

# VARIABLE FREQUENCY DRIVE L300P Series

**for Fan and Pump Applications**



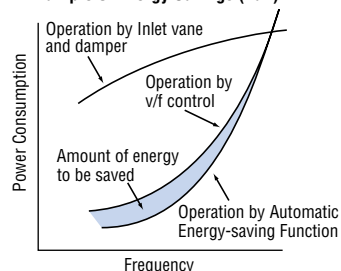
# Hitachi's L300P Series Variable Frequency Drives Increased Energy Savings for Your

## WIDE RANGE OF APPLICATION SPECIFIC FUNCTIONS

### ●AUTOMATIC ENERGY-SAVING FUNCTION

With its Automatic Energy-saving Function, the L300P delivers "real-time" energy-saving operation for your fan and pump applications. The function insures that motor operates at minimum current in response to the torque required by the load.

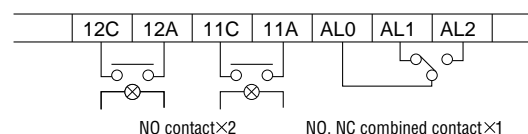
■Example of Energy Savings (Fan)



### ●ENHANCED INPUT/OUTPUT TERMINALS

Three relay output terminals are provided as standard for flexible interface to external control systems.

■INTELLIGENT RELAY OUTPUTS

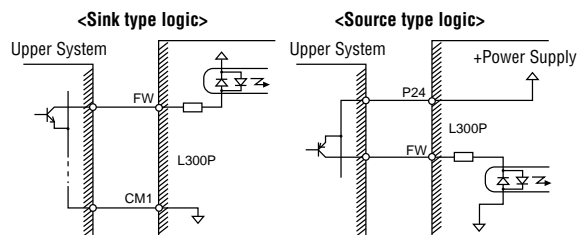


### ●ANALOG OUTPUT MONITOR

In addition to pulse output monitor(FM), programmable analog output monitors are also available for both voltage(0–10VDC) and current(4–20mA) at AM and AMI terminals of the L300P.

### ●INTELLIGENT INPUT/OUTPUT TERMINAL SYSTEM

The L300P features an intelligent control terminal system, which allows necessary drive I/O functions to be freely programmed. Input terminals can be selected for either sink or source type logic.



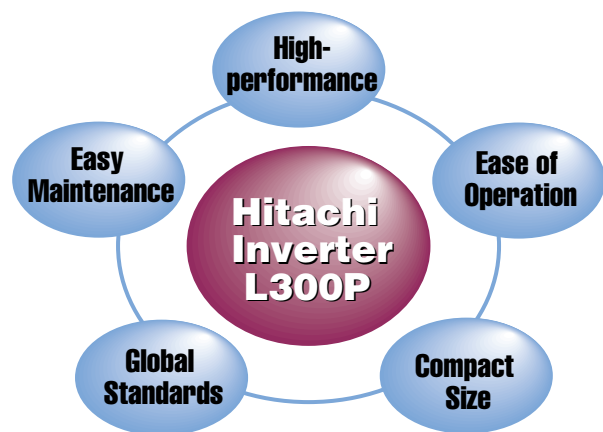
### ●EASY-TO-USE OPERATOR PANEL

L300P's operator panel supports various monitoring functions.

- Output frequency
- Output current
- Rotational direction
- PID feedback value
- Input terminals status
- Output terminals status
- Converted value of output frequency
- Output voltage
- Input voltage
- Cumulative operation (run) time
- Cumulative power-on time
- Trip event counter
- Trip history

# Frequency Drive Delivers Fan and Pump Applications!

## FOR OPTIMAL OPERATION



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## EASE OF MAINTENANCE

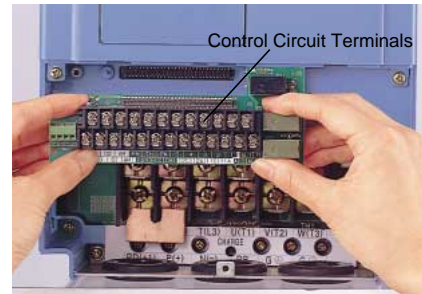
### ● EASY-REMOVABLE COOLING FAN AND DC BUS CAPACITOR

Cooling fan(s) and DC bus capacitors can be easily changed in the field. A fan ON/OFF function can be activated to provide longer cooling fan life.



### ● REMOVABLE CONTROL CIRCUIT TERMINALS

Eliminates control rewiring when field replacing the L300P.



## PROTECTION FOR VARIOUS INSTALLATION ENVIRONMENTS

### ● COMPACT DESIGN

The L300P's compact size helps economize panel space. Installation area is reduced by approximately 30% from that of our previous series. (Comparison of 11kW (15HP))



## USER-FRIENDLY OPERATION

### ● EASE OF OPERATION WITH DIGITAL OPERATOR (OPE-SR)

Output frequency can be controlled by the integral potentiometer provided as standard on the OPE-SR.

The OPE-SR can be removed for remote control, and has an easy-to-see 4-digit display and LEDs to indicate the unit being monitored (i.e. frequency, amps, power, etc.). A multilingual operator (English, French, German, Italian, Spanish, and Portuguese) with copy function (SRW-0EX) and a digital operator without potentiometer (OPE-S) are also available as options.

### ● USER SELECTION OF COMMAND FUNCTIONS ("Quick Menu")

You can select frequently used commands and store them for fast reference.

### ● BUILT-IN RS485

RS485 is provided as standard for ASCII serial communication.

### ● PROGRAMMING SOFTWARE

Optional PC drive configuration software which runs on Windows® Operating System.



# ENVIRONMENTAL FRIENDLINESS

## ● EMI FILTER

EMI filters to meet European EMC (EN61800-3) and low-voltage directive (EN50178) are available for system conformance.

## ● REDUCED NOISE FROM CONTROL POWER SUPPLY

Noise terminal voltage of the control power supply has been improved by 20dB (μV), resulting in significant reductions to noise interference with sensors and other peripheral devices.

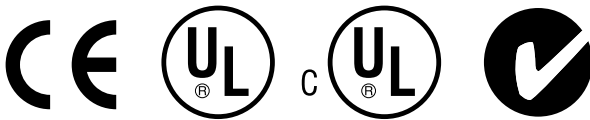
# PROTECTION FOR VARIOUS INSTALLATION ENVIROMENTS

Standard enclosure protection for the L300P is IP20 (NEMA 1). IP54 (NEMA 12) will also be available via optional enclosure kit (available soon).

# GLOBAL PERFORMANCE

## ● CONFORMITY TO GLOBAL STANDARDS

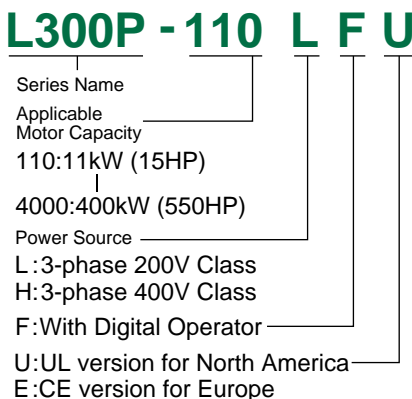
CE, UL, cUL, C-Tick approvals.



## ● NETWORK COMPATIBILITY

The L300P can communicate with LONWORKS™, PROFIBUS®, DeviceNet™, Modbus RTU™, and Ethernet™ with communication options (available soon).

### ■ MODEL NAME INDICATION



### ■ MODEL CONFIGURATION

Applicable Motor Capacity in kW (HP)	3-phase 200V class	3-phase 400V class	3-phase 600V class
11(15)	L300P-110LFU	L300P-110HFU/E	3.7-75kW (5-100HP) Available soon
15(20)	L300P-150LFU	L300P-150HFU/E	
18.5(25)	L300P-185LFU	L300P-185HFU/E	
22(30)	L300P-220LFU	L300P-220HFU/E	
30(40)	L300P-300LFU	L300P-300HFU/E	
37(50)	L300P-370LFU	L300P-370HFU/E	
45(60)	L300P-450LFU	L300P-450HFU/E	
55(75)	L300P-550LFU	L300P-550HFU/E	
75(100) 110(150)		Planning Available soon	
132(180) 400(550)		Planning Available soon	

# STANDARD SPECIFICATIONS

Item		200V Class							
Model L300P-XXX	UL version	110LFU	150LFU	185LFU	220LFU	300LFU	370LFU	450LFU	550LFU
	CE version	-	-	-	-	-	-	-	-
Enclosure (*1)		IP20 (NEMA 1)							
Applicable motor (4-pole, kW(HP)) (*2)		11(15)	15(20)	18.5(25)	22(30)	30(40)	37(50)	45(60)	55(75)
Rated capacity (kVA)	200V	15.2	20.1	25.3	29.4	39.1	48.4	58.5	72.7
	220V	16.8	22.1	27.8	32.4	43.0	53.3	64.3	80.0
Rated input voltage		3-phase (3-wire) 200–240V (±10%), 50/60Hz							
Rated output voltage (*3)		3-phase (3-wire) 200–240V (According to supply voltage)							
Rated output current (continuous) (A)		44	58	73	85	113	140	169	210
Control method		Line to line sine wave PWM							
Output frequency range (*4)		0.1–400Hz							
Frequency accuracy		Digital: ±0.01% of maximum frequency, Analog: ±0.2%(25±10°C)							
Frequency resolution		Digital setting: 0.01Hz, Analog setting: (Maximum frequency)/4,000							
V/f characteristics		V/f free-setting, Constant torque and reduced torque of V/f control							
Overload capacity		120%/30sec., 150%/0.5sec.							
Acceleration/deceleration time		0.01–3,600sec. (Linear/curve, accel./decel. selection), Two-stage accel./decel.							
Braking	Dynamic braking (Short-time) (*5)	Built-in BRD circuit (optional resistor)		External dynamic braking unit (option)					
	DC braking	Performs at start; under set frequency at deceleration, or via an external input (braking force, time, and operating frequency).							
Input signal	Frequency setting	Operator	Set by $\Delta$ key/ $\nabla$ key						
		Potentiometer	Set by potentiometer						
		External signal	DC 0–10V, –10–+10V (input impedance 10k $\Omega$ ), 4–20mA (input impedance 100 $\Omega$ )						
		External port	Set by RS485						
	Forward /reverse Start /stop	Operator	Run key/Stop key (FW/RV can be set by function command.)						
		External signal	FW RUN/STOP (NO contact), RV set by terminal assignment (NO/NC selection), 3-wire input possible						
		External port	Set by RS485						
	Intelligent input terminals	Selection of 5 functions from: RV(Reverse), CF1-CF4(Multispeed command), JG(Jogging), DB(External DC braking), SET(Second motor constants setting), 2CH(Second accel./decel.), FRS(Free-run stop), EXT(External trip), USP(Unattended start protection), CS(Change to/from commercial power supply), SFT(Software lock), AT(Analog input selection), RS(Reset), STA(3-wire start), STP(3-wire stop), F/R(3-wire fwd./rev.), PID(PID On/Off), PIDC(PID reset), UP/DWN(Remote-controlled accel./decel.) UDC(Remote-controlled data clearing), SF1-SF7(Multispeed bit command 1-7), OLR(Overload limit change), and NO(Not selected)							
	Thermistor input	One terminal							
	Output signal	Intelligent output terminals	Two NO contacts and one NO-NC combined contact (Selection from: RUN, FA1, FA2, OL, OD, AL, FA3, IP, UV, RNT, ONT and THM)						
Intelligent monitor output terminals		Analog voltage, analog current, pulse line output							
Display monitor		Output frequency, output current, scaled value of output frequency, trip history, I/O terminal condition, input power, output voltage							
Other functions		V/f free-setting (up to 5 points), frequency upper/lower limit, frequency jump, accel./decel. curve selection, manual torque boost value and frequency adjustment, analog meter tuning, starting frequency setting, carrier frequency setting, electronic thermal free-setting, external frequency output zero/span reference, external frequency input bias start/end, analog input selection, retry after trip, reduced voltage start, overload restriction, automatic energy-saving							
Carrier frequency range		0.5–12kHz							
Protective functions		Over-current protection, overload protection, braking resistor overload protection, over-voltage protection, EEPROM error, under-voltage error, CT(Current transformer) error, CPU error, external trip, USP error, ground fault, input over-voltage protection, instantaneous power failure, option 1 connection error, option 2 connection error, inverter thermal trip, phase failure detection, IGBT error, thermistor error							
Environmental conditions	Ambient operating /storage temperature(*6)/humidity	–10–50°C (*8) / –20–65°C / 25–90%RH (No condensation)							
	Vibration (*7)	5.9m/s <sup>2</sup> (0.6G), 10–55Hz							
	Location	Less than 1,000m of altitude, indoors (no corrosive gas nor dust)							
Color		Blue							
Options		EMI filters, input/output reactors, DC reactors, radio noise filters, braking resistors, braking units, LCR filter, multilingual operator with copy function, communication cables, option PCB							
Standard digital operator		OPE-SR (Cables (option): ICS-1(1m), ICS-3(3m))							
Weight kg (lbs.)		5 (11)	5 (11)	12 (26.4)	12 (26.4)	12 (26.4)	20 (44)	30 (66)	30 (66)

\*1: The protection method conforms to JEM 1030 / NEMA(U.S.).

