

HITACHI
Inspire the Next

VARIABLE FREQUENCY DRIVE

SJ700 Series

Powerful Inverter



High performance with Many useful

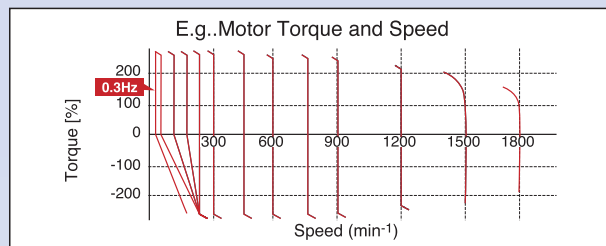
High starting Torque, Powerful Drive and easy setting

High starting Torque 200% at 0.3Hz

Improvement of [Sensorless Vector Control], [Auto Tuning] realize High starting torque 200% and more at 0.3Hz.

Easy adjusting of Motor constant

The best for applications, which need high torque, such as cranes, extruders and lifts.

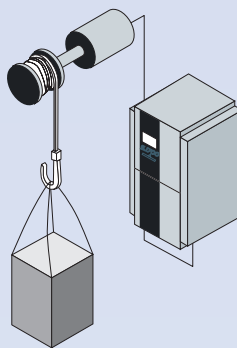


Hitachi original 0Hz Domain sensorless vector control

Keep 150% * torque at 0Hz speed signal

Crane applications require high torque at starting

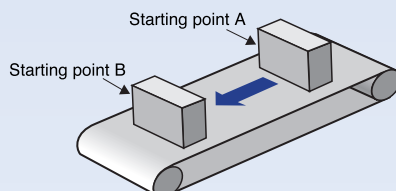
*150%torque in case 1 frame big inverter capacity of motor



Position Control Function

With combination of the SJ700 and a motor with an encoder, position control is possible by adding SJ-FB feedback option card to the inverter.

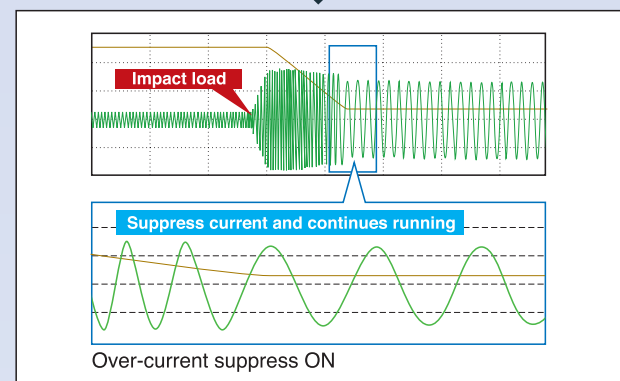
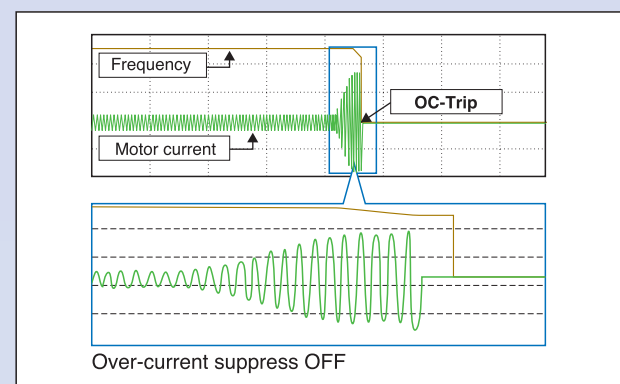
When position control is necessary with conveyor application, the system can be built with lower cost. According to four parameters (position command, speed command, acceleration time and deceleration time), the SJ700 will move an object from original position A to target position B. After the movement, the inverter keeps servo lock status.



Trip avoidance function

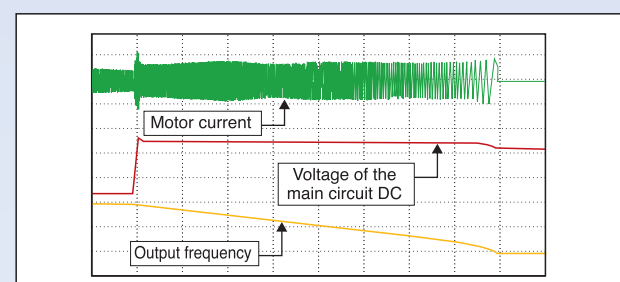
Over current & voltage suppress function

Higher internal calculation speed* improve current control performance Over-current suppress and Over-voltage suppress function avoid inverter trip during acceleration and deceleration period.



DC Bus AVR Function During Deceleration

The SJ700 controls deceleration time for DC bus voltage not to exceed over-voltage trip level. This realizes trip-less operation during deceleration.



Functions and User Friendly.

Programming [EzSQ: Easy Sequence] function

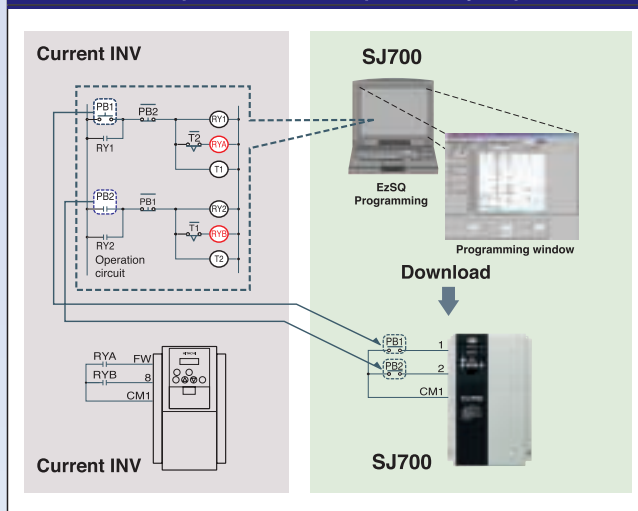
Inverter control by Built-in Programming function

Simple sequence operation is realized by downloading to an inverter the program created by programming soft EzSQ. It is also possible to automatic speed control according to a load situation like a swift lift function for crane or a conveyor, and to operate.

Since an external circuit can be simplified, a control board is made small and a cost cut can be aimed at.

Password function is added to prevent program information leaks. This is also useful for unexpected data rewriting or deletion by operation mistake.

[The example of a use] Example for Rely sequence



Item	Description	
Language Spec	Language type	BASIC Like
	Supported Device	Windows(DOS/V)OS:Windows98SE,Windows2000,WindowsXP)
	Memory area	512 steps or 4K byte (Smaller of these)Program is stored in internal of inverter.
	Programming environment	Editor(Windows),Display(Windows) Grammar check(Windows) Program download/upload, All clear
	Executable format	Interpreter 2.0ms/command (Sub routine supported. 8 nested)
I/O function	External input	Contact signal/Open collector signal input (Internal DC24V power supply available)
		Program RUN command General-purpose input Maximum of 8 point(X(00)-X(07))
	External analog input	XA(0) : 0-10V (O terminal)
		XA(1) : 4-20mA (OI terminal)
		XA(2) : 0-10V (O2 terminal)
External output	General-purpose output terminal	Maximum of 8 point(Y(00)-Y(05))
	External analog output	YA(0) : Setup for FM terminal is possible.
		YA(1) : Setup for AM terminal is possible.
		YA(2) : Setup for AMI terminal is possible.
Command	Programmable flow control <Loop,Unconditional jump, conditional jump, Time control, Sub routine, Others>	
	Operation command <+, -, *, /, substitution, mod, abs>	
	I/O control(Bit input, Word input, Bit output, Word output)	
	Timer control <on delay, off delay>	
	Inverter parameter setting	
Reserved word	User	U(00)-U(31)/32 point
	Timer	UL(00)-UL(03)/4 point
	Set frequency	SET-Freq
	Acceleration time	ACCEL
	Deceleration time	DECEL
	Monitor	Output frequency, Output current, Rotative direction, PID feedback, Converted frequency, Output torque, Output voltage, Power, Cumulative RUN time, Cumulative power-on time, trip
	General-purpose input contact	X(00)-X(07)/8 point
	General-purpose output contact	Y(00)-Y(05)/6 point(1 point is relay output)
	Internal user	UB(00)-UB(07)/8 point
	Internal timer contact	TD(0)-TD(7)/8 point
	Inverter input and output	In a remote operator display code.

