HITACHI

HITACHI INVERTER

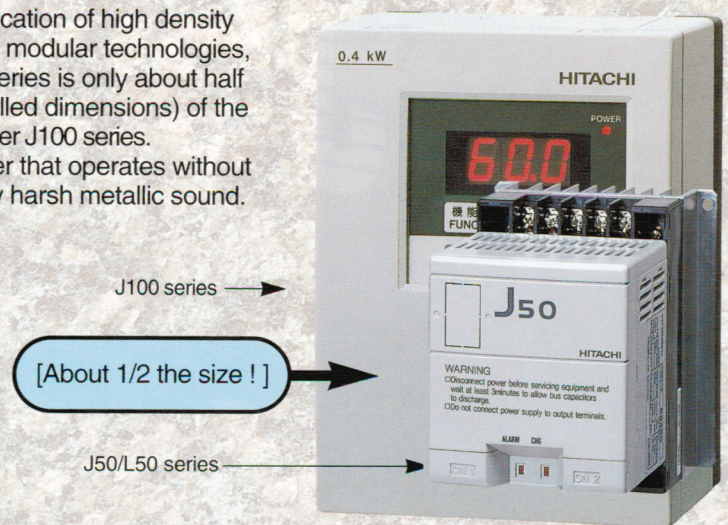# J50/L50 series

An Innovative New Inverter
Compactness and Quiet Control !

J50

HITACHI

WARNING
☐ Disconnect power before servicing equipment and wait at least 3 minutes to allow bus capacitors to discharge.
☐ Do not connect power supply to output terminals.

ALARM   CHG

CN 1   CN 2

Hitachi has now developed the the J50/L50 Series.

The compact quiet series.

- Through application of high density mounting and modular technologies, the J50/L50 series is only about half the size (installed dimensions) of the compact inverter J100 series.
- A quiet inverter that operates without producing any harsh metallic sound.

J100 series ⟶

[About 1/2 the size !]

J50/L50 series ⟶

0.4 kW

HITACHI

POWER

60.0

J50

HITACHI

WARNING
①Disconnect power before servicing equipment and wait at least 3minutes to allow bus capacitors to discharge.
②Do not connect power supply to output terminals.

ALARM CN1

An innovative inverter with considerations for easy wiring, operation and maintenance.

- In consideration of the power line, the J50/L50 series is provided with main circuit wiring terminals arranged neatly from top to bottom for FFB (fuse-free breaker) and MgSw (electromagnetic contactors/switches).
- Connectors are used for the control circuit to reduce the number of wirings.
- All the models of the series are self-cooled types (cooling fan not equipped) to facilitate maintenance. Life-limited parts such as capacitors can be easily replaced.
- A DIN rail mounting base (optional) which allows attaching the unit like an FFB or MgSw is available.

When mounted on DIN rail

● Examples of use

The inverter is usable for fan, pump, air conditioner, cooling tower, conveyor, motor-driven shutter, automatic door, mechanical type speed changer (pulley), etc.

compact and quiet inverter,

Easy operation via Digital Operator.

- The operation is simple with the digital operator, and connecting a cable allows remote operation of the inverter from a distance.
- The unit is also controllable with the conventional remote operator (DOP) or copy unit (DRW). Use of the copy unit enables easy copying of data and parameters.
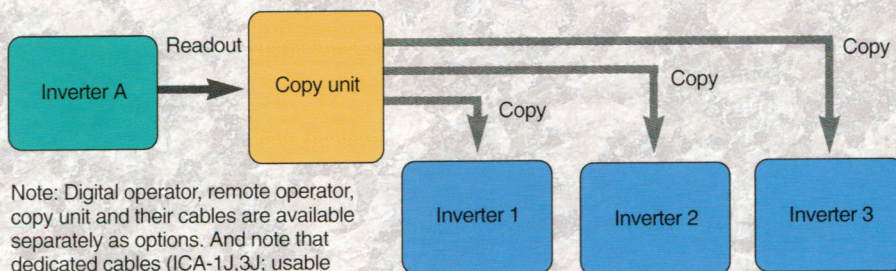
Note: Digital operator, remote operator, copy unit and their cables are available separately as options. And note that dedicated cables (ICA-1J,3J; usable commonly with J series) are required for DOP and DRW.
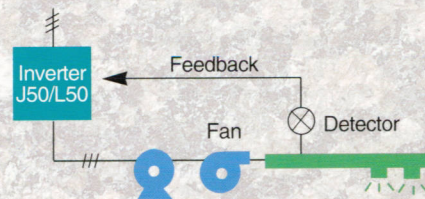
With digital operator mounted (options)

Compact, yet packed with functions.

● PID control
PID control function is included for automatically adjusting the inverter output frequency (motor revolution) to be constant versus the target value (setting). Effective for control of air flow of fan or pressure control of pump.

● Multistage speed operation (16 speeds)
Up to 16 speeds are settable for multistage speed operation.

● Either voltage or current input usable for external frequency setting
Either voltage or current signal can be used for frequency setting from the exterior. A variable resistor is also attachable for this purpose.

● Description of type

J50/L50 - 002 L B 2

Series name, J50/L50 series

Applicable motor rating 002: 0.2kW to 015: 1.5kW

Input power spec. L: three-phase 200V class
S: single-phase 200V class
(manufactured on order: L50 series)

B: Control panel not equipped

Version number

Standard Specifications

Item		3-phase 200V class				Single-phase 200V class		
Model name		L50-002LB	L50-004LB	L50-007LB	L50-015LB	J50/L50-002SB	J50/L50-004SB	J50/L50-007SB
Protective structure		Open type (IP00), natural air cooling						
Max. motor rating (4P, kW) [1]		0.2	0.4	0.75	1.5	0.2	0.4	0.75
Rated capacity (kVA)	200 V	0.5	0.9	1.4	2.5	0.5	0.9	1.4
	230 V	0.6	1.0	1.6	2.8	0.6	1.0	1.6
Rated input voltage		3-phase 200 to 220/200 to 230V ±10%, 50/60Hz ±5%				Single-phase 200 to 240V ±10%, 50/60Hz ±5%..		
Rated output voltage [2]		3-phase 200 to 230V				3-phase 200 to 240V (at no load)		
Rated output current (A) [3]		1.4	2.6	4.0	7.1	1.4	2.6	4.0
Control method		Sine-wave PWM control						
Output frequency range [4]		0.5 to 120 Hz						
Frequency accuracy		Digital setting: ±0.01% of max. frequency Analog setting: ±1% of max. frequency (25°C ±10°C)						
Frequency setting resolution		Digital setting: 0.1Hz (1Hz at above 100Hz with digital operator) Analog setting: 1/500 of max. frequency (at 10VDC input)						
Voltage/frequency characteristic		V/F freely settable for constant torque, reduced torque						
Overload current rating		150%, one minute						
Acceleration/deceleration time		0.1 to 990 sec (acceleration/deceleration separately settable)						
Starting torque [5]		Approx. 100% (when torque boost adjusted)						
Average braking torque	Regenerative braking [6]	Approx. 100% (50 Hz), 50% (60Hz)			Approx.70%(50Hz) 30%(60Hz)	Approx. 100% (50 Hz), 50% (60Hz)		
	DC braking	Operation starts when frequency drops to minimum frequency or below during deceleration (operation frequency, time and braking power can be changed)						
Frequency setting	External signal	1W, 1 to 2 kΩ variable resistor or 0 to 10V DC, 0 to 20mA DC (nominal) (settable to 0 to 5V DC, 4 to 20mA DC with each operator)						
	Operator	Keying with digital operator, remote operator or copy unit (all are available as options)						
Operation command	External signal	Forward run/stop (1a contact)[reverse run selectable at terminal assignment "RV"(reverse run)]						
	Operator	Keying with digital operator, remote operator or copy unit (all are available as options)						
Input signal	Intelligent input pins	Five functions selectable from RV(reverse run command), CF1 to CF4(multistage speed command), STN(initial setting), 2CH(2-stage acceleration/deceleration command), FRS(free run stop command), EXT (external trip), SFT(soft lock), and RS(reset).(With standard function type, one function selectable from RV, CF1, STN, FRS, EXT, SFT and RS.)						
Output signal	Intelligent output pins	Two functions selectable from A-F(analog output frequency), d-F (digital output frequency), A(analog current) monitors, and AR (frequency arrival signal), RUN(running signal). (No output signal with standard function type.)						
	Alarm output	OFF at inverter alarm (changeable to ON at alarm): transistor output						
Other functions		AVR function , frequency upper/lower limiter, max.frequency adjustment , electronic thermal level adjustment, PID function, frequency jump, retry, external frequency start/end (gain, bias) setting						
Protective functions		Overcurrent, overvoltage, undervoltage, overheat, overload limit, electronic thermal						
Operating environment	Ambient temperature/humidity	-10°C to 50°C (-10°C to 40°C when the optional operator is installed) 20% to 90% (non-condensing)						
	Vibration [7]	5.9 m/s² (0.6 G) or less						
	Place of use	Altitude 1,000 m or less, indoors (free of dust and corrosive gas)						
Options		Digital operator, remote operator, copy unit and their cables, regenerative braking unit, AC reactor, inverter noise filter						
Approx. weight (kg)		0.6	0.7	0.8	1.5	0.6	0.7	0.9

[1] Applicable motor refers to Hitachi's standard 3-phase motor. If using motor of other make, motor rated current (at 50Hz) should not exceed inverter rated output current.

[2] Voltage exceeding the power supply voltage cannot be output.

[3] Rated input current will exceed the rated output current. The input will be about 1.2 times the rated output in case of 3-phase 200V class and about 2 times in case of single-phase 200V class (These figures apply when power supply capacity is 25 kVA and impedance is 5%.) Be careful when selecting wiring tools.

[4] If motor is to be operated beyond 50/60Hz, the customer should consult the motor manufacturer about maximum allowable revolution of motor, etc.
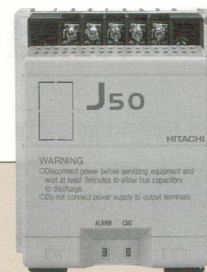
[5] This is the value at rated voltage when using Hitachi's standard 3-phase 4-pole motor.