\*2: The applicable motor refers to Hitachi standard 3-phase motor (4-pole).  
To use other motors, care must be taken to prevent the rated motor current (50Hz) from exceeding the rated output current of the inverter.

\*3: The output voltage decreases as the main power supply voltage decreases except for the use of AVR function.

\*4: To operate the motor beyond 50/60Hz, please consult with the motor

manufacturer about the maximum allowable rotation speed.

\*5: Braking resistor is not integrated in the inverter. Please install optional braking resistor or dynamic braking unit when large control torque is required.

\*6: Storage temperature refers to the temperature in transportation.

\*7: Conforms to the test method specified in JIS C0911(1984).

\*8: Maximum operating temperature at 3kHz carrier frequency.  
Above 3kHz, see derating data in instruction manual.



Item		400 V Class							
Model L300P-XXX	UL version	110HFU	150HFU	185HFU	220HFU	300HFU	370HFU	450HFU	550HFU
	CE version	110HFE	150HFE	185HFE	220HFE	300HFE	370HFE	450HFE	550HFE
Enclosure (*1)		IP20 (NEMA 1)							
Applicable motor (4-pole, kW(HP)) (*2)		11(15)	15(20)	18.5(25)	22(30)	30(40)	37(50)	45(60)	55(75)
Rated capacity (kVA)	400V	15.2	20.1	25.3	29.4	39.4	48.4	58.8	72.7
	440V	16.8	22.1	27.8	32.4	43.4	53.3	64.7	80.0
Rated input voltage		3-phase (3-wire) 380–480V (±10%), 50/60Hz							
Rated output voltage (*3)		3-phase (3-wire) 380–480V (According to supply voltage)							
Rated output current (continuous) (A)		22	29	37	43	57	70	85	105
Control method		Line to line sine wave PWM							
Output frequency range (*4)		0.1–400Hz							
Frequency accuracy		Digital: ±0.01% of maximum frequency, Analog: ±0.2%(25±10°C)							
Frequency resolution		Digital setting: 0.01Hz, Analog setting: (Maximum frequency)/4,000							
V/f characteristics		V/f free-setting, Constant torque and reduced torque of V/f control							
Overload capacity		120%/30sec., 150%/0.5sec.							
Acceleration/deceleration time		0.01–3,600sec. (Linear/curve, accel./decel. selection), Two-stage accel./decel.							
Braking	Dynamic braking (Short-time) (*5)	Built-in BRD circuit (optional resistor)		External dynamic braking unit (option)					
	DC injection braking	Performs at start; under set frequency at deceleration, or via an external input (braking force, time, and operating frequency).							
Input signal	Frequency setting	Operator	Set by key/key						
		Potentiometer	Set by potentiometer						
		External signal	DC 0–10V, –10–+10V (input impedance 10kΩ), 4–20mA (input impedance 100Ω)						
		External port	Set by RS485						
	Forward/reverse Start/stop	Operator	Run key/Stop key (FW/RV can be set by function command.)						
		External signal	FW RUN/STOP (NO contact), RV set by terminal assignment (NO/NC selection), 3-wire input possible						
		External port	Set by RS485						
	Intelligent input terminals	Selection of 5 functions from: RV(Reverse), CF1-CF4(Multispeed command), JG(Jogging), DB(External DC braking), SET(Second motor constants setting), 2CH(Second accel./decel.), FRS(Free-run stop), EXT(External trip), USP(Unattended start protection), CS(Change to/from commercial power supply), SFT(Software lock), AT(Analog input selection), RS(Reset), STA(3-wire start), STP(3-wire stop), F/R(3-wire fwd./rev.), PID(PID On/Off), PIDC(PID reset), UP/DWN(Remote-controlled accel./decel.), UDC(Remote-controlled data clearing), SF1-SF7(Multispeed bit command 1-7), OLR(Overload limit change), and NO(Not selected)							
	Thermistor input	One terminal							
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Carrier frequency range		0.5–12kHz							
Protective functions		Over-current protection, overload protection, braking resistor overload protection, over-voltage protection, EEPROM error, under-voltage error, CT(Current transformer) error, CPU error, external trip, USP error, ground fault, input over-voltage protection, instantaneous power failure, option 1 connection error, option 2 connection error, inverter thermal trip, phase failure detection, IGBT error, thermistor error							
Environmental conditions	Ambient operating /storage temperature(*6)/humidity	–10–50°C (*8) / –20–65°C / 25–90%RH (No condensation)							
	Vibration (*7)	5.9m/s <sup>2</sup> (0.6G), 10–55Hz							
	Location	Less than 1,000m of altitude, indoors (no corrosive gas nor dust)							
Color		Blue							
Options		EMI filters, input/output reactors, DC reactors, radio noise filters, braking resistors, braking units, LCR filter, multilingual operator with copy function, communication cables, option PCB							
Standard digital operator		OPE-SR (Cables (option): ICS-1(1m), ICS-3(3m))							
Weight kg (lbs.)		5 (11)	5 (11)	12 (26.4)	12 (26.4)	12 (26.4)	20 (44)	30 (66)	30 (66)

\*1: The protection method conforms to JEM 1030 / NEMA(U.S.).

\*2: The applicable motor refers to Hitachi standard 3-phase motor (4-pole).  
To use other motors, care must be taken to prevent the rated motor current (50Hz) from exceeding the rated output current of the inverter.

\*3: The output voltage decreases as the main power supply voltage decreases except for the use of AVR function.

\*4: To operate the motor beyond 50/60Hz, please consult with the motor

manufacturer about the maximum allowable rotation speed.

\*5: Braking resistor is not integrated in the inverter. Please install optional braking resistor or dynamic braking unit when large control torque is required.

\*6: Storage temperature refers to the temperature in transportation.

\*7: Conforms to the test method specified in JIS C0911(1984).

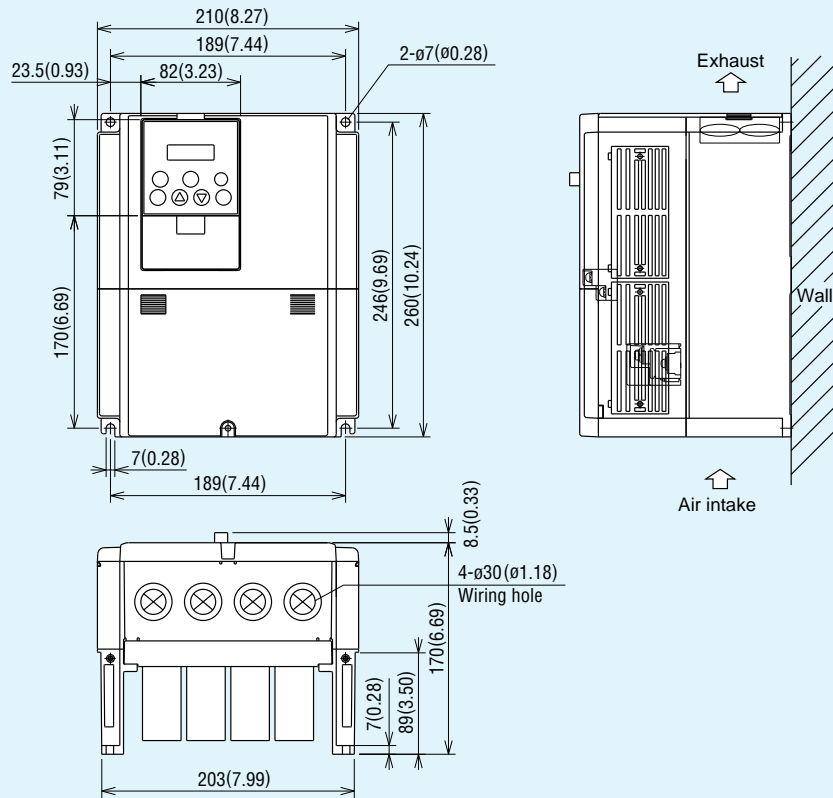
\*8: Maximum operating temperature at 3kHz carrier frequency.

Above 3kHz, see derating data in instruction manual.

# DIMENSIONS

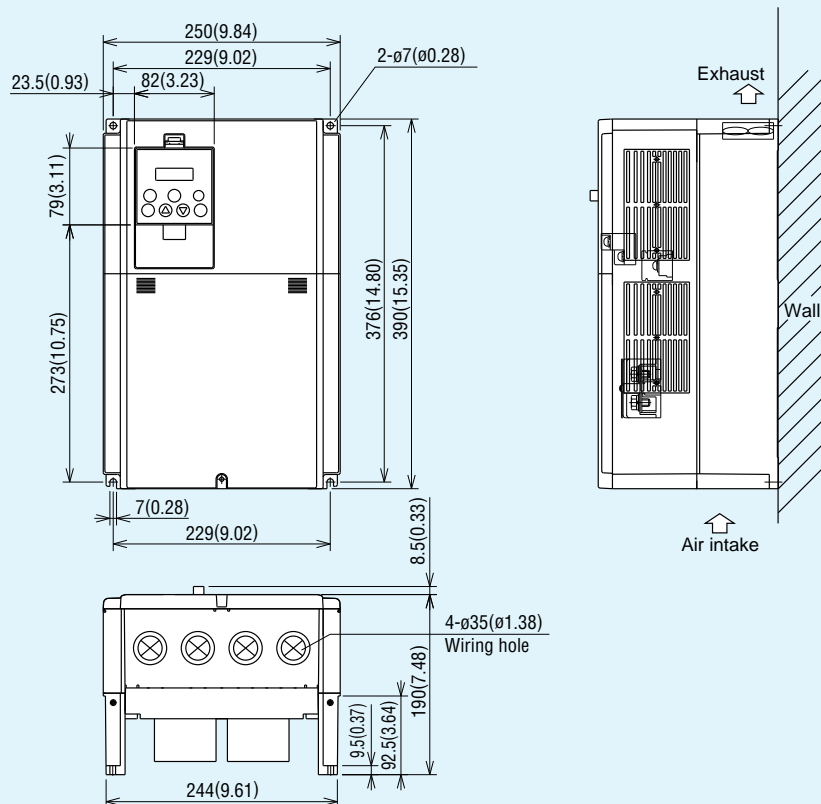
## ●L300P-110-150LFU, 110-150HFE, 110-150HFU

