

5-2 Function Explanation

F: Fundamental function

F00

Data protection

F 0 0 D A T A P R T C

◆Setting can be made so that a set value cannot be changed by keypad panel operation.

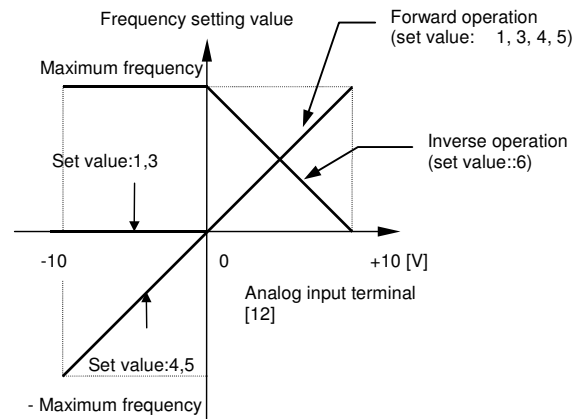
Set value 0: The data can be changed.
1: The data cannot be changed.

[Setting procedure]

0 to 1: Press the **STOP** and **▲** keys simultaneously to change the value from 0 to 1, then press the **FUNC DATA** key to validate the change.

1 to 0: Press the **STOP** and **▼** keys simultaneously to change the value from 1 to 0, then press the **FUNC DATA** key to validate the change.

Forward / Inverse operation



F01

Frequency command 1

F 0 1 F R E Q C M D 1

◆This function selects the frequency setting method.

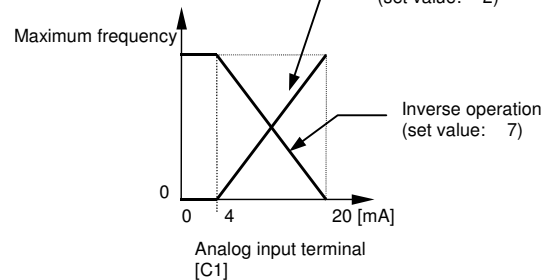
Related functions
E01 to E09
(Set values 10,11)
C30

- 0: Setting by keypad panel operation (**▲** **▼** key)
 - 1: Setting by voltage input (terminal [12] (0 to +10V))
 - 2: Setting by current input (terminal [C1] (4 to 20mA)).
 - 3: Setting by voltage input + current input (terminal [12] + terminal [C1]) (-10 to +10V + 4 to 20mA).
 - 4: Reversible operation with polarity (terminal [12] (-10 to +10V))
 - 5: Reversible operation with polarity (terminal [12] +[V1](Option) (-10 to +10V))
 - 6: Inverse mode operation (terminal [12] (+10V to 0))
 - 7: Inverse mode operation (terminal [C1] (20 to 4mA))
 - 8: Setting by UP/DOWN control mode 1 (initial value = 0) (terminals [UP] and [DOWN])
 - 9: Setting by UP/DOWN control mode 2 (initial value =last final value) (terminals [UP] and [DOWN])
- See the function explanation of E01 to E09 for details.
- 10: DIO option (OPC-G11S-DIO)*
- * For details, see the OPC-G11S-DIO instruction manual

Related functions:
E01 to E09
(Set value 13)

Related functions:
E01 to E09
(Set value10, 11)

Frequency setting value



F02

Operation method

F 0 2 O P R M E T H O D

◆This function sets the operation command input method.

Set value 0: Key pad operation

(**FWD** **REV** **STOP** keys).

Press the **FWD** for forward operation.

Press the **REV** for reverse operation.

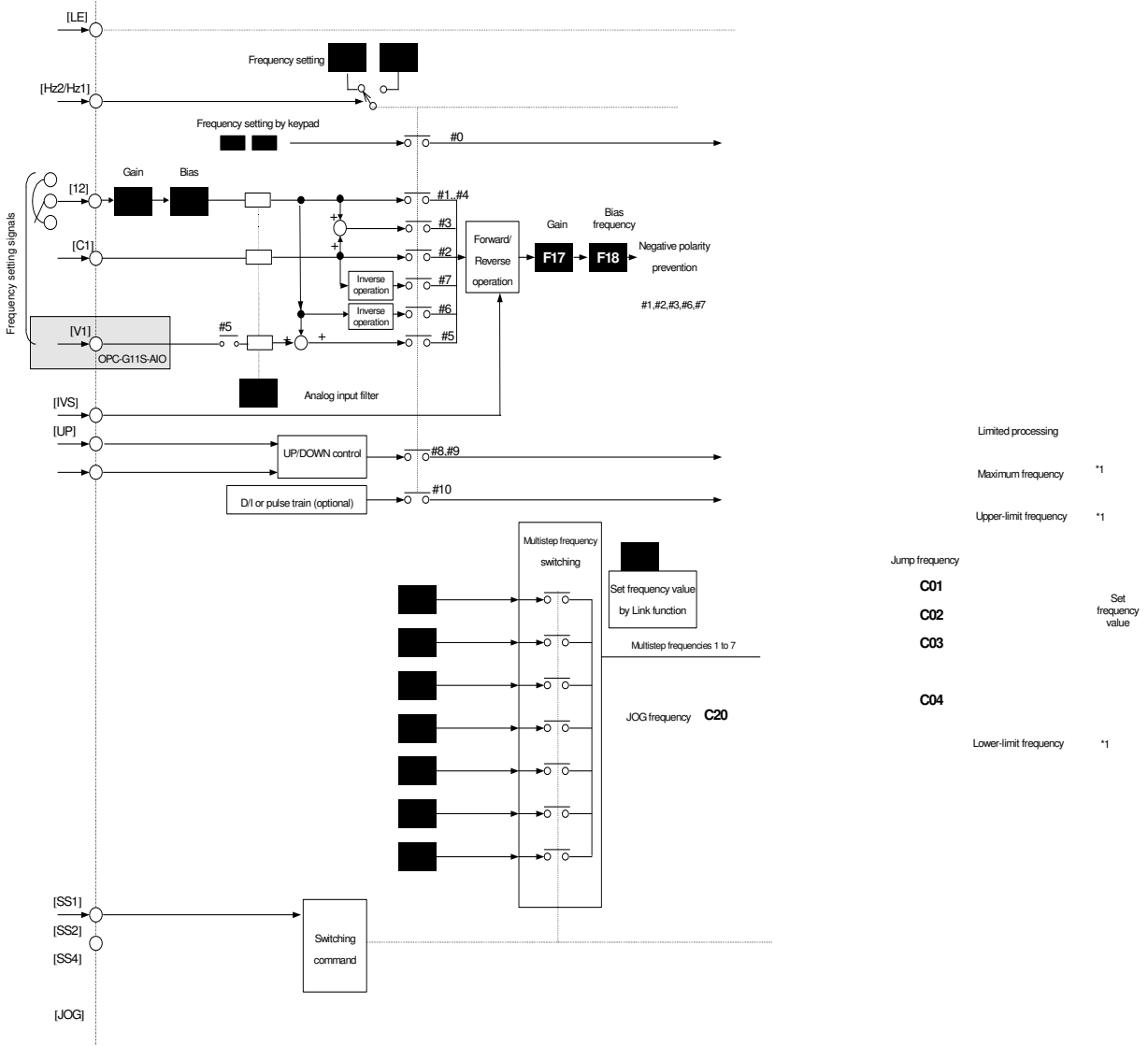
Press the **STOP** for deceleration to a stop.

Input from terminals [FWD] and [REV] is ignored.

1: Operation by external input (terminals [FWD] and [REV]).

* This function can only be changed when terminals FWD and REV are open.

- REMOTE/LOCAL switching from the keypad panel automatically changes the set value of this function.



Frequency setting block diagram

*1: Data changes by the selected motor.

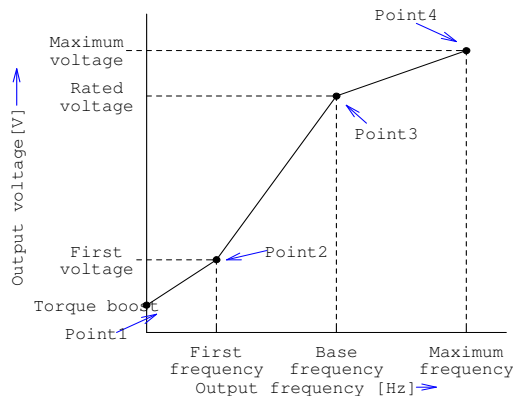
| Motor No. | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
|--------------------------|---------|---------|---------|---------|---------|
| Maximum frequency | F03 | P04 | P21 | A01 | A18 |
| Frequency Limiter (High) | F15 | P16 | P33 | A13 | A30 |
| Frequency Limiter (Low) | F22 | F22 | F22 | F22 | F22 |

| | |
|------------|----------------------------|
| F03 | Maximum frequency 1 |
| F04 | Base frequency 1 |
| F05 | First Frequency 1 |
| F06 | First voltage 1 |
| F07 | Rated voltage 1 |
| F08 | Maximum voltage 1 |

◆Setting V/f function

The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

Arbitrary V/f can be set by setting the points 1 to 4 as shown in the figure below.



[Combination of the points]

Point 1: Torque boost

Point 2: First frequency + First voltage

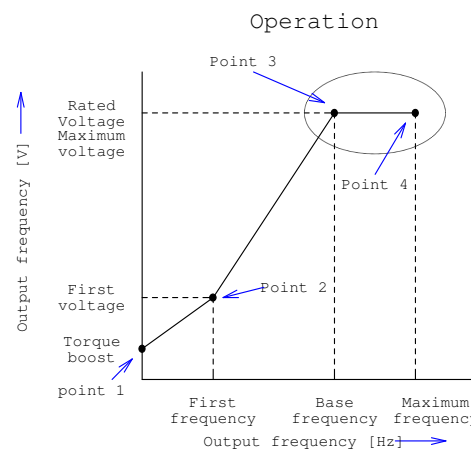
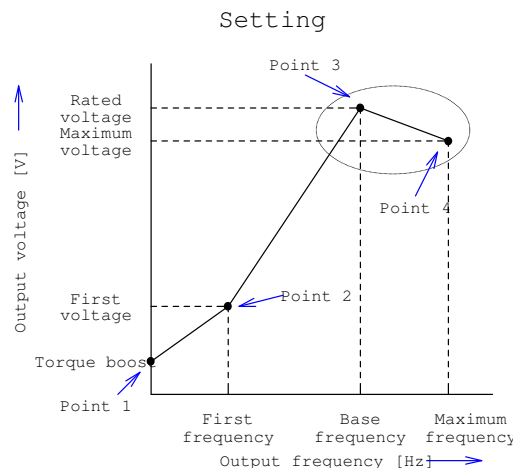
Point 3: Base frequency + Rated voltage

Point 4: Maximum output frequency + Maximum output voltage

The V/f function can be individually set to each motor. The table below shows the function codes for each motor.

| Name | Function code | | | | |
|-------------------|---------------|---------|---------|---------|---------|
| | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
| Maximum frequency | F03 | P04 | P21 | A01 | A18 |
| Base frequency | F04 | P05 | P22 | A02 | A19 |
| First frequency | F05 | P06 | P23 | A03 | A20 |
| First voltage | F06 | P07 | P24 | A04 | A21 |
| Rated voltage | F08 | P08 | P25 | A05 | A22 |
| Maximum voltage | F09 | P09 | P26 | A06 | A23 |
| Torque boost | F11 | P12 | P29 | A09 | A26 |

Note: When the rated voltage is set in larger value than the maximum voltage, the rated voltage becomes the same value as the maximum voltage.



[Setting First V/f function]

The First V/f function is set at the point 2. The First voltage is set invalid (0V) by default.

Setting range

0V: the First V/f not used.

10 to 240V: AVR operation

The First function is enabled or disabled under the following conditions;

First V/f function valid conditions:

- 1) The First voltage is set in the values other than 0V. (Factory setting)
- 2) The set First frequency is smaller than the set base frequency.

Both of the above conditions 1) and 2) should be satisfied.

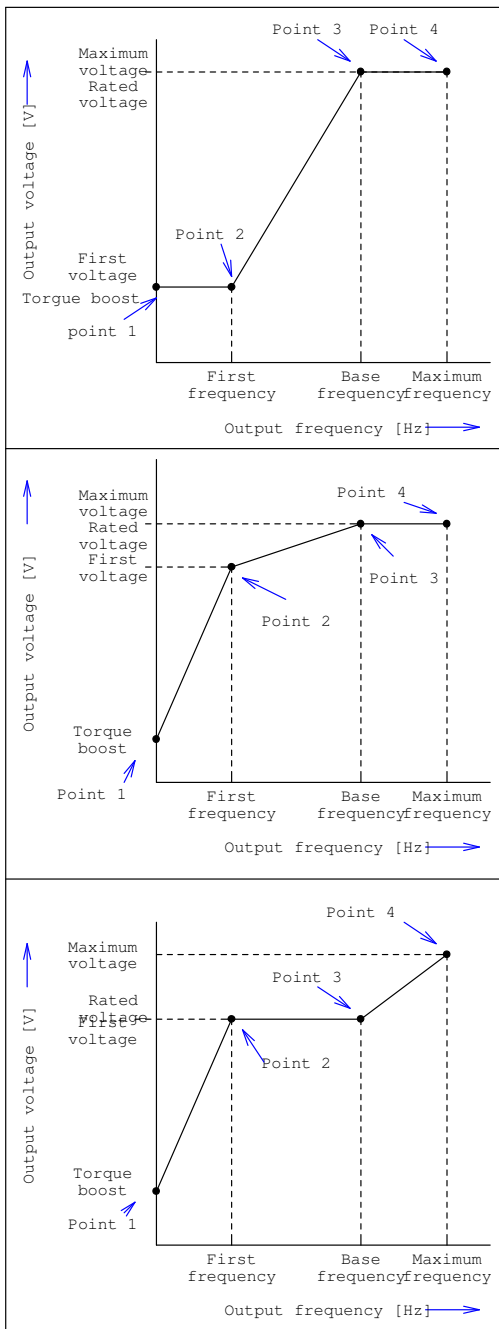
First V/f function invalid conditions:

- 1) The First voltage is set to 0V (Factory setting).
- 2) The First frequency is equal to and larger than the base frequency.

Either of the above conditions 1) and 2) should be satisfied.

If the First v/f function is invalid, setting point 1, 3, and 4 determines the V/f.

The First V/f function (point 2) enable the setting shown in the figure below.



F 0 3 M A X H z - 1

◆ This function sets the maximum output frequency for motor

Setting range: 50 to 1667 Hz

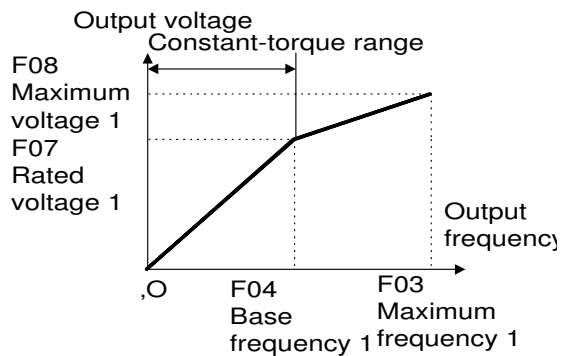
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

F 0 4 B A S E H z - 1

◆ This function sets the maximum frequency in the constant-torque range of motor 1 or the output frequency at the rated voltage. Match the rating of the motor.

Setting range: 25 to 1667 Hz

Note: When the set value of base frequency 1 is higher than that of maximum frequency 1, the output voltage does not increase to the rated voltage because the maximum frequency limits the output frequency.



F 0 5 F I R S T H z 1

◆ Setting the First frequency of motor 1.

Setting range: 25 to 1667Hz

Set the frequency within the range below the base frequency.

F 0 6 F I R S T V 1

◆ Setting the voltage at the First frequency of motor 1 (frequency set with F05).

