Silectron sistemi

INVERTER

GVX2000

INNOVATION IN THE WAKE OF TRADITION

Bonfiglioli Group

Bonfiglioli / Trasmital / Components / Silectron

New Power Solutions

Silectron sistemi

Bonfiglioli Group

GVX2000
0.55-500 kW

GVX900
0.2-4 kW

GSX600
0.4-2.2 kW

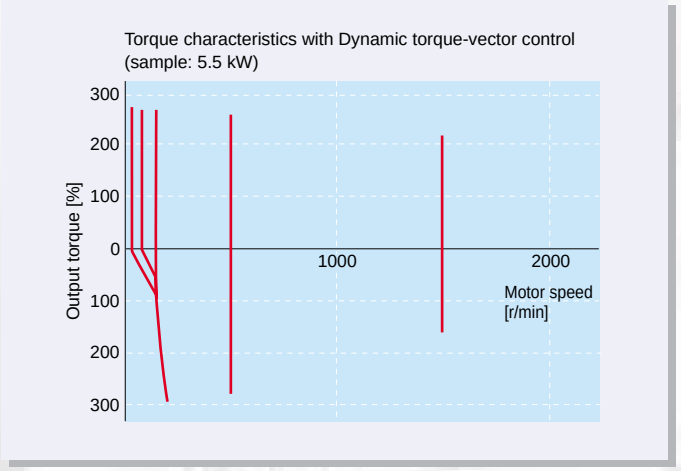
LMS
0.4-4 kW

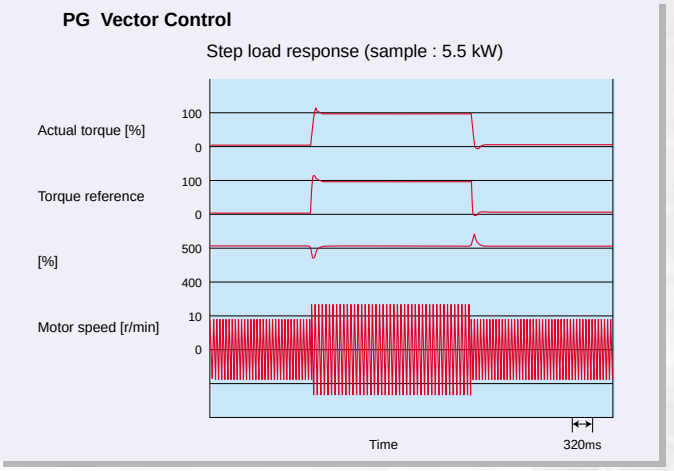
COMPLETE AND ADVANCED SOLUTIONS IN POWER TRANSMISSION FOR ANY INTELLIGENT AND HIGH EFFICIENT APPLICATION

Dynamic torque-vector control

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.

- The torque values obtained with an inverter GVX2000 for high performances applications are:
  - 250% of rated motor torque on short period
  - 200% of rated motor torque at 0.5Hz (180% for models over 30kW)
- 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 deceleration 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 performances of starting torque and control precision:
  - Speed control range: 1:1200
  - Speed control accuracy: ±0.02%
  - Speed control response: 40Hz - (25kW or smaller)