* Windows® is a registered trademark of Microsoft Corporation.U.S.A and other countries.

Internal Option

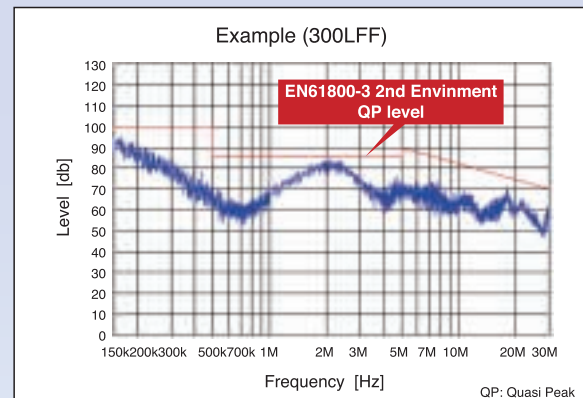
Built-in EMC Filter

Cost and space reduction compared with external EMC Filter.
Reduces electromagnetic noise.

EN61800-3 2nd-Environment

Brake circuit up to 22kW

Cost and Space reduction compared with external Braking Controller.



Ease of Maintenance

Easy-removable construction for maintenance

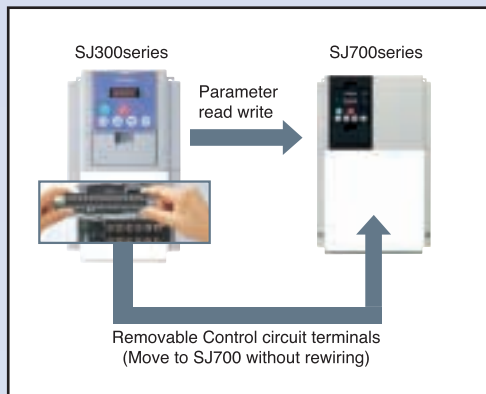
Field replacement of cooling fan(s) and DC bus capacitor can be accomplished in a fraction of the time.
Using Logic terminal move to SJ700 without wiring change.
Read SJ300 Parameter by SRW remote operator and write them in to SJ700



Easy-removable
Cooling Fan



Easy-removable
Dc bus Capacitor



Long life time components & Life time warning function

Long life time components

Design lifetime 10 Years or more Dc bus capacitor & Cooling Fan.

Cooling Fan ON/OFF control lead more longer life time.

*Ambient temperature: Average 40 deg C (no corrosive gasses oil mist or dust)

Design lifetime is calculation and out of guaranty.

Life time warning function

Avoid trouble before the malfunction by lifetime Warning signal.

The monitor of the temperature rise of a Dc bus capacitor, cooling fan degradation degree, a cooling fin, and a motor can be carried out.

Replace the components before the malfunction.

Easy Operation

User selection of Parameter functions

Data comparison function

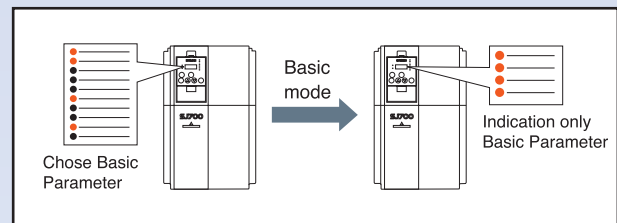
A display of only the parameter changed from the default is possible.

User selected function

Indication User setting 12 Parameters as U001-U012.

Basic mode (default)

Indication Basic Parameter for common used Parameters



Other Functions

- The direct input of function code selection is also attained other than a scroll type allowing for a shorter set up time.
- Continuously pushing the function key for 3 seconds, causes the display to jump to output frequency monitor (d001) mode from every key.

Network compatibility

The port corresponding to RS-485 Modbus-RTU is equipped as standard.

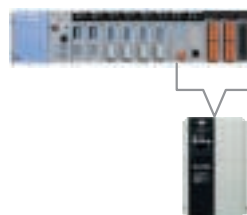
SJ700 can communicate with DeviceNet PROFIBUS-DP LonWorks with communication options.

-DeviceNet is a trade mark of Open DeviceNet Vender Association, Inc.

-LonWorks is a registered trade mark of Echelon Corporation

-PROFIBUS-DP is a registered trade mark of PROFIBUS Nutzer Organization

Simple & Low cost wiring Ease of installation and replacement



Global standards

Conformity to global standards

CE, UL, c-UL, C-Tick approvals.



Logic input & output Terminal apply sink & source logic

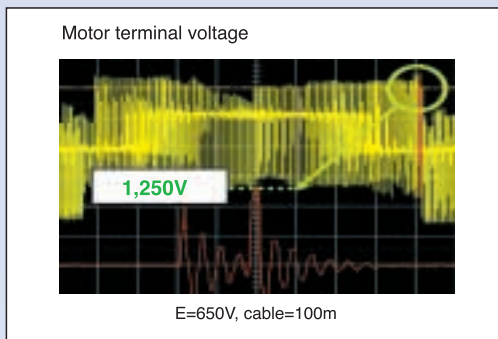
Wide Input power voltage range

Input voltage 240V for 200V class and 480V for 400V class as standard.

Environmental Friendliness

Micro Surge Voltage suppress function (Patent registered in Japan, USA & Korea)

Hitachi original PWM control suppressing Motor terminal Voltage less than 2 times of INV DC voltage E.
Lower than Hitachi motor Max. insulation voltage (1,250V)
(during regenerating operation increase the DC bus voltage may over motor max. insulation voltage)



EU RoHS compliant

EU RoHS compliant by restricting to use hazardous substances.
(except solder in power module)

Improvement of environment

Varnish coating of internal PC board & plating of main circuit copper bus bar as standard.

Versatile Functions

Instantaneous Power Failure Disregard Function

The SJ700 ignores instantaneous power failure when power fluctuation happens frequently as long as DC bus voltage keeps higher than under-voltage level.

Safe stop

Shut down INV output by electric circuit without CPU realize high quality emergency stop.

Intelligent input terminal and output terminal delay time function

Simplification of an external circuit is possible.

Active frequency matching function

Restart by motor frequency search restart function without motor remaining voltage.

Controlled deceleration and stop on power loss

Analog Input Disconnection Detecting Function

The SJ700 outputs disconnection signal when frequency command through analog input is lost.

Acceleration/Deceleration curve functions

The pattern (5 kinds) which can be chosen according to a usage is carried.