[Unit:mm (inch)]  
Inches for reference only



## ●L300P-185-300LFU, 185-300HFE, 185-300HFU

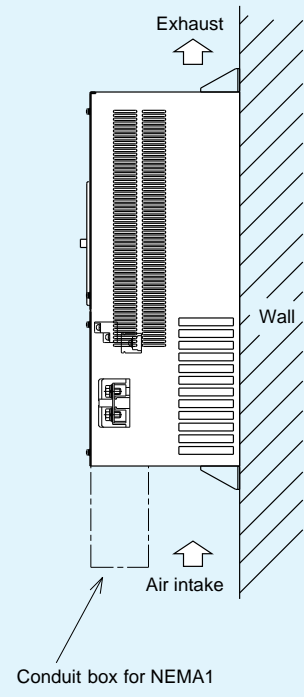
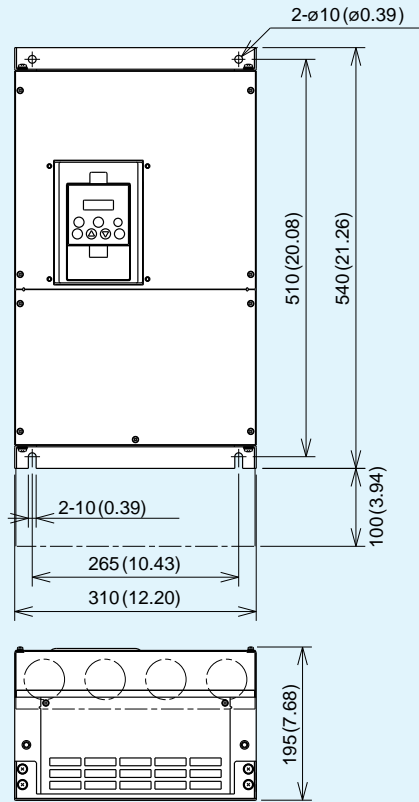
[Unit:mm (inch)]  
Inches for reference only





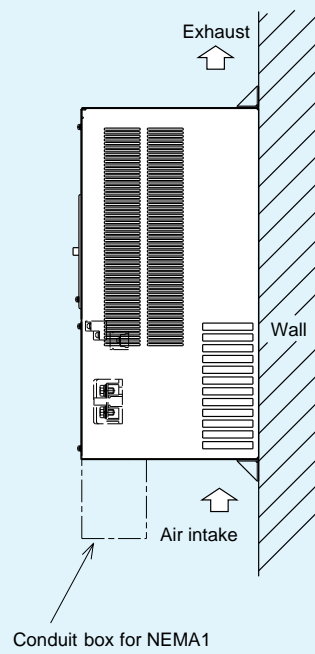
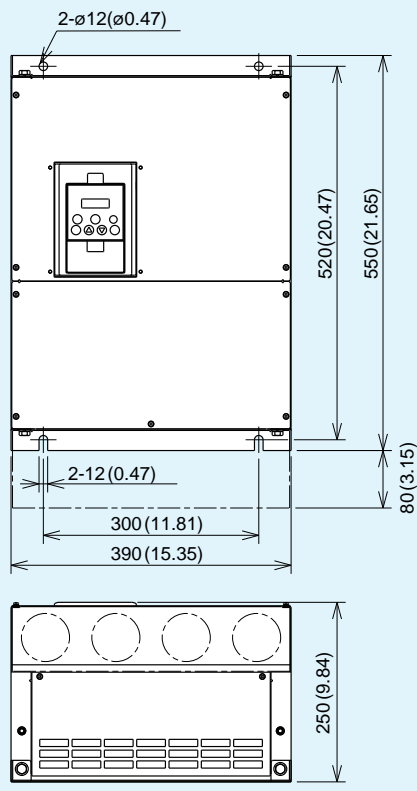
●L300P-370LFU, 370HFE, 370HFU

[Unit:mm (inch)]  
Inches for reference only



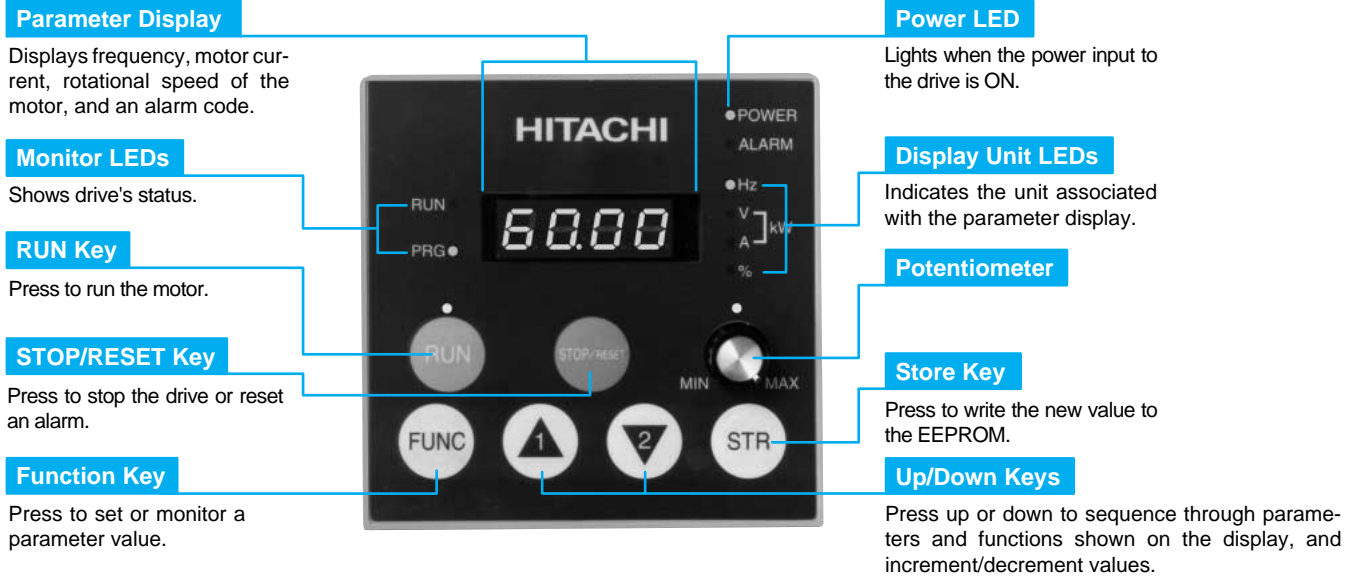
●L300P-450-550LFU, 450-550HFE, 450-550HFU

[Unit:mm (inch)]  
Inches for reference only

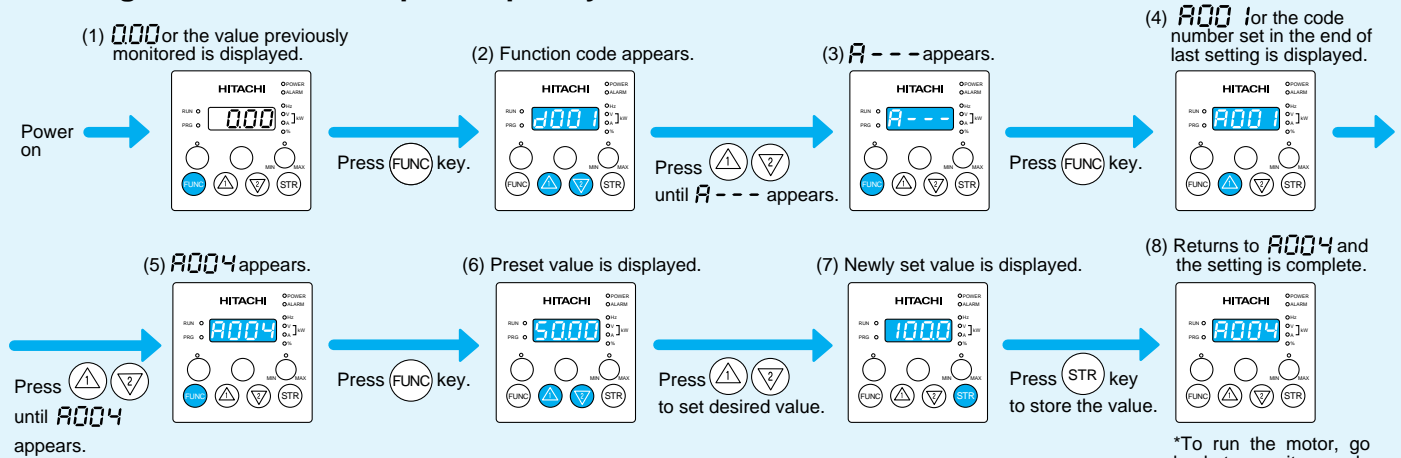


# OPERATION and PROGRAMMING

L300P Series can be easily operated with the digital operator (OPE-SR) provided as standard. The Digital operator can also be detached and used for remote-control. A multilingual (English, French, German Italian, Spanish, and Portuguese) operator with copy function (SRW-0EX) or a digital operator without potentiometer(OPE-S) is also available as an option.

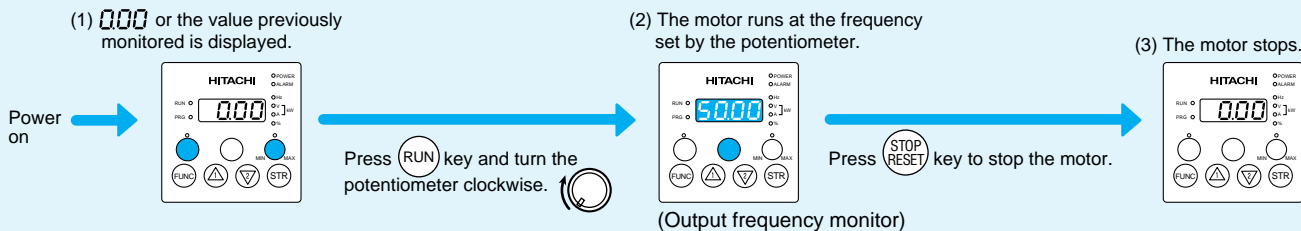


## 1. Setting the maximum output frequency

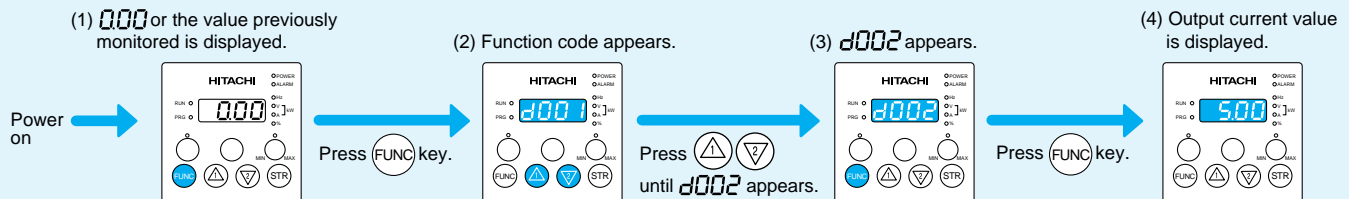


\*To run the motor, go back to monitor mode or basic setting mode.

## 2. Running the motor (by potentiometer)



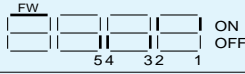
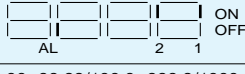
## 3. Monitoring output current value



# FUNCTION LIST

## ●Monitor Mode and Standard Setting Mode

○ = Allowed  
 × = Not permitted

	Code	Name	Description	Default Setting		Run-time Setting	Run-time Data Edit
				-FE(CE)	-FU(UL)		
Monitor Mode	d001	Output frequency monitor	0.00–99.99/100.0–400.0Hz	-	-	-	-
	d002	Output current monitor	0.00–99.99/100.0–999.9A	-	-	-	-
	d003	Motor rotational direction monitor	F(Forward) / o(Stop) / r(Reverse)	-	-	-	-
	d004	PID feedback monitor	0.00–99.99/100.0–999.9/1000. –9999./1000–9999/ [100–[ 999(10,000–99,900)	-	-	-	-
	d005	Intelligent input terminal condition monitor	 (Example) Terminal 2 and 1 : ON Terminal 5, 4, and 3 : OFF	-	-	-	-
	d006	Intelligent output terminal condition monitor	 (Example) Terminal 2 and 1 : ON AL :OFF	-	-	-	-
	d007	Output frequency scaled value monitor	0.00–99.99/100.0–999.9/1000. –9999./1000–3996(10,000–39,960)	-	-	-	-
	d013	Output voltage monitor	0.0–600.0V	-	-	-	-
	d014	Power monitor	0.0–999.9kW	-	-	-	-
	d016	Cumulative operation (run) time monitor	0.–9999./1000–9999/ [100–[ 999 (10,000–99,900)hr	-	-	-	-
	d017	Cumulative power-on time monitor	0.–9999./1000–9999/ [100–[ 999 (10,000–99,900)hr	-	-	-	-
	d080	Trip count monitor	0.–9999./1000–6553(10,000–65,530)	-	-	-	-
	d081   d086	Trip monitor 1–16	Please refer to page 15.	-	-	-	-
	d090	Warning monitor	Warning code	-	-	-	-
Setting Mode	F001	Output frequency setting	0.0, Starting frequency to maximum frequency / maximum frequency for second motor	0.00Hz	0.00Hz	○	○
	F002	Acceleration time (1) setting	0.01–99.99/100.0–999.9/1000. –3600. sec.	30.00s	30.00s	○	○
	F202	Acceleration time (1) setting for second motor	0.01–99.99/100.0–999.9/1000. –3600. sec.	30.00s	30.00s	○	○
	F003	Deceleration time (1) setting	0.01–99.99/100.0–999.9/1000. –3600. sec.	30.00s	30.00s	○	○
	F203	Deceleration time (1) setting for second motor	0.01–99.99/100.0–999.9/1000. –3600. sec.	30.00s	30.00s	○	○
	F004	Motor rotational direction setting	00(Forward) / 01 (Reverse)	00	00	×	×
Expanded Function	A---	To expanded function A (Basic functions)					
	b---	To expanded function b (Protective functions and fine tuning functions)					
	C---	To expanded function C (Terminal setting functions)					
	H---	To expanded function H (Motor constants setting functions)					
	P---	To expanded function P (Option setting functions)					
	U---	To expanded function U (User's selection functions)					

## ●Expanded Function A

○ = Allowed  
 × = Not permitted

	Code	Name	Description	Default Setting		Run-time Setting	Run-time Data Edit
				-FE(CE)	-FU(UL)		
Basic Setting	A001	Frequency command	00(Potentiometer) / 01(Terminals) / 02(Operator) / 03(RS485) / 04 (Option(1)) / 05(Option(2))	01	01	×	×
	A002	Run command	01(Terminals) / 02(Operator) / 03(RS485) / 04 (Option(1)) / 05(Option(2))	01	01	×	×
	A003	Base frequency setting	30.00Hz-Maximum frequency	50.00	60.00	×	×
	A203	Base frequency setting for second motor	30.00Hz-Maximum frequency for second motor	50.00	60.00	×	×
Analog Input Setting	A004	Maximum frequency setting	30.00–400.0Hz	50.00	60.00	×	×
	A204	Maximum frequency setting for second setting	30.00–400.0Hz	50.00	60.00	×	×
	A005	AT selection	00(Selection between O and OI at AT) / 01(Selection between O and O2 at AT)	00	00	×	×
	A006	O2 selection	00(Independent) / 01(Only positive) / 02(Both positive and negative)	01	01	×	×
	A011	External frequency output zero reference	0.00–400.0Hz	0.00	0.00	×	○
	A012	External frequency output span reference	0.00–400.0Hz	0.00	0.00	×	○
Multispeed and Jogging Frequency Setting	A013	External frequency input bias start	0–100%	0	0	×	○
	A014	External frequency input bias end	0–100%	100	100	×	○
	A015	External frequency offset enable	00(External frequency output zero reference) / 01(0Hz)	01	01	×	○
	A016	External frequency filter time constant	1–30 (Sampling time = 2 msec.)	8	8	×	○
	A019	Multispeed operation setting selection	00(Binary: up to 16-stage speed at 4 terminals) / 01(Bit: up to 8-stage speed at 8 terminals)	00	00	×	×
	A020	Multispeed frequency setting (0)	0.00, Starting frequency to maximum frequency	0.00	0.00	○	○
	A220	Multispeed frequency setting (0) for second motor	0.00, Starting frequency to maximum frequency for second motor	0.00	0.00	○	○
	A021   A035	Multispeed frequency setting (1–15)	0.00, Starting frequency to maximum frequency	0.00	0.00	○	○
A038	Jogging frequency setting	0.00, Starting frequency to 9.99Hz	1.00	1.00	○	○	
A039	Jog stop mode selection	00(Free-run stop/disabled during operation) / 01(Controlled deceleration/disabled during operation) / 02(DC braking to stop/disabled during operation) / 03(Free-run stop/enabled during operation) / 04(Controlled deceleration/enabled during operation) / 05(DC braking to stop/enabled during operation)	00	00	×	○	

## ●Expanded Function A

○ = Allowed  
 × = Not permitted

Code	Name	Description	Default Setting		Run-time Setting	Run-time Data Edit
			-FE(CE)	-FU(UL)		
V/f Characteristic	A041	Torque boost method selection	00(Manual torque boost) / 01(Automatic torque boost)		×	×
	A241	Torque boost method selection for second motor	00(Manual torque boost) / 01(Automatic torque boost)		×	×
	A042	Manual torque boost value	0.0–20.0%		○	○
	A242	Manual torque boost value for second motor	0.0–20.0%		○	○
	A043	Manual torque boost frequency adjustment	0.0–50.0%		○	○
	A243	Manual torque boost frequency adjustment for second motor	0.0–50.0%		○	○
	A044	V/f characteristic curve selection	00(CT) / 01(VT) / 02(V/f free-setting)		×	×
DC Braking	A051	DC braking enable	00(Disabled) / 01(Enabled)		×	○
	A052	DC braking frequency setting	0.00–60.00Hz		×	○
	A053	DC braking wait time	0.0–5.0sec.		×	○
	A054	DC braking force setting	0.0–70.0%		×	○
	A055	DC braking time setting	0.0–60.0sec.		×	○
	A056	DC braking edge/level selection	00(Edge) / 01(Level)		×	○
	A057	DC braking force setting at the starting point	0.0–70.0%		×	○
Upper/Lower Limit and Jump Frequency	A061	Frequency upper limit setting	0.00, Starting frequency to maximum frequency		×	○
	A261	Frequency upper limit setting for second motor	0.00, Starting frequency to maximum frequency for second motor		×	○
	A062	Frequency lower limit setting	0.00, Starting frequency to maximum frequency		×	○
	A262	Frequency lower limit setting for second motor	0.00, Starting frequency to maximum frequency for second motor		×	○
	A063	Jump frequency (1) setting	0.00–400.0Hz		×	○
	A064	Jump frequency width (1) setting	0.00–10.00Hz		×	○
	A065	Jump frequency (2) setting	0.00–400.0Hz		×	○
	A066	Jump frequency width (2) setting	0.00–10.00Hz		×	○
	A067	Jump frequency (3) setting	0.00–400.0Hz		×	○
	A068	Jump frequency width (3) setting	0.00–10.00Hz		×	○
PID Control	A071	PID function enable	00(Disabled) / 01(Enabled)		×	○
	A072	PID proportional gain	0.2–5.0		○	○
	A073	PID integral gain	0.0–3,600.0sec.		○	○
	A074	PID differential gain	0.0–100.0sec.		○	○
	A075	Process variable scale conversion	0.01–99.99%		×	○
	A076	Process variable source setting	00(at OI) / 01(at O)		×	○
AVR Function	A081	AVR function selection	00(Always ON) / 01(Always OFF) / 02(OFF during deceleration)		×	×
	A082	AVR voltage selection	200/215/220/230/240, 380/400/415/440/460/480V		×	×
Operation Mode and Accel./Decel. Function	A085	Operation mode selection	00(Normal operation) / 01(Energy-saving operation)		×	×
	A086	Optimal energy savings capture rate	0.0–100.0sec.		○	○
	A092	Acceleration time (2)	0.01–3600.sec.		○	○
	A292	Acceleration time (2) for second motor	0.01–3600.sec.		○	○
	A093	Deceleration time (2)	0.01–3600.sec.		○	○
	A293	Deceleration time (2) for second motor	0.01–3600.sec.		○	○
	A094	Selection method to use second accel./decel.	00(2CH input from terminal) / 01(Transition frequency)		×	×
	A294	Selection method to use second accel./decel. for second motor	00(2CH input from terminal) / 01(Transition frequency)		×	×
	A095	Accel(1) to Accel(2) frequency transition point	0.00–400.0Hz		×	×
	A295	Accel(1) to Accel(2) frequency transition point for second motor	0.00–400.0Hz		×	×
	A096	Decel(1) to Decel(2) frequency transition point	0.00–400.0Hz		×	×
External Frequency Tuning	A296	Decel(1) to Decel(2) frequency transition point for second motor	0.00–400.0Hz		×	×
	A097	Acceleration curve selection	00(Linear) / 01(S-curve) / 02(U-shape) / 03(Reverse U-shape)		×	×
	A098	Deceleration curve selection	00(Linear) / 01(S-curve) / 02(U-shape) / 03(Reverse U-shape)		×	×
	A101	External frequency output zero reference at OI	0.00–400.0Hz		×	○
	A102	External frequency output span reference at OI	0.00–400.0Hz		×	○
	A103	External frequency input bias start at OI	0–100%		×	○
	A104	External frequency input bias end at OI	0–100%		×	○
	A105	External frequency offset enable	00(External frequency output zero reference) / 01(0Hz)		×	○
Accel./Decel. Curve	A111	External frequency output zero reference at O2	–400.0–400.0Hz		×	○
	A112	External frequency output span reference at O2	–400.0–400.0Hz		×	○
Accel./Decel. Curve	A113	External frequency input bias start at O2	–100–100%		×	○
	A114	External frequency input bias end at O2	–100–100%		×	○
Accel./Decel. Curve	A131	Acceleration curve constants setting	01(Minimum)–10(Extreme)		×	○
	A132	Deceleration curve constants setting	01(Minimum)–10(Extreme)		×	○