Setting range: 0, 10 to 240V

Setting the voltage to 0V will stop the voltage adjustment function. This means the First V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

F 0 7 R A T E D V - 1

◆This function sets the rated value of the voltage output to motor 1. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 1 exceeds maximum output voltage 1, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

F 0 8 M A X V - 1

◆This function sets the maximum value of the voltage output to motor 1. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 50 to 240V

F09 Acceleration time 1

F10 Deceleration time 1

F 0 9 A C C T I M E 1
F 1 0 D E C T I M E 1

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

Setting range Acceleration time 1: 1.0 to 3,600 seconds

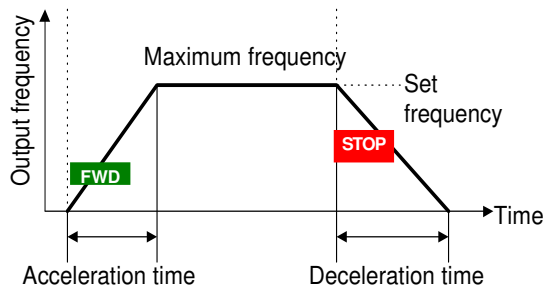
Deceleration time 1: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

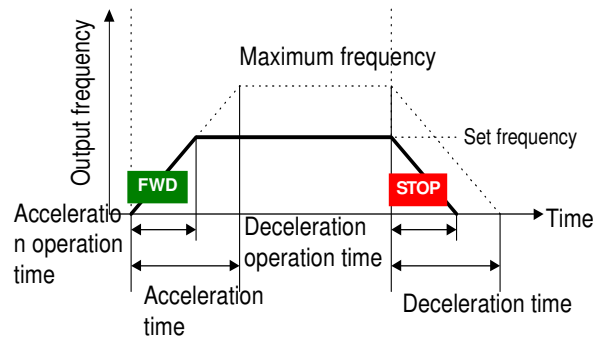
Set frequency = maximum frequency

The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.
Acceleration deceleration operation time = set value x (set frequency/maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, the inverter occasionally does the overcurrent trip.

F11 Torque boost 1

F 1 1 T R Q B O O S T 1

◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.

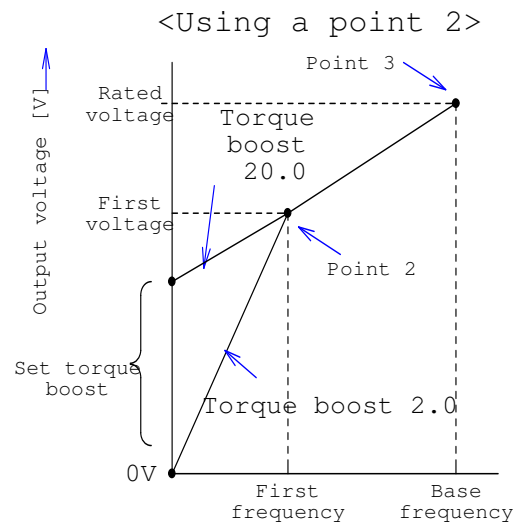
◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

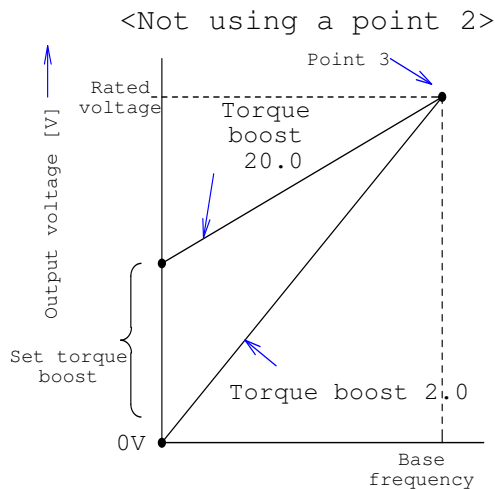
Torque boost setting range: 2.0 to 20.0

Note: If the set torque boost is excessively large, the motor will be over-excited, resulting in the flow of overcurrent. Therefore, set the torque boost value suitable for the motor used.

With change of torque boost, the First V/f will also change as shown below:

◆Torque characteristics





◆Output voltage indicated by the set value for the torque boost.

Calculate the output voltage that corresponds to the torque boost set value by the following formula:

$$\text{Output voltage} = \frac{(\text{Torque boost set value} - 2.0) \times 1675 \times \text{Set rated voltage}}{131,072}$$

Remarks:

When the torque boost set value is 2.0, the output voltage becomes 0V.

- F12** Electric thermal O/L relay for motor1(selection)
- F13** Electric thermal O/L relay for motor1(level)
- F14** Electric thermal O/L relay for motor1 (Thermal time constant)

The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by F14 (thermal time constant).

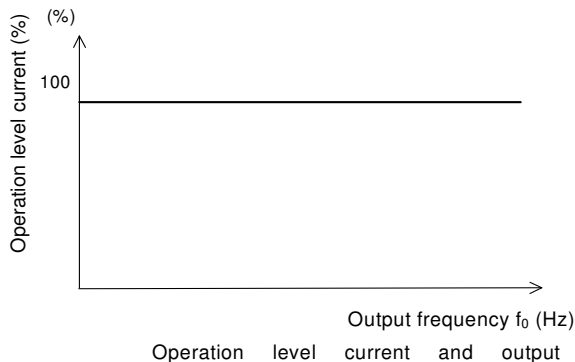
F 1 2 E L C T R N O L 1

◆This function specifies whether to operate the electric thermal O/L relay.

Set value 0: Inactive
1: Active

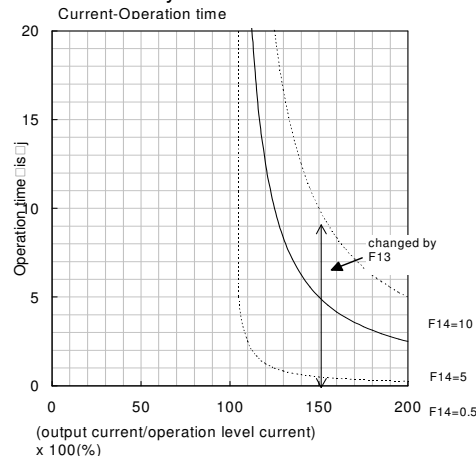
F 1 3 O L L E V E L 1

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.



F 1 4 T I M E C N S T 1

◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L



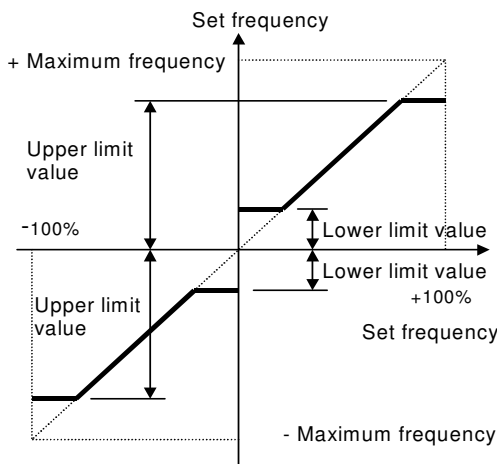
relay activates can be set.
The setting range:0.1 to 300.0 seconds (in 0.1 seconds steps).

F15 Frequency limiter (High)

F 1 5 H L I M I T E R 1

◆This function sets the upper limits for the setting frequency.

Setting range: 0 to 1667 Hz



- ❖ The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.
- ❖ If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.
- ❖ When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

F16 Starting frequency1(frequency)

F 1 6 S T A R T H z 1

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

◆Frequency: This function sets the frequency at startup.

Setting range: 0.1 to 100Hz

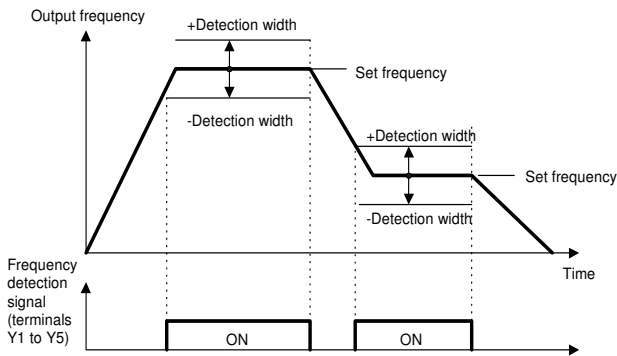
F17 Frequency arrival1 (FAR)(detection width)

F 1 7 F A R H Y S T R

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ±10Hz the setting frequency.

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].



F18 OL1 function signal (Level)

F 1 8 O L 1 L E V E L

◆This function determines the operation level of the electric thermal O/L relay or output current.

Setting range: 1.00 to 100A

The operation release level is 90% of the set value.

F20 OL1 function signal(Timer)

F 2 0 O L 1 T I M E R

◆This function is used when "1"(Output limit) is set at "F24 Overload early warning (operation selection)".

Setting range: 0.0 to 60.0 seconds

◆Set the time from when the operation level is attained until the overload early warning function is activated.

F21 Electric thermal O/L relay (for braking resistor)

F 2 1 D B R O L

◆This function controls the frequent use and continuous operating time of the braking resistor to prevent the resistor from overheating.

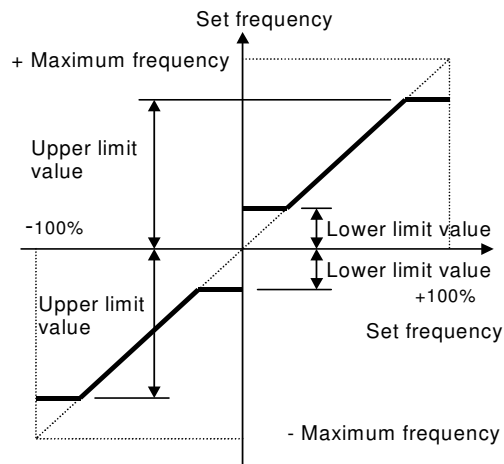
| Inverter capacity | Operation |
|----------------------|------------------------------------------------------------------------------------------|
| 7.5kW (10Hp) or less | 0:Inactive 1:Active(built-in braking resistor) 2:Active(external braking resistor) |
| 11kW (15Hp) or more | 0: Inactive |

F22 Frequency limiter (Low)

F 2 2 L L I M I T E R

◆This function sets the lower limits for the setting frequency of all motors.

Setting range: 0 to 1667Hz



❖ The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.

❖ If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.

When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

F23 Start frequency (Holding time)

F 2 3 H O L D I N G t

◆Holding time: This function sets the holding time during which the start frequency is sustained at startup. Set values: 0.1 to 10.0 seconds

❖ The holding time does not apply at the time of switching between forward and reverse.

❖ The holding time is not included in the acceleration time.

❖ The holding time also applies when pattern operation (C21) is selected. The holding time is included in the timer value.

F24 OL1 function signal (mode select)

F 2 4 O L 1 W A R N I N G

◆Overload warning kind can selected between the warning based on electric thermal characteristics and the warning based on the output current.

Setting range 0: Electronic thermal O/L relay
1: Output current

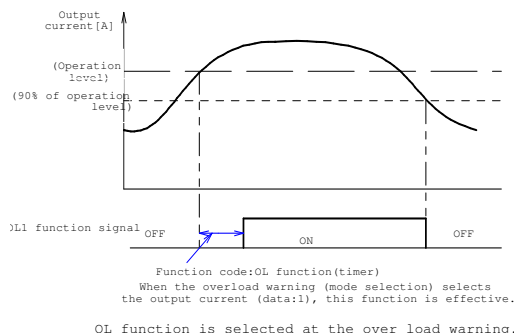
| Set value | Function | Description |
|-----------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 | Electronic thermal O/L relay | Overload early warning by the electronic thermal O/L relay (having inverse-time characteristics) that reacts to the output current. The operation selection and thermal time constant for the inverse-time characteristics are the same as those set for the electric thermal O/L relay for protecting the motor (F13 and F14). |
| 1 | Output current | The inverter issues an overload early warning if the output current exceeds the preset current value for the present duration. |

The function signal (level and timer) can be individually set to each motor. The table below shows the setting codes for each motor.

| Name | Function code | | | | |
|-------------------------|---------------|---------|---------|---------|---------|
| | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
| Function signal (Level) | F18 | P19 | P36 | A16 | A33 |
| Function signal (Timer) | F20 | P20 | P37 | A17 | A34 |

The overload warning signal can be allocated to the transistor output terminals Y1 to Y4 or the contact output terminals Y5A and Y5C.

The figure below shows the overload warning action.

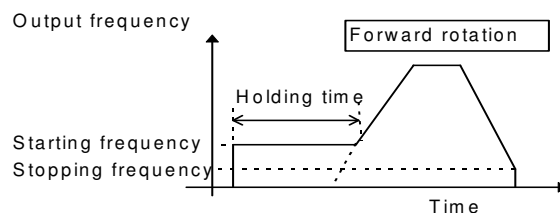


F25 Stop frequency

F 2 5 S T O P H z

◆This function sets the frequency of stop.

Setting range: 0.0 to 6.0Hz



The operation does not start when the starting frequency is less than the stopping frequency or when the setting frequency is less than the stopping frequency.

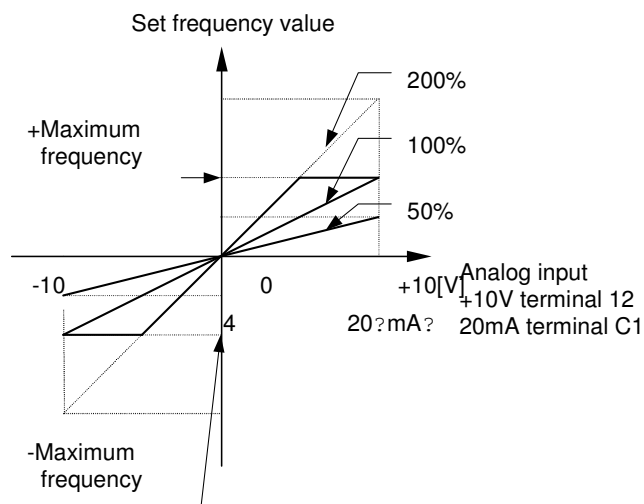
F26 Gain

F 2 6 F R E Q G A I N

◆This function sets the rate of the set frequency value to analog input.

Setting range 0.0 to 200.0%

Operation follows the figure below.



F27 **Bias frequency**

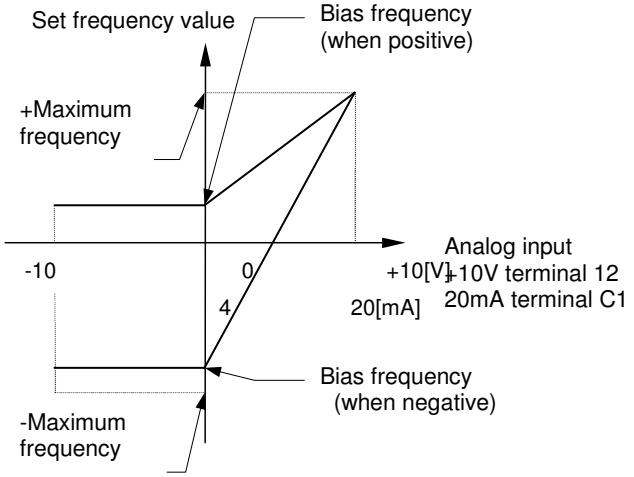
F 2 7 F R E Q B I A S

◆This function adds a bias frequency to the set frequency value to analog input .

Setting range -1667Hz to +1667Hz

The operation follows the figure below.

When the bias frequency is higher than the maximum frequency or lower than the - maximum frequency, it is limited to the maximum or - maximum frequency.



F30

Restart mode after momentary power failure (operation selection)

◆This function selects operation if momentary power failure occurs.

The function for detecting power failure and activating protective operation (i.e., alarm output, alarm display, inverter output cutoff) for undervoltage can be selected. The automatic restart function (for automatically restarting a coasting motor without stopping) when the supply voltage is recovered can also be selected.

