Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
F29	FMA and FMP terminals (Select)	0: Analogue output (FMA) 1: Pulse output (FMP)	1	0	×	0	
F30	FMA (Voltage adjust)	0 to 200%	1%	100	○	0	
F31	(Function)	0: Output frequency 1 (before slip compensation) 1: Output frequency 2 (after slip compensation) 2: Output current 3: Output voltage 4: Output torque 5: Load factor 6: Input power 7: PID feedback value 8: DC link circuit voltage	1	0	△	0	
F33	FMP (Pulse rate)	300 to 6000p/s (Pulse count at 100%)	1p/s	1440	○	0	
F34	(Voltage adjustment)	0%, 1 to 200%	1%	0	○	0	
F35	(Function)	0 to 8 (Same as F31)	1	0	△	0	
F36	30Ry operation mode	0: Excited when tripping 1: Excited during regular operation	1	0	×	0	
F40	Torque limiter 1 (Driving)	20 to 200% 999: Inactive	1%	180	○	0	
F41	(Braking)	0%: Automatic deceleration control 20 to 200% 999: Inactive	1%	150	○	0	
F42	Torque vector control 1	0: Inactive 1: Active	1	0	×	0	

Description of change during operation

○: The data changed by the ∧ or ∨ key takes effect on the inverter operation. However, press the FUNC DATA key to store the new data.

△: Press the ∧ or ∨ key to change the data. The new data takes effect after the FUNC DATA key is pressed to store the data.

×: The data can be changed only while the inverter is stopped.

E: Extension terminal functions

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
E01	X1 terminal function	0: Multistep frequency selection [SS1] 1: Multistep frequency selection [SS2] 2: Multistep frequency selection [SS4] 3: Multistep frequency selection [SS8]	1	0	×	0	
E02	X2 terminal function	4: Acceleration/deceleration time selection [RT1] 5: 3-wire operation stop command [HLD] 6: Coast-to-stop command [BX] 7: Alarm reset [RST]		1	×	0	
E03	X3 terminal function	8: Trip command(External fault) [THR] 9: Frequency setting 2/1 [Hz2/Hz1] 10: Motor 2/ Motor 1 [M2/M1] 11: DC brake command [DCBRK]		2	×	0	
E04	X4 terminal function	12: Torque limiter 2/Torque limiter 1 [TL2/TL1] 13: UP command [UP] 14: DOWN command [DOWN] 15: Write enable for KEYPAD [WE-KP]		6	×	0	
E05	X5 terminal function	16: PID control cancel [Hz/PID] 17: Inverse mode changeover [IVS] (terminal 12 and C1) 18: Link enable [LE]		7	×	0	
E10	Acceleration time 2	0.01 to 3600s	0.01s	10.0	○	6	
E11	Deceleration time 2			10.0	○	6	
E16	Torque limiter 2 (Driving)	20 to 200% 999: Inactive	1%	180	○	0	
E17	(Brake)	0%: Automatic deceleration control, 20 to 200% 999: Inactive	1%	150	○	0	
E20	Y1 terminal function	0: Inverter running [RUN] 1: Frequency equivalence [FAR] 2: Frequency level detection [FDT] 3: Undervoltage detection signal [LV] 4: Torque polarity [B/D]	1	0	×	0	
E21	Y2 terminal function	5: Torque limiting [TL] 6: Auto restarting [IPF] 7: Overload early warning [OL] 8: Life time alarm [LIFE] 9: Frequency level detection 2 [FAR2]		7	×	0	
E29	Frequency level detection delay	0.01 to 10.0s	0.01s	0.1	○	6	
E30	FAR function signal (Hysteresis)	0.0 to 10.0Hz	0.1Hz	2.5	○	2	
E31	FDT function signal (Level)	0 to 400Hz	1Hz	50	○	0	
E32	(Hysteresis)	0.0 to 30.0Hz	0.1Hz	1.0	○	2	
E33	OL function signal (Mode select)	0: Electronic thermal overload relay 1: Output current	1	0	△	0	
E34	(Level)	5 to 200% of the rated inverter current	0.01A	4 pole motor rated motor current	○	6	
E35	(Timer)	0.0 to 60.0s	0.1s	10.0	○	2	
E40	Display coefficient A	0.00 to 200.0	0.01	0.01	○	6	
E41	B	0.00 to 200.0	0.01	0.00	○	6	
E42	LED display filter	0.0 to 5.0s	0.1s	0.5	○	2	

C: Control functions of frequency

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
C01	Jump frequency (Jump freq. 1)	0 to 400Hz	1Hz	0	O	0	
C02	(Jump freq. 2)			0	O	0	
C03	(Jump freq. 3)			0	O	0	
C04	(Hysteresis)	0 to 30Hz	1Hz	3	O	0	
C05	Multistep frequency setting (Freq. 1)	0.00 to 400.0Hz	0.01Hz	0.00	O	4	
C06	(Freq. 2)			0.00	O	4	
C07	(Freq. 3)			0.00	O	4	
C08	(Freq. 4)			0.00	O	4	
C09	(Freq. 5)			0.00	O	4	
C10	(Freq. 6)			0.00	O	4	
C11	(Freq. 7)			0.00	O	4	
C12	(Freq. 8)			0.00	O	4	
C13	(Freq. 9)			0.00	O	4	
C14	(Freq. 10)			0.00	O	4	
C15	(Freq. 11)			0.00	O	4	
C16	(Freq. 12)			0.00	O	4	
C17	(Freq. 13)			0.00	O	4	
C18	(Freq. 14)			0.00	O	4	
C19	(Freq. 15)			0.00	O	4	
C21	Timer operation	0: Inactive 1: Active	1	0	×	0	
C22	Stage 1	0.00 to 3600s	0.01s	0.00	O	6	
C30	Frequency command 2	0 to 8 (Same as F01)	1	2	×	0	
C31	Analogue setting signal offset adjustment (Terminal 12)	-5.0 to +5.0%	0.1%	0.0	O	3	
C32	(Terminal C1)	-5.0 to +5.0%	0.1%	0.0	O	3	
C33	Analogue setting signal filter	0.00 to 5.00s	0.01s	0.05	O	4	

Description of change during operation

O: The data changed by the ∧ or ∨ key takes effect on the inverter operation. However, press the FUNC DATA key to store the new data.

Δ: Press the ∧ or ∨ key to change the data. The new data takes effect after the FUNC DATA key is pressed to store the data.

×: The data can be changed only while the inverter is stopped.

P: Motor parameters

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
P01	Number of motor 1 poles	2 to 14	2	4	×	0	
P02	Motor1 (Capacity)	0.01 to 5.5kW (4.0kW or less) 0.01 to 11.00kW(5.5/7.5kW)	0.01kW	Nominal applied motor kW	×	4	
P03	(Rated current)	0.00 to 99.9A	0.01A	4 pole motor standard rating	×	6	
P04	（Tuning)	0: Inactive 1: Active (%R1, %X) 2: Active (%R1, %X, Io)	1	0	×	12	
P05	(Online tuning)	0: Inactive 1: Active	1	0	×	0	
P06	(No-load current)	0.00 to 99.9A	0.01A	4 pole motor standard rating	×	6	
P07	（%R1 setting）	0.00 to 50.00%	0.01%	4 pole motor standard rating	O	4	
P08	（%X setting）	0.00 to 50.00%	0.01%	4 pole motor standard rating	O	4	
P09	(Slip compensation control 1)	0.00 to 15.00Hz	0.01Hz	0.00	O	4	
P10	(Slip compensation response time 1)	0.01 to 10.00s	0.01s	0.50	O	4	

Description of change during operation

O: The data changed by the ∧ or ∨ key takes effect on the inverter operation. However, press the FUNC DATA key to store the new data.

Δ: Press the ∧ or ∨ key to change the data. The new data takes effect after the FUNC DATA key is pressed to store the data.

×: The data can be changed only while the inverter is stopped.

H: High performance functions

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
H01	Total operation time	Monitor only	10h	0	-	0	
H02	Trip history	Monitor only	-	----	-		
H03	Data initializing (Data reset)	0: Manual set value 1: Return to factory set value	1	0	×	0	
H04	Auto-reset (Times)	0: Inactive 1 to 10 times	1 time	0	○	0	
H05	(Reset interval)	2 to 20s	1s	5	○	0	
H06	Fan stop operation	0: Inactive 1: Active	1	0	○	0	
H07	ACC/DEC pattern (Mode select).	0: Linear acceleration/deceleration 1: S-curve acceleration/deceleration (weak) 2: S-curve acceleration/deceleration (strong) 3: Non-linear	1	0	×	0	
H09	Start mode (Rotating motor pickup mode)	0: Inactive 1: Active (only when Auto-restart after momentary power failure mode) 2: Active(All start mode)	1	1	×	0	
H10	Energy-saving operation	0: Inactive 1: Active	1	0	○	0	
H11	Dec mode	0: Normal 1: Coast-to-stop	1	0	○	0	
H12	Instantaneous overcurrent limiting	0: Inactive 1: Active	1	1	×	0	
H13	Auto-restart (Restart time)	0.1 to 5.0s	0.1s	0.1	×	2	
H14	(Frequency fall rate)	0.00 to 100.0Hz/s	0.01Hz/s	10.00	○	4	
H20	PID control (Mode select)	0: Inactive 1: Forward operation 2: Reverse operation	1	0	×	0	
H21	(Feedback signal)	0: Terminal 12 (0 to +10 Vdc) input 1: Terminal C1 (4 to 20 mA) input 2: Terminal 12 (+10 to 0 Vdc) input 3: Terminal C1 (20 to 4 mA) input	1	1	×	0	
H22	P (Gain)	0.01 to 10.00 times (1 to 1000%)	0.01 time	0.10	○	4	
H23	I (Integral time)	0.0: Inactive 0.1 to 3600s	0.1s	0.0	○	2	
H24	D (Differential time)	0.00: Inactive 0.01 to 10.0s	0.01s	0.00	○	4	
H25	(Feedback filter)	0.0 to 60.0s	0.1s	0.5	○	2	
H26	PTC thermistor (Mode select)	0: Inactive 1: Active	1	0	○	0	
H27	(Level)	0.00～5.00V	0.01V	1.60	○	4	
H28	Droop operation	-9.9～0.0Hz	0.1Hz	0.0	○	3	

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
H30	Serial link (Function select)	Monitor, Frequency setting, Operation command 0: O × × 1: O O × 2: O × O 3: O O O	1	0	O	0	
H31	RS485 (Address)	1 to 31	1	1	×	0	
H32	(Mode select on no response error)	0: Immediate Er8 1: Er8 after interval set by timer 2: Retry in interval set by timer (Er8 after failure to restore) 3: Continuation of operation	1	0	O	0	
H33	(Timer)	0.0 to 60.0s	0.1s	2.0	O	2	
H34	(Baud rate)	0:19200[bit/s] 1:9600 2:4800 3:2400 4:1200	1	1	O	0	
H35	(Data length)	0:8bit 1:7bit	1	0	O	0	
H36	(Parity check)	0: None 1: Even parity 2: Odd parity	1	0	O	0	
H37	(Stop bits)	0: 2 bits 1: 1 bit	1	0	O	0	
H38	(No response error detection time)	0: Not detected 1 to 60s	1s	0	O	0	
H39	(Response interval)	0.00 to 1.00s	0.01s	0.01	O	4	
H40	Maximum temperature of heat sink	Monitor only	degree C	-	-	0	
H41	Maximum effective current	Monitor only	A	-	-	6	
H42	Main circuit capacitor life	Monitor only	0.1%	-	-	0	
H43	Cooling fan operation time	Monitor only	10h	-	-	0	
H44	Inverter ROM version	Monitor only	-	-	-	0	
H45	Keypad panel ROM version	Monitor only	-	-	-	0	
H46	Option ROM version	**Monitor only**	-	-	-	0	

Description of change during operation

O: The data changed by the ⋀ or ⋁ key takes effect on the inverter operation. However, press the FUNC DATA key to store the new data.