## Expanded Function b

○ = Allowed  
 × = Not permitted

Code	Name	Description	Default Setting		Run-time Setting	Run-time Data Edit		
			-FE(CE)	-FU(UL)				
Restart after Instantaneous Power Failure	b001	Selection of restart mode	00(Alarm) / 01(Restart at 0Hz) / 02(Resume operation after frequency matching) / 03(Resume previous frequency after frequency matching, then decelerate to stop and display trip information)		00	00	×	○
	b002	Allowable instantaneous power failure time	0.3-1.0sec.		1.0	1.0	×	○
	b003	Time delay enforced before motor restart	0.3-100.0sec.		1.0	1.0	×	○
	b004	Instantaneous power failure and under-voltage trip enable	00(Disabled) / 01(Enabled)		00	00	×	○
	b005	Number of restarts after instantaneous power failure and under-voltage trip	00(16 times) / 01(Infinite)		00	00	×	○
	b006	Phase failure detection enable	00(Disabled) / 01(Enabled)		01	01	×	○
	b007	Restart frequency setting	0.00-400.0Hz		0.00	0.00	×	○
Electronic Thermal	b012	Level of electronic thermal setting	0.20*rated current-1.20*rated current		Rated current	Rated current	×	○
	b212	Level of electronic thermal setting for second motor	0.20*rated current-1.20*rated current		Rated current	Rated current	×	○
	b013	Electronic thermal characteristics	00(CT) / 01(VT) / 02(V/f free-setting)		01	01	×	○
	b213	Electronic thermal characteristics for second motor	00(CT) / 01(VT) / 02(V/f free-setting)		01	01	×	○
	b015	Free-setting electronic thermal frequency (1)	0.0-400.0Hz		0.0	0.0	×	○
	b016	Free-setting electronic thermal current (1)	0.0-999.9A		0.0	0.0	×	○
	b017	Free-setting electronic thermal frequency (2)	0.0-400.0Hz		0.0	0.0	×	○
	b018	Free-setting electronic thermal current (2)	0.0-999.9A		0.0	0.0	×	○
	b019	Free-setting electronic thermal frequency (3)	0.0-400.0Hz		0.0	0.0	×	○
b020	Free-setting electronic thermal current (3)	0.0-999.9A		0.0	0.0	×	○	
Overload Restriction	b021	Overload restriction operation mode	00(Disabled) / 01(Enabled during accel./decel.) / 02(Enabled during constant speed)		01	01	×	○
	b022	Overload restriction setting	0.50*rated current-1.50*rated current		Rated current* 1.20	Rated current* 1.20	×	○
	b023	Deceleration rate at overload restriction	0.1-30.0		1.0	1.0	×	○
	b024	Overload restriction operation mode (2)	00(Disabled) / 01(Enabled during accel./decel.) / 02(Enabled at constant speed)		01	01	×	○
	b025	Overload restriction setting (2)	0.50*rated current-1.50*rated current		Rated current* 1.20	Rated current* 1.20	×	○
	b026	Deceleration rate at overload restriction (2)	0.1-30.0		1.0	1.0	×	○
Software Lock	b031	Software lock mode selection	00(All parameters except b031 are locked when SFT from terminal is on) / 01(All parameters except b031 and output frequency F001 are locked when SFT from terminal is on) / 02(All parameters except b031 are locked) / 03(All parameters except b031 and output frequency F001 are locked) / 10(Run-time data edit mode)		01	01	×	○
Others	b034	Warning time	0.0-6553(65,530hr) (Output to intelligent terminal)		0.0	0.0	×	○
	b035	Rotational direction restriction	00(Enabled for both directions) / 01(Enabled for forward) / 02(Enabled for reverse)		00	00	×	×
	b036	Reduced voltage soft start selection	00(Short)-06(Long)		06	06	×	○
	b037	Display selection	00(All) / 01(Function group) / 02(All including user's selection)		01	01	×	○
	b080	AM terminal analog meter tuning	0-255		150	150	○	○
	b081	FM terminal analog meter tuning	0-255		60	60	×	○
	b082	Start frequency setting	0.10-9.99Hz		0.50	0.50	×	○
	b083	Carrier frequency setting	0.5-12.0kHz (When derated)		3.0	3.0	×	×
	b084	Initialization mode selection	00(Trip history clear) / 01(Parameter initialization) / 02(Trip history clear and parameter initialization)		00	00	×	×
	b085	Country code for initialization	00(Japanese version) / 01(European version) / 02(North American version)		01	02	×	×
	b086	Frequency scaling conversion factor	0.1-99.9		1.0	1.0	○	○
	b087	STOP key enable	00(Disabled) / 01(Enabled)		00	00	×	○
	b088	Resume on free-run stop cancellation mode	00(Restart at 0Hz) / 01(Resume operation after frequency matching)		00	00	×	○
	b090	Dynamic braking usage ratio	0.0-100.0%		0.0	0.0	×	○
	b091	Stop mode selection	00(Deceleration and stop) / 01(Free-run stop)		00	00	×	×
	b092	Cooling fan control	00(Fan is always ON) / 01(Fan is ON during run, OFF during stop)		00	00	×	×
	b095	Dynamic braking control	00(Disabled) / 01(Enabled during run) / 02(Enabled)		00	00	×	○
	b096	Activation level of dynamic braking setting	330-380/660-760V		360/720	360/720	×	○
	b098	PTC thermal protection control	00(Disabled) / 01(PTC enabled) / 02(NTC enabled)		00	00	×	○
	b099	PTC thermal protection level setting	0.0-9999Ω		3000	3000	×	○
Free-setting V/f pattern	b100	Free-setting V/f frequency (1)	0.0-400.0Hz		0.0	0.0	×	×
	b101	Free-setting V/f voltage (1)	0.0-800.0V		0.0	0.0	×	×
	b102	Free-setting V/f frequency (2)	0.0-400.0Hz		0.0	0.0	×	×
	b103	Free-setting V/f voltage (2)	0.0-800.0V		0.0	0.0	×	×
	b104	Free-setting V/f frequency (3)	0.0-400.0Hz		0.0	0.0	×	×
	b105	Free-setting V/f voltage (3)	0.0-800.0V		0.0	0.0	×	×
	b106	Free-setting V/f frequency (4)	0.0-400.0Hz		0.0	0.0	×	×
	b107	Free-setting V/f voltage (4)	0.0-800.0V		0.0	0.0	×	×
	b108	Free-setting V/f frequency (5)	0.0-400.0Hz		0.0	0.0	×	×
	b109	Free-setting V/f voltage (5)	0.0-800.0V		0.0	0.0	×	×
	b110	Free-setting V/f frequency (6)	0.0-400.0Hz		0.0	0.0	×	×
	b111	Free-setting V/f voltage (6)	0.0-800.0V		0.0	0.0	×	×
	b112	Free-setting V/f frequency (7)	0.0-400.0Hz		0.0	0.0	×	×
	b113	Free-setting V/f voltage (7)	0.0-800.0V		0.0	0.0	×	×

## ●Expanded Function C

○ = Allowed  
 × = Not permitted

Code	Name	Description	Default Setting		Run-time Setting	Run-time Data Edit	
			-FE(CE)	-FU(UL)			
Intelligent Input Terminal Setting	C001	Terminal (1) function	01(RV:Reverse) / 02(CF1:Multispeed(1)) / 03(CF1:Multispeed(2)) / 04(CF3:Multispeed(3)) / 05(CF4:Multispeed(4)) / 06(JG:Jogging) / 07(DB:External DC braking) / 08(SET:Second constants setting) / 09(2CH:Second accel./decel.) / 11(FRS:Free-run stop) / 12(EXT:External trip) / 13(USP:Unattended start protection) / 14(CS:Change to/from commercial power supply) / 15(SFT:Software lock) / 16(AT:Analog input selection) / 18(RS:Reset) / 20(STA:3-wire start) / 21(STP:3-wire hold) / 22(F/R:3-wire fwd./rev.) / 23(PID:PID On/Off) / 24(PIDC:PID reset) / 27(UP:Remote-controlled accel.) / 28(DWN:Remote-controlled decel.) / 29(UDC:Remote-controlled data clearing) / 32(SF1:Multispeed bit command(1)) / 33(SF2:Multispeed bit command(2)) / 34(SF3:Multispeed bit command(3)) / 35(SF4:Multispeed bit command(4)) / 36(SF5:Multispeed bit command(5)) / 37(SF6:Multispeed bit command(6)) / 38(SF7:Multispeed bit command(7)) / 39(OLR:Overload limit change) / 255(NO:Not selected)	18	18	×	○
	C002	Terminal (2) function		16	16	×	○
	C003	Terminal (3) function		03	13	×	○
	C004	Terminal (4) function		02	02	×	○
	C005	Terminal (5) function		01	01	×	○
Intelligent Input Terminal State Setting	C011	Terminal (1) active state	00(NO) / 01(NC)	00	00	×	○
	C012	Terminal (2) active state	00(NO) / 01(NC)	00	00	×	○
	C013	Terminal (3) active state	00(NO) / 01(NC)	00	01	×	○
	C014	Terminal (4) active state	00(NO) / 01(NC)	00	00	×	○
	C015	Terminal (5) active state	00(NO) / 01(NC)	00	00	×	○
	C019	Terminal FW active state	00(NO) / 01(NC)	00	00	×	○
Intelligent Output Terminal Setting	C021	Terminal (11) function	00(RUN:Run signal) / 01(FA1:Frequency arrival signal (at the set frequency)) / 02(FA2:Frequency arrival signal (at or above the set frequency)) / 03(OL:Overload advance notice signal) / 04(OD:Output deviation for PID control) / 05(AL:Alarm signal) / 06(FA3:Frequency arrival signal (only at the set frequency)) / 08(IP:Instantaneous power failure signal) / 09(UV:Under-voltage signal) / 11(RNT:Operation time over) / 12(ONT:Power-on time over) / 13(THM:Thermal alarm)	01	01	×	○
	C022	Terminal (12) function		00	00	×	○
	C026	Alarm relay terminal function		05	05	×	○
	C027	FM signal selection	00(Output frequency) / 01(Output current) / 03(Digital output frequency-only at C027) / 04(Output voltage) / 05(Power) / 06(Thermal load ratio) / 07(LAD frequency)	00	00	×	○
	C028	AM signal selection		00	00	×	○
	C029	AMI signal selection		00	00	×	○
Intelligent Output Terminal State and Output Level setting	C031	Terminal (11) active state	00(NO) / 01(NC)	00	00	×	○
	C032	Terminal (12) active state	00(NO) / 01(NC)	00	00	×	○
	C036	Alarm relay terminal active state	00(NO) / 01(NC)	01	01	×	○
	C040	Overload signal output mode	00(During accel./decel) / 01(At constant speed)	01	01	×	○
	C041	Overload level setting	0.00*rated current-2.00*rated current	Rated current	Rated current	×	○
	C042	Arrival frequency setting for acceleration	0.0-400Hz	0.0	0.0	×	○
	C043	Arrival frequency setting for deceleration	0.0-400Hz	0.0	0.0	×	○
	C044	PID deviation level setting	0.0-100%	3.0	3.0	×	○
	C061	Electronic thermal warning level	0-100%	80	80	×	○
	C070	Data commanding method	02(Operator) / 03(RS485) / 04 (Option(1)) / 05(Option(2))	02	02	×	×
Serial Communication	C071	Communication speed selection	03(2400bps) / 04(4800bps) / 05(9600bps) / 06(19200bps)	04	04	×	○
	C072	Address allocation	1..32	1	1	×	○
	C073	Communication bit length selection	7(7-bit) / 8(8-bit)	7	7	×	○
	C074	Communication parity selection	00(No parity) / 01(Even) / 02(Odd)	00	00	×	○
	C075	Communication stop bit selection	1(1-bit) / 2(2-bit)	1	1	×	○
	C078	Communication wait time	0.0-1000msec	0.0	0.0	×	○
	C081	Fine tuning for O terminal input	0- 6553(65530)	Factory set	Factory set	○	○
	C082	Fine tuning for O1 terminal input	0- 6553(65530)	Factory set	Factory set	○	○
Analog Meter Setting	C083	Fine tuning for O2 terminal input	0- 6553(65530)	Factory set	Factory set	○	○
	C085	Thermistor tuning	0.0-1000	100	100	○	○
	C086	AM offset tuning	0.0-10.0V	0.0	0.0	○	○
	C087	AMI meter tuning	0.0-255%	50	50	○	○
	C088	AMI offset tuning	0-20mA	Factory set	Factory set	○	○
	C091	Debug mode enable	00(Display) / 01(No display)	00	00	×	○
Others	C101	UP/DOWN mode selection	00(Clear previous frequency) / 01(Keep previous frequency)	00	00	×	○
	C102	Reset mode selection	00(Cancel trip state when reset signal turns ON) / 01(Cancel trip state when reset signal turns OFF) / 02(Cancel trip state when reset signal turns ON(Enabled during trip state))	00	00	○	○
	C103	Restart frequency after reset	00(Restart at 0Hz) / 01(Resume operation after frequency matching)	00	00	×	○
	C121	Zero tuning at O terminal	0- 6553(65530)	Factory set	Factory set	○	○
	C122	Zero tuning at O1 terminal	0- 6553(65530)	Factory set	Factory set	○	○
	C123	Zero tuning at O2 terminal	0- 6553(65530)	Factory set	Factory set	○	○

## ●Expanded Function H

H003	Motor capacity setting	0.20-75.0(kW)	Factory set	Factory set	×	×
H203	Motor capacity setting for second motor	0.20-75.0(kW)	Factory set	Factory set	×	×
H004	Motor poles setting	2/4/6/8	4	4	×	×
H204	Motor poles setting for second motor	2/4/6/8	4	4	×	×
H006	Motor stabilization constant setting	0-255	100	100	○	○
H206	Motor stabilization constant setting for second motor	0-255	100	100	○	○

## ●Expanded Function P

P001	Operation mode selection in case of Option (1) error	00(Trip) / 01(Continuous operation)	00	00	×	○
P020	Operation mode selection in case of Option (2) error	00(Trip) / 01(Continuous operation)	00	00	×	○

## ●Expanded Function U

P001   P020	User's selection of 12 functions	no / d01-P02	no	no	×	○
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# TERMINALS

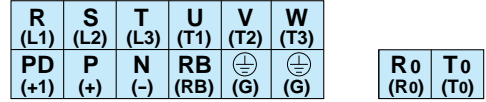
## Main Circuit Terminals

### Terminal Description

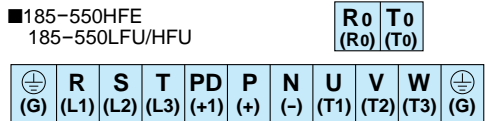
Terminal Symbol	Terminal Name
R(L1), S(L2), T(L3)	Main power supply input terminals
U(T1), V(T2), W(T3)	Inverter output terminals
PD(+1), P(+)	DC reactor connection terminals
P(+), RB(RB)	External braking resistor connection terminals
P(+), N(-)	External braking unit connection terminals
⊕(G)	Ground connection terminal
R0(R0), T0(T0)	Control power supply input terminals

