Fuji Electric

Innovating Energy Technology

SiC-SBD-equipped Inverter

FRENIC-MEGA GX-SiC Series

24A1-E-0014a

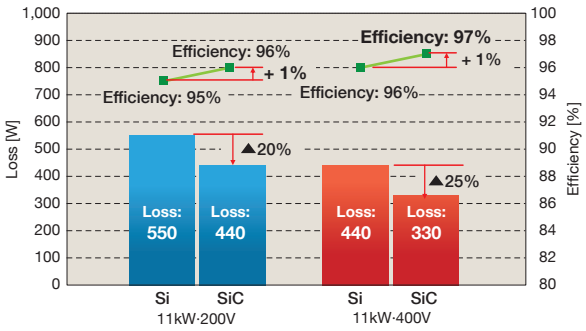
Now equipped with next-generation power device SiC-SBD!!

Introducing the new "FRENIC-MEGA GX-SiC Series" inverter equipped with next-generator power semiconductor device SiC-SBD (SiC-Schottky Barrier Diode)!!

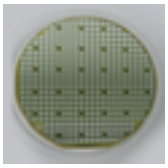
Realizes a significant loss reduction

By equipping the synchronous motor-driven FRENIC-MEGA GX inverter with this SiC-SBD, inverter loss is reduced by an astonishing 20% compared with the previous model.

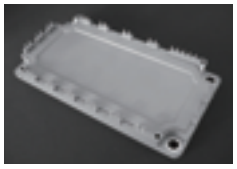
■Inverter loss comparison example (11kW)



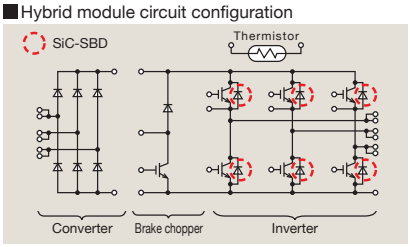
■SiC-SBD wafer



■Hybrid module exterior



■Hybrid module circuit configuration



Inherited features of FRENIC-MEGA GX Series

Boasts the same functionality and performance as the FRENIC-MEGA GX type while realizing a significant loss reduction.

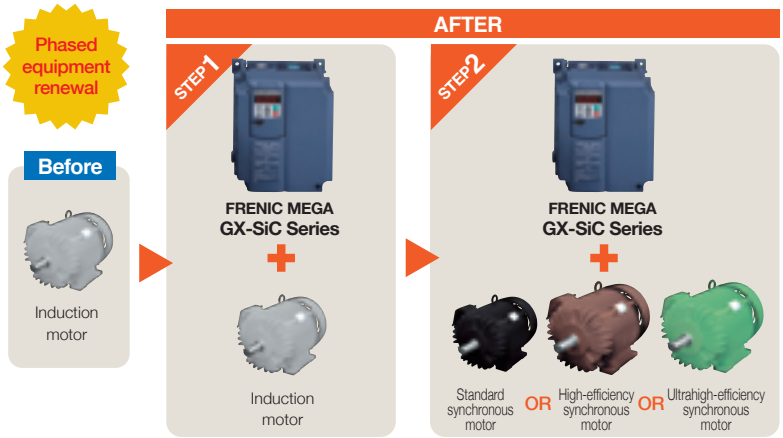
Inherited high performance

- Control system compatible with vector control with speed sensor, vector control without speed sensor, and V/f control.
- Compatible with two specifications based on application (load).

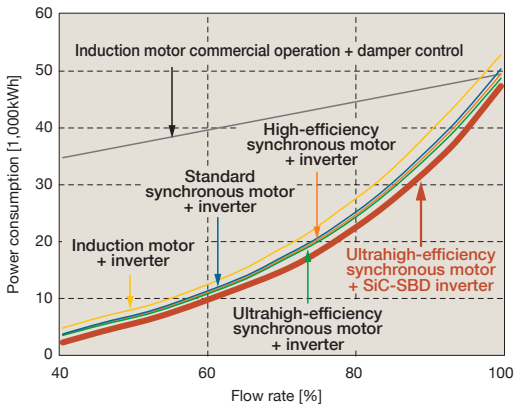
	Applicable Load	Feature	Overload Current Rating
HD (High Duty) spec.	Heavy load	Powerful drive possible	200% for 3 sec., 150% for 1 min.
LD (Low Duty) spec.	Light load	Drive possible with motor which enlarged size 1 to 2 time.	150% for 1 min.

Further energy savings achieved in combination with synchronous motor

Further energy savings are possible for constantly running devices such as fans and pumps when operated in combination with Fuji Electric's synchronous motors. The versatile new FRENIC-MEGA GX-SiC Series can be used for variable torgue applications and constant torque applications when used in combination with the magnetic pole position sensor/sensorless series. Induction motor and synchronous motor operation are possible by changing settings, making it ideal for early introduction.



■Pump operation power consumption comparison example (11kW)



Improved maintainability

- Keypad equipped with USB connector

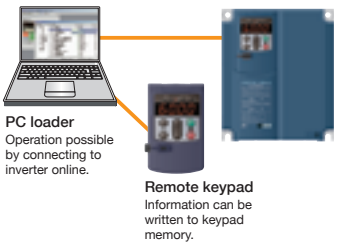
Improved operability in the workplace

■All types of inverter unit information can be saved to the keypad memory, allowing information to be checked from any location.

Example of use in office

■Information can be transferred at the production area directly from the keypad USB connection to the computer (PC loader).
■Regular gathering of lifetime information can be carried out efficiently.
■Equipment and machinery trouble checks can be performed with the real-time trace function.

Example of use in production area



PC loader
Operation possible by connecting to inverter online.

Remote keypad
Information can be written to keypad memory.

Features

1. The SiC-SBD inverter can be connected directly to the computer without the need for a converter using a commercial USB cable (mini B).
2. Inverter support for the following functions is possible by employing a PC loader.
   (1) Function code data editing, comparing, copying
   (2) Operation monitor, real-time trace
   (3) Trouble history information (indicating the last four trouble records)
   (4) Maintenance information
   (5) Historical trace

- The following items can be checked easily from the keypad or PC loader capable of outputting maintenance period forecast signals.

Item			
Inverter cumulative time (h)	Inverter startup count (times)	Equipment maintenance warning cumulative time (h) /startup count (times)	Inverter lifetime forecast information display

- Parts with long operating life employed (design lifetime: 10 years)
  (main circuit capacitors, electrolytic capacitors, cooling fans)
- Standard compliance: This production has not obtained UL certification.

Standard Specifications

Three-phase 200V

Item			Specifications		
Model (FRN□□□GX1S-2JSI)			5.5	7.5	11
Nominal applied motor*1[kW]		HD spec.	5.5	7.5	11
		LD spec.	7.5	11	15
Output rating	Rated capacity*2[kVA]	HD spec.	10	14	18
		LD spec.	11	16	20
	Rated current*3[A]	HD spec.	27	37	49
		LD spec.	31.8 (29)	46.2 (42)	59.4 (55)
	Overload current rating	HD spec.	150%-1min, 200%-3.0s		
		LD spec.	120%-1min		
Power supply voltage	Main power phase, voltage, frequency		3-phase 200 to 240V, 50Hz/60Hz		
	Acceptable voltage, frequency variation		Voltage: +10 to -15% (Voltage unbalance: 2% or less *4), Frequency: +5 to -5%		
	Required power supply capacity*5 (with DCR) [kVA]	HD spec.	7.4	10	15
		LD spec.	10	15	20
DC reactor (DCR)			Optional		
Protective structure (IEC 60529)			IP20 closed type		
Cooling fan			Fan cooling		
Weight [kg]			6.5	6.5	5.8

