



# HITACHI SJ100 SERIES INTRODUCTION



The SJ100 Series combines a small footprint with sensorless vector control, self-tuning, and automatic voltage regulation, among other advanced features.

## Features

- Sensorless vector control
- V/F Control
- Dynamic braking circuit
- PID Control
- Advanced I/O functions
- Auto-tune (motor constants)
- Keypad or remote operations
- Serial communications (with optional SC-OPE3I)
- 16-stage multi-speed operation mode
- Use of integrated potentiometer or programming keypad for local speed setting; keypad also sets up parameters
- External analog input (0-10VDC or 4-20mA) for remote frequency control
- Output frequency range of 0.5 to 360 Hz
- Electronic overload protection
- Ability to locate a keypad remotely
- Motor thermistor input (PTC input)
- Automatic voltage regulation (AVR)
- Six programmable digital inputs
- Two programmable digital outputs
- Compact size

SJ100 Series Drives									
Motor Rating	kW	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5
	Hp	.25	.5	1	2	3	5	7.5	10
Single/three-phase 230V (NFU)	✓	✓	✓	✓	✓	✓			
Three-phase 230V (LFU)							✓	✓	✓
Three-phase 460V (HFU)		✓	✓	✓	✓	✓	✓	✓	✓

## Configuration methods

The SJ100 Series drives can be configured multiple ways. The drive can be configured using the built-in digital keypad, the remote digital keypad with serial communications (SC-OPE3I), or the optional Windows-based software (DOP-PRO, *recommended*).

## Control and monitoring

There are a variety of choices for controlling and monitoring your SJ100 drive. Some of your choices are listed below:

**Digital Keypad** — A built-in digital keypad comes standard with every Hitachi drive. This keypad allows you to program your drive as well as monitor specific parameters during operation.

**Intelligent Terminal System** — The built-in intelligent terminal system allows you to connect controls, such as a PLC, for a sourcing 4-20mA, 0-10VAC frequency command and discrete run/stop functions of the drive.

## Remote digital keypad with serial communications

The SC-OPE3I has a 4-line, 20-character back-lit LCD display and built-in EEPROM program storage. It gives your drive RS232-RS422/485 connectivity and enables you to communicate with your drive using multiple serial protocols. The SC-OPE3I has complete programming and monitoring functionality. It must be remotely mounted when used with the SJ100 Series.

## Accessories

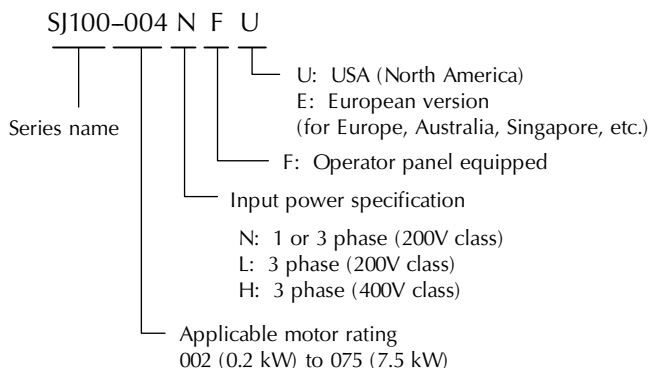
- AC line reactors
- Braking resistors
- Filters
- Remote display
- Remote digital keypad with serial communications
- Windows configuration software

*The detailed descriptions and specifications for the SJ100 accessories are available later in this section.*

## Typical applications

- Material handling
- Extruding
- Strip forming
- Compressors
- Molding
- Mixing

## Hitachi model number convention



1-800-633-0405

# SJ100 SPECIFICATIONS

200V Class, Single/Three-phase Input						
<b>Model</b>		SJ100-002NFU	SJ100-004NFU	SJ100-007NFU	SJ100-015NFU	SJ100-022NFU
<b>Price</b>		<--->	<--->	<--->	<--->	<--->
<b>Motor Rating <sup>1</sup></b>	<b>HP</b>	1/4HP	1/2HP	1HP	2HP	3HP
	<b>kW</b>	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW
<b>Rated Capacity (240V) kVA</b>		0.5	1.0	1.6	2.9	4.1
<b>Rated Input Voltage</b>		Single phase: 200 to 240V +5%/-10%, 50/60Hz ±5% Three-phase: 200-230V ±10%, 50/60Hz ±5%				
<b>Rated Output Voltage <sup>2</sup></b>		Corresponds to input voltage				
<b>Rated Input Current (A)</b>	<b>Single phase</b>	3.5	5.8	9.0	17.5	24.2
	<b>Three phase</b>	2.0	3.4	5.2	10.0	14.0
<b>Rated Output Current (A)</b>		1.6	2.6	4.0	8.0	11.0
<b>Dynamic Braking (without external resistor) <sup>3</sup></b>		Approx 100%			Approx 70%	Approx 20%
<b>Dynamic Braking (with external resistor) <sup>3</sup></b>		Approx 150%				Approx 100%
<b>DC Injection Braking</b>		Operating frequency, time, and braking force variable				
<b>Protective Structure <sup>4</sup></b>		IP20				
<b>Ambient Operating Temperature <sup>5</sup></b>		-10° to 40°C (14°-104°F)				
<b>Storage Temperature <sup>6</sup></b>		-10° to 70°C (14°-158°F)				
<b>Humidity</b>		20 to 90% humidity (no condensation)				
<b>Vibration <sup>7</sup></b>		5.9m/s <sup>2</sup> (0.6G), 10 to 55 Hz				
<b>Location</b>		Altitude 1,000m or less, indoors (no corrosive gases or dust)				
<b>Coating Color</b>		Gray				
<b>Watt Loss <sup>8</sup>100% (I)</b>		19W	29W	41W	79W	107W
<b>Weight: kg (lb)</b>		0.8 (1.8)	0.8 (1.8)	1.3 (2.9)	2.3 (5)	2.8 (6.2)
<b>Dimensions (HxWxD) (mm)</b>		120x67x107	120x67x107	130x98x156	180x140x153	180x140x164
Accessories						
<b>AC Reactor</b>	<b>Single Phase</b>	HRL010L	HRL050H	HRL020L	HRL030L	HRL050L
	<b>Three Phase</b>	HRL010H	HRL005L	HRL010L	HRL020L	HRL030L
<b>Braking Resistor</b>		SRB200-1		SRB200-2	SRB300-1	
<b>RF Capacitive Filter</b>		CFI-L				
<b>RF Inductive Filter</b>		ZCL-B40				
<b>EMI Filter</b>	<b>Single Phase</b>	FFL100-SB3	FFL100-SB3	FFL100-SB5	FFL100-SB11	FFL100-SB11
	<b>Three Phase</b>	FFL100-LB3	FFL100-LB3	FFL100-HB6	FFL100-HB11	FFL-HB11
<b>Conduit Box</b>		L100CB-SMALL		L100CB-MEDIUM		
<b>Remote Operator Interface</b>		SC-OPE3I				
<b>Remote Operator Interface Cables</b>		SC-OPE3BK				
<b>Pulse Width Modulation Filter for Analog Output Metering</b>		FA-4PWM				
<b>Software</b>		DOP-PRO				

1: The applicable motor refers to Hitachi standard 3-phase motor (4 pole). To use another motor, the rated motor current must NOT exceed the rated output current of the inverter.

