# 5 Selecting Function

## 5-1 Function Selection List

### F: Fundamental functions

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| F00 | Data protection | 0: Data change enabled,<br>1: Data protected | - | - | 0 | X | |
| F01 | Frequency command | 0: Key operation (△, ▽ key)<br>1: Voltage input (terminal [12]) (0 to +10VDC)<br>2: Current input (terminal[C1]) (4 to 20mADC)<br>3: Voltage input + current input (terminals[12]+[C1])<br>4: Analog (VR built in inverter) | - | - | 4 | X | |
| F02 | Operation method | 0: Key operation (rotation direction: By terminal block)<br>1: External signal (digital input)<br>2: Key operation (forward rotation)<br>3: Key operation (reverse rotation) | - | - | 2 | X | |
| F03 | Maximum output frequency | 50 to 120Hz | Hz | 1 | 50 | X | |
| F04 | Base frequency | 25 to 120Hz | Hz | 1 | 50 | X | |
| F05 | - | Data cannot be changed. | - | - | 0 | - | |
| F06 | | | | | 0 | | |
| F07 | Acceleration time | 0.0 to 60.0s<br>0.01 second is set when 0.0 is specified. | s | 0.1 | 6.0 | ○ | |
| F08 | Deceleration time | 0.1 to 60.0s | s | 0.1 | 6.0 | ○ | |
| F09 | Torque boost | 0,1 : Variable torque characteristic<br>2 to 31: Constant torque characteristic | - | 1 | 13 | ○ | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| F10 | Electronic thermal overload relay for motor (Select) | 0: Inactive<br>1: Active (for selfventilated 4-pole standard motor)<br>2: Active (for servoventilated 4-pole motor) | - | - | 1 | △ | |
| F11 | (Level) | 20 to 135% of inverter rated current | A | 0.01 | Typical value of 4-pole motor | △ | |
| F12 | (Thermal time constant) | 0.5 to 10.0min | min | 0.1 | 5.0 | △ | |
| F14 | Restart after momentary power failure (Select) | 0: Inactive (Trip and alarm when power failure occurs)<br>1: Inactive (Trip and alarm when power recovers)<br>2: Active (Momentarily stops and restarts at setting frequency of before power failure)<br>3: Active (Momentarily stops and restarts at starting frequency) | - | - | 0 | X | |
| F15 | Frequency limiter (High) | 0 to 120Hz | Hz | 1 | 70 | ○ | |
| F16 | (Low) | 0 to 120Hz | | | 0 | ○ | |
| F17 | Gain (for frequency setting signal) | 0: For 0 to 10VDC (4 to 20 mA DC)<br>1: For 0 to 5VDC (4 to 12 mA DC) | - | - | 0 | X | |
| F18 | Bias frequency | -120 to 120Hz | Hz | 1 | 0 | ○ | |
| F20 | DC injection brake (Starting freq.) | Fixed to 3Hz | Hz | - | 3.0 | - | |
| F21 | (Level) | 0 to 100% | % | 1 | 50 | ○ | |
| F22 | (Braking time) | 0.0 s (Inactive), 0.1 to 30.0 s | s | 0.1 | 0.0 | ○ | |
| F23 | Starting frequency | 1 to 6Hz | Hz | 1 | 1 | X | |
| F24 | - | Data cannot be changed. | - | - | 0.0 | - | |
| F25 | Stop frequency | 1 to 6Hz | Hz | 1 | 1 | X | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ∧ ∨)

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| F26 | Motor sound (carrier freq.) | 0 to 15kHz<br>0.75kHz is set when 0 is specified | kHz | 1 | 15 | ○ | |
| F27 | (sound tone ) | 0: Level 0 1: Level 1<br>2: Level 2 3: Level 3 | - | - | 0 | ○ | |
| F30 | FM terminal (Voltage adjust) | 0 to 200% | % | 1 | 100 | ○ | |
| F31 | (Function) | 0: Output frequency<br>1: Output current<br>2: PID feedback amount<br>3: DC link circuit voltage | - | - | 0 | △ | |
| F36 | 30Ry operation mode | 0: Excited when tripped<br>1: Normally excited | - | - | 0 | X | |

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## E: Extension Terminal Functions

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| E01 | X1 terminal (function selection) | Use the code values listed below to select [X1], [X2] and [X3] terminal functions. | - | - | 0 | X | |
| E02 | X2 terminal (function selection) | | - | - | 2 | X | |
| E03 | X3 terminal (function selection) | | - | - | 3 | X | |
| | | 0: Multistep frequency 1 (SS1)<br>1: Multistep frequency 2 (SS2)<br>2: Coast-to-stop command (BX)<br>3: Alarm reset (RST)<br>4: External alarm (THR)<br>5: Write enable command for keypad (WE-KP)<br>6: PID control cancel (Hz/PID)<br>7: Link operation selection (LE) | | | | | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA ), ○ = possible (enabled by using ⋀ ⋁)

## C: Control Functions of Frequency

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| C01 | Jump frequency1 | 0 to 120Hz | Hz | 1 | 0 | ○ | |
| C02 | 2 | | | 1 | 0 | ○ | |
| C03 | 3 | | | 1 | 0 | ○ | |
| C04 | (Hysteresis) | 0 to 30Hz | Hz | 1 | 3 | ○ | |
| C05 | Multistep frequency 1 | 0.0 to 120Hz | Hz | 0.1 | 0.0 | ○ | |
| C06 | 2 | | | 0.1 | 0.0 | ○ | |
| C07 | 3 | | | 0.1 | 0.0 | ○ | |

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## P: Motor Parameters

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| P00 | Motor characteristics | 0 to 10 | - | - | 2 | ○ | |

## H: High Performance Functions

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| H01 | Operation time | Operation time accumulation | 100 Hr | 1 | 0 | - | |
| H02 | Trip history | The contents of the last four alarms are displayed sequentially. | - | - | --- | - | |
| H03 | Data initialization | 1: Initialized (return to factory setting value) | - | - | 0 | X | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ∧ ∨)

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| H04 | Retry (count) | 0: No retry<br>1: Retry (Count is fixed to 5.) | - | - | 0 | △ | |
| H06 | Cooling fan on/ off control | 0: Inactive<br>1: Active | - | - | 0 | △ | |
| H20 | PID control (Mode select) | 0: Inactive<br>1: Active (forward operation)<br>2: Active (reverse operation) | - | - | 0 | X | |
| H21 | (Feedback signal select) | 0: Terminal [12] (0 to +10VDC) Input<br>1: Terminal [C1] (4 to 20mADC)Input<br>2: Terminal [12] (+1 to +5VDC) Input | - | - | 1 | X | |
| H22 | (P-gain) | 0.01 to 10.0 times (1to1000%) | - | 0.01 | 0.01 | ○ | |
| H23 | (I-gain) | 0.0s : Inactive<br>0.1 to 999s | s | 0.1 | 0.0 | ○ | |
| H24 | (D-gain) | 0.00s : Inactive<br>0.01 to 10.0s | s | 0.01 | 0.00 | ○ | |
| H25 | (Feedback filter) | 0.0 to 60.0s | s | 0.1 | 0.5 | ○ | |

## O: Optional Functions

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| o00 | Option selection (RS485 communication) | 0: Option inactive<br>1: Option active<br>Set 0 when the optional RS485 communication unit is not used. | - | - | 0 | △ | |
| o01 | Station address | 1 to 31 | - | - | 1 | △ | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA ), ○ = possible (enabled by using ⋀ ⋁)

| Function code No. | Name | Setting range | Unit | Min. unit | Factory setting | Change during operation | User setting |
|---|---|---|---|---|---|---|---|
| o02 | Selection of operation in error occurrence | 0: Er8 trip with eight continuous communication errors or check sum errors<br>1: Er8 trip after the time (o03) set in the timer elapses with eight continuous communication errors or check sum errors<br>2: Er8 trip if communication does not recover until the time (o03) set in the timer elapses<br>3: Retry and operation continuation with communication or check sum error | - | - | 0 | △ | |
| o03 | Selection of time set in timer | 1 to 60s | s | 1 | 2 | △ | |
| o04 | Transmission rate | 0: 19200bps 1: 9600bps<br>2: 4800bps 3: 2400bps<br>4: 1200bps | - | - | 1 | △ | |
| o05 | Data length selection | 0:8bits 1:7bits | - | - | 0 | △ | |
| o06 | Parity bit selection | 0: No parity 1: Even parity<br>2: Odd parity | - | - | 0 | △ | |
| o07 | Stop bit selection | 0:2bits 1:1bit | - | - | 0 | △ | |
| o08 | Communication discontinuation detection time | 0: No detection,1 to 60s | s | 1 | 0 | △ | |
| o09 | Response interval | 0.00 to 1.00 | s | 0.01 | 0.01 | v | |
| o10 | RS485 command selection (frequency setting) | 0: Selection of frequency setting selected with F01<br>1: Selection of frequency setting from RS485 | - | - | 0 | X | |
| o11 | RS485 command selection (operation command) | 0: Selection of operation command selected with F02<br>1: Selection of operation command from RS485 | - | - | 0 | X | |

Table 5-1-1 Table of Function Selection List

**Note:** For details on "o01" to "o11", refer to the instruction manual that came with the optional RS485 serial communication unit.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ∧ ∨)

## 5-2 Details of Each Function

### F00 Data protection

| Factory setting | Change during operation |
|---|---|
| 0 | X |

Set data can be locked to prevent it from being changed by mistake when using the keypad panel:

0 Data can be changed.

1 Data is protected.

Data is changed when the STOP + △ or ▽ key are pressed simultaneously.

### F01 Frequency command

| Factory setting | Change during operation |
|---|---|
| 4 | X |

The following five values can be selected:

0 Key operation [△ ▽ key]

1 Voltage input (terminal 12) (0 to + 10VDC)

2 Current input (terminal C1) (4 to 20mADC)

3 Voltage input (terminal 12) + current input (terminal C1)

4 Analog setting (POT built in inverter)

**CAUTION**

High-speed operation can be set by the inverter easily. Carefully check the limit of the motor and machine before changing the setting.
**Otherwise injuries could occur.**

### F02 Operation method

| Factory setting | Change during operation |
|---|---|
| 2 | X |

The following four values can be selected: refer to Table 2-3-3.

0 Key operation [RUN STOP key]

The motor runs when the RUN key is pressed and decelerates to stop when the STOP key is pressed. The direction of rotation depends on the FWD and REV terminals as follows.

When the external power supply is used (Set SW7 at CM.)
+24 to +27 VDC
supplied to FWD - P24/CM: Forward
+24 to +27 VDC
supplied to REV - P24/CM: Reverse
Operation is impossible when
+24 to +27 VDC is supplied to both or none of FWD - P24/CM and
REV - P24/CM.

When the internal power supply is used (Set SW7 at P24.)
FWD - P24/CM short-circuited: Forward
REV - P24/CM short-circuited: Reverse
Operation is impossible when both the FWD and REV terminals or none of them are short-circuited with the P24/CM terminal.



Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

| | | 1 | External signal operation (Digital input) (FWD, REV)<br>When the external power supply is used (Set SW7 at CM):<br>Forward operation with +24 to +27 VDC supplied to FWD - P24/CM and deceleration to stop with them open.<br>Reverse operation with +24 to +27 VDC supplied to REV - P24/CM and deceleration to stop with them open.<br>No operation with +24 to +27 VDC supplied to both FWD - P24/CM and REV - P24/CM.<br><br>When the internal power supply is used (Set SW7 at P24):<br>Forward operation with FWD - P24/CM short-circuited and deceleration to stop with them open.<br>Reverse operation with REV - P24/CM short-circuited and deceleration to stop with them open.<br>No operation with both FWD - CM and REV - CM short-circuited. |
|---|---|---|---|

| | | 2 | Keypad operation<br>(forward rotation) [RUN STOP key]<br><br>The motor runs forward when the RUN key is pressed and decelerates-to-stop when the STOP key is pressed. FWD and REV terminal input is ignored. |
|---|---|---|---|

| | | 3 | Keypad operation<br>(reverse rotation) [RUN STOP key]<br><br>The motor runs in reverse when the RUN key is pressed and decelerates-to-stop when the STOP key is pressed. FWD and REV terminal input is ignored. |
|---|---|---|---|

**Note:** **This function can be changed only while the FWD and REV terminals are open**.

## F03 Maximum output frequency

| Factory setting | Change during operation |
|---|---|
| 50Hz | X |

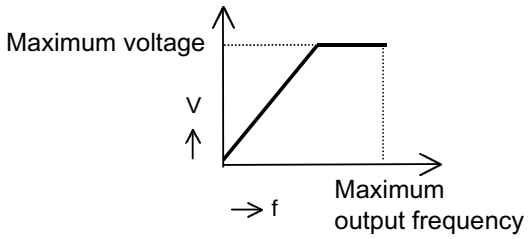
This function sets the maximum output frequency.

| | | 5 | 0 |
|---|---|---|---|

to

| 1 | 2 | 0 |
|---|---|---|

The maximum output frequency can be set with a resolution of 1 Hz in a range between 50 and 120 Hz.




**CAUTION**

High-speed operation can be set by the inverter easily. Carefully check the limit of the motor and machine before changing the setting.
**Otherwise injuries could occur.**

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ∧ ∨)

## F04 Base frequency

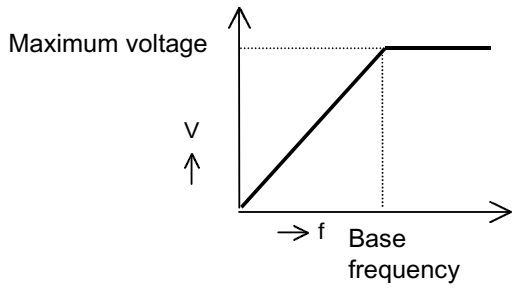
| Factory setting | Change during operation |
|---|---|
| 50Hz | X |

This function sets a base frequency (branch point between constant torque characteristic and constant output characteristic).

25 to 120

The base frequency can be set with a resolution of 1 Hz in a range between 25 and 120 Hz.

Set a frequency matching the motor characteristics.
A value exceeding the maximum frequency can be set but the output voltage is reduced.




## F05
## F06

| Factory setting | Change during operation |
|---|---|
| 0 | X |

Data cannot be changed.

## F07 Acceleration time

| Factory setting | Change during operation |
|---|---|
| 6. 0s | ○ |

0.0 to 60.0

The time taken to increase from 0.0 Hz to the maximum output frequency can be set in an increment of 0.1 s step in a range between 0.0 and 60.0 s.

0.01 is set when 0.0 is specified.

## F08 Deceleration time

| Factory setting | Change during operation |
|---|---|
| 6. 0s | ○ |

0.1 to 60.0

The time taken to increase from the maximum output frequency to 0.0 Hz can be set in a range between 0.1 and 60.0 s. (In an increment of 0.1 s step)

5

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ⋀ ⋁)

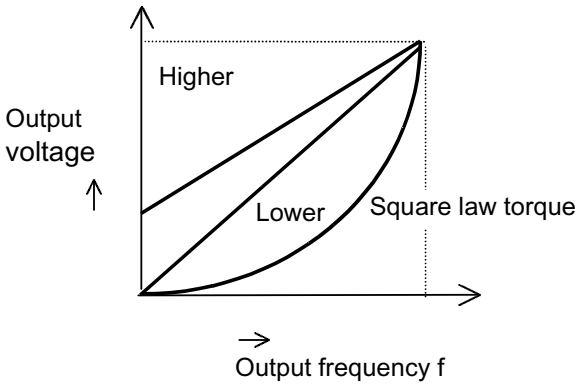
## F09 Torque boost

| Factory setting | Change during operation |
|---|---|
| 13 | ○ |

This function can choose between 32 types of boost according to the load type and motor characteristics.

00 to 01 — For square law torque loads (fan, pump)

02 to 31 — Lower ↓ Higher




## F10 Electronic thermal O/L relay (Select)

| Factory setting | Change during operation |
|---|---|
| 1 | △ |

This function is used to select between the following three values:

00 Inactive

01 Active for selfventilated 4-pole standard motor

02 Active for servoventilated 4-pole standard motor

## F11 Electronic thermal O/L relay (Level)

| Factory setting | Change during operation |
|---|---|
| Motor rated current | △ |

0.14 to 2.23 — This function sets the operation level of an electronic thermal O/L relay by using an ampere value according to the motor rated current. 20 to 135% of the inverter rated current can be set. Values less than 9.99A can be set in 0.01A step and values more than 10.0A can be set in 0.1A step.

Set the value obtained by multiplying the motor rated current by coefficient K in the table below according to the wiring length between the inverter and motor.

| Inverter capacity | Wiring length | | | | |
|---|---|---|---|---|---|
| | 0m | 40m | 50m | 100m | 200m |
| GSX600-0.4-S | K=1 | | | K=1.1 | |
| GSX600-0.75-S to GSX600-2.2-S | K=1 | | | | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

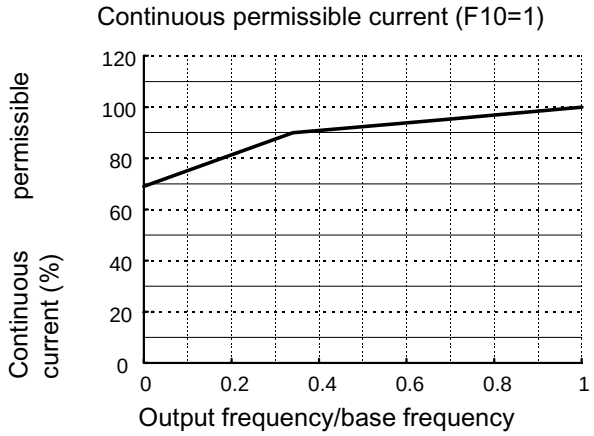
## F12 Electronic thermal O/L relay (thermal time constant)

| Factory setting | Change during operation |
|---|---|
| 5. 0min | △ |

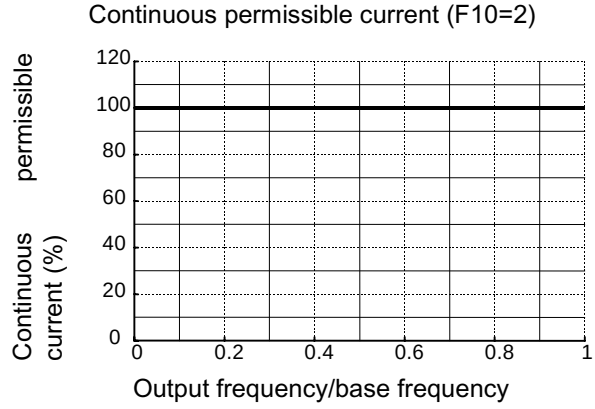
0.5 to 1 0.0

This function sets the operating time of the electronic thermal O/L relay when the current that is 150% of the operation level flows.
0.5 to 10.0 min. can be set
(in 0.1 min. step).

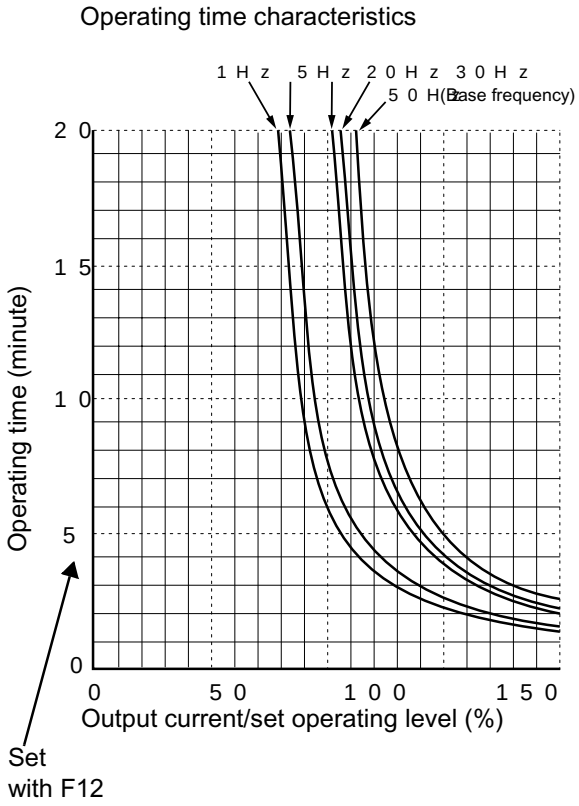
The figure below shows the continuous permissible current with F10 (electronic thermal O/L relay [Select]) = 1.




The figure below shows the continuous permissible current with F10 (electronic thermal O/L relay [Select]) = 2. 100% of the continuous permissible current is the current value set with function F11 (electronic thermal O/L relay [Level]).




The graph below shows the electronic thermal O/L relay operating characteristics. Output current values for the electronic thermal operating levels (values set with function F11) are plotted horizontally and operating times for output current are plotted vertically.
This graph is for F10 = 1 with the base frequency of 50Hz. The characteristics for output frequencies exceeding the base frequency are the same as the characteristics for the base frequency.
When function F10 is set to 2, the characteristics are always the same as those for the base frequency. The operating time with output current of 150% can be adjusted by using function F12 (electronic thermal O/L relay (thermal time constant)).




Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

## F14 Restart after momentary power failure (Select)

| Factory setting | Change during operation |
|---|---|
| 0 | X |

This function determines whether operation is restarted upon recovery from momentary power failure:

0 Inactive

Failure while inverter is stopped:
The stop status is continued after recovery from the failure.
Failure during operation:
LU indication is held immediately due to undervoltage and the inverter trips with alarm output.

1 Inactive

Failure while inverter is stopped:
The stop status is continued after recovery from the failure.
Failure during operation:
LU indication is held upon recovery from the failure and the inverter trips with alarm output.

2 Active
The inverter restarts with the frequency at the momentary power failure when 0.5s elapses after recovery from the fail

3 Active
The inverter restarts with the starting frequency when 0.5s elapses after recovery from the failure.

2,

3 = valid upon recovery from the failure with LU being on.

The table below lists approximate LU indication times for a momentary power failure during operation.

| Inverter Type (kW) | 0.1 | 0.2 | 0.4 | 0.75 | 1.5 | 2.2 |
|---|---|---|---|---|---|---|
| Time (s) | 0.6 | 1.2 | 2.6 | 4.8 | 3.0 | 5.0 |

## F15 Frequency limiter (High)

| Factory setting | Change during operation |
|---|---|
| 70Hz | ○ |

## F16 Frequency limiter (Low)

| Factory setting | Change during operation |
|---|---|
| 0 | ○ |

This function sets the upper and lower limits of output frequencies.

0 to 120 → 0 to 120Hz can be set with a resolution of 1Hz.

If the upper limit and lower limit settings are reversed, the upper limit is valid and the lower limit is ignored.
Hence, the operation is always performed with the upper limit regardless of the frequency setting.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ∧ ∨)

## F17 Gain (for frequency setting signal)

| Factory setting | Change during operation |
|---|---|
| 0 | X |

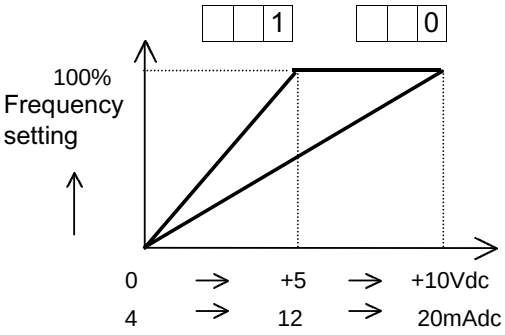
This function outputs the frequency obtained by multiplying the reference frequency by a ratio.