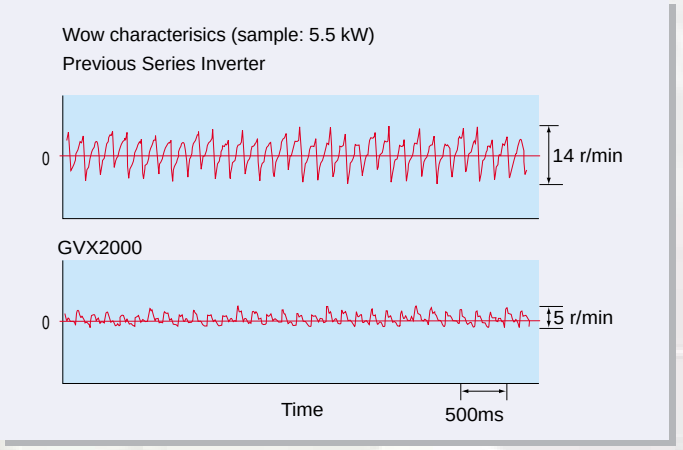


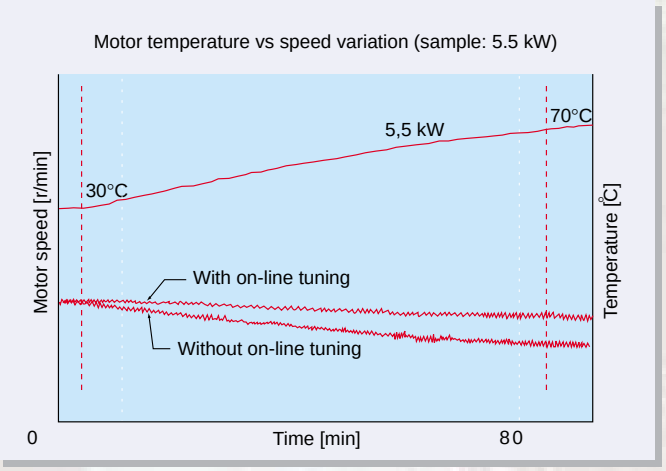
Reduced motor wow at low speed

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 unique digital AVR.

Reduced motor wow at low speed

- 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.



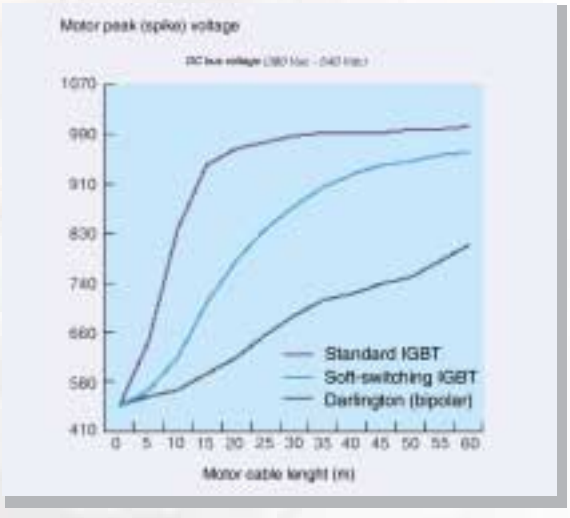


IGBT soft switching technology

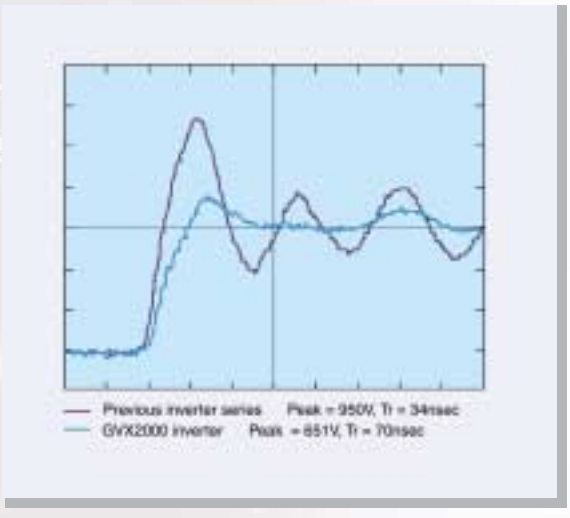
The GVX2000 series inverter utilizes improved new generation IGBT power devices, with the gate controlled by the new soft-switching commutation techniques.

This increases the pulse switching time, reducing the motor peak voltage and prolonging the motor insulation life, without using additional output filters or reactors and without compromising performances.

Peak voltage reduction at motor terminals in relation to the cable length



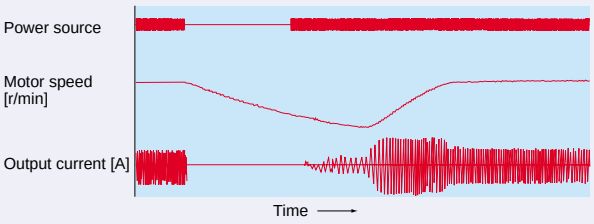
Comparison between a GVX2000 drive with soft-switching technology and a traditional drive



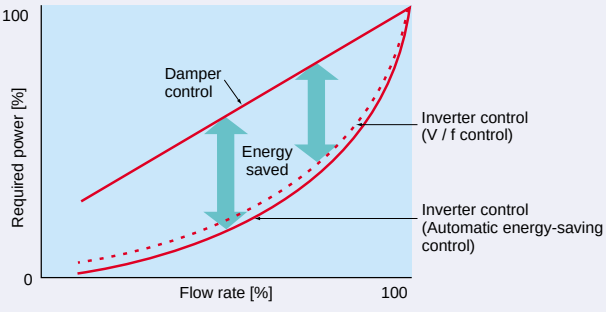
Advanced, convenient functions

- 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.

