

WJ-C1

Compact high-performance inverter

HITACHI
Inspire the Next

Creating the Future with Easy Operation and Smart Control

The Right Drive to Succeed



The Right Drive to Succeed



HITACHI Inverter WJ C1

Global support

**Support to improve
operating effectiveness**

Support for cost reductions

**Support for stable
operation of equipment**

**Support for Green
Transformation**

Grobal support

Support for various communication protocols and corresponds to the international standards.

Support for various communication protocols

Various communication protocols are supported, while network support, and external ports are available. Modbus-RTU(RS485) communication remains as standard. Following fieldbus networks are available with option boards. CC-Link, EtherCAT, PROFIBUS-DP, PROFINET.



*The communication option supporting CC-Link, EtherCAT, PROFIBUS-DP, PROFINET can be used only in the basic mode.
 *EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany. PROFIBUS® and PROFINET® are registered trademarks of PROFIBUS Nutzerorganisation e.V.(PNO). CC-Link® is a registered trademark of Mitsubishi Electric Corporation. Other company names and product names mentioned are the property of the respective trademarks or registered trademarks.

"High quality" to comply international standards

Corresponds to the EU Directive, UL and cUL. Complying with the RoHS2.

Corresponds to the EU Directive, UL and cUL in order to guarantee the quality and safety. The quality is recognized in Europe and the United States.

EU Directive	LVD	: EN 61800-5-1
	EMC directive	: EN IEC 61800-3
	RoHS2 directive	: EN IEC 63000
	Machinery directive	: EN ISO13849-1/
	(Functional Safety)	EN 61800-5-2/ EN 61508
UL		



Complying with the RoHS2.

This product complies with EU RoHS2, which restricts the use of hazardous materials.

A noise filter is required for complying of EMC directive.

Complying with the RoHS2.

This product complies with EU RoHS2, which restricts the use of hazardous materials.



Hiwin Industrial Equipment Systems Co., Ltd.
 Hiwin(RVO) devices is certified by ISO 14001 standard of environmental management system and ISO 9001 standard of quality assurance management system.

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Support to improve operating effectiveness

We have improved our maintenance free design with features such as our new jog dial and simple copying and conversion of parameters of our prior design.

JOG dial facilitates parameter setting process

From conventional button to new JOG dial. Parameter can be set smoothly and intuitively.



You can set the parameter smoothly with a single finger, and you can set all functions easily.

Operation example



Output frequency setting (Monitor)

Select an output frequency command to the motor (min. frequency to max. frequency (Hz)).



SET key

Press SET key to determine parameter.



Select a frequency with JOG dial.



SET key

Press SET key to determine parameter. You can adjust frequency as if you were operating a volume knob on audio equipment.

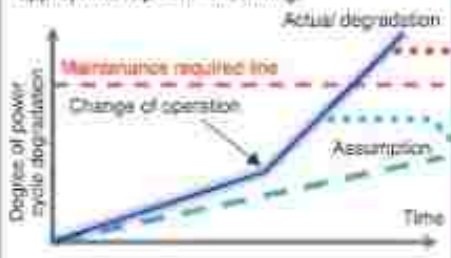
Preventative Maintenance Advance Notification

Inverter diagnostic

Actual operation data can be monitored to predict the degree of power modules cycle degradation (approximate). In addition to the lifetime assessment of capacitors and cooling fans of our WJ200, a lifetime assessment of power modules is installed in the new WJ series C1 (Afterward "WJ Series C1" referred as WJ-C1.) Preventative maintenance is realized by lifetime assessment of components. This function can prevent system downtime in production line, or essential operations.

Example of system diagnostic

The data shows that the degradation is more quickly than expected, and it notifies the appropriate replacement timing.



If parts is not replaced...

The system goes down and the production line stops.



The stable system operation is realized by lifetime assessment of component in advance.





Familiar size and design for easy replacement

Direct replacement becomes easy as installation area or footprint of WJ200 and WJ-C1 are the same.



Two selectable modes

In addition to the newly added multi-function "extended mode" normally found in the SJ series P1, the WJ-C1 also has "basic mode" equivalent to the WJ200. The operation mode of WJ-C1 can be selected from the extended mode and the basic mode. Moreover, the optional remote operator WOP enables copying parameter settings from WJ200 to WJ-C1 (extended mode) while converting parameters to the new format.



*Remote operator VOP is required to read parameters of WJ-C1 (extended). Some

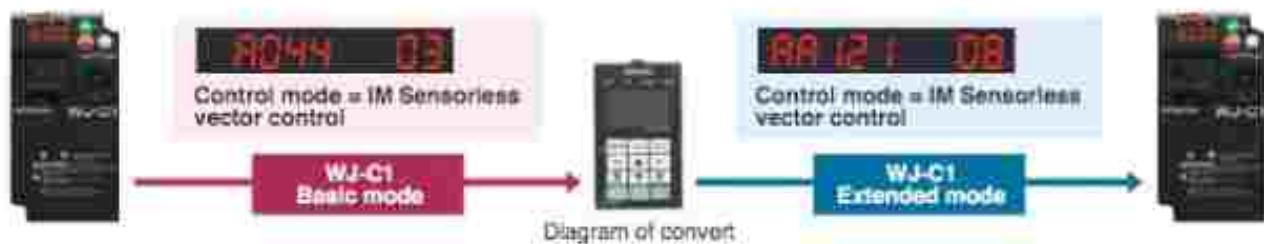
Extended mode (5 digit)



Basic mode (4 digit)



Combination of copy			Operator
WJ200 WJ-C1 (Basic mode)	Convert	WJ-C1(Extended mode)	WOP 
WJ200 WJ-C1 (Basic mode)	Copy	WJ-C1(Basic mode)	
WJ-C1(Extended mode)	Copy	WJ-C1(Extended mode)	VOP 

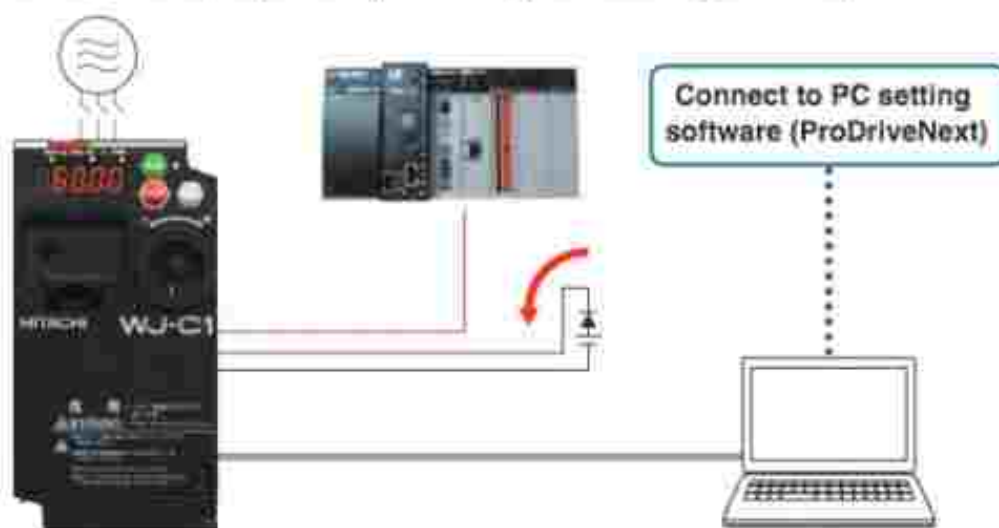


Support to improve operating effectiveness

You can conveniently simulate applications and set parameters without the need of power source.

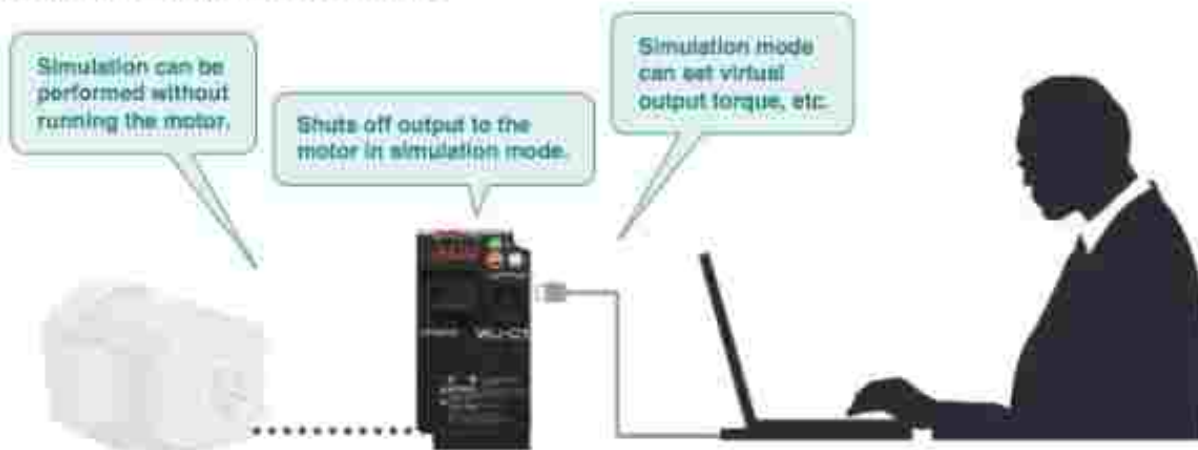
Parameters can be set prior to installation by 24VDC control power supply.

In addition to the normal power supply, WJ-C1 can be operated by supplying an external 24VDC. Parameter setting can be done before going on site because WJ-C1 can be operated without the main power supply. Therefore, installation time on site can be shortened and operational efficiency increased. You can also connect to a PLC to program or operate using the PC Setting Software (ProDriveNext).



Simulation function reduces test run time

This function shuts off only the motor output while each inverter function is enabled. Parameters and analog inputs can be used to set virtual output current, etc. to verify the operation of the host device in the event of an alarm without a motor.



Support for cost reductions

Functions such as simple vector control and multiple PID can reduce the cost of the host device.

- Improvement or added item from WJ200.
- New functions of WJ-C1.

Simple vector control without the need for optional board

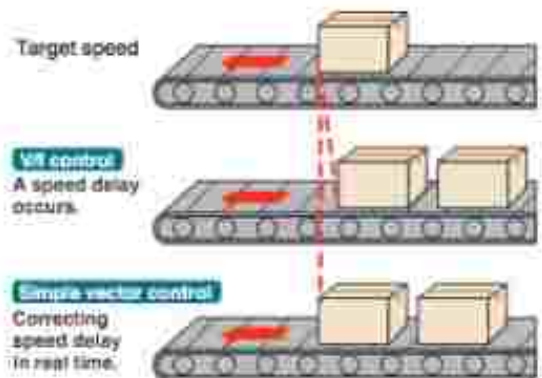
WJ-C1 can use simple vector control without an additional optional board.

It supports IM motor sensorless vector control and V/f control. The WJ-C1 can calculate and compensate the speed deviation from internally calculated speed sensor data in real time while improving torque characteristics.

Example: V/f control



Example: Simple vector control

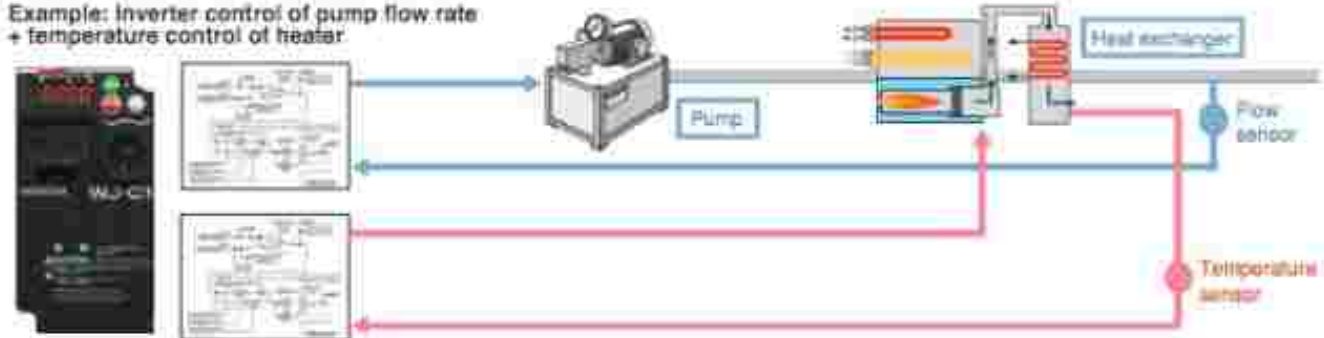


Reduction of system hardware cost by multiple PID function

WJ-C1 has two PID loop controllers. The inverter controls the operation of the motor with PID controller, and an external device can also be controlled independently with another PID controller.

Therefore, WJ-C1 can control the motor and the external device without a host device, such as a PLC.

Example: Inverter control of pump flow rate + temperature control of heater



Waveform can be checked by trace function without measuring instruments

This function visualizes the sampling data of parameters selected by an operator. The operator can then check the status of WJ-C1 by checking waveform at "trip" without additional or external measuring instruments.



Support for stable operation of equipment

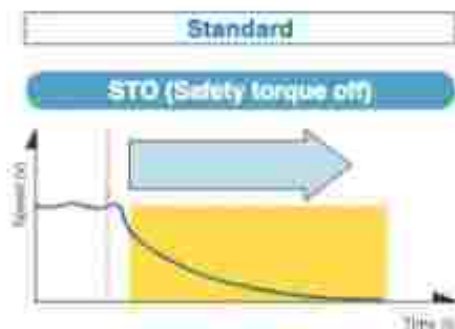
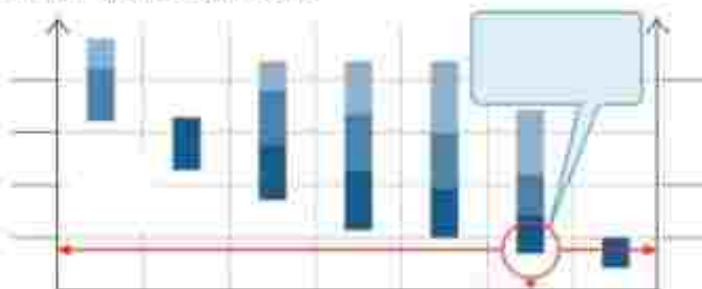
Supports the stable operation of the system with inverters which is certified "functional safety SIL3" as standard.

Certified "functional safety SIL3" as standard

Supports the stable operation of the system with inverter that is certified functional safety SIL3.

