e-Front runners

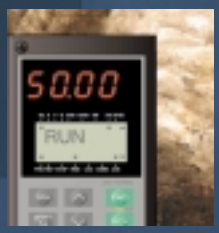
FUJI ELECTRIC

FRENIC 5000G11S

SERIES

FUJI INVERTERS

Now with dynamic torque vector control:
Optimum control for all situations.



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TÜV Rheinland | BAUART GEPRÜFT | TYPE APPROVED

CE

MEH 413b

Ideal combination of power and multiple-function. Dynamic torque-vector control promises optimum motor control under any operating condition.

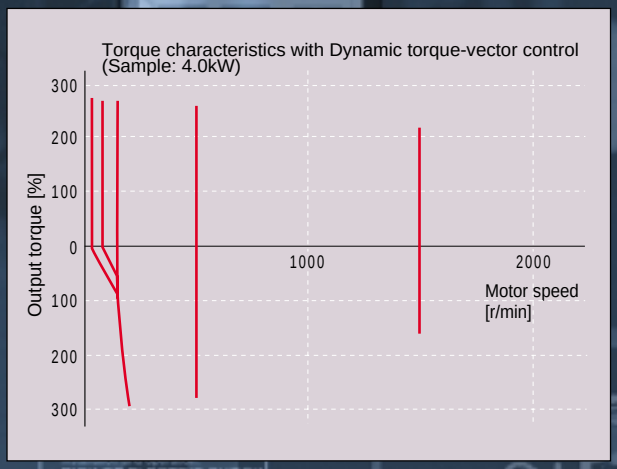
1. Dynamic torque-vector control

Powerful

Dynamic torque-vector control system performs high-speed calculation to determine the required motor power for the load status. Our key technology is optimal control of voltage and current vectors for maximum output torque.

- A high starting torque of 200% at 0.5Hz.*
  * 180% for 30kW or larger models.
- Achieves smooth acceleration/deceleration in the shortest time for the load condition.
- Using a high-speed CPU quickly responds to an abrupt load change, detects the regenerated power to control the deceleration time. This automatic decerelation function greatly reduces the inverter tripping.

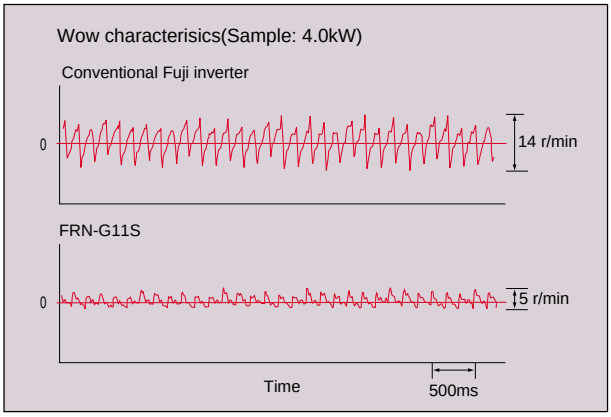
- Feedback control with PG
  Enables the inverter to execute "vector control with PG" by adding an optional PG feedback card to obtain higher performance.
  - Speed control range : 1:1200
  - Speed control accuracy : ±0.02%
  - Speed control response : 40Hz
    (22kW or smaller)



2. Reduced motor wow at low speed

Smooth

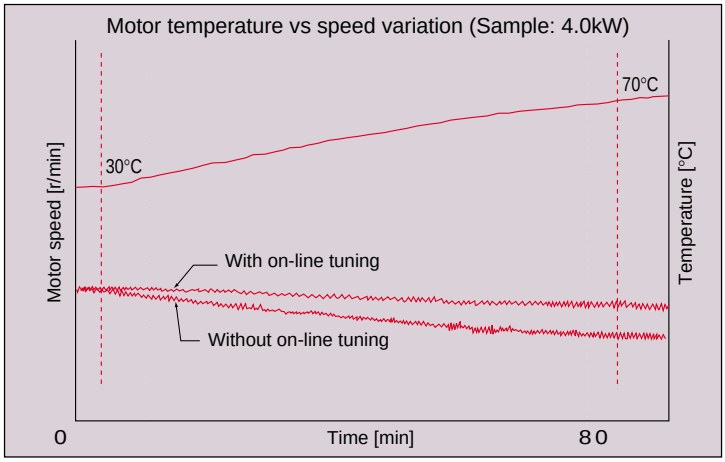
- Motor wow at low speed (1Hz) reduced to less than 1/2 of that achieved by conventional inverters, with the dynamic torque-vector control system, in combination with the Fuji's unique digital AVR.



G11S

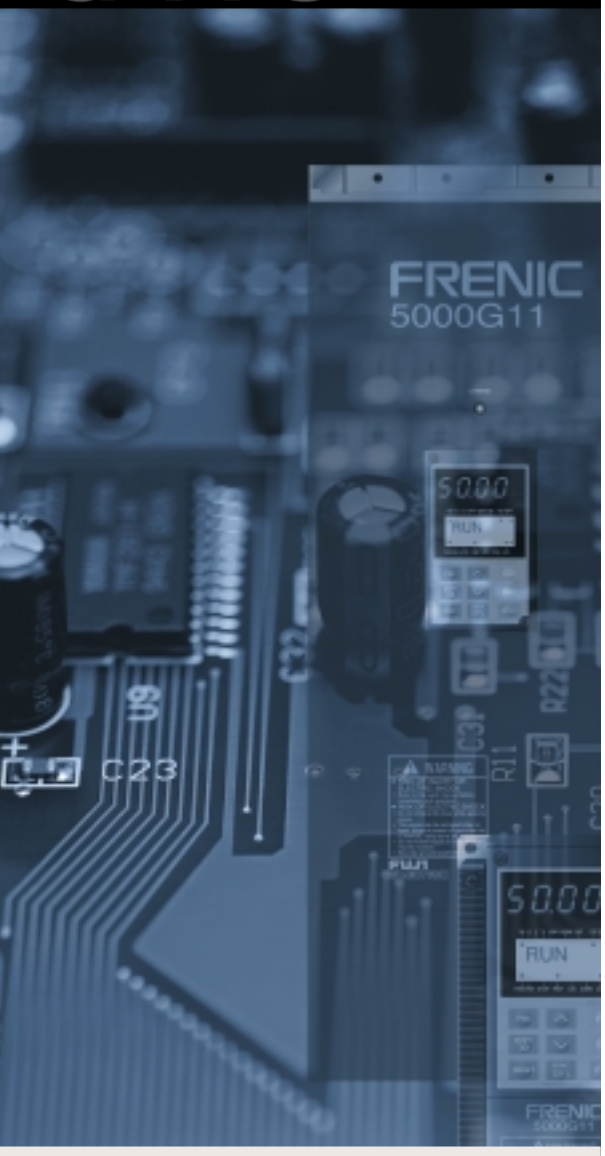
3. New on-line tuning system

- On-line tuning to continuously check for variation of motor characteristics during running for high-precision speed control.
- This tuning function also available for a second motor, which allows high-precision driving of the second motor by changeover operation between two motors.



4. Environment-friendly features

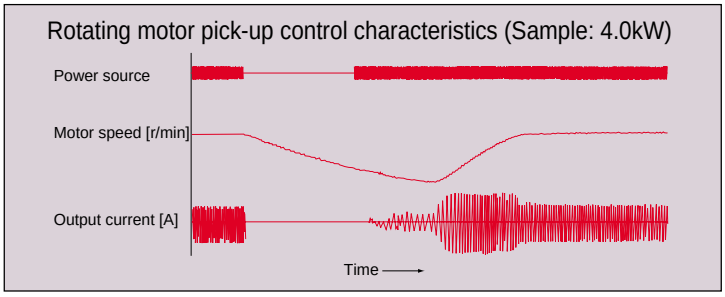
- Provided with low-noise control power supply systems which minimize noise interference on peripheral devices such as sensors.
- Equipped with terminals for connecting DC REACTOR that can suppress harmonics.
- Complied with EMC Directive (Emission) when connected to optional EMC-compliance filter.

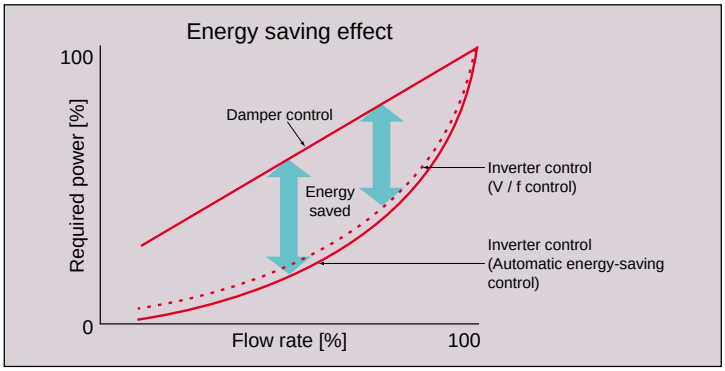


5. Advanced, convenient functions

Economical

- 16-step speed, 7 pattern operation with timer control, rotating motor pick-up control for conveyance machinery
- Automatic energy-saving operation, PID control, cooling fan on/off control, line/inverter changeover operation for fans and pumps
- Rotating motor pick-up control:
  Restarts motor without any shocks, by detecting motor speed where motor is coasting after momentary power failure occurs.
- Automatic energy-saving operation function:
  Minimizes inverter and motor loss at light load.





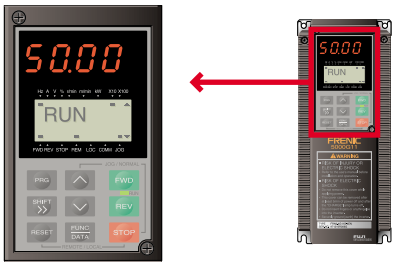
6. Global products, communication

Global

- Conforms to major world safety standards: UL, cUL, TÜV (up to 22kW), EN (CE marking)
- Equipped with RS485 interface as standard, RS232C interface as option.
- Connection to field bus: Profibus-DP, Interbus-S, DeviceNet, Modbus Plus, CAN open (Option)
- Universal DI/DO : Monitors digital I/O signal status and transmits to a host controller, helping to simplify factory automation.
- Inverter support loader for Windows is supplied to facilitate function code setting.

7. Intelligent Keypad panel

- Copy function: Easily copies function codes and data to other inverters.
- Six languages (English, French, German, Italian, Spanish, and Japanese) are available as standard.
- Jogging (inching) operation from the Keypad or external signal
- Remote operation using optional extension cable (CBIII-10R-□□□)



8. Protective functions, Maintenance

Protection

- Motors with various characteristics can be used by setting thermal time constant for the electronic thermal overload relay.
- Input phase loss protective function protects the inverter from damage caused by disconnection of power supply lines.
- Motor is protected with a PTC thermistor.
- Input terminals for auxiliary control power supply (1.5kW or larger models) : Alarm signal output will be held even if main circuit power supply has shut down.

Excellent maintainability

The items below can be monitored on the Keypad panel and making it easy to analyze the cause of trip and to take preventive measures.

- Input/output terminals check
- Life expectancy of main-circuit capacitors
- Inverter on-load factor
- Accumlated operation time
- Inverter operating condition (output current, heat sink temperature, input power, etc.)
- Detailed data on trip cause

9. Extensive product line

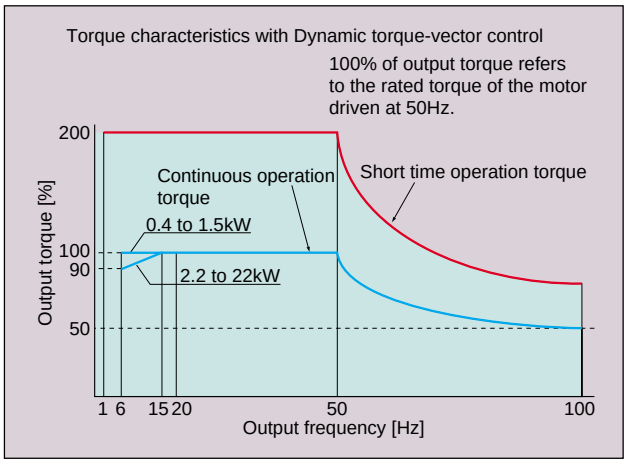
- Since the product is equipped with a dual rating feature, it can be used for variable torque rating control [VT] (5.5kW or larger), as well as constant torque rating [CT].

  The variable torque rating can be used for one-class higher than the constant torque rating.

  *For 30kW only, the model numbers for the VT rating and CT rating are different.
- Totally-enclosed casing (IP40) (up to 22kW as standard).
- Optional IP20 enclosure available for 30kW or larger models.
- Water-proof models(IP65 for 7.5kW or smaller, IP54 for 11 to 22kW) as a separate series (available soon).

10. Other useful functions

- Side-by-side mounting (up to 22kW) saves space when inverters are installed in a panel.
- The uniform height (260mm) of products (up to 7.5kW) makes it easy to design panels.
- User-definable control terminals: Digital input (9 points), transistor output (4points), and relay contact output (1point).
- Active drive feature: Performs prolonged acceleration at reduced torque, monitoring the load status to prevent tripping.
- Stall prevention function is provided as standard. Active or inactive can be also selected.



The above torque characteristics may not be obtained depending on the motor characteristics.

Variation

Easy to apply to customer systems. A consistent design concept in all models from 0.4kW to 400kW.

Nominal applied motors [kW]	400V series	
	Constant Torque Rating (CT)	Variable Torque Rating (VT)
0.4	FRN0.4G11S-4EN	
0.75	FRN0.75G11S-4EN	
1.5	FRN1.5G11S-4EN	
2.2	FRN2.2G11S-4EN	
4.0	FRN4.0G11S-4EN	
5.5	FRN5.5G11S-4EN	
7.5	FRN7.5G11S-4EN	FRN5.5G11S-4EN
11	FRN11G11S-4EN	FRN7.5G11S-4EN
15	FRN15G11S-4EN	FRN11G11S-4EN
18.5	FRN18.5G11S-4EN	FRN15G11S-4EN
22	FRN22G11S-4EN	FRN18.5G11S-4EN
30	FRN30G11S-4EN	FRN30G11S-4EV
37	FRN37G11S-4EN	FRN30G11S-4EN
45	FRN45G11S-4EN	FRN37G11S-4EN
55	FRN55G11S-4EN	FRN45G11S-4EN
75	FRN75G11S-4EN	FRN55G11S-4EN
90	FRN90G11S-4EN	FRN75G11S-4EN
110	FRN110G11S-4EN	FRN90G11S-4EN
132	FRN132G11S-4EN	FRN110G11S-4EN
160	FRN160G11S-4EN	FRN132G11S-4EN
200	FRN200G11S-4EN	FRN160G11S-4EN
220	FRN220G11S-4EN	FRN200G11S-4EN
280	FRN280G11S-4EN	FRN220G11S-4EN
315	FRN315G11S-4EN	FRN280G11S-4EN
400	FRN400G11S-4EN	FRN315G11S-4EN
500		FRN400G11S-4EN

How to read the model number

Code	Application range
G	General industrial machines

Code	Series name
FRN	FRENIC 5000 series

Code	Protective Structure
S	Standared

Code	Version
EN	EN
EV	EV(VT only)

FRN 5.5 G 11 S - 4 EN

Code	Nominal applied motors [kW]
0.2	0.2kW
0.4	0.4kW
0.75	0.75kW
1.5	1.5kW
to	to
400	400kW

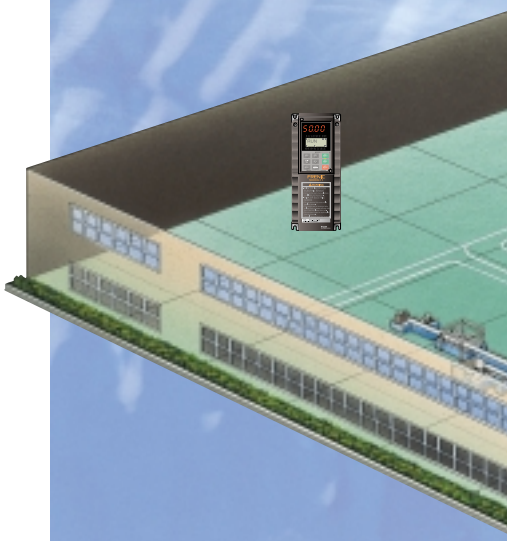
Code	Developed inverter series
11	11 series

Code	Input power source
4	Three-phase 400V

FRENIC 5000G1 industrial plant

Fans

- Air-conditioning system (for factory, building, office, hospital, clean room, shop, and cattle barn)
- Dryer
- Boiler fan
- Fans for controlling furnace temperature
- Roof fans controlled as a group
- Refrigerator
- Compressor
- Built-in blower in a film-manufacturing machine
- Cooling-tower fans
- Ventilating fans
- Air-conditioning equipment



Food processing machines

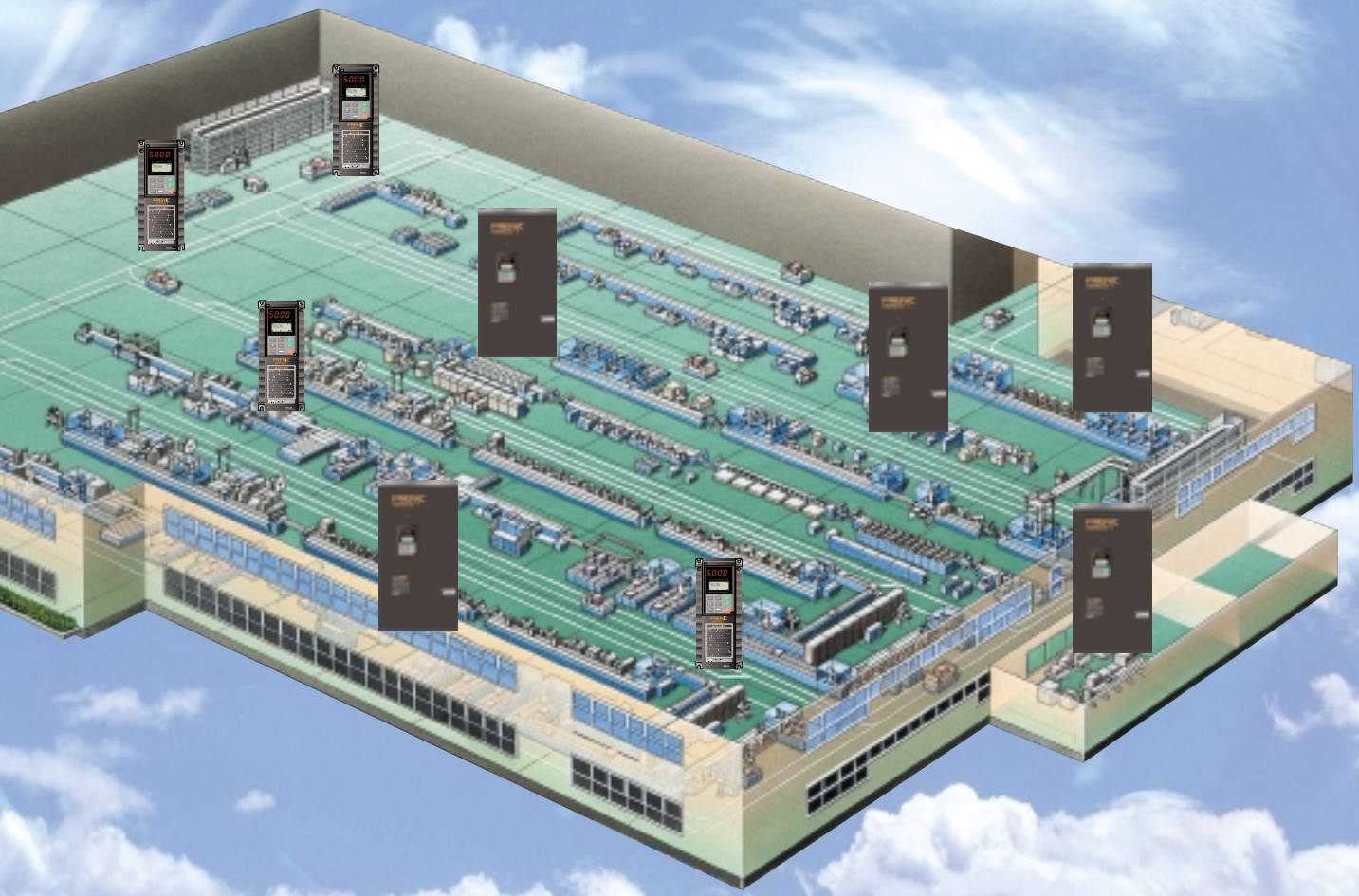
- Food mixing machine
- Food slicer
- Grain milling machine (bread, cake, noodles)
- Tea making machine
- Rice cleaning machine

1S can be used for almost all and equipment areas.