Analog Command Holding Function (AHD)

Output frequency can be changed with UP/DOWN Function with analog signal as reference value. The frequency at power shutdown can be saved, too.

Pulse train input function

Pulse train input for Frequency reference or PID feed back signal with SJ-FB(speed feed back card:option).

Integrated Input Electric Power monitor

Input electric power(kW) and Integrated input electric power for monitoring energy saving.

Automatic Carrier Frequency Adjustment Function

The SJ700 detects motor current and automatically reduces carrier frequency according to the current.

The resolution of a monitor (voltage, current) output is improved to 10 bits.

Powerful Inverter
SJ700



STANDARD SPECIFICATIONS

● 3-phase 200V class

Model SJ700-			US Version	055LFUF2	075LFUF2	110LFUF2	150LFUF2	185LFUF2	220LFUF2	300LFUF2	370LFUF2	450LFUF2	550LFUF2
Enclosure (*1)				IP20									
Applicable motor (4-pole, kW(HP)) (*2)				5.5(7.5)	7.5(10)	11(15)	15(20)	18.5(25)	22(30)	30(40)	37(50)	45(60)	55(75)
Output Ratings	Rated capacity (KVA)	200V	8.3	11.0	15.9	22.1	26.3	32.9	41.9	50.2	63.0	76.2	
		240V	9.9	13.3	19.1	26.6	31.5	39.4	50.2	60.2	75.6	91.4	
	Rated output current (A)		24	32	46	64	76	95	121	145	182	220	
	Overload capacity(output current)		150%,60sec., 200%,3sec.										
	Rated output voltage (*3)		3-phase (3-wire) 200 to 240V (corresponding to input voltage)										
Input Rating	Rated input voltage (V)			3-phase 200 to 240V+10%, -15%, 50/60Hz±5%									
Braking	Dynamic braking (Short-time) (*4)			Built-in BRD circuit (optional resistor)						External dynamic braking unit (option)			
	Minimum value of resistor (Ω)			17	17	17	7.5	7.5	5	-			
Vibration (*5)				5.9m/s²(0.6G), 10-55Hz						2.9m/s²(0.3G), 10-55Hz			
Integrated EMC filter				Built-in									
Zero-phase Reactor				Built-in									
Weight (lbs.)				6(13.2)	6(13.2)	6(13.2)	14(30.8)	14(30.8)	14(30.8)	22(48.4)	30(66)	30(66)	43(94.6)

● 3-phase 400V class

Model SJ700-			European Version	055HFEF2	075HFEF2	110HFEF2	150HFEF2	185HFEF2	220HFEF2	300HFEF2	370HFEF2	450HFEF2	550HFEF2	
			US Version	055HFUF2	075HFUF2	110HFUF2	150HFUF2	185HFUF2	220HFUF2	300HFUF2	370HFUF2	450HFUF2	550HFUF2	
Enclosure (*1)				IP20										
Applicable motor (4-pole, kW(HP)) (*2)				5.5(7.5)	7.5(10)	11(15)	15(20)	18.5(25)	22(30)	30(40)	37(50)	45(60)	55(75)	
Output Ratings	Rated capacity (KVA)	400V	9.7	13.1	17.3	22.1	26.3	33.2	40.1	51.9	63.0	77.6		
		480V	11.6	15.8	20.7	26.6	31.5	39.9	48.2	62.3	75.6	93.1		
	Rated output current (A)		14	19	25	32	38	48	58	75	91	112		
	Overload capacity(output current)		150%,60sec., 200%,3sec.											
	Rated output voltage (*3)		3-phase (3-wire) 380 to 480V (corresponding to input voltage)											
Input Rating	Rated input voltage (V)		3-phase 380 to 480V +10%, -15%, 50/60Hz±5%											
Braking	Dynamic braking (Short-time) (*4)		Built-in BRD circuit (optional resistor)							External dynamic braking unit (option)				
	Minimum value of resistor (Ω)		70	50	50	24	24	20	-					
Vibration (*5)				5.9m/s²(0.6G), 10-55Hz							2.9m/s²(0.3G), 10-55Hz			
Integrated EMC filter				Built-in										
Zero-phase Reactor				Built-in										
Weight (lbs.)				6(13.2)	6(13.2)	6(13.2)	14(30.8)	14(30.8)	14(30.8)	22(48.4)	30(66)	30(66)	30(66)	

Model Name Indication

SJ700-055 H F E F 2

Series Name

Applicable Motor Capacity
004: 0.4kW(1/2HP)
4000: 400kW(500HP)

Power Source
L : 3-phase 200V class
H : 3-phase 400V class

F : With keypad

U : US version
E : European version

F : Integrated EMC filter

Version

Model Configuration

● Available ○ Plan model

Applicable Motor kW (HP)	3-phase 200V			3-phase 400V		
	LFUF2	HFEF2	HFUF2	LFUF2	HFEF2	HFUF2
0.4(1/2)	○			●	●	●
0.75(1)	○	○	○	●	●	●
1.5(2)	○	○	○	●	●	●
2.2(3)	○	○	○	●	●	●
3.7(5)	○			○	○	○
4.0(5)		○	○			
5.5(7.5)	●	●	●		○	○
7.5(7.5)	●	●	●		○	○
11(15)	●	●	●		○	○
15(20)	●	●	●		○	○
18.5(25)	●	●	●		○	○
22(30)	●	●	●		○	○