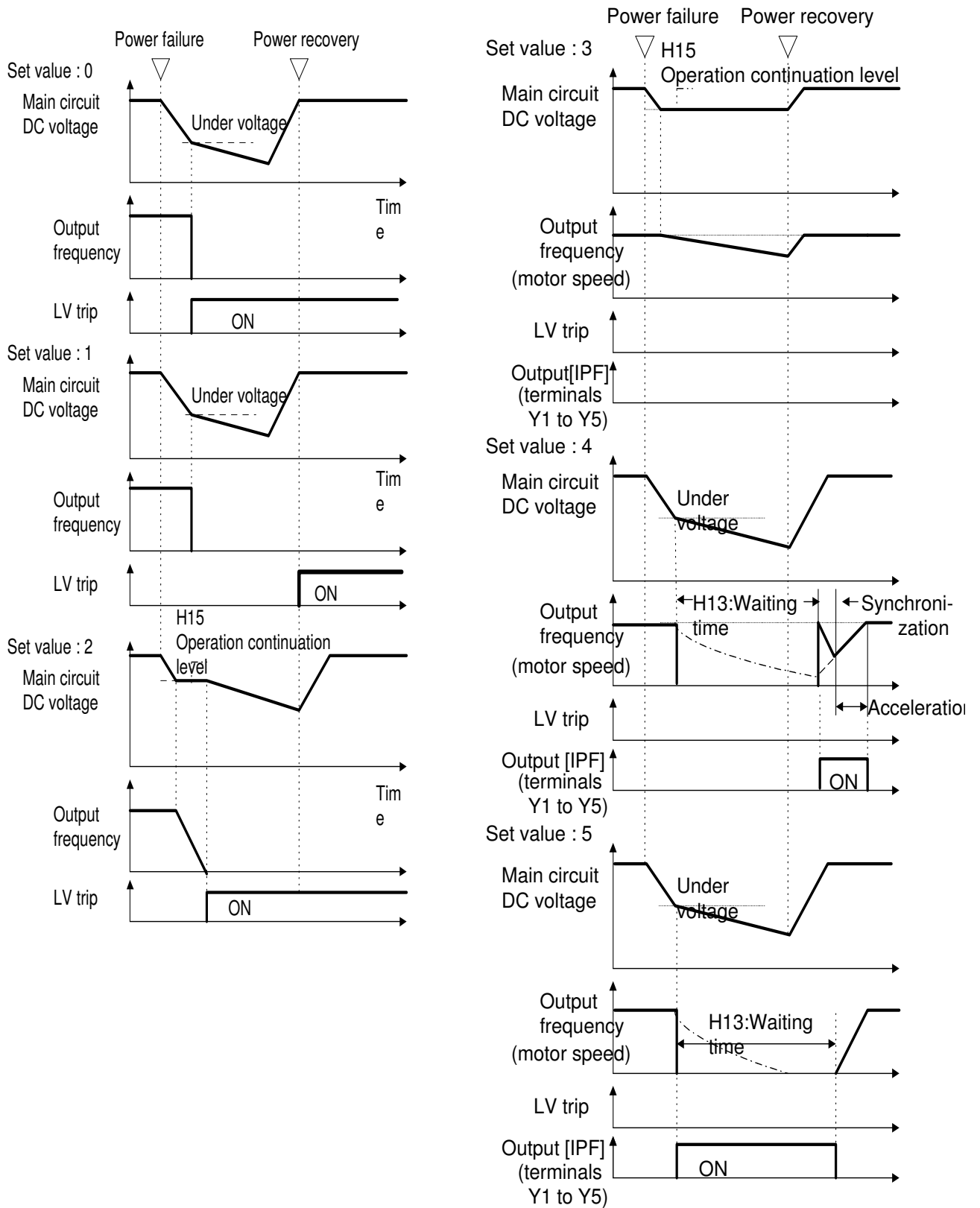
F 3 0 R E S T A R T

Setting range: 0 to 5

The following table lists the function details.

| Set value | Function name | Operation at power failure | Operation at power recovery | |
|-----------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 0 | Inactive (intermediate inverter trip) | If undervoltage is detected, the protective function is activated and output stops. | Inverter is not restarted. | Inputting the protective function reset command and operation command restarts operation. |
| 1 | Inactive (inverter trip at recovery) | If undervoltage is detected, the protective function is not activated, but output stops. | The protective function is activated, but operation is not restarted. | |
| 2 | Inactive (inverter trip after deceleration to a stop at power failure) | When the operation continuation level (H15) is reached, deceleration to a stop occurs. The DC voltage of the main circuit sharpens the deceleration slope so that the undervoltage protective function is not activated. The inverter collects the inertia energy of the load and control the motor until it stops, then the undervoltage protective function is activated. If the amount of inertia energy from the load is small, and the undervoltage level is achieved during deceleration, the undervoltage protective function is then activated. | The protective function is activated, and operation is not restarted | |
| 3 | Active (operation continued, for high-inertia loads) | When the operation continuation level is achieved, energy is collected from the inertia amount of the load to extend the operation continuation time. If undervoltage is detected, the protective function is not activated, but output stops. | Operation is automatically restarted. For power recovery during operation continuation, rotation accelerates directly to the original frequency. If undervoltage is detected, operation automatically restarts with the frequency at that time. | |
| 4 | Active (restart with the frequency at power failure) | If undervoltage is detected, the protective function is not activated, but output stops. | Operation is automatically restarted with the frequency at power failure. | |
| 5 | Active (restart with the start frequency, for low-inertia loads) | If undervoltage is detected, the protective function is not activated, but output stops. | Operation is automatically restarted with the frequency set by F23, "Starting frequency." | |

Function codes H13 to H16 are provided to control a restarting operation after momentary power failure. These functions should be understood and used.



Note: Dotted-dashed lines indicate motor speed.

| | |
|-----|-------------------------------|
| F31 | DC brake (starting frequency) |
| F33 | DC brake (braking level) |
| F34 | DC brake (braking time) |

F 3 1 D C B R K H z

◆**Starting frequency:** This function sets the frequency with which to start a DC injection brake to decelerate the motor to a stop.

Setting range: 0 to 60Hz

F 3 3 D C B R K L V L

◆**Operation level:** This function sets the output current level when a DC injection brake is applied. Set a percentage of inverter rated output current in 1% steps.

Setting range: 0 to 100%

F 3 4 D C B R K t

◆**Time:** This function sets the time of a DC injection brake operation.

Setting range: 0.0 Inactive
0.1 to 30.0 seconds

⚠ CAUTION

Do not use the inverter brake function for mechanical holding.
Injury may result.

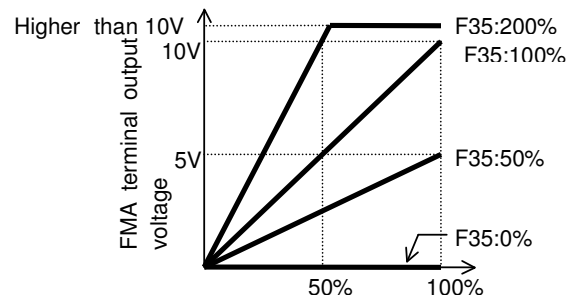
| | |
|-----|--------------------------|
| F35 | FMA (voltage adjustment) |
| F36 | FMA (function) |

◆Monitor data (e.g. output frequency, output current) can be output to terminal FMA as a DC voltage. The amplitude of the output can also be adjusted.

F 3 5 F M A V - A D J

◆This function adjusts the voltage value of the monitor item selected in F36 when the monitor amount is 100%. A value from 0 to 200 (%) can be set in 1% steps.

Setting range: 0 to 200%



F 3 6 F M A F U N C

◆This function selects the monitor item to be output to terminal FMA.

| Set value | Monitor item | Definition of 100% monitor amount |
|-----------|-------------------------|--------------------------------------|
| 0 | Output frequency 1 | Maximum output frequency |
| 1 | Output current | Rated output current of inverter x 2 |
| 2 | Output voltage | 250V |
| 3 | DC link circuit voltage | 500V |

| | |
|-----|--------------------------|
| F37 | FMP (pulse rate) |
| F38 | FMP (voltage adjustment) |
| F39 | FMP (function) |

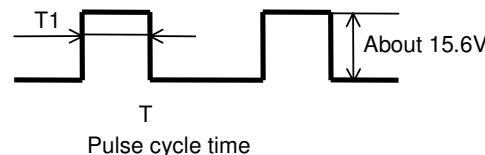
Monitor data (e.g., output frequency, output current) can be output to terminal FMP as pulse voltage. Monitor data can also be sent to an analog meter as average voltage. When sending data to a digital counter or other instrument as pulse output, set the pulse rate in F37 to any value and the voltage in F38 to 0%.

When data is sent to an analog meter or other instrument as average voltage, the voltage value set in F38 determines the average voltage and the pulse rate in F37 is fixed to 2670 (p/s).

F 3 7 F M P P U L S E S

◆This function sets the pulse frequency of the monitor item selected in F39 within a range of 300 to 6000 (p/s) in 1 p/s steps.

Setting range: 300 to 6,000 p/s



Pulse frequency (p/s) = 1/T
Duty (%) = T1/T x 100
Average voltage (V) = 15.6 x T1/T

F 3 8 F M P V - A D J

◆This function sets the average voltage of pulse output to terminal FMP.

Setting range

- 0%: The pulse frequency varies depending on the monitor amount of the monitor item selected in F39. (The maximum value is the value set in F37.)
- 1 to 200%: Pulse frequency is fixed at 2,670 p/s. The average voltage of the monitor item selected in F39 when the monitor amount is 100% is adjusted in the 1 to 200% range (1% steps). (The pulse duty varies.)

F 3 9 F M P F U N C

◆This function selects the monitor item to be output to terminal FMP.

The set value and monitor items are the same as those of F36.

E: Extension Terminal Functions

- E01** X1 Terminal function
- E09** X9 Terminal function

◆ Each function of digital input terminals X1 to X9 can be set as codes.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|--|--|--|
| E | 0 | 1 | X | 1 | F | U | N | C | | | |
| E | 0 | 2 | X | 2 | F | U | N | C | | | |
| E | 0 | 3 | X | 3 | F | U | N | C | | | |
| E | 0 | 4 | X | 4 | F | U | N | C | | | |
| E | 0 | 5 | X | 5 | F | U | N | C | | | |
| E | 0 | 6 | X | 6 | F | U | N | C | | | |
| E | 0 | 7 | X | 7 | F | U | N | C | | | |
| E | 0 | 8 | X | 8 | F | U | N | C | | | |
| E | 0 | 9 | X | 9 | F | U | N | C | | | |

| Combination of set value input signals | | | Frequency selected |
|----------------------------------------|------------|------------|------------------------|
| 2 [SS4] | 1 [SS2] | 0 [SS1] | |
| off | off | off | Assigned by F01 or C30 |
| off | off | on | C05 MULTI Hz-1 |
| off | on | off | C06 MULTI Hz-2 |
| off | on | on | C07 MULTI Hz-3 |
| on | off | off | C08 MULTI Hz-4 |
| on | off | on | C09 MULTI Hz-5 |
| on | on | off | C10 MULTI Hz-6 |
| on | on | on | C11 MULTI Hz-7 |

Setting range
0.0 to 1667Hz

Related function
C05 to C11

| Set value | Function |
|-----------|----------------------------------------------------------------|
| 0,1,2 | Multistep frequency selection (1 to 7 steps) [SS1],[SS2],[SS4] |
| 3 | Self-hold selection [HLD] |
| 4 | Coast-to-stop command [BX] |
| 5 | Alarm reset [RST] |
| 6 | External alarm [THR] |
| 7 | Jogging [JOG] |
| 8 | Frequency setting 2/frequency setting 1 [Hz2/Hz1] |
| 9 | DC injection brake command [DCBRK] |
| 10 | UP command [UP] |
| 11 | DOWN command [DOWN] |
| 12 | Edit permission command (data change permission) [WE-KP] |
| 13 | Forward/inverse switching (terminals 12 and C1) [IVS] |
| 14 | Interlock (52-2) [IL] |
| 15 | Link operation selection (Standard:RS485) [LE] |
| 16 | Universal DI [U-DI] |
| 17 | Motor selection signal (M1) |
| 18 | Motor selection signal (M2) |
| 19 | Motor selection signal (M3) |
| 20 | Motor selection signal (M4) |
| 21 | Motor selection signal (M5) |
| 22 | Motor selection signal Bitt0 (Least significant bit) (MBCD[0]) |
| 23 | Motor selection signal Bitt1 (MBCD[1]) |
| 24 | Motor selection signal Bitt2 (Most significant bit) (MBCD[2]) |
| 25 | Motor selection signal Parity bit (MBCD[P]) |

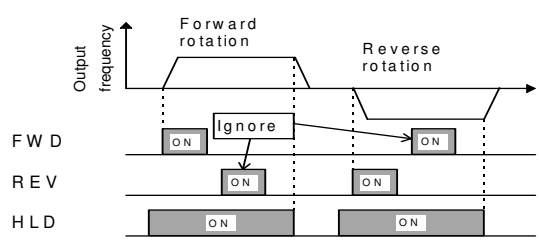
Note: Data numbers which are not set in the functions from E01 to E09, are assumed to be inactive.

Multistep frequency selection

The frequency can be switched to a preset frequency in function codes C05 to C11 by switching the external digital input signal. Assign values 0 to 2 to the target digital input terminal. The combination of input signals determines the frequency.

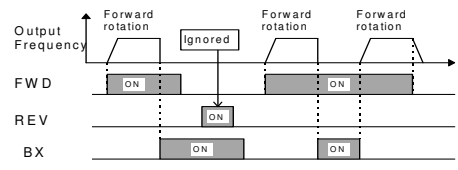
Self-hold selection [HLD]

This selection is used for 3-wire operation. The FWD or REV signal is self-held when HLD-CM is on, and the self-hold is cleared when HLD-CM is turned off. To use this HLD terminal function, assign 6 to the target digital input terminal.



Coast-to-stop command [BX]

When BX and CM are connected, inverter output is cut off immediately and the motor starts to coast-to-stop. An alarm signal is neither output nor self-held. If BX and CM are disconnected when the operation command (FWD or REV) is on, operation starts at the start frequency. To use this BX terminal function, assign value "4" to the target digital input terminal.



Alarm reset [RST]

When an inverter trip occurs, connecting RST and CM clears the alarm output (for any fault); disconnecting them clears trip indication and restarts operation. To use this RST terminal function, assign value "5" to the target digital input terminal.

External fault [THR]

Disconnecting THR and CM during operation cuts off inverter output (i.e., motor starts to coast-to-stop) and outputs alarm OH2, which is self-held internally and cleared by RST input. This function is used to protect an external brake resistor and other components from overheating. To use this THR terminal function, assign value "6" to the

target digital input terminal. ON input is assumed when this terminal function is not set.

Jogging operation [JOG]

This function is used for jogging (inching) operation to position a work piece. When JOG and CM are connected, the operation is performed with the jogging frequency set in function code C20 while the operation command (FWD-CM or REV-CM) is on. To use this JOG terminal function, assign value "7" to the target digital input terminal.

Frequency setting 2/frequency setting 1

This function switches the frequency setting method set in function codes F01 and C30 by an external digital input signal.

| Set value input signal | Frequency setting method selected |
|------------------------|-----------------------------------|
| 8 | |
| off | F01 FREQ CMD1 |
| on | C30 FREQ CMD2 |

DC brake command

When the external digital input signal is on, DC injection braking starts when the inverter's output frequency drops below the frequency preset in function code F31 after the operation command goes off. (The operation command goes off when the **STOP** key is pressed at keypad panel operation and when both terminals FWD and REV go on or off at terminal block operation.) The DC injection braking continues while the digital input signal is on. In this case, the longer time of the following is selected:

- The time set in function code F34.
- The time, which the input signal is set on.

| Set value input signal | Operation selected |
|------------------------|-----------------------------------------|
| 9 | |
| off | No DC injection brake command is given. |
| on | A DC injection brake command is given. |

UP command [UP]/DOWN command [DOWN]

When an operation command is input (on), the output frequency can be increased or decreased by an external digital input signal. The change ranges from 0 to maximum frequency. Operation in the opposite direction of the operation command is not allowed.

| Combination of set value input signals | | Function selected (when operation command is on) |
|----------------------------------------|------------|----------------------------------------------------------------------------|
| 11 | 10 | |
| off | off | Holds the output frequency. |
| off | on | Increases the output frequency according to the acceleration time . |
| on | off | Decreases the output frequency according to the deceleration time . |
| on | on | Holds the output frequency. |

There are the two types of UP/DOWN operations as shown below. Set the desired type by setting the frequency (F01 or C30).

| Frequency setting (F01 or C30) | Initial value at power input on | Operation command reentry during deceleration |
|--------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------|
| 8 (UP/DOWN1) | 0Hz | Operates at the frequency at reentry. Frequency FWD ON OFF (REV) OFF OFF |
| Related function F01 | | |
| 9 (UP/DOWN2) | Previous frequency | Returns to the frequency before deceleration. Frequency FWD ON OFF (REV) OFF OFF |

Wire enable for KEYPAD [WE-KPI]

This function allows the data to be changed only when an external signal is being input, thereby making it difficult to change the data.

| 12 | Function selected |
|------------|-----------------------|
| off | Inhibit data changes. |
| on | Allow data changes. |

Note:

If a terminal is set to value 12, the data becomes unable to be changed. To change the data, turn on the terminal and change the terminal setting to another number.

Inverse mode changeover IVS

The analog input (terminals 12 and C1) can be switched between forward and inverse operations by an external digital input signal.

| Set value input signal | Function selected |
|------------------------|----------------------------------------------------------------|
| 13 | |
| off | Forward operation when forward operation is set and vice versa |
| on | Inverse operation when forward operation is set and vice versa |

Interlock signal(52-2) [IL]

When a contactor is installed on the output side of the inverter, the contactor opens at the time of a momentary power failure, which hinders the reduction of the DC circuit voltage and may prevent the detection of a power failure and the correct restart operation when power is recovered. The restart operation at momentary power failure can be performed effectively with power failure information provided by an external digital input signal.

| Set value input signal | Function |
|------------------------|-----------------------------------------------------------------|
| 14 | |
| off | No momentary power failure detection operation by digital input |
| on | Momentary power failure detection operation by digital input |

Link enable (RS485 standard, BUS)[LE]

Frequency and operation commands from the link can be enabled or disabled by switching the external digital input signal. Select the command source in H30, "Link function." Assign value "15" to the target digital input terminal and enable or disable commands in this input signal state.

| Set value input signal | Function selected |
|---------------------------|------------------------|
| 15 | |
| off | Link command disabled. |
| on | Link command enabled. |

Universal DI [U-DI]

Assigning value "16" to a digital input terminal renders the terminal a universal DI terminal. The ON/OFF state of signal input to this terminal can be checked through the RS485.