[6] The braking torque at capacitive feedback is the average deceleration torque at the shortest deceleration (stoppage from 50/60 Hz) of the motor itself. It is not the continuous regeneration torque. And the average deceleration torque varies with motor loss. This value decreases when operating beyond 50/60Hz. Note that a braking resistor is not assembled in the inverter. If a large regeneration torque is required, the optional regenerative braking unit should be used.
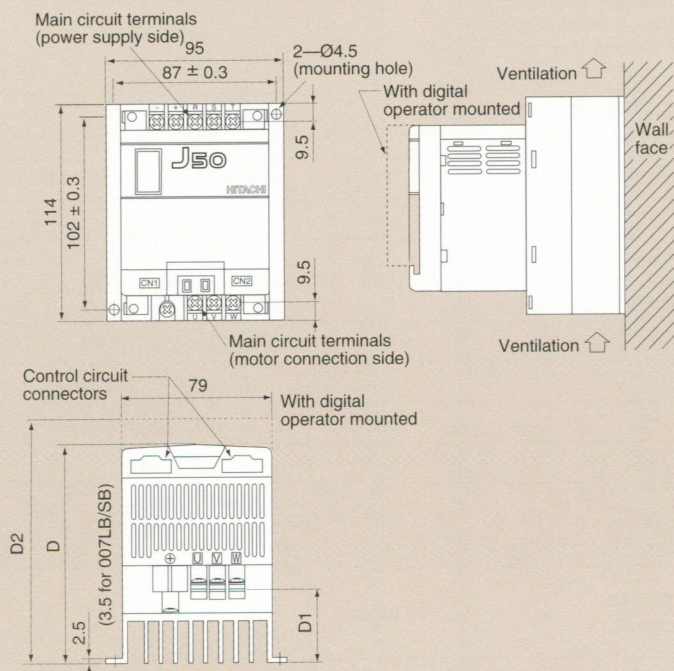
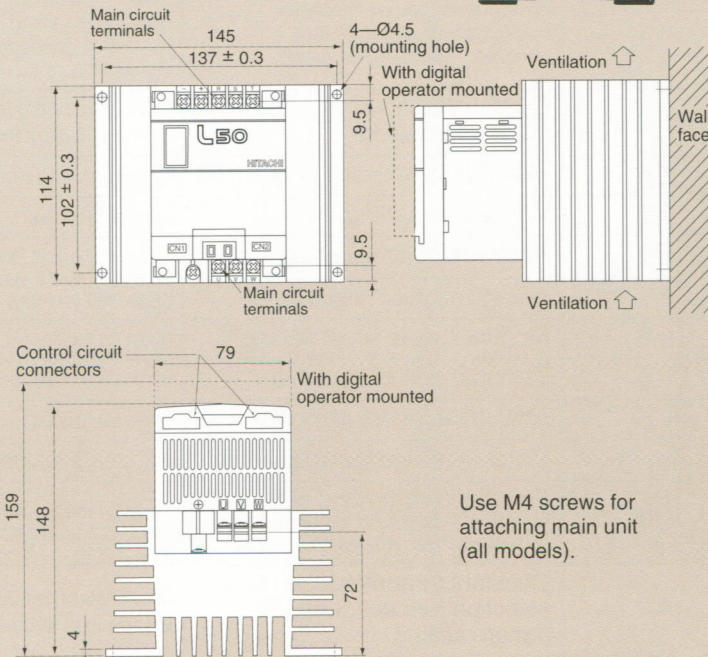[7] Consult us with regard to specifications other than the standard ones.

Dimensions

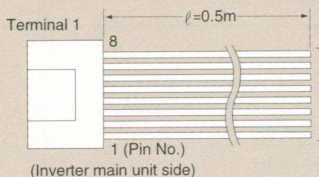## ● L50-002LB to 007LB
J50/L50-002SB to 007SB

Main circuit terminals (power supply side)
95
87 ± 0.3
2—Ø4.5 (mounting hole)
With digital operator mounted
Ventilation ⬆
Wall face
9.5
114
102 ± 0.3
9.5
CN1
CN2
Main circuit terminals (motor connection side)
Ventilation ⬆

Control circuit connectors
79
With digital operator mounted
D2
D
D1
2.5
(3.5 for 007LB/SB)
U V W

Model	D	D1	D2
L50-002LB J50/L50-002SB	102	26	113
L50-004LB J50/L50-004SB	115	39	126
L50-007LB J50/L50-007SB	138	62	149

● L50-015LB

Main circuit terminals
145
137 ± 0.3
4—Ø4.5 (mounting hole)
With digital operator mounted
Ventilation ⬆
Wall face
9.5
114
102 ± 0.3
9.5
CN1
CN2
Main circuit terminals
Ventilation ⬆

Control circuit connectors
79
With digital operator mounted
159
148
72
4

Use M4 screws for attaching main unit (all models).

● Control circuit connector, cables (available at option) — See p.20 for details.

ICL-0.5
Terminal 1
8
ℓ=0.5m
Terminal 2 (not processed)
1 (Pin No.)
(Inverter main unit side)

ICL-1S
Terminal 1
8
ℓ=1m
Terminal 2 (not processed)
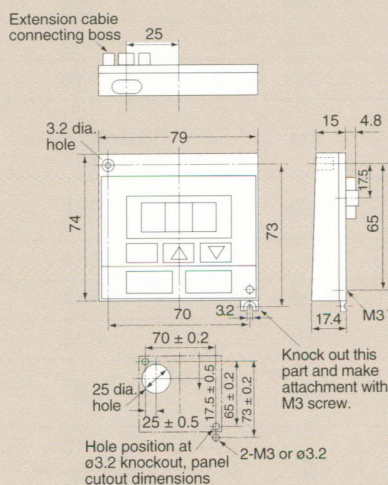1 (Pin No.)
(Inverter main unit side)
Shielded
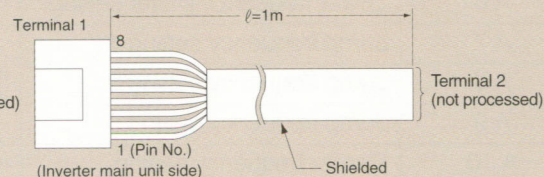
● Operators for data setting (available at option)

Digital operator (OPE-J)
Extension cable connecting boss
25
3.2 dia. hole
79
74
73
70
3.2
70 ± 0.2
25 dia. hole
25 ± 0.5
17.5 ± 0.5
65 ± 0.2
73 ± 0.2
Hole position at ø3.2 knockout, panel cutout dimensions
2-M3 or ø3.2
15
4.8
17.5
65
17.4
M3
Knock out this part and make attachment with M3 screw.

Remote control cable for digital operator
11
27
21
16.5
26
7
25
23
17
13.7
ICJ-1 cable length 1 m, ICJ-3 cable length 3 m
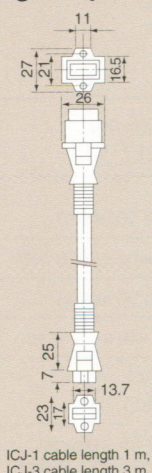
Remote operator/Copy unit (DOP-0EA/DRW-0EA or DRW-0EA2)
95
91
155
145
M4
2—ø4.5
27
23
15
10
135
10
136
92
145
Panel cutout
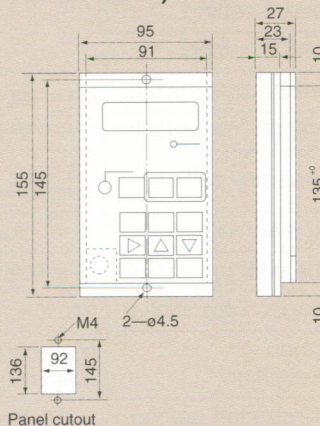
Connection cable for DOP/DRW and J50/L50
38
23
15
6.5
ø12.5
ø13.5
ICA-1J cable length 1 m, ICA-3J cable length 3 m,
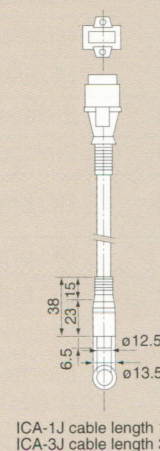
Note: Cable is unnecessary when attaching digital operator to J50/L50 main unit. Use the cable for remote control of the J50/L50.

Note: The remote operator or copy unit cannot be mounted directly to the J50/L50 main unit. Use the dedicated cable (ICA-1J,3J) for the connection.

Function List (See p.9 to p.16 for details of the functions.)

The initial setting listed below are sample values for L50 and J50.

Digital operator (OPE-J) command no.	Function name	Settable range	Initial setting	Remote operator (DOP)/ Copy unit(DRW) function no.
F 1	Monitor (operating frequency, output current, motor rotating direction, PID feedback value)	Select from among operating frequency, output current and motor rotating direction for display (feedback value is also displayable.	—	(monitor mode)
F 2	Operation(output) frequency setting	0.0, 0.5 to 99.9 (Hz): 0.1Hz steps 100 to 135 (Hz):1Hz steps	0.0 (Hz)	(monitor mode)
F 4	Motor rotating direction selection	F(forward run), r(reverse run)	F	Key operation and F-20
F 5	V/F pattern setting	00 to 10 (codes)	02	F-00
F 6	Acceleration time setting	0.5 to 9.9 (s): 0.1s steps 10 to 59 (s): 1s steps 60 to 990 (s): 10 s steps	10(s)	(monitor mode)
F 7	Deceleration time setting			
F 8	Manual torque boost setting	00 to 99 (codes)	31	(monitor mode)
F 9	Setting mode changeover	00 to 03 (codes)	00	(monitor mode)
F 10	Analog meter adjustment	01 to 99 (codes)	72	(monitor mode)
F 11	Motor receiving voltage setting	200, 208, 220, 230, 240 (V)	200 (V)	F-31
F 14	Expanded command setting (used when shifting to expanded commands from A0 onward)	00 to 94 : A0 to A94 .00 to .11 : C0 to C11	00	—
A 0	Constant torque/reduced torque selection fore xpanded V/F pattern setting	00: constant torque charac. 01: reduced torque charac.	00 (code)	F-00
A 3	Maximum frequency adjustment	0 to 15 (Hz)	0 (Hz)	F-01
A 4	Start frequency adjustment	0.5 to 10.0 (Hz)	0.5 (Hz)	F-02
A 5	Upper frequency limiter setting	0.0, 0.5 to 135 (Hz) (function is invalid when 0.0 is set)	0.0 (Hz)	F-03
A 6	Lower frequency limiter setting			F-04
A 7	Jump frequency setting 1	0.0, 0.5 to 135 (Hz) (function is invalid when 0.0 is set)	0.0 (Hz)	F-42
A 8	Jump frequency setting 2			F-43
A 9	Jump frequency setting 3			F-44
A 10	Carrier frequency setting	0.6* to 2.1 to 12 (kHz)	12 (kHz)	F-30
A 12	Multistage speed 1 setting	0.0, 0.5 to 135 (Hz)	5.0 (Hz)	F-05
A 13	Multistage speed 2 setting		20.0 (Hz)	F-06
A 14	Multistage speed 3 setting		40.0 (Hz)	F-07
A 15	Multistage speed 4 setting		0.0 (Hz)	F-08
A 16	Multistage speed 5 setting		0.0 (Hz)	F-09
A 17	Multistage speed 6 setting		0.0 (Hz)	F-10
A 18	2-stage acceleration time setting	0.1 to 990(s)(setting steps are the same as with F6 , F7)	1.0(s)	(monitor mode)
A 19	2-stage deceleration time setting			
A 20	DC braking frequency setting	0.0, 0.5 to 10 (Hz) (function is invalid when 00 is set)	0.0 (Hz)	F-12
A 21	DC braking force setting	00 to 20(codes)(invalid when 00 is set)	00	F-13
A 22	DC braking time setting	00 to 60(s)(invalid when 00 is set)	00 (s)	F-14
A 23	Electronic thermal level adjustment	000, 50 to 120 (%) (invalid when 000 is set)	100 (%)	F-15
A 24	Electronic thermal characteristic selection	000(reduced torque char.), 100(constant torque char.)	000	F-21
A 26	External frequency start setting	< Gain/bias adjustment for external frequency setting > 0.0, 0.5 to 135(Hz) (invalid when 0.0 is set)	0.0	F-18
A 27	External frequency end setting			F-19