SPECIFICATIONS

● General Specifications

Items			General Specifications
Control	Control method		Line to line sine wave pulse-width modulation (PWM) control
	Output frequency range (*6)		0.1-400.0Hz
	Frequency accuracy		Digital: ±0.01% of the maximum frequency, Analog: ±0.2%(25±10° C)
	Frequency resolution		Digital setting: 0.01Hz, Analog setting: (Maximum frequency)/4,000 (O terminal: 12bit 0-10V, O2 terminal: 12bit -10--+10V)
	V/f characteristics		V/f optionally variable (30-400Hz of base frequency), V/f control (constant torque, reduced torque), Sensorless vector control
	Speed fluctuation		±0.5% (sensorless vector control)
	Acceleration/deceleration time		0.01-3,600sec. (Linear/curve, accel./decel. selection), Two-stage accel./decel.
	Starting Torque		200% at 0.3Hz (Sensorless vector control), 150% at around 0Hz (Sensorless vector control, 0Hz domain with motor one frame size down)
	Carrier frequency range		0.5-15.0kHz
	DC braking		Performs at start: under set frequency at deceleration, via an external input (braking force, time, and operating frequency).
Input signal	Frequency setting	Operator	Up and Down keys
		External signal	DC 0-10V, -10--+10V (input impedance 10kΩ), 4-20mA (input impedance 100Ω)
		External port	Setting via RS485 communication
	Forward /reverse Start /stop	Operator	Start/stop commands (forward/reverse switching by parameter setting)
		External signal	Forward-operation start/stop commands (reverse-operation start/stop possible when relevant commands are assigned to intelligent input terminals)3-wire input possible (when relevant commands are assigned to control circuit terminals)
		External port	Setting via RS485 communication
	Intelligent input terminals	Terminals	8 terminals, NO/NC switchable, sink logic/source logic switchable
		Functions	Reverse operation (RV), Multi-speed 1 setting (CF1), Multi-speed 2 setting (CF2), Multi-speed 3 setting (CF3), Multi-speed 4 setting (CF4), Jogging (JG), external DC braking (DB), 2nd motor control (SET), 2-stage acceleration/deceleration (2CH), free-run stop (FRS), external trip (EXT), unattended start protection (USP), commercial power supply switching (CS), software lock (SFT), analog input switching (AT), 3rd motor control (SET3), reset (RS), starting by 3-wire input (STA), stopping by 3-wire input (STP), forward/reverse switching by 3-wire input (F/R), PID disable (PID), PID integration reset (PIDC), control gain switching (CAS), acceleration by remote control (UP), deceleration by remote control (DWN), data clearance by remote control (UDC), forcible operation (OPE), Multi-speed bit 1 (SF1), Multi-speed bit 2 (SF2), Multi-speed bit 3 (SF3), Multi-speed bit 4 (SF4), Multi-speed bit 5 (SF5), Multi-speed bit 6 (SF6), Multi-speed bit 7 (SF7), overload restriction selection (OLR), torque limit selection (enabling/disabling) (TL), torque limit 1 (TRQ1), torque limit 2 (TRQ2), P/PI switching (PPI), braking confirmation (BOK), orientation (ORT), LAD cancellation (LAC), clearance of position deviation (PCLR), permission of 90° shift phase (STAT), trigger for frequency addition (A145) (ADD), forcible-terminal operation (F-TM), permission of torque command input (ATR), cumulative power clearance (KHC), servo-on (SON), pre-excitation (FOC), general-purpose input 1 (MI1), general-purpose input 2 (MI2), general-purpose input 3 (MI3), general-purpose input 4 (MI4), general-purpose input 5 (MI5), general-purpose input 6 (MI6), general-purpose input 7 (MI7), general-purpose input 8 (MI8), analog command holding (AHD), no assignment (no)
	Thermistor input		1 terminal (PTC characteristics)
	Output signal	Intelligent output terminals	Terminals
Functions			Running (RUN), constant-speed reached (FA1), set frequency overreached (FA2), overload notice advance signal (1) (OL), output deviation for PID control (OD), alarm signal (AL), set frequency reached (FA3), over-torque (OTQ), instantaneous power failure (IP), undervoltage (UV), torque limited (TRQ), operation time over (RNT), plug-in time over (ONT), thermal alarm signal (THM), brake release (BRK), braking error (BER), 0 Hz detection signal (ZS), speed deviation maximum (DSE), positioning completed (POK), set frequency overreached 2 (FA4), set frequency reached 2 (FA5), overload notice advance signal (2) (OL2), PID feedback comparison (FBV), communication line disconnection (NDc), logical operation result 1 (LOG1), logical operation result 2 (LOG2), logical operation result 3 (LOG3), logical operation result 4 (LOG4), logical operation result 5 (LOG5), logical operation result 6 (LOG6), capacitor life warning (WAC), cooling-fan speed drop (WAF), starting contact signal (FR), heat sink overheat warning (OHF), low-current indication signal (LOC), general-purpose output 1 (M01), general-purpose output 2 (M02), general-purpose output 3 (M03), general-purpose output 4 (M04), general-purpose output 5 (M05), general-purpose output 6 (M06), inverter ready (IRDY), forward rotation (FWR), reverse rotation (RVR), major failure (MJA), alarm code 0 to 3 (AC0 to AC3)
Monitor output terminals			Analog voltage output, analog current output, pulse-string output (e.g., A-F, D-F [n-fold, pulse output only], A, T, V, P)
Monitoring on display			Output frequency, output current, output torque, frequency conversion data, trip history, input/output terminal status, electric power, and others
Other functions			Free V/f setting (7 breakpoints), frequency upper/lower limit, jump (center) frequency, acceleration/deceleration according to characteristic curve, manual torque boost level/breakpoint, energy-saving operation, analog meter adjustment, start frequency setting, carrier frequency adjustment, electronic thermal function (available also for free setting), external start/end frequency/frequency rate, analog input selection, retry after trip, restart after instantaneous power failure, output of various signals, starting with reduced voltage, overload restriction, initial-value setting, automatic deceleration at power failure, AVR function, fuzzy acceleration/deceleration, online/offline auto-tuning, high-torque multi-motor operation (sensorless vector control of two motors by one inverter)
Protective functions			Overcurrent protection, overvoltage protection, undervoltage protection, electronic thermal protection, temperature error protection, instantaneous power failure protection, phase loss input protection, braking-resistor overload protection, ground-fault current detection at power-on, USP error, external trip, emergency stop trip, CT error, communication error, option board error, and others
Environmental conditions	Ambient operating/storage temperature(*7)/ humidity		-10-50° C / -20-65° C / 20-90%RH (No condensation)
	Location		Altitude 1,000m or less, indoors (no corrosive gases or dust)
Options	Digital input expansion card		SJ-DG (4digits BCD, 16bits binary)
	Feedback expansion card		SJ-FB (vector control loop speed sensor)
	Network interface card		SJ-DN(DeviceNetTM), SJ-PBT(PROFIBUSR), SJ-LW(LONWORKSR)
	Others		EMI filters, input/output reactors, radio noise filters, braking resistors, braking units, LCR filter, communication cables

*1: The protection method conforms to JEM 1030.

*2: The applicable motor refers to Hitachi standard 3-phase motor (4-pole).

To use other motors, be sure 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: Braking resistor is not integrated in the inverter. Please install optional braking resistor or dynamic braking unit when large braking torque is required.

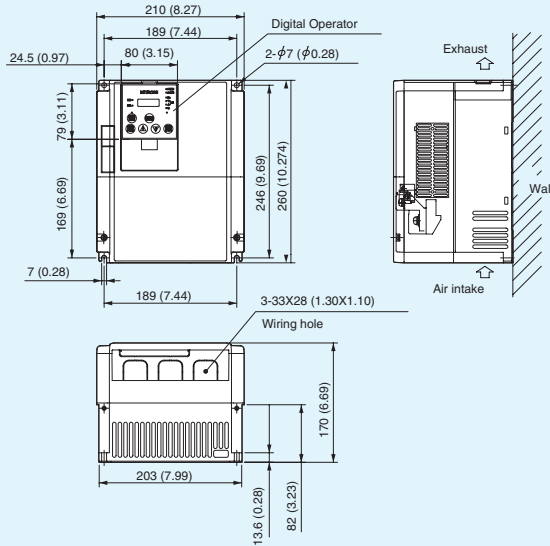
*5: Conforms to the test method specified in JIS C0040(1999).

*6: To operate the motor beyond 50/60Hz, please consult with the motor manufacturer about the maximum allowable rotation speed.

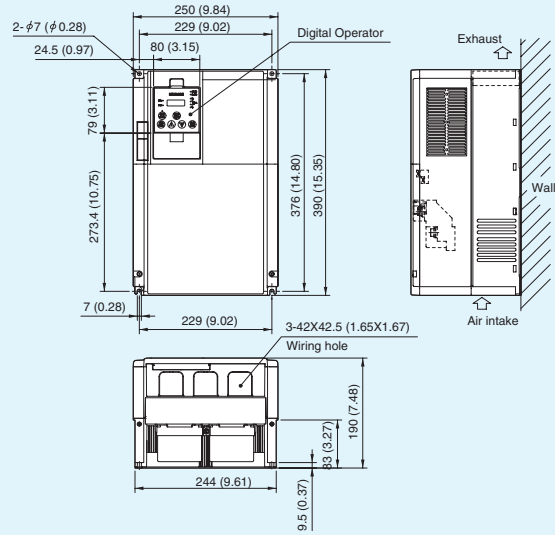
*7: Storage temperature refers to the temperature in transportation.