This function selects an analog input signal level with a value from [ ][ ]1 to [ ][ ]4 that is set by function [F][0][1].

[ ][ ]0 The maximum frequency is output at +10VDC (20mA DC).

[ ][ ]1 The maximum frequency is output at +5VDC (12mADC).

When this function is used with function [F][1][8] (bias frequency ), the gain set with this function is valid and the gained frequency is biased.

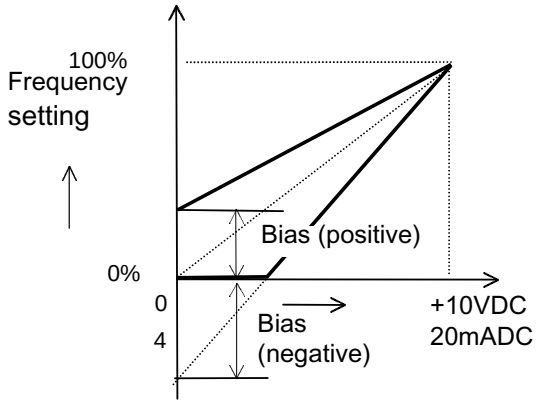



## F18 Bias frequency

| Factory setting | Change during operation |
|---|---|
| 0 | ○ |

This function outputs a frequency biased for the analog frequency setting.

[-][1][2][0] to [1][2][0] -120 to 120Hz can be set with a resolution of 1Hz.




## F20 DC injection brake (starting frequency)

| Factory setting | Change during operation |
|---|---|
| 3.0Hz | X |

This function sets 3.0Hz (fixed) as the starting frequency of DC injection brake.

## F21 DC injection brake (Level)

| Factory setting | Change during operation |
|---|---|
| 50% | ○ |

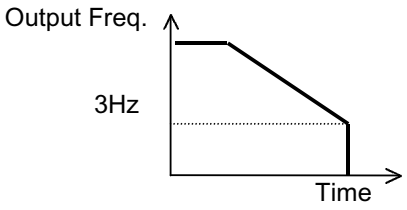
This function sets a DC brake current level. Levels can be set in 1% unit by assuming the level of the inverter rated current to be 100%.

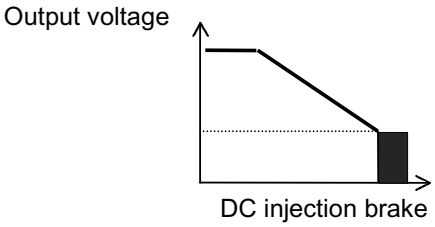
Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ⋀ ⋁)

## F22 DC injection brake (Braking time)

| Factory setting | Change during operation |
|---|---|
| 0.0s | ○ |

This function sets the DC injection braking time.
0.0 : No DC injection braking
0.1 to 30.0 : DC injection braking time 0.1 to 30s (in 0.1s step)



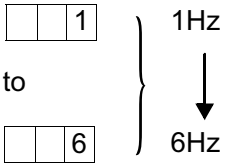




**CAUTION**
Do not use the inverter brake function for mechanical holding.
**Otherwise injuries could occur.**

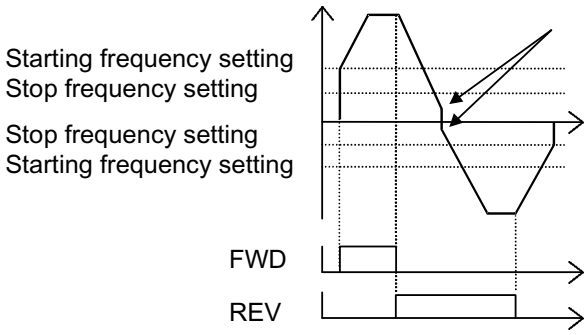
## F23 Starting frequency
## F25 Stop frequency

| | Factory setting | Change during operation |
|---|---|---|
| F23 | 1Hz | X |
| F25 | 1Hz | X |

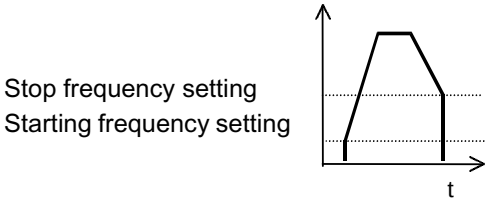
These functions set a starting or stop frequency in a range from 1 to 6Hz in 1Hz step.




Output frequency in forward/reverse operation




Starting frequency < stop frequency




If the set frequency is lower than the stop frequency, the inverter output is 0Hz.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ▲ ▼)

**F24**

| Factory setting | Change during operation |
|---|---|
| 0. 0 | - |

Data cannot be changed.

## F26 Motor sound (carrier freq.)

| Factory setting | Change during operation |
|---|---|
| 15kHz | ○ |

This function changes the motor tone quality by changing the carrier frequency.

[ ][ ][0]

to

[ ][1][5]

Choose among 16 types according to the usage conditions.

Data code 0 : 0.75kHz (Low carrier)
1 : 1kHz
2 : 2kHz
15 : 15kHz (High carrier, low noise)

**Note:** When the inverter is operating at 9kHz or higher carrier frequency, the carrier frequency for may be reduced to 8kHz automatically to protect the inverter.

## F27 Motor sound (sound tone)

| Factory setting | Change during operation |
|---|---|
| 0 | ○ |

This function adjusts the motor operation sound when a value of 7 or less is set with function F26.

[ ][ ][0] Level 0

to

[ ][ ][3] Level 3

## F30 FM terminal (voltage adjust)

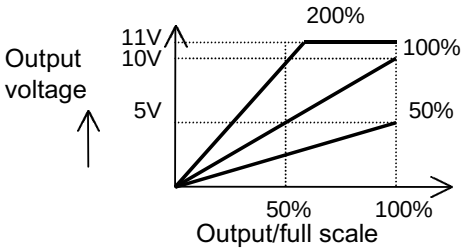
| Factory setting | Change during operation |
|---|---|
| 100% | ○ |

This function regulates the frequency meter voltage level output to the FM terminal in the range from 0 to 200% (in 1% step).

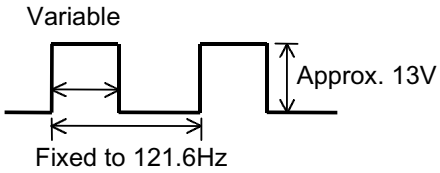
[ ][ ][0] (Full scale about 0VDC)

to

[2][0][0] (Full scale about 11VDC)




**Note:** Output to the FM terminal is pulse output with constant frequency and variable duty.




5

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

## F31 FM terminal (Function)

| Factory setting | Change during operation |
|---|---|
| 0 | △ |

This function selects the contents of output to the FM terminal.

0 Output frequency (maximum output frequency = 100%)

1 Output current (inverter rated current x 2 = 100%)

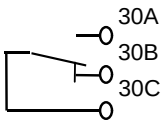
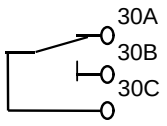
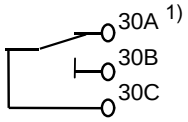
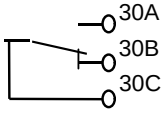
2 PID feedback value (full scale = 100%)

3 DC link circuit voltage (500VDC = 100%)

## F36 30Ry operation mode

| Factory setting | Change during operation |
|---|---|
| 0 | X |

This function sets the operation mode of alarm output for any fault (30Ry).

| F36 | Normal operation | Tripped |
|---|---|---|
| 0 (Excited when tripped) |   |   |
| 1 (Normally excited) |   |   |

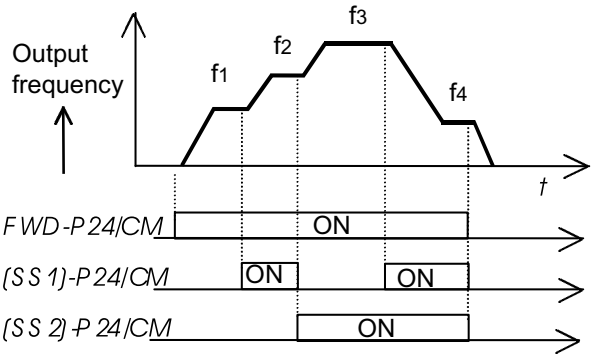
1) The status without inverter power supply is the same as the status when inverter is tripped.

## E01 X1 terminal (function selection)
## E02 X2 terminal
## E03 X3 terminal

| | Factory setting | Change during operation |
|---|---|---|
| E01 | 0 | X |
| E02 | 2 | X |
| E03 | 3 | X |

0 Multistep frequency selection 1 (SS1)

1 Multistep frequency selection 2 (SS2)




f1: Frequency selected with F01 (keypad panel/analog/freq. setting POT )
f2: Frequency selected with C05
f3: Frequency selected with C06
f4: Frequency selected with C07

OFF input is assumed if SS1 or SS2 is not selected.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

| | | 2 | Coast-to-stop command (BX)<br>Inverter output is cut when the BX terminal is connected to the P24/CM terminal.<br>OFF input is assumed when BX is not selected. |
|---|---|---|---|
| | | 3 | Alarm reset (RST)<br>The alarm output is released between the RST and P24/CM terminals when power is turned on.<br>The trip status is released between the RST and P24/CM terminals when power is turned off.<br>(Refer to 6-2 Alarm Reset on page 6-3) |
| | | 4 | External alarm (THR)<br>Inverter trips with OH2 when the THR terminal is disconnected from the P24/CM terminal.<br>ON input is assumed when THR is not selected. |
| | | 5 | Write enable command for keypad (WE-KP)<br>Function change from the keypad panel is disabled when the WE-KP terminal is disconnected from the P24/CM terminal.<br>Function change from the keypad panel is enabled when the WE-KP terminal is connected to the P24/CM terminal.<br>ON input is assumed when WE-KP is not selected. |
| | | 6 | PID control cancel (Hz/PID)<br>PID control operates when the Hz/PID terminal is disconnected from the P24/CM terminal and does not operate when they are connected.<br>OFF is assumed when the Hz/PID is not selected.<br>Hz/PID is valid only when function H 2 0 is set to 1 or 2.<br>(PID control operation). |
| | | 7 | Link operation selection (LE)<br>Operation setting can be done by commands from RS485 when the LE terminal is connected to the P24/CM terminal.<br>A command from RS485 is ignored when the LE terminal is disconnected from the P24/CM terminal.<br>ON input is assumed when LE is not selected.<br>LE is valid only when function o 0 0 is set to 1 (option operation). |

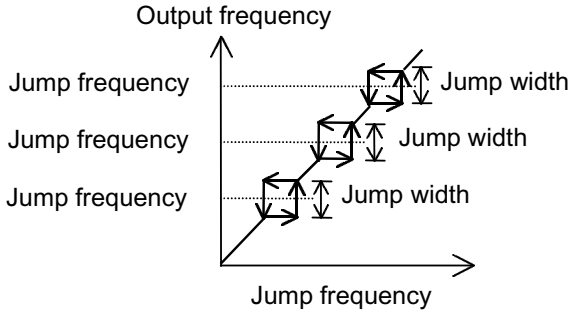
5

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ⋀ ⋁)

## C01 C02 C03 Jump frequency 1, 2, 3

| | Factory setting | Change during operation |
|---|---|---|
| C01 | 0.0Hz | ○ |
| C02 | 0.0Hz | ○ |
| C03 | 0.0Hz | ○ |

These functions jump frequencies to prevent overlap between the load mechanical resonance point and inverter output frequency.
Up to three jump points can be set.
These function do not operate when 0Hz is set.
No frequency is jumped during acceleration and deceleration.
If three continuous frequencies are set, the total of the three jump widths is set as the jump width.




## C04 Jump frequency (Hysteresis)

| Factory setting | Change during operation |
|---|---|
| 3Hz | ○ |

This function sets a jump width in a range from 0 to 30Hz in 1Hz step.

