OMRON

And Now Even More Inverter Power with DeviceNet Communications and Flux Vector Control

Advanced General-purpose Inverter

SYSDRIVE 3G3RV Series Version V1

realizing

Flux Vector Control Provides the Inverter with the Holding Power of a Servo Driver

Advanced Specifications in a Compact Inverter

Flux Vector Control

NEW

High Starting Torque and High-precision Speed Control with Flux Vector Control

Flux vector control has been added as an Inverter control mode to join open-loop vector and V/f control. With flux vector control, a unique high-speed current vector control method enables quickly following changes in the speed reference. In addition, high-torque operation at 150% or higher is possible from zero speed.

3G3FV and 3G3RV Successors

Version V1 of the 3G3RV is the successor of the 3G3FV Series and the earlier 3G3RV Series. For details, refer to the respective replacement manual.

- Replacing the 3G3FV with Version V1 of the 3G3RV
  1. The rated current is lower than the 3G3FV's.
  2. The minimum connectable resistance is greater than the 3G3FV's.
  3. The terminal wiring (wire numbers and terminal block allocations) is different.
- Replacing the Earlier 3G3RV with Version V1 of the 3G3RV
  Be sure to use the correct carrier frequency for the CT/VT selection.

Default Parameter Settings	3G3RV	Version V1 of 3G3RV
CT/VT Selection	VT	CT
Carrier frequency	15 kHz	2 kHz

Select Constant or Variable Torque

Select Overload Detection According to Application

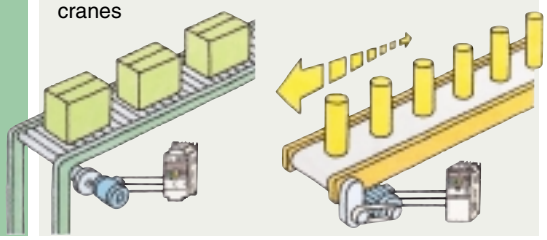
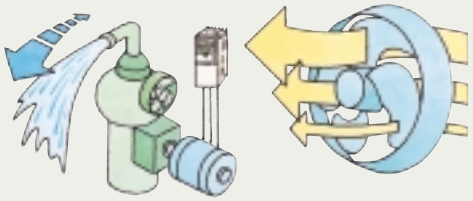
Match the overload detection conditions to the application by selecting constant torque (CT) for loads such as conveyors or cranes, or variable torque (VT) for loads such as fans or pumps. (The setting range for Inverter parameters, such as the carrier frequency, overload resistance, and maximum output frequency, will vary.) The torque characteristic can also be effectively selected for V/f control or open-loop vector control.

Complete Autotuning Functions

Autotuning with a Stationary Motor

Autotuning can be used to set motor constants for open-loop vector control and motor line resistance for long motor cables.
Autotuning motor constants for open-loop vector control can even be performed without turning the motor, making autotuning easier than ever.
The following types of autotuning are supported.

- Rotational autotuning for open-loop vector control
- Stationary autotuning for open-loop vector control
- Line resistance autotuning using stationary autotuning for V/f control or open-loop vector control

Type of load		Constant Torque (CT)	Variable Torque (VT)
Characteristic		Loads with constant torque at all speeds 	Loads with lower torque at lower speeds 
Applications		Friction loads or weight loads, e.g., conveyors or cranes 	Air and water-related machines, such as fans and pumps 
Parameter settings	Inverter overload protection level	150% of Inverter's rated torque/minute	120% of Inverter's rated torque/minute
	Carrier frequency selection	Low carrier noise or 2 kHz	Low carrier noise or 2 to 15 kHz
	Maximum output frequency	300 Hz	400 Hz

CONTENTS

This catalog presents only information related to selecting products and does not include application precautions. Always refer to user documentation for the product for application precautions before attempting to use the product.

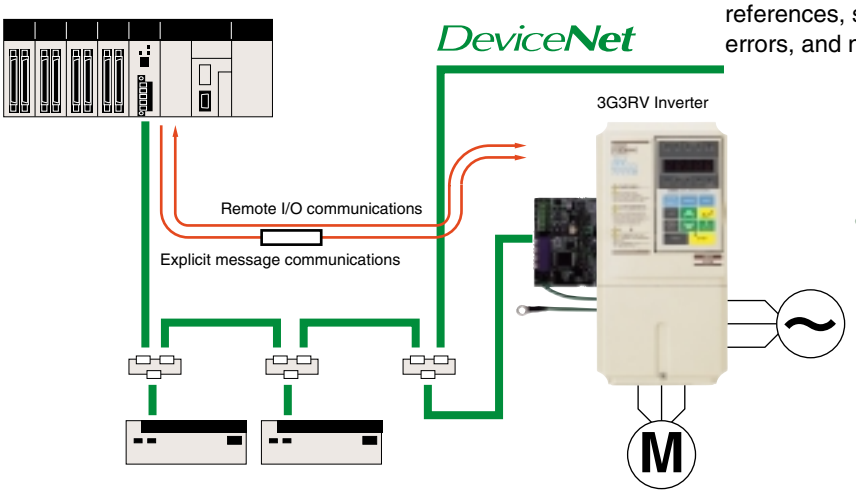
DeviceNet Communications

DeviceNet Communications Card Supported by All Models (Same as 3G3FV Series)

A 3G3FV-PDRT2 DeviceNet Communications Card can be mounted to provide a DeviceNet interface for the Inverter.

• Remote I/O Communications: A PLC connected via DeviceNet can send speed references and operation commands or it can monitor Inverter status. Standard settings provide two output words from the PLC to the Inverter and two input words from the Inverter to the PLC. Using advanced remote I/O functions, parameters specified by number in the Inverter can be written from the PLC.

• Message Communications: Explicit messages can be sent from the PLC to achieve many control and monitoring functions for the Inverter, including specifying speed references, specifying forward/reverse commands, reading errors, and more.



3G3RV-PDRT2
DeviceNet Communications Card
(DeviceNet Slave Function)

Multi-function Inputs and Outputs

Freely Allocated Analog Inputs/Outputs, Contact Inputs/Outputs, and Pulse Outputs

Two analog outputs and one pulse train output enable monitoring of system status, including output frequency and output voltage.

Likewise, two analog inputs accommodate functions such as output voltage bias and acceleration/deceleration time gain, while five contact inputs accept multistep speed references, emergency stops, etc. Two contact outputs allow frequency coincidence, excessive torque detection, and other functions. The ability to freely allocate functions to all of these inputs and outputs allows the user to customize system functions.

Versatile Frequency Reference Inputs

Frequency references can be input via an analog input (voltage or current), Digital Operator, pulse train signal, or DeviceNet communications.

Built-in Braking Transistor

Complete Braking Functions

All models of 18.5 kW or less are equipped with a built-in braking transistor that allows powerful braking by simply connecting a braking resistor.

Protective Functions

Protective Functions Ensure Safety

A high-speed, high-precision current limiting function suppresses tripping from excessive current, and a stall prevention function for acceleration/deceleration, power loss compensation function, and fault retry function combine to improve continuous operation.

A PTC thermistor built into the motor protects the motor from overheating.

Easy to Use and Gentle on the Environment, with a Wide Selection to Meet Exact Needs

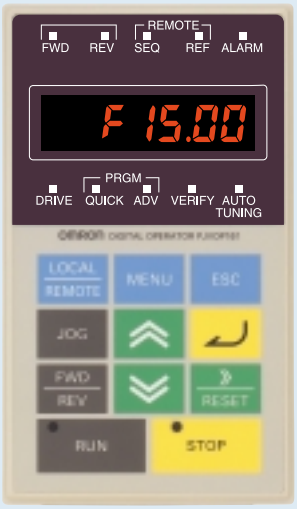
Easy Operation

Digital Operator (LED: Standard, LCD: Optional)

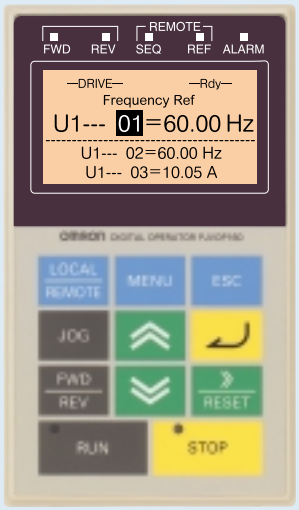
Faster Setup and Maintenance for Easier Operation

Complete support is provided for the Digital Operator's Quick Program Mode for operation with a minimum of parameter settings, Verify Mode for batch confirmation of changed parameters, and a copy function for uploading/downloading parameters if replacement should be required. A Japanese/English-language LCD Digital Operator is also available as an option.

Standard LED Digital Operator



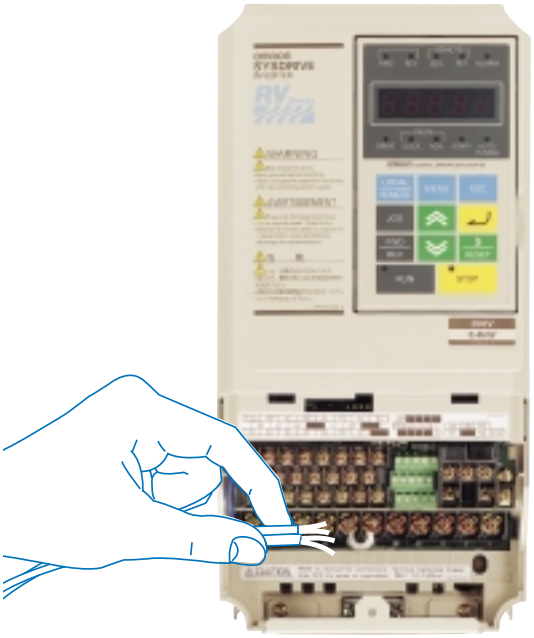
Optional LCD Digital Operator



Maintenance

Easy Maintenance and Inspection

• A detachable control circuit terminal makes it possible to replace the unit without disconnecting the wiring.



• Screw terminals are used for the main circuit terminals and control circuit terminals to simplify wiring and enhance reliability.
• Independent wire covers enable easier wiring.
• ON/OFF control for the cooling fan lengthens the service life of the fan, and enhances reliability. Fan replacement is also quick and easy due to the detachable fan design.

• The accumulated running time and cooling fan operation time can be recorded and/or displayed.

Gentle on the Environment

Energy-saving Control Functions

Energy-saving Operation for Maximum Motor Efficiency

The voltage reference (during V/f control) or slip frequency control (during vector control) constantly maximizes motor efficiency in response to load and turning speed. This enables a superb energy-saving effect for fans, pumps and other machinery.

Low-carrier PWM Control

Low-noise Operation

In addition to the conventional high-carrier PWM control, the RV Series is equipped with a unique, low-carrier PWM control that suppresses noise. The control mode can be selected depending on the functions and application. (Note: When a fixed torque load application is selected, the low-carrier PWM control mode is automatically applied.)

Harmonic Countermeasure

Compatible with Harmonic Suppression Countermeasure Guidelines

All models of 22 kW or above include a built-in DC reactor to improve the power factor. The DC reactor is optional for all models of 18.5 kW or less, ensuring compatibility with harmonic suppression countermeasure guidelines.

A Wide Range to Choose From

Maximum Applicable Motor Capacity

Applicable to Motors with 0.4- to 110-kW or 0.4- to 300-kW Capacity

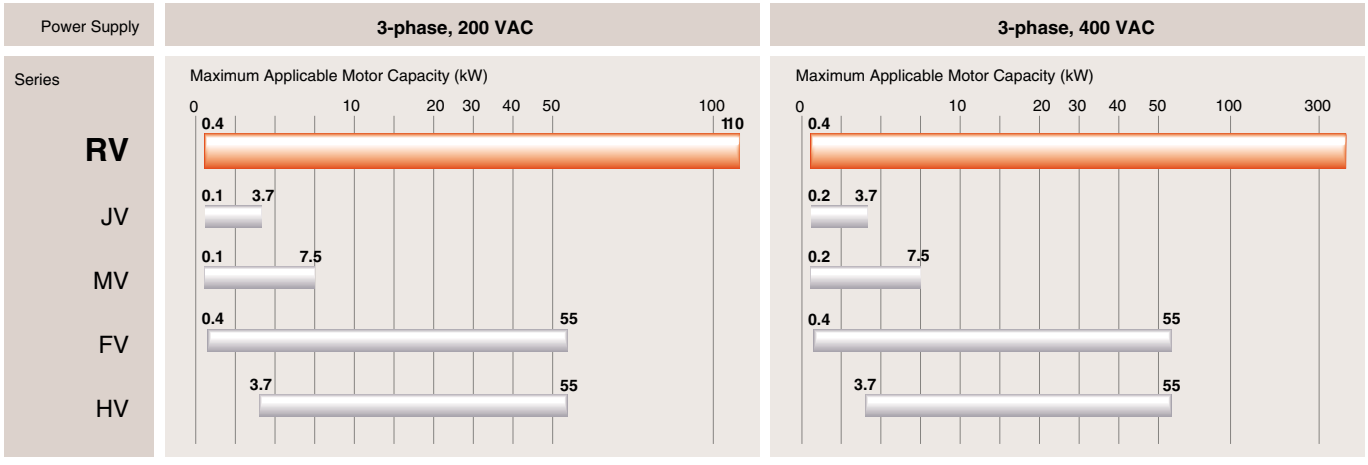
The RV Series accommodates a wide range of motors, with low to high capacity.

Power Supply

Operates from a Variety of Power Supplies

Two power supply voltage series enable versatile use.

- 3-phase, 200-V series (200 to 240 V)
- 3-phase, 400-V series (380 to 480 V)
- Standard models can also be connected to DC power supply devices and other converters.



Standards

Complies with Major International Standards

Standard models comply with UL/uCL standards for the U.S. and Canada, and CE standards for Europe.

3G3RV-series Inverters

■ Standard Inverter Specifications

200-V Class Inverters	**Model (3G3RV-□□□□□-V1)**		**A2004**	**A2007**	**A2015**	**A2022**	**A2037**	**A2055**	**A2075**	**A2110**	**A2150**	**A2185**	**B2220**	**B2300**	**B2370**	**B2450**	**B2550**	**B2750**	**B2900**	**B211K**	---	---	---	---	---
	Max. applicable motor output (kW)		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	---	---	---	---	---
	Output specifications	**Rated output capacity (kVA)**	1.2	1.6	2.7	3.7	5.7	8.8	12	17	22	27	32	44	55	69	82	110	130	160	---	---	---	---	---
		Rated output current (A)	3.2	4.1	7.0	9.6	15	23	31	45	58	71	85	115	145	180	215	283	346	415	---	---	---	---	---
		Max. output voltage (V)	3-phase, 200 to 240 VAC (Depends on input voltage.)																						
		Max. output frequency (Hz)	CT (low carrier, fixed torque applications): 300 Hz VT (high carrier, variable torque applications): 400 Hz																						
	Power supply specifications	**Rated voltage (V) Rated frequency (Hz)**	3-phase, 200 to 240 VAC, 50/60 Hz																						
		Allowable voltage fluctuation	–15% to +10%																						
		Allowable frequency fluctuation	±5%																						
	Power consumption (See note 1.) (W)		59	69	100	129	186	248	332	544	612	712	860	1,217	1,426	1,771	2,206	2,997	3,434	3,975	---	---	---	---	---
	Approx. weight (kg)		3				4		6	7	11		21	24	57	63	86	87	108	150	---	---	---	---	---
400-V Class Inverters	**Model (3G3RV-□□□□□-V1)**		**A4004**	**A4007**	**A4015**	**A4022**	**A4037**	**A4055**	**A4075**	**A4110**	**A4150**	**A4185**	**B4220**	**B4300**	**B4370**	**B4450**	**B4550**	**B4750**	**B4900**	**B411K**	**B413K**	**B416K**	**B418K**	**B422K**	**B430K**
	Max. applicable motor output (kW)		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	300
	Output specifications	**Rated output capacity (kVA)**	1.4	1.6	2.8	4.0	5.8	9.5	13	18	24	30	34	46	57	69	85	110	140	160	200	230	280	390	510
		Rated output current (A)	1.8	2.1	3.7	5.3	7.6	12.5	17	24	31	39	45	60	75	91	112	150	180	216	260	304	370	506	675
		Max. output voltage (V)	3-phase, 380 to 480 VAC (Depends on input voltage.)																						
		Max. output frequency (Hz)	CT selected (low carrier, fixed torque applications): 300 Hz VT selected (high carrier, variable torque applications): 400 Hz																						
	Power supply specifications	**Rated voltage (V) Rated frequency (Hz)**	3-phase, 380 to 480 VAC 50/60 Hz																						
		Allowable voltage fluctuation	–15% to +10%																						
		Allowable frequency fluctuation	±5%																						
	Power consumption (See note 1.) (W)		53	58	84	115	148	209	307	410	498	634	725	995	1,144	1,316	1,698	1,974	2,285	2,950	3,390	3,938	4,609	5,277	8,158
	Approx. weight (kg)		3			4			6		10		21		36			88	89	102	120	160	260	280	405

Control characteristics	**Countermeasures against power supply harmonics**	A DC Reactor (sold separately) can be connected.	A DC Reactor is built in.
	Control method	Sine wave PWM	
	Carrier frequency	2.0 to 15 kHz	
	Speed control range	1:1,000 (Flux vector control) or 1:100 (Open loop vector control) (See note 2.)	
	Speed control accuracy	±0.02% (Flux vector control at 25°C±10°C) or ±0.2% (Open loop vector control at 25°C ±10°C) (See note 2.)	
	Speed control response	40 Hz (Flux vector control) or 5 Hz (Open loop vector control) (See note 2.)	
	Torque control	Supported. (Set in the parameters.)	
	Torque control accuracy	±0.5 (See note 2.)	
	Frequency control range	0.01 to 300 Hz (CT selected.), 0.01 to 400 Hz (VT selected.) (See note 3.)	
	Frequency accuracy (temperature characteristics)	Digital references: ±0.01% (–10 to 40°C) Analog references: ±0.1% (25±10°C)	
	Frequency setting resolution	Digital references: 0.01 Hz (for frequencies less than 100 Hz) or 0.1 Hz (for 100 Hz and higher frequencies) Analog references: 0.03 Hz/60 Hz (±11 bits)	
	Output frequency resolution	0.001 Hz	
	Overload capacity	CT selected: 150% of rated output current per minute VT selected: 120% of rated output current per minute	
	Frequency setting signal	–10 to +10 V, 0 to 10 V, 4 to 20 mA, or pulse-train input	
	Acceleration/Deceleration time	0.01 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings)	
	Braking torque	Approximately 20% (Approximately 125% with Braking Resistor option) Inverters with a max. motor capacity of 18.5 kW and higher are equipped with a built-in Braking Resistor. (See note 4.)	
	Voltage/frequency characteristics	Select flux vector control, select open loop vector control, select from 15 standard V/f patterns, or set a custom V/f pattern.	
Protective functions	**Motor protection**	Protection by electronic thermal overload relay.	
	Momentary overcurrent protection	Stops at approx. 200% of rated output current.	
	Overload protection	CT selected: 150% of rated output current per minute VT selected: 120% of rated output current per minute	
	Overvoltage protection	200 V Class Inverter: Stops when main-circuit DC voltage is above 410 V. 400 V Class Inverter: Stops when main-circuit DC voltage is above 820 V.	
	Undervoltage protection	200 V Class Inverter: Stops when main-circuit DC voltage is below 190 V. 400 V Class Inverter: Stops when main-circuit DC voltage is below 380 V.	
	Momentary power loss ridethru (Selectable)	Stops for power loss lasting 15 ms or more. Power loss processing settings can be set to continue operation if power is restored within 2 s.	
	Cooling fin overheating	Protection by thermistor.	
	Ground fault protection	Protection by electronic circuits. (Detected at approx. 100% or more of rated current.)	
	Charge indicator (internal LED)	Lit when the main circuit DC voltage is approx. 50 V or more.	
Environment	**Application site**	Indoor (no corrosive gas, oil spray, or metal filings)	
	Ambient operating temperature	–10°C to 45°C (–10°C to 40°C when enclosed and wall-mounted)	–10°C to 45°C (Mounted in a panel)
	Ambient operating humidity	90% max. (with no condensation)	
	Storage temperature	–20°C to 60°C	
	Altitude	1,000 m max.	
	Vibration resistance	20 Hz max., 9.8 m/s^2 max.; 20 to 50 Hz, 2 m/s^2 max	
	Protective structure	Enclosed, wall-mounting (NEMA1: Equivalent to IP20) or Mounted in a panel (equivalent to IP00)	Mounted in a panel (equivalent to IP00)

Note: **1.** The power consumption is the amount of power consumed in the Inverter when it is operating at its rated output.

2. Rotational autotuning is required to obtain the specifications listed in the table for flux vector control or open loop vector control.

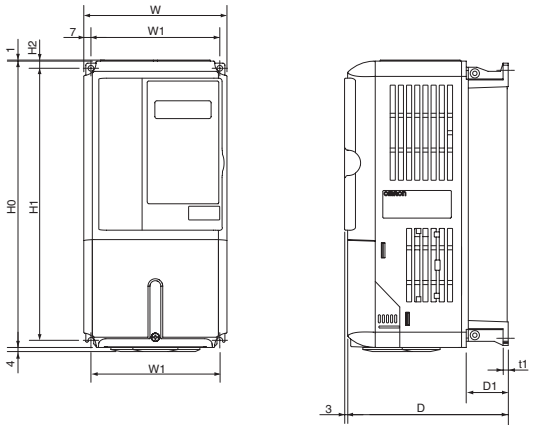
3. When CT is selected, the overload capacity is 150% of rated output current. (CT cannot be selected for the 110 kW)
When VT is selected, the overload capacity is 120% of rated output current.
Increase the Inverter capacity if loads exceeding these current values are expected.

4. When a Braking Resistor or Braking Resistor Unit is being connected, set L3-04=0 to disable stall prevention during deceleration. If deceleration stall prevention is not disabled, the system may not stop within the specified deceleration time.

■ Dimensions (Unit: mm)

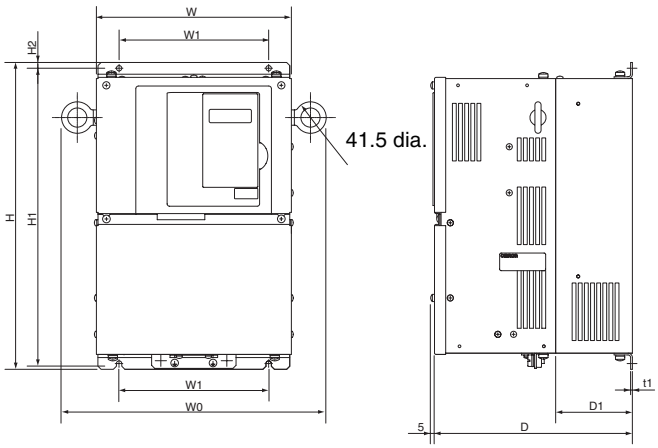
3G3RV-A2004 to A2185-V1 (0.4 to 18.5 kW), Three-phase 200 V AC
3G3RV-A4004 to A4185-V1 (0.4 to 18.5 kW), Three-phase 400 V AC

Dimensions Diagram A



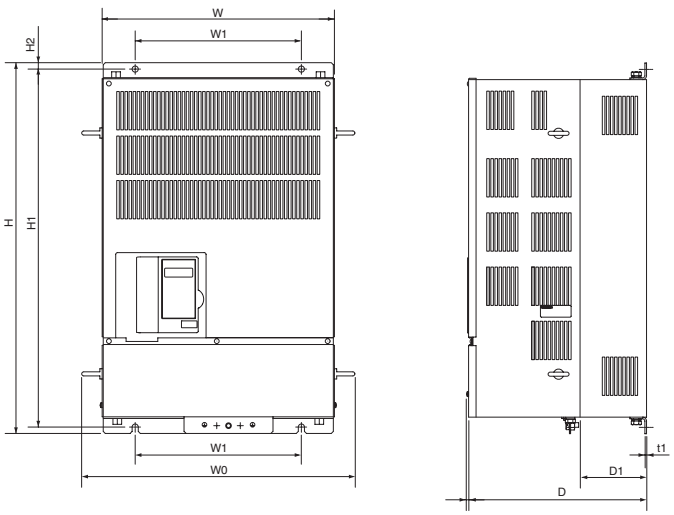
3G3RV-B2220 to B2300-V1 (22 to 30 kW), Three-phase 200 V AC
3G3RV-B4220 to B4550-V1 (22 to 55 kW), Three-phase 400 V AC

Dimensions Diagram B



3G3RV-B2370 to B211K-V1 (37 to 110 kW), Three-phase 200 V AC
3G3RV-B4750 to B430K-V1 (75 to 300 kW), Three-phase 400 V AC

Dimensions Diagram C

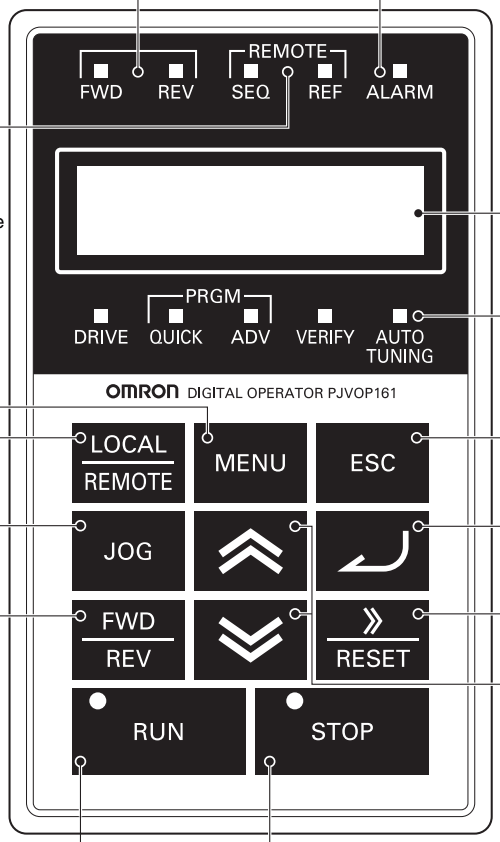


The following table lists the dimensions for the RV-series Inverters.

Voltage Class	Max. Motor Output (kW)	Model 3G3RV-	Figure	Dimensions										Mounting Holes (d)
				W0	W	H	D	W1	H0	H1	H2	D1	t1	
200 V 3-phase	0.4	A2004-V1	A	---	140	280	157	126	280	266	7	39	5	M5
	0.75	A2007-V1												
	1.5	A2015-V1												
	2.2	A2022-V1												
	3.7	A2037-V1					177					59		
	5.5	A2055-V1												
	7.5	A2075-V1			200	300	197	186	300	285	7.5	65.5	2.3	M6
	11	A2110-V1				310								
	15	A2150-V1			240	350	207	216	350	335		78		
	18.5	A2185-V1				380								
	22	B2220-V1	B	345	254.2	400	258	195	---	385		100		
	30	B2300-V1		370	279.2	450		220		435				
	37	B2370-V1	C	470	379.2	600	298	250		575	13		3.2	M10
	45	B2450-V1					328					130		
	55	B2550-V1		545	454.2	725	348	325		700				
	75	B2750-V1												
	90	B2900-V1		615	505.2	850	358	370		820	15		4.5	M12
	110	B211K-V1		690	579.2	885	378	445		855		140		
400 V 3-phase	0.4	A4004-V1	A	---	140	280	157	126	280	266	7	39	5	M5
	0.75	A4007-V1												
	1.5	A4015-V1												
	2.2	A4022-V1					177					59		
	3.7	A4037-V1												
	5.5	A4055-V1												
	7.5	A4075-V1			200	300	197	186	300	285	7.5	65.5	2.3	M6
	11	A4110-V1												
	15	A4150-V1			240	350	207	216	350	335		78		
	18.5	A4185-V1												
	22	B4220-V1	B	370	280	450	258	220	---	435		100		
	30	B4300-V1												
	37	B4370-V1		420	329.2	550	283	260		535		105		
	45	B4450-V1												
	55	B4550-V1												
	75	B4750-V1	C	545	454.2	725	348	325		700	13	130	3.2	M10
	90	B4900-V1												
	110	B411K-V1		615	505.2	850	358	370		820	15		4.5	M12
	132	B413K-V1												
	160	B416K-V1		690	579.2	916	378	445		855		140		
	185	B418K-V1		846	710	1,305	413	540		1,270		125.5		
	220	B422K-V1						730		1,440				
	300	B430K-V1		1,037	916	1,475								

■ Digital Operator Operations

Digital Operator Components



Alarm Indicator

Rotation Direction Indicators

FWD: Lit when there is a forward run command input.
REV: Lit when there is a reverse run command input.

Remote Mode Indicators

Indicate the input mode selected for the control circuit terminals.

SEQ: Lit when the run command from the control circuit terminal is enabled.
REF: Lit when the frequency reference from control circuit terminals A1 and A2 is enabled.

MENU Key

Selects menu items (modes).

LOCAL/REMOTE Key

Switches between operation via the Digital Operator and parameter settings. This Key can be enabled or disabled by setting a parameter.

Run Command Keys

These keys operate the Inverter when the Inverter is being operated from the Digital Operator.

JOG Key

Jog operation is performed while this key is pressed.

FWD/REV Keys

Switches between forward and reverse operation.

RUN Key

The red LED on the left will light when the RUN Key is pressed.

STOP Key (See note.)

The red LED on the left will light when the STOP Key is pressed.

Data Display

Displays monitor data, constant numbers, and settings (in five digits).

Drive/Programming Mode Display

DRIVE: Lit in Drive Mode.
QUICK: Lit in Quick Programming Mode.
ADV: Lit in Advanced Programming Mode.
VERIFY: Lit in Verify Mode.
A. TUNE: Lit in Autotuning Mode.

ESC Key

Returns to the status before the ENTER Key was pressed.

ENTER Key

Selects modes, groups, functions, and constant names.

Displays a constant's set value if the constant's name is being displayed. Writes a new set value if pressed again after setting.

Digit Selection/RESET Key

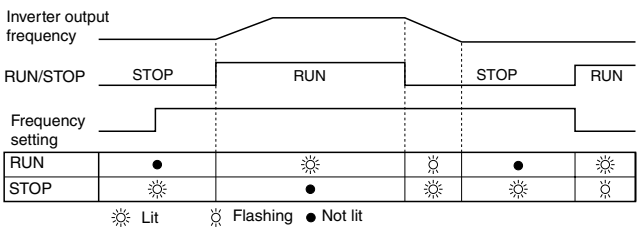
Selects the digit of the set value to be changed. The selected digit will flash.

Also used to reset operation after an error has occurred.

Increment Key
Decrement Key

Selects modes, groups, functions, constant names, and settings.

Note: The status of the RUN and STOP Indicators (lit, flashing, or not lit) depend on the Inverter's operation.



Example Digital Operator Operations

Step		Operation	Key operations	Digital Operator Displays
1	Power ON	Display frequency reference.	---	F 0.00 DRIVE Indicator lit
2	Run condition setting	Select Local mode.	LOCAL/REMOTE	Remote Indicators (SEQ and REF) not lit FWD Indicator lit
3	Forward JOG (6 Hz)	Operates while key is being pressed.	JOG	F 6.00 Displayed while JOG Key is pressed.
4	Frequency setting	Enter reference value change mode.	↵	F 0.00
		Change digit.	RESET	F 15.00 Selected digit flashes.
		Change reference value.	∧ ∨	
		Write setting.	↵	After "End" display F 15.00
		Exit reference value change mode.	ESC	F 15.00
		Select output frequency monitor display.	∧	0.00
5	Forward operation	Run operation (15 Hz)	RUN	F 15.00 RUN RUN Indicator lit
6	Change frequency reference value (15 to 60 Hz)	Select frequency reference display.	∨	F 15.00
		Enter reference change mode.	↵	F 15.00
		Change digit.	RESET	F 60.00 Selected digit flashes.
		Change reference value.	∧ ∨	
		Write setting.	↵	After "End" display F 60.00
		Exit reference value change mode.	ESC	F 60.00
		Select output frequency monitor display.	∧	60.00
7	Reverse operation	Switch to reverse operation.	FWD/REV	-60.00 RUN Indicator lit
8	Stop	Decelerate to a stop.	STOP	0.00 Decelerating: RUN RUN Indicator flashing. Stopped: STOP STOP Indicator lit.

Monitor Functions (Examples)

	Name	
U1-01	Frequency reference (Hz)	60.00
U1-02	Output frequency (Hz)	60.00
U1-03	Output current (A)	2.08
U1-04	Control mode	2
U1-05	Motor speed	60.00
U1-06	Output voltage (V)	168.1
U1-07	DC bus voltage (V)	Pn305
U1-08	Output power (kW)	0.4
U1-09	Torque reference (internal, %)	100.0
U1-10	Input terminal status	[.1111111
U1-11	Output terminal status	o1....111
U1-12	Operation status	.1.1.1.1
U1-13	Cumulative operation time (hr)	700

Autotuning Procedure

This procedure performs stationary autotuning for line-to-line resistance only when using V/f control. This example uses a 3.7-kW motor, 4 pole, 200 V, and 14.0 A.)

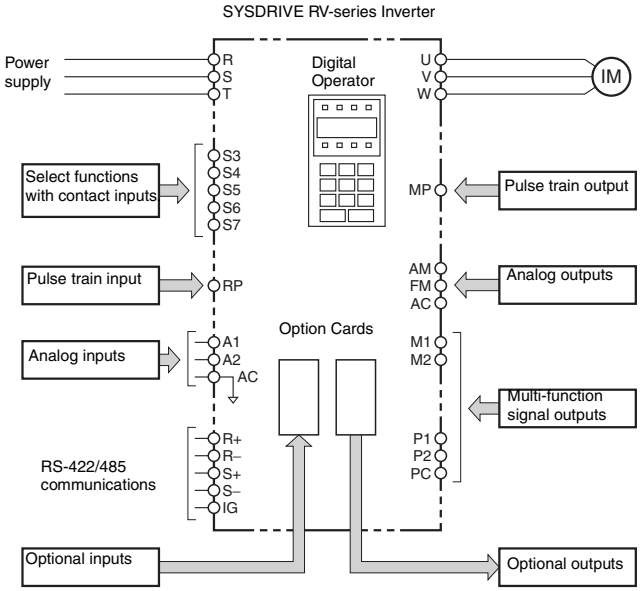
Step	Key operations	Digital Operator Displays	
Select mode (Press several times until AUTO TUNING flashes.)	MENU	t1-01	AUTO TUNING Indicator flashing
Select autotuning mode.	↵	t1-01	AUTO TUNING Indicator lit
Confirm stationary autotuning for line-to-line resistance. (Confirm that the setting is 2.)	↵	02	---
---	ESC	t1-01	---
Select motor output power.	⋀	t1-02	---
Confirm motor output power. (Same as Inverter's rated output.)	↵	003.70	---
---	ESC	t1-02	---
Select motor rated current.	⋀	t1-04	---
Confirm motor rated current. (Same motor current capacity as Inverter.)	↵	0014.0	---
---	⋀	t1-04	---
Start autotuning.	⋀	tUn12	DRIVE Indicator lit
---	RUN	tUn12	---
Autotuning ends.	---	End	---
Return to Drive mode (Press several times until DRIVE flashes.)	MENU	F60.00	DRIVE Indicator lit

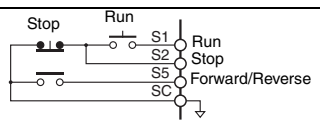
Displaying Monitor Items

Step	Key operations	Digital Operator Displays
Turn ON power.	---	---
	MENU Press repeatedly until DRIVE Indicator lights.	F 0.00 DRIVE Indicator lit.
Select mode.		
Select Drive mode.	↵	---
Frequency reference monitor	⋀	F 0.00 DRIVE Indicator lit.
Output frequency monitor	⋀	0.00
Output current monitor	⋀	0.00A
Output voltage monitor (Monitor item set with o1-01.)	⋀	0.0u
U1-□□ monitor	⋀	U1-01
U2-□□ monitor (Error trace)	⋀	U2-01
U3-□□ monitor (Error history)	⋀	U3-01

■ Software Functions

The SYSDRIVE 3G3RV-series Inverters are equipped with flexible software for a variety of applications. Select the best functions for your application from the multitude of available software functions and customize the Inverter to your application.



Function name	Example application	Purpose	Description
Energy saving	General	Automatic max. efficiency operation	Supplies voltage to the motor that maximizes its efficiency for the load and rotational speed. (Includes automatic temperature compensation function.)
PID control	Pumps, air conditioning	Automatic process control	Performs the PID calculation in the Inverter and uses the result as the frequency reference for steady control of a variable such as pressure, flow, or volume.
Speed search	Driving inertial loads such as blowers	Start free-run motors	Automatically adjusts the speed of a freely spinning motor to the set speed. A motor speed detector is not required.
DC injection braking	Equipment that continues rotating such as blowers and pumps	Start free-run motors	When a freely spinning motor's rotational direction is unknown, this function uses DC injection braking to stop the motor and then restarts it.
Commercial/Inverter power switching	Blowers, pumps, inertial equipment, extruding machines	Automatic switching of commercial power supply and Inverter	Switches between operation from a commercial power supply and operation from the Inverter without stopping the motor.
Multistep speed operation	Conveyors	Scheduled operation at preset speeds	Operates at a frequency stored in memory (up to 17 steps) based on the signal inputs. The Inverter can be connected to a PLC easily and simple positioning can be performed with limit switches and other inputs.
Acceleration/deceleration time switching	Automatic platens, conveyors	Switch acceleration/deceleration time with external signals	The acceleration/deceleration time is switched with external signals. Useful when using one Inverter to switch operation of two motors or when you require smooth acceleration/deceleration at high speeds.
Inverter overheating prediction	Air conditioning	Preventive maintenance	A warning can be displayed when the Inverter's ambient temperature approaches the protection temperature. (An optional thermoswitch is required.)
3-wire sequence control	General	Simple control circuit structure	The motor can be operated with automatic-reset push button switches. 
Select operation location	General	Improve operability	The source of Inverter operation and references (Digital Operator or external references, and signal inputs or options) can be selected online.

Function name	Example application	Purpose	Description
Reference Frequency Hold	General	Improve operability	This function temporarily pauses the increase or decrease in the frequency that occurs during acceleration/deceleration.
UP/DOWN operation	General	Improve operability	The speed setting can be raised and lowered by turning ON and OFF contact inputs.
Error retries	Air conditioning	Improve reliability	Even though the Inverter detects an error, the error is reset automatically after self-diagnosis and motor operation is restarted without stopping. The number of retries can be set up to 10.
Emergency Stop without a Braking Resistor Unit (DC injection braking)	High-speed router	Stop motor with DC injection braking	The motor can be decelerated quickly from its top speed without a Braking Resistor Unit. Use a deceleration duty less than 5% and a braking torque between 50% and 70%.
Dwell function	Equipment with high inertial loads, such as centrifuges	Smoothly accelerate and decelerate high inertial loads	Motor stalling can be prevented by temporarily holding the output frequency during acceleration or deceleration.
Zero servo function	Elevators, carts	Stop at zero-speed and lock motor	The motor is locked and held at zero-speed even if an external force is applied in either the forward or reverse direction.
Motor 1 or 2 selection	Conveyors	Two motors, one inverter	A single Inverter can be switched to operate either one of two motors.
Torque control	Winders, reels, helpers	Tension, constant control, torque assist	The motor's generated torque is adjusted freely with an external reference. This function is ideal for tension control in winders and torque followers in mechanical helpers.
Torque limit (Drooping characteristic)	Blowers, pumps, extruding machines	Improve equipment protection and continuation of operation, limit torque	When the motor's generated torque reaches a certain level, it is recognized as an overload and the output frequency is adjusted. This function is ideal for tripless operation of pumps and blowers.
Upper and lower frequency limit	Blowers, pumps	Limit motor speed	The frequency reference's upper limit, lower limit, bias, and gain can be set independently without peripheral equipment.
Jump frequency	General equipment	Prevent resonance in the system	Automatically avoids resonance points during steady speed operation to prevent resonance in the mechanical system. Can also be used to control dead zones in the system.
Carrier frequency setting	General equipment	Decrease noise	Reduce noise resonance in the mechanical system by setting a different carrier frequency for the Inverter.
Automatic continuation after reference lost	Air conditioning	Improve reliability by continuing operation	Automatically continues operation at the preset frequency even if the frequency reference is lost because the host computer goes down. This function can provide seamless air conditioning service in intelligent buildings.
Load speed monitor	General	Improve monitoring	Various values can be displayed such as the motor speed (r/min), load equipment speed (r/min), or line speed (m/min).
Operation signal	General	Zero-speed interlock	This signal is ON while the motor is rotating; it can be used as an interlock signal when stopped. (OFF during free run.)
Zero-speed signal	Production equipment	Zero-speed interlock	This signal is ON when the output frequency is below the minimum frequency; it can be used as a feed rotation reversing signal in production equipment.
Frequency (speed) matching signal	Production equipment	Zero speed reached interlock	This signal is ON when the frequency reference (speed reference) matches the output frequency (motor speed when V/f with PG control is being used); it can be used as an interlock signal for operations such as cutting.
Overtorque signal	Production equipment, blowers, cutters, extruding machines	Improve equipment protection, improve reliability by continuing operation	This signal is ON when the motor's generated torque exceeds the overtorque detection level; it can be used as a protective interlock signal to detect overloads such as dulled cutting blades in production equipment.
Low voltage signal	General	A type of malfunction signal	This signal is ON when the Inverter detects a low voltage; it can be used as a power-interruption detection flag when external measures are being used to handle power interruptions.
User-defined speed matching signal	General	Reference speed matching interlock	This signal is ON when the speed matches a user-defined frequency reference.
Output frequency detection 1	General	Gear shift interlock	This signal is ON when the output frequency is above a user-defined level.
Output frequency detection 2	General	Gear shift interlock	This signal is ON when the output frequency is below a user-defined level.

Function name	Example application	Purpose	Description
Baseblock signal	General	Operating interlock	This signal is ON when the Inverter's output is blocked.
Braking Resistor protection	General	Preventive maintenance	This signal is ON when the built-in Braking Resistor is overheating or an error has been detected in the Braking Transistor.
Frequency reference sudden change detection	General	Improve reliability by continuing operation	This signal is ON when the Inverter detects that the frequency reference sudden changed to less than 10% of the set value; it can be used to detect errors in the host sequencer.
Multi-function analog input	General	Improve operability	The external analog input can be used for an auxiliary frequency reference. It can also be used to adjust settings such as the reference frequency, output voltage, acceleration/deceleration time, and overtorque detection level.
Multi-function analog output	General	Improve monitoring	Any two U1 monitors (frequency meter, current meter, voltage meter, or power meter) can be connected.
Pulse train input	General	Improve operability	The pulse train input can be used to input the frequency reference. It can also be used to input PID set points and PID feedback values in a pulse train when PID control is being used.
Pulse train output	General	Improve monitoring	A total of 6 values can be monitored such as the frequency reference, output frequency, PID set point, and PID feedback value.
PG speed control (optional)	General	Improve speed control performance	The speed control accuracy can be improved significantly by installing a PG Speed Control Card.

■ User Parameters

User Parameter Descriptions

- If a parameter number is not listed, it will not be displayed on the Digital Operator.
- The password (A1-04) setting can be used to restrict access to parameters.
- In the *Control mode* columns, “A,” “Q,” and “No” indicate the access level and accessibility.

  A: Advanced (when advanced program mode is selected)

  Q: Quick (when quick program mode or advanced program mode is selected)

  No: Not accessible

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Environment Settings Mode Selections	A1-00	Language selection for Digital Operator display (See note 1.)	0 to 6	---	1	Yes	A	A	A	A
	A1-01	Parameter access level	0 to 2	---	2	Yes	A	A	A	A
	A1-02	Control method selection	0 to 2	---	0	No	Q	Q	Q	Q
	A1-03	Initialize	0 to 3330	---	0	No	A	A	A	A
	A1-04	Password	0 to 9999	---	0	No	A	A	A	A
	A1-05	Password setting	0 to 9999	---	0	No	A	A	A	A
	A2-01 to A2-32	Setting the user parameters	b1-01 to o3-02	---	---	No	A	A	A	A
Operation Mode Selections	b1-01	Reference selection	0 to 4	---	1	No	Q	Q	Q	Q
	b1-02	Operation method selection	0 to 3	---	1	No	Q	Q	Q	Q
	b1-03	Stopping method selection	0 to 3 (See note 2.)	---	0	No	Q	Q	Q	Q
	b1-04	Prohibition of reverse operation	0, 1	---	0	No	A	A	A	A
	b1-05	Operation selection for setting E1-09 or less	0 to 3	---	0	No	No	No	No	A
	b1-06	Time to read sequence control input twice	0, 1	---	1	No	A	A	A	A
	b1-07	Operation selection after switching to remote mode	0, 1	---	0	No	A	A	A	A
	b1-08	Run Command selection in programming modes	0 to 2	---	0	No	A	A	A	A
DC Injection Braking	b2-01	Zero-speed level (DC injection braking starting frequency)	0.0 to 10.0	0.1 Hz	0.5 Hz	No	A	A	A	A
	b2-02	DC injection braking current	0 to 100	1%	50%	No	A	A	A	No
	b2-03	DC injection braking time at start	0.00 to 10.00	0.01 s	0.00 s	No	A	A	A	A
	b2-04	DC injection braking time at stop	0.00 to 10.00	0.01 s	0.50 s	No	A	A	A	A
	b2-08	Magnetic flux compensation volume	0 to 1000	0.1%	0%	No	No	No	A	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Speed Search	b3-01	Speed search selection (current detection or speed calculation)	0 to 3	1	2 (See note 3.)	No	A	A	A	No
	b3-02	Speed search operating current (current detection)	0 to 200	1%	120% (See note 3.)	No	A	No	A	No
	b3-03	Speed search deceleration time (current detection)	0.1 to 10.0	0.1 s	2.0 s	No	A	No	A	No
	b3-05	Speed search wait time (current detection or speed calculation)	0.0 to 20.0	0.1 s	0.2 s	No	A	A	A	A
	b3-10	Magnetic flux compensation as a percentage of the no-load current	1.00 to 1.20	0.01 s	1.10	No	A	No	A	No
	b3-14	Rotation direction search selection	0, 1	1	1	No	A	A	A	No
	b3-17	Speed search retrial current level	0 to 200	1	150%	No	A	No	A	No
	b3-18	Speed search retrial detection time	0.00 to 1.00	0.01 s	0.10 s	No	A	No	A	No
	b3-19	Number of speed search retrials	0 to 10	1	0	No	A	No	A	No
Timer Function	b4-01	Timer function ON delay time	0.0 to 300.0	0.1 s	0.0 s	No	A	A	A	A
	b4-02	Timer function OFF delay time	0.0 to 300.0	0.1 s	0.0 s	No	A	A	A	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
PID Control	b5-01	PID control method selection	0 to 4	1	0	No	A	A	A	A
	b5-02	Proportional gain (P)	0.00 to 25.00	0.01	1.00	Yes	A	A	A	A
	b5-03	Integral (I) time	0.0 to 360.0	0.1 s	1.0 s	Yes	A	A	A	A
	b5-04	Integral (I) limit	0.0 to 100.0	0.1%	100.0%	Yes	A	A	A	A
	b5-05	Derivative (D) time	0.00 to 10.00	0.01 s	0.00 s	Yes	A	A	A	A
	b5-06	PID limit	0.0 to 100.0	0.1%	100.0%	Yes	A	A	A	A
	b5-07	PID offset adjustment	−100.0 to 100.0	0.1%	0.0%	Yes	A	A	A	A
	b5-08	PID primary delay time constant	0.00 to 10.00	0.01 s	0.00 s	Yes	A	A	A	A
	b5-09	PID output characteristics selection	0, 1	1	0	No	A	A	A	A
	b5-10	PID output gain	0.0 to 25.0	0.1	1.0	No	A	A	A	A
	b5-11	PID reverse output selection	0, 1	1	0	No	A	A	A	A
	b5-12	Selection of PID feedback command loss detection	0 to 2	1	0	No	A	A	A	A
	b5-13	PID feedback command loss detection level	0 to 100	1%	0%	No	A	A	A	A
	b5-14	PID feedback command loss detection time	0.0 to 25.5	0.1 s	1.0 s	No	A	A	A	A
	b5-15	PID sleep function operation level	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
	b5-16	PID sleep operation delay time	0.0 to 25.5	0.1 s	0.0 s	No	A	A	A	A
	b5-17	Accel/decel time for PID reference	0.0 to 6000.0	0.1 s	0.0 s	No	A	A	A	A

Note: **1.** Displayed only when using the optional LCD-monitor type Digital Operator.
2. Setting range is 0 or 1 for flux vector control.
3. The setting will revert to the factory setting when the control mode is changed. (The factory settings for V/f control are shown.)

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Dwell Functions	b6-01	Dwell frequency at start	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
	b6-02	Dwell time at start	0.0 to 10.0	0.1 s	0.0 s	No	A	A	A	A
	b6-03	Dwell frequency at stop	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
	b6-04	Dwell time at stop	0.0 to 10.0	0.1 s	0.0 s	No	A	A	A	A
Droop Control	b7-01	Droop control gain	0.0 to 100.0	0.1%	0.0%	Yes	No	No	No	A
	b7-02	Droop control delay time	0.03 to 2.00	0.01 s	0.05 s	Yes	No	No	No	A
Energy Saving	b8-01	Energy-saving mode selection	0, 1	1	0	No	A	A	A	A
	b8-02	Energy-saving gain	0.0 to 10.00	0.1	0.7	Yes	No	No	A	A
	b8-03	Energy-saving filter time constant	0.00 to 10.00	0.01s	0.50 s	Yes	No	No	A	A
	b8-04	Energy-saving coefficient	0.00 to 655.00	0.01	(See note 1.)	No	A	A	No	No
	b8-05	Power detection filter time constant	0 to 2000	1 ms	20 ms	No	A	A	No	No
Zero-Servo	b9-01	Zero-servo gain	0 to 100	1	5	No	No	No	No	A
	b9-02	Zero-servo completion width	0 to 16383	1	10	No	No	No	No	A
Zero-servo completion width	C1-01	Acceleration time 1	0.1 to 6000.0 (See note 2.)	0.1 s	10.0 s	Yes	Q	Q	Q	Q
	C1-02	Deceleration time 1				Yes	Q	Q	Q	Q
	C1-03	Acceleration time 2				Yes	A	A	A	A
	C1-04	Deceleration time 2				Yes	A	A	A	A
	C1-05	Acceleration time 3				No	A	A	A	A
	C1-06	Deceleration time 3				No	A	A	A	A
	C1-07	Acceleration time 4				No	A	A	A	A
	C1-08	Deceleration time 4				No	A	A	A	A
	C1-09	Fast (deceleration) stop time				No	A	A	A	A
	C1-10	Accel/decel time setting unit	0, 1	1	1	No	A	A	A	A
	C1-11	Accel/decel time switching frequency	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
S-curve Acceleration/ Deceleration	C2-01	S-curve characteristic time at acceleration start	0.00 to 2.50	0.01 s	0.20 s	No	A	A	A	A
	C2-02	S-curve characteristic time at acceleration end	0.00 to 2.50	0.01 s	0.20 s	No	A	A	A	A
	C2-03	S-curve characteristic time at deceleration start	0.00 to 2.50	0.01 s	0.20 s	No	A	A	A	A
	C2-04	S-curve characteristic time at deceleration end	0.00 to 2.50	0.01 s	0.00 s	No	A	A	A	A
Motor Slip Compensation	C3-01	Slip compensation gain	0.0 to 2.5	0.1	0.0 (See note 3.)	Yes	A	No	A	No
	C3-02	Slip compensation primary delay time	0 to 10000	1 ms	2000 ms (See note 3.)	No	A	No	A	No
	C3-03	Slip compensation limit	0 to 250	1%	200%	No	A	No	A	No
	C3-04	Slip compensation selection during regeneration	0, 1	1	0	No	A	No	A	No
	C3-05	Output voltage limit operation selection	0, 1	1	0	No	No	No	A	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Torque Compensation	C4-01	Torque compensation gain	0.00 to 2.50	0.01	1.00	Yes	A	A	A	No
	C4-02	Torque compensation primary delay time constant	0 to 10000	1 ms	200 ms (See note 3.)	No	A	A	A	No
	C4-03	Forward starting torque	0.0 to 200.0	0.1%	0.0%	No	No	No	A	No
	C4-04	Reverse starting torque	−200.0 to 0.0	0.1%	0.0%	No	No	No	A	No
	C4-05	Starting torque time constant width	0 to 200	1 ms	10 ms	No	No	No	A	No
Speed Control (ASR)	C5-01	ASR proportional (P) gain 1	0.00 to 300.00	0.01	0.20	Yes	No	A	No	A
	C5-02	ASR integral (I) time 1	0.000 to 10.000	0.001 s	0.200 s	Yes	No	A	No	A
	C5-03	ASR proportional (P) gain 2	0.00 to 300.00	0.01	0.02	Yes	No	A	No	A
	C5-04	ASR integral (I) time 2	0.000 to 10.000	0.001 s	0.050 s	Yes	No	A	No	A
	C5-05	ASR limit	0.0 to 20.0	0.1%	5.0%	No	No	A	No	No
	C5-06	ASR primary delay time	0.000 to 0.500	0.001 s	0.004 s	No	No	No	No	A
	C5-07	ASR switching frequency	0.0 to 400.0	0.1 Hz	0.0 Hz	No	No	No	No	A
	C5-08	ASR integral (I) limit	0 to 400	1%	400%	No	No	No	No	A
Carrier Frequency	C6-01	CT/VT selection	0, 1	1	0	No	Q	Q	Q	Q
	C6-02	Carrier frequency selection	0 to F	1	Depends on C6-01 setting.	No	Q	Q	Q	Q
	C6-03	Carrier frequency upper limit (See note 6.)	2.0 to 15.0 (See note 5.)	0.1 kHz	2 kHz (See note 4.)	No	A	A	A	A
	C6-04	Carrier frequency lower limit (See note 6.)	0.4 to 15.0 (See note 5.)	0.1 kHz	2 kHz (See note 4.)	No	A	A	No	No
	C6-05	Carrier frequency proportional gain (See note 6.)	00 to 99	1	0	No	A	A	No	No

Note: **1.** The initial value is changed according to the motor capacity.

2. The acceleration time and deceleration time setting ranges depend on the C1-10 setting (Accel/decel time setting unit). When C1-10 is set to 0, the acceleration time and deceleration time setting ranges are 0.00 to 600.00 s.

3. The setting will revert to the factory setting when the control mode is changed. (The factory settings for V/f control are shown.)

4. The factory setting depends on the Inverter's capacity.

5. The setting range depends on the Inverter's capacity.

6. These parameters can be set and read only when C6-01 is set to 1 (VT selected) and C6-02 is set to 0F.

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Preset Reference	d1-01	Frequency reference 1	0 to 400.00 (See note.)	0.01 Hz	0.00 Hz	Yes	Q	Q	Q	Q
	d1-02	Frequency reference 2				Yes	Q	Q	Q	Q
	d1-03	Frequency reference 3				Yes	Q	Q	Q	Q
	d1-04	Frequency reference 4				Yes	Q	Q	Q	Q
	d1-05	Frequency reference 5				Yes	A	A	A	A
	d1-06	Frequency reference 6				Yes	A	A	A	A
	d1-07	Frequency reference 7				Yes	A	A	A	A
	d1-08	Frequency reference 8				Yes	A	A	A	A
	d1-09	Frequency reference 9				Yes	A	A	A	A
	d1-10	Frequency reference 10				Yes	A	A	A	A
	d1-11	Frequency reference 11				Yes	A	A	A	A
	d1-12	Frequency reference 12				Yes	A	A	A	A
	d1-13	Frequency reference 13				Yes	A	A	A	A
	d1-14	Frequency reference 14				Yes	A	A	A	A
	d1-15	Frequency reference 15				Yes	A	A	A	A
	d1-16	Frequency reference 16				Yes	A	A	A	A
	d1-17	Jog frequency reference	0 to 400.00	0.01 Hz	6.00 Hz	Yes	Q	Q	Q	Q
Reference Limits	d2-01	Frequency reference upper limit	0.0 to 110.0	0.1%	100.0%	No	A	A	A	A
	d2-02	Frequency reference lower limit	0.0 to 110.0	0.1%	0.0%	No	A	A	A	A
	d2-03	Master speed reference lower limit	0.0 to 110.0	0.1%	0.0%	No	A	A	A	A
Jump Frequencies	d3-01	Jump frequency 1	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
	d3-02	Jump frequency 2		0.1 Hz	0.0 Hz	No	A	A	A	A
	d3-03	Jump frequency 3		0.1 Hz	0.0 Hz	No	A	A	A	A
	d3-04	Jump frequency width	0.0 to 20.0	0.1 Hz	1.0 Hz	No	A	A	A	A
Reference Frequency Hold	d4-01	Frequency reference hold function selection	0, 1	1	0	No	A	A	A	A
	d4-02	+ – Speed limits	0 to 100	1%	10%	No	A	A	A	A
Torque Control	d5-01	Torque control selection	0, 1	1	0	No	No	No	No	A
	d5-02	Torque reference delay time	0 to 1000	1 ms	0 ms	No	No	No	No	A
	d5-03	Speed limit selection	1, 2	1	1	No	No	No	No	A
	d5-04	Speed limit	–120 to 120	1%	0%	No	No	No	No	A
	d5-05	Speed limit bias	0 to 120	1%	10%	No	No	No	No	A
	d5-06	Speed/ torque control switching timer	0 to 1000	1 ms	0 ms	No	No	No	No	A
Field Weakening	d6-01	Field weakening level	0 to 100	1%	80%	No	A	A	No	No
	d6-02	Field frequency	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	No	No
	d6-03	Field forcing function selection	0, 1	1	0	No	No	No	A	A
	d6-06	Field forcing limit	100 to 400	1%	400%	No	No	No	A	A

Note: A frequency reference exceeding the maximum output frequency cannot be set. Set the motor parameters in E1 and E2 (and E3 and E3, if necessary) before setting the frequency reference.

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
V/f Pattern	E1-01	Input voltage setting	155 to 255 (See note 1.)	1 V	200 V (See note 1.)	No	Q	Q	Q	Q
	E1-03	V/f pattern selection	0 to F	1	F	No	Q	Q	No	No
	E1-04	Max. output frequency	40.0 to 400.0 (See note 5.)	0.1 Hz	60.0 Hz	No	Q	Q	Q	Q
	E1-05	Max. voltage	0.0 to 255.0 (See note 1.)	0.1 V	200.0 V (See note 1.)	No	Q	Q	Q	Q
	E1-06	Base frequency	0.0 to 400.0	0.1 Hz	60.0 Hz	No	Q	Q	Q	Q
	E1-07	Mid. output frequency	0.0 to 400.0	0.1 Hz	3.0 Hz (See note 2.)	No	A	A	A	No
	E1-08	Mid. output frequency voltage	0.0 to 255.0 (See note 1.)	0.1 V	15.0 V (See notes 1 and 2.)	No	A	A	A	No
	E1-09	Min. output frequency	0.0 to 400.0	0.1 Hz	1.5 Hz (See note 2.)	No	Q	Q	A	A
	E1-10	Min. output frequency voltage	0.0 to 255.0 (See note 1.)	0.1 V	9.0 V (See notes 1 and 2.)	No	A	A	A	No
	E1-11	Mid. output frequency 2	0.0 to 400.0	0.1 Hz	0.0 Hz (See note 3.)	No	A	A	A	A
	E1-12	Mid. output frequency voltage 2	0.0 to 255.0 (See note 1.)	0.1 V	0.0 V (See note 3.)	No	A	A	A	A
	E1-13	Base voltage	0.0 to 255.0 (See note 1.)	0.1 V	0.0 V (See note 4.)	No	A	A	Q	Q

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Motor Setup	E2-01	Motor rated current	0.32 to 6.40 (See note 7	0.01 A	1.90 A (See note 6.)	No	Q	Q	Q	Q
	E2-02	Motor rated slip	0.00 to 20.00	0.01 Hz	2.90 Hz (See note 6.)	No	A	A	A	A
	E2-03	Motor no-load current	0.00 to 1.89 (See note 8	0.01 A	1.20 A (See note 6.)	No	A	A	A	A
	E2-04	Number of motor poles	2 to 48	2	4 poles	No	No	Q	No	Q
	E2-05	Motor line-to-line resistance	0.000 to 65.000	0.001 Ω	9.842 Ω (See note 5.)	No	A	A	A	A
	E2-06	Motor leak inductance	0.0 to 40.0	0.1%	18.2% (See note 6.)	No	No	No	A	A
	E2-07	Motor iron saturation coefficient 1	0.00 to 0.50	0.01	0.50	No	No	No	A	A
	E2-08	Motor iron saturation coefficient 2	0.00 to 0.75	0.01	0.75	No	No	No	A	A
	E2-09	Motor mechanical loss	0.0 to 10.0	0.1%	0%	No	No	No	No	A
	E2-10	Motor iron loss for torque compensation	0 to 65535	1 W	14 W (See note 6.)	No	A	A	No	No
	E2-11	Motor rated output	0.40 to 650.00	0.01 kW	0.4 kW (See note 6.)	No	Q	Q	Q	Q
Motor 2 V/f Pattern	E3-01	Motor 2 control method selection	0 to 3	1	0	No	A	A	A	A
	E3-02	Motor 2 max. output frequency (FMAX)	40.0 to 400.0 (See note 5.)	0.1 Hz	60 Hz	No	A	A	A	A
	E3-03	Motor 2 max. voltage (VMAX)	0.0 to 255.0 (See note 1.)	0.1 V	200.0 V (See note 1.)	No	A	A	A	A
	E3-04	Motor 2 max. voltage frequency (FA)	0.0 to 400.0	0.1 Hz	60.0 Hz	No	A	A	A	A
	E3-05	Motor 2 mid. output frequency 1 (FB)	0.0 to 400.0	0.1 Hz	3.0 Hz (See note 2.)	No	A	A	A	No
	E3-06	Motor 2 mid. output frequency voltage 1 (VC)	0.0 to 255.0 (See note 1.)	0.1 V	15.0 V (See notes 1 and 2.)	No	A	A	A	No
	E3-07	Motor 2 min. output frequency (FMIN)	0.0 to 400.0	0.1 Hz	1.5 Hz (See note 2.)	No	A	A	A	A
	E3-08	Motor 2 min. output frequency voltage (VMIN)	0.0 to 255.0 (See note 1.)	0.1 V	9.0 V (See notes 1 and 2.)	No	A	A	A	No

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Motor 2 Setup	E4-01	Motor 2 rated current	0.32 to 6.40 (See note 7	0.01 A	1.90 A (See note 6.)	No	A	A	A	A
	E4-02	Motor 2 rated slip	0.00 to 20.00	0.01 Hz	2.90 Hz (See note 6.)	No	A	A	A	A
	E4-03	Motor 2 no-load current	0.00 to 1.89 (See note 8.)	0.01 A	1.20 A (See note 6.)	No	A	A	A	A
	E4-04	Motor 2 number of poles (number of poles)	2 to 48	2	4 poles	No	No	A	No	A
	E4-05	Motor 2 line-to-line resistance	0.000 to 65.000	0.001 Ω	9.842 Ω (See note 6.)	No	A	A	A	A
	E4-06	Motor 2 leak inductance	0.0 to 40.0	0.1%	18.2% (See note 6.)	No	No	No	A	A
	E4-07	Motor 2 rated capacity	0.0 to 650.00	0.01 kW	0.40 kwh (See note 6.)	No	A	A	A	A

Note: **1.** These are values for a 200 V Class Inverter. Values for a 400 V Class Inverter are double.
2. The factory setting will change when the control method is changed. The V/f control factory settings are given.
3. E1-11 and E1-12 are disregarded when set to 0.0.
4. E1-13 is set to the same value as E1-05=E1-03 by autotuning.
5. When C6-01 is set to 0 (CT selected), the upper limit of the setting range is 150.0 Hz.
6. The factory settings depend on the Inverter capacity. The values for a 200 V Class Inverter of 0.4 kW are given.
7. The setting range is 10% to 200% of the Inverter's rated output current. The value for a 200 V Class Inverter of 0.4 kW is given.
8. The setting range depends on the Inverter’s capacity. The values for a 200 V Class Inverter of 0.4 kW are given.

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
PG Option Setup	F1-01	PG parameter	0 to 60000	1	600	No	No	Q	No	Q
	F1-02	Operation selection at PG open circuit (PGO)	0 to 3	1	1	No	No	A	No	A
	F1-03	Operation selection at overspeed (OS)	0 to 3	1	1	No	No	A	No	A
	F1-04	Operation selection at deviation	0 to 3	1	3	No	No	A	No	A
	F1-05	PG rotation	0, 1	1	0	No	No	A	No	A
	F1-06	PG division rate (PG pulse monitor)	1 to 132	1	1	No	No	A	No	A
	F1-07	Integral value during accel/decel enable/disable	0, 1	1	0	No	No	A	No	No
	F1-08	Overspeed detection level	0 to 120	1%	115%	No	No	A	No	A
	F1-09	Overspeed detection delay time	0.0 to 2.0	0.1 s	1.0 s	No	No	A	No	A
	F1-10	Excessive speed deviation detection level	0 to 50	1%	10%	No	No	A	No	A
	F1-11	Excessive speed deviation detection delay time	0.0 to 10.0	0.1 s	0.5 s	No	No	A	No	A
	F1-12	Number of PG gear teeth 1	0 to 1000	1	0	No	No	A	No	No
	F1-13	Number of PG gear teeth 2		1	0	No	No	A	No	No
	F1-14	PG open-circuit detection time	0.0 to 10.0	0.1 s	2.0 s	No	No	A	No	A
Analog Reference Board	F2-01	Bi-polar or uni-polar input selection	0, 1	1	0	No	A	A	A	A
Digital Reference Board	F3-01	Digital input option	0 to 7	1	0	No	A	A	A	A
Analog Monitor Boards	F4-01	Channel 1 monitor selection	1 to 99	1	2	No	A	A	A	A
	F4-02	Channel 1 gain	0.00 to 2.50	0.01	1.00	Yes	A	A	A	A
	F4-03	Channel 2 monitor selection	1 to 99	1	3	No	A	A	A	A
	F4-04	Channel 2 gain	0.00 to 2.50	0.01	0.5	Yes	A	A	A	A
	F4-05	Channel 1 output monitor bias	−10.0 to 10.0	0.1%	0.0%	Yes	A	A	A	A
	F4-06	Channel 2 output monitor bias	−10.0 to 10.0	0.1%	0.0%	Yes	A	A	A	A
	F4-07	Analog output signal level for channel 1	0, 1	1	0	No	A	A	A	A
	F4-08	Analog output signal level for channel 2	0, 1	1	0	No	A	A	A	A
Not Used	F5-01 to F5-09	Do not set.								

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Communications Option Cards	F6-01	Operation after communications error	0 to 3	1	1	No	A	A	A	A
	F6-02	Detection method for external communications input error	0, 1	1	0	No	A	A	A	A
	F6-03	Operation after external communications input error	0 to 3	1	1	No	A	A	A	A
	F6-04	Not used	0 to 60000	1	0	No	A	A	A	A
	F6-06	Torque reference/ torque limit selection from optical option	0, 1	1	0	No	No	No	No	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Multi-function Contact Inputs	H1-01	Terminal S3 function selection	0 to 78	1	24	No	A	A	A	A
	H1-02	Terminal S4 function selection	0 to 78	1	14	No	A	A	A	A
	H1-03	Terminal S5 function selection	0 to 78	1	3 (0) (See note 1.)	No	A	A	A	A
	H1-04	Terminal S6 function selection	0 to 78	1	4 (3) (See note 1.)	No	A	A	A	A
	H1-05	Terminal S7 function selection	0 to 78	1	6 (4) (See note 1.)	No	A	A	A	A
	H1-06	Terminal S8 function selection	0 to 78	1	8 (6) (See note 1.)	No	A	A	A	A
Multi-function Contact Outputs	H2-01	Terminal M1-M2 function selection (contact)	0 to 3D	1	0	No	A	A	A	A
	H2-02	Terminal P1 function selection (open collector)	0 to 3D	1	1	No	A	A	A	A
	H2-03	Terminal P2 function selection (open collector)	0 to 3D	1	2	No	A	A	A	A
Multi-function analog inputs	H3-01	Signal level selection (terminal A1)	0, 1	1	0	No	A	A	A	A
	H3-02	Gain (terminal A1)	0.0 to 1000.0	0.1%	100.0%	Yes	A	A	A	A
	H3-03	Bias (terminal A1)	−100.0 to 100.0	0.1%	0.0%	Yes	A	A	A	A
	H3-04	Signal level selection (terminal A3)	0, 1	1	0	No	A	A	A	A
	H3-05	Multi-function analog input (terminal A3) function selection	0 to 1F	1	1F	No	A	A	A	A
	H3-06	Gain (terminal A3)	0.0 to 1000.0	0.1%	100.0%	Yes	A	A	A	A
	H3-07	Bias (terminal A5)	−100.0 to 100.0	0.1%	0.0%	Yes	A	A	A	A
	H3-08	Signal level selection (terminal A2)	0 to 2	1	2	No	A	A	A	A
	H3-09	Multi-function analog input (terminal A2) function selection	0 to 1F	1	0	No	A	A	A	A
	H3-10	Gain (terminal A2)	0.0 to 1000.0	0.1%	100.0%	Yes	A	A	A	A
	H3-11	Bias (terminal A2)	−100.0 to 100.0	0.1%	0.0%	Yes	A	A	A	A
	H3-12	Analog input filter time constant	0.00 to 2.00	0.01 s	0.03 s	No	A	A	A	A
	H3-13	Terminal A1/A2 switching	0, 1	1	0	No	A	A	A	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Multi-function Analog Outputs	H4-01	Analog output 1 monitor selection (terminal FM)	1 to 99	1	2	No	A	A	A	A
	H4-02	Analog output 1 gain (terminal FM)	0.00 to 2.50	0.01	1.00	Yes	Q	Q	Q	Q
	H4-03	Analog output 1 bias (terminal FM)	−10.0 to 10.0	0.1%	0.0%	Yes	A	A	A	A
	H4-04	Analog output 2 monitor selection (terminal AM)	1 to 99	1	3	No	A	A	A	A
	H4-05	Analog output 2 gain (terminal AM)	0.00 to 2.50	0.01	0.50	Yes	Q	Q	Q	Q
	H4-06	Analog output 2 bias (terminal AM)	−10.0 to 10.0	0.1%	0.0%	Yes	A	A	A	A
	H4-07	Analog output 1 signal level selection	0, 1	1	0	No	A	A	A	A
	H4-08	Analog output 2 signal level selection	0, 1	1	0	No	A	A	A	A
RS-422A/485 Communications:	H5-01	Slave address	0 to 20 (See note 2.)	1	1F	No	A	A	A	A
	H5-02	Communication speed selection	0 to 4	1	3	No	A	A	A	A
	H5-03	Communication parity selection	0 to 2	1	0	No	A	A	A	A
	H5-04	Stopping method after communication error	0 to 3	1	3	No	A	A	A	A
	H5-05	Communication error detection selection	0, 1	1	1	No	A	A	A	A
	H5-06	Send wait time	5 to 65	1 ms	5 ms	No	A	A	A	A
	H5-07	RTS control ON/OFF	0, 1	1	1	No	A	A	A	A
Pulse Train I/O	H6-01	Pulse train input function selection	0 to 2	1	0	No	A	A	A	A
	H6-02	Pulse train input scaling	1000 to 32000	1 Hz	1440 Hz	Yes	A	A	A	A
	H6-03	Pulse train input gain	0.0 to 1000.0	0.1%	100.0%	Yes	A	A	A	A
	H6-04	Pulse train input bias	−100.0 to 100.0	0.1%	0.0%	Yes	A	A	A	A
	H6-05	Pulse train input filter time	0.00 to 2.00	0.01 s	0.10 s	Yes	A	A	A	A
	H6-06	Pulse train monitor selection	1, 2, 5, 20, 24, or 36 only	1	2	Yes	A	A	A	A
	H6-07	Pulse train monitor scaling	0 to 32000	1 Hz	1440 Hz	Yes	A	A	A	A

Note: **1.** The values in parentheses indicate factory settings when initialized in 3-wire sequence.
2. When H5-01 is set to 0, the Inverter will not respond to RS-422A or RS-485 transmissions.

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Motor Overload	L1-01	Motor protection selection	0 to 3	1	1	No	Q	Q	Q	Q
	L1-02	Motor protection time constant	0.1 to 5.0	0.1 min	1.0 min	No	A	A	A	A
	L1-03	Alarm operation selection during motor overheating	0 to 3	1	3	No	A	A	A	A
	L1-04	Motor overheating operation selection	0 to 2	1	1	No	A	A	A	A
	L1-05	Motor temperature input filter time constant	0.00 to 10.00	0.01 s	0.20 s	No	A	A	A	A
Momentary power loss processing	L2-01	Momentary power loss detection	0 to 2	1	0	No	A	A	A	A
	L2-02	Momentary power loss ride-through time	0 to 25.5	0.1 s	0.1 s (See note 1.)	No	A	A	A	A
	L2-03	Min. baseblock time	0.1 to 5.0	0.1 s	0.2 s (See note 1.)	No	A	A	A	A
	L2-04	Voltage recovery time	0.0 to 5.0	0.1 s	0.3 s	No	A	A	A	A
	L2-05	Undervoltage detection level	150 to 210 (See note 2.)	1 V	190 V (See note 2.)	No	A	A	A	A
	L2-06	KEB deceleration time	0.0 to 200.0	0.1 s	0.0 s	No	A	A	A	A
	L2-07	Momentary recovery acceleration time	0.0 to 25.5	0.1 s	0 s (See note 3.)	No	A	A	A	A
	L2-08	Frequency reduction gain at KEB start	0 to 300	1	100	No	A	A	A	A
Stall Prevention	L3-01	Stall prevention selection during accel	0 to 2	1	1	No	A	A	A	No
	L3-02	Stall prevention level during accel	0 to 200	1%	150% (See note 4.)	No	A	A	A	No
	L3-03	Stall prevention limit during accel	0 to 100	1%	50%	No	A	A	A	No
	L3-04	Stall prevention selection during decel	0 to 3	1	1	No	Q	Q	Q	Q
	L3-05	Stall prevention selection during running	0 to 2	1	1	No	A	A	No	No
	L3-06	Stall prevention level during running	30 to 200	1%	150% (See note 4.)	No	A	A	No	No
	L3-11	Overvoltage inhibit selection	0, 1	1	0	No	No	No	A	A
	L3-12	Overvoltage inhibit voltage level	350 to 390	1 V	380 V	No	No	No	A	A
Reference Detection	L4-01	Speed agreement detection level	0.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
	L4-02	Speed agreement detection width	0.0 to 20.0	0.1 Hz	2.0 Hz	No	A	A	A	A
	L4-03	Speed agreement detection level (+/–)	–400.0 to 400.0	0.1 Hz	0.0 Hz	No	A	A	A	A
	L4-04	Speed agreement detection width (+/–)	0.0 to 20.0	0.1 Hz	2.0 Hz	No	A	A	A	A
	L4-05	Operation when frequency reference is missing	0, 1	1	0	No	A	A	A	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux vector
Fault Restart	L5-01	Number of auto restart attempts	0 to 10	1	0 attempts	No	A	A	A	A
	L5-02	Auto restart operation selection	0, 1	1	0	No	A	A	A	A
Torque Detection	L6-01	Torque detection selection 1	0 to 8	1	0	No	A	A	A	A
	L6-02	Torque detection level 1	0 to 300	1%	150%	No	A	A	A	A
	L6-03	Torque detection time 1	0.0 to 10.0	0.1 s	0.1 s	No	A	A	A	A
	L6-04	Torque detection selection 2	0 to 8	1	0	No	A	A	A	A
	L6-05	Torque detection level 2	0 to 300	1%	150%	No	A	A	A	A
	L6-06	Torque detection time 2	0.0 to 10.0	0.1 s	0.1 s	No	A	A	A	A
Torque Limits	L7-01	Forward drive torque limit	0 to 300	1%	200%	No	No	No	A	A
	L7-02	Reverse drive torque limit	0 to 300	1%	200%	No	No	No	A	A
	L7-03	Forward regenerative torque limit	0 to 300	1%	200%	No	No	No	A	A
	L7-04	Reverse regenerative torque limit	0 to 300	1%	200%	No	No	No	A	A
	L7-06	Integral time setting for torque limit	5 to 10000	1 ms	200 ms	No	No	No	A	No
	L7-07	Control method selection for torque limit during acceleration and deceleration	0, 1	1	0	No	No	No	A	No
Hardware Protection	L8-01	Protect selection for internal DB resistor (Type ERF)	0, 1	1	0	No	A	A	A	A
	L8-02	Overheat pre-alarm level	50 to 130	1°C	95°C (See note 1.)	No	A	A	A	A
	L8-03	Operation selection after overheat prealarm	0 to 3	1	3	No	A	A	A	A
	L8-05	Input open-phase protection selection	0, 1	1	0	No	A	A	A	A
	L8-07	Output open-phase protection selection	0 to 2	1	0	No	A	A	A	A
	L8-09	Ground protection selection	0, 1	1	1	No	A	A	A	A
	L8-10	Cooling fan ON/OFF	0, 1	1	0	No	A	A	A	A
	L8-11	Cooling fan ON/OFF delay time	0 to 300	1 s	60 s	No	A	A	A	A
	L8-12	Ambient temperature	45 to 60°C	1°C	45°C	No	A	A	A	A
	L8-15	OL2 characteristics selection at low speeds	0, 1	1	1	No	A	A	A	A
	L8-18	Soft CLA	0, 1	1	1	No	A	A	A	A

Note: **1.** The factory settings depend on the Inverter capacity. The values for a 200 V Class Inverter of 0.4 kW are given.
2. These are values for a 200 V Class Inverter. Values for a 400 V Class Inverter are double.
3. When this setting is 0, the Inverter will accelerate to the speed set for momentary power losses at the acceleration rate set in parameters C1-01 to C1-08.
4. This setting is for C6-01 = 1 (CT selected). The value is 120% when C6-01 = 0 (VT selected).

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux Vector
Hunting Prevention Function	N1-01	Hunting prevention function selection	0, 1	1	1	No	A	A	No	No
	N1-02	Hunting prevention gain	0.00 to 2.50	0.01	1.00	No	A	A	No	No
Speed Feedback Protection Control Functions	N2-01	Speed feedback detection control (AFR) gain	0.00 to 10.00	0.01	1.00	No	No	No	A	No
	N2-02	Speed feedback detection control (AFR) time constant	0 to 2000	1 ms	50 ms	No	No	No	A	No
	N2-03	Speed feedback detection control (AFR) time constant 2	0 to 2000	1 ms	750 ms	No	No	No	A	No
High-slip Braking	N3-01	High-slip braking deceleration frequency width	1 to 20	1%	5%	No	A	A	A	A
	N3-02	High-slip braking current limit	100 to 200	1%	150%	No	A	A	A	A
	N3-03	High-slip braking stop dwell time	0.0 to 10.0	1.0 s	1.0 s	No	A	A	A	A
	N3-04	High-slip braking OL time	30 to 1200	1 s	40 s	No	A	A	A	A
Feed Forward	N5-01	Feed forward control selection	0, 1	1	0	No	No	No	No	A
	N5-02	Motor acceleration time	0.001 to 10.000	0.001 s	(See note 1.)	No	No	No	No	A
	N5-03	Feed forward proportional gain	0.00 to 100.00	0.01	1.0	No	No	No	No	A
	N5-04	Response frequency for speed command	0.00 to 50.00	0.01	40.00 Hz	No	No	No	No	A
Monitor Select	o1-01	Monitor selection	4 to 33	1	6	Yes	A	A	A	A
	o1-02	Monitor selection after power up	1 to 4	1	1	Yes	A	A	A	A
	o1-03	Frequency units of reference setting and monitor	0 to 39999	1	0	No	A	A	A	A
	o1-04	Setting unit for frequency parameters related to V/f characteristics	0, 1	1	0	No	No	No	No	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux Vector
Multi-function Selections	o2-01	LOCAL/REMOTE key enable/disable	0, 1	1	1	No	A	A	A	A
	o2-02	STOP key during control circuit terminal operation	0, 1	1	1	No	A	A	A	A
	o2-03	User parameter initial value	0 to 2	1	0	No	A	A	A	A
	o2-04	kVA selection	0 to FF	1	0	No	A	A	A	A
	o2-05	Frequency reference setting method selection	0, 1	1	0	No	A	A	A	A
	o2-06	Operation selection when digital operator is disconnected	0, 1	1	0	No	A	A	A	A
	o2-07	Cumulative operation time setting	0 to 65535	1 hour	0 hour	No	A	A	A	A
	o2-08	Cumulative operation time selection	0, 1	1	0	No	A	A	A	A
	o2-10	Fan operation time setting	0 to 65535	1 hour	0 hour	No	A	A	A	A
	o2-12	Fault trace/fault history clear function	0, 1	1	0	No	A	A	A	A
	o2-14	Output power monitor clear selection	0, 1	1	0	No	A	A	A	A
Copy Function	o3-01	Copy function selection	0 to 3	1	0	No	A	A	A	A
	o3-02	Read permitted selection	0, 1	1	0	No	A	A	A	A

Function	Parameter number	Name	Setting range	Min. setting units	Factory setting	Change during operation	Control mode			
							V/f	V/f with PG	Open loop vector	Flux Vector
Motor Autotuning	T1-00	Motor 1/2 selection (See note 2.)	1, 2	1	1	No	A	A	A	A
	T1-01	Autotuning mode selection	0 to 2	1	2: V/f control or V/f with PG control 0: Open loop vector control (See note 3.)	No	A	A	A	A
	T1-02	Motor rated output power (See note 4.)	10% to 200% of the Inverter's rated output (See note 6.)	0.1 kW	Same as the Inverter's rated output	No	A	A	A	A
	T1-03	Motor rated voltage (See notes 4 and 5.)	0 to 255.5 V (See note 8.)	0.1 V	200.0 V (See note 8.)	No	No	No	A	A
	T1-04	Motor rated current (See note 4.)	10% to 200% of the Inverter's rated current (See note 6.)	0.01 A	Current of a general motor with the same capacity as the Inverter	No	A	A	A	A
	T1-05	Motor rated frequency (See note 4 and 5.)	0 to 400.00 (See note 7.)	0.01 Hz	60.00 Hz	No	No	No	A	A
	T1-06	Number of motor poles	2 to 48	1	4	No	No	No	A	A
	T1-07	Motor rated speed (See note 4.)	0 to 24000 (See note 7.)	1 r/min	1750 r/min	No	No	No	A	A
	T1-08	Number of PG pulses when turning	0 to 60000	1	600	No	No	No	A	A
	T1-09	Motor no-load current	0.00 to 1.89	0.01	(See note 1.)	No	No	No	A	A

Note: **1.** The factory setting depends on the Inverter capacity.

2. Normally this parameter is not displayed. It is displayed only when one of the multi-function digital inputs is set as the motor selecting input (one of inputs H1-01 to H1-05 set to 16).

3. Only setting 2 (autotuning resistance between lines) can be selected when the control mode is set to V/f control or V/f control with PG.

4. When using a constant output motor, set the base speed.

5. When using a dedicated inverter motor or vector motor, the voltage and frequency may be lower than they are in general-purpose motors. Always check the motor nameplate and test reports. If the no-load values are known, set the no-load voltage in T1-03 and the no-load frequency in T1-05 in order to optimize accuracy.

6. The motor can be controlled stably by vector control if the setting is in the range of 50% to 100% of the Inverter's value.

7. The setting range depends on the Inverter's capacity and the setting in C6-01 (CT/VT selection).

8. These are values for a 200 V Class Inverter. Values for a 400 V Class Inverter are double.

■ Protective Functions

Fault Detection

When the Inverter detects a fault, the error information is displayed at the Digital Operator, the fault contact output operates, and the Inverter output is shut OFF causing the motor to coast to a stop. (The stopping method can be selected for some faults, and the selected stopping method will be used with these faults.)

Use one of the following methods to reset the fault before restarting the Inverter.

- Set a multi-function contact input (H1-01 to H1-06) to 14 (Fault Reset) and turn ON the fault reset signal.
- Press the RESET Key on the Digital Operator.
- Turn the main circuit power supply OFF and then ON again.

Error details		Error display	Explanation
Overcurrent	(OC)	oC	The Inverter output current exceeded the overcurrent detection level. (200% of rated current)
Ground Fault	(GF)	GF	The ground fault current at the Inverter output exceeded approximately 50% of the Inverter rated output current.
Fuse Blown	(PUF)	PUF	The fuse in the main circuit is blown.
Main Circuit Overvoltage	(OV)	ov	The main circuit DC voltage exceeded the overvoltage detection level. 200 V Class: Approx. 410 V 400 V Class: Approx. 820 V
Main Circuit Undervoltage Main Circuit MC Operation Failure	(UV1)	Uv1	The main circuit DC voltage is below the Undervoltage Detection Level (L2-05). 200 V Class: Approx. 190 V 400 V Class: Approx. 380 V
Control Power Fault	(UV2)	Uv2	The control power supply voltage dropped.
Inrush Prevention Circuit Fault	(UV3)	Uv3	The MC did not respond for 10 s even though the MC ON signal has been output. 200 V Class: 37 to 110 kW 400 V Class: 75 to 300 kW
Main Circuit Voltage Fault	(PF)	PF	This fault is detected when an input power supply phase is lost or phase voltages become imbalanced.
Output Open-phase	(LF)	LF	An open-phase occurred at the Inverter output. This fault is detected when L8-07 is set to 1.
Cooling Fin Overheating	(OH, OH1)	oH oH1	The temperature of the Inverter's cooling fins exceeded the setting in L8-02 or 100°C. The Inverter's internal cooling fan stopped. OH: Temperature exceeded L8-02 setting (0 to 2) OH1: Temperature exceeded about 100°C
Motor Overheating Alarm	(OH3)	oH3	The Inverter will stop to operate according to the setting of L1-03.
Motor Overheating Fault	(OH4)	oH4	The Inverter will stop according to the setting of L1-04.
Installed Braking Resistor Overheating	(RH)	rH	The braking resistor protection function, which was set in L8-01, was activated.
Internal Braking Transistor Fault	(RR)	rr	The braking transistor is not operating properly.
Motor Overload	(OL1)	oL1	The motor overload protection function has operated based on the internal electronic thermal value.
Inverter Overload	(OL2)	oL2	The Inverter overload protection function has operated based on the internal electronic thermal value.
Overtorque Detected 1	(OL3)	oL3	There has been a current greater than the setting in L6-02 for longer than the setting in L6-03.
Overtorque Detected 2	(OL4)	oL4	There has been a current greater than the setting in L6-05 for longer than the setting in L6-06.
High-slip Braking OL	(OL7)	oL7	The output frequency did not change within the high-slip braking time set in N3-04.
Undertorque Detected 1	(UL3)	UL3	There has been a current less than the setting in L6-02 for longer than the setting in L6-03.

Error details		Error display	Explanation
Undertorque Detected 2	(UL4)	UL4	There has been a current less than the setting in L6-05 for longer than the setting in L6-06.
Overspeed	(OS)	oS	The speed has been greater than the setting in F1-08 for longer than the setting in F1-09.
PG Disconnection Detected	(PGO)	PGo	PG pulses were input when the Inverter was outputting a frequency (soft start output ≥ E1-09).
Excessive Speed Deviation	(DEV)	dEv	The speed deviation has been greater than the setting in F1-10 for longer than the setting in F1-11.
Control Fault	(CF)	CF	The torque limit was reached continuously for 3 seconds or longer during a deceleration stop during open-loop vector control.
PID Feedback Reference Lost	(FbL)	FbL	PID feedback reference loss detection is enabled (b5-12 = 2) and the PID feedback input was less than the PID feedback loss detection level (b5-13) for longer than the PID feedback loss detection time (b5-14).
External Fault input from Communications Option Card	(EF0)	EF0	An external fault was input from a Communications Option Card.
External fault (Input terminal 3)	(EF3)	EF3	An external fault was input from a multi-function input terminal.
External fault (Input terminal 4)	(EF4)	EF4	
External fault (Input terminal 5)	(EF5)	EF5	
External fault (Input terminal 6)	(EF6)	EF6	
External fault (Input terminal 7)	(EF7)	EF7	
External fault (Input terminal 8)	(EF8)	EF8	
Operator Connection Fault	(OPR)	oPr	The connection to the Digital Operator was broken during operation for a RUN command from the Digital Operator.
RS-422/485 Communications Error	(CE)	CE	A normal reception was not possible for 2 s or longer after control data was received once.
Option Communications Error	(BUS)	bUS	A communications error was detected during a run command or while setting a frequency reference from a Communications Option Card.
Operator Communications Fault 1 CPU External RAM Fault	(CPF00)	CPF00	Communications with the Digital Operator were not established within 5 seconds after the power was turned on. CPU External RAM Fault
Operator Communications Fault 2	(CPF01)	CPF01	After communications were established, there was a communications error with the Digital Operator for more than 2 seconds.
Baseblock circuit error	(CPF02)	CPF02	The Inverter's control section failed.
EEPROM error	(CPF03)	CPF03	
CPU internal A/D converter error	(CPF04)	CPF04	
CPU external A/D converter error	(CPF05)	CPF05	
Option Card connection error	(CPF06)	CPF06	The Option Card is not connected properly.
ASIC internal RAM fault	(CPF07)	CPF07	The Inverter control circuit is damaged.
Watchdog timer fault	(CPF08)	CPF08	
CPU-ASIC mutual diagnosis fault	(CPF09)	CPF09	
ASIC version fault	(CPF10)	CPF10	The Inverter control circuit is faulty
Option Card fault	(CPF20)	CPF20	The Option Card's A/D converter failed.
Communications Option Card self diagnostic error	(CPF21)	CPF21	Communications Option Card fault.
Communications Option Card model code error	(CPF22)	CPF22	
Communications Option Card mutual diagnostic error	(CPF23)	CPF23	

Alarm Detection

Alarm detection is one of the Inverter protection functions, but does not operate the fault contact output. The system will automatically returned to its original status once the cause of the alarm has been removed.

The Digital Operator display flashes and the alarm is output from the multi-function outputs.

Error details		Error display	Explanation
Forward/Reverse Run Commands Input Together	(EF)	EF	Both the forward and Reverse Run Commands have been ON for more than 0.5 s.
Main Circuit Undervoltage	(UV)	Uv	One of the following conditions occurred when there was no Run signal. • The main circuit DC voltage was below the Undervoltage Detection Level Setting (L2-05). • The surge current limiting magnetic contactor opened. • The control power supply voltage fell below the minimum (CUV level).
Main Circuit Overvoltage	(OV)	ov	The main circuit DC voltage exceeded the overvoltage detection level. 200 V Class: Approx. 400 V 400 V Class: Approx. 800 V
Cooling Fin Overheating	(OH)	oH	The temperature of the Inverter's cooling fins exceeded the setting in L8-02. (Alarm occurs when L8-03 = 3, which is the factory default setting.
Inverter Overheating Prealarm	(OH2)	oH2	An OH2 alarm signal (Inverter overheating alarm signal) was input from a multi-function input terminal (S3 to S7).
Motor Overheating	(OH3)	oH3	E was set for H3-05 or H3-09 and the motor temperature thermistor input exceeded the alarm detection level.
Overtorque 1	(OL3)	oL3	There has been a current greater than the setting in L6-02 for longer than the setting in L6-03.
Overtorque 2	(OL4)	oL4	There has been a current greater than the setting in L6-05 for longer than the setting in L6-06.
Undertorque 1	(UL3)	UL3	There has been a current less than the setting in L6-02 for longer than the setting in L6-03.
Undertorque 2	(UL4)	UL4	There has been a current less than the setting in L6-05 for longer than the setting in L6-06.
Overspeed	(OS)	oS	The speed has been greater than the setting in F1-08 for longer than the setting in F1-09.
The PG is Disconnected	(PG0)	PG0	The Inverter is outputting a frequency, but PG pulses aren't being input.
Excessive Speed Deviation	(DEV)	dEv	The speed deviation has been greater than the setting in F1-10 for longer than the setting in F1-11.
External Fault (Input Terminal S3)	(EF3)	EF3	An external fault was input from a multi-function input terminal (S3 to S8).
External Fault (Input Terminal S4)	(EF4)	EF4	
External Fault (Input Terminal S5)	(EF5)	EF5	
External Fault (Input Terminal S6)	(EF6)	EF6	
External Fault (Input Terminal S7)	(EF7)	EF7	
PID Feedback Reference Lost	(FbL)	FbL	A PID feedback reference loss was detected (b5-12 = 2) and the PID feedback input was less than b5-13 (PID feedback loss detection level) for longer than the time set in b5-14 (PID feedback loss detection time).
Communications Error	(CE)	CE	Normal reception was not possible for 2 s or longer after control data was received once.
Option Card Communications Error	(BUS)	bUS	A communications error occurred in a mode where the Run Command or a frequency reference is set from a Communications Option Card.
Communications on Standby	(CALL)	CAL	Control data was not normally received when power was turned ON.

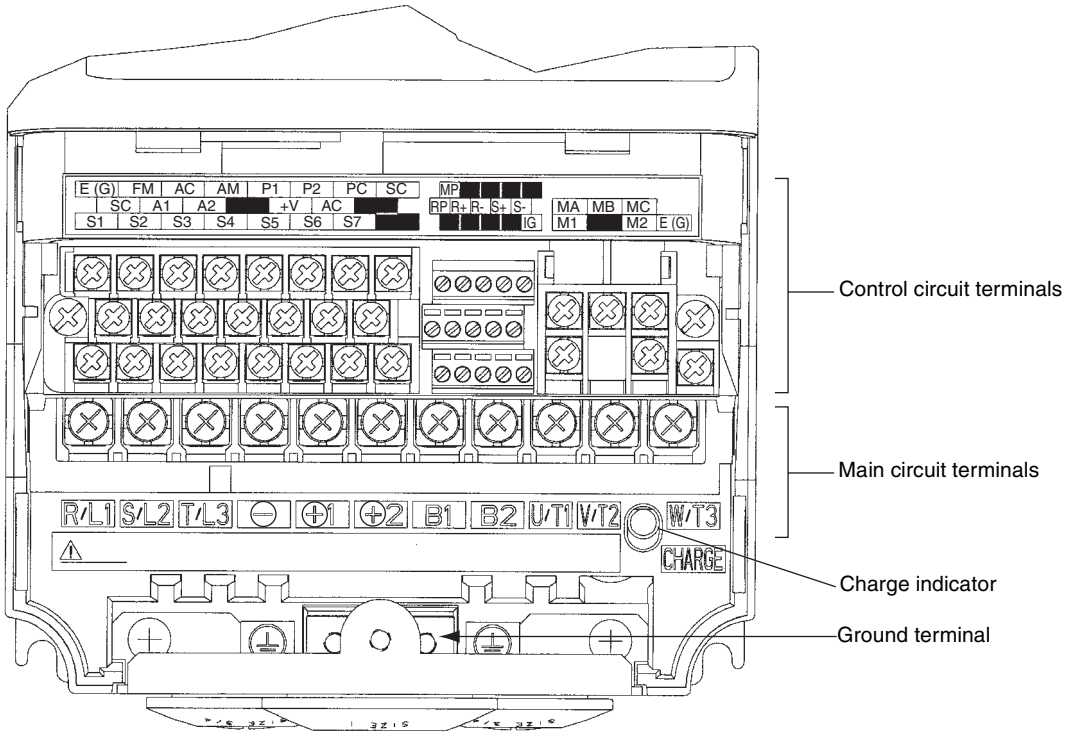
Operation Errors

An operation error will occur if there is an invalid parameter setting or a contradiction between two parameter settings. It won't be possible to start the Inverter until the parameters have been set correctly. (The alarm output and fault contact outputs will not operate either.)

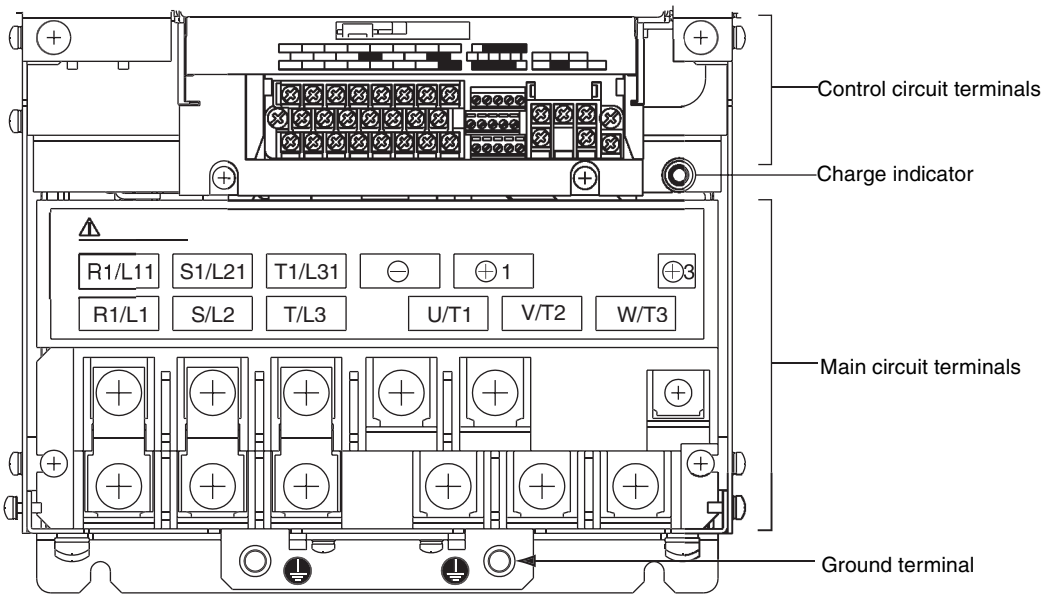
Error details		Error display	Explanation
Incorrect Inverter capacity setting	(OPE01)	oPE01	The Inverter capacity setting doesn't match the Unit. (Contact your dealer.)
Parameter setting range error	(OPE02)	oPE02	The parameter setting is outside of the valid setting range.
Multi-function input selection error	(OPE03)	oPE03	The same setting has been assigned to more than one multi-function input (H1-01 to H1-05), or neither the UP command or DOWN command is set.
Option Card Selection Error	(OPE05)	oPE05	The Option Card was selected as the frequency reference source by setting b1-01 to 3, but an Option Card isn't connected (C option).
Control Method Selection Error	(OPE06)	oPE06	1 (V/f with PG) was selected in A1-02, but a PG Speed Control Board isn't connected.
Multi-function Analog Input Selection Error	(OPE07)	oPE07	The same setting has been selected for the analog input selection and the PID function selection.
Parameter Selection Error	(OPE08)	oPE08	A setting has been made that is not used in the current control method.
PID Control Selection Error	(OPE09)	oPE09	The PID sleep function is enabled (b5-01 ≠ 0 and b5-15 ≠ 0), but the stopping method is not set to either “decelerate to stop” or “coast to stop” (b1-03 >1).
V/f Data Setting Error	(OPE10)	oPE10	The settings in parameters E1-04, E1-06, E1-07, and E1-09 do not satisfy the required conditions.
Parameter Setting Error	(OPE11)	oPE11	There was an invalid setting.
EEPROM Write Error	(ERR)	Err	A verification error occurred when writing EEPROM.

■ Terminal Block Configuration

Terminal Arrangement for the 200-V Class 0.4 kW Inverter



Terminal Arrangement for the 200-V Class 22 kW Inverter



Main-circuit Terminals

Voltage Class	200-V Class			400-V Class		
Model (3G3RV-□-V1)	A2004 to A2185	B2220 to B2300	B2370 to B211K	A4004 to A4185	B4220 to B4550	B4750 to B430K
Maximum Applied Motor Capacity	0.4 to 18.5 kW	22 to 30 kW	37 to 110 kW	0.4 to 18.5 kW	22 to 55 kW	75 to 300 kW
R/L1	Main-circuit power supply input	Main-circuit power supply input R-R1, S-S1, T-T1 are wired when shipped from the factory.		Main-circuit power supply input	Main-circuit power supply input R-R1, S-S1, T-T1 are wired when shipped from the factory.	
S/L2						
T/L3						
R1/L11	---			---		
S1/L21						
T1/L31						
U/T1	Inverter output			Inverter output		
V/T2						
W/T3						
B1	For Braking Resistor Unit connection	---		For Braking Resistor Unit connection	---	
B2						
⊖	For DC reactor connection (⊕1 and ⊕2) For DC power supply input (⊕1 and ⊖) (See note 1.)	For DC power supply input (⊕1 and ⊖) (See note 1.) For Braking Unit connection (⊕3 and ⊖)		For DC reactor connection (⊕1 and ⊕2) For DC power supply input (⊕1 and ⊖) (See note 1.)	For DC power supply input (⊕1 and ⊖) (See note 1.) For Braking Unit connection (⊕3 and ⊖)	
⊕1						
⊕2						
⊕3	---			---		
S/L2	---		Cooling fan power supply input (See note 2.)	---		
R/L1				---		Cooling fan power supply input (See note 3.)
S200/L2200	---					
S400/L2400						
⏚	Ground (to resistance of 100 Ω or less)			Ground (to resistance of 10 Ω or less)		

Note: **1.** The DC power supply inputs "⊕1 and ⊖" do not conform to UL/cUL standards.

2. Cooling fan power supply input R/L1-S/L2: 200 to 220-VAC, 50-Hz input or 200 to 230-VAC, 60-Hz input (A transformer is required for 230-VAC, 50-Hz input or 240-VAC, 50/60-Hz input.)

3. Cooling fan power supply input R/L1-S200/LS200: 200 to 220-VAC, 50-Hz input or 200 to 230-VAC, 60-Hz input; R/L1-S400/L2400: 380 to 480-VAC, 50/60 Hz input

Control-circuit Terminals (Same for 200-V and 400-V Class)

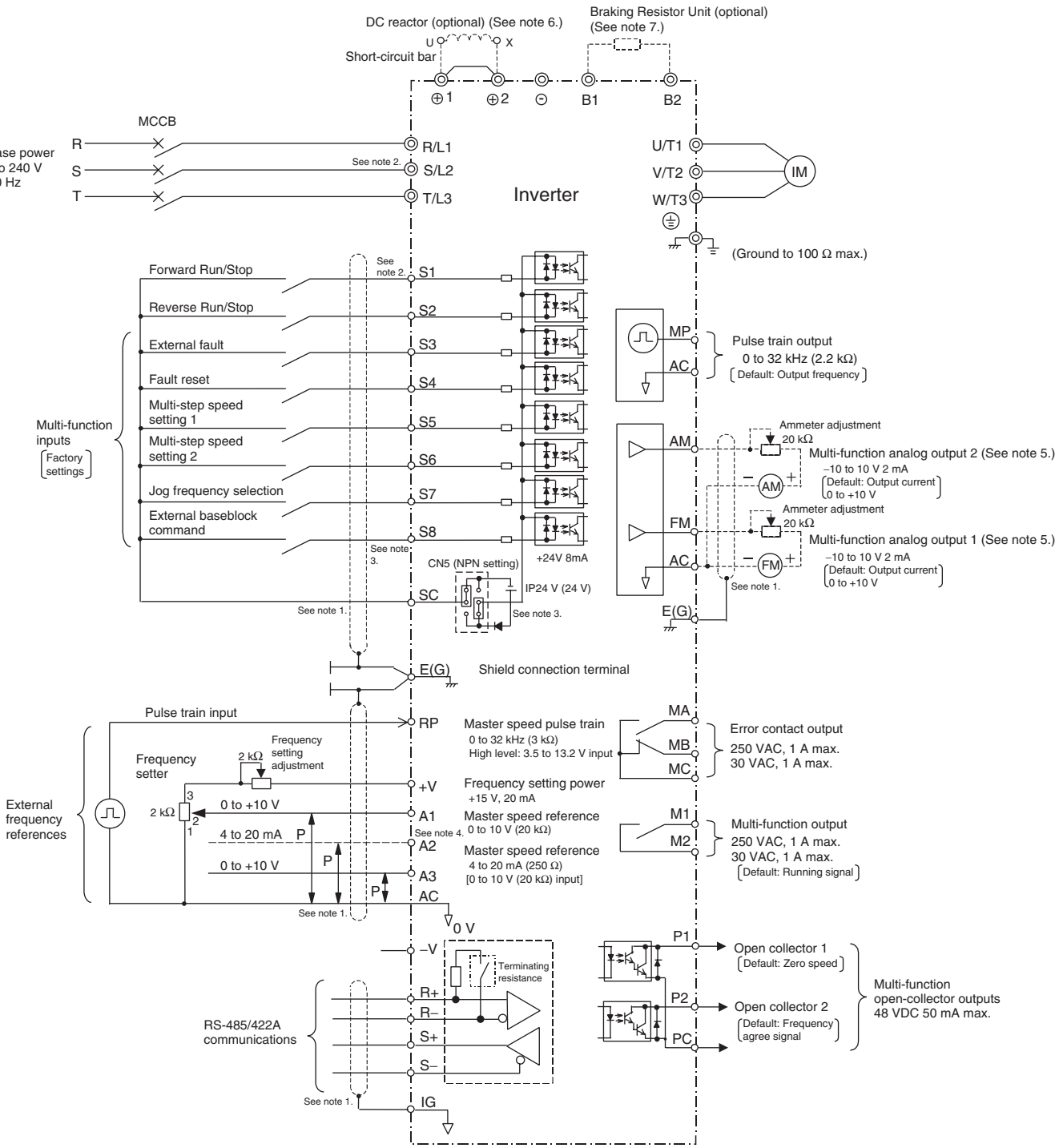
Type	Signal Symbol	Signal Name	Terminal Function	Signal Level
Sequence Input	S1	Forward-stop command	Forward when ON, stop when OFF	+24 V DC, 8 mA photocoupler
	S2	Reverse-stop command	Reverse when ON, stop when OFF	
	S3	Multi-function input selection 1	Factory setting: External fault detected when ON	
	S4	Multi-function input selection 2	Factory setting: Fault reset when ON	
	S5	Multi-function input selection 3	Factory setting: Each multi-step speed command 1 effective when ON	
	S6	Multi-function input selection 4	Factory setting: Each multi-step speed command 2 effective when ON	
	S7	Multi-function input selection 5	Factory setting: Inching frequency selected when ON	
	S8	Multi-function input selection 5	Factory setting: Inching frequency selected when ON	
	SC	Sequence control input common	---	
Analog Input	+V	+15-V power supply	+15-V power supply for analog reference	+15 V (20 mA maximum allowable current)
	–V	–15-V power supply	–15-V power supply for analog reference	–15 V (20 mA maximum allowable current)
	A1	Main speed frequency reference	0 to 10 V/100%	0 to 10 V (input impedance: 20 kΩ)
	A2	Multi-function analog input	4 to 20 mA/100%, 0 to 10 V/100% Factory setting: Add to terminal A1 (H3-09 = 0)	4 to 20 mA (input impedance: 250 kΩ) 0 to 10 V (input impedance: 20 kΩ)
	A3	Multi-function analog input	0 to 10 V/100%, –10 to 10 V/100% Factory setting: Not used.	0 to 10 VC (input impedance: 20 kΩ) –10 to 10 VC (input impedance: 20 kΩ)
	AC	Analog common	0 V	---
	E (G)	Shield wire, optional ground connection	---	---
Sequence Output	P1	Multi-function contact output 1	Factory setting: Zero speed Zero level (b2-01) or below when ON.	Open collector output +48 VDC, 50 mA
	P2	Multi-function contact output 2	Factory setting: Frequency agreement detection ON when the frequency is within ±2 Hz of the set frequency.	
	PC	Photocoupler output common	---	
	MA	Fault output (NO contact)	ON between MA and MC during fault ON between MB and MC during fault.	Relay output Dry contacts Contact capacity 250 VAC, 1 A max. 30 VDC, 1 A max.
	MB	Fault output (NC contact)		
	MC	Relay contact output common	---	
	M1	Multi-function contact output (NO contact)	Factory setting: RUN ON between M1 and M2 during operation.	
	M2			

Type	Signal Symbol	Signal Name	Terminal Function	Signal Level
Analog Monitor Output	FM	Multi-function analog monitor 1	Factory setting: Output frequency 0 to 10 V/100% frequency	0 to +10 VDC ±5% 2 mA max.
	AM	Multi-function analog monitor 2	Factory setting: Current monitor 5 V/Inverter rated current	
	AC	Analog common	---	
Pulse Input/ Output	RP	Multi-function pulse input	Factory setting: Frequency reference input (H6-01 = 0)	0 to 32 kHz (3 kΩ)
	MP	Multi-function pulse monitor	Factory setting: Output frequency (H6-06 = 2)	0 to 32 kHz (2.2 kΩ)

Communications-circuit Terminals (Same for 200-V and 400-V Class)

Type	Signal Symbol	Signal Name	Terminal Function	Signal Level
RS-422A/ 485 Communications	R+	Receive data	For 2-wire RS-485 communications, short R+ and S+, as well as R– and S–.	Differential input, photocoupler isolation
	R–			
	S+	Send data		Differential input, photocoupler isolation
	S–			
	IG	Shield wire for communications	---	---

■ Standard Connections



Note: **1.** Shield, P Twisted-pair wires

2. Main circuit terminals are indicated with double circles and control circuit terminals are indicated with single circles.

3. Sequence input signals S1 to S8 are labeled for sequence connections (0 V common and sinking mode) for no-voltage contacts or NPN transistors. These are the default settings.

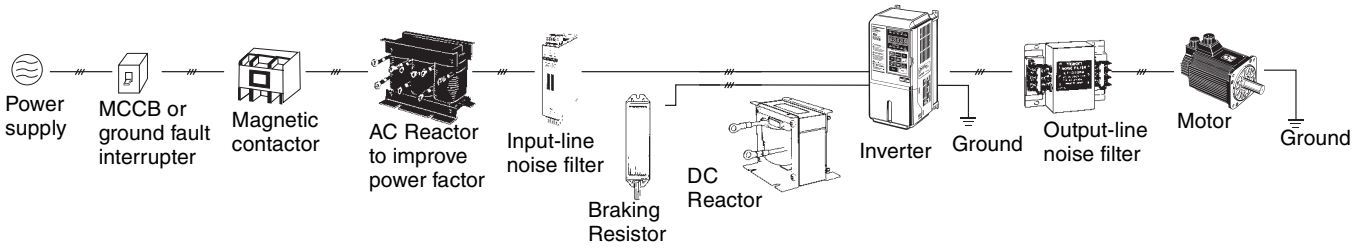
4. The main frequency reference input is selectable; it can be input from parameter H3-13, the voltage input (terminal A1), or the current input (terminal A2). The factory default setting is the voltage input.

5. The multi-function analog output is a dedicated meter output for an analog frequency meter, ammeter, voltmeter, watt-meter, etc. Do not use this output for feedback control or for any other control purpose.

6. DC Reactors are built into 200-V class Inverters in the 22 to 110 kW range and 400-V class Inverters in the 22 to 160 kW range to improve the input power factor, so it isn't necessary to add a DC Reactor to these models. Remove the short bar when connecting a DC reactor to Inverters with a capacity of 18.5 kW or less.
7. Set parameter L8-01 to 1 when using a Braking Resistor (3G3IV-PERF150WJ□). When using a Braking Resistor Unit, a cutoff sequence for the power supply must be made using a thermal relay trip.

■ Specifications of Optional Items and Peripheral Devices

The following optional items and peripheral devices can be used with the Inverter. Select them according to the application.



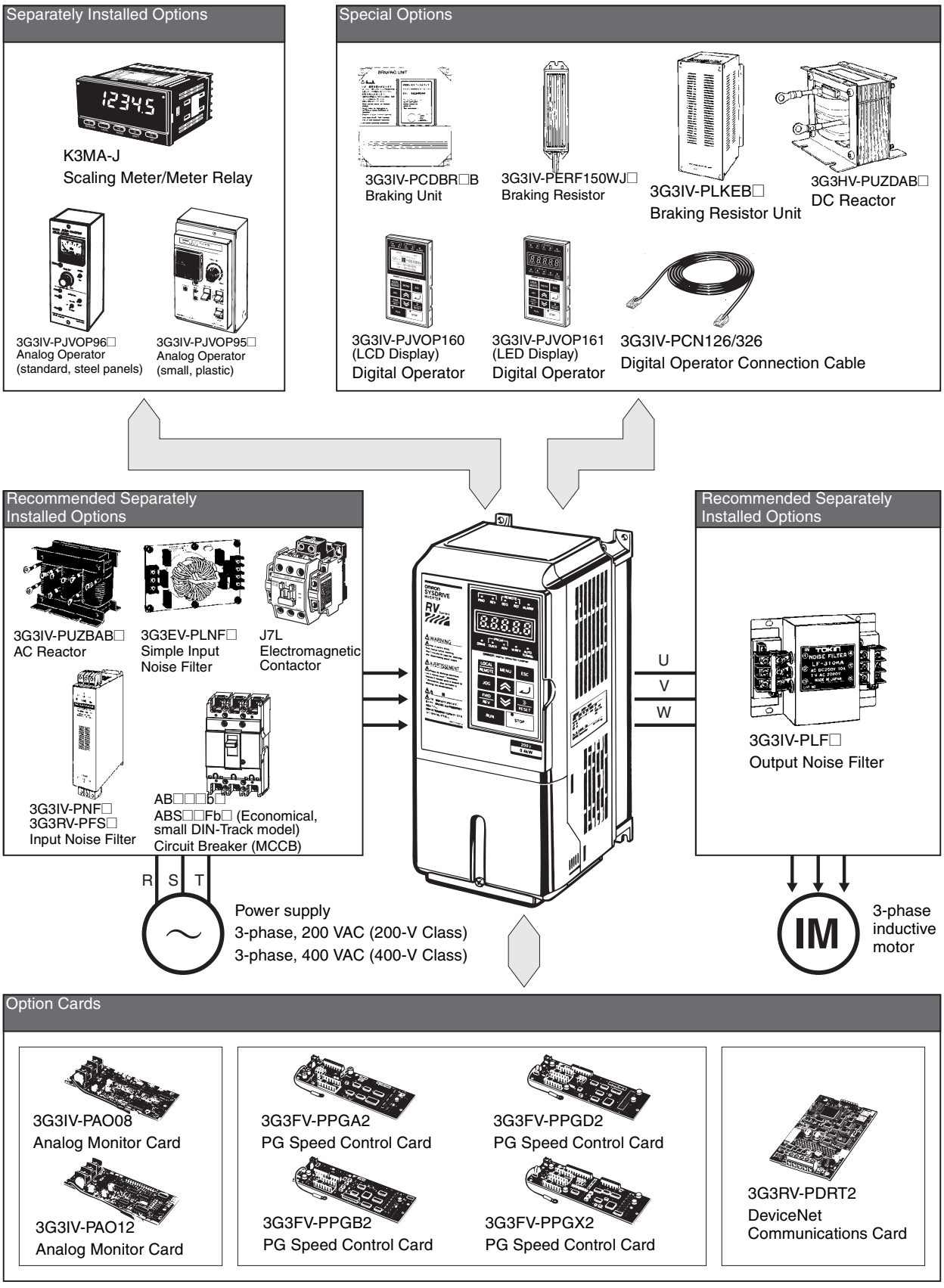
Purpose	Name	Model	Description
Protect Inverter wiring	MCCB or Ground Fault Interrupter (See note.)	Examples: LG's AB/EB, AB□F/EB□F Mitsubishi Electric's NV Series	Always connect a breaker to the power supply line to protect Inverter wiring. Use a ground fault interrupter suitable for high frequencies.
Prevents burning when a Braking Resistor is used.	Electromagnetic Contactor	Example: J7L-□-□□ Fuji Electric's SC Series	Install to prevent the braking resistor from burning out when one is used. Always attach a surge absorber to the coil.
Contains switching surge	Surge Absorber	Example: MARCON Electric's DCR2-□	Absorbs surge from the magnetic contactor and control relays. Connect surge absorbers to all magnetic contactors and relays near the Inverter.
Isolates I/O signals	Isolator	Example: MARCON Electric's DGP□	Isolates the I/O signals of the Inverter and is effective against inductive noise.
Improve the input power factor of the Inverter	DC Reactor AC Reactor	3G3HV-PUZDAB□ 3G3IV-PUZBAB□	Used to improve the input power factor of the Inverter. All Inverters of 22 kW or higher contain built-in DC reactors. These are optional for Inverters of 18 kW or less. Install DC and AC reactors for applications with a large power supply capacity (600 kVA or higher).
Reduce the affects of radio and control device noise	Input Noise Filter	3G3IV-PFN□ 3G3EV-PLNF□	Reduces noise coming into the inverter from the power supply line and to reduce noise flowing from the inverter into the power supply line. Connect as close to the Inverter as possible.
	EMC-compliant Input Noise Filter	3G3RV-PFS□	This input noise filter is for use in systems that must comply with the EC's EMC Directives. Select a filter appropriate for the Inverter model.
	Output Noise Filter	3G3IV-PLF□	Reduces noise generated by the Inverter. Connect as close to the Inverter as possible.
Enable stopping the machine in a set time	Braking Resistor	3G3IV-PERF150WJ□	Consumes the regenerative motor energy with a resistor to reduce deceleration time (use rate: 3% ED).
	Braking Resistor Unit	3G3IV-PLKEB□	Consumes the regenerative motor energy with a resistor to reduce deceleration time (use rate: 10% ED).
	Braking Unit	3G3IV-PCDBR□B	Used with a Braking Resistor Unit to reduce the deceleration time of the motor.
Operates the Inverter externally	Analog Operator (small plastic Operator)	3G3IV-PJVOP95□	Allows frequency reference settings and ON/OFF operation control to be performed by analog references from a remote location (50 m max.). Frequency counter specifications: 60/120 Hz, 90/180Hz
	Analog Operator (Standard steel-plate Operator)	3G3IV-PJVOP96□	Allows frequency reference settings and ON/OFF operation control to be performed by analog references from a remote location (50 m max.). Frequency counter specifications: 75 Hz, 150 Hz, 220 Hz
	Digital Operator Connecting Cable	1 m cable: (3G3IV-PCN126) 3 m cable: (3G3IV-PCN326)	Extension cable to use a Digital Operator remotely. Cable length: 1 m or 3 m
Provides Inverter momentary power loss recovery time	Momentary Power Loss Recovery Unit	3G3IV-PP00□	Handles momentary power losses for the control power supply for models 2.2 kW or less (maintains power for 2 s).

Purpose	Name	Model	Description
Set/monitor frequencies and voltages externally.	Scaling Meter/ Meter Relay	K3MA-J	Measures the output voltage externally and designed for use with a PWM Inverter.

Note: Use a ground fault interrupter with a current sensitivity of 200 mA minimum and an operating time of 0.1 s minimum to prevent operating errors. The interrupter must be suitable for high-frequency operation.
Example: NV series by Mitsubishi Electric Corporation (manufactured in or after 1988)
EG, SG series by Fuji Electric Co., Ltd. (manufactured in or after 1984)

3G3RV-series Inverters

■ Options



Separately Installed Options

Name	Model number	Application
Scaling Meter/Meter Relay	K3MA-J	Connects to a multi-function analog output from the Inverter. Used to display rotational speeds of motors, line speeds, etc., in physical units.
Analog Operator (standard with steel panels)	3G3IV-PJVOP96□	Allows frequency reference settings and ON/OFF operation control to be performed by analog references from a remote location (50 m max.). Frequency counter specifications: 75 Hz, 150 Hz, 220 Hz
Analog Operator (small, plastic)	3G3IV-PJVOP95□	Allows frequency reference settings and ON/OFF operation control to be performed by analog references from a remote location (50 m max.). Frequency counter specifications: 60/120 Hz, 90/180Hz

Special Options

Name	Model number	Application
Braking Unit	3G3IV-PCDBR□B	Used with a Braking Resistor Unit to reduce the deceleration time of the motor. Not required with Inverters of 7.5 kW or less for 200-V class Inverters or for Inverters of 15 kW or less for 400-V class Inverters.
Braking Resistor	3G3IV-PERF150WJ□	Consumes the regenerative motor energy with a resistor to reduce deceleration time (use rate: 3% ED). Not required with Inverters of 3.7 kW or less for 200-V class Inverters or for Inverters of 2.2 kW or less for 400-V class Inverters.
Braking Resistor Unit	3G3IV-PLKEB□	Consumes the regenerative motor energy with a resistor to reduce deceleration time (use rate: 10% ED).
DC Reactor	3G3HV-PUZDAB□	Used to control harmonics generated by the Inverter and to improve the input power factor of the Inverter. All Inverters of 18.5 kW or higher contain built-in DC reactors.
Digital Operator with LCD Display	3G3IV-PJVOP160	Used to display and change the Inverter's parameters and perform maintenance. The Digital Operator is equipped with a copy function, so if some problem arises the Digital Operator can be replaced just by mounting another one.
Digital Operator with LED Display	3G3IV-PJVOP161	Used to display and change the Inverter's parameters and perform maintenance. The Digital Operator is equipped with a copy function, so if some problem arises the Digital Operator can be replaced just by mounting another one.
Digital Operator Connecting Cable	3G3IV-PCN126 (1 m)	Extension cable for the 3G3RV Series to use a Digital Operator remotely.
	3G3IV-PCN326 (3 m)	

Recommended Separately Installed Option

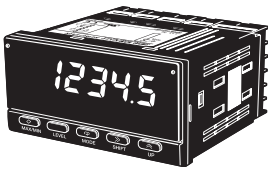
Name	Model number	Application
AC Reactor (Yaskawa)	3G3IV-PUZBAB□	Used to control harmonics generated by the Inverter or when the power supply capacity is greatly larger than the Inverter's capacity. Also used to increase the power factor.
EMC-compliant Input Noise Filter (Schaffner)	3G3RV-PFS□	This input noise filter is required to make the system comply with the EC's EMC Directives.
Input Noise Filter (Schaffner)	3G3IV-PFN□	Reduces noise coming into the inverter from the power supply line and to reduce noise flowing from the inverter into the power supply line.Connected to the power supply input side.
Simple Input Noise Filter (Yaskawa)	3G3EV-PLNF□	Reduces noise coming into the inverter from the power supply line and to reduce noise flowing from the inverter into the power supply line. Connected to the power supply input side.
Output Noise Filter (Tokin)	3G3IV-PLF□	Controls noise generated by the Inverter so it does not enter the power supply. Connected to the motor output side.
Circuit Breaker or Ground Fault Interrupter (See note.)	LG Industrial: AB/EB, AB□F/ EB□F	Use in the power supply line to protect the Inverter's wiring.
Electromagnetic Contactor	J7L-□-□□	Install to prevent the braking resistor from burning out when one is used.

Option Cards

Name	Model number	Application
Analog Monitor Cards	3G3IV-PAO08	The resolution of the analog output from the Inverter is 11 bits. Use this Card if there are not enough analog outputs. The output resolution of the 3G3IV-PAO08 is (0 to 10 V output for frequency meters or output current meters) and the output resolution of the 3G3IV-PAO12 is 1/2048 (0 to ±10 V for control applications).
	3G3IV-PAO12	
PG Speed Control Cards	3G3FV-PPGA2	Phase-A (single-phase) pulse input and open collector output for V/f control with a PG. Maximum response frequency: 30 kHz, with pulse monitor output.
	3G3FV-PPGB2	Phase-A/B pulse inputs and open collector output for V/f control. Maximum response frequency: 30 kHz, with pulse monitor output.
	3G3FV-PPGD2	Phase-A (single-phase) pulse input and line driver output (RS-422) for V/f control with a PG. Maximum response frequency: 30 kHz, with pulse monitor output.
	3G3FV-PPGX2	Phase-A/B/Z pulse inputs and line driver output (RS-422) for V/f control. Maximum response frequency: 30 kHz, with pulse monitor output
DeviceNet Communications Card	3G3RV-PDRT2	Use for DeviceNet communications with a Programmable Controller or other DeviceNet master device.

■ Separately Installed Options

Scaling Meters/Meter Relays
K3MA-J



Connect a Scaling Meter to the Inverter's analog monitor output to display rotational speeds of devices or linear speed of equipment (such as the line) in the physical units that you actually want to read.

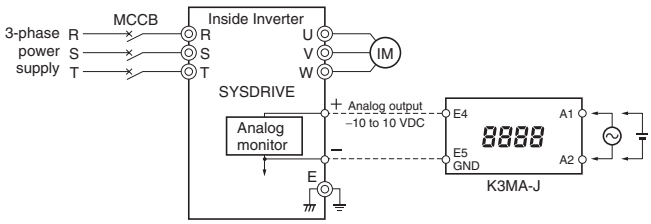
Standard Models and Application

Input	Output	Power supply voltage	
		100 to 240 VAC (50/60 Hz)	24 VAC (50/60 Hz), 24 VDC
DC voltage or DC current input	None	K3MA-J AC100-240V	K3MA-J AC/DC24V
	Relay contact outputs (Two SPST-NO)	K3MA-J-A2 AC100-240V	K3MA-J-A2 AC/DC24V

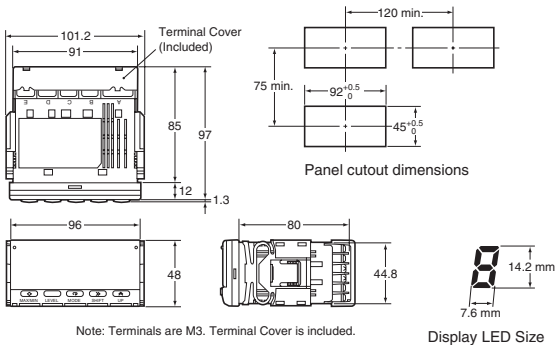
Standard Specifications

Input signal	DC voltage/current (0 to 20 mA, 4 to 20 mA, 0 to 5 V, 1 to 5 V, ±5 V, ±10 V)
Measurement method	Double integral method
Input impedance	Current input: 45 Ω max. Voltage input: 1 MΩ max.
Sampling period	250 ms
Display refresh cycle	Sampling period (the sampling time multiplied by the number of measurements for averaging if average processing is selected)
Max. no. of displayed digits	5 digits (–19999 to 99999)
Display	7-segment digital display
Polarity display	When the input signal is negative, the "–" symbol is displayed automatically.
Zero display	Leading zeros are not displayed.
Scaling method	Programmable with front-panel key inputs (up to the max. number of digits) The decimal point position can be set as desired.
Hold function	Max. hold (maximum value), Min. hold (minimum value)
Comparative output hysteresis setting	Programmable with front-panel key inputs (0001 to 9999).
Other functions	Forced-zero (with front-panel key), zero-limit, scaling teach function, display color change (green (red), green, red (green), red), OUT type change (upper limit, lower limit, upper/lower limit), and average processing (simple average: OFF, 2, 4, or 8 times)
Output Relays	2 SPST-NO
Comparative output response time	750 ms max.
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP00 + finger protection (VDE 0106/100)
Memory Protection	Non-volatile memory (can be overwritten 100,000 times)

Wiring Example



Dimensions

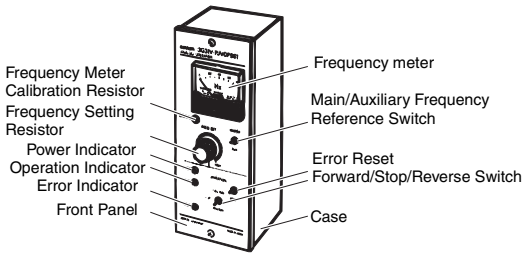


Analog Operators

Standard Steel Case

3G3IV-PJVOP96□

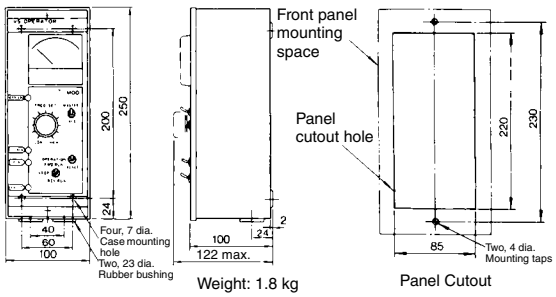
An Analog Operator allows frequency reference settings and ON/OFF operation control to be performed by analog references from a remote location (50 m max.)
Frequency meter scale: 75 Hz, 150 Hz, or 220 Hz



Standard Specifications

Model No.	Frequency Meter Specifications
3G3IV-PJVOP961	DCF-6A, 3 V, 1 mA, 75 Hz
3G3IV-PJVOP962	DCF-6A, 3 V, 1 mA, 150 Hz
3G3IV-PJVOP963	DCF-6A, 3 V, 1 mA, 220 Hz

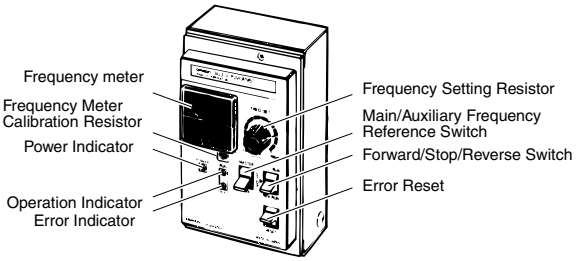
Dimensions



Compact Plastic Analog Operator

3G3IV-PVJOP95□

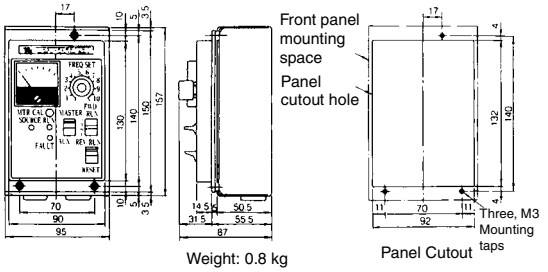
An Analog Operator allows frequency reference settings and ON/OFF operation control to be performed by analog references from a remote location (50 m max.)
Frequency meter scale: 60/120 Hz or 90/180 Hz



Standard Specifications

Model No.	Frequency Meter Specifications
3G3IV-PJVOP951	TRM-45, 3 V, 1 mA, 60/120 Hz
3G3IV-PJVOP952	TRM-45, 3 V, 1 mA, 90/180 Hz

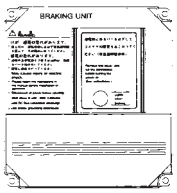
Dimensions



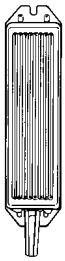
■ Special Options

Braking Units, Braking Resistors, and Braking Resistor Units

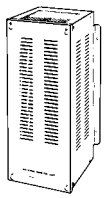
A Braking Unit and Braking Resistor are required when braking the Inverter, although Braking Units are built into all Inverters with capacities between 0.4 and 18.5 kW. Select the appropriate Braking Resistor or Braking Resistor Unit based on the Inverter's application.



Braking Unit
3G3IV-PCDBR□B



Braking Resistor
(Resistor for installation)
3G3IV-PERF150WJ□



Braking Resistor Unit
(Separate Unit)
3G3IV-PLKEB□

Inverter		Braking Unit		Braking Resistors[1]								
				Braking Resistors (Duty factor 3% ED, 10 s max.)[2, 3]				Braking Resistor Units (Duty factor 10% ED, 10 s max.)[3]				
Voltage	Max. Motor Capacity (kW)	3G3IV-PCDBR□B	Qty Used	3G3IV-PERF150WJ□	Resistance	Qty Used	Approx. braking torque (%)	3G3IV-PLKEB□	Resistor Specifications (per Unit)	Qty Used	Braking torque (%)	Min. resistance (Ω)[4]
200-V Class	0.4	Internal		201	200 Ω	1	220	20P7	70 W 200 Ω	1	220	48
	0.75			201	200 Ω	1	125	20P7	70 W 200 Ω	1	125	48
	1.5			101	100 Ω	1	125	21P5	260 W 100 Ω	1	125	48
	2.2			700	70 Ω	1	120	22P2	260 W 70 Ω	1	120	16
	3.7			620	62 Ω	1	100	23P7	390 W 40 Ω	1	125	16
	5.5			---	---	---	---	25P5	520 W 30 Ω	1	115	16
	7.5			---	---	---	---	27P5	780 W 20 Ω	1	125	9.6
	11			---	---	---	---	2011	2,400 W 13.6 Ω	1	125	9.6
	15			---	---	---	---	2015	3,000 W 10 Ω	1	125	9.6
	18.5			---	---	---	---	2015	3,000 W 10 Ω	1	125	9.6
	22	2022	1	---	---	---	---	2022	4,800 W 6.8 Ω	1	125	6.4
	30	2015	2	---	---	---	---	2015	3,000 W 10 Ω	2	125	9.6
	37	2015	2	---	---	---	---	2015	3,000 W 10 Ω	2	100	9.6
	45	2022	2	---	---	---	---	2022	4,800 W 6.8 Ω	2	120	6.4
	55	2022	2	---	---	---	---	2022	4,800 W 6.8 Ω	2	100	6.4
	75	2110	1	---	---	---	---	2022	4,800 W 6.8 Ω	3	110	1.6
	90	2110	1	---	---	---	---	2022	4,800 W 6.8 Ω	4	120	1.6
	110	2110	1	---	---	---	---	2018	4,800 W 8 Ω	5	100	1.6

Inverter		Braking Unit		Braking Resistors[1]								
				Braking Resistors (Duty factor 3% ED, 10 s max.)[2, 3]				Braking Resistor Units (Duty factor 10% ED, 10 s max.)[3]				
Voltage	Max. Motor Capacity (kW)	3G3IV-PCDBR□B	Qty Used	3G3IV-PERF150WJ□	Resistance	Qty Used	Approx. braking torque (%)	3G3IV-PLKEB□	Resistor Specifications (per Unit)	Qty Used	Braking torque (%)	Min. resistance (Ω)[4]
400-V Class	0.4	Internal		751	750 Ω	1	230	40P7	70 W 750 Ω	1	230	96
	0.75			751	750 Ω	1	130	40P7	70 W 750 Ω	1	130	96
	1.5			401	400 Ω	1	125	41P5	260 W 400 Ω	1	125	64
	2.2			301	300 Ω	1	115	42P2	260 W 250 Ω	1	135	64
	3.7			201	200 Ω	1	110[5]	43P7	390 W 150 Ω	1	135	32
	5.5			---	---	---	---	45P5	520 W 100 Ω	1	135	32
	7.5			---	---	---	---	47P5	780 W 75 Ω	1	130	32
	11			---	---	---	---	4011	1,040 W 50 Ω	1	135	20
	15			---	---	---	---	4015	1,560 W 40 Ω	1	125	20
	18.5			---	---	---	---	4018	4,800 W 32 Ω	1	125	19.2
	22	4030	1	---	---	---	---	4022	4,800 W 27.2 Ω	1	125	19.2
	30	4030	1	---	---	---	---	4030	6,000 W 20 Ω	1	125	19.2
	37	4045	1	---	---	---	---	4037	9,600 W 16 Ω	1	125	12.8
	45	4045	1	---	---	---	---	4045	9,600 W 13.6 Ω	1	125	12.8
	55	4030	2	---	---	---	---	4030	6,000 W 20 Ω	2	135	19.2
	75	4045	2	---	---	---	---	4045	9,600 W 13.6 Ω	2	145	12.8
	90	4220	1	---	---	---	---	4045	9,600 W 13.6 Ω	2	100	12.8
	110	4220	1	---	---	---	---	4030	6,000 W 20 Ω	3	100	19.2
	132	4220	1	---	---	---	---	4045	9,600 W 13.6 Ω	4	140	12.8
	160	4220	1	---	---	---	---	4045	9,600 W 13.6 Ω	4	140	12.8

Note: **1.** When a Braking Resistor or Braking Resistor Unit is connected, set L3-04=0 to disable stall prevention during deceleration. If deceleration stall prevention is not disabled, the system may not stop within the specified deceleration time.

2. When a Braking Resistor is connected, set L8-01=1 to enable DB resistor protection.

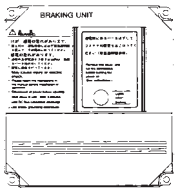
3. This is the duty factor when there is not a constant output. The duty factor is lower when there is a constant output.

4. The minimum resistance is the minimum value per Braking Unit. Select a resistance that i greater than the minimum value and produces sufficient braking torque.

5. The utilization rate is 2% ED.

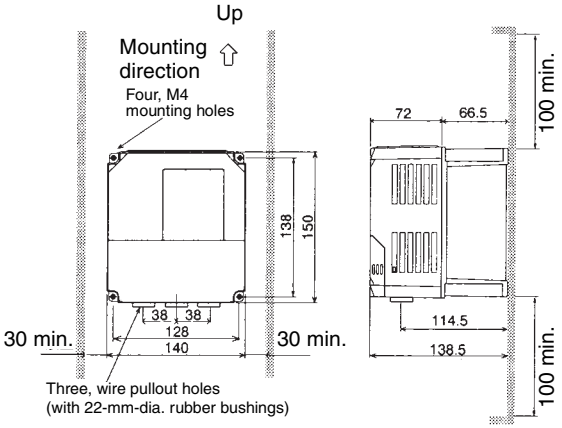
■ Special Options

3G3IV-PCDBR□B



Use a Braking Unit together with a Braking Resistor Unit to reduce the deceleration time of the motor. A Braking Unit is not required with 200-V-class Inverters with a capacity of 18.5 kW or less or with 400-V-class Inverters with a capacity of 18.5 W or less.

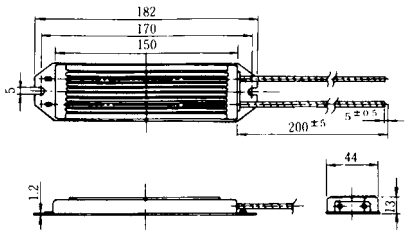
Dimensions



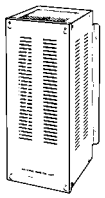
3G3IV-PERF150WJ□

A Braking Resistor consumes the regenerative motor energy with a resistor to reduce deceleration time (use rate: 3% ED). The Resistor can be installed in the back of the Inverter (200-V Inverters with a capacity of 3.7 kW or less, 400-V Inverters with a capacity of 2.2 kW or less.)

Dimensions



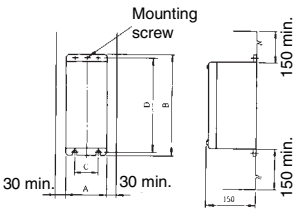
3G3IV-PLKEB□



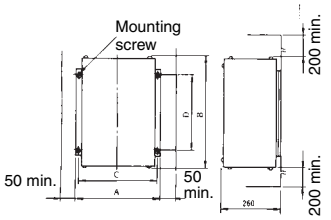
A Braking Resistor Unit is used to absorb the regenerative motor energy with a resistor to reduce deceleration time (use rate: 10% ED).

Dimensions

Dimensions Diagram 1



Dimensions Diagram 2



Voltage Class	Model number (3G3IV-PLKEB□)	Dimensions Diagram	Dimensions (mm)					Weight (kg)
			A	B	C	D	Mounting Screws	
200-V Class	20P7	1	105	275	50	260	M5 × 3	3.0
	21P5	1	130	350	75	335	M5 × 4	4.5
	22P2	1	130	350	75	335	M5 × 4	4.5
	23P7	1	130	350	75	335	M5 × 4	5.0
	25P5	1	250	350	200	335	M6 × 4	7.5
	27P5	1	250	350	200	335	M6 × 4	8.5
	2011	2	266	543	246	340	M8 × 4	10
	2015	2	356	543	336	340	M8 × 4	15
	2018	2	446	543	426	340	M8 × 4	19
	2022	2	446	543	426	340	M8 × 4	19
400-V Class	40P7	1	105	275	50	260	M5 × 3	3.0
	41P5	1	130	350	75	335	M5 × 4	4.5
	42P2	1	130	350	75	335	M5 × 4	4.5
	43P7	1	130	350	75	335	M5 × 4	5.0
	45P5	1	250	350	200	335	M6 × 4	7.5
	47P5	1	250	350	200	335	M6 × 4	8.5
	4011	2	350	412	330	325	M6 × 4	16
	4015	2	350	412	330	325	M6 × 4	18
	4018	2	446	543	426	340	M8 × 4	19
	4022	2	446	543	426	340	M8 × 4	19
	4030	2	356	956	336	740	M8 × 4	25
	4037	2	446	956	426	740	M8 × 4	33
	4045	2	446	956	426	740	M8 × 4	33

■ Special Options

Digital Operators

3G3IV-PJVOP160 (LCD Display)
3G3IV-PJVOP161 (LED Display)

Used to display/change the Inverter's parameters and monitor the frequency or current. The Operator can perform commands such as starting and stopping operation.

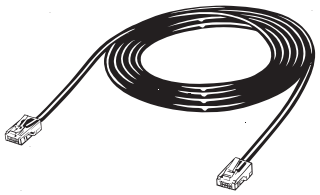
3G3IV-PJVOP160

3G3IV-PJVOP161

Digital Operator Connection Cable

3G3IV-PCN□26

Use a Connection Cable to connect a Digital Operator to the Inverter at some distance from the Inverter. Both 1-m and 3-m Cables are available.

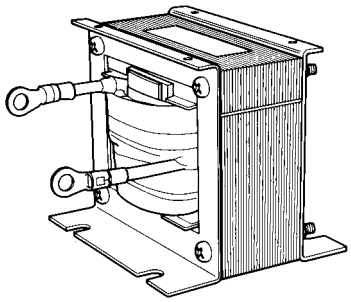


3G3IV-PCN126 (Cable length: 1 m)
3G3IV-PCN326 (Cable length: 3 m)

■ Special Options

DC Reactors (Yaskawa Electric)

3G3HV-PUZDAB□



A DC Reactor is used to control harmonics generated by the Inverter. It is more effective than and can be used in combination with an AC Reactor.
These DC Reactors are for Inverters with capacities of 18.5 kW and less. (The 22 kW and larger Inverters have built-in DC Reactors.)

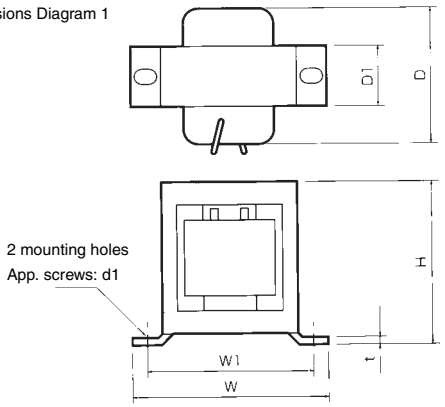
Standard Specifications and Applications

Inverter		DC Reactor			
Class	Max. Motor Capacity (kW)	Model number (3G3HV-PUZDAB□)	Rated Voltage (V)	Rated Current (A)	Imped-ance (mH)
200-V Class	0.4/0.75	5.4A8MH	800 DC	5.4	8
	1.5 to 3.7	18A3MH		18	3
	5.5/7.5	36A1MH		36	1
	11/15	72A0.5MH		72	0.5
	18.5	90A0.4MH		90	0.4

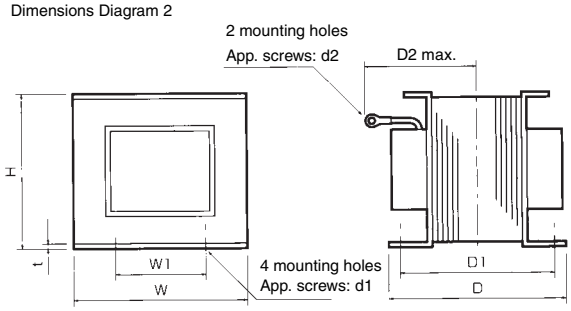
Inverter		DC Reactor			
Class	Max. Motor Capacity (kW)	Model number (3G3HV-PUZDAB□)	Rated Voltage (V)	Rated Current (A)	Imped-ance (mH)
400-V Class	0.4/0.75	3.2A28MH	800 DC	3.2	28
	1.5/2.2	5.7A11MH		5.7	11
	3.7	12A6.3MH		12	6.3
	5.5/7.5	23A3.6MH		23	3.6
	11/15	33A1.9MH		33	1.9
	18.5	47A1.3MH		47	1.3

Dimensions

Dimensions Diagram 1



Dimensions Diagram 2



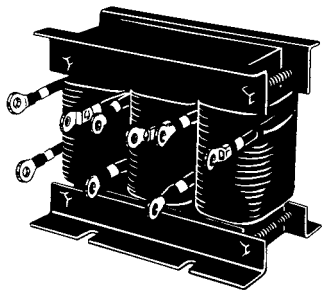
Model 3G3HV-PUZDAB □	Dimen-sions Dia-gram	Dimensions (mm)									Wel-ght (kg)
		H	W	W1	D	D1	D2	t	d1	d2	
5.4A8MH	1	53	85	74	60	32	---	0.8	M4	---	0.8
18A3MH	2	76	86	60	72	55	80	1.2	M4	M5	2.0
36A1MH	2	93	105	64	92	80	90	1.6	M6	M6	3.2
72A0.5MH	2	93	105	64	112	100	105	1.6	M6	M8	4.9
90A0.4MH	2	117	133	86	105	80	120	1.6	M6	M8	6.5
3.2A28MH	1	53	85	74	60	32	---	0.8	M4	---	0.8
5.7A11MH	1	60	90	80	60	32	---	0.8	M4	---	1.0
12A6.3MH	2	76	86	60	72	55	80	1.2	M4	M5	2.0
22A3.6MH	2	93	105	64	92	80	90	1.6	M6	M5	3.2
33A1.9MH	2	93	105	64	102	90	95	1.6	M6	M4	4.0
47A1.3MH	2	100	115	72	115	90	125	1.6	M6	M6	6.0

■ Recommended Separately Installed Options

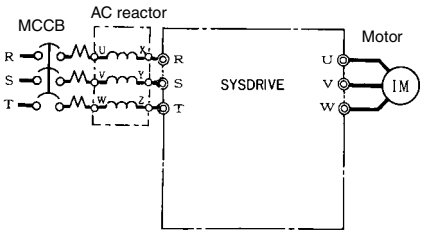
AC Reactors (Yaskawa Electric)

3G3IV-PUZBAB□

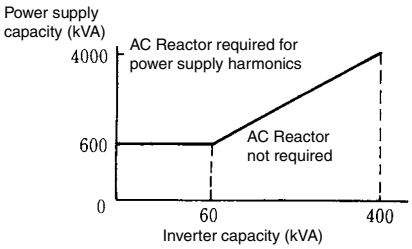
Connect an AC Reactor when the power supply capacity is significantly greater than the Inverter's capacity or you want to improve the power factor. Select the AC Reactor from the following tables according to the motor capacity.



Connection Example



Application Example



Standard Specifications and Applications
200-V Class

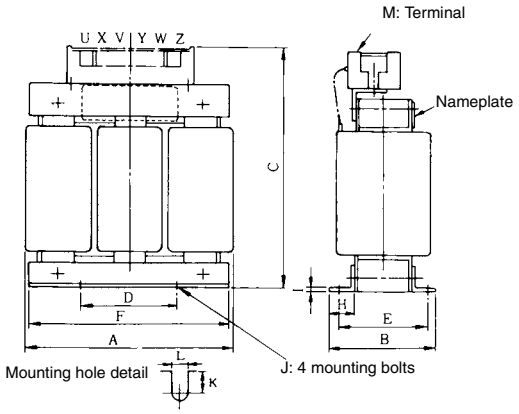
Max. Motor Capacity (kW)	Current (A)	Impedance (mH)	Model 3G3IV-PVZBAB□	Dimensions Diagram	Dimensions (mm)												Approx. weight (kg)	Loss (W)
					A	B	B1	C	D	E	F	H	J	K	L	M		
0.4	2.5	4.2	2.5A4.2MH	1	120	71	---	120	40	50	105	20	M6	10.5	7	M4	2.5	15
0.75	5	2.1	5A2.1MH		120	71	---	120	40	50	105	20	M6	10.5	7	M4	2.5	15
1.5	10	1.1	10A1.1MH		130	88	---	130	50	65	130	22	M6	11.5	7	M4	3	25
2.2	15	0.71	15A0.71MH		130	88	---	130	50	65	130	22	M6	11.5	7	M4	3	30
3.7	20	0.53	20A0.53MH	2	130	88	114	105	50	65	130	22	M6	11.5	7	M5	3	35
5.5	30	0.35	30A0.35MH		130	88	119	105	50	70	130	22	M6	9	7	M5	3	45
7.5	40	0.265	40A0.265MH		130	98	139	105	50	75	130	22	M6	11.5	7	M6	4	50
11	60	0.18	60A0.18MH		160	105	147.5	130	75	85	160	25	M6	10	7	M6	6	65
15	80	0.13	80A0.13MH		180	100	155	150	75	80	180	25	M6	10	7	M8	8	75
18.5	90	0.12	90A0.12MH		180	100	150	150	75	80	180	25	M6	10	7	M8	8	90
22	120	0.09	120A0.09MH		180	100	155	150	75	80	180	25	M6	10	7	M10	8	90
30	160	0.07	160A0.07MH		210	100	170	175	75	80	205	25	M6	10	7	M10	12	100
37	200	0.05	200A0.05MH		210	115	182.8	175	75	95	205	25	M6	10	7	M10	15	110
45	240	0.044	240A0.044MH		240	126	218	215±5	150	110	240	25	M6	8	7	M10	23	125
55	280	0.038	280A0.038MH		240	126	218	215±5	150	110	240	25	M8	8	10	M12	23	130

400-V Class

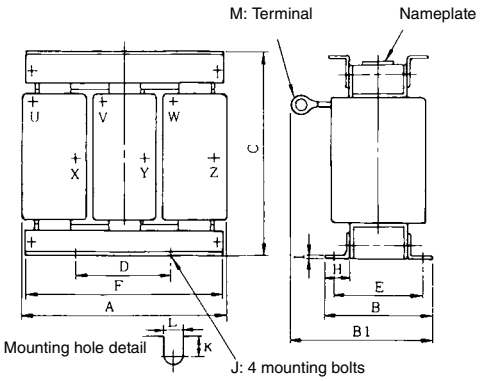
Max. Motor Capacity (kW)	Current (A)	Impedance (mH)	Model 3G3IV-PVZBAB□	Dimensions Diagram	Dimensions (mm)												Approx. weight (kg)	Loss (W)
					A	B	B1	C	D	E	F	H	J	K	L	M		
0.4	1.3	18.0	1.3A18.0MH	1	120	71	---	120	40	50	105	20	M6	10.5	7	M4	2.5	15
0.75	2.5	8.4	2.5A8.4MH		120	71	---	120	40	50	105	20	M6	10.5	7	M4	2.5	15
1.5	5	4.2	5A4.2MH		130	88	---	130	50	70	130	22	M6	9	7	M4	3	25
2.2	7.5	3.6	7.5A3.6MH		130	88	---	130	50	70	130	22	M6	9	7	M4	3	35
3.7	10	2.2	10A2.2MH		130	88	---	130	50	65	130	22	M6	11.5	7	M4	3	43
5.5	15	1.42	15A1.42MH		130	98	---	130	50	75	130	22	M6	11.5	7	M4	4	50
7.5	20	1.06	20A1.06MH	2	160	90	115	130	75	70	160	25	M6	10	7	M5	5	50
11	30	0.7	30A0.7MH		160	105	132.5	130	75	85	160	25	M6	10	7	M5	6	65
15	40	0.53	40A0.53MH		180	100	140	150	75	80	180	25	M6	10	7	M6	8	90
18.5	50	0.42	50A0.42MH		180	100	145	150	75	80	180	25	M6	10	7	M6	8	90
22	60	0.36	60A0.36MH		180	100	150	150	75	75	180	25	M6	10	7	M6	8.5	90
30	80	0.26	80A0.26MH		210	100	150	175	75	80	205	25	M6	10	7	M8	12	95
37	90	0.24	90A0.24MH		210	115	177.5	175	75	95	205	25	M6	10	7	M8	15	110
45	120	0.18	120A0.18MH		240	126	193	205±5	150	110	240	25	M8	8	10	M10	23	130
55	150	0.15	150A0.15MH		240	126	198	205±5	150	110	240	25	M8	8	10	M10	23	150

Dimensions

Dimensions Diagram 1



Dimensions Diagram 2



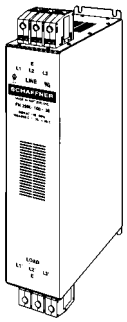
■ Recommended Separately Installed Options

EMC-compliant Input Noise Filter (Schaffner)

3G3RV-PFS□

Always use the following Noise FIlter when making the system compliant with the EC's EMC Directives. Connect the noise filter between the power supply and the Inverter's power supply terminals (R/L1, S/L2, and T/L3).

There are screw holes on the top of the Noise Filter to mount the Inverter. These screw holes can be used to secure the Inverter to the top of the Noise Filter.



Standard Specifications and Applications

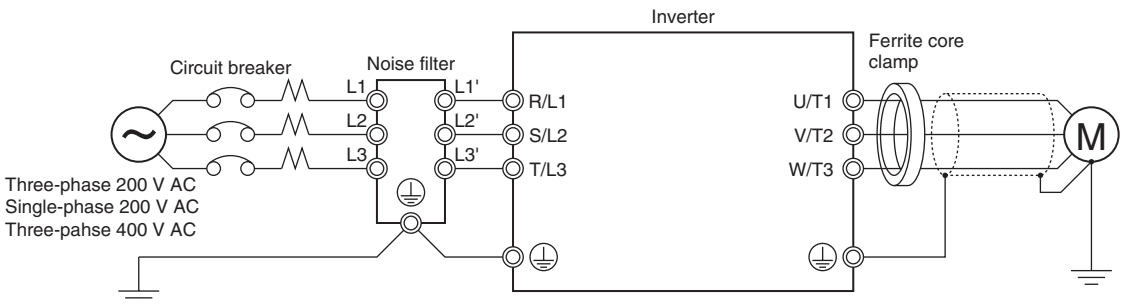
- Filters for 3-phase 200-V Inverters

Inverter	EMC-compliant Input Noise Filter			
Max. motor capacity (kW)	Rated current (A)	Model	Weight (kg)	Dia-gram
0.4	10	3G3RV-PFS5972-10-07	1.1	1
0.75				
1.5				
2.2	18	3G3RV-PFS5972-18-07	1.3	
3.7	35	3G3RV-PFS5973-35-07	1.4	
5.5				
7.5	60	3G3RV-PFS5973-60-07	3	2
11				
15	100	3G3RV-PFS5973-100-07	4.9	3
18.5				
22	130	3G3RV-PFS5973-130-35	4.3	5
30				
37	160	3G3RV-PFS5973-160-40	6	6
45	240	3G3RV-PFS5973-240-37	11	7
55				

- Filters for 3-phase 400-V Inverters

Inverter	EMC-compliant Input Noise Filter			
Max. motor capacity (kW)	Rated current (A)	Model	Weight (kg)	Dia-gram
0.4	10	3G3RV-PFS5972-10-07	1.1	1
0.75				
1.5				
2.2				
3.7	18	3G3RV-PFS5972-18-07	1.3	
5.5				
7.5	35	3G3RV-PFS5972-35-07	2.1	2
11				
15	60	3G3RV-PFS5972-60-07	4	3
18.5				
22	70	3G3RV-PFS5972-70-52	3.4	4
30				
37	130	3G3RV-PFS5972-130-35	4.7	5
45				
55				

Wiring Example



Dimensions

Diagram 1

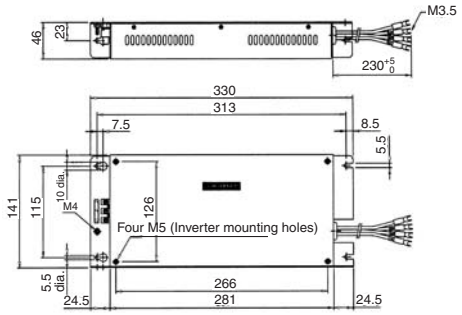


Diagram 2

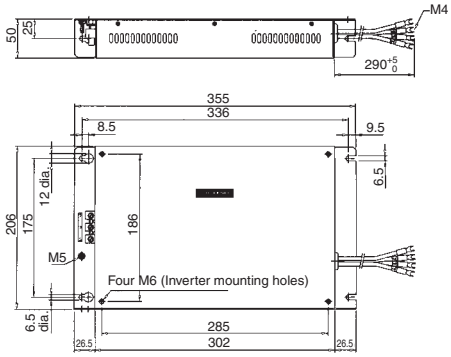


Diagram 3

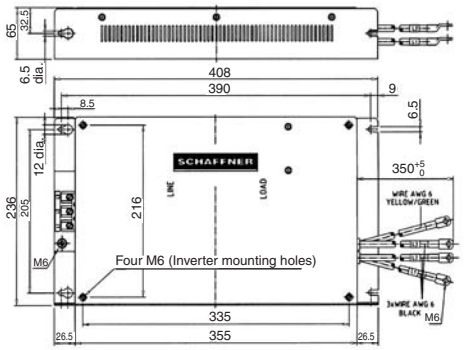


Diagram 4

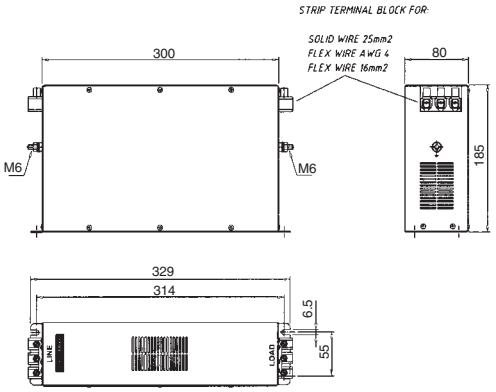


Diagram 5

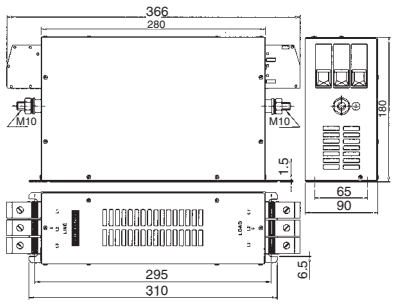


Diagram 6

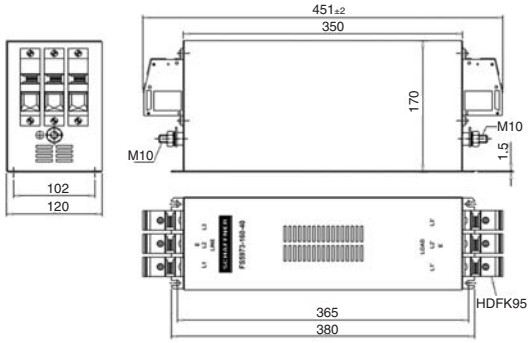
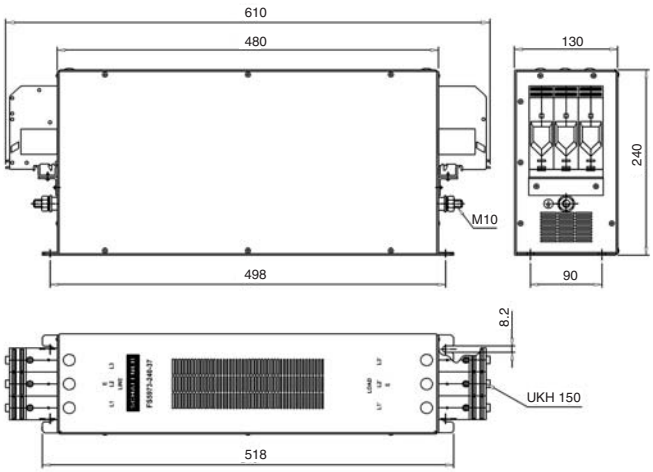


Diagram 7

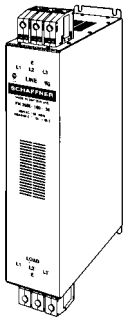


■ Recommended Separately Installed Options

Input Noise Filter (Schaffner)

3G3IV-PFN□

The input noise filter suppresses high-frequency noise generated by the Inverter so that it isn't transmitted to the power supply line. The filter is effective in preventing interference to nearby equipment such as radios in areas with little electromagnetic noise.



Standard Specifications and Applications

- Filters for 3-phase 200-V Inverters

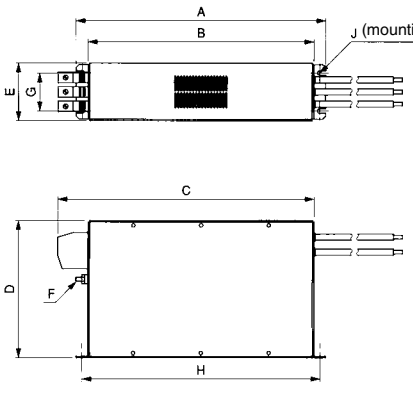
Max. motor capacity (kW)	Inverter capacity (kVA)	Input Noise Filter	
		Model	Rated current (A)
5.5	10.3	3G3IV-PFN258L4207	42
7.5	13.7	3G3IV-PFN258L5507	55
11	20.6	3G3IV-PFN258L7534	75
15	27.4	3G3IV-PFN258L10035	100
18.5	34	3G3IV-PFN258L13035	130
22	41	3G3IV-PFN258L13035	130
30	54	3G3IV-PFN258L18007	180
37	68	3G3IV-PFN359P25099	250
45	78	3G3IV-PFN359P25099	250
55	95	3G3IV-PFN359P30099	300

- Filters for 3-phase 400-V Inverters

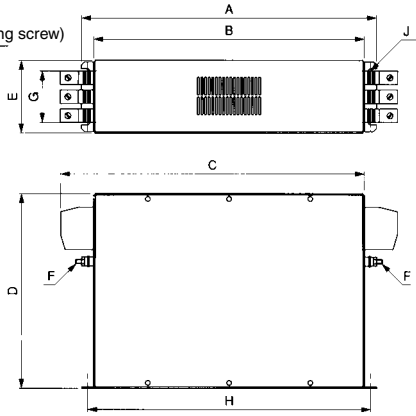
Max. motor Capacity (kW)	Inverter capacity (kVA)	Input Noise Filter	
		Model	Rated current (A)
11	20.6	3G3IV-PFN258L4207	42
15	27.4	3G3IV-PFN258L5507	55
18.5	34	3G3IV-PFN258L5507	55
22	41	3G3IV-PFN258L7534	75
30	54	3G3IV-PFN258L10035	100
37	68	3G3IV-PFN258L13035	130
45	82	3G3IV-PFN258L13035	130
55	110	3G3IV-PFN258L18007	180

Dimensions

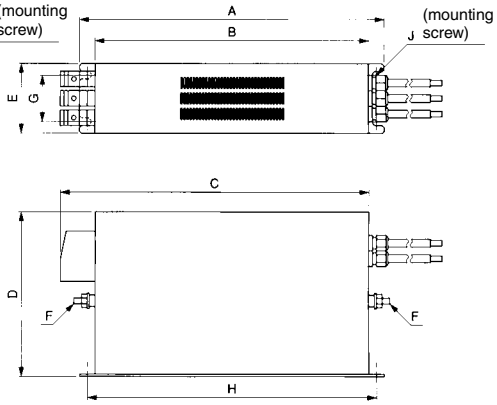
Dimensions Diagram 1



Dimensions Diagram 2

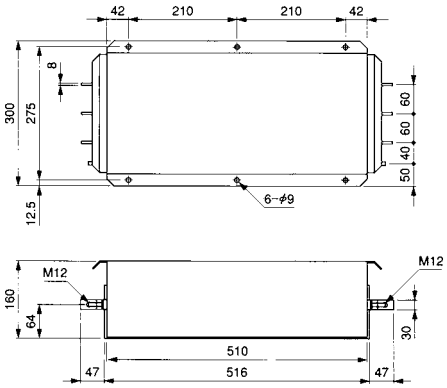


Dimensions Diagram 3



Model 3G3IV-	Dimensions Diagram	Dimensions (mm)									Weight (kg)
		A	B	C	D	E	F	G	H	J	
PFN258L4207	1	329	300	325	185	70	M6	45	314	Four, M5	2.8
PFN258L5507		329	300	353	185	80	M6	55	314	Four, M5	3.1
PFN258L7534	2	329	300	377	220	80	M6	55	314	Four, M5	4
PFN258L10035		379	350	436	220	90	M10	65	364	Four, M5	5.5
PFN258L13035		439	400	486	240	110	M10	80	414	Four, M5	7.5
PFN258L18007	3	438	400	480	240	110	M10	80	413	Four, M5	11
PFN359P25099	4	---	---	---	---	---	---	---	---	---	16
PFN359P30099		---	---	---	---	---	---	---	---	---	16

Dimensions Diagram 4

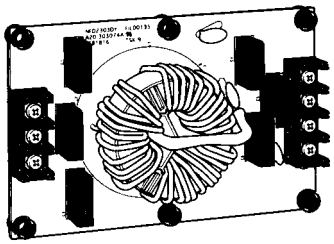


■ Recommended Separately Installed Options

Simple Input Noise Filter (Yaskawa Electric)

3G3EV-PLNF□

The input noise filter suppresses high-frequency noise generated by the Inverter so that it isn't transmitted to the power supply line.



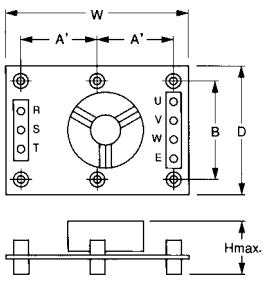
Standard Specifications and Applications

Inverter		Simple Input Noise Filter		
Voltage Class	Max. Motor Capacity (kW)	Model No.	Qty	Rated Current (A)
200-V Class	0.4	3G3EV-PLNFD2103DY	1	10
	0.75	3G3EV-PLNFD2103DY	1	10
	1.5	3G3EV-PLNFD2103DY	1	10
	2.2	3G3EV-PLNFD2153DY	1	15
	3.7	3G3EV-PLNFD2303DY	1	30
	5.5	3G3EV-PLNFD2203DY	2	40
	7.5	3G3EV-PLNFD2303DY	2	60
	11	3G3EV-PLNFD2303DY	3	90
	15	3G3EV-PLNFD2303DY	3	90
	18.5	3G3EV-PLNFD2303DY	4	120
	22	3G3EV-PLNFD2303DY	4	120
400-V Class	0.4	3G3EV-PLNFD4053DY	1	5
	0.75	3G3EV-PLNFD4053DY	1	5
	1.5	3G3EV-PLNFD4103DY	1	10
	2.2	3G3EV-PLNFD4103DY	1	10
	3.7	3G3EV-PLNFD4153DY	1	15
	5.5	3G3EV-PLNFD4203DY	1	20
	7.5	3G3EV-PLNFD4303DY	1	30
	11	3G3EV-PLNFD4203DY	2	40
	15	3G3EV-PLNFD4303DY	2	60
	18.5	3G3EV-PLNFD4303DY	2	60
	22	3G3EV-PLNFD4303DY	3	90
	30	3G3EV-PLNFD4303DY	3	90
	37	3G3EV-PLNFD4303DY	4	120
	45	3G3EV-PLNFD4303DY	4	120

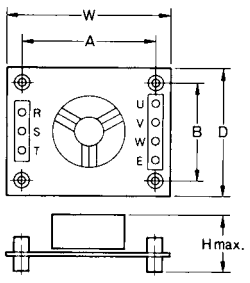
Dimensions

Model 3G3EV-	Dimensions Diagram	Dimensions							Weight (kg)
		W	D	H max	A	A'	B	Mounting Screws	
PLNFD2103DY	1	120	80	55	108	---	68	M4 × 4 20 mm	0.2
PLNFD2153DY	1	120	80	55	108	---	68	M4 × 4 20 mm	0.2
PLNFD2203DY	1	170	90	70	158	---	78	M4 × 4 20 mm	0.4
PLNFD2303DY	2	170	110	70	---	79	98	M4 × 6 20 mm	0.5
PLNFD4053DY	2	170	130	75	---	79	118	M4 × 6 30 mm	0.3
PLNFD4103DY	2	170	130	95	---	79	118	M4 × 6 30 mm	0.4
PLNFD4153DY	2	170	130	95	---	79	118	M4 × 6 30 mm	0.4
PLNFD4203DY	2	200	145	100	---	94	133	M4 × 6 30 mm	0.5
PLNFD4303DY	2	200	145	100	---	94	133	M4 × 6 30 mm	0.6

Dimensions Diagram 1



Dimensions Diagram 2

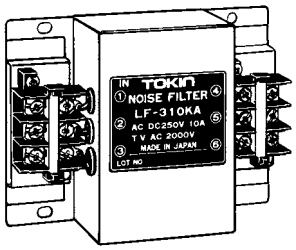


■ Recommended Separately Installed Options

Output Noise Filter (Tokin)

3G3IV-PLF□

An Output Noise Filter suppresses noise generated by the Inverter so it isn't transmitted to through the output. Connect the Output Noise Filter to the Inverter's motor output.



Standard Specifications and Applications

- 200-V Inverters

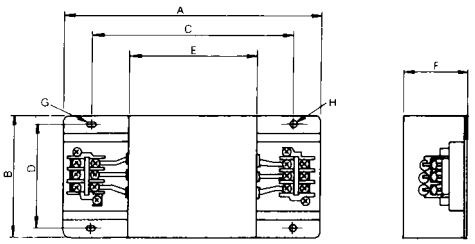
Max. motor capacity (kW)	Inverter capacity (kVA)	Output Noise Filter	
		Model number	Rated current (A)
0.1	0.3	3G3IV-PLF310KA	10
0.2	0.6	3G3IV-PLF310KA	10
0.4	1.4	3G3IV-PLF310KA	10
0.75	2.1	3G3IV-PLF310KA	10
1.5	2.7	3G3IV-PLF310KA	10
2.2	4.1	3G3IV-PLF310KA	10
3.7	6.9	3G3IV-PLF320KA	20
5.5	10.3	3G3IV-PLF350KA	50
7.5	13.7	3G3IV-PLF350KA	50
11	20.6	3G3IV-PLF350KA × 2P	100
15	27.4	3G3IV-PLF350KA × 2P	100
18.5	34	3G3IV-PLF350KA × 2P	100

- 400-V Inverters

Max. motor capacity (kW)	Inverter capacity (kVA)	Output Noise Filter	
		Model number	Rated current (A)
0.2	0.9	3G3IV-PLF310KB	10
0.4	1.4	3G3IV-PLF310KB	10
0.75	2.1	3G3IV-PLF310KB	10
1.5	2.7	3G3IV-PLF310KB	10
2.2	4.1	3G3IV-PLF310KB	10
3.7	6.9	3G3IV-PLF310KB	10
5.5	10.3	3G3IV-PLF320KB	20
7.5	13.7	3G3IV-PLF320KB	20
11	20.6	3G3IV-PLF335KB	35
15	27.4	3G3IV-PLF335KB	35
18.5	34	3G3IV-PLF345KB	45
22	41	3G3IV-PLF375KB	75
30	54	3G3IV-PLF375KB	75
37	68	3G3IV-PLF3110KB	110
45	82	3G3IV-PLF3110KB	110

Dimensions

Model 3G3IV-	Terminal	A	B	C	D	E	F	G	H	Weight (kg)
PLF310KA	TE-K5.5 M4	140	100	100	90	70	45	7 × 4.5 dia.	4.5 dia.	0.5
PLF320KA	TE-K5.5 M4	140	100	100	90	70	45	7 × 4.5 dia.	4.5 dia.	0.6
PLF350KA	TE-K22 M6	260	180	180	160	120	65	7 × 4.5 dia.	4.5 dia.	2.0
PLF310KB	TE-K5.5 M4	140	100	100	90	70	45	7 × 4.5 dia.	4.5 dia.	0.5
PLF320KB	TE-K5.5 M4	140	100	100	90	70	45	7 × 4.5 dia.	4.5 dia.	0.6
PLF335KB	TE-K5.5 M4	140	100	100	90	70	45	7 × 4.5 dia.	4.5 dia.	0.8
PLF345KB	TE-K22 M6	260	180	180	160	120	65	7 × 4.5 dia.	4.5 dia.	2.0
PLF375KB	TE-K22 M6	540	320	480	300	340	240	9 × 6.5 dia.	6.5 dia.	12.0
PLF3110KB	TE-K60 M8	540	340	480	300	340	240	9 × 6.5 dia.	6.5 dia.	19.5



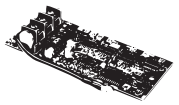
■ Option Cards

Analog Monitor Card

The resolution of the Inverter's analog output is 11 bits, which is enough to be used as control signals. Use this Card if the Inverter's analog outputs are insufficient.

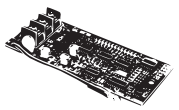
There are two Analog Monitor Cards available: the 3G3IV-PAO08 has an output resolution of 1/256 (0 to 10 V output for frequency meters or output current meters) and the 3G3IV-PAO12 has an output resolution of 1/2,048 (0 to ±10 V for control applications).

3G3IV-PAO08



Item	Specifications
Output resolution	1/256 (8 bits)
Output voltage	0 to 10 V (non-insulated)
Output channels	2 channels

3G3IV-PAO12

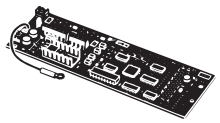


Item	Specifications
Output resolution	1/2,048 (11 bits + sign)
Output voltage	0 to ±10 V (non-insulated)
Output channels	2 channels

PG Speed Control Cards

Use these cards for V/f control with speed feedback control from the PG (pulse generator/encoder). There are two models available with different response frequencies and signal input interfaces.

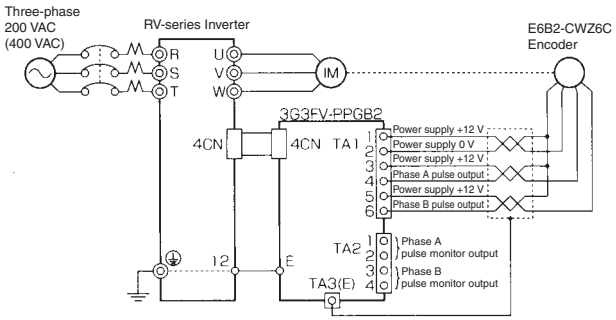
3G3FV-PPGB2



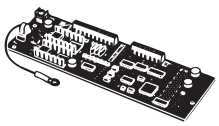
Specifications

Item	Specifications
Input signal	Phase A/B pulse output, For open collector outputs
Max. response frequency	30 kHz
Monitor output	Open collector output

Wiring Example



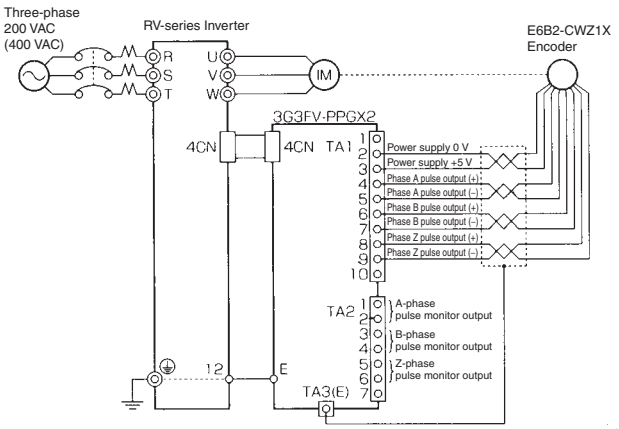
3G3FV-PPGX2



Specifications

Item	Specifications
Input signal	Phase A/B/C pulse output, Line driver input (RS-422)
Max. response frequency	300 kHz
Monitor output	Line driver output

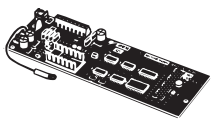
Wiring Example



PG Speed Control Cards (for V/f Control with PG)

Use these cards for V/f control with speed feedback control from the PG (pulse generator/encoder). There are two models available with different response frequencies and signal input interfaces.

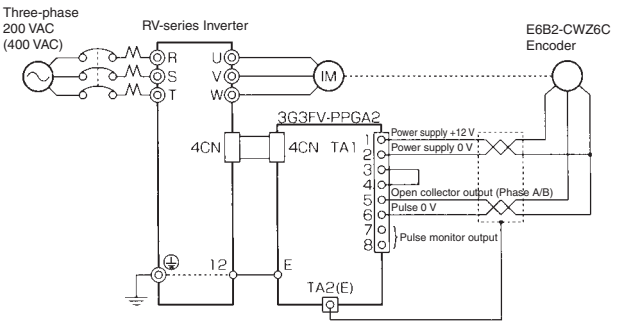
3G3FV-PPGA2



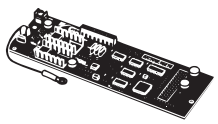
Specifications

Item	Specifications
Input signal	Phase A (single) pulse output, For open collector outputs
Max. response frequency	30 kHz
Monitor output	Open collector output

Wiring Example



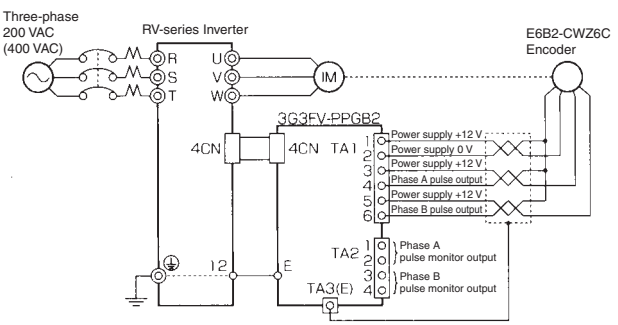
3G3FV-PPGD2



Specifications

Item	Specifications
Input signal	Phase A (single) pulse output, Line driver input (RS-422)
Max. response frequency	300 kHz
Monitor output	Line driver output

Wiring Example



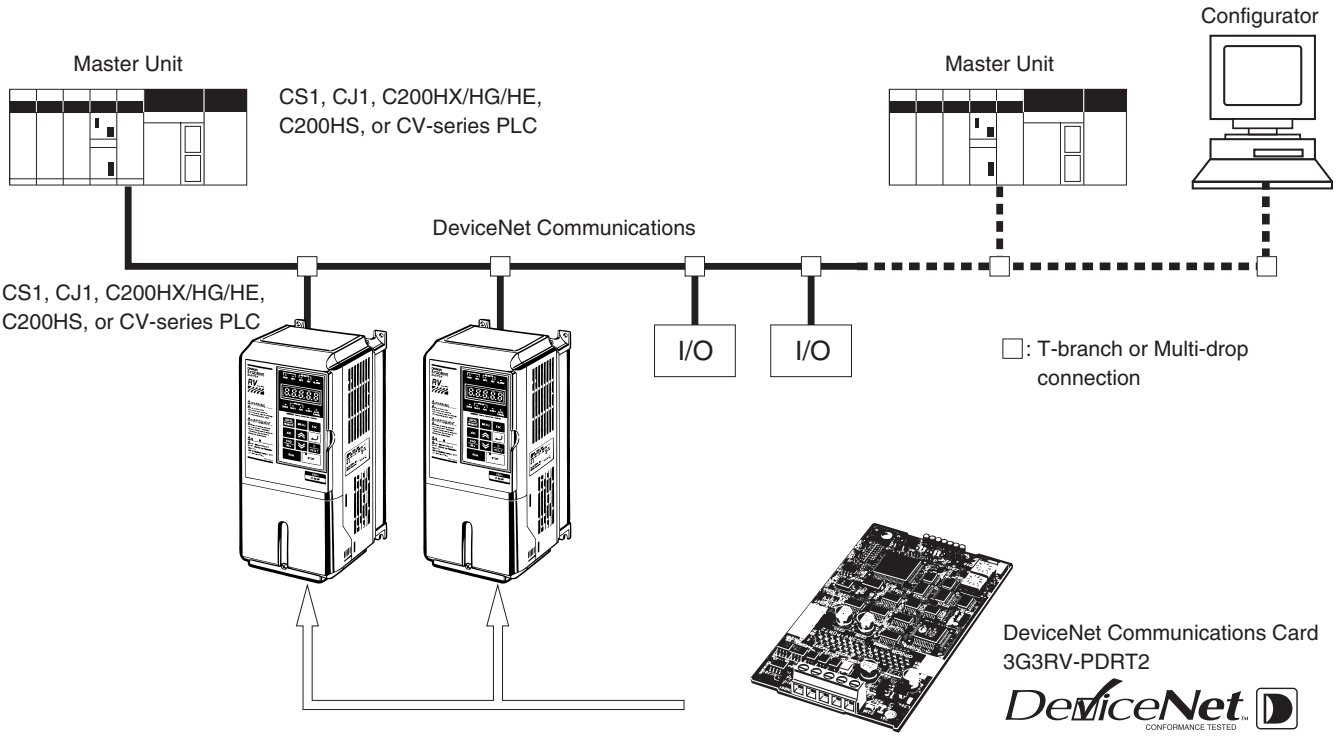
■ Option Cards

DeviceNet Communications Card

3G3FV-PDRT2

Use the DeviceNet Communications Card for DeviceNet communications with a PLC or other Controller.