DIMENSIONS

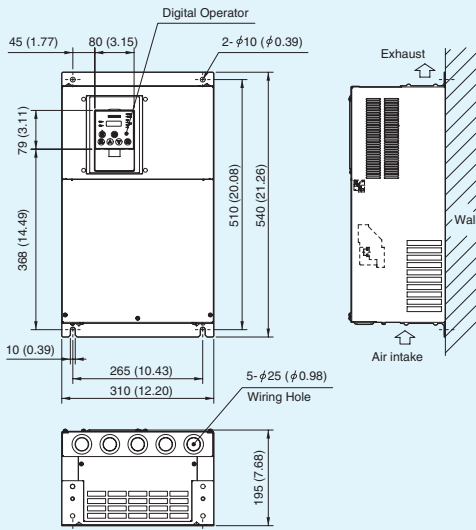
● SJ700-055-110 LFUF2/HFEF2, HFUF2



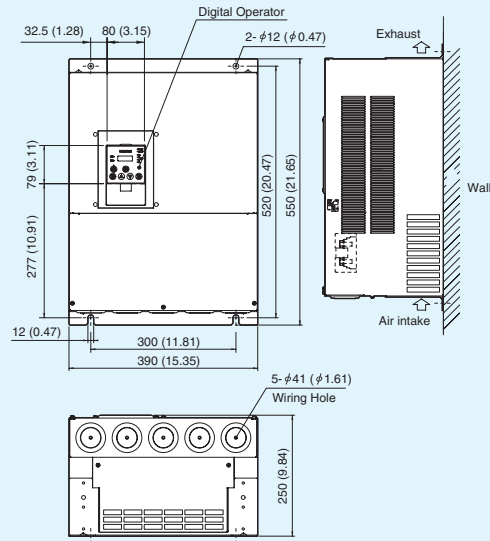
● SJ700-150-220 LFUF2/HFEF2, HFUF2



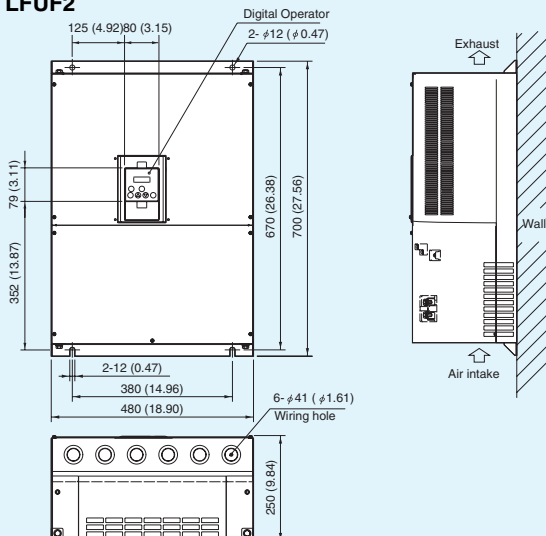
● SJ700-300 LFUF2/HFEF2, HFUF2



● SJ700-370-450 LFUF2/370-550HFEF2, HFUF2



● SJ700-550 LFUF2



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

OPERATION and PROGRAMMING

SJ700 Series can be easily operated with the digital operator provided as standard. The digital operator can also be detached and can be used for remote-control. Multilingual (English, French, German, Italian, Spanish and Portuguese) operator with copy function (SRW-0EX) and digital operator with potentiometer are also available as options.

Parameter Display

Displays frequency, motor current, rotational speed of the motor, and an alarm code.

Monitor LEDs

Shows drive status.

RUN key enable LED

Lights up when the inverter is ready to respond to the RUN key.

RUN Key

Press to run the motor.

STOP/RESET Key

Press to stop the drive or reset an alarm.

Function Key

Press to set or monitor a parameter value.

Power LED

Lights when the power input to the drive is ON.

ALARM LED

Lights to indicate that the inverter has tripped.

Display Unit LEDs

Indicates the unit associated with the parameter display.

Store Key

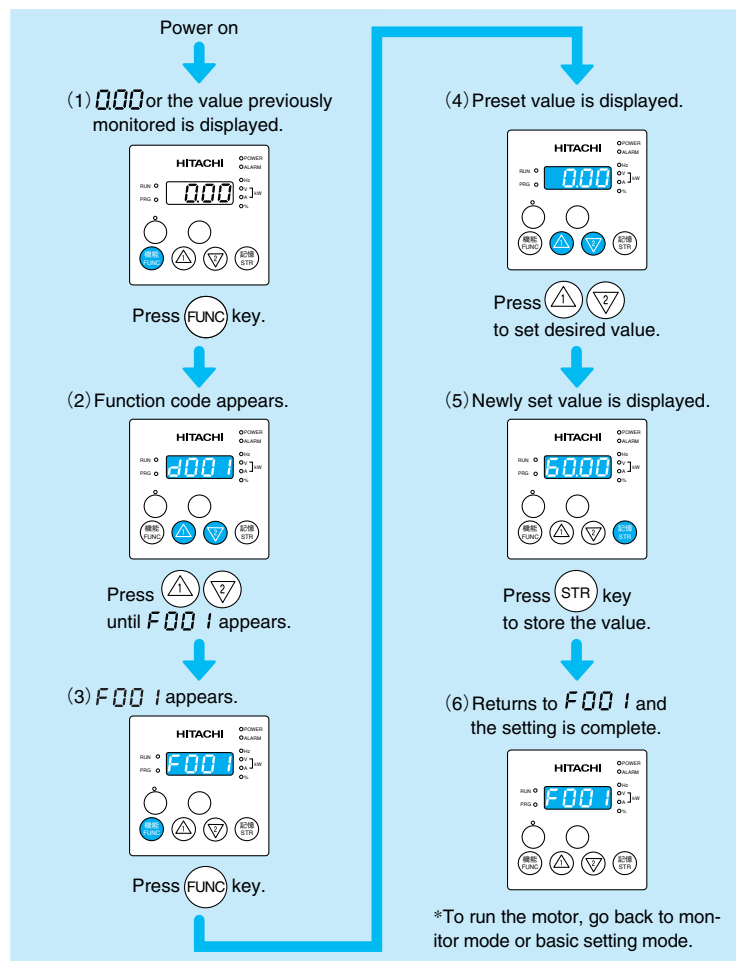
Press to write the new value to the EEPROM.

Up/Down Keys

Press up or down to sequence through parameters and functions shown on the display, and increment/decrement values.



●Setting the output frequency



●The contents of a basic mode display.(default)

If a desired parameter is not displayed, check the setting of function "b037" (function code display restriction). To display all parameters, specify "00" for "b037".

No.	Display code	Item
1	d001 to d104	Monitor display
2	F001	Output frequency setting
3	F002	Acceleration (1) time setting
4	F003	Deceleration (1) time setting
5	F004	Operation direction setting
6	A001	Frequency source setting
7	A002	Run command source setting
8	A003	Base frequency setting
9	A004	Maximum frequency setting
10	A005	[AT] selection
11	A020	Multi-speed frequency setting
12	A021	Multi-speed 1 setting
13	A023	Multi-speed 2 setting
14	A044	1st control method
15	A045	V/f gain setting
16	A085	Operation mode selection
17	b001	Selection of restart mode
18	b002	Allowable under-voltage power failure time
19	b008	Retry-after-trip selection
20	b011	Retry wait time after trip
21	b037	Function code display restriction
22	b083	Carrier frequency setting
23	b084	Initialization mode selection
24	b130	Selection of overvoltage suppression function
25	b131	Setting of overvoltage suppression level
26	C021	Setting of intelligent output terminal 11
27	C022	Setting of intelligent output terminal 12
28	C036	Alarm relay active state

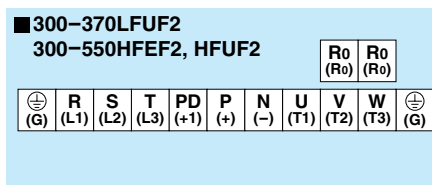
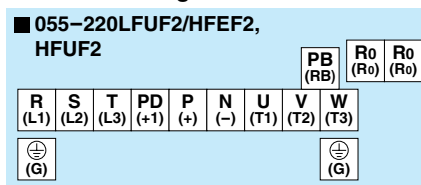
TERMINALS

MAIN CIRCUIT TERMINALS

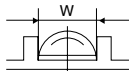
● Terminal Description

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
Ro(Ro), To(To)	Control power supply input terminals

● Terminal Arrangement



● Screw Diameter and Terminal Width

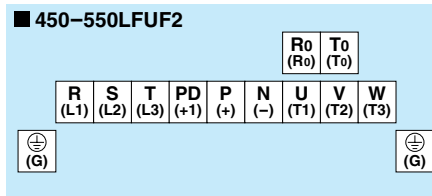


W:Terminal width

Model	Screw diameter	Terminal width (mm)
055,075LFUF2/HFEF2, HFUF2	M5	18
110LFUF2/HFEF2, HFUF2	M6	18
150,185LFUF2/150-300HFEF2, HFUF2	M6	23
220,300LFUF2/HFEF2, HFUF2	M8	23 *1
370,450LFUF2/370-550HFEF2, HFUF2	M8	29
550LFUF2	M10	40 *2
RoTo terminals (All models)	M4	9

*1 Ground Screw diameter is M6

*2 Ground Screw diameter is M8



CONTROL CIRCUIT TERMINALS

● Terminal Arrangement

H	O2	AM	FM	TH	FW	8	CM1	5	3	1	14	13	11	AL1	
L	O	OI	AM1	P24	PLC	CM1	7	6	4	2	15	CM2	12	AL0	AL2

Screw diameter:M3

Terminal Width:6.4mm

● Terminal Description

			Symbol	Name	Explanation of Terminals	Ratings
Analog	Power Supply		L	Common Terminal for Analog Power Source	Common terminal for H, O, O2, OI, AM, and AMI. Do not ground.	-
			H	Power Source for Frequency Setting	Power supply for frequency command input	DC 10V, 20mA max.
	Frequency Setting		O	Frequency Command Terminal	Maximum frequency is attained at DC 10V in DC 0-10V range. Set the voltage at A014 to command maximum frequency below DC 10V.	Input impedance: 10kΩ, Allowable input voltage range: DC -0.3~+12V
			O2	Frequency Command Extra Terminal	O2 signal is added to the frequency command of O or OI in DC 0~±10V range. By changing configuration, frequency command can be input also at O2 terminal.	Input impedance:10kΩ, Allowable input voltage range: DC 0~±12V
			OI	Frequency Command Terminal	Maximum frequency is attained at DC 20mA in DC 4-20mA range. When the intelligent terminal configured as AT is on, OI signal is enabled.	Input impedance: 100Ω, Allowable input voltage range: DC 0-24mA
Digital	Monitor Output		AM	Analog Output Monitor (Voltage)	Selection of one function from: Output frequency, output current, torque, output voltage, input power, electronic thermal load ratio, and LAD frequency.	DC 0-10V, 2mA max.
			AMI	Analog Output Monitor (Current)		DC 4-20mA, 250Ω max.
	Monitor Output		FM	Digital Monitor (Voltage)	[DC0-10V output (PWM output)] Selection of one function from: Output frequency, output current, torque, output voltage, input power, electronic thermal load ratio, and LAD frequency. [Digital pulse output (Pulse voltage DC 0/10V)] Outputs the value of output frequency as digital pulse (duty 50%)	Digital output frequency range: 0-3.6kHz, 1.2mA max.
	Power Supply		P24	Power Terminal for Interface	Internal power supply for input terminals. In the case of source type logic, common terminal for contact input terminals.	DC 24V, 100mA max.
			CM1	Common Terminal for Interface	Common terminal for P24, TH, and FM. In the case of sink type logic, common terminal for contact input terminals. Do not ground.	-
	Contact Input	Run Command	FW	Forward Command Input	The motor runs forward when FW terminal is ON, and stops when FW is OFF.	[Input ON condition] Voltage between each terminal and PLC: DC 18V min.
		Functions	1 2 3 4 5 6 7 8	Intelligent Input Terminals	Assign 8 functions to terminals. (Refer to the standard specifications for the functions.)	[Input OFF condition] Voltage between each terminal and PLC: DC 3V max.
						Input impedance between each terminal and PLC: 4.7Ω
						Allowable maximum voltage between each terminal and PLC: DC 27V
	Open Collector Output	State	11 12 13 14 15	Intelligent Output Terminals	Assign 5 functions to open collector outputs. When the alarm code is selected at C062, terminal 11-13 or 11-14 are reserved for error codes of inverter trip. (Refer to the standard specifications for the functions.)	Decrease in voltage between each terminal and CM2: 4V max. during ON
					Both sink and source logic are always applicable between each terminal and CM1.	Allowable maximum voltage: DC 27V
			CM2	Common Terminal for Intelligent Output Terminals	Common terminal for intelligent output terminal 11-15.	Allowable maximum current: 50mA
Analog	Analog Input	Sensor	TH	Thermistor Input Terminals	The inverter trips when the external thermistor detects abnormal temperature. Common terminal is CM1. [Recommended thermistor characteristics] Allowable rated power: 100mW or over. Impedance in the case of abnormal temperature: 3kΩ Note: Thermal protection level can be set between 0 and 9999Ω.	Allowable input voltage range DC0-8V [Input Circuit]
Digital	Relay Output	State/Alarm	AL0 AL1 AL2	Alarm Output Terminals	In default setting, an alarm is activated when inverter output is turned off by a protective function.	Maximum capacity of relays AL1-AL0: AC 250V, 2A(R load)/0.2A(L load) DC 30V, 8A(R load)/0.6A(L load) AL2-AL0: AC 250V, 1A(R load)/0.2A(L load) DC 30V, 1A(R load)/0.2A(L load) Minimum capacity of relays AL1-AL0, AL2-AL0: AC100V, 10mA DC5V, 100mA