## C05 Multistep frequency 1
## C06 Multistep frequency 2
## C07 Multistep frequency 3

| | Factory setting | Change during operation |
|---|---|---|
| C05 | 0.0Hz | ○ |
| C06 | 0.0Hz | ○ |
| C07 | 0.0Hz | ○ |

These functions set a multistep frequency from 0 to 120Hz in 0.1Hz step (for 99.9 Hz or less) or 1Hz step (for 100Hz or more) by switching the external contact signal.
The ON and OFF of terminal function SS1/SS2 (see explanation of E01, E02, and E03) switches between the frequencies set by these functions C05, C06, and C07.

## P00 Motor characteristics

| Factory setting | Change during operation |
|---|---|
| 2 | ○ |

This function removes abnormalities in the output current such as current vibration.

0 Current vibration is not suppressed.

to

10 Current vibration is minimized.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ⋀ ⋁)

## H01 Operation time

This function displays the integration time of power supply applied to the inverter.
0 to 655 are displayed to indicate 0 to 65500 hours.
If the integration time exceeds 65500 hours, 65500 is displayed continuously. While the total of power supply times is less than one hour, the times are not integrated.

## H02 Trip history

This function memorizes the history of the last four protection operations.
Each data item can be called using the ▽ key.
The calling procedure is shown below:

The contents of a new alarm is stored in the data area for the history of the latest alarm. At this time, the history of the latest alarm is stored in the data area for the second latest alarm. The histories of the second and third latest alarms are moved in this way and the history of the fourth latest alarm is deleted.
Stored trip histories are not deleted although data initialization is executed with H03.

| No. | Procedure | Display example | Remarks |
|---|---|---|---|
| 1 | Call H02 | H02 | |
| 2 | Press the FUNC DATA key | OU2 | The contents (history) of the latest alarm are displayed. |
| 3 | Press the ▽ key / Press the △ key | OH2 | The contents of the second latest alarm are displayed. |
| 4 | Press the ▽ key / Press the △ key | OC1 | The contents of the third latest alarm are displayed. |
| 5 | Press the ▽ key / Press the △ key | - - - | The contents of the fourth latest alarm are displayed. (This example is for no history.) |
| 6 | Press the ▽ key | End | |

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA ), ○ = possible (enabled by using △ ▽)

## H03 Data initialization

| Factory setting | Change during operation |
|---|---|
| 0 | X |

This function initializes data items set with all functions to values set in the factory.

0 Manually set value

to

1 Initialized (factory set value)

The display is changed from 0 to 1 when the STOP and △ keys are pressed simultaneously.

When the FUNC DATA key is pressed under this condition, initial data is written and a frequency set by the built-in POT (VR) is displayed automatically.

## H04 Retry

| Factory setting | Change during operation |
|---|---|
| 0 | △ |

This function selects a retry operation if the inverter is tripped.

0 : No retry

to

1 : The retry count is fixed to 5 and retry starts when 0.5s elapses after tripping.

Retry is attempted only for an overcurrent/overvoltage trip that occurs during operation.

## H06 Cooling fan on/off control

| Factory setting | Change during operation |
|---|---|
| 0 | △ |

0 : ON-OFF No control (always on)

to

1 : ON-OFF Control
(The fan is turned off when the inverter temperature becomes low after operation is stopped.)

## H20 PID control (Mode select)

| Factory setting | Change during operation |
|---|---|
| 0 | X |

0 : Inactive
1 : Active (forward)
2 : Active (reverse)
} Select a PID control operation.

The feedback signal value (%) is displayed by assuming the full scale to be 100% when a PID control operation is selected.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using △ ▽)

## H21 PID control (Feedback signal select)

| Factory setting | Change during operation |
|---|---|
| 1 | X |

This function selects a PID control feedback signal.

[ ][ ][0] Terminal 12 (0 to +10VDC)

[ ][ ][1] Terminal C1 (4 to 20mADC)

[ ][ ][2] Terminal 12 (+1 to +5VDC)

## H22 PID control (P-gain)

| Factory setting | Change during operation |
|---|---|
| 0.01 | ○ |

This function sets a P-gain.

[0.][0][1] to [1][0.][0] P-gain from 0.01 to 10.0 times (1 to 1000%) (in increment of 0.01 step)

## H23 PID control (I-gain)

| Factory setting | Change during operation |
|---|---|
| 0.0s | ○ |

This function sets an integral time.

[ ][0.][0] : No integration

[ ][0.][1] to [9][9][9] : Integral time 0.1 to 999s

(in 0.1s step for 99.9s or less, 1s step for 100s or more)

## H24 PID control (D-gain)

| Factory setting | Change during operation |
|---|---|
| 0.00s | ○ |

This function sets a derivative time.

[0.][0][0] : No derivative

[0.][0][1] to [1][0.][0] : Derivative time 0.01 to 10.0s (in 0.01s step)

## H25 PID control (Feedback filter)

| Factory setting | Change during operation |
|---|---|
| 0.5s | ○ |

This function sets a filter time constant of PID feedback.

[ ][0.][0] to [6][0.][0] : Time constants 0.0 to 60.0s (in 0.1s step)

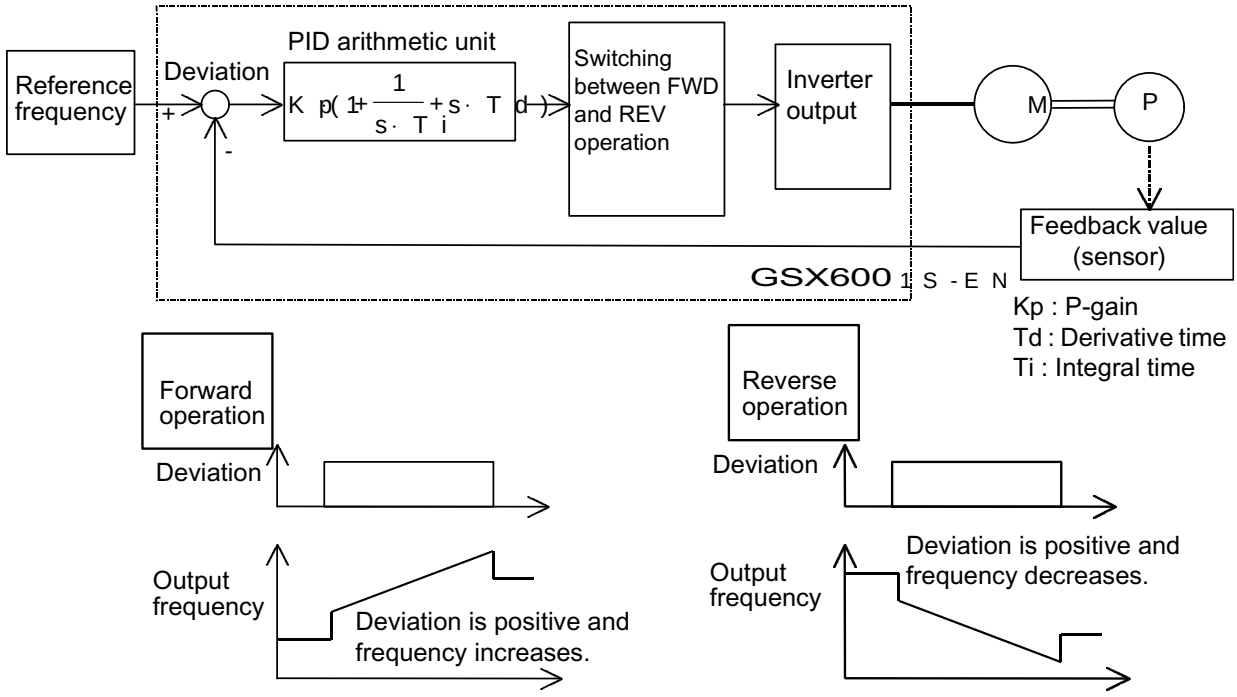
5

Change during operation: X = impossible, △ = possible (enabled by using [FUNC DATA]), ○ = possible (enabled by using [Λ] [V])

# PID control

In PID control, an output frequency is adjusted to a feedback value.

Use F 0 1 to set a frequency and H 2 1 to make the feedback value and the reference value equal.




## o00 Option selection (RS485 communication)

**For explanations of "o01" to "o11", refer to the instruction manual that comes with the optional RS485 serial communication unit.**

| Factory setting | Change during operation |
|---|---|
| 0 | △ |

0 : Option inactive

1 : Option active

Always set 0 when the optional RS485 serial communication unit is not used. If 1 is set, Er 8 occurs.

Change during operation: X = impossible, △ = possible (enabled by using FUNC DATA), ○ = possible (enabled by using ∧ ∨)

# 6 Protective Function

## 6-1 List of protective functions

When the protective function is activated, inverter output is instantly cut off (while the motor coasts until it is stopped), and an alarm is issued, and the details of the alarm are displayed on the keypad panel.

| Alarm Name | Keypad panel display | Contents of operation | |
|---|---|---|---|
| Overcurrent | OC1 | During acceleration | If the inverter output current momentarily exceeds the overcurrent detection level because of an overcurrent in the motor or the short-circuit in the output circuit, the output is shut down, an alarm is issued, and the inverter is tripped. |
| | OC2 | During deceleration | |
| | OC3 | While running at constant speed | |
| Overvoltage | OU1 | During acceleration | If the DC voltage of the main circuit exceeds the overvoltage detection level because of an increase in the regenerating current from the motor, etc., output is shut down, an alarm is issued, and the inverter is tripped. However, protection against inadvertent overvoltage loading (e.g. high-voltage line) might not be provided. |
| | OU2 | During deceleration | |
| | OU3 | While running at constant speed | |
| Undervoltage | LU | If the DC voltage of the main circuit falls below the undervoltage detection level because of a lowered power supply, output is shut down to protect the inverter. If the restart function after momentary power failure is not activated, an alarm is issued and the inverter is tripped. If the restart function is activated, the inverter restarts automatically with no alarm.<br>For further details of the protective function, refer to the descriptions of Function F14. | |
| Overheating of heat sink | OH1 | If the temperature of the heat sink used for cooling the rectifier diodes and IGBTs rises because of cooling fan failure, etc., protective function is activated to stop operation, an alarm is issued, and the inverter is tripped. | |

| Alarm Name | Keypad panel display | Contents of operation |
|---|---|---|
| External Alarm | OH2 | If the control circuit terminal THR (functional change of X1 to X3 terminals) is set to OFF, an alarm is issued and the inverter is tripped. |
| Motor overload | OL | If the motor current exceeds the operating level set by the electronic thermal O/L relay, output is shut down to protect the motor, an alarm is issued, and the inverter is tripped. |
| Inverter overload | OLU | If the output current exceeds the inverter rated overload current, output is shut down, an alarm is issued, and the inverter is tripped. |
| Memory Error | Er1 | If memory error occurs, such as a missing or invalid data, output is shut down, an alarm is issued , and the inverter is tripped. |
| CPU Error | Er3 | If CPU error occurs because of noise, etc., output is shut down, an alarm is issued , and the inverter is tripped. |
| RS485 Communication Error | Er8 | If an error occurs in serial communication via the RS485, output is shut down, an alarm is issued , and the inverter is tripped. For further details, refer to the instruction manual for RS485 communication cards. |



Table 6-1-1 List of Protective Functions

## 6-2 Alarm Reset

To release the trip status, enter the reset command by pressing the reset key or from terminal (RST) after removing the cause of the trip. Since the reset command is an edge operation, be sure to input a command string such as OFF → ON → OFF as shown in Figure 6-2-1.
When releasing the trip status, set the operation command to OFF. When the operation command is set to ON, check that operation starts after resetting.
If the cause of tripping is Er1, reset the error and initialize data. If the inverter is not reset, contact Bonfiglioli Riduttori div. Silectron sistemi.