Machine tools
- Grinding machine
- Sanding machine
- Milling machine
- Lathe
- Drilling machine
- Turntable
- Work positioning machine
- PC board drilling machine
- Winding machine
- Press

Conveyance machinery
- Crane (traveling, traversing, hoisting)
- Automated warehouse
- Conveyor (belt, chain, screw, roller)
- Lift
- Car parking facility
- Elevator, escalator
- Automatic door
- Shutter equipment
- Speed-change gear

Chemical machinery/wood working machines
- Fluid mixing machine
- Extruder
- Vibrator
- Centrifugal separator
- Coating machine
- Take-up roller
- Routing machine
- Sanding machine
- Planing machine



Electric pumps
- Tankless water supply system
- Submersible motor pump
- Vacuum pump
- Fountain pump
- Cooling water pump
- Circulating hot water pump
- Well pump
- Agricultural storage pump
- Water treatment system
- Constant-flow pump
- Sludge pump

Packaging machinery
- Individual packaging/inner-packaging machine
- Packing machine
- Outer-packaging machine

Paper making/ textile machinery
- Spinning machine
- Knitting machine
- Textile printing machine
- Industrial sewing machine
- Synthetic fiber manufacturing plant

Other machinery
- Automated feed/medicine mixer
- Commercial-use washing machine
- Offset printing press
- Book-binding machine
- Car-washing machine
- Shredder
- Dishwasher
- Test equipment
- Crusher

Standard Specifications

FRENIC5000G11S 400V series

Type	FRN□□□G11S-4EN		0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15	18.5	22	–	30	37	45	55	75	90	110	132	160	200	220	280	315	400
	FRN30G11S-4EV *1)		–	–	–	–	–	–	–	–	–	–	–	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Applied motor	Nominal (CT use)	kW	0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15	18.5	22	–	30	37	45	55	75	90	110	132	160	200	220	280	315	400
	Maximum (VT use)	kW	–	–	–	–	–	7.5	11	15	18.5	22	–	30	37	45	55	75	90	110	132	160	200	220	280	315	400	500
Output ratings	Rated capacity *2)	kVA	1.0	1.7	2.6	3.9	6.4	9.3	12	17	21	28	32	32	43	53	65	80	107	126	150	181	218	270	298	373	420	531
	Rated voltage *3)	V	3-phase 380, 400, 415V/50Hz 380, 400, 440, 460V/60Hz OM:440V/50Hz																									
	Rated current *4)	A	1.5	2.5	3.7	5.5	9.0	13	18	24	30	39	45	–	60	75	91	112	150	176	210	253	304	377	415	520	585	740
	Overload capability	Cont. (VT use) A	–	–	–	–	–	16.5	23	30	37	44	–	60	75	91	112	150	176	210	253	304	377	415	520	585	650	960
		Short time *1) (CT use)	150% of rated current for 1min. 200% of rated current for 0.5s											150% of rated current for 1min. 180% of rated current for 0.5s													
	Rated frequency	Hz	50, 60Hz																									
Input ratings	Phases, Voltage, Frequency		3-phase 380 to 480V 50/60Hz											3-phase 380 to 440V/50Hz 380 to 480V/60Hz *5)														
	Voltage / frequency variations		Voltage : +10 to –15% (Voltage unbalance *6) : 2% or less) Frequency :+5 to –5%																									
	Momentary voltage dip capability *7)		When the input voltage is 310V or more, the inverter can be operated continuously. When the input voltage drops below 310V from rated voltage, the inverter can be operated for 15ms . The smooth recovery method is selectable.																									
	Rated current *8) A	(with DCR)	0.82	1.5	2.9	4.2	7.1	10.0	13.5	19.8	26.8	33.2	39.3	54	54	67	81	100	134	160	196	232	282	352	385	491	552	704
		(without DCR)	1.8	3.5	6.2	9.2	14.9	21.5	27.9	39.1	50.3	59.9	69.3	86	86	104	124	150	-	-	-	-	-	-	-	-	-	-
	Required power supply capacity (with DCR)	kVA	0.6	1.1	2.1	3.0	5.0	7.0	9.4	14	19	24	28	38	38	47	57	70	93	111	136	161	196	244	267	341	383	488
Control	Starting torque *1)		200% (with Dynamic torque-vector control selected)											180% (with Dynamic torque-vector control selected)													
Braking	Standard Braking torque		150%		100%					20% *9)				15 to 10% *9)														
	Standard Time	s	5		5					No limit																		
	Standard Duty cycle	%	5	3	5	3	2	3	2	No limit																		
	Braking torque (Using options)		150%											100%														
	DC injection braking		Starting frequency: 0.1 to 60.0Hz Braking time: 0.0 to 30.0s Braking level: 0 to 100% of rated current																									
Enclosure (IEC 60529)			IP 40											IP 00(IP20:Option)														
Cooling method			Natural cooling		Fan cooling																							
Standards			-UL/cUL -CE Marking (Low Voltage) -EMC Directive -TÜV (up to 22kW) -EN 61800-2 (Ratings, specifications for low voltage adjustable frequency a.c. power drive systems) -EN 61800-3 (EMC product standard including specific test methods)																									
Mass		kg	2.2	2.5	3.8	3.8	3.8	6.5	6.5	10	10	10.5	10.5	31	31	36	41	42	50	73	73	104	104	145	145			

CT : Constant Torque VT : Variable Torque

NOTES:
*1) Specifications for VT use are shown below.

Output ratings	Overload capability	Short time	110% of rated current for 1min.
Control	Starting torque		50%

*2) Inverter output capacity (kVA) at 415V. *3) Output voltage is proportional to the power supply voltage and cannot exceed the power supply voltage. *4) Current derating may be required in case of low impedance loads such as high frequency motor. *5) When the input voltage is 380V/50Hz or 380 to 415V/60Hz, the tap of the auxiliary transformer must be changed. *6) Refer to the EN 61800-3(5.2.3). *7) Tested at standard load condition (85% load). *8) This value is under FUJI original calculation method. (Refer to the Technical Information.) *9) With a nominal applied motor, this value is average torque when the motor decelerates and stops from 60Hz. (It may change according to motor loss.)

Conformity to Low Voltage Directive

The FRENIC5000G11S Series conforms to the Low Voltage Directive with EN 50178.

Conformity to EMC Directive

- Emission requirement
  EMC filters in compliance with EN61800-3 are provided for all models (Option).
- Immunity requirement
  The FRENIC5000G11S Series inverters meet EN61800-3 as standard.

Common Specifications

Item			Explanation
Output frequency	Setting	Maximum frequency	50 to 400Hz *1)
		Base frequency	25 to 400Hz *1)
		Starting frequency	0.2 to 60Hz, Holding time: 0.0 to 10.0s
		Carrier frequency *2)	**CT use** 0.75 to 15kHz (55kW or smaller)*3) 0.75 to 10kHz (75kW or larger) **VT use** 0.75 to 15kHz (22kW or smaller) 0.75 to 10kHz (30 to 75kW) 0.75 to 6kHz (90kW or larger)
	Accuracy (Stability)		· Analog setting : ±0.2% of Maximum frequency (at 25 ± 10°C) · Digital setting : ±0.01% of Maximum frequency (at -10 to +50°C)
	Setting resolution		· Analog setting : 1/3000 of Maximum frequency ex.) 0.02Hz at 60Hz, 0.04Hz at 120Hz, (0.15Hz at 400Hz : EN) · Digital setting : 0.01Hz at Maximum frequency of up to 99.99Hz (0.1Hz at Maximum frequency of 100Hz and above) · LINK setting : · 1/20000 of Maximum frequency ex.) 0.003Hz at 60Hz, 0.006Hz at 120Hz, (0.02Hz at 400Hz : EN) · 0.01Hz (Fixed)
Control	Control method		· V/f control (Sinusoidal PWM control) · Dynamic torque-vector control (Sinusoidal PWM control) · Vector control with PG (*) (EN only)
	Voltage / freq. (V/f) characteristic		Adjustable at base and maximum frequency, with AVR control : 320 to 480V
	Torque boost		Selectable by load characteristics: Constant torque load (Auto/manual), Variable torque load (Manual)
	Operation method		· KEYPAD operation : or key, key · Digital input signal operation : FWD or REV command, Coast-to-stop command, etc. · LINK operation : RS485 (Standard) T-Link (FUJI private link), Profibus-DP, Interbus-S, DeviceNet, Modbus Plus, JPCN1,CAN open (Option)
	Frequency setting (Frequency command)		· KEYPAD operation: or key · External potentiometer (*) : 1 to 5kΩ (1/2W) · Analog input : 0 to +10V DC (0 to +5V DC), 4 to 20mA DC (Reversible) 0 to ±10V DC (0 to ± 5V DC) ....Reversible operation by polarized signal can be selected. (Inverse) +10 to 0V DC, 20 to 4mA DC......Inverse mode operation can be selected. · UP/DOWN control : Output frequency increases when UP signal is ON, and decreases when DOWN signal is ON. · Multistep frequency : Up to 16 different frequencies can be selected by digital input signal. · Pulse train input (*) : 0 to 100kp/s · Digital signal (parallel) (*) : 16-bit binary · LINK operation : RS485 (Standard) T-Link (FUJI private link), Profibus-DP, Interbus-S, DeviceNet, Modbus Plus, JPCN1, CAN open (Option) · Programmed PATTERN operation: Max. 7 stages
	Jogging operation		or key, FWD or REV digital input signal
	Running status signal		Transistor output (4 points) : RUN, FAR, FDT, OL, LU, TL, etc. Relay output (2 points) : · Same as transistor output · Alarm output (for any fault) Analog output (1 point) : Output frequency, Output current, Output torque, etc. Pulse output (1 point) : Output frequency, Output current, Output torque, etc.
	Acceleration / Deceleration time		0.01 to 3600s : · Independently adjustable acceleration and deceleration · 4 different times are selectable. Mode select : Linear, S-curve (weak), S-curve (strong), Non-linear
	Active drive		When the acceleration time reaches 60s, the motor output torque is automatically reduced to rated torque. Then the motor operation mode is changed to torque limiting operation. The acceleration time is automatically extended up to 3 times.
	Frequency limiter		High and Low limiters can be preset.
	Bias frequency		Bias frequency can be preset.
	Gain for frequency setting		Gain for frequency setting can be preset. (0.0 to 200.0%) ex.) Analog input 0 to +5V DC with 200% gain results in maximum frequency at 5V DC.
	Jump frequency control		Jump frequency (3 points) and its common jump hysteresis width (0 to 30Hz) can be preset.
	Rotating motor pick up (Flying start)		A rotating motor (including inverse rotating mode) can be smoothly picked up without stopping the motor (speed search method).
	Auto-restart after momentary power failure		Automatic restart is available without stopping motor after a momentary power failure (speed search method). When "Smooth recovery" mode is selected, the motor speed drop is held minimum. (The inverter searches the motor speed, and smoothly returns to setting frequency. Even if the motor circuit is temporarily opened, the inverter operates without a hitch.)
	Line / Inverter changeover operation		Controls the switching operation between line power and inverter. The inverter has sequence function inside.
	Slip compensation		The inverter output frequency is controlled according to the load torque to keep motor speed constant. When the value is set at "0.00" and "Torque-vector" is set at "active", the compensation value automatically selects the Fuji standard motor. Slip compensation can be preset for the second motor.
	Droop operation		The motor speed droops in proportion to output torque (–9.9 to 0.0Hz).
	Torque limiting		· When the motor torque reaches a preset limiting level, this function automatically adjusts the output frequency to prevent the inverter from tripping due to an overcurrent. · Torque limiting 1 and 2 can be individually set, and are selectable with a digital input signal.
	Torque control		Output torque (or load factor) can be controlled with an analog input signal.
	PID control		This function can control flowrate, pressure, etc. (with an analog feedback signal.) **• Reference signal** · KEYPAD operation (or key) : Setting freq. / Max. freq. X 100 (%) · Voltage input (Terminal 12 and V2) : 0 to +10V DC · Current input (Terminal C1) : 4 to 20mA DC · Reversible operation with polarity (Terminal 12) : 0 to ±10V DC · Reversible operation with polarity (Terminal 12 + V1) : 0 to ±10V DC · Inverse mode operation (Terminal 12 and V2) : +10 to 0V DC · Inverse mode operation (Terminal C1) : 20 to 4mA DC · PATTERN operation : Setting freq./Max. freq. X 100 (%) · DI option input (*) : · BCD, setting freq./Max. freq. X 100 (%) · Binary, full scale/100 (%) · Multistep frequency setting : Setting freq./Max. freq. X 100 (%) · RS485 : Setting freq./Max. freq. X 100 (%) **• Feedback signal** · Terminal 12 (0 to +10V DC or +10 to 0V DC) · Terminal C1 (4 to 20mA DC or 20 to 4mA DC)

NOTES: (*) Option
*1) For application at 120Hz or above, please contact FUJI.
*2) Inverter may automatically reduce carrier frequency, in accordance with ambient temperature or output current for protecting inverter.
*3) The minimum carrier frequency changes depending on maximum output frequency.

Item		Explanation	
Control	**Automatic deceleration**	Torque limiter 1 (Braking) is set at "F41: 0" (Same as Torque limiter 2 (Braking)). · In deceleration : The deceleration time is automatically extended up to 3 times the setting time for tripless operation even if braking resistor not used. · In constant speed operation : Based on regenerative energy, the frequency is increased and tripless operation is active.	
	Second motor's setting	This function is used for two motors switching operation. · The second motor's V/f characteristics (base and maximum frequency) can be preset. · The second motor's circuit parameter can be preset. Torque-vector control can be applied to both motors.	
	Energy saving operation	This function minimizes inverter and motor losses at light load.	
	Fan stop operation	This function is used for silent operation or extending the fan's lifetime.	
	Universal DI	Transmits to main controller of LINK operation.	
	Universal DO	Outputs command signal from main controller of LINK operation.	
	Universal AO	Outputs analog signal from main controller of LINK operation.	
	Zero speed control (*)	The motor speed is controlled with the speed reference of zero.	
	Positioning control (*)	The SY option card can be used for positioning control by differential counter method.	
	Synchronized operation (*)	This function controls the synchronized operation between 2 axes with PGs.	
Indication	**Operation mode (Running)**	LED monitor	LCD monitor (English, German, French, Spanish, Italian,Japanese)
		· Output frequency 1 (Before slip compensation) (Hz) · Output frequency 2 (After slip compensation) (Hz) · Setting frequency (Hz) · Output current (A) · Output voltage (V) · Motor synchronous speed (r/min) · Line speed (m/min) · Load shaft speed (r/min) · Torque calculation value (%) · Input power (kW) · PID reference value ("F01") · PID reference value (Remote) ("C30") · PID feedback value · Trip history :Cause of trip by code (Even when main power supply is off, trip history data of the last 4 trips are retained.)	Operation monitor & Alarm monitor **Operation monitor** · Displays operation guidance · Bargraph: Output frequency (%), Output current (A), Output torque (%) **Alarm monitor** · The alarm data is displayed when the inverter trips. Function setting & monitor **Function setting** Displays function codes and its data or data code, and changes the data value. **Operation condition** · Output frequency (Hz) · Motor synchronous speed (r/min) · Output current (A) · Load shaft speed (r/min) · Output voltage (V) · Line speed (m/min) · Torque calculation value (%) · PID reference value · Setting frequency (Hz) · PID feedback value · Operation condition · Driving torque limiter setting vaiue (%) (FWD / REV, IL, VL / LU, TL) · Braking togue limiter setting value (%) **Tester function (I/O check)** · Digital I/O: ■ (ON), □ (OFF) · Analog I/O: (V), (mA), (H), (p/s) **Maintenance data** · Operation time (h) · Cooling fan operation time (h) · DC link circuit voltage (V) · Communication error times · Temperature at inside air (°C) (KEYPAD, RS485, Option) · Temperature at heat sink (°C) · ROM version · Maximum current (A) (Inverter, KEYPAD, Option) · Main circuit capacitor life(%) · Control PC board life (h) **Load factor calculation** · Measurement time (s) · Average current (A) · Maximum current (A) · Average braking power (%) **Alarm data** · Output frequency (Hz) · Temperature at inside air (°C) · Output current (A) · Hest sink temperature (°C) · Output voltage (V) · Communication error times · Torque calculation value (%) (KEYPAD, RS485, Option) · Setting frequency (Hz) · Digital input terminal condition · Operation condition (Remote, Communication) (FWD / REV, IL, VL / LU, TL) · Transistor output terminal condition · Operation time (h) · Trip history code · DC link circuit voltage (V) · Multiple alram exist
	Stopping	Selected setting value or output value	
	Trip mode	Displays the cause of trip by codes as follows. · OC1 (Overcurrent during acceleration) · OC2 (Overcurrent during deceleration) · OC3 (Overcurrent running at constant speed) · EF (Ground fault) · Lin (Input phase loss) · FUS (Fuse blown) · OU1 (Overvoltage during acceleration) · OU2 (Overvoltage during deceleration) · OU3 (Overvoltage running at constant speed) · LU (Undervoltage) · OH1 (Overheating at heat sink) · OH2 (External thermal relay tripped) · OH3 (Overtemperature at inside air) · dBH (Overheating at DB circuit) · OL1 (Motor 1 overload) · OL2 (Motor 2 overload) · OLU (Inverter unit overload) · OS (Overspeed) · PG (PG error) · Er1 (Memory error) · Er2 (KEYPAD panel communication error) · Er3 (CPU error) · Er4 (Option error) · Er5 (Option error) · Er7 (Output phase loss error, impedance imbalance) · Er8 (RS485 error)	
	Charge lamp	When the DC link circuit voltage is higher than 50V, the charge lamp is ON.	