### Terminal Arrangement

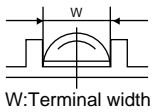
■110-150HFE, 110-150LFU/HFU



■185-550HFE  
185-550LFU/HFU



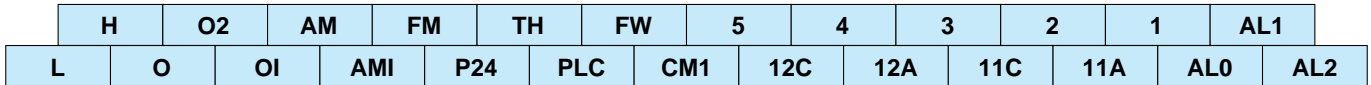
### Screw Diameter and Terminal Width



Model	Main Circuit Terminals				R0, T0 Terminals
	110-150HFE/ LFU/HFU	185LFU, 185-370HFE/HFU	220-370LFU 450-550HFE/HFU	450-550LFU	All models
<b>Screw diameter</b>	M6	M6	M8	M10	M4
<b>Terminal width(mm)</b>	17.5	18	23	35	9

## Control Circuit Terminals

### Terminal Arrangement



Screw diameter M3, Terminal width 6.4mm

### Terminal Description

Terminal Symbol	Explanation of Terminals	Remarks
L	Common terminal for analog frequency command input and analog monitor output	—
H	Power supply for frequency command input	DC10V
O	Frequency Commands	Frequency command input (DC 0-+10V)
O2		Frequency command input (DC-10-+10V)
OI		Frequency command input (DC 4-20mA)
AM	Monitoring Terminals	Analog voltage output monitor
AMI		Analog current output monitor
FM		Pulse duty monitor
P24	Frequency monitor, internal power supply for input terminals	DC24V
TH	Thermistor input (Motor temperature detection)	—
PLC	Common terminal for external power supply of PLCs, etc.	—
FW	Forward command input	—
CM1	Common terminal for FW, FM, and intelligent input terminals	—
5	Intelligent Input Terminals	Selection of 5 functions from: RV(Reverse), CF1-CF4(Multispeed command), JG(Jogging), DB(External DC braking), SET(Second constants setting), 2CH(Second accel./decel.), FRS(Free-run stop), EXT(External trip), USP(Unattended start protection), CS(Change to/from commercial power supply), SFT(Software lock), AT(Analog input selection), RS(Reset), STA(3-wire start), STP(3-wire hold), F/R(3-wire fwd./rev.), PID(PID On/Off), PIDC(PID reset), UP/DWN(Remote-controlled accel./decel.) UDC(Remote-controlled data clearing), SF1-SF7(Multispeed bit command 1-7), OLR(Overload limit change), and NO(Not selected)
4		
3		
2		
1		
12C	Intelligent Output Terminals	Selection form the following: RUN(Run signal), FA1(Frequency arrival signal (at the set frequency)), FA2(Frequency arrival signal (at or above the set frequency)), OL(Overload advance notice signal), OD(Output deviation for PID control), AL(Alarm signal), FA3(Frequency arrival signal (only at the set frequency)), IP(Instantaneous power failuer signal), UV(Under-voltage signal), RNT(Operation (run) time over), ONT(Power-on time over), and THM(Thermal alarm)
12A		
11C		
11A		
AL0		
AL1		
AL2		
Relay input		
Intelligent relay output		

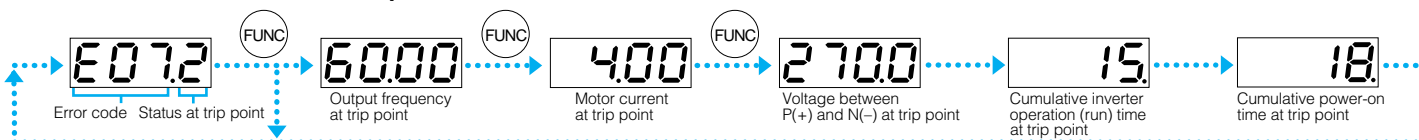
# PROTECTIVE FUNCTIONS

Name	Cause(s)	Display on digital operator	Display on remote operator/copy unit ERR1****	
Over-current protection	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current for the inverter, so the inverter output is turned off.	While at constant speed	<b>E01</b>	OC.Drive
		During deceleration	<b>E02</b>	OC.Drive
		During acceleration	<b>E03</b>	OC.Accel
Overload protection(*1)	When a motor overload is detected by the electronic thermal function, the inverter trips and turns off its output.		<b>E05</b>	Over.L
Braking resistor overload protection	When the regenerative braking resistor exceeds the usage time allowance or an over-voltage caused by the stop of the BRD function is detected, the inverter trips and turns off its output.		<b>E06</b>	OL.BRD
Over-voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor, the inverter trips and turns off its output.		<b>E07</b>	Over.V
EEPROM error(*2)	When the built-in EEPROM memory has problems due to noise or excessive temperature, the inverter trips and turns off its output.		<b>E08</b>	EEPROM
Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault. This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns off its output.		<b>E09</b>	Under.V
CT(Current transformer) error	If a strong source of electrical interference is close to the inverter or abnormal operations occur in the built-in CT(Current transformer), the inverter trips and turns off its output.		<b>E10</b>	CT
CPU error	When a malfunction in the built-in CPU has occurred, the inverter trips and turns off its output.		<b>E11</b>	CPU1
External trip	When a signal to an intelligent input terminal configured as EXT has occurred, the inverter trips and turns off its output.		<b>E12</b>	EXTERNAL
USP error	An error occurs when power is cycled while the inverter is in RUN mode if the Unattended Start Protection (USP) is enabled. The inverter trips and does not go into RUN mode until the error is cleared.		<b>E13</b>	USP
Ground fault	The inverter is protected by the detection of ground faults between the inverter output and the motor during power-up tests. This feature protects the inverter only.		<b>E14</b>	GND.Fit.
Input over-voltage protection	When the input voltage is higher than the specified value, it is detected 60 seconds after power-up and the inverter trips and turns of its output.		<b>E15</b>	OV.SRC
Instantaneous power failure	When power is cut for more than 15msec., the inverter trips and turns off its output. If power failure continues, the error will be cleared. The inverter restarts if it is in RUN mode when power is cycled.		<b>E16</b>	Inst.P-F
Option 1 connection error	An error has been detected in an option or at connecting terminals for it.		<b>E17</b>	NG.OP1
Option 2 connection error			<b>E18</b>	NG.OP2
Inverter thermal trip	When the inverter internal temperature is higher than the specified value, the thermal sensor in the inverter module detects the higher temperature of the power devices and trips, turning off the inverter output.		<b>E21</b>	OH.FIN
Missing phase	One of three lines of 3-phase power supply is missing.		<b>E24</b>	PH.Fail
IGBT error	When instantaneous over-current has occurred, the inverter trips and turns off its output to protect main circuit element.		<b>E30</b>	IGBT
Thermistor error	When the thermistor inside the motor detects temperature higher than the specified value, the inverter trips and turns off its output.		<b>E35</b>	TH
Out of operation due to under-voltage	Due to insufficient voltage, the inverter has turned off its output and been trying to restart. If it fails to restart, it goes into the under-voltage error.		<b>--U</b>	UV.WAIT

(\*1)You can clear the error by pressing the Start / Reset key 10 seconds after the trip occurred.

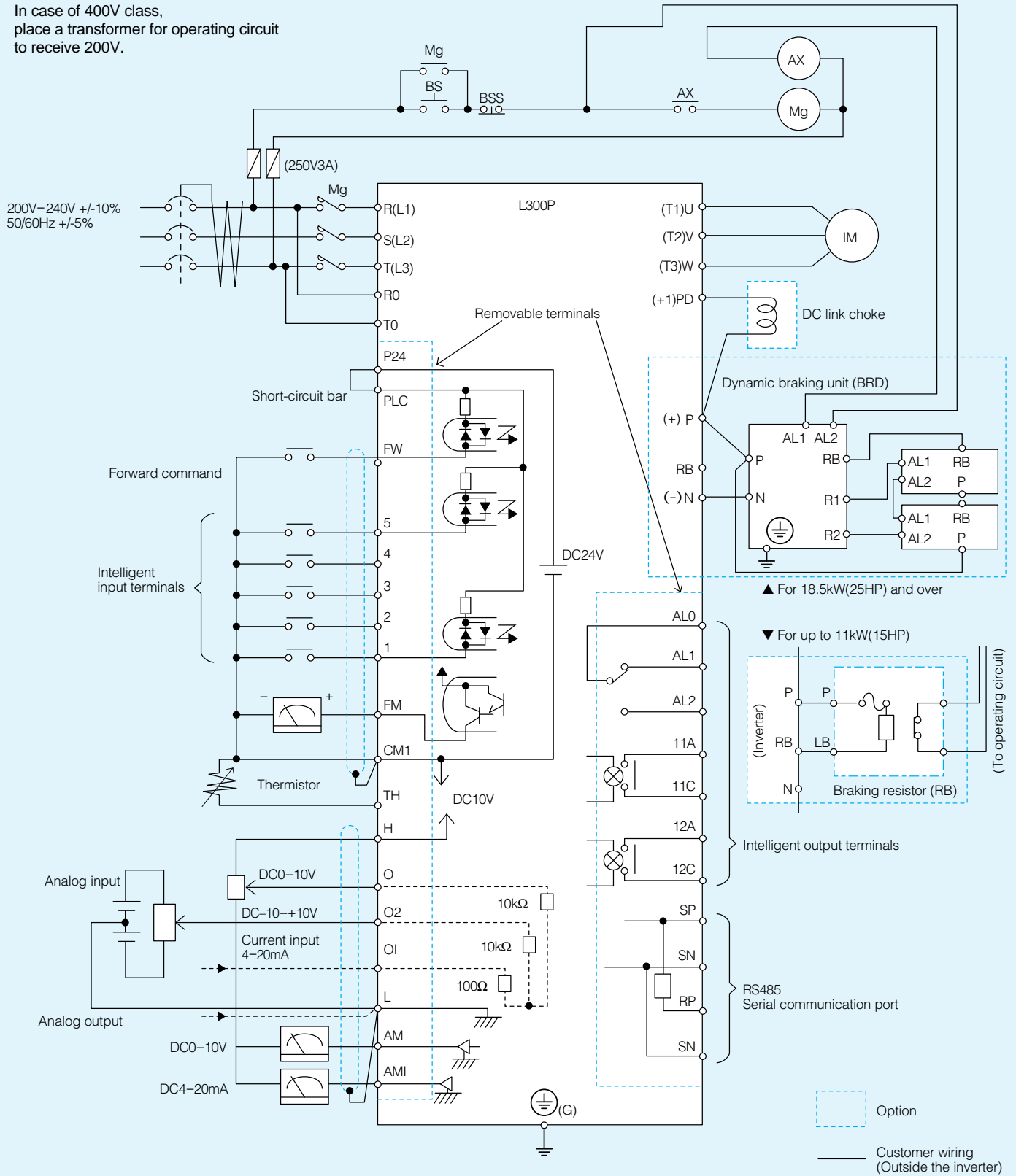
(\*2)If an EEPROM error **E08** occurs, be sure to confirm the parameter data values are still correct.

## <How to access the details about the present fault>



# CONNECTING DIAGRAM

In case of 400V class, place a transformer for operating circuit to receive 200V.