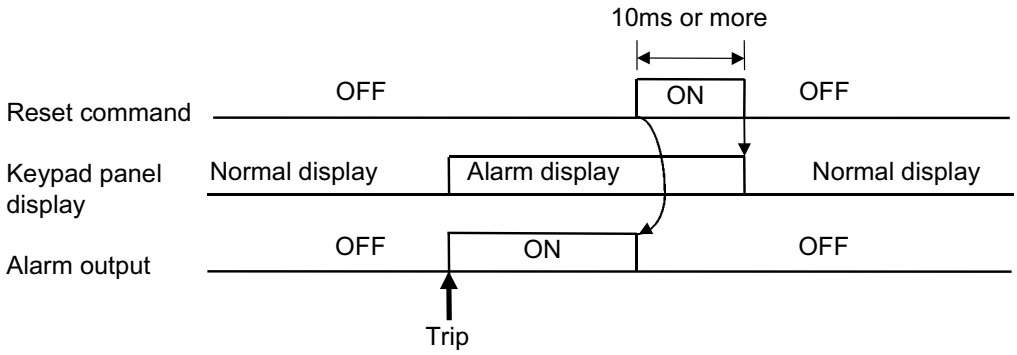



Figure. 6-2-1 How to input the reset command



**WARNING**

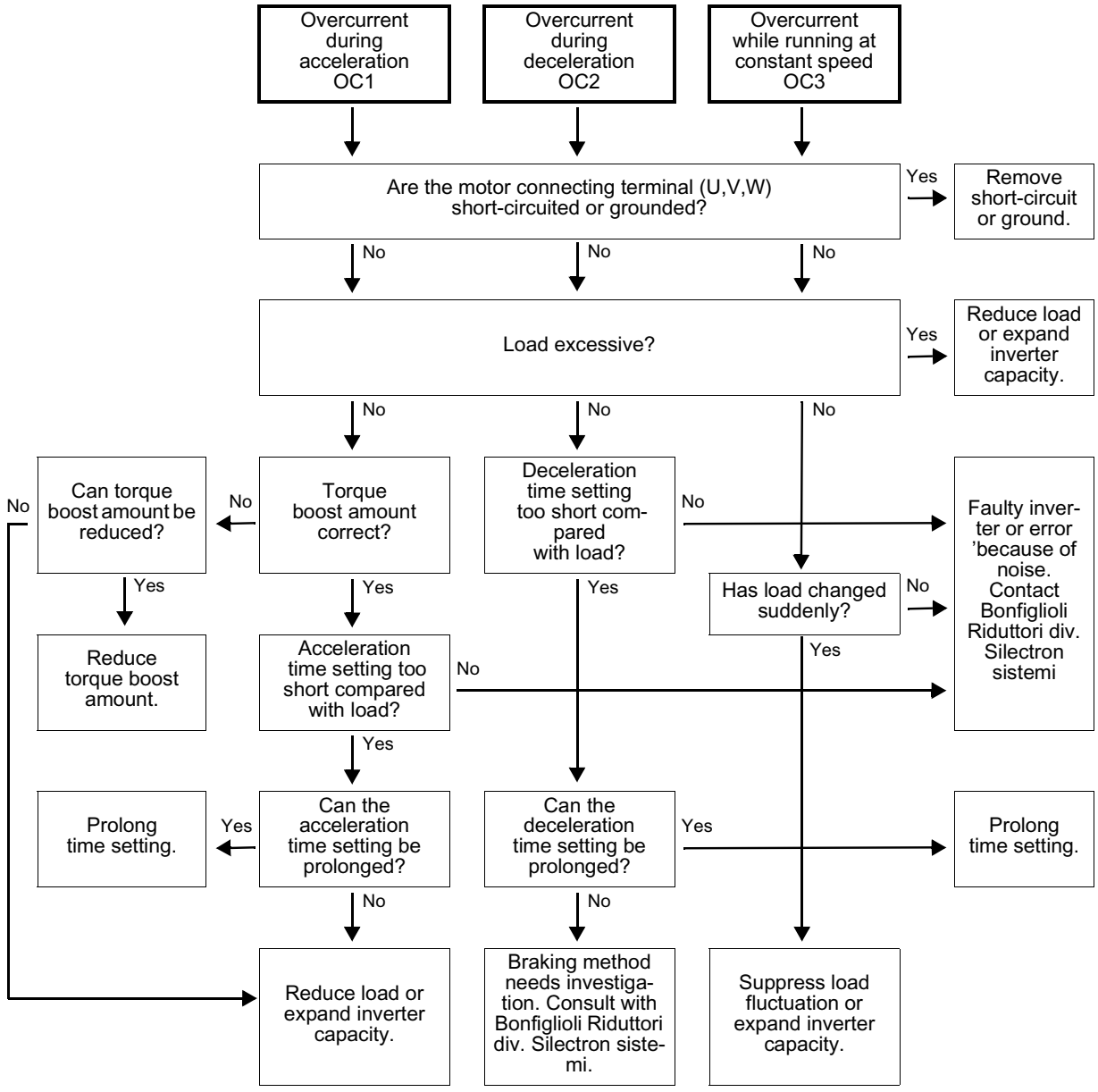
If alarm reset is activated with operation signal ON, the inverter suddenly restarts which may be hazardous. Be sure to disable the operating signal when releasing the trip status:
**Otherwise fire could occur.**

# 7 Troubleshooting

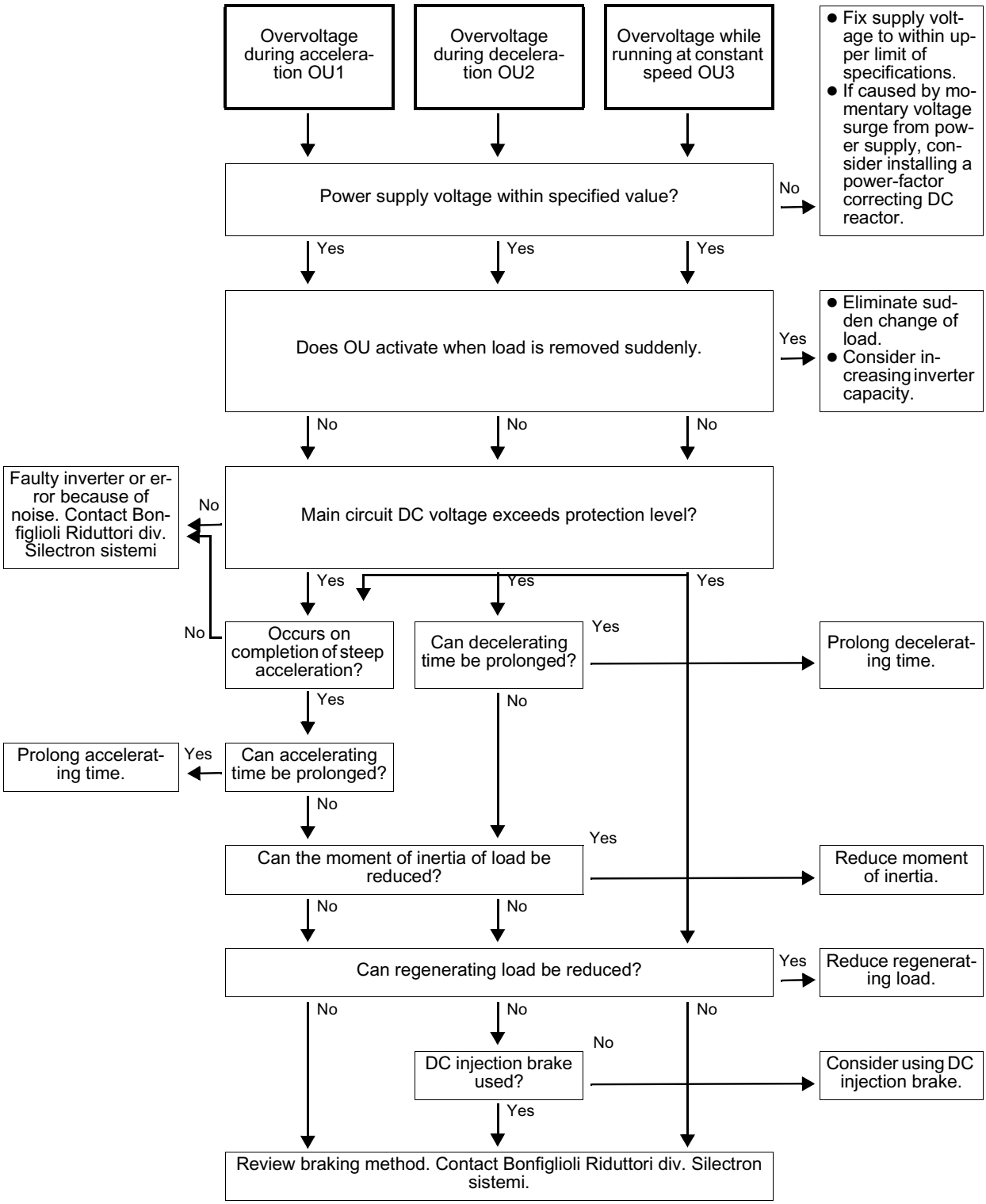
## 7-1 In case of tripping

In the event the inverter tripping, diagnose by the help of the alarm display as shown below.

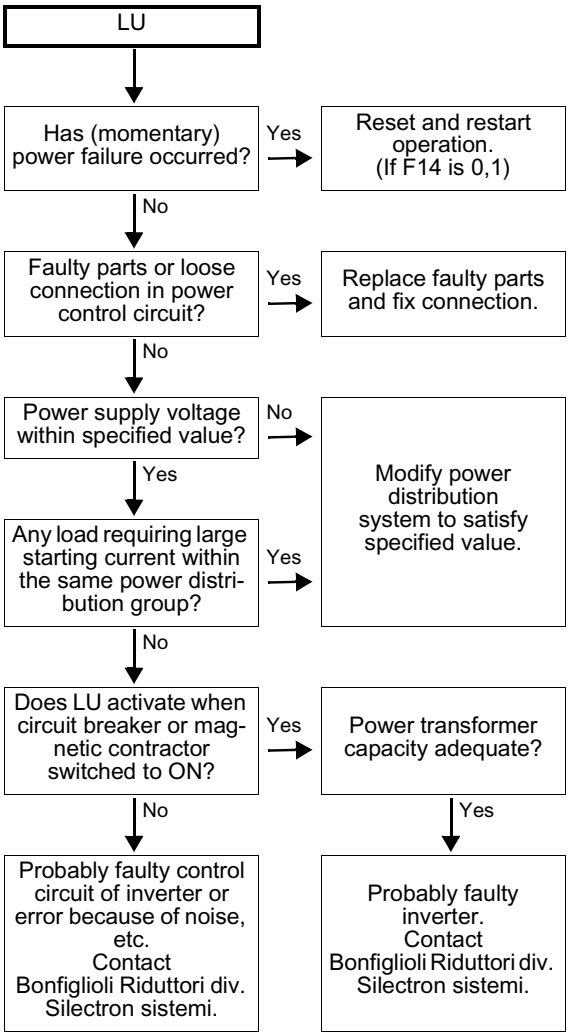
1) Overcurrent (OC)



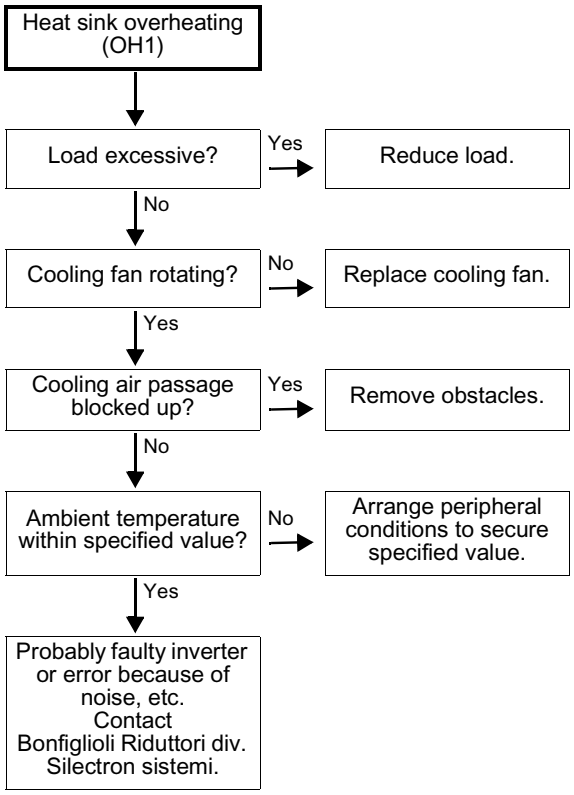
2) Overvoltage(OU)