Δ: Press the ⋀ or ⋁ key to change the data. The new data takes effect after the FUNC DATA key is pressed to store the data.

×: The data can be changed only while the inverter is stopped.

A: Alternative motor parameters

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
A01	Maximum frequency 2	50 to 400Hz	1Hz	50	×	0	
A02	Base frequency 2	25 to 400Hz	1Hz	50	×	0	
A03	Rated voltage 2 (at base frequency 2)	0V, 80 to 240V(200V class) 0V,160 to 480V(400V class)	1V	230 400	×	0	
A04	Maximum voltage 2 (at maximum frequency 2)	80 to 240V (200V class) 160 to 480V(400V class)	1V	230 400	×	0	
A05	Torque boost 2	0,1,2,3 to 31	1	0	○	0	
A06	Electronic thermal overload relay for motor 2 (Select)	0: Inactive 1: Active (for general purpose motors) 2: Active (for inverter motors)	1	1	△	0	
A07	(level)	20 to 135% of the rated inverter current	0.01A	4 pole motor rated motor current	○	6	
A08	(Thermal time constant)	0.5 to 10 min.	0.1min	5.0	○	2	
A09	Torque vector control 2	0:Inactive 1:Active	1	0	×	0	
A10	Number of motor 2 poles	2 to 14	2	4	×	0	
A11	Motor 2 (Capacity)	0.01 to 5.5kW (4.0kW or smaller) 0.01 to 11.00kW(5.5/7.5kW)	0.01kW	Nominal applied motor kW	×	4	
A12	(Rated current)	0.00 to 99.9A	0.01A	4 pole motor standard rating	×	6	
A13	(Tuning)	0: Inactive 1: Active (%R1, %X) 2: Active (%R1, %X, Io)	1	0	×	12	
A14	(Online tuning)	0: Inactive, 1: Active	1	0	×	0	
A15	(No-load current)	0.00 to 99.9A	0.01A	4 pole motor standard rating	×	6	
A16	（%R1 setting）	0.00 to 50.00%	0.01%	4 pole motor standard rating	○	4	
A17	（%X setting）	0.00 to 50.00%	0.01%	4 pole motor standard rating	○	4	
A18	(Slip compensation control 2)	0.00 to 15.00Hz	0.01Hz	0.00	○	4	
A19	(Slip compensation response time 2)	0.01 to 10.00s	0.01s	0.50	○	4	

Description of change during operation

○: The data changed by the ∧ or ∨ key takes effect on the inverter operation. However, press the FUNC DATA key to store the new data.

△: Press the ∧ or ∨ key to change the data. The new data takes effect after the FUNC DATA key is pressed to store the data.

×: The data can be changed only while the inverter is stopped.

o: Optional functions

Function code	Name	Setting range	Min. unit	Factory setting	Change during operation	RS485 Data format	User setting
o00	Optional selection	0: Option inactive 1: Option active Set 0 when optional card is not used.	-	0	O	0	

Description of change during operation

O: The data changed by the ⋀ or ⋁ key takes effect on the inverter operation. However, press the FUNC DATA key to store the new data.

Δ: Press the ⋀ or ⋁ key to change the data. The new data takes effect after the FUNC DATA key is pressed to store the data.

×: The data can be changed only while the inverter is stopped.

5-2 Detail Description of Each Function

F: Fundamental functions

Data protection

◆ The setting data can be protected against inadvertent operation at the keypad panel.

0: Data change enabled
1: Data protected
[Setting method]

0→1: Press the STOP + ∧ keys simultaneously.

1→0: Press the STOP + ∨ keys simultaneously.

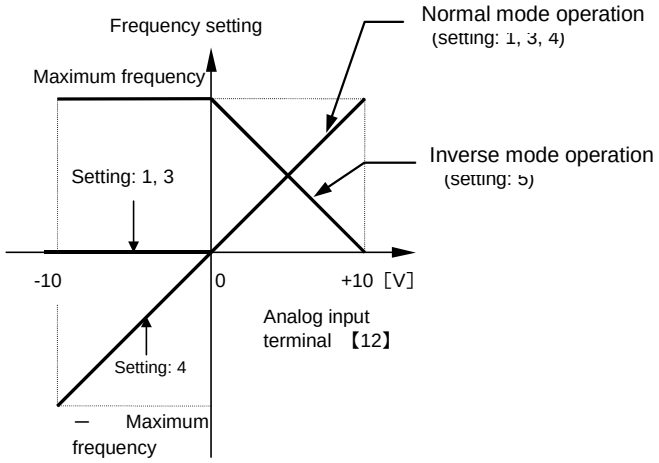
F01 *Frequency command 1*

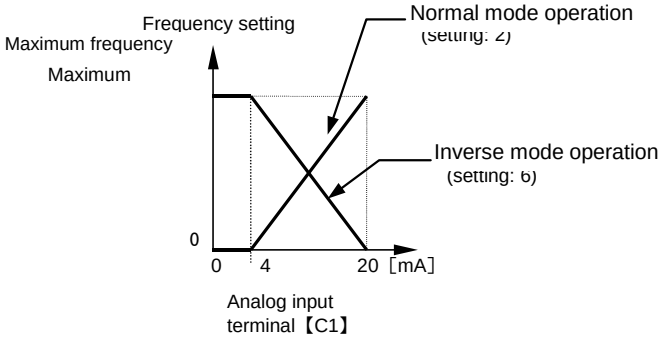
◆ The frequency setting method can be selected.

0: The frequency is set by the operation of ∧ and ∨ keys.

1: The frequency is set by the voltage input (at terminal 12) (0 to +10 Vdc).
2: The frequency is set by the current input (at terminal C1) (4 to 20 mAdc).
3: The frequency is set by the voltage input and current input (terminal 12 and terminal C1) ((-10 to +10 Vdc) + (4 to 20 mAdc)). Inputs at terminals 12 and C1 are added to determine the frequency.
4:The frequency is set by the voltage input with polarity (at terminal 12) (-10 to +10 Vdc). In the case of input with polarity, operation at a direction opposite to the operation command is possible.
5:The frequency is set by voltage input inverse mode operation (at terminal 12) (+10 to 0 Vdc).
6:The frequency is set by current input inverse mode operation (at terminal C1) (20 to 4 mAdc).
7:UP/DOWN control mode 1
The frequency is set by terminal UP, terminal DOWN. (initial value = 0)
8:UP/DOWN control mode 2
The frequency is set by terminal UP, terminal DOWN (initial value = last value during previous operation).
Refer to the description of the E01 to E05 functions for details.

Description of forward and reverse operation

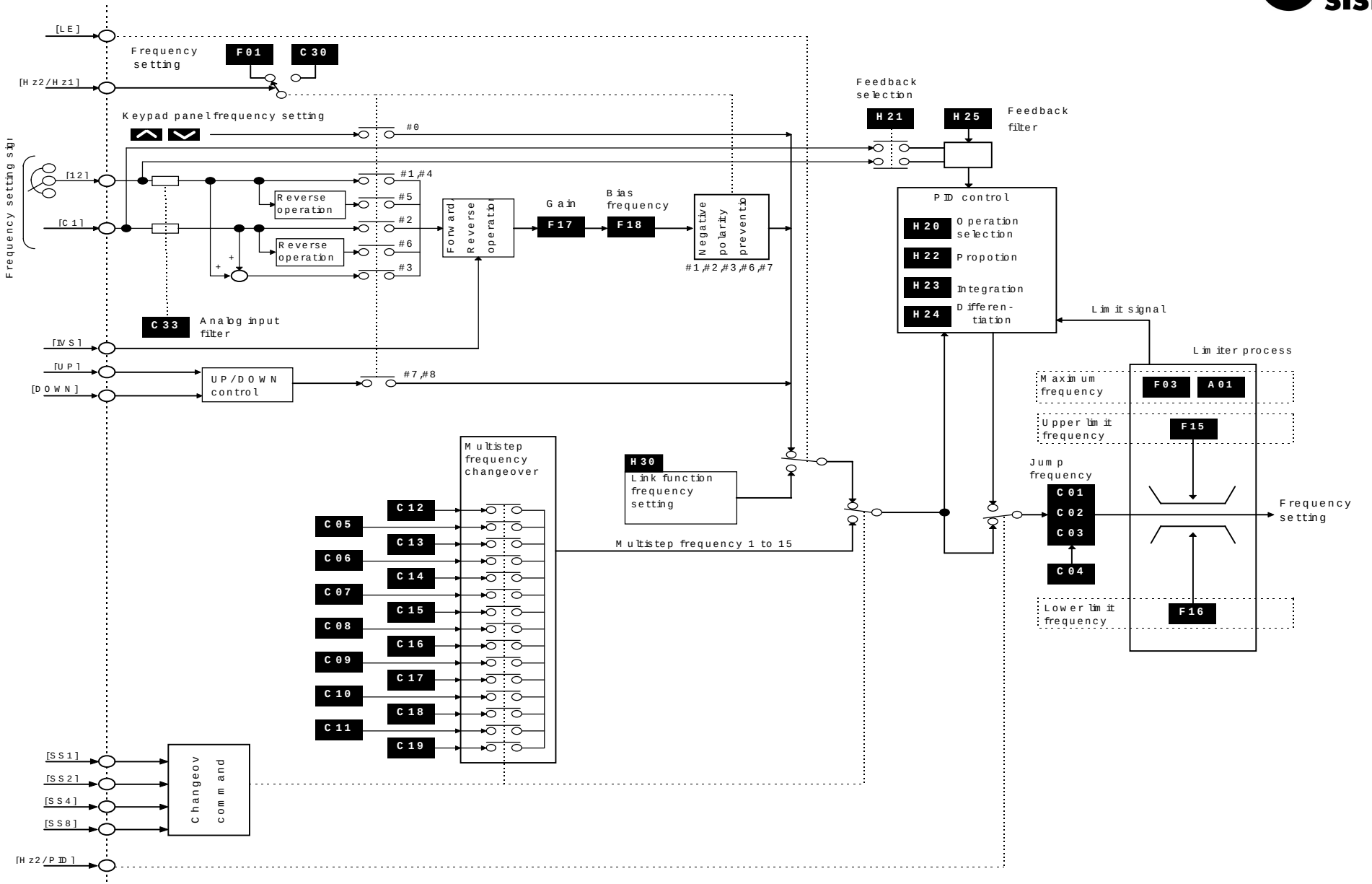




F02 *Operation method*

◆ The operation input method is set. (Note: This function can be changed only when the FWD and REV terminals are open).