| Digital operator (OPE-J) command no.	Function name	Settable range	Initial setting	Remote operator (DOP)/ Copy unit(DRW) function no.
A 39	Frequency arrival signal, frequency ratio setting for acceleration	000 to 100%; ratio to the maximum frequency set in V/F pattern	000	F-48
A 40	Frequency arrival signal, frequency ratio setting for deceleration			F-49
A 45	AVR function selection	00: AVR function OFF, 01: AVR function ON	00	F-24
A 46	Alarm contact output selection	1a: a contact(turned ON at alarm occurrence), 1b: b contact(turned OFF at alarm occurrence)	1b	F-23
A 62	Base frequency setting	< For expanded V/F pattern setting > 50 to 120 (Hz)	60 (Hz)	F-00
A 63	Maximum frequency setting			
A 66	External frequency start ratio setting	< Setting of external frequency operating ratio > 000 to 100 (%)	000	F-50
A 67	External frequency end ratio setting			F-51
A 68	Jump frequency range setting 1	Setting of range of jump frequencies specified at A7 to A9; invalid when 0.0 is set. 0.0 to 9.9 (Hz)	0.0 Hz	F-45
A 69	Jump frequency range setting 2			F-46
A 70	Jump frequency range setting 3			F-47
A 71	Multistage speed 7 setting	0.0 0.5 to 135 (Hz) Up to 16 speeds settable in combination with F2 and A12 to A17	0.0 Hz	F-11
A 72	Multistage speed 8 setting			F-34
A 73	Multistage speed 9 setting			F-35
A 74	Multistage speed 10 setting			F-36
A 75	Multistage speed 11 setting			F-37
A 76	Multistage speed 12 setting			F-38
A 77	Multistage speed 13 setting			F-39
A 78	Multistage speed 14 setting			F-40
A 79	Multistage speed 15 setting			F-41
A 82	Allowable undervoltage time setting	0.3 to 3.0(s)	1.0 (s)	F-26
A 83	Retry waiting time setting	0.3 to 100(s)	10 (s)	F-27
A84	Soft lock setting	00: no lock 01: soft lock	00	F-22
A85	Overload limit deceleration time setting	0.1 to 30(s), 31; function invalid when 31 is set	1.0 (s)	F-25
A88	External trip contact selection	1a: a contact 1b: b contact	1b	F-23
A89*	Output current monitor setting	000, 0.8A, 1.4A, 2.6A, 4.0A, 7.1A	000	(monitor mode)
A90	P gain setting	0.2 to 5.0	0.2	F-59
A91	I gain setting	0.0* to 0.5 to 150	0.5	F-60
A92	D gain setting	000 to 100	000	F-61
A93	PID scale ratio setting	0.01 to 99.9	1.00	F-62
A94	PID function selection	00: PID function OFF 01: PID function ON	00	F-24
C0	Input pin setting 1	00(RV), 01(CF1), 02(CF2), 03(CF3), 04(CF4), 07(STN), 09(2CH), 11(FRS), 12(EXT), 15(SFT), 18(RS) 99(test mode: do not use)	01	F-52
C1	Input pin setting 2		02	F-53
C2	Input pin setting 3		09	F-54
C3	Input pin setting 4		00	F-55
C4	Input pin setting 5		18	F-56
C10	Output pin setting 11	Ar(frequency arrival signal) and run (running signal) outputs, A-F(analog output frequency), d-F (digital output frequency) and A(analog current) monitors	A-F	F-57
C11	Output pin setting 12	Ar and run outputs	run	F-58

Note 1: The functions that can be changed during operation are F1, F2, F6, F7, F8, F10, A12 to A19, A71 to A79 and A89.
Note 2: The asterisk (*) represents to take effect after version 2.

Terminal Configuration and Functions

● Main circuit
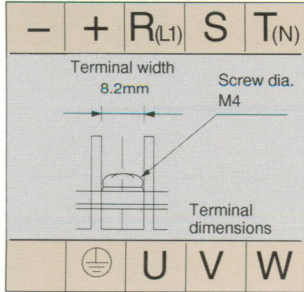
Terminal symbol	Terminal name	Function
R,S,T, (L1)* (N)*	Main power source input terminals	Connect input (commercial) power (connect to R and T for single-phase model)
U,V,W	Inverter output terminals	Connect 3-phase motor.
−, +	Regenerative braking unit connection terminals (capacitor connection terminals)	Connect optional regenerative braking unit when braking torque required.
⏚	Ground (Protective Earth)	Ground to prevent electric shock and reduce noise.

Terminal width 8.2mm
Screw dia. M4
Terminal dimensions

| − | + | R(L1) | S | T(N) |
| ⏚ | U | V | W |

* L1, N: Symbols for J50 series
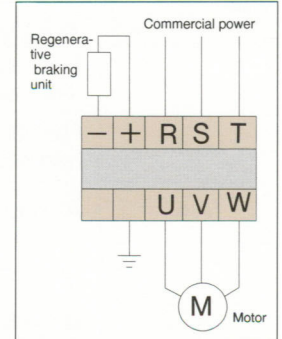
● Control circuit

Connector pin arrangement

CN1   Note

| 1 | 2 | 3 | 4 | L | 11 | CM | 12 |

CN2

| FW | 5 | H | O | OI | L | AL0 | AL1 |

Note: In the J50 series, a common terminal for input signals is assigned to PV12.

Applicable connector type
Manufacturer: Japan Aviation Electronics Industry Ltd.
Housing   : IL-8S-S3L-(N)
Contact   : IL-C2-10000,0001

(See p.21 for details.)

● Pin Symbols and Names (See p.8 for functional description.)

Symbol	Signal	Connector	Name	Function	Remarks
1(CF1)	Input signal	CN 1	Intelligent input 1	● Functions freely selected from the following can be assigned to pins No.1 to No.5. Parenthesized functions at left are initial settings. RV, CF1, CF2, CF3, CF4, STN, 2CH, FRS, EXT, SFT, RS	Example of L50, and J50
2(CF2)			Intelligent input 2		
3(2CH)			Intelligent input 3		
4(RV)			Intelligent input 4		
5(RS)		CN 2	Intelligent input 5		Activated(ON) with SW closed, inactivated(OFF) with SW open. Von max. 1.5V (at 1L = 6.5 mA)
FW			Forward run command		
L or PV12		CN 1	Common terminal for input and output(11) signals		
L		CN 2			
H	Frequency command input	CN 2	Power for frequency command	● External analog signal used for frequency command	10V DC, 10mA max.
O			Frequency command (voltage command)		0 to 10V DC Input impedance 30kΩ
OI			Frequency command (current command)		0 to 20mA DC Input impedance 250Ω
L		CN1 CN2	Common terminal for input and output(11) signals		—
11(A-F)	Output	CN1	Intelligent output 11	● Functions selected from the following can be assigned to these terminals. Parenthesized functions at left are initial settings. [11]: A-F, d-F, A, Ar, run [12]: Ar, run	10V DC output, output load resistance 10kΩ (L is common)
12(RUN)			Intelligent output 12		Transistor output (open collector), max. 27V DC, 50mA
CM			Common terminal for output 12		
AL0	Alarm output	CN2	Alarm output	(inverter internal circuit)	Transistor output (open collector), max. 27V DC, 50mA
AL1					

Note: L (common) terminal is the same for CN1 and CN2. The common terminal for each signal is as follows.

| Signal | 1, 2, 3, 4, 5 | H, O, OI, 11 | 12 | AL1 |

● Control circuit names and functions

| Signal	Function symbol	Name	Details of function	Reference page
Input signal	FW	Forward run command		16
	RV	Reverse run command		
	CF1	Multistage speed command 1	Each contact signal is used when changing over the inverter output frequency (motor rotating speed). CF1 to CF4 are used in combination for the changeover (up to 16 speeds). (Only CF1 is usable with the standard function type, and a maximum of two speeds are available.)	11
	CF2	Multistage speed command 2		
	CF3	Multistage speed command 3		
	CF4	Multistage speed command 4		
	STN	Initial setting command	Used to return each data of inverter to initial setting (setting when shipped from factory).	16
	2CH	2-stage acceleration/deceleration command	Used to change the acceleration/deceleration time.	12
	FRS	Free run stop command	Cuts off inverter output and puts motor in free run stop (natural stop) status.	16
	EXT	External trip input	Trip signal input from device other than inverter itself. (When signal is input, inverter output is cut off and alarm is output.)	15
	SFT	Soft lock command	Used to disable change of each setting data (soft lock).	14
	RS	Reset input	Used to reset data at inverter trip.	16
	L	Common	Common terminal for input signal (except $J50_2$ series) and output pin 11.	—
	PV12	Common	Common terminal for input signal ($J50_2$ series)	—
Frequency command input	H	Frequency command power source	If voltage and current commands are input simultaneously, the command will be the total value of the two.	13
	O	Frequency command (voltage command)		
	OI	Frequency command (current command)		
	L	Common		
Monitor/ output signal	A-F	Analog output frequency monitor	Analog signal is output according to inverter output frequency.	16
	d-F	Digital output frequency monitor	Digital signal (pulse train) is output according to inverter output frequency.	16
	A	Analog current monitor	Analog signal is output according to inverter output current.	16
	Ar	Frequency arrival signal	This is output when inverter output frequency reaches certain level.	14
	RUN	Running signal	This is output when inverter is running.	16
	CM	Common	Common terminal for output signal (pin no.12).	—
Alarm output	AL0	Alarm output	This is output when inverter protective function is activated to trip inverter. This is normally ON, and is turned OFF at alarm or when power is cut off (1b contact spec.). (Operator can change this to OFF in normal status or at power off and to ON when alarm occurs (1a contact spec.).)	14
	AL1			

Details of Functions

■ Monitor (output frequency, output current, motor rotating direction, PID feedback value)
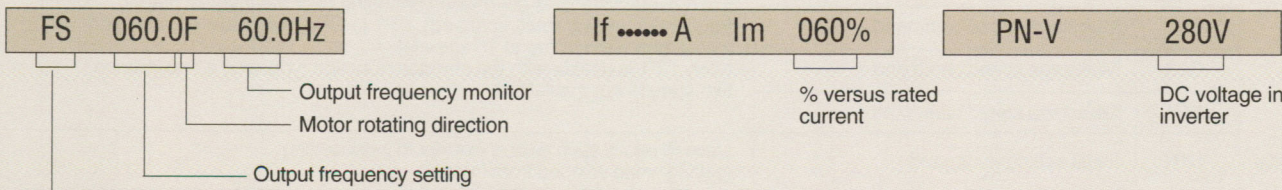
[Digital operator]

F 1

| 6 0.0 | 6 0. | F | 0 0.0 |

Output frequency | Output current | Motor rotating direction | PID feedback value
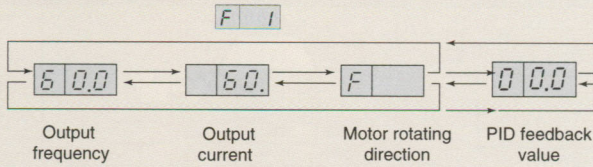
● Monitored values are displayed in the sequence shown at left.
● Output current is displayed in % versus the rated current. (It is distinguished from output frequency by the period(.) at the end.)
● PID feedback value is displayed when PID function has been selected.

[Remote operator/copy unit](Monitor mode)

| FS 060.0F 60.0Hz | | If ••••• A Im 060% | | PN-V 280V |

Output frequency monitor
Motor rotating direction
Output frequency setting

% versus rated current

DC voltage in inverter

FS: Operation with operator .. 1S to 15S: In multistage speed run
TM: At external frequency command
PI: In PID control mode

■ Output frequency setting

[Digital operator] F 2 ———— valid when setting frequency from digital operator.

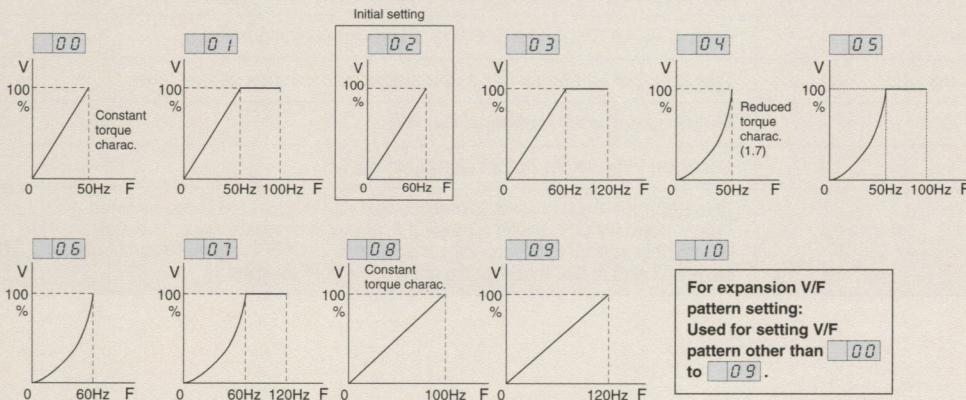**[Remote operator copy unit]** **(monitor mode)**— described above (in monitor)

■ Motor rotating direction selection

[Digital operator] F 4 — F: forward run r: reverse run

**[Remote operator copy unit]** ———— designation by key input on remote operator.

■ V/F pattern setting F 5 , F-00 , expansion V/F pattern setting R 0 , R 6 2 , R 6 3

V/F pattern (base frequency, max. frequency, torque characteristic) should be set so as to meet motor rating and load characteristic.
Patterns other than those below are settable by R 0 , R 6 2 , R 6 3 after setting code 1 0 (or F-00 with remote operator).