3) Undervoltage(LU)

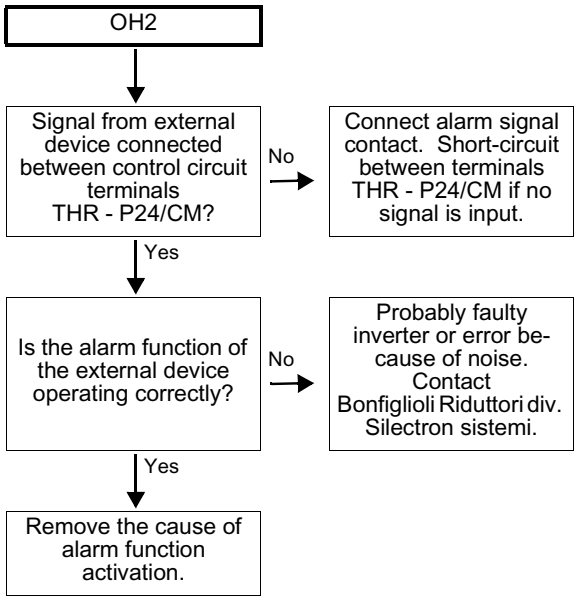



4) Overheating of heat sink (OH1)

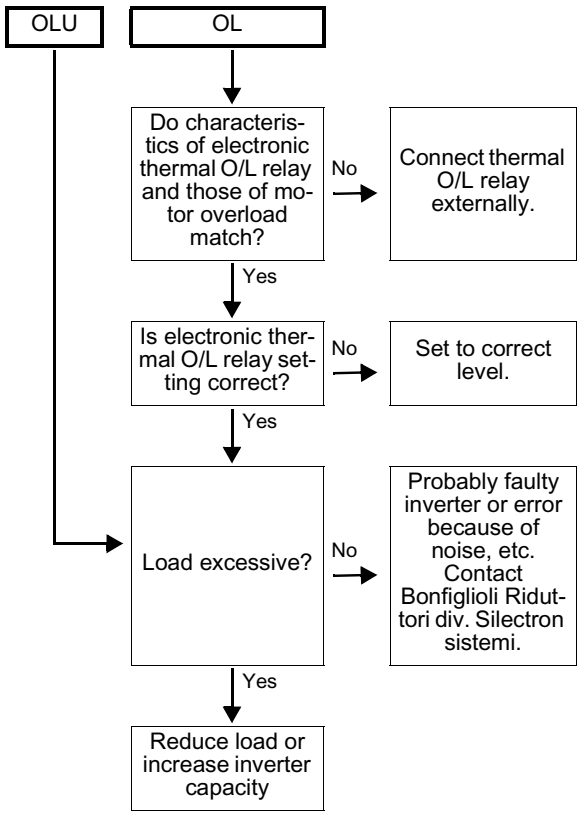



7

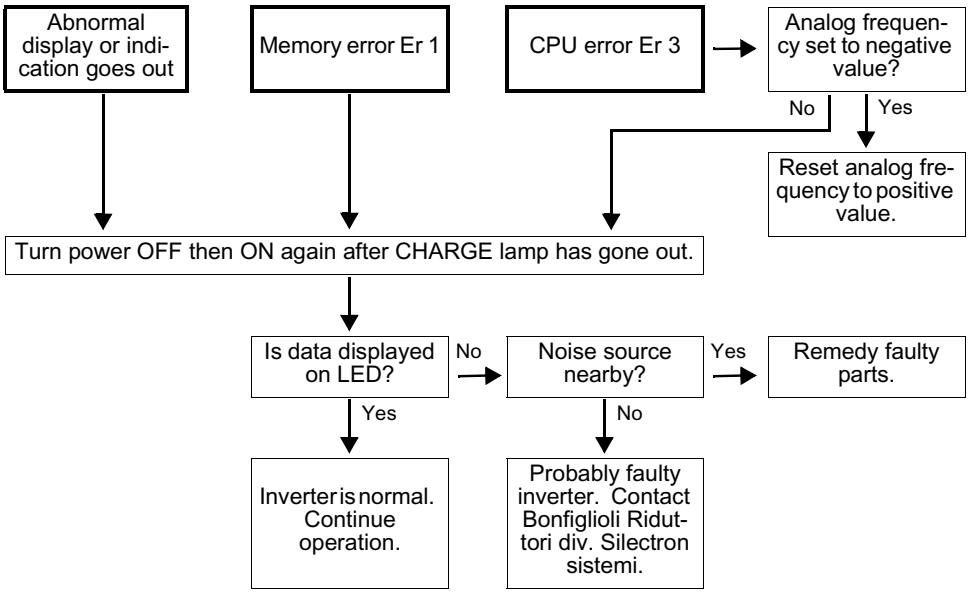
5) External alarm input (OH2)



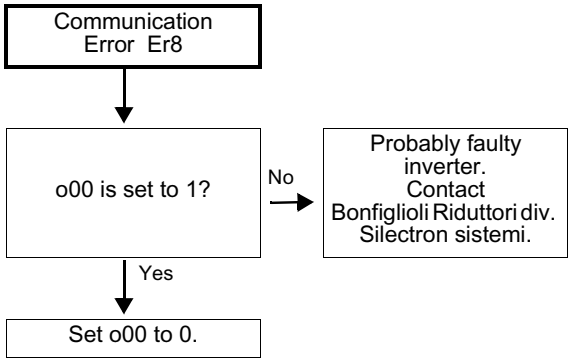

6) Inverter overload (OLU) or motor overload (OL)



7) Memory error (Er1) CPU error (Er3)



8) RS485 Communication Error (Er8)
[In case RS485 communication is not used*]

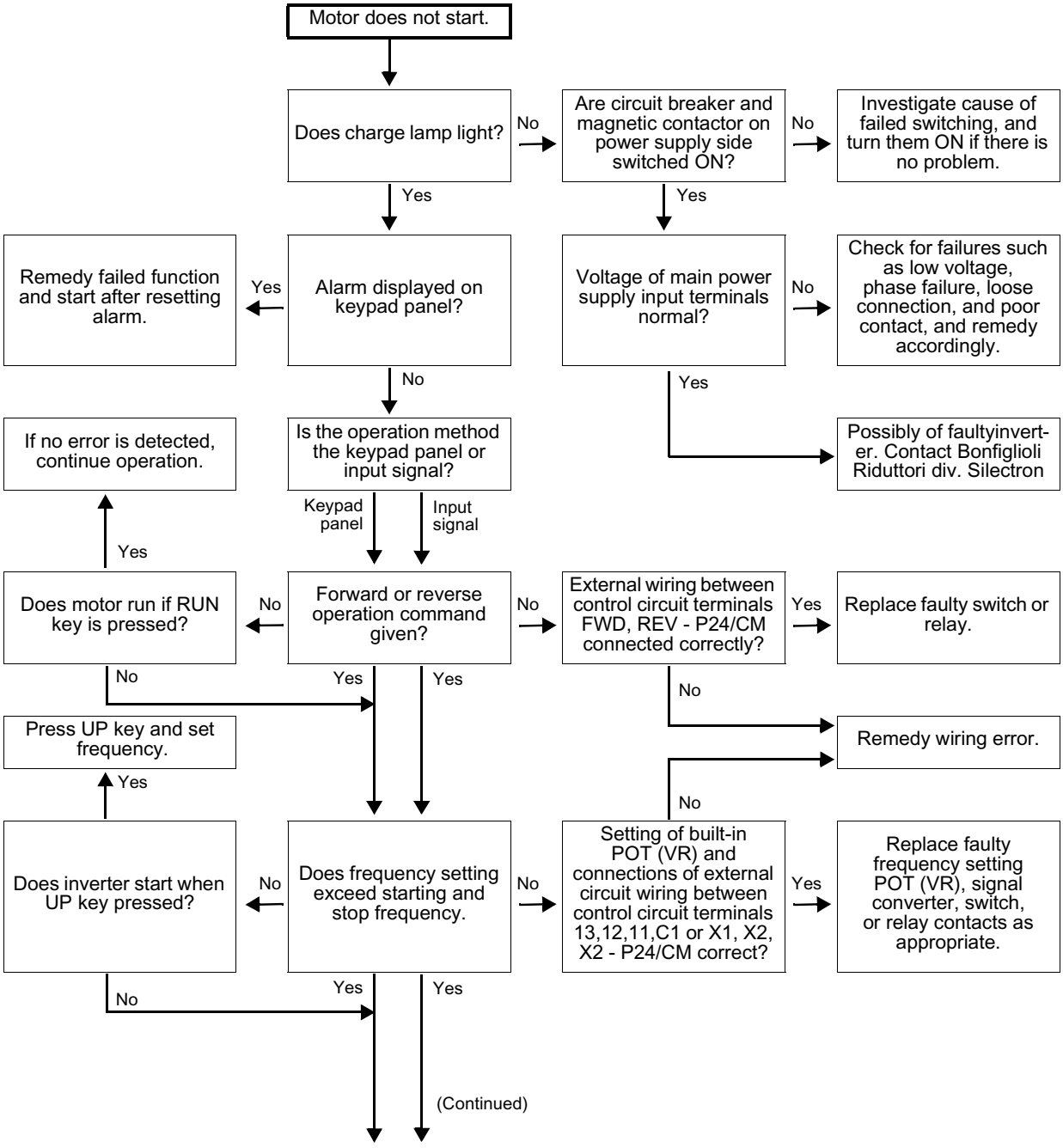


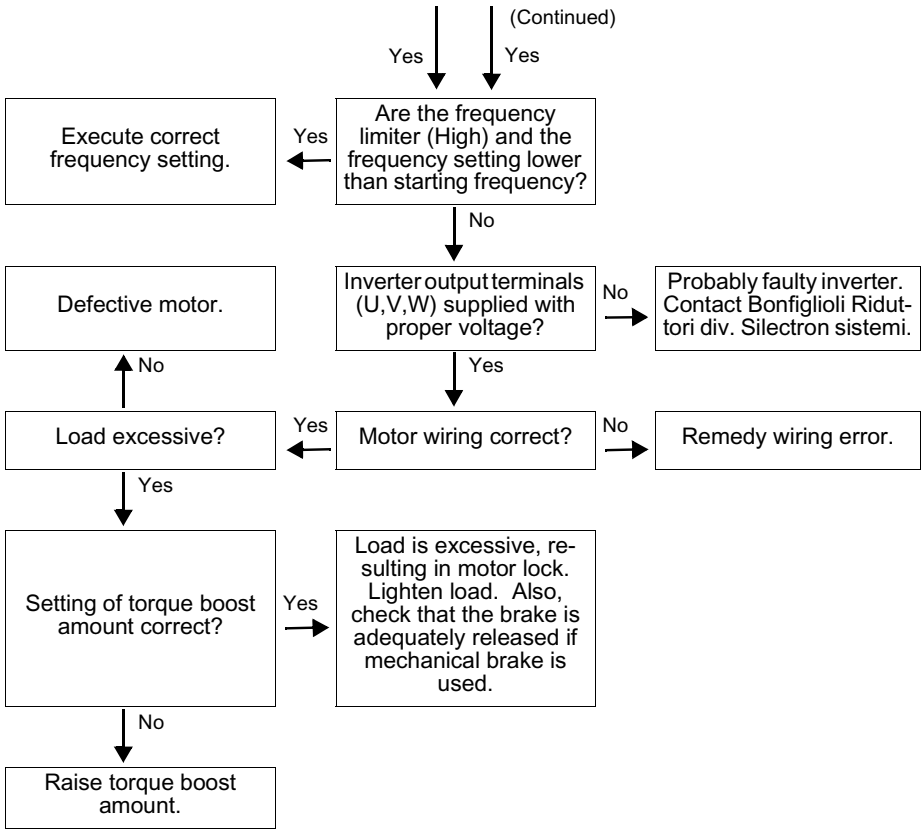

* For Er8 measures when using RS485,
refer to the instruction manual for optional RS485 communication card.

## 7-2 Other trouble

1) When motor does not rotate.

**Note:** Verify the function settings for the operation commands and frequency setting values on the keypad panel.

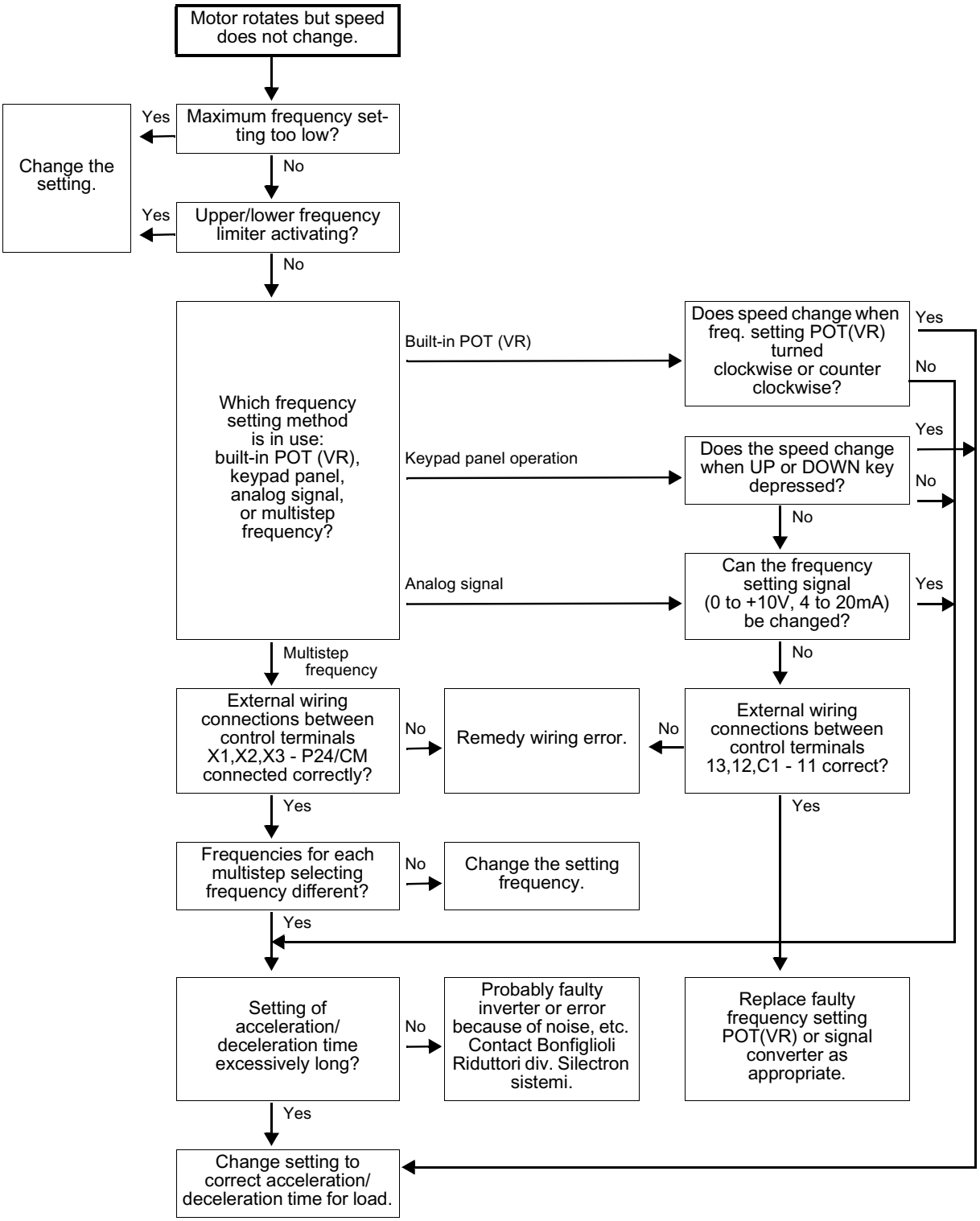





The motor does not rotate if the following commands are given.

1. An operation command is given while coast-to-stop command is output to the control terminals.
2. Both operation command FWD and REV are input.

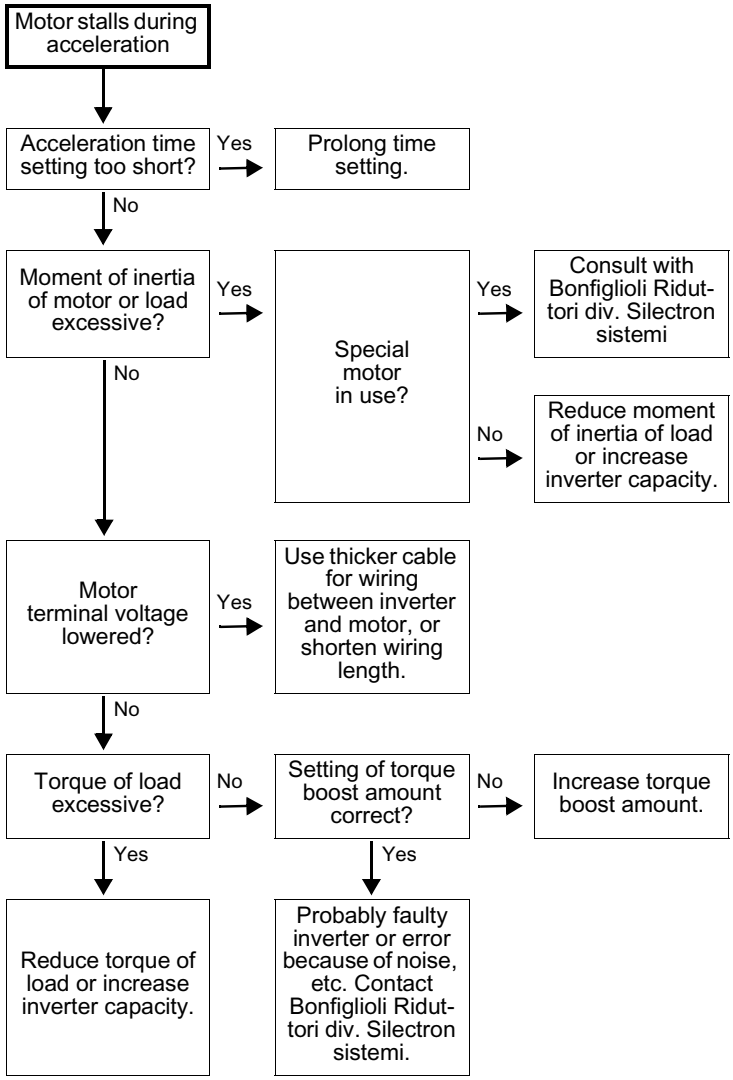
2) When motor rotates but the speed does not change.



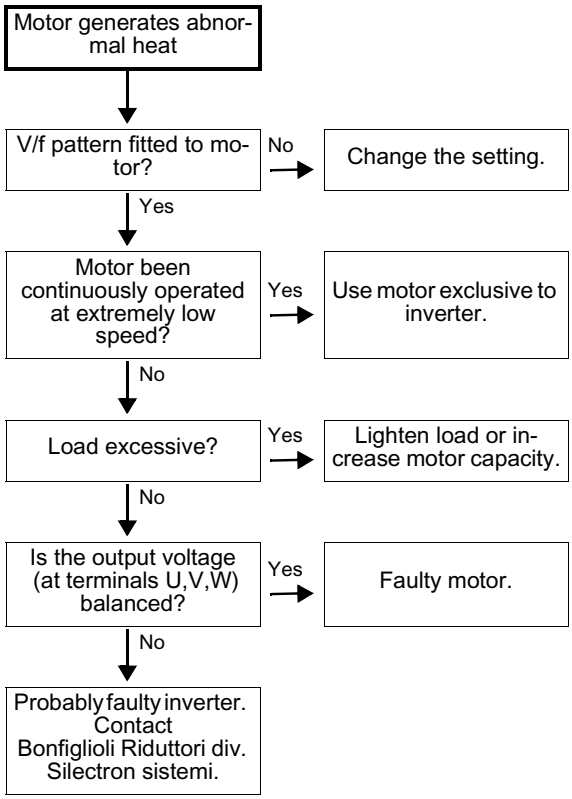
In the following cases, change of motor speed is also restricted.

1. Bias frequency (F18) setting value is large.
2. Signals are input from both control terminals 12 and C1 and there is no significant change in the added value.
   (When F01 is 3)
3. Load is excessive and stall prevention function is activated.

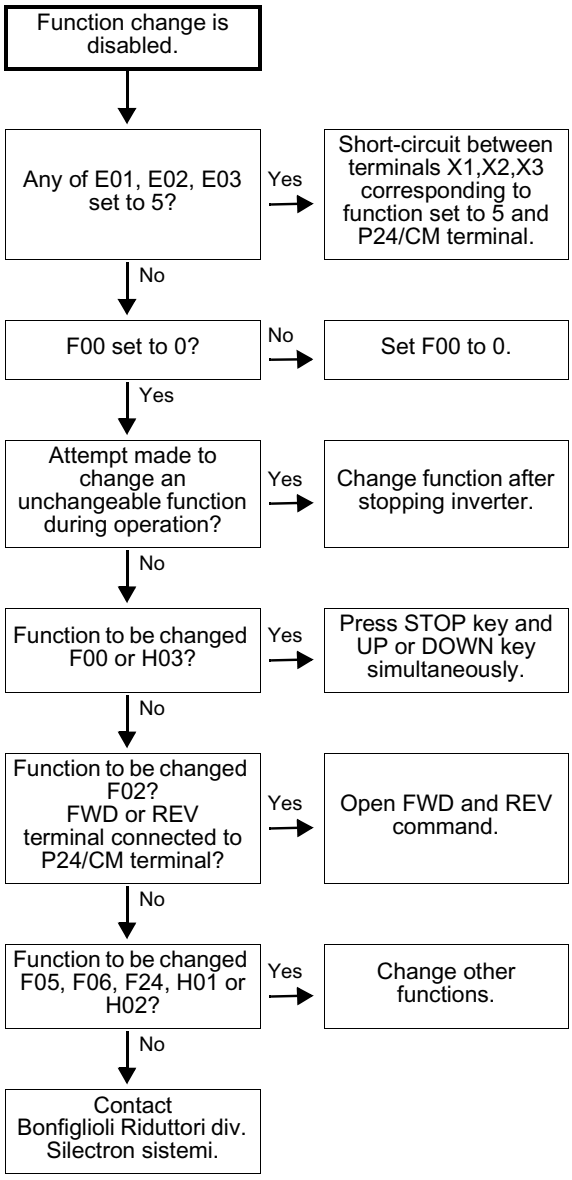
3) When motor stalls during acceleration



4) When motor generates abnormal heat



5) When function change disabled



# 8 Maintenance and Inspection

Execute the daily inspection and periodic inspection for preventing a fault and ensuring long-term reliability.
Note the following regarding the work.

## 8-1 Daily Inspection

During the operation and conduction, the visual inspection for abnormal operation is executed from the outside without removing the covers.
Inspections are usually done to check the following:

1. The expected performance (satisfying the standard specification) is obtained.
2. The environment satisfies the standard specification.
3. The keypad panel display is normal.
4. There are no abnormal sound, vibrations or unpleasant odors.
5. There are no overheating marks or discoloration.