This product complies with international standards for the construction of safety systems in standard specifications.

- EN ISO13849-1, Cat.3 PLc
- EN 61800-5-2, EN 61508:SIL3



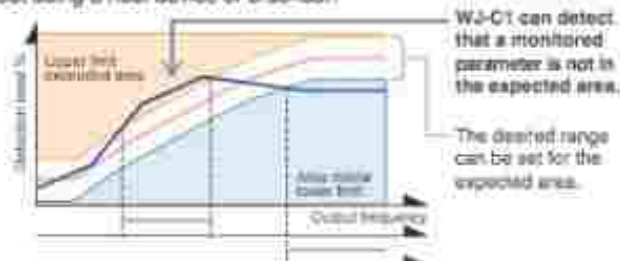
WJ-C1 can assist on the stable operation of a system by detecting "Unusual state" conditions.

Non-steady detection

This function can detect abnormalities such as a clogged pipe and belt rip. The function prevents problems in production, or operations while it contributes to notify operations and stabilize functional deviations.

Output current and other monitor data are monitored by the inverter, to detect conditions that differ from the steady state without a sensor. Alarms and warnings are issued to detect a sign of a failure without using a host device or a sensor.

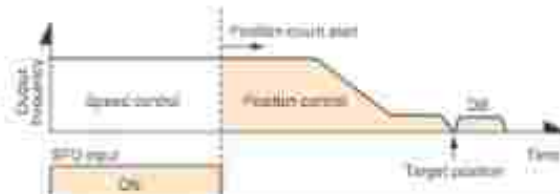
WJ-C1 detects and notifies a failure on the production line.



Easy to use simple positioning control

The pulse-speed can be detected up to 32kHz, thus the WJ-C1 can control the motor by simple positioning over a wider range than the WJ200.

WJ-C1 also is equipped with the simple position control (when using feedback-signal). This function of WJ200 received good reviews from end users. Speed control operation and position control operation can be selected. While the input terminal is turned on, the current position counter is 0. If the terminal is turned off during operation, position control operation starts from when the terminal is turned off. (Speed/position switching)



Support for Green Transformation

"Green Transformation (GX)" is indispensable initiative to achieve economic growth while resolving environmental issues. We are contributing to the global initiative to achieve carbon neutral status.



Energy saving by PM motor

WJ-C1 is equipped with both control functions for induction motor and PM motor. The controller can be re-parametrized when replacing an induction motor with a PM motor. In addition, the new overcurrent-level setting function prevents a demagnetizing of PM motor due to overcurrent.

Overcurrent level adjustment

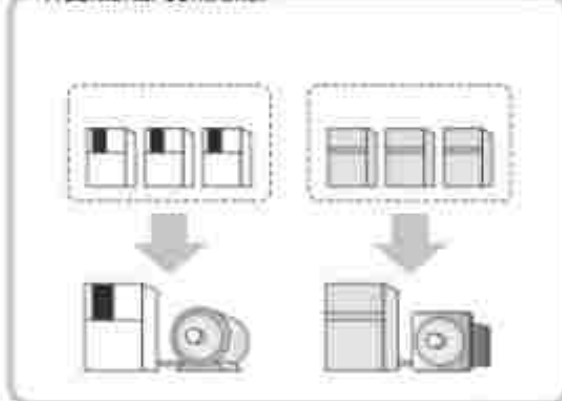
The overcurrent trip level can be adjusted by parameters.



PM motors that contribute to energy conservation

PM motors are more efficient than induction motors, contributing to energy savings. Energy measures will help to reduce costs, while at the same time resolving global environmental issues.

Traditional controller



WJ-C1



*Since the operation differs from that of WJ200 such as the frequency matching function, it needs to be verified on the actual device.

•When using PM sensorless vector control, contact your dealer.

First step toward environmental measures: Use of recycled resin

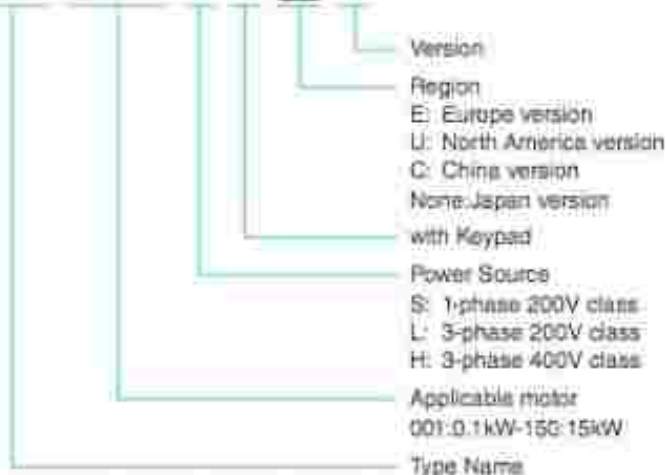
Decarbonization is becoming an urgent issue around the world, Hitachi Industrial Equipment Systems is working to become carbon neutral in various businesses. WJ-C1 takes the first step toward realizing a recycling-oriented society by using recycled resin for its outer housing.



Model configuration

WJ series C1 model name indication

C1-001 L F □ 2



Lineup

Applicable motor (kW)	0.1	0.2	0.4	0.75	1.5	2.2	3.0	3.7	4.0	5.5	7.5	11	15
1-phase 200 V (NO rating) ¹	●	●	●	●	●	●							
3-phase 200 V (NO rating)	●	●	●	●	●	●		●		●	●	●	●
3-phase 400 V (NO rating)			●	●	●	●	●		●	●	●	●	●

(Note) The applicable motor series is 1-phase (except 3-phase motor (4-pole)) series: 400V class 3.0kW and 4.0kW.
 To use other motors, be sure to prevent the rated motor current from exceeding the rated output current of the inverter.

Standard Specifications

Single phase 200V class

Model name ¹⁾		C1-001	SP-02	30	50C	004	007	015	300				
Motor ¹⁾	kW	LD	0.2	0.4	0.55	1.1	2.2	3.0					
		NO	0.1	0.2	0.4	0.75	1.5	2.2					
	HP	LD	1/4	1/2	3/4	1.5	3	4					
		NO	1/8	1/4	1/2	1	2	3					
Rated capacity (kVA)	Basic	200V	LD	0.4	0.6	1.0	2.0	3.3	4.1				
		NO	0.2	0.5	1.0	1.7	2.7	3.8					
		240V	LD	0.4	0.7	1.4	2.4	3.9	4.9				
	Extended	NO	0.2	0.6	1.2	2.0	3.3	4.5					
		200V	LD	0.4	0.7	1.2	2.0	3.4	4.2				
		NO	0.2	0.5	1.1	1.7	2.7	3.8					
240V	LD	0.5	0.8	1.8	2.4	4.0	5.0						
NO	0.2	0.6	1.2	2.0	3.3	4.5							
Rated input voltage (V)		Single phase 200V to 240V (15% ~ +10%), 50/60Hz ± 5%											
Rated output voltage (V) ²⁾		Three phases 200 to 240V											
Rated output current (A)	Basic	LD	1.2	1.9	3.5	6.0	9.8	12.0					
		NO	1.0	1.6	3.0	5.0	8.0	11.0					
	Extended	LD	1.0	2.0	3.5	6.0	9.8	12.2					
		NO	1.0	1.6	3.2	5.0	8.0	11.0					
Braking torque	Regenerative Braking	Built-in regenerative braking circuit (Separate discharge resistor)											
	Maximum braking resistor (Ω)	100			50			50					
Cooling method		Self-cooling						Force ventilation					
Weight (kg)		1.0		1.0		1.1		1.6		1.8		1.8	

¹⁾ The part of the motor's name indicates an applicable motor capacity at NO rating.

²⁾ LD: Light Duty; NO: Normal Duty/Over rating.

Applicable motors are 1-phase three phase asynchronous motor (4P), which are identical West of Mexico.

When use other manufacturer motors, be sure to not exceed a rated current of a motor (the rated output current of the inverter).

³⁾ The output voltage cannot exceed the actual input voltage (Main power supply voltage).

Standard Specifications

• Three phases 200V class

Model name			IC1	IC2	UF	IE	001	002	004	007	015	022	037	055	075	110	150																		
Motor ¹⁾	kW	LD	0.2	0.4	0.75	1.1	2.2	3.0	5.5	7.5	11	15	22	30	40	55	75	110																	
		NO	0.1	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	22	30	40	55	75	110																
	HP	LD	1/4	1/2	1	1.5	3	4	7.5	10	15	20	25	35	45	60	80	110	150																
		NO	1/8	1/4	1/2	1	2	3	5	7.5	10	15	20	25	35	45	60	80	110																
Rated capacity (kVA)	Basic	200V	LD	0.4	0.8	1.2	2.0	3.3	4.1	6.7	10.0	13.8	19.3	25.9	33.9	45.4	61.9	83.4	114.9																
			NO	0.2	0.5	1.0	1.7	2.7	3.9	6.0	8.6	11.4	16.2	20.7	28.6	38.6	51.9	70.4	95.4																
		240V	LD	0.4	0.7	1.4	2.4	3.9	4.9	8.1	12.4	16.8	23.2	30.6	40.9	54.9	73.4	98.4	133.4																
			NO	0.3	0.6	1.2	2.0	3.3	4.3	7.2	10.3	13.7	19.5	24.9	33.9	45.4	61.9	83.4	114.9																
	Extended	200V	LD	0.4	0.7	1.2	2.0	3.4	4.2	6.7	10.3	15.8	20.7	24.2	33.9	45.4	61.9	83.4	114.9																
			NO	0.2	0.5	1.1	1.7	2.7	3.9	6.0	8.6	11.4	16.2	21.6	28.6	38.6	51.9	70.4	95.4																
		240V	LD	0.5	0.8	1.4	2.4	4.0	5.0	8.1	12.4	18.7	24.9	28.1	38.6	51.9	70.4	95.4	133.4																
			NO	0.3	0.6	1.3	2.0	3.3	4.3	7.2	10.3	13.8	19.5	24.9	33.9	45.4	61.9	83.4	114.9																
Rated input voltage (V)			Three phases 200V to 240V (-15%/+10%), 50/60Hz ±5%																																
Rated output voltage (V)			Three phases 200 to 240V																																
Rated output current (A)	Basic	LD	1.2	1.9	3.1	5.0	5.8	12.0	18.6	30.0	45.0	61.0	83.0	110.0	150.0	200.0	275.0	375.0																	
			1.0	1.6	3.0	5.0	6.0	11.0	17.5	25.0	33.0	47.0	60.0	80.0	105.0	140.0	190.0	260.0																	
	Extended	LD	1.0	2.0	3.8	6.0	9.8	12.3	19.6	30.0	45.0	60.0	70.0	100.0	135.0	180.0	245.0	330.0																	
			1.0	1.8	3.3	5.0	8.0	11.0	17.5	25.0	33.0	47.0	60.0	80.0	105.0	140.0	190.0	260.0																	
Braking torque	Regenerative Braking		Built-in regenerative braking circuit (Separate discharge resistor)																																
	Minimum braking resistor (Ω)		100			50			35			20			17			10																	
Cooling method			Self-cooling						Force ventilation																										
Weight (kg)			1.0			1.0			1.1			1.2			1.6			1.8			2.0			3.5			3.8			4.5			6.5		

*1 The part of the motor's name indicates an approximate motor capacity at 50 rating.

*2 LD: Light Duty, NO: Normal Duty (Over rating).

Application: Hottan are Hottan's three-phase standard motor (4P), which are standard brand of Hottan.

When use other manufacturer motor, be sure to not exceed a rated current of a motor the rated output current of the motor.

*3 The output voltage cannot exceed the actual input voltage (Main power supply voltage).

• Three phases 400V class

Model name			IC1	IC2	UF	IE	004	007	015	022	030	040	055	075	110	150													
Motor ¹⁾	kW	LD	0.75	1.5	2.2	3.0	6.0	8.0	15	20	30	40	55	75	110	150													
		NO	0.4	0.75	1.5	2.2	3.0	4.0	6.0	8.0	11	15	20	25	35	50	75												
	HP	LD	1	2	3	4	5	7.5	10	15	20	25	35	45	60	80	110												
		NO	1/2	1	3	3	4	5	7.5	10	15	20	25	30	40	55	75												
Rated capacity (kVA)	Basic	380V	LD	1.3	2.6	3.9	5.2	10.4	13.8	20.7	28.6	42.9	57.8	79.7	109.6	149.5	209.4												
			NO	1.1	2.2	3.3	4.4	6.7	9.0	13.5	18.0	27.0	36.0	51.0	68.0	94.0	127.0												
		460V	LD	1.7	3.4	5.1	6.8	13.6	18.1	27.2	36.3	54.4	72.5	100.6	134.8	186.4	255.2												
			NO	1.6	3.2	4.8	6.4	9.6	12.8	19.2	25.6	38.4	51.2	70.4	93.6	128.0													
	Extended	380V	LD	1.3	2.6	3.9	5.2	10.4	13.8	20.7	28.6	42.9	57.8	79.7	109.6	149.5	209.4												
			NO	1.1	2.2	3.3	4.4	6.7	9.0	13.5	18.0	27.0	36.0	51.0	68.0	94.0													
		460V	LD	1.7	3.4	5.1	6.8	13.6	18.1	27.2	36.3	54.4	72.5	100.6	134.8	186.4	255.2												
			NO	1.6	3.2	4.8	6.4	9.6	12.8	19.2	25.6	38.4	51.2	70.4	93.6	128.0													
Rated input voltage (V)			Three phases 300V to 480V (-15%/+10%), 50/60Hz ±5%																										
Rated output voltage (V)			Three phases 380 to 480V																										
Rated output current (A)	Basic	LD	2.1	4.1	6.1	8.1	16.2	21.6	32.4	43.2	64.8	86.4	129.6	172.8	244.8	331.2													
			1.9	3.8	5.7	7.6	11.4	15.2	22.8	30.4	45.6	60.8	84.0	112.0	152.0														
	Extended	LD	2.1	4.1	6.1	8.1	16.2	21.6	32.4	43.2	64.8	86.4	129.6	172.8	244.8	331.2													
			1.9	3.8	5.7	7.6	11.4	15.2	22.8	30.4	45.6	60.8	84.0	112.0	152.0														
Braking torque	Regenerative braking		Built-in regenerative braking circuit (Separate discharge resistor)																										
	Minimum braking resistor (Ω)		180				100				70				35														
Cooling method			Self-cooling			Force ventilation																							
Weight (kg)			1.5			1.8			1.8			2.0			2.0			3.0			3.5			4.5			6.5		

*1 The part of the motor's name indicates an approximate motor capacity at 50 rating.