This input terminal is only used to check for an incoming input signal through communication and does not affect inverter operation.,

Settings when shipped from the factory

| Digital input | Setting at factory shipment | |
|------------------|-----------------------------|-------------------------------------|
| | Set value | Description |
| Terminal X1 | 0 | Multistep frequency selection (SS1) |
| Terminal X2 | 1 | Multistep frequency selection (SS2) |
| Terminal X3 | 2 | Multistep frequency selection (SS4) |
| Terminal X4 | 5 | Alarm reset (RST) |
| Terminal X5 | 17 | Motor selection signal (M1) |
| Terminal X6 | 18 | Motor selection signal (M2) |
| Terminal X7 | 19 | Motor selection signal (M3) |
| Terminal X8 | 20 | Motor selection signal (M4) |
| Terminal X9 | 21 | Motor selection signal (M5) |

E10**Motor selection****E 1 0 M T R S E L C T**

◆The motor can be switched in either of the following methods:

Switching on the keypad panel ... Selecting a motor by entering a motor number on the keypad panel.

Switching on the terminal base ... Selecting a motor

from outside using the digital input signals (terminal X1 to X9)

Setting range

- 1 Switching on the keypad panel: Motor1 is selected.
- 2 Switching on the keypad panel: Motor2 is selected.
- 3 Switching on the keypad panel: Motor3 is selected.
- 4 Switching on the keypad panel: Motor4 is selected.
- 5 Switching on the keypad panel: Motor5 is selected.
- 6 Switching on the terminal base: Bit selection
- 7 Switching on the terminal base: Binary code selection (no parity function)
- 8 Switching on the terminal base: Binary code selection (even parity function)
- 9 Switching on the terminal base: Binary code selection (odd parity function)

The selected motor number is displayed on the LCD screen of the keypad panel. Be sure to confirm the motor number on the screen when the motor is switched.

⚠ WARNING

Securely check the motor number. If you mistake the motor number, an unexpected motor starts operation.

Injury may result.

[Switching on the keypad panel]

Setting a value between 1 and 5 automatically selects the motor switching method on the keypad panel. Select a required motor number to switch the inverter control to the corresponding motor.

[Switching on the terminal base]

Setting a value between 6 and 9 automatically selects the motor switching method on the terminal base. In this switching method, the motor is switched by a digital input from the external device. This switching method is effective only when the inverter is stopped; i.e., motor switchover is impossible during inverter operation.

Switching on the terminal base is classified into bit selection (set value 6) and binary code selection (set value 7, 8 and 9).

Motor switching method by bit selection and binary code selection is explained below.

1. Bit selection (set value 6)

A digital input (from terminal X1 to X9) corresponds to each motor .

Setting data at the terminals X1 to X9 (function codes E01 to E09).

Set value Content

- | | |
|----|------------------------------------|
| 17 | Motor selection (bit code) Motor 1 |
| 18 | Motor selection (bit code) Motor 2 |
| 19 | Motor selection (bit code) Motor 3 |
| 20 | Motor selection (bit code) Motor 4 |
| 21 | Motor selection (bit code) Motor 5 |

[Setting example]

If a number 21 is set at E01 (terminal X1), the motor 5 is selected with the digital input 1 (X1 - CM) turned ON.

Function setting by digital input (X1 to X9) from the host controller.

| Digital input allocation function | ON/OFF setting | | | | |
|-----------------------------------|----------------|---------|---------|---------|---------|
| | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
| selecting Motor 1 (M1) | ON | OFF | OFF | OFF | OFF |
| selecting Motor 2 (M2) | OFF | ON | OFF | OFF | OFF |
| selecting Motor 3 (M3) | OFF | OFF | ON | OFF | OFF |
| selecting Motor 4 (M4) | OFF | OFF | OFF | ON | OFF |
| selecting Motor 5 (M5) | OFF | OFF | OFF | OFF | ON |

Caution:

1. When the bit selection (set value 6) is set, it is impossible to set the values 22 to 25 (motor selection with binary code)for the function codes E01 to E09.
2. There is no need set data for selecting all the motors (M1) to (M5). Allocate data to the necessary number of the motors.
3. The LCD monitor screen displays an error code “ErL” (Motor switching error), if two or more motors are selected while the inverter is stopped. Motor selection error (ErL) can be output to the transistor (terminals Y1 to Y4).
The inverter gets back to normal by selecting only one motor under this condition. If you issue an operation command while “ErL” is lit, the inverter trips with the output stopped. The error display remains “ErL”.
4. This above alarm is output when the inverter is operated, if no motor is selected from (M1) to (M5) or no signal is sent to a terminal from X1 to X9 although a motor has been selected. In that case, the LCD monitor screen displays an error code “ErL”(Motor switching error).

2. Binary code selection

The binary code selection is a method of selecting a motor by entering a motor number converted into a binary code to a digital input (terminals X1 to X9).

Setting the terminals X1 to X9 (function code E01 to E09)

Set value Content

- 22 Bit0 (Least significant bit) (MBCD[0])
- 23 Bit1 (MBCD[1])
- 24 Bit2 (Most significant bit) (MBCD[2])
- 25 Parity bit (MBCD[P])

Function setting by digital inputs (X1 to X9) from the host controller.

The method of entering a binary code corresponding to the motor number is explained here by taking an example where set values are allocated as follows.

Example:

- Function code set value
- E01 (terminal X1) 22
- E02 (terminal X2) 23
- E03 (terminal X3) 24
- E04 (terminal X4) 25

When a number 7 (no parity function) is selected by the motor switching selection (E10).

Because the parity function is not used here, a number 25 (motor selection parity bit) need not be allocated at a terminal from X1 to X9 (E01 to E09). The input to the terminal X4 is invalid in the above example.

| Digital input allocation function | ON/OFF setting | | | | |
|-----------------------------------|----------------|---------|---------|---------|---------|
| | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
| Terminal X1 (MBCD[0]) | ON | OFF | ON | OFF | ON |
| Terminal X2 (MBCD[1]) | OFF | ON | ON | OFF | OFF |
| Terminal X3 (MBCD[2]) | OFF | OFF | OFF | ON | ON |
| Terminal X4 (MBCD[P]) | - | - | - | - | - |

When a number 8 (even parity function) is selected by the motor switching selection (E10).

| Digital input allocation function | ON/OFF setting | | | | |
|-----------------------------------|----------------|---------|---------|---------|---------|
| | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
| Terminal X1 (MBCD[0]) | ON | OFF | ON | OFF | ON |
| Terminal X2 (MBCD[1]) | OFF | ON | ON | OFF | OFF |
| Terminal X3 (MBCD[2]) | OFF | OFF | OFF | ON | ON |
| Terminal X4 (MBCD[P]) | ON | ON | OFF | ON | OFF |

When a number 9 (odd parity function) is selected by the motor switching selection (E10).

| Digital input allocation function | ON/OFF setting | | | | |
|-----------------------------------|----------------|---------|---------|---------|---------|
| | Motor 1 | Motor 2 | Motor 3 | Motor 4 | Motor 5 |
| Terminal X1 (MBCD[0]) | ON | OFF | ON | OFF | ON |
| Terminal X2 (MBCD[1]) | OFF | ON | ON | OFF | OFF |
| Terminal X3 (MBCD[2]) | OFF | OFF | OFF | ON | ON |
| Terminal X4 (MBCD[P]) | OFF | OFF | ON | OFF | ON |

Caution:

- When the binary code selection (set values 7,8 and 9) is set, it is impossible to set the values 17 to 21 (motor selection by each bit) at the function code E01 to E09.
- There is no need to set data for selecting all the motors (MCBD[0]) to (MCBD[2]). Set only the required number of motors.
- The LCD monitor screen displays an error code "ErL" (Motor switching error) when binary code 0 or 6 or more is selected while the inverter is stopped. Motor selection warning "ErL" can be output to the transistor terminals Y1 to Y4.
- The above alarm is output. If there is no setting for motor selection (MBCD[0]) to (MBCD[2]) or there is no input to the terminals X1 to X9 although a motor has been selected. In that case, the LCD monitor screen displays an error code "ErL"(motor switching error).

The inverter gets back to normal by setting binary code to any of 1 to 5 in this condition. If you issue an operation command while "ErL" is lit, the inverter trips with the output stopped. The error display remains "ErL".

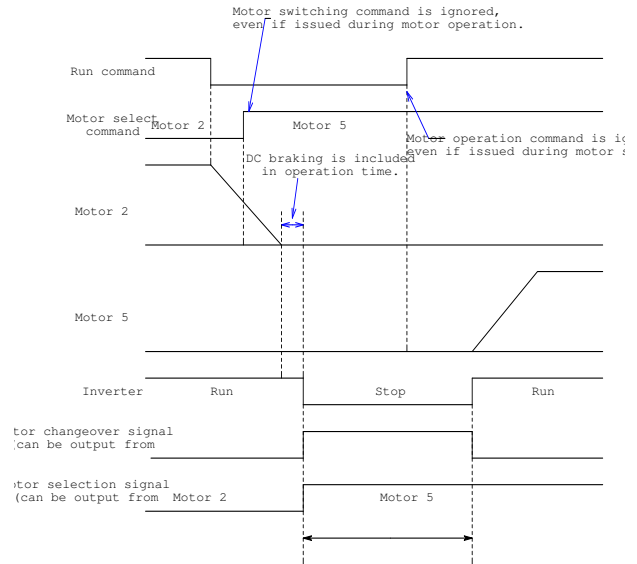
Press **RESET** key or enter a RST command from the terminal block to get the inverter back to normal.

[Motor switching sequence]

The delay time (about 240ms) is set in FRN-H11S series to prohibit motor operation until the motor is completely switched. It will take about 240ms to switch a motor connected with the inverter through an electromagnetic contactor. The delay time is determined based on such assumption. Determine the signal output timing from the host controller by considering this delay time.

Remarks:

The motor switching signal can be output while the operation is prohibited (for delay time) by setting a number 19 (a signal indicating that motor switching is in progress) in terminals Y1 to Y5 (E20 to E24).



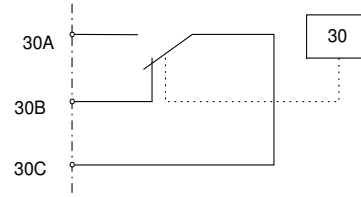
E11 30Ry operation mode

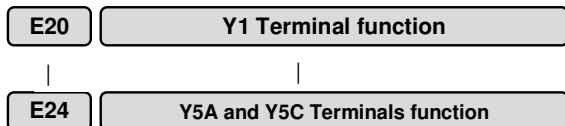
E 1 1 3 0 R Y M O D E

◆ This function specifies whether to activate (excite) the alarm output relay (30Ry) for any fault at normal or alarm status.

| Set value | Operation |
|-----------|--------------------------------------------------------------------------------------|
| 0 | At normal 30A - 30C: OFF, 30B - 30C: ON At abnormal 30A - 30C: ON, 30B - 30C: OFF |
| 1 | At normal 30A - 30C: ON, 30B - 30C: OFF At abnormal 30A - 30C: OFF, 30B - 30C: ON |

◆ When the set value is 1, contacts 30A and 30C are connected when the inverter control voltage is established (about one second after power on).





| | | | | | | | | | | | | |
|---|---|---|---|---|--|---|---|---|---|--|--|--|
| E | 2 | 0 | Y | 1 | | F | U | N | C | | | |
| E | 2 | 1 | Y | 2 | | F | U | N | C | | | |
| E | 2 | 2 | Y | 3 | | F | U | N | C | | | |
| E | 2 | 3 | Y | 4 | | F | U | N | C | | | |
| E | 2 | 4 | Y | 5 | | F | U | N | C | | | |

◆Some control and monitor signals can be selected and output from terminals [Y1] to [Y5]. Terminals [Y1] to [Y4] use transistor output terminals; [Y5A] and [Y5C] use relay contacts.

| Set value | Output signal |
|-----------|------------------------------------------------|
| 0 | Inverter running [RUN] |
| 1 | Frequency equivalence signal [FAR] |
| 2 | Frequency level detection [FDT1] |
| 3 | Undervoltage detection signal [LV] |
| 4 | Restarting-after momentary power failure [IPF] |
| 5 | Overload early warning [OL1] |
| 6 | KEYPAD operation mode [KP] |
| 7 | Inverter stopping [STP] |
| 8 | Ready output [RDY] |
| 9 | Terminal AX function [AX] |
| 10 | Alarm indication1 [AL1] |
| 11 | Alarm indication2 [[AL2] |
| 12 | Alarm indication4 [AL4] |
| 13 | Alarm indication8 [AL8] |
| 14 | Fan operation signal [FAN] |
| 15 | Retry function operating [TRY] |
| 16 | Universal DO [U-DO] * |
| 17 | Overheat early warning [OH] |
| 18 | Motor selection error signal [Erl] |
| 19 | Motor changeover signal[MCHG] |
| 20 | Motor 1 selection signal [M1SEL] |
| 21 | Motor 2 selection signal [M2SEL] |
| 22 | Motor 3 selection signal [M3SEL] |
| 23 | Motor 4 selection signal [M4SEL] |
| 24 | Motor 5 selection signal [M5SEL] |
| 25 | Binary signal 1 for selecting motor [MB1] |
| 26 | Binary signal 2 for selecting motor [MB2] |
| 27 | Binary signal 4 for selecting motor [MB4] |

Note: For output signals marked *, refer to instruction manuals for RS-485 communication .

Inverter running [RUN]

"Running" means that the inverter is outputting a frequency. "RUN" signal is output as when there is output speed (frequency). When the DC injection brake function is active, "RUN" signal is off.

Frequency equivalence signal [FAR]

See the explanation of function code F17 (frequency arrival [detection width]).

Frequency level detection [FDT1]

See the explanation of function codes E31 and E32 (frequency detection).

Undervoltage detection signal [LV]

If the undervoltage protective function activates, i.e. when the main circuit DC voltage falls below the undervoltage detection level, an ON signal is output. The signal goes off when the voltage recovers and increases above the detection level. The ON signal is retained while the undervoltage protective function is activating. Undervoltage detection level: 200V

Restart after momentary power failure [IPF]

Following a momentary power failure, this function reports the start of the restart mode, the occurrence of an automatic pull-in, and the completion of the recovery operation.

Following a momentary power failure, an ON signal is output when power is recovered and a synchronization (pull-in) operation is performed. The signal goes off when the frequency (before power failure) is recovered. For 0Hz restart at power recovery, no signal is output because synchronization ends when power is recovered. The frequency is not recovered to the frequency before the power failure occurrence.

Overload early warning [OL1]

Before the motor stops by the trip operation of an electronic thermal O/L relay, this function outputs an ON signal when the load reaches the overload early warning level.

For setting procedure, see "F18 OL1 function signal (Level)", and "E24 Overload early warning (operation selection)."

Note: This function is effective for each motor.

You can choose the method judging overload early warning between overload early warning by electronic thermal relay and that by output current.

Keypad operation mode [KP]

An ON signal is output when operation command keys (**FWD** , **REV** and **STOP**) on the keypad panel can be used (i.e., 0 set in "F02 Operation") to issue operation and stop commands.

Inverter stopping [STP]

This function outputs an inverted signal to Running (RUN) to indicate zero speed. An ON signal is output when the DC injection brake function is operating.

Ready output [RDY]

This function outputs an ON signal when the inverter is ready to operate. The inverter is ready to operate when the main circuit and control circuit power is established and the inverter protective function is not activating. About one second is required from power-on to ready for operation in normal condition.

Terminal AX function [AX]

When an operation (forward or reverse) command is entered, this function outputs an ON signal. When a stop command is entered, the signal goes off after inverter output stops. When a coast-to-stop command is entered and the inverter protective function operates, the signal goes off immediately.