Initial setting

| 0 0 | 0 1 | 0 2 | 0 3 | 0 4 | 0 5 |

| 0 6 | 0 7 | 0 8 | 0 9 | 1 0 |

For expansion V/F pattern setting: Used for setting V/F pattern other than 0 0 to 0 9 .

[Expansion V/F pattern]

① R 0 : torque characteristic — code 0 0 (constant torque), 0 1 (reduced torque)
② R 6 2 : base frequency } 50~120(Hz)
③ R 6 3 : maximum frequency
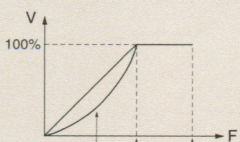
With remote operator | VF-VC 060-120 |
① ② ③

■ Acceleration time $\boxed{F\ 6}$, ACCEL-1 , deceleration time $\boxed{F\ 7}$ DECEL-1

The time (slope) taken for rising from 0 Hz to the maximum frequency set in V/F pattern is settable. Also, the time (slope) taken for falling from the maximum frequency to 0 Hz is settable.
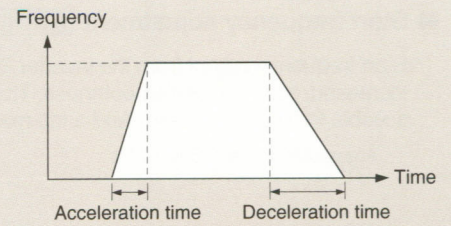
■ Torque boost (manual) $\boxed{F\ 8}$ V-Boost <**>

Motor torque is adjustable by increasing output voltage in the low frequency region.
If an extremely large value is set, the inverter may trip.
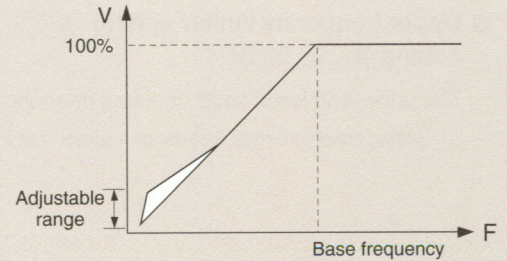
■ Setting mode (run/frequency command sending end) changeover $\boxed{F\ 9}$, F-SET-**** , F/R-SW****

Run/stop command and frequency command sending ends are settable. A desired combination of command sending ends should be selected in code.

Code	Run command sending end	Frequency command sending end
00	Operator	Operator
01	Operator	Terminal
02	Terminal	Operator
03	Terminal	Terminal

Operator: For sending command by key input on digital operator/ remote operator
Terminal: For sending command via control circuit (input pin)

■ Analog meter adjustment $\boxed{F\ 10}$, M-ADJ**

The scale of the analog frequency meter and ammeter connected to the inverter can be calibrated. (For adjusting method, refer to the instruction manual.)

■ Motor receiving voltage setting $\boxed{F\ 11}$, F-31

The voltage at the base frequency set in V/F pattern is settable.
(The voltage is selectable from 200, 208, 220, 230 and 240 V.)

Note 1: The motor receiving voltage setting will be invalid unless the AVR function $\boxed{A\ 45}$ is activated (ON). (Output is provided according to the input power voltage.)
2: A maximum output voltage exceeding the input power voltage cannot be output.
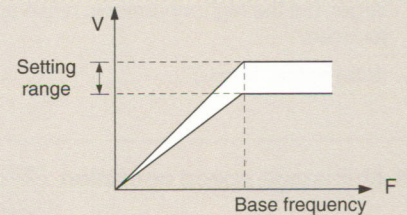
■ AVR function selection $\boxed{A\ 45}$, F-24

The AVR (Automatic Voltage Regulator) function can be made valid (ON) or invalid (OFF).

AVR function: Corrects the output voltage to prevent torque variation even if the input power voltage fluctuates. But a maximum output voltage exceeding the input power voltage cannot be output.

Note 1: Set the motor receiving voltage when the AVR function is valid (turned ON).
2: This function is invalid (OFF) in the standard function type.

■ Maximum frequency adjustment $\boxed{A\ 3}$, F-01

This is effective for fine adjustment of the maximum frequency after setting it in the V/F pattern.

Adjustable range: 0 to 15 Hz

Maximum frequency can be output up to 135 Hz (120 + 15 = 135 Hz) by using this function.
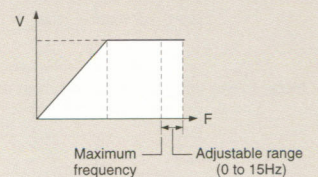
■ Start frequency adjustment $\boxed{R~4}$ $\boxed{F\text{-}02}$

Start frequency output from the inverter is adjustable. Although start torque can be increased, start will lose smoothness. Therefore an increased start torque is not suitable for shockless start. And a trip may occur depending on the load condition.
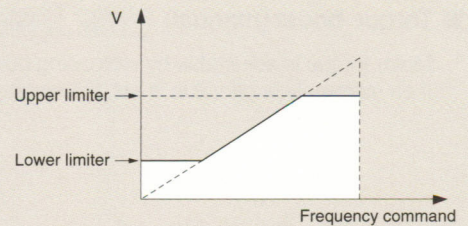
Adjustable range: 0.5 to 10 Hz
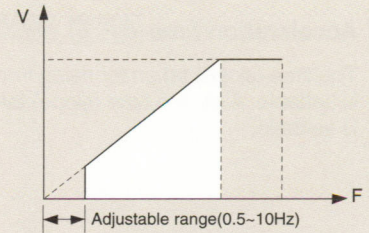
■ Upper frequency limiter setting $\boxed{R~5}$, $\boxed{F\text{-}03}$, lower frequency limiter setting $\boxed{R~6}$, $\boxed{F\text{-}04}$

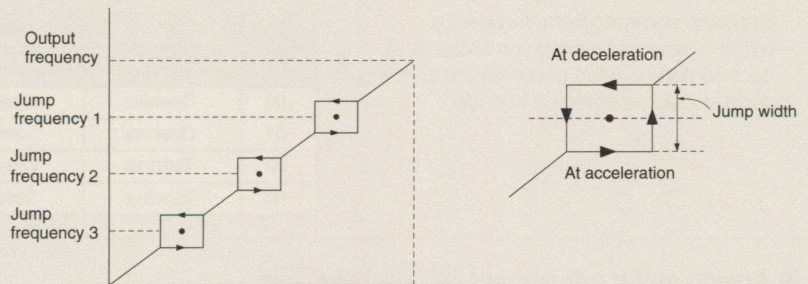The upper and lower limits of output frequency can be restricted.

Setting condition: max. frequency ≥ upper limit ≥ lower limit ≥ start frequency

■ Frequency jump $\boxed{R~7}$, $\boxed{R~8}$, $\boxed{R~9}$, $\boxed{F\text{-}42}$, $\boxed{F\text{-}43}$, $\boxed{F\text{-}44}$
Frequency jump width $\boxed{R68}$, $\boxed{R69}$, $\boxed{R70}$, $\boxed{F\text{-}45}$, $\boxed{F\text{-}46}$, $\boxed{F\text{-}47}$

Used for operation while avoiding resonance with load and machine. Up to 3 jump frequencies are settable.

■ PWM carrier frequency $\boxed{R~10}$, $\boxed{F\text{-}30}$

The PWM carrier frequency is changeable in the J50/L50 series. When lowering the PWM carrier frequency, motor noise becomes larger, but the higher harmonic noise and leakage current can be reduced.

(Initial setting: 12 kHz)

Effect of carrier frequency

Carrier frequency	Low ←→ High	
Motor noise	Large ←→ Small	
Leakage current	Small ←→ Large	

Note: This table is not a quantitative one.

■ Multistage speed operation $\boxed{R12}\sim\boxed{R17}$, $\boxed{R71}\sim\boxed{R79}$, $\boxed{F~2}$ $\boxed{F\text{-}05}\sim\boxed{F\text{-}11}$, $\boxed{F\text{-}34}\sim\boxed{F\text{-}41}$, $\boxed{FS^{**}}$

The output frequency (motor speed) of inverter can be switched over using an external contact signal (multistage speed operation).
● Up to 16 speeds are settable with the multi-function type.
● Up to 2 speeds are settable with the standard function type. ($\boxed{R12}$, $\boxed{F~2}$, $\boxed{F\text{-}05}$ $\boxed{FS^{**}}$)
● Among input pins 1 to 5, multistage speed commands CF1 to CF4 are assigned and each switch is turned on (short-circuited) as shown below.
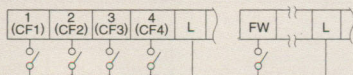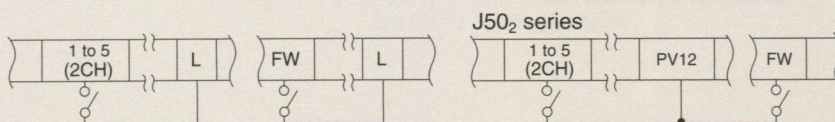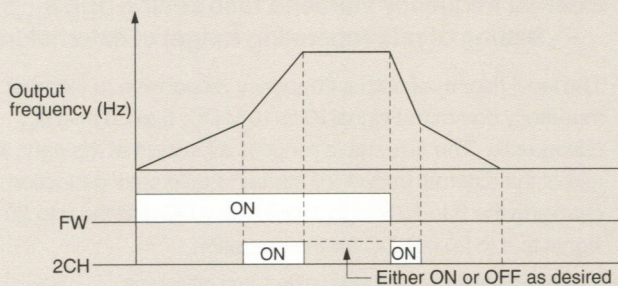

Note: In the J50₂ series, a common terminal is assigned to PV12 as shown below.
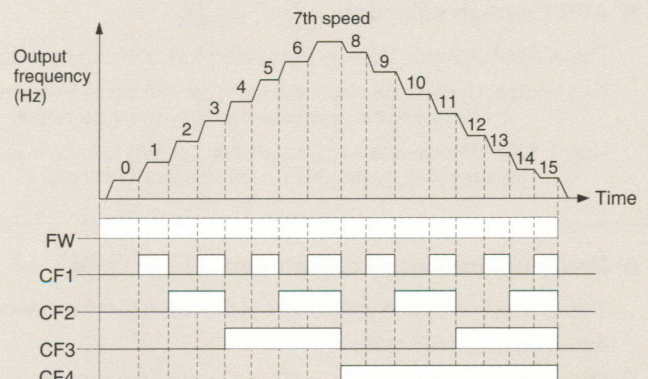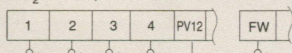
■ 2-stage acceleration/deceleration time (2nd acceleration / deceleration time) $A18$, $A19$, ACCEL-2 DECEL-2

Acceleration/deceleration time (slope) is changeable during operation using an external contact signal. This function is effective when two motors having different load inertia characteristics are switched over for use or when it is desired to change acceleration/deceleration time during operation.
● 2-stage acceleration/deceleration command (2CH) is assigned to any of input pins 1 to 5.
● This function is not available in the standard function type.
● When 2CH is turned ON, acceleration/deceleration is performed at the time rate set by the above command.