*2 LD: Light Duty, NO: Normal Duty (Over rating).

Application: Hottan are Hottan's three-phase standard motor (4P), which are standard brand of Hottan except 400V class 3.0 kW and 4.0 kW.

When use other manufacturer motor, be sure to not exceed a rated current of a motor the rated output current of the motor.

*3 The output voltage cannot exceed the actual input voltage (Main power supply voltage).

Common Specifications

Item	Specifications					
Control method	PWM control					
Output frequency range**	0.01 to 800.00 Hz					
Frequency accuracy	For the maximum frequency, digital source $\pm 0.01\%$, analog source $\pm 0.2\%$ (25 \times 10 ⁻³ °C)					
Frequency resolution	Digital source: 0.01 Hz, analog source: maximum frequency/1000					
Control mode (Frequency and voltage combination)**	<table border="0"> <tr> <td rowspan="4">M</td> <td>V/F control (constant torque/reduced torque/free V/F, automatic torque boost)</td> </tr> <tr> <td>V/F control with encoder</td> </tr> <tr> <td>M sensorless vector control</td> </tr> <tr> <td>M sensorless vector control with encoder (Simple vector control)</td> </tr> </table>	M	V/F control (constant torque/reduced torque/free V/F, automatic torque boost)	V/F control with encoder	M sensorless vector control	M sensorless vector control with encoder (Simple vector control)
M	V/F control (constant torque/reduced torque/free V/F, automatic torque boost)					
	V/F control with encoder					
	M sensorless vector control					
	M sensorless vector control with encoder (Simple vector control)					
Rated current (A/MHz)	M sensorless vector control**					
Rated overload current	Dual Rating: Normal Duty (ND): 150% / 60 sec.; Light Duty (LD): 180% / 60 sec.					
Acceleration/deceleration time	0.00 to 3600.00 sec (linear, curve setting)					
Starting torque†	200 % of Motor Rated Torque at 0.5 Hz (M sensorless vector control)					
Control frequency range	Normal Duty (ND): 2 to 10kHz Light Duty (LD): 2 to 10kHz (with setting)					
Monitor function**	Output frequency, Output current, Output torque, Trip history, V/F terminal status, Input power, DC voltage, etc.					
Protective function**	Overcurrent, Overvoltage, Undervoltage, Electronic thermal, Overload and etc.					
Other functions	Free V/F characteristic setting, Manual torque boost, auto-tuning, Simple positioning functions, Energy saving operation, FFO control, Brake control, Commercial switching function, Upper and lower speed limit, Speed jump, External start/stop, Analog output adjustment, etc.					
Keypad	3 digits, 7 seg. 6 status LED + 1 status symbol LED, 4 Keys and 1 JOG dial, 1 LED for indicating RUN command source (non-detachable)					
Input	Frequency reference	Keypad, External operator, PGAS, Communication option, Internal analog input.				
	RUN/STOP command	Keypad, External operator, PGAS, Communication option, Input terminal				
	Input terminals	Terminal (1) to (7) (NO/NC selectable, Sink/PLC+24 (impedance)/Source/PLC-, (impedance) selectable); terminal (8) is source logic fixed				
	Pulse input	3 terminals max. 30kHz \times 3 (terminal (E) when enable phase A), terminal (F) (when enable phase B), terminal (G) (when enable phase Z)				
	Analog input	2 terminals (terminal (A1), (A2) for 0 to 10 VDC voltage input and 4 to 20 mA current input selectable)				
Output	Thermistor input	1 terminal (shared with terminal (S)) (support for PTC type thermistor)				
	Safety input	2 terminals (terminal (ST1) and terminal (ST2))				
	Output terminals	2 terminals with open collector (NO/NC selectable, capable for Sink/Source circuit) 1 terminal for relay output (1% type)				
Communication	STO Stop Monitor Output	1 terminal (shared with terminal (1)), switched to EDM by slide switch				
	Analog/Pulse output	2 terminals (terminal (A3) for 0 to 10 VDC voltage output / 4 to 20 mA current output selectable) terminal (A4) for pulse output, max. 32 kHz/ 0 to 10 VDC output selectable				
	USB	Micro-B (for inverter configuration software ProDriveLab)				
Option	PGAS	Support for Modbus-RTU** (RS-485 serial communication)				
	External operator	RJ45 connector (Exclusive connector for remote operator)				
External control power supply	WJ200 series field release options: WJ-EDT for EtherCAT® communication, WJ-FPS for PROFINET® communication, WJ-PN for PROFINET communication, WJ-GDL for CC-LINK® communication**					
EMC noise filter	WJ200 series field release options: WJ-EDT for EtherCAT® communication, WJ-FPS for PROFINET® communication, WJ-PN for PROFINET communication, WJ-GDL for CC-LINK® communication**					
Operating environment	One unit can be mounted (except WJ-FPS; functional safety option is not supported)					
	Ambient temperature	External 24 VDC can be input from PPG terminal (Installation of reverse-current-protection diode is mandatory).				
	Storage temperature**	Not built-in optional external noise filter can be connected				
	Humidity	ND (normal duty): -10 to 50 °C (LD (light duty): -10 to 40 °C)				
Installation site**	Vibration	-40 to 85 °C				
	Altitude	20 to 90 %RH (non-condensing)				
Structure	Structure	0.075 mm amplitude for 10 to 87 Hz 0.8 mm/s ² (1.0 G) for 87 to 150 Hz				
	Protection	IP20 (UL open type), replaceable Fan				
Standards**	Standards**	Altitude: 1000 m or less, indoors (free from corrosive gases, oil mist, dust and effect of radiation)				
	CE/EN (IEC 61800-3:2018 (EMC filter option required) EN 61800-5-1:2007, EN 61800-5-1:2007A1:2017, EN 61800-5-1:2007A11:2021, EN 61800-5-2:2017, EN IEC 63000:2018, UL: UL 61800-5-1, 1st Ed., Issue Date 2012-05-08, Revision Date 2021-02-11, -Overvoltage Category 3, -Pollution Degree 2 Other: IEC 6222 No.274, 2nd Ed., Issue Date 2017-04-01 Safety function: STO (Safety torque off function) EN 61800-5-2:2017, SIL3, EN ISO 11849-1:2015, Cat 3 PLc EN 61508-1 to 7:2010)					
Other optional components	Noise Filter, DC link choke, AC reactor, Braking resistor, Regenerative braking unit, External operator (Basic Mode / DPL-SP/OPS-SP/KOPE-SP/INT/VOF, Extended Mode, VOP), Inverter configuration software ProDriveLab™, etc.					

** The output frequency range depends on the control mode and the motor used. Contact the motor manufacturer for the maximum allowable frequency of the motor when operating beyond base frequency.

† Motor constants might need to be adjusted depending on the control mode.

** When using sensorless vector control for permanent magnet motor (PMS), contact your dealer.

†† The value is specified for the 4 poles (100% standard value) controlled by the M sensorless vector control at 60 rating. Torque characteristics may vary depending on the control mode and the motor used.

††† Monitor function is for reference only. To obtain more accurate values, apply an external device.

†††† When a driver error (E030) occurs due to the protective function, it may be resulted from the short-circuit protection, as well as damaged IGBT. Depending on the operating conditions of the inverter, an inverter error may occur instead of a driver error.

††††† Trademark

†††††† - Modbus® is a registered trademark of Schneider Electric, USA, Inc.
 - EtherCAT® is registered trademark and certified technology, licensed by Beckhoff Automation, Gernert, Germany.
 - PROFINET® and PROFINET are registered trademarks of PROFIBUS International s.r.l. (PIA).
 - CC-LINK® is a registered trademark of Mitsubishi Electric Corporation.

††††††† The storage temperature is the temperature during transportation.

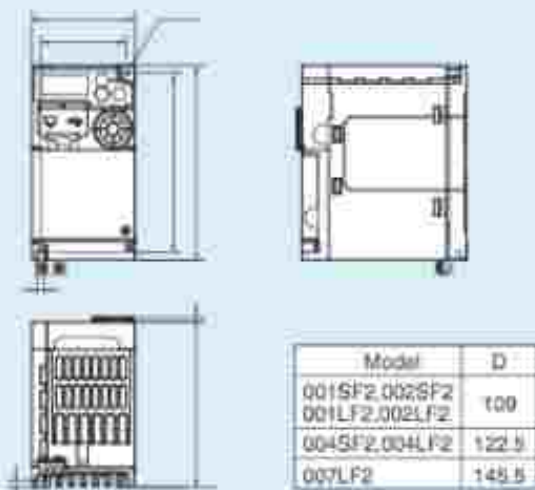
†††††††† For installation at an altitude of 1000m or more, the atmospheric pressure will decrease by approximately 1% for every 100m altitude increase. Apply 1% current derating from the rated current for every 100m altitude increase and conduct an evaluation test before using at an altitude of 2000m or more, please contact HILTI Inverter distributor.

††††††††† The standard information on the company specifications and this document is as of March 2023.

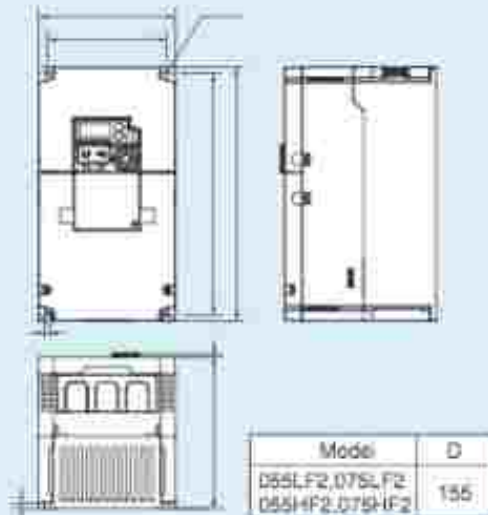
†††††††††† (Redesignated WJ200 in basic mode and WJ-G1 in extended mode).

Dimensions

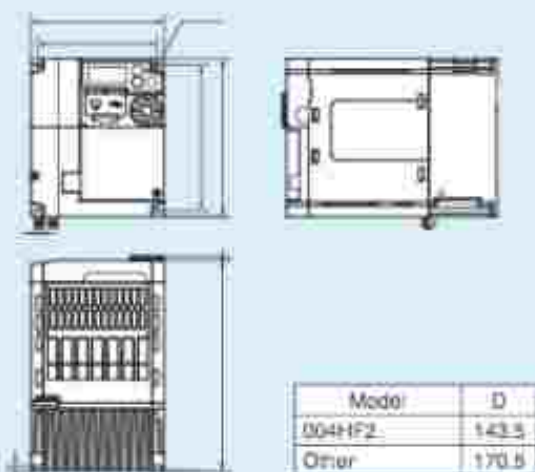
- C1-001SF2 to 004SF2
- C1-001LF2 to 007LF2



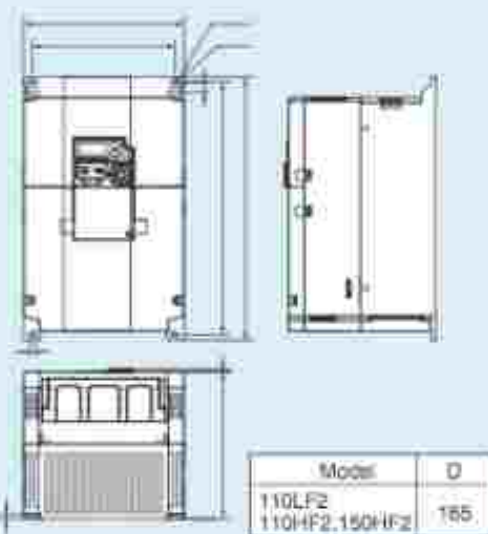
- C1-055LF2
- C1-075LF2
- C1-055HF2
- C1-075HF2



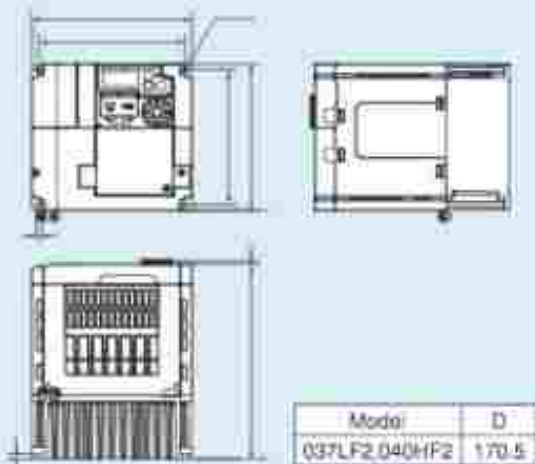
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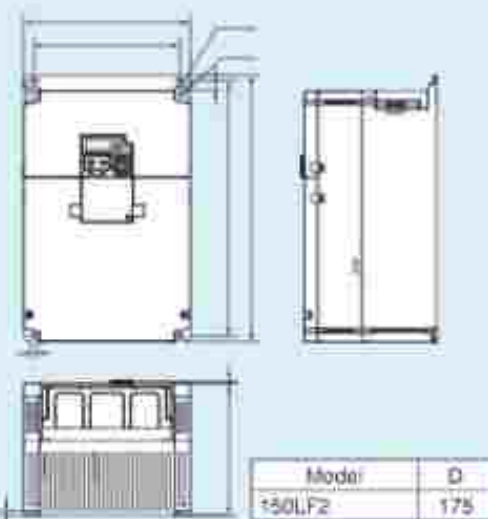
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Terminals

Terminal symbol

Terminal symbol	Terminal name
R/L1, S/L2, T/L3 (Single-phase N)	Input terminal for main power supply
U/T1, V/T2, W/T3	Inverter output terminal
PD/+1 (Single-phase-1), P/- (Single-phase-1)	DC link choke connection terminal
P/+ (Single-phase-1), PB	External braking resistor connection terminal
N/- (Single-phase-1), N+/- (Single-phase-1)	Regenerative braking unit connection terminal
0 (GND)	Inverter ground terminal

Main circuit terminal block arrangement

Models	Screw size	Terminal arrangement
001SF2 to 004SF2, 001LF2 to 007LF2	M3.5	Figure 1
007SF2 to 022SF2, 015LF2 to 007LF2, 004HF2 to 040HF2	M4	Figure 2
055LF2, 075LF2, 055HF2, 075HF2, 110LF2, 110HF2, 150HF2, 150LF2	M6	Figure 3

Terminal Arrangement

Figure 1: 001SF2 to 004SF2 / 001LF2 to 007LF2

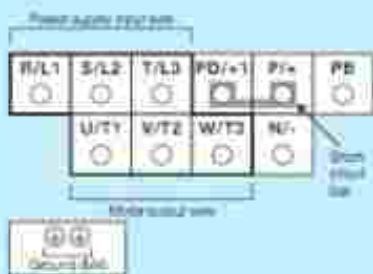


Figure 2: 007SF2 to 022SF2 / 015LF2 to 007LF2 / 004HF2 to 040HF2

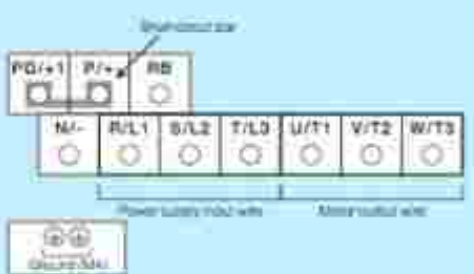
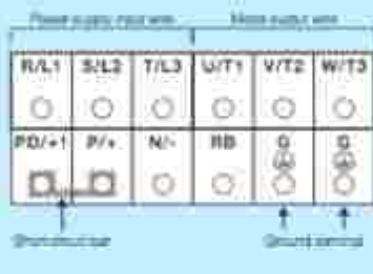
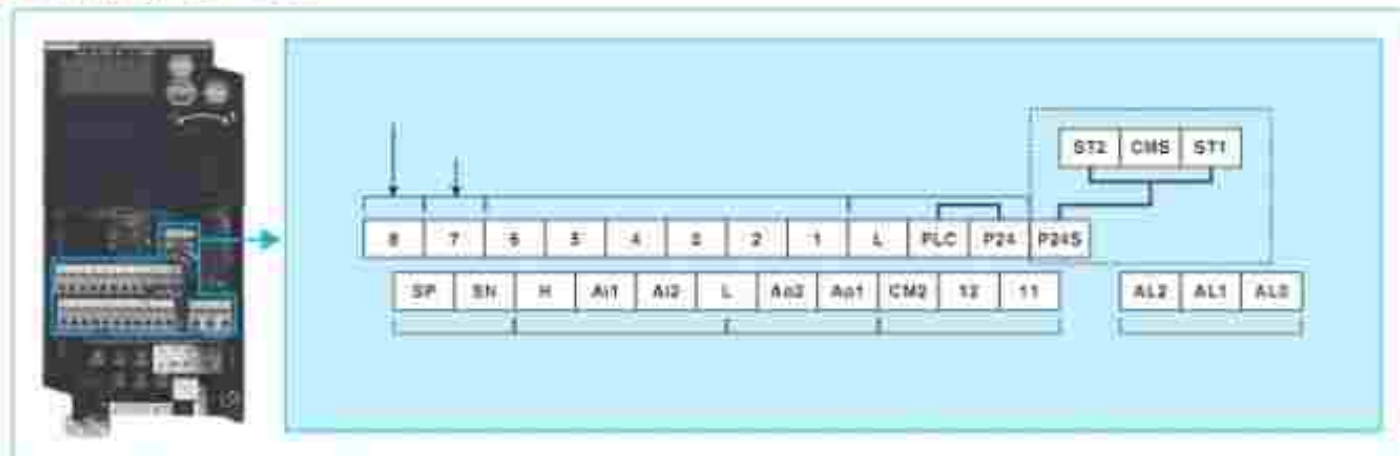


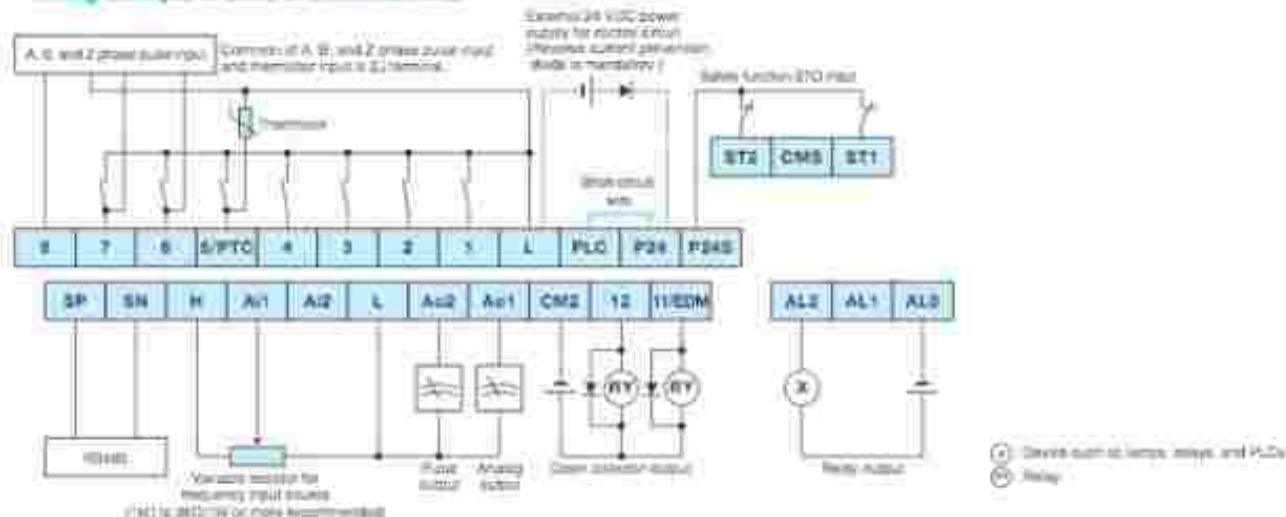
Figure 3: 055LF2, 075LF2, 055HF2, 075HF2, 110LF2, 110HF2, 150HF2, 150LF2



Control circuit terminal block



Wiring example of control circuit terminal




• Terminal symbol

Item	Terminal symbol	Terminal name	Description	Electrical characteristics	
Analog output	Power supply	L	Common for input signal	Common terminal for internal power supply, input terminal (1) to (3), analog input/output and pulse output terminals.	—
		H	Power supply for frequency setting	This is a 15 VDC power supply. It is used when using analog input terminals and variable resistor for speed setting.	Maximum allowable output current: 10 mA
	Analog input	AI1	Analog input 1 (Voltage/Current input)	Analog voltage/current input terminal. Analog input/output ratio can be selected by parameter setting. • Analog voltage input 0 to 10 VDC voltage input. It is adjusted at the factory to match the maximum frequency at 5.0 VDC input. • Analog current input 4 to 20 mA current input. It is adjusted at the factory to match the maximum frequency at 12.8 mA input.	Input impedance: Approx. 100 Ω Allowable input voltage range: -0.3 to +12 VDC
AI2		Analog input 2 (Voltage/Current input)	When "Thermistor type selector" (CA-40) set to "PTC (01)", (8) terminal is for external thermistor input. An external thermistor is connected between this terminal and the (5) terminal to trip the inverter due to a temperature error. Regardless of the sink or source logic, the common is the (5) terminal.	Input impedance: Approx. 100 Ω Allowable input current range: 0 to 24 mA	
Thermistor input	8 (PTC)	External thermistor input	When "Thermistor type selector" (CA-40) set to "PTC (01)", (8) terminal is for external thermistor input. An external thermistor is connected between this terminal and the (5) terminal to trip the inverter due to a temperature error. Regardless of the sink or source logic, the common is the (5) terminal.	PTC type	
Digital input	Power supply	L	Common for input signal	Common terminal for internal power supply, input terminal (1) to (3), analog input/output and pulse output terminals.	—
		PS4	Power supply terminal for input signal	24 VDC internal power supply terminal for contact input. Common to source logic input. By supplying external 24 VDC to this terminal, it is possible to operate only the contact input and parameter can be re-written. When an external power supply is connected, be sure to connect a thermal fuse protection device.	Maximum allowable current: 100 mA
		PLC	Intelligent input common	Sink logic short-circuit to (PS4) terminal. Source logic short-circuit to (L) terminal. When driving the contact input with an external power supply, remove the short-circuit wire. See P18 Connecting the Intelligent Input terminals to a programmable controller for more information.	—
	Contact input/Pulse input	1	Intelligent input	Each terminal function can be selected by parameter setting for each terminal. Both sink and source logic are supported. See P18 Connecting the Intelligent Input terminals to a programmable controller for more information.	Voltage between each input and (PLC) ON voltage: Min. 15 VDC OFF voltage: Max. 3 VDC Maximum allowable voltage: 27 VDC Load current: 5 mA (at 27 VDC) Internal resistance: 4.7 kΩ
		2	Intelligent input/Pulse input 2	When 2-phase pulse input is required for homing function or home search function, set "Pulse input 2" in "Input terminal 2" function (CA-07).	Input pulse: Minimum: 0.3 Hz to maximum: 32 kHz (27V - (PLC) voltage)
		7	Intelligent input/Pulse input (2-Direction) signal	When "Pulse input target function selection" (CA-90) is other than "Disable (00)", (7) terminal is for 2-phase pulse input or direction terminal for single-phase pulse input. When (CA-90) is "Disable (00)", (7) terminal is intelligent input terminal.	ON voltage: Min. 15 VDC OFF voltage: Max. 3 VDC Maximum allowable voltage: 27 VDC Load current: 5 mA (at 27 VDC) Internal resistance: 4.7 kΩ
		8	Intelligent input/Pulse input (4-Phase) pulse input	When "Pulse input target function selection" (CA-90) is other than "Disable (00)", (8) terminal is for 2 to 24 VDC pulse input. When (CA-90) is "Disable (00)", (8) terminal is intelligent input terminal. (Note that the internal circuit is different from input terminal (1) to (7).)	Input pulse: Minimum: 0.3 Hz to maximum: 32 kHz (24 - (PLC) voltage) ON voltage: Min. 4 VDC OFF voltage: Max. 1 VDC Maximum allowable voltage: 27 VDC Internal resistance: 11 kΩ
	Open collector output	11 12	Intelligent output	Each terminal function can be selected by parameter setting for each terminal. Both sink logic and source logic are supported. See P18 Programmable Controller for more information.	Open collector output Between each terminal and (CM2): Maximum allowable voltage: 27 VDC Maximum allowable current: 50 mA Voltage drop when turn ON: 4 VDC or less
CM2		Common to intelligent output	Common terminal for output terminal (11) and (12)	Maximum allowable current: 100 mA	
Relay output	ALC AL1 AL2	Intelligent relay output	1/2 contact output. Terminal function can be selected by parameter setting. (The default setting is alarm output.)	Maximum contact capacity: (AL1) - (PLC): 250 VAC 2 A (resistive), 0.2 A (inductive load) 30 VDC 3 A (resistive), 0.5 A (inductive load) (AL2) - (PLC): 250 VAC 1 A (resistive), 0.2 A (inductive load) 30 VDC 1 A (resistive), 0.2 A (inductive load) Minimum contact capacity: 100 VAC, 10 mA 5 VDC, 100 mA	
			—	—	
Monitor output	AO1	Analog output (Voltage/Current output)	Analog voltage/current output terminal. Analog voltage/current output can be selected by parameter setting. • Analog voltage output The monitor value selected by the parameter is output as 0 to 10 VDC. • Analog current output The monitor value selected by the parameter is output as 4 to 20 mA.	<ul style="list-style-type: none"> In the case of voltage output: • Max. allowable output current: 20 mA • Output voltage accuracy: ±1% (ambient temperature: 25°C ±10°C) In the case of current output: • Allowable load impedance: 200 Ω or higher • Output current accuracy: ±1% (ambient temperature: 25°C ±10°C) 	
			AO2	Analog voltage output/Digital pulse output	Analog voltage/digital pulse output terminal. Analog voltage/digital pulse output can be selected by parameter setting. • Analog voltage output The monitor value selected by the parameter is output as 0 to 10 VDC. • Digital pulse output The monitor value selected by the parameter is output as 10 VDC pulse signal.
Serial communication	3P EN	RS485 communication	RS485 (pair to Modbus-RTU/RS485). To connect the signal ground of the external control device, use (5) terminal.	Maximum baud rate: 115.2 kbps Built-in terminal resistance: 100 Ω Switched by dip switch 3P: RS485 differential (+) signal 5P: RS485 differential (-) signal	
Safety function	PS4S	24 VDC output	24 VDC power supply terminal dedicated to (ET) / (ST) terminals.	Maximum output current: 100 mA	
	CM5	Common to PS4S output	Common terminal for (PS4S)	—	
	S71 S72	STO input 1 STO input 2	STO input terminal.	(S71) - (CM5) voltage ON voltage: Min. 15 VDC OFF voltage: Max. 5 VDC Maximum allowable voltage: 27 VDC Load current: 5.0 mA (at 27 VDC) Internal resistance: 4.7 kΩ	
11 (EDM)	STO Slave Monitor Output	When EDM function switch is turned on, output terminal (11) switches to the EDM signal output terminal.	Open collector output (EDM) - (CM5) Maximum allowable voltage: 27 VDC Maximum allowable current: 50 mA Voltage drop when turn ON: 4 VDC or less		

Operation

Keypad Description

WJ-C1 can be operated easily using the keypad.



LED for unit and status

- MENUS:** ON while display minor value. (RED)
- RUN:** ON while the inverter output is ON and while in RUN mode during ramp down. Also, blinks when the inverter is not possible to RUN such when given a 2Hz RUN command.
- AL:** ON while the inverter trip is active. (RED)
- PWD:** ON while the inverter is ready for parameter editing. (GREEN) Blinks during warning.
- Fc:** ON while display frequency data. (GREEN)
- A:** ON while display current data. (GREEN)
- PWR:** ON while the power input to the inverter. (GREEN)

7 segment LED display (5 digit)

RUN key enable LED: ON while the inverter is ready to RUN from RUN key of the keypad. (GREEN)

Key operation

- RUN:** is to run the motor from keypad.
- STOP/RESET:** is to stop the motor from keypad. It is to reset a 5-pass alarm.
- Esc:** is to change the function code group or is to cancel the current situation.
- JOG dial:** is to move up or down the selection.
- SET:** is to confirm the change or is to save the edited parameter.

JOG dial

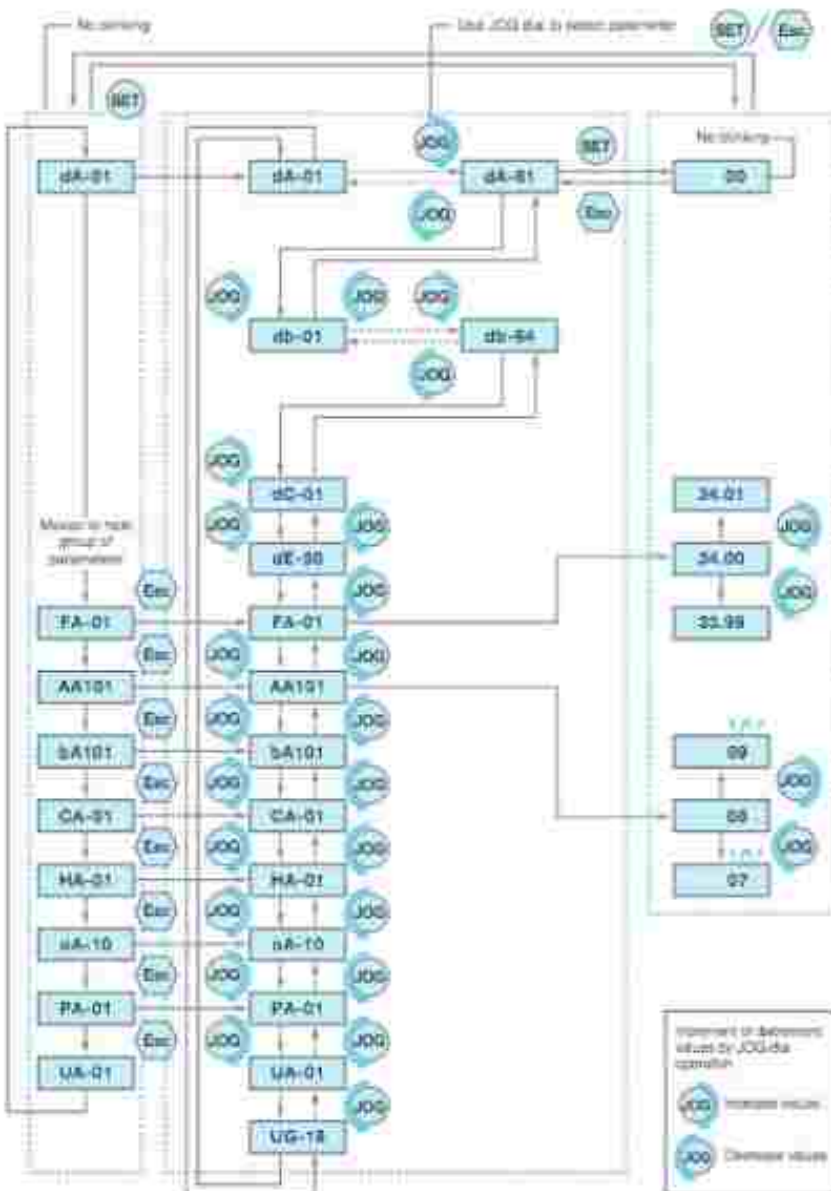
SET

USB connector

RJ45 connector

Function code structure and keypad navigation map. (Extended mode)

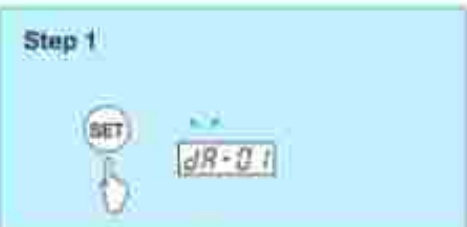
The JOG dial operation and navigation map are shown in the figure below.



Single-edit mode operation

To use the single-edit mode on WJ-C1, press longer (more than 3 sec.) the SET key. The figure below shows the operation method.

Step 1



Step 2

The blinking digit is moved by the SET and Esc keys right and left. Use JOG dial to change the value of the digit.



Step 3

When the least significant digit is blinking, the SET key selects that parameter.

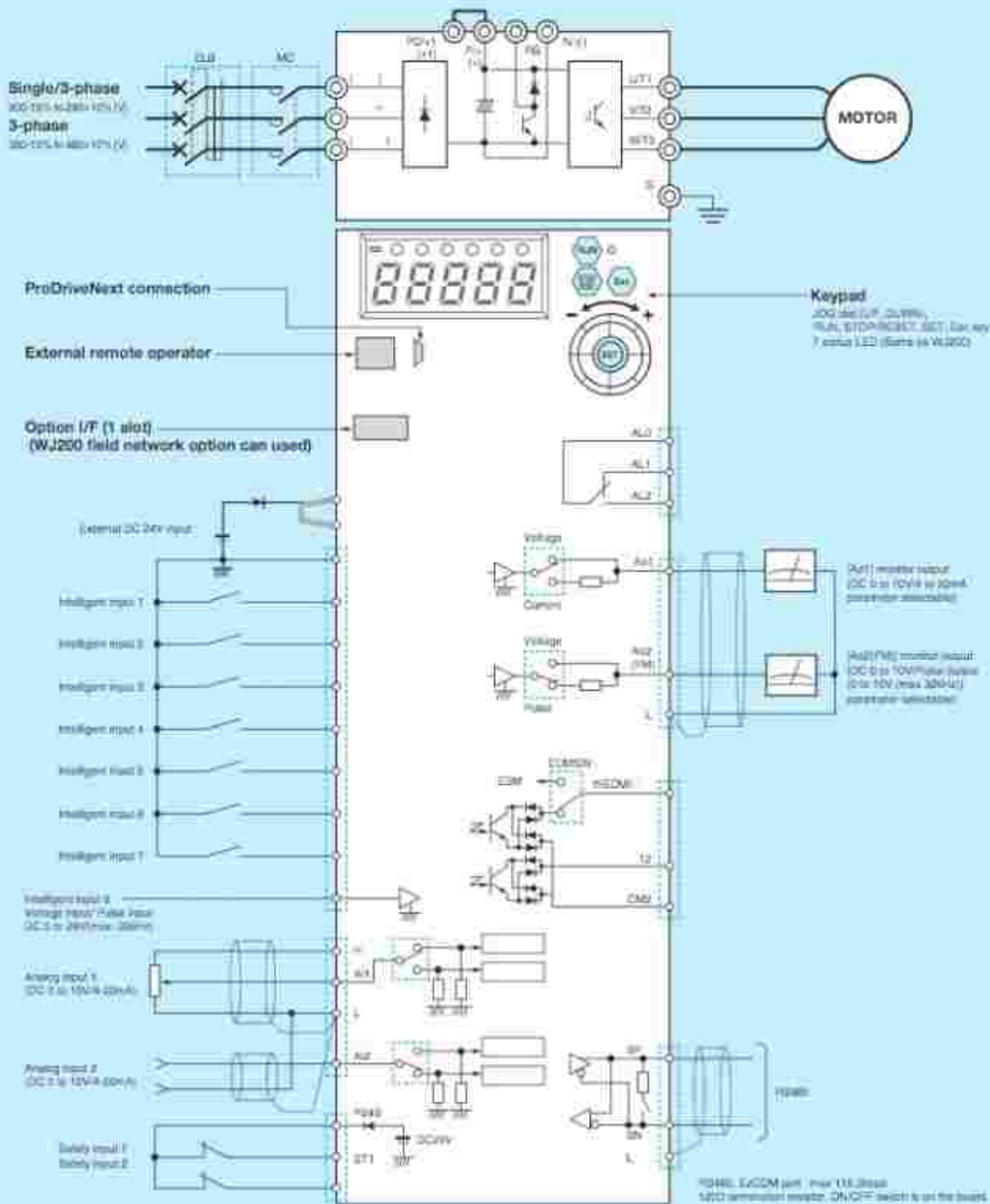


Protective Functions

Name	Cause(s)	Error Code
Over current error	Shuts off the inverter output and trips, when detecting a large output current exceeding the overcurrent level. Overcurrent level can be set by Overcurrent detection level (3b-05). If factory setting (3b-05) is set to 2.2 times the rated output current of MD rating regardless of NOCD rating setting. When a large output current exceeding the overcurrent level is detected, the inverter can perform to run for a certain number of times without tripping by the parameter setting.	E001
Motor overload error (1)	Shuts off the inverter output and trips when the electronic thermal function detects a motor overload exceeding the motor rated current. The only reset overload error and the behavior after motor overload end is changed according to the setting of the motor rated current and the electronic thermal function.	E005
Braking resistor overload error	Shuts off the inverter output and trips, when the braking resistor operation current (BRD) usage rate exceeds the usage rate specified in Dynamic brake use ratio (3a-60).	E006
Overvoltage error	Shuts off the inverter output and trips, when detecting a high DC bus voltage exceeding the overvoltage limit. Overvoltage level is approx. 400 VDC (300 V class) or approx. 600 VDC (400 V class). When a high DC bus voltage exceeding the overvoltage level is detected, the inverter can perform to run for a certain number of times without tripping by the parameter setting.	E007
Memory error	Shuts off the inverter output and trips, when the internal memory has problems. CPU error (E011) may be issued instead. The reset operation is not accepted. A power-on reset is required. When the inverter recovers by a power-on reset, make sure the parameter setting is correct.	E008
Undervoltage error	Shuts off the inverter output and trips, when detecting a low DC bus voltage below the undervoltage level to prevent the temperature control operation. Undervoltage level is approx. 170 VDC (200 V class) or approx. 345 VDC (400 V class). When a low DC bus voltage below the undervoltage level is detected, the inverter can perform to run for a certain number of times without tripping by the parameter setting.	E009
Current detector error	Shuts off the inverter output and trips, when detects abnormally on the built-in current sensor.	E010
CPU error	Shuts off the inverter output and trips, when the internal CPU has problems or malfunction.	E011
External trip	Shuts off the inverter output and trips, when the inverter receives an input from an external equipment to trip terminal error is assigned External fault (EXT).	E012
USB error	Shuts off the inverter output and trips, when the inverter power is turned ON while specified as RUN command. Unfiltered start protection function is valid when input terminal function (Unfiltered start protection (UNFP) is turned on or (URP) active selection (CA-70) is Enable (01). RUN command detection is executed for 2 seconds after the power is turned on.	E013
Ground fault error	The inverter instantly issues Non power-on, when detects the ground fault between the inverter output and the motor on power up. The system does not work while inverter type Checkpoints of the ground fault detector can be selected by Detect ground fault resistor (DGR) setting. When the setting 24 VDC power supply has been launched prior to the main power supply (E, T), the ground fault detector function is activated at the time the main power supply is turned on.	E014
Input overvoltage error	When Power supply overvoltage selection (3b-01) is Error (01), the inverter has when power overvoltage condition for more than 100 seconds while the inverter is in the status, Input overvoltage level can be set by Power supply overvoltage level setting (3a-82).	E015
Temperature detector error	The inverter trips when there is a problem in the temperature detector circuit such as disconnection.	E019
Temperature error	Shuts off the inverter output and trips, when the internal temperature is above the threshold.	E021
CPU communication error	Shuts off the inverter output and trips, when occurs a communication error in an external CPU.	E002
Input phase loss	Shuts off the inverter output and trips, when detects a phase loss of input side of main circuit. Unrecoverable of the input phase loss condition can be selected by input phase loss detection enable (3b-05) setting. The single phase inverter and all of the power when input phase loss. In this case, set 3b-05 to Death (00).	E004
Main circuit error	Shuts off the inverter output and trips, when occurs a malfunction on the main circuit board.	E023
Analog input level over error	When (A11) input selection (Cb-06) or (A4) input selection (Cb-1E) is Current (02), the inverter trips when excessive current comes into the analog input terminal (AI/A4). Power of the inverter when occurs this error, and check the wiring conduction of analog input.	E008
Over error	At the time of an instantaneous occurrence from motor or external braking resistor, or the main circuit failure the inverter turns off the output to prevent the main circuit.	E000
Output phase loss	Shuts off the inverter output and trips, when a loose connection, disconnection of output line, disconnection inside the motor, etc. are detected. Enable/disable of the output phase loss detector can be selected by Output phase loss detection enable (3b-08) setting. Detection of output phase loss is executed in the region of output frequency 5 Hz to 120 Hz.	E004
Thermistor error	Shuts off the inverter output and trips, when an abnormal temperature is observed with an external thermistor. When Thermistor type selection (Cb-42) is PTC (01), the built-in limit (L) become for external PTC type thermistor. In this case, input terminal (I1) function (CA-02) setting is invalid. The thermistor of abnormal temperature can be set by Thermistor error level (3b-70) and Thermistor gain adjustment (Cb-21). When (Cb-42) is PTC (01), this error is occurred when the external thermistor is disconnected and re-generated after trip reset. In this case, it is required to correct the thermistor or short between (I1) terminal and (L) terminal.	E005
Brake error	Shuts off the inverter output and trips, when the inverter can not detect whether the input function Answer back from brake (BRK) is ON or OFF during Brake release wait time (AP-01) (AP-1a) after the inverter has output a Brake release (BRV). When BRK is not allocated at input terminal function (CA-01) to (CA-06), this error is not occurred.	E006
Overload Error at low speed	When the inverter output power (less than 0.2 Hz), shuts off the inverter output and trips when the electronic thermal function detects a motor overload monitoring the inverter output current to prevent the main circuit failure.	E006
Converter overload error	Shuts off the inverter output and trips when the thermal protection function detects an inverter/rectifier overload limiting the inverter output current. When the converter overload error occurs, reset command can not be accepted for 10 seconds. There is no user parameter to consider (inverter) overload protection. The inverter overload protection is accepting in the low output current of MD rating. It is impossible to change the trip, and parallel overload error and the inverter after controller overload error the Motor overload error (E005). Response by setting of load loss selection (Cb-30) MD rated clearing is applied. The serial use Current limiter.	E009
Remote operator disconnection error	Shuts off the inverter output and trips, when occurs the error between optical switch control and inverter due to noise, loose connection or disconnection. Enable/disable of the output direction between optical switch control and inverter can be selected by Action selection in output direction (Cb-20) setting.	E040
RS485 communication error	Shuts off the inverter output and trips, when RS485 communication timeout occurs because of a malfunction due to noise, loose wire connection, wiring disconnection, etc. Enable/disable of the RS485 communication timeout detector can be selected by RS485 communication error selection (CP-06) setting. This error may occur even if the communication settings with the external control device do not match. In this case, the connection is not normally established and an error occurs in the host device. It is required to check the RS485 communication setting (CP-01) to (CP-06).	E041
ITTC error	Shuts off the inverter output and trips, when the RTC data incorporated in the remote operation (VCP) has returned to the initial state.	E042
ExSO inappropriate command error	Shuts off the inverter output and trips, when there is an inappropriate command in ExSO program. This error is also occurred when the ExSO program is executed despite it is not downloaded.	E043
ExSO reading error	Shuts off the inverter output and trips, when the reading the subroutines, for, next, etc. exceeds 3 times in ExSO program.	E044
ExSO terminal stopper error	Shuts off the inverter output and trips, when command can't be obtained appropriately while ExSO program is executed such as window and S-Drive.	E045
ExSO overassignment 0 to 9	Shuts off the inverter output and trips, when the user-assigned trip command is executed in ExSO program.	E050 to E059
Action error 0 to 9	Shuts off the inverter output and trips, when the inverter device errors in the action assigned on the action XF.	E060 to E069
STO shutdown error STO internal error STO path 1 error STO path 2 error	Shuts off the inverter output and trips, when the inverter detects errors in the circuit related to safety function STO.	E090 to E093
Encoder disconnection error	Shuts off the inverter output and trips, when the inverter detects an encoder wiring disconnection.	E100
Positioning range error	Shuts off the inverter output and trips, when the actual position exceeds the preset position range set by Position control range setting (forward) (AE-02) and Position control range setting (reverse) (AE-04).	E104
Speed deviation error	When Speed deviation error threshold selection (3b-40) is Error (01), shuts off the inverter output and trips when the deviation between the frequency reference and the feedback speed exceeds the deviation specified in Speed deviation error detection level (3b-6E). When this error is occurred, output terminal function Speed over detector (DSE) is turned on.	E105
Excessive speed error	Shuts off the inverter output and trips when the motor speed runs over a preset value set by Over speed detection level (3b-50) for the limit set by Over-speed detection time (3b-61).	E107
Contact error	When output terminal function Contacts check signal (CHK) is assigned as one of input terminal function (CA-01) to (CA-06), shuts off the inverter output and trips when (CHK) is not turned on/off for the time set by Contacts response check time (AP-13) after activation of Contacts check signal (CHK).	E110
PID soft start error	Set an PID soft start error detection enable (A4-01) to Enable (01) or (02), shuts off the inverter output and trips when a PID feedback value is not achieved a threshold level within the determined time. The time out trip can be set by PID soft start time (A4-63), and The threshold level of PID feedback value can be set by PID soft start error detection level (A4-52).	E120
Abnormal upper limiting error Abnormal lower limiting error	When Abnormal upper level detection action (ECS) and Abnormal lower level detecting action (LC-07) are Tri (02) or Tri after deceleration stop (02), shuts off the inverter output and trips when the value exceeds the range. Abnormal upper limiting error (E121) is generated. When the value falls below the range, Abnormal lower limiting error (E122) is generated.	E121, E122