Alarm indication [AL1] [AL2] [AL4]

This function reports the operating status of the inverter protective function.

| Alarm detail (inverter protective function) | Output terminal | | | |
|--------------------------------------------------------------|-----------------|-----|-----|-----|
| | AL1 | AL2 | AL4 | AL8 |
| Overcurrent, ground fault, fuse blown | on | off | off | off |
| Overvoltage | off | on | off | off |
| Undervoltage shortage, input phase failure | on | on | off | off |
| Motors 1 to 5 overload | off | off | on | off |
| Inverter overload | on | off | on | off |
| Heat sink overheating, inverter inside overheating | off | on | on | off |
| External alarm input, braking resistor overheating | on | on | on | off |
| Memory error, CPU error | off | off | off | on |
| Keypad panel communication error, option communication error | on | off | off | on |
| Option error | off | on | off | on |
| Output wiring error | off | off | on | on |
| RS-485 communication error | on | off | on | on |
| Motor selection error | on | on | off | on |

In normal operation terminals do not output a signal.

Fan operating signal [FAN]

When used with "H06 Cooling fan ON/OFF control," this function outputs a signal while the cooling fan is operating.

Retry function operating [TRY]

When a value of 1 or larger is set to "H04 Retry perating," the signal is output while retry operation is activating when the inverter protective function is activated.

Universal DO [U-DO]

Assigning value "16" to a transistor output terminal renders the terminal a universal DO terminal. This function enables ON/OFF through the RS485. This function serves only to turn on and off the transistor output through communication and is not related to inverter operation.

Overheat early warning [OH]

This function outputs a early warning signal when heat sink temperature is (overheat detection level - 10°C) or higher.

Motor selection error [ErL]

This inverter issues this error signal when several motors are selected at the same the time, no motor is selected, no input is given to terminals X1 to X9, or the specified binary code is out of the selection range. The error is also displayed in the LCD monitor screen.

Motor changeover signal [MCHG]

When the inverter receives a motor changeover signal from a terminal selected among the terminals X1 to X9, the inverter outputs the signal for switching the electromagnetic contactors of the motors. The changeover time present in the inverter is about 240ms. The inverter, however, does not output the changeover signal while the motor is operating or the DC braking resistor is operating. In this case, wait until the motor stops before re-inputting the changeover signal.

Motor selection signal [M1SEL, M2SEL, M3SEL, M4SEL, M5SEL]

This signal is issued when the motor selected by a preset value is reselected by input from any of the terminals X1 to X9.

Binary signal for selecting motors [MB1, MB2, MB4]

This signal is issued as a 3-bit binary code when the motor selected by a preset value is reselected by input from any of the terminals X1 to X9. [MB1] corresponds to LSB and [MB4] corresponds to MSB.

Settings when shipped from the factory

| Digital input | Setting at factory shipment | |
|---------------|-----------------------------|------------------------------|
| | Set value | Description |
| Terminal Y1 | 0 | Operating [RUN] |
| Terminal Y2 | 1 | Frequency arrival [FAR] |
| Terminal Y3 | 2 | Frequency detection [FDT1] |
| Terminal Y4 | 5 | Overload early warning [OL1] |
| Terminal Y5 | 9 | Terminal AX function [AX] |

E25

Y5 Ry operation mode

E 2 5 Y 5 R Y M O D E

◆This function specifies whether to excite the Y5 relay at "ON signal mode" or "OFF signal mode".

| Set value | Operation |
|-----------|--------------------------------------------------------------------------|
| 0 | At "OFF signal mode" Y5A - Y5C: OFF At "ON signal mode" Y5A - Y5C: ON |
| 1 | At "OFF signal mode" Y5A - Y5C: ON At "ON signal mode" Y5A - Y5C: OFF |

◆When the set value is 1, contacts Y5A and Y5C are connected when the inverter control voltage is established (about one second after power on).

E31

Frequency detection1 (operation level)

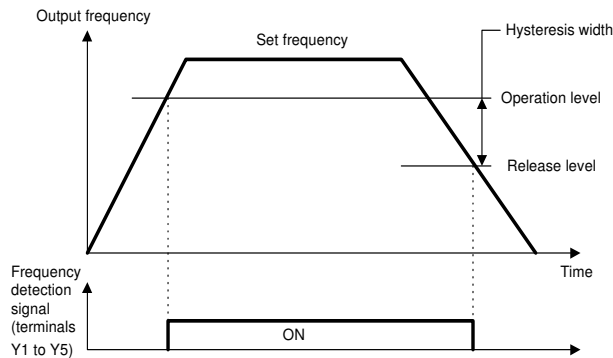
E32

Frequency detection (hysteresis width)

E 3 1 F D T 1 L E V E L
E 3 2 F D T H Y S T R

◆This function determines the operation (detection) level of the output frequency and hysteresis width for operation release. When the output frequency exceeds the set operation level, an ON signal can be selected and output from terminals [Y1] to [Y5].

Setting range (Operation level): 0 to 1667Hz
(Hysteresis width): 0.0 to 30.0 Hz



E40 **Display coefficient A**

E41 **Display coefficient B**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|--|--|--|--|
| E | 4 | 0 | C | O | E | F | A | | | | |
| E | 4 | 1 | C | O | E | F | B | | | | |

◆These coefficients are conversion coefficients, which are used to determine the load and line speed and the target value and feedback amount (process amount) of the PID controller displayed on the LED monitor.

Setting range

Display coefficient A:-999.00 to 0.00 to +999.00
 Display coefficient B:-999.00 to 0.00 to +999.00

◆Load and line speed

Use the display coefficient A.
 Displayed value = output frequency x (0.01 to 200.00)
 Although the setting range is ±999.00, the effective value range of display data is 0.01 to 200.00. Therefore, values smaller or larger than this range are limited to a minimum value of 0.01 or a maximum value of 200.00.

E42 **LED Display filter**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| E | 4 | 2 | D | I | S | P | L | A | Y | F | L |
|---|---|---|---|---|---|---|---|---|---|---|---|

◆Among data in "E43 LED monitor (Function)," some data need not be displayed instantaneously when the data changes. For such data, a flickering suppression filter can be used.

Setting range: 0.0 to 5.0 seconds

E43 **LED monitor (Function)**

E44 **LED monitor (display at STOP mode)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|--|
| E | 4 | 3 | L | E | D | M | N | T | R | | |
| E | 4 | 4 | L | E | D | M | N | T | R | 2 | |

◆Monitored items in "E43 LED monitor (Function)"

| Set value | Display item |
|-----------|----------------|
| 3 | Output current |
| 4 | Output voltage |

◆The data during inverter operation, during stopping, at frequency setting, and at PID setting is displayed on the LED.

◆Display during running and stopping

During running, the items selected in "E43 LED monitor (Function)," are displayed. In "E44 LED monitor (display at stop mode)," specify whether to display some items out of the set values or whether to display the same items as during running.

| Value set to E43 | E44=0 | | E44=1 | |
|------------------|-------------------------------------------|---------------------------------|-------------|----------------|
| | At stopping | During running | At stopping | During running |
| 0 | Set frequency value (Hz) | Output frequency (Hz) | | |
| 1 | Set frequency value (Hz) | | | |
| 2 | Output current (A) | | | |
| 3 | Output voltage (command value) (V) | | | |
| 4 | Motor synchronous speed set value (r/min) | Motor synchronous speed (r/min) | | |
| 5 | Line speed set value (m/min.) | Line speed (m/min.) | | |
| 6 | Load shaft speed set value (r/min) | Load shaft speed (r/min) | | |

◆Display at frequency setting

When a set frequency is checked or changed by the keypad panel, the set value shown below is displayed. Select the display item by using "E43 LED monitor (Function)." This display is not affected by "E44 LED monitor (display at stop mode)."

| Value set to E43 | Frequency setting |
|------------------|----------------------------------------|
| 0,1,2,3 | Set value of frequency (Hz) |
| 4 | Set value of synchronous speed (r/min) |
| 5 | Set value of line speed (m/min.) |
| 6 | Set value of load speed (r/min) |

E45 LCD monitor (Function)

E 4 5 L C D M N T R

◆This function selects the item to be displayed on the LCD monitor in the operation mode.

| Set value | Display item |
|-----------|---------------------------------------------------------------------------------------------------|
| 0 | Operation status, rotating direction, operation guide |
| 1 | Output frequency (before slip compensation), output current, calculated torque value in bar graph |

Set value: 0

During running

60.0

RUN^{FWD}
M1
PRG⇒PRG MENU
F/D⇒LED SHIFT

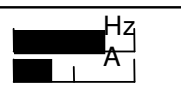
When stopping

60.0

STOP^{M1}
PRG⇒PRG MENU
F/D⇒LED SHIFT

Set value: 1

60.0



Fout/Iout

Full-scale value of bar graph

| Display item | Full-scale |
|------------------|------------------------------|
| Output frequency | Maximum frequency |
| Output current | 200% of inverter rated value |

Note: The scale cannot be adjusted.

E46 Language

E 4 6 L A N G U A G E

◆This function selects the language for data display on the LCD monitor.

| Set value | Language displayed |
|-----------|--------------------|
| 0 | Japanese |
| 1 | English |

Note: English language is used for all LCD screens in this manual. For other languages, refer to the relevant instruction manual.

E47 LCD monitor (contrast)

E 4 7 C O N T R A S T

◆This function adjusts the LCD contrast. Increase the set value to raise contrast and decrease to lower contrast.

| | |
|-----------|--------------------|
| Set value | 0,1,2 ••••• 8,9,10 |
| Screen | Low ←————→ High |

C: Control Functions of Frequency

- C01** Jump frequency 1
- C02** Jump frequency 2
- C03** Jump frequency 3
- C04** Jump frequency (Hysteresis)

- ◆ This function makes the set frequency jump so that the inverter's output frequency does not match the mechanical resonance point of the load.
- ◆ Up to three jump points can be set.
- ◆ This function is ineffective when jump frequencies 1 to 3 are set to 0Hz.
- ◆ A jump does not occur during acceleration or deceleration.

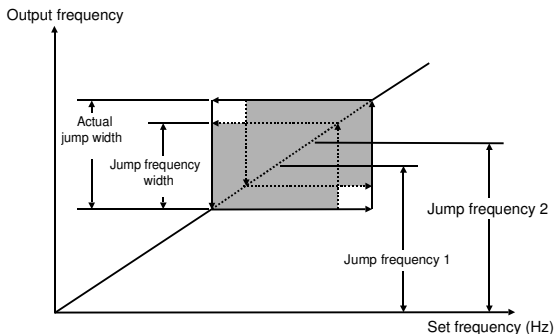
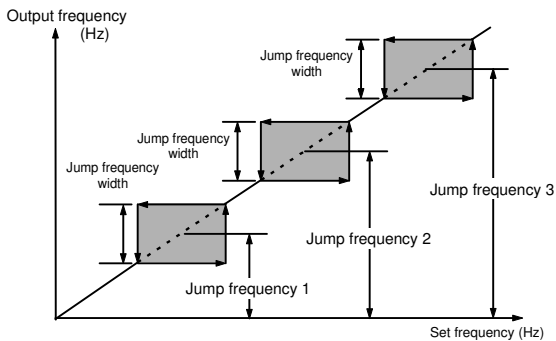
When a jump frequency setting range overlaps another range, both ranges are added to determine the actual jump area.

| | | | | | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--|
| C | 0 | 1 | J | U | M | P | H | z | 1 | |
| C | 0 | 2 | J | U | M | P | H | z | 2 | |
| C | 0 | 3 | J | U | M | P | H | z | 3 | |

Set value: 0 to 1667Hz (P11S: 0 to 120Hz)
In 1Hz steps (min.)

| | | | | | | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| C | 0 | 4 | J | U | M | P | H | Y | S | T | R |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|

◆ Jump frequency width
Set value: 0 to 30Hz
In 1Hz steps (min.)



- C05** Multistep frequency 1
- C11** Multistep frequency 7

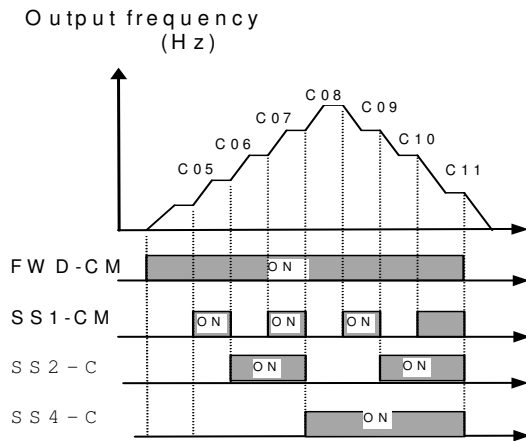
- ◆ The motor speed can be changed in a maximum of 8 steps by combining the multistep frequencies (from C05 to C11) with the terminal functions (from E01 to E09). Use the multistep frequencies when operating the motor by changing the motor speed in several steps.
- ◆ The multistep frequencies 1 to 7 can be switched by turning on and off terminal functions SS1, SS2, and SS4. (See E01 to E09 for terminal function definitions.)
- ◆ OFF input is assumed for any undefined terminal of SS1, SS2, and SS4.

Note: The multistep frequencies override the frequencies set by F01 or C30.

| | | | | | | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| C | 0 | 5 | M | U | L | T | I | H | z | - | 1 |
| C | 0 | 6 | M | U | L | T | I | H | z | - | 2 |
| C | 0 | 7 | M | U | L | T | I | H | z | - | 3 |
| C | 0 | 8 | M | U | L | T | I | H | z | - | 4 |
| C | 0 | 9 | M | U | L | T | I | H | z | - | 5 |
| C | 1 | 0 | M | U | L | T | I | H | z | - | 6 |
| C | 1 | 1 | M | U | L | T | I | H | z | - | 7 |

Related functions
E01 to E09
(Set value:0 to 3)

Set value: 0 to 1667Hz
In 0.1Hz steps (min.)



C20 **JOG frequency**

C 2 0 J O G H z

◆This function sets the frequency for jogging operation of motor, which is different from the normal operation.
Setting range 0.00 to 1667 Hz

◆Starting with the jogging frequency is combined with jogging select signal input from the keypad panel or control terminal. For details, see the explanations of "E01 Terminal X1," to "E09 Terminal X9."

C28 **Setting analog input resolution**

C 2 8 R E S O L U T I O N

◆This function is used to set the resolution applied to the analog inputs for setting the frequency (voltage input and current input).

Setting range: 0,1 to 20Hz
In 1Hz steps

C30 **Frequency command 2**

C 3 0 F R E Q C M D 2

◆This function selects the frequency setting method.

For the setting method, see the explanation for F01.

Related functions
E01 to E09
(Set value:11)
F01

C31 **Offset (terminal [12])**

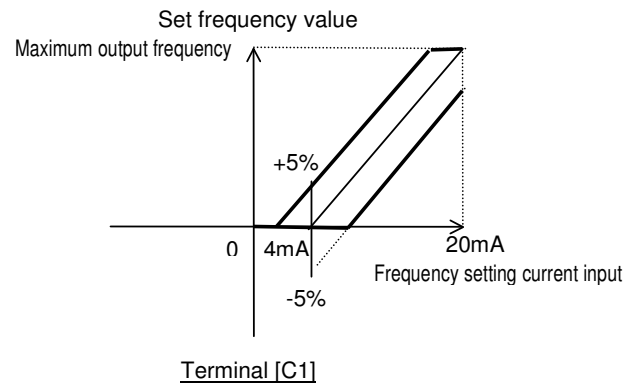
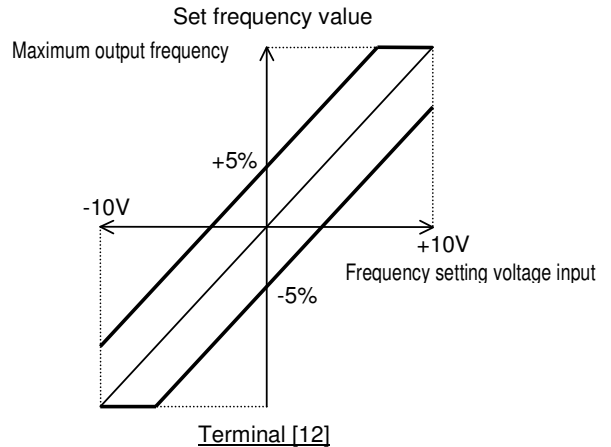
C32 **Offset (terminal [C1])**

C 3 1 O F F S E T 1 2

C 3 2 O F F S E T C 1

◆This function sets the offset of the analog input (terminals [12] and [C1]).

The setting range is -5.0 to +5.0% (in 0.1% steps) of the maximum output frequency.



C33 **Analog setting signal filter**

C 3 3 R E F F I L T E R

◆Analog signals input from control terminal 12 or C1 may contain noise, which renders control unstable. This function adjusts the time constant of the input filter to remove the effects of noise.
Setting range: 0.00 to 5.00 seconds

◆A set value too large delays control response though stabilizing control. A set value too small speeds up control response but renders control unstable.

If the optimum value is not known, change the setting when control is unstable or response is delayed.

Note: The set value is commonly applied to terminals 12 and C1.