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	E01	OC.Drive
		During deceleration	E02	OC.Decel
		During acceleration	E03	OC.Accel
		Others	E04	Over.C
Overload protection(*1)	When a motor overload is detected by the electronic thermal function, the inverter trips and turns off its output.		E05	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.		E06	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.		E07	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.		E08	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.		E09	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, the inverter trips and turns off its output.		E10	CT
CPU error	When a malfunction in the built-in CPU has occurred, the inverter trips and turns off its output.		E11	CPU
External trip	When a signal to an intelligent input terminal configured as EXT has occurred, the inverter trips and turns off its output.		E12	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.		E13	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.		E14	GND.Flt.
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 off its output.		E15	OV.SRC
Instantaneous power failure	When power is cut for more than 15ms, 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.		E16	Inst.P-F
Temperature error due to low cooling-fan speed	The inverter will display the error code shown on the right if the lowering of cooling-fan speed is detected at the occurrence of the temperature error described below.		E20	OH.stFAN
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.		E21	OH.FIN
Gate array error	Communication error has occurred between CPU and gate array.		E23	GA
Phase loss detection	One of three lines of 3-phase power supply is missing.		E24	PH.Fail
Main circuit error (*3)	The inverter will trip if the gate array cannot confirm the on/off state of IGBT because of a malfunction due to noise or damage to the main circuit element.		E25	Main.Cir
IGBT error	When an instantaneous over-current has occurred, the inverter trips and turns off its output to protect main circuit element.		E30	IGBT
Thermistor error	When the thermistor inside the motor detects temperature higher than the specified value, the inverter trips and turns off its output.		E35	TH
Braking error	The inverter turns off its output when it can not detect whether the braking is ON or OFF within waiting time set at b024 after it has released the brake. (When braking is enabled at b120)		E36	BRAKE
Emergency stop (*4)	If the EMR signal (on three terminals) is turned on when the slide switch (SW1) on the logic board is set to ON, the inverter hardware will shut off the inverter output and display the error code shown on the right.		E37	EMR
Low-speed overload protection	If overload occurs during the motor operation at a very low speed at 0.2 Hz or less, the electronic thermal protection circuit in the inverter will detect the overload and shut off the inverter output. (2nd electronic thermal control) (Note that a high frequency may be recorded as the error history data.)		E38	OL-LowSP
Modbus communication error	If timeout occurs because of line disconnection during the communication in Modbus-RTU mode, the inverter will display the error code shown on the right. (The inverter will trip according to the setting of "C076".)		E41	NET.ERR
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.		----	UV.WAIT
Easy sequence function Error	Error indications by protective functions with the easy sequence function used.		E43	PRG.CMD
			E44	PRG.NST
			E45	PRG.ERR1
Expansion card 1 connection error	An error has been detected in an expansion card or at its connecting terminals.		E60~E69	OP1-0 ~ OP1-9
Expansion card 2 connection error			E70~E79	OP2-0 ~ OP2-9

*1: Reset operation is acceptable 10 seconds after the trip.

*2: Check the parameters when EEPROM error occurs.

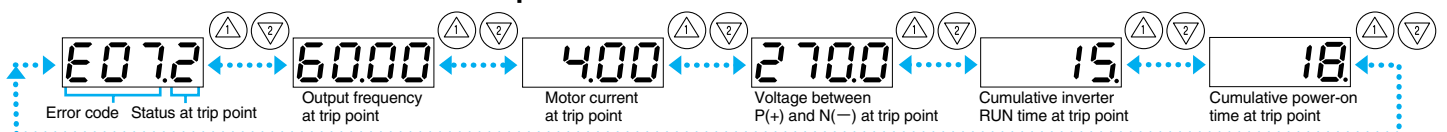
*3: The inverter will not accept reset commands input via the RS terminal or entered by the STOP/RESET key. Therefore, turn off the inverter power.

*4: The inverter will not accept the reset command entered from the digital operator. Therefore, reset the inverter by turning on the RS terminal.

〈Status Display〉

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
0	Reset	2	Deceleration	4	Acceleration	6	Starting	8	Overload Restriction
1	Stop	3	Constant Speed	5	f0 Stop	7	DB	9	Forcible or servo-on

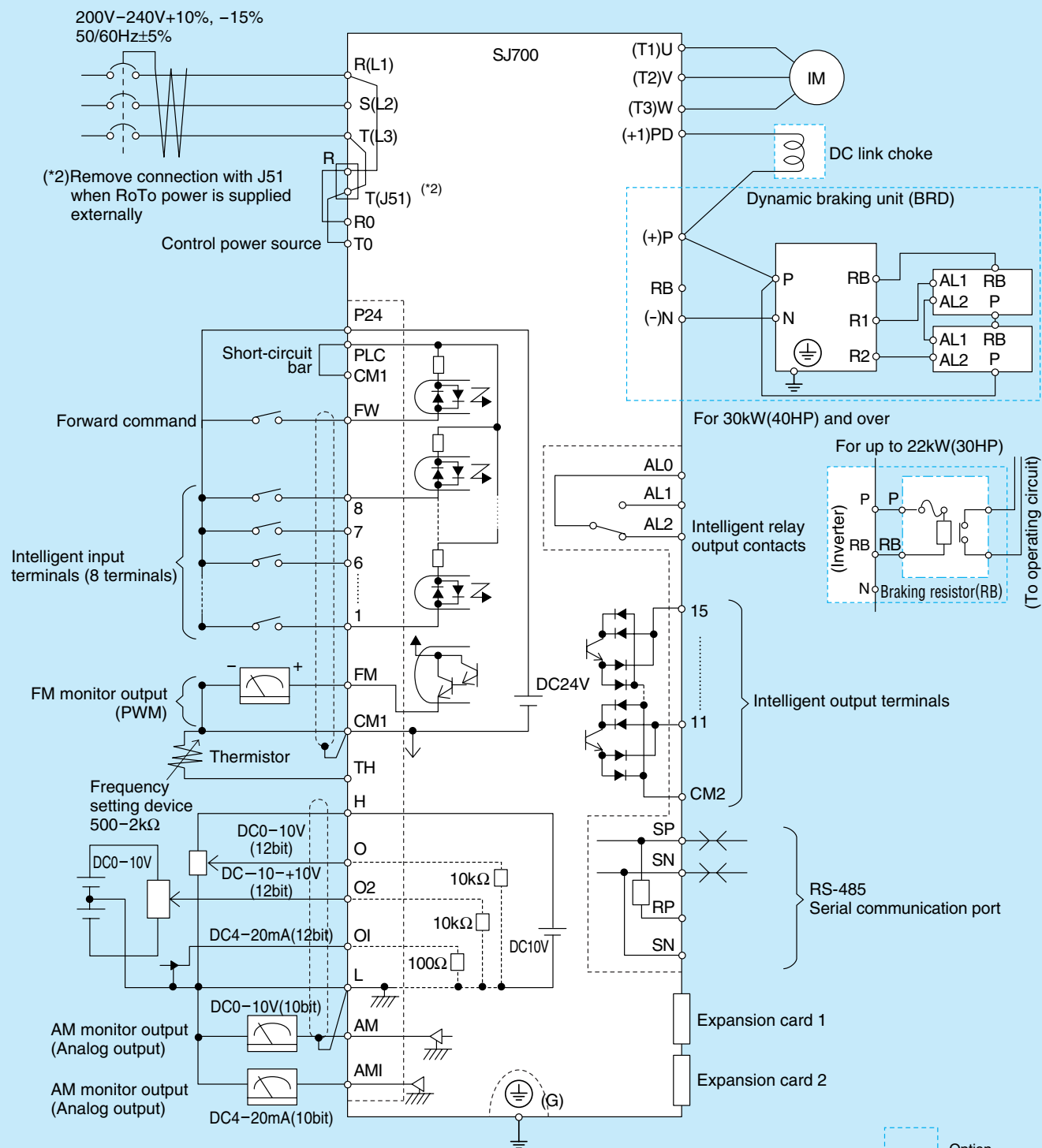
〈How to access the details about the present fault〉



CONNECTING DIAGRAM

● Source type logic

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



Option

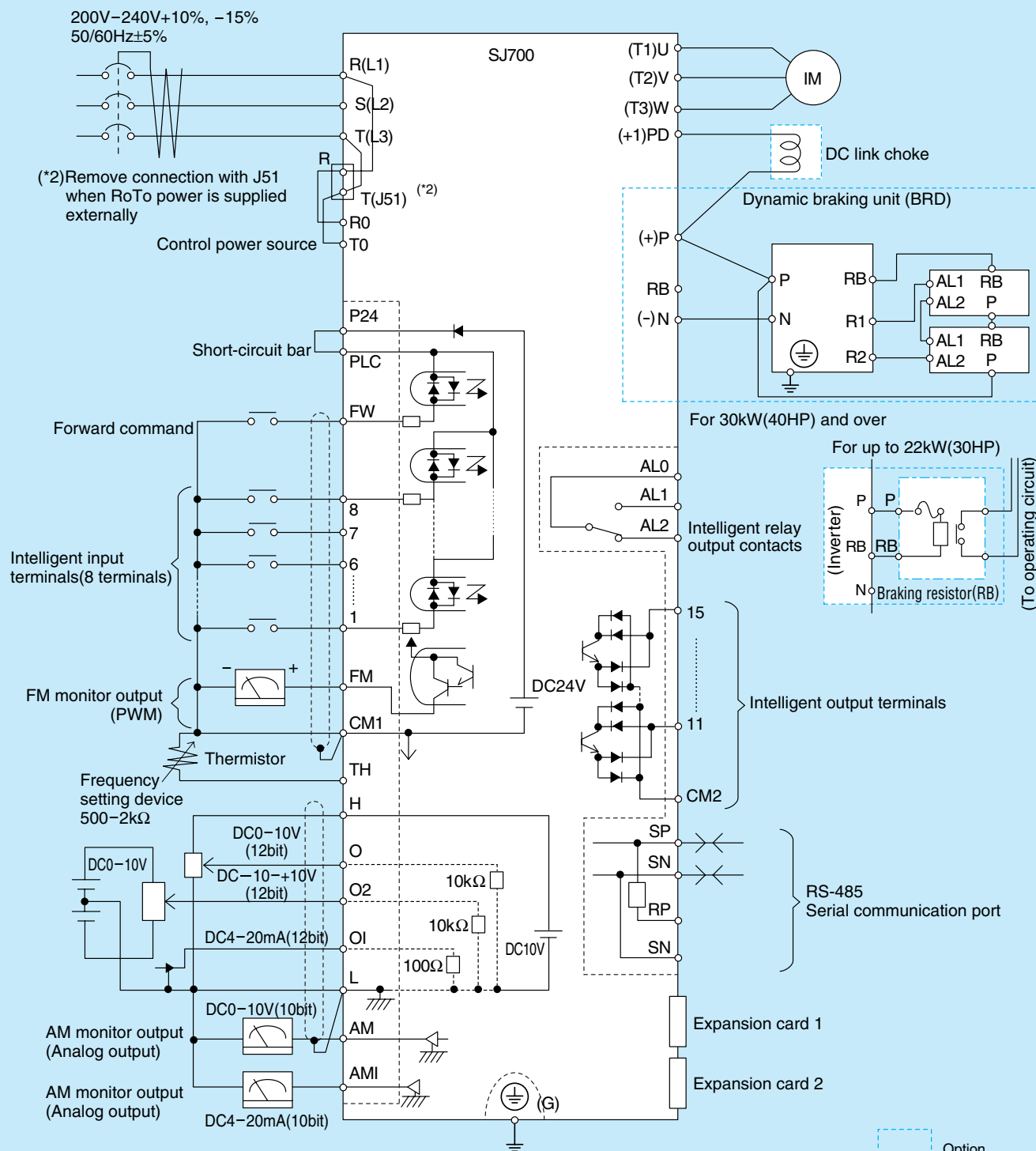
Customer wiring
(Outside the inverter)

Terminal Name	FW, 1, 2, 3, 4, 5, 6, 7, 8	FM, TH	H, O, O2, OI, AM, AMI
Common terminal	P24	CM1	L

CONNECTING DIAGRAM

● Sink type logic

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



Terminal Name	FW, 1, 2, 3, 4, 5, 6, 7, 8, FM, TH	H, O, O2, OI, AM, AMI
Common terminal	CM1	L

Option

Customer wiring
(Outside the inverter)

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. Also see: Application to the 400V-class 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.
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 of motor. *Explosion-proof verification is not available for SJ700 Series.
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 terminal. 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 run	A max. 400Hz can be selected on the SJ700 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. A full line of high-speed motors is available from Hitachi.

[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]

Installation of an AC reactor on the input side	<p>In the following examples involving a general-purpose inverter, a large peak current flows on the main power supply side, and is able to 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)</p> <p>(B) The power supply capacity is at least 10 times greater than the inverter capacity (the power supply capacity is 500 kVA or more).</p> <p>(C) Abrupt power supply changes are expected.</p> <p>Examples:</p> <p>(1) Several inverters are interconnected with a short bus.</p> <p>(2) A thyristor converter and an inverter are interconnected with a short bus.</p> <p>(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.</p> <p>Note: Example calculation with $V_{RS} = 205V$, $V_{ST} = 201V$, $V_{TR} = 200V$ V_{RS} : R-S line voltage, V_{ST} : S-T line voltage, V_{TR} : T-R line voltage</p> $\text{Unbalance factor of voltage} = \frac{\text{Max. line voltage (min.)} - \text{Mean line voltage}}{\text{Mean line voltage}} \times 100$ $= \frac{V_{RS} - (V_{RS} + V_{ST} + V_{TR})/3}{(V_{RS} + V_{ST} + V_{TR})/3} \times 100 = \frac{205 - 202}{202} \times 100 = 1.5 (\%)$
Using a private power generator	<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

Wiring connections		(1) Be sure to connect main power wires with R(L1), S(L2), and T(L3) terminals (input) 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 (⊕).
Wiring between inverter and motor	Electromagnetic contactor	When an electromagnetic contactor is installed between the inverter and the motor, do not perform on-off switching during running operation.
	Thermal relay	When used with standard applicable output motors (standard three-phase squirrel-cage four-pole motors), the SJ700 Series does not need a thermal relay for motor protection due to the internal electronic protective circuit. A thermal relay, however, should be used: <ul style="list-style-type: none">● 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.
Installing a circuit breaker		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.
Wiring distance		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.)
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).
Phase advance capacitor		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.

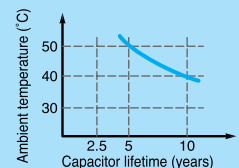
● High-frequency Noise and Leakage Current

- (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 DC bus capacitor deteriorates as it undergoes internal chemical reaction, it should normally be replaced every 10 years. (10 years is not the guaranteed lifespan but rather, the expected design lifespan.) 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. JEMA standard is the 5 years at ambient temperature 40°C used in 12 hours daily. (according to the "Instructions for Periodic Inspection of General-Purpose Inverter" (JEMA).)

Also, such moving parts as a 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.

Information in this brochure is subject to change without notice.