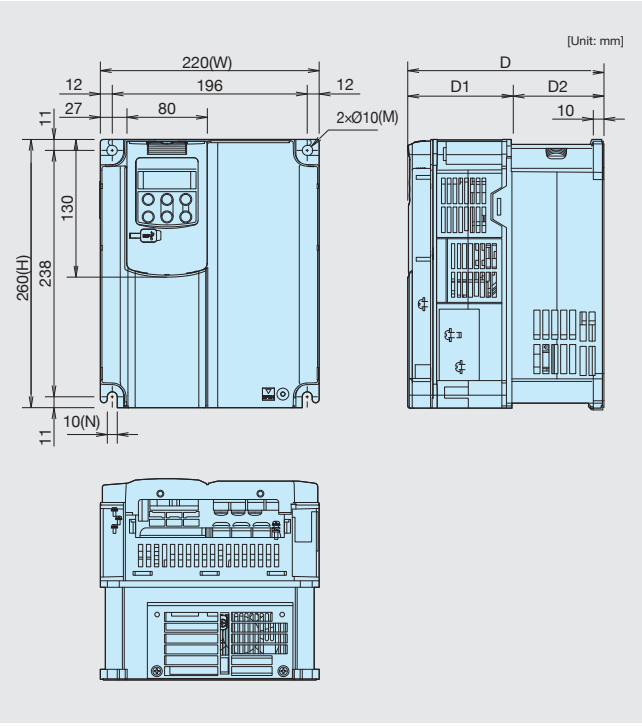
Three-phase 400V

Item			Specifications		
Model (FRN□□□GX1S-2JSI)			5.5	7.5	11
Nominal applied motor*1[kW]		HD spec.	5.5	7.5	11
		LD spec.	7.5	11	15
Output rating	Rated capacity*2[kVA]	HD spec.	10	14	18
		LD spec.	12	17	22
	Rated current*3[A]	HD spec.	13.5	18.5	24.5
		LD spec.	16.5	23	30.5
	Overload current rating	HD spec.	150%-1min, 200%-3.0s		
		LD spec.	120%-1min		
Power supply voltage	Main power phase, voltage, frequency		3-phase 380 to 480V, 50Hz/60Hz		
	Acceptable voltage, frequency variation		Voltage: +10 to -15% (Voltage unbalance: 2% or less *4), Frequency: +5 to -5%		
	Required power supply capacity*5 (with DCR) [kVA]	HD spec.	7.4	10	15
		LD spec.	10	15	20
DC reactor (DCR)			Optional		
Protective structure (IEC 60529)			IP20 closed type		
Cooling fan			Fan cooling		
Weight [kg]			6.5	6.5	5.8

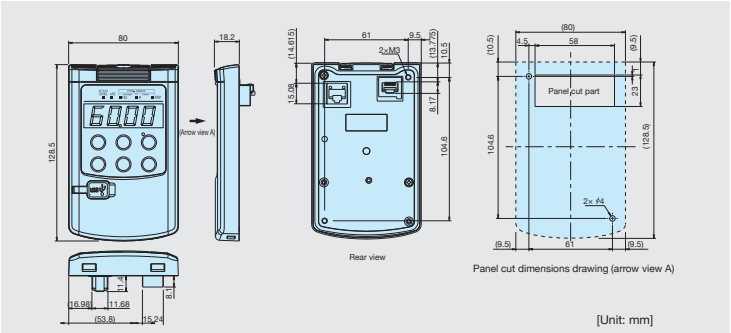
*1: The nominal applied motors are Fuji Electric's synchronous motor series (6P).
*2: Rated capacities indicated are based on a 220 V rating for the 200 V series, and a 440 V rating for the 400 V series.
*3: If used with ambient temperature of 40 °C or higher and carrier frequency of 3kHz or more, adjust at the load side so that the current during continuous operation is less than or equal to the current value in parentheses ( ).
*4: Interphase voltage unbalance ratio (%) = (max. voltage [V] - min. voltage [V])/3-phase average voltage [V] x 67 (See IEC61800-3). Use an AC reactor (ACR: option) when used with unbalance ratio of 2 to 3%.
*5: Indicates values for inverter with DC reactor (DCR).

External Dimensions

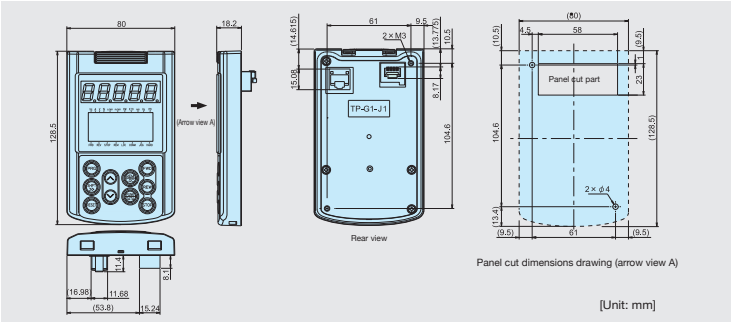
■Inverter



■Keypad with USB (equipped as standard) Model: TP-E1U



■Multi-function keypad (option) Model: TP-G1-J1/TP-G1-C1



[Unit: mm]

Series	Model	Body external dimensions						
		W	H	D	D1	D2	M	N
Three-phase 200V	FRN5.5GX1S-2JSI	220	260	195	105	90	2×ϕ10	10
	FRN7.5GX1S-2JSI							
	FRN11GX1S-2JSI							
Three-phase 400V	FRN5.5GX1S-4JSI							
	FRN7.5GX1S-4JSI							
	FRN11GX1S-4JSI							

NOTES

When running general-purpose motors

- **Driving a 400V general-purpose motor**
  When driving a 400V general-purpose motor with an inverter using extremely long cables, damage to the insulation of the motor may occur. Use an output circuit filter (OFL) if necessary after checking with the motor manufacturer. Fuji's motors do not require the use of output circuit filters because of their reinforced insulation.
- **Torque characteristics and temperature rise**
  When the inverter is used to run a general-purpose motor, the temperature of the motor becomes higher than when it is operated using a commercial power supply. In the low-speed range, the cooling effect will be weakened, so decrease the output torque of the motor. If constant torque is required in the low-speed range, use a Fuji inverter motor or a motor equipped with an externally powered ventilating fan.
- **Vibration**
  When the motor is mounted to a machine, resonance may be caused by the natural frequencies, including that of the machine. Operation of a 2-pole motor at 60Hz or more may cause abnormal vibration.
  * Study use of tier coupling or dampening rubber.
  * It is also recommended to use the inverter jump frequencies control to avoid resonance points.
- **Noise**
  When an inverter is used with a general-purpose motor, the motor noise level is higher than that with a commercial power supply. To reduce noise, raise carrier frequency of the inverter. High-speed operation at 60Hz or more can also result in more noise.