Motor 2,3 (P: Motor Parameters)

P01 **Number of motor poles**

P 0 1 M P O L E S

◆This function sets the number of poles of motor to be driven. If this setting is not made, an incorrect motor speed (synchronous speed) is displayed on the LED.

Set values: 2, 4, 6, 8, 10, 12, 14

P02 **Motor (capacity)**

P 0 2 M - C A P

◆The nominal applied motor capacity is set at the factory. The setting should be changed when driving a motor with a different capacity.

Setting range: 0.01 to 45kW

P03 **Motor (Rated current)**

P 0 3 M - I r

◆This function sets the rated current value of motor 2. Setting range: 0.00 to 2,000A

P04 **Maximum frequency 2**

P05 **Base frequency 2**

P06 **First frequency 2**

P07 **First voltage 2**

P08 **Rated voltage 2**

P09 **Maximum voltage 2**

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

P 0 4 M A X H z - 2

◆This function sets the maximum output frequency for the motor 2.

Setting range: 50 to 1667 Hz

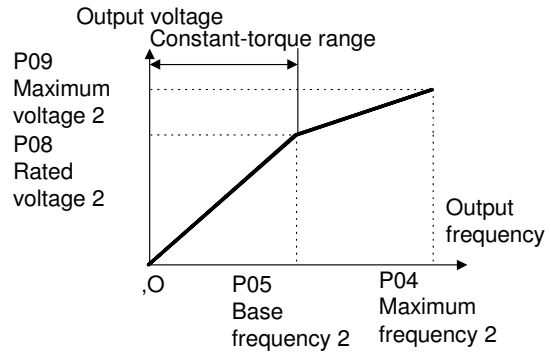
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

P 0 5 B A S E H z - 2

◆This function sets the maximum output frequency in the constant-torque range of motor2 or the output frequency at the rated voltage. Match the rating of the motor.

Setting range 25 to 1667Hz

Note: When the set value of base frequency 2 is higher than that of maximum frequency 2, the output voltage does not increase of the rated voltage, because the maximum frequency limits the output frequency.



P 0 6 F I R S T H z 2

◆Setting the first frequency of motor 2.

Setting range: 25 to 1667Hz

Set the frequency within the range below the base frequency.

P 0 7 F I R S T V - 2

◆Setting the voltage at the segment frequency (frequency set with P06) of motor2.

Setting range: 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

P 0 8 R A T E D V - 2

◆This function sets the rated value of voltage output to motor 2. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 2 exceeds maximum output voltage 2, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

P 0 9 M A X V - 2

◆This function sets the maximum value of the voltage output for motor 2. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 0, 50 to 240V

P10 **Acceleration time 2**

P11 **Deceleration time 2**

P 1 0 A C C T I M E 2
P 1 1 D E C T I M E 2

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

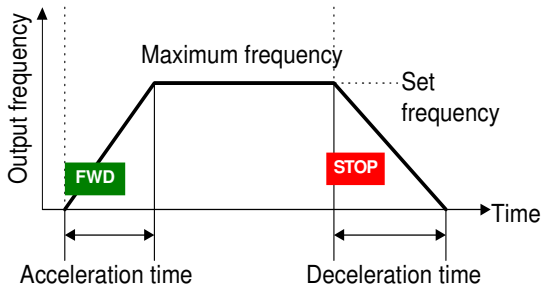
Setting range Acceleration time 2: 1.0 to 3,600 seconds

Deceleration time 2: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.
Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

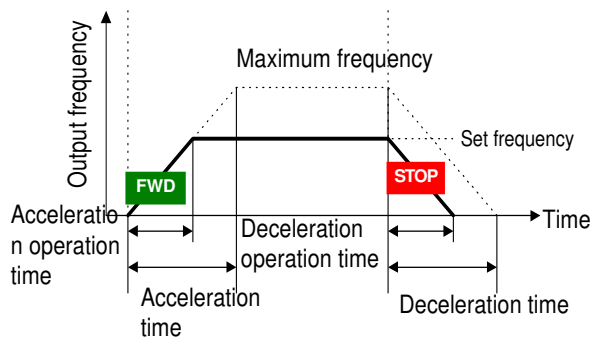
Set frequency = maximum frequency

The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.
Acceleration deceleration operation time = set value x (set frequency/maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, the inverter occasionally does the overcurrent trip.

P12 Torque boost 2

P 1 2 T R Q B O O S T 2

- ◆Torque boost function is effective in such a case where the motor dose not rotate in a low-speed (low frequency) range due to torque shortage.
- ◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.

Setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

P13 Electronic thermal O/L relay for motor 2 (Selection)

P14 Electronic thermal O/L relay for motor 2 (Level)

P15 Electronic thermal O/L relay for motor 2 (Thermal time constant)

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by P15 (thermal time constant).

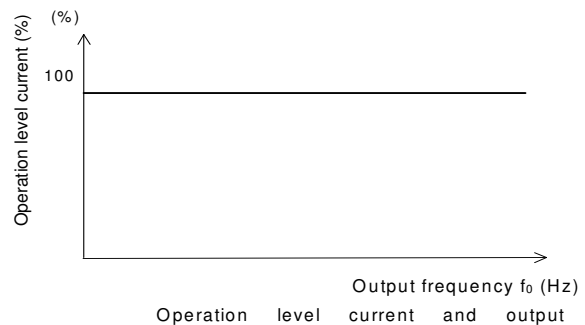
P 1 3 E L C T R N O L 2

◆This function specifies whether to operate the electric thermal O/L relay.

Set value 0: Inactive
1: Active

P 1 4 O L L E V E L 2

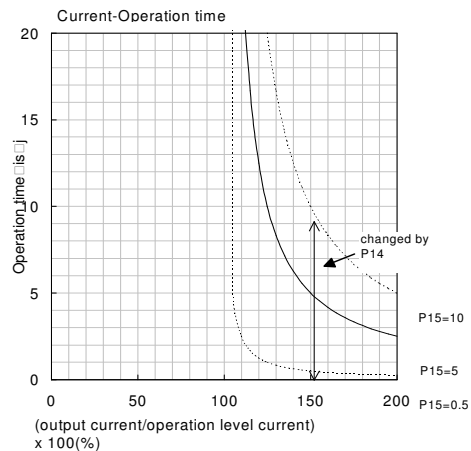
◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.



P 1 5 T I M E C N S T 2

◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

Setting range: 0.1 to 300.0 seconds (in 0.1 seconds steps).

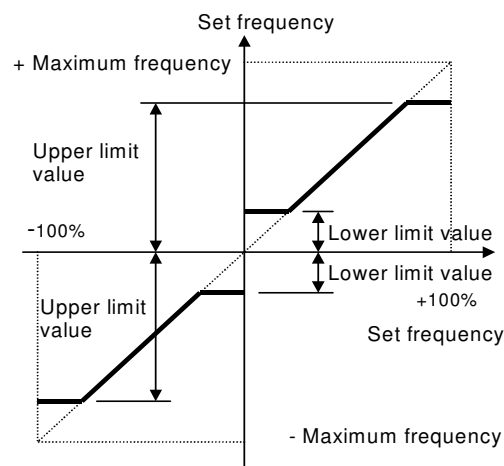


P16 Frequency limiter (High2)

P 1 6 H L I M I T E R 2

◆This function sets the upper limits for the setting frequency.

Setting range: 0 to 1667 Hz



- ❖ The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.
- ❖ If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.
- ❖ When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

P17 Starting frequency 2 (frequency)

P 1 7 S T A R T H z 2

- ◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.
- ◆Frequency: this function sets the frequency at startup.

Setting range: 0.1 to 100Hz

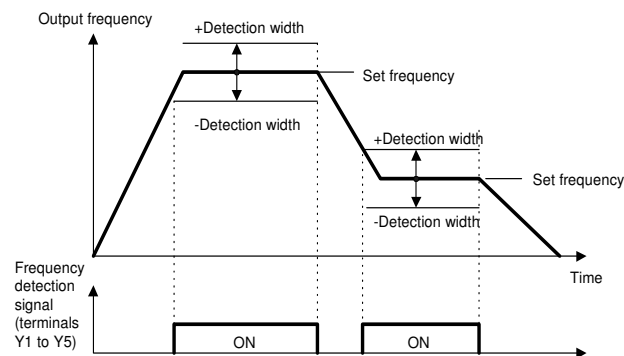
P18 Frequency arrival 2(FAR) (detection width)

P 1 8 F A R H Y S T R 2

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].



P19 OL2 function signal (level)

P 1 9 O L 2 L E V E L

◆This function determines the operation level of the electric thermal O/L relay or output current.

Setting range: 1.00 to 100A

The operation release level is 90% of the set value.

P20 OL2 function signal (Timer)

P 2 0 O L 2 T I M E R

◆This function is used when “1”(Output limit) is set at “F24 Overload early warning (operation selection)”.

Setting range: 0.0 to 60.0 seconds

◆Set the time from when the operation level is attained until the overload early warning function is activated.

P21 Maximum frequency 3

P22 Base frequency 3

P23 First frequency 3

P24 First voltage 3

P25 Rated voltage 3

P26 Maximum voltage 3

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

P 2 1 M A X H z - 3

◆This function sets the maximum output frequency for the motor 3

Setting range: 50 to 1667 Hz

Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

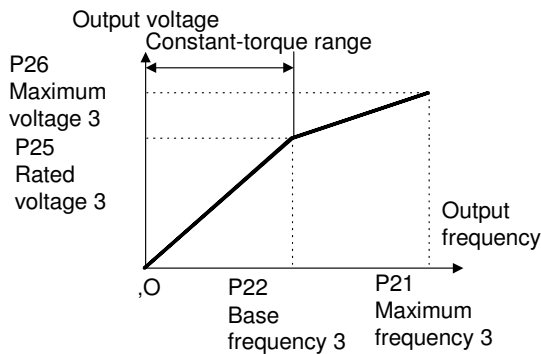
P 2 2 B A S E H z - 3

◆This function sets the maximum output frequency in the constant-torque range of motor3 or the output frequency at the rated output voltage. Match the rating of the motor.

Setting range: 25 to 1667Hz

Note: When the set value of base frequency 3 is higher

than that of maximum output frequency 3; the output voltage does not increase to the rated voltage, because the maximum frequency limits the output frequency.



P 2 3 F I R S T H z 3

◆Setting the first frequency of motor 3.
Setting range: 25 to 1667Hz
Set the frequency within the range below the base frequency.

P 2 4 F I R S T V 3

◆Setting the voltage at the first frequency (frequency set with P23) of motor 3.
Setting range: 0, 10 to 240V
Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.
Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

P 2 5 R A T E D V - 3

◆This function sets the rated value of voltage output to motor 3. Note that a voltage higher than the supply (input) voltage cannot be output.
Setting range: 0, 50 to 240V
Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 3 exceeds maximum output voltage 3; the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

P 2 6 M A X V - 3

◆This function sets the maximum value of the voltage output to motor 3. Note that a voltage higher than the supply (input) voltage cannot be output.
Setting range 0, 50 to 240V

P27 Acceleration time 3

P28 Deceleration time 3

P 2 7 A C C T I M E 3

P 2 8 D E C T I M E 3

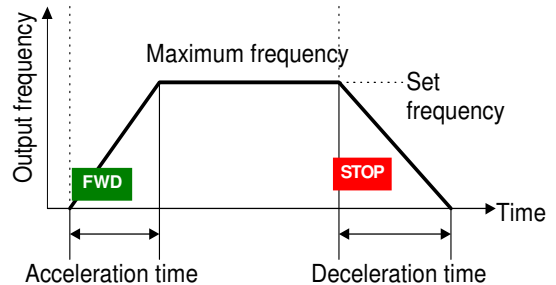
◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

Setting range Acceleration time 3: 1.0 to 3,600 seconds
Deceleration time 3: 1.0 to 3,600 seconds

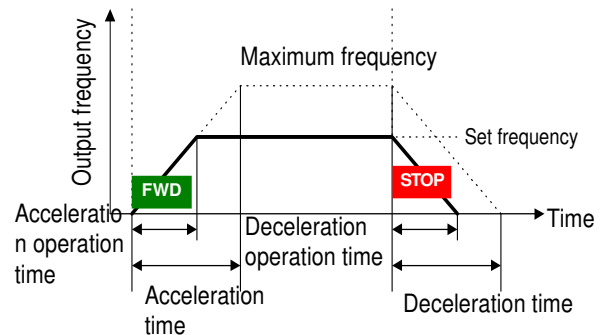
Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency
The actual operation time matches the set value.



Set frequency < maximum frequency
The actual operation time differs from the set value.
Acceleration deceleration operation time = set value x (set frequency/maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

P29 Torque boost 3

P 2 9 T R Q B O O S T 3

◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.
◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.
Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

- P30** Electronic thermal O/L relay for motor 3 (Selection)
- P31** Electronic thermal O/L relay for motor 3 (Level)
- P32** Electronic thermal O/L relay for motor3 (Thermal time constant)

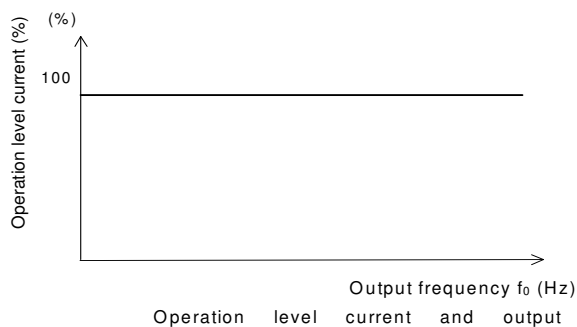
◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by P32 (thermal time constant).

P 3 0 E L C T R N O L 3

◆This function specifies whether to operate the electric thermal O/L relay.
Set value 0: Inactive
1: Active

P 3 1 O L L E V E L 3

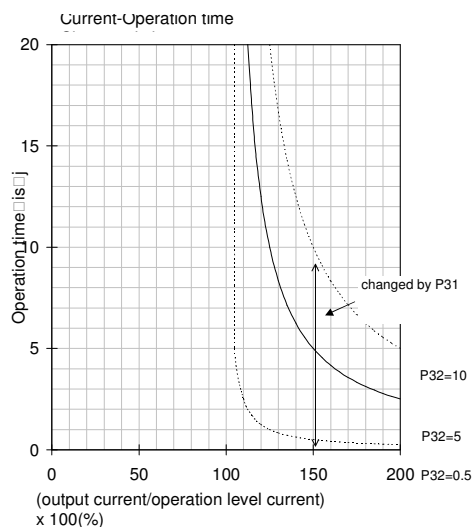
◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.



P 3 2 T I M E C N S T 3

◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.

Setting range: 0.1 to 300.0 seconds (in 0.1 seconds steps).

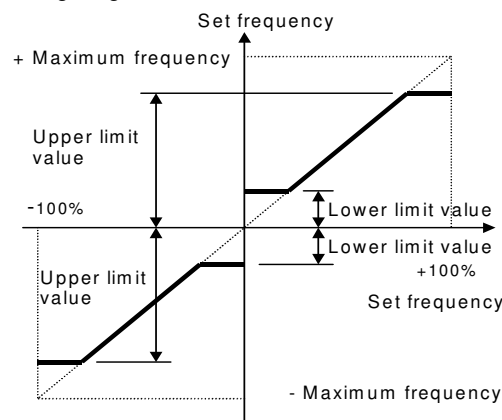


P33 Frequency limiter (High3)

P 3 3 H L I M I T E R 3

◆This function sets the upper limits for the setting frequency.

Setting range: 0 to 1667 Hz



- ❖ The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.
- ❖ If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.
- ❖ When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

P34 Starting frequency 3 (frequency)

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

P 3 4 S T A R T H z 3

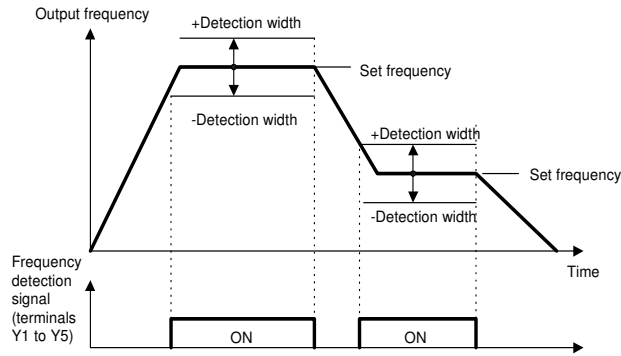
◆Frequency: This function sets the frequency at startup.
Setting range: 0.1 to 100Hz

P35 Frequency arrival 3(FAR) (detection width)

P 3 5 F A R H Y S T R 3

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.
Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].



P36 **OL3 function signal (level)**

P 3 6 O L 3 L E V E L

◆ This function determines the operation level of the electric thermal O/L relay or output current.

Setting range: 1.00 to 100A

The operation release level is 90% of the set value.

