If you know the motor parameters, set the values in the relevant codes for better control performance.

(This value is set according to the model number before shipping)

H 31

This is used to display the motor speed. If you set this value to 2, inverter will display 3600 rpm instead 1800rpm at 60Hz output frequency. (See motor nameplate)

H 32

This is used in ' Slip Compensation' control. If you set this value incorrectly, motor may stall during slip compensation control. (See motor nameplate)

H 33

This is very importance parameter that must be set correctly. This value is referenced in many other inverter parameters. (See motor nameplate)

H 34

This parameter is only displayed when ' Slip Compen' is selected in FU2-40 [Control Method].

This function is used to maintain constant motor speed. To keep the motor speed constant, the output frequency varies within the limit of slip frequency set in FU2-32 according to the load current. For example, when the motor speed decreases below the reference speed (frequency) due to a heavy load, the inverter increases the output frequency higher than the reference frequency to increase the motor speed. The inverter increases or decreases the output by delta frequency shown below.

$$\text{Delta Freq.} = \frac{\text{Output current} - \text{No load}}{\text{Rated current} - \text{No load}} \times \text{Rated Slip}$$

Output frequency = Reference freq. + Delta freq.

H 36

This value is used for calculating the output wattage when FU2-72 is set to ' Watt' .

H 37

This parameter is used for sensorless control, minimum Accel/Decel, optimum Accel/Decel and speed search. For better control performance, this value must be set as exact as possible.

Set ' 0' for loads that has load inertia less than 10 times that of motor inertia.

Set ' 1' for loads that have load inertia about 10 times that of motor inertia.

FU2-39: Carrier Frequency

H 39

This parameter affects the audible sound of the motor, noise emission from the inverter, inverter temperature, and leakage current. If the ambient temperature where the inverter is installed is high or other equipment may be affected by potential inverter noise, set this value lower.

This is also used to avoid an induced resonance in the machine or motor.

Note: If this value must be set higher than 3 kHz, derate the load current by 5% per 1 kHz.

FU2-40: Control Method Selection



This is to select the control method of inverter.

| Setting Range | | Description |
|---------------|---------|-----------------------------|
| Select | Display | |
| V/F | 0 | Volts/Hz Control |
| Slip compen | 1 | Slip compensation operation |
| PID | 2 | PID feedback operation |

[V/F]: This parameter controls the voltage/frequency ratio constant. It is recommended to use the torque boost function when a greater starting torque is required.

Related Functions: FU2-26 ~ FU2-28 [Torque Boost]

[Slip compen]: This function is used to maintain constant motor speed. To keep the motor speed constant, the output frequency varies within the limit of slip frequency set in FU2-32 according to the load current. For example, when the motor speed decreases below the reference speed (frequency) due to a heavy load, the inverter increases the output frequency higher than the reference frequency to increase the motor speed. The inverter increases or decreases the output by delta frequency shown below.

$$\text{Delta Freq.} = \frac{\text{Output current} - \text{No load}}{\text{Rated current} - \text{No load}} \times \text{Rated Slip}$$

Output frequency = Reference freq. + Delta freq.

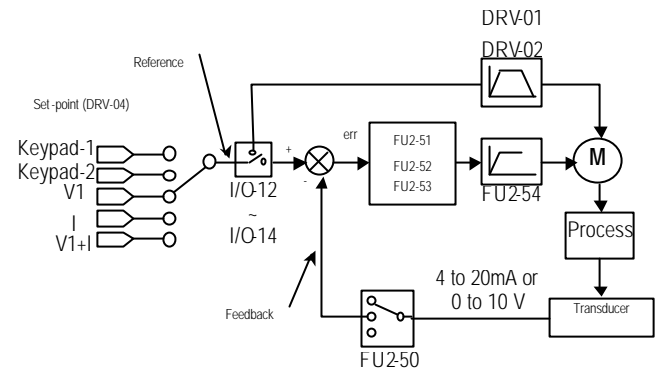
Note: Motor parameters must be set correctly for better performance of control.

Related Functions: FU2-30 ~ FU2-37 [Motor Parameters]

[PID]: For HVAC or Pump applications, the PID control can be used to adjust the actual output by comparing a feedback with a 'Set-point' given to

the inverter. This 'Set-point' can be in the form of Speed, Temperature, Pressure, Flow level, etc. The 'Set-point' and the feedback signals are provided externally to the inverter analog input terminals V1, V2 or I. The inverter compares the signals in calculating 'total-error' which is reflected in the inverter output.

Please see FU2-50 to FU2-54 for more detail.



[PID Control Block Diagram]

Note: PID control can be bypassed to manual operation temporarily by defining one of the multifunction input terminals (P1-P3) to "Open-Loop". The inverter will change to manual operation from PID control when this terminal is ON, and change back to PID control when this terminal is OFF.

Related Functions: DRV-04 [Frequency Mode]
 I/O-01 to I/O-10 [Analog Signal Setting]
 I/O-12 to I/O-14 [Multi-Function Input]
 FU2-50 to FU2-54 [PID Feedback]

FU2-50: PID Feedback Signal Selection
FU2-51: P Gain for PID Control
FU2-52: I Gain for PID Control
FU2-53: D Gain for PID Control
FU2-54: Limit Frequency for PID Control



Select the feedback signal for PID control. This can be set one of 'I', 'V1', 'V2' according to the signal (current or voltage) and the terminal (V1 or V2).

Chapter 4 - Parameter Description [FU2]

H 51

Set the proportional gain for PID control. When P-Gain is set at 100% and I-Gain at 0.0 second, it means the PID controller output is 100% for 100% error value.

H 52

Set the integral gain for PID control. This is the time the PID controller takes to output 100% for 100% error value.

H 53

Set the differential gain for PID control.

H 54

This is the frequency at which the output frequency is limited during PID control.

[P Control] This is to compensate the error of a system proportionally. This is used to make the controller response fast for an error. When P control is used alone, the system is easily affected by an external disturbance during steady state.

[I Control] This is to compensate the error of a system integrally. This is used to compensate the steady state error by accumulating them. Using this control alone makes the system unstable.

[PI control] This control is stable in many systems. If “D control” is added, it becomes the 3rd order system. In some systems this may lead to system instability.

[D Control] Since the D control uses the variation ratio of error, it has the merit of controlling the

error before the error is too large. The D control requires a large control quantity at start, but has the tendency of increasing the stability of the system. This control does not affect the steady state error directly, but increases the system gain because it has an attenuation effect on the system. As a result, the differential control component has an effect on decreasing the steady state error. Since the D control operates on the error signal, it cannot be used alone. Always use it with the P control or PI control.

Related Functions: DRV-04 [Frequency Mode]
FU2-40 [Control Method]
I/O-01 ~ I/O-10 [Analog Signal Scaling]

FU2-70: Reference Frequency for Accel/Decel

H 70

This is the reference frequency for acceleration and deceleration. If a decided Accel/Decel time from a frequency to a target frequency is required, set this value to ‘Delta freq’.

| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| Max freq | 0 | The Accel/Decel time is the time that takes to reach the maximum frequency from 0 Hz. |
| Delta freq | 1 | The Accel/Decel time is the time that takes to reach a target frequency from a frequency (currently operating frequency). |

Related Functions: DRV-01, DRV-02 [Accel/Decel Time]
FU2-71 [Accel/Decel Time Scale]
I/O-25 ~ I/O-38 [1st ~ 7th Accel/Decel Time]

FU2-71: Accel/Decel Time Scale



This is used to change the time scale.

Related Functions: DRV-01, DRV-02 [Accel/Decel Time]
FU2-70 [Reference Freq. for Accel/Decel]
I/O-25 ~ I/O-38 [1st ~ 7th Accel/Decel Time]

| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| 0.01 sec | 0 | The Accel/Decel time is changed by 0.01 second. The maximum setting range is 600 seconds. |
| 0.1 sec | 1 | The Accel/Decel time is changed by 0.1 second. The maximum setting range is 6000 seconds. |
| 1 sec | 2 | The Accel/Decel time is changed by 1 second. The maximum setting range is 60000 seconds. |

FU2-72: Power On Display



This code selects the parameter to be displayed first on keypad (DRV-00) when the power is turned on.

| Setting Range | Description |
|---------------|----------------------------|
| 0 | DRV-00 [Command Frequency] |
| 1 | DRV-01 [Acceleration Time] |
| 2 | DRV-02 [Deceleration Time] |
| 3 | DRV-03 [Drive Mode] |
| 4 | DRV-04 [Frequency Mode] |
| 5 | DRV-05 [Step Frequency 1] |
| 6 | DRV-06 [Step Frequency 2] |
| 7 | DRV-07 [Step Frequency 3] |
| 8 | DRV-08 [Output Current] |
| 9 | DRV-09 [Motor Speed] |
| 10 | DRV-10 [DC link Voltage] |

| | |
|----|--|
| 11 | DRV-11 [User Display selected in FU2-73] |
| 12 | DRV-12 [Fault Display] |
| 13 | DRV-13 [Motor Direction] |

FU2-73: User Display Selection



This code selects the kind of display to be displayed in code DRV-11.

| Setting range | | Description |
|---------------|---------|--|
| Select | Display | |
| Voltage | 0 | Displays the output voltage of inverter. |
| Watt | 1 | Displays the output power of inverter. |
| Torque | 2 | Displays the output torque of inverter. |

Note: The display of 'Watt' and 'Torque' is approximate value.

Related Functions: DRV-11 [User Display]

FU2-74: Gain for Motor Speed Display



This code is used to change the motor speed display to rotating speed (r/min) or mechanical speed (m/min). The display is calculated by following equation.

Rotating speed = $120 \times F / P$, where F=Output frequency, P= motor pole number

Mechanical speed = Rotating speed x Motor RPM Display Gain

Related Functions: DRV-00 [Output Frequency]
DRV-09 [Motor Speed]
FU2-31 [Number of Motor Pole]

Chapter 4 - Parameter Description [FU2]

FU2-75: DB (Dynamic Braking) Resistor Mode Selection

H 75

This code is used to protect the DB resistor from over heating.

| Setting Range | | Description |
|---------------|---------|--|
| Select | Display | |
| None | 0 | This is selected when there is no resistor connected. At this time, inverter does not generate DB turn on signal. |
| None | 1 | |
| Ext. DB-R | 2 | This is selected when using an external DB resistor. Enable Duty (%): 0 ~ 30 % Continuous Turn On Time: 15 seconds |

The inverter turns the DB turn on signal OFF when the Continuous Turn On Time expires during dynamic braking, and an over voltage fault can occur. When this happens, increase the deceleration time or install an external high-duty DB resistor.

Install an exterior high-duty DB resistor when the load accelerates and decelerates frequently. Set the FU2-75 [DB Resistor Mode selection] to ' Ext. DB-R' , and set the FU2-76 [Duty of DB Resistor].

FU2-76: Duty of DB (Dynamic Braking) Resistor

H 76

This must be set when using an external DB resistor. The duty is calculated by ' $\%ED = \text{Decel time} * 100 / (\text{Accel time} + \text{Steady speed time} + \text{Decel time} + \text{Stop status time})$ ' .

FU2-79: Software Version

H 79

Displays the software version.

FU2-81 ~ FU2-90: 2nd Motor Related Functions

H 81

H 90

These functions are displayed only when one of the multifunction inputs is set at ' 2nd func' in I/O-12 to I/O-14.

When using two motors with an inverter by exchanging them, different values can be set for the 2nd motor by using the multifunction input terminal.

Following table is the 2nd functions corresponding to the 1st functions.

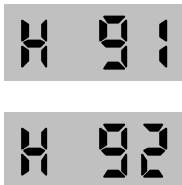
| 2 nd Functions | 1 st Functions | Description |
|---------------------------|---------------------------|--------------------------|
| FU2-81 [2nd Acc time] | DRV-01 [Acc. time] | Acceleration time |
| FU2-82 [2nd Dec time] | DRV-02 [Dec. time] | Deceleration time |
| FU2-83 [2nd BaseFreq] | FU1-21 [Base freq] | Base Frequency |
| FU2-84 [2nd V/F] | FU1-29 [V/F Pattern] | Volts/Hz mode |
| FU2-85 [2nd F-boost] | FU1-27 [Fwd Boost] | Forward torque boost |
| FU2-86 [2nd R-boost] | FU1-28 [Rev Boost] | Reverse torque boost |
| FU2-87 [2nd Stall] | FU1-60 [Stall Level] | Stall prevention level |
| FU2-88 [2nd ETH 1min] | FU1-51 [ETH 1min] | ETH level for 1 minute |
| FU2-88 [2nd ETH cont] | FU1-52 [ETH cont] | ETH level for continuous |
| FU2-90 [2nd R-Curr] | FU2-33 [Rated-Curr] | Motor rated current |

The 1st functions are applied if the multifunction terminal is not defined to ' 2nd Func ' or if it is not ON. The 2nd function parameters are applied when the multifunction input terminal set to ' 2nd Func ' is ON. Parameters not listed on the table above are applied to the 2nd motor as to the 1st motor.

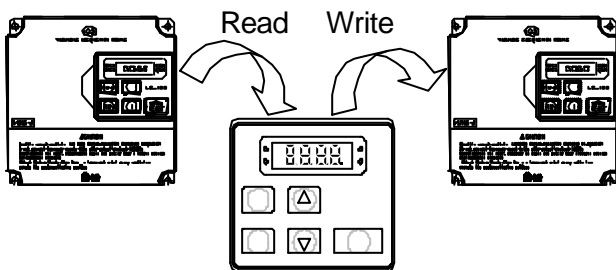
Exchange the motor connection from the 1st motor to the 2nd motor or the opposite when the motor is stopped. Over voltage or over current fault can occur when the motor connection is exchanged during operation.

The ' User V/F ' function of FU1-29 [V/F Pattern] is used for both the 1st motor and the 2nd motor .

FU2-91: Parameter Read
FU2-92: Parameter Write



This is useful for programming multiple inverters to have same parameter settings. The keypad can read (upload) the parameter settings from the inverter memory and can write (download) them to other inverters.



FU2-93: Parameter Initialize



This is used to initialize parameters back to the factory default values. Each parameter group can be initialized separately.

| Setting Range | | Description |
|---------------|---------|--|
| Select | Display | |
| No | 0 | Displayed after initializing parameters. |
| All Groups | 1 | All parameter groups are initialized to factory default value. |
| DRV | 2 | Only Drive group is initialized. |
| FU1 | 3 | Only Function 1 group is initialized. |
| FU2 | 4 | Only Function 2 group is initialized. |
| I/O | 5 | Only Input/Output group is initialized. |

Note: FU1-30 ~ FU1-37 [Motor Parameters] must be set first after initializing parameters.

FU2-94: Parameter Write Protection



This function is used to lock the parameters from being changed. When the parameters are locked, the display arrow changes from solid to dashed line.

The lock and unlock code is ' 12 ' .

FU2-99: Return Code



This code is used to exit a group. Press [FUNC] key to exit.

Related Functions: FU1-99 [Return Code]
I/O-99 [Return Code]

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4.4 Input/Output Group [I/O]

I/O-00: Jump to Desired Code



Jumping directly to any parameter code can be accomplished by entering the desired code number.

I/O-01 ~ I/O-05: Analog Voltage Input (V1) Signal Adjustment

This is used to adjust the analog voltage input signal when the frequency is referenced by the control terminal ' V1' . This function is applied when DRV-04 is set to ' V1' or ' V1+f' . Reference frequency versus Analog voltage input curve can be made by four parameters of I/O-02 ~ I/O-04.



This is the filtering time constant for V1 signal input. Increase this value if the V1 signal is affected by noise causing unstable operation of the inverter. Increasing this value makes response time slower.



This is the minimum voltage of the V1 input at which inverter outputs minimum frequency.