Output frequency (Hz)

FW — ON

2CH — ON   ON
└─ Either ON or OFF as desired

J50₂ series

| 1 to 5 (2CH) | L | | FW | L | | 1 to 5 (2CH) | PV12 | FW |

■ DC braking frequency, torque and time settings $A20$, $A21$, $A22$, F-12 F-13 F-14

Effective for enhancing positioning and stop accuracies because of use of DC braking at deceleration and stop of the motor.

Note 1: These settings should be invalidated when acceleration and deceleration are repeated frequently.
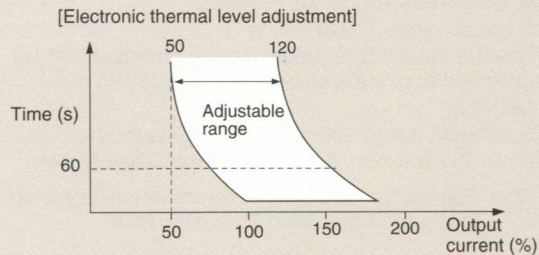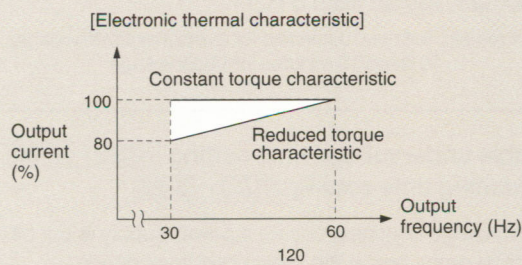   2: Too large a braking torque may cause tripping.

Output frequency (Hz)

Braking frequency

Braking time

Time

Braking torque
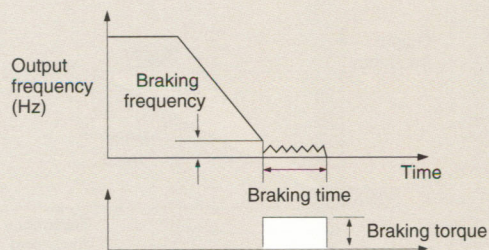
■ Electronic thermal level and characteristic selection $A23$, $A24$, F-15 F-21

An electronic thermal relay is incorporated for protecting the motor from overheat. Its level and characteristics are selectable.
● Either constant torque or reduced torque is selectable as a characteristic.

Note 1: For continuous use in a region outside 30 to 60 Hz, a moving type thermal relay should be installed.
   2: For using a general-purpose motor, the reduced torque characteristic should be selected. The constant torque characteristic is intended for using a constant torque motor exclusive for an inverter.
   3: Level of 100% corresponds to the rated current value of the applicable inverter model.

[Electronic thermal characteristic]

Constant torque characteristic

Output current (%)

100

80

Reduced torque characteristic

30   60   Output frequency (Hz)
      120

[Electronic thermal level adjustment]

50   120

Time (s)

Adjustable range

60

50   100   150   200   Output current (%)

■ External frequency start/end setting $\boxed{A\,26}$, $\boxed{A\,27}$, $\boxed{F\text{-}18}$, $\boxed{F\text{-}19}$
— Gain and bias adjustment of external frequency command
External frequency start/end ratio setting $\boxed{A\,66}$, $\boxed{A\,67}$, $\boxed{F\text{-}50}$, $\boxed{F\text{-}51}$
— Setting of ratio(operating range) of external frequency command

The level (slope) of output frequency responsive to external frequency command signal (0 to 10 V DC, 0 to 20 mA) is changeable. The adjustable range is as shown at the right. Also, use of the external frequency start/end ratio setting function allows changing the 0 to 10 V signal to 0 to 5 V DC and the 0 to 20 mA signal to 4 to 20 mA DC for the operation.
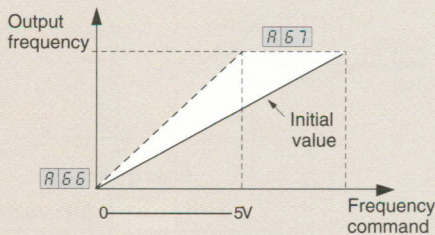
Setting condition: start ratio value ≤ end ratio value
(End ratio should be set first.)
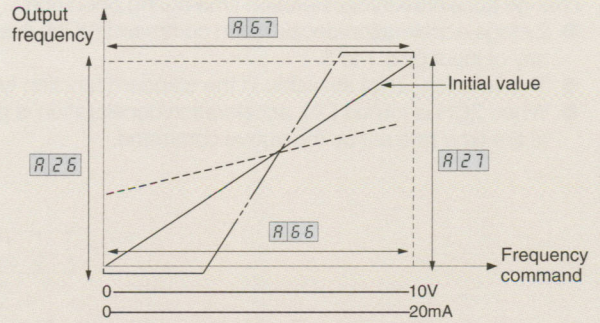
< Setting example 1 > With 0 to 5 V DC input
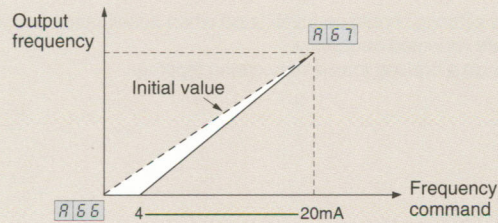
$$\boxed{A\,66} : 0 \left(= \frac{0V}{10V} \times 100\right)$$

$$\boxed{A\,67} : 50 \left(= \frac{5V}{10V} \times 100\right)$$

< Setting example 2 > With 4 to 20 mA DC input

$$\boxed{A\,66} : 20 \left(= \frac{4mA}{20mA} \times 100\right)$$

$$\boxed{A\,67} : 100 \left(= \frac{20mA}{20mA} \times 100\right)$$

■ Retry selection $\boxed{A\,34}$, $\boxed{F\text{-}20}$

Retry or restart function is selectable from the following:
[After stoppage due to inverter trip (alarm signal output)]
[Automatic restart from 0 Hz]

No. of retries: 3 times/10 minutes for overcurrent/overvoltage,
16 times/10 minutes for undervoltage

■ Allowable undervoltage time setting $\boxed{A\,82}$, $\boxed{F\text{-}26}$
■ Retry waiting time setting $\boxed{A\,83}$, $\boxed{F\text{-}27}$

An undervoltage condition occurs if power supply is cut off or if voltage drops below the prescribed level during operation. If this condition is within the set undervoltage time, then operation can be restarted.
● Settable range: 0.3 to 3.0 (s)
Beyond the set time, undervoltage protection will be activated and/or the inverter will be stopped due to "power failure".
For restart (retry) after activation of overcurrent/overvoltage protective function, the standby time is adjustable.

Note: This function will be ineffective unless the retry selection $\boxed{A\,34}$ function is set to "0 Hz auto restart".
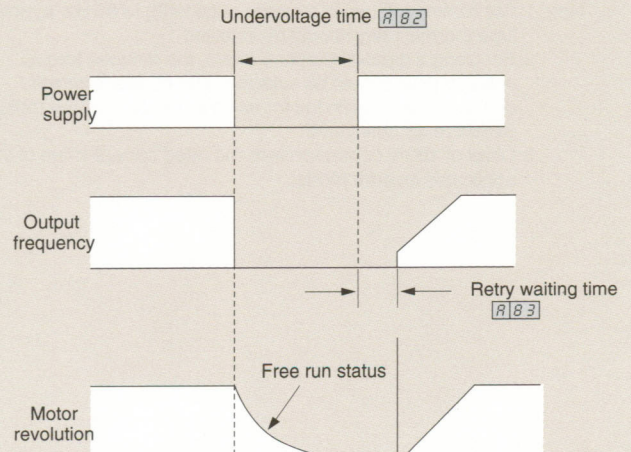
■ Setting of desired arrival frequency at acceleration/ deceleration $A39$, $A40$, F-48, F-49

(1) Signal can be output when output frequency reaches a certain level.
● The frequency level at acceleration and deceleration is settable individually.
● Frequency arrival (Ar) signal can be assigned to either output pin 11 or 12.
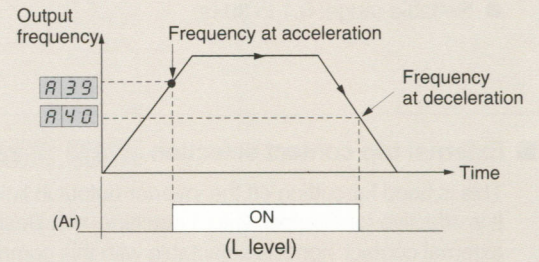
> Note 1: This function is not available in the standard function type.
> 2: An open-collector circuit is used for the output, and is turned to L level at ON.

(2) If 000 is set for $A39$ or $A40$, this signal is usable as a frequency matching signal (output when constant speed is reached).

■ Selection of alarm output specification $A46$, F-23

The operating specification for the alarm output signal is selectable in accordance with the machine specification and/or the host equipment, etc.

> Note: The output is a transistor output of open-collector circuitry.

	Operation (signal level)	
	a contact spec.	b contact spec.
When normal	OFF(H level)	ON(L level)
At fault	ON (L level)	OFF(H level)
At power failure	OFF(H level)	OFF(H level)

■ Soft lock setting $A84$, F-22 — setting to disable data rewrite

Setting or change of data and parameters can be inhibited (or soft-locked) via this function. But even in the soft-lock status, the monitor, external signals and frequency command from each operator remain valid.
● In the multi-function type, the function is usable even with external contact signals. The soft-lock function (SFT) is assigned to input pins 1 to 5 and short-circuiting is applied as shown in the figure.
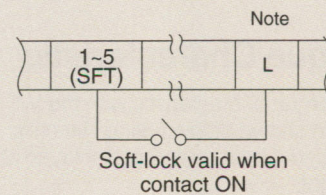
Soft-lock valid when contact ON

> Note: In the J50 series, a common terminal is assigned not to L, but to PV12.

14

■ Deceleration time setting under overload limitation `A 85`, `F-25`

Deceleration time is adjustable when overload limit is activated.
(Setting should be increased when using a load having a large inertia moment.)
● Settable range: 0.1 to 30 (s)

■ External trip contact selection `A 88`, `F-23`

This is used for cutting off the inverter output in linkage with external contact signal.
It is effective for interlock with a machine, etc. Besides, the contact specification of
external contact signal is selectable with this command.
● External trip input (EXT) is assigned to input pins 1 to 5.
● When this function is activated, the inverter outputs an alarm signal and the
output is tripped.

Note
1~5 (EXT)   L

a contact spec.
(operates when closed)
b contact spec.
(operates when opened)
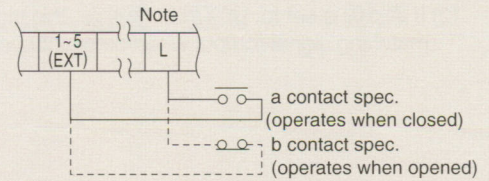
Note: In the J50 series, a common terminal
is assigned not to L, but to PV12.

■ PID function selection `A 94`, `F-24`
■ PID gain setting `A 90`, `A 91`, `A 92`, `F-59`, `F-60`, `F-61`
■ PID scale ratio setting `A 93`, `F-62`

Output frequency is adjusted by P (proportional), I (integral) and D (derivative) control
according to the difference between the target value (setting) and the feedback value from
the exterior. This is effective for constant control of fan airflow and pressure control of a pump.
Target value: set by operator or by multistage speed command
Feedback value: current or voltage frequency command signal
Target and feedback values can be displayed via scaling `A 93`.
Target value can be displayed by frequency setting `F 2` or by multistage speed setting `A 12` ~ `A 17`,
`A 71` ~ `A 79`, while feedback value can be displayed by monitor function `F 1`.

Note: Refer to the instruction manual for details.

Torque Characteristic

The torque characteristic with the V/F
pattern shown below (using Hitachi's
enclosed 4-pole motor) is displayed at
the right.