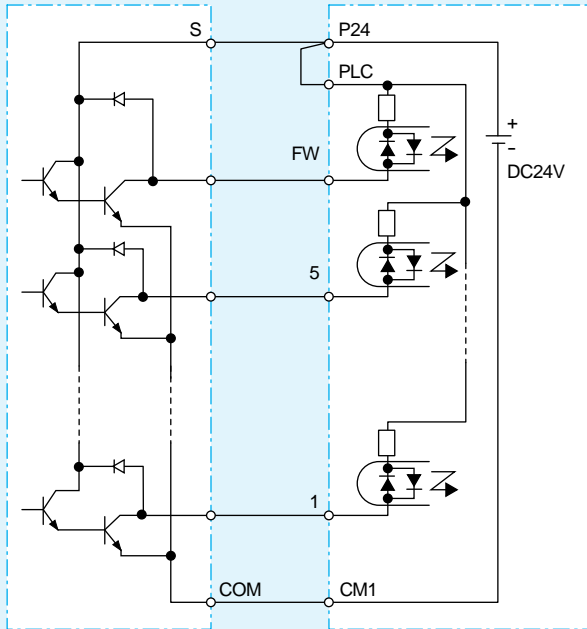


Terminal Name	FW, 1, 2, 3, 4, 5, FM, TH	H, O, O2, OI, AM, AMI
Common	CM1	L

# CONNECTING TO PLC

## 1. USING INTERNAL POWER SUPPLY OF THE INVERTER

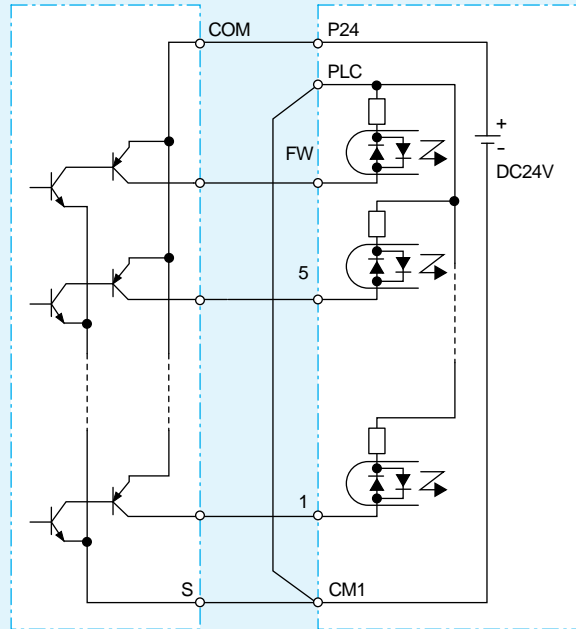
### (1) Sink type logic



Hitachi H series PLC  
Output Module  
YTR48

L300P

### (2) Source type logic



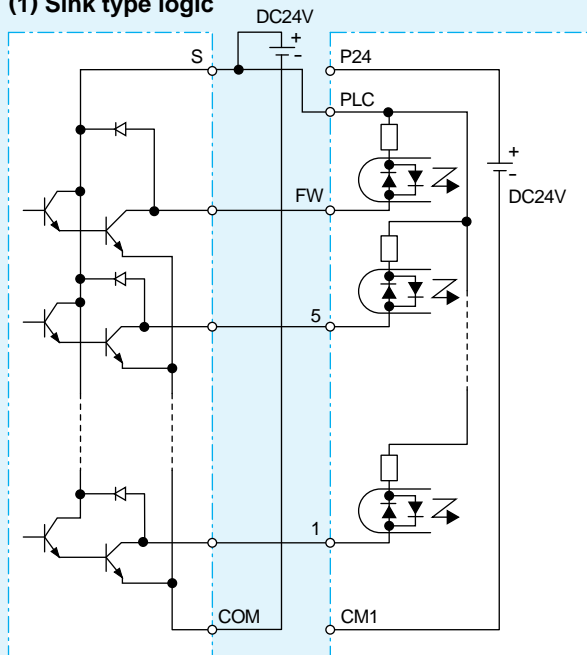
Hitachi H series PLC  
Output Module  
YTS48

L300P

(Note: Place short-circuit bar between PLC and CM1 instead of P24 and PLC.)

## 2. USING EXTERNAL POWER SUPPLY

### (1) Sink type logic

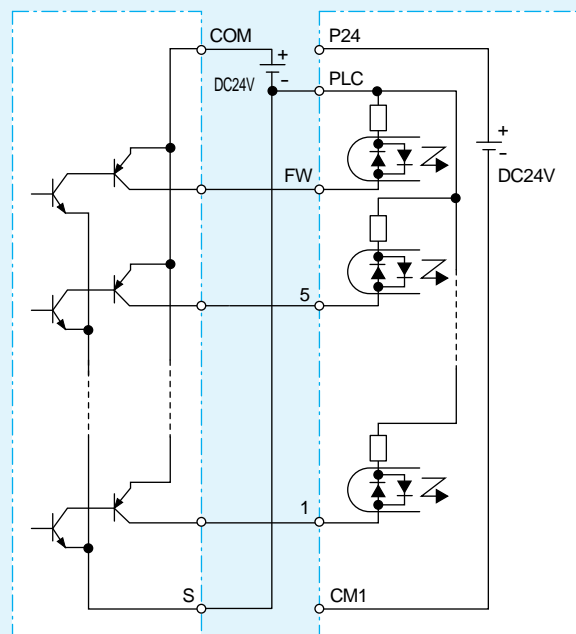


Hitachi H series PLC  
Output Module  
YTR48

L300P

(Note: Remove short-circuit bar between P24 and PLC.)

### (2) Source type logic

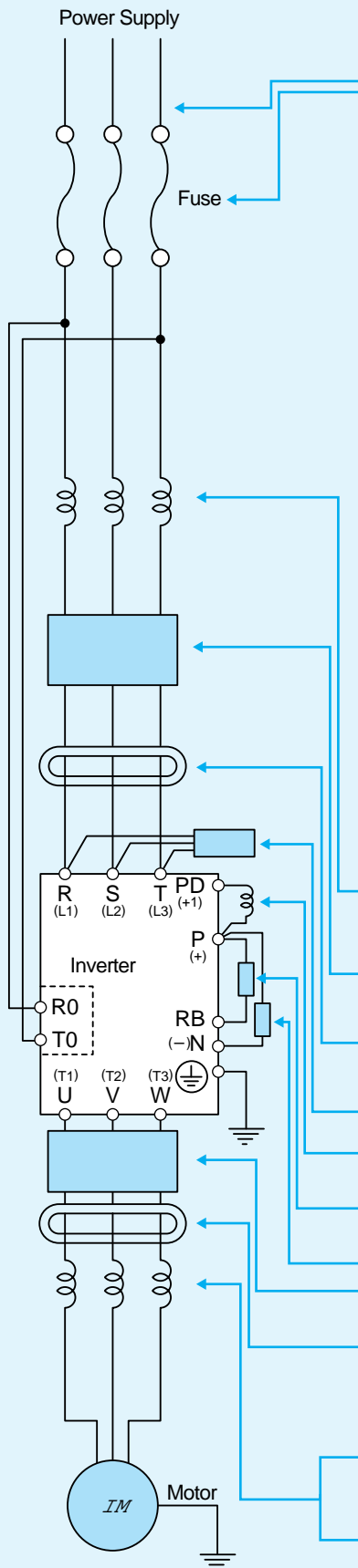


Hitachi H series PLC  
Output Module  
YTS48

L300P

(Note: Remove short-circuit bar between P24 and PLC.)  
(Note: Be sure to turn on the inverter after turning on the PLC and its external power supply to prevent the parameters in the inverter from being modified.)

# WIRING and OPTIONS



Input Voltage	Motor Output (kW(HP))	Model	Wiring		Signal Lines	Fuse (Class J)
			Power Lines			
			AWG	mm <sup>2</sup>		
200V	11(15)	L300P-110LFU	AWG 4	21.2mm <sup>2</sup>	0.75mm <sup>2</sup> shielded wire	70A
	15(20)	L300P-150LFU	AWG 2	33.8mm <sup>2</sup>		90A
	18.5(25)	L300P-185LFU	AWG 1	42.4mm <sup>2</sup>		110A
	22(30)	L300P-220LFU	AWG 1/0	53.5mm <sup>2</sup>		150A
	30(40)	L300P-300LFU	AWG 2/0	67.4mm <sup>2</sup>		175A
	37(50)	L300P-370LFU	AWG 1 *2	42.4mm <sup>2</sup> *2		225A
	45(60)	L300P-450LFU	AWG 1 *2	42.4mm <sup>2</sup> *2		250A
400V	55(75)	L300P-550LFU	AWG 1/0 *2	53.5mm <sup>2</sup> *2		300A
	11(15)	L300P-110HFU	AWG 8	8.4mm <sup>2</sup>	0.75mm <sup>2</sup> shielded wire	40A
	15(20)	L300P-150HFU	AWG 6	13.3mm <sup>2</sup>		50A
	18.5(25)	L300P-185HFU	AWG 6	13.3mm <sup>2</sup>		60A
	22(30)	L300P-220HFU	AWG 4	21.2mm <sup>2</sup>		70A
	30(40)	L300P-300HFU	AWG 2	33.8mm <sup>2</sup>		90A
	37(50)	L300P-370HFU	AWG 1	42.4mm <sup>2</sup>		110A
45(60)	L300P-450HFU	AWG 1 (75 )	42.4mm <sup>2</sup>	150A		
55(75)	L300P-550HFU	AWG 1/0 (75 )	53.5mm <sup>2</sup>	175A		

Note 1: Field wiring connection must be made by a UL and cUL listed closed-loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimp tool specified by the connector manufacturer.  
 Note 2: Be sure to use bigger wires for power lines if the distance exceeds 20m(22yd).

Name	Function
Input side AC reactor	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.
EMI filter	Reduces the conducted noise on the power supply wiring generated by the inverter. Connect to the inverter input side.
Radio noise filter	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise (can also be used on output).
Radio noise filter (Capacitive filter)	This capacitive filter reduces radiated noise from the main power wires in the inverter input side.
DC link choke	Suppresses harmonics generated by the inverter.
Braking resistor	This is useful for increasing the inverter's control torque for high duty-cycle (on-off) applications, and improving the decelerating capability.
Braking unit	
Output side noise filter	Reduces radiated noise from wiring in the inverter output side.
Radio noise filter	Electrical noise interference may occur on nearby equipment such as a radio receiver. This magnetic choke filter helps reduce radiated noise (can also be used on input).
AC reactor	This reactor reduces the vibration in the motor caused by the inverter's switching waveforms, by smoothing the waveforms to approximate commercial power quality. It is also useful when wiring from the inverter to the motor is more than 10m in length, to reduce harmonics.
LCR filter	Sine wave shaping filter for the output side.

# PERIPHERAL EQUIPMENT

## ● OPERATOR

Model	Potentiometer	Remote Control	Installation in L300P	Copy Function	Multilingual
OPE-S		○	○		
OPE-SR	○	○	○ (Standard for L300P)		
SRW-0EX		○	○	○	○

## ● CABLE FOR OPERATOR

Model	Cable Length
ICS-1	1m (3.3ft)
ICS-3	3m (9.8ft)

## ● OPTION PCB (Up to 2 PCBs are mountable inside L300P)

Model	Cable Length	Function
SJ-DG *1	Digital Input PCB	External command input in BCD or binary data
SJ-DN *2	PCB for DeviceNet	Communication with DeviceNet

(\*1, \*2 : Available soon)

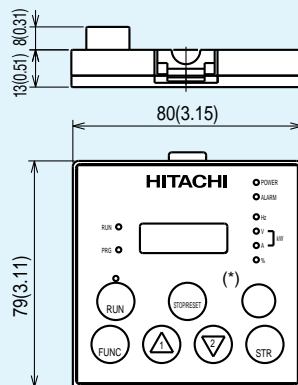
## ■ REMOTE OPERATOR SRW-0EX(Optional)



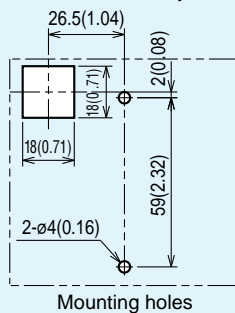
## ■ DIMENSIONS

[Unit:mm (inch)]  
Inches for reference only

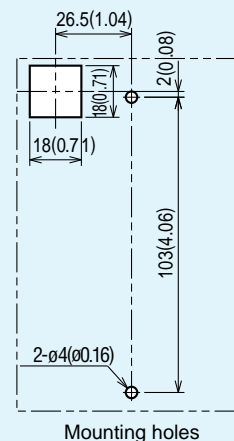
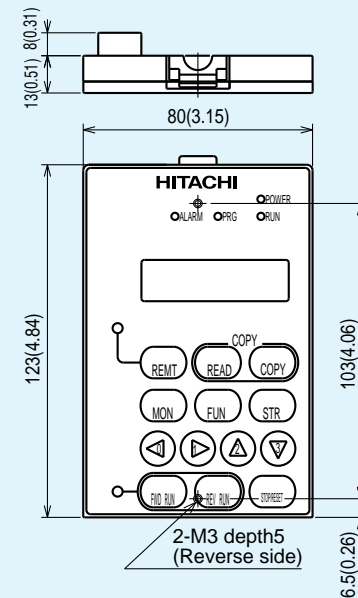
### ● OPE-S(R)



\*Potentiometer installed only in ORE-SR.