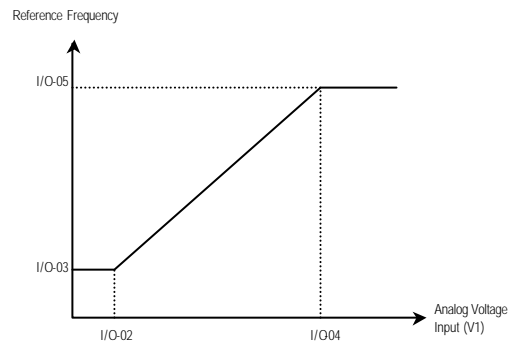
This is the inverter output minimum frequency when there is the minimum voltage (I/O-02) on the V1 terminal.



This is the maximum voltage of the V1 input at which inverter outputs maximum frequency.



This is the inverter output maximum frequency when there is the maximum voltage (I/O-03) on the V1 terminal.



[Reference Frequency vs. Analog Voltage Input, V1 (0 to 10V)]

Related Functions: DRV-04 [Frequency Mode]
FU1-20 [Maximum Frequency]

I/O-06 ~ I/O-10: Analog Current Input (I) Signal Adjustment

This is used to adjust the analog current input signal when the terminal ' I' references the frequency. This function is applied when DRV-04 is set to ' V1' or ' V1+f' . Reference frequency versus Analog current input curve can be made by four parameters of I/O-07 ~ I/O-10.



This is the filtering time constant for ' I' signal input.

Chapter 4 - Parameter Description [I/O]

If the 'I' signal is affected by noise causing unstable operation of the inverter, increase this value. Increasing this value makes response time slower.



This is the minimum current of the 'I' input at which inverter outputs minimum frequency.



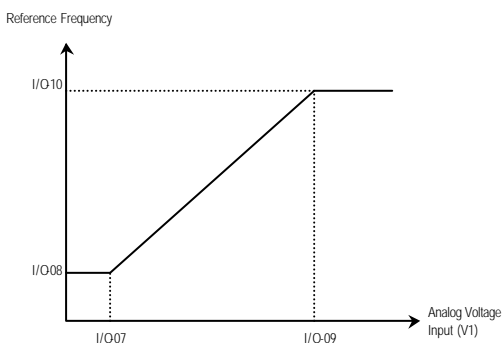
This is the inverter output minimum frequency when there is minimum current (I/O-07) on the 'I' terminal.



This is the maximum current of the 'I' input at which inverter outputs maximum frequency.



This is the inverter output maximum frequency when there is the maximum current (I/O-09) on the 'I' terminal.



[Reference Frequency vs. Analog Current Input, I (4 to 20mA)]

Related Functions: DRV-04 [Frequency Mode]
FU1-20 [Maximum Frequency]

I/O-11: Criteria for Analog Input Signal Loss



This is to set the criteria for analog input signal loss when DRV-04 [Frequency Mode] is set to 'V1', 'I' or 'V1+I'. Following table shows the setting value.

| Setting Range | | Description |
|---------------|---------|--|
| Select | Display | |
| None | 0 | Does not check the analog input signal. |
| half of x1 | 1 | The inverter determines that the frequency reference is lost when the analog input signal is less than half of the minimum value (I/O-02 or I/O-07). |
| below x1 | 2 | The inverter determines that the frequency reference is lost when the analog input signal is less than the minimum value (I/O-02 or I/O-07). |

When the analog input signal is lost, inverter displays the following.



Related Functions: I/O-48 [Lost command] selects the operation after determining the loss of frequency reference.

The following table shows the selection in I/O-48.

| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| None | 0 | Continuous operating after loss of frequency reference. |
| FreeRun | 1 | Inverter cuts off its output after determining loss of frequency reference. |
| Stop | 2 | Inverter stops by its Decel pattern and Decel time after determining loss of frequency reference. |

I/O-49 [Time out] sets the waiting time before determining the loss of reference signal. Inverter waits to determine the loss of a reference signal

until times out.

Note: I/O-48 and I/O-49 also apply when DRV-04 is set to 'Keypad-1' or 'Keypad-2' for determining the loss of command frequency.

| | |
|---------------------------|--|
| Related Functions: | DRV-04 [Frequency Mode] I/O-02 [V1 Input Minimum Voltage] I/O-07 [I Input Minimum Current] I/O-48 [Lost command] I/O-49 [Time out] |
|---------------------------|--|

I/O-12: Multi-function Input Terminal ' P1' Define
I/O-13: Multi-function Input Terminal ' P2' Define
I/O-14: Multi-function Input Terminal ' P3' Define



Multi-function input terminals can be defined for many different applications. The following table shows the various definitions for them.

| Setting Range | | Description |
|---------------|---------|-----------------------------------|
| Select | Display | |
| Speed-L | 0 | Multi-step speed - Low |
| Speed-M | 1 | Multi-step speed - Mid |
| Speed-H | 2 | Multi-step speed - High |
| XCEL-L | 3 | Multi-accel/decel - Low |
| XCEL-M | 4 | Multi-accel/decel - Mid |
| XCEL-H | 5 | Multi-accel/decel - High |
| DC-Brake | 6 | DC injection braking during stop |
| 2nd Func | 7 | Reserved for future use |
| -Reserved- | 8 | Exchange to commercial power line |
| -Reserved- | 9 | Reserved for future use |
| Up | 10 | Up drive |
| Down | 11 | Down drive |
| 3-Wire | 12 | 3 wire operation |
| Ext Trip-A | 13 | External trip A |
| Ext Trip-B | 14 | External trip B |
| -Reserved- | 15 | Reserved for future use |

| Setting Range | | Description |
|---------------|---------|--|
| Select | Display | |
| Open-Loop | 16 | Exchange between PID mode and V/F mode |
| -Reserved- | 17 | Reserved for future use |
| Analog Hold | 18 | Hold the analog input signal |
| XCEL Stop | 19 | Disable accel and decel |
| -Reserved- | 20 | Reserved for future use |
| | 21 | |
| | 22 | |
| | 23 | |
| | 24 | |
| | 25 | |
| | 26 | |

[Speed-L, Speed-M, Speed-H]

By setting P1, P2, P3 terminals to ' Speed-L' , ' Speed-M' and ' Speed-H' respectively, inverter can operate at the preset frequency set in DRV-05 ~ DRV-07 and I/O-20 ~ I/O-24.

The step frequencies are determined by the combination of P1, P2 and P3 terminals as shown in the following table.

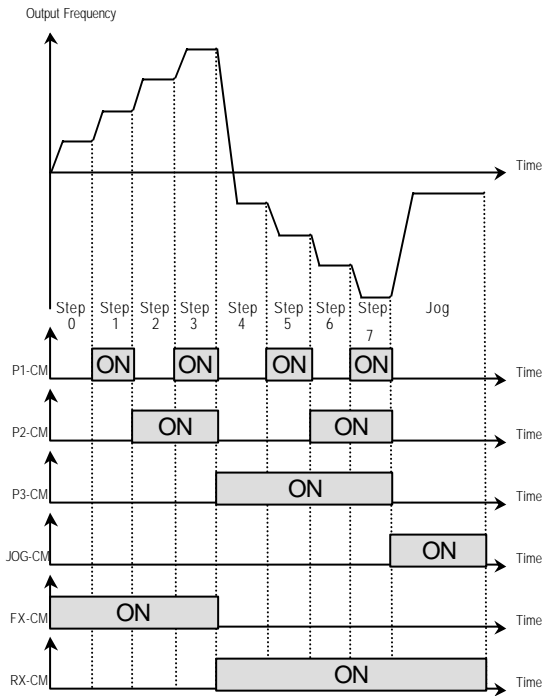
| Step Frequency | Parameter Code | Speed-H (P3) | Speed-M (P2) | Speed-L (P1) |
|----------------|----------------|--------------|--------------|--------------|
| Step Freq-0 | DRV-00 | 0 | 0 | 0 |
| Step Freq-1 | DRV-05 | 0 | 0 | 1 |
| Step Freq-2 | DRV-06 | 0 | 1 | 0 |
| Step Freq-3 | DRV-07 | 0 | 1 | 1 |
| Step Freq-4 | I/O-21 | 1 | 0 | 0 |
| Step Freq-5 | I/O-22 | 1 | 0 | 1 |
| Step Freq-6 | I/O-23 | 1 | 1 | 0 |
| Step Freq-7 | I/O-24 | 1 | 1 | 1 |

0: OFF, 1: ON

I/O-20 [Jog Frequency] can be used as one of the step frequencies.

If the ' Jog' terminal is ON, inverter operates to Jog frequency regardless of other terminal inputs.

Chapter 4 - Parameter Description [I/O]



[Multi-Step Frequency Operation]

Related Functions: DRV-05 ~ DRV-07 [Step Frequency]
I/O-20 [Jog Frequency]
I/O-21 ~ I/O-24 [Step Frequency]

Note: The frequency for 'Speed 0' is determined by DRV-04.

[XCEL-L, XCEL-M, XCEL-H]

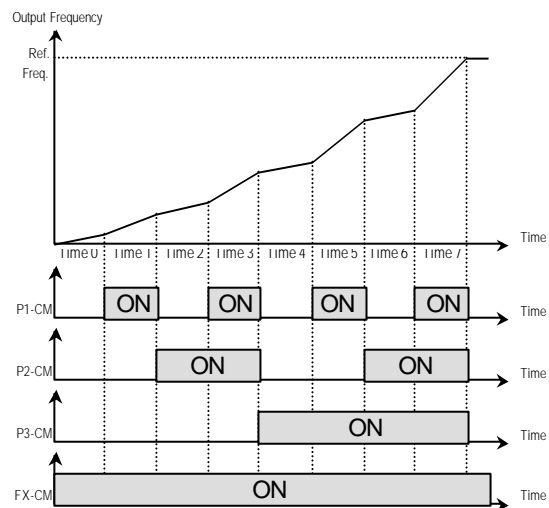
By setting P1, P2 and P3 terminals to 'XCEL-L', 'XCEL-M' and 'XCEL-H' respectively, up to 8 different Accel and Decel times can be used. The Accel/Decel time is set in DRV-01 ~ DRV-02 and I/O-25 ~ I/O-38.

The Accel/Decel time is determined by the combination of P1, P2 and P3 terminals as shown in the following table.

| Accel/Decel Time | Parameter Code | XCEL-H (P3) | XCEL-M (P2) | XCEL-L (P1) |
|------------------|----------------|-------------|-------------|-------------|
| Accel Time-0 | DRV-01 | 0 | 0 | 0 |
| Decel Time-0 | DRV-02 | | | |
| Accel Time-1 | I/O-25 | 0 | 0 | 1 |
| Decel Time-1 | I/O-26 | | | |

| Accel/Decel Time | Parameter Code | XCEL-H (P3) | XCEL-M (P2) | XCEL-L (P1) |
|------------------|----------------|-------------|-------------|-------------|
| Accel Time-2 | I/O-27 | 0 | 1 | 0 |
| Decel Time-2 | I/O-28 | | | |
| Accel Time-3 | I/O-29 | 0 | 1 | 1 |
| Decel Time-3 | I/O-30 | | | |
| Accel Time-4 | I/O-31 | 1 | 0 | 0 |
| Decel Time-4 | I/O-32 | | | |
| Accel Time-5 | I/O-34 | 1 | 0 | 1 |
| Decel Time-5 | I/O-35 | | | |
| Accel Time-6 | I/O-36 | 1 | 1 | 0 |
| Decel Time-6 | I/O-37 | | | |
| Accel Time-7 | I/O-38 | 1 | 1 | 1 |
| Decel Time-7 | I/O-39 | | | |

0: OFF, 1: ON



[Multi-Accel/Decel Time Operation]

Related Functions: I/O-25 ~ I/O-38 [1st ~ 7th Accel/Decel Time]

[DC-Brake]

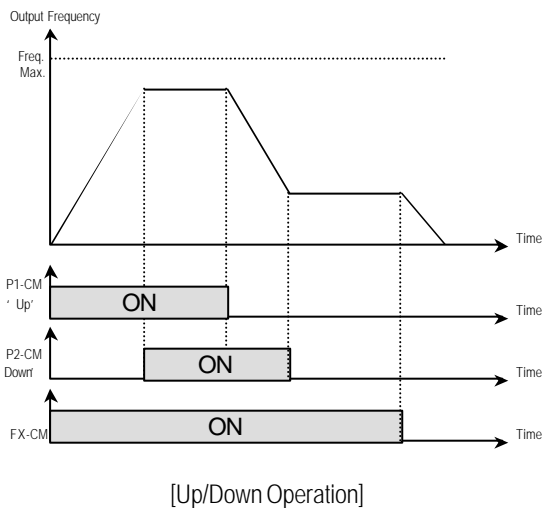
DC Injection Braking can be activated during inverter stopped by configuring one of the multi-function input terminals (P1, P2, P3) to 'DC-Brake'. To activate the DC Injection Braking, close the contact on the assigned terminal while the inverter is stopped.

[2nd Function]

Inverter uses parameters set in FU2-81 ~ 89 when this terminal is ON. This function must be used when motor is stopped to avoid over current or over voltage trip.

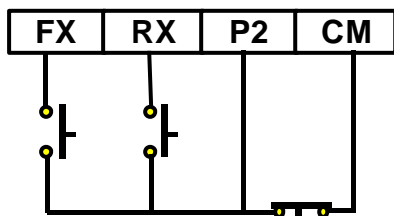
[Up, Down]

By using the Up and Down function, the drive can accelerate to a steady speed and decelerate down to a desired speed by using only two input terminals.

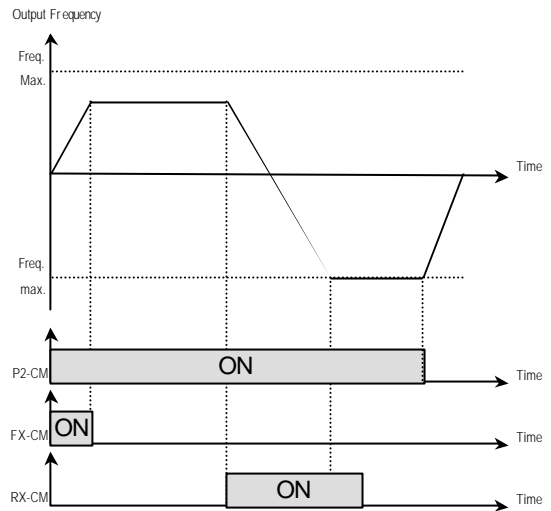


[3-Wire]

This function is for 3-wire start/stop control. This function is mainly used with a momentary push button to hold the current frequency output during acceleration or deceleration.



[Wiring for 3-Wire Operation, P2 set to ' 3-Wire']



[3-Wire Operation]

[Ext Trip-A]

This is a normally open contact input. When a terminal set to ' Ext Trip-A' is ON, inverter displays the fault and cuts off its output. This can be used as an external latch trip.

[Ext Trip-B]

This is a normally closed contact input. When a terminal set to ' Ext Trip-B' is OFF, inverter displays the fault and cuts off its output. This can be used as an external latch trip.

[Open-Loop]

This is used to exchange the control mode of inverter from PID mode (Close Loop) to V/F mode (Open Loop).

DRV-03 [Drive Mode] and DRV-04 [Frequency Mode] are applied when the mode has been changed.

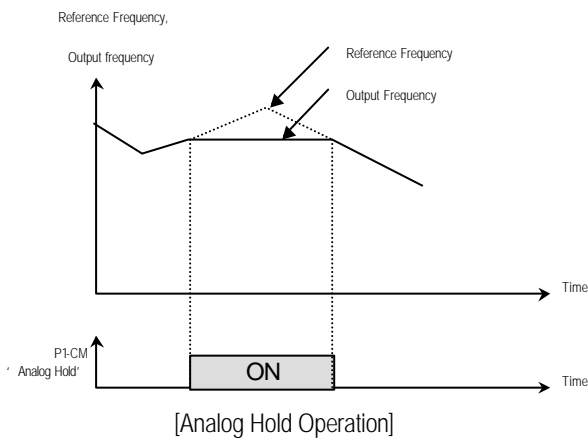
Note: This function can be used only when the inverter is stopped.

Chapter 4 - Parameter Description [I/O]

[Analog Hold]

When there is an analog input signal for frequency reference and 'Analog hold' terminal is ON, inverter fixes its output frequency regardless of the frequency reference change. The changed frequency reference is applied when the terminal is OFF.

This function is useful when a system requires constant speed after acceleration.



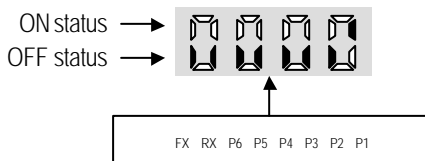
I/O-15: Terminal Input Status I/O-16: Terminal Output Status

1 15

This code displays the input status of control terminals. Terminals P4, P5, P6 and Q1, Q2, Q3 are provided on optional Sub-Board.

[7-Segment Keypad Display]

The 'JOG' terminal is not displayed on 7-Segment keypad.

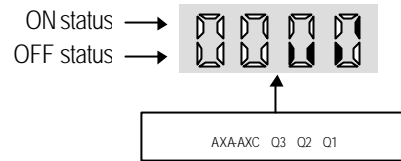


1 16

This code displays the output status of control terminals.

[7-Segment Keypad Display]

The 'JOG' terminal is not displayed on 7-Segment keypad.



I/O-17: Filtering Time Constant for Multi-function Input Terminals

1 17

This is the response time constant for terminal inputs (JOG, FX, RX, P3, P2, P1, RST, BX). This is useful where there is a potential for noise. The response time is determined by 'Filtering time constant * 0.5msec'.

I/O-20: Jog Frequency

1 20

This code sets the jog frequency. See [Speed-L, Speed-M, Speed-H] in I/O-12 ~ I/O-14.

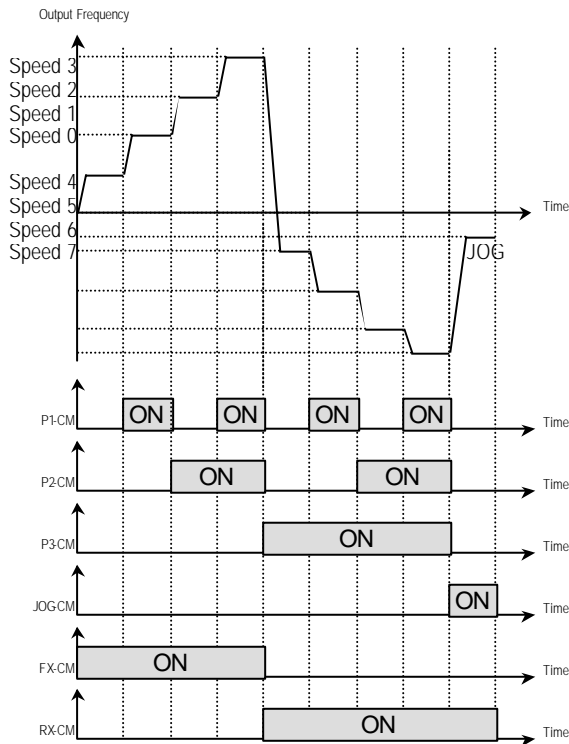
I/O-21 ~ I/O-24: Step Frequency 4, 5, 6, 7

1 21

1 24

These codes set the step frequencies. These frequencies are applied when the multi-function input terminals (P1, P2, P3) select the step. See [Speed-L, Speed-M, Speed-H] in I/O-12 ~ I/O-14.

Related Functions: DRV-05 ~ DRV-07 [Step Frequency 1 ~ 3]
I/O-12 ~ I/O-14 [Multi-function inputs]
I/O-17 [Filtering Time Constant]



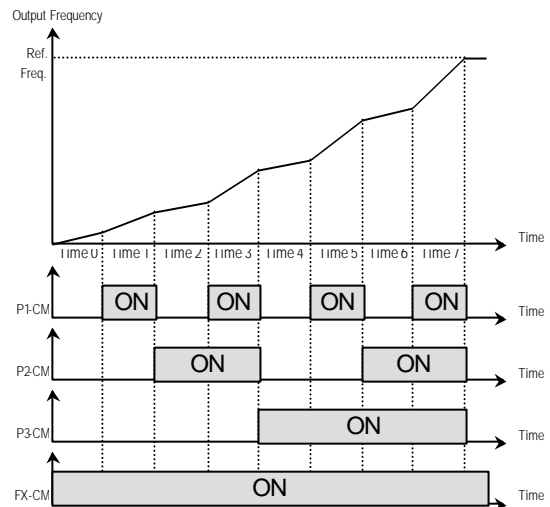
['JOG' and 'Multi-Step' Operation]

I/O-25 ~ I/O-38: 1st ~ 7th Accel/Decel Time

1 25

1 38

These codes are applied when the multi-function input terminals (P1, P2, P3) select the Accel/Decel time. See [XCEL-L, XCEL-M, XCEL-H] in I/O-12 ~ I/O-14.



[Multi-Accel/Decel Time Operation]

Related Functions: I/O-25 ~ I/O-38 [1st ~ 7th Accel/Decel Time]

Related Functions: DRV-01 ~ DRV-02 [Accel/Decel Time]
FU2-70 [Reference Freq. for Accel/Decel]
FU2-71 [Accel/Decel Time Scale]
I/O-12 ~ I/O-14 [Multi-function inputs]

I/O-40: FM (Frequency Meter) Output
I/O-41: FM Adjustment

1 40

1 41

Frequency meter displays the inverter output Frequency, Current, Voltage and DC link voltage

Chapter 4 - Parameter Description [I/O]

with pulse signals on the FM terminal. The average ranges from 0V to 10V. I/O-41 is used to adjust the FM value.

[Frequency]

FM terminal outputs inverter output frequency.

The output value is determined by,

$$\text{FM Output Voltage} = (\text{Output freq.} / \text{Max. freq.}) \times 10\text{V} \times \text{IO-41} / 100$$

[Current]

FM terminal outputs inverter output current. The output value is determined by,

$$\text{FM Output Voltage} = (\text{Output current} / \text{Rated current}) \times 10\text{V} \times \text{IO-41} / 150$$

[Voltage]

FM terminal outputs inverter output voltage. The output value is determined by,

$$\text{FM Output Voltage} = (\text{Output voltage} / \text{Max. output voltage}) \times 10\text{V} \times \text{IO-41} / 100$$

[DC link vtg]

FM terminal outputs the DC link voltage of inverter.

The output value is determined by,

$$\text{FM Output Voltage} = (\text{DC link voltage} / \text{Max. DC link voltage}) \times 10\text{V} \times \text{IO-41} / 100$$

I/O-42: FDT (Frequency Detection) Level

I/O-43: FDT Bandwidth

1 42

1 43

These functions are used in I/O-44 [Multi-function Output]. See [FDT-#] in I/O-44.

Related Functions: I/O-44 [Multi-function Output]

I/O-44: Multi-function Output define (MO-MG)

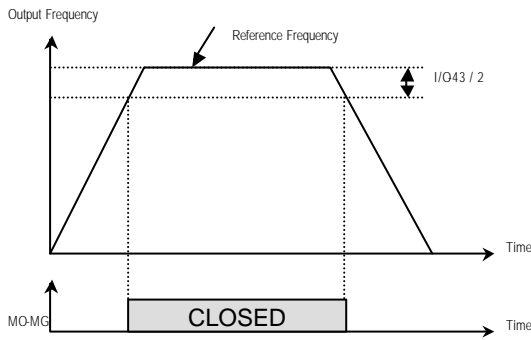
1 44

The opencollector output works (Close) when the defined condition has occurred.

| Setting Range | | Description |
|---------------|---------|---|
| Select | Display | |
| FDT-1 | 0 | Output frequency arrival detection |
| FDT-2 | 1 | Specific frequency level detection |
| FDT-3 | 2 | Frequency detection with pulse |
| FDT-4 | 3 | Frequency detection with contact closure |
| FDT-5 | 4 | Frequency detection with contact closure (inverted FDT-4) |
| OL | 5 | Overload detection |
| IOL | 6 | Inverter overload detection |
| Stall | 7 | Stall prevention mode detection |
| OV | 8 | Over voltage detection |
| LV | 9 | Low voltage detection |
| OH | 10 | Overheat detection |
| Lost Command | 11 | Lost command detection |
| Run | 12 | Inverter running detection |
| Stop | 13 | Inverter stop detection |
| Steady | 14 | Steady speed detection |
| -Reserved- | 15-16 | Reserved for future use |
| Ssearch | 17 | Speed search mode detection |
| -Reserved- | 18-19 | Reserved for future use |
| Ready | 20 | Inverter ready detection |

[FDT-1]

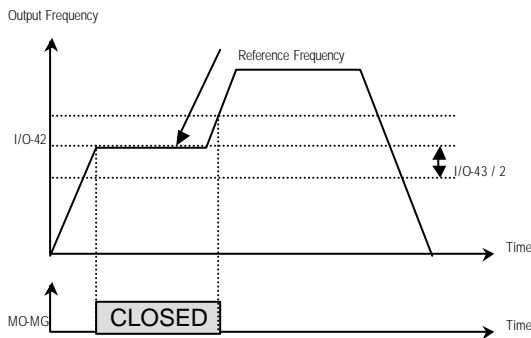
When the output frequency reaches the reference frequency (target frequency), MO-MG terminal is CLOSED.



[MO-MG configured as ' FDT-1']

[FDT-2]

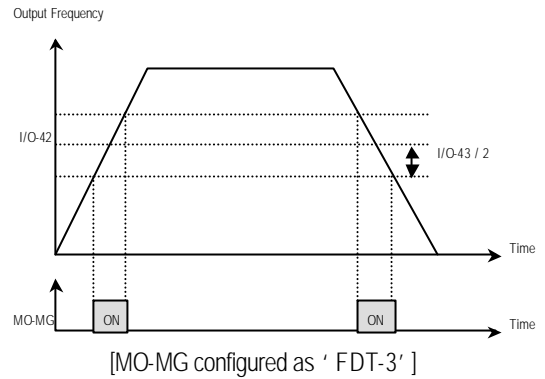
MO-MG is CLOSED when the reference frequency is in I/O-43 [FDT Bandwidth] centered on I/O-42 [FDT Frequency], and the output frequency reaches I/O-43 centered on I/O-42.



[MO-MG configured as ' FDT-2']

[FDT-3]

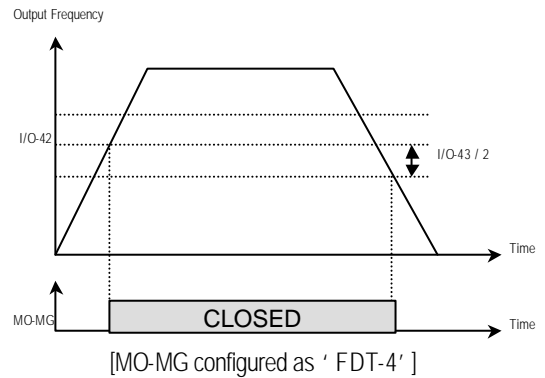
MO-MG is CLOSED when the output frequency reaches the band centered on the FDT frequency. The output is OPENED when the output frequency goes outside the FDT bandwidth centered on the FDT frequency.



[MO-MG configured as ' FDT-3']

[FDT-4]

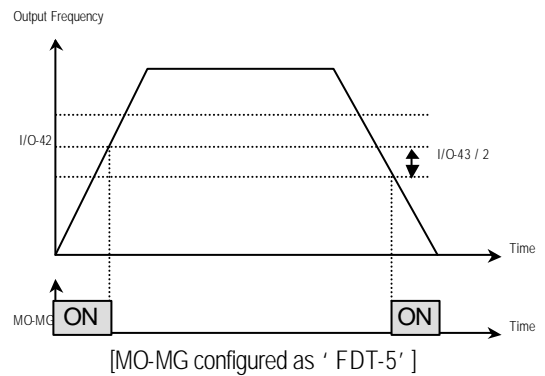
MO-MG is CLOSED when the output frequency reaches the FDT frequency. The output is OPENED when the output frequency goes below the FDT bandwidth centered on the FDT frequency.



[MO-MG configured as ' FDT-4']

[FDT-5]

This is the inverted output of [FDT-4].

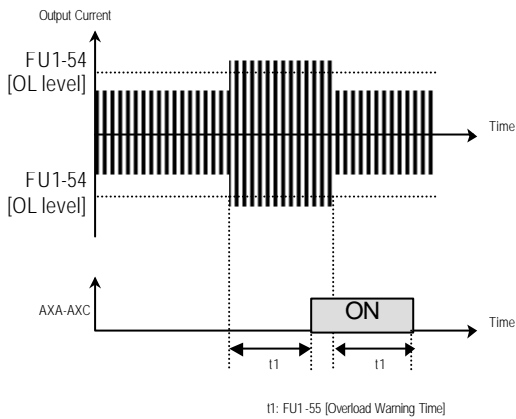


[MO-MG configured as ' FDT-5']

Chapter 4 - Parameter Description [I/O]

[OL]

MO-MG is CLOSED when the output current has reached the FU1-54 [Overload Warning Level] for the FU1-55 [Overload Warning Time].

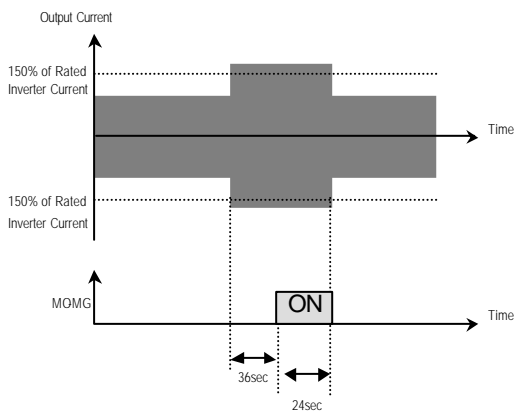


[[AXA-AXC configured as ' OL']

Related Functions: FU1-54 [Overload Warning Level]
FU1-55 [Overload Warning Time]

[IOL]

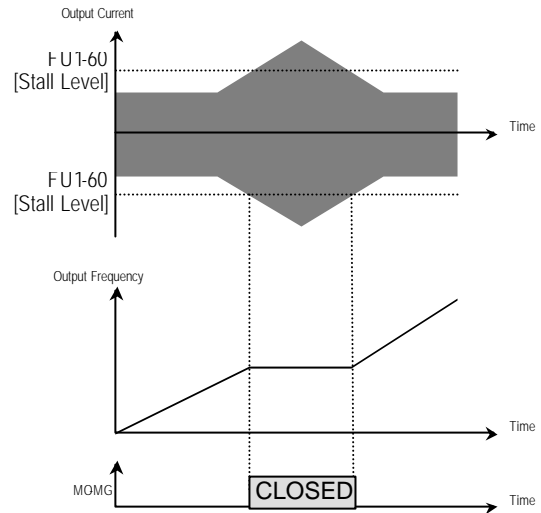
MO-MG is CLOSED when the output current is above the 150% of rated inverter current for 36 seconds. If this situation is continued for one minute, the inverter will cut off its output and displays ' IOL' (Inverter overload) Trip. See the nameplate for the rated inverter current.



[MO-MG configured as ' IOL']

[Stall]

MO-MG is CLOSED when the inverter is on the stall prevention mode.

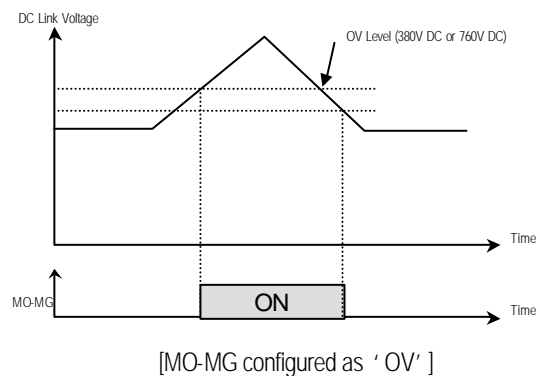


[MO-MG configured as ' Stall']

Related Functions: FU1-59 [Stall Prevention Mode]
FU1-60 [Stall Prevention Level]

[OV]

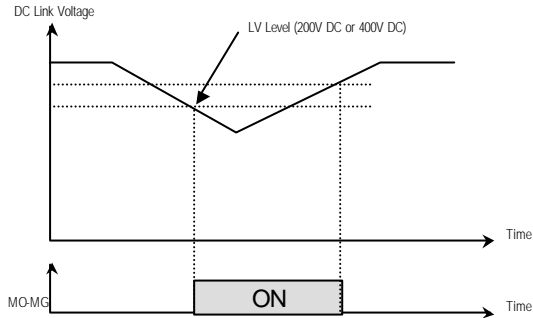
MO-MG is CLOSED when the DC link voltage is above the Over-voltage level.



[MO-MG configured as ' OV']

[LV]

MO-MG is CLOSED when the DC link voltage is below the Low-voltage level.



[MO-MG configured as 'LV']

[OH]

MO-MG is CLOSED when the heat sink of the inverter is above the reference level.

[Lost Command]

MO-MG is CLOSED when frequency reference is lost.

Related Functions: I/O-11 [Criteria for Analog Signal Loss]
 I/O-48 [Operating Method at Signal Loss]
 I/O-49 [Waiting Time for Time Out]

[Run]

MO-MG is CLOED when the inverter is running.

[Stop]

MO-MG is CLOED when the inverter is stopped.

[Steady]

MO-MG is CLOED when the inverter is steady speed status.

[Ssearch]

MO-MG is CLOSED during the inverter is speed searching.

[Ready]

MO-MG is CLOED when the inverter is ready to run.

I/O-45: Fault Output Relay (30A, 30B, 30C)

1 45

This function is used to allow the fault output relay to operate when a fault occurs. The output relay terminal is 30A, 30B, 30C where 30A-30C is a normally open contact and 30B-30C is a normally closed contact.

| Bit | Setting | Display | Description |
|------------------|---------|---------|---|
| Bit 0 (LV) | 0 | 000 | Fault output relay does not operate at ' Low voltage ' trip. |
| | 1 | 001 | Fault output relay operates at ' Low voltage ' trip. |
| Bit 1 (Trip) | 0 | 000 | Fault output relay does not operate at any fault. |
| | 1 | 010 | Fault output relay operates at any fault except ' Low voltage ' and ' BX ' (inverter disable) fault. |
| Bit 2 (Retry) | 0 | 000 | Fault output relay does not operate regardless of the retry number. |
| | 1 | 100 | Fault output relay operates when the retry number set in FU2-26 decreases to 0 by faults. |

When several faults occurred at the same time, Bit 0 has the first priority.

Related Functions: DRV-12 [Fault Display]
 FU2-26 [Retry Number]

**I/O-46: Inverter Number
 I/O-47: Baud Rate**

1 46

Chapter 4 - Parameter Description [I/O]

This code sets the inverter number. This number is used in communication between inverter and communication board.

1 47

This code sets the communication speed. This is used in communication between inverter and communication board.

I/O-48: Operating at Loss of Freq. Reference
I/O-49: Waiting Time after Loss of Freq. Reference

1 48

There are two kinds of loss of frequency reference. One is the loss of digital frequency reference and the other is of analog frequency reference.

Loss of digital frequency reference is applied when DRV-04 [Frequency Mode] is set to 'Keypad-1' or 'Keypad-2'. At this time, the 'Loss' means the communication error between inverter and keypad or communication board during the time set in I/O-49.

Loss of analog frequency reference is applied when DRV-04 [Frequency Mode] is set to other than 'Keypad-1' or 'Keypad-2'. At this time, the 'Loss' is determined by the criteria set in I/O-11 [Criteria for Analog Input Signal Loss].

| Setting Range | | Description |
|----------------------------|-------|---|
| LCD | 7-Seg | |
| None | 0 | Inverter keeps on operating at the previous frequency. |
| FreeRun (Coast to stop) | 1 | Inverter cuts off its output. |
| Stop | 2 | Inverter stops with Decel time (DRV-02) and Decel pattern (FU1-26). |

1 49

This is the time inverter determines whether there is a frequency reference or not. If there is no frequency reference satisfying I/O-11 during this time, inverter determines that it has lost of frequency reference.

Related Functions: DRV-04 [Frequency Mode]
I/O-11 [Criteria for Analog Signal Loss]

I/O-50: Communication Protocol Selection

1 50

This code selects the RS485 protocol between inverter and computer.

| Setting Range | | Description |
|---------------|---------|-------------------------------|
| Select | Display | |
| LG-Bus ASCII | 0 | 7 bit Data, No Parity, 2 Stop |
| Modbus RTU | 7 | 8 bit Data, No Parity, 1 Stop |

I/O-99: Return Code (7-Segment Keypad)

rt

This code is used to exit a group. Press [FUNC] key to exit.

CHAPTER 5 - MODBUS-RTU COMMUNICATION

5.1 Introduction

This manual is about the specifications, installation and operation of MODBUS-RTU for communication with PC or FA computer.

5.1.1 Features

Easy use of drives in Factory Automation by user programming.
Change and monitoring of drive parameters using computer.

5.1.2 Interfacing type of RTU Reference:

- Allows the drive to communicate with any other computers.
- Allows connection of up to 32 drives with multi-drop link system.
- Ensure noise-resistant interface.

Users can use any kind of RS232-485 converters. However a converter that has built-in ' automatic RTS control' is highly recommended. Because the specifications of converters depend on the manufacturers, please refer to the manual for detailed converter specifications.

5.1.3 Before Installation

Before installation and operation, this manual should be read thoroughly. If not, it can cause personal injury or damage other equipment.

5.2 Specifications

5.2.1 Performance Specifications

| Items | Specifications |
|-----------------------|-----------------------------------|
| Communication method | RS485 |
| Transmission form | Bus method Multi-drop Link System |
| Applicable inverter | IG5 series drive |
| Number of drives | Maximum 32 drives connectable |
| Transmission distance | Max. 1200m |

5.2.2 Hardware Specifications

| Items | Specifications |
|--------------|--|
| Installation | S+, S-, CM terminals on control terminal strip |
| Power Supply | Insulated from the inverter power supply |

5.2.3 Communication Specifications

| Items | Specifications |
|---------------------|--|
| Communication speed | 19200/9600/4800/2400/1200 bps selectable |

Chapter 5 - MODBUS-RTU Communication

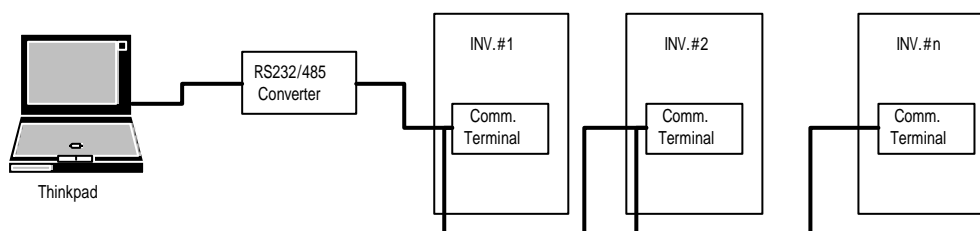
| Items | Specifications |
|----------------------|-----------------------------------|
| Control procedure | Asynchronous communication system |
| Communication system | Half duplex system |
| Character system | ASCII (8 bit) |
| Stop bit length | 1 bit |
| Sum check | 2 byte |
| Parity check | None |

5.3 Installation

5.3.1 Connecting the communication line

- First connect the 485 GND of MODBUS-RTU communication line to the inverter' s (CM) terminals of the control terminals.
- Then connect the MODBUS-RTU communication line to the inverter' s (S+),(S-) terminals of the control terminals.
- Check the connection and turn ON the inverter.
- If the communication line is connected correctly set the communication related parameters as the following:
- Operate with DriveView if DriveView is operating, if not operate with the Keypad.
 DRV-03 [Drive mode] : 3(RS485)
 DRV-04 [Freq. mode] : 5(RS485)
 I/O-46 [Inv. Number] :1~32 (If more than 1 inverters are connected, be sure to use different numbers for each inverter)
 I/O-47 [Baud-rate] : 9,600 bps (Factory default)
 I/O-48 [Lost Mode] : 0 - No action (Factory default)
 I/O-49 [Time-Out] : 10 – 1.0sec (Factory default)
 I/O-50 [Comm.Prot] : 7 - Modbus-RTU, 8bit data, No parity, 1 stop bit

5.3.2 System configuration



The number of drives to be connected is up to 32 drives.

The specification of length of communication line is max. 1200m. To ensure stable communication, limit the length below 700m.

Use shielded wire for all control signal wiring.

5.4 Operating

5.4.1 Operating Steps

- Check whether the computer and the inverter are connected correctly.
- Turn ON the inverter. But, do not connect the load until stable communication between the computer and the inverter is verified.
- Start the operating program for the inverter from the computer.
- Operate the inverter using the operating program for the inverter.
- Refer to “6. Troubleshooting” if the communication is not operating normally.
- User program or the “DriveView” program supplied from LG Industrial Systems can be used as the operating program for the inverter if I/O-50 [Comm.Prot] was set to default value 0.

5.5 Communication Protocol

The communication structure is that the iG5 drives are slaves and a computer/host is the master.

5.5.1 Supported Function Code

| Function Code | Name |
|---------------|--------------------------|
| 0x03 | Read Hold Register |
| 0x04 | Read Input Register |
| 0x06 | Preset Single Register |
| 0x10 | Preset Multiple Register |

5.5.2 Exception Code

| Exception Code | Name |
|----------------|----------------------|
| 0x01 | ILLEGAL FUNCTION |
| 0x02 | ILLEGAL DATA ADDRESS |
| 0x03 | ILLEGAL DATA VALUE |
| 0x06 | SLAVE DEVICE BUSY |

5.5.3 Baud Rate

1200, 2400, 4800, **9600**, 19200bps (default value of 9600bps)

Chapter 5 - MODBUS-RTU Communication

5.6 Parameter Code List

< Common >

| Parameter address | Description | Unit | Read/Write | Data value (HEX) | Note |
|-------------------|------------------------|---------|------------|---|----------|
| 0000 | Inverter model | - | R | 7: SV4G5 | |
| 0001 | Inverter capacity | - | R | 0: 0.5Hp , 1: 1Hp , 2: 2Hp 3: 3Hp , 4: 5Hp, 5: 5.4Hp | |
| 0002 | Inverter input voltage | - | R | 0: 220V class, 1: 440V class | |
| 0003 | Version | - | R | 313043: Version 1.0C 353043: Version 5.0C | |
| 0004 | Parameter write enable | - | R/W | 0: Write disable (default) 1: Write enable | |
| 0005 | Reference frequency | 0.01 Hz | R/W | | |
| 0006 | Operation reference | - | R/W | Bit 0: Stop(R/W) Bit 1: Forward(R/W) Bit 2: Reverse(R/W) Bit 3: Fault reset(W) Bit 4: Emergency stop(W) | |
| 0007 | Accel time | 0.1 sec | R/W | | |
| 0008 | Decel time | 0.1 sec | R/W | | |
| 0009 | Output Current | 0.1 A | R | | |
| 000A | Output frequency | 0.01 Hz | R | | |
| 000B | Output voltage | 1 V | R | | |
| 000C | DC Link voltage | | | | |
| 000D | Output power | | | | Not used |
| 000E | Operating status | - | R | Bit 0: Stop Bit 1: Forward Bit 2: Reverse Bit 3: Fault (Trip) Bit 4: Accelerating Bit 5: Decelerating Bit 6: Speed reached Bit 7: DC Braking | |
| 000F | Trip info | - | R | Bit 0: OC Bit 1: OV Bit 2: EXT Bit 3: BX Bit 4: LV Bit 5: Fuse Open Bit 6: GF Bit 7: OH | |
| 0010 | Input terminal info | - | R | Bit 0: FX Bit 1: RX | |

Chapter 5 - MODBUS-RTU Communication

| Parameter address | Description | Unit | Read/Write | Data value (HEX) | Note |
|-------------------|----------------------|------|------------|--|----------|
| | | | | Bit 2: BX Bit 3: RST- Bit 8: P1 Bit 9: P2 Bit 10: P3 | |
| 0011 | Output terminal info | - | R | Bit 0: Q1 (OC) | |
| 0012 | V1 | - | R | 0 - FFFF | |
| 0013 | V2 | - | - | | Not used |
| 0014 | I | - | R | 0 - FFFF | |
| 0015 | RPM | - | R | | |

< DRV Group >

| Parameter address(*3) | Parameter Code | Description | Default value | Max. value | Min. value | Unit | Note |
|-----------------------|----------------|-----------------|---------------|-------------|-------------|--------|-----------|
| 6100 | DRV #00 | Cmd. Freq. | 5000 | FU1-20.(*1) | FU1-22.(*2) | 0.01Hz | |
| 6101 | DRV #01 | Acc. Time | 100 | 9999 | 0 | 0.1sec | |
| 6102 | DRV #02 | Dec. Time | 200 | 9999 | 0 | 0.1sec | |
| 6103 | DRV #03 | Drive mode | 1 | 2 | 0 | | |
| 6104 | DRV #04 | Freq. mode | 2 | 4 | 0 | | |
| 6105 | DRV #05 | Speed - 1 | 1000 | FU1-20 | 0 | 0.01Hz | |
| 6106 | DRV #06 | Speed - 2 | 2000 | FU1-20 | 0 | 0.01Hz | |
| 6107 | DRV #07 | Speed - 3 | 3000 | FU1-20 | 0 | 0.01Hz | |
| 6108 | DRV #08 | Output Current | 0 | - | - | 0.1A | Read Only |
| 6109 | DRV #09 | Output speed | 0 | - | - | RPM | Read Only |
| 610A | DRV #10 | DC Link Voltage | 0 | - | - | 0.1V | Read Only |

(*1) Refer to FU1 for #20 max Freq.

(*2) Refer to FU1 #22 for Start Freq.

(*3) Parameter address is HEX data

< FU1 Group >

| Parameter address | Parameter Code | Description | Default value | Max. value | Min. value | Unit | Note |
|-------------------|----------------|--------------|---------------|------------|------------|---------|------|
| 6203 | FU1 #03 | Run prohibit | 0 | 2 | 0 | | |
| 6205 | FU1 #05 | Acc. pattern | 0 | 4 | 0 | | |
| 6206 | FU1 #06 | Dec. pattern | 0 | 4 | 0 | | |
| 6207 | FU1 #07 | Stop mode | 0 | 2 | 0 | | |
| 6208 | FU1 #08 | DcBr freq. | 500 | 5000 | FU1-22 | 0.01Hz | |
| 6209 | FU1 #09 | DcBlk time | 10 | 6000 | 0 | 0.01sec | |
| 620A | FU1 #10 | DcBr value | 50 | 200 | 0 | 1% | |
| 620B | FU1 #11 | DcBr time | 10 | 600 | 0 | 0.1sec | |

Chapter 5 - MODBUS-RTU Communication

| Parameter address | Parameter Code | Description | Default value | Max. value | Min. value | Unit | Note |
|-------------------|----------------|--------------|---------------|------------|------------|--------|--------------|
| 620C | FU1 #12 | DcSt value | 50 | 200 | 0 | 1% | |
| 620D | FU1 #13 | DcSt time | 0 | 600 | 0 | 0.1sec | |
| 6214 | FU1 #20 | Max freq. | 5000 | 40000 | 4000 | 0.01Hz | |
| 6215 | FU1 #21 | Base freq. | 5000 | FU1-20 | 3000 | 0.01Hz | |
| 6216 | FU1 #22 | Start freq. | 10 | 1000 | 10 | 0.01Hz | |
| 6217 | FU1 #23 | Freq limit | 0 | 1 | 0 | | Yes/No |
| 6218 | FU1 #24 | F-limit Lo. | 0 | FU1-25 | 0 | 0.01Hz | |
| 6219 | FU1 #25 | F-limit Hi. | 5000 | FU1-20 | FU1-24 | 0.01Hz | |
| 621A | FU1 #26 | Torque boost | 0 | 1 | 0 | | boostMsg |
| 621B | FU1 #27 | Fwd boost | 50 | 150 | 0 | 0.1% | |
| 621C | FU1 #28 | Rev boost | 50 | 150 | 0 | 0.1% | |
| 621D | FU1 #29 | V/F pattern | 0 | 2 | 0 | | VfPatternMsg |
| 621E | FU1 #30 | User freq. 1 | 1250 | FU1-32 | 0 | 0.01Hz | |
| 621F | FU1 #31 | User volt. 1 | 25 | 100 | 0 | % | |
| 6220 | FU1 #32 | User freq. 2 | 2500 | FU1-34 | FU1-30 | 0.01Hz | |
| 6221 | FU1 #33 | User volt. 2 | 50 | 100 | 0 | % | |
| 6222 | FU1 #34 | User freq. 3 | 3750 | FU1-36 | FU1-32 | 0.01Hz | |
| 6223 | FU1 #35 | User volt. 3 | 75 | 100 | 0 | % | |
| 6224 | FU1 #36 | User freq. 4 | 5000 | FU1-20 | FU1-34 | 0.01Hz | |
| 6225 | FU1 #37 | User volt. 4 | 100 | 100 | 0 | % | |
| 6226 | FU1 #38 | Volt control | 1000 | 1100 | 40 | % | |
| 6227 | FU1 #39 | Energy save | 0 | 30 | 0 | % | |
| 6232 | FU1 #50 | ETH select | 0 | 1 | 0 | | Yes/No |
| 6233 | FU1 #51 | ethperc | 180 | 250 | FU1-52 | % | |
| 6234 | FU1 #52 | contperc | 120 | FU1-51 | 50 | % | |
| 6235 | FU1 #53 | Motor type | 0 | 1 | 0 | | MotorMsg |
| 6236 | FU1 #54 | OL level | 150 | 250 | 30 | % | |
| 6237 | FU1 #55 | OL time | 100 | 300 | 0 | 0.1sec | |
| 6238 | FU1 #56 | OLT select | 0 | 1 | 0 | | Yes/No |
| 6239 | FU1 #57 | OLT level | 200 | 250 | 30 | % | |
| 623A | FU1 #58 | OLT time | 600 | 600 | 0 | 0.1sec | |
| 623B | FU1 #59 | Stall prev. | 0 | 7 | 0 | | |
| 623C | FU1 #60 | Stall level | 200 | 250 | 30 | % | |

< FU2 Group >

| Parameter address | Parameter Code | Description | Default value | Max. value | Min value | Unit | Note |
|-------------------|----------------|--------------|---------------|------------|-----------|--------|------|
| 630A | FU2 #10 | Jump freq | 0 | 1 | 0 | | |
| 630B | FU2 #11 | Jump lo 1 | 0 | FU2-12 | 0 | 0.01Hz | |
| 630C | FU2#12 | Jump Hi 1 | 0 | FU1-20 | FU2-11 | 0.01Hz | |
| 630D | FU2 #13 | Jump lo 2 | 0 | FU2-14 | 0 | 0.01Hz | |
| 630E | FU2 #14 | jump Hi 2 | 0 | FU1-20 | FU2-13 | 0.01Hz | |
| 630F | FU2 #15 | jump lo 3 | 0 | FU2-16 | 0 | 0.01Hz | |
| 6310 | FU2 #16 | jump Hi 3 | 0 | FU1-20 | FU2-15 | 0.01Hz | |
| 6314 | FU2 #20 | Power-on run | 0 | 1 | 0 | | |
| 6315 | FU2 #21 | RST restart | 0 | 1 | 0 | | |
| 6316 | FU2 #22 | ssMode | 0000 | 1111 | 0000 | | |
| 6317 | FU2 #23 | ssStallPerc | 180 | 200 | 80 | % | |
| 6318 | FU2 #24 | SS P-Gain | 100 | 9999 | 0 | | |
| 6319 | FU2 #25 | SS I-Gain | 1000 | 9999 | 0 | | |
| 631A | FU2 #26 | Retry number | 0 | 10 | 0 | | |
| 631B | FU2 #27 | Retry delay | 10 | 600 | 0 | 0.1sec | |
| 631E | FU2 #30 | Motor select | * | 5 | 0 | | |
| 631F | FU2 #31 | Pole number | 4 | 12 | 2 | | |
| 6320 | FU2 #32 | Rated-Slip | * | 1000 | 0 | 0.01Hz | |
| 6321 | FU2 #33 | Rate d-Curr | * | 999 | 1 | 0.1A | |
| 6322 | FU2 #34 | Noload-Curr | * | 999 | 1 | 0.1A | |
| 6324 | FU2 #36 | Efficiency | * | 100 | 50 | % | |
| 6325 | FU2 #37 | Inertiarate | 0 | 2 | 0 | | |
| 6327 | FU2 #39 | Carrier freq | 30 | 100 | 10 | 0.1kHz | |
| 6328 | FU2 #40 | Control mode | 0 | 2 | 0 | | |
| 6332 | FU2 #50 | PID F/B | 0 | 1 | 0 | | |
| 6333 | FU2 #51 | PID P-gain | 3000 | 9999 | 0 | | |
| 6334 | FU2 #52 | PID I-time | 300 | 9999 | 0 | | |
| 6335 | FU2 #53 | PID D-time | 0 | 9999 | 0 | | |
| 6336 | FU2 #54 | PID limit | 5000 | FU1-20 | 0 | 0.01Hz | |
| 6346 | FU2 #70 | Acc/Dec freq | 0 | 1 | 0 | | |
| 6347 | FU2 #71 | Time scale | 1 | 2 | 0 | | |
| 6348 | FU2 #72 | PowerOn disp | 0 | 13 | 0 | | |
| 6349 | FU2 #73 | User disp | 0 | 2 | 0 | | |
| 634A | FU2 #74 | RPM factor | 100 | 1000 | 1 | % | |
| 634B | FU2#75 | DB Mode | 2 | 2 | 0 | | |
| 634C | FU2#76 | DB % ED | 10 | 30 | 0 | % | |
| 634F | FU2 #79 | SW version | | | | | |
| 6351 | FU2 #81 | 2nd Acc time | 50 | 9999 | 0 | 0.1sec | |
| 6352 | FU2 #82 | 2nd Dec time | 100 | 9999 | 0 | 0.1sec | |
| 6353 | FU2 #83 | 2nd BaseFreq | 5000 | FU1-20 | 3000 | 0.01Hz | |

Chapter 5 - MODBUS-RTU Communication

| Parameter address | Parameter Code | Description | Default value | Max. value | Min value | Unit | Note |
|-------------------|----------------|-------------|---------------|------------|-----------|------|------|
| 6354 | FU2 #84 | 2nd V/F | 0 | 2 | 0 | | |
| 6355 | FU2 #85 | 2nd F-boost | 20 | 150 | 0 | 0.1% | |
| 6356 | FU2 #86 | 2nd R-boost | 20 | 150 | 0 | 0.1% | |
| 6357 | FU2 #87 | 2nd Stall | 200 | 250 | 30 | % | |
| 6358 | FU2 #88 | 2nd ETH | 180 | 250 | FU2-89 | % | |
| 6359 | FU2 #89 | 2nd ETH | 120 | FU2-88 | 50 | % | |
| 635A | FU2 #90 | 2nd R-Curr | 18 | 999 | 1 | 0.1A | |

(*1), (*2), (*3) value can change according to the capacity.

< I/O Group >

| Parameter address | Parameter Code | Description | Default value | Max. value | Min value | Unit | Note |
|-------------------|----------------|-------------|---------------|------------|-----------|--------|------|
| 6401 | I/O #01 | V1 filter | 500 | 9999 | 0 | ms | |
| 6402 | I/O #02 | V1 volt x1 | 0 | IO-04 | 0 | 0.01V | |
| 6403 | I/O #03 | V1 freq y1 | 0 | FU1-20 | 0 | 0.01Hz | |
| 6404 | I/O #04 | V1 volt x2 | 1000 | 1200 | IO-02 | 0.01V | |
| 6405 | I/O #05 | V1 freq y2 | 5000 | FU1-20 | 0 | 0.01Hz | |
| 6406 | I/O #06 | I filter | 500 | 9999 | 0 | ms | |
| 6407 | I/O #07 | I curr x1 | 400 | IO-09 | 0 | 0.01mA | |
| 6408 | I/O #08 | I freq y1 | 0 | FU1-20 | 0 | 0.01Hz | |
| 6409 | I/O #09 | I curr x2 | 2000 | 2400 | IO-07 | 0.01mA | |
| 640A | I/O #10 | I freq y2 | 5000 | FU1-20 | 0 | 0.01Hz | |
| 640B | I/O #11 | Wire broken | 0 | 2 | 0 | | |
| 640C | I/O #12 | P1 define | 0 | 26 | 0 | | |
| 640D | I/O #13 | P2 define | 1 | 26 | 0 | | |
| 640E | I/O #14 | P3 define | 2 | 26 | 0 | | |
| 640F | I/O #15 | In Status | | | | | |
| 6410 | I/O #16 | Out Status | | | | | |
| 6411 | I/O #17 | TI Filt Num | 15 | 20 | 2 | | |
| 6414 | I/O #20 | Jog freq | 1000 | FU1-20 | 0 | 0.01Hz | |
| 6415 | I/O #21 | Speed - 4 | 4000 | FU1-20 | 0 | 0.01Hz | |
| 6416 | I/O #22 | Speed - 5 | 5000 | FU1-20 | 0 | 0.01Hz | |
| 6417 | I/O #23 | Speed - 6 | 4000 | FU1-20 | 0 | 0.01Hz | |
| 6418 | I/O #24 | Speed - 7 | 3000 | FU1-20 | 0 | 0.01Hz | |
| 6419 | I/O #25 | Acc - 1 | 200 | 9999 | 0 | 0.1sec | |
| 641A | I/O #26 | Dec - 1 | 200 | 9999 | 0 | 0.1sec | |
| 641B | I/O #27 | Acc - 2 | 300 | 9999 | 0 | 0.1sec | |
| 641C | I/O #28 | Dec - 2 | 300 | 9999 | 0 | 0.1sec | |
| 641D | I/O #29 | Acc - 3 | 400 | 9999 | 0 | 0.1sec | |
| 641E | I/O #30 | Dec - 3 | 400 | 9999 | 0 | 0.1sec | |
| 641F | I/O #31 | Acc - 4 | 500 | 9999 | 0 | 0.1sec | |