2: The output voltage decreases as the main power supply voltage decreases. (Except when using the AVR function.) Output voltage cannot exceed input voltage.

3: The braking torque at capacitive feedback is the average deceleration torque at the shortest deceleration (stoppage from 50/60 Hz) of the motor itself. It is not the continuous regenerative braking torque. And the average deceleration torque varies with motor loss. This value decreases when operating beyond 50/60 Hz. Note that a braking resistor is not included in the inverter. If a large regeneration torque is required, the optional regenerative braking resistor should be used.

4: Protective structure is based on EN60529.

5: The ambient temperature must be in the range of -10° to 40°C. If the range will be up to 50°C, set the carrier braking frequency to 2.1 kHz or less (the low limit is .5kHz) and derate the output current to 80% or less. See the SJ100 manual on our Web site for derating curves.

6: The storage temperature refers to the short-term temperature during transport.

7: Conforms to the test method specified in JIS C09011 (1984).

8: Rated output current (In). Based output frequency 50Hz Or 60Hz. Carrier frequency 5kHz.



# SJ100 SPECIFICATIONS

200V Class Three-phase Input			
Model	SJ100-037LFU	SJ100-055LFU	SJ100-075LFU
Price	<--->	<--->	<--->
Motor Rating <sup>1</sup>	HP	5HP	7.5HP
	kW	3.7kW	5.5kW
Rated Capacity (240V) kVA	6.6	9.6	12.7
Rated Input Voltage	Three phase: 230V ±10%		
Rated Output Voltage <sup>2</sup>	Corresponds to input voltage		
Rated Input Current (A)	22.0	70.0	40.0
Rated Output Current (A)	17.5	24	32
Dynamic Braking (without external resistor) <sup>3</sup>	Approximately 20%		
Dynamic Braking (with external resistor) <sup>3</sup>	Approximately 100%		
DC Injection Braking	Operating frequency, time and braking force variable		
Protective Structure <sup>4</sup>	IP20		
Ambient Operating Temperature <sup>5</sup>	-10 to 50°C (14-122°F)		
Storage Temperature <sup>6</sup>	-10 to 70°C (14-158°F)		
Humidity	20 to 90% humidity, (no condensation)		
Vibration <sup>7</sup>	5.9m/s <sup>2</sup> (0.6G), 10 to 55 Hz		
Location	Altitude 1,000 m or less, indoors, (no corrosive gases or dust)		
Coating Color	Gray		
Watt Loss <sup>8</sup> 100% (I)	181W	216W	288W
Weight, kg (lb)	2.8 (6.2)	5.5 (12.1)	5.7 (12.5)
Dimensions (HxWxD) (mm)	180x140x164	257x182x170	257x182x170
Accessories			
AC Reactor	HRL050L	HRL075L	HRL110L
Braking Resistor	SRB400-1	SRB400-1 x2pcs parallel	
RF Capacitive Filter	CFI-L		
RF Inductive Filter	ZCL-B40	ZCL-A	
EMI Filter	FFL100-HB17	FFL100-HB32	
Conduit Box	L100CB-MEDIUM	L100CB-LARGE	
Ethernet Interface	HA-EDRV2		
Fuses	30A	40A	50A
Remote Operator Interface	SC-OPE3I		
Remote Operator Interface Cables	SC-OPE3BK		
Pulse Width Modulation Filter for Analog Output Metering	FA-4PWM		
Software	DOP-PRO		

1 - 8 0 0 - 6 3 3 - 0 4 0 5

1: The applicable motor refers to Hitachi standard 3-phase motor (4 pole). To use another motor, the rated motor current must NOT exceed the rated output current of the inverter.

2: The output voltage decreases as the main power supply voltage decreases. (Except when using the AVR function.) Output voltage cannot exceed input voltage.

3: The braking torque at capacitive feedback is the average deceleration torque at the shortest deceleration (stoppage from 50/60 Hz) of the motor itself. It is not the continuous regenerative braking torque. And the average deceleration torque varies with motor loss. This value decreases when operating beyond 50/60 Hz. Note that a braking resistor is not included in the inverter. If a large regeneration torque is required, the optional regenerative braking resistor should be used.

4: Protective structure is based on EN60529.

5: The ambient temperature must be in the range of -10° to 40°C. If the range will be up to 50°C, set the carrier braking frequency to 2.1 kHz or less (the low limit is .5KHz) and derate the output current to 80% or less. See the online SJ100 manual on our Web site for derating curves.

6: The storage temperature refers to the short-term temperature during transport.

7: Conforms to the test method specified in JIS C09011 (1984).

8: Rated output current (In). Based output frequency 50Hz Or 60Hz. Carrier frequency 5kHz.

# SJ100 SPECIFICATIONS

400V Class Three-phase Input							
Model	SJ100-004HFU	SJ100-007HFU	SJ100-015HFU	SJ100-022HFU	SJ100-040HFU	SJ100-055HFU	SJ100-075HFU
Price	<--->	<--->	<--->	<--->	<--->	<--->	<--->
Motor Rating <sup>1</sup>	HP	1/2HP	1HP	2HP	3HP	5HP	10HP
	kW	0.4kW	0.75kW	1.5kW	2.2kW	4.0kW	7.5kW
Rated Capacity (460V) kVA	1.1	1.9	3.0	4.3	6.8	10.4	12.7
Rated Input Voltage	Three phase: 380V to 460V ±10%, 50/60Hz ±5%						
Rated Output Voltage <sup>2</sup>	Corresponds to input voltage						
Rated Input Current (A)	2.0	3.3	5.0	7.0	11.0	16.5	20.0
Rated Output Current (A)	1.5	2.5	3.8	5.5	8.6	13	16
Dynamic Braking (without external resistor) <sup>3</sup>	Approximately 100%				Approximately 70%		
Dynamic Braking (with external resistor) <sup>3</sup>	Approximately 150%						
DC Injection Braking	Operating frequency, time and braking force variable						
Protective Structure <sup>4</sup>	IP20						
Ambient Operating Temperature <sup>5</sup>	-10 to 50°C (14-122°F)						
Storage Temperature <sup>6</sup>	-10 to 70°C (14-158°F)						
Humidity	20 to 90% humidity, (no condensation)						
Vibration <sup>7</sup>	5.9m/s <sup>2</sup> (0.6G), 10 to 55 Hz						
Location	Altitude 1,000 m or less, indoors, (no corrosive gases or dust)						
Coating Color	Gray						
Watt Loss <sup>8</sup> 100% (I)	32W	44W	65W	92W	151W	219W	261W
Weight: kg (lb)	1.3 (2.9)	1.7 (3.7)	1.7 (3.7)	2.8 (6.2)	2.8 (6.2)	5.5 (12.1)	5.7 (12.5)
Dimensions (HxWxD) (mm)	130x98x129	130x98x156	130x98x156	180x140x164	180x140x164	257x182x170	257x182x170
Accessories							
AC Reactor	HRL005H	HRL010H	HRL030H	HRL030H	HRL050H	HRL075H	HRL110H
Braking Resistor	SRB200-1			SRB200-2		SRB400-1 x 2 pcs in series	
RF Capacitive Filter	CFI-H						
RF Inductive Filter	ZCL-B40						
EMI Filter	FFL100-HB6			FFL100-HB11		FFL100-HB32	
Conduit Box	L100CB-MEDIUM					L100CB-LARGE	
Ethernet Interface	HA-EDRV2						
Remote Operator Interface	SC-OPE3I						
Remote Operator Interface Cables	SC-OPE3BK						
Pulse Width Modulation Filter	FA-4PWM						
Software	DOP-PRO						

- 1: The applicable motor refers to Hitachi standard 3-phase motor (4 pole). To use another motor, the rated motor current must NOT exceed the rated output current of the inverter.
- 2: The output voltage decreases as the main power supply voltage decreases. (Except when using the AVR function.) Output voltage cannot exceed input voltage.
- 3: The braking torque at capacitive feedback is the average deceleration torque at the shortest deceleration (stoppage from 50/60 Hz) of the motor itself. It is not the continuous regenerative braking torque. And the average deceleration torque varies with motor loss. This value decreases when operating beyond 50/60 Hz. Note that a braking resistor is not included in the inverter. If a large regeneration torque is required, the optional regenerative braking resistor should be used.
- 4: Protective structure is based on EN60529.
- 5: The ambient temperature must be in the range of -10° to 40°C. If the range will be up to 50°C, set the carrier braking frequency to 2.1 kHz or less (the low limit is .5kHz) and derate the output current to 80% or less. See the SJ100 manual on our Web site for derating curves.
- 6: The storage temperature refers to the short-term temperature during transport.
- 7: Conforms to the test method specified in JIS C09011 (1984).
- 8: Rated output current (In). Based output frequency 50Hz Or 60Hz. Carrier frequency 5kHz.



# SJ100 SPECIFICATIONS — GENERAL

The following table contains specifications common to all SJ100 Series drives.

## SJ100 Series General Specifications

<b>Series Ratings (kW)<sup>1</sup></b> <i>Applicable Motor Rating</i>	230V single and three-phase: 0.2-7.5kW 460V three phase: 0.4-7.5kW
<b>Series Ratings (Hp)</b> <i>Applicable Motor Horsepower</i>	230V single and three-phase: 0.25-10Hp 460V three-phase: 0.5-10Hp
<b>Control Method</b>	Sine-wave pulse width modulation (PWM) control
<b>Volt/Freq. Characteristic</b>	V/F optionally variable, V/F control (constant torque, reduced torque), sensorless vector control
<b>Overload Current Rating</b>	150%, 60 seconds
<b>Acceleration/Deceleration Time</b>	0.1-3000 sec. (linear acceleration/deceleration), second acceleration/deceleration setting available
<b>Output Frequency Range <sup>2</sup></b>	0.5 to 360 Hz
<b>Frequency Accuracy</b>	Digital command: ±0.01% of the max. frequency, analog command: ±0.1% of the max. frequency (25°C ± 10°C)
<b>Frequency Setting Resolution</b>	Digital: 0.1 Hz, analog: max. frequency/1000

## Control Input Signal

<b>Frequency Setting</b>	<b>Digital Operator Panel</b>	Up and Down keys and Value setting
	<b>Potentiometer</b>	Analog setting
	<b>External Signal <sup>3</sup></b>	0 to 10VDC (input impedance 10kΩ) 4-20mA (input impedance 250Ω), Potentiometer: 1kΩ to 2kΩ(2W) variable resistor
<b>Forward/Reverse Run</b>	<b>Digital Operator Panel</b>	Run/stop (forward/reverse run change by command)
	<b>External Signal</b>	Forward run/stop (1a contact) Reverse operation command available at terminal assignment (1a/1b selectable)
<b>Intelligent Input Terminal</b>	FW (forward run command), RV (reverse run command), CF1 to CF4 (multi-stage speed setting), JG (jogging command), 2CH (2-stage acceleration/deceleration command), FRS (free run stop command), EXT (external trip), USP (USP function), SFT (soft lock), AT (analog current input select signal), RS (reset), PTC (thermal protection)	

## Control Output Signal

<b>Intelligent Output Terminal</b>	RUN (running signal), FA1,2 (frequency arrival signal), OL (overload advance notice signal), OD (deviation signal at PID control), AL (alarm signal)
<b>Frequency Monitor</b>	PWM output; Select analog output frequency monitor, analog output current monitor or digital output frequency monitor
<b>Alarm Output Contact</b>	ON for the inverter alarm (1C contact output) (possible to change to OFF for the alarm)
<b>Other Functions</b>	AVR function, upper/lower limiter, PID control, carrier frequency change, frequency jump, electronic thermal level adjustment, gain/bias setting function, retry function
<b>Protective Functions</b>	Overcurrent, overvoltage, undervoltage, overload, extreme high/low temperature, CPU error, memory error, ground fault detection at startup, internal communication error

**Notes:**

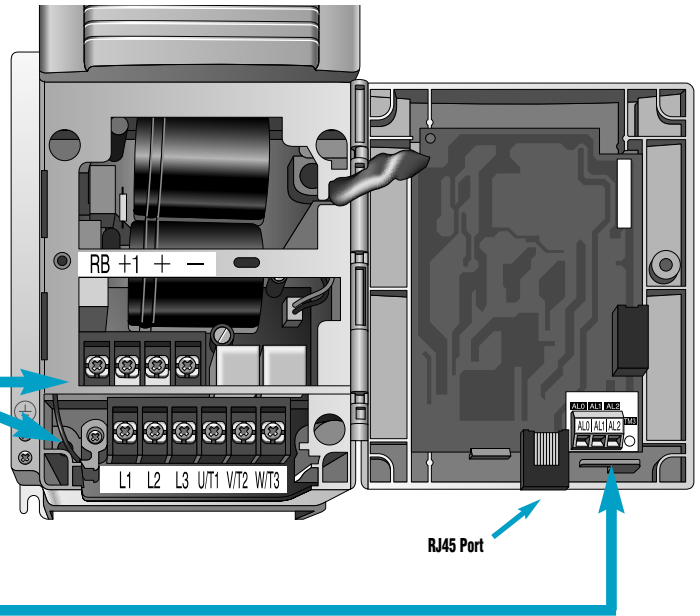
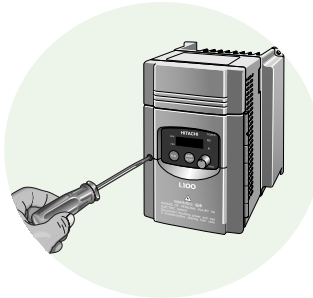
- 1: The applicable motor refers to Hitachi standard 3-phase motor (4 pole). To use another motor, the rated motor current must NOT exceed the rated output current of the inverter
- 2: To operate the motor above 60 Hz, refer to the motor manufacturer's specification of maximum rotation speed.
- 3: The frequency command is the maximum frequency at 9.8 V for input voltage 0-10 VDC, or at 19.6 mA for input current 4-20 mA.