0:The motor starts or stops upon keypad operation (RUN or STOP key).
The direction of rotation is determined by the FWD and REV terminals on the control terminal block as follows.
FWD-P24 short-circuited: Forward rotation
REV-P24 short-circuited: Reverse rotation
The motor does not start if both the FWD and REV terminals are connected with the P24 terminal or both of them are open.
1: External signal (digital input)
The motor starts or stops upon the state of the FWD and REV terminals on the control terminal block.
FWD-P24 short-circuited: forward rotation
REV-P24 short-circuited: reverse rotation
The motor does not start if both the FWD and REV terminals are connected with the P24 terminal or both of them are open.
2: Keypad operation (forward rotation only)
The motor runs in the forward direction when the RUN key is pressed and it decelerates to stop when the STOP key is pressed.
3: Keypad operation (reverse rotation only)
The motor runs in the reverse direction when the RUN key is pressed and it decelerates to stop when the STOP key is pressed.



Frequency setting block diagram

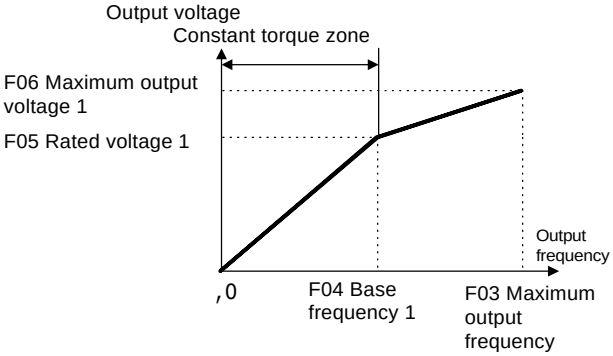
F03 Maximum frequency 1

◆ This is the maximum frequency which is output by the inverter of motor 1.
Setting range: 50 to 400 Hz
If a value larger than the rating of the driven unit is set, the motor or machine may be broken. Set a value suitable for the driven unit.

F04 Base frequency 1

◆ This is the maximum output frequency in the constant torque zone of motor 1, that is, the output frequency at the rated output voltage. Set the rating of the motor.
Setting range: 25 to 400 Hz

Note) If the setting of base frequency 1 is larger than the setting of maximum frequency 1, the output frequency is limited by the maximum frequency and the output voltage does not rise to the rated voltage.



F05 Rated voltage 1

◆ This is the output voltage value at base frequency 1 which is output to motor 1. However, voltages exceeding the source (input) voltage cannot be output.
Setting range: 0, 80 to 240 V for 200V class
0, 160 to 480 V for 400V class
A "0" setting stops the operation of the voltage adjustment function. Therefore a voltage proportional to the source voltage is output.

Note) If the setting of rated voltage 1 is larger than the setting of maximum output voltage 1, the voltage is limited by the maximum output voltage and it does not rise to the rated voltage.

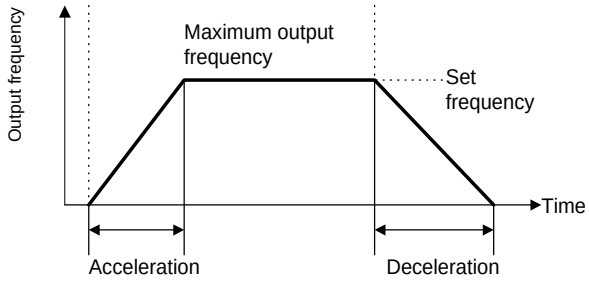
F06 Maximum voltage 1

◆ This is the maximum value of the output voltage of the inverter of motor 1. However, voltages exceeding the source (input) voltage cannot be output.
Setting range: 0, 80 to 240 V for 200V class
0, 160 to 480 V for 400V class

F07 Acceleration time 1

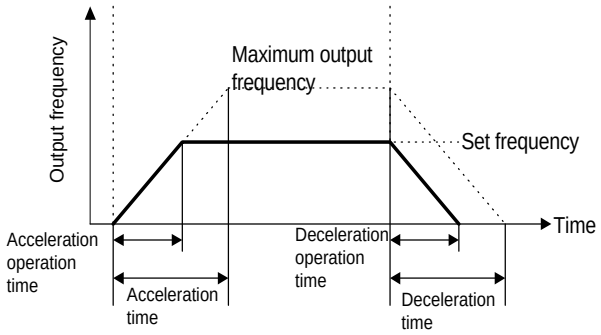
F08 Deceleration time 1

◆ These are the acceleration time taken for the output frequency to reach the maximum frequency from the start, and the deceleration time taken to stop from the maximum output frequency.
Setting range: Acceleration time 1: 0.01 to 3600s
Deceleration time 1: 0.01 to 3600s
The number of significant digits of the acceleration and deceleration time is three. Therefore the uppermost three digits can be set.
The acceleration time and deceleration time are set based on the maximum frequency. The relationship between the frequency setting and the acceleration/deceleration time is as shown below.



Set frequency＜Maximum output frequency

The setting differs from the actual operation time.
Acceleration/deceleration time
＝Setting×（Set frequency / Maximum output frequency）



Note) If an excessively short acceleration or deceleration time is set though the load torque or moment of inertia of the load is large, the torque limiter or stall prevention function is activated. When these functions are activated, the time becomes longer than the operation time explained above.

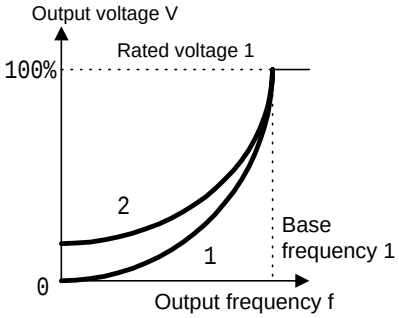
F09 Torque boost 1

◆ This function is for motor 1. The following options can be selected.
- Selection of load characteristics such as automatic torque boost, square reduction torque load, proportional torque load and constant torque load.
- Correction of magnetic flux shortage of motor in accordance with the voltage drop in low frequency zone, and torque boost during low speed operation (boosting of V/f characteristics).

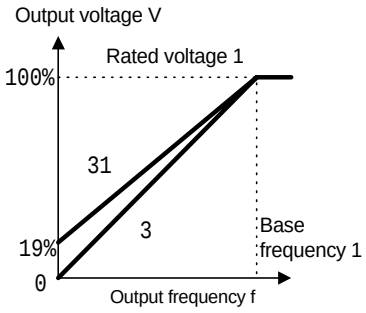
Setting range	Description of selection
0	Automatic torque boost characteristics where the torque boost value of the constant torque load is automatically adjusted (refer to function code P04 Motor 1 Tuning)
1	Square reduction torque characteristics for fan and pump loads
2	Proportional torque characteristics for intermediate load between the square reduction torque and torque characteristics.
3 to 31	Constant torque characteristics

◆ Torque characteristics

<Square reduction torque characteristics>
<Proportional torque characteristics>



<Constant torque characteristics>



Note) When the torque boost value is excessively large, the motor is excessively excited in the low speed zone at all types of characteristics. If operation continues in such a state, the motor may be overheated. Set a value according to the characteristics of the driven motor.

F10 Electronic thermal overload relay 1 (Select)

F11 Electronic thermal overload relay 1 (Level)

F12 Electronic thermal overload relay 1 (Thermal time constant)

The electronic thermal overload relay watches the output frequency, output current and operation time of the inverter to prevent the motor from overheat. The protective function becomes active when 150% of the set amperage flows for the time set at F12 (thermal time constant).

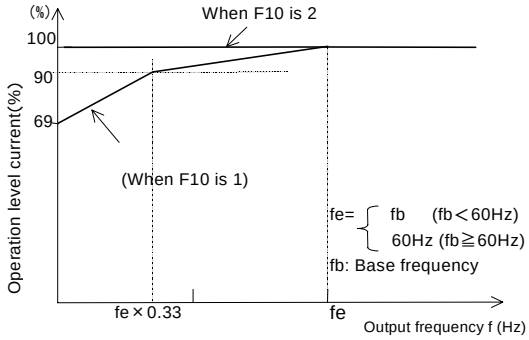
F10

◆ Selection between active and inactive operation of the electronic thermal overload relay and selection of the target motor are made. When the general purpose motor is selected, the operation level is low at low revolution speeds according to the cooling characteristics of the motor.

Setting: 0 Inactive
1 Active (for general purpose motor)
2 Active (for forced-ventilated motor)

F11

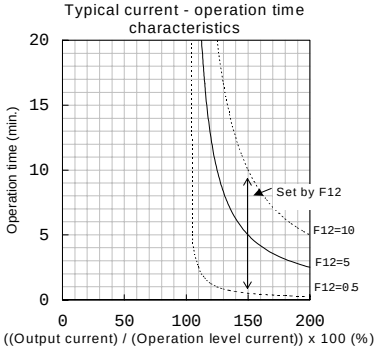
◆ The operation level of the electronic thermal overload relay is set in amperage. Enter the value 1.0 to 1.1 times rated current of the motor. The setting range is 20 to 135% of the rated inverter current.



Graph of relationship between operation level current and output frequency

F12

Set the time since 150% of the operation level current flows continuously until the electronic thermal overload relay functions.
Setting range: 0.5 to 10.0 min.



(minimum unit 0.1 minute)

F13 *Electronic thermal overload relay (for External braking resistor)*

◆ This function controls the operation frequency of the braking resistor and the continuous operation hours to prevent the braking resistor from being overheated.

Setting

0: Inactive
1: Active (for external braking resistor)
2: Active (for large capacity external braking resistor)

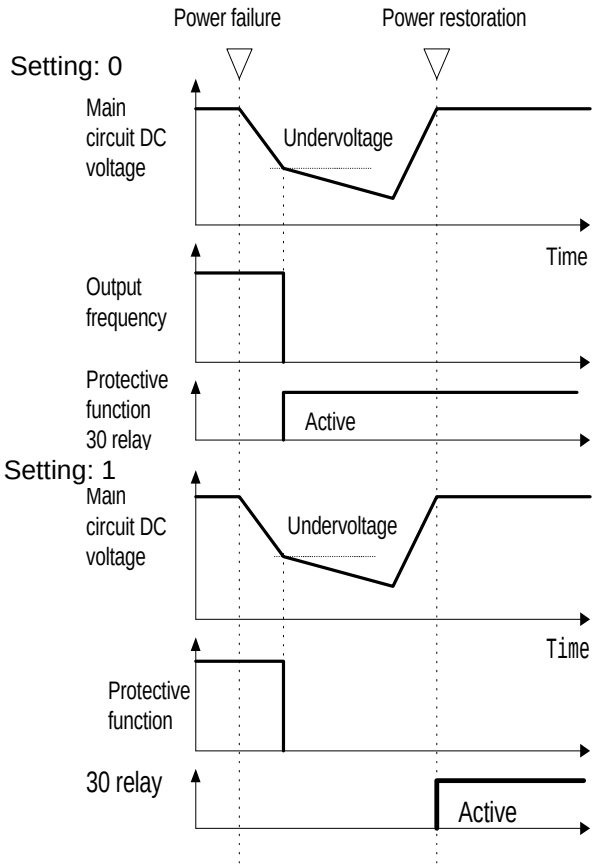
F14 *Restart mode after momentary power failure*

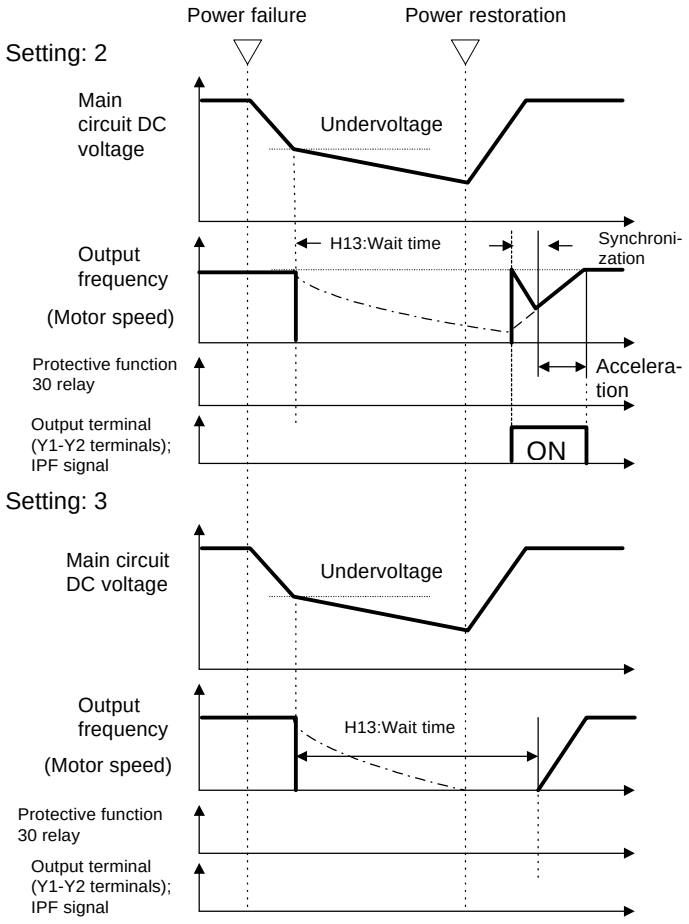
◆ Select the operation to be taken by the inverter upon momentary power failure.
You can select between protective operation (alarm output, alarm display, and inverter output shutoff) upon detection of power failure to be taken against an undervoltage and restart after momentary power failure where the coasting motor is not stopped but automatically restarted after the source voltage is recovered.

Setting range: 0 to 3 (Refer to the table below for details of the function).

<table>
<tr><th>Setting</th><th>Name of function</th><th>Operation upon power failure</th><th colspan="2">Operation upon power recovery</th></tr>
<tr><td>0</td><td>Inactive after momentary power failure (The inverter trips immediately).</td><td>Upon detection of an undervoltage, a protective function is activated to stop the output.</td><td>The inverter does not restart.</td><td rowspan="2">The inverter restarts after the protective function is reset and an operation command is input.</td></tr>
<tr><td>1</td><td>Inactive after momentary power failure (The inverter trips after the power is recovered).</td><td>Upon detection of an undervoltage, no protective function is activated but the output is stopped.</td><td>A protective function is activated; the inverter does not restart.</td></tr>
<tr><td>2</td><td>Restart after momentary power failure (The inverter restarts at the frequency effective at the time of power failure).</td><td>Upon detection of an undervoltage, no protective function is activated but the output is stopped.</td><td colspan="2">The inverter automatically restarts at the output frequency effective at the time of power failure.</td></tr>
<tr><td>3</td><td>Restart after momentary power failure (The inverter restarts at the starting frequency; for low inertia loads).</td><td>Upon detection of an undervoltage, no protective function is activated but the output is stopped.</td><td colspan="2">The inverter automatically restarts at the starting frequency set at F23.</td></tr>
</table>

Function codes used for the restart after momentary power failure include H13 and H14. Refer to the description of these codes, too. As well, a rotating motor pickup function can be selected as a starting method after a momentary power failure. (Refer to function code H09 for details of setting).
When the pickup function is used, the speed of the coasting motor is detected and the motor is started without a shock. Because a speed detection time is necessary if the pickup function is made effective, the pickup function should be made ineffective and restart should be made at the frequency effective before the power failure in a system with a large inertia to restore the original frequency, to make the most of the small decrease in the speed of the coasting motor.
The effective range of the pickup function is 5 to 120 Hz. If the detected speed is out of the effective range, the inverter restarts according to the regular function of restart after momentary power failure.



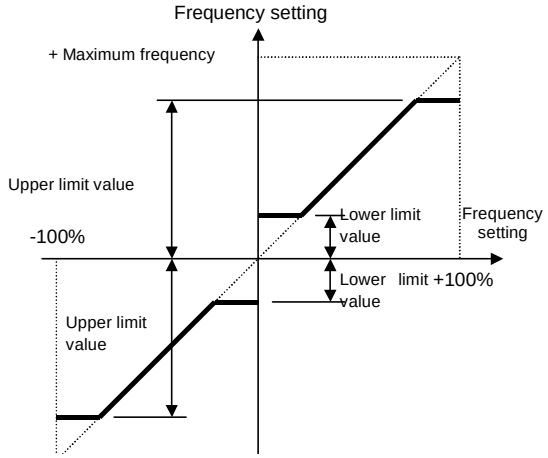


Note: The chain line indicates the motor speed.

F15 Frequency limiter (High)

F16 Frequency limiter (Low)

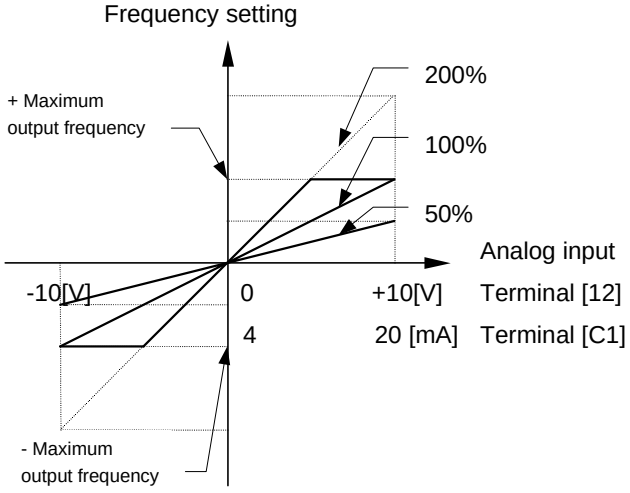
◆ Set the upper and lower limits of the frequency setting.
Setting range: 0 to 400 Hz



*The starting frequency is output when the inverter starts operation, and the stopping frequency is output when it stops operation.
*(Low limit) > (High limit) ... Priority is given to the High limit value.

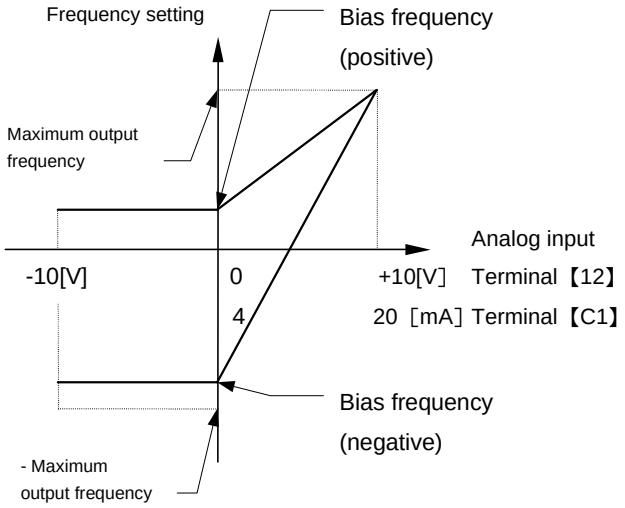
F17 Gain (Frequency setting signal)

◆ Set the ratio of the frequency setting in relation to the analogue input.
The operation is as shown in the figure below.



F18 Bias frequency

This function obtains the frequency setting from addition of the frequency setting in relation to the analogue input and a bias frequency. The operation is as shown in the figure below. However, if the bias frequency is larger (smaller) than the maximum frequency (- maximum frequency), the limit is set at the maximum output frequency (- maximum output frequency).



F20 DC brake (Starting frequency)

F21 DC brake (Braking level)

F22 DC brake (Braking time)

F20

◆ Starting frequency: Set the frequency at which the DC brake starts operation during deceleration and stop.
Setting range: 0.0 to 60.0 Hz

F21

◆ Braking level: Set the output current level during DC braking. The level can be set in an increment of 1% of the rated inverter output current.
Setting range: 0 to 100%
Actual minimum level is fixed to 5% even if this function set from 1 to 5% for 5.5/7.5GVX1000-T.

F22

◆ Braking time: Set the operation time of DC braking.
Setting range: 0.0 Inactive
0.1 to 30.0 s

⚠ **CAUTION**	The brake function of the inverter does not insure the function of a mechanical latch. **Injuries could occur.**

F23 Starting frequency (value)

F24 Starting frequency (Holding time)

F25 Stop frequency

◆The starting frequency can be set to insure the torque during start of operation. Holding time for at the starting frequency before acceleration can be set to wait for establishment of the magnetic flux of the motor during start of operation.

F23

◆Frequency: Set the starting frequency.
Setting range: 0.1 to 60.0 Hz

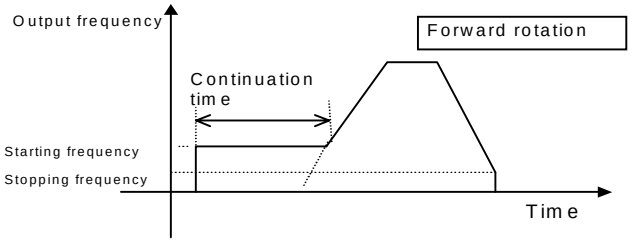
F24

◆Holding time: Set the time for continuing the starting frequency during start of operation.
Setting range: 0.0 to 10.0 s

*The Holding time is not placed during changeover between forward and reverse rotation.
*The Holding time is not included in the acceleration time.
*The function is effective even when C21 Timer operation is selected; the time is included in the timer value.

F25

◆Set the stop frequency.
Setting range: 0.1 to 6.0 Hz



When the starting frequency is smaller than the stop frequency and the frequency setting is smaller than the stop frequency, operation does not start.

F26 Motor sound (Carrier frequency)

◆This function adjusts the carrier frequency. After adjustment, reduction of the motor noise, avoidance of resonance with the mechanical system, reduction of leakage current from the output circuit wiring, reduction of inverter noise and other effects can be obtained.
Setting range: 0.75 to 15 (0.75 to 15 kHz)

Carrier frequency	Lower Higher
Motor noise	Larger to Smaller
Output current waveform	Worse to Better
Leakage current	Less to More
Noise generation	Less to More

For example, when 0.75 kHz is set, reduce the motor torque by about 15%. When a large value is set, the inverter loss increases, raising the inverter temperature.

F27 Motor sound (Sound tone)

◆The sound tone of the motor noise can be changed when the carrier frequency is 7 kHz or lower. Use the function according to preference.
Setting range: 0, 1, 2, 3

F29 FMA and FMP terminals (Select)

◆Select the operation method of the FM terminal.
0: Analogue output (FMA function)
1: Pulse output (FMP function)

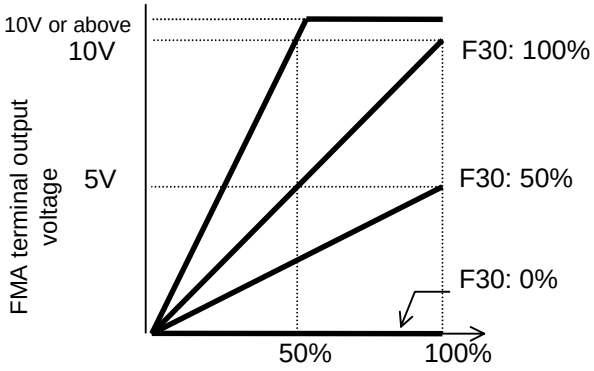
F30 FMA (Voltage adjust)

F31 FMA (Function)

The output frequency, output current and other monitor data can be output to the FM terminal in a DC voltage. The amplitude can be adjusted.
Note) To use the FM terminal for analogue outputs, set F29 at "0" and set SW1 on the control board to FMA.

F30

◆Adjust the voltage corresponding to 100 [%] of the monitoring amount of the monitoring item selected at F31 in a range from 0 to 200 [%] (in an increment of 1 [%]).
Setting range: 0 to 200 [%]



F31

◆ Select the monitoring item to be output at the FM terminal.

Setting	Target of monitoring	Definition of 100% of monitoring amount
0	Output frequency 1 (before slip compensation)	Maximum output frequency
1	Output frequency 2 (after slip compensation)	Maximum output frequency
2	Output current	2 times rated inverter output current
3	Output voltage	250V (200V class) , 500V (400V class)
4	Output torque	2 times rated motor torque
5	Load factor	2 times rated motor load
6	Input power	2 times rated inverter output
7	PID feedback value	100% feedback value
8	DC link circuit voltage	500V (200V class) 1000V (400V class)

F33 *FMP (Pulse rate)*

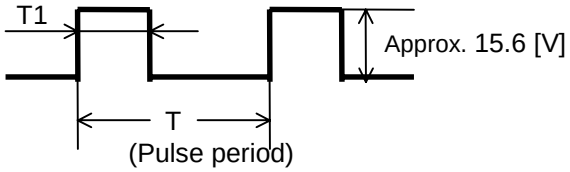
F34 *FMP (Voltage adjust)*

F35 *FMP (Function)*

The output frequency, output current and other monitor data can be output at the FM terminal in pulse voltages. The average voltage can be connected to an analogue meter.
To select the pulse output and connect a digital counter or the like, set the F33 pulse rate to a desired value and set the F34 voltage to 0%.
To select the average voltage and connect an analogue meter, set the F34 voltage to determine the average voltage; the F33 pulse rate is fixed at 2670 [p/s].
Note) To use the FM terminal for the pulse output, set F29 to "1" and set SW1 on the control board to the FMP side.

F33

◆ Set the pulse frequency corresponding to 100 [%] of the monitoring amount of the monitoring item selected by F35 in a range from 300 to 6000 [p/s].
Setting range: 300 to 6000 [p/s]



Pulse period [p/s] = 1/T
Duty [%] = T1/T X 100
Average voltage [V] = 15.6 X T1/T

F34

◆ Set the average voltage of the pulse output at the FM terminal.
Setting range: 0 to 200 [%]
However, if "0" is set, the pulse frequency varies according to the monitoring amount of the monitoring item selected at F35 (with the maximum value being the F33 setting). If a value between 1 and 200 is set, the pulse frequency is fixed at 2670 [p/s]. The average voltage corresponding to 100 [%] of the monitoring amount of the monitoring item selected at F35 is adjusted in a range between 1 and 200 [%] (in an increment of 1 [%]). (The duty of the pulse changes).
Note: FMP has approx. 0.2V offset voltage even if FMP outputs zero value.

F35

Select the monitoring item to be output at the FM terminal. The options to be selected are the same as F31.

F36 *30Ry operation mode*

◆ Select whether the alarm output relay (30Ry) of the inverter is activated (excited) during normal operation or during a trip.

Setting	Description of operation	
0	During normal operation	30A－30C：OFF 30B－30C：ON
	Upon a trip	30A－30C：ON 30B－30C：OFF
1	During normal operation	30A－30C：ON 30B－30C：OFF
	Upon a trip	30A－30C：OFF 30B－30C：ON

Note) Because the contact between 30A and 30C is on after the inverter is turned on (after about 1 second since the power is turned on) when the setting is "1", care must be taken to the sequence design.

F40 *Torque limiter 1 (Driving)*

F41 *Torque limiter 1 (Braking)*

◆ The torque limiting operation calculates the motor torque from the output voltage, current, resistance of the primary winding of the motor and other data to control the frequency so that the calculated value does not exceed the control value. This operation insures inverter operation without tripping upon abrupt changes in the load torque while the limit value is maintained.

◆ Select the limit values of the driving torque and braking torque.

◆ The acceleration/deceleration operation time during activation of this function becomes longer than the set acceleration/deceleration time. When the driving torque is limited during constant speed operation, the frequency is lowered to reduce the load torque. (When the braking torque is limited, the contrary occurs).

Setting range: 20 to 200,999%

Set "999" to inactivate the torque limiter.

Set only the braking torque to "0" to automatically avoid OU tripping caused by power regeneration.

WARNING	• If the torque limiter has been selected, the inverter may operate at an acceleration/deceleration time or speed different from the set ones. Design the machine so that safety is ensured even in such cases. **Otherwise an accident could occur.**

F42 *Torque vector control 1*

◆ The torque vector control calculates the torque suitable for the load to make the most of the motor torque, and controls the voltage and current vectors to optimum ones according to the calculated value.

Setting	State of operation
0	Inactive
1	Active

◆ When "1" (active) is selected, the settings of the following function codes become different from the written ones.

1) F09 "Torque boost 1"
Works as "0" value (automatic torque boost).

2) P09 "Slip compensation control"
Slip compensation is automatically activated.
When "0" is set, the slip compensation amount of a 4 pole standard three-phase motor is assumed.
When the setting is other than "0", the written setting is applied.

◆ Use the torque vector control function under the following conditions.

1) A single motor
If two or more motors are connected, accurate control is difficult.

2) The data of function codes of motor 1 (P03 "Rated current", P06 "No-load current", P07 "%R1" and P08 "%X") must be accurate.
If the standard three-phase motor made by Bonfiglioli Riduttori is used, the above data is automatically input when function code P02 "Capacity" is set. When another motor is used, perform auto tuning.

3) The rated motor current must not be too smaller than the rated inverter current. Though it depends on the model, the one smaller by two ranks than the standard applicable motor of the inverter is the allowable smallest motor.

4) The wiring distance between the inverter and motor must be up to 50 m. Too long a wiring distance disables accurate control due to the leakage current flowing through the static capacity between the cable and the ground.

5) When a reactor is connected between the inverter and the motor or when the wiring impedance is large enough to be overlooked, change the data using P04 "Auto tuning".
If these conditions cannot be satisfied, change the setting to "0" (inactive).

(E:Extension Terminal Functions)

E01 X1 terminal function

E02 X2 terminal function

E03 X3 terminal function

E04 X4 terminal function

E05 X5 terminal function

◆ The function of each digital input terminal X1 to X5 can be set arbitrarily using a code.

Setting	Function
0,1,2,3	Multistep frequency selection (1 to 15 steps)
4	Acceleration/deceleration selection (1 step)
5	Self holding selection [HLD]
6	Coast-to-stop command [BX]
7	Alarm reset [RST]
8	External alarm [THR]
9	Frequency setting 2 / frequency setting 1 [Hz2 / Hz1]
10	Motor 2 / motor 1 [M2 / M1]
11	DC brake command [DCBRK]
12	Torque limit 2 / torque limit 1 [TL2 / TL1]
13	UP command [UP]
14	DOWN command [DOWN]
15	Write enable for keypad (data change allowed) [WE-KP]
16	PID control cancel [Hz / PID]
17	Forward/reverse operation switch (terminal 12 and terminal C1) [IVS]
18	Link operation selection (RS485 standard, BUS Option) [LE]

Note) The data numbers not assigned to E01 through E05 are considered to be inactive.

0, 1, 2, 3 - Multistep frequency

Frequencies set to function codes C05 through C19 can be selected according to external digital input signal switching. Set data 0 to 3 to the desired digital input terminals and combination of input signals determines the selected frequency.

Multistep frequency selection

Combination of input signals				Selected frequency
0 [SS1]	**1 [SS2]**	**2 [SS4]**	**3 [SS8]**	
off	**off**	**off**	**off**	Selected by F01 or C30
on	**off**	**off**	**off**	C05 Multistep frequency 1
off	**on**	**off**	**off**	C06 Multistep frequency 2
on	**on**	**off**	**off**	C07 Multistep frequency 3
off	**off**	**on**	**off**	C08 Multistep frequency 4
on	**off**	**on**	**off**	C09 Multistep frequency 5
off	**on**	**on**	**off**	C10 Multistep frequency 6
on	**on**	**on**	**off**	C11 Multistep frequency 7
off	**off**	**off**	**on**	C12 Multistep frequency 8
on	**off**	**off**	**on**	C13 Multistep frequency 9
off	**on**	**off**	**on**	C14 Multistep frequency 10
on	**on**	**off**	**on**	C15 Multistep frequency 11
off	**off**	**on**	**on**	C16 Multistep frequency 12
on	**off**	**on**	**on**	C17 Multistep frequency 13
off	**on**	**on**	**on**	C18 Multistep frequency 14
on	**on**	**on**	**on**	C19 Multistep frequency 15

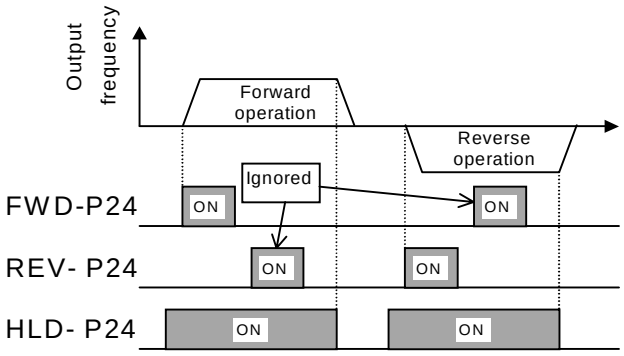
4 - Acceleration/deceleration time selection

Acceleration/deceleration time set to function codes E10 and E11 can be selected according to external digital input signal switching.