* When Electronic thermal decrease function enable (3c-12) is Enable (00), the inverter does not accept a reset operation for 10 seconds. Reset for a while before performing a reset operation after (3c-12) is Enable (Lower deceleration) (01) or Enable (Time constant deceleration) (02). Stop for reset immediately after error occurs. However, the feedback accumulated value is not cleared, and the value continue to decrease after reset operation. Therefore, when the inverter is restarted immediately after reset operation, the inverted accumulated value may directly reach 100% and the error may occur again. In this case, wait for a while before restarting.

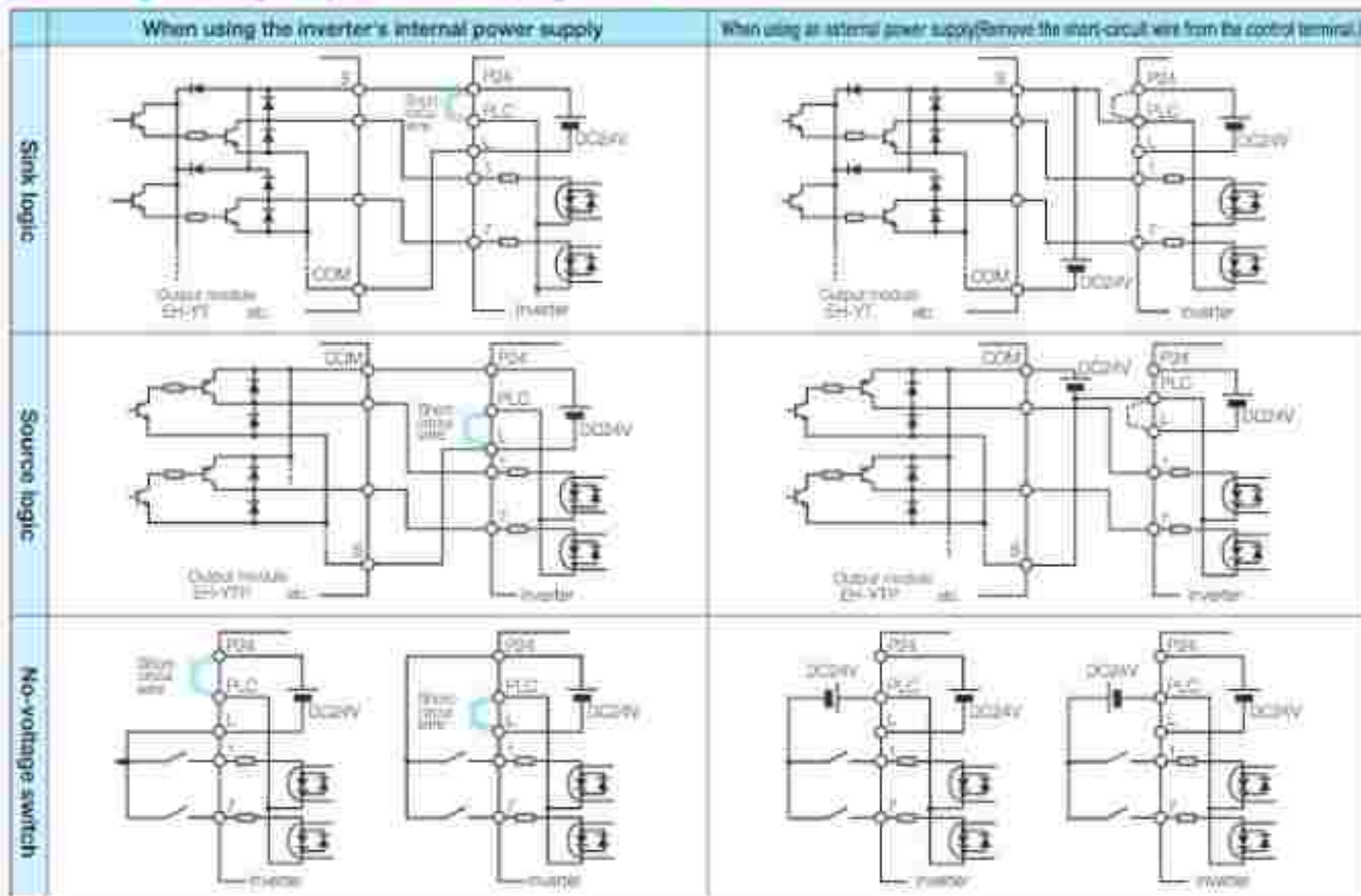
Connecting Diagram



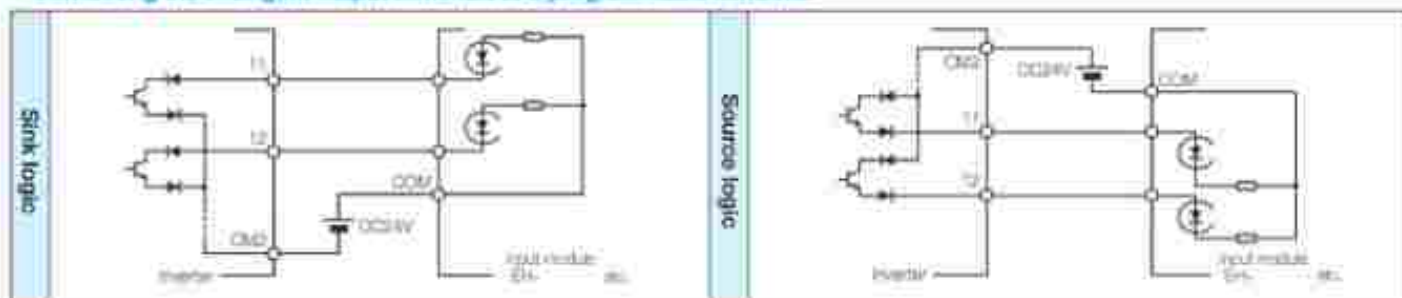
(*) The single-phase model does not have 3LL2 terminal.
 STC Slave Monitor Output is enabled by EXM0N.
 The pulse input sensitive (P/L/A, P/L/B, P/L/C) for A, B, C phase signal, sensibly design as a normally closed or common P-Mode figure.
 (j) Monitor functions In (1) are not initial values, except A02(PM) terminal.
 When enable the fan-cooling function, Thermistor Input(PID) can only be assigned to the right terminal.

Connecting to PLC

Connecting the intelligent input terminals to a programmable controller

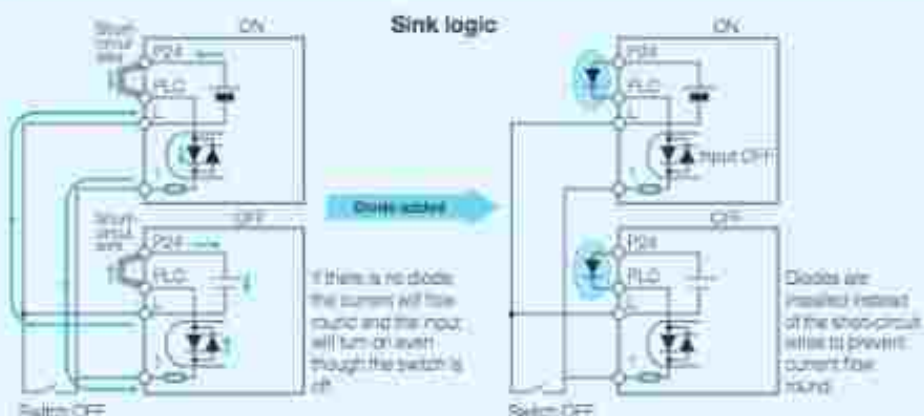


Connecting the intelligent output terminals to a programmable controller

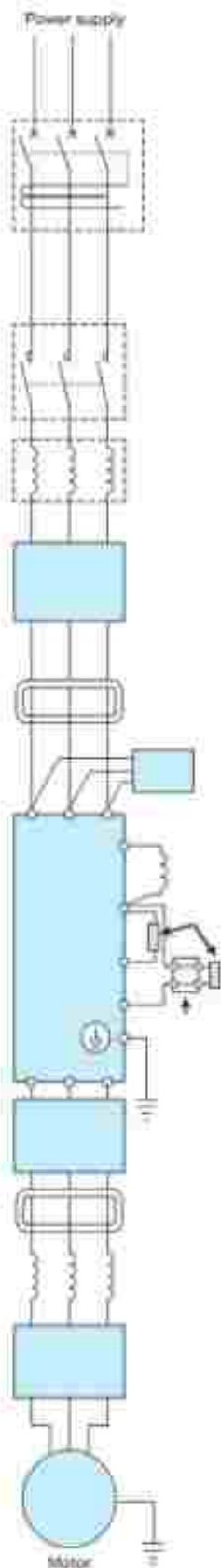


Cautions when using multiple inverters

If a common input (switch, etc.) is used for multiple inverters and the timing of power-on is different, the current may run around as shown in the figure on the right, and it may be recognized as ON even if the input is OFF. In that case, be sure to insert a diode (rated 50 V/0.1 A) in the positions shown in the figure to prevent the current flow round. For the source logic, refer to the User's Guide.



Wiring and Accessories



Voltage (V)	Inverter capacity (kW)	Motor (1/2HP)	Wiring				Applicable equipment									
			Main cable terminal block wiring (AWG (mm ²))	Terminal block size (Terminal block width)	Cable terminal Power/Ground	Terminal block size (Power/Ground (Power/Ground))	Earth-leakage breaker (ELB)	Magnetic contactor (MC)	Earth-leakage breaker (ELB)	Magnetic contactor (MC)	Thermal relay	Terminal block				
			Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)	Earth-leakage breaker (ELB)				
Star-Point 200V	0.1	0.075	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.2	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.4	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.75	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	1.1	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	2.2	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
Three-phase 200V	0.1	0.075	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.2	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.4	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.75	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	1.1	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	2.2	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
Three-phase 400V	0.4	0.075	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	0.75	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	1.1	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	2.2	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	3.7	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	5.5	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	7.5	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	11	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	15	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0
	22	0.09	AWG18(0.75)	30x17(2mm)	30x17(2mm)	3.0-1.2(1.5-1.0) 4(1.5)	20-30	2	H-C	H-C	20-30	2	H-C	H-C	24	FRN200-0

Caution

- The applicable devices shown in the tables are those when the main circuit is protected by a 3-phase 4-wire 100V induction motor (400V) with 20 kW and 40 W is used.
- For the circuit breaker, choose an appropriate device by taking wiring capacity into consideration. (Use an inverse-time type.)
- To ensure safety, use an earth-leakage breaker (ELB).
- Use a 10C reactor and 0.1F reactor.
- If the wiring length exceeds 20 m, a 10C reactor is recommended to be used.
- Use 0.1F reactor for radio noise filter.
- When the wiring length is specified longer, noise (lightning) may cause a short circuit of the IGBT. Careless lightning may damage the terminal block or inverter.
- Always always remove a short for earth-leakage breaker (ELB) (Wiring of 10C reactor wiring length between the inverter and the motor. Also use an inverse-time type earth-leakage breaker. High current type products may malfunction).
- Leakage current is approx. 20mA when IGBT and 10C reactor are used and added with a photo tube.
- As the main circuit of the wire is high, the leakage current of 10C wire increases by about 8 times that of 0.1F wire.
- Therefore, use an earth wire (earth-leakage current) that is added on the upper right. If the total wiring length exceeds 100 m, use a 0.1F wire.
- Be careful with the UL standard. Class 1 (hardway) type is permitted for Class 1 UL standard circuit as approved by the power supply side.

Total wiring length	Capacity subject (kVA)
100 m or shorter	30
200 m or shorter	100
300 m or shorter	200

No.	Name	Function
1	Wire	
2	Earth-leakage breaker (ELB)	Refer to table of the recommended wire (diameter and wiring type)
3	Magnetic contactor (MC)	
4	Input-side AC reactor (for harmonic suppression, power factor improvement)	This is applied as a countermeasure against harmonic suppression, in which inductance of power supply voltage is 3% or above, or when power supply capacity is 500 kVA or above. It is also used when a radio change is made to power supply voltage. It is also effective in improving power factor.
5	Inverter noise filter	This reduces conducted noise generated from the inverter and transmitted through the wires. Connected to the primary side (input side) of the inverter.
6	Radio noise filter (Zero-phase reactor)	When the inverter is used, noise may be generated on an adjacent radio or other devices through wiring on the primary side (input side) of inverter. This is used for reducing the noise (reducing radiation noise).
7	Input-side radio noise filter	This reduces the radiation noise that is emitted from the wire on the input side.
8	DC link choke	This suppresses harmonics generated from the inverter.
9	Braking resistor	This is used for increasing the braking torque of inverter, repeating power on and off at high interval, or reducing the speed of high load caused by moment of inertia.
10	Regenerative braking unit	
11	Output-side noise filter	This is installed between the inverter and motor to reduce the radiation noise that is emitted from the wire. It is used to reduce radio interference on radio or television or prevent malfunctioning of measurement instruments and sensors.
12	Radio noise filter (Zero-phase reactor)	This is applied for reducing noise generated on the output side of inverter. It can be used on both input side and output side.
13	Output-side AC reactor for reducing vibration/preventing malfunctioning of thermal relay	When a general-use motor is driven by the inverter, compressed with or without it is run by commercial power supply, large vibration may be generated. By connecting the device between the inverter and motor, the vibration of motor can be reduced. Also, if the wiring length between the inverter and motor is long (10 m or longer), by installing a reactor, malfunctioning of the thermal relay caused by harmonics attributable to winding of inverter can be prevented. It is also possible to use a current sensor instead of a thermal relay.
14	LCR filter	This is an output-side sinusoidal filter to be installed between the inverter and motor to improve output current and voltage waveform to reduce motor vibration, noise, and radiation noise from motor. It is also effective in suppressing surge voltage.

Differences from WJ200

Item		WJ200	WJ-C1
Control method		V/f control Sensorless vector control PM sensorless vector control (synchronous start type)	V/f control IM sensorless vector control Sensorless vector control with encoder PM sensorless vector control (synchronous start type)
Keypad	Display	4-digit LED indication	5-digit LED indication
	Operation	Up/down button	JOG dial
Rated input voltage	200V	200 to 242V -15%~+10%	200 to 242V -15%~+10%
	400V	380 to 480V -15%~+10%	380 to 480V -15%~+10%
Mounting dimensions		Compatible with WJ200	
Max frequency	V/f	400Hz	500Hz
	Sensorless (IM)	400Hz	500Hz
	Sensorless (PM)	400Hz	500Hz
Control Circuit Terminals	Input terminal	7 terminals	8 terminals
	Frequency setting	2-terminal D (Voltage) / Cr (Current)	2-terminal A1/A2 (Voltage/Current selectable)
	Monitor output	2-terminal AM (Voltage) / EO (Pulse)	2-terminal Ap1 (Voltage/Current selectable) / Ao2 (Voltage/Pulse selectable)
LSE connector		Mini-B	Micro-B
Functional safety		STO/Safe torque off function EN 61800-5-2:2017, EN 61508part 1-7:2010 EN ISO 13849-1:2015, EN ISO 13849-2:2012	STO/Safe torque off function EN 61800-5-2:2017, EN 61508part 1-7:2010 EN ISO 13849-1:2015, EN ISO 13849-2:2012
Communication function	Built-in terminal resistor	200Ω	120Ω
Record Number of Trip History		8 times	10 times
Simulation Mode		None	Available
Gain Mapping		None	Available
PID function		One system	Independent 2 systems, soft start function, sleep function
Multi-stage acceleration/deceleration		None	Available
Number of Trip letters		3 times	3 times
Contactor control		None	Available
Life warning	Power module	None	Available
	Inrush current limit circuit	None	Available
Emergency-stop drive mode		None	Available
Tracing function		None	Available
Input/output phase loss limit		None	Available
Overcurrent protection level		Fixed	Variable (parameter setting)
Speed command compensation with encoder		V/f control	V/f control IM sensorless vector control
Non-steady detection function		None	Available
Pulse input		Pulse-input A max. 32kHz Pulse-input B max. 2kHz	Pulse-input A max. 32kHz Pulse-input B max. 32kHz
Z phase input		None	Available
Parameter system		Basic mode	Basic mode/extended mode
Emergency stop		OPE-DR min OPE-DR, SBK WOP	OPE-DR min (Basic mode) OPE-DR, SBK (Basic mode) WOP (Basic mode) VOP/Extended mode

Communication Option

WJ-ECT
WJ-PB
WJ-PN

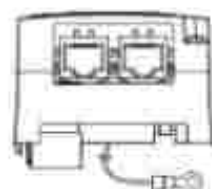
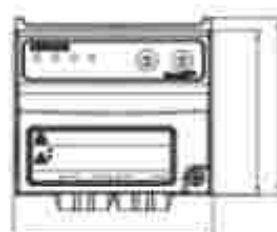
EtherCAT Communication Module (WJ-ECT) / PROFIBUS Communication Module (WJ-PB) / PROFNET Communication Module (WJ-PN)CC-Link(WJ-CL)

• Specifications

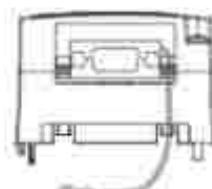
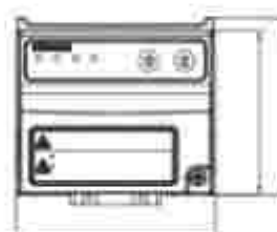
Item		Specification	
EtherCAT OPTION (WJ-ECT)	Communication protocol	EtherCAT CiA402 Drive profile	
	Physical layer	100BASE-TX (IEEE802.3)	
	Connector	RJ45 (In / Out)	
	Communication distance	Distance between nodes (between devices) : 100 (m) max.	
	Station address	1 to 99 : Set by the address setting switch, 1 to 85528 : Set by configuration (The station address setting depends on the addressing mode used by the EtherCAT master.)	
	Distributed stack	Free run mode (asynchronous)	
	Process data	PDO file mapping	
	Melco (CoE)	Emergency messages, SDO requests, SDO responses, Abort SDO	
	CiA402 drive profile	Velocity mode	
PROFIBUS OPTION (WJ-PB)	Communication protocol	PROFIBUS DPV0/PROFIBUS DPV1	
	Connector, Cable	D-sub 9 pin, PROFIBUS DP cable (2x 50 (m) pair 5-2 as Cable Type A)	
	Node address	0 to 99 : set by (copy) switches 0 to 128 : set by parameters	
	Profile PROFDrive	Version	4.2
		Application class	ACT (Standard Drive)
		Telegram	Standard telegram 1 (WJ-PB telegram 103 (same as PPO3) / WJ-PB telegram 104 (same as PPO4) / WJ-PB telegram 105 (see PPO5)
		Telegram output	From P150 to P179 parameters
		Operating mode	Speed control mode
	Jogging	Only jogging 1 is supported	
PROFNET OPTION (WJ-PN)	Communications protocol	protocol PROFNET IO-Link2.32	
	Device type	PROFNET IO Device	
	Conformance class	B	
	Physical	DCP, LLDP, SSWP, MTP	
	Network	1	
	RT / RTT	only RT	
	Physical layer	Auto negotiation (100BASE-TX (IEEE802.3) only)	
	Connector	RJ45 (Port 1 / 2)	
	MAC address	3 (Host, Port 1 / 2)	
	Recommended cable	100BASE-TX supported (category 5e or higher). STP cable (straight or cross allowed)	
	Communications distance	Distance between nodes: 100 (m) max.	
	Profile PROFDrive	Version	4.2
Application class		ACT (Standard Drive)	
Telegram		Standard telegram 1 (WJ-PN telegram 103 (same as PPO3 of PROFDrive version 2) / WJ-PN telegram 104 (same as PPO4 of PROFDrive version 2) / WJ-PN telegram 105 (see PPO5 of PROFDrive version 2)	
Telegram output		From P150 to P179 parameters	
Operating mode		Speed control mode	
Jogging	Only jogging 1 is supported		

Dimensions

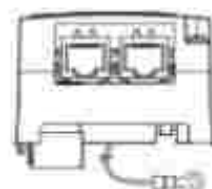
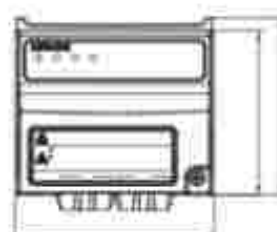
• EtherCAT WJ-ECT



• PROFIBUS WJ-PB



• PROFNET WJ-PN



Communication Option

WJ-CCL

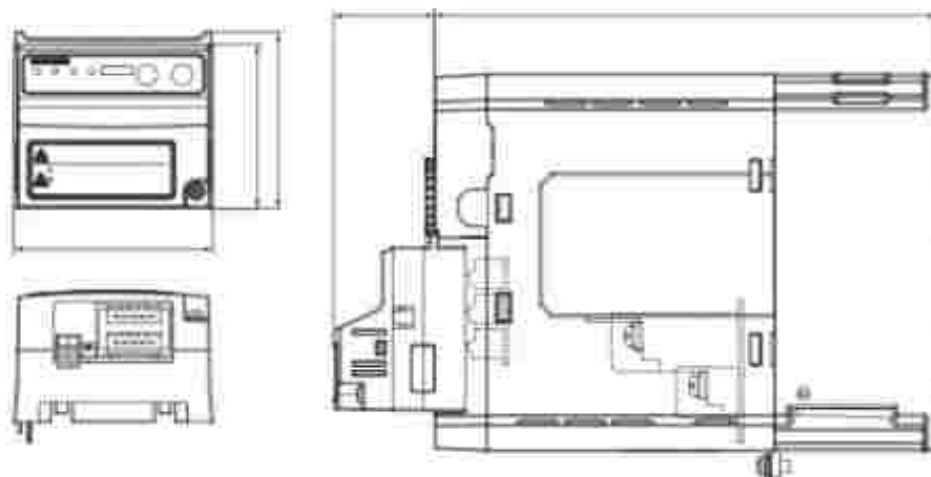
Item	Specification
Shape	Cabinet unit (can be reworked later), connector connection
Power supply	DC24V and DC5V are supplied from inverter. Power is supplied from the external 24V input connector and parameters of WJ-CCL and inverter can be set. However, if the inverter cannot be operated.
Wire size	0.14 to 1.5mm ² (2B to 16AWG) applies to external 24V input connector.
Ambient temperature	0 to 50°C Other general specifications is accordance with inverter.
24V control power supply current	320mA (Consider separately when using an external device via the inverter-controlled terminal.)
Station type	Remote device station
Communication speed	10M5M2.5M25k15kbits (Communication speed is selectable by DIP switch.)
Station number	1 to 64 (Station number is selectable by the rotary switch.)
CC-Link Ver.	1 (1.00 and 1.10), 2 (CC-Link Version is selectable by DIP switch.)
Extended cycle setting	Single, double, quadruple, and octuple (Setting is selectable by DIP switch.)
Communication method	Broadcast polling method
Synchronization method	Frame synchronization method
Encoding method	NRZ
Transmission path format	Path format (ISA RS485 compliant)
Transmission format	HDLC compliant
Error control system	CRC (K ² + X ² + X + 1)
Number of Occupied station	1 station fixed
Number of link points	FX, FX32 points Single: R/W: 4 points / RW: 4 points Double: R/W: 8 points/RW: 8 points Quadruple: R/W: 16 points/RW: 16 points Octuple: R/W: 32 points/RW: 32 points
Number of connected units	Up to 64 units (Number of connected units is depending on the device to be connected. Up to 42 units when only WJ-C1 is connected.)
Connection cable	CC-Link dedicated cable Ver. 1.10, CC-Link dedicated high flexible cable for Ver. 1.10, CC-Link dedicated cable
Terminal resistance	110 Ω (normally used) or 100 Ω can be selected by the terminal resistance switch (DIP switch)

Connector	Manufacturer	Model	Number of accessories
CC-Link connector	3M Japan Limited	35605-6206-90MDF	2 pieces
External 24V input connector	Phoenix Contact GmbH & Co. KG	MC 1.5/2-ST-3.5	1 piece

Connector	Symbol	Signal Type	Covering Color
CC-Link connector	DA	Communication data High	Blue
	DB	Communication data Low	White
	DD	Signal ground	Yellow
	(NC)	-	-
	SLD	Shield	(Shield)
External 24V input connector	24V	External 24VDC power	-
	L	External power supply common	-

Dimensions

• WJ-CCL



When mounting the communication option (WJ-C1, WJ-C) (Depth) dimension is increased by 37mm. Take care when the communication option WJ-C1 is installed in the cabinet.

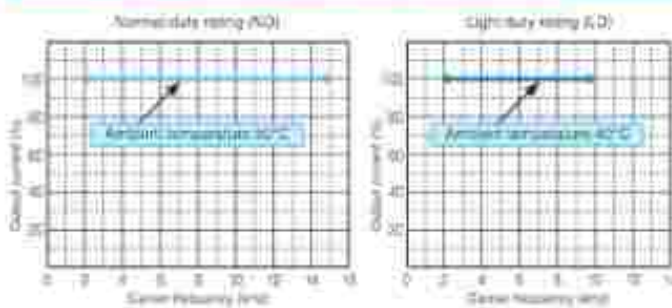
Current Derating

Derating necessity table

Single-phase 200 V	Required	Three-phase 200 V	Required	Three-phase 400 V	Required
C1-0015F2	-	C1-001LF2	-	C1-004HF2	↓
C1-0025F2	-	C1-002LF2	↓	C1-007HF2	↓
C1-0045F2	↓	C1-004LF2	-	C1-015HF2	-
C1-0075F2	↓	C1-007LF2	-	C1-022HF2	-
C1-0155F2	-	C1-015LF2	-	C1-032HF2	-
C1-0225F2	-	C1-022LF2	-	C1-040HF2	↓
-	-	C1-037LF2	↓	C1-055HF2	-
-	-	C1-055LF2	-	C1-075HF2	-
-	-	C1-075LF2	-	C1-110HF2	-
-	-	C1-110LF2	↓	C1-150HF2	↓
-	-	C1-150LF2	↓	-	-

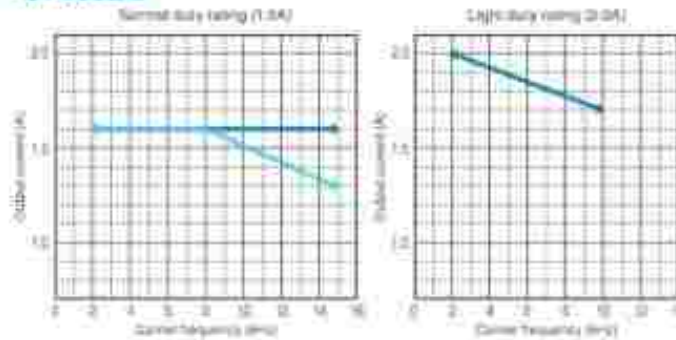
↓ Derating required - Derating not required

Models requiring no current derating

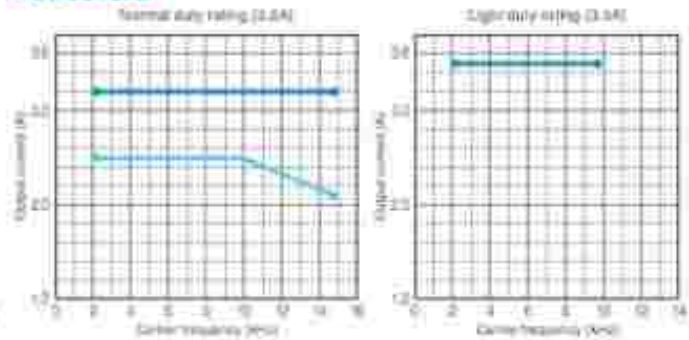


Models requiring current derating

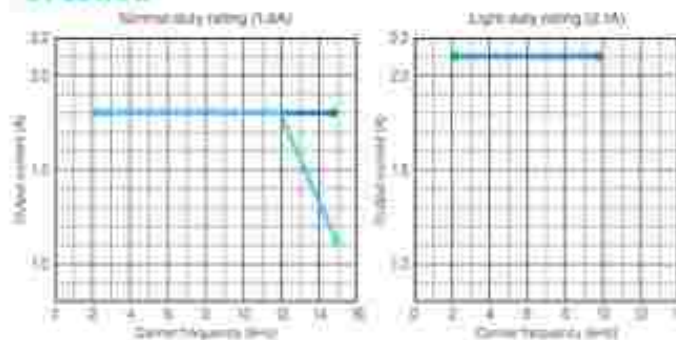
C1-002LF2



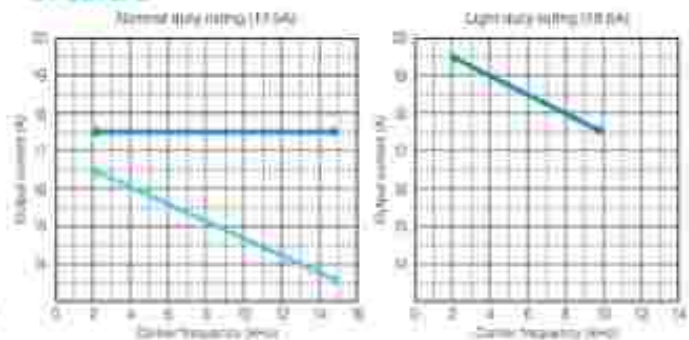
C1-0045F2



C1-004HF2



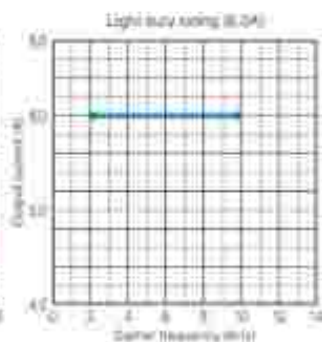
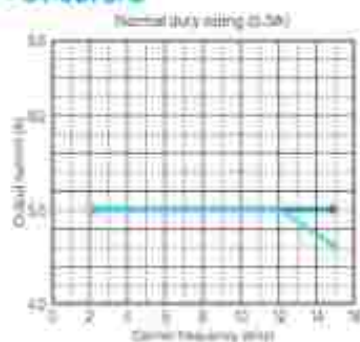
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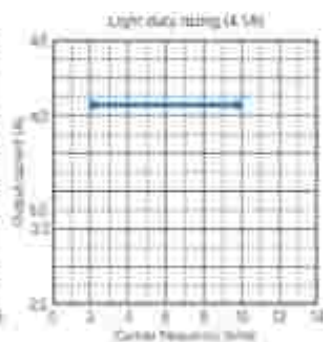
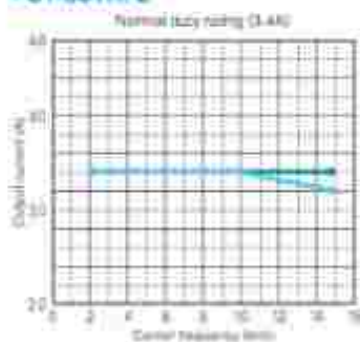
Current Derating

Models requiring current derating

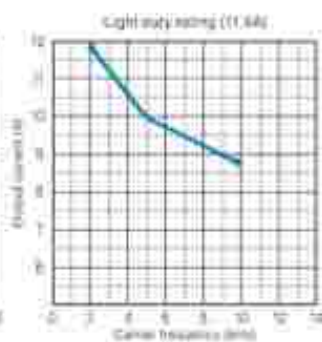
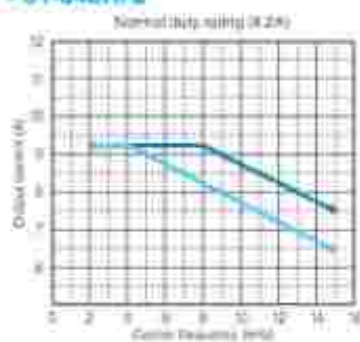
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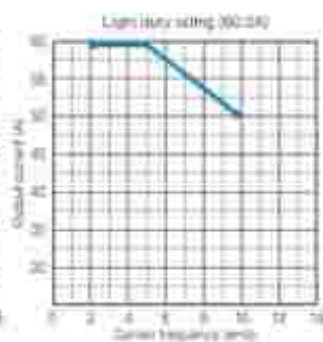
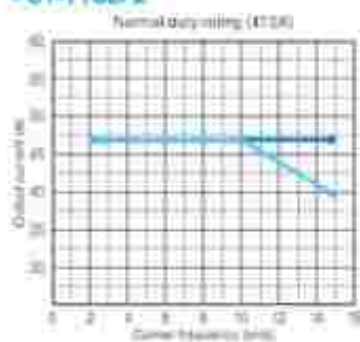
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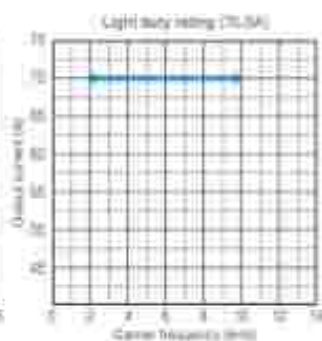
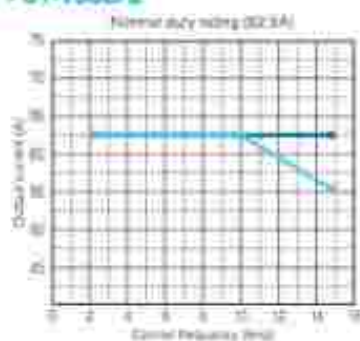
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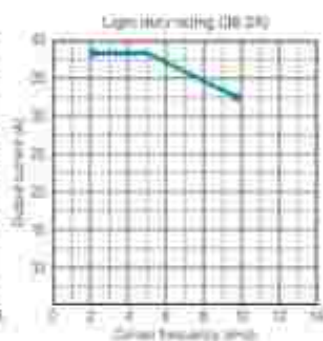
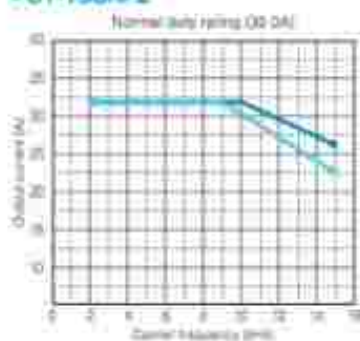
• C1-110LF2



• C1-150LF2



• C1-150HF2



Application to Motors

Application to general-purpose motors

Operating frequency	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	A general-purpose motor audible noise run by an inverter is slightly greater than it by a 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 trapezoidal 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 60Hz, 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.
Synchronous (MS) motor High-speed (HRM) motor	In most cases, the synchronous (MS) motor and the high-speed (HRM) 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.
Permanent magnet motor	Voltage is induced at the motor power terminal during motor rotation even if the inverter power supply is cut off. Therefore, please do not touch the terminals of the motor and inverter during motor rotation. PM motor can not be operated with commercial power supply. In addition, PM motor and inverter are "one to one" combination. Contact your dealer when you use PM 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 any of 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 or through the control circuit terminal. Do not operate by installing a electromagnetic contactor (MC) 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. 600Hz can be selected on the WJ series C1. However, a two-pole motor can attain up to approx. 35,400 min ⁻¹ , 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 60Hz. High frequency motors are also available in Hitachi.

Repetitive operation on starting or plugging

About frequent repetition use (crane, elevator, press, washing machine), a power semiconductor (IGBT, a rectification diode, thyristor) in the inverter may come to remarkably have a short life by thermal fatigue.

The life can be prolonged by lower a load electric current, lengthen acceleration / deceleration time, lower carrier frequency, or increasing capacity of the inverter.

Operation use in highlands beyond 1,000m above sea level

Due to the air density decreasing, whenever standard inverters are used for altitudes above 1000m, the following conditions are additionally required for proper operation. In application for operation over 2500m, kindly contact your nearest sales office for assistance.

1. Reduction of inverter rated current

Current rating has to be reduced 1% for every 100m that exceeds from an altitude of 1000m.

For example, for inverters placed at an altitude of 2000m, the rated current has to be reduced 10% (Rated current x 0.9) from its original amount. ((2000m-1000m)/100m)x-1%=-10%

2. Reduction of breakdown voltage

Whenever an inverter is used at altitude beyond 1000m, the breakdown voltage decreases as follows:

1000m or less: 1.00 / 1500m: 0.95 / 2000m: 0.90 / 2500m: 0.85. As mentioned in the user's guide, please avoid any withstand voltage test.

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 WJ series G1(ND): 10°C to 50°C, WJ series G1(LD): -10°C to 40°C. When the ambient temperature ranges 40 and 50°C, the carrier frequency and the output current must be limited depending on the load type. Please refer to the user's guide.

Main power supply

<p>Installation of an AC reactor on the input side</p>	<p>In the following examples involving a general-purpose inverter, a large peak current flows on the main power supply side, and 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 strikes 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) Abnormal 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 $V_{11} = 200V$, $V_{12} = 201V$, $V_{13} = 200V$ V_{11}: R-S line voltage, V_{12}: S-T line voltage, V_{13}: T-R line voltage</p> $\text{Unbalance factor of voltage} = \frac{\text{Max. line voltage (min.)} - \text{Mean line voltage}}{\text{Mean line voltage}} \times 100$ $= \frac{V_{11}(V_{12}+V_{13})+V_{12}V_{13}}{(V_{11}+V_{12})+V_{13}} \times 100 = \frac{200(201+200)}{202} \times 100 = 1.5(\%)$
<p>Using a private power generator</p>	<p>An inverter run by a private power generator may overheat the generator or suffer from a deformed output voltage waveform of the generator. Generally, the generator capacity should be five times that of the inverter (kVA) in a PAM control system, or six times greater in a PAM control system.</p>

Notes on Peripheral Equipment Selection

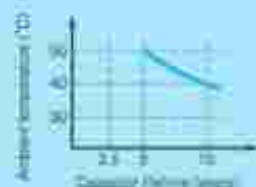
<p>Wiring connections</p>	<p>(1) Be sure to connect main power wires with R/S, L1 (Single-phase L1), S/L2, T/L3 (Single-phase N) terminals (input) and motor wires to U (T1), V (T2), and W (T3) terminals (output). (Incorrect connection will cause an immediate failure.)</p> <p>(2) Be sure to provide a grounding connection with the ground terminal (GG).</p>
<p>Wiring between inverter and motor</p>	<p>Electromagnetic contactor</p> <p>When an electromagnetic contactor is installed between the inverter and the motor, do not perform on-off switching during running operation.</p> <p>Thermal relay</p> <p>When an inverter is used with a standard applicable output motor (Hitachi standard three-phase squirrel-cage four-pole motor), a thermal relay for motor protection is not required due to the internal electronic protective function. A thermal relay, however, should be used;</p> <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. If the wiring length is 10 m or more, the thermal relay tends to turn off readily. In this case, provide an AC reactor on the output side or use a current sensor.
<p>Installing a circuit breaker</p>	<p>Install a circuit breaker on the main power input side to protect inverter wiring and ensure personal safety. Choose an inverter-compatible circuit breaker. The conventional type may malfunction due to harmonics from the inverter. For more information, consult the circuit breaker manufacturer.</p>
<p>Wiring distance</p>	<p>The wiring distance between the inverter and the remote operator should be 20 meters or less. Shielded cable should be used on the wiring. Beware of voltage drops on main circuit wires. (A large voltage drop reduces torque.)</p>
<p>Earth leakage relay</p>	<p>If the earth leakage relay (or earth leakage breaker) is used, it should have a sensitivity level of 30 mA or more (per inverter).</p>
<p>Phase advance capacitor</p>	<p>Do not use a capacitor for power factor improvement between the inverter and the motor because the high-frequency components of the inverter output may overheat or damage the capacitor.</p>

High-frequency Noise and Leakage Current

- (1) High-frequency components are included in the input/output of the inverter main circuit, and they may cause interference in a transmitter, radio, or sensor if used near the inverter. The interference can be minimized by attaching noise filters (option) in the inverter circuitry.
- (2) The switching action of an inverter causes an increase in leakage current. Be sure to ground the inverter and the motor.

Lifetime of Primary Parts

Because a DC bus capacitor deteriorates as it undergoes internal chemical reaction, it should normally be replaced every 10 years. Be aware, however, that its life expectancy is considerably shorter when the inverter is subjected to such adverse factors as high temperatures or heavy loads exceeding the rated current of the inverter. The approximate lifetime of the capacitor is as shown in the figure at the right when it is used 24 hours daily (80% ND load) JEMA standard in 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. Please plan to replace new inverter depends on the load, ambient condition in advance.



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 injury may occur, be sure to provide safety devices to avoid any 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.