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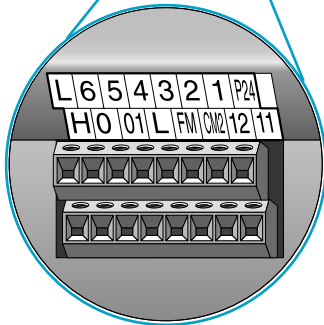
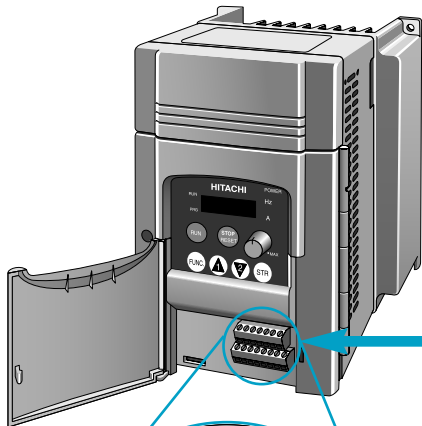
# SJ100 SPECIFICATIONS — TERMINALS

Main Circuit Terminals	
Symbol	Terminal Name
L1, L2, L3	Main power supply input terminals
T1, T2, T3	Inverter output terminals
+, +1	DC choke (HDC) connection terminals
G or $\perp$	Ground terminal
+, RB	DB resistor connection terminals



Alarm Circuit Terminals		
Symbol	Terminal Function	Remarks
AL0	Alarm relay common contact	Contact rating: 250VAC: 2.5A (res. load), 0.2A (PF=0.4)
AL1	Alarm relay common contact, normally closed	30VDC: 3.0A (res. load) 0.7A (PF=0.4)
AL2	Alarm relay common contact, normally open	

Control Circuit Terminals		
Symbol	Terminal Function	Remarks
L	Common terminal for intelligent input terminals	—
6, 5, 4, 3, 2, 1	Intelligent input terminals	27VDC max.
P24	+24V for intelligent input terminals	24 VDC
H	+10VDC input for frequency command	10VDC, 10mA max.
O	Frequency command input, voltage command	0 to 10VDC; Input impedance 10k $\Omega$
OI	Frequency command input, current	4 to 20mA; Input impedance 250 $\Omega$
L	Common terminal for frequency command	—
FM	Monitor terminal (frequency, current, etc.)	PWM output
CM2	Common terminal for intelligent output terminals	100mA
12	Intelligent output terminals	Open collector output L level at operation (ON)
11	Intelligent output terminals	

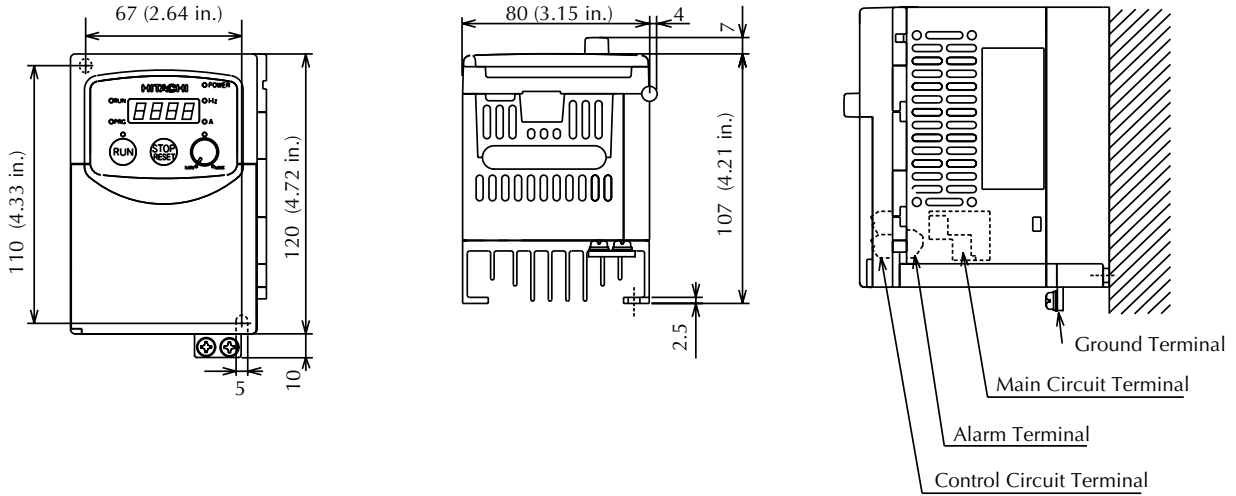


Standard Wiring							
Motor (Hp)	Motor (KW)	SJ100 Inverter Model	Wiring		Fuse (class J rated 600V)		
			Power Wires	Control Wires	1 phase	3 phase	
1/4	0.2	002NFU	AWG 16	18-28 AWG/ 14 to 0.75 mm <sup>2</sup> shielded wire (Use 18 AWG/ 0.75mm <sup>2</sup> wire for the alarm signal wire)	10A	5A	
1/2	0.4	004NFU					
1	0.75	007NFU					
2	1.5	015NFU	AWG 12		15A	10A	
3	2.2	022NFU			20A	15A	
5	3.7	037LFU	AWG 10		30A	20A	
7.5	5.5	055LFU	AWG 12		N/A	30A	40A
10	7.5	075LFU	AWG 10			50A	
1/2	0.4	004HFU	AWG 16			3A	6A
1	0.75	007HFU					
2	1.5	015HFU	AWG 12	10A			
3	2.2	022HFU	AWG 14	15A			
5	4.0	040HFU		20A			
7.5	5.5	055HFU	AWG 12	20A			
10	7.5	075HFU		25A			

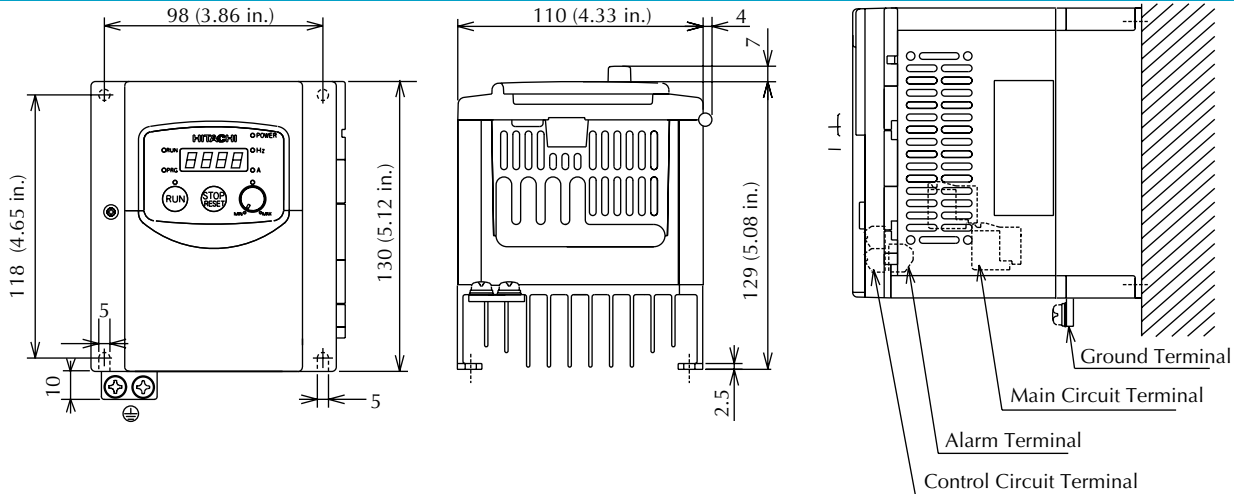
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# SJ100 SPECIFICATIONS — DIMENSIONS

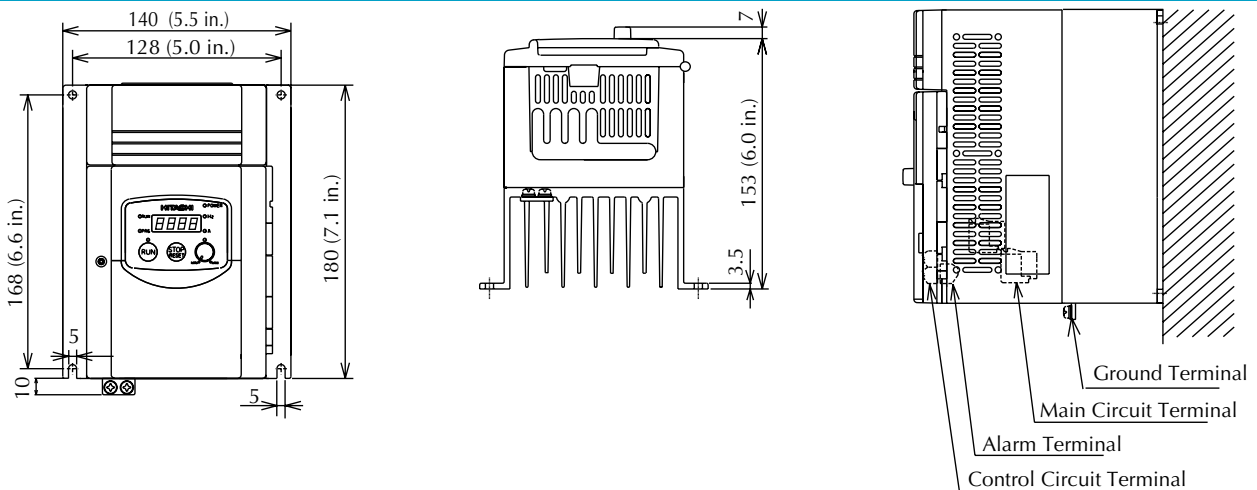
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## SJ100 -007NFU, 004HFU



## SJ100 -015NFU



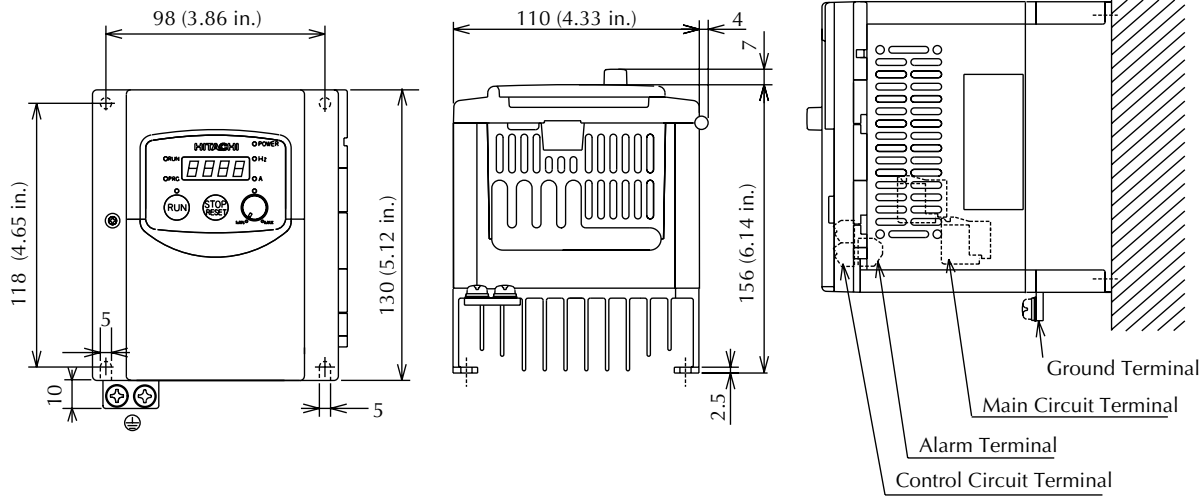
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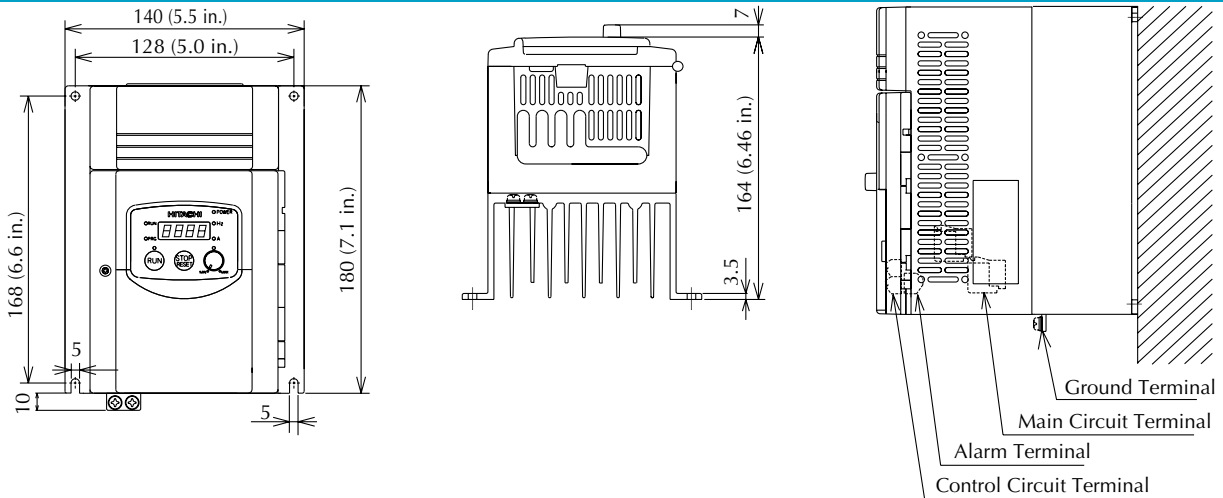
# SJ100 SPECIFICATIONS — DIMENSIONS

## SJ100 -007HFU, 015HFU

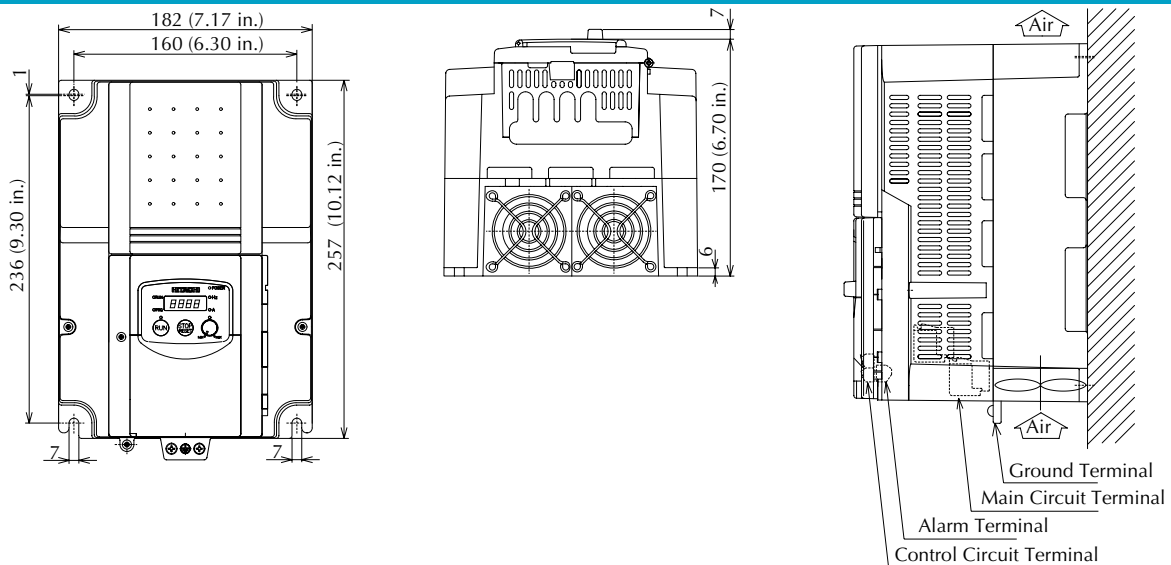


## SJ100 -022NFU, 037LFU, 022HFU, 040HFU

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## SJ100 -055LFU, 075LFU, 055HFU, 075HFU





# PLC MODULE COMPATIBILITY TO DRIVES

<b>DirectLOGIC PLC Modules for Use with Hitachi Drives</b>	
<b>DL05 Analog Module</b>	<b>Description</b>
F0-2AD2DA-2	2 channel in, 2 channel out voltage analog option card
<b>DL205 DC Output Module</b>	<b>Description</b>
D2-16TD2-2	16-pt. 12-24 VDC current sourcing output module, 1 common (2 common terminals), 0.1A/point, 1.6A/module, no fuse, European type removal terminal
<b>DL205 Relay Output Modules</b>	<b>Description</b>
D2-04TRS	4-pt. 5-30 VDC or 5-240 VAC isolated relay output module, 4 Form A (SPST) relays, 4 commons, 4A/point, 8.0A/module, replaceable fuse, removable terminal
D2-08TR	8-pt. 5-30 VDC or 5-240 VAC output module, 8 Form A (SPST) relays, 1 common (2 common terminals), 1A/point, 4.0A/module, replaceable fuse, removable terminal
F2-08TR	8-pt relay output, 10A/common, 5-30VDC or 5-240VAC
F2-08TRS	8-pt. 12-28 VDC or 12-240 VAC output module, 5 Form A (SPST) relays, 3 Form C (SPDT) relays, 8 isolated commons, 7A/point max., no fuses, removable terminal
<b>DL205 DC Input Modules</b>	<b>Description</b>
D2-08ND3	8-pt. 12-24 VDC current sinking/sourcing, 1 common (2 common terminals), removable terminal
D2-16ND3-2	16-pt. 24 VDC current sinking/sourcing 2 commons (isolated), European type removable terminal
<b>DL205 Analog Output Module</b>	<b>Description</b>
F2-02DAS-1	2 channel, 16-bit, Isolated 4-20mA sourcing (2 isolated commons)
F2-02DAS-2	2 channel analog output, 16 bit resolution, isolated, range: 0-5V, 0-10V
<b>DL205 Analog Input Modules*</b>	<b>Description</b>
F2-04AD-2	4 channel, 12-bit, 0-10V. Designed to operate with a 24VDC user supplied power supply.
F2-04AD-2L	4 channel, 12-bit, 0-10V. Designed to operate with a 12 VDC user supplied power supply.
F2-08AD-2	8 channel, 12-bit, 0-10V. Designed to operate with a 24VDC user supplied power supply.
<b>DL305 DC Output Modules</b>	<b>Description</b>
D3-08TD2	8-pt. 5-24 VDC current sourcing output module, 0.5A/point, 2 commons (internally connected), non-removable terminal, 2 non-replaceable fuses
D3-16TD2	16-pt. 5-24 VDC current sourcing output module, 0.5A/point, 2 commons (isolated), removable terminal, 2 non-replaceable fuses
<b>DL305 Relay Output Modules</b>	<b>Description</b>
D3-08TR	8-pt. 5-30 VDC or 5-220 VAC output module, 5A/point DC or 4A/point AC, 8 Form A relays (SPST), 2 commons (isolated), non-removable terminal, 2 user replaceable fuses
F3-08TRS-1	8-pt. 12-30 VDC or 12-220 VAC output module, 10A/point, 2 Form C (SPDT) relays and 6 Form A (SPST) relays, 8 commons (isolated), removable terminal, 8 non-replaceable fuses
D3-16TR	16-pt. 5-30 VDC or 5-220 VAC output module, 2A/point, 16 Form A relays (SPST), 2 commons (isolated), removable terminal, no internal fuses
<b>DL305 DC Input Modules</b>	<b>Description</b>
D3-08ND2	8-pt. 24 VDC current sourcing input module, 2 commons (internally connected), non-removable terminal
D3-16ND2-1	16-pt. 24 VDC current sourcing input module, 2 commons (internally connected), removable terminal
D3-16ND2-2	16-pt. 24 VDC, current sourcing input module, 8 commons (internally connected), 24 Pin removable connector (solder type connector included)
D3-16ND2F	16-pt. 24 VDC fast response (0.8 ms) current sourcing input module, 2 commons (internally connected), removable terminal
F3-16ND3F	16-pt. 5 VDC/12-24 VDC fast response (1 ms) current sinking/sourcing input module, 2 commons (internally connected), removable terminal

\*Use these modules with FA-4PWM



# PLC MODULE COMPATIBILITY TO DRIVES

## DirectLOGIC PLC Modules for Use with Hitachi Drives

<b>DL305 Analog Output Modules</b>	<b>Description</b>
F3-04DAS	4 channel isolated analog output module, 12-bit resolution, ranges: 0 to 10V, ±750VDC channel to channel isolation
<b>DL305 Analog Input Modules*</b>	<b>Description</b>
F3-04ADS	4 channel isolated analog input module, 12-bit resolution, 0 to 10 V
F3-16AD	16 channel analog input module, 12-bit resolution, 0 to 10 V
<b>DL405 DC Output Modules</b>	<b>Description</b>
D4-16TDS	16-pt. 12-24 VDC current sourcing output module, 2 commons (isolated), 0.5A/point, 3A/common, removable terminal
D4-32TD2	32-pt. 12-24 VDC current sourcing output module, 4 commons (isolated), 0.2A/point, 1A/common. Connectors sold separately. Requires one connector.
<b>DL405 Relay Output Modules</b>	<b>Description</b>
D4-08TR	8-pt. 5-30 VDC or 5-250 VAC output module, 8 Form A (SPST) relays, 2 commons (isolated), 2A/point, 5A/common, removable terminal
F4-08TRS-1	8-pt. 12-30 VDC or 12-250 VAC isolated output module, 4 Form A (SPST) and 4 Form C (SPDT) relays, 8 commons (isolated), 10A/point, 40A/module, removable terminal
F4-08TRS-2	8-pt. 12-30 VDC or 12-250 VAC isolated output module, 4 Form A (SPST) relays and 4 Form C (SPDT) relays, 8 commons (isolated), 5A/point, 40A/module, replaceable fuses, removable terminals
D4-16TR	16-pt. 5-30 VDC or 5-250 VAC output module, 8 Form A (SPST) relays, 2 commons (isolated), 1A/point, 5A/common, removable terminals
<b>DL405 DC Input Modules</b>	<b>Description</b>
D4-08ND3S	8-pt. Input module 24-48 VDC, sink/source, 8 commons (isolated), removable terminal
D4-16ND2	16-pt. 12-24 VDC current sourcing input module, 2 commons (isolated), removable terminal
D4-16ND2F	16-pt. 12-24 VDC current sourcing input module, fast response (1 ms), 2 commons (isolated), removable terminal
D4-32 ND3-1	32-pt. 24 VDC current sinking/sourcing input module, 4 commons (isolated). Connectors sold separately. Requires one connector.
D4-64ND2	64-pt. Input module 20-28 VDC, sourcing input, 8 commons (isolated). Connectors sold separately. Requires two connectors.
<b>DL405 Analog Output Modules</b>	<b>Description</b>
F4-04DAS-1	4 channel, 16 bit, isolated 4-20mA sourcing (4 isolated commons)
F4-04DAS-2	4 channel analog output module, 16-bit resolution, isolated, ranges: 0-5V, 0-10V
<b>DL405 Analog Input Modules*</b>	<b>Description</b>
F4-04AD	4 channel analog input module, 12-bit resolution, 0 to 10 V
F4-04ADS	4 channel isolated analog input module, 12-bit resolution, 0 to 10 V
F4-08AD	8 channel analog input module, 12-bit resolution, 0 to 10 V
F4-16AD-2	16 channel analog input module, 12-bit resolution, ranges: 0-5V, 0-10V
<b>*Use these modules with FA-4PWM</b>	

1 - 8 0 0 - 6 3 3 - 0 4 0 5

# FREQUENTLY ASKED QUESTIONS

## **What is sensorless vector control?**

Sensorless vector control is a technique used in variable frequency drives to rotate the force vector in the motor without the use of a shaft position sensor. The goal of AC sensorless vector technology is to give the user DC-like control while making traditional speed or shaft position feedback from the motor unnecessary. The SV control removes a major source of complexity and potential for failure (the tach. feedback), while simplifying many AC drive installations.

## **How do I connect a resistor (SRB) to an inverter drive?**

Connect the resistor leads to “+” (or “P”) and “RB.” There are also a set of “overtemperature” contact terminals on the resistor which should be wired to an intelligent input allocated for “trip” purposes. It would also be appropriate to wire any emergency stop contacts in series with this overtemperature contact.

## **How does Hz correlate to speed on an inverter drive?**

Motor base speed divided by 60 Hz = RPM/Hz. Example: 1200RPM divided by 60 = 20 rpm/Hz. This information is useful for scaling the inverter display to display rpms instead of Hz. Simply place the above result into B86 and then choose D07 to display. The display will read 0 - 1200 rpm.

## **Do I need to purchase anything else to program my drive?**

No, you can program the drives from the front panel using the function keys and the appropriate parameters described in the manual.

## **What is the duty cycle?**

The duty cycle is the percent of time a device is on versus off. It can be the ratio of operating time of a motor to its resting time. This parameter usually is specified in association with the allowable thermal rise for the device.

## **Can the software be used with Allen-Bradley equipment?**

No, the DOP software cannot be used with the Allen-Bradley equipment due to the function blocks capability of the Allen-Bradley equipment.

## **Can I use a separate power supply for my drive?**

Yes, you can use an external 24VDC power supply to source the voltage for your intelligent input terminals. You will need to connect the common on the remote power supply to the drive's “L” terminal. However, do not connect the “+” terminal of the internal supply to the external one.

## **I cannot get my intelligent terminal to program with the options I want. It just skips over them. Why?**

If the option you wish to use is the default assigned to a different terminal, the inverter will not let you program it in two places. You will need to use it at its default location or change it so that you do not have it in two places. Also, if the drive is in Run, items such as Intelligent Terminal Allocation cannot be changed due to safety reasons.

## **Can I use the 24VDC supply on the inverter for field devices on my machine?**

The 24VDC supply on the inverter is for the operation of control terminals and is not recommended for use with other devices.

## **Will the SJ100 accept encoder feedback?**

No, the SJ-100 will not accept encoder feedback. It is a micro drive and does not have the option card, and therefore no encoder feedback.