P37 **OL3 function signal (Timer)**

P 3 7 O L 3 T I M E R

◆ This function is used when “1”(Output limit) is set at “F24 Overload early warning (operation selection)”.

Setting range: 0.0 to 60.0 seconds

◆ Set the time from when the operation level is attained until the overload early warning function is activated.

High Performance functions (H: High Performance function)

H03 Data initializing (Data reset)

H 0 3 D A T A I N I T

◆ This function returns all function data changed by the customer to the factory setting data (initialization).

Set value 0: Disabled.
1: Initializing data.

◆ To perform initialization, press the **STOP** and **▲** keys together to set 1, then press the **FUNC DATA** key. The set values of all functions are initialized. The set value in H03 automatically returns to 0 following the end of initialization.

H04 Auto-reset (Times)

H05 Auto-reset (Reset interval)

H 0 4 A U T O - R E S E T

H 0 5 R E S E T I N T

◆ When the inverter protective function, which invokes the retry operation, is activated, this function releases operation of the protective function and restarts operation without issuing an alarm or terminating output.

Set the protective function release count and waiting time from its operation startup to release.

Setting range (Count): 0, 1 to 10
(Waiting time): 2 to 20 seconds

To not use the retry function, set "H04 Retry (count)" to 0.
◆ Inverter protective functions that can invoke retry function.

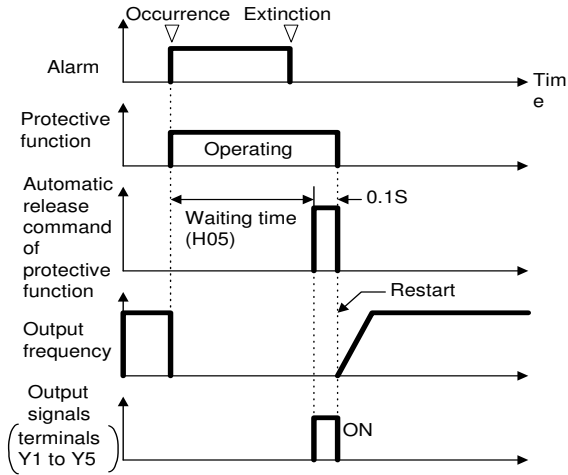
| | |
|--------------------------------------|---------------------------------------|
| OC1, OC2, OC3 : Overcurrent | dBH : Braking resistor overheating |
| OV1, OV2, OV3 : Overvoltage | OL1 : Motor overload |
| OH1 : Heat sink overheating | OLU : Inverter overload |
| OH3 : Inverter inside overheating | |

◆ When the value of "H04 Retry (count)," is set from 1 to 10, an inverter run command is immediately entered following the wait time set in H05, "Retry (wait time)," and the startup of the retry operation. If the cause of the alarm has been removed at this time, the inverter starts without switching to alarm mode. If the cause of the alarm still remains, the protective function is reactivated according to the wait time set in "H05 Retry (waiting time)." This operation is repeated until the cause of the alarm is removed. The restart operation switches to alarm mode when the retry count exceeds the value set in "H04 Retry (count)."

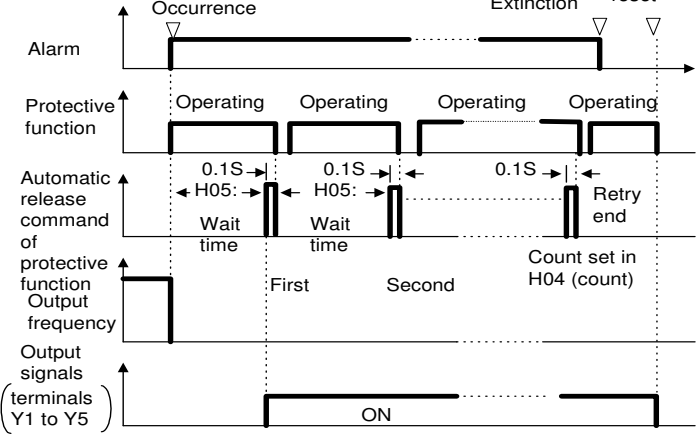
The operation of the retry function can be monitored from terminals Y1 to Y5.

| | |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>⚠ WARNING</p> | <p>When the retry function is selected, operation automatically restarts depending on the cause of the trip stop. (The machine should be designed to ensure safety during a restart)</p> |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

When retry succeeded



retry failed



H06 Fan stop operation

H 0 6 F A N S T O P

◆ This function specifies whether cooling fan ON/OFF control is automatic. While power is applied to the inverter, the automatic fan control detects the temperature of the cooling fin in the inverter and turns the fan on or off.

When this control is not selected, the cooling fan rotates continually.

Set value 0: ON/OFF control disabled.
1: ON/OFF control enabled.

The cooling fan operating status can be monitored from terminals Y1 to Y5.

H07 PWM switchover

H 0 7 P W M S E L E C T

Set value 0: PWM method – 1
1: PWM method – 2

Changing the method of generating PWM waveform (output voltage waveform) yields the effects shown in the table below. Change the method in accordance with your use condition.

| | Output rated current*1 | Reduction in motor temperature |
|--------|------------------------|--------------------------------|
| H07: 0 | ○ | △ |
| H07: 1 | △ | ○ |

A circle shows the more effective feature between PWM method 1 and 2.

H08 Rev. phase sequence lock

H 0 8 R E V L O C K

◆When accidental reversing is expected to cause a malfunction, this function can be set to prevent reversal. This function prevents a reversing operation resulting from a connection between the REV and CM terminals, inadvertent activation of the **REV** key, or negative analog input from terminal 12 or V1

Set value 0: Inactive
1: Active

This function is inactive when H18 Torque Control is active. So Reversing operation is active.

H11 DEC mode

H 1 1 D E C M O D E

◆This function selects the inverter stopping method when a stop command is entered.

Set value 0: Linear deceleration
1: Coasting-to-stop

Note: This function is effective only when a stop command is entered and, therefore, is ineffective when the motor is stopped by lowering the set frequency.

H13 Auto-restart (Restart time)

H 1 3 R E S T A R T T

◆Instantaneous switching to another power line (when the power of an operating motor is cut off or power failure occurs) creates a large phase difference between the line voltage and the voltage remaining in the motor, which may cause electrical or mechanical failure. To rapidly switch power lines, write the remaining voltage attenuation time to wait for the voltage remaining in the motor to attenuate. This function operates at restart after a momentary power failure.

Setting range: 0.1 to 5.0 seconds

◆When the momentary power failure time is shorter than the wait time value, a restart occurs following the wait time. When the power failure time is longer than the wait time value, a restart occurs when the inverter is ready to operate (after about 0.2 to 0.5 second).

H14 Auto-restart (Freq. fall rate)

H 1 4 F A L L R A T E

◆This function determines the reduction rate of the output frequency for synchronizing the inverter output frequency and the motor speed. This function is also used to reduce the frequency and thereby prevent stalling under a heavy load during normal operation.

Setting range: 0.00, 0.01 to 100.00 Hz/s

◆ When 0.00 is set, the frequency is reduced according to the set deceleration time.

Note: A too large frequency reduction rate may temporarily increase the regeneration energy from the load and invoke the overvoltage protective function. Conversely, a rate that is too small extends the operation time of the current limiting function and may invoke the inverter overload protective function.

H15 Auto-restart (Holding DC voltage)

H 1 5 H O L D V

◆This function is for when 2 (deceleration-to-stop at power failure) or 3 (operation continuation) is set to "F30 Restart after momentary power failure (operation selection)." Either function starts a control operation if the main circuit DC voltage drops below the set operation continuation level.

Setting range 200 to 300V

◆When the power supply voltage to the inverter is high, control can be stabilized even under an excessive load by raising the operation continuation level. However, when the level is too high, this function activates during normal operation and causes unexpected motion. Please contact Fuji electric when changing the initial value.

H16 Auto-restart (OPR command self hold time)

H 1 6 S E L F H O L D T

◆As the power to an external operation circuit (relay sequence) and the main power to the inverter is generally cut off at a power failure, the operation command issued to the inverter is also cut off. This function sets the time an operation command is to be held in the inverter. If a power failure lasts beyond the self-hold time, power-off is assumed, automatic restart mode is released, and the inverter starts operation at normal mode when power is applied again. (This time can be considered the allowable power failure time.)

Setting range: 0.0 to 30.0 seconds, 999

When 999 is set, an operation command is held (i.e., considered a momentary power failure) while control power in the inverter is being established or until the main circuit DC voltage is about 0.

H26 PTC thermistor (Mode select)

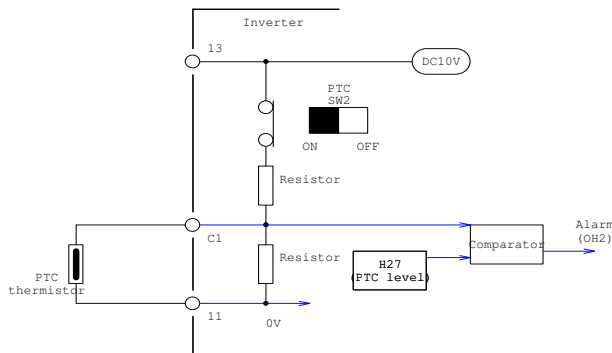
H 2 6 P T C M O D E

◆Select the PTC thermistor function when the PTC thermistor for the heating protection is connected with a motor.

Set value 0: Non-operation
1: Operation

◆Connect the PTC thermistor as shown in the figure below, and set the switch (PTC SW2) in the inverter (control board) to ON side.

The protective operation is shared with the external alarm input to terminals selected from [X1] to [X9]. The protection function, therefore, operates as "OH2: External thermal relay tripped."



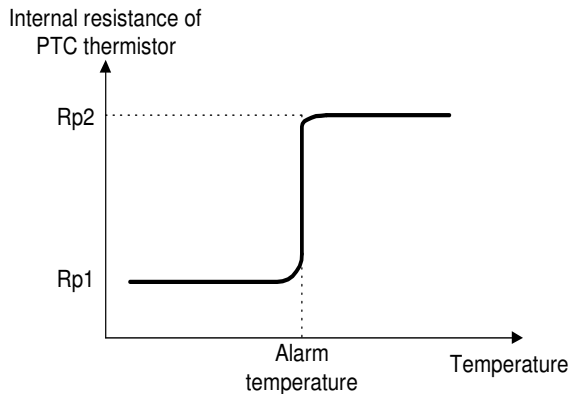
H27 PTC thermistor (Level)

H 2 7 P T C L E V E L

◆The voltage input to terminal [C1] is compared to the set voltage (Level). When the input voltage is equal to or greater than the set voltage (Level), "H26 PTC thermistor (Mode select)," starts.

Setting range: 0.00 to 5.00V

◆The PTC thermistor has its own alarm temperature. The internal resistance value of the thermistor changes greatly at the alarm temperature. The operation (voltage) level is set using this change in the resistance value.



The figure in "H26 PTC thermistor (Mode select)," shows that resistor 250Ω and the thermistor (resistance value Rp) are connected in parallel. Hence, voltage Vc1 (Level) at terminal [C1] can be calculated by using the following formula.

$$V_{c1} = \frac{250ER_p}{1000 + \frac{250ER_p}{250 + R_p}} \times 10mV_n$$

The operation level can be set, by setting Rp within the following range.

$$R_{p1} < R_p < R_{p2}$$

To obtain Rp easily, use the following formula.

$$R_p = \frac{R_{p1} + R_{p2}}{Q} m\Omega_n$$

H30 Serial link (Function select)

H 3 0 L I N K F U N C

◆The link function (communication function) provides RS485 (provided as standard).

The serial link function includes:

- 1) Monitoring (data monitoring, function data check)
- 2) Frequency setting
- 3) Operation command (FWD, REV, and other commands for digital input)
- 4) Write function data

Setting range: 0 to 3

Communication can be enabled and disabled by a digital input. This function sets the serial link function when communication is enabled.

| Set value | Frequency command | Operation command |
|-----------|-------------------|-------------------|
| 0 | Disabled | Disabled |
| 1 | Enabled | Disabled |
| 2 | Disabled | Enabled |
| 3 | Enabled | Enabled |

The data monitoring and function data write functions are always enabled. Disabling communication using digital input brings about the same result as when 0 is set to this function.

H31 RS485 (Address)



H39 RS485 (Response interval)

These functions set the conditions of RS485 communication. Set the conditions according to the upstream device. Refer to technical manual for the protocol.

H 3 1 A D D R E S S

◆This function sets the station address of RS485.

Setting range: 1 to 31

H 3 2 M O D E O N E R
H 3 3 T I M E R

◆This function sets processing at communication error and sets the error processing timer value.

Setting range: 0 to 3

| Set value | Processing at communication error |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 | Immediate Er 8 trip (forced stop) |
| 1 | Continue operation within timer time, Er 8 trip after timer time. |
| 2 | Continue operation and effect retry within timer time, then invoke an Er 8 trip if a communication error occurs. If an error does not occur, continue operation. |
| 3 | Continue operation. |

H 3 4 B A U D R A T E

◆This function sets the baud rate.

Setting range: 0 to 4

| Set value | Baud rate |
|-----------|-------------|
| 0 | 19200 bit/s |
| 1 | 9600 bit/s |
| 2 | 4800 bit/s |
| 3 | 2400 bit/s |
| 4 | 1200 bit/s |

H 3 5 L E N G T H

◆This function sets data length.

| Set value | Data length |
|-----------|-------------|
| 0 | 8 bit |
| 1 | 7 bit |

H 3 6 P A R I T Y

◆This function sets the parity bit.

| Set value | Parity bit |
|-----------|------------|
| 0 | None |
| 1 | Even |
| 2 | Odd |

H 3 7 S T O P B I T S

◆This function sets the stop bit.

| Set value | Stop bit |
|-----------|----------|
| 0 | 2 bit |
| 1 | 1 bit |

H 3 8 N O R E S t

◆In a system where the local station is always accessed within a specific time, this function detects that access was stopped due to an open-circuit or other fault and invokes an Er 8 trip.

Setting range: 0 (No detection)

1 to 60 seconds

H 3 9 I N T E R V A L

◆This function sets the time from when a request is issued from the upstream device to when a response is returned.

Setting range: 0.00 to 1.00 second

Motor 4,5 (A: Alternative Motor Parameters)

| | |
|-----|---------------------|
| A01 | Maximum frequency 4 |
| A02 | Base frequency 4 |
| A03 | First frequency 4 |
| A04 | First voltage 4 |
| A05 | Rated voltage 4 |
| A06 | Maximum voltage 4 |

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

A 0 1 M A X H z - 4

◆This function sets the maximum output frequency for the motor 4.

Setting range: 50 to 1667 Hz

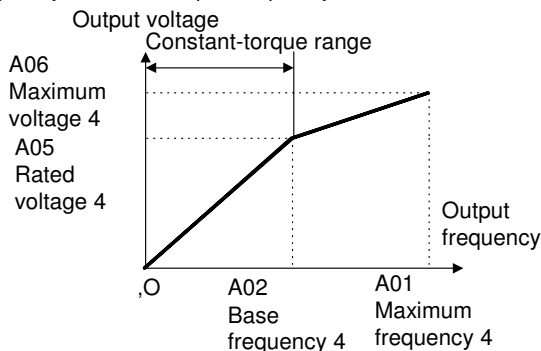
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

A 0 2 B A S E H z - 4

◆This function sets the maximum output frequency in the constant – torque range of motor 4 or the output frequency at the rated voltage. Match the rating of the motor.

Setting range: 25 to 1667 Hz

Note: When the set value of base frequency 4 is higher than that of maximum frequency 4, the output voltage does not increase to the rated voltage, because the maximum frequency limits the output frequency.



A 0 3 F I R S T H z 4

◆Setting the first frequency of motor 4.

Setting range: 25 to 1667Hz

Set the frequency within the range below the base frequency.

A 0 4 F I R S T V 4

◆Setting the voltage at the first frequency (frequency set

with A03) of motor 4.