Item		Explanation
Protection	**Overload**	Protects the inverter by electronic thermal and detection of inverter temperature.
	Overvoltage	Detects DC link circuit overvoltage,and stops the inverter. 400V series: 800V DC
	Undervoltage	Detects DC link circuit undervoltage,and stops the inverter. 400V series: 400V DC
	Input phase loss	Phase loss protection for power line input.
	Overheating	Protects the inverter by detection of inverter temperature.
	Short-circuit	Short-circuit protection for inverter output circuit
	Ground fault	· Ground fault protection for inverter output circuit (3-phase current detection method) · Zero-phase current detection method (30kW or larger)
	Motor overload	· The inverter trips,and then protects the motor. · Electronic thermal overload relay can be selected for standard motor or inverter motor · Thermal time constant (0.5 to 75.0 minutes) can be preset for a special motor. · The second motor's electronic thermal overload relay can be preset for 2-motor changeover operation.
	DB resistor overheating	· Prevents DB resistor overheating by internal electronic thermal overload relay (7.5kW or smaller). · Prevents DB resistor overheating by external thermal overload relay attached to DB resistor (11kW or larger). (The inverter stops electricity discharge operation to protect the DB resistor.)
	Stall prevention	· Controls the output frequency to prevent oC (overcurrent) trip when the output current exceeds the limit value during acceleration. · Lowers the output frequency to hold almost constant torque when the output current exceeds the limit value during operation at constant speed. · Controls the output frequency to prevent oU (overvoltage) trip when the DC link circuit voltage exceeds the limit value during deceleration.
	Output phase loss	When the inverter executes auto-tuning, detects each phase impedance imbalance (and stops the inverter).
	Motor protection by PTC thermistor	When the motor temperature exceeds allowable value, the inverter trips automatically.
	Auto reset	When the inverter is tripped, it resets automatically and restarts.
Condition (Installation and operation)	**Installation location**	Free from corrosive gases, flammable gases, oil mist, dusts, and direct sunlight. Indoor use only.
	Altitude	1000m or less. Applicable to 3000m with power derating (-10%/1000m)
	Ambient temperature	–10 to +50 °C. For inverters of 22kW or smaller, remove the ventilation covers when operating it at a temperature of 40 °C or above.
	Ambient humidity	5 to 95%RH (non-condensing)
	Vibration	3mm at from 2 to less than 9Hz, 9.8m/s^2 at from 9 to less than 20Hz 2m/s^2 at from 20 to less than 55Hz, 1m/s^2 at from 55 to less than 200Hz
Storage condition		-Temperature : –25 to +65 °C, -Humidity : 5 to 95%RH (non-condensing)

Terminal Functions

	Symbol	Terminal name	Function	Remarks	Func. code
Main circuit	L1/R, L2/S, L3/T	Power input	Connect a 3-phase power supply.		
	U, V, W	Inverter output	Connect a 3-phase induction motor.		
	P1, P(+)	For DC REACTOR	Connect the DC REACTOR for power-factor correcting or harmonic current reducing.	DC REACTOR: Option	
	P(+), N(-)	For BRAKING UNIT	· Connect the BRAKING UNIT (Option). · Used for DC bus connection system.	BRAKING UNIT (Option): 11kW or larger	
	P(+), DB	For EXTERNAL BRAKING RESISTOR	Connect the EXTERNAL BRAKING RESISTOR (Option)	Only for 7.5kW or smaller	
	⏚ G	Grounding	Ground terminal for inverter chassis (housing).		
	R0, T0	Auxiliary control power supply	Connect the same AC power supply as that of the main circuit to back up the control circuit power supply.	0.75kW or smaller: Not correspond	
Analog input	13	Potentiometer power supply	+10V DC power supply for frequency setting POT (POT: 1 to 5kΩ)	· Allowable maximum output current : 10mA	
	12	Voltage input	· 0 to +10V DC/0 to 100% (0 to +5V DC/0 to 100%) · Reversible operation can be selected by function setting. 0 to ±10V DC /0 to ±100% (0 to ±5V DC/0 to ±100%) · Inverse mode operation can be selected by function setting or digital input signal. +10 to 0V DC/0 to 100%	· Input impedance: 22kΩ · Allowable maximum input voltage: ±15V DC · If input voltage is 10 to 15V DC, the inverter estimates it to10V DC.	F01, C30
		(Torque control)	Used for torque control reference signal.		H18
		(PID control)	Used for PID control reference signal or feedback signal.		F01, H21
		(PG feedback)	Used for reference signal of PG feedback control (option)		
	C1	Current input	· 4 to 20mA DC/0 to 100% · Inverse mode operation can be selected by function setting or digital input signal. 20 to 4mA DC/0 to 100%	· Input impedance: 250Ω · Allowable maximum input current: 30mA DC · If input current is 20 to 30mA DC , the inverter estimates it to 20mA DC.	
		(PID control)	Used for PID control reference signal or feedback signal.		F01, H21
		(PTC-Thermistor Input)	The PTC-thermistor (for motor protection) can be connected to terminal C1 - 11.	Change over the Pin switch on control board. (SW2 : PTC)	H26, H27
	V2	Voltage input 2	0 to +10V DC	Can't change over the terminal C1.	F01
	11	Common	Common for analog signal	Isolated from terminal CMY and CM.	
Digital input	FWD	Forward operation commond	FWD: ON ..... The motor runs in the forward direction. FWD: OFF ..... The motor decelerates and stops.	When FWD and REV are simultaneously ON,the motor decelerates and stops.	F02
	REV	Reverse operation commond	REV: ON ..... The motor runs in the reverse direction. REV: OFF ..... The motor decelerates and stops.		
	X1 X2 X3 X4 X5 X6 X7 X8 X9	Digital input 1 Digital input 2 Digital input 3 Digital input 4 Digital input 5 Digital input 6 Digital input 7 Digital input 8 Digital input 9	These terminals can be preset as follows.	· ON state maximum input voltage: 2V (maximum source current : 5mA) · OFF state maximum terminal voltage: 22 to 27V (allowable maximum leakage current: 0.5mA)	E01 to E09
	(SS1) (SS2) (SS4) (SS8)	Multistep freq. selection	(SS1) : 2 (0, 1) different frequencies are selectable. (SS1,SS2) : 4 (0 to 3) different frequencies are selectable. (SS1,SS2,SS4) : 8 (0 to 7) different frequencies are selectable. (SS1,SS2,SS4,SS8) : 16 (0 to 15) different frequencies are selectable.	Frequency 0 is set by F01 (or C30). (All signals of SS1 to SS8 are OFF)	C05 to C19
	(RT1) (RT2)	ACC / DEC time selection	(RT1) : 2 (0, 1) different ACC / DEC times are selectable. (RT1,RT2) : 4 (0 to 3) different ACC / DEC times are selectable.	Time 0 is set by F07/F08. (All signals of RT1 to RT2 are OFF)	F07, F08 E10 to E15
	(HLD)	3-wire operation stop command	Used for 3-wire operation. (HLD): ON ..... The inverter self-holds FWD or REV signal. (HLD): OFF ..... The inverter releases self-holding.	Assigned to terminal X7 at factory setting.	
	(BX)	Coast-to-stop command	(BX): ON ..... Motor will coast-to-stop. (No alarm signal will be output.)	· The motor restarts from 0Hz by turning off BX with the operation command (FWD or REV) ON. · Assigned to terminal X8 at factory setting.	H11
	(RST)	Alarm reset	(RST): ON ..... Faults are reset. (This signal should be held for more than 0.1s.)	· During normal operating, this signal is ignored. · Assigned to X9 at factory setting.	
	(THR)	Trip command (External fault)	(THR): OFF ..... "OH2 trip" occurs and motor will coast-to-stop.	This alarm signal is held internally.	
	(JOG)	Jogging operation	(JOG): ON ..... JOG frequency is effective.	This signal is effective only while the inverter is stopping.	C20
	(Hz2/Hz1)	Freq. set 2 / Freq. set 1	(Hz2/Hz1): ON ..... Freq. set 2 is effective.	If this signal is changed while the inverter is running, the signal is effective only after the inverter stops.	C30 / F01
	(M2/M1)	Motor 2 / Motor 1	(M2/M1): ON ..... The motor circuit parameter and V/f characteristics are changed to the second motor's ones.	If this signal is changed while the inverter is running, the signal is effective only after the inverter stops.	A10 to A18 / P01 to P09
	(DCBRK)	DC brake command	(DCBRK): ON ..... The DC injection brake is effective. (In the inverter deceleration mode)	If the operation command(FWD/REV) is input while DC braking is effective, the operation command (FWD/REV) has priority.	F20 to F22
	(TL2/TL1)	Torque limiter 2 / Torque limiter 1	(TL2/TL1): ON ..... Torque limiter 2 is effective.		E16, E17 / F40, F41
	(SW50) (SW60)	Switching operation between line and inverter	(SW50(SW60)): ON .....The motor is changed from inverter operation to line operation. (SW50(SW60)): OFF ..... The motor is changed from line operation to inverter operation.	Main circuit changeover signals are output through Y1 to Y5 terinal.	
	(UP) (DOWN)	UP command DOWN command	(UP): ON ..... The output frequency increases. (DOWN): ON ..... The output frequency decreases. · The output frequency change rate is determined by ACC / DEC time. · Restarting frequency can be selected from 0Hz or setting value at the time of stop.	When UP and DOWN commands are simultaneously ON, DOWN signal is effective.	F01, C30
	(WE-KP)	Write enable for KEYPAD	(WE-KP): ON ..... The data is changed by KEYPAD.		F00
	(Hz/PID)	PID control cancel	(Hz/PID): ON ..... The PID control is canceled,and frequency setting by KEYPAD (▬ or ▬)is effective.		H20 to H25
	(IVS)	Inverse mode changeover	(IVS): ON ..... Inverse mode is effective in analog signal input.	If this signal is changed while the inverter is running, the signal is effective only after the inverter stops.	F01, C30
	(IL)	Interlock signal for 52-2	Connect to auxiliary contact (1NC) of 52-2.		
	(Hz/TRQ)	TRQ control cancel	(Hz/TRQ): ON ..... The torque control is canceled, and ordinary operation is effective.		H18
	(LE)	Link enable (RS485, Bus)	(LE): ON ..... The link opereation is effective. Used to switch operation between ordinary operation and link operation to communication.	RS485: Standard, Bus: Option	H30
	(U-DI)	Universal DI	This signal is transmitted to main controller of LINK operation.		
	(STM)	Pick up start mode	(STM): ON ..... The "Pick up" start mode is effective.		H09
	(PG/Hz)	SY-PG enabled	(PG/Hz): ON ..... Synchronized operation or PG-feedback operation is effective.	Option	
	(SYC)	Syuhronization command	(SYC): ON ..... The motor is controlled for synchronized operation between 2 axes with PGs.	Option	
	(ZERO)	Zero speed command	(ZERO): ON ..... The motor speed is controlled with the speed reference of zero.	This function can be selected at PG feedback control. Option	
	(STOP1)	Forced stop command	(STOP1): OFF ..... The motor decelerates and stops.		
	(STOP2)	Forced stop command with Deceleration time4	(STOP2): OFF ..... The motor decelerates and stops with Deceleration time4.		E15
	(EXITE)	Pre-exciting command	(EXITE): ON ..... The magnetic flux can be established preliminary before starting at PG vector mode.		
	PLC	PLC terminal	Connect PLC power supply to avoid malfunction of the inveter that has SINK type digital input,when PLC power supply is off.		
	P24	DC voltage supply	DC voltage supply (+24V, max. 100mA)		

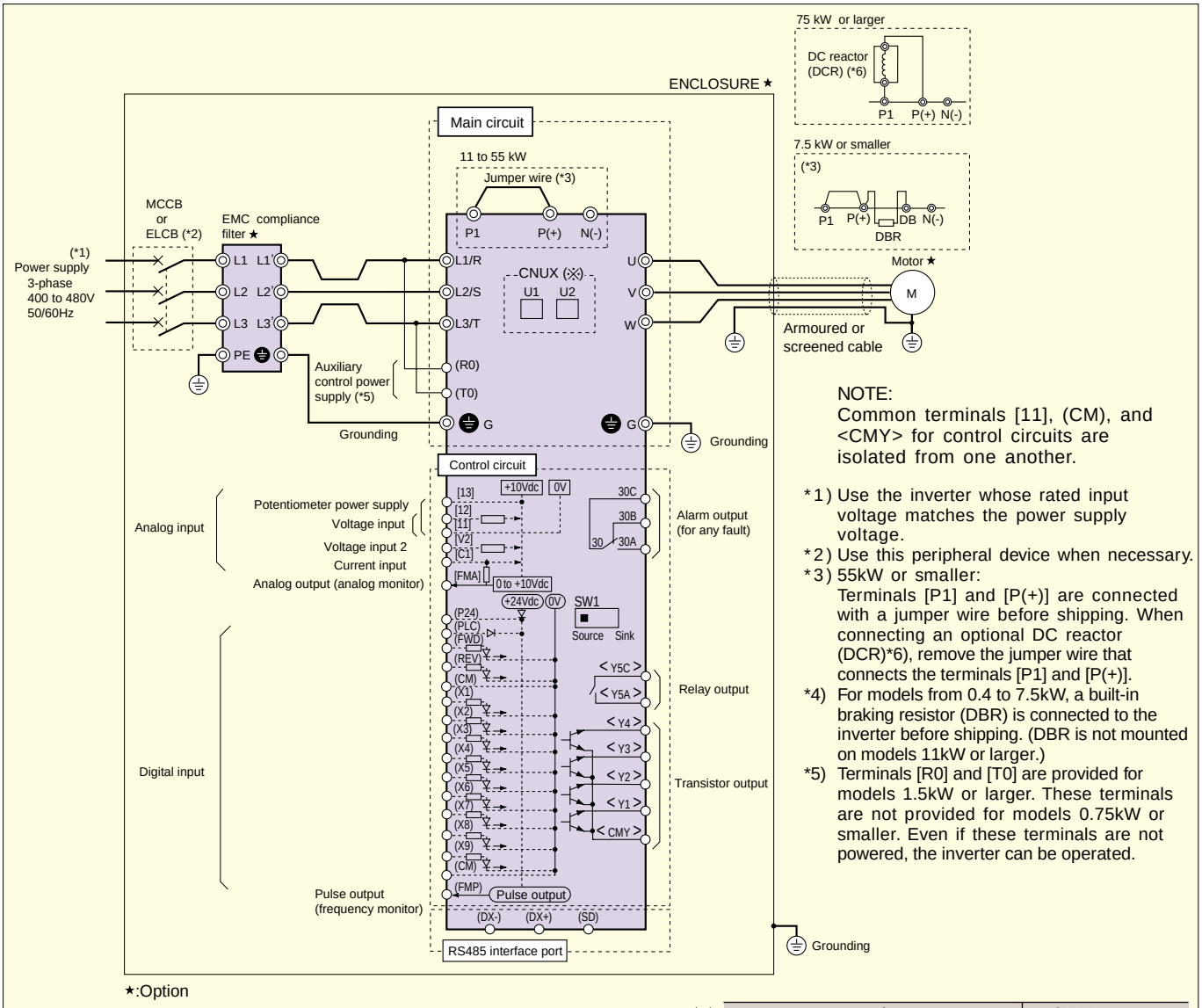
Terminal Functions

	Symbol	Terminal name	Function	Remarks	Func. code
Analog output	FMA (11)	Analog monitor (Common)	Output voltage (0 to 10V DC) is proportional to selected function's value as follows. The proportional coefficient and bias value can be preset. · Output frequency 1 (Before slip compensation) (0 to max. frequency) · Output frequency 2 (After slip compensation) (0 to max. frequency) · Output current (0 to 200%) · Output voltage (0 to 200%) · Output torque (0 to 200%) · Load factor (0 to 200%) · Input power (0 to 200%) · PID feedback value (0 to 100%) · PG feedback value (0 to max. speed) · DC link circuit voltage (0 to 1000V) · Universal AO (0 to 100%)	Allowable maximum output current: 2mA	F30 to F31
Pulse output	FMP (CM)	Pulse rate monitor (Common)	· Pulse rate mode : Pulse rate is proportional to selected function's value* (50% duty pulse) · Average voltage mode : Average voltage is proportional to selected function's value* (2670p/s pulse width control) * Kinds of function to be output is same as those of analog output (FMA).	Allowable maximum output current : 2mA	F33 to F35
	CM	Common	Common for pulse output	Isolated from terminal CMY and 11.	
Transistor output	Y1 Y2 Y3 Y4	Transistor output 1 Transistor output 2 Transistor output 3 Transistor output 4	Output the selected signals from the following items.	· ON state maximum output voltage : 3V (Allowable maximum sink current : 50mA) · OFF state maximum leakage current : 0.1mA (Allowable maximum voltage : 27V)	E20 to E23
	(RUN)	Inverter running	Outputs ON signal when the output frequency is higher than starting frequency.		
	(FAR)	Frequency equivalence signal	Outputs ON signal when the difference between output frequency and setting frequency is smaller than FAR hysteresis width.		E30
	(FDT1)	Frequency level detection	Outputs ON signal by comparison of output frequency and preset value (level and hysteresis).		E31, E32
	(LU)	Undervoltage detection signal	Outputs ON signal when the inverter stops by undervoltage while the operation command is ON.		
	(B/D)	Torque polarity	Outputs ON signal in braking or stopping mode, and OFF signal in driving mode.		
	(TL)	Torque limiting	Outputs ON signal when the inverter is in torque-limiting mode.		
	(IPF)	Auto-restarting	Outputs ON signal during auto restart operation (Instantaneous power failure) mode. (including "restart time")		
	(OL1)	Overload early warning	· Outputs ON signal when the electronic thermal value is higher than preset alarm level. · Outputs ON signal when the output current value is higher than preset alarm level.		E33 to E35
	(KP)	KEYPAD operation mode	Outputs ON signal when the inverter is in KEYPAD operation mode.		F02
	(STP)	Inverter stopping	Outputs ON signal when the inverter is in stopping mode or in DC braking mode.		
	(RDY)	Ready output	Outputs ON signal when the inverter is ready for operation.		
	(SW88)	Line/Inv changeover (for 88)	Outputs 88's ON signal for Line/Inverter changeover operation.		
	(SW52-2)	Line/Inv changeover (for 52-2)	Outputs 52-2's ON signal for Line/Inverter changeover operation.		
	(SW52-1)	Line/Inv changeover (for 52-1)	Outputs 52-1's ON signal for Line/Inverter changeover operation.		
	(SWM2)	Motor2/Motor1	Outputs the motor changeover switch ON signal from motor 1 to motor 2.		A01 to A18
	(AX)	Auxiliary terminal (for 52-1)	Used for auxiliary circuit of 52-1. (Same function as AX1, AX2 terminal by FRENIC5000G9S series. (30kW or larger))	Refer to wiring diagram example.	
	(TU)	Time-up signal	Outputs time up signal (100ms ON pulse) at every stage end of PATTERN operation.		C21 to C28
	(TO)	Cycle completion signal	Outputs one cycle completion signal (100ms ON pulse) at PATTERN operation.		
	(STG1) (STG2) (STG4)	Stage No. indication 1 Stage No. indication 2 Stage No. indication 4	Outputs PATTERN operation's stage No. by signals STG1, STG2 and STG4.		
	(AL1) (AL2) (AL4) (AL8)	Alarm indication 1 Alarm indication 2 Alarm indication 4 Alarm indication 8	Outputs trip alarm No. by signals AL1, AL2, AL4, and AL8.		
	(FAN)	Fan operation signal	Outputs the inverter cooling fan operation status signal.		H06
	(TRY)	Auto-resetting	Outputs ON signal at auto resetting mode. (Including "Reset interval")		H04, H05
	(U-DO)	Universal DO	Outputs command signal from main controller of LINK operation.		
	(OH)	Overheat early warning	Outputs ON signal when the heat sink temperature is higher than (trip level – 10°C), and outputs OFF signal when the temperature is lower than (trip level – 15°C).		
	(SY)	Synchronization completion signal	Synchronization completion signal for synchronized operation.	Option	
	(LIFE)	Lifetime alarm	Outputs ON signal when the calculated lifetime is longer than preset alarm level.		
	(FDT2)	2nd Freq. level detection	2nd-outputs ON signal by comparison of output frequency and preset value (FDT2 level).		
	(OL2)	2nd OL level early warning	2nd-outputs ON signal when the output current value is larger than preset alarm level (OL2 level).		
	(C1OFF)	Terminal C1 off signal	Outputs ON signal when the C1 current is smaller than 2mA.		
	(DNZS)	Speed existence signal	Outputs ON signal at detection of motor speed when using OPC-G11S-PG/PG2/SY.		
	CMY	Common (transistor output)	Common for transistor output signal.	Isolated from terminals CM and 11.	
Relay output	30A, 30B 30C ,	Alarm relay output	Outputs a contact signal when a protective function is activated.	· Contact rating : 250V AC, 0.3A, cosø=0.3 48V DC, 0.5A, non-inductive	F36
			Changeable exciting mode active or non-exciting mode active by function "F36".		E24
	Y5A, Y5C	Relay output	Functions can be selected the same as Y1 to Y4.		E25
			Changeable exciting mode active or non-exciting mode active by function "E25".		
LINK	DX+, DX-, SD	RS485 I/O terminal	Connect the RS485 link signal.		

Basic Wiring Diagram

Keypad panel Operation

The following diagram is for reference only. For detailed wiring diagrams, refer to the relevant instruction manual.



NOTE:
Common terminals [11], (CM), and <CMY> for control circuits are isolated from one another.

*1) Use the inverter whose rated input voltage matches the power supply voltage.
*2) Use this peripheral device when necessary.
*3) 55kW or smaller:
Terminals [P1] and [P(+)] are connected with a jumper wire before shipping. When connecting an optional DC reactor (DCR)*6), remove the jumper wire that connects the terminals [P1] and [P(+)].
*4) For models from 0.4 to 7.5kW, a built-in braking resistor (DBR) is connected to the inverter before shipping. (DBR is not mounted on models 11kW or larger.)
*5) Terminals [R0] and [T0] are provided for models 1.5kW or larger. These terminals are not provided for models 0.75kW or smaller. Even if these terminals are not powered, the inverter can be operated.

★:Option

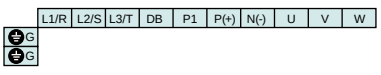
(※)

Input voltage	CNUX connector
400 to 440V/50Hz, 440 to 480V/60Hz	U1 (Factory setting)
380V/50Hz (398V or smaller), 380 to 415V/60Hz (430V or smaller)	U2

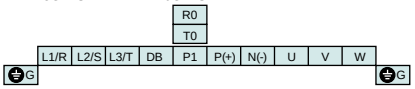
Terminal Arrangement

• Main circuit terminals

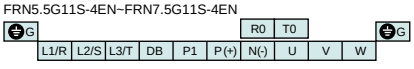
FRN0.4G11S-4EN~FRN0.75G11S-4EN



FRN1.5G11S-4EN~FRN4.0G11S-4EN



FRN5.5G11S-4EN~FRN7.5G11S-4EN



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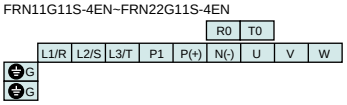
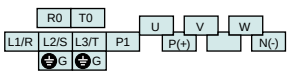
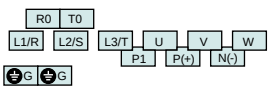


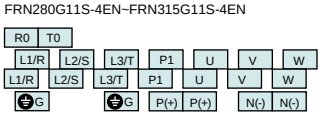
FRN30G11S-4EN~FRN110G11S-4EN / FRN30G11S-4EV



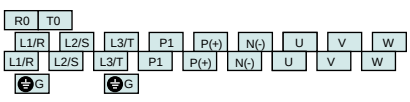
FRN132G11S-4EN~FRN220G11S-4EN

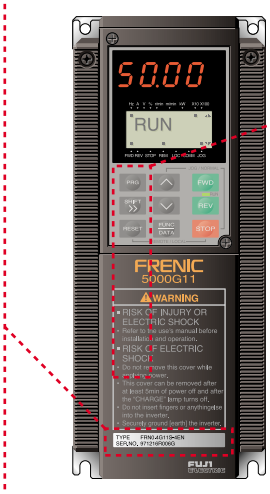


FRN280G11S-4EN~FRN315G11S-4EN

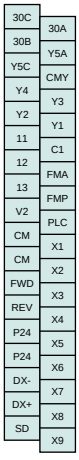


FRN400G11S-4EN



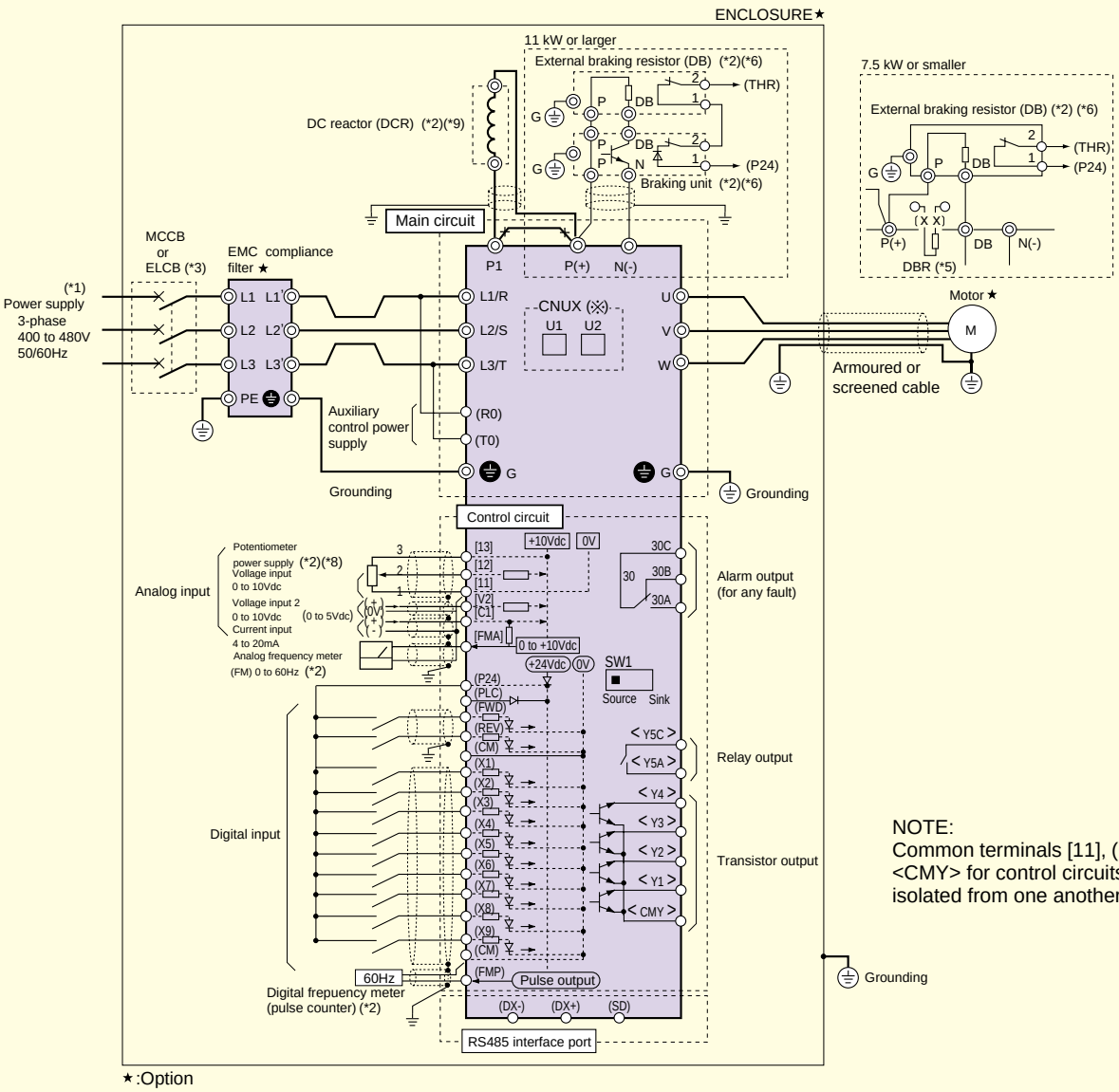


• Control circuit terminals



External signal input Operation

The following diagram is for reference only. For detailed wiring diagrams, refer to the relevant instruction manual.



★:Option

(※)

Input voltage	CNUX connector
400 to 440V/50Hz, 440 to 480V/60Hz	U1 (Factory setting)
380V/50Hz (398V or smaller), 380 to 415V/60Hz (430V or smaller)	U2

*1) Use the inverter whose rated input voltage matches the power supply voltage.
*2) An optional device. Use it when necessary.
*3) Use this peripheral device when necessary.
*4) Terminals [P1] and [P(+)] are connected with a jumper wire before shipping. When connecting an optional DC reactor (DCR) *9), remove the jumper wire that connects the terminals [P1] and [P(+)].
*5) For models from 0.2 to 7.5kW, a built-in braking resistor (DBR) is connected to the inverter before shipping. (DBR is not mounted on models 11kW or larger.) When connecting an optional external braking resistor (DB), remove the DBR connection cables from [P(+)] and [DB] terminals. The end of the removed cables (indicated with an X) must be insulated.
*6) When connecting an optional external braking resistor (DB), be sure to also use an optional braking unit *8). Connect the optional braking unit to the [P(+)] and [N(-)] terminals. Auxiliary terminals [1] and [2] have polarity.
Be sure to connect cables to these terminals correctly. (See the diagram)
*7) Terminals [R0] and [T0] are provided for models 1.5kW or larger. These terminals are not provided for models 0.75kW or smaller. Even if these terminals are not powered, the inverter can be operated.

Keypad panel

LED monitor
In operation mode:
Displays the setting frequency, output current, voltage, motor speed, or line speed.
In trip mode:
Displays code indicating the cause of trip.

LCD monitor
In operation mode :
Displays various items of information such as operation condition and function data.
Operation guidance, which can be scrolled, is displayed at the bottom.
In program mode :
Displays functions and data.

Up/Down keys
In operation mode :
Increases or decreases the frequency or speed.
In program mode :
Increases or decreases function code number and data set value.

Unit indication
Displays the unit for the information shown on the LED monitor.

FWD/REV keys
In operation mode :
Starts the inverter with forward or reverse operation command.
Pressing the FWD or REV key lights the RUN lamp.
Invalid when the function code F02 (Operation method) is set at 1 (External signal operation).

Program key
Switches the display to a menu screen or to the initial screen for operation mode or alarm mode.

Shift key (Column shift)
In program mode :
Moves the cursor horizontally at data change. Pressing this key with the UP or DOWN key, the screen changes to the next function block.

Stop key
In operation mode :
Stops the inverter.
Invalid when the function code F02 (Operation method) is set at 1 (External signal operation).

Reset key
In program mode :
Cancels the current input data and shifts the screen.
In trip mode :
Releases the trip-stop state.

Function/Data Select key
In operation mode :
Changes the displayed values of LED monitor.
In program mode :
Selects the function code or stores the data.

Keypad panel operation

Perform the wiring shown in the Basic wiring diagram on page 14. Turn on inverter power, and use the ▲ or ▼ key to set an output frequency. Press the FUNC/DATA key, then press the FWD or REV key.
The inverter starts running using the factory setting function data.
Press the STOP key to stop the inverter.

Procedure for selecting function codes and data codes

The following is a sample procedure for selecting a function code and changing the function data.

① Press the PRG key to switch the operation monitor screen to the program menu screen.

```
RUN                    FWD
PRG → PRG    MENU
F/D  → LED   SHIFT
```

② Select "1. DATA SET" , and press the FUNC/DATA key.

```
→ 1. DATA SET
  2. DATA CHECK
  3. OPR MNTR
  4. I / O CHECK
```

③ Press the ▲ or ▼ key to select a target function code. To quickly scroll the function select screen, press SHIFT key and the ▲ or ▼ key at the same time. At the target function, press FUNC/DATA key.

```
F00  DATA PRTC
F01  FREQ CMD 1
F02  OPR METHOD
F03  MAX Hz-1
```

④ Use the ▲ , ▼ , and SHIFT keys to change the function data to the target value. (Use the SHIFT key to move the cursor when you want to enter a numerical value.)

```
F01  FREQ CMD 1

                0
0~11
```

⑤ Press the FUNC/DATA key to store the updated function data in memory.
The screen shifts for the selection of the next function.

```
F02  OPR METHOD
F03  MAX Hz-1
F04  BASE Hz-1
F05  RATED V-1
```

⑥ Pressing the PRG key switches the screen to the operation monitor screen.

```
RUN                    FWD
PRG → PRG    MENU
F/D  → LED   SHIFT
```

1) **Setting a frequency**
When the operation monitor screen is displayed, a frequency can be set by using the ▲ or ▼ key in both the operation and stop modes. When the target frequency is displayed, press the FUNC/DATA key to enter the frequency in memory.

2) **Switching a unit indication**
During both operation and stop modes, each time the FUNC/DATA key is pressed, the value displayed on the LED monitor changes, and the unit indication on the LCD monitor shifts from Hz to A, V, r/min, m/min, kW, and % in this order in accordance with the displayed value.

Function settings

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

Fundamental Functions

	Function			Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
	Code	Name	LCD monitor				
Basic Functions	F00	Data protection	F00 DATA PRTC	0 : Data change enable 1 : Data protection	-	0	
	F01	Frequency command 1	F01 FREQ CMD 1	0 : KEYPAD operation (or key) 1 : Voltage input (terminals 12 and V2) (0 to +10V DC, 0 to +5V DC) 2 : Current input (terminal C1) (4 to 20mA DC) 3 : Voltage and current input (terminals 12 and C1) 4 : Reversible operation with polarity (terminal 12)(0 to ±10V DC) 5 : Reversible operation with polarity (terminals 12 and V1) (0 to ±10V DC) 6 : Inverse mode operation (terminals 12 and V2) (+10 to 0V DC) 7 : Inverse mode operation (terminal C1) (20 to 4mA DC) 8 : UP/DOWN control 1 (initial freq. = 0Hz) 9 : UP/DOWN control 2 (initial freq. = last value) 10 : PATTERN operation 11 : DI option or Pulse train input	-	0	
	F02	Operation method	F02 OPR METHOD	0 : KEYPAD operation (or or key) 1 : FWD or REV command signal operation	-	0	
	F03	Maximum frequency 1	F03 MAX Hz-1	50 to 400Hz	1Hz	50	
	F04	Base frequency 1	F04 BASE Hz-1	25 to 400Hz	1Hz	50	
	F05	Rated voltage 1 (at Base frequency 1)	F05 RATED V-1	0(Free), 320 to 480V	1V	400	
	F06	Maximum voltage 1 (at Maximum frequency 1)	F06 MAX V-1	320 to 480V	1V	400	
	F07	Acceleration time 1	F07 ACC TIME1	0.01 to 3600s	0.01s	6.00	20.00
	F08	Deceleration time 1	F08 DEC TIME1	0.01 to 3600s	0.01s	6.00	20.00
	F09	Torque boost 1	F09 TRQ BOOST1	0.0 : Automatic (for constant torque load) 0.1 to 1.9 : Manual (for variable torque load) 2.0 to 20.0 : Manual (for constant torque load)	0.1	0.0 (EV : 0.1)	
	F10	Electronic thermal (Select) overload relay for motor 1	F10 ELCTRN OL1	0 : Inactive 1 : Active (for 4-pole standard motor) 2 : Active (for 4-pole inverter motor)	-	1	
	F11	(Level)	F11 OL LEVEL1	Approx. 20 to 135% of rated current	0.01A	*1)	
	F12	(Thermal time constant)	F12 TIME CNST 1	0.5 to 75.0 min	0.1min	5.0	10.0
	F13	Electronic thermal overload relay (for braking resistor)	F13 DBR OL	[7.5kW or smaller] 0 : Inactive 1 : Active (built-in braking resistor) 2 : Active (DB***-4/4C external braking resistor)	-	1	
				[11kW or larger] 0 : Inactive	-	0	
	F14	Restart mode after momentary power failure (operation selection)	F14 RESTART	0 : Inactive (Trip and alarm when power failure occurs.) 1 : Inactive (Trip, and alarm when power recovers.) 2 : Inactive (Deceleration stop, and alarm.) 3 : Active (Smooth recovery by continuous operation mode) 4 : Active (Momentarily stops and restarts at output frequency of before power failure) 5 : Active (Momentarily stops and restarts at starting frequency)	-	0	
	F15	Frequency (High)	F15 H LIMITER	0 to 400Hz	1Hz	70	
	F16	limiter (Low)	F16 L LIMITER	0 to 400Hz	1Hz	0	
	F17	Gain (for frequency setting signal)	F17 FREQ GAIN	0.0 to 200.0%	0.1%	100.0	
	F18	Bias frequency	F18 FREQ BIAS	–400.0 to 400.0Hz	0.1Hz	0.0	
	F20	DC brake (Starting freq.)	F20 DC BRK Hz	0.0 to 60.0Hz	0.1Hz	0.0	
	F21	(Braking level)	F21 DC BRK LVL	0 to 100%	1%	0	
	F22	(Braking time)	F22 DC BRK t	0.0 (DC brake inactive), 0.1 to 30.0s	0.1s	0.0	
	F23	Starting frequency (Freq.)	F23 START Hz	0.1 to 60.0Hz	0.1Hz	0.5	
	F24	(Holding time)	F24 HOLDING t	0.0 to 10.0s	0.1s	0.0	
	F25	Stop frequency	F25 STOP Hz	0.1 to 60.0Hz	0.1Hz	0.2	
	F26	Motor sound (Carrier freq.)	F26 MTR SOUND	**CT use** 0.75 to 15kHz (Up to 55kW) 0.75 to 10kHz (75kW and above) **VT use*** 0.75 to 15kHz (Up to 22kW) 0.75 to 10kHz (30 to 75kW) 0.75 to 6kHz (90kW and above) *In case of VT use, carrier frequency should be adjusted depending on capacity.	1kHz	15 (Up to 55kW)* 10 (75kW and above)*	
	F27	(Sound tone)	F27 SOUND TONE	0 : level 0 1 : level 1 2 : level 2 3 : level 3	-	0	
	F30	FMA (Voltage adjust)	F30 FMA V-ADJ	0 to 200%	1%	100	
	F31	(Function)	F31 FMA FUNC	0 : Output frequency 1 (Before slip compensation) 1 : Output frequency 2 (After slip compensation) 2 : Output current 3 : Output voltage 4 : Output torque 5 : Load factor 6 : Input power 7 : PID feedback value 8 : PG feedback value 9 : DC link circuit voltage 10 : Universal AO	-	0	
	F33	FMP (Pulse rate)	F33 FMP PULSES	300 to 6000 p/s (at full scale)	1p/s	1440	
	F34	(Voltage adjust)	F34 FMP V-ADJ	0% : (Pluse rate output: 50% duty) 1 to 200% : (Voltage adjust: 2670p/s, duty adjust)	1%	0	
	F35	(Function)	F35 FMP FUNC	0 : Output frequency 1 (Before slip compensation) 1 : Output frequency 2 (After slip compensation) 2 : Output current 3 : Output voltage 4 : Output torque 5 : Load factor 6 : Input power 7 : PID feedback value 8 : PG feedback value 9 : DC link circuit voltage 10 : Universal AO	-	0	
	F36	30RY operation mode	F36 30RY MODE	0 : The relay (30) excites on trip mode. 1 : The relay (30) excites on normal mode.	-	0	
	F40	Torque limit 1 (Driving)	F40 DRV TRQ 1	20 to 200, 999% (999: No limit) *2)	1%	180	150
	F41	(Braking)	F41 BRK TRQ 1	0 (Automatic deceleration control), 20 to 200, 999% (999: No limit) *2)	1%	150	100
	F42	Torque vector control 1	F42 TRQVECTOR1	0 : Inactive 1 : Active	-	0	

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

Extension Terminal Funcitons

	Function Code	Name	LCD monitor	Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
X1-X9 Terminal	E01	X1 terminal function	E01 X1 FUNC	Selects from the following items.	-	0	
	E02	X2 terminal function	E02 X2 FUNC		-	1	
	E03	X3 terminal function	E03 X3 FUNC		-	2	
	E04	X4 terminal function	E04 X4 FUNC		-	3	
	E05	X5 terminal function	E05 X5 FUNC		-	4	
	E06	X6 terminal function	E06 X6 FUNC		-	5	
	E07	X7 terminal function	E07 X7 FUNC		-	6	
	E08	X8 terminal function	E08 X8 FUNC		-	7	
	E09	X9 terminal function	E09 X9 FUNC		-	8	
ACC 2,3,4 DEC 2,3,4	E10	Acceleration time 2	E10 ACC TIME2	0.01 to 3600s	0.01s	10.00	100.00
	E11	Deceleration time 2	E11 DEC TIME2		0.01s	10.00	100.00
	E12	Acceleration time 3	E12 ACC TIME3		0.01s	15.00	100.00
	E13	Deceleration time 3	E13 DEC TIME3		0.01s	15.00	100.00
	E14	Acceleration time 4	E14 ACC TIME4		0.01s	3.00	100.00
	E15	Deceleration time 4	E15 DEC TIME4		0.01s	3.00	100.00
	E16	Torque limit 2 (Driving)	E16 DRV TRQ 2	20 to 200%, 999% (999: No limit) *2)	1%	180	150
	E17	(Braking)	E17 BRK TRQ 2	0 (Automatic deceleration control), 20 to 200%, 999% (999: No limit) *2)	1%	150	100
Y1-Y5C Terminal	E20	Y1 terminal function	E20 Y1 FUNC	Selects from the following items.	-	0	
	E21	Y2 terminal function	E21 Y2 FUNC		-	1	
	E22	Y3 terminal function	E22 Y3 FUNC		-	2	
	E23	Y4 terminal function	E23 Y4 FUNC		-	7	
	E24	Y5A,Y5C terminal function	E24 Y5 FUNC		-	10	
	E25	Y5 RY operation mode	E25 Y5RY MODE	0 : Inactive (Y5 Ry excites at "ON signal" mode.) 1 : Active (Y5 Ry excites at "OFF signal" mode.)	-	0	
	E30	FAR function signal (Hysteresis)	E30 FAR HYSTR	0.0 to 10.0 Hz	0.1Hz	2.5	
	E31	FDT1 function signal (Level)	E31 FDT1 LEVEL	0 to 400 Hz	1Hz	50	
	E32	(Hysteresis)	E32 FDT HYSTR	0.0 to 30.0 Hz	0.1Hz	1.0	
	E33	OL1 function signal (Mode select)	E33 OL1 WARNING	0 : Thermal calculation 1 : Output current	-	0	
	E34	(Level)	E34 OL1 LEVEL	Approx. 5 to 200% of rated current	0.01A	*1)	
	E35	(Timer)	E35 OL TIMER	0.1 to 60.0s	0.1s	10.0	
	E36	FDT2 function (Level)	E36 FDT2 LEVEL	0 to 400 Hz	1Hz	50	
	E37	OL2 function (Level)	E37 OL2 LEVEL	Approx. 5 to 200% of rated current	0.01A	*1)	

Multistep freq. selection (1 to 4 bit): 0 [SS1], 1 [SS2], 2 [SS4], 3 [SS8]

ACC / DEC time selection (1 to 2 bit): 4 [RT1], 5 [RT2]

6	: 3-wire operation stop command	[HLD]
7	: Coast-to-stop command	[BX]
8	: Alarm reset	[RST]
9	: Trip command (External fault)	[THR]
10	: Jogging operation	[JOG]
11	: Freq. set. 2 / Freq. set. 1	[Hz2/Hz1]
12	: Motor 2 / Motor 1	[M2/M1]
13	: DC brake command	[DCBRK]
14	: Torque limiter 2 / Torque limiter 1	[TL2/TL1]
15	: Switching operation between line and inverter (50Hz)	[SW50]
16	: Switching operation between line and inverter (60Hz)	[SW60]
17	: UP command	[UP]
18	: DOWN command	[DOWN]
19	: Write enable for KEYPAD	[WE-KP]
20	: PID control cancel	[Hz/PID]
21	: Inverse mode changeover (terminals 12 and C1)	[IVS]
22	: Interlock signal for 52-2	[IL]
23	: TRQ control cancel	[Hz/TRQ]
24	: Link enable (Bus,RS485)	[LE]
25	: Universal DI	[U-DI]
26	: Pick up start mode	[STM]
27	: SY-PG enable	[PG/Hz]
28	: Synchronization command	[SYC]
29	: Zero speed command	[ZERO]
30	: Forced stop command	[STOP1]
31	: Forced stop command with Deceleration time 4	[STOP2]
32	: Pre-exciting command	[EXITE]
33	: Line speed control Cancellation	[Hz/LSC]
34	: Line speed frequency memory	[LSC-HLD]
35	: Frequency setting 1/ Frequency setting 2	

0	: Inverter running	[RUN]
1	: Frequency equivalence signal	[FAR]
2	: Frequency level detection	[FDT1]
3	: Undervoltage detection signal	[LU]
4	: Torque polarity	[B/D]
5	: Torque limiting	[TL]
6	: Auto-restarting	[IPF]
7	: Overload early warning	[OL1]
8	: KEYPAD operation mode	[KP]
9	: Inverter stopping	[STP]
10	: Ready output	[RDY]
11	: Line/Inv changeover (for 88)	[SW88]
12	: Line/Inv changeover (for 52-2)	[SW52-2]
13	: Line/Inv changeover (for 52-1)	[SW52-1]
14	: Motor 2 / Motor 1	[SWM2]
15	: Auxiliary terminal (for 52-1)	[AX]
16	: Time-up signal	[TU]
17	: Cycle completion signal	[TO]
18	: Stage No. indication 1	[STG1]
19	: Stage No. indication 2	[STG2]
20	: Stage No. indication 4	[STG4]
21	: Alarm indication 1	[AL1]
22	: Alarm indication 2	[AL2]
23	: Alarm indication 4	[AL4]
24	: Alarm indication 8	[AL8]
25	: Fan operation signal	[FAN]
26	: Auto-resetting	[TRY]
27	: Universal DO	[U-DO]
28	: Overheat early warning	[OH]
29	: Synchronization completion signal	[SY]
30	: Life expectancy detection signal	[LIFE]
31	: 2nd Freq. level detection	[FDT2]
32	: 2nd OL level early warning	[OL2]
33	: Terminal C1 off signal	[C1OFF]
34	: Speed existence signal	[N-EX]
35	: Speed agreement signal	[DSAG]
36	: PG error signal	[PG-ABN]
37	: Torque limiting (Signal with delay)	[TL2]

For Line / Inverter changeover operation: [SW88], [SW52-2], [SW52-1]

For PATTERN operation: [TU], [TO], [STG1], [STG2], [STG4]

For Alarm signal output: [AL1], [AL2], [AL4], [AL8]

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

Extension Terminal Functions (cont'd)

	Function			Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
	Code	Name	LCD monitor				
LED & LCD Monitor	E40	Display coefficient A	E40 COEF A	–999.00 to 999.00	0.01	0.01	
	E41	Display coefficient B	E41 COEF B	–999.00 to 999.00	0.01	0.00	
	E42	LED Display filter	E42 DISPLAY FL	0.0 to 5.0s	0.1s	0.5	
	E43	LED Monitor (Function)	E43 LED MNTR	0 : Output frequency 1 (Before slip compensation) (Hz) 1 : Output frequency 2 (After slip compensation) (Hz) 2 : Setting frequency (Hz) 3 : Output current (A) 4 : Output voltage (V) 5 : Motor synchronous speed (r/min) 6 : Line speed (m/min) 7 : Load shaft speed (r/min) 8 : Torque calculation value (%) 9 : Input power 10 : PID reference value 11 : PID reference value (remote) 12 : PID feedback value	-	0	
	E44	(Display at STOP mode)	E44 LED MNTR2	0 : Setting value 1 : Output value	-	0	
	E45	LCD Monitor (Function)	E45 LCD MNTR	0 : Displays operation guidance 1 : Bar graph (Output freq.,Output current,and Output torque)	-	0	
	E46	Language	E46 LANGUAGE	0 : Japanese 1 : English 2 : German 3 : French 4 : Spanish 5 : Italian	-	1	
	E47	LCD Monitor (Contrast)	E47 CONTRAST	0(Soft) to 10(Hard)	-	5	

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

Control Functions of Frequency

	Function			Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
	Code	Name	LCD monitor				
Jump Hz Control	C01	Jump (Jump freq. 1)	C01 JUMP Hz 1	0 to 400Hz	1Hz	0	
	C02	frequency (Jump freq. 2)	C02 JUMP Hz 2		1Hz	0	
	C03	(Jump freq. 3)	C03 JUMP Hz 3		1Hz	0	
	C04	(Hysteresis)	C04 JUMP HYSTR	0 to 30Hz	1Hz	3	
Multi-Hz Control	C05	Multistep (Freq. 1)	C05 MULTI Hz-1	0.00 to 400.00Hz	0.01Hz	0.00	
	C06	frequency (Freq. 2)	C06 MULTI Hz-2		0.01Hz	0.00	
	C07	setting (Freq. 3)	C07 MULTI Hz-3		0.01Hz	0.00	
	C08	(Freq. 4)	C08 MULTI Hz-4		0.01Hz	0.00	
	C09	(Freq. 5)	C09 MULTI Hz-5		0.01Hz	0.00	
	C10	(Freq. 6)	C10 MULTI Hz-6		0.01Hz	0.00	
	C11	(Freq. 7)	C11 MULTI Hz-7		0.01Hz	0.00	
	C12	(Freq. 8)	C12 MULTI Hz-8		0.01Hz	0.00	
	C13	(Freq. 9)	C13 MULTI Hz-9		0.01Hz	0.00	
	C14	(Freq.10)	C14 MULTI Hz10		0.01Hz	0.00	
	C15	(Freq.11)	C15 MULTI Hz11		0.01Hz	0.00	
	C16	(Freq.12)	C16 MULTI Hz12		0.01Hz	0.00	
	C17	(Freq.13)	C17 MULTI Hz13		0.01Hz	0.00	
	C18	(Freq.14)	C18 MULTI Hz14		0.01Hz	0.00	
	C19	(Freq.15)	C19 MULTI Hz15		0.01Hz	0.00	
	C20	JOG frequency	C20 JOG Hz	0.00 to 400.00Hz	0.01Hz	5.00	
PATTERN Operation	C21	PATTERN (Mode select) operation	C21 PATTERN	0 : Active (Mono-cycle operation, and then stops.) 1 : Active (Continuous cyclic operation while operation command is effective.) 2 : Active (Mono-cycle operation,and after continues at the latest setting frequency.)	-	0	
	C22	(Stage 1)	C22 STAGE 1	• Operation time: 0.00 to 6000s • F1 to F4 and R1 to R4 Code FWD / REV ACC / DEC F1 : FWD ACC1 / DEC1 F2 : FWD ACC2 / DEC2 F3 : FWD ACC3 / DEC3 F4 : FWD ACC4 / DEC4 R1 : REV ACC1 / DEC1 R2 : REV ACC2 / DEC2 R3 : REV ACC3 / DEC3 R4 : REV ACC4 / DEC4	0.01s	0.00 F1	
	C23	(Stage 2)	C23 STAGE 2		0.01s	0.00 F1	
	C24	(Stage 3)	C24 STAGE 3		0.01s	0.00 F1	
	C25	(Stage 4)	C25 STAGE 4		0.01s	0.00 F1	
	C26	(Stage 5)	C26 STAGE 5		0.01s	0.00 F1	
	C27	(Stage 6)	C27 STAGE 6		0.01s	0.00 F1	
	C28	(Stage 7)	C28 STAGE 7		0.01s	0.00 F1	
		*Setting for operation time, FWD/REV rotation and ACC/DEC time select.					
	C30	Frequency command 2	C30 FREQ CMD 2	0 : KEYPAD operation (or key) 1 : Voltage input (terminal 12) (0 to +10V DC, 0 to +5V DC) 2 : Inactive 3 : Inactive 4 : Reversible operation with polarity (terminal 12) (0 to ±10V DC) 5 : Reversible operation with polarity (terminal 12 and V1) (0 to ±10V DC) 6 : Inverse mode operation (terminal 12) (+10 to 0V DC) 7 : Inactive 8 : UP/DOWN control 1 (initial freq. = 0Hz) 9 : UP/DOWN control 2 (initial freq. = last value) 10 : PATTERN operation 11 : DI option or Pulse train input	-	2	
	C31	Bias (Terminal 12)	C31 BIAS 12	–100.0 to +100.0%	0.1%	0.0	
	C32	Gain (Terminal 12)	C32 GAIN 12	0.0 to +200.0%	0.1%	100.0	
	C33	Analog setting signal filter	C33 REF FILTER	0.00 to 5.00s	0.01s	0.05	

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

Motor Parameters

	Function Code	Name	LCD monitor	Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
Motor 1	P01	Number of motor 1 poles	P01 M1 POLES	2 to 14	2	4	
	P02	Motor 1 (Capacity)	P02 M1-CAP	22kW or smaller : 0.01 to 45.00 kW 30kW or larger : 0.01 to 500.00 kW	0.01kW	*1)	
	P03	(Rated current)	P03 M1-Ir	0.00 to 2000 A	0.01A	*1)	
	P04	(Tuning)	P04 M1 TUN1	0 : Inactive 1 : Active (One time tuning of %R1 and %X (on motor stopping mode)) 2 : Active (One time tuning of %R1, %X and Io (on motor running mode))	-	0	
	P05	(On-line Tuning)	P05 M1 TUN2	0 : Inactive 1 : Active (Real time tuning of %R2)	-	0	
	P06	(No-load current)	P06 M1-Io	0.00 to 2000 A	0.01A	*1)	
	P07	(%R1 setting)	P07 M1-%R1	0.00 to 50.00 %	0.01%	*1)	
	P08	(%X setting)	P08 M1-%X	0.00 to 50.00 %	0.01%	*1)	
	P09	(Slip compensation control 1)	P09 SLIP COMP1	0.00 to +15.00 Hz	0.01Hz	0.00	

High Performance Functions

	Function Code	Name	LCD monitor	Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
High Performance Functions	H03	Data initializing (Data reset)	H03 DATA INIT	0 : Manual set value 1 : Return to factory set value	-	0	
	H04	Auto-reset (Times)	H04 AUTO-RESET	0 (Inactive), 1 to 10 times	1	0	
	H05	(Reset interval)	H05 RESET INT	2 to 20s	1s	5	
	H06	Fan stop operation	H06 FAN STOP	0 : Inactive 1 : Active (Fan stops at low temperature mode)	-	0	
	H07	ACC/DEC (Mode select) pattern	H07 ACC PTN	0 : Inactive (linear acceleration and deceleration) 1 : S-shape acceleration and deceleration (mild) 2 : S-shape acceleration and deceleration (variable) 3 : Curvilinear acceleration and deceleration	-	0	
	H08	Rev. phase sequence lock	H08 REV LOCK	0 : Inactive 1 : Active	-	0	
	H09	Start mode (Rotating motor pick up)	H09 START MODE	0 : Inactive 1 : Active (Only when Auto-restart after momentary power failure mode) 2 : Active (All start modes)	-	0	
	H10	Energy-saving operation	H10 ENERGY SAV	0 : Inactive 1 : Active (Only when torque boost "F09" is set at manual setting mode.)	-	0 (EV : 1)	
	H11	DEC mode	H11 DEC MODE	0 : Normal (according to "H07" mode) 1 : Coast-to-stop	-	0	
	H12	Instantaneous overcurrent limiting	H12 INST CL	0 : Inactive 1 : Active	-	1	
	H13	Auto-restart (Restart time)	H13 RESTART t	0.1 to 10.0s	0.1s	0.1	0.5
	H14	(Freq. fall rate)	H14 FALL RATE	0.00 to 100.00Hz/s	0.01Hz/s	10.00	
	H15	(Holding DC voltage)	H15 HOLD V	400 to 600V	1V	470	
	H16	(OPR command selfhold time)	H16 SELFHOLD t	0.0 to 30.0s, 999s (999s : The operation command is held while DC link circuit voltage is larger than 50V.)	0.1s	999	
	H18	Torque control	H18 TRQ CTRL	0 : Inactive (Frequency control) 1 : Active (Torque control by terminal 12 (Driving)) (0 to +10V/0 to 200%) 2 : Active (Torque control by terminal 12 (Driving & Braking) (0 to ±10V/0 to ±200%)	-	0	
	H19	Active drive	H19 AUT RED	0 : Inactive 1 : Active	-	0	
PID Control	H20	PID control (Mode select)	H20 PID MODE	0 : Inactive 1 : Active (PID output 0 to 100% / Frefuency 0 to max.) 2 : Active (Inverse operation mode : PID output 0 to 100% / Frefuency max. to 0)	-	0	
	H21	(Feedback signal)	H21 FB SIGNAL	0 : Terminal 12 (0 to +10V) 1 : Terminal C1 (4 to 20mA) 2 : Terminal 12 (+10 to 0V) 3 : Terminal C1 (20 to 4mA)	-	1	
	H22	(P-gain)	H22 P-GAIN	0.01 to 10.00	0.01	0.10	
	H23	(I-gain)	H23 I-GAIN	0.0 : Inactive 0.1 to 3600.0s	0.1s	0.0	
	H24	(D-gain)	H24 D-GAIN	0.00 : Inactive 0.01 to 10.0s	0.01s	0.00	
	H25	(Feedback filter)	H25 FB FILTER	0.0 to 60.0s	0.1s	0.5	
Y1-Y5C Terminal	H26	PTC thermistor (Mode select)	H26 PTC MODE	0 : Inactive 1 : Active	-	0	
	H27	(Level)	H27 PTC LEVEL	0.00 to 5.00V	0.01V	1.60	
	H28	Droop operation	H28 DROOP	–9.9 to 0.0Hz	0.1Hz	0.0	
Serial Link	H30	Serial link (Function select)	H30 LINK FUNC	(Code) (Monitor) (Frequency command) (Operation command) 0 : X - - ×: Valid 1 : X X - - : Invalid 2 : X - X 3 : X X X	-	0	
	H31	RS 485 (Address)	H31 485ADDRESS	1 to 31	1	1	
	H32	(Mode select on no response error)	H32 MODE ON ER	0 : Trip and alarm (Er8) 1 : Operation for H33 timer, and alarm (Er8) 2 : Operation for H33 timer,and retry to communicate. * If the retry fails, then the inverter trips("Er 8"). 3 : Continuous operation	-	0	
	H33	(Timer)	H33 TIMER	0.0 to 60.0s	0.1s	2.0	
	H34	(Baud rate)	H34 BAUD RATE	0 : 19200 bit/s 1 : 9600 2 : 4800 3 : 2400 4 : 1200	-	1	
	H35	(Data length)	H35 LENGTH	0 : 8 bit 1 : 7 bit	-	0	
	H36	(Parity check)	H36 PARITY	0 : No checking 1 : Even parity 2 : Odd parity	-	0	
	H37	(Stop bits)	H37 STOP BITS	0 : 2 bit 1 : 1 bit	-	0	
	H38	(No response error detection time)	H38 NO RES t	0 (No detection), 1 to 60s	1s	0	
	H39	(Response interval)	H39 INTERVAL	0.00 to 1.00s	0.01s	0.01	

Alternative Motor Parameters

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

	Function Code	Name	LCD monitor	Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
Motor 2	A01	Maximum frequency 2	A01 MAX Hz-2	50 to 400Hz	1Hz	50	
	A02	Base frequency 2	A02 BASE Hz-2	25 to 400Hz	1Hz	50	
	A03	Rated voltage 2 (at Base frequency 2)	A03 RATED V-2	0 (Free), 320 to 480V	1V	400	
	A04	Maximum voltage 2 (at Maximum frequency 2)	A04 MAX V-2	320 to 480V	1V	400	
	A05	Torque boost 2	A05 TRQ BOOST2	0.0 : Automatic (for constant torque load) 0.1 to 1.9 : Manual (for variable torque load) 2.0 to 20.0 : Manual (for constant torque load)	-	0.0 (EV : 0.1)	
	A06	Electronic thermal overload relay (Select) for motor 2	A06 ELCTRN OL2	0 : Inactive 1 : Active (for 4-pole standard motor) 2 : Active (for 4-pole inverter motor)	-	1	
	A07	(Level)	A07 OL LEVEL2	Approx. 20 to 135% of rated current	0.01A	*1)	
	A08	(Thermal time constant)	A08 TIME CNST2	0.5 to 75.0 min	0.1min	5.0	10.0
	A09	Torque vector control 2	A09 TRQVECTOR2	0 : Inactive 1 : Active	-	0	
	A10	Number of motor 2 poles	A10 M2 POLES	2 to 14	2	4	
	A11	Motor 2 (Capacity)	A11 M2-CAP	22kW or smaller : 0.01 to 45.00 kW 30kW or larger : 0.01 to 500.00 kW	0.01kW	*1)	
	A12	(Rated current)	A12 M2-Ir	0.00 to 2000 A	0.01A	*1)	
	A13	(Tuning)	A13 M2 TUN1	0 : Inactive 1 : Active (One time tuning of %R1 and %X (on motor stopping mode)) 2 : Active (One time tuning of %R1, %X and Io (on motor running mode))	-	0	
	A14	(On-line Tuning)	A14 M2 TUN2	0 : Inactive 1 : Active (Real time tuning of %R1 and %X)	-	0	
	A15	(No-load current)	A15 M2-Io	0.00 to 2000 A	0.01A	*1)	
	A16	(%R1 setting)	A16 M2-%R1	0.00 to 50.00 %	0.01%	*1)	
	A17	(%X setting)	A17 M2-%X	0.00 to 50.00 %	0.01%	*1)	
	A18	Slip compensation control 2	A18 SLIP COMP2	0.00 to +15.00 Hz	0.01Hz	0.00	

NOTES :
*1) Typical value of standard Fuji 4P motor.
*2) Percent shall be set according to FUNCTION CODE : P02 or A09, Motor capacity.
Torque referenced here may not be obtainable when DATA CODE : 0 is selected for FUNCTION CODE : P02 or A09.

User Functions

The functions in the yellow boxes can be set while the inverter is running. Other functions must be set while the inverter is stopped.

Function Code	Name	LCD monitor	Setting range	Min. unit	Factory setting –22kW	Factory setting 30kW–
U01	Maximum compensation frequency during braking torque limit	U01 USER 01	0 to 65535	1	75	
U02	1st S-shape level at acceleration	U02 USER 02	1 to 50%	1	10	
U03	2nd S-shape level at acceleration	U03 USER 03	1 to 50%	1	10	
U04	1st S-shape level at deceleration	U04 USER 04	1 to 50%	1	10	
U05	2nd S-shape level at deceleration	U05 USER 05	1 to 50%	1	10	
U08	Main DC link (Initial value)	U08 USER 08	0 to 65535	1	XXXX	
U09	capacitor (Measured value)	U09 USER 09	0 to 65535	1	0	
U10	PC board capacitor powered on time	U10 USER 10	0 to 65535h	1	0	
U11	Cooling fan operating time	U11 USER 11	0 to 65535h	1	0	
U13	Magnetize current vibration damping gain	U13 USER 13	0 to 32767	1	819	410
U15	Slip compensation filter time constant	U15 USER 15	0 to 32767	1	556	546
U23	Integral gain of continuous operation at power failure	U23 USER 23	0 to 65535	1	1738	1000
U24	Proportional gain of continuous operation at power failure	U24 USER 24	0 to 65535	1	1024	1000
U48	Input phase loss protection	U48 USER 48	0, 1, 2	-	–55kW 0	75kW– 1
U49	RS485 protocol selection	U49 USER 49	0, 1	-	0	
U56	Speed agreement (Detection width)	U56 USER 56	0 to 50%	1	10	
U57	/PG error (Delection timer)	U57 USER 57	0.0 to 10.0s	0.1	0.5	
U58	PG error selection	U58 USER 58	0, 1	-	1	
U59	Braking-resistor function select	U59 USER 59	00 to A8 (HEX)	1	00	
U60	Regeneration avoidance at deceleration	U60 USER 60	0, 1	-	0	
U61	Voltage detect offset and gain adjustment	U61 USER 61	–22kW : 0 (Fixed.) 30kW– : 0, 1, 2	-	0	

Function	Description			LED monitor
Overcurrent protection (Short-circuit) (Ground fault)	• Stops running to protect inverter from an overcurrent resulting from overload. • Stops running to protect inverter from an overcurrent due to a short-circuit in the output circuit. • Stops running to protect inverter from an overcurrent due to a ground fault in the output circuit. • Stops running to protect inverter from an overcurrent resulting from ground fault in the output circuit by detecting zero-phase current.		During acceleration	OC1
			During deceleration	OC2
			While running at constant speed	OC3
		• 30kW or larger model only	Groung fault	EF
Overvoltage protection	• The inverter stops when it detects an overvoltage in the DC link circuit.	• 800V DC or more • Protection is not assured if excess AC line voltage is applied inadvertently.	During acceleration	OU1
			During deceleration	OU2
			While running at constant speed	OU3
Incoming surge protection	• Protects the inverter against surge voltage between the main circuit power line and ground. • Protects the inverter against surge voltage in the main circuit power line.	• The inverter may be tripped by some other protective function.		
Undervoltage protection	• Stops the inverter when the DC link circuit voltage drops below undervoltage level.	• 360V (22kW or smaller), 370V (30kW or larger)		LU
Input phase loss protection	• The inverter is protected from being damaged when open-phase fault occurs.			Lin
Overheat protection	• Stops the inverter when it detects excess heat sink temperature in case of cooling fan failure or overload.			OH1
	• Stops the inverter when it detects an abnormal rise in temperature in the inverter unit caused by insufficient ventilation in cubicles or an abnormal ambient temperature. • Stops the inverter when it detects an abnormal rise in temperature inside the inverter.			OH3
	• When the built-in braking resistor overheats, the inverter stops discharging and running. • Function data appropriate for the resistor type (built-in/external) must be set.	7.5kW or smaller model only		dbH
Electronic thermal overload relay (Motor protection)	• This function stops the inverter by detecting an inverter overload.			OLU
	• This function stops the inverter by detecting an overload in a standard motor or inverter motor.		Motor 1 overload	OL1
			Motor 2 overload	OL2
Fuse blown	• When a blown fuse is detected, the inverter stops running.	• 30kW or larger model only		FUS
Stall prevention (Momentary overcurrent limitation)	• When an output current exceeds the limit during acceleration, this function lowers output frequency to prevent the occurrence of an OC1 trip.	• The stall prevention function can be disabled.		
Active drive	• During running in which acceleration is 60s or longer, this function increases the acceleration time to prevent the occurrence of an OLU trip.	• The acceleration time can be prolonged up to three times the preset time.		
External alarm input	• The inverter stops on receiving external alarm signals.	• Use THR terminal function (digital input).		OH2
Overspeed protection	• Stops the inverter when the output frequency exceeds the rated maximum frequency by 20%.			OS
PG error	• If disconnection occurs in pulse generator circuits, the inverter issues an alarm.			PG
Alarm output (for any fault)	• The inverter outputs a relay contact signal when the inverter issued an alarm and stopped.	• Output terminals: 30A, 30B, and 30C • Use the RST terminal function for signal input. • Even if main power input is turned off, alarm history and trip-cause data are retained.		
Alarm reset command	• An alarm-stop state of the inverter can be cleared with the RESET key or by a digital input signal (RST).			
Alarm history memory	• Store up to four instances of previous alarm data.			
Storage of data on cause of trip	• The inverter can store and display details of the latest alarm history data.			
Memory error	• The inverter checks memory data after power-on and when the data is written. If a memory error is detected, the inverter stops.			Er1
KEYPAD panel communication error	• If an error is detected in communication between the inverter and KEYPAD when the Keypad panel is being used, the inverter stops.	• When operated by external signals, the inverter continues running. The alarm output (for any fault) is not output. Only Er2 is displayed.		Er2
CPU error	• If the inverter detects a CPU error caused by noise or some other factor, the inverter stops.			Er3
Option communication error	• If a checksum error or disconnection is detected during communication, the inverter issues an alarm.			Er4
Option error	• If a linkage error or other option error is detected, the inverter issues an alarm.			Er5
Output phase loss error	If an unbalance of output circuits is detected during auto-tuning, this function issues an alarm (and stops the inverter).			Er7
RS485 communication error	• If an RS485 communication error is detected, the inverter issues an alarm.			Er8

NOTES :

1)Retaining alarm signal when auxiliary controll power supply is not used :
If the inverter power supply is cut off while an internal alarm signal is being output, the alarm signal cannot be retained.

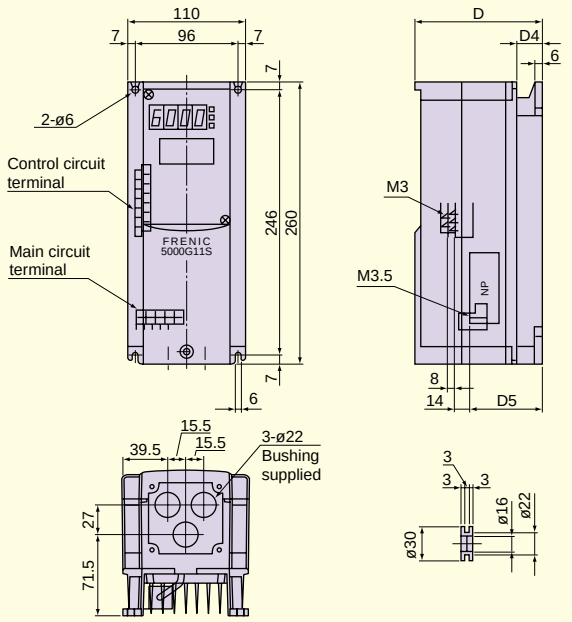
2)To issue the RESET command, press the [RESET] key on the KEYPAD panel or connect terminals RST and CM and disconnect them afterwards.

3)Fault history data is stored for the past four trips.

External Dimensions

Fig. 1

FRN0.4G11S-4EN,FRN0.75G11S-4EN



Type	D	D4	D5
FRN0.4G11S-4EN	130	36.5	80
FRN0.75G11S-4EN	145	51.5	95

Fig. 2

FRN1.5G11S-4EN to FRN4.0G11S-4EN

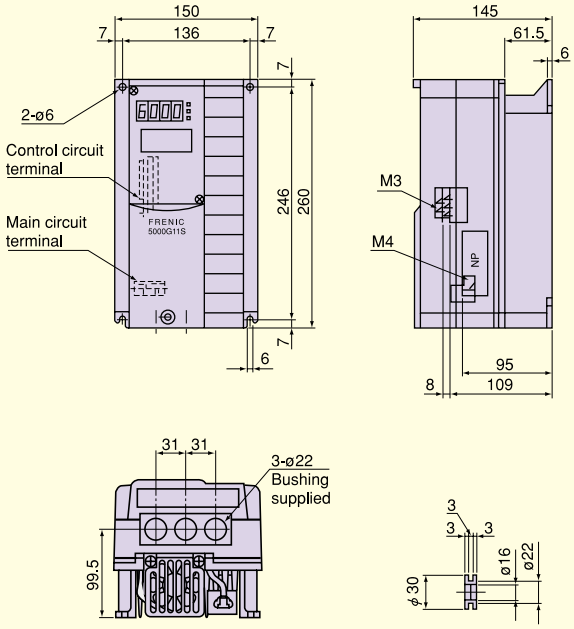


Fig. 3

FRN5.5G11S-4EN,FRN7.5G11S-4EN

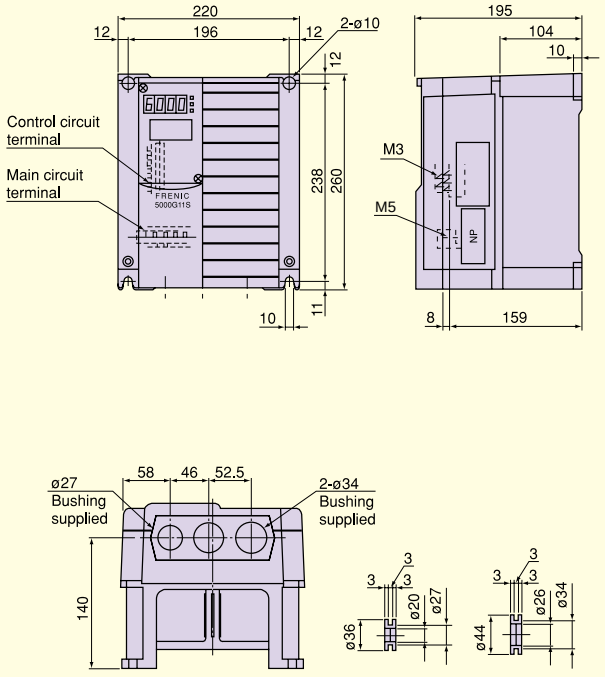


Fig. 4

FRN11G11S-4EN to FRN22G11S-4EN

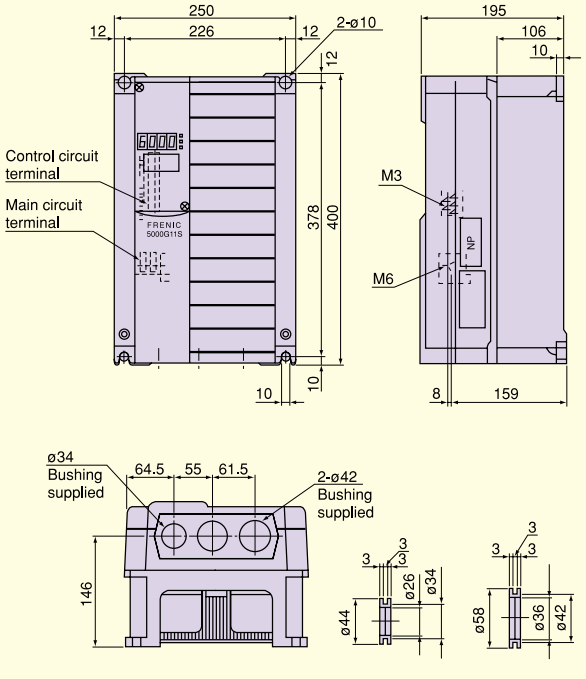
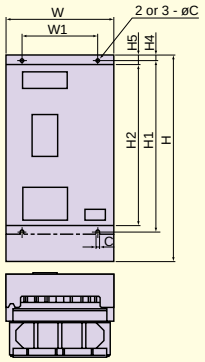
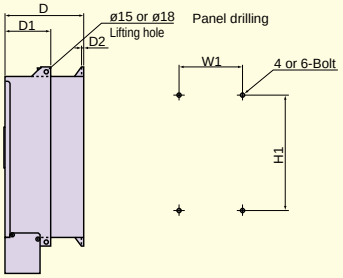


Fig. 5

FRN30G11S-4EN to FRN220G11S-4EN
FRN30G11S-4EV



Internal mounting type



External cooling type

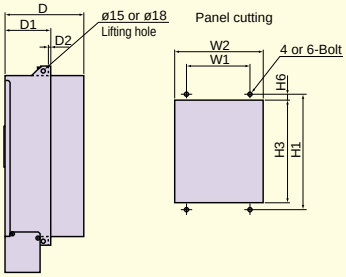
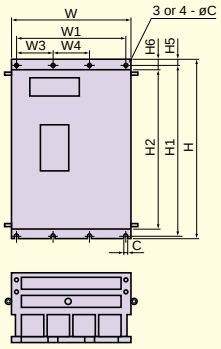
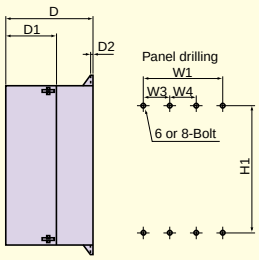


Fig. 6

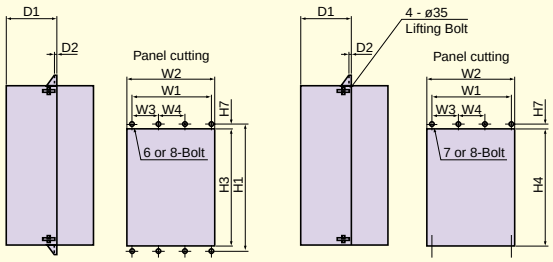
FRN280G11S-4EN to FRN400G11S-4EN



Internal mounting type



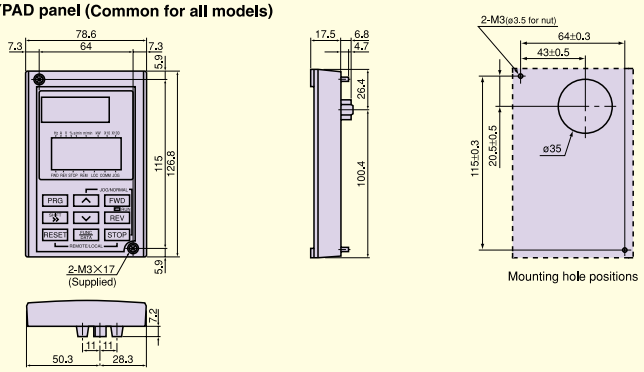
External cooling type



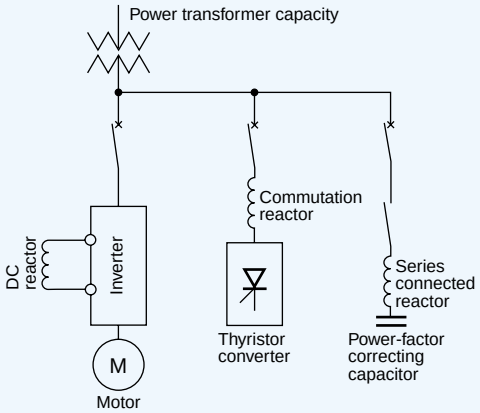
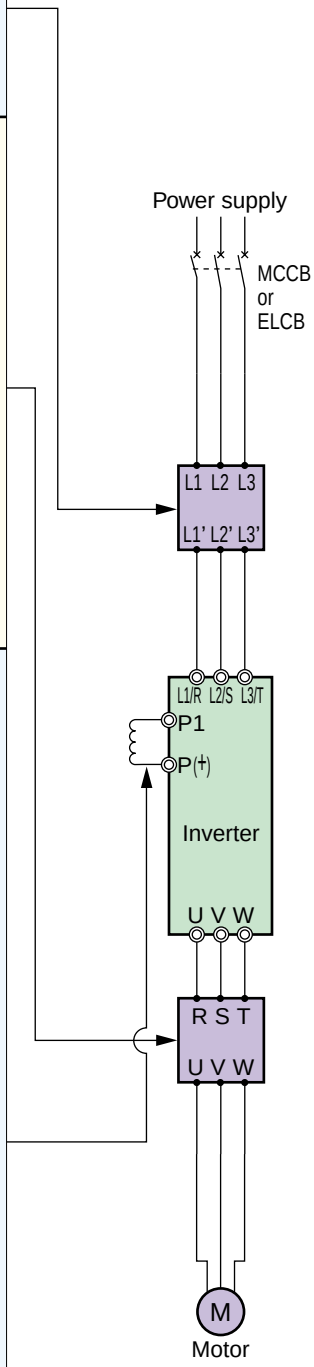
Power supply voltage	Nominal applied motor (kW)	Type	Fig.	Dimensions (mm)																		Mtg. Bolt
				W	W1	W2	W3	W4	H	H1	H2	H3	H4	H5	H6	H7	D	D1	D2	C	
400V	30	FRN30G11S-4EN/FRN30G11S-4EV	5	340	240	326	—	—	645	530	500	512	—	12	25	9	255	145	4	10	M8
	37	FRN37G11S-4EN		375	275	361											270				
	45	FRN45G11S-4EN							770	655	625	637									
	55	FRN55G11S-4EN																			
	75	FRN75G11S-4EN							835	720	690	702									
	90	FRN90G11S-4EN		530	430	510			827.5	710	675	685		15.5	32.5	12.5	315	175		15	M12
	110	FRN110G11S-4EN																			
	132	FRN132G11S-4EN															360	220			
	160	FRN160G11S-4EN							1087.5	970	935	945									
	200	FRN200G11S-4EN		680	580	660	290														
	220	FRN220G11S-4EN																			
	280	FRN280G11S-4EN	6						1400	1370	1330	1340	1335		35	14.5	450	285	6.4		
	315	FRN315G11S-4EN																			
	400	FRN400G11S-4EN		880	780	860	260	260													

Fig.7

KEYPAD panel (Common for all models)



Reactor, Filter, and Other Accessories

Name (Type)	Function	Mounting position
EMC compliance filter (EFL-□□□G11-4) (RF3□□□-F11)	This is a special filter which complies with the European EMC (Emission) Directive. *Note: Other prerequisites must be fulfilled to ensure compliance with EMC Directives. Refer to this filters operation manual for details.*	
Output circuit filter (OFL-□□□-4A)	Connected to the output circuit of inverters under low-noise operation with carrier frequency from 0.75 to 15kHz, (0.75 to 10kHz lower for 75kW or larger inverters), this filter has the following functions: ① Suppressing fluctuation of motor terminal voltage. Protects the motor insulation from being damaged by surge voltage. ② Suppressing radial noise or inductive noise from output side wiring. Effective noise suppression device for long wiring applications such as plant.	
DC REACTOR(DCR) (DCR4-□□□)	[Use the DCR to normalize the power supply in the following cases.] ① The power transformer capacity is 500kVA or over and exceeds the inverter rated capacity by 10 times. ② The inverter and a thyristor converter are connected with the same transformer. * Check if the thyristor converter uses a commutation reactor. If not, AC reactor must be connected to the power supply side. ③ Overvoltage trip occurs due to open/close of the phase-advancing capacitor for the power supply lines. ④ The voltage unbalance exceeds 2%. Voltage unbalance (%) = $\frac{\text{Max. voltage [V]} - \text{Min. Voltage [V]}}{\text{Three-phase average voltage [V]}} \times 67$  [For improving input power-factor, reducing harmonics] • Used to reduce input harmonic current (correcting power-factor) • For the resultant effects, refer to the appended guidelines.	

EMC filter, DC reactor

EMC filter

Fig. A

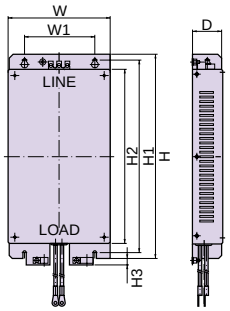


Fig. B

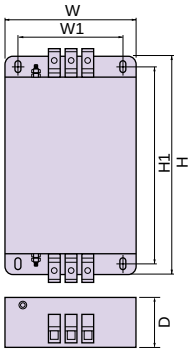
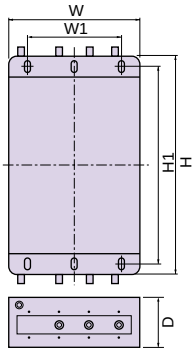


Fig. C



Inverter type	EMC filter type	Fig.	Dimensions, mm							
			W	W1	H	H1	H2	H3	D	Mtg. bolt
FRN0.4 to 0.75G-4EN	EFL-0.75G11-4	A	116	90	310	293	265	10	42	M5
FRN1.5 to 4.0G11S-4EN	EFL-4.0G11-4		155	105	310	293	265	10	45	M5
FRN5.5 to 7.5G11S-4EN	EFL-7.5G11-4		225	167	331	311	260	10	47.5	M8
FRN11 to 15G11S-4EN	EFL-15G11-4		250	185	480	449	400	20	70	M8
FRN18.5 to 22G11S-4EN	EFL-22G11-4		250	185	480	449	400	20	70	M8
FRN30G11S-4EN/EV	RF3100-F11	B	200	166	435	408	-	-	130	M6
FRN 37 to 90 G11S-4EN	RF3180-F11		200	166	495	468	-	-	160	M6
FRN110 to132G11S-4EN	RF3280-F11	C	250	170	587	560	-	-	205	M6
FRN160 to 220G11S-4EN	RF3400-F11		250	170	587	560	-	-	205	M6
FRN280 to 315G11S-4EN	RF3880-F11		364	300	688	648	-	-	180	M6

DC reactor

Fig. A

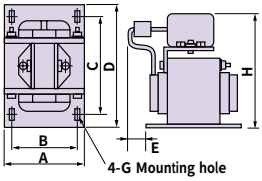


Fig. B

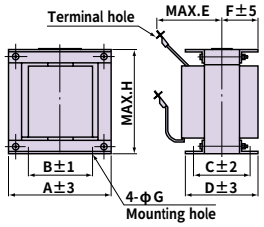


Fig. C

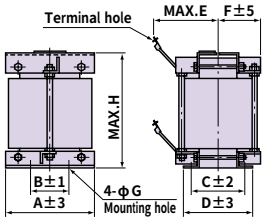
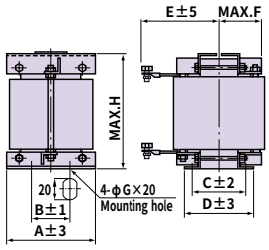


Fig. D



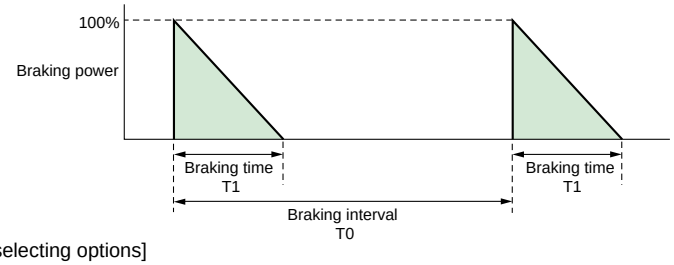
Power supply voltage	Nominal applied motor (kW)	Inverter type		Reactor type	Fig.	Dimensions, mm									Mass (kg)
		CT Rating	VT Rating			A	B	C	D	E	F	G	H	Terminal screw	
Three-phase 400V	0.4	FRN0.4G11S-4EN		DCR4-0.4	A	66	56	72	90	15	-	5.2 × 8	94	M4	1.0
	0.75	FRN0.75G11S-4EN		DCR4-0.75	A	66	56	72	90	20	-	5.2 × 8	94	M4	1.4
	1.5	FRN1.5G11S-4EN	—	DCR4-1.5	A	66	56	72	90	20	-	5.2 × 8	94	M4	1.6
	2.2	FRN2.2G11S-4EN		DCR4-2.2	A	86	71	80	100	15	-	6 × 9	110	M4	2.0
	4.0	FRN4.0G11S-4EN		DCR4-3.7	A	86	71	80	100	20	-	6 × 9	110	M4	2.6
	5.5	FRN5.5G11S-4EN		DCR4-5.5	A	86	71	80	100	20	-	6 × 9	110	M4	2.6
	7.5	FRN7.5G11S-4EN	FRN5.5G11S-4EN	DCR4-7.5	A	111	95	80	100	24	-	7 × 11	130	M5	4.2
	11	FRN11G11S-4EN	FRN7.5G11S-4EN	DCR4-11	A	111	95	80	100	24	-	7 × 11	130	M5	4.3
	15	FRN15G11S-4EN	FRN11G11S-4EN	DCR4-15	A	146	124	96	120	15	-	7 × 11	171	M5	5.9
	18.5	FRN18.5G11S-4EN	FRN15G11S-4EN	DCR4-18.5	A	146	124	96	120	25	-	7 × 11	171	M6	7.2
	22	FRN22G11S-4EN	FRN18.5G11S-4EN	DCR4-22A	A	146	124	96	120	25	-	7 × 11	171	M6	7.2
	30	FRN30G11S-4EN	FRN30G11S-4EV	DCR4-30B	B	152	90	115	157	100	78	8	130	M8	13
	37	FRN37G11S-4EN	FRN30G11S-4EN	DCR4-37B	B	171	110	110	150	100	75	8	150	M8	15
	45	FRN45G11S-4EN	FRN37G11S-4EN	DCR4-45B	B	171	110	125	165	110	82	8	150	M8	18
	55	FRN55G11S-4EN	FRN45G11S-4EN	DCR4-55B	B	171	110	130	170	110	85	8	150	M8	20
	75	FRN75G11S-4EN	FRN55G11S-4EN	DCR4-75B	C	190	160	115	151	100	75	10	240	M10	20
	90	FRN90G11S-4EN	FRN75G11S-4EN	DCR4-90B	C	190	160	125	161	120	80	10	250	ø12	23
	110	FRN110G11S-4EN	FRN90G11S-4EN	DCR4-110B	C	190	160	125	161	120	80	10	250	ø12	25
	132	FRN132G11S-4EN	FRN110G11S-4EN	DCR4-132B	C	200	170	135	171	120	85	10	260	ø12	28
	160	FRN160G11S-4EN	FRN132G11S-4EN	DCR4-160B	C	210	180	135	171	120	85	12	290	ø12	32
	200	FRN200G11S-4EN	FRN160G11S-4EN	DCR4-200B	C	210	180	135	171	140	90	12	295	ø12	35
	220	FRN220G11S-4EN	FRN200G11S-4EN	DCR4-220B	C	220	190	135	171	140	90	12	300	ø15	40
	280	FRN280G11S-4EN	FRN220G11S-4EN	DCR4-280B	C	220	190	145	181	150	95	12	320	ø15	45
	315	FRN315G11S-4EN	FRN280G11S-4EN	DCR4-315B	D	220	190	145	181	150	95	12	320	ø15	52
	400	FRN400G11S-4EN	FRN315G11S-4EN	DCR4-400B	D	240	210	145	181	170	95	12	340	ø15	60
	500	—	FRN400G11S-4EN	DCR4-500B	D	260	225	145	181	185	100	12	340	ø15	70

NOTES : Connect a DC reactor to FRN75G11S-4EN or larger model (including FRN55G11S-4EN for VT use) without fail.
CT : Constant Torque VT : Variable Torque

Braking unit, Braking resistor

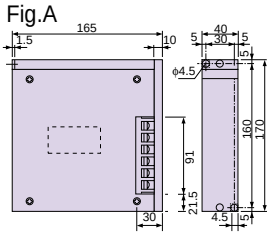
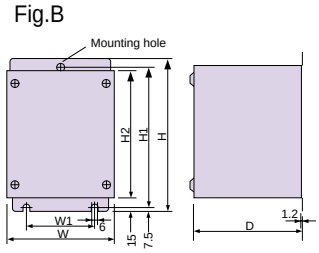
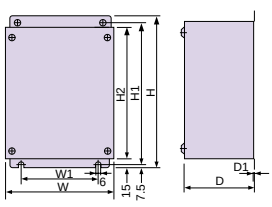
Power supply voltage	Inverter				Option				CT	Continuous braking (100% torque conversion value)		Repetitive braking (100s or less cycle)		VT	Continuous breaking (MAX. braking torque)		Repetitive braking (100s or less cycle)	
	Constant Torque Rating (CT)		Variable Torque Rating (VT)		Braking unit		Braking resistor											
	Motor (kW)	Inverter type	Motor (kW)	Inverter type	Type	Q'ty	Type	Q'ty	Max. braking torque (%)	Braking time (s)	Discharging capability (kWs)	Duty cycle (%)	Average loss (kW)	Max. braking torque (%)	Braking time (s)	Discharging capability (kWs)	Duty cycle (%)	Average loss (kW)
Three-phase 400V	0.4	FRN0.4G11S-4EN	—	—	—	—	DB0.75-4	1	150%	45	9	22	0.044	—	—	—	—	—
	0.75	FRN0.75G11S-4EN			—	—		1		45	17	18	0.068					
	1.5	FRN1.5G11S-4EN			—	—	DB2.2-4	1		45	34	10	0.075					
	2.2	FRN2.2G11S-4EN			—	—		1		30	33	7	0.077					
	4.0	FRN4.0G11S-4EN			—	—	DB3.7-4	1		20	37	5	0.093					
	5.5	FRN5.5G11S-4EN	7.5	FRN5.5G11S-4EN	—	—	DB5.5-4	1		20	55	5	0.138	100%	15	55	3.5	0.138
	7.5	FRN7.5G11S-4EN	11	FRN7.5G11S-4EN	—	—	DB7.5-4	1		10	38	5	0.188		7	38	3.5	0.188
	11	FRN11G11S-4EN	15	FRN11G11S-4EN	BU3-220-4	1	DB11-4	1		10	55	5	0.275		7	55	3.5	0.275
	15	FRN15G11S-4EN	18.5	FRN15G11S-4EN		1	DB15-4	1		10	75	5	0.375		8	75	4	0.375
	18.5	FRN18.5G11S-4EN	22	FRN18.5G11S-4EN		1	DB18.5-4	1		10	93	5	0.463		8	93	4	0.463
	22	FRN22G11S-4EN	—	—		1	DB22-4	1		8	88	5	0.55		—	—	—	—
	—	—	30	FRN30G11S-4EV	BU37-4C	1	DB30-4C	1	—	—	—	—	—		10	150	10	1.5
	30	FRN30G11S-4EN	37	FRN30G11S-4EN		1		1	100%	10	150	10	1.5	75%	10	150	10	1.5
	37	FRN37G11S-4EN	45	FRN37G11S-4EN		1	DB37-4C	1		10	185	10	1.85		10	185	10	1.85
	45	FRN45G11S-4EN	55	FRN45G11S-4EN	BU55-4C	1	DB45-4C	1		10	225	10	2.25		10	225	10	2.25
	55	FRN55G11S-4EN	75	FRN55G11S-4EN		1	DB55-4C	1		10	275	10	2.75		10	275	10	2.75
	75	FRN75G11S-4EN	90	FRN75G11S-4EN	BU90-4C	1	DB75-4C	1		10	375	10	3.75		10	375	10	3.75
	90	FRN90G11S-4EN	110	FRN90G11S-4EN		1	DB110-4C	1		10	450	10	4.5		10	450	10	4.5
	110	FRN110G11S-4EN	132	FRN110G11S-4EN	BU132-4C	1	DB110-4C	1		10	550	10	5.5		10	550	10	5.5
	132	FRN132G11S-4EN	160	FRN132G11S-4EN		1	DB132-4C	1		10	660	10	6.65		10	660	10	6.65
	160	FRN160G11S-4EN	200	FRN160G11S-4EN	BU220-4C	1	DB160-4C	1		10	800	10	8.0		10	800	10	8.0
	200	FRN200G11S-4EN	220	FRN200G11S-4EN		1	DB200-4C	1		10	1000	10	10.0		10	1000	10	10.0
	220	FRN220G11S-4EN	280	FRN220G11S-4EN		1	DB220-4C	1		10	1100	10	11.0		10	1100	10	11.0
	280	FRN280G11S-4EN	315	FRN280G11S-4EN		2	DB160-4C	2		11	1600	11	16.0		10	1600	10	16.0
	315	FRN315G11S-4EN	400	FRN315G11S-4EN		2	DB160-4C	2		10	1600	10	16.0		9	1600	9	16.0
	400	FRN400G11S-4EN	500	FRN400G11S-4EN		2	DB200-4C	2		10	2000	10	20.0		9	2000	9	20.0

NOTE:
The braking time and duty cycle (%) are calculated as the constant-torque braking used for deceleration.



• Duty cycle (%) = $\frac{T1}{T0} \times 100$ [%]

[Procedure for selecting options]
All three conditions listed below must be satisfied.
① The maximum braking torque does not exceed the value shown in the table.
② The energy discjarged in the resistor for each braking (the area of the triangle shown in the above figure) does not exceed the discharging capability (kWs) in the table.
③ The average loss (energy discharged in the resistor divided by a braking interval) does not exceed the average loss (kW) shown in the table.

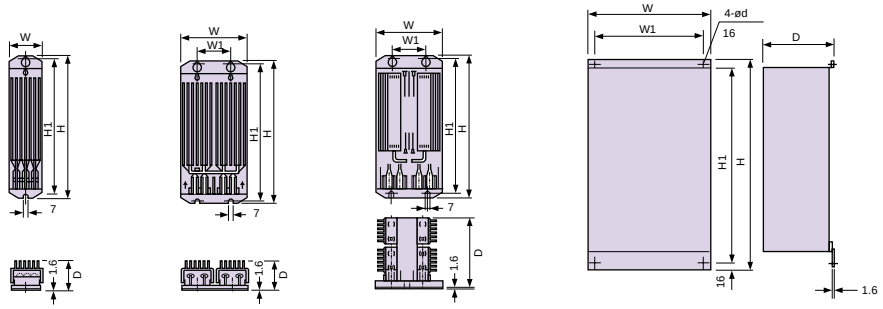
Name (type)	Dimensions
Braking unit	Fig.A  Fig.B  Fig.C 

Voltage	Type	Fig.	Dimensions [mm] W	W1	H	H1	H2	D	D1	Mass [kg]
400V series	BU3-220-4	A	See Fig. A						–	1.1
	BU37-4C	B	150	100	280	265	250	160	–	4
	BU55-4C	C	230	130					1.2	5.5
	BU90-4C									
	BU132-4C		250	150	370	355	340		2.4	9
	BU220-4C				450	435	420			13

Name (type)	Dimensions

Braking resistor

Fig.A Fig.B Fig.C Fig.D



Voltage	Type	Fig.	Dimensions [mm]						Mass [kg]
			W	W1	H	H1	D	d	
400V series	DB0.75-4	A	64	-	310	295	67	–	1.3
	DB2.2-4		64		470	45	67	–	2.0
	DB3.7-4		64		470	455	67	–	1.7
	DB5.5-4	B	142	74	470	455	67	–	4.5
	DB7.5-4		142	74	520	495	67	–	5.0
	DB11-4	C	142	74	430	415	160	–	6.9
	DB15-4	C	142	74	430	415	160	–	6.9
	DB18.5-4	C	142	74	510	495	160	–	8.7
	DB22-4	C	142	74	510	495	160	–	8.7
	DB30-4C	D	420	388	660	628	140	10	11
	DB37-4C	D					240	10	14
	DB45-4C	D						10	19
	DB55-4C				750	718		10	21

Output circuit filter (OFL-□□□-4A)

Fig.A

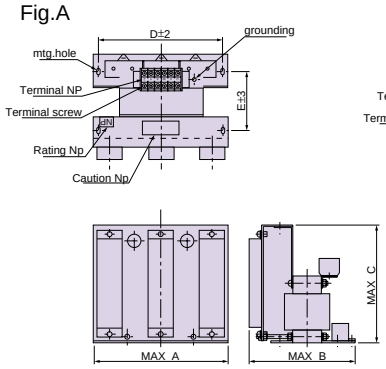


Fig.B

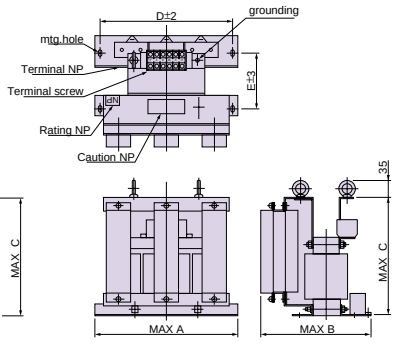


Fig.C

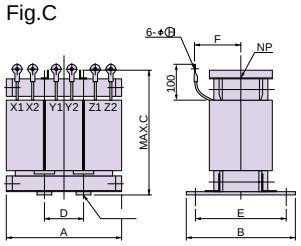


Fig.D

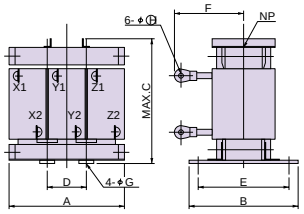
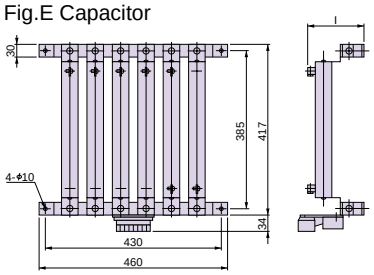


Fig.E Capacitor



The capacitor for the filter OFL-30-4A or larger has to be installed separately.
(The capacitor mass is not included in the filter mass on the table below.)