When running 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.
- **Brake motors**
  For motors equipped with parallel-connected brakes, their braking power must be supplied from the primary circuit (commercial power supply). If the brake power is connected to the inverter power output circuit (secondary circuit) by mistake, problems may occur.
  Do not use inverters for driving motors equipped with series-connected brakes.
- **Geared motors**
  If the power transmission mechanism uses an oil-lubricated gearbox or speed changer/reducer, then continuous motor operation at low speed may cause poor lubrication. Avoid such operation.
- **Single-phase motors**
  Single-phase motors are not suitable for inverter-driven variable speed operation. Use three-phase motors.

Environmental conditions

- **Installation location**
  Use the inverter in a location with an ambient temperature range of -10 to 50˚C.
  The inverter and braking resistor surfaces become hot under certain operating conditions. Install the inverter on nonflammable material such as metal.
  Ensure that the installation location meets the environmental conditions specified in "Environment" in inverter specifications.

Combination with peripheral devices

- **Installing a molded case circuit breaker (MCCB)**
  Install a recommended molded case circuit breaker (MCCB) or an earth leakage circuit breaker (ELCB) in the primary circuit of each inverter to protect the wiring. Ensure that the circuit breaker capacity is equivalent to or lower than the recommended capacity.
- **Installing a magnetic contactor (MC) in the output (secondary) circuit**
  If a magnetic contactor (MC) is mounted in the inverter's secondary circuit for switching the motor to commercial power or for any other purpose, ensure that both the inverter and the motor are fully stopped before you turn the MC on or off. Remove the surge killer integrated with the MC.
- **Installing a magnetic contactor (MC) in the input (primary) circuit**
  Do not turn the magnetic contactor (MC) in the primary circuit on or off more than once an hour as an inverter fault may result. If frequent starts or stops are required during motor operation, use FWD/REV signals.
- **Protecting the motor**
  The electronic thermal facility of the inverter can protect the general-purpose motor. The operation level and the motor type (general-purpose motor, inverter motor) should be set. For high-speed motors or water-cooled motors, set a small value for the thermal time constant to protect the motor.
  If you connect the motor thermal relay to the motor with a long cable, a high-frequency current may flow into the wiring stray capacitance. 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).
- **Discontinuance of power-factor correcting capacitor**
  Do not mount power factor correcting capacitors in the inverter (primary) circuit. Use a AC/DC REACTOR to improve the inverter power factor. Do not use power factor correcting capacitors in the inverter output circuit (secondary). An overcurrent trip will occur, disabling motor operation.
- **Discontinuance of surge killer**
  Do not mount surge killers in the inverter output (secondary) circuit.
- **Reducing noise**
  Use of a filter and shielded wires are typical measures against noise to ensure that EMC Directives are met.
- **Measures against surge currents**
  If an overvoltage 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.
  We recommend connecting a AC/DC REACTOR to the inverter.
- **Megger test**
  When checking the insulation resistance of the inverter, use a 500V megger and follow the instructions contained in the Instruction Manual.

Wiring

- **Wiring distance of control circuit**
  When performing remote operation, use twisted shielded wire and limit the distance between the inverter and the control box to 20m.
- **Wiring length between inverter and motor**
  If long wiring is used between the inverter and the motor, the inverter will overheat or trip as a result of overcurrent (high-frequency current flowing into the stray capacitance) in the wires connected to the phases. Ensure that the wiring is shorter than 50m. If this length must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL).
  When wiring is longer than 50m, and sensorless vector control or vector control with speed sensor is selected, execute off-line tuning.
- **Wiring size**
  Select cables with a sufficient capacity by referring to the current value or recommended wire size.
- **Wiring type**
  Do not use multicore cables that are normally used for connecting several inverters and motors.
- **Grounding**
  Securely ground the inverter using the grounding terminal.

Selecting inverter capacity

- **Driving general-purpose motor**
  Select an inverter according to the applicable motor ratings listed in the standard specifications table for the inverter. When high starting torque is required or quick acceleration or deceleration is required, select an inverter with a capacity one size greater than the standard.
- **Driving special motors**
  Select an inverter that meets the following condition: Inverter rated current > Motor rated current.

Transportation and storage

When transporting or storing inverters, follow the procedures and select locations that meet the environmental conditions that agree with the inverter specifications.

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