V
100%

1 ~ 50 ~ 100 (Hz) F
1 ~ 60 ~ 120

Torque %

150
130
125
100
95
90
80
75
50
45
25

Max. torque
(at torque boost adjustment, short-time)
200/220/60Hz
Continuous operating torque
200/50Hz

0 6 10 20 30 40 50 60 70 80 90 100 110 120
0 5 - - - - - 25 - - - - - 50 - - - - - 75 - - - - -100
Output frequency Hz
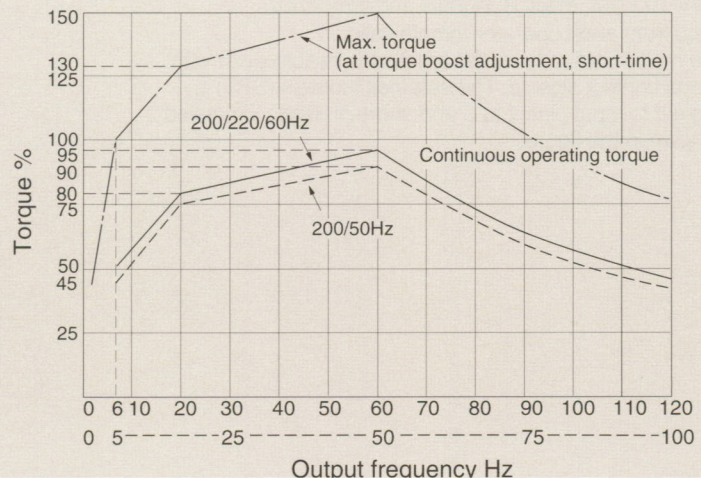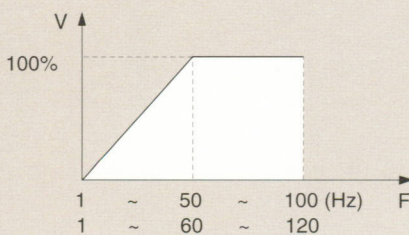
■ Input pin setting [input signal assignment] $C\ 0$ ~ $C\ 4$, F-52 ~ F-56

Selected functions can be freely assigned to input signals (pin No. 1 to 5).

● Pin No. and command

Pin No.	Connector	Setting command		Initial setting
1	CN1	$C\ 0$	F-52	01 (CF1)
2		$C\ 1$	F-53	02 (CF2)
3		$C\ 2$	F-54	09 (2CH)
4		$C\ 3$	F-55	18 (RS)
5	CN2	$C\ 4$	F-56	00 (RV)

● Selectable functions

Code	Symbol	Function	Reference page	Code	Symbol	Function	Reference page
00	RV	Reverse run command	16	09	2CH	2-stage acceleration/deceleration	12
01	CF1	1st multistage speed command	11	11	FRS	Free run stop command	16
02	CF2	2nd multistage speed command	11	12	EXT	External trip input	15
03	CF3	3rd multistage speed command	11	15	SFT	Soft lock	14
04	CF4	4th multistage speed command	11	18	RS	Reset	16
07	STN	Initial setting	16	99	Test mode: do not use		

● Forward run command (FW), reverse run command (RV)

Used for inverter operation according to external contact signals. Valid when the run command sending end is "terminal". (Setting mode changeover $F\ 9$ is in code 02 or 03.)

Note: Inverter will stop if FW and RV are turned ON simultaneously.
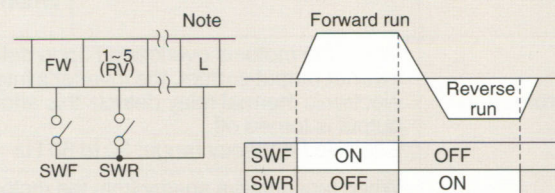
Note: In the J50 series, a common terminal is assigned not to L, but to PV12.

● Initial setting (STN)

Data of each function can be returned to the initial settings (status when shipped from factory). (Refer to instruction manual for initial setting method.)

● Free run stop command (FRS)

The motor can be subjected to free-run stop with the inverter output turned off during operation. This is effective in combination with a brake-equipped motor, etc.
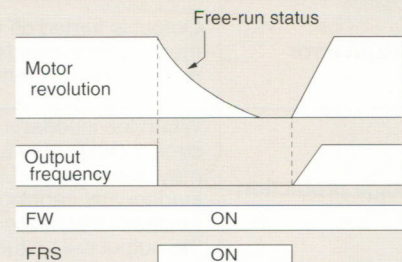
● Reset (RS)

The alarm signal output status due to activation of the inverter protective function can be released by external contact input.
(If this function is activated during operation, the output will turn off.)

■ Output pin setting [output signal assignment] $C\ 10$ ~ $C\ 11$, F-57, F-58

Selected functions can be assigned to output signals (pin No. 11, 12).

Pin No.	Connector	Setting command		Initial setting	Selectable func.
11	CN2	$C\ 10$	F-57	A-F	A-F(analog output frequency), A(analog output current), d-F(digital output frequency) monitors, Ar(frequency arrival) and run (running) signals
12		$C\ 11$	F-58	RUN	Ar (frequency arrival) and run (running) signals

● Monitor output signal

A-F (analog output frequency), A (analog output current)

0 to 10V full scale, I mA max. (internal resistance 10 to 22 kΩ)

Duty ratio t/T proportional to output frequency/current is output.
Approx. 10V
(10V at max.frequency, 10V at 200% of rated current)

d-F (digital output frequency)

Approx. 10V
1/output frequency
Pulse train of same frequency as output frequency is output. (Duty ratio is 50%.)
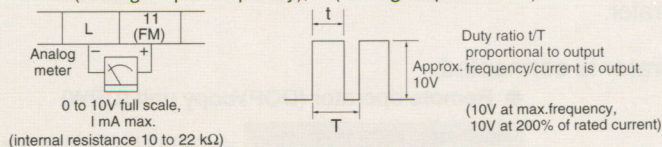
● run (running) signal

This is output while the inverter is running. Output is of open- collector type, and is at L level when ON.

● Ar (frequency arrival) signal — See p.14

Note: Common terminals for pin No. 11 and 12 are L and CM, respectively.(See p.7, 18.)

Protective Functions

The following functions are incorporated for protection of the inverter. When a protective function is activated, the inverter output is turned off, the motor enters a free-run stop status, and an alarm signal is output. Reset is necessary for restarting operation, so the status is held until a reset is made.

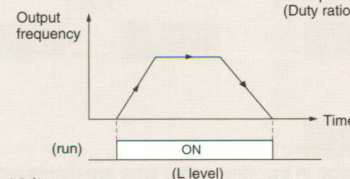| Function name	Details		Main unit ALARM LED display	Operator display *1	
				Digital operator (OPE-J)	Remote operator (DOP) copy unit (DRW)
Overcurrent protection	If an overcurrent flows during acceleration, deceleration or constant speed operation, or a fault occurs in the current detection circuit, the protective circuit will operate to turn off the inverter output.	During constant speed	Lights steadily	E 1	OC. Drive
		During deceleration		E 2	OC. Decel
		During acceleration		E 3	OC. Accel
		When stopped		E 4	Over. C
Overload protection	When the motor is overloaded upon detecting the inverter output current, the inverter's internal electronic thermal relay detects this and the inverter output is turned off. Effective frequency range: 30 to 60 Hz		Flashes (ON: 0.3 s, OFF: 0.3 s)	E 5	Over. L
Overvoltage protection	When regenerative energy from the motor or receiving voltage is high, or load is suddenly lightened during overload limiting action, causing the converter voltage to exceed the prescribed level, the protective circuit will operate to turn off the inverter output.		Flashes (ON: 5.0 s, OFF: 5.0 s)	E 7	Over. V
EEPROM error	Output is turned off when the inverter's internal memory becomes faulty as a result of external noise, abnormal temperature rise, etc.		Flashes (ON: 5.0 s, OFF: 0.3 s)	E 8	EEPROM
Undervoltage protection	When the inverter's incoming voltage drops, the control circuit may function abnormally, the motor may overheat, and the torque may become inadequate, causing the converter voltage to decrease below the prescribed level. In such cases the output will be turned off.		Flashes (ON: 1.5 s, OFF: 1.5 s)	E 9	Under.V
External trip *2	When external equipment or devices operate abnormally, the inverter will take in these signals and turn off the output.		Flashes (ON: 5.0 s, OFF: 2.0 s)	E 12	EXTERNAL
Abnormal temperature	If the temperature of the power module in the main circuit rises due to a hot environment, an overload or some other reason, the inverter output will be turned off.		Flashes (ON: 2.0s, OFF: 0.3s)	E 15	OH FIN

*1 These are the displays when the optional operators are connected. Display appears simultaneously on the main unit ALARM LED.
*2 This is valid when external trip (EXT) function is selected at the control circuit.

[Alarm reset method] — Any of the following methods is usable.
(1) After turning off main circuit power (and CHG LED goes out), turn on the power again.
(2) After input of reset signal for longer than 0.1 second, reset is made (valid when reset (RS) function is selected at control circuit).
(3) Press the [STOP] key on the digital or remote operator.

[Alarm monitor method] — valid when optional operator is connected.
● Digital operator (OPE-J)

Err → E 1 → E 2 → Err
      ↓
      4 0 u
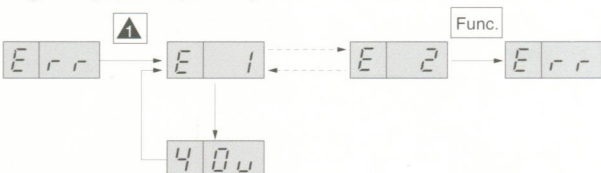
● Remote operator (DOP)/copy unit (DRW)

? ERR COUNT 001 — cumulative alarm count

? ER1 Over V — cause of alarm

? ER1 PN-V400V — DC voltage at alarm occurrence

J50/L50 series inverter

Top terminal board

Bottom terminal board

ELB *1

Power supply
3ø 200~220V/
200~230V

R
S   *2
T

+
−

Motor

U
V
W

IM

(3-phase 200V)

ALARM LED
(alarm monitor)

CHG LED
(power supply
charge monitor)

3rd class
ground

Regenerative
braking unit(option)

DC10V
(10mA max)

H
O
OI
L   *3

Variable resistor
(1W, 1~2kΩ)

Current input

To control ground
of host equipment

DC12V

Connector for
operator

Control panel(option)

Digital operator (OPE-J)
remote operator (DOP)
copy unit (DRW)