Power supply voltage	Filter type	Fig. No.	Dimensions [mm]										Approx. mass[kg]
			A	B	C	D	E	F	I	Ground terminal	Terminal screw H	Mounting screw G	
Three-phase 400V	OFL-0.4-4A	A	220	175	195	200	95	–	–	M4	M4	M5	7
	OFL-1.5-4A												7
	OFL-3.7-4A			225	220		115						14
	OFL-7.5-4A		290	290	230	260	160			M5	M5	M6	22
	OFL-15-4A	B	330	275	310	300	145			M6	M6	M8	35
	OFL-22-4A			300	330		170						45
	OFL-30-4A	C	210	175	210	70	140	90	160	–	6.4	8	12
	OFL-37-4A		220	190	220	75	150	95					15
	OFL-45-4A	D • E		195	265	70	155	140			8.4	10	17
	OFL-55-4A		260	200	275	85	160	150					22
	OFL-75-4A			210	290		170		233		10.5	12	25
	OFL-90-4A							155					28
	OFL-110-4A		300	230	330	100	190	170					38
	OFL-132-4A			240	340		200				13		42
	OFL-160-4A							180					48
	OFL-200-4A		320	270	350	105	220	190	333			15	60
	OFL-220-4A		340	300	390	115	250						70
	OFL-280-4A		350		430			200					78

Option cards and other options

<table>
<tr><th>Name (type)</th><th>Function</th><th>Specifications</th></tr>
<tr><td>Relay output card
(OPC-G11S-RY)</td><td>• Includes four relay output circuits.
• Converts transistor output signals from inverter control output terminals Y1 to Y4 to relay (1SPDT) output signals.</td><td></td></tr>
<tr><td>Digital I/O interface card
(OPC-G11S-DIO)</td><td>• For setting frequency using a binary code.
• For monitoring frequency, output current, and output voltage using a binary code.
• For input and output of other individual signals.</td><td></td></tr>
<tr><td>Analog I/O interface card
(OPC-G11S-AIO)</td><td>• For setting a torque limit value using an input analog signal.
• For input of auxiliary signal to set frequency.
• For analog monitoring of inverter output frequency, output current, and torque.</td><td></td></tr>
<tr><td>T-link interface card
(OPC-G11S-TL)</td><td>• For setting a frequency.
• For setting and reading function data for function codes.
• For setting operation commands (FWD, REV, RST, etc.).
• For monitoring the operation status.
• For reading trip information.</td><td>• Used together with MICREX-F series PLC.</td></tr>
<tr><td>Open bus card</td><td>It is an optional card conforming to various open buses.
The following operation can be made from the personal computer and PLC.
• Setting of running frequency
• Setting of operation command (FWD,REV,RST,etc.)
• Setting/reading of data code of each function code
• Monitoring running frequency and operation status</td><td><table><tr><th>Correspondent bus</th><th>Option type</th></tr><tr><td>Profibus DP</td><td>OPC-G11S-PDP</td></tr><tr><td>DeviceNet</td><td>OPC-G11S-DEV</td></tr><tr><td>Modbus Plus</td><td>OPC-G11S-MBP</td></tr><tr><td>Interbus-S</td><td>OPC-G11S-IBS</td></tr><tr><td>CAN open</td><td>OPC-G11S-COP</td></tr></table></td></tr>
<tr><td>RS232C communication adaptor
(OPC-G11S-PC)</td><td>The RS232C communication can be done by connecting it to the keypad panel on the main body of the inverter.</td><td></td></tr>
<tr><td>Personal computer loader</td><td>• The operation status monitoring and the parameter setting can be made through the inverter's RS-485 interface from the host personal computer.
• The parameter can be read and written collectively or individually.
• Comparison of two arbitrary parameters.
• Monitor of output frequency, output current, and operation status of inverter.
• Monitor of alarm history and operation information on alarm.</td><td>Communication
• Physical level : EIA-RS-485
• The number of units connected
: Maximum 31 inverters
• Synchronous method
: start-stop synchronization
• Transmission method : half duplex</td></tr>
<tr><td>PG feedback card
(OPC-G11S-PG)</td><td>• For performing PG vector control using feedback signals obtained from a PG.</td><td>Applicable Pulse Encoder specification:
• 100 to 3000P/R • A, B, Z phase
• 12V or 15V</td></tr>
<tr><td>PG feedback card
(OPC-G11S-PG2)</td><td>• For performing PG vector control using feedback signals obtained from a PG.</td><td>Applicable Pulse Encoder specification:
• 20 to 3000P/R • A, B, Z phase
• 5V</td></tr>
<tr><td>Synchronized operation card
(OPC-G11S-SY)</td><td>• Speed control by pulse train input can be made.</td><td>Applicable Pulse Encoder specification:
• 20 to 3000P/R • A, B, Z phase
• 12V or 15V</td></tr>
<tr><td>Extension cable for keypad panel (CBIII-10R-□□)</td><td>Connects the keypad panel to an inverter unit.
Three cable types are available: straight 2m, curled 1m, and curled 2m.
The curled 1m cable can be extended up to 5m, and the curled 2m cable up to 10m.
Note: Cables once extended to the maximum length do not return to their original length.</td><td><table><tr><th>Type</th><th>Nominal length</th><th>Maximum length</th></tr><tr><td>CBIII-10R-2S</td><td>2m</td><td>2m</td></tr><tr><td>CBIII-10R-1C</td><td>1m</td><td>5m</td></tr><tr><td>CBIII-10R-2C</td><td>2m</td><td>10m</td></tr></table></td></tr>
<tr><td>IP20 enclosure adapter
(P20G11-□□)</td><td>• Used to put 30kW or larger models to change its enclosure of IP00 into that of IP20.</td><td><table><tr><th>Type</th><th>Applicable inverter type</th></tr><tr><td>P20G11-30</td><td>FRN30G11S-4EN
FRN30G11S-4EV</td></tr><tr><td>P20G11-55</td><td>FRN37G11S-4EN to FRN55G11S-4EN</td></tr><tr><td>P20G11-75-4</td><td>FRN75G11S-4EN</td></tr><tr><td>P20G11-75-2</td><td>FRN75G11S-2EN</td></tr><tr><td>P20G11-110</td><td>FRN90G11S-4EN to FRN110G11S-4EN</td></tr><tr><td>P20G11-160</td><td>FRN132G11S-4EN to FRN160G11S-4EN</td></tr><tr><td>P20G11-220</td><td>FRN200G11S-4EN to FRN220G11S-4EN</td></tr></table></td></tr>
<tr><td>Mounting adapter for external cooling
(PBG11-□□)</td><td>• Used to put the cooling fan section of the inverter outside the panel.
• Only applicable to 22kW and below inverters. (30kW and above inverters can be modified to external cooling type by replacing the mounting bracket, as standard.)</td><td><table><tr><th>Type</th><th>Applicable inverter type</th></tr><tr><td>PBG11-0.75</td><td>FRN0.4G11S-4EN to FRN0.75G11S-4EN</td></tr><tr><td>PBG11-3.7</td><td>FRN1.5G11S-4EN to FRN3.7G11S-4EN</td></tr><tr><td>PBG11-7.5</td><td>FRN5.5G11S-4EN to FRN7.5G11S-4EN</td></tr><tr><td>PBG11-22</td><td>FRN11G11S-4EN to FRN22G11S-4EN</td></tr></table></td></tr>
<tr><td>Panel-mount adapter
(MAG9-□□)</td><td>Used to put an FRN-G11S inverter to be mounted in panel holes that were used to mount an FVR-G7S inverter.</td><td><table><tr><th>Type</th><th>Applicable inverter type</th></tr><tr><td>MAG9-3.7</td><td>FRN0.4G11S-4EN to FRN3.7G11S-4EN</td></tr><tr><td>MAG9-7.5</td><td>FRN5.5G11S-4EN to FRN7.5G11S-4EN</td></tr><tr><td>MAG9-22</td><td>FRN11G11S-4EN to FRN22G11S-4EN</td></tr></table></td></tr>
</table>

Wiring equipment

Power supply voltage	Nominal applied motor (kW)	Inverter type		MCCB or ELCB Rated current (A)		Fuji Magnetic contactor (MC)			Recommended wire size (mm^2)					
						MC1 for input circuit		MC2 for output circuit	Input circuit [L1/R,L2/S,L3/T]		Output circuit [U.V.W]		DCR circuit [P1,P(+)]	DB circuit [P(+),DB,N(-)]
		Constant Torque Rating (CT)	Variable Torque Rating (VT)	With DCR	Without reactor	With DCR	Without reactor		With DCR	Without reactor	CT	VT		
Three-phase 400V	0.4	FRN0.4G11S-4EN	—	5	5	SC-05	SC-05	SC-05	2.5	2.5	2.5	—	2.5	2.5
	0.75	FRN0.75G11S-4EN												
	1.5	FRN1.5G11S-4EN			10									
	2.2	FRN2.2G11S-4EN		10	15									
	4.0	FRN4.0G11S-4EN												
	5.5	FRN5.5G11S-4EN		15	20		SC-4-0					2.5		
	7.5	FRN7.5G11S-4EN	FRN5.5G11S-4EN	20	30		SC-5-1			6				
	11	FRN11G11S-4EN	FRN7.5G11S-4EN	30	40		SC-N1	SC-4-0	6	10	4	4	4	2.5
	15	FRN15G11S-4EN	FRN11G11S-4EN	40	50	SC-5-1		SC-5-1	10		6	6	6	
	18.5	FRN18.5G11S-4EN	FRN15G11S-4EN		60	SC-N1	SC-N2	SC-N01		16	10	10	10	
	22	FRN22G11S-4EN	FRN18.5G11S-4EN	50	75		SC-N2S			25				
	30	FRN30G11S-4EN	FRN30G11S-4EV	75	100	SC-N2	SC-N3	SC-N2	16	50	25	25	25	
	37	FRN37G11S-4EN	FRN30G11S-4EN	100	125	SC-N2S	SC-N4	SC-N2S	25	70	35	35	35	
	45	FRN45G11S-4EN	FRN37G11S-4EN		150	SC-N3		SC-N3	35		50	50	50	
	55	FRN55G11S-4EN	FRN45G11S-4EN	125	175		SC-N5	SC-N4	50	35 × 2	70	70	70	4
	75	FRN75G11S-4EN	FRN55G11S-4EN	175	—	SC-N4	—	SC-N5	95*1	—	95	35 × 2	50 × 2	6
	90	FRN90G11S-4EN	FRN75G11S-4EN	200		SC-N7		SC-N7	50 × 2		50 × 2	50 × 2	70 × 2	10
	110	FRN110G11S-4EN	FRN90G11S-4EN	225				SC-N8	70 × 2		70 × 2	70 × 2	95 × 2	
	132	FRN132G11S-4EN	FRN110G11S-4EN	300		SC-N8					95 × 2	95 × 2	120 × 2	
	160	FRN160G11S-4EN	FRN132G11S-4EN	350		SC-N11		SC-N11	120 × 2		120 × 2	120 × 2	150 × 2	16
	200	FRN200G11S-4EN	FRN160G11S-4EN	400		SC-N12		SC-N12	150 × 2		185 × 2	185 × 2	185 × 2	25
	220	FRN220G11S-4EN	FRN200G11S-4EN	500					185 × 2					50
	280	FRN280G11S-4EN	FRN220G11S-4EN	600		SC-N14		SC-N14	240 × 2		300 × 2	300 × 2	300 × 2	
	315	FRN315G11S-4EN	FRN280G11S-4EN	Contact Fuji										
	400	FRN400G11S-4EN	FRN315G11S-4EN											
	500	—	FRN400G11S-4EN											

NOTES :
- For molded-case circuit breakers (MCCB) and earth-leakage circuit breakers (ELCB), the required frame type and series depend on the facility transformer capacity and other factors. When selecting optimal breakers, refer to the relevant technical data.
- Also select the rated sensitive current of ELCB utilizing the technical data.
- The recommended wire sizes are based on the condition that the temperature inside the panel does not exceeds 50°C.
- The above wires are 600V HIV insulated cables (75°C).
- Data in the above table may differ for different conditions (ambient temperature, power supply voltage, and other factors).

*1: For VT use, 35 × 2.

NOTES

Application to standard motors

• Driving a 400V standard motor

When driving a 400V standard motor with an inverter, damage may occur in the insulation of motor. Use the output circuit filter (OFL) if necessary after confirmation with the motor manufacturer.The use of Fuji Electric Motor does not require the output circuit filter because of its reinforced insulation.

• Torque characteristics and temperature rise

When the inverter is used to operate a standard motor, the temperature rises a little higher than during operation by a commercial power supply. The cooling effect decreases in the low-speed range, reducing the allowable output torque. (If a constant torque is required in the low-speed range, use a Fuji inverter motor or a motor equipped with a separately ventilating fan.)

• Vibration

Use of an inverter does not increase vibration of a standard motor, but when the motor is mounted to a machine, resonance may be caused by the natural frequencies including the natural frequency of the machine system.
* We recommend that you use rubber coupling or anti-vibration rubber.
* We also recommend that you use the inverter jump frequency control function to avoid resonance point in the motor operation.
Note that operation of a 2-pole motor at 60Hz or over may cause abnormal vibration.

• Noise

When an inverter drives a standard motor, the motor noise level increases compared with driven by a commercial power supply. To reduce noise, set the inverter carrier frequency at a high level. High-speed operation at 60Hz or over can result in more noise.

Application to special motors

• Explosion-proof motors

When driving an explosion-proof motor with an inverter, use a combination of a motor and an inverter that has been approved in advance. Such approved products are available in our special product series. Contact Fuji for details.

• Submersible motors and pumps

These motors have a larger rated current than standard motors. Select the inverter capacity so that these motors can run within the inverter rated current. These motors differ from standard motors in thermal characteristics. Set a small value according to the thermal time constant of motor for setting electronic thermal relay function.

• Brake motors

For motors with parallel-connection brakes, obtain the brake power from the primary circuit (commercial power supply). If you connect the brake power to the inverter power output circuit by mistake, problems may occur. Do not use inverters for driving motors equipped with series-connection brakes.

• Geared motors

When the power transmission mechanism uses an oil-lubricated gearbox or speed changer/reducer, continuous motor operation at low speed may cause poor lubrication.

• Synchronous motors

It is necessary to use software suitable for the motor type. Contact Fuji for details.

• Single-phase motors

Single-phase motors are not suitable for inverter-driven variable speed operation. Use three-phase motors.
* Even if a single-phase power supply is available, use a three-phase motor, because the inverter provides three-phase output.

Combination with peripheral device

• Installation location

Use the inverter in an ambient temperature range between -10 to 50˚C.
* When driving an inverter of 22kW or smaller at a place in a temperature of 40˚C or over, remove the ventilation covers. Install an inverter on non-flammable material. The inverter and braking resistor surfaces become hot under certain operating conditions.

• Installing Fuji Auto Breaker (MCCB)

Install a Fuji Auto Breaker (MCCB) or earth-leakage circuit breaker in the primary circuit of the inverter to protect wires.

• Magnetic contactor in the secondary circuit

If a magnetic contactor is mounted in the secondary circuit for switching to the motor operation by commercial power supply or for any other purposes, ensure that the inverter and the motor are stopped before you turn on or off the contactor. For switching operation from/to commercial power supply, use of newly developed "Line/inverter changeover operation" function using terminals such as SW88, SW52-2, SW52-1, SW50, is recommended.

• Magnetic contactor in the primary circuit

Do not open or close the magnetic contactor in the primary circuit more than once an hour. If frequent starts or stops are required during motor operation, send FWD or REV signals to the control terminal.

• Protecting the motor

When you drive a motor with an inverter, the motor can be protected with an electronic thermal relay function of the inverter. In addition to the operation level, set the motor type (standard motor, inverter motor). For high-speed motors or water-cooled motors, set a small value as the thermal time constant and protect the motor in combination with the "cooling system OFF" signal. When driving several motors with an inverter, connect a thermal relay to each motor and turn on the inverter's electronic thermal relay function. If you connect the motor thermal relay to the motor with a long cable, high-frequency current may flow into the wiring floating capacity. This may cause the relay to trip at a current lower than the set value for the thermal relay. If this happens, lower the carrier frequency or use the output circuit filter (OFL).

• Power-factor correcting capacitor

Do not mount the power-factor correcting capacitor in the inverter primary circuit. (Use the DC reactor to improve the inverter power factor.) Do not use the power-factor correcting capacitor in the inverter secondary circuit. Overcurrent trip will occur, disabling motor operation.

• Reducing noise

Use of filter and shielded wires are typical measures against noise that meets EMC Directives. For details, refer to the operation procedure manual.

• Measures against surge current

If OV trip occurs while the inverter is stopped or operated under a light load, it is assumed that the surge current is generated by open/close of the phase-advancing capacitor in the power system.
* Connect a DC reactor to the inverter.

• Megger test

When checking insulation resistance of the inverter, use a 500V megger and follow the instructions described in the instruction manual.

Wiring

• Control circuit wiring length

When conducting a remote control, limit the wiring length between the inverter and operator box to 20m or less and use twisted shielded cable.

• Wiring length between inverter and motor

If long wiring is used between the inverter and the motor, the inverter will overheat or trip because of overcurrent (under the influence of high-frequency current flowing into the floating capacity) in the wires connected to the phases. Ensure that the wiring is shorter than 50m for models 3.7kW or smaller, shorter than 100m for 5.5kW or larger. If these lengths must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL). When wiring is longer than 50m, and Dynamic torque-vector control or vector with PG is selected, execute off-line tuning.

• Wiring size

Select a cable with a sufficient capacity by referring to the current value or recommended wire size.

• Grounding

Securely ground the inverter using the grounding terminal.

Selecting inverter capacity

• Driving standard motor

Select an inverter from the capacity range of nominal applied motors shown in the inverter standard specifications table. When large starting torque is required or acceleration or deceleration is required in a short time, select an inverter with a capacity one class greater than the standard.

• Driving special motor

Select an inverter that meets the following condition: Inverter rated current > Motor rated current

Transportation, storage

When transporting or storing inverters, select the procedures and places that meet the environmental conditions given in the inverter specifications. Ensure that the above environmental conditions are met also when transporting an inverter mounted to a machine.

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