## 8-2 Periodic Inspection

The periodic inspection must be executed after stopping the operation and cutting off the power source and removing the surface cover.
After power-off, time is needed for the smoothing capacitors in the DC section in the main circuit to discharge. To prevent electric shock, make sure that the voltage falls down to the safety value (25VDC and below) using a multimeter after the charge lamp (CRG) goes off.

**WARNING**

1. Start inspection five minutes or more after turning off the power supply. (Check that the charge lamp (CRG) goes off, and check the voltage is 25V DC or below between terminals P(+) and N(-).
   **There is danger of electric shock.**
2. Only the designated person can perform the maintenance and replace components. (Take off any metal objects such as a watch or ring).
   (Use insulated tools).
3. Never modify the inverter.
   **There is danger of electric shock or injury.**

| Check part | | Check item | How to inspect | Evaluation criteria |
|---|---|---|---|---|
| Environment | | 1. Check the ambient air temperature, humidity, vibration, atmosphere (dust, gas oil mist, waterdrops)<br>2. Are foreign matter or dangerous objects such as tools not left around the equipment? | 1. Measure by visual inspection and the meter.<br>2. With visual inspection | 1. The specified standard value must be satisfied.<br>2. No foreign matter or dangerous objects left near the inverter? |
| Voltage | | Are the voltages in the main circuit and the control circuit normal? | Measure with the multimeter. | The specified standard value must be satisfied. |
| Keypad panel | | 1. Is the display hard to read?<br>2. Are the characters complete? | 1., 2. Visual inspection | 1., 2. The display can be read and is not abnormal. |
| Structure such as a frame or cover | | 1. Abnormal sound or vibration?<br>2. Loose bolts (part to be tightened) ?<br>3. Deformation or damage?<br>4. Discoloration by overheating?<br>5. Stains and dust? | 1. With Visual inspection and hearing<br>2. Tighten more<br>3., 4., 5. With visual inspection | 1., 2., 3., 4., 5. Not abnormal. |
| Main circuit | Comon | 1. Loose and missing bolts?<br>2. Deformation, cracks, damage, and discoloration by overheating and deterioration in the equipment and the insulation?<br>3. Stains and dust? | 1. Tighten more<br>2., 3. Visual inspection | 1., 2., 3. Not abnormal.<br>**Note:** A discolored short-circuiting bar does not indicate a problem. |

| Check part | | Check item | How to inspect | Evaluation criteria |
|---|---|---|---|---|
| Main circuit | Conductor and wire | 1. Discoloration and distortion of a conductor by overheating?<br>2. Cracks, crazing, and discoloration of the wire sheath? | 1., 2. Visual inspection | 1., 2. Not abnormal. |
| | Terminal block | Not damaged? | Visual inspection | Not abnormal. |
| | Smoothing capacitor | 1. Electrolyte leakage, discoloration, crazing, and swelling of a case?<br>2. Is a safety valve not out, and are any valves protruding excessively?<br>3. Measure the capacitance if necessary | 1., 2. Visual inspection<br>3. Measure using the capacitance measuring instrument (Note) | 1., 2. Not abnormal.<br>3. The capacitance is initial value x 0.85 or more. |
| Main circuit | Resistor | 1. Unpleasant smell and crazing of the insulation by overheating<br>2. No open circuit? | 1. Olfactory and visual inspection<br>2. Visual inspection or use a multimeter by removing a connection on one side. | 1. Not abnormal.<br>2. Less than about ±10% of the indicated resistance value |
| | Transformer and reactor | Abnormal buzzing or unpleasant smell? | Aural, olfactory, and visual inspection | Not abnormal. |
| | Magnetic contactor and relay | 1. Rattling when operating?<br>2. Roughness of contact? | 1. Aural<br>2. Visual inspection | 1., 2. Not abnormal. |

| Check part | | Check item | How to inspect | Evaluation criteria |
|---|---|---|---|---|
| Control circuit | Control PC board and connector | 1. Loose screws or connectors?<br>2. Unpleasant smell or discoloration?<br>3. Cracks, damage, deformation, or excessive rust?<br>4. Electrolyte leakage or a deformed mark on the capacitor? | 1. Tighten more.<br>2. Olfactory and visual inspection<br>3., 4. Visual inspection | 1., 2., 3., 4. Not abnormal. |
| Cooling system | Cooling fan (1.5 kW minimum) | 1. Abnormal sound or vibration?<br>2. Loose of bolts?<br>3. Discoloration by overheating? | 1. Aural and visual inspection. Turn with hand. (Make sure power is off)<br>2. Tighten more<br>3. Visual inspection | 1. The fan must rotate smoothly.<br>2., 3. Not abnormal |
| | Ventilation way | Clogging-up or foreign substance on heat sink or intake/ exhaust ports? | Visual inspection | Not abnormal |

Table 8-2-1 Periodic inspection list

**Note:** Use a capacitance measuring instrument available on the market which is easy to use.

**Remark:** If the equipment is stained, wipe it with a cleaning cloth, which is chemically neutral.
Vacuum-clean the dust.

## 8-3 Electrical measurements in the Main Circuit

The indicated values depend on the meter types because of harmonic components included in the voltage and current of the main power supply (input) and the output (motor) side of the inverter. Therefore, when measuring with a meter for the commercial power frequency, use the meters shown in Table 8-3-1.

The power-factor cannot be measured using the power-factor meter available on the market which measures the phase difference between voltage and current. When the power-factor must be measured, measure the power, voltage, and current on the input side and output side. Then, calculate the power-factor using the following formulas:

Single-phase

$$\text{Power factor} = \frac{\text{Electric power [W]}}{\text{Voltage [V] x Current [A]}} \text{ x } 100\ [\%]$$

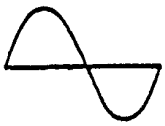
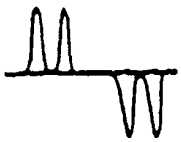
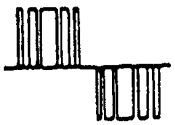
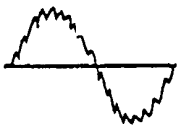
| Item | Input (power supply) side | | | Output (motor) side | | | DC circuit |
|---|---|---|---|---|---|---|---|
| | Voltage waveform  | | Current waveform  | Voltage waveform  | | Current waveform  | (P(+), N(-)) FM, 11 Terminal section |
| Meter name | Ammeter $A_R$ | Voltmeter $V_R$ | Wattmeter $W_R$ | Ammeter $A_{U,V,W}$ | Voltmeter $V_{U,V,W}$ | Wattmeter $W_{U,W}$ | DC voltmeter V |
| Meter type | Moving-iron type | Rectifier or moving-iron type | Power meter | Moving-iron type | Rectifier type [1] | Power meter | Moving-coil type |
| Symbol |  |  | - |  |  | - |  |

Table 8-3-1 Meter for measuring the main circuit

1) When measuring the output voltage by rectifier type meter, an error may occur. Use a digital AC power meter for good accuracy.

[In the case of single-phase input series]

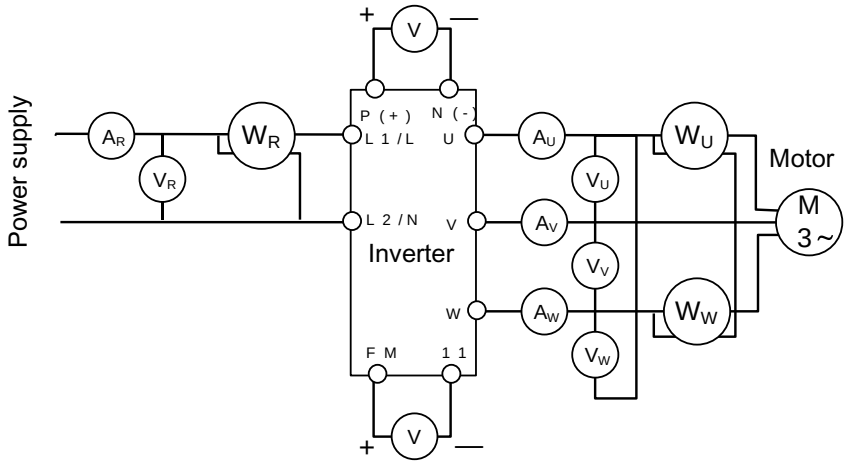



Figure 8-3-1 Diagram for connections of meters

## 8-4 Insulation Test

As much as possible, do not test the inverter with a megger because an insulation test was done at shipping from the factory. If a megger test must be done, test as described below. If the test method is incorrect, there is a possibility of damaging the product. Incorrect use of test specifications for the dielectric strength test may damage products like megger test. If the dielectric strength test must be conducted, contact Bonfiglioli Riduttori div. Silectron sistemi.

1) Megger test for the main circuit

1. Test with a 500V DC megger.
2. If the test voltage is connected to the control circuit, remove all connection wires to the control circuit.
3. Connect the main circuit terminals using common wires as shown in Figure 8-4-1
4. Execute a megger test only between the common wire connected to the main circuit and the ground (terminal ⏚G).
5. If the megger indicates 5MΩ or more, it is normal. (This is the value measured with an inverter only).

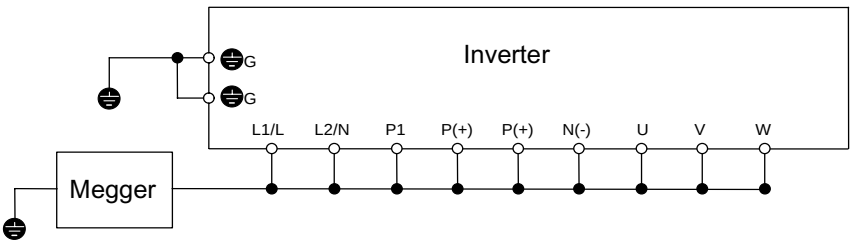



Figure 8-4-1 Megger Test

2) Insulation test in the control circuit

The megger test and the dielectric strength test must not be executed in the control circuit because those parts will be damaged and cannot be repaired.
Use a high-resistance multimeter for the control circuit.

1. Remove all external wiring from the control circuit terminals.
2. Execute a continuity test between grounds. If the result is 1MΩ or more, it is normal.

3) External main circuit and sequence control circuit

Remove wiring from all the terminals of the inverter in order not to apply the test voltage to the inverter.

## 8-5 Parts Replacement

The life expectancy of a part depends on the type of the part and the environment and the usage conditions. Parts should be replaced as shown in Table 8-5-1.
For spare parts, please contact Bonfiglioli Riduttori div. Silectron sistemi.

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| Part name | Standard term for replacement | Comments |
|---|---|---|
| Cooling fan | 3 years | Exchange for a new part |
| Smoothing capacitor | 5 years | Exchange for a new part (Decide after a check) |
| Aluminum electrolytic capacitor on the PC board. | 7 years | Exchange for a new part (Decide after a check) |
| Other parts | - | Decide after a check |

Table 8-5-1 Parts replacement

## 8-6 Inquiries about the Product and Guarantee of the product

1) For inquiries

If there is damage, a fault in the product, or a question about the product, provide the following information to Bonfiglioli Riduttori div. Silectron sistemi:

a) Inverter type
b) SER. No. (equipment serial number)
c) Purchasing date
d) Inquiry contents (e.g., damaged part and the extent of damage, questions, phenomenon, and status of a fault)

2) Guarantee of the product

The product guarantee term is one year after purchase or 18 months from the year and month of manufacture on the nameplate, whichever expires first.
However, the product will not be repaired free of charge in the following cases, even if the guarantee term has not expired:

1. The cause is incorrect use or inappropriate repairing and modification.
2. The product is used outside the standard specified range.
3. The cause is dropping after purchasing or damage during transport.
4. The cause is earthquake, fire, storm or flood damage, lightening, abnormal voltage, or other natural calamities and secondary disasters.