Setting range: 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

A 0 5 R A T E D V - 4

◆This function sets the rated value of voltage output to motor 4. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 4 exceeds maximum output voltage 4, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

A 0 6 M A X V - 4

◆This function sets the maximum value of the voltage output to motor4. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 0, 50 to 240V

| | |
|-----|---------------------|
| A07 | Acceleration time 4 |
| A08 | Deceleration time 4 |

A 0 7 A C C T I M E 4
A 0 8 D E C T I M E 4

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

Setting range Acceleration time 4: 1.0 to 3,600 seconds

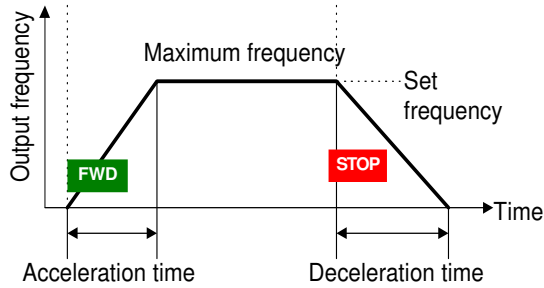
Deceleration time 4: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

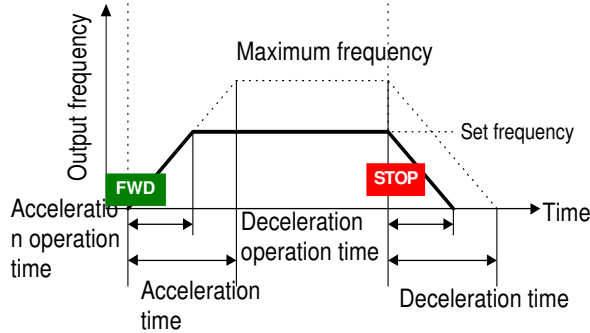
Set frequency = maximum frequency

The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.
 Acceleration deceleration operation time = set value x (set frequency/maximum frequency)



Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, the inverter occasionally does the overcurrent trip.

A09 Torque boost 4

A 0 9 T R Q B O O S T 4

- ◆Torque boost function is effective in such a case where the motor does not rotate in a low-speed (low frequency) range due to torque shortage.
- ◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage. Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.

- A10 Electronic thermal O/L relay for motor 4 (Selection)**
- A11 Electronic thermal O/L relay for motor 4 (Level)**
- A12 Electronic thermal O/L relay for motor 4 (Thermal time constant)**

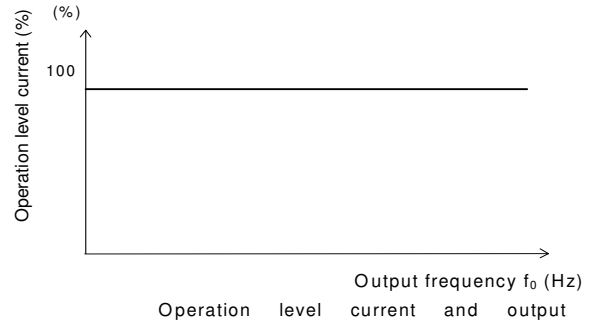
A 1 0 E L C T R N O L 4

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by A12 (thermal time constant).

- ◆The function specifies whether to operate the electric thermal O/L relay.
 Set value 0: Inactive
 1: Active

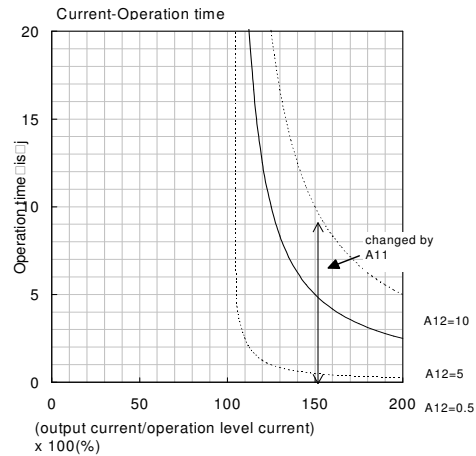
A 1 1 O L L E V E L 4

- ◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.



A 1 2 T I M E C N S T 4

- ◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set. Setting range: 0.1 to 300.0 seconds (in 0.1 seconds steps).

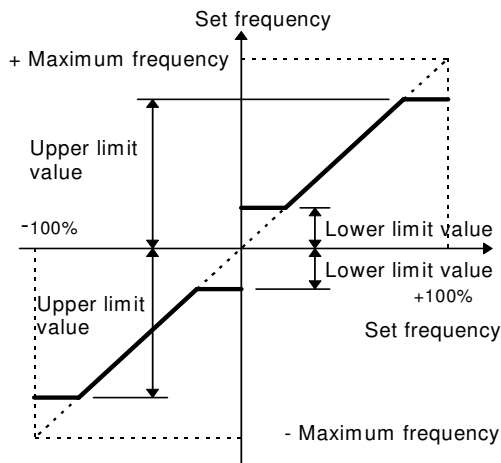


A13 Frequency limiter (High4)

A 1 3 H L I M I T E R 4

◆This function sets the upper limits for the setting frequency.

Setting range: 0 to 1667 Hz



- ❖ The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.
- ❖ If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.
- ❖ When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

A14 Starting frequency 4 (frequency)

A 1 4 S T A R T H z 4

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

◆Frequency: This function sets the frequency at startup.

Setting range: 0.1 to 100Hz

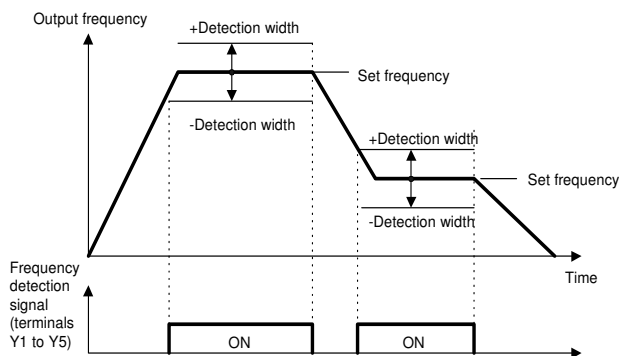
A15 Frequency arrival 4(FAR) (detection width)

A 1 5 F A R H Y S T R 4

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].



A16 OL4 function signal (level)

A 1 6 O L 4 L E V E L

◆This function determines the operation level of the electric thermal O/L relay or output current.

Setting range: 1.00 to 100A

The operation release level is 90% of the set value.

A17 OL4 function signal (Timer)

A 1 7 O L 4 T I M E R

◆This function is used when "1"(Output limit) is set at "F24 Overload early warning (operation selection)".

Setting range: 0.0 to 60.0 seconds

◆Set the time from when the operation level is attained until the overload early warning function is activated.

A18 Maximum frequency 5

A19 Base frequency 5

A20 First frequency 5

A21 First voltage 5

A22 Rated voltage 5

A23 Maximum voltage 5

◆Setting V/f function

◆The V/f function is used to set the relation between the output voltage and the output frequency according to the characteristics of the motor to be used.

The setting method is the same as that for F03 to F08. Refer to page 5-8.

A 1 8 M A X H z - 5

◆This function sets the maximum output frequency in the motor 5.

Setting range: 50 to 1667 Hz

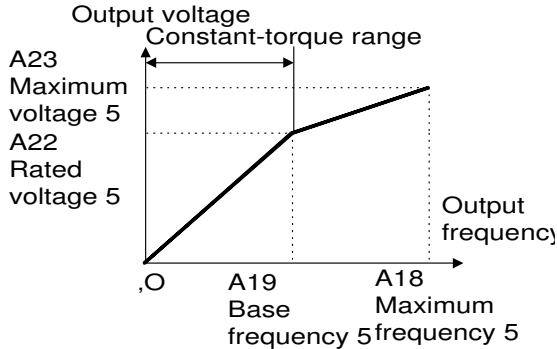
Setting a value higher than the rated value of the device to be driven may damage the motor or machine. Match the rating of the device.

A 1 9 B A S E H z - 5

◆This function sets the maximum output frequency in the constant-torque range of motor 5 or the output frequency at the rated voltage. Match the rating of the motor.

Setting range: 25 to 1667 Hz

Note: When the set value of base frequency 5 is higher than that of maximum frequency 5, the output voltage does not increase to the rated voltage, because the maximum frequency limits the output frequency.



A 2 0 F I R S T H z 5

◆Setting the first frequency of motor 5.

Setting range: 25 to 1667Hz

Set the frequency within the range below the base frequency.

A 2 1 F I R S T V 5

◆Setting the voltage at the first frequency (frequency set with A20) of motor 5.

Setting range: 0, 10 to 240V

Setting the voltage 0V will stop the voltage adjustment function. This means the first V/f is not used.

Set the voltage within the range from the torque boost to the rated voltage with the threshold values inclusive.

A 2 2 R A T E D V - 5

◆This function sets the rated value of voltage output to motor 5. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 0, 50 to 240V

Value 0 terminates operation of the voltage regulation function, thereby resulting in the output of a voltage proportional to the supply voltage.

Note: When the set value of rated voltage 5 exceeds maximum output voltage 5, the output voltage does not increase to the rated voltage because the maximum output voltage limits the output voltage.

A 2 3 M A X V - 5

◆This function sets the maximum value of the voltage output for motor 5. Note that a voltage higher than the supply (input) voltage cannot be output.

Setting range: 0, 50 to 240V

| | |
|-----|---------------------|
| A24 | Acceleration time 5 |
| A25 | Deceleration time 5 |

A 2 4 A C C T I M E 5
A 2 5 D E C T I M E 5

◆This function sets the acceleration time for the output frequency from startup to maximum frequency and the deceleration time from maximum frequency to operation stop.

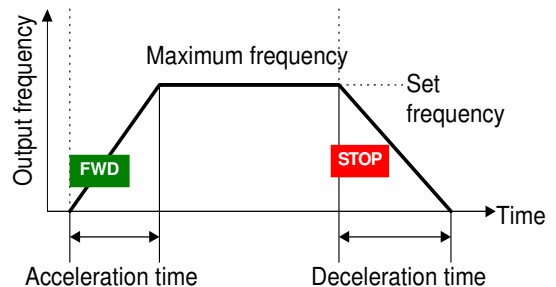
Setting range Acceleration time 5: 1.0 to 3,600 seconds
Deceleration time 5: 1.0 to 3,600 seconds

Acceleration and deceleration times are represented by the three most significant digits, thereby the setting of three high-order digits can be set.

Set acceleration and deceleration times with respect to maximum frequency. The relationship between the set frequency value and acceleration/deceleration times is as follows:

Set frequency = maximum frequency

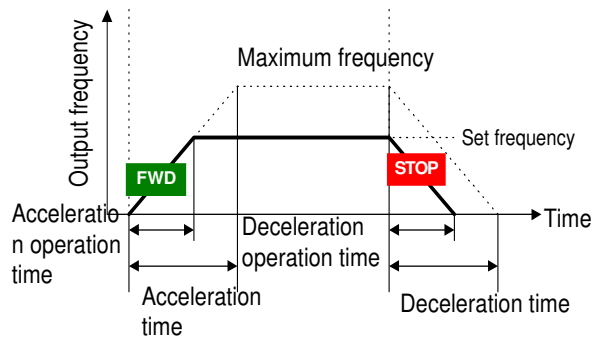
The actual operation time matches the set value.



Set frequency < maximum frequency

The actual operation time differs from the set value.

Acceleration deceleration operation time = set value x (set frequency / maximum frequency)



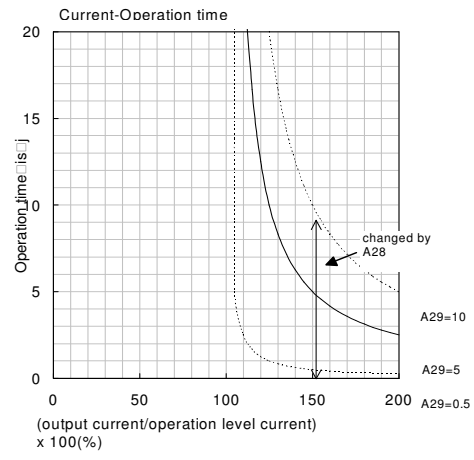
Note: If the set acceleration and deceleration times are too short even though the resistance torque and moment of inertia of the load are great, The inverter occasionally does the overcurrent trip.

A26 Torque boost 5

A 2 6 T R Q B O O S T 5

◆Torque boost function is effective in such a case where the motor dose not rotate in a low-speed (low frequency) range due to torque shortage.
 ◆When a large value is set as the torque boost, the motor starting voltage increases, preventing torque shortage.
 Torque boost setting range: 2.0 to 20.0

The setting method is the same as that for F11. Refer to page 5-9.



A27 Electronic thermal O/L relay for motor 5 (Selection)

A28 Electronic thermal O/L relay for motor 5 (Level)

A29 Electronic thermal O/L relay for motor 5 (Thermal time constant)

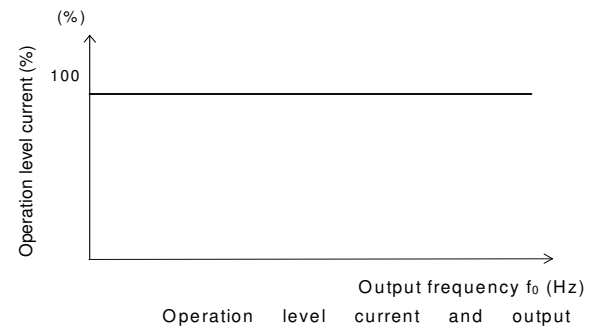
A 2 7 E L C T R N O L 5

◆The electronic thermal O/L relay manages the output frequency, output current, and operation time of the inverter to prevent the motor from overheating when 150% of the set current value flows for the time set by A29 (thermal time constant).
 ◆The function specifies whether to operate the electric thermal O/L relay.

Set value 0: Inactive
 1: Active

A 2 8 O L L E V E L 5

◆This function sets the operation level (current value) of the electronic thermal. Enter a value from 1 to 1.1 times the current rating value of the motor.



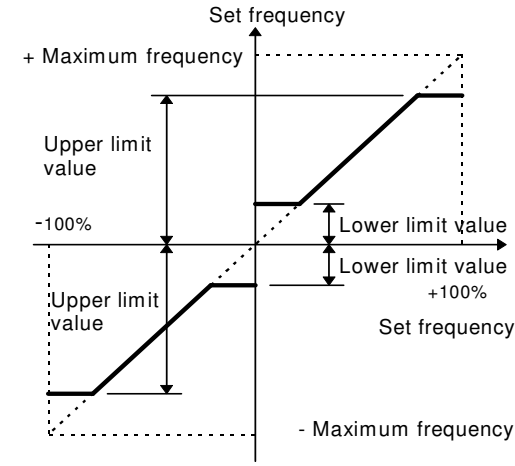
A 2 9 T I M E C N S T 5

◆The time from when 150% of the operation level current flows continuously to when the electronic thermal O/L relay activates can be set.
 The setting range is 0.1 to 300.0 seconds (in 0.1 seconds steps).

A30 Frequency limiter (High5)

A 3 0 H L I M I T E R 5

◆This function sets the upper limits for the setting frequency.
 Setting range: 0 to 1667 Hz



- ❖ The inverter output starts with the start frequency when operation begins, and stops with the stop frequency when operation ends.
- ❖ If the upper limit value is less than the lower limit value, the upper limit value overrides the lower limit value.
- ❖ When the lower limit value is set, the inverter operate the motor at the lower limit speed by receiving an operation command even if the frequency command is 0(Hz).

A31

Starting frequency 5 (frequency)**A 3 1 S T A R T H z 5**

◆The starting frequency can be set to reserve the torque at startup and can be sustained until the magnetic flux of the motor is being established.

◆Frequency: This function sets the frequency at startup.

Setting range: 0.1 to 100Hz

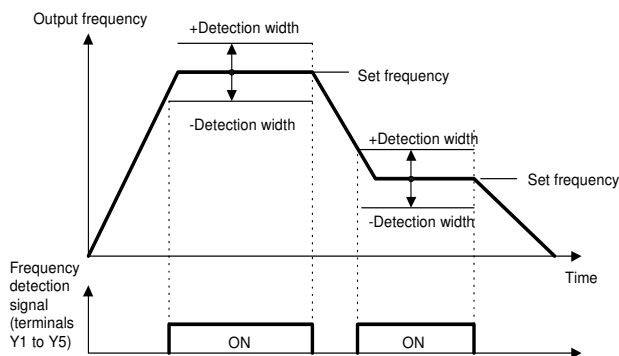
A32

Frequency arrival 5(FAR) (detection width)**A 3 2 F A R H Y S T R 5**

◆This function adjusts the detection width when the output frequency is the same as the set frequency (operating frequency). The detection width can be adjusted from 0 to ± 10 Hz the setting frequency.

Setting range: 0.0 to 10.0Hz

When the frequency is within the detection width, an ON signal can be selected and output from terminals [Y1] to [Y5].



A33

OL5 function signal (level)**A 3 3 O L 5 L E V E L**

◆This function determines the operation level of the electric thermal O/L relay or output current.

Setting range: 1.00 to 100A

The operation release level is 90% of the set value.

A34

OL5 function signal (Timer)**A 3 4 O L 5 T I M E R**

◆This function is used when "1"(Output limit) is set at "F24 Overload early warning (operation selection)".

Setting range: 0.0 to 60.0 seconds

◆Set the time from when the operation level is attained until the overload early warning function is activated.