Rotating motor pick-up control characteristics
(sample: 5.5 kW)



Energy saving effect



Environment-friendly features

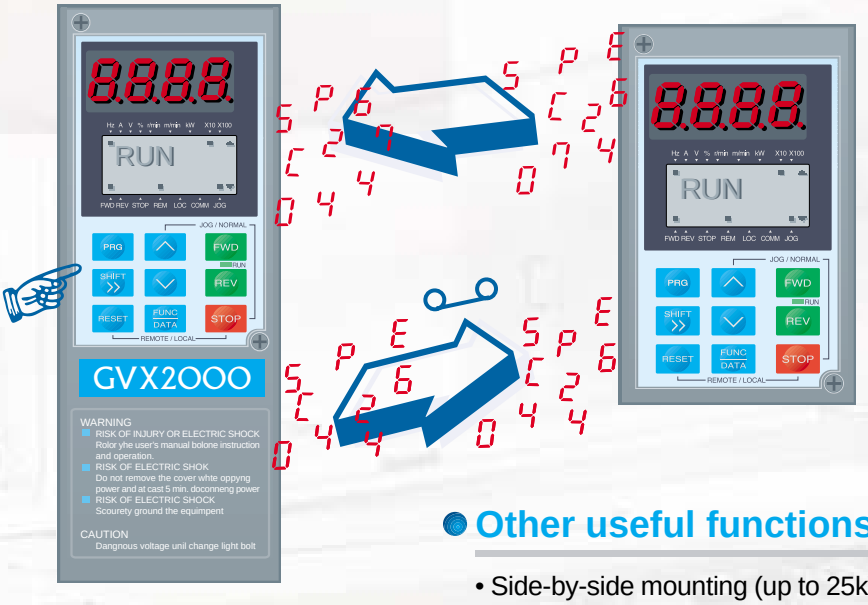
- Provided with low-noise control power supply systems which minimize noise interference on peripheral devices such as sensors.
- Equipped with terminals for connecting DC REACTOR that can suppress harmonics.
- Complied with EMC Directive (Emission) when connected to optional EMC-compliance filter.

Global products, communication

- Conforms to major world safety standards: CE, UL, cUL, TÜV, C-Tick.
- Equipped with RS485 interface as standard.
- Connection to field bus: Profibus-DP, Interbus-S, DeviceNet, Modbus Plus and others, with the ANY-BUS option.
- Universal DI/DO: monitors digital I/O signal status and transmits to a host controller, helping to simplify factory automation.

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 (1,5 to 10m)



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 (2.2 kW or larger models) : alarm signal output will be held even if main circuit power supply has shut down.

Excellent maintainability

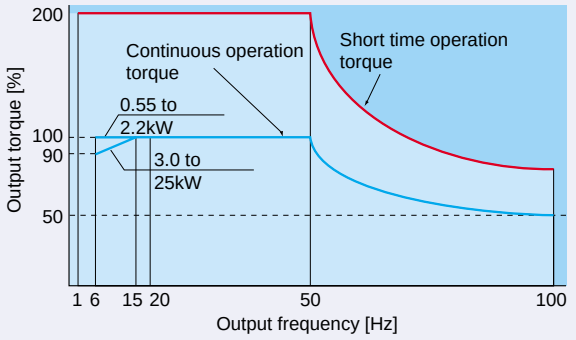
The items below can be monitored on the Keypad panel and making it easy to analyze the cause of trip and to take preventive measures.

- 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

Other useful functions

- Side-by-side mounting (up to 25kW) saves space when inverters are installed in a panel.
- The uniform height (260mm) of products (up to 11kW) makes it easy to design panels.
- User-definable control terminals: digital input (9 points), transistor output (4 points), relay contact output (1 point), and alarm relay contact output.
- 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.

Torque characteristics with Dynamic torque-vector control
100% of output torque refers to the rated torque of the motor driven at 50Hz.



Extensive product line

- Since the product is equipped with a dual rating feature, it can be used for standard applications (fan, pumps, conveyors, multimotