The Available Solution

SF-320 & HF-320

General-purpose Compact Inverter
V/F CONTROL-SENSORLESS VECTOR CONTROL

SF & HF

200V class 0.2–7.5kW
400V class 0.4–7.5kW

Sumitomo Heavy Industries, Ltd.
POWER TRANSMISSION & CONTROLS GROUP

Cat. No.
D1001E-1

SF-320・HF-320

From now on ……

Select a model the sensible way by Load characteristics!!

Two series are available for different purposes.

General-purpose inverter, ***SF-320*** *, and sensorless vector inverter,* ***HF-320***

High-function" to "High Functionality and easy operation

- Front cover protects programming keys to comply with PL Law.
- External signals permit use for various applications.
- Easily switch operation between panel and external signal.

The method of operation remains unchanged!

- The two models share external dimensions, basic functions, and basic operation so you can focus your selection based on load characteristics.
- The HF Series eliminate complicated setup for achieving starting torque.

State-of-the-art functions

1. Intelligent terminal

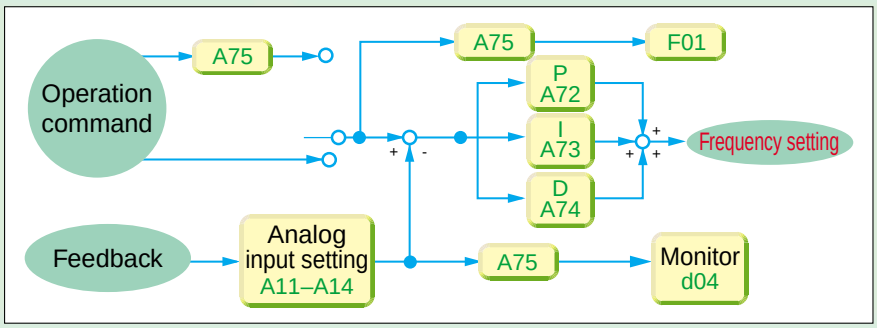
Program the terminals for the functions required by the application.

2. Multistep speed change (16 stages)

Fine adjustment meets the need in the age of Flexible Manufacturing System (FMS).

3. PID function

Use PID function to simplify process control.



Global applications

The overseas specification series are also available.

Standard lineup of 400 V-class series for small capacity motors

0.2 0.4 0.75 1.5 2.2 3.7 5.5 7.5 kW

Input···3-phase, 200 V／Output···3-phase, 200 V

Input···3-phase, 400 V／Output···3-phase, 400 V

Input···Single-phase, 200 V／Output···3-phase, 200 V * (W-version only)

□F 3202 - A20 - □

Series name
S: SF-320 Series
H: HF-320 Series

Voltage class
2: 200V class
4: 400V class

Applicable motor capacity
A20: 0.2kW 2A2: 2.2kW
A40: 0.4kW 3A7: 3.7kW
A75: 0.75kW 5A5: 5.5kW
1A5: 15kW 7A5: 7.5kW

Type
None: standard specifications
W: CE, UL, Standard specifications
(Single phase series is only available for W type.)
A: Southeast asian Specifications
(Carrier Frequency Default Setting is lower.)

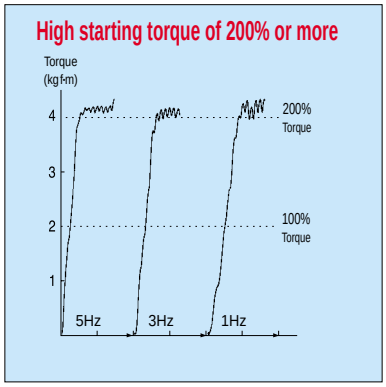
SF-320

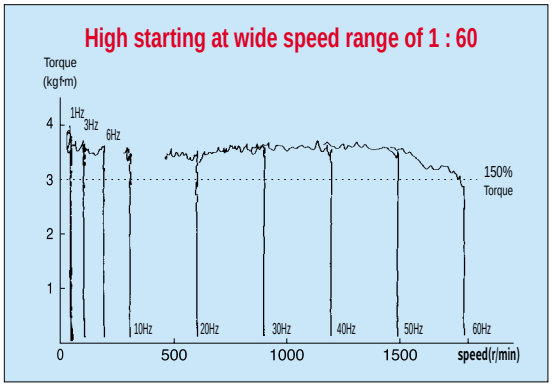
- Apply V/f control method in multi-motor application* and in PID function for industrial pumps and fans.

*Operation of more than one motor with one inverter

HF-320

- The sensorless vector control method provides 200% starting torque ! Furthermore, the maximum torque during operation exceeds 150%.
- The auto tuning function permits high-performance operation.
- This inverter is suitable for machines that need high torque during start-up, slow-speed operation or regular operation. It is ideal for applications such as extruders, high-viscosity pumps, cart drivers, elevators, and special agitators, as well as for applications that need regenerative braking.





◆ List of Functions

■Monitor Mode/Basic Setting Mode

	HF	SF	Code	Function	Monitor/setting Range	Initial setting
Monitor	●	●	d01	Output frequency monitor	0.0–360.0Hz	–
	●	●	d02	Output current monitor	0.00–999.9A	–
	●	●	d03	Running direction monitor	F(forward run), r(reverse run), □(stop)	–
	●	●	d04	PID feedback value monitor	0.01–9,999	–
	●	●	d05	Input terminal status monitor	Display the status of terminal	–
	●	●	d06	Output terminal status monitor	Display the status of terminal	–
	●	●	d07	Operating frequency converted value monitor	(output frequency (Hz))×(frequency converted value: b86)	–
	●	●	d08	Trip monitor	Details of the latest error are displayed	–
	●	●	d09	Trip history monitor	The causes of past two errors, excluding the latest one, are displayed	–
Setting	●	●	F01	Output frequency setting	0.5–360Hz	Volume set value
	●	●	F02	Acceleration time 1 setting	0.1–3000s	10.0s
	●	●	F03	Deceleration time 1 setting	0.1–3000s	10.0s
	●	●	F04	Running direction setting	Forward/Reverse	Forward
Expanded Function	●	●	A--	(Extended function of A group setting)		
	●	●	B--	(Extended function of B group setting)		
	●	●	C--	(Extended function of C group setting)		
	●		H--	(Extended function of H group setting)		

■Expanded Function A (Frequently Used Functions)

	HF	SF	Code	Function	Monitor/setting Range	Initial setting
Basic setting	●	●	A01	Frequency Command	00: Potentiometer(Front case) 01: Control terminal 02: Panel or Digital operator	00
	●	●	A02	Run command	01: Control terminal 02: Panel or Digital operator	02
	●	●	A03	Base frequency setting	50–360Hz	60Hz
	●	●	A04	Maximum frequency setting	50–360Hz	60Hz
Analog input setting	●	●	A11	External frequency setting start	0.03–60Hz	0.0Hz
	●	●	A12	External frequency setting end	0.0–360Hz	0.0Hz
	●	●	A13	External frequency setting start rate	0–100%	0%
	●	●	A14	External frequency setting end rate	0–100%	100%
	●	●	A15	External frequency start pattern setting	00: Set frequency of (A11) 01: 0Hz	01
	●	●	A16	External frequency sampling count setting	1–8 times	8
Multispeed freg setting	●	●	A20 | A35	Multispeed frequency setting (speed 0–speed 15)	Setting range: 0.0–360Hz Arbitrary setting is possible	0: 0Hz 1: 5Hz 2: 10Hz 3: 15Hz 4: 20Hz 5: 30Hz 6: 40Hz 7: 50Hz 8: 60Hz Other: 0Hz
	●	●	A38	Jogging frequency setting	0.00–9.99Hz	1.0Hz
	●	●	A39	Jogging stop operation selection	00: Free run stop 01: Decelerate stop 02: DC braking	00
V/F characteristics	●	●	A41	Torque boost mode selection	00: Manual 01: Auto	00
	●	●	A42	Manual torque boost setting	0–99	30
	●	●	A43	Boost frequency setting	0.0–50.0%	1.5%
	●	●	A44	V/F characteristics setting	00: Constant torque 01: Reduced torque 02: Sensorless vector (HF only)	00
	●	●	A45	Output voltage gain setting	50–100%	100%

	HF	SF	Code	Function	Monitor/setting Range	Initial setting
DC Braking	●	●	A51	DC braking function selection	00: Invalid 01: Valid	00
	●	●	A52	DC braking frequency setting	0.00–10.0Hz	0.5
	●	●	A53	DC braking output delay time setting	0.00–5s	0.0
	●	●	A54	DC braking power setting	0–100%	0
	●	●	A55	DC braking time setting	0.0–60s	0.0
Upper/Lower limiter, jump frequency	●	●	A61	Frequency upper limit setting	0.0–360Hz	0.0Hz
	●	●	A62	Frequency lower limit setting	0.0–360Hz	0.0Hz
	●	●	A63	Jump frequency setting 1	0.0–360Hz	0.0Hz
	●	●	A64	Jump frequency width setting 1	0.0–10Hz	0.5Hz
	●	●	A65	Jump frequency setting 2	0.0–360Hz	0.0Hz
	●	●	A66	Jump frequency width setting 2	0.0–10Hz	0.5Hz
	●	●	A67	Jump frequency setting 3	0.0–360Hz	0.0Hz
	●	●	A68	Jump frequency width setting 3	0.0–10Hz	0.5Hz
PID Control	●	●	A71	Selection of PID function	00: Without PID control 01: With PID control	00
	●	●	A72	P gain setting	0.2–5 times	1.0
	●	●	A73	I gain setting	0.0–150s	1.0
	●	●	A74	D gain setting	0.0–100s	0.0
	●	●	A75	PID scale rate setting	0.01–99.9	1.0
	●	●	A76	Feedback input method setting	00: IRF terminal (Current input) 01: VRF terminal (Voltage input)	00
AVR	●	●	A81	AVR function selection	00: ON 01: OFF 02: OFF at deceleration	02
	●	●	A82	Motor input voltage setting	200/220/230/240 200V class 380/400/415/440/460 400V class	200/400
Acceleration/Deceleration function	●	●	A92	Second acceleration time setting	0.1–3,000S	15.0S
	●	●	A93	Second deceleration time setting	0.1–3,000S	15.0S
	●	●	A94	Second acceleration/deceleration switching method	00: External contact signal (2nd acceleration/deceleration terminal) 01: Preset frequency	00
	●	●	A95	Acceleration switching frequency	0–360Hz	0Hz
	●	●	A96	Deceleration switching frequency	0–360Hz	0Hz
	●	●	A97	Acceleration pattern selection	00: Linear 01: S-curve	00
	●	●	A98	Deceleration pattern selection	00: Linear 01: S-curve	00

■Expanded Function H (HF–320 Sensorless Vector Control Tuning function)(Note 1)

Code		Function	Setting Range	Initial setting
Sensorless Vector Control	H01	Auto tuning mode selection	0: Without auto tuning 1: With auto tuning 2: Measurement of resistance and inductance	0
	H02	Motor data selection	0: Standard motor 1: AF motor (Inverter motor) 2: Auto tuning data (H30–H34 selection)	0
	H03	Motor capacity	0.1/0.2/0.4/0.75/1.5/2.2/3.7/5.5/7.5 (kW)	(Note 2)
	H04	Motor poles	2/4/6/8	4
	H05	Speed control response constant setting	0–99 Equivalent to 10 mec per set value of 1	20
	H06	Motor stabilization constant setting	0–255%	100
Motor Constant	H20	Motor constant R1 setting	0–0.999,1.00–9.99,10.0–65.5 Unit: Ω	(Note 3)
	H21	Motor constant R2 setting	0–0.999,1.00–9.99,10.0–65.5 Unit: Ω	(Note 3)
	H22	Motor constant L setting	0–0.999,1.00–9.99,10.0–65.5 Unit: mH	(Note 3)
	H23	Motor constant Io setting	0–0.999,1.00–9.99,10.0–65.5 Unit: A	(Note 3)
	H24	Inertia setting	Ratio to the single inertia of a motor with the same kW as the inverter 0–0.999,1000 Unit: %	2.0
Auto Tuning Motor Constant	H30	Motor constant R1 setting	0.–0.999,1.00–9.99,10.0–65.5 Unit: Ω	(Note 3)
	H31	Motor constant R2 setting	0.–0.999,1.00–9.99,10.0–65.5 Unit: Ω	(Note 3)
	H32	Motor constant L setting	0.–0.999,1.00–9.99,10.0–65.5 Unit: Ω	(Note 3)
	H33	Motor constant Io setting	0.–0.999,1.00–9.99,10.0–65.5 Unit: mH	(Note 3)
	H24	Inertia setting	Ratio to the single inertia of a motor with the same kW as the inverter 0–0.999,1000 Unit: %	2.0

(Note 1) SF-320 Series have no H parameter.
(Note 2) The same capacity as the inverter
(Note 3) Data on SUMITOMO standard motors with the same capacity as the inverter

◆ Operation

■Explanation of operation panel

Easily operate the SF-320 and HF-320 series with the standard equipped digital operator panel.

Monitor section (LED)
Displays the monitored frequency, motor current, motor r/min, or alarm condition.

Monitor lamp
Indicates the monitor item.

Run key
Press to start the motor.

Stop / Reset key
Press to stop the motor or to cancel the alarm.

Function key
Key to enter the monitor, basic setting, and extension function modes

Power lamp
Indicates ON/OFF of the control circuit power supply.

Monitor lamp
Indicates the monitor item.
Hz: Frequency, A: Rated current

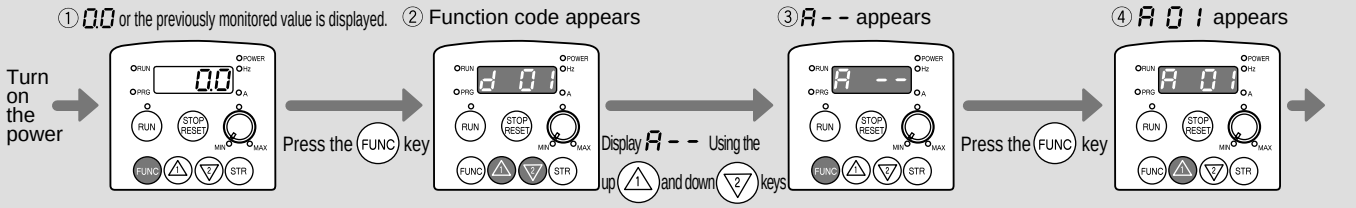
Frequency setting potentiometer

Store key
Use to store the set data.

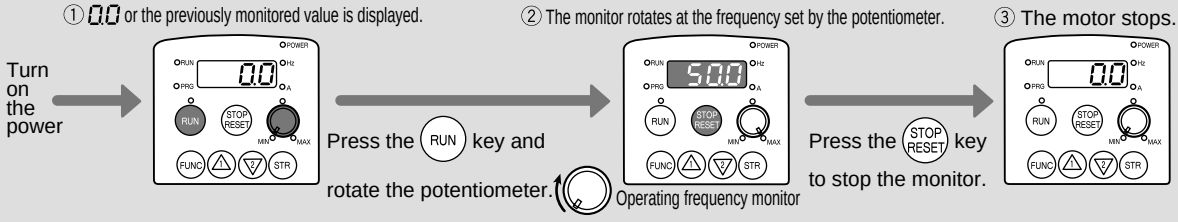
UP / down keys
Scroll the function code No. or change the setting

■Method of operation

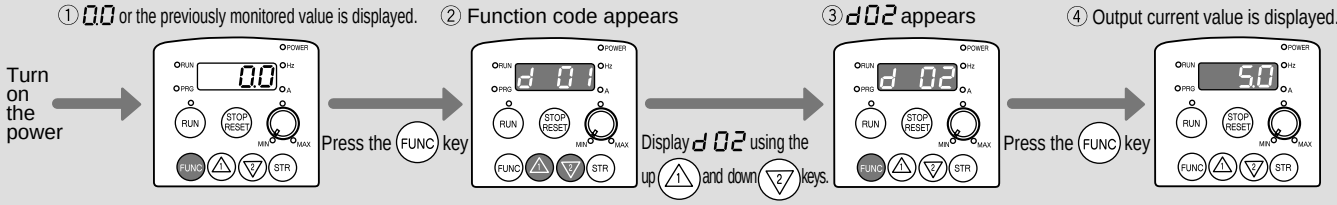
1. Setting (Setting the maximum frequency)



2. Running the motor (Using the potentiometer)



3. Monitoring (Monitoring the output current value)



◆ Explanation of Functions

■Monitor

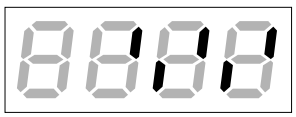
d01 Output frequency monitor
d02 Output current monitor
d03 Operation direction monitor
d04 PID feedback value monitor
d05 Input terminal status monitor
d06 Output terminal status monitor
d07 Output frequency equivalent monitor
d08 Trip monitor
d09 Trip history monitor

• The output frequency and current value can also be monitored.

d05 Input terminal status monitor

The status of all multifunctional input terminals is displayed together.

·Example of display

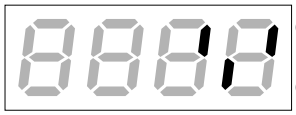


Terminal No. RST 3DF 2DF RR FR (SF)
RST DFH DFM DFL RR FR (HF)

d06 Output terminal status monitor

• The status of the error output terminal and multifunctional output terminal is displayed together.

·Example of display



Terminal No. AL DRV UPF (SF, HF)

The status of error output terminal ON means the case where an error has occurred or power is turned off (b-contact point) or an error has occurred (a-contact point).

d07 Output frequency equivalent monitor

• The output frequency multiplied by the conversion factor set by b86 is displayed.
Use this to display line speed. (Refer to p.10.)

d08 Trip monitor
d09 Trip history monitor

• d08 displays the contents of the latest error. In addition to the error code, the output frequency, output current, and DC voltage between P and N at time of trip can be viewed.
• d09 shows the error codes of the last two trips prior to the latest one.(Refer to p.13)

■Setting the output frequency

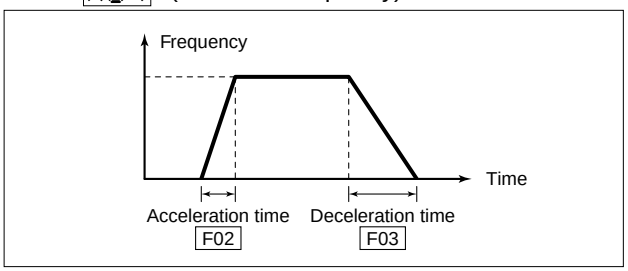
F01 Output frequency setting

• When setting the frequency command destination of A01 to 02:Panel or Digital operator, set the output frequency by F01. Also use F01 to set one of the multispeed frequency.

■Setting the acceleration/deceleration time

F02 Acceleration time 1 setting
F03 Acceleration time 1 setting

· F02 is the acceleration time from 0Hz to A04 (maximum frequency). F03 is the deceleration time from A04 (maximum frequency) to 0Hz.



■Setting the direction of operation

F04 Operation direction setting

• The direction of motor operation (rotation) is set.

■Setting the frequency command destination and operation command destination

A01 Frequency command
A02 Operation command

• The frequency command destination and operation/stop command destination are set by the following codes.

Even if the operation command destination is set to the control terminal, the STOP key on the panel and operator is valid. It can be made invalid as well. (Function code b87)

A01 Code of frequency command destination

Command destination	Code
Main unit volume	00
Control terminal (VRF and IRF terminals)	01
Digital panel	02

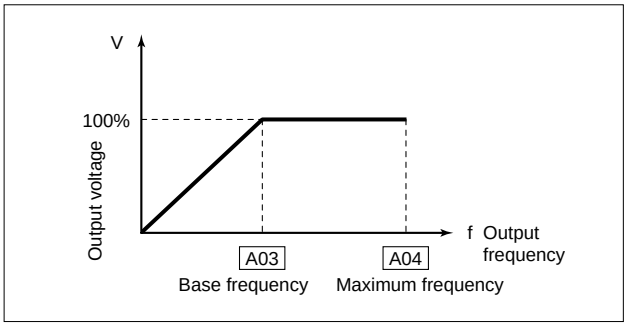
A02 Code of operation command destination

Command destination	Code
Control terminal (VRF and IRF terminals)	01
Digital panel	02

■Setting the base frequency and maximum frequency

A03 Base frequency setting
A04 Maximum frequency setting

• The base frequency and maximum frequency can be set within the 50-360 Hz range (1 Hz).

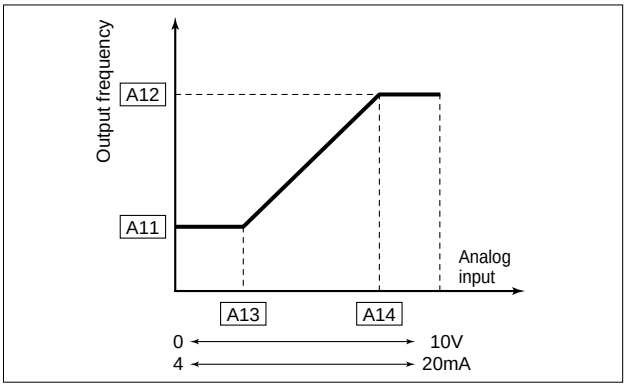


Explanation of Functions

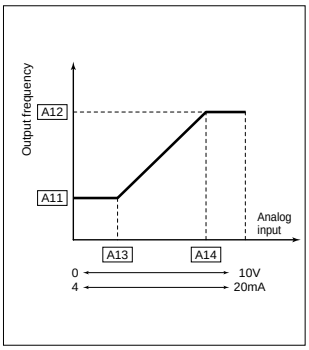
Analog input setting

A11 External frequency setting start
A12 External frequency setting end
A13 External frequency setting start rate
A14 External frequency setting end rate
A15 External frequency start pattern setting
A16 External frequency sampling count setting

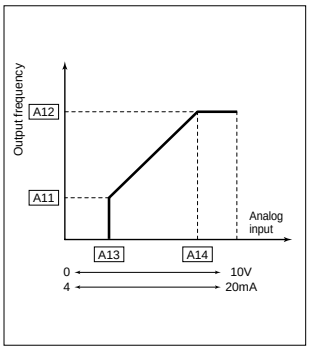
• The frequency scaling for the analog input signal (4-20mA or 0-10V) is adjusted as follows.



A11 : The scaling start frequency is set.
A12 : The scaling end frequency is set.
A13 : The analog input level for the scaling start frequency is set.
A14 : The analog input level for the scaling end frequency is set.
• A15 sets the frequency output start method.



When A15 : 00
Starting at the start frequency (set by A11).



When A15 : 01
Starting at 0 Hz.

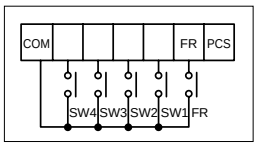
• A16 sets the number of sampling times (1-8 times) of the analog input filter.
The average value sampled is used to determine the command frequency.
Reduce the sample number to increase response time. Increase the sample number to filter out noisy signals.

Set value	1 ◄——► 8
Response	Quick ◄——► Slow
Stability (Filter effect)	Small ◄——► Large

Multispeed frequency setting

A20 - A35 Multispeed frequency setting
• A maximum of 16 multispeed operation is possible when multispeed frequencies are set in A20 - A35 . (Input terminals are set with C01-C06.)

	Multispeed frequency setting code	Multifunctional input terminal SW4	SW3	SW2	SW1
0 speed	A20	OFF	OFF	OFF	OFF
1 speed	A21	OFF	OFF	OFF	ON
2 speed	A22	OFF	OFF	ON	OFF
3 speed	A23	OFF	OFF	ON	ON
4 speed	A24	OFF	ON	OFF	OFF
5 speed	A25	OFF	ON	OFF	ON
6 speed	A26	OFF	ON	ON	OFF
7 speed	A27	OFF	ON	ON	ON
8 speed	A28	ON	OFF	OFF	OFF
9 speed	A29	ON	OFF	OFF	ON
10 speed	A30	ON	OFF	ON	OFF
11 speed	A31	ON	OFF	ON	ON
12 speed	A32	ON	ON	OFF	OFF
13 speed	A33	ON	ON	OFF	ON
14 speed	A34	ON	ON	ON	OFF
15 speed	A35	ON	ON	ON	ON

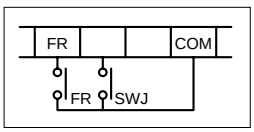


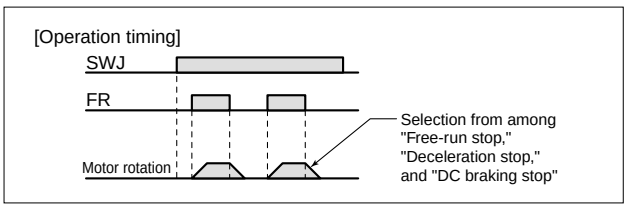
* Multispeed 1 through 15 can always be activated. However, Multispeed 0 can only be activated when A01 is programmed to 02.
* Additionally, A20 through A35 can be programmed using F01 when each corresponding speed is activated.
* Setting during operation is possible.

Jogging operation setting

A38 Jogging frequency setting
A39 Jogging stop mode selection

• Use motor jogging operation for simple positioning. Assign jogging to any of the input terminals FR through RST.
• The operation after jogging can be selected from among "Free-run stop," "Deceleration stop," and "DC braking stop."

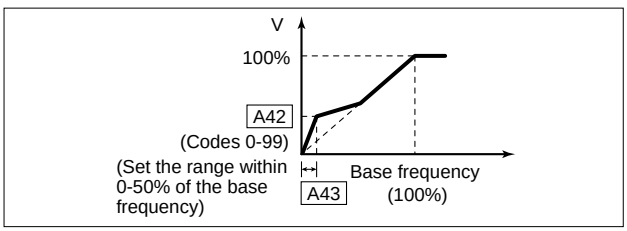




Torque boost setting

A41 Torque boost mode selection
A42 Manual torque boost setting
A43 Manual torque boost frequency adjustment

• The output voltage is raised in the low-frequency band to adjust the motor torque. A41 permits selection of Manual/Auto for torque boost.
• When the torque boost is set to Manual, the torque boost level and the boost frequency can be set.



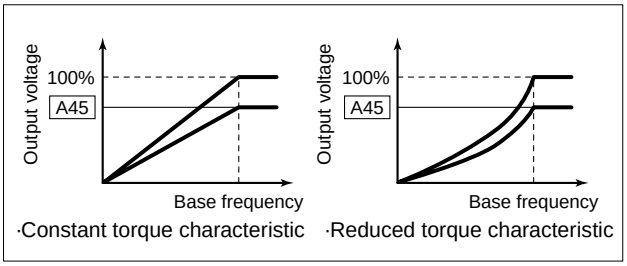
◆ Explanation of Functions

■V/F characteristic setting

A44 V/F characteristics setting
A45 Output voltage gain setting

- A44 permits selection of constant torque or reduced torque of the V/F characteristic by means of a load. HF-320 permits selection of sensorless control as well.
- The output voltage at the base frequency can be set within 50-100% of the range by A45.

Use this to operate a motor with rated voltage lower than the inverter supply voltage under optimum condition.

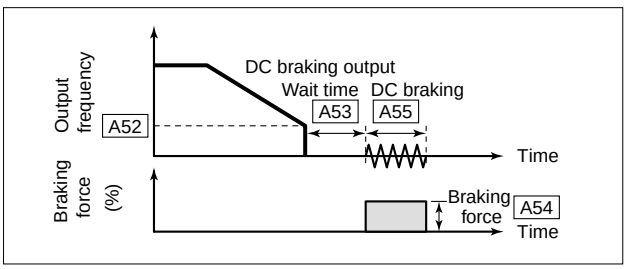


■DC braking

A51 DC braking function selection
A52 DC braking frequency setting
A53 DC braking output wait time setting
A54 DC braking force setting
A55 DC braking time setting

- Use DC braking during deceleration and stopping for position and to adjust stopping accuracy.
- When the DC braking output wait time is set, the operation during that time will be in the free-run state.

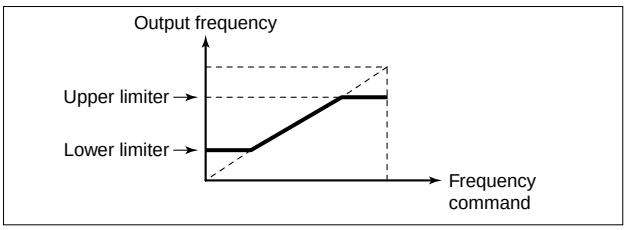
(Note 1) Disable DC braking for applications with frequent starts and stops.
(Note 2) Excessively strong braking force may cause tripping.



■Upper/lower limiter

A61 Frequency upper limiter setting
A62 Frequency lower limiter setting

- The upper and lower limits of the output frequency can be controlled.

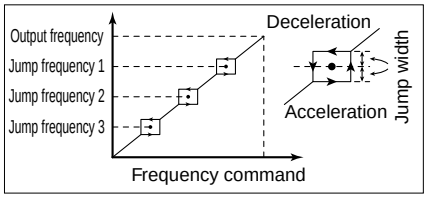


■Jump frequency setting

A63, A65, A67 Jump frequency setting
A64, A66, A68 Jump frequency width setting

* Used to avoid resonance frequencies on the applied machinery.

A maximum of three jump frequencies can be set.



■PID function

A71 PID control selection
A72 P gain setting
A73 I gain setting
A74 D gain setting
A75 PID scale setting
A76 Feedback input method setting

Use PID operation to control processes with a feedback signal. PID control the motor speed to drive the error between the target value and feedback value to zero.
It is effective for controlling processes such as temperature, pressure, flow rate, and air capacity.

⟨P: Proportional control⟩

In this control, the operation quantity is proportional to the deviation of the target value and feedback value.

A72 P gain setting K_P

- The response of the operation quantity with respect to deviation is adjusted.

K_P	Large ⟷ Small
Response	Quick ⟷ Slow
Stability	Unstable ⟷ Stable

⟨I: Integral control⟩

Under the proportional control alone, the operation quantity is small when the deviation is small; therefore correction may not be sufficient, and will not coincide with the target value.
I: Integral control is the function to correct the above. Deviation is accumulated with the passage of time to correct the operation quantity.

A73 I gain setting K_I

- Integral time is set. When the integral time is short (I/K_I), the response is quick.

K_I	Small ⟷ Large
Response	Quick ⟷ Slow
Stability	Unstable ⟷ Stable

⟨D: Differential operation⟩

Differential operation uses the rate of change of the deviation to adjust the operation quantity. It is used for correction of P (proportional) and I (integral) control.

A74 D gain setting K_D

K_D	Large ⟷ Small
Response	Quick ⟷ Slow
Stability	Unstable ⟷ Stable

A75 PID scale setting

· This function converts the target value so that it will match the feedback value.
d04 permits monitoring of the value obtained by multiplying the feedback value by the factor of A75.
Indication by flow rate and air capacity is also possible.

◆ Explanation of Functions

A76 Feedback input method setting

• The feedback input destination is set.

Code [00] ... IRF terminal (4–20mA)

[01] ... VRF terminal (0–10VDC)

■AVR function

A81 AVR function selection

A82 AVR motor voltage selection

• Irrespective of the input power, the output voltage is corrected and maintained at a constant value according to the motor voltage. (However, output voltage exceeding the input voltage of the inverter is not possible.)

• The AVR function can be turned OFF during deceleration.

■2nd deceleration function

A92 2nd Acceleration time setting

A93 2nd Deceleration time setting

A94 2nd accel/decel change method

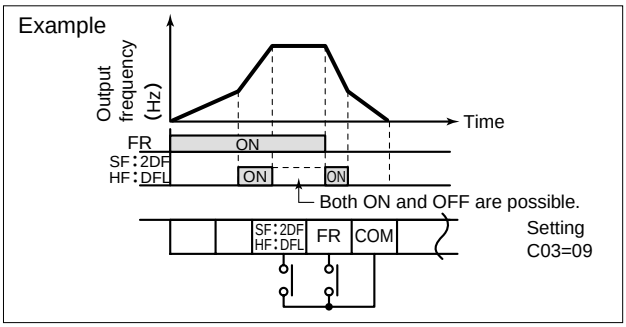
A95 Acceleration time crosseover frequency

A96 Deceleration time crossover frequency

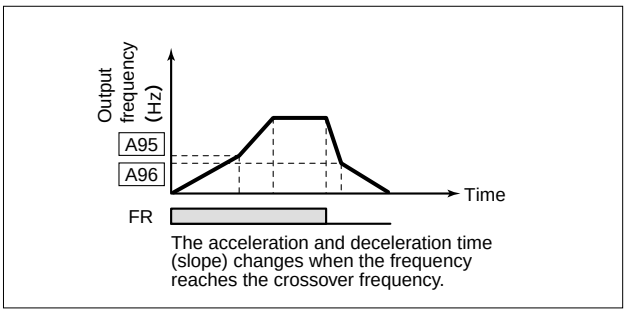
• The acceleration and deceleration time can be changed during operation. Use the 2nd acceleration and 2nd deceleration times when load inertia changes during operation.

• Change the acceleration and deceleration time with input terminals or with the crossover frequency setting.

〈Change by terminal〉



〈Change by crossover frequency〉



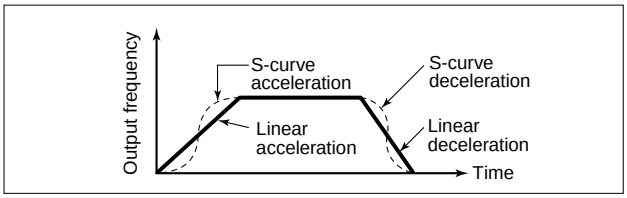
■Acceleration/deceleration pattern

A97 Acceleration pattern selection

A98 Deceleration pattern selection

• The characteristics of acceleration and deceleration can be selected from among "linear" and "S-curve."

• The S-curve permits softer starts and stops than linear acceleration/deceleration. It is effective in preventing cargo from tipping.



■Setting the restart (mode)

b01 Restart mode

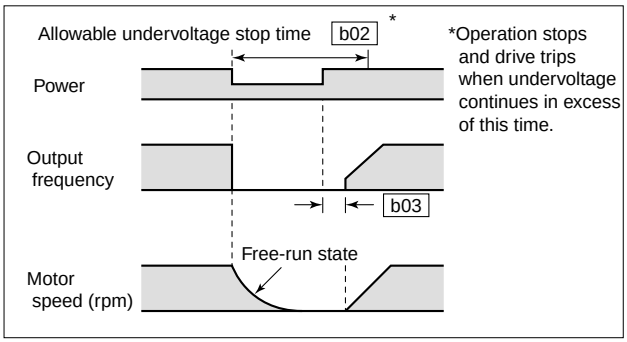
b02 Allowable undervoltage time setting

b03 Retry waiting time setting

• Retry or restart is possible after undervoltage, overcurrent, and overvoltage protection functions. (If the fault conditions still persists after the decided retrials, the drive will stop.)

〈Set value of b01〉

Set value	Function
00	Alarm output after tripped
01	0 Hz restart
02	Frequency matching restart
03	Deceleration stop after frequency matching restart



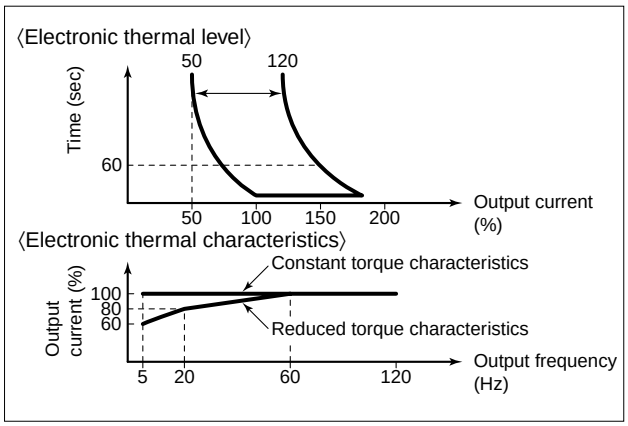
■Electronic thermal

b12 Electronic thermal level setting (Note 1)

b13 Electronic thermal characteristics selection

• Level and characteristic setting are available for the built-in electronic thermal relay to protect motor from overheating.

◆ Explanation of Functions



(Note) Contact the technical staff at our factory when the electronic thermal level is to be set below 50%.

■Overload restriction

b21 Overload restriction peration mode selection
b22 Overload restriction level setting
b23 Overload restriction deceleration rate

- The level at which the overload restriction function is activated, details of operation, and deceleration rate for overload restriction can be set.
- * When this function is used for a load with a large moment of inertia, the overload restriction level will extend the deceleration time.

■Software lock (data change prevention)

b31 Lock selection

- When set data should not be changed, use this software lock function.
- The software lock function is enabled by code setting or by a control terminal.

Set value	Function
00*	[When software lock terminal is ON] Change of any function other than software lock is impossible.
01*	[When software lock terminal is ON] Change of any function other than software lock and frequency setting is impossible.
02	[Whether software lock terminal is ON or OFF] Change of any function other than software lock is impossible.
03	[Whether software lock terminal is ON or OFF] Change of any function other than software lock and frequency setting is impossible.

* When the control terminal is used

■No-load reactive current setting

b32 Reactive current setting

- The no-load (reactive) current of the motor is set.

Note: b32 is only for SF-320.

■Analog meter adjustment

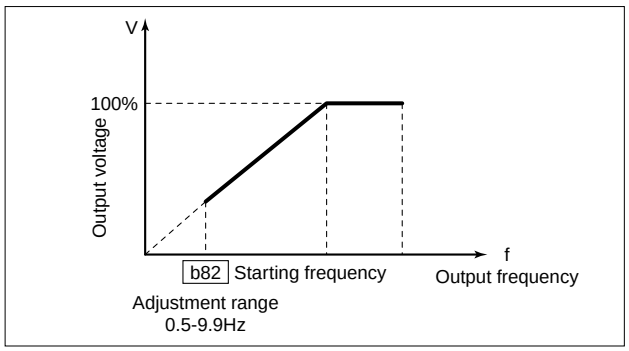
b81 Analog meter adjustment

- The scale of an analog frequency counter and ammeter connected to the inverter can be adjusted.

■Starting frequency adjustment

b82 Starting frequency adjustment

- The starting frequency output from the inverter can be adjusted. Increase the starting frequency to increase the starting torque. (Higher values will reduce the soft start and increase the inrush current.)



■Carrier frequency setting

b83 Carrier frequency setting

- The carrier frequency can be changed. When the carrier frequency is lowered, the motor noise increases, but generated high-frequency noise and leakage current can be reduced.
  (The carrier frequency is held at 1 kHz automatically when DC braking is working.)

Carrier frequency	Low ◄——► High
Motor noise	Large ◄——► Small
Leak current	Small ◄——► Large

(Note) The table is not quantitative.

■Data/trip history initialization

b84 Initialization mode selection
b85 Initialization data selection

- Data on all the functions can be returned to the initial set values. In addition, the trip history can be cleared.

■Setting the frequency conversion scale display function

b86 Frequency conversion value setting

- The d07 monitor permits monitoring of the frequency after scale conversion. The line speed and speed of rotation can be displayed.
  Displayed value = Output frequency × b86

(Example) When the line speed is 6 m/min at 60 Hz
0.1 is set to b86 .
〈Display〉
At 20 Hz: 2.0 (2 m/min)
At 40 Hz: 4.0 (4 m/min)

Explanation of Functions

STOP key-meaning selection

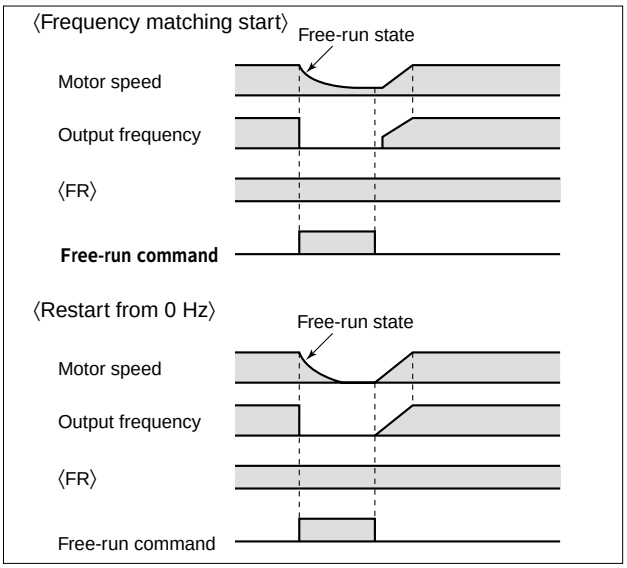
b87 STOP key meanning selection

- Even when operation command is set to external signal (control terminal), STOP the key on the operator is valid. It can be made invalid with this function.

Operation restart mode after free-run

b88 Free-run operation mode setting

- The inverter operation after canceling the free-run command can be selected.



(Note) In "Frequency matching start," operation starts at motor coasting speed to reduce the chance of tripping. However, response is slower than "Restart from 0 Hz."

Setting the multifunctional input terminal

C01 – C06 Multifunctional input terminal function setting

- Functions are selected and assigned freely to input terminals, FR through RST. C11 – C16 permits selection of input signal polarity A-contact (NO) or B-contact (NC) for each terminal.
- C06 and C16 are only for HF-320.

〈Selection function〉

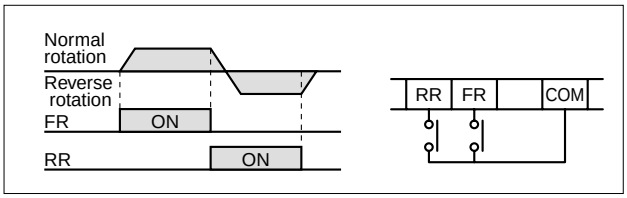
Code	Function	Code	Function
00	Forward command	09	No.2 acceleration/ deceleration command
01	Reverse command	11	Free-run command
02	Multi-stage speed 1 command	12	External trip
03	Multi-stage speed 2 command	13	USP function
04	Multi-stage speed 3 command	15	Software lock
05	Multi-stage speed 4 command	16	Analog current input selection
06	Jog operation command	18	Reset
08*	B-mode selection	27*	Frequency Up
		28*	Frequency Down

*HF-320 only.

• Forward/reverse operation command

Use this when operating the inverter with an external contact signal. (control terminal)

It is valid when the operation command destination is "Terminal block."

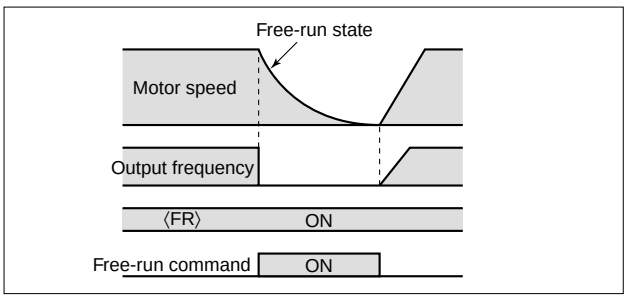


- Multi-stage speed command (Refer to p.7.)
- Inching operation command (Refer to p.7.)
- No.2 acceleration/deceleration command

The No.2 acceleration/deceleration change method must be set to "terminal" by A94. (Refer to p.9.)

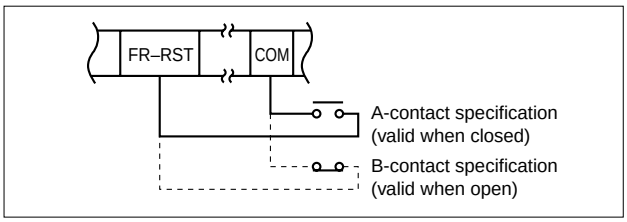
- Free-run stop command

The inverter output can be cut off during operation for free-run stop of the motor. It can be used on a motor with brake.



- External trip input

Use this to shut off inverter output with external contact signal to provide safety interlock with operating equipment.



(Note) External trip input is assigned to the inputs (FR through RST). When this function is activated, the inverter outputs an fault signal and cuts off output.

- USP (Urattended Start Prevention) function

The function can prevent resumption of operation when the power retarns with operation command engaged. When this function is enabled and power is applied with run (operation) command issued to the control terminal, the drive trips and displays the trip code for "USP error."

- Software lock (Refer to p.10.)
- Analog current input selection

Analog input for frequency command can be switched between voltage (0-10VDC) and current (4-20mA) inputs.

When using analog current input or analog voltage input, set the frequency command destination to "Terminal."

◆ Explanation of Functions

Input method	Terminal assignment	Terminal ON/OFF
Current (4-20 mA)	Assigned	ON
Voltage (0-10 V)		OFF
Current + Voltage	Not assigned	–

(Note) When no terminal is assinged, the frequency equivalent to the current command value plus voltage command value is output.

• Reset

This digital input removes the trip condition from the drive and cancels the fault signal.

(Note) When this function is turned on during operation, the output is cut off.

■Multifunctional input terminal contact setting

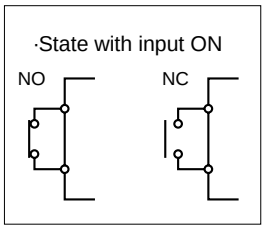
C11 - C16 Multifunctional input terminal contact setting

• The contact condition of each multifunction input terminal can be independently set to A -contact (NO-normally open) or B-contact (NC-normally closed).

• C16 is only for HF-320.

Multifunctional input terminal		Setting code
SF-320	HF-320	
FR	FR	C11
RR	RR	C12
2DF	DFL	C13
3DF	DFM	C14
RST	DFH	C15
	RST	C16

A-contact (NO): ON (operation) when short-circuited
B-contact (NC): ON (operation) when opened



■Setting the multifunctional output terminal

C21 , C22 Multifunctional output terminal contact setting
C41 Overload signal level setting
C42 Frequency detect setting during acceleration
C43 Frequency detect setting during deceleration
C44 PID deviation level setting

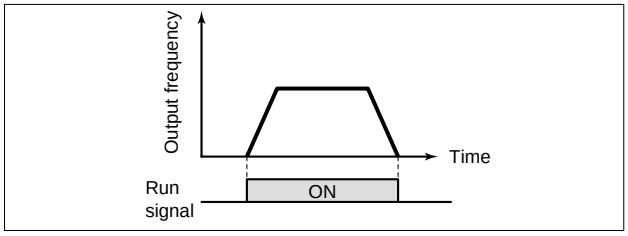
• The functions of output terminals UPF and DRV are assigned freely by C21 and C22 . The output is an open collector type.

Code	Function	Code	Function
00	Run signal	03	Overload signal
01	Frequency match signal	04	PID deviation signal
02	Frequency detect signal	05	Alarm signal

• C31 and C32 sets the output condition to either A-contact (NO-normally open) or B-contact (NC-normally closed).

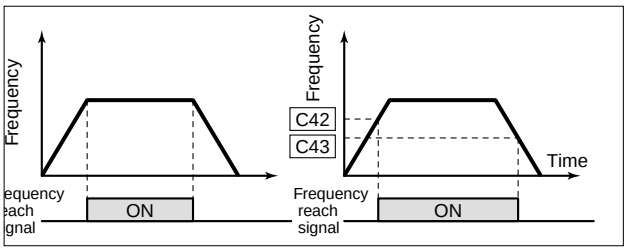
• Run signal

Output when the inverter is operating.



• Frequency match signal and frequency detect signal

These functions for the multifunction output terminals enable output signals either when output frequency matches command frequency or when output frequency exceeds detect frequencies. The detect frequencies are assigned with C42 and C43 separately for acceleration and deceleration.



• Overload signal

When the output current exceeds the level set by C41 the signal is output.

• PID deviation signal

A signal is output when the deviation of the target value and feedback value exceeds the value set by C44 during PID control.

• Alarm signal

When a trip occurs, the multifunctional output terminal (open collector output) outputs a fault signal.

■Selection of the monitor signal

C23 Monitor signal selection

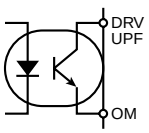
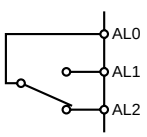
Set value	Contents of monitor
00	Analog output and frequency monitor
01	Analog output and current monitor
02	Digital output and frequency monitor

• The output monitor from the FRQ terminal is selected. In the case of a digital output frequency monitor, the scale is changed by the coefficient set by b86 . (Refer to b81 and b86 .)

■Multifunctional output terminal and alarm terminal contact setting

C31 C32 Multifunctional output terminal contact setting
C33 Alarm terminal contact setting

• The operation specification of the multifunctional output terminals UPF and DRV and alarm terminals AL0-AL2 can be selected from among A-contact and B-contact.

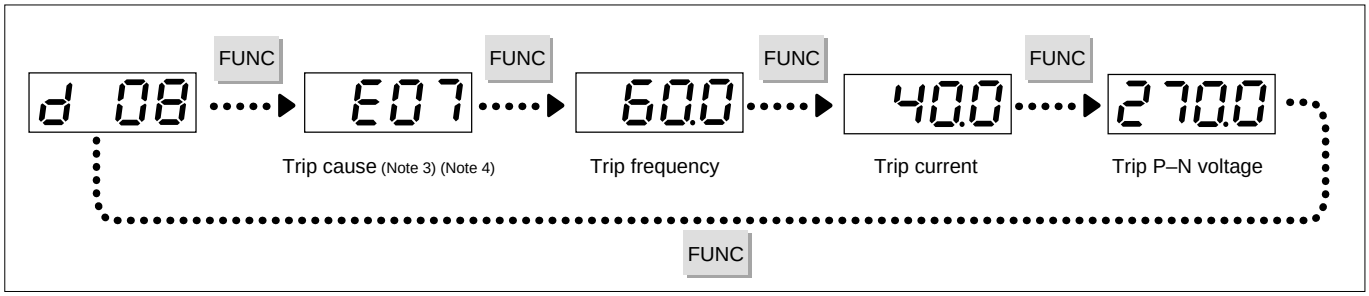
Terminal	A-contact specification	B-contact specification
Output (Transistor output) 	(Initial setting) L level when ON H level when OFF	H level when ON L level when OFF
Alarm (Relay output) 	(Initial setting) AL0-AL1 open when normal or power is cut off AL0-AL1 closed when alarm	AL0-AL1 closed when normal AL0-AL2 closed when alarm or power is cut off

◆ Protective Functions

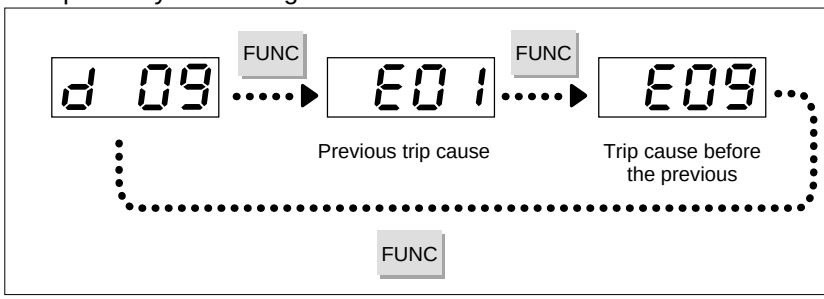
Name	Description		Digital panel/ Digital operator	Remote operator ERR1****
Overcurrent protection	When output of an inverter is short circuited, the motor is locked or drive sees sudden heavy load, the inverter output current exceeds a certain level, and the inverter output is cut off.	Constant speed	E01	OC.Drive
		Deceleration	E02	OC.Decel
		Acceleration	E03	OC.Accel
		Others	E04	Over.c
Overload protection (Note 1)	When a motor overload is detected by the electronic thermal function, the output of the inverter is cut off.		E05	Over.L
Overvoltage protection	When the inverter DC bus voltage exceeds a certain level due to regenerative energy from the motor, this protection engages and the output of the inverter is cut off.		E07	Over.V
EEPROM error (Note 2)	When the built-in memory has problems due to noise or excessive temperature rise, this protection engages and the output of the inverter is cut off.		E08	EEPROM
Undervoltage protection	Output is cut off when the DC bus voltage goes down below a certain level. Low DC bus voltage of an inverter causes improper function of the control circuit, generates the motor heat and causes low torque. Trip level is approximately 150-160V for 200V Class and 300-320V for 400V Class.		E09	Under.V
CPU error	Malfunction or error of the built-in CPU causes this fault and shuts the inverter output off.		E11 E22	CPU1 CPU2
External trip	A fault indication from external equipment signals an intelligent input terminal programmed for External Trip to cut off the output of the inverter.		E12	EXTERNAL
USP error	With USP function enabled through the intelligent terminal, a run command when power comes on causes this fault.		E13	USP
Ground fault protection	At power up, the inverter looks for ground fault at the motor output terminals. This protection is provided for the inverter and not for operator safety.		E14	GND.Fit
Input overvoltage protection	When the input voltage is higher than the specified value, inverter responds to this 100 seconds after power up by faulting and by cutting off the output. The detection level is approximately 258V for 200V Class and 516V for 400V Class.		E15	OV.SRC
Thermal protection	When thermal sensor in the inverter detects high temperature in the power module, the inverter trips and shuts output off.		E21	OH FIN
Undervoltage wait condition	The drive shuts output and waits when input voltage drops below a specific value.		_ _U	UV.WAIT

(Note 1) Press the reset key 10 seconds after the alarm has occurred.
(Note 2) If an EEPROM error E08 occurs, be sure to comfirm the seting value again.

■Trip Monitoring Method



■Trip History Monitoring Method



(Note 3) Details of the latest error are displayed
(Note 4) ___ is displayed when there is no error.

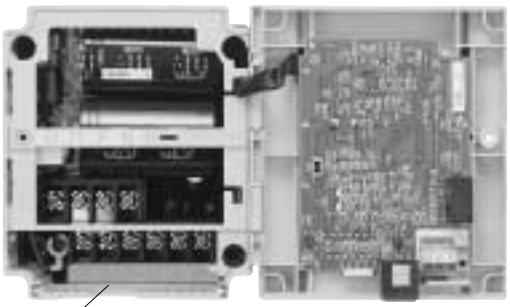
◆ Standard

Model			200 V class								400 V class						
			SF3202-A20	SF3202-A40	SF3202-A75	SF3202-1A5	SF3202-2A2	SF3202-3A7	SF3202-5A5	SF3202-7A5	SF3204-A40	SF3204-A75	SF3204-1A5	SF3204-2A2	SF3204-3A7	SF3204-5A5	SF3204 7A5
Applicable motor (kW) (Note 1)			0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Output	Rated capacity (kVA)		0.6	1.0	1.5	2.7	3.8	6.1	9.1	12.2	1.1	1.9	2.9	4.2	6.6	9.9	12.2
	Rated output current		1.6	2.6	4.0	7.1	10	15.9	24.0	32.0	1.5	2.5	3.8	5.5	8.6	13.0	16.0
	Rated output voltage (Note 2)		3-phase 200–230 V (corresponding to input voltage)								3-phase 380–460 V (corresponding to input voltage)						
	Overload current rating		150%, 60 seconds														
Power	Rated input voltage		3-phase: 200–230V±10%								3-phase: 380–460V±10%						
	Frequency		50/60Hz±5%								50/60Hz±5%						
Control	Control method		Sinusoidal pulse width modulation (PWM) control														
	Output frequency range (Note 3)		0.5–360Hz														
	Frequency accuracy		Digital command: ±0.01% of the Max. frequency, Analog command: ±0.1% (25˚C±10˚C) of the Max. frequency														
	Frequency setting resolution		Digital: 0.01Hz, Analog: Max. frequency/1000														
	Carrier frequency		0.5–16 kHz variable														
	Volt./Freq. characteristic		V/f characteristic (Setting available for constant torque, reduced torque.) • V/f characteristics variable arbitrarily														
	Acceleration/Deceleration time		0.1–3000sec. linear acceleration/deceleration, second acceleration/deceleration setting available														
	Dynamic braking (short time) (Note 4)		40%			30%		20%			40%		30%		20%		
	DC braking		Operating frequency, time, and braking force variable														
Input signal	Frequency setting signal	Digital	Operation by operator key														
		Analog	Operation by built-in potentiometer (Analog setting)														
		External setting	DC0–10V • DC4–20mA (Note 5)														
	Operation signal	Operator panel	Run/Stop (Forward/Reverse change by function)														
		External setting	Forward run (A-contact), Reverse run available with terminal assignments (A- or B-contact selectable)														
	Intelligent input terminal		Forward run command, reverse run command, multi-stage speed setting, jogging command 2-stage acceleration/deceleration command, free run stop command, external trip, USP function, software lock, analog current input select signal, Reset														
Output signal	Intelligent output terminal		Run, frequency match/detect, overload, PID deviation, alarm														
	Frequency monitor		Analog output frequency monitor, analog output current monitor or digital output frequency monitor.														
	Alarm output contact		ON for the inverter alarm (IC contact output) (Possible to change to OFF for the alarm)														
Other functions			AVR function, upper/lower limiter, PID control, carrier frequency, jump frequency, electronic thermal level, gain/bias adjustment, retry function, automatic torque boost, trip monitoring etc.														
Protective function			Overcurrent, overvoltage, undervoltage, overload, high temperature, CPU error, EEPROM error, ground fault detection at startup, internal communication error etc.														
Operating environment	Location		Indoor (Corrosion, toxicity, inflammable gas, dust, or oil mist not allowed.)														
	Ambient temperature		-10–50˚C (Note 6)														
	Storage temperature		-10–60˚C (Temperature in a short period of time during transportation)														
	Ambient humidity		90% RH or less														
	Altitude		Altitude 1,000m or less														
	Vibration		0.6 G or less														
Protective structure			IP20														
Weight (kg)			0.8	0.85	0.9	1.7	1.8	2.8	5.5	5.7	1.3	1.7	1.7	1.7	2.8	5.5	5.7

(Note 1) The applicable motor refers to Sumitomo 3-phase standard motor and AF motor (4-pole).
To use other motors, care must be taken to prevent the rated motor current (50Hz) from exceeding the output current of the inverter.
(Note 2) The output voltage decreases as the main power supply voltage decreases. (Except when AVR function is active)
(Note 3) To operate the motor beyond 60Hz, consult the motor manufacturer about the maximum allowable rotation speed.
(Note 4) The value is the average deceleration torque based on energy absorption capacity for short deceleration cycle (stoppage from 60Hz). This does apply to continuous regenerative load.
(Note 5) The frequency command is the maximum frequency at 9.8V for input voltage 0–10 VDC, or at 19.6mA for input current 4–20mA.
If this characteristic is not convenient, contact your Sumitomo sales representative.
(Note 6) To use the inverter at 40˚C or higher, it is necessary to reduce the output current rating and carrier frequency values.

◆ Terminal Functions

[Main circuit terminals]



Main circuit terminals Front case (right open)

[Control circuit terminals]

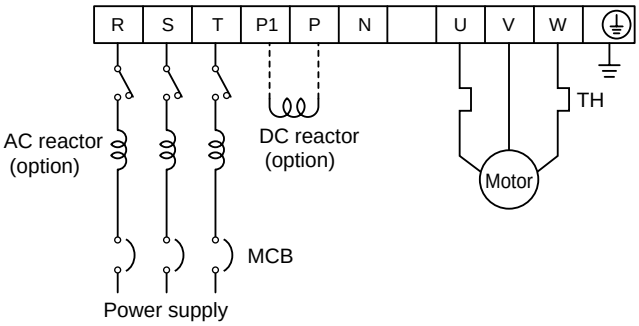
Ternimal section cover (left open) Control circuit terminals

	Terminal screw diameter	Terminal width
Main circuit terminals	M4(M3.5)	9(7.1)
Control circuit terminals	M2 (press-tight type)	–
Alarm terminal	M3 (press-tight type)	–
Ground	M4	–

( ) : SF3202-A20–A75

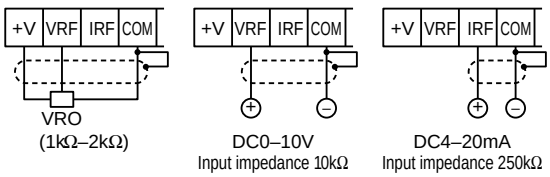
■Main Circuit Terminals

Symbol	Terminal name	Explanation
R,S,T	Main power supply input terminals	Connect the input power supply
U,V,W	Inverter output terminals	Connect the motor
P,P1	DC reactor connection terminals	Connect the DC reactor for harmonic suppression. Power factor improvent (Remove the shorting bar when connecting a DC reactor.)
⏚	Ground connection terminal	Ground to prevent electric shock and reduce noise.



■Control Circuit Terminal

Symbol		Terminal Name	Remarks
FRQ	Input / Monitor signal	Monitor terminal (frequency, current, etc.)	PWM output
COM		Common terminal for monitor and frequency command	–
PCS		External DC power supply	DC24V, Max.30mA
RST 3DF 2DF RR FR		Intelligent input terminals: Select from forward run command, reverse run command, multispeed commands, 2-stage acceleration / deceleration command,free run stop, external trip, jogging, analog input selection, software lock, reset.	Contact input SW — (FR,RR,RST 2DF,3DF) / COM Operation by SW Close. (Changeable to operation by SW Open.) (Note 2) Minimum ON time: 12 ms or more
+V	Frequency command (Note 1)	Power supply for frequency command	DC10V
VRF		Frequency command input (voltage command)	DC0–10V (Variable by parameter) Input impedance 10kΩ
IRF		Frequency command input (current command)	DC4–20mA (Variable by parameter) Input impedance 250Ω
COM		Common terminal for frequency command	–
DRV UPF OM	Output signal	Intelligent output terminals: Select from match run, overload , alarm, frequency match, and frequency detect.	Open collector output L level at operation (ON) DC27V, Max.50mA
AL2 AL1 AL0	Alarm output	Alarm output terminals (IC contact (relay) output) AL0 AL1 AL2 〈Initial setting〉 When normal, power OFF: AL0-AL2 Close When alarm: AL0-AL2 Open (Switchable to AL0-AL1 Close when normal.)	Contact rating AC250V 2.5A (resistive load) 0.2A (cosφ=0.4) DC30V 3.0A (resistive load) 0.7A (cosφ=0.4) (Min.) AC100V 10mA DC 5V 100mA

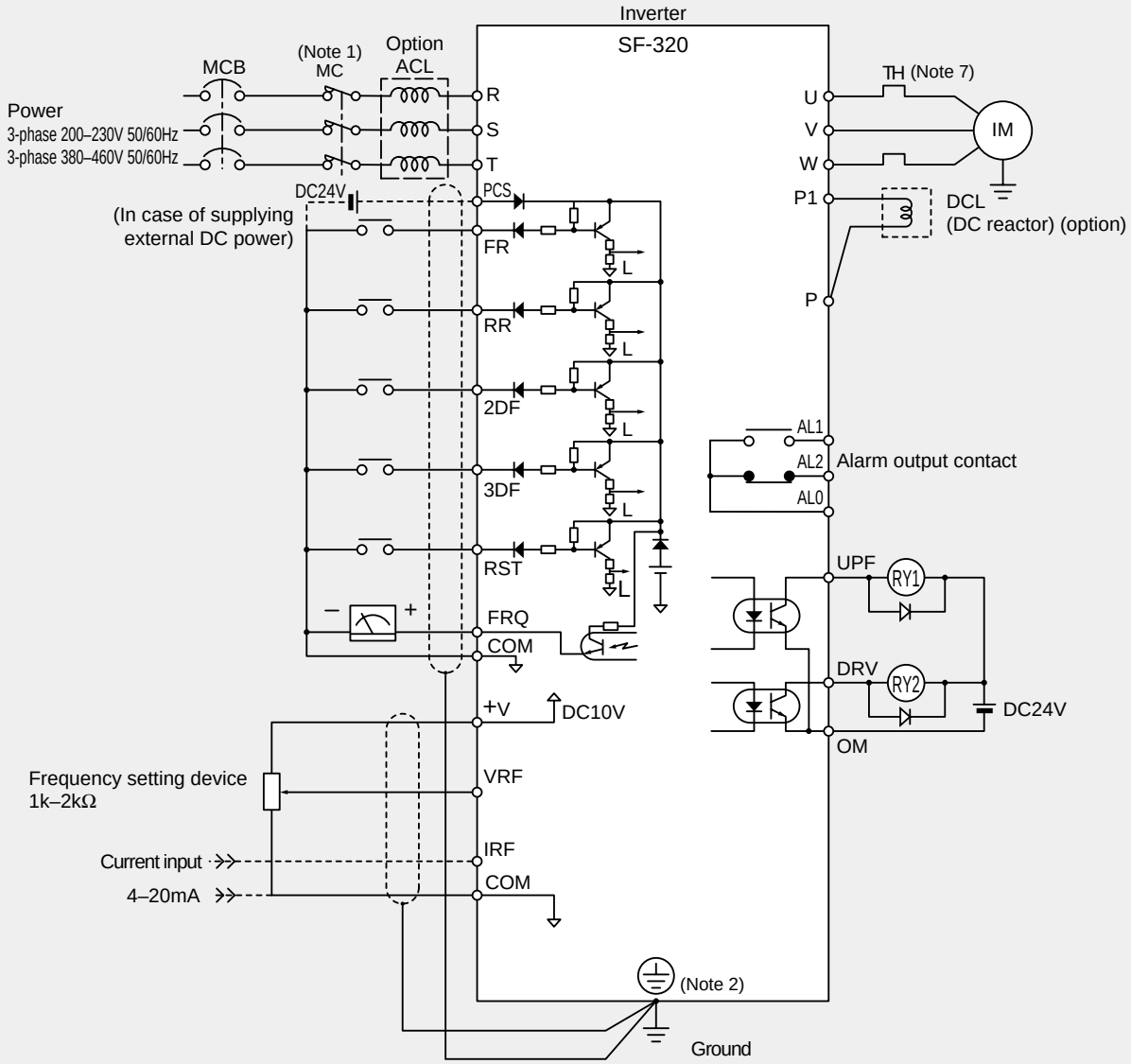


Note: When the analog input selection is not assigned to the multifunctional input terminal, the frequency obtained by adding the voltage command value and current command value is output. When either voltage or current is selected, be sure to allot the analog input selection to the multifunctional input terminal.

(Note 1) The maximum frequency command is 9.8 V when the voltage input is 0-10 VDC, and 19.6 mA when the current input is 4-20 mA.
(Note 2) The reset terminal cannot be changed to [Operation with (SW) Open].

◆ Basic Connection Diagram

〈Basic connection diagram〉



(Note 1) Do not start and stop the motor with only the MC swithch.

⚠ (Note 2) Be sure to ground the inverter chassis and motor.

(Note 3) The common of each terminals differ.

Terminal	FR, RR, 2DF, 3DF, RST, FRQ	+V, VRF, IRF	UPF, DRV
Common	COM	COM	OM

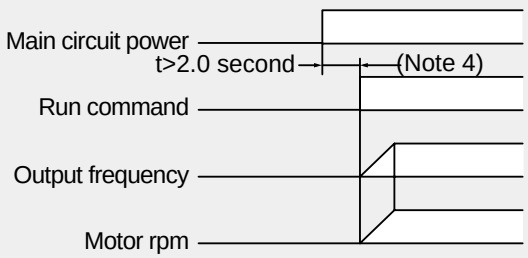
(Note 4) Refer to the figure at right for the power ON and Run command ON timing. Even if the main circuit power and operation command are turned ON simultaneously, the control power will not be turned ON for 2.0 seconds and not permit operation.

(Note 5) When the contactor is to be opened and closed for each operation, be sure to insert an ACL on the primary side of the contactor to reduce the inrush current.

(Note 6) When a DC reactor is used, remove the shorting bar between terminals P and P1.

(Note 7) Provide external thermal overload protection for each when operating frequency is below 30 Hz or when multiple motors are used.

[Turn on the main power at the timing shown below.]

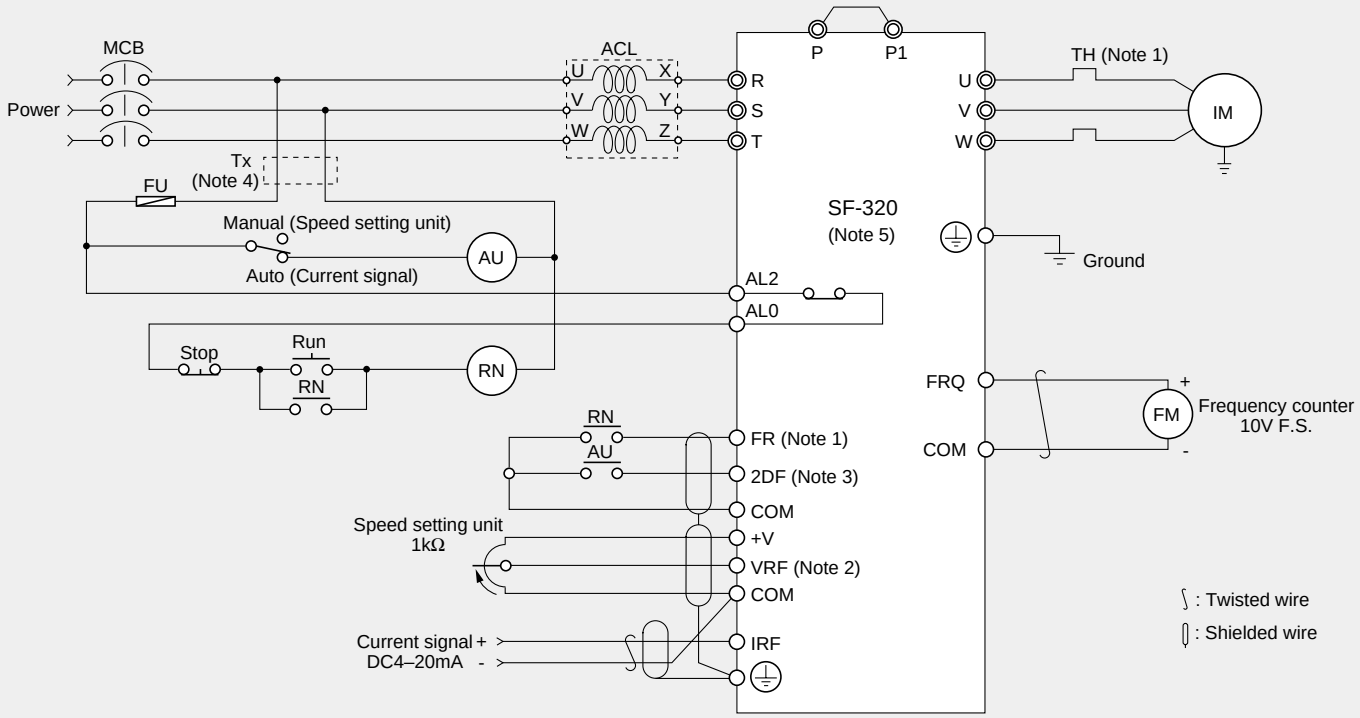


◆ Applied Connection Diagram

✻Refer to p.24 for circuits using PID.

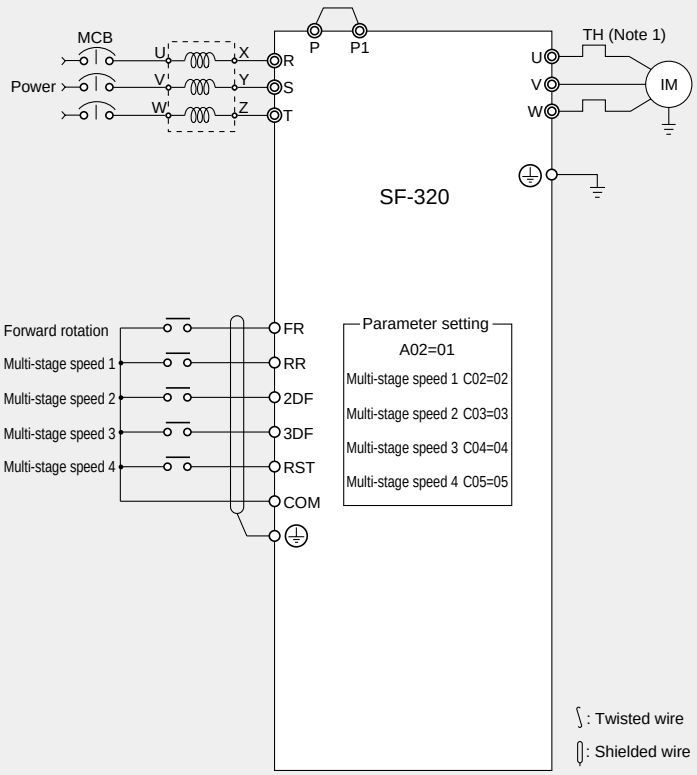
■Operation by current signal (4-20 mADC)

When terminal 2DF is used as a current/voltage signal (speed setting unit) changeover signal input



(Note 1) Set parameter A02 to “01: Input to control circuit.”
(Note 2) Set parameter A01 to “01: Input to control circuit.”
(Note 3) Set parameter C03 to “16: Current input selection.”
(Note 4) Install a step-down transformer when the power is 400 V-class.
(Note 5) Set parameters C33 to "00".

■Multispeed operation (16-step speed)



Frequency setting by external signal

Frequency setting	Multi-stage speed 1	Multi-stage speed 2	Multi-stage speed 3	Multi-stage speed 4
A20	×	×	×	×
A21	○	×	×	×
A22	×	○	×	×
A23	○	○	×	×
A24	×	×	○	×
A25	○	×	○	×
A26	×	○	○	×
A27	○	○	○	×
A28	×	×	×	○
A29	○	×	×	○
A30	×	○	×	○
A31	○	○	×	○
A32	×	×	○	○
A33	○	×	○	○
A34	×	○	○	○
A35	○	○	○	○

(×···Open, ○···Closed)

(Note) Install it when the operation frequency is less than 30 Hz.

◆ Standard

Model			200 V class								400 V class						
			HF3202-A20	HF3202-A40	HF3202-A75	HF3202-1A5	HF3202-2A2	HF3202-3A7	HF3202-5A5	HF3202-7A5	HF3204-A40	HF3204-A75	HF3204-1A5	HF3204-2A2	HF3204-3A7	HF3204-5A5	HF3204-7A5
Applicable motor (kW) (Note 1)			0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	0.4	0.75	1.5	2.2	3.7	5.5	7.5
Output	Rated capacity (kVA)		0.6	1.0	1.5	3.0	4.2	6.7	9.1	12.2	1.1	1.9	2.9	4.2	6.6	9.9	12.2
	Rated output current		1.6	3.0	5.0	8.0	11	17.5	24.0	32.0	1.5	2.5	3.8	5.5	8.6	13.0	16.0
	Rated output voltage (Note 2)		3-phase 200–230 V (corresponding to input voltage)								3-phase 380–460 V (corresponding to input voltage)						
	Overload current rating		150%, 60 seconds														
Power	Rated input voltage		3-phase: 200–230V±10%								3-phase: 380–460V±10%						
	Frequency		50/60Hz±5%														
Control	Control method		Sensorless vector (V/F control) sinusoidal pulse width modulation PWM control														
	Output frequency range (Note 3)		0.5–360Hz														
	Frequency accuracy		Digital command: ±0.01% of the Max. frequency, Analog command: ±0.1% (25˚C±10˚C) of the Max. frequency														
	Frequency setting resolution		Digital: 0.01Hz, Analog: Max. frequency/1000														
	Carrier frequency		0.5–16 kHz variable														
	Volt./Freq. characteristic		V/f characteristic (Setting available for constant torque, reduced torque.) • V/f characteristics variable arbitrarily														
	Acceleration/Deceleration time		0.1–3000sec. linear acceleration/deceleration, second acceleration/deceleration setting available														
	Dynamic braking (short time) (Note 4)		40%			30%	20%				40%		30%	20%			
	Dynamic control (succession)		Use an optional dynamic braking resistor. (Refer to pp.23 and 27.)														
	DC braking		Operating frequency, time, and braking force variable														
Input signal	Frequency setting signal	Digital	Operation by operator key														
		Analog	Operation by built-in potentiometer (Analog setting)														
		External setting	DC0–10V • DC4–20mA (Note 5)														
	Operation signal	Operator panel	Run/Stop (Forward/Reverse change by function)														
		External setting	Forward run (A-contact), Reverse run available with terminal assignments (A- or B-contact selectable)														
	Intelligent input terminal		Forward run command, reverse run command, multi-stage speed setting, jogging command 2-stage acceleration/deceleration command, free run stop command, external trip, USP function, software lock, analog current input select signal, Reset														
Output signal	Intelligent output terminal		Run, frequency match/detect, overload, PID deviation, alarm														
	Frequency monitor		Analog output frequency monitor, analog output current monitor or digital output frequency monitor.														
	Alarm output contact		ON for the inverter alarm (IC contact output) (Possible to change to OFF for the alarm)														
Other functions			AVR function, S-curve acceleration/deceleration, upper and lower limiters, 16-stage speed, fine adjustment of start frequency, carrier frequency, jump frequency, gain and bias setting, jogging run, electronic thermal level adjustment, retry function, trip history monitor, 2nd setting selection, auto tuning.														
Protective function			Overcurrent, overvoltage, undervoltage, overload, high temperature, CPU error, EEPROM error, ground fault detection at startup, internal communication error etc.														
Operating environment	Location		Indoor (Corrosion, toxicity, inflammable gas, dust, or oil mist not allowed.)														
	Ambient temperature		-10–50˚C (Note 6)														
	Storage temperature		-10–60˚C (Temperature in a short period of time during transportation)														
	Ambient humidity		90% RH or less														
	Altitude		Altitude 1,000m or less														
	Vibration		0.6 G or less														
Protective structure			IP20														
Weight (kg)			0.8	0.85	0.9	1.7	1.8	2.8	5.5	5.7	1.3	1.7	1.7	1.7	2.8	5.5	5.7

(Note 1) The applicable motor refers to Sumitomo 3-phase standard motor and AF motor (4-pole).
To use other motors, care must be taken to prevent the rated motor current (50Hz) from exceeding the output current of the inverter.
(Note 2) The output voltage decreases as the main power supply voltage decreases. (Except when AVR function is active)
(Note 3) To operate the motor beyond 60Hz, consult the motor manufacturer about the maximum allowable rotation speed.
(Note 4) The value is the average deceleration torque based on energy absorption capacity for short deceleration cycle (stoppage from 60Hz). This does apply to continuous regenerative load.
(Note 5) The frequency command is the maximum frequency at 9.8V for input voltage 0–10 VDC, or at 19.6mA for input current 4–20mA.
If this characteristic is not convenient, your Sumitomo sales representative.
(Note 6) To use the inverter at 40˚C or higher, it is necessary to reduce the output current rating and carrier frequency values.

Explosion-proof motor series with protection type "frameproof (d2G4)".

200V•400V class

NEW

Features

1. Control range: 1:20 wide-range control
2. Starting torque: 200% or more
3. Speed fluctuation:±1% accuracy (Sensorless vector control operation)

Specifications

kW×P	Motor frame No.	Specifications							Scope of manufacture
		Insulation	Characteristics	Output base frequency	Protection type: Indoor JP44	Protection type: Outdoor JPW44	Starting torque	Constant power range	
0.2×4	T-71S	Class B	1:20 Constant torque Continuous rating	Dedicated to 60 Hz	Totally-enclosed self-cooled		200% or more	–120Hz	1. Available • Direct coupling with CYCLO • Outdoor • JEM flange • Foot mounted 2. Unavailable • With PG • With brake
0.4×4	T-80M								
0.75×4	T-90L				Totally-enclosed fan-cooled				
1.5×4	T-100L								
2.2×4	T-112M							–110Hz	
3.7×4	T-132MS							–100Hz	

200 V class 0.2 kW model alone is available.

⚠ The output base frequency is 60 Hz only. Any other base frequency setting may cause fire. Be sure to set the base frequency at 60 Hz.

⚠ The explosion-proof (d2G4) motor is used only with HF-320 Series, and it cannot be used with SF-320 Series. Set the inverter to "Sensorless vector control."

Option

Operator station specifications for Exd2

Model No.	EGFCT3203			
Ordering type	OS1-Exd2-□-□	OS2-Exd2-□-□	OS3-Exd2-□-□	OS4-Exd2-□-□
Frequency counter	Scale: 0-100% (Special scale is also available.)			
Volume	RA30YN-2W 1kΩ			
Pilot lamp	–	Power indication	Power indication	Power indication
Operation switch	ON-OFF selector switch	Reverse-Stop-Normal selector switch	Normal-Reverse selector switch	ON-OFF pushbutton switch

(Products are made according to customer's specifications.)

Ordering type OS1-Exd2- 2 -□

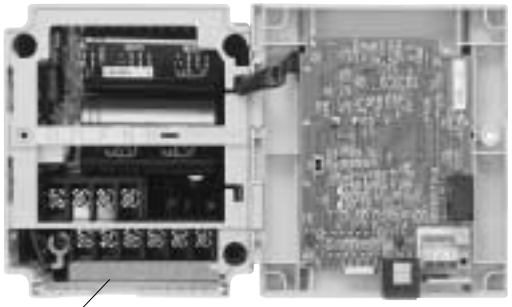
- 1. Pilot lamp power: 24 VDC
- 2. Pilot lamp power: 100 VAC
- 3. Pilot lamp power: 200 VAC

Meter input specifications: 0-10 V.F.S.

Contact us when the wiring distance exceeds 30 m.

◆ Terminal Functions

[Main circuit terminals]



Main circuit terminals Front case (right open)

[Control circuit terminals]

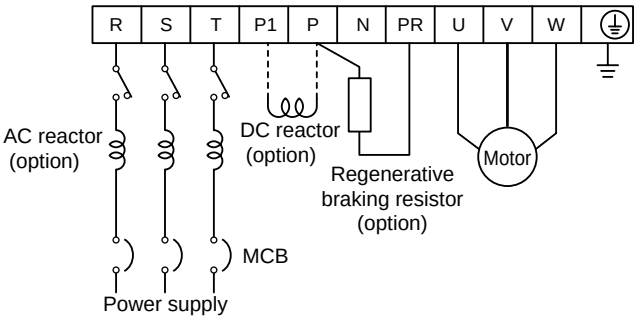
Ternimal section cover (left open) Control circuit terminals

	Terminal screw diameter	Terminal width
Main circuit terminals	M4(M3.5)	9(7.1)
Control circuit terminals	M2 (press-tight type)	–
Alarm terminal	M3 (press-tight type)	–
Ground	M4	–

( ) : HF3202-A20–A75

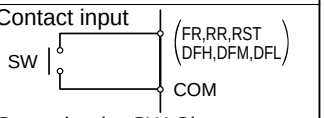
■Main Circuit Terminals

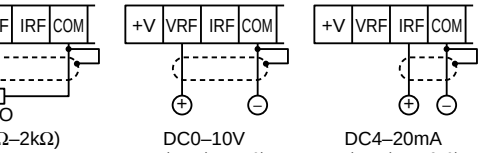
Symbol	Terminal name	Explanation
R,S,T	Main power supply input terminals	Connect the input power supply
U,V,W	Inverter output terminals	Connect the motor
PR,P, P1,N	P–PR: Regenerative braking resistor (Note 1)	Regenerative brerakking registor terminals
	P-P1: Short bar or DCL	Connect the DC reactor for harmonic suppression. Power factor improvent
⏚	Ground	Ground to prevent electric shock and reduce noise.



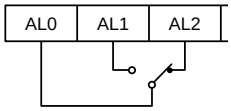
(Note 1) Contact our company when continuous regenerative operation is desired.

■Control Circuit Terminal

Symbol		Terminal Name	Remarks
FRQ	Input / Monitor signal	Monitor terminal (frequency, current, etc.)	PWM output DC 10V 1mA
COM		Common terminal for monitor and frequency command	–
PCS		External DC power supply	DC24V, Max.30mA
RST		Intelligent input terminals: Select from forward run command, reverse run command, multispeed commands, 2-stage acceleration/deceleration command, free run stop, external trip, jogging, analog input selection, software lock, reset, and initial setting. Un attended start prevention.	Contact input  Operation by SW Close. (Changeable to operation by SW Open.) (Note 2) Minimum ON time: 12 ms or more
DFM, DFH			
DFL			
RR			
FR			
+V	Frequency command (Note 1)	Power supply for frequency command	DC10V
VRF		Frequency command input (voltage command)	DC0–10V (Variable by parameter) Input impedance 10kΩ
IRF		Frequency command input (current command)	DC4–20mA (Variable by parameter) Input impedance 250Ω
COM		Common terminal for frequency command	–
DRV	Output signal	Intelligent onput terminals: Select from run, overload, alarm,frequency match, and set frequency defect.	Open collector output L level at operation (ON) DC27V, Max.50mA
UPF			
OM			
AL2	Alarm output	Alarm output terminals (IC contact (relay) output) 〈Initial setting〉 When normal, power OFF: AL0-AL2 Close When alarm: AL0-AL2 Open (Switchable to AL0-AL1 Close when normal.)	Contact rating AC250V 2.5A (resistive load) 0.2A (cosφ=0.4) DC30V 3.0A (resistive load) 0.7A (cosφ=0.4) (Min.) AC100V 10mA DC 5V 100mA
AL1			
AL0			

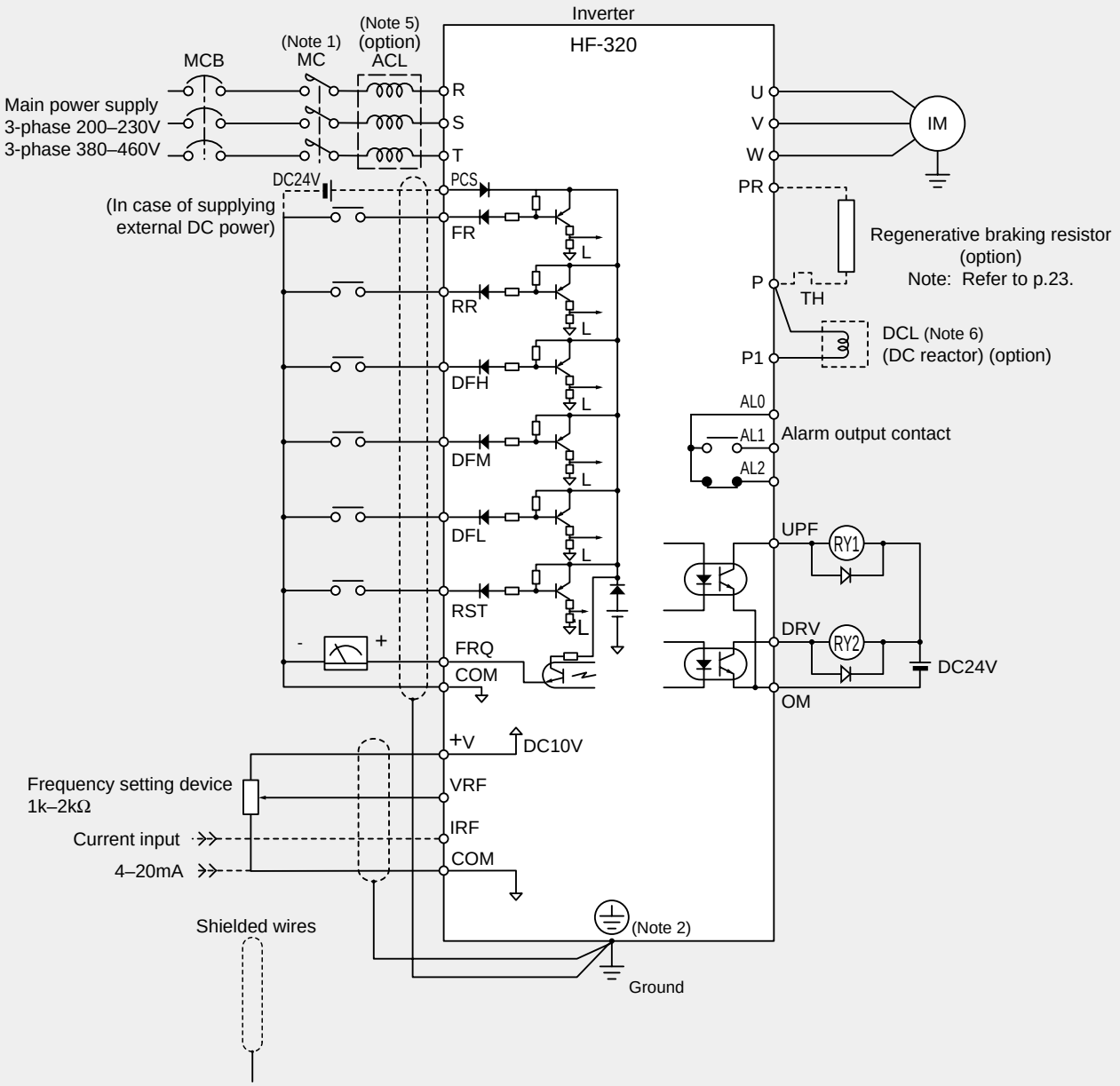


Note: When the analog input selection is not assigned to the multifunctional input terminal, the frequency obtained by adding the voltage command value and current command value is output. When either voltage or current is selected, be sure to allot the analog input selection to the multifunctional input terminal.



(Note 1) The maximum frequency command is 9.8 V when the voltage input is 0-10 VDC, and 19.6 mA when the current input is 4-20 mA.
(Note 2) The reset terminal cannot be changed to [Operation with (SW) Open].

Connection Diagram



(Note 1) Do not start and stop the motor with only the MC switch.
Refer to p.23 for the reference circuit for MC.

⚠(Note 2) Be sure to ground the inverter chassis and motor.

(Note 3) The common of each terminals differ.

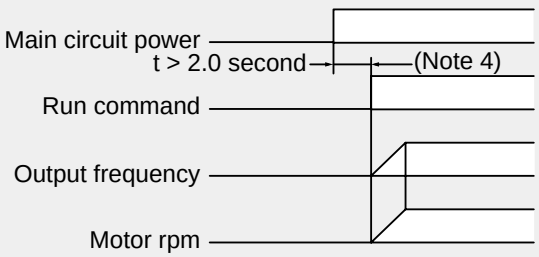
Terminal	FR, RR, DFH, DFM, DFL, RST, FRQ	+V, VRF, IRF	UPF, DRV
Common	COM	COM	OM

(Note 4) Refer to the figure at right for the power ON and Run command ON timing. Even if the main circuit power and operation command are turned ON simultaneously, the control power will not be turned ON for 2.0 seconds and not permit operation.

(Note 5) When the contactor is to be opened and closed for each operation, be sure to insert an ACL on the primary side of the contactor to reduce the inrush current.

(Note 6) When a DC reactor is used, remove the shorting bar between terminals P and P1.

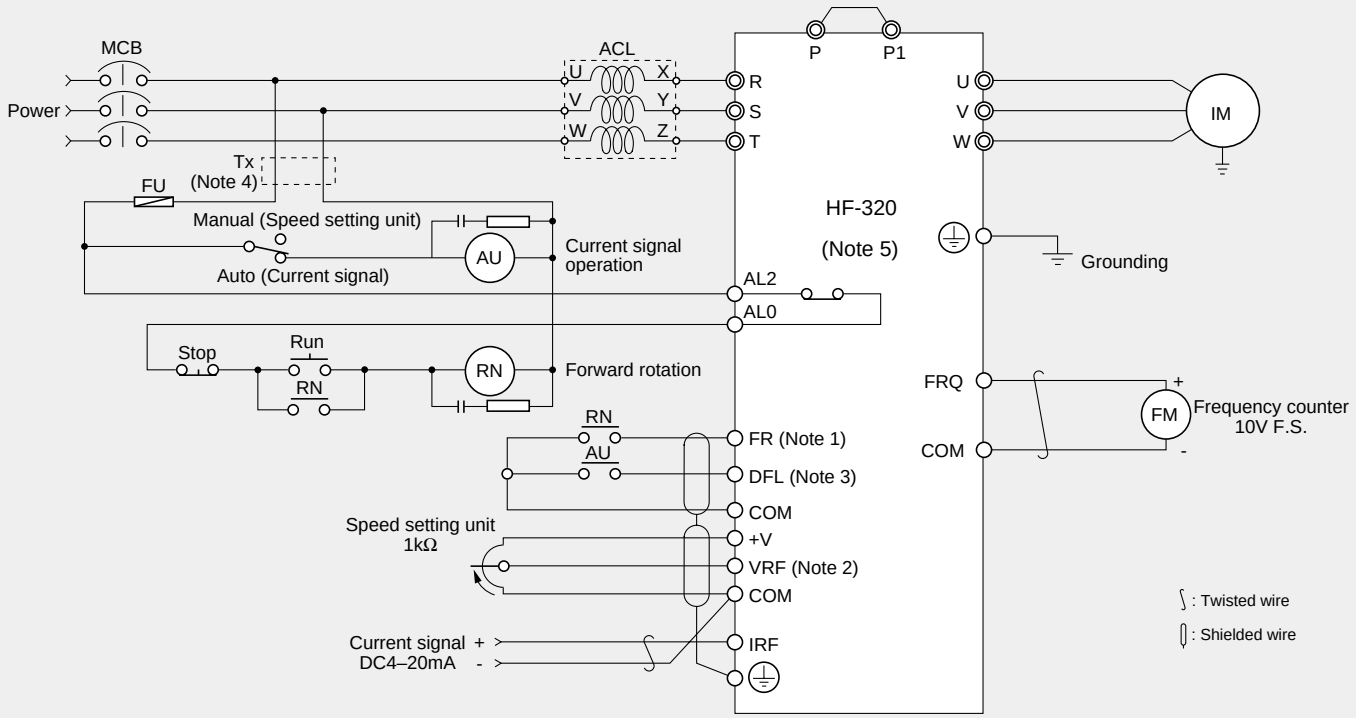
[Turn on the main power at the timing shown below.]



◆ Applied Connection Diagram

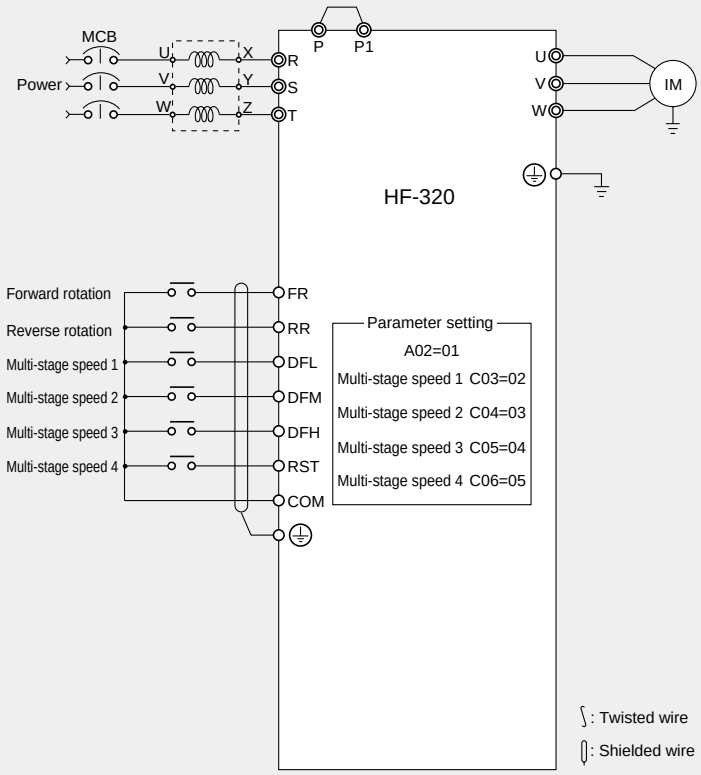
■Operation by current signal (4-20 mADC)

When terminal DFL is used as a current/voltage signal (speed setting unit) changeover signal input



(Note 1) Set parameter A02 to “01: Input to control circuit.”
(Note 2) Set parameter A01 to “01: Input to control circuit.”
(Note 3) Set parameter C03 to “16: Current input selection.”
(Note 4) Install a step-down transformer when the power is 400 V-class.
(Note 5) Set parameter C33 to "00".

■Multispeed operation (16-step speed)



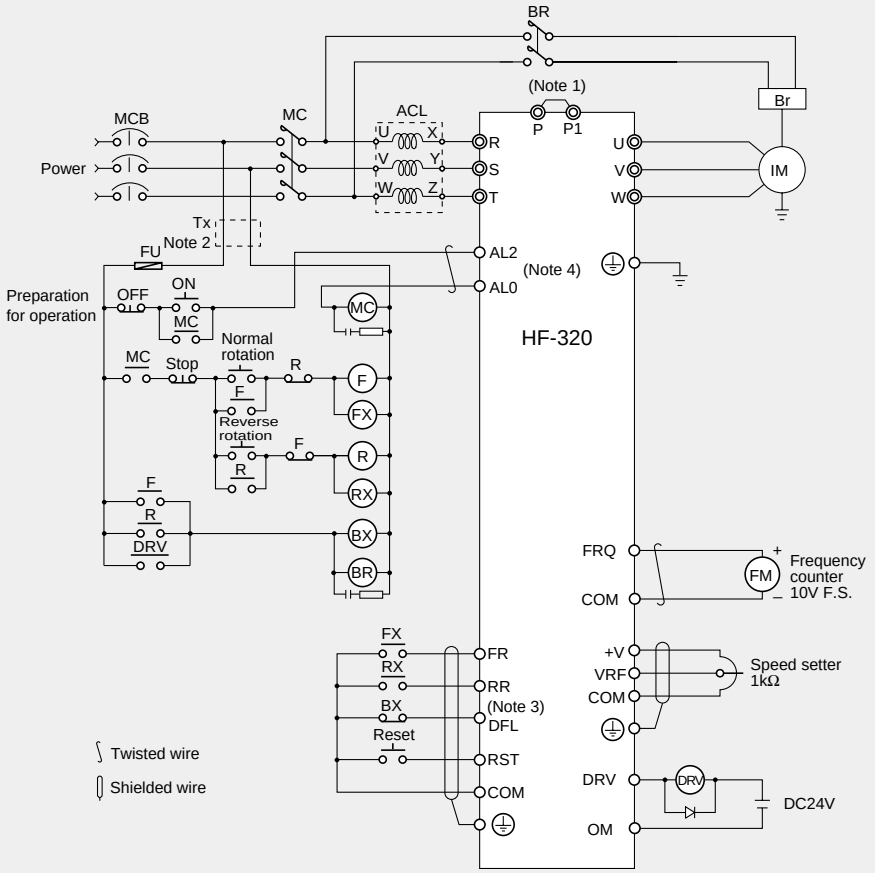
Frequency setting by external signal

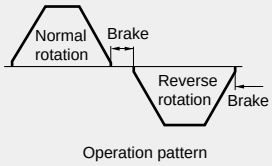
Frequency setting	Multi-stage speed 1	Multi-stage speed 2	Multi-stage speed 3	Multi-stage speed 4
A20	×	×	×	×
A21	○	×	×	×
A22	×	○	×	×
A23	○	○	×	×
A24	×	×	○	×
A25	○	×	○	×
A26	×	○	○	×
A27	○	○	○	×
A28	×	×	×	○
A29	○	×	×	○
A30	×	○	×	○
A31	○	○	×	○
A32	×	×	○	○
A33	○	×	○	○
A34	×	○	○	○
A35	○	○	○	○

(×··· Open, ○··· Closed)

Reference Circuit

■Operation of motor with brake

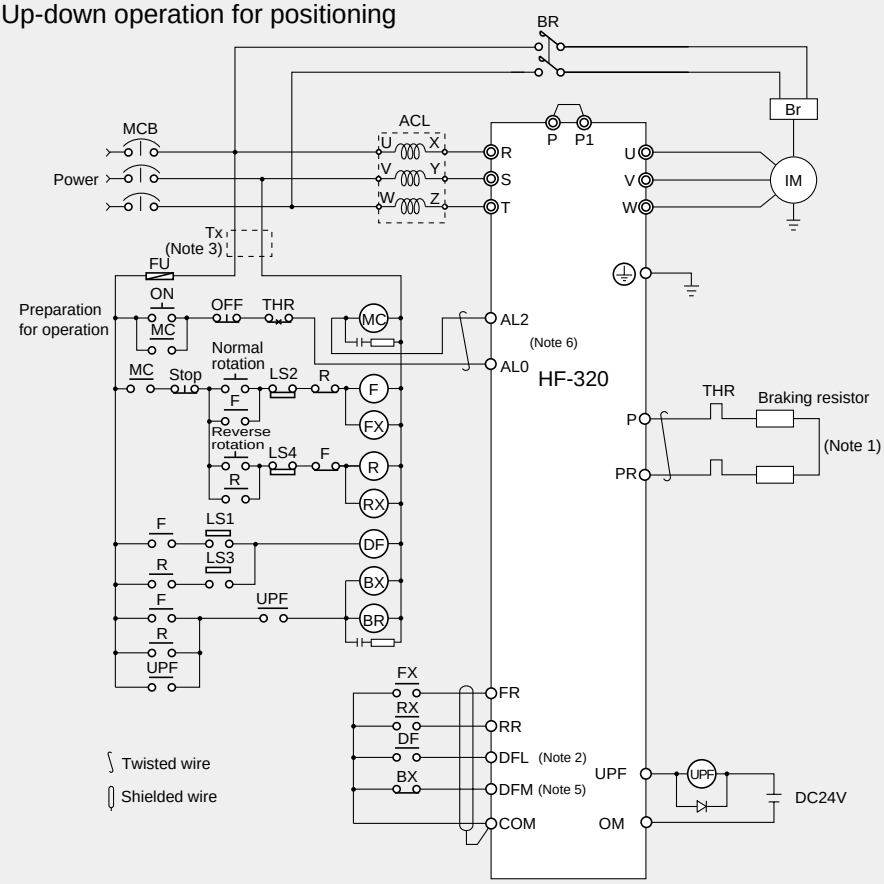


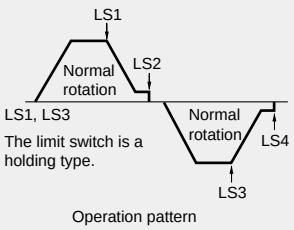


Operation pattern

(Note 1) When using a DC reactor, remove the shorting bar betweer and P1 and connect them.
(Note 2) When the power supply is a 400 V class, install a step-down transformer.
(Note 3) Set parameter C03 to 11.
(Note 4) Set parameter C33 to 00.

■Up-down operation for positioning



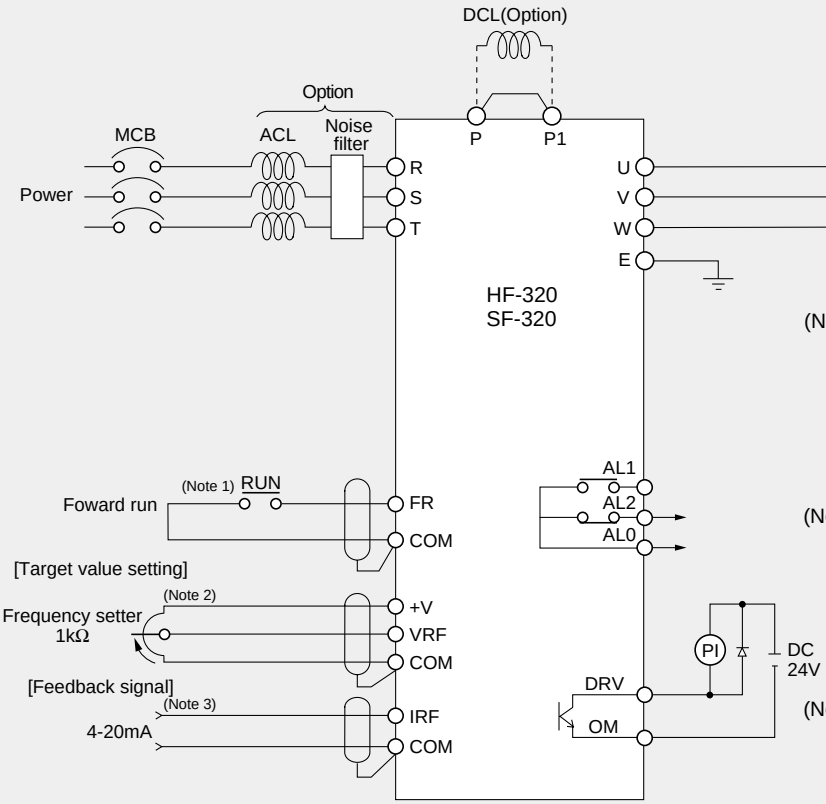


Operation pattern

(Note 1) Use inflammable cable for braking resistor wiring.
(Note 2) Parameter A21 is for slow-speed frequency setting and A20 is for high-speed setting.
(Note 3) When the power supply is a 400 V class, install a step-down transformer.
(Note 4) Set parameter C21 to 02 and adjust the braking timing by C42 and C43. Parameters C42 and C43 should be set at approx. 2 Hz usually.
(Note 5) Set parameter C03 to 11.
(Note 6) Set parameter C33 to 00.

◆ Reference Circuit

■PID circuit



(Note 1) Command source parameters

Purpose	Parameter No.	Set value
Inputting target signal to VRF terminal.	A01	01
Using FR terminal for normal rotation command.	A02	01
PID control is set.	A71	01
Feedback input destination: IRF terminal	A76	00 (Initial value)

(Note 2) PID adjusting parameters

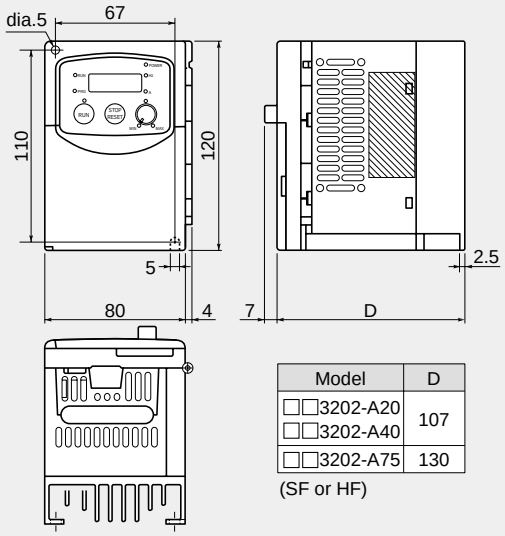
Details of adjustment	Parameter No.
P (proportional) gain	A72
I (integral) gain	A73
D (differential) gain	A74
Level matching of target value and feedback value	A75

(Note 3) Parameters setting for PID deviation signal

Purpose	Parameter No.	Set value
DRV terminal function setting	C22	04
PID deviation signal detection level setting	C44	0–100%

Dimensional Drawings

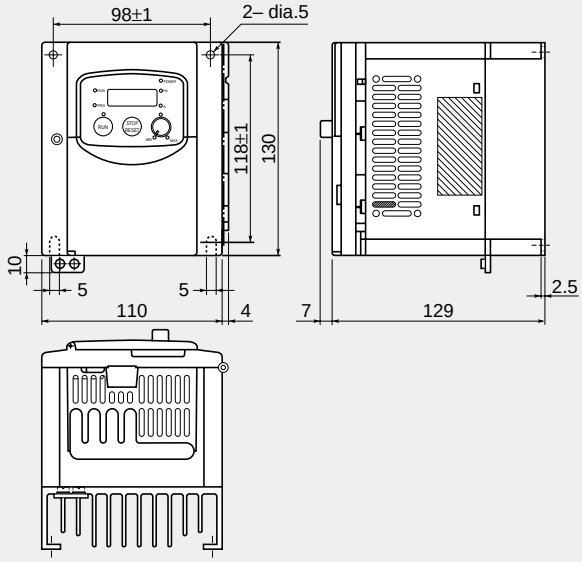
SF3202-A20, A40, A75
HF3202-A20, A40, A75



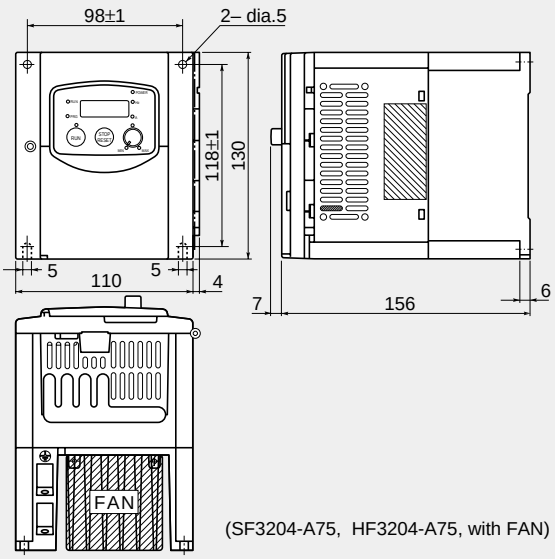
Model	D
□□3202-A20 □□3202-A40	107
□□3202-A75	130

(SF or HF)

SF3204-A40
HF3204-A40

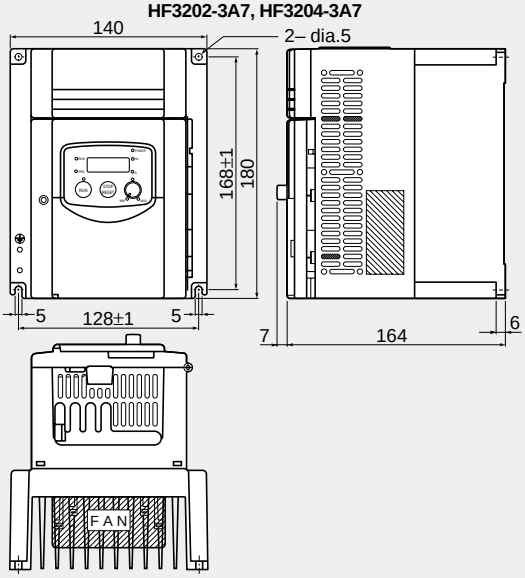


SF3202-1A5, 2A2, SF3204-A75, 1A5, 2A2
HF3202-1A5, 2A2, HF3204-A75, 1A5, 2A2

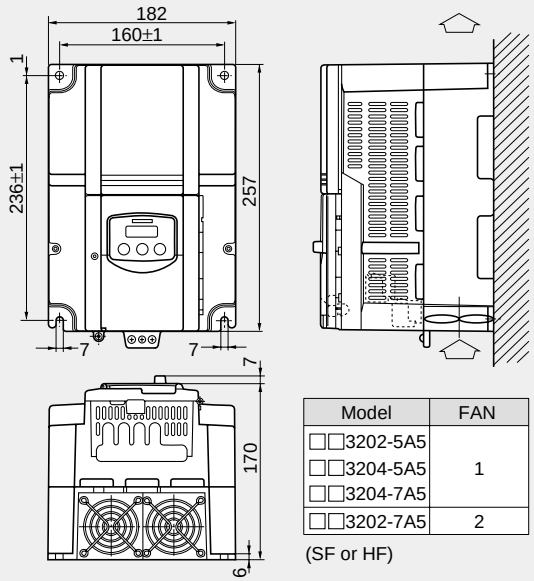


(SF3204-A75, HF3204-A75, with FAN)

SF3202-3A7, SF3204-3A7
HF3202-3A7, HF3204-3A7



SF3202-5A5, 7A5, SF3204-5A5, 7A5
HF3202-5A5, HF3204-5A5, 7A5



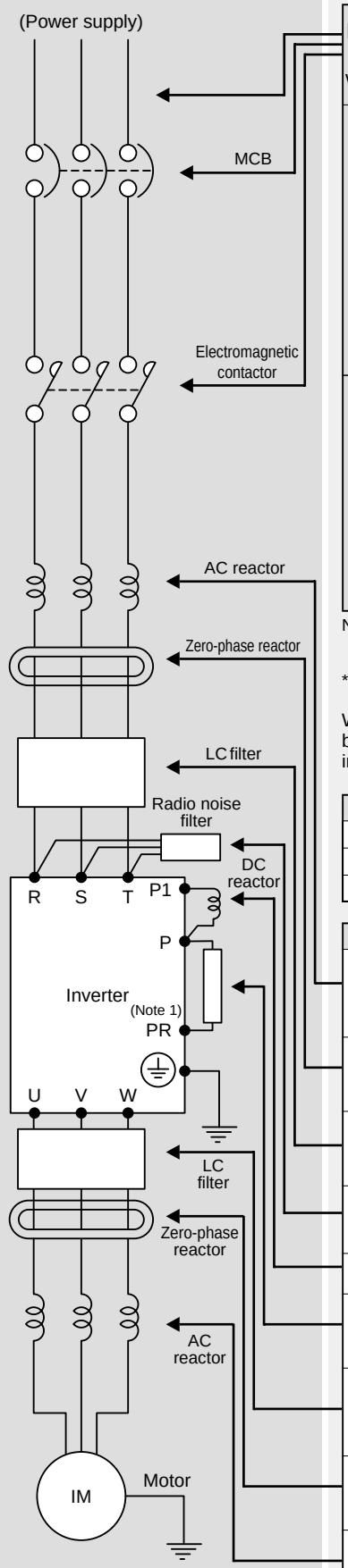
Model	FAN
□□3202-5A5 □□3204-5A5 □□3204-7A5	1
□□3202-7A5	2

(SF or HF)

(Note) Overseas specification models have different dimensions. Contact our company for details.

Applicable Wiring for Accessories and Options

Common



Standard Accessories

Rated input voltage	Inverter model		Circuit breaker (made by Mitsubishi Electric)	Electromagnetic contactor (made by Fuji Electric)	Cable size 20m (mm^2)
	SF-320 series	HF-320 series			
200V	SF3202-A20 SF3202-A40	HF3202-A20 HF3202-A40	NF-30 5A	SC - 03	2
	SF3202-A75	HF3202-A75	NF-30 10A		
	SF3202-1A5 SF3202-2A2	HF3202-1A5 HF3202-2A2	NF-30 20A	SC - 1N	
	SF3202-3A7	HF3202-3A7	NF-30 30A	SC-2N (2SN)	3.5
	SF3202-5A5	HF3202-5A5	NF-50 50A		5.5
	SF3202-7A5	HF3202-7A5	NF-100 60A		8
400V	SF3204-A40 SF3204-A75	HF3204-A40 HF3204-A75	NF-30 5A	SC - 03	2
	SF3204-1A5 SF3204-2A2	HF3204-1A5 HF3204-2A2	NF-30 10A		
	SF3204-3A7	HF3204-3A7	NF-30 20A	SC - 1N	3.5
	SF3204-5A5 SF3204-7A5	HF3204-5A5 HF3204-7A5	NF-30 30A		

Notes: 1. The shown accessories are for use with SUMITOMO 3-phase, 4-pole motors.
2. Select the circuit breaker based on required capacity.
3. Use thicker cables when wiring distance exceeds 20 m.

*The alarm output point should be 0.75 mm^2.

When using an earth leakage breaker (ELB), select the breaker's trip current from the table below based on the total wire distance (ℓ) by summing the distance from the breaker to the inverter and the inverter to the motor.

ℓ	Trip current (mA)
100m or less	30
300m or less	100
600m or less	200

Notes: 1. When CV wiring is used in metal conduit, the leakage current is approximately 30mA/km.
2. Leakage current will increase eightfold with IV type cable due to higher dielectric constant. In this case, use ELB with the next higher trip rating.

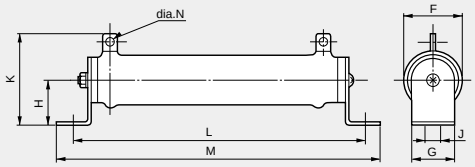
Name	Function
Input AC reactor for harmonic suppression/power smoothing/powerfactor improvement	This is useful in suppressing harmonics induced on the power supply lines, or when the main power voltage imbalance exceeds 3%, (and power source capacity is more than 500kVA), or to smooth out line fluctuations. It also improves the power factor.
Radio noise filter Zero-phase reactor	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise.
Input noise filter for inverter LC filter	This filter reduces the conducted noise in the power supply wiring between the inverter and the power distribution system. Connect it to the inverter primary (input side).
Input radio noise filter (XY filter)	This capacitive filter reduces radiated noise from the main power wires in the inverter input side.
DC reactor	The inductor or choke filter suppresses harmonics generated by the inverter.
Regenerative braking resistor HF-320 only	The regenerative braking resistor is useful for increasing the inverter's control torque for high duty-cycle (on-off) applications, and improving the decelerating capacity.
Output noise filter LC filter	This filter reduces radiated noise emitted on the inverter output cable that may interfere with radio or television reception and test equipment and sensor operation.
Radio noise filter Zero-phase reactor	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise.
Output AC reactor	Install it on the output side to reduce leakage current contributed by higher harmonics. Contact our company for details.

(Note 1) SF-320 Series are not equipped with a PR terminal. Use HF-320 when regenerative braking is required.

Options for braking resistor•HF-320

Rated power (W)	Dimensions								Weight (g)
	F	G	H	J	K	L	M	N	
200	28	26	22	6	53	287	306	4	340
300	44	40	40	10	78	309	335	5	840
400	44	40	40	10	78	385	411	5	1000
750	57	40	40	10	84	355	381	5	1360

100% braking torque: 10 sec 10% ED

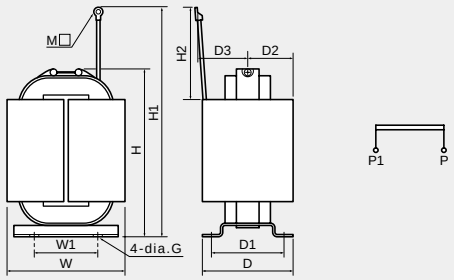


Voltage (V)	Capacity (kW)	Braking resistor				Thermal relay set value (A)
		Part No.	Rated power	Resistance	Qty	
200V	0.2	Y135AA201	200W	400Ω	1	0.83
	0.4	Y135AA200	200W	200Ω	1	0.83
	0.75	Y135AA205	300W	200Ω	1	1.25
	1.5	Y135AA204	300W	80Ω	1	1.25
	2.2	Y135AA208	400W	70Ω	1	1.7
	3.7	Y135AA203	300W	20Ω	2-pc series	2.1
	5.5	X435AC069	750W	10Ω	2-pc series	5.3
	7.5	X435AC069	750W	10Ω	2-pc series	5.3
400V	0.4	Y135AA202	200W	750Ω	1	0.42
	0.75	Y135AA207	300W	750Ω	1	0.63
	1.5	Y135AA206	300W	400Ω	1	0.63
	2.2	Y135AA209	400W	250Ω	1	0.83
	3.7	Y135AA204	300W	80Ω	2-pc series	1.1
	5.5	Y135AA209	400W	250Ω	3-pc series	2.0
	7.5	Y135AA209	400W	250Ω	3-pc series	2.0

Type of thermal relay: TR-ONH

DC reactor for power factor improvement and higher harmonics control

A DC reactor is available for improvement of the power factor of the inverter, ensuring power line impedance, and control of higher harmonics.



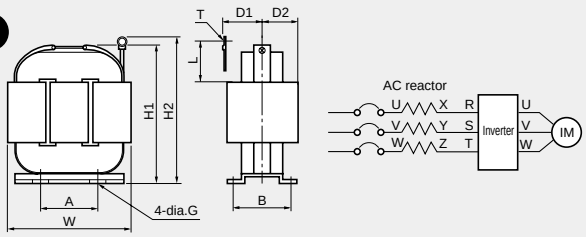
(Note) Models below 200 V class 3.7 kW of SF-320 and HF-320 are subject to the "Guideline for the Suppression of Harmonics in Household and General-Use Equipment" issued by the Ministry of International Trade and Industry in September 1994. Therefore, it is necessary to install a reactor for inverters to be installed from January 1, 1997 onward to conform to the standards described in these guidelines.

	Applicable capacity (kW)	Specification		Part No. Y220DA	W	W1	D	D1	D2	D3	H	H1	H2	G	Connection terminal	Weight (kg)	Insulation
		Current(A)	L(mH)														
200V Series	0.2	1.0	29.7	032	52	35	40	32	20	22	65	-	300	dia.4	M4	0.3	B
	0.4	2.0	14.8	033	52	35	40	32	20	22	75	-	300	dia.4	M4	0.4	B
	0.75	3.75	9.72	034	52	35	50	42	25	27	85	-	300	dia.4	M4	0.6	B
	1.5	7.5	4.83	035	74	50	45	37	-	-	120	145	-	dia.5	M5	1.0	B
	2.2	11.0	3.41	036	74	50	45	37	-	-	120	145	-	dia.5	M5	1.1	B
	3.7	18.5	2.13	037	90	60	62	52	-	-	140	170	-	dia.5	M8	2.0	B
	5.5	28.0	1.47	038	90	60	62	52	-	-	140	170	-	dia.5	M5	2.4	B
	7.5	38.0	1.11	039	100	80	95	80	-	-	140	170	-	5.5X7	M5	3.5	B
400V Series	0.4	1.0	59.3	003	52	35	40	32	20	22	75	-	300	dia.4	M4	0.4	B
	0.75	1.88	38.9	004	52	35	50	42	25	27	85	-	300	dia.4	M4	0.6	B
	1.5	3.75	19.3	005	59	40	60	47	30	35	100	-	300	dia.4	M4	0.9	B
	2.2	5.5	13.7	006	74	50	45	37	-	-	120	140	-	dia.5	M5	1.1	B
	3.7	9.25	8.52	007	74	50	70	62	-	-	120	145	-	dia.5	M5	1.8	B
	5.5	14.0	5.87	008	90	60	62	52	-	-	140	165	-	dia.5	M5	1.5	B
	7.5	19.0	4.46	009	100	80	95	80	-	-	140	165	-	5.5X7	M5	3.5	B

AC reactor for power factor improvement and higher harmonics control

An AC reactor is available for improvement of the power factor of the inverter, ensuring proper power line impedance, and control of higher harmonics.

* The AC reactor is for 3-phase input.



(Note) Models below 200 V class 3.7 kW of SF-320 and HF-320 are subject to the "Guideline for the Suppression of Harmonics in Household and General-Use Equipment" issued by the Ministry of International Trade and Industry in September 1994. Therefore, it is necessary to install a reactor for inverters to be installed from January 1, 1997 onward to conform to the standards described in these guidelines.

	Applicable capacity (kW)	Specification		Part No. Y220CA	W	DI	D2	H1	H2	A	B	G	L	T	Weight (kg)	Insulation
		Current(A)	L(mH)													
200V Series	–0.4	2.1	5.8	053	90	35	30	100	-	50	38	4	300	M4	1.0	B
	0.75	4.0	3.1	054	90	35	30	100	-	50	38	4	300	M4	1.1	B
	1.5	8.0	1.6	055	90	40	35	100	120	55	48	4	-	M4	1.6	B
	2.2	11	1.2	056	115	42	37	120	145	55	43	4	-	M4	2.1	B
	3.7	17	0.7	057	115	42	37	120	145	55	43	4	-	M5	2.4	B
	5.5	24	0.5	058	155	45	40	150	180	80	50	5	-	M5	3.9	F
	7.5	33	0.4	059	155	45	40	150	185	80	50	5	-	M6	4.4	F
400V Series	0.4	1.2	22	080	90	35	30	100	-	50	38	4	300	M4	1.0	B
	0.75	2.1	12	081	90	35	30	100	-	50	38	4	300	M4	1.1	B
	1.5	4.0	6.5	082	90	40	35	100	-	55	48	4	300	M4	1.7	B
	2.2	5.5	4.6	083	115	42	37	120	-	55	43	4	300	M4	2.5	B
	3.7	9.0	2.9	084	115	42	37	120	145	55	43	4	-	M4	2.8	B
	5.5	13	2.0	085	155	45	40	150	175	80	50	5	-	M4	4.2	B
	7.5	17	1.5	086	155	45	40	150	175	80	50	5	-	M5	4.4	B

◆ Noise filter

1. Zero-phase reactor (inductive filter)

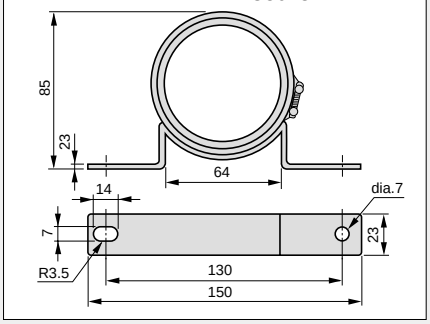
Common to 200 V and 400 V classes, as well as input and output sides

- 3.7 kW or less
  Part No. X480AC188
  Type RC5078
- 5.5 kW or more
  Part No. X480AC192
  Type RC9129

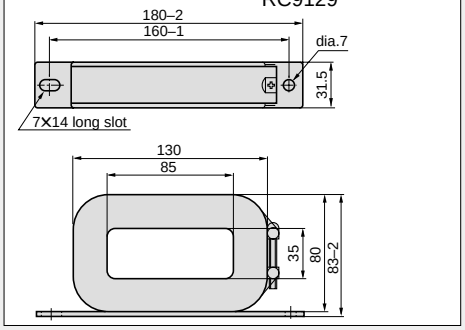
Method of connection

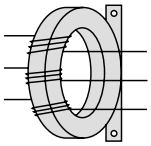
(1) It can be used on both input (power supply) side and output (motor) side of the inverter.
(2) Wind the cables of the three phases respectively on the input or output side more than three times (4 turns) in the same direction. If cables are too thick to wind more than three times (4 turns), arrange two or more zero-phase reactors to reduce the number of winding turns.
(3) Make the gap between the cable and the inside of the core as small as possible.

Zero-phase reactor
RC5078



Zero-phase reactor
RC9129



Winding turns	More than 3 times (4T)
Qty used	1 pc
Winding	

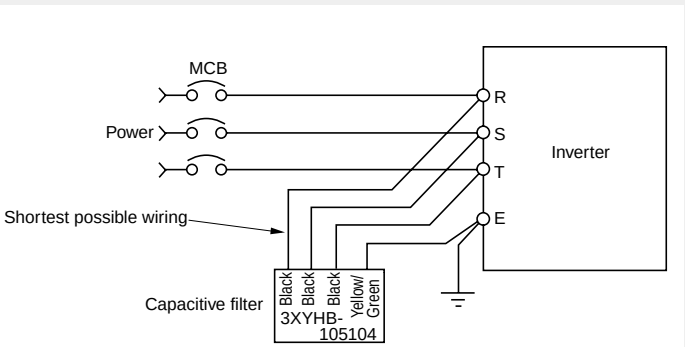
2. Capacitive filter

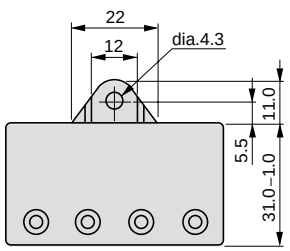
Common to all capacities
Common to 200 V and 400 V classes

Part No. X480AC185
Type 3XYHB-105104

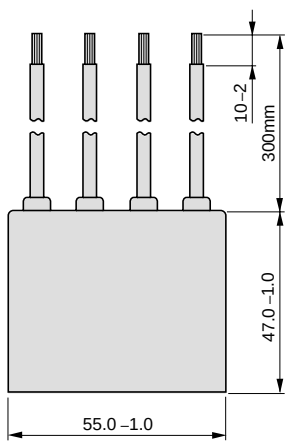
Method of connection

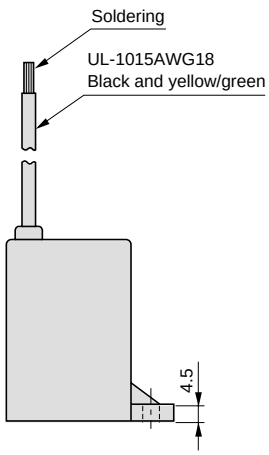
(1) Connect directly to the input (power) terminal of the inverter. Make the connection cable as short as possible.
(2) Correctly ground the equipment. (Grounding resistance: 100Ω or less)
(3) It cannot be used for the output (motor) side of the inverter.





Leakage current
200V: 3.9mA
400V: 7.8mA





◆ Noise filter

3. LC filter

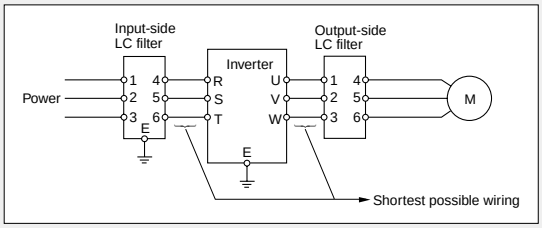
200V class

Power supply	Applicable motor (kW)	Input side		Output side	
		Type	Part No.	Type	Part No.
3-phase 200V class	0.2–0.4	NF3010A-VZ	X480AC289	CC3005C-P	X480AC163
	0.75–1.5			CC3010C-P	X480AC164
	2.2	NFf3020A-VZ	X480AC290	CC3015C-P	X480AC165
	3.7			CC3020C-P	X480AC166
	5.5	NF3030A-VZ	X480AC291	CC3030C-P	X480AC167
	7.5	NF3040A-VZ	X480AC292	CC3045C-P	X480AC168

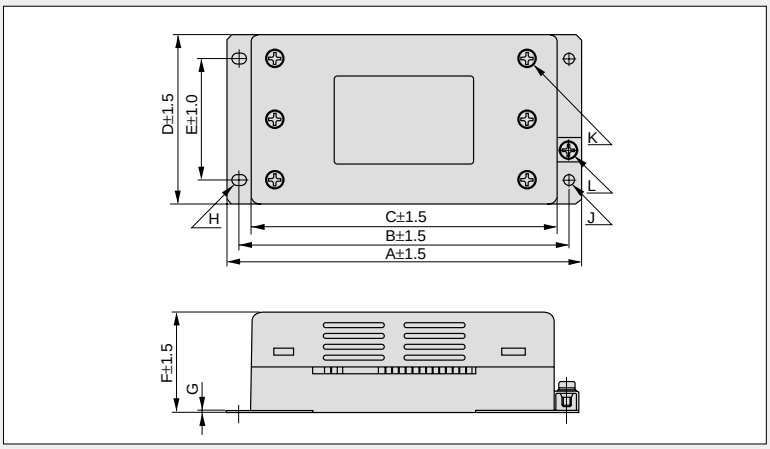
400V class

Power supply	Applicable motor (kW)	Input side		Output side	
		Type	Part No.	Type	Part No.
3-phase 400V class	0.4–1.5	NF3010C-VZ	X480AC296	CC3005C-P	X480AC163
	2.2–3.7			CC3010C-P	X480AC164
	5.5	NFf3020C-VZ	X480AC297	CC3015C-P	X480AC165
	7.5			CC3020C-P	X480AC166

(1) Connect the input-side filter between the power supply and inverter input terminal, and the output-side filter between the inverter output terminal and motor. Make the connection cable as short as possible.
(2) Use grounding cable as thick as possible. Correctly ground the equipment.
(3) The input and output cables of the filter should be sufficiently separated.
(4) Do not connect the input-side filter to the inverter output (motor) side.

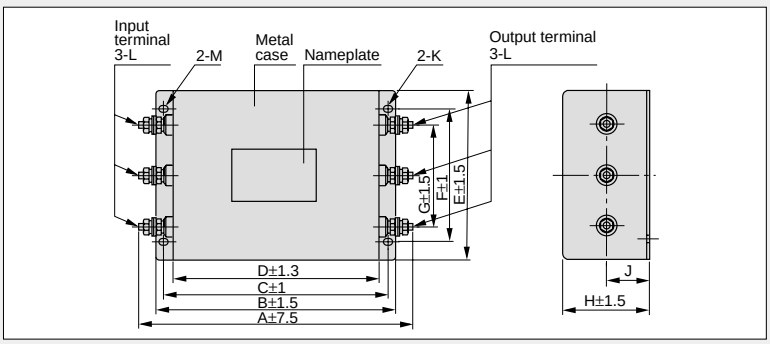


Input-side LC filter



Model	Type	A	B	C	D	E	F	G	H	J	K	L
X480AC289	NF3010A-VZ	128	118	108	63	43	42	1.0	4.5×6	dia.4.5	M4	M4
X480AC290	NF3020A-VZ											
X480AC291	NF3030A-VZ	145	135	125	70	50						
X480AC292	NF3040A-VZ	179	167	155	90	70	54	1.6			M5	
X480AC296	NF3010C-VZ	128	118	108	63	43	42	1.0			M4	
X480AC297	NF3020C-VZ											

Output-side LC filter



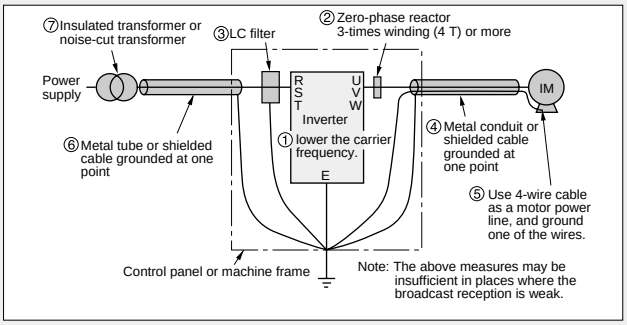
Output side		Dimensions (Unit: mm)											
Type	Part No.	A	B	C	D	E	F	G	H	J	K	L	M
CC3005C-P	X480AC163	147	140	125	110	95	70	50	50	25	dia.4.5	M4	R2.25 length 6
CC3010C-P	X480AC164												
CC3015C-P	X480AC165												
CC3020C-P	X480AC166	167	160	145	130	110	80	60	70	35	dia.5.5	M5	R2.75 length 7
CC3030C-P	X480AC167	215	200	185	170	120	90	70	70	35	dia.5.5	M5	R2.75 length 7
CC3045C-P	X480AC168	255	230	215	200	140	110	80	80	40	dia.6.5	M6	R3.25 length 8

◆ Example of noise filter use

when AM radio picks up noise

1. When noise level is high

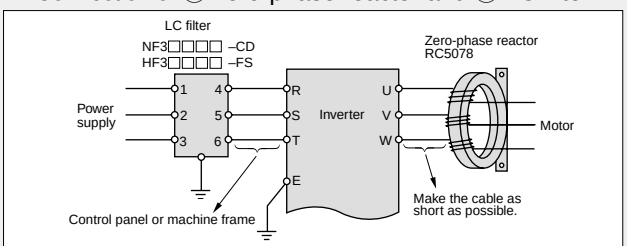
Take possible measures among the following in the order of ①–⑦.
Each measure will improve noise reduction.



■ Corrective measures

①Lower the carrier frequency as much as possible. Up to approx. 10 kHz when low-noise operation is necessary.
②Install a zero-phase reactor on the output side of the inverter. (Type: RC9129)
③Install an LC filter on the input side of the inverter. (□□□□-FS)
④Connect the inverter and motor with a metal conduit or shielded cable.
⑤Use 4-wire cable as a motor power line, and ground one of the wires.
⑥Connect the inverter and power with a metal conduit or shielded cable.
⑦Install a drive isolation or noise reduction transtormer for the power supply.
□□□□ differs according to the inverter capacity and voltage.

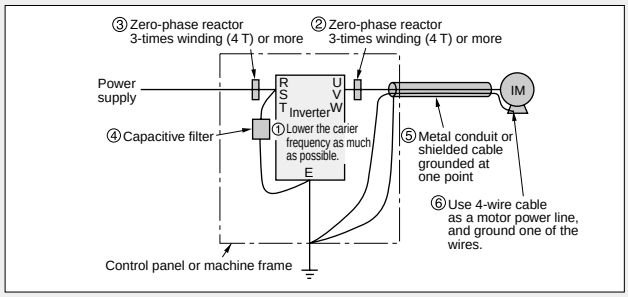
■ Connection of ② zero-phase reactor and ③ LC filter



Note: Turn wires the same number of times for all phases of the zero-phase reactor. 3 times (4 T) or more Increase the number of zero-phase reactor when the cable is too thick to wind correctly.

2. When noise level is low

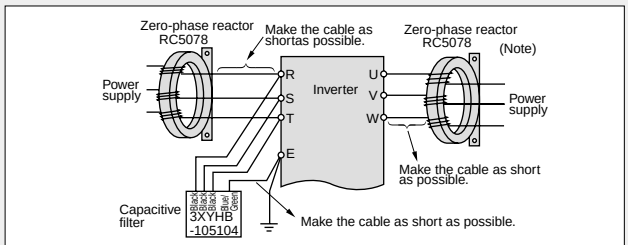
Take possible measures among the following in the order of ①–⑥.
Each measure will improve noise reduction.



■ Corrective measures

①Lower the carrier frequency as much as possible. Up to approx. 10 kHz when low-noise operaton is necessary.
②Install a zero-phase reactor on the output side of the inverter. (Type: RC5078, RC9129)
③Install a zero-phase reactor on the input side the inverter. (Type: RC5078, RC9129)
④Install a capacitive filter on the input side of the inverter. (Type: 3XYHB-105104)
⑤Connect the inverter and motor with a metal conduit or shielded cable.
⑥Use 4-wire cable as a motor power line, and ground one of the wires.

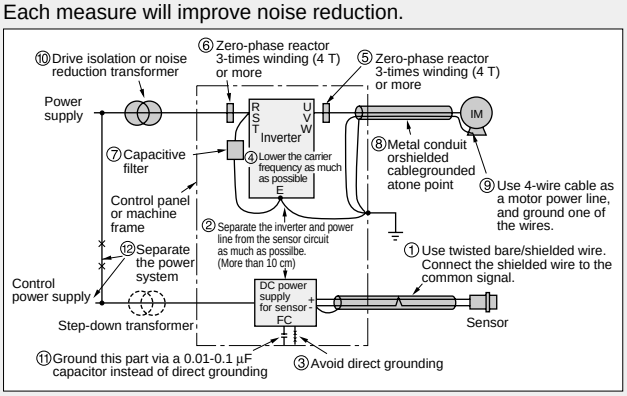
■ Connection of ②③ zero-phase reactor and ④ capacitive filter



Note: Turn wires the same number of times for all phases of the zero-phase reactor. 3 times (4 T) or more Increase the number of zero-phase reactor when the cable is too thick to wind correctly.

Measures to take when proximity switch/photoelectric switch, etc. malfunction

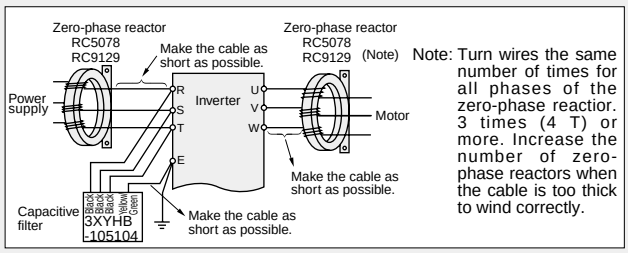
Take possible measures among the following in the order of ①–⑫.
Each measure will improve noise reduction.



■Corrective measures

①Use twisted pair/shielded wire as a sensor signal line, and connect the shielded wire to common.
②Separate the inverter and power line from the sensor circuit as much as possible. (More than 10 cm desirable)
③Remove the grounding wire when the power supply for the sensor is grounded.
④Lower the carrier frequency as much as possible. Up to approx. 10 kHz when low-noise operation is necessary.
⑤Install a zero-phase reactor on the output side of the inverter. (Type: RC5078, RC9129)
⑥Install an LC filter on the input side of the inverter. (Type: □□□□FS)
⑦Install a capacitive filter on the input side of the inverter. (Type: 3XYHB-105104)
⑧Use a metal conduit or shielded cable for power supply wiring.
⑨Use 4-wire cable as a motor power line, and ground one of the wires.
⑩Install a drive isolation or noise reduction transformer for the inverter power supply.
⑪Gorund the power supply for the sensor via a 0.01-0.1 →(630V 0.1µF)
⑫Separate the inverter power supply from the sensor power supply system.

■Connection of ⑤⑥ reactors and ⑦ capacitive filter

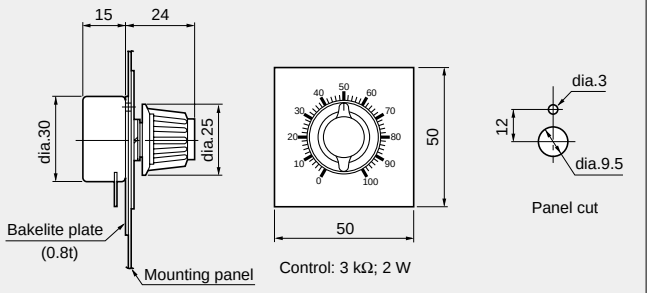


Note: Turn wires the same number of times for all phases of the zero-phase reactior. 3 times (4 T) or more. Increase the number of zero-phase reactors when the cable is too thick to wind correctly.

◆ Peripheral equipment

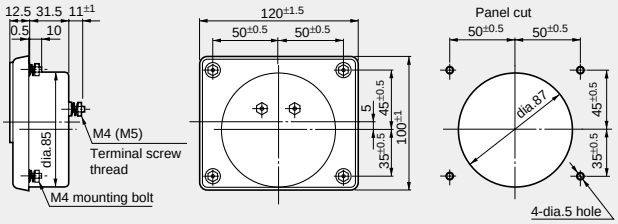
Frequency setting unit: VR-07 1kΩ, 2W

Unit VR07



% speed meter: DCF-12N[10V F.S.]

0-100%; 50divisions (X525AA048)



AC ammeter: ACF-12N

The CT directly detects the current of the secondary side of the inverter.