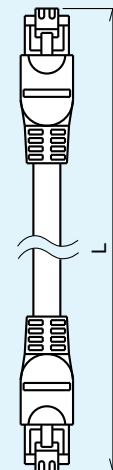


### ● SRW-0EX



### ● ICS-1, 3

(Cables for OPE-S(R) and SRW-0EX)

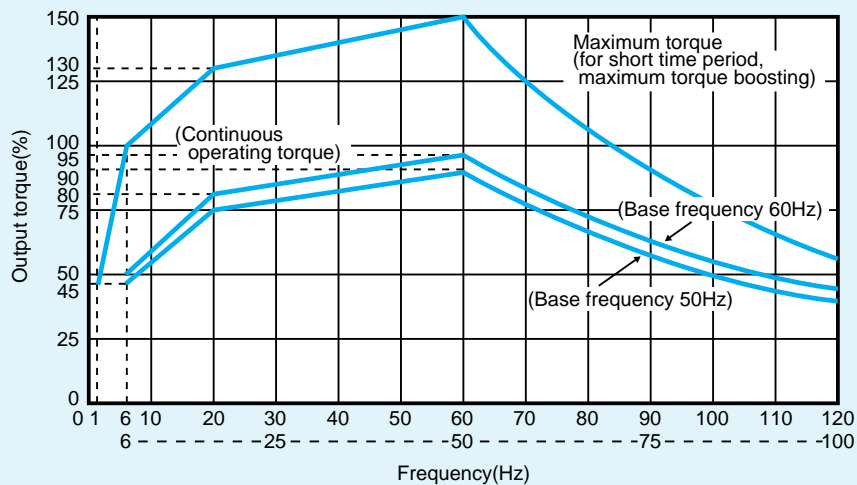
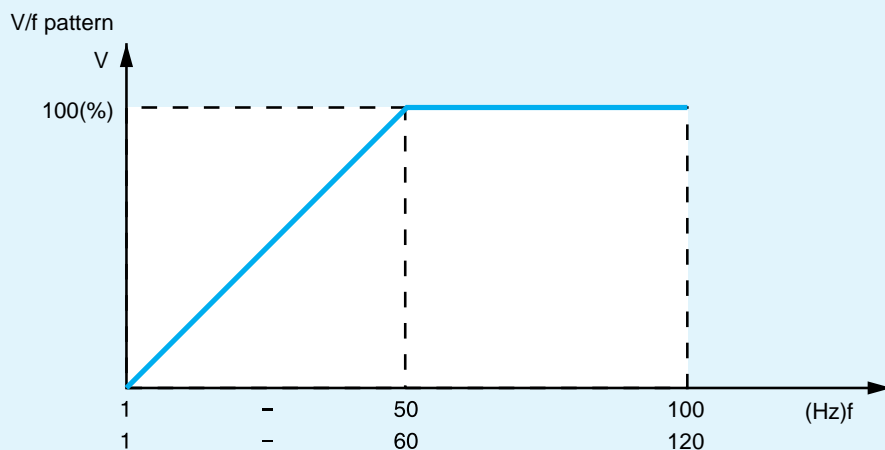


Model Name	Cable Length
ICS-1	1m (3.3ft)
ICS-3	3m (9.8ft)



# TORQUE CHARACTERISTICS

● Typical torque performance based on V/f pattern (top) is shown below.



# FOR CORRECT OPERATION

## ●Application to Motors

### [Application to general-purpose motors]

Operating frequency	The overspeed endurance of a general-purpose motor is 120% of the rated speed for 2 minutes (JIS C4,004). For operation at higher than 60Hz, it is required to examine the allowable torque of the motor, useful life of bearings, noise, vibration, etc. In this case, be sure to consult the motor manufacturer as the maximum allowable rpm differs depending on the motor capacity, etc.
Torque characteristics	The torque characteristics of driving a general-purpose motor with an inverter differ from those of driving it using commercial power (starting torque decreases in particular). Carefully check the load torque characteristic of a connected machine and the driving torque characteristic of the motor.
Motor loss and temperature increase	An inverter-driven general-purpose motor heats up quickly at lower speeds. Consequently, the continuous torque level(output) will decrease at lower motor speeds. Carefully check the torque characteristics vs speed range requirements.
Noise	When run by an inverter, a general-purpose motor generates noise slightly greater than with commercial power.
Vibration	When run by an inverter at variable speeds, the motor may generate vibration, especially because of (a) unbalance of the rotor including a connected machine, or (b) resonance caused by the natural vibration frequency of a mechanical system. Particularly, be careful of (b) when operating at variable speeds a machine previously fitted with a constant speed motor. Vibration can be minimized by (1) avoiding resonance points using the frequency jump function of the inverter, (2) using a tire-shaped coupling, or (3) placing a rubber shock absorber beneath the motor base.
Power transmission mechanism	Under continued, low-speed operation, oil lubrication can deteriorate in a power transmission mechanism with an oil-type gear box (gear motor) or reducer. Check with the motor manufacturer for the permissible range of continuous speed. To operate at more than 60 Hz, confirm the machine's ability to withstand the centrifugal force generated.

### [Application to special motors]

Gear motor	The allowable rotation range of continuous drive varies depending on the lubrication method or motor manufacturer. (Particularly in case of oil lubrication, pay attention to the low frequency range.)
Brake-equipped motor	For use of a brake-equipped motor, be sure to connect the braking power supply from the primary side of the 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 for each motor of a different pole count. At the time of pole changing, be sure to stop the motor.
Submersible motor	The rated current of a submersible motor is significantly larger than that of the general-purpose motor. In inverter selection, be sure to check the rated current of the motor. Also see: Application to the 400V-class motor.
Explosion-proof motor	Inverter drive is not suitable for a safety-enhanced explosion-proof type motor. The inverter should be used in combination with a pressure-proof explosion-proof type motor. * Explosion-proof verification is not available for L300P 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 suitable for a connected machine. As to proper inverter selection, consult the manufacturer.
Single-phase motor	A single-phase motor is not suitable for variable-speed operation by an inverter drive. Therefore, use a three-phase motor.

### [Application to the 400V-class motor]

A system applying a voltage-type PWM inverter with IGBT may have surge voltage at the motor terminals resulting from the cable constants including the cable length and the cable laying method. Depending on the surge current magnification, the motor coil insulation may be degraded. In particular, when a 400V-class motor is used, a longer cable is used, and critical loss can occur, take the following countermeasures:

- (1) install the LCR filter between the inverter and the motor,
- (2) install the AC reactor between the inverter and the motor, or
- (3) enhance the insulation of the motor coil.

## ●Notes on Use

### [Drive]

Run/Stop	Run or stop of the inverter must be done with the keys on the operator panel or through the control circuit terminals. Do not operate by installing an electromagnetic contactor (Mg) in the main circuit.
Emergency motor stop	When the protective function is operating or the power supply stops, the motor enters the free run stop state. When an emergency stop is required or when the motor should be kept stopped, use of a mechanical brake should be considered.
High-frequency operation	A max. 400Hz can be selected on the L300P Series. However, a two-pole motor can attain up to approx. 24,000 rpm, which is extremely dangerous. Therefore, carefully make selection and settings by checking the mechanical strength of the motor and connected machines. Consult the motor manufacturer when it is necessary to drive a standard (general-purpose) motor above 60 Hz.

### [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 gasses, mist of liquid for grinding, or salt. Install the inverter away from direct sunlight in a well-ventilated room that is free of vibration. The inverter can be operated in the ambient temperature range from -10 to 50 °C. (Carrier frequency and output current must be reduced in the range of 40 to 50 °C.)

## [Main power supply]

<p>Installation of an AC reactor on the input side</p>	<p>In the following examples involving a general-purpose inverter, a large peak current flows on the main power supply side, and may destroy the converter module. Where such situations are foreseen or the connected equipment must be highly reliable, install an AC reactor between the power supply and the inverter. Also, where influence of indirect lightning strike is possible, install a lightning conductor.</p> <p>(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.</p> <p>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.</p> <p>In cases (A), (B) and (C), it is recommended to install an AC reactor on the main power supply side.          Note: Example calculation with <math>V_{RS} = 205V</math>, <math>V_{ST} = 201V</math>, <math>V_{TR} = 200V</math>  <math>V_{RS}</math> : R-S line voltage, <math>V_{ST}</math> : S-T line voltage, <math>V_{TR}</math> : T-R line voltage</p> $\text{Unbalance factor of voltage} = \frac{\text{Max. line voltage (min.)} - \text{Mean line voltage}}{\text{Mean line voltage}} \times 100$ $= \frac{V_{RS} - (V_{RS} + V_{ST} + V_{TR})/3}{(V_{RS} + V_{ST} + V_{TR})/3} \times 100 = \frac{205 - 202}{202} \times 100 = 1.5 (\%)$
<p>Using a private power generator</p>	<p>An inverter run by a private power generator may overheat the generator or suffer from a deformed output voltage waveform of the generator. Generally, the 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.</p>

## ●Notes on Peripheral Equipment Selection

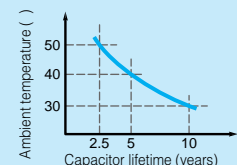
<p>Wiring connections</p>	<p>(1) Be sure to connect main power wires with R(L1), S(L2), and T(L3) (input) terminals and motor wires to U(T1), V(T2), and W(T3) terminals (output). (Incorrect connection will cause an immediate failure.)          (2) Be sure to provide a grounding connection with the ground terminal (⊕).</p>
<p>Wiring between inverter and motor</p>	<p>Electro-magnetic contactor          When an electromagnetic contactor is installed between the inverter and the motor, do not perform on-off switching during running operation.</p> <p>Thermal relay          When used with standard applicable output motors (Hitachi standard three-phase squirrel-cage four-pole motors), the L300P Series does not need a thermal relay for motor protection due to the internal electronic protective circuit. A thermal relay, however, should be used:          • during continuous running outside a range of 30 to 60 Hz.          • for motors exceeding the range of electronic thermal adjustment (rated current).          • when several motors are driven by the same inverter; install a thermal relay for each motor.          • The RC value of the thermal relay should be more than 1.1 times the rated current of the motor. Where the wiring length is 10 m or more, the thermal relay tends to turn off readily. In this case, provide an AC reactor on the output side or use a current sensor.</p>
<p>Installing a circuit breaker</p>	<p>Install a circuit breaker on the main power input side to protect inverter wiring and ensure personal safety. Choose an inverter-compatible circuit breaker. The conventional type may malfunction due to harmonics from the inverter. For more information, consult the circuit breaker manufacturer.</p>
<p>Wiring distance</p>	<p>The wiring distance between the inverter and the remote operator panel should be 20 meters or less. When this distance is exceeded, use CVD-E (current-voltage converter) or RCD-E (remote control device). Shielded cable should be used on the wiring. Beware of voltage drops on main circuit wires. (A large voltage drop reduces torque.)</p>
<p>Earth leakage relay</p>	<p>If the earth leakage relay (or earth leakage breaker) is used, it should have a sensitivity level of 15 mA or more (per inverter).</p>
<p>Phase advance capacitor</p>	<p>Do not use a capacitor for power factor improvement between the inverter and the motor because the high-frequency components of the inverter output may overheat or damage the capacitor</p>

## ●High-frequency Noise and Leakage Current

- (1) High-frequency components 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.
- (2) The switching action of an inverter causes an increase in leakage current. Be sure to ground the inverter and the motor.

## ●Lifetime of Primary Parts

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 exceeding the rated current of the inverter. The approximate lifetime of the capacitor is as shown in the figure at the right when it is used 12 hours daily (according to the "Instructions for Periodic Inspection of General-Purpose Inverter" (JEMA)). Also, such moving parts (cooling fan) should be replaced. Maintenance inspection and parts replacement must be performed by only specified trained personnel.



## Precaution 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; a trained 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, outer space, nuclear power, electrical power, transport vehicles, clinics, and underwater equipment, please consult with us in advance.
- For application in a facility where human life is involved or serious losses may occur, make sure to provide 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.

**HITACHI**