Input signal	Selected acceleration/deceleration time
4 [RT1]	
off	F07 Acceleration time 1 F08 Deceleration time 1
on	E10 Acceleration time 2 E11 Deceleration time 2

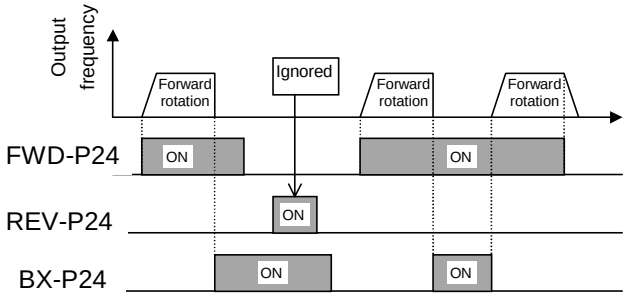
5 - 3-wire operation stop command [HLD]

Used for three-wire operation. When HLD-P24 is ON, the FWD or REV signal is maintained, and when it is OFF, the signal is reset.



Note : The inverter operates while FWD-P24 or REV-P24 is ON even if HLD-P24 is OFF. An external interlock sequence ,which makes FWD-P24 and REV-P24 OFF when HLD-P24 is OFF, is required.

6 - Coast-to-stop command [BX]
When the BX terminal is connected to the P24 terminal, the inverter output is immediately shut off and the motor coasts to stop. No alarm signal is output. This signal is not maintained.
When the operation command (FWD or REV) is ON and the BX terminal is disconnected from the P24 terminal, the motor starts at the starting frequency.



7 - Alarm reset [RST]
Upon tripping, when the connection between the RST and P24 terminals is turned on, the batch alarm output is removed, and when the connection is turned off, the trip display is removed and operation is restarted.

8 - Trip command (External fault) [THR]
When the connection between the THR and P24 terminals is turned off, the inverter output is shut off (to allow the motor to coast to stop), and an alarm [OH2] is output. This signal is maintained internally until an RST input is added. This function is used to protect the external braking resistor from being overheated. When this terminal function is not set, an ON input is assumed.

9 - Frequency setting 2/1 [Hz2 / Hz1]
An external digital input signal switches the frequency setting method defined by function codes F01 and C30.
The signal operation is changed under PID control. (Refer to H20 through H25).

Input signal **9 [Hz2/Hz1]**	Selected frequency setting
off	F01 Frequency setting 1
on	C30 Frequency setting 2

10 - Motor 2/1 [M2 / M1]
An external digital input signal switches each motor constant. However, this input is effective only when the operation command to the inverter is turned off and the inverter is stopped. Therefore operation at 0 Hz is not included.

Input signal **10 [M2/M1]**	Selected motor
off	Motor 1
on	Motor 2

11 - DC brake command [DCBRK]
When the external digital input signal is ON, DC braking starts and continues as far as the signal remains turned on after the operation command is turned off (or, the STOP key is pressed in the keypad panel operation mode or both the FWD and REV terminals are turned on or turned off in the terminal block operation mode) and the inverter frequency drops below the frequency set at F20. In this case, the longer time between the time set at function code F22 and the time when the input signal is turned on, is given priority. However, operation is restarted if the operation command is turned on.

12 - Torque limiter 2/Torque limiter 1 [TL2 / TL1]
An external digital input signal switches between the torque limiter values set at function codes F40 and F41 or E16 and E17.

Input signal **12 [TL2/TL1]**	Selected torque limit value
off	F40 Torque limiter 1 (Driving) F41 Torque limiter 1 (Braking)
on	E16 Torque limiter 2 (Driving) E17 Torque limiter 2 (Braking)

13/14 UP command/DOWN command [UP]/[DOWN]
The output frequency can be increased or decreased according to the external digital input signal while the operation command is input (turned on). The changing range is 0 to the maximum output frequency and operation in a direction opposite to that in the operation command is impossible.

Input signal		Selected function (when operation command is ON)
13	**14**	
off	**off**	The output frequency is maintained.
off	**on**	The output frequency increases at the acceleration time.
on	**off**	The output frequency decreases at the deceleration time.
on	**on**	The output frequency is maintained.

15 - Write enable for KEYPAD [WE-KP]
This function allows program changes only while the external signal is input; this is for the protection of the program from inadvertent changes.

Input signal **15 [WE-KP]**	Selected function
off	Data change disabled
on	Data change enabled

Note) If data 15 is set to a terminal erroneously, program change become disabled. Turn the terminal ON then change to another number.

16 - PID control cancel [Hz/PID]
An external digital input signal can disable PID control.

Input signal **16 [Hz/PID]**	Selected function
off	PID control valid
on	PID control invalid (frequency setting through keypad panel)

17 - Inverse mode changeover (Terminal 12 and C1) [IVS]
An external digital input signal switches between the forward and reverse operations of analogue inputs (terminals 12 and C1).

Input signal **17 [IVS]**	Selected function
off	When forward operation is set→forward operation When reverse operation is set→reverse operation
on	When forward operation is set→reverse operation When reverse operation is set→forward operation

18 - Link enable (RS485) [LE]
An external digital input signal is switched to validate or invalidate the frequency command and operation command from the link. The source of the command can be set at H30 Link function.

Input signal **18 [LE]**	Selected function
off	Link command invalid
on	Link command valid

E10 Acceleration time 2

E11 Deceleration time 2

- Additional acceleration and deceleration time can be selected besides F07 "Acceleration time 1" and F08 "Deceleration time 1".
- The operation and setting range are the same as those for F07 "Acceleration time 1" and F08 "Deceleration time 1". Refer to these functions.
- To switch between the acceleration and deceleration time, select any terminal from among E01 "X1 terminal (Function selection)" through E05 "X5 terminal (Function selection)" as a switching signal input terminal. Set the selected terminal to "4" (acceleration/deceleration time selection) and supply a signal to the terminal to switch. Switching is effective during acceleration, during deceleration or during constant speed operation.

E16 Torque limiter 2 (Driving)

E17 Torque limiter 2 (Braking)

- Use these functions to switch the torque limiter levels set at F40 and F41 using an external control signal. The external signal is supplied to an arbitrary control terminal among X1 through X5, the function of which is set to torque control 2 / torque control 1 (data 12) at E01 to E05.

E20 Y1 terminal function

E21 Y2 terminal function

- A part of control and monitor signals can be output at the Y1 and Y2 terminals.

Setting	Output signal
0	Inverter running [RUN]
1	Frequency equivalence [FAR]
2	Frequency level detection [FDT]
3	Undervoltage detection signal [LV]
4	Torque polarity [B/D]
5	Torque limiting [TL]
6	Auto restarting [IPF]
7	Overload early warning [OL]
8	Life time alarm [LIFE]
9	Frequency level detection 2 [FAR2]

0 - Inverter running [RUN]
"Inverter running" means that the inverter outputs a frequency as a speed signal. At this time, an ON signal is output. However, if the DC braking function is active, the signal is turned off.

1 - Frequency equivalence [FAR]
Refer to the description for function code E30 Frequency equivalence (detection width).

2 - Frequency level detection [FDT]
Refer to the description for function codes E31 and E32 Frequency level detection.

3 - Undervoltage detection signal [LV]
When the undervoltage protection function is active, that is, when the main circuit DC voltage is below the undervoltage detection level, an ON signal is output. After the voltage is restored to become higher than the undervoltage detection level, the signal is turned off. The ON signal is output also during activation of the undervoltage protection function.

Undervoltage detection level: Approx 200 Vdc (200V class)
Approx 400Vdc (400V class)

4 - Torque polarity [B/D]
The polarity of the torque calculated inside the inverter is judged and the driving/braking torque discrimination signal is output.
When the calculated torque is the driving torque, an OFF signal is output, and when it is the braking torque, an ON signal is output.

5 - Torque limiting [TL]
When the torque limit is set, a stall prevention function automatically functions to change the output frequency automatically; the torque limiting signal is output externally to reduce the load or to indicate an excessive load at the monitor.
The ON signal is output during torque limit, regeneration avoidance operation and current limit.

6 - Auto restarting [IPF]
An event of momentary power failure, start-up of restart mode after momentary power failure, and automatic synchronization and recovery are reported to the outside.
When the power is recovered and synchronization starts after a momentary power failure, an ON signal is output, and the signal changes to the OFF signal after the frequency before the momentary power failure is achieved.
In the startup at the starting frequency mode, completion of restart is assumed at the time of power recovery, and the signal is turned off in this timing. (Refer to the description for F14).

7 - Overload early warning [OL]
An overload early warning level before thermal protection trip (electronic thermal overload relay) of the motor is judged and an ON signal is output.
Either the electronic thermal overload forecast or output current overload forecast can be selected for overload forecast judgement.
For the setting method, refer to Overload early warning (Operation selection) (E33) and Overload early warning (Operation level) (E34).
Note) This function is effective only for motor 1.

8 - Life time alarm [LIFE]
Life judgement output for main circuit capacitor
Refer to section 8-2 (1) "Capacity measurement of main circuit capacitor" for description.

9 - Frequency level detection 2 [FAR2]
This is a frequency level detection (detection width) signal where function code E29 "Frequency level detection delay" takes effect.
Detection level of the frequency is detected at the output frequency before the torque limiter.

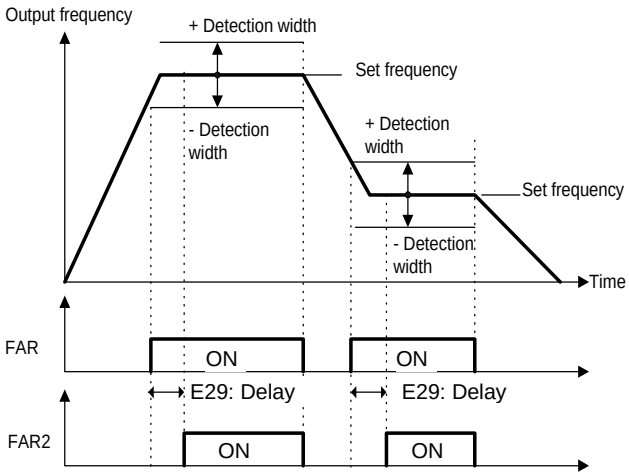
E29 Frequency level detection delay

E30 FAR function signal (Hysteresis)

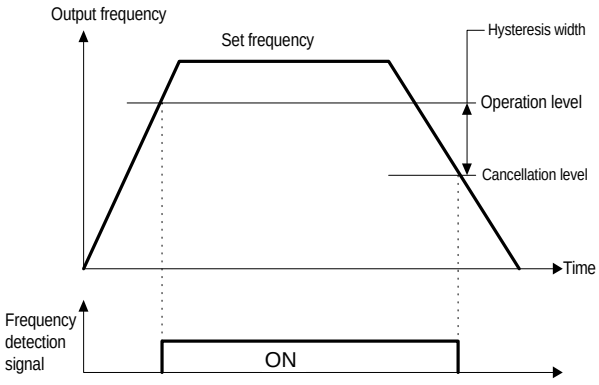
◆ Adjust the hysteresis and signal output delay for achievement of the output frequency to the set frequency (operation frequency).
The delay is valid only for FAR2 and it can be adjusted between 0.01 and 10.0 seconds. The hysteresis can be adjusted in a range of 0 to +/-10 Hz of the output frequency.
The output frequency changes according to the torque limiting operation. When the frequency exceeds the setting range (width), the signal is turned off in a mode (FAR: E20, 21 set to "1") or it is not turned off in another mode (FAR2: E20, 21 set to "9").
E29: Setting range: 0.01 to 10.0 s
E30: Setting range: 0.0 to 10.0 Hz
An ON signal can be output from the terminal within the detection range (width).

E31 FDT function signal (Level)

E32 FDT function signal (Hysteresis)



◆ Determine the operation (detection) level of the output frequency and the hysteresis width for operation cancellation. When the output frequency exceeds the set operation level, an ON signal can be output from the terminal.
Setting range: (Operation level): 0 to 400 Hz
(Hysteresis width): 0.0 to 30.0 Hz



E33 OL function signal (Mode select)

◆The OL function signal includes two variations: "overload forecast by means of the function of the electronic thermal overload relay" and "overload forecast by means of output current".
Setting: 0 Electronic thermal overload relay
1 Output current

Setting	Function	Outline
0	Electronic thermal overload relay	Overload forecast using the characteristics of the electronic thermal overload relay which show inverse time limit characteristics against the output current. The operation selection of the inverse time limit characteristics and the thermal time constant are the same characteristics as those of the electronic thermal overload relay (F10, F12) for motor protection. To use for the forecast, set an earlier output than the electronic thermal overload relay for motor protection.
1	Output current	When the output current exceeds the set current for a period longer than the set time, an overload forecast is issued.

E34 OL function signal (Level)

Determine the level of the electronic thermal overload relay or output current.
Setting range:
Rated inverter output current x (5 to 200%)
The operation cancellation level is 90% of the set value.

E35 OL function signal (Timer)

◆When E33 "OL function signal (Mode select)" is set at "1" (output current), set the time taken until the forecast is issued.
Setting range: 0.1 to 60.0 s

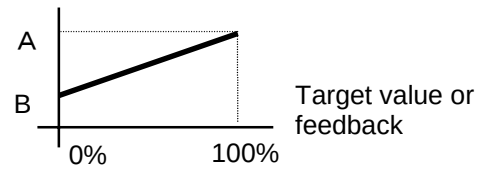
E40 Display coefficient A

E41 Display coefficient B

◆Use these functions as conversion coefficients for determining the display value (process amount) of the load speed, line speed and target value and feedback amount of the PID adjuster.
Setting range
Display coefficient A: 0.00 to 200.0
Display coefficient B: 0.00 to 200.0

◆Load speed and line speed
Use E40 "Display coefficient A".
(Displayed value) = (Output frequency) x (0.01 to 200.0)
The effective value of the display data is 0.01 to 200.0. Therefore the display is limited by the minimum value of 0.01 and the maximum value of 200.0 even if the value exceeds the range.

◆Target value and feedback amount of PID adjuster
Set the maximum value of the display data at E40 "Display coefficient A" and set the minimum value at E41 "Display coefficient B".
Display value = (Target value or feedback amount) x (Display coefficient A - B) + B



E42 LED display filter

The data of "LED monitor" includes data for which display of the changing moment is not necessary. This type of data can be provided with a filter for flicker prevention.
Setting range: 0.0 to 5.0 s

◆The target display items are the output current and output voltage.

C: Control Functions of Frequency

C01 ***Jump frequency 1***

C02 ***Jump frequency 2***

C03 ***Jump frequency 3***

C04 ***Jump frequency hysteresis***

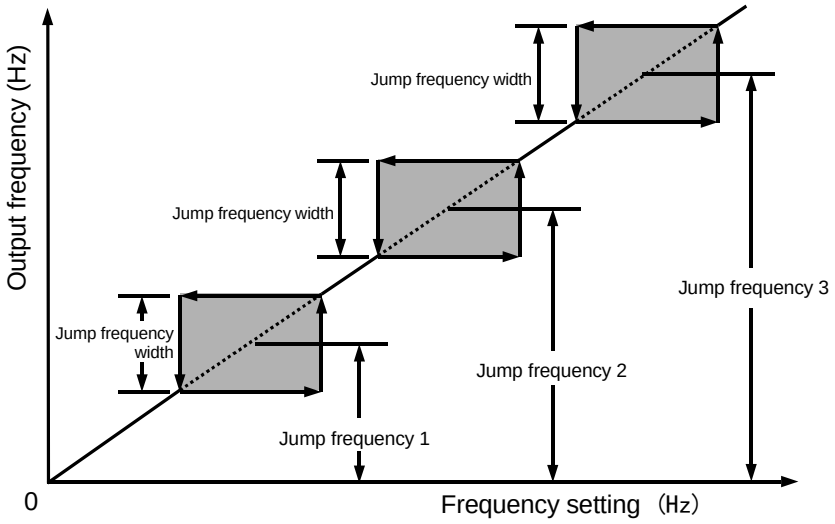
- These functions jump the inverter output frequency at the set frequencies to avoid mechanical resonance with the load.
- Three jump frequencies can be set.
- This function is inactive when all the jump frequencies 1 through 3 are set at 0 Hz.
- The frequencies are not jumped during acceleration or deceleration.
  If the setting ranges of jump frequencies overlap, the sum of the setting ranges is jumped.

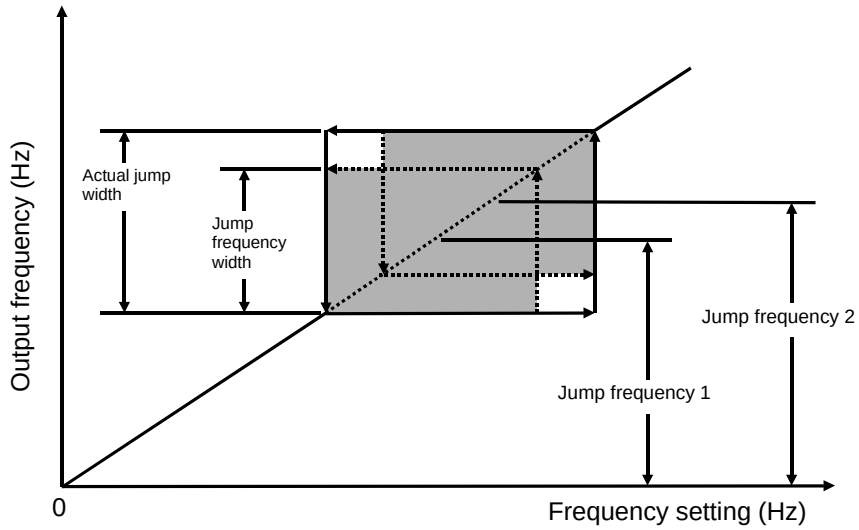
C01 **C02** **C03**

Setting range: 0 to 400 Hz
Minimum unit: 1 Hz

C04

Setting range: 0 to 30 Hz
Minimum unit: 1 Hz





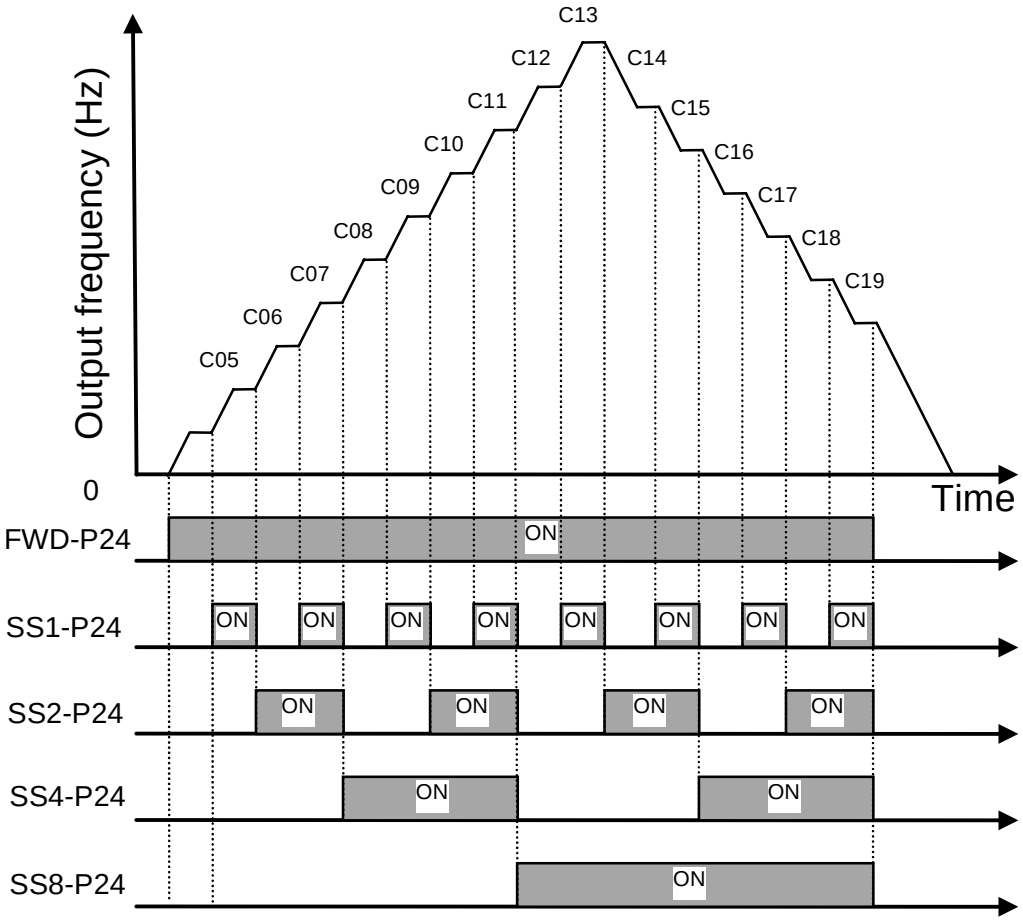
C05 ***Multistep frequency 1***

through

C19 ***Multistep frequency 15***

- Terminal functions SS1, SS2, SS4 and SS8 are turned on or off to switch multistep frequencies 1 through 15. (Refer to E01 through E05 for the definition of the terminal function).
- Undefined terminals among terminal functions SS1, SS2, SS4 and SS8 are assumed to be turned off.

Setting range: 0.00 to 400.0 Hz
Minimum unit: 0.01 Hz



C21 ***Timer operation***

C22 ***Stage 1***

◆ An operation pattern from the start of operation to automatic stop can be created.

C21

◆ Select active or inactive timer operation.
0: Inactive timer operation
1: Active timer operation

C22

◆ Set the time from the start of operation to automatic stop.
Setting range: 0.00 to 3600 s

Note) If the power is turned off or the inverter is stopped or trips during timer operation, the counted time is reset.

C30 ***Frequency command 2***

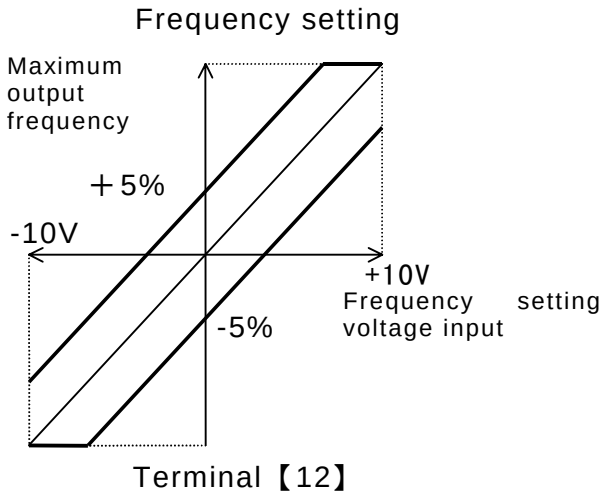
◆ Select the frequency setting method.