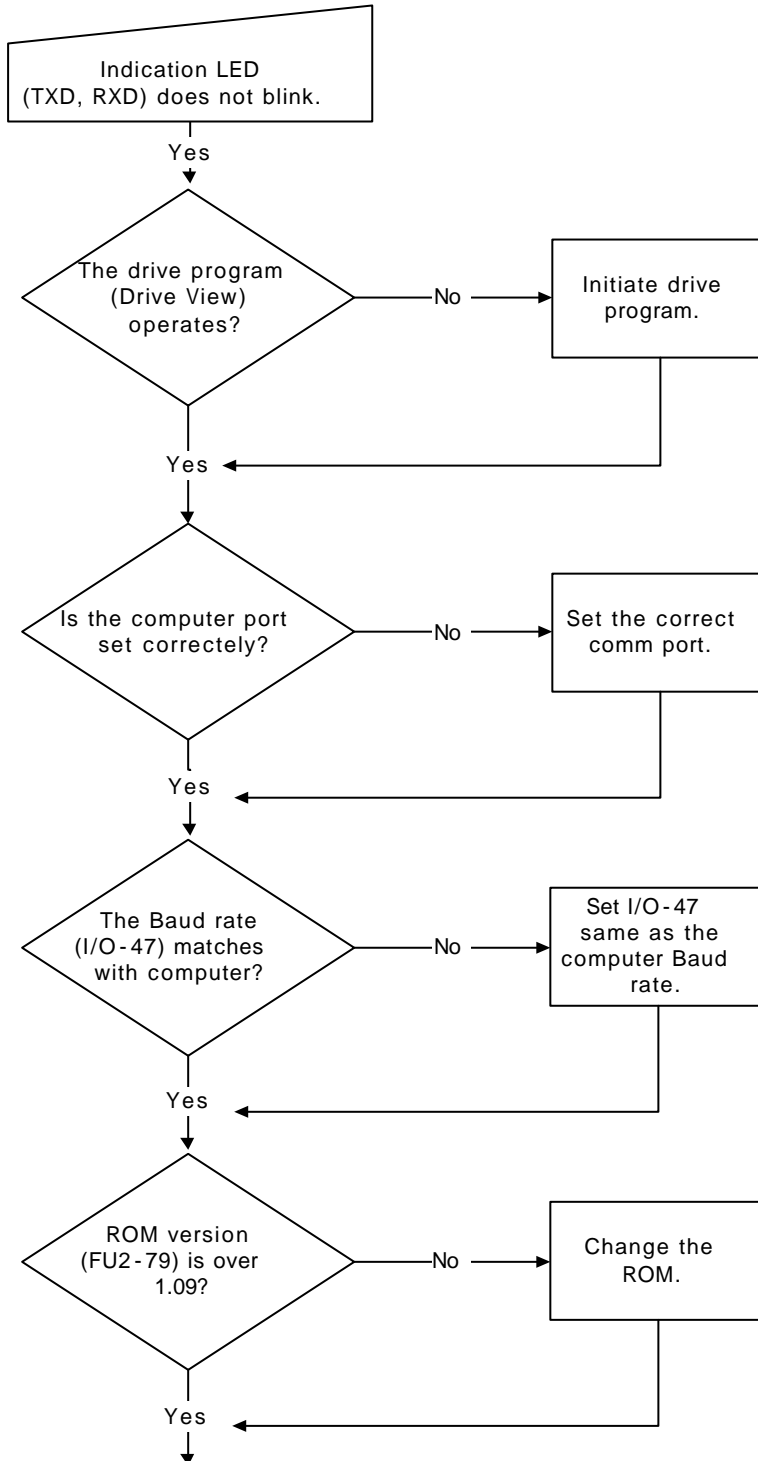
Chapter 5 - MODBUS-RTU Communication

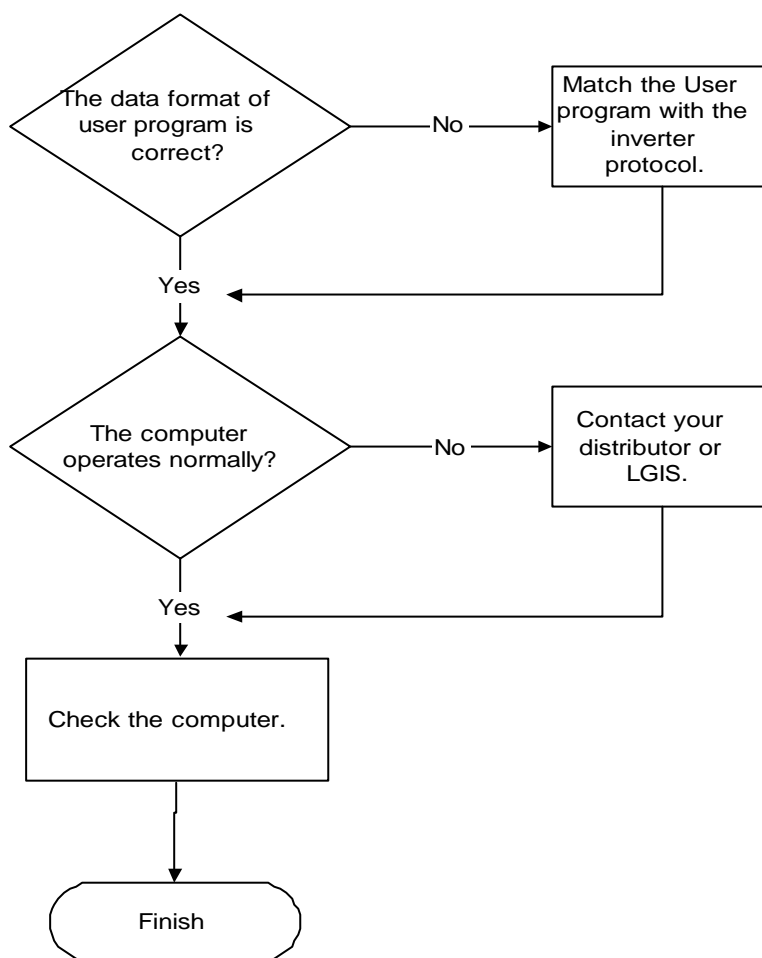
| Parameter address | Parameter Code | Description | Default value | Max. value | Min value | Unit | Note |
|-------------------|----------------|--------------|---------------|------------|-----------|--------|------|
| 6420 | I/O #32 | Dec – 4 | 500 | 9999 | 0 | 0.1sec | |
| 6421 | I/O #33 | Acc – 5 | 400 | 9999 | 0 | 0.1sec | |
| 6422 | I/O #34 | Dec – 5 | 400 | 9999 | 0 | 0.1sec | |
| 6423 | I/O #35 | Acc – 6 | 300 | 9999 | 0 | 0.1sec | |
| 6424 | I/O #36 | Dec – 6 | 300 | 9999 | 0 | 0.1sec | |
| 6425 | I/O #37 | Acc – 7 | 200 | 9999 | 0 | 0.1sec | |
| 6426 | I/O #38 | Dec – 7 | 200 | 9999 | 0 | 0.1sec | |
| 6428 | I/O #40 | FM mode | 0 | 3 | 0 | | |
| 6429 | I/O #41 | FM adjust | 100 | 200 | 10 | % | |
| 642A | I/O #42 | FDT freq | 3000 | FU1-20 | 0 | 0.01Hz | |
| 642B | I/O #43 | FDT band | 1000 | FU1-20 | 0 | 0.01Hz | |
| 642C | I/O #44 | Aux mode | 12 | 20 | 0 | | |
| 642D | I/O #45 | Relay mode | 2 | 7 | 0 | BIT3 | |
| 642E | I/O #46 | Inv. no | 1 | 31 | 1 | | |
| 642F | I/O #47 | Baud rate | 3 | 4 | 0 | | |
| 6430 | I/O #48 | Lost command | 0 | 2 | 0 | | |
| 6431 | I/O #49 | Time out | 10 | 1200 | 1 | 0.1sec | |
| 6432 | I/O #50 | Comm. Prot | 7 | 7 | 0 | | |

Chapter 5 - MODBUS-RTU Communication

5.7 Troubleshooting

Refer to this chapter when a trouble is occurred.





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5.8 ASCII Code List

| Character | Hex | Character | Hex | Character | Hex |
|-----------|-----|-----------|-----|-----------|-----|
| A | 41 | q | 71 | @ | 40 |
| B | 42 | r | 72 | [| 5B |
| C | 43 | s | 73 | \ | 5C |
| D | 44 | t | 74 |] | 5D |
| E | 45 | u | 75 | | 5E |
| F | 46 | v | 76 | | 5F |
| G | 47 | w | 77 | | 60 |
| H | 48 | x | 78 | { | 7B |
| I | 49 | y | 79 | | 7C |
| J | 4A | z | 7A | } | 7D |
| K | 4B | 0 | 30 | ~ | 7E |
| L | 4C | 1 | 31 | BEL | 07 |
| M | 4D | 2 | 32 | BS | 08 |
| N | 4E | 3 | 33 | CAN | 18 |
| O | 4F | 4 | 34 | CR | 0D |
| P | 50 | 5 | 35 | DC1 | 11 |
| Q | 51 | 6 | 36 | DC2 | 12 |
| R | 52 | 7 | 37 | DC3 | 13 |
| S | 53 | 8 | 38 | DC4 | 14 |
| T | 54 | 9 | 39 | DEL | 7F |
| U | 55 | space | 20 | DLE | 10 |
| V | 56 | ! | 21 | EM | 19 |
| W | 57 | " | 22 | ACK | 06 |
| X | 58 | # | 23 | ENQ | 05 |
| Y | 59 | \$ | 24 | EOT | 04 |
| Z | 5A | % | 25 | ESC | 1B |
| a | 61 | & | 26 | ETB | 17 |
| b | 62 | ' | 27 | ETX | 03 |
| c | 63 | (| 28 | FF | 0C |
| d | 64 |) | 29 | FS | 1C |
| e | 65 | * | 2A | GS | 1D |
| f | 66 | + | 2B | HT | 09 |
| g | 67 | , | 2C | LF | 0A |
| h | 68 | - | 2D | NAK | 15 |
| i | 69 | . | 2E | NUL | 00 |
| j | 6A | / | 2F | RS | 1E |
| k | 6B | : | 3A | S1 | 0F |
| l | 6C | ; | 3B | SO | 0E |
| m | 6D | < | 3C | SOH | 01 |
| n | 6E | = | 3D | STX | 02 |
| o | 6F | > | 3E | SUB | 1A |
| p | 70 | ? | 3F | SYN | 16 |
| | | | | US | 1F |
| | | | | VT | 0B |

* ASCII Code List

| Character | Hex | Character | Hex | Character | Hex |
|-----------|-----|-----------|-----|-----------|-----|
| space | 20 | A | 41 | a | 61 |
| ! | 21 | B | 42 | b | 62 |
| " | 22 | C | 43 | c | 63 |
| # | 23 | D | 44 | d | 64 |
| \$ | 24 | E | 45 | e | 65 |
| % | 25 | F | 46 | f | 66 |
| & | 26 | G | 47 | g | 67 |
| ' | 27 | H | 48 | h | 68 |
| (| 28 | I | 49 | i | 69 |
|) | 29 | J | 4A | j | 6A |
| * | 2A | K | 4B | k | 6B |
| + | 2B | L | 4C | l | 6C |
| , | 2C | M | 4D | m | 6D |
| - | 2D | N | 4E | n | 6E |
| . | 2E | O | 4F | o | 6F |
| / | 2F | P | 50 | p | 70 |
| 0 | 30 | Q | 51 | q | 71 |
| 1 | 31 | R | 52 | r | 72 |
| 2 | 32 | S | 53 | s | 73 |
| 3 | 33 | T | 54 | t | 74 |
| 4 | 34 | U | 55 | u | 75 |
| 5 | 35 | V | 56 | v | 76 |
| 6 | 36 | W | 57 | w | 77 |
| 7 | 37 | X | 58 | x | 78 |
| 8 | 38 | Y | 59 | y | 79 |
| 9 | 39 | Z | 5A | z | 7A |
| : | 3A | [| 5B | | |
| ; | 3B | \ | 5C | | |
| < | 3C |] | 5D | | |
| = | 3D | | 5E | | |
| > | 3E | | 5F | | |
| ? | 3F | | 60 | | |
| @ | 40 | | | | |

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CHAPTER 6 - TROUBLESHOOTING & MAINTENANCE

6.1 Fault Display

When a fault occurs, the inverter turns off its output and displays the fault status in DRV-07. The last 5 faults are saved in FU2-01 through FU2-05 with the operation status at the instance of fault.

| Display | Protective Function | Description |
|---------|---|--|
| OC | Over Current Protection | The inverter turns off its output when the output current of the inverter flows more than 200% of the inverter rated current. |
| OV | Over Voltage protection | The inverter turns off its output if the DC voltage of the main circuit increases higher than the rated value when the motor decelerates or when regenerative energy flows back to the inverter due to a regenerative load. This fault can also occur due to a surge voltage generated at the power supply system. |
| OLt | Current Limit Protection (Overload Protection) | The inverter turns off its output if the output current of the inverter flows at 180% of the inverter rated current for more than the current limit time (S/W). |
| OH | Heat Sink Over Heat | The inverter turns off its output if the heat sink overheats due to a damaged cooling fan or an alien substance in the cooling fan by detecting the temperature of the heat sink. |
| ETH | Electronic Thermal | The internal electronic thermal of the inverter determines the over heating of the motor. If the motor is overloaded the inverter turns off the output. The inverter cannot protect the motor when driving a multi-pole motor or when driving multiple motors, so consider thermal relays or other thermal protective devices for each motor. Overload capacity: 150% for 1 min |
| LV | Low Voltage Protection | The inverter turns off its output if the DC voltage is below the detection level. Insufficient torque or over heating of the motor can occur when the input voltage of the inverter drops. |
| COL | Input Phase Open | The inverter turns off the output when one or more of the input (R, S, T) phase is open and the output load is over 50% of the inverter rated current for more than 1 minute. The inverter checks whether the phase is open by detecting the DC voltage of the main circuit. |
| OPO | Output Phase Open | The inverter turns off its output when the one or more of the output (U, V, W) phase is open. The inverter detects the output current to check the phase open of the output. |
| b4 | BX Protection (Instant Cut Off) | Used for the emergency stop of the inverter. The inverter instantly turns off the output when the BX terminal is turned ON, and returns to regular operation when the BX terminal is turned OFF. Take caution when using this function. |
| 1OLt | Inverter Overload | The inverter turns off its output when the output current of the inverter flows more than the rated level (150% for 1 minute-Inversely proportional to time). |
| E4tA | External Fault A | Use this function if the user needs to turn off the output by an external fault signal. (Normal Open Contact) |
| E4tB | External Fault B | Use this function if the user needs to turn off the output by an external fault signal. (Normal Close Contact) |
| --- | Operating Method when the Frequency Reference is Lost | According to I/O-48 [Operating Method when the Frequency Reference is Lost], there are 3 modes: continue operation, decelerate and stop, and free run,. |

Chapter 6 - Troubleshooting & Maintenance

| Display | Protective Function | Description |
|---------|---------------------|--|
| EO1 | EEPROM Error 1 | The keypad EEPROM has a fault causing parameter read/write error. |
| EO2 | EEPROM Error 2 | The ROM version for the inverter and keypad are different. |
| HW | Inverter HW Fault | When an error occurs to the control circuitry of the inverter a fault signal is sent. There are the CPU error, the EEP error, Wiring Error, Fan Fault, Ground Fault and NTC Damage for this fault. |
| CPU2 | CPU Error | The CPU has a fault. |
| EEP | EEP Error | The EEPROM on inverter main board has a fault. |
| WIRE | Wiring Error | The input/output wiring of inverter is wrong. |
| FAN | Fan fault | The cooling fan does not rotate. |
| GF | Ground Fault | A ground fault occurs. |
| NTC | NTC Damage | NTC is damaged. |

Note: "HW" is displayed when "FAN", "WIRE", "EEP", "CPU2", "GF", or "NTC" faults occur. Use "FUNC", "UP", "UP", "UP" keys to see the detailed fault contents.

6.1.1 Operating Method and Fault Display when Frequency Reference is Lost

■ I/O-48 [Operating Method when Frequency Reference is Lost]

| I/O-48 Setting | Function Description |
|----------------|--|
| 0 (None) | Continues operation when the frequency reference is lost (Factory Default) |
| 1 (FreeRun) | Free runs and stops when the frequency reference is lost. |
| 2 (Stop) | Decelerates and stops when the frequency reference is lost. |

■ Keypad Display when Analog Frequency Reference is Lost

| Keypad Display | Contents |
|----------------|---|
| ___L | Displayed when V1 analog frequency reference is lost. |
| ___L | Displayed when I analog frequency reference is lost. |

■ Fault Contents and Operating Status Prior to Fault

1) Present Fault Contents (Ex: Over Current)

| Code | Display | Description |
|-------|---------|--|
| DRV-7 | OC | Displays the present fault contents (Over current) |

Check the fault contents before pressing the reset key. Press the [FUNC] key and then use the [↑(Up)], [↓(Down)] keys to check the operating information (output frequency, output current, acceleration, deceleration, constant speed status) prior to fault. Press the [FUNC] key to exit. The inverter will store the fault contents to the memory in FU2-1 when the [RESET] key is pressed.

2) Fault History Contents

FU2-1~5 [Fault history] has the 5 most current faults in its memory. The smallest number will be the most current fault in its memory. Check the operating information prior to fault.

| Code | Display | Description |
|-------|-------------|-----------------|
| FU2-1 | Last trip-1 | Fault history 1 |
| FU2-2 | Last trip-2 | Fault history 2 |
| FU2-3 | Last trip-3 | Fault history 3 |
| FU2-4 | Last trip-4 | Fault history 4 |
| FU2-5 | Last trip-5 | Fault history 5 |

The FU2-6 [Erase Fault History] erases FU2-1~5 [Fault History] contents from the memory, and returns the contents to the factory default status.

6.2 Fault (Inverter Fault) Reset

There are 3 ways to reset the inverter. The auto retry number will be initialized when the user resets the inverter.

- 1) Reset by using the [STOP/RESET] key of the keypad.
- 2) Reset by shorting the RST-CM terminals on the control terminals.
- 3) Turn OFF the inverter and turn the inverter back ON.

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6.3 Fault Remedy

| Protective Function | Cause | Remedy |
|--|---|---|
| Over Current Protection | <ol style="list-style-type: none"> 1) Acceleration/Deceleration time is too short compared to the GD² of the load. 2) Load is larger than the inverter rating. 3) Inverter turns output on while motor is free running. 4) Output short or ground fault has occurred. 5) Mechanical brake of the motor is operating too fast. 6) Components of the main circuit have overheated due to a faulty cooling fan. | <ol style="list-style-type: none"> 1) Increase Accel/Decel time. 2) Increase inverter capacity. 3) Operate after motor has stopped. 4) Check output wiring. 5) Check mechanical brake operation. 6) Check cooling fan. <p>(Caution) Operating prior to correcting fault may damage the IGBT.</p> |
| Over Voltage Protection | <ol style="list-style-type: none"> 1) Deceleration time is too short compared to the GD² of the load. 2) Regenerative load on inverter output. 3) Line voltage is too high. | <ol style="list-style-type: none"> 1) Increase deceleration time. 2) Use regenerative resistor option. 3) Check line voltage. |
| Current Limit Protection (Overload Protection) | <ol style="list-style-type: none"> 1) Load is larger than inverter rating. 2) User selected incorrect inverter capacity. 3) User set incorrect V/F pattern. | <ol style="list-style-type: none"> 1) Increase capacity of motor and inverter. 2) Select a correct inverter capacity. 3) Select a correct inverter capacity. |
| Heat Sink Overheat | <ol style="list-style-type: none"> 1) Cooling fan is damaged or an alien substance is inserted. 2) Cooling system has faulted. 3) Ambient temperature too high. | <ol style="list-style-type: none"> 1) Exchange cooling fans and/or eliminate alien substance. 2) Check for any alien substances in heat sink. 3) Keep ambient temperature under 40 °C (104 °F). |
| Electronic Thermal | <ol style="list-style-type: none"> 1) Motor has overheated. 2) Load is larger than inverter rating. 3) ETH level too low. 4) User selected incorrect inverter capacity. 5) User set incorrect V/F pattern. 6) Operating too long at low speeds. | <ol style="list-style-type: none"> 1) Reduce load and/or running duty. 2) Increase inverter capacity. 3) Adjust ETH level to an appropriate level. 4) Select a correct inverter capacity. 5) Select a correct V/F pattern. 6) Install a cooling fan with a separate blower. |
| Low Voltage Protection | <ol style="list-style-type: none"> 1) Line voltage too low. 2) Load larger than line capacity connected to input. (welding machine, motor with high starting current connected to the commercial line) 3) Damaged or faulty magnetic switch at input side of inverter. | <ol style="list-style-type: none"> 1) Check line voltage. 2) Increase line capacity. 3) Exchange magnetic switch. |
| Output Phase Open | <ol style="list-style-type: none"> 1) Faulty contact on the magnetic switch at the output. 2) Faulty output wiring | <ol style="list-style-type: none"> 1) Check magnetic switch on output. 2) Check output wiring. |
| H/W Fault | <ol style="list-style-type: none"> 1) Fan Fault 2) Wiring Error 3) CPU Error 4) EEPROM Error 5) Ground Fault 6) NTC Damage | <ol style="list-style-type: none"> 1) Check cooling fan. 2) Check input and output wiring. 3) Exchange inverter. 4) Check inverter, motor, and wiring insulation. 5) Check NTC. |
| LOV (V1) LOI (I) | Frequency Reference is Lost | Eliminate cause of fault. |
| Inverter Overload | <ol style="list-style-type: none"> 1) Load is larger than inverter rating. 2) User selected incorrect inverter capacity. | <ol style="list-style-type: none"> 1) Increase motor and/or inverter capacity. 2) Select correct inverter capacity. |

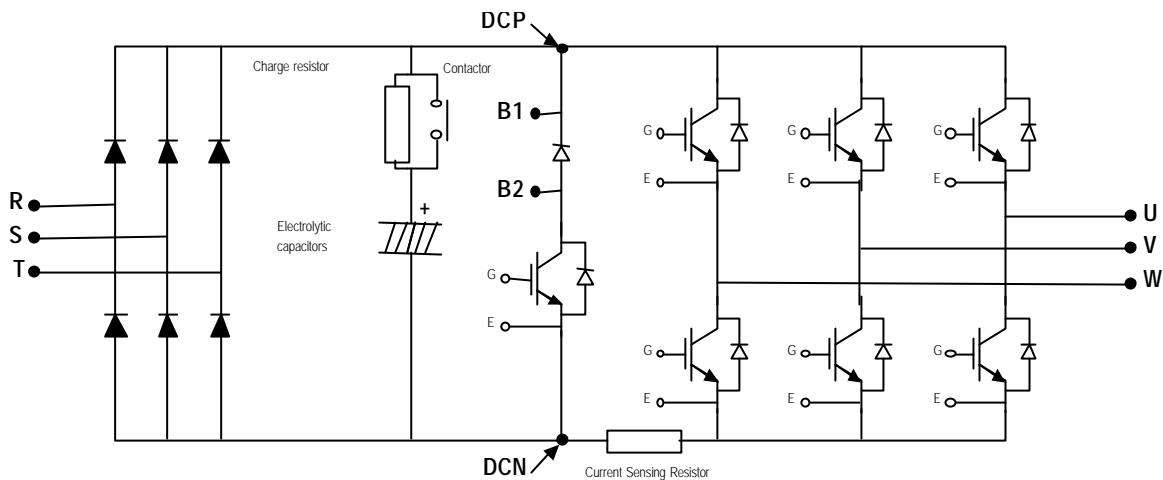
6.4 Troubleshooting

| Condition | Check Point |
|---|--|
| The motor does not rotate | 1) Main circuit inspection Input (line) voltage normal? (LED charge lamp on?) Motor connected correctly? 2) Input signal inspection Input signal to inverter functioning? Forward and reverse signals inputted simultaneously to inverter? Inverter receiving command input frequency signal? 3) Parameter setting inspection Reverse prevention (FU1-03) function set? Operation mode (FU1-01) set correctly? Command frequency set to 0? 4) Load inspection Load too large, or motor restrained. (Mechanical Brake) 5) Other Alarm displayed on keypad, or alarm LED lit? (STOP LED blinking?) |
| The motor rotates in opposite directions | Phase sequence of output terminal U, V and W correct? Starting signal (Forward/Reverse) connected correctly? |
| The difference between the rotating speed and the reference is too big | Reference frequency verified? (Check the level of input signal) Following parameter setting verified? Lower Limit Frequency (FU1-24), Upper Limit Frequency (FU1-25), Analog Frequency Gain (I/O-1~10) External noise? (Use a shielded wire) |
| The inverter does not accelerate or decelerate smoothly | Acceleration/Deceleration time too short. Load too large? Torque Boost (FU1-27, 28) value too high? (Current limit function and the stall prevention function verified?) |
| The motor current is too high | Load too large? Torque Boost Value (manual) too high? |
| The rotating speed does not increase The rotating speed oscillates when the inverter is operating. | Upper Limit Frequency (FU1-25) value correct? Load too large? Torque Boost (FU1-27, 28) value too high? (stall prevention function (FU1-59, 60) verified?) 1) Load inspection Load oscillating? 2) Input signal inspection Reference frequency signal oscillating? 3) Other Wiring too long? (Over 500m) (1,500ft) |

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6.5 How to Check Power Components

Before checking the power components, be sure to disconnect AC Input supply and wait until the Main Electrolytic Capacitors (DCP-DCN) discharge.



- 1) Disconnect the power input line (R, S, T) and the inverter output to the motor (U, V, W).
- 2) Verify whether the inverter terminal R, S, T, U, V, W, B1, B2 is shorted or open by changing the polarity of the tester.
- 3) Verify capacitor has discharged before testing.
- 4) The tester should display several mega-ohms when open. The tester can display terminal is shorted for a short time and then display several mega-ohms because of the electrolytic capacitor. The tester should display $1\ \Omega \sim 10\ \Omega$ when terminal is shorted. If all measured values are about the same, individual modules are OK.
- 4) Module elements and associated test points:

| Elements | | Test Polarity | | Measured Value | Element | Test Polarity | | Measured Value |
|--------------|-----|---------------|----|----------------|---------|---------------|-----|----------------|
| | | + | - | | | + | - | |
| Diode Module | D1 | R | B1 | Open | D4 | R | DCN | Short |
| | | B1 | R | Short | | DCN | R | Open |
| | D2 | S | B1 | Open | D5 | S | DCN | Short |
| | | B1 | S | Short | | DCN | S | Open |
| | D3 | T | B1 | Open | D6 | T | DCN | Short |
| | | B1 | T | Short | | DCN | T | Open |
| IGBT Module | Tr1 | U | B1 | Open | Tr4 | U | DCN | Short |
| | | B1 | U | Short | | DCN | U | Open |
| | Tr3 | V | B1 | Open | Tr6 | V | DCN | Short |
| | | B1 | V | Short | | DCN | V | Open |
| | Tr5 | W | B1 | Open | Tr2 | W | DCN | Short |
| | | B1 | W | Short | | DCN | W | Open |

6.6 Maintenance

The iG5 series is an industrial electronic product with advanced semiconductor components, however temperature, humidity, vibration and eventually aging parts may still affect it. To avoid this, it is recommended to perform routine inspections.

6.6.1 Precautions

- Be sure to remove the drive power input while performing maintenance.
- Be sure to perform maintenance only after checking that the DC bus has discharged. The bus capacitors in the electronic circuit can still be charged even after the power is turned off.
- The correct output voltage can only be measured by using a rectifier voltage meter. Other voltage meters including digital voltage meters are likely to display incorrect values caused by the high frequency PWM output voltage of the drive.

6.6.2 Routine Inspection

Be sure to check the following before operation.

- The conditions of the installation location.
- The conditions of the drive cooling.
- Abnormal vibration.
- Abnormal heating.

6.6.3 Periodical Inspection

- Any loose bolt, nut or rust caused by surrounding conditions? If so, tighten up or replace.
- Any deposits inside of the drive or cooling fan? If so, remove the deposits using air.
- Any deposit on the drive's PCB (Printed Circuit Boards)? If so, remove the deposits using air.
- Any abnormal contacts in the various connectors of the drive's PCB? If so, check the condition of the connector in question.
- Check the rotating condition of the cooling fan, the size and condition of the capacitors and the connections with the magnetic contactor. Replace it if there is any abnormality.

Chapter 6 - Troubleshooting & Maintenance

6.7 Daily and Periodic Inspection Items

| Inspection Location | Inspection Item | Inspection | Period | | | Inspection Method | Criterion | Measuring Instrument |
|------------------------------------|---------------------------|---|--------|--------|--------|--|---|--|
| | | | Daily | 1 year | 2 year | | | |
| All | Ambient Environment | Is there any dust? Is the ambient temperature and humidity adequate? | O | | | Refer to the precautions | Temperature: -10~+40 no freezing. Humidity: Under 50% no dew | Thermometer, Hygrometer, Recorder |
| | Equipment | Is there any abnormal oscillation or noise | O | | | Use sight and hearing | No abnormality | |
| | Input Voltage | Is the input voltage of the main circuit normal | O | | | Measure the voltage between the terminals R, S, T | | Digital Multi-Meter/Tester |
| Main Circuit | All | Megger check (between the main circuit and the ground) Are any fixed parts removed? Are there any traces of overheating at each component's cleaning? | | O | O | Undo the inverter connections short the terminals R, S, T, U, V, W and measure between these parts and the ground. Tighten the screws. Visual check. | Over 5M No fault | DC 500V class Megger |
| | Conductor/Wire | Is the conductor rusty? Is the wire coating damaged? | | O | | Visual check | No fault | |
| | Terminal | Is there any damage? | | O | | Visual check | No fault | |
| | IGBT Module /Diode Module | Check the resistance between each of the terminals. | | | O | Undo the inverter connection and measure the resistance between R, S, T P, N and U, V, W P, N with a tester. | (Refer ' How to Check Power Components ") | Digital Multi-Meter/Analog Tester |
| | Smoothing Capacitor | Is there any liquid coming out? Is the safety pin out, and is there any swelling? Measure the capacitance. | O | O | | Visual check. Measure with a capacitance-measuring device. | No fault Over 85% of the rated capacity | Capacitance Measuring Device |
| | Relay | Is there any chattering noise during operation? Is there any damage to the contact | | O | | Auditory check. Visual check. | No fault | |
| | Resistor | Is there any damage to the resistor insulation? Is the wiring in the resistor damaged (open)? | | O | | Visual check. Disconnect one of the connections and measure with a tester. | No fault Error must be within $\pm 10\%$ the displayed resistance | Digital Multi-Meter/Analog Tester |
| Control Circuit Protective Circuit | Operation Check | Is there any unbalance between each phases of the output voltage? Nothing must be wrong with display circuit after executing the sequence protective operation | | O | | Measure the voltage between the output terminals U, V and W. Short and open the inverter protective circuit output. | The voltage balance between the phases for 200V (800V) class is under 4V (8V). The fault circuit operates according to the sequence. | Digital Multi-Meter/Rectifying Voltmeter |

Chapter 6 - Troubleshooting & Maintenance

| Inspection Location | Inspection Item | Inspection | Period | | | Inspection Method | Criterion | Measuring Instrument |
|---------------------|---------------------|--|--------|--------|--------|--|--|----------------------------|
| | | | Daily | 1 year | 2 year | | | |
| Cooling System | Cooling Fan | Is there any abnormal oscillation or noise? Is the connection area loose? | ○ | ○ | | Turn OFF the power and turn the fan by hand. Tighten the connections. | Must rotate smoothly. No fault | |
| Display | Meter | Is the displayed value correct? | ○ | ○ | | Check the meter reading at the exterior of the panel | Check the specified and management values. | Voltmeter/ Ammeter etc. |
| Motor | All | Are there any abnormal vibrations or noise? Is there any unusual odor? | ○ ○ | | | Auditory, sensory, visual check. Check for overheat and damage. | No fault | |
| | Insulation Resistor | Megger check (between the output terminals and the ground terminal) | | | ○ | Undo the U, V and W connections and tie the motor wiring. | Over 5M | 500V class Megger |

Note: Values in () is for the 400V class inverters

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CHAPTER 7 - OPTIONS

7.1 Braking Resistor

7.1.1 Lower Braking Magnitude

| Model Number SvxxxiG5-x | | 004-1/2 | 008-1/2 | 015-1/2 | 022-2 | 037-2 040-2 | 004-4 | 008-4 | 015-4 | 022-4 | 037-4 040-4 |
|----------------------------|-------------------------------|---------|---------|---------|-------|----------------|-------|-------|-------|-------|----------------|
| Duty | Enable Duty [%] | 5 | 5 | 3 | 2 | 2 | 5 | 5 | 3 | 2 | 2 |
| | Continuous Braking Time [Sec] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Resistor | Resistor Value [Ω] | 400 | 200 | 100 | 60 | 40 | 1800 | 900 | 450 | 300 | 200 |
| | Resistor Capacity [W] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

7.1.2 Higher Braking Magnitude

[200V Class]

| Model Number SvxxxiG5-x | | 004-1/2 | | 008-1/2 | | 015-2/1 | | 022-2 | | 037-2 040-2 | |
|----------------------------|-------------------------------|---------|-----|---------|-----|---------|-----|-------|-----|----------------|-----|
| Average Braking Torque [%] | | 100 | 150 | 100 | 150 | 100 | 150 | 100 | 150 | 100 | 150 |
| Duty | Enable Duty [%] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Continuous Braking Time [Sec] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Resistor | Resistor Value [Ω] | 400 | 300 | 200 | 150 | 100 | 60 | 60 | 50 | 40 | 33 |
| | Resistor Capacity [W] | 100 | 150 | 100 | 150 | 200 | 300 | 300 | 400 | 600 | 600 |

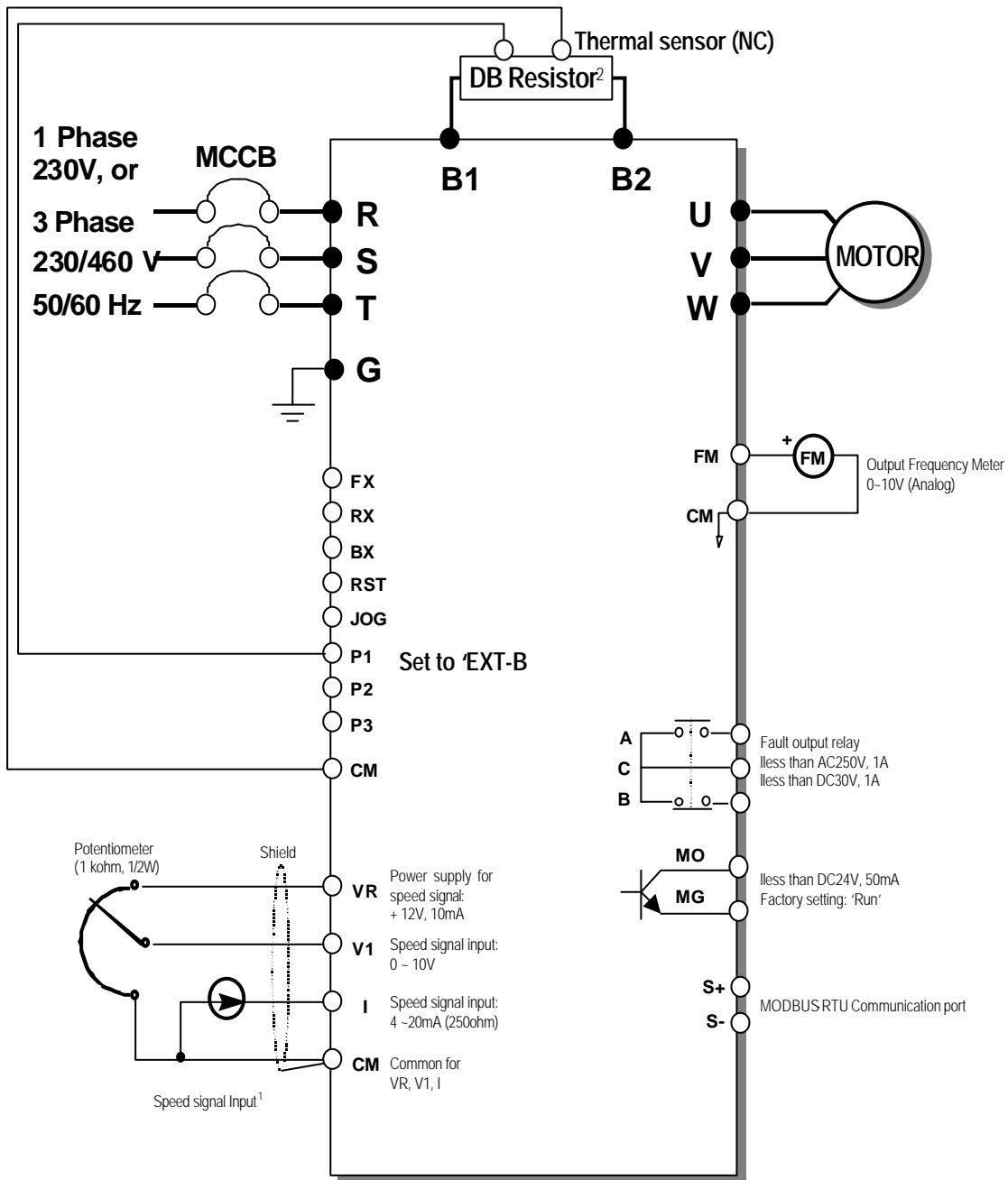
[400V Class]

| Model Number SvxxxiG5-x | | 004-4 | | 008-4 | | 015-4 | | 022-4 | | 037-4 040-4 | |
|----------------------------|-------------------------------|-------|-----|-------|-----|-------|-----|-------|-----|----------------|-----|
| Average Braking Torque [%] | | 100 | 150 | 100 | 150 | 100 | 150 | 100 | 150 | 100 | 150 |
| Duty | Enable Duty [%] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | Continuous Braking Time [Sec] | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Resistor | Resistor Value [Ω] | 400 | 300 | 900 | 600 | 450 | 300 | 300 | 200 | 200 | 130 |
| | Resistor Capacity [W] | 100 | 150 | 100 | 150 | 200 | 300 | 300 | 400 | 500 | 600 |

Chapter 7 - Options

7.1.3 Braking resistor wiring diagram

Wire the braking resistor to the inverter as short as possible.

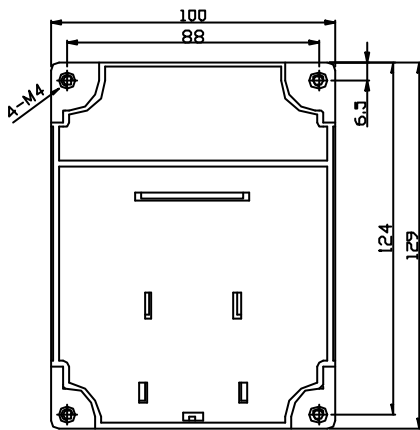


Note) 1. Analog speed command can be set by Voltage, Current and both of them.
2. DB resistor is optional.

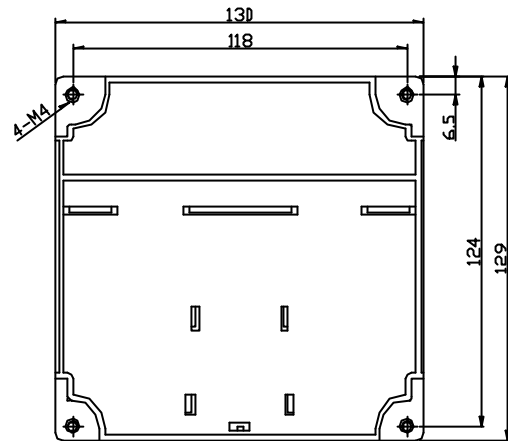
7.2 DIN Rail Base

Unit: mm

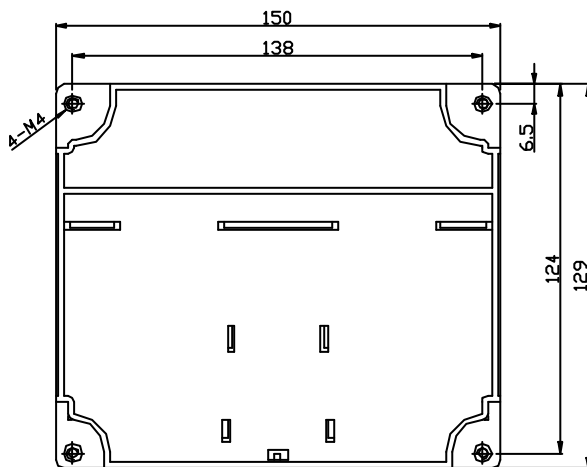
SV004iG5-1/2
SV008iG5-2



SV008iG5-1
SV015iG5-2
SV004/008/015iG5-4



SV015iG5-1
SV022/037/040iG5-2/4



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APPENDIX A - FUNCTIONS BASED ON THE USE

Set the function properly according to the load and operating conditions. The application and the related functions are listed at the following table.

| Use | Related Parameter Code |
|--|--|
| Accel/Decel time, pattern adjustment | DRV-01 [Acceleration Time], DRV-02 [Deceleration Time], FU1-05 [Acceleration Pattern], FU1-06 [Deceleration Pattern] |
| Reverse rotation prevention | FU1-03 [Forward, Reverse Prevention] |
| Minimum time accel/decel | FU1-05 [Acceleration Pattern], FU1-06 [Deceleration Pattern] |
| Accel/decel at continuous rating range | FU1-05 [Acceleration Pattern], FU1-06 [Deceleration Pattern] |
| Braking operation adjustment | FU1-07 [Stop Method], FU1-08-11 [DC Braking], FU1-12-13 [DC braking at Start] |
| Operations for frequencies over 50 Hz | FU1-20 [Maximum Frequency], FU1-25 [Frequency Upper Limit], I/O-05 [Frequency Corresponding to Max. Voltage of V1], I/O-10 [Frequency Corresponding to Max. Current of I] |
| Selecting an appropriate output characteristics for the load | FU1-20 [Maximum Frequency], FU1-21 [Base Frequency] |
| Motor output torque adjustment | FU1-22 [Starting Frequency], FU1-26-28 [Torque Boost], FU1-59-60 [Stall Prevention], FU2-30 [Rated Motor] |
| Output frequency limit | FU1-23-25 [Frequency Upper/Lower Limit], I/O-01-10 [Analog Frequency Setting] |
| Motor Overheat protection | FU1-50-53 [Electronic Thermal], FU2-30 [Rated Motor] |
| Multi step operation | I/O-12-14 [Define the Multi Function Input Terminals], I/O-20-27 [Jog, Multi Step Frequency], FU1-23-25 [Frequency Upper/Lower Limit] |
| Jog Operation | I/O-20 [Jog Frequency] |
| Frequency Jump Operation | FU2-10-16 [Frequency Jump] |
| Timing the electronic brake operation | I/O-42-43 [Frequency Detection Level], I/O-44 [Multi Function Output] |
| Displaying the rotating speed | DRV-04 [Motor Speed], FU2-74 [Motor RPM Display Gain] |
| Function alteration prevention | FU2-94 [Parameter Lock] |
| Energy Saving | FU1-39 [Energy Saving] |
| Auto restart operation after alarm stop | FU2-27-28 [Auto Retry] |
| 2 nd motor operation | FU2-81-90 [2 nd Function] |
| PID feedback operation | FU2-50-54 [PID Operation] |
| Frequency reference signal and output adjusting | I/O-01-10 [Analog Frequency Setting] |
| Define the multi function input terminals | I/O-12-14 [Define the Multi Function Input Terminals] |
| Define the multi function output terminals | I/O-44 [Multi Function Auxiliary Contact Output Setting] |
| Commercial line <-> inverter switchover operation | I/O-12-14 [Define the Multi Function Input Terminals], I/O-44 [Multi function Auxiliary Contact Output Setting] |
| Frequency meter calibration | I/O-40-41 [FM Output] |
| Operate by communicating with a computer | I/O-46 [Inverter No.], I/O-47 [communication Speed], I/O-48-49 [Loss of Reference] |

APPENDIX B- PERIPHERAL DEVICES

| Inverter Models | Motor [HP] | MCCB, ELB | Magnetic Contactor | Wire, mm ² (AWG) | | | AC Input Fuse | AC Reactor | DC Reactor |
|-----------------|------------|---------------|--------------------|-----------------------------|----------|----------|---------------|----------------|-----------------|
| | | | | R,S,T | U,V,W | Ground | | | |
| SV004iG5-1 | 0.5 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 3.5 (12) | 10 A | 2.13 mH, 5.7 A | 7.00 mH, 5.4 A |
| SV008iG5-1 | 1 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 3.5 (12) | 10 A | 2.13 mH, 5.7 A | 7.00 mH, 5.4 A |
| SV015iG5-1 | 2 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 3.5 (12) | 15 A | 1.20 mH, 10 A | 4.05 mH, 9.2 A |
| SV004iG5-2 | 0.5 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 3.5 (12) | 10 A | 2.13 mH, 5.7 A | 7.00 mH, 5.4 A |
| SV008iG5-2 | 1 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 3.5 (12) | 10 A | 2.13 mH, 5.7 A | 7.00 mH, 5.4 A |
| SV015iG5-2 | 2 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 3.5 (12) | 15 A | 1.20 mH, 10 A | 4.05 mH, 9.2 A |
| SV022iG5-2 | 3 | ABS33a, EBS33 | SMC-15P | 2 (14) | 2 (14) | 3.5 (12) | 25 A | 0.88 mH, 14 A | 2.92 mH, 13 A |
| SV037iG5-2 | 5 | ABS33a, EBS33 | SMC-20P | 3.5 (12) | 3.5 (12) | 3.5 (12) | 40 A | 0.56 mH, 20 A | 1.98 mH, 19 A |
| SV040iG5-2 | 5.4 | ABS33a, EBS33 | SMC-20P | 3.5 (12) | 3.5 (12) | 3.5 (12) | 40 A | 0.56 mH, 20 A | 1.98 mH, 19 A |
| SV004iG5-4 | 0.5 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 2 (14) | 6 A | 8.63 mH, 2.8 A | 28.62 mH, 2.7 A |
| SV008iG5-4 | 1 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 2 (14) | 6 A | 8.63 mH, 2.8 A | 28.62 mH, 2.7 A |
| SV015iG5-4 | 2 | ABS33a, EBS33 | SMC-10P | 2 (14) | 2 (14) | 2 (14) | 10 A | 4.81 mH, 4.8 A | 16.14 mH, 4.6 A |
| SV022iG5-4 | 3 | ABS33a, EBS33 | SMC-20P | 2 (14) | 2 (14) | 2 (14) | 10 A | 3.23 mH, 7.5 A | 11.66 mH, 7.1 A |
| SV037iG5-4 | 5 | ABS33a, EBS33 | SMC-20P | 2 (14) | 2 (14) | 2 (14) | 20 A | 2.34 mH, 10 A | 7.83 mH, 10 A |
| SV040iG5-4 | 5.5 | ABS33a, EBS33 | SMC-20P | 2 (14) | 2 (14) | 2 (14) | 20 A | 2.34 mH, 10 A | 7.83 mH, 10 A |

DECLARATION OF CONFORMITY

Council Directive(s) to which conformity is declared:

CD 73/23/EEC and CD 89/336/EEC

Units are certified for compliance with:

EN50178 (1997)
EN 50081-1 (1992)
EN 55022 (1994)
EN 50082-2 (1995)
EN 61000-4-2 (1995)
ENV 50140 (1993) & ENV 50204 (1995)
EN 61000-4-4 (1995)
EN 61000-4-5 (1995)
ENV 50141 (1993)
EN 61000-4-8 (1993)
EN 61000-4-11 (1994)

Type of Equipment: Inverter (Power Conversion Equipment)
Model Name: SV - iG5 Series
Trade Mark: LG Industrial Systems Co., Ltd.
Representative: LG International (Deutschland) GmbH
Address: Lyoner Strasse 15,
60528, Frankfurt am Main,
Germany

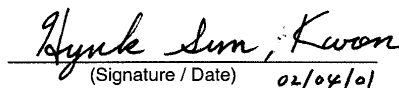
Manufacturer: LG Industrial Systems Co., Ltd.
Address: 181, Samsung-Ri, Mokchon-Myon, Chonan-Si,
330-845, Chungnam,
Korea

We, the undersigned, hereby declare that equipment specified above conforms to the Directives and Standards mentioned.

Place: **Frankfurt am Main**
Germany

Chonan, Chungnam,
Korea

 20/02/01
(Signature / Date)

 02/04/01
(Signature / Date)

Mr. Ik-Seong Yang / Dept. Manager
(Full name / Position)

Mr. Hyeok-Sun Kwon / Gneral Manager
(Full name / Position)

TECHNICAL STANDARDS APPLIED

The standards applied in order to comply with the essential requirements of the Directives 73/23/CEE "Electrical material intended to be used with certain limits of voltage" and 89/336/CEE "Electromagnetic Compatibility" are the following ones:

-
- **EN 50178 (1997)** "Safety of information technology equipment" .
 - **EN 50081-1 (1992)** "Electromagnetic compatibility. Generic emission standard. Part 1: Residential, commercial and light industry."
 - **EN 55022 (1994)** "Limits and methods of measurements of radio interference characteristics of information technology equipment."
 - **EN 50082-1 (1997)** "Electromagnetic compatibility. Generic immunity standard. Part 1: Residential, commercial and light industry."
 - **EN 61000-4-2 (1995)** "Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test. Basic EMC Publication (IEC 1000-4-2: 1995)."
 - **ENV 50140 (1993)** "Electromagnetic compatibility - Basic immunity standard - Radiated radio- frequency electro magnetic field - Immunity test."
 - **ENV 50204 (1995)** "Radio electromagnetic field from digital radio telephones."
 - **EN 61000-4-4: 1995** "Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transients / burst immunity test. Basic EMC Publication (IEC 1000-4-4: 1995)."
 - **EN 61000-4-5: 1995** "Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 5: Surge immunity test. Basic EMC Publication (IEC 1000-4-5: 1995)."
 - **ENV 50141 (1993)** "Electromagnetic compatibility. Basic immunity standard. Conducted disturbances induced by radio-frequency fields."
 - **EN 61000-4-8: 1993** "Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test - Basic EMC Publication (IEC 1000-4-8: 1993)."
 - **EN 61000-4-11: 1994** "Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage variations immunity tests (IEC 1000-4-11: 1994)."
-