FW
5
4
3
2
1

Input command

11
L   *3

Output/monitor

12

CM
CN1

AL1

Alarm
output

AL0
CN2

RY

RY

Connector (CN1,CN2) pin arrangement

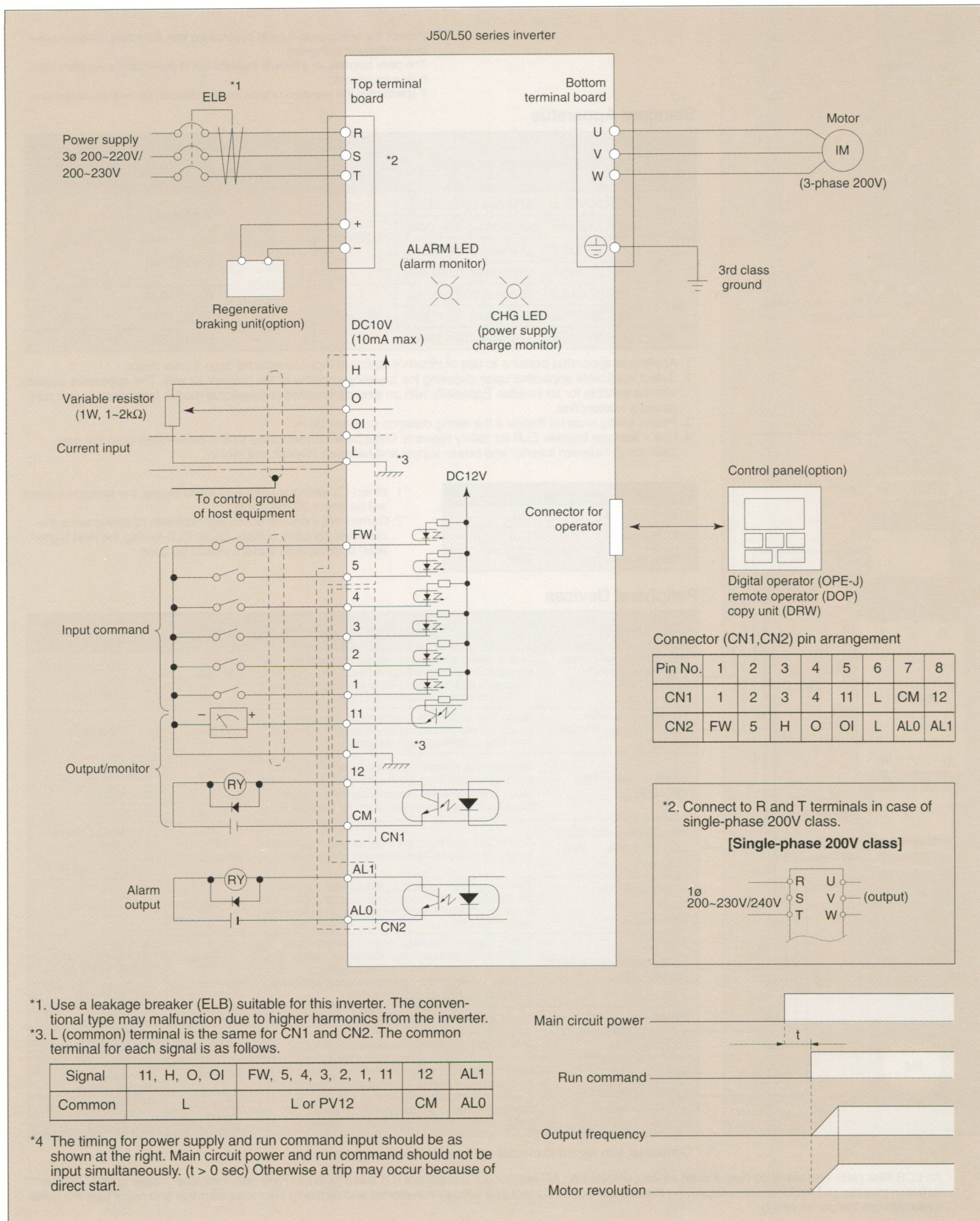| Pin No.	1	2	3	4	5	6	7	8
CN1	1	2	3	4	11	L	CM	12
CN2	FW	5	H	O	OI	L	AL0	AL1

*2. Connect to R and T terminals in case of
single-phase 200V class.

[Single-phase 200V class]

1ø
200~230V/240V

R   U
S   V   (output)
T   W

*1. Use a leakage breaker (ELB) suitable for this inverter. The conventional type may malfunction due to higher harmonics from the inverter.
*3. L (common) terminal is the same for CN1 and CN2. The common terminal for each signal is as follows.

Signal	11, H, O, OI	FW, 5, 4, 3, 2, 1, 11	12	AL1
Common	L	L or PV12	CM	AL0

*4 The timing for power supply and run command input should be as shown at the right. Main circuit power and run command should not be input simultaneously. (t > 0 sec) Otherwise a trip may occur because of direct start.

Main circuit power

t

Run command

Output frequency

Motor revolution

Power supply

ELB

Electromagnetic contactor

R S T

Inverter

U V W

Thermal relay

IM   Motor

Provide the wiring equipment in accordance with the safety codes required by jurisdictional authorities.
The table below is an example selected out of the Hitachi's standard distribution equipment.
If specified in the standard or laws and regulations, follow their instructions.

Standard Apparatus

Motor output (kW)	Applicable inverter model		Wiring		Apparatus (Hitachi model name)	
			Power wiring	Signal wiring	Leakage breaker ELB	Electromagnetic contactor *4
0.2	J50/L50-002LB	(3-phase 200V class)	1.25mm²	See p.20	EX30(5A)	H20
	J50/L50-002SB	(single-phase 200V class)				
0.4	J50/L50-004LB	(3-phase 200V class)			EX30(10A)	
	J50/L50-004SB	(single-phase 200V class)				
0.75	J50/L50-007LB	(3-phase 200V class)	2mm²		EX30(10A)	H20
	J50/L50-007SB	(single-phase 200V class)			EX30(15A)	H25
1.5	J50/L50- 015LB	(3-phase 200V class)			EX30(15A)	H25

*1. Applicable apparatus pertains to use of Hitachi's standard 3-phase squirrel-cage 4-pole motor.
*2. Select applicable apparatus upon checking the breaking capacity of the breaker as well. The apparatus should also be suitable for an inverter. Especially with an already-installed conventional model, higher harmonics may cause a malfunction.
*3. Power wiring must be thicker if the wiring distance exceeds 20 m.
*4. Use a leakage breaker ELB for safety reasons. Detectable current of the ELB is determined from the total distance (l) between inverter and power supply and between inverter and motor.

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

*1. When CV wiring is used with metal piping, the leakage current will be about 30 mA per km.
*2. Current will increase about eightfold with IV wiring since the dielectric constant is high. So an ELB having the next higher level of detectable current should be used.

Peripheral Devices

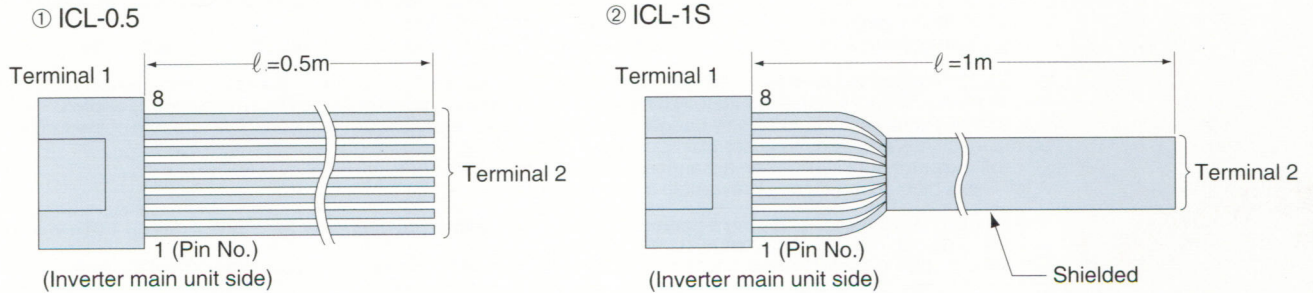| Name	Function	Model	Applicable inverter model
AC reactor for power harmonics/power factor improvement (ALI-☐☐L)	This is useful when power voltage unbalance rate exceeds 3% and power capacity exceeds 500 kVA, or when a sudden power voltage variation occurs. It also helps to improve the power factor.	ALI-2.5L	(3-phase 200V class) J50/L50- 002LB to 015LB
Radio noise filter < zero-phase reactor > (ZCL-A)	Noise may occur in a nearby radio, etc. via the power supply side wiring when using the inverter. This filter helps to reduce the noise.	ZCL-A	All models
Inverter noise filter (JF-L☐☐)	Reduces the normal-mode noise between power wires generated from the inverter and the common-mode noise between power supply and ground. Connect to the inverter primary side (input side).	JF-L5	J50/L50- 002LB to 007LB
		JF-L10	J50/L50-015LB
		JF-S8	J50/L50-002 to 007SB
Input-side radio noise filter (capacitive filter) (CFI-L)	Connected directly to the inverter power terminals to reduce noise radiated from the power wiring.	CFI-L (200V class)	(3-phase 200V class, all models) J50/L50- 002LB to 015LB
Regenerative braking unit (BRD-☐)	This is useful for increasing the control torque of the inverter or when frequently repeating ON-OFF of the inverter or when the load has a large inertia moment (GD2).	BRD-E2,S2	All models
Output-side noise filter (ACF-C☐☐)	This is installed between inverter and motor to reduce noise radiated from the power supply. It is useful for reducing radio-wave disturbance in a radio or TV set and for preventing malfunction of a measuring instrument or sensors.	ACF-C6	J50/L50- 002LB to 007LB 002SB to 007SB
		ACF-C12	J50/L50-015LB
Radio noise filter < zero-phase reactor > (ZCL-A)	Useful for reducing noise produced in the inverter output side. (It is usable on either input or output side.)	ZCL-A	All models
AC reactor for reducing vibration (ACL-L☐☐)	Vibration may increase when driving a general-purpose motor with an inverter as compared with operation on commercial power. Connecting this reactor between inverter and motor allows reduction of torque pulsation of the motor.	ACL-L-0.4	J50/L50- 002 , 004LB 002SB, 004SB
		ACL-L-0.75	J50/L50-007LB 007SB
		ACL-L-1.5	J50/L50-015LB

* Consult us with regard to models not listed in the above table.

* An LCR filter (with sine wave on output side) which combines an AC reactor (L), a capacitor (C) and a resistor (R) is also available. Installing an LCR filter between inverter and motor enables improving the inverter output current and voltage waveforms and reducing the motor vibration and noise plus the noise

■ Control circuit connectors, cables

The control circuit used for controlling the inverter by way of external signals is of a connector type. Connectors and cables for this are not supplied with the inverter main unit. The dedicated connectors and cables (available at option) given below should be used for the control circuit. They can also be purchased from a Japan Aviation Electronics Industry dealer or prepared by the user.

● Connectors and cables (options) for J50/L50 series control circuit

① ICL-0.5

② ICL-1S

Pin No.	Wire color		Terminal processing		Length ℓ (m)		Wire type	
	①	②	Terminal 1	Terminal 2	①	②	①	②
1	Brown	Brown	Housing: IL-8S-S3L-(N) , Contact: IL-C2-10000 Japan Aviation Electronics Industry, Ltd.	Not processed	0.5	1.0	ULI007 1 × 24 AWG	Shielded cable (8 × 0.3SQ) MICD-8 × 0.3SQ
2	Red	Red						
3	Orange	White						
4	Yellow	Yellow						
5	Green	Green						
6	Blue	Blue						
7	Violet	Black						
8	Gray	Gray						

● When preparing on user side

(1) When ordering control circuit cable from JAE
 • Where to order: Japan Aviation Electronics Industry dealer
 • What to specify: Housing, contacts, cable length, wire type (indicated below)
 (Consult dealer regarding minimum lot size.)
 • Example of ordering: ICL-0.5 or ICL-1S
 In case that there is any unnecessary pin number (non-connected wire), specify it as 'UNUSED' when ordering.

(2) When user will manufacture connector and cable
 Purchase the housing, contacts and crimping tool indicated below from a Japan Aviation Electronics Industry dealer.
 Also prepare suitable wires.

● Manufacturer: Japan Aviation Electronics Industry, Ltd.
● Model   Housing: IL-8S-33L-(N)
      Contact: IL-C2-0001(individual part; for manual crimping tool)
        IL-C2-10000(reel type; for semi-automatic crimping machine)
      Suitable wires: AWG #22 to 28, sheath diameter; ø1.0 to 1.7

[Crimping tools]

Tool name	Applicable cable (stranded wires)		Approx. cable length
	AWG# (cross-sectional area, reference data)	Sheath diameter	
CT150-I-IL (manual)	#28 (0.08 mm²) to #26 (0.13 mm²)	ø1.0 ~ ø1.3	5 m or less
CT150-IB-IL (manual)	#26 (0.13 mm²) to #24 (0.20 mm²)	ø1.2 ~ ø1.5	10 m or less
CT150-IC-IL (manual)	#24 (0.20 mm²) to #22 (0.32 mm²)	ø1.4 ~ ø1.7	20 m or less
Semi-automatic crimping machine Main unit: CT350-2-IL (applicator: 350-IL-2B)	#28 (0.08 mm²) to #22 (0.32 mm²)	ø1.0 ~ ø1.7	#28 to #26, 5 m or less #26 to #24, 10 m or less #24 to #22, 20 m or less

Note: Shielded wires are recommended.