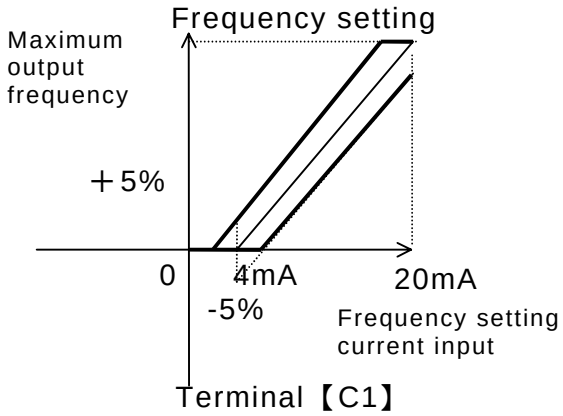
For the selectable frequency setting methods, refer to the description of F01.

C31 ***Analogue setting signal offset adjustment (Terminal 12)***

C32 ***Analogue setting signal offset adjustment (Terminal C1)***

◆ Set the offset of the analogue input (terminal [12], terminal [C1]).
The offset can be set in the range between -5.0 [%] and + 5.0 [%] of the maximum output frequency (in 0.1 [%] step).





C33 ***Analogue setting signal filter***

◆ The analogue signal supplied to control terminal 12 or C1 sometimes includes electric noise. Electric noise make the control unstable. Adjust the time constant of the input filter to remove the effects of electric noise.
Setting range: 0.00 to 5.00 s

◆ With a large time constant (setting), the control becomes stable but there is a delay in the control response. With a small time constant, the response is quick but the control becomes unstable.
If the setting is not clear, change the setting when the control is unstable or the response is slow.

Note) The function applies to both terminals [12] and [C1] (in common). However, when a PID feedback signal is input, H25 "PID control feedback filter" is applied.

P: Motor parameters

P01 Number of motor 1 poles

◆ This parameter is the number of poles of driven motor 1. Write a value to display correct motor speeds (synchronized speeds) at the LED.
Setting range: 2, 4, 6, 8, 10, 12 or 14

P02 Motor 1 (Capacity)

◆ A standard applicable motor capacity is set before shipment from the factory. Change the setting to drive a motor rated at other than the standard applicable motor capacity.
Setting range: 0.01 to 5.50 kW(3.7kW or smaller)
0.01 to 11.00kW (5.5, 7.5kW)
Set the standard applicable motor capacity specified in section 9-1 "Standard Specifications". The setting range should be between the rank higher by one rank or lower by two ranks from the standard applicable motor capacity. If the range is exceeded, accurate control may not be possible. If a value between the standard applicable motor capacity and the capacity of another rank is set, the data of the lower capacity is automatically written for the data of the related functions.

◆ After the setting of this function is changed, the settings of the following related functions change to the data for the 4 pole standard three-phase standard motor.
P03 "Motor 1 (Rated current)"
P06 "Motor 1 (No-load current)"
P07 "Motor 1 (%R1)"
P08 "Motor 1 (%X)"

Note) The settings of 4 pole standard three-phase standard motor are the data for 3-phase 200V or 400V / 50 Hz.

P03 Motor 1 (Rated current)

◆ This parameter is the rated current of motor 1.
Setting range: 0.00 to 99.9 A

P04 Motor 1 (Tuning)

◆ The motor data is measured and the data is automatically written.

Setting	State of operation
0	Inactive
1	The primary resistance (%R1) of the motor and the leakage reactance (%X) of the base frequency are measured while the motor is stopped, and the data is automatically written to P07 and P08.(Static tuning)
2	The primary resistance (%R1) of the motor and the leakage reactance (%X) of the base frequency are measured while the motor is stopped, then the no-load current (Io) is measured **<u>while the motor turns</u>**, and P06, P07 and P08 are automatically written.(Dynamic tuning)

◆ Perform a tuning when the P06, P07 and P08 data written in the inverter in advance differs from the actual motor data, that is, in the following cases. Improvement in the control and calculation accuracy is expected.
- When a motor other than the 4 pole standard three-phase motor (4 poles) is used.
- When the impedance on the output side cannot be ignored due to a long wiring length between the inverter and the motor or connection of a reactor.
- When %R1 or %X is unknown due to a non standard motor or a special motor.

Tuning procedure

1. Adjust the voltage and frequency according to the characteristics of the motor. Adjust "F03", "F04", "F05" and "F06".
2. Enter the motor constants which cannot be tuned. P02 "Capacity", P03 "Rated current", P06 "No-load current" (The no-load current is not necessary in Dynamic tuning).
3. To tune the no-load current, too, disconnect the motor from the mechanical units and check that no danger occurs even if the motor turns.
4. Set P04 "Tuning" to "1" (motor stop) or "2" (motor rotation) and press the FUNC/DATA key to write the data, then issue an operation command (press the RUN key or turn the FWD or REV terminal on) to start tuning. Tuning takes several seconds to several tens of seconds. (When the setting is "2", the motor accelerates to a half of the base frequency in the set acceleration/deceleration time to tune the no-load current, then decelerates. Therefore the time necessary for tuning varies according to the set acceleration/deceleration time).
5. During tuning, the set data ("1" or "2") blinks rapidly and, upon the end of tuning, the next function code (P05) is displayed. When the FWD or REV terminal is connected to start tuning, disconnect the terminal.

Note) Turn the BX and RST terminals off before starting tuning.

⚠ **WARNING**	• If auto tuning is set at "**2**", the motor turns at a half of the base frequency. Make sure that the motor is disconnected from the mechanical units and that no danger results from the rotation. **Otherwise injuries could occur.**

P05 Motor 1 (Online tuning)

◆ The motor temperature changes after operation for a long time, changing the motor speed. Use online tuning to reduce the speed fluctuation caused by temperature changes of the motor.

Setting	State of operation
0	Inactive
1	Active

P06 Motor 1 (No-load current)

◆ This parameter is the no-load current (exciting current) of motor 1.
Setting range: 0.00 to 99.9 A

P07 Motor 1 (%R1 setting)

P08 Motor 1 (%X setting)

◆ Write these parameters when a motor other than the 4 pole standard three-phase motor is used and the impedance between the inverter and motor and motor constant are already known.

◆ Calculate %R1 in the following formula.

$$\%R1 = \frac{R1 + CableR}{V/(\sqrt{3} \times I)} \times 100[\%]$$

where:

R1
: Resistance of primary coil of motor for single phase [ohm]

Cable R:
: Resistance of output cable for single phase [ohm]

V:
: Rated voltage [V]

I:
: Rated motor current [A]

◆ Calculate %X in the following formula.

$$\%X = \frac{X_1 + X_2 \cdot X_M/(X_2 + X_M) + X_{CABLE}}{V/(\sqrt{3} \cdot I)} \cdot 100[\%]$$

where

X_1: Primary leakage reactance of motor [ohm]
X_2: Secondary leakage reactance of motor (conversion to primary value) [ohm]
X_M: Motor excitation reactance [ohm]
X_{CABLE}: Reactance of output cable [ohm]
V: Rated voltage [V]
I: Rated motor current [A]

Note) Use the reactance effective at F04 "Base frequency 1".

◆ Add the value for a reactor and filter connected to the output circuit. If the cable value can be ignored, the cable value should be "0".

P09 Motor 1 (Slip compensation control 1)

◆ When the load torque changes, the motor slip changes and the motor speed fluctuates. With the slip compensation control, a frequency proportional to the motor torque is added to the output frequency of the inverter to minimize the fluctuation of the motor speed caused by torque changes.
Setting range: 0.00 to 15.00 Hz

◆ Calculate the slip compensation data in the following formula.

$$\text{Slip compensation amount} = \text{Base frequency} \times \frac{\text{Slip [r / min]}}{\text{Synchronized speed [r / min]}} \text{ [Hz]}$$

(Slip) = (Synchronized speed) - (Rated speed)

P10 Motor 1 (Slip compensation response time 1)

◆ Set the response time for slip compensation.

Note) With a small setting, the response time becomes shorter, but regeneration may cause over voltage tripping with some loads. In this case, set this function to longer time.

H: High Performance Functions

H01 Total operation time

◆The total power-on time of the inverter is displayed.
A number between 0 and 6500 is displayed, indicating 0 to 65000 hours. (The time is displayed in ten hours, though the inverter counts each hour. The time shorter than one hour is not counted).

H02 Trip history

◆A history of the latest four events of activation of protective functions is stored in memory. To call up each event, press the ▽ key. Press the ▽ or △ key to confirm the history.

	Procedure		Display example	Remarks
1	Call up H 0 2		H 0 2	
2	FUNC DATA ↓	△ ↑	1. O U 2	The latest protective operation is displayed.
3	▽ ↓	△ ↑	2. O H 1	The protective operation before the previous one is displayed.
4	▽ ↓	△ ↑	3. O C 1	The protective operation before the two previous ones is displayed.
5	▽ ↓	△ ↑	4. - - -	The protective operation before the three previous ones is displayed.
6	▽ ↓ →	↑	E n d	

The new record of protective operation is stored in the latest protective operation memory, and the previous records are shifted one by one, and the record of protective operation before the four previous ones is deleted.

H03 Data initializing(Data reset)

◆This function restores (initialises) the factory data over alterations made by the user.
Setting 0: Disabled
1: Initialise

Press the STOP and △ keys simultaneously to change the setting to "1", then press the FUNC DATA key to initialise the settings of all functions. After initialisation is completed, the setting automatically returns to "0".

H04 Auto-reset(Times)

H05 Auto-reset (Reset interval)

When the protective function of the inverter which starts the retry function is activated, operation of the inverter protective function is cancelled to restart the inverter automatically instead of an alarm and output stop.

H04

◆Set the number of resetting cycles of the protective function.
Setting range: 0 to 10 (0: retry inactive)

H05

◆Set the wait time from activation of a protective function to resetting.
Setting range: 2 to 20 s

◆Inverter protective functions for retry and start

OC1, OC2, OC3	Over current
OU1, OU2, OU3	Over voltage
OH1	Overheated heat sink
dbH	Overheated braking resistor
OL1	Overloaded motor 1
OL2	Overloaded motor 2
OLU	Overloaded inverter

◆When the data of H04 Retry (Times) is set to 1 to 10, retry operation starts and the time set at H05 "Retry (Reset interval)" elapses, then an inverter start command is automatically input. If the cause of the alarm has been removed, the inverter starts without entering the alarm mode. If the cause of the alarm remains, the protective function is activated again to wait for the time set at H05 "Retry (Times)". If the cause of the alarm is not removed after the number of repetition cycles set at H04 "Retry (Reset interval)", the inverter enters the alarm mode.

⚠ **WARNING**	If the retry function has been selected, the inverter may automatically restart according to some causes after tripping. (Design the machine so that human safety is ensured after restarting). **Otherwise an accident could occur.**