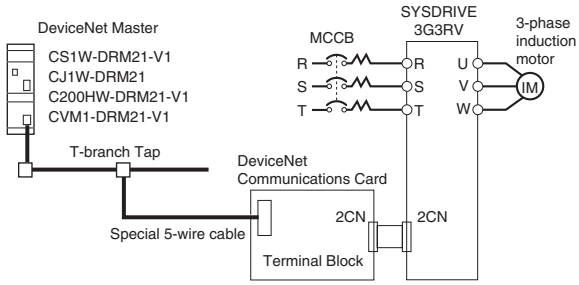
Of course, using DeviceNet communications reduces wiring, and allows use of the Smart Slave functions, used for diagnosis of equipment faults and preventive maintenance. Also, the various status data can be monitored from a PT or the Configurator.



Specifications

Item	Specifications
Connection method	Multi-drop or T-branch
Communications power supply	11 to 24 V DC
Communications power supply current consumption	50 mA max., 20 mA TYP
Communications speed	500, 250, or 125 kbps (auto-detected)
Communications cycle time	Approx. 10, 20, or 40 ms (depends on the communications speed)
Communications media	Special 5-wire cable
Number of connectable Inverters	63 Inverters (Check the Master Unit's specifications for other limitations.)
Remote I/O words required	Any one of the following 6 remote I/O formats can be selected. Input / Output / Name 2 words / 2 words / Basic remote I/O 2 words / 2 words / Standard remote I/O (factory default setting) 3 words / 3 words / Special remote I/O 4 words / 4 words / Control I/O remote I/O 5 words / 4 words / Control I/O + Status remote I/O 5 words / 4 words / Control I/O + multi-function input monitor remote I/O We recommend using the status data when the following Smart Slave functions are processed in the PLC.
Smart Slave functions	Warning torque detection function, current trace function, operating time monitor function, total ON time monitor function, contact operations monitor function, Power ON time monitor function, average power monitor function, automatic baud rate detection, network power supply voltage monitoring

Wiring Example



■ SYSDRIVE-related Options

Circuit Breakers and Electromagnetic Contactors

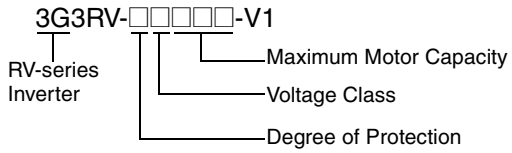
All Inverters with 22-kW or higher capacity are equipped with a built-in DC Reactor.
Inverters with 18.5-kW or lower capacity are available with and without a DC Reactor (3G3HV-PUZDAB□).

Inverter			No-fuse Circuit Breaker (MCCB)				Electromagnetic Contactor (MC)			
Power supply	Capacity (kW)	Rated current (A)	Without Reactor		With Reactor		Without Reactor		With Reactor	
			Model number	Current (A)	Model number	Current (A)	Model number	Rated operational current/Interrupting capacity (A)	Model number	Rated operational current/Interrupting capacity (A)
200 V 3-phase	0.4	3.6	ABS33b5A	5	ABS33b5A	5	J7L-09	11/110	J7L-09	11/110
	0.75	4.9	ABS33b10A	10	ABS33b10A	10	J7L-12	13/130	J7L-12	13/130
	1.5	8.4	ABS33b15A	15	ABS33b10A	10	J7L-18	18/180	J7L-12	13/130
	2.2	11.5	ABS33b20A	20	ABS33b15A	15	J7L-22	20/200	J7L-18	18/180
	3.7	18	ABS33b30A	30	ABS33b20A	20	J7L-40	35/350	J7L-22	20/200
	5.5	24	ABS53b50A	50	ABS53b40A	40	J7L-50	50/500	J7L-40	35/350
	7.5	37	ABS103b60A	60	ABS53b50A	50	J7L-65	65/650	J7L-50	50/500
	11	52	ABS103b75A	75	ABS103b75A	75	J7L-75	75/750	J7L-75	75/750
	15	68	ABS203b125A	125	ABS103b100A	100	J7L-125	125/1250	J7L-100	105/1050
	18.5	84	ABS203b225A	225	ABS203b125A	125	J7L-150	150/1500	J7L-125	125/1250
	22	94	---	---	ABS203b150A	150	---	---	J7L-150	150/1500
	30	120	---	---	ABS203b175A	175	---	---	J7L-180	180/1800
	37	160	---	---	ABS203b225A	225	---	---	J7L-220	220/2500
	45	198	---	---	ABS403b250A	250	---	---	SC-N11 (See note.)	300/---
	55	237	---	---	ABS403b300A	300	---	---	SC-N11 (See note.)	300/---
	75	317	---	---	ABS403b400A	400	---	---	SC-N12 (See note.)	400/---
	90	381	---	---	ABS603b500A	500	---	---	SC-N14 (See note.)	600/---
	110	457	---	---	ABS603b600A	600	---	---	SC-N14 (See note.)	600/---

Inverter			No-fuse Circuit Breaker (MCCB)				Electromagnetic Contactor (MC)			
Power supply	Capacity (kW)	Rated current (A)	Without Reactor		With Reactor		Without Reactor		With Reactor	
			Model number	Current (A)	Model number	Current (A)	Model number	Rated operational current/Interrupting capacity (A)	Model number	Rated operational current/Interrupting capacity (A)
400 V 3-phase	0.4	2.2	ABS33b3A	3	ABS33b3A	3	J7L-09	7/70	J7L-09	7/70
	0.75	2.5	ABS33b5A	5	ABS33b5A	5	J7L-09	7/70	J7L-09	7/70
	1.5	4.4	ABS33b10A	10	ABS33b10A	10	J7L-18	13/130	J7L-18	13/130
	2.2	6.4	ABS33b15A	15	ABS33b10A	10	J7L-22	20/200	J7L-18	13/130
	3.7	9.0	ABS33b20A	20	ABS33b15A	15	J7L-22	20/200	J7L-22	20/200
	5.5	15	ABS33b30A	30	ABS33b20A	20	J7L-40	32/320	J7L-22	20/200
	7.5	20	ABS33b30A	30	ABS33b30A	30	J7L-40	32/320	J7L-40	32/320
	11	29	ABS53b50A	50	ABS53b40A	40	J7L-65	65/650	J7L-50	48/480
	15	37	ABS103b60A	60	ABS53b50A	50	J7L-65	65/650	J7L-65	65/650
	18.5	47	ABS103b75A	75	ABS103b60A	60	J7L-75	75/750	J7L-65	65/650
	22	50	---	---	ABS103b75A	75	---	---	J7L-75	75/750
	30	66	---	---	ABS103b100A	100	---	---	J7L-100	105/1050
	37	83	---	---	ABS203b125A	125	---	---	J7L-150	150/1500
	45	100	---	---	ABS203b150A	150	---	---	J7L-150	150/1500
	55	120	---	---	ABS203b175A	175	---	---	J7L-180	180/1800
	75	165	---	---	ABS203b225A	225	---	---	J7L-220	220/2500
	90	198	---	---	ABS403b250A	250	---	---	SC-N11 (See note.)	300/---
	110	238	---	---	ABS403b300A	300	---	---	SC-N11 (See note.)	300/---
	132	286	---	---	ABS403b350A	350	---	---	SC-N12 (See note.)	400/---
	160	334	---	---	ABS403b400A	400	---	---	SC-N12 (See note.)	400/---

Note: These magnetic contactors are made by Fuji Electric.

■ Model Number Explanation



Maximum Motor Capacity

004	0.4 kW
007	0.75 kW
015	1.5 kW
022	2.2 kW
037	3.7 kW
055	5.5 kW
075	7.5 kW
110	11 kW
150	15 kW
185	18.5 kW
220	22 kW
300	30 kW
370	37 kW
450	45 kW
550	55 kW
750	75 kW
900	90 kW
11k	110 kW
13k	132 kW
16k	160 kW
18k	185 kW
22k	220 kW
30k	300 kW

Voltage Class

2	Three-phase 200 V AC (200-V Class)
4	Three-phase 400 V AC (400-V Class)

Degree of Protection

A	Enclosed wall-mounted (IP20 or higher)
B	Open chassis

■ Standard Models

Voltage class	Degree of protection	Max. motor capacity	Model number
200-V class	Enclosed wall-mounted	0.4 kW	3G3RV-A2004-V1
		0.75 kW	3G3RV-A2007-V1
		1.5 kW	3G3RV-A2015-V1
		2.2 kW	3G3RV-A2022-V1
		3.7 kW	3G3RV-A2037-V1
		5.5 kW	3G3RV-A2055-V1
		7.5 kW	3G3RV-A2075-V1
		11 kW	3G3RV-A2110-V1
		15 kW	3G3RV-A2150-V1
		18.5 kW	3G3RV-A2185-V1
	Open chassis	22 kW	3G3RV-B2220-V1
		30 kW	3G3RV-B2300-V1
		37 kW	3G3RV-B2370-V1
		45 kW	3G3RV-B2450-V1
		55 kW	3G3RV-B2550-V1
		75 kW	3G3RV-B2750-V1
		90 kW	3G3RV-B2900-V1
		110 kW	3G3RV-B211K-V1
400-V class	Enclosed wall-mounted	0.4 kW	3G3RV-A4004-V1
		0.75 kW	3G3RV-A4007-V1
		1.5 kW	3G3RV-A4015-V1
		2.2 kW	3G3RV-A4022-V1
		3.7 kW	3G3RV-A4037-V1
		5.5 kW	3G3RV-A4055-V1
		7.5 kW	3G3RV-A4075-V1
		11 kW	3G3RV-A4110-V1
		15 kW	3G3RV-A4150-V1
		18.5 kW	3G3RV-A4185-V1
	Open chassis	22 kW	3G3RV-B4220-V1
		30 kW	3G3RV-B4300-V1
		37 kW	3G3RV-B4370-V1
		45 kW	3G3RV-B4450-V1
		55 kW	3G3RV-B4550-V1
		75 kW	3G3RV-B4750-V1
		90 kW	3G3RV-B4900-V1
		110 kW	3G3RV-B411K-V1
		132 kW	3G3RV-B413K-V1
		160 kW	3G3RV-B416K-V1
		185 kW	3G3RV-B418K-V1
		220 kW	3G3RV-B422K-V1
		300 kW	3G3RV-B430K-V1

■ Selecting the Motor Capacity

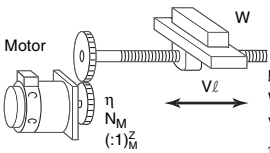
Select a motor before selecting the Inverter. Calculate the load inertia in the application, calculate the motor capacity and torque required to handle the load, and select an appropriate motor.

■ Simple Selection Method (Calculation of the Required Output)

With this method, you select the motor based on the output (W) required when the motor is rotating at a steady rate. This method does not include the involved calculations for acceleration and deceleration, so add some extra capacity to the calculated value when selecting the motor. This is a simple way to calculate the size of motor needed in equipment that operates at a steady rate for long periods, such as fans, conveyors, and mixing machines. This method is not suitable for the following kinds of applications:

- Applications requiring sudden start-ups
- Applications where the equipment starts and stops frequently
- Applications where there is a lot of inertia in the transmission system
- Applications with a very inefficient transmission system

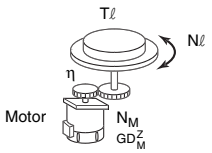
Linear Motion: Steady Power P_O (kW)



$$P_0 = \frac{\mu \cdot W \cdot V\ell}{6120 \cdot \eta}$$

μ: Friction coefficient
W: Weight of moveable load (kg)
Vℓ: Speed of moveable load (m/min)
η: Efficiency of reduction mechanism (transmission)

Rotational Motion: Steady Power P_O (kW)



$$P_0 = \frac{T\ell \cdot N\ell}{9535 \cdot \eta}$$

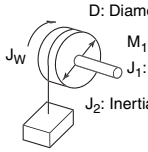
Tℓ: Load torque at load axis (N · m)
Nℓ: Speed of load axis (r/min)
η: Efficiency of reduction mechanism (transmission)

■ Detailed Selection Method (R.M.S. Calculation Method)

With this method, you calculate the effective torque and maximum torque required in the application's operating pattern. This method provides a detailed motor selection that matches the operating pattern.

Calculating the Motor Shaft Conversion Inertia

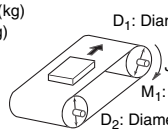
Use the following equations to calculate the inertia of all of the parts and convert that to the motor shaft conversion inertia.



M2: Mass of object (kg)
JW: Inertia (kg·m²)

$$J_W = J_1 + J_2 = \left(\frac{M_1 \cdot D^2}{8} + \frac{M_2 \cdot D^2}{4}\right) \times 10^{-6}\ (kg \cdot m^2)$$

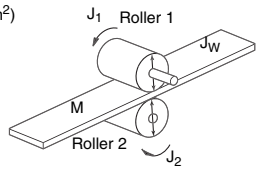
M3: Mass of object (kg)
M4: Mass of belt (kg)



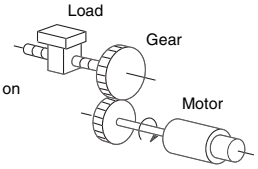
JW: Inertia (kg·m²)
J1: Inertia of cylinder 1 (kg·m²)
J2: Inertia of cylinder 2 (kg·m²)
J3: Inertia due to object (kg·m²)
J4: Inertia due to belt (kg·m²)

$$J_W = J_1 + J_2 + J_3 + J_4 = \left(\frac{M_1 \cdot D_1^2}{8} + \frac{M_2 \cdot D_2^2}{4} \cdot \frac{D_1^2}{D_2^2} + \frac{M_3 \cdot D_1^2}{4} + \frac{M_4 \cdot D_1^2}{4}\right) \times 10^{-6}\ (kg \cdot m^2)$$

JW: Inertia of entire system (kg·m²)
J1: Inertia of roller 1 (kg·m²)
J2: Inertia of roller 2 (kg·m²)
D1: Diameter of roller 1 (mm)
D2: Diameter of roller 2 (mm)
M: Effective mass of workpiece (kg)



$$J_W = J_1 + \left(\frac{D_1}{D_2}\right)^2 J_2 + \frac{M \cdot D_1^2}{4} \times 10^{-6}\ (kg \cdot m^2)$$



JW: Load inertia (kg · m²)
Z1: Number of gear teeth on motor side
J1: Motor gear inertia (kg · m²)

Gear ratio G = Z1 / Z2

Z2: Number of gear teeth on load side
J2: Load gear inertia (kg· m²)

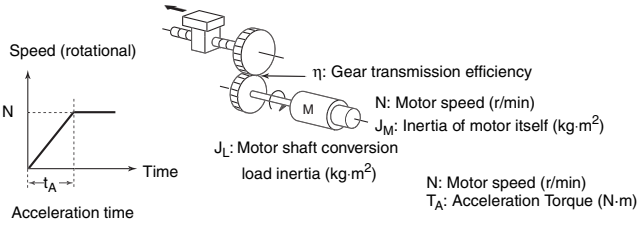
$$J_L = J_1 + G^2 (J_2 + J_W)\ (kg \cdot m^2)$$

JL: Motor shaft conversion load inertia (kg·m²)

Calculating the Motor Shaft Conversion Torque and Effective Torque

Calculate the total combined torque required for the motor to operate based on the acceleration torque due to the motor shaft conversion load inertia (calculated above) and the load torque due to friction force and the external force applied to the load.

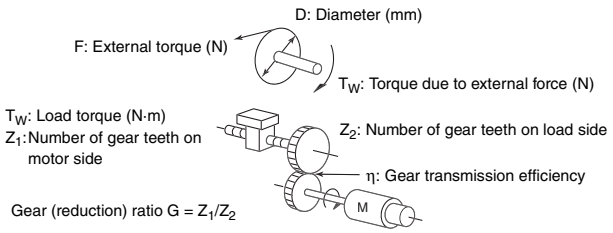
- Acceleration Torque



Acceleration Torque (T_A)

$$T_A = \frac{2\pi N}{60 t_A}\left(J_M + \frac{J_L}{\eta}\right) \text{ (N·m)}$$

- Motor Conversion Load Torque (External and Friction)



$$T_W = F \cdot \frac{D}{2} \times 10^{-3} \text{ (N·m)}$$

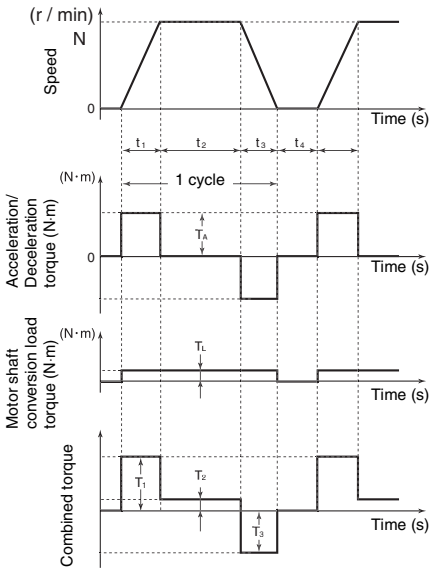
(Friction force in general:

$F = \mu W$ μ: Friction coefficient
W: Weight of moving parts

$$T_L = T_W \cdot \frac{G}{\eta} \text{ (N·m)}$$

T_L: Motor shaft conversion load torque (N·m)

- Calculating the Combined Torque and Effective Torque



Effective torque T_{RMS} (N·m) =

$$\sqrt{\frac{\Sigma (Ti)^2 \cdot ti}{\Sigma ti}}$$

$$= \sqrt{\frac{T_1^2 \cdot t_1 + T_1^2 \cdot t_2 + T_3^2 \cdot t_3}{t_1 + t_2 + t_3 + t_4}}$$

Maximum torque T_{MAX} (N·m) =

$$T_1 = T_A + T_L$$

Note: Use the Servomotor's Motor Selection Software to calculate the motor conversion inertia, effective torque, and maximum torque shown above.

Selecting the Motor

Use the results of the calculations above and the equations below to determine the required motor capacity from the effective torque and maximum torque. Use the larger of the following motor capacities when selecting the motor.
When selecting the motor, set a motor capacity higher than the calculated capacity to provide some extra capacity.

- Motor Capacity Supplied for Effective Torque:
  Motor capacity (kW) = $1.048 \cdot N \cdot T_{RMS} \cdot 10^{-4}$ (N: Max. speed in r/min)
- Motor Capacity Supplied for Maximum Torque:
  Motor capacity (kW) = $(1.048 \cdot N \cdot T_{MAX} \cdot 10^{-4})/1.5$ (N: Max. speed in r/min)

■ Selecting the Inverter Capacity

Select an Inverter that is large enough to handle the motor selected in *Selecting the Motor* above. Basically, select an Inverter with a maximum motor capacity that matches the motor capacity calculated above.

After selecting the Inverter, verify that the following conditions are satisfied. If the conditions are not satisfied, select the Inverter that is one size larger and check the conditions again.

- Motor's rated current ≤ Inverter's rated output current
- The application's continuous maximum torque output time ≤ 1 minute

Note: **1.** If the Inverter's overload endurance is 120% of the rated output current for one minute, check for 0.8 minute.

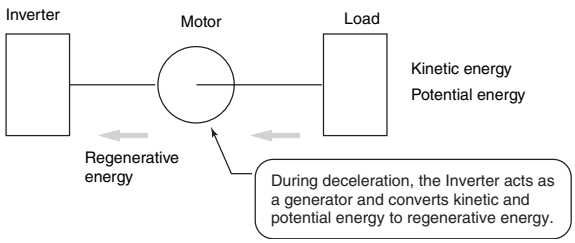
2. Use an Inverter that is one size larger than determined by the conditions above if open-loop vector control with PG is being used and a holding torque is required at 0 r/min or a torque that is 150% or more of the rated torque is required regularly at low frequencies (10 Hz or less).

■ Applications Requiring Braking Resistors

In applications where excessive regenerative motor energy is produced during deceleration or descent, the main-circuit voltage in the Inverter may rise high enough to damage the Inverter. Standard Inverters are equipped with an overvoltage protection function so the main-circuit overvoltage (OV) is detected and operation is stopped to prevent damage. Although the Inverter will be protected, the overvoltage protection function will generate an error and the motor will stop; this system configuration will not provide stable continuous operation.

About Regenerative Energy

The load connected to the motor has kinetic energy if it is rotating or potential energy if it is at a high level. The kinetic or potential energy is returned to the Inverter when the motor decelerates or lowers the load. This phenomenon is known as regeneration and the returned energy is called regenerative energy.



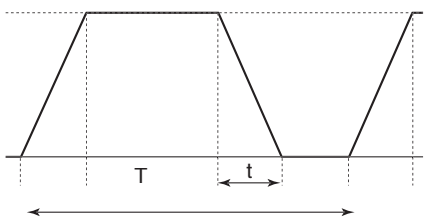
Avoiding the Use of a Braking Resistor

The following methods can be used to avoid having to connect a Braking Resistor. These methods require the deceleration time to be extended, so you must evaluate whether extending the deceleration time will cause any problems in the application.

- Enable the "stall prevention during deceleration" function; the default setting for this function is enabled. (The deceleration time is extended automatically to prevent main-circuit overvoltage from occurring.)
- Set a longer deceleration time. (This reduces the rate at which the regenerative energy is produced.)
- Select "coast to stop" as the stopping method. (Regenerative energy will not be returned to the Inverter.)

■ Simple Method for Braking Resistor Selection

This is a simple method for determining the braking resistance from the percentage of time that regenerative energy is produced during a normal operating pattern.



Use rate (duty) = t/T x 100 (%ED)

t: Deceleration time (regenerative time)

T: Time for 1 cycle of operation

Use Rate: 3% ED or Less

Select a Braking Resistor. Refer to *Braking Units, Braking Resistors, and Braking Resistor Units* on page 51 or the Braking Resistor selection tables in the Inverter's Operation Manual or Catalog for more details on selecting the appropriate Braking Resistor. (A cooling fan can be installed on the Braking Resistor if a high-capacity Inverter is being used.)

Use Rate: 10% ED or Less

Select a Braking Resistor Unit. Refer to *Braking Units, Braking Resistors, and Braking Resistor Units* on page 51 or the Braking Resistor selection tables in the Inverter's Operation Manual or Catalog for more details on selecting the appropriate Braking Resistor Unit.

■ Detailed Method for Braking Resistor Selection

If the Braking Resistor's use rate (duty factor) exceeds 10% ED or the application requires an extremely large braking torque, use the following method to calculate the regenerative energy and select a Braking Resistor.

Calculating the Required Braking Resistance

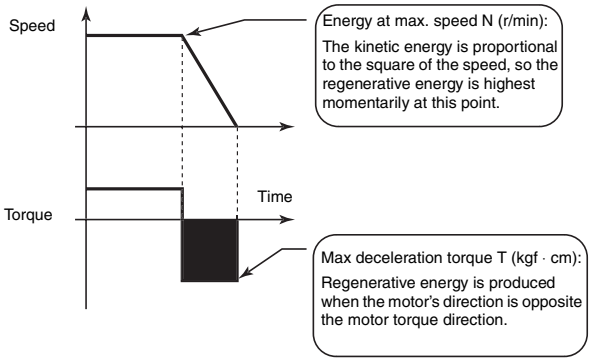
$$\text{Braking Resistor's resistance: } R \leq \frac{V^2}{1.048 \times (T - 0.2 \times Tm) \times N \times 10^{-1}}$$

V: 385 V for a 200-V Class Inverter
760 V for a 400-V Class Inverter

T: Maximum braking torque (kgf·cm)

T_m: Motor's rated torque (N·cm)

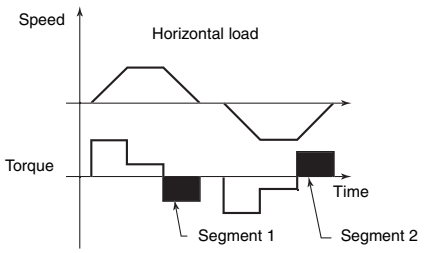
N: Maximum speed (r/min)

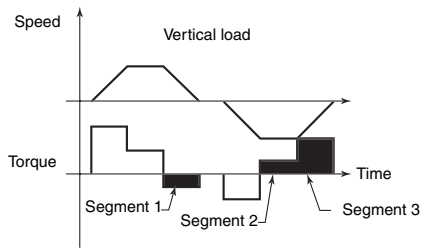


Note: Use the value for the braking torque calculated in *Calculating the Motor Shaft Conversion Torque and Effective Torque* on page 72.

Calculating the Average Regenerative Energy

Regenerative energy is produced when the motor is rotating in the opposite direction of the motor torque. Use the following equations to calculate the regenerative energy produced in each segment of the cycle.





$$P_i = N \times T \times t \times 1.048 \times 10^{-1}$$

P_i: Regenerative energy (J) produced in segment i

N: Motor's speed (r/min)
(Use the average speed if the speed varies.)

T: Deceleration torque (N·m)

t: Deceleration time (s)

Calculate the average regenerative energy by adding the power produced in each segment of the cycle and dividing by the total cycle time.

$$\text{Average regenerative energy (W)} = \frac{(P_1 + P_2 + \cdots + P_i)}{\text{1 cycle time}}$$

Note: **1.** The speed is positive when the motor is rotating forward and the torque is positive when it is in the forward direction.
2. Use the value for the braking torque calculated in *Calculating the Motor Shaft Conversion Torque and Effective Torque* on page 72.

Selecting the Braking Resistor

Select the appropriate Braking Resistor based on the required braking resistance and average regenerative energy that were calculated above.

- Required braking resistance ≥ Braking Resistor Unit's resistance ≥ Inverter or Braking Unit's minimum resistance
- Average regenerative energy ≤ Braking Resistor Unit's allowable power

Note: **1.** The internal braking transistor will be damaged if a resistor is connected with a resistance below the Inverter or Braking Unit's minimum resistance. If the required resistance is less than the minimum resistance, increase the Inverter's capacity and replace the Inverter or Braking Unit with one that has a minimum resistance less than the required resistance.

2. Two or more Braking Units can be connected in parallel. Use the following equation to determine the braking resistance when driving two or more Units.

Braking resistance (Ω) = (required braking resistance calculated above) x (number of Units)

3. Do not select the braking resistance with the results calculated above. A rating of 150 W is not the allowed power, it is the maximum rated power in resistance units. The actual allowed power rating depends upon the resistor.

Read and Understand this Catalog

Please read and understand this catalog before purchasing the product. Please consult your OMRON representative if you have any questions or comments.

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