For Correct Operation

● Notes on Planning and Use

Installation location and operating environment		Avoid installation in areas of high temperature, excessive humidity, or where moisture can easily collect, as well as areas that are dusty, subject to corrosive gases, mist of liquid for grinding, or salt. Install the inverter away from direct sunlight in a well ventilated room that is free of vibration. In installation on a control panel, the ambient operating temperature range is -10 to 50°C.
Wiring connections		(1) Be sure to connect power wires with R, S and T (input) terminals and motor wires to U, V and W wires. (Incorrect connection will cause a breakdown.) (2) Be sure to provide grounding connection with the ground terminal (⏚).
Drive	Run/stop	Run or stop must be done by a control circuit terminal, but not by a magnetic contactor (Mg) located on the input/output side of the main circuit.
	Emergency motor stop	During protective operation and sudden power stops, the motor shaft rotates freely. When an emergency stop is required or when the motor should be kept stopped, use the mechanical brake.
	High-frequency run	A max. 120 Hz can be selected on the J50/L50 series by choosing the V/F pattern. A further 15 Hz can be added through frequency adjustment to raise the max. setting to 135 Hz. However, a two-pole motor can attain up to approx. 8,100 min^{-1} (rpm), which is extremely dangerous. Therefore, carefully check the mechanical strength of the motor and paired machines and select and set appropriately. Consult motor manufacturer when a standard (general-purpose) motor is driven at over 60 Hz. A full line of high-speed motors is available from Hitachi.
Torque characteristics		The torque characteristics of driving a general-purpose motor with an inverter differ from that of driving it with a commercial power source (note starting torque in particular). Carefully check the load torque characteristic of the paired machine and the driving characteristic of the motor.
Motor loss and rising temperature		An inverter-driven general-purpose motor heats up swiftly at lower speeds. Consequently, the torque level permitting continuous use decreases with lower motor speeds.
Vibration		When run by an inverter at variable motor speeds, the motor may generate vibration, especially because of (a) unbalance of the rotor and paired machine, or (b) vibration caused by the natural resonance of a paired machine. Be careful of (b) when operating at variable speeds a machine previously fitted with a constant speed motor. Vibration can be minimized by using a tire-shaped coupling or by placing a rubber shock absorber beneath the motor base.
Power transmission mechanism		Under continued, low-speed operation, oil lubrication can deteriorate in the power transmission mechanism with an oil-type gear box (gear motor) or reducer. Check with the motor manufacturer for the permissible range of continuous revolutions. To operate at more than 60 Hz, confirm the machine's ability to withstand the centrifugal force generated.
Wiring between inverter and motor		(1) Install an electromagnetic contactor between the inverter and the motor to prevent on-off switching during operation. With a pole-change motor, always stop the motor before changing windings on the output side of the inverter. (2) In a system where the IGBT voltage-type PWM inverter is used, a surge voltage may occur at the motor terminal due to a cable constant, e.g. long length of cable (more than 10 m). If the surge voltage is significant, insulation of motor winding may deteriorate.
Thermal relay		When used with standard applicable output motors (Hitachi's standard three-phase, squirrel-cage, four-pole motors), J50/L50 series, which feature internal electronic thermal protection, do not need a thermal relay for motor protection. A thermal relay, however, should be used: • during continuous running at a range out of 30 to 60 Hz, • for motors exceeding the range of electronic thermal adjustment (rated current), or • when several motors are driven by the same inverter. • The RC value of thermal relay should be more than 1.1 times the rated current of motor. Where the wiring length is long (more than 10 m), the thermal relay tends to turn off readily. In this case, provide ACL on the output side or use a current sensor.
Parallel operation		(1) When several motors run simultaneously from low frequency to gradually higher frequency, select an inverter so that the sum of the rated motor current values (If) will be less than the rated output current of the inverter (I). $If_1 + If_2 + If_3 + \cdots \leq 1$ Ensure that the starting current is less than the overload capacity of the inverter. Consult your nearest Hitachi representative regarding sequential starts. (2) Where multiple motors under V/F control are switched over on a group-by-group basis, select a motor capacity so that it will be nearest to the sum of capacities in each group.
Soft start and stop		When starting or stopping a load with a large inertia moment, short soft start/soft stop (acceleration/deceleration) time may cause the inverter to trip. In such cases, make the start (acceleration) time and stop (deceleration) time longer.
Installing a circuit breaker		Install a circuit breaker on the power supply side to protect inverter wiring and ensure personal safety.
Wiring distance		The wiring distance between the inverter and the remote operator panel should be less than 20 meters. When this distance is exceeded, use CVD-E or RCD-E. Shielding cable should be used on the wiring. Beware of voltage drops on main circuit wires.
Earth leakage relay		If the earth leakage relay (or earth leakage breaker) is used, it should have a sensitivity level of 15 mA or more (per inverter). Use a breaker whose sensitive current level is raised in the high frequency area.
Phase advance capacitor		Do not use a capacitor for power factor improvement between inverter and motor because the higher harmonics of the inverter output may overheat or damage the capacitor.
Noise and leakage current		(1) Higher harmonics are included in the input/output of the inverter main circuit, and they may cause interference in a transmitter, radio or sensor if used near the inverter. The interference can be minimized by attaching noise filters (option) in the inverter circuitry. Provide a proper countermeasure referring to Hitachi Inverter Technical Guidebook [Noise]. (2) The switching action of an inverter causes an increase in leakage current. Be sure to ground the inverter and motor.
Using a private power generator		An inverter run by a private power generator may overheat or suffer a deformed output voltage waveform. Generally, generator capacity should be five times that of the inverter (kVA) in a PWM control system, or six times greater in a PAM control system.

Effects of distributor lines on inverters	In the cases below involving a general-purpose inverter, a large peak current flows on the power supply side, sometimes destroying the converter module. Where such situations are foreseen, or the paired equipment must be highly reliable, install an AC reactor between the power supply and the inverter.
	(A) The unbalance factor of the power supply is 3% or higher. (Note)
	(B) The power supply capacity is at least 10 times greater than the inverter capacity (the power supply capacity is 500 kVA or more).
	(C) Abrupt power supply changes are expected.
	    Examples: (1) Several inverters are interconnected with a short bus.
	              (2) A thyristor converter and an inverter are interconnected with a short bus.
	              (3) An installed phase advance capacitor opens and closes.
	In cases (A), (B) or (C), we recommend installing an AC reactor of 3% (in a voltage drop at rated current) with respect to the supply voltage on the power supply side.
	
	Note: Unbalance factor of voltage $= 100 \times \dfrac{\text{Max. deviation voltage}}{\text{Mean voltage}}$
	
	Unbalance factor of voltage $= 100 \times \dfrac{6}{199} = 3.0\%$
		Example) $V_{RS} = 200$ V, $V_{ST} = 203$ V, $V_{TR} = 197$ V
		
		V_{RS}: Voltage across wires RS
		V_{ST}: Voltage across wires ST
		V_{TR}: Voltage across wires TR

Lifetime of smoothing capacitor	Because a smoothing capacitor deteriorates as it undergoes internal chemical reaction, it should normally be replaced every five years. Be aware, however, that its life expectancy is considerably shorter when the inverter is subjected to such adverse factors as high temperatures or heavy loads. The approximate lifetime of the capacitor is as shown in the figure at the right when it is used 12 hours daily. Also, such consumable parts as cooling fan should be replaced according to "Instructions for Periodic Inspection of General-Purpose Inverter" (JEMA).	 Capacitor lifetime curve

● Notes on motors

General-purpose motor	The overspeed endurance of general-purpose motor is 120% of rated speed for 2 minutes (JIS-C4004). For operation at higher than 60 Hz, it is required to examine the allowable torque of motor, useful life of bearing, noise, vibration, etc. In this case, consult the motor manufacturer.
Gear motor	The allowable rotation range of continuous drive varies depending on the lubrication method or the model of motor. (In case of oil lubrication, pay attention to the low frequency range.) The Hitachi GX/CX gear motor is of a grease lubrication type. The grease lubrication capability remains unchanged even if the motor rotating speed decreases.
Brake-equipped motor	In case of inverter drive, the starting torque is reduced. Therefore, the brake-release type of motor is not applicable. (The Hitachi HBF brake is usable. For its use, be sure to supply braking power supply from the primary side of inverter.)
Pole-change motor	There are different kinds of pole-change motors; constant output characteristic type, constant torque characteristic type, etc. (with different rated current values). In motor selection, check the maximum allowable current of motor. At the time of pole changing, be sure to stop the motor.
Submersible motor	The rated current of submersible motor is significantly different from that of general-purpose motor. In inverter selection, be sure to take this parameter into consideration.
Explosion-proof motor	Inverter drive is not suitable for a safety-enhanced explosion-proof type of motor. The inverter should be used in combination with a pressure-proof explosion-proof type of motor. Since the inverter has a non-explosion-proof structure, install it at a safe position. For inverter drive of a pressure-proof-enhanced explosion-proof type of motor, verification of one-to-one combination is required (explosion-proof verification by the Industrial Safety Research Center of the Ministry of Labor). Therefore, even for inverter drive of the existing pressure-proof type of motor, re-verification of combinational use is necessary. Note that it is not permitted to perform inverter drive for explosion-proof motor out of the range indicated on the rating plate of motor. (Explosion-proof verification is not attained for J50/L50 series. For explosion-proof operation, use other series of motors.)
Synchronous (MS) motor High-speed (HFM) motor	In most cases, the synchronous (MS) motor and the high-speed (HFM) motor are designed and manufactured to meet the specifications of combination arrangement. As to inverter selection, consult the manufacturer.
Vibration motor	In comparison with general-purpose motors, the vibration motor with identical nominal output (kW) requires a larger starting current and has a larger rated current. The starting/rated current of vibration motor provides an unbalanced load on the vibration flywheel equipped on the motor shaft. Therefore, the motor load current becomes unbalanced also at rotation of the vibration flywheel. Select an inverter so that a current two times larger than the rated current of vibration motor will be equal to a rated output current of inverter.
Single-phase motor	The single-phase motor is not suitable for variable-speed operation by inverter drive. Therefore, use a three-phase motor. If a capacitor-start single-phase motor is used, a high-frequency current is applied to the capacitor in motor to damage it. Also, if a split-phase start or repulsion-start-induction motor is used, the starting coil may be burnt since the internal centrifuge switch does not work.

● Inquiries:

When placing an order, notify the following conditions.

[Machine to be used] ... Name of equipment, purpose of use

[Motor specifications] ... Rated output (kW), number of poles, rated voltage (V), current (A), frequency (Hz), rated time constant

[Inverter specifications] ... Output capacity (kVA), input power (V), control method (PWM, PAM, voltage-type, current-type), output frequency range (Hz), number of motors to be connected, use conditions of application control equipment and other optional devices

[Operating conditions] ... Torque characteristics (constant torque, reduced torque, constant output, reduced output, etc.), frequency of start (operation cycle, etc.), load inertial moment (motor-axis conversion), speed change rate required by combined machine

[Other special requirement conditions]

[For Correct Usage]

● Before use, be sure to read through the instruction manual to insure proper use of the inverter. Note that the inverter requires electrical wiring, so have a specialist carry out the wiring.

● The inverter is intended for use with three-phase AC motors. For use with a load other than this, please consult with us.

● The inverter is designed for general industrial applications. For special applications in fields such as aircraft, outer space, nuclear power, electrical power, transport vehicles, clinics and so on, please consult with us in advance. Also, for application in an important facility where human life is involved, make sure to provide safety devices to avoid a serious accident.

HITACHI