## **We are building a panel for our drives. How can we know the heat put out by each drive?**

The watt loss chart shows the amount of heat generated by the drive at 70 and 100 percent load of drive. The units are given in watts lost.

## **What is the main advantage in using an inverter to drive a motor, compared to alternative solutions?**

An inverter can vary the motor speed with very little loss of efficiency, unlike mechanical or hydraulic speed control solutions. The resulting energy savings usually pays for the inverter in a relatively short time.

## **Although the SJ100 inverter is a variable speed drive, can I use it in a fixed-speed application?**

A fixed-speed application usually is a result of cost-sensitivity or negligible benefits if variable speed were used (consumer products are examples). In those cases, the power source connects directly to the motor (no special drive needed). However, using a variable speed drive can benefit many types of industrial and commercial motor applications, by providing controlled acceleration and deceleration, high torque at low speeds, and energy savings over alternative solutions.



## FREQUENTLY ASKED QUESTIONS

***The term “inverter” is a little confusing, since we also use “drive” and “amplifier” to describe the electronic unit that controls a motor. What does “inverter” mean?***

The terms inverter, drive, and amplifier are used interchangeably in industry, but there are subtle differences. A *drive* can refer to the motor, the control electronics, or both. This term is used particularly when the motor and electronics are integrated in the same housing. The term *variable speed drive* can include many types of devices, such as anything that has a variable speed output (including the Hitachi inverter). *Amplifier* more commonly refers to a linear amplifier for servo motor control, or a stepper motor driver IC. Finally, we use *inverter* to describe the Hitachi motor controller because of the way the switching electronics alternately inverts or directly couples its internal DC voltage bus to generate a variable AC output.

***Can I use an inverter and AC induction motor in a positioning application?***

That depends on the required precision, and the slowest speed the motor must turn and still deliver torque. The SJ100 inverter will deliver full torque while turning the motor at only 0.5 Hz (15 RPM). DO NOT use an inverter if you need the motor to stop and hold the load position without the aid of a mechanical brake (use a servo or stepper motion control system).

***Does the optional digital operator interface or the PC software (DOP Plus) provide features beyond what is available from the keypad on the unit?***

Yes. However, note first that the same set of parameters and functions are equally accessible from either the unit's keypad or from remote devices. The DOP Pro PC software lets you save or load inverter configurations to or from a disk file. And, the hand-held digital operator provides hard-wired terminals, a safety requirement for some installations.

***Why does the manual or other documentation use terminology such as “200V class” instead of naming the actual voltage, such as “230 VAC?”***

A specific inverter model is set at the factory to work across a voltage range particular to the destination country for that model. The model specifications are on the label on the side of the inverter. A European 200V class inverter (“EU” marking) has different parameter settings than a USA 200V class inverter (“US” marking). The initialization procedure can set up the inverter for European or U.S. commercial voltage ranges.

***Why is there not a 100V class version of the SJ100 inverter, so it would work with a USA 115VAC power source, for example?***

Most industrial, commercial, or heavy appliance applications use 230VAC in the USA. Also, a built-in advantage is that using the higher voltage means less current to deliver the same amount of power. This allows you to use smaller diameter (and less expensive) wire for power and motor wiring.

***I live in a country where the domestic utility power is 115 VAC. Is there a way to conveniently access a 230 VAC power source for a test bench to develop a motor application?***

A 1:2 step-up transformer is available from a number of sources (check your local electrical supply house). The transformer will be designed to develop 230 VAC from 115 VAC, for example. Be sure the power output rating (kW) of the transformer is greater than 1.73 times the three-phase current of the motor you intend to power. We recommend doing this for motors 1/2 horse-power or smaller, with small loads. For 400 V class inverters, we recommend only using a utility power source of the correct voltage.

***Some models of Hitachi inverters will accept either single phase or three-phase power input. How do I know which input power type to use?***

If three-phase power is conveniently available for your application, we recommend using that. The inverter can develop its three-phase output power most efficiently from three-phase input power. In the absence of three-phase power, you can use a single-phase power source with slightly less efficiency but the power output rating is the same for N models (single or three-phase).

# FREQUENTLY ASKED QUESTIONS

## ***If I decide to use single-phase input power for the inverter, can I also use a single-phase motor?***

No. All Hitachi inverters develop a variable three-phase output, requiring the use of a three-phase AC induction motor.

## ***Why doesn't the motor have a neutral connection as a return to the inverter?***

The motor theoretically represents a “balanced Y” load if all three stator windings have the same impedance. The Y connection allows each of the three wires to alternately serve as input or return on alternate half-cycles.

## ***Does the motor need a chassis ground connection?***

Yes, for several reasons. This is for protection in the event of a short in the motor that puts a live voltage on its housing. Motors and other components exhibit leakage currents that increase with aging. And, a grounded chassis generally emits less electrical noise than an ungrounded one.

## ***What type of motor is compatible with the Hitachi inverters?***

The motor type must be a three-phase AC induction motor. Use an inverter-grade motor that has 800V insulation for 200V class inverters, or 1600V insulation for 400V class. Regarding motor size, in practice, it's better to first find the right size motor for your application, then look for the inverter to match the motor.

## ***How many poles should the motor have?***

Using a four-pole motor will work for most applications. Hitachi inverters can be configured to operate motors with 2, 4, 6, or 8 poles. The greater the number of poles, the slower the top motor speed will be, but it will have higher torque at the slowest speed.

## ***Will I be able to add dynamic (resistive) braking to my Hitachi SJ100 drive after the initial installation?***

Yes. The SJ100 inverter already has a dynamic braking circuit built in. Just add the resistor sized to meet the braking requirements.

## ***How will I know if my application will require resistive braking?***

For new applications, it may be difficult to tell before you actually test a motor/drive solution. In general, some applications can rely on system losses such as friction to serve as the decelerating force, or otherwise can tolerate a long decel time. These applications will not need dynamic braking. However, applications with a combination of a high-inertia load and a required short decel time will need dynamic braking. This is a physics question that may be answered either empirically or through extensive calculations.

## ***Several options related to electrical noise suppression are available for the Hitachi inverters. How can I know if my application will require any of these options?***

The purpose of these noise filters is to reduce the inverter electrical noise so the operation of nearby electrical devices is not affected. Some applications are governed by particular regulatory agencies, and noise suppression is mandatory. In those cases, the inverter must have the corresponding noise filter installed. Other applications may not need noise suppression, unless you notice electrical interference with the operation of other devices.

## ***The SJ100 features PID loop control. PID loops are usually associated with chemical processes, heating, or process industries in general. How could the PID loop feature be useful in my application?***

You will need to determine which main variable is affected by the motor in your application. That is the process variable (PV) for the motor. Over time, a faster motor speed will cause a faster change in the PV than a slow motor speed. By using the PID loop feature, the inverter commands the motor to run at the optimal speed required to maintain the PV at the desired value for current conditions. Using the PID loop feature will require an additional sensor and other wiring, and is considered an advanced application.