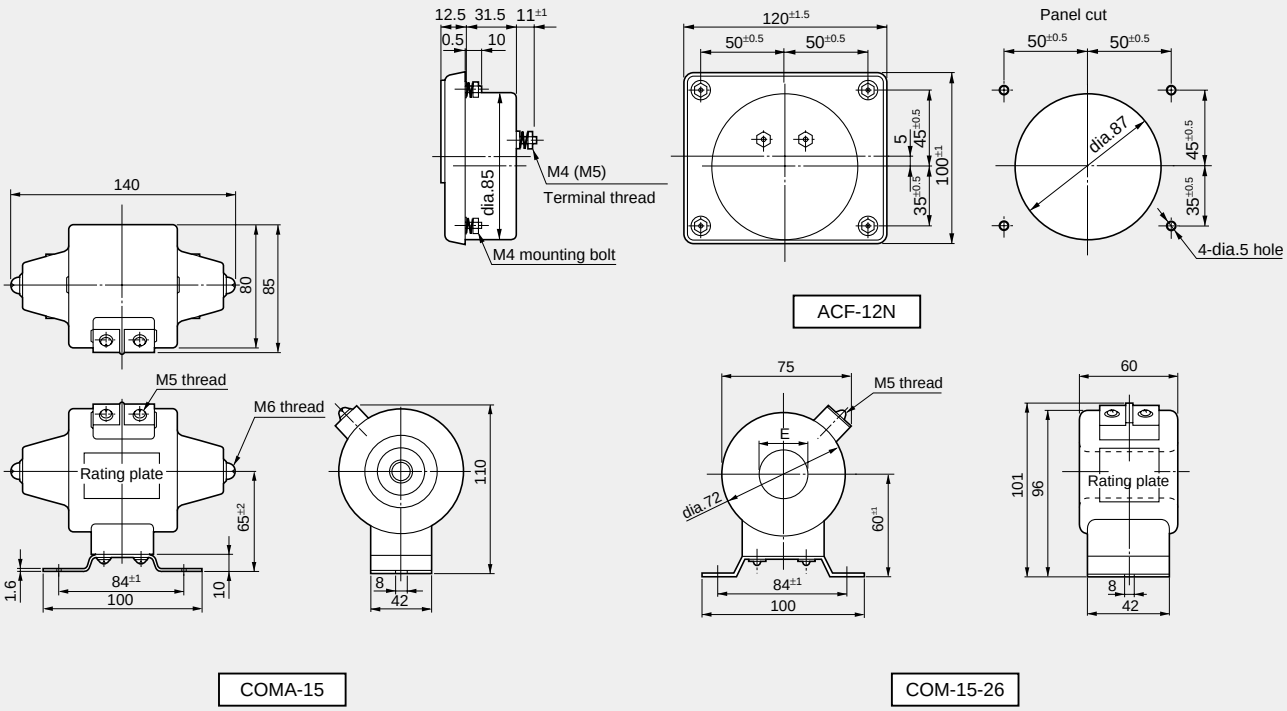


Table of combination of AC ammeter (ACF-12N) and current transformer

Motor capacity (kW)	200V class					400V class				
	Part No.	Meter		CT	Number of primary through holes	Part No.	Meter		CT	Number of primary through holes
		Rated current [A]	Max. scale [A]	Type			Rated current [A]	Max. scale [A]	Type	
0.2	X525AA078	3	3	COMA-15 5/5A	-	-	-	-	-	-
0.4	X525AA079	5	5	COMA-15 5/5A	-	X525AA078	3	3	COMA-15 5/5A	-
0.75	X525AA080	5	10	COMA-15 10/5A	-	X525AA079	5	5	COMA-15 5/5A	-
1.5	X525AA081	5	15	COMA-15 15/5A	-	X525AA080	5	10	COMA-15 10/5A	-
2.2	X525AA082	5	20	COMA-15 20/5A	-	X525AA080	5	10	COMA-15 10/5A	-
3.7	X525AA083	5	30	COMA-15 30/5A	-	X525AA081	5	15	COMA-15 15/5A	-
5.5	X525AA042	5	50	COMA-15-26 50/5A	3	X525AA082	5	20	COMA-15 20/5A	-
7.5	X525AA042	5	50	COMA-15-26 50/5A	3	X525AA083	5	30	COMA-15 30/5A	-

Construction of current transformer (CT) COMA-15 type: Totally molded current transformer with primary winding
COM-15-26 type: Totally molded current transformer, throughhole type
COM-15-30 type: Totally molded current transformer, throughhole type

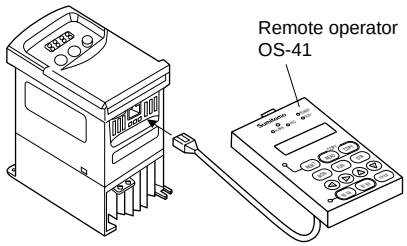
Install the current transformer (CT) on the output side of the inverter.

◆ Peripheral equipment

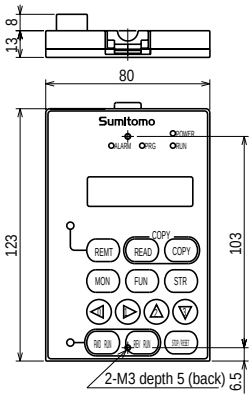
■Remote operator

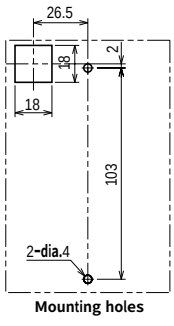
SF-320•HF-320 common option

Example connection

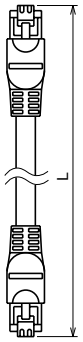


●OS-41





●ICS-1, 3



Model	Cable length: L (m)
ICS–1	1
ICS–3	3

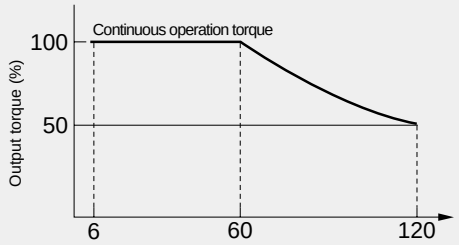
Caution in selecting peripheral equipment

Wiring and connection		(1) Be sure to connect the power supply to RST (input terminals) and the motor to U, V, W (output terminals). (2) Be sure to connect the grounding terminal. (⏚ mark) Inverters generate high frequency, increasing leakage current. Be sure to ground the inverter and motor.
Wiring between inverter and motor	Electromagnetic contactor	When using an electromagnetic contactor between the inverter and motor, do not turn the contactor ON or OFF during inverter operation.
	Thermal relay	Install a thermal relay that matches the motor in the following cases: * Install a thermal relay for each motor when operating more than one motor with one inverter. * Set the current of the thermal relay at the rated motor current x 1.1. When the wiring length is long (more than 10 m), the thermal relay may be activated too quickly. Install an AC reactor or current sensor on the output side. * When motors are to be operated with the rated current exceeding the adjustable level of the built-in electronic thermal relay. 〈SF-320〉 * When operation continues at frequencies beyond the 30-60 Hz range.
Earth leakage breaker		Install an earth leakage breaker on the input side for protection of the inverter wiring and operators. Conventional earth leakage breakers may malfunction because of high harmonics from the inverter; therefore use an earth leakage breaker that is applicable to the inverter. The leakage current differs according to the cable length. Refer to p.26.
Wiring distance		The wiring distance between the inverter and operation panel should be less than 20 m. If it exceeds 20 m, use a current/voltage converter, etc. Use shielded cable for wiring. When the wiring distance between the motor and inverter is long, the leakage current from high harmonics may cause the protective function of the inverter and peripheral equipment to be activated. The situation will be improved by an AC reactor installed on the output side of the inverter. Select appropriate cable to prevent voltage drop. (Large voltage drop lowers the torque.)
Phase-advanced capacitor		Do not use a phase-advanced capacitor. When a power factor improving capacitor is connected between the inverter and motor, the capacitor may be heated or broken by the higher harmonics in the inverter output.

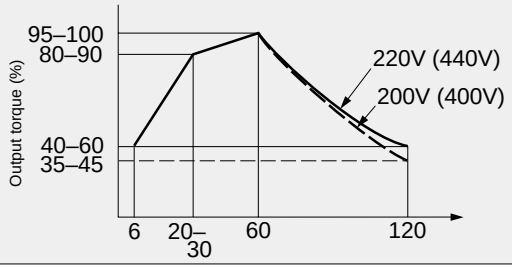
◆ Notes to inverter users

Continuous operation torque characteristics

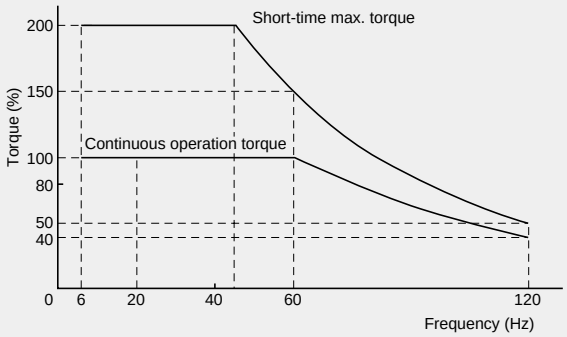
AF motor
〈Inverter motor〉



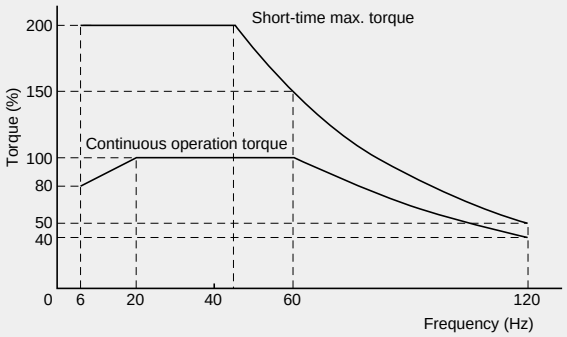
General purpose motor



HF-320 Output torque characteristics when general-purpose motors are operated under sensorless vector control



0.2–0.4 kW



0.75–3.7 kW

●Combination ... The output torque is 100% when the motor rating is 60 Hz.
Use an AF motor when constant torque is necessary for motors 5.5 kW or more.

Motor temperature rise

When a general-purpose motor is used in variable-speed operation with an inverter, the temperature rise of the motor will be slightly greater than in cases where commercial power is used. The causes are shown below:

Influence of output waveform ····· Unlike commercial power, the output waveform of an inverter is not a perfect sine wave, and contains higher harmonics. Therefore, the motor loss increases and the temperature is slightly higher.

Reduction in the motor cooling effect during slow-speed operation ··· Motors are cooled by the fan on the motor itself. When the motor speed is reduced by an inverter, the cooling effect will decrease.

Therefore, lower the load torque or use an inverter motor to control temperature rise when the frequency is below the frequency of commercial power.

Life of major parts

The electrolytic capacitor, cooling fan, and other parts used for inverters are consumables. Their life substantially depends on the operating condition of inverters. When replacement is necessary, contact our dealer or service center.

◆ Warranty

1. Warranty policy on inverter

Warranty period	The warranty shall be 18 months from date of shipment or 12 months after intial operation, whichever is shorter.
Warranty condition	In the event that any problem or damage to the Product arises during the "Warranty Period" from defects in the Product whenever the Product is properly installed and combined with the Buyer's equipment or machines maintained as specified in the maintenance manual, and properly operated under the conditions described in the catalog or as otherwise agreed upon in writing between the Seller and the Buyer or its customers; the Seller will provide, at its sole discretion, appropriate repair or replacement of the Product without charge at a designated facility, except as stipulated in the "Warranty Exclusions" as described below. However, if the Product is installed or integrated into the Buyer's equipment or machines, the Seller shall not reimburse the cost of: removal or re-installation of the Product or other incidental costs related thereto, any lost opportunity, any profit loss or other incidental or consequential losses or damages incurred by the Buyer or its customers.
Warranty exclusion	Not withstanding the above warranty, the warranty as set forth herein shall not apply to any problem or damage to the Product that is caused by: 1. Installation, connection, combination or integration of the Product in or to the other equipment or machine that rendered by any person or entity other than the Seller; 2. Insufficient maintenance or improper operation by the Buyer or its customers such that the Product is not maintained in accordance with the maintenance manual provided or designated by the Seller; 3. Improper use or operation of the Product by the Buyer or its customers that is not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Product not in conformity with the specifications; 4. Any problem or damage on any equipment or machine to which the Product is installed, connected or combined or any specifications particular to the Buyer or its customers; 5. Any changes, modifications, improvements or alterations to the Product or those functions that are rendered on the Product by any person or entity other than the Seller; 6. Any parts in the Product that are supplied or designated by the Buyer or its customers; 7. Earthquake, fire, flood, salt air, gas, lightning, acts of God or any other reasons beyond the control of the Seller; 8. Normal wear and tear, or deterioration of the Product's parts, such as the cooling fan bearings; 9. Any other troubles, problems or damage to the Product that are not attributable to the Seller.
Others	The Seller will not be responsibility for the installation and removal of the inverter. Any inverter transportation cost shall be born by both Seller and Buyer.

2. Warranty policy on repaired and returned products

Warranty period	The warranty shall be 6 months from date of repair and shipment.
Warranty condition	Warranty on repaired Product will apply only on the replacement parts used in the repair done or authorized by the Seller. All other aspects conform to the Warranty Conditions described in item 1.
Warranty exclusion	Please refer to Warranty Exclusions described in item 1.
Others	Please refer to Others decribed in item 1.

⚠ SAFETY PRECAUTIONS

- Before use, be sure to read the Instruction Manual thoroughly to insure proper use of the inverter.
- Note that the inverter requires electrical wiring; a specialist should carry out the wiring.
- The inverter in this catalog is designed for general industrial applications. For special applications in fields such as aircraft, aerospace, nuclear power, electrical power, transportation, medical equipment, and submarine relay equipment, please consult with us in advance.
- For application in a facility where human safety is involved or serious losses may occur, make sure to provide adequate safety devices to avoid a serious accident.
- The inverter is intended for use with a three-phase AC motor. For use with a load other than this, please consult with us.

Worldwide Sumitomo Network

U.S.A
Sumitomo Machinery Corporation of America
4200 Holland Blvd.,
Chesapeake, VA 23323
Tel :(1)757-485-3355
Fax:(1)757-487-3193

Canada
SM-Cyclo of Canada, Ltd.
870A Equestrian Court Oakville,
Ontario, Canada L6L 6L7
Tel :(1)905-469-1050
Fax:(1)905-469-1055

Mexico
SM-Cyclo De Mexico, S.A. de C.V.
Calle "C" No. 506A Parque Industrial
Almacentro Apodaca, N. L., Mexico 66600
Tel :(52)8-369-3697
Fax:(52)8-369-3699

Brazil
SM-Cyclo Reductores Do Brasil Ltda.
Av. Dr. Ulysses Guimarães,
3533, 09990-080 Diadema, São Paulo, Brazil
Tel :(55)11-4071-4388
Fax:(55)11-4071-2922

Chile
SM-Cyclo De Chile, Ltda.
Avenida Zanartu #1231, Comuna Nunoa,
Casilla No.22 Santiago 60, Chile
Tel :(56)2-237-2407
Fax:(56)2-237-0225

Argentina
SM-Cyclo De Argentina S.A.
Montes de Oca #6719, (B1606BMG)
Munro, Buenos Aires, Argentina
Tel :(54)11-4765-5332
Fax:(54)11-4765-5517

United Kingdom
Sumitomo (SHI) Cyclo Drive Europe, Ltd.
Marfleet Kingston Upon Hull HU9 5RA,
United Kingdom
Tel :(44)1482-788022
Fax:(44)1482-713205

SM-Cyclo U.K. Ltd.
Marfleet Kingston Upon Hull HU9 5RA,
United Kingdom
Tel :(44)1482-790340
Fax:(44)1482-790321

France
SM-Cyclo France E.U.R.L.
65/75 Avenue Jean Mermoz
F-93120 La Courneuve France
Tel :(33)149-929494
Fax:(33)149-929490

Italy
SM-Cyclo Italy S.r.l.
Via dell' Artigianato 23 20010
Cornaredo (Mi)
Tel :(39)02-9356-2121
Fax:(39)02-9356-9893

Netherlands
SM-Cyclo Benelux BV
Den Engelsman 16D NL-6026 RB
Maarheeze The Netherlands
Tel :(31)495599777
Fax:(31)495593177

Sweden
SM-Cyclo Scandinavia AB
Företagsvägen 30A S-232 37
Arlöv Sweden
Tel :(46)40430220
Fax:(46)40431001

Spain
SM-Cyclo Iberia,S.L.
Pol.Ind.C/En Proyecto no.29, Parc.66,
Nave B 46470 Catarroja(Valencia) Spain
Tel :(34)9-6-1264461
Fax:(34)9-6-1265602

Switzerland
SM-Cyclo Switzerland AG
Lerzenstrasse 27 CH8953 Dietikon
Tel :(41)56-6-33 0441
Fax:(41)56-6-33 0442

Belgium
SMBE Branch Belgium Office
Gentsesteenweg 1387
B-1082 Brüssel
Tel :(32)2-469-0517
Fax:(32)2-469-0207

South Africa
SM-Cyclo of South Africa Proprietary Ltd.
P. O. Box 2808, Edenvale 1610
78 Watt Street, Meadowdale
Germiston 1401
Tel :(27)11-974-3145
Fax:(27)11-974-2530

Germany
Sumitomo (SHI) Cyclo Drive Germany, GmbH
Cyclostraße 92
D-85229 Markt Indersdorf
Tel :(49)8136-66-0
Fax:(49)8136-5771

SCG Branch Hannover Office
Auf dem kessel lande 4 30900 Wedemark
Tel :(49)5130-7922-71
Fax:(49)5130-7922-79

Austria
SCG Branch Austria Office
Weinheberstraße 9 A-4020 Linz
Tel &Fax:(43)732-330766

China
Sumitomo (SHI) Cyclo Drive China, Ltd.
No. 7 Sanijing Road Dongli Economic
Development Zone, Tianjin
Tel :(86)22-2499-3501
Fax:(86)22-2499-3133

Hong Kong
SM-Cyclo of Hong Kong Co., Ltd.
Rm 708, Kowloon Plaza, 485
Castle Peak Road, Kowloon, Hong Kong
Tel:(852)2460-1881
Fax:(852)2460-1882

Singapore
Sumitomo (SHI) Cyclo Drive
Asia Pacific Pte., Ltd.
No.36 Tuas South Street 3,
Singapore 638031
Tel :(65)863-2238
Fax:(65)863-4238

Malaysia
SM-Cyclo of Malaysia Sdn. Bhd.
No.2, Jalan TP 7/5,
Sime-uep Industrial Park, 40400 Shah Alam,
Selangor Malaysia
Tel :(60)3-5128909
Fax:(60)3-5128809

Thailand
SM-Cyclo of Thailand Co., Ltd.
195, Empire Tower
Unit 1504, 15th Floor
South Sathorn Road, Yannawa Sathorn
Bangkok 10120, Thailand
Tel :(66)2-670-0998
Fax:(66)2-670-0999

Australia
SM-Cyclo of Australia Pty., Ltd.
13 Centre Place, Wetherill Park,
NSW 2164
Tel :(61)2-9756-2455
Fax:(61)2-9756-2002

Philippine
SCA Branch Philippines Office
Unit 504, Amberland Plaza
Condominium, Julia Vargas Ave.,
Ortigas Center Metro Manila
Tel:(63)2-637-2106
Fax:(63)2-632-7372

Taiwan
Tatung SM-Cyclo Co., Ltd.
22 Chungshan N. Road.,
3rd Sec. Taipei,
Taiwan, 104 R.O.C.
Tel :(886)2-2595-7275
Fax:(886)2-2595-5594

Korea
SM-Cyclo of Korea Co., Ltd.
Royal Bldg. 9F. Rm. 913
5 Danju-dong Chongro-ku Seoul 110
Tel :(82)2-730-0151
Fax:(82)2-730-0156

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POWER TRANSMISSION & CONTROLS GROUP
Sumitomo Heavy Industries, Ltd.
5-9-11, KITA-SHINAGAWA SHINAGAWA-KU, TOKYO 141-8686, JAPAN
PHONE: (03)5488-8363 FAX: (03)5488-8355
TELEX: J24580 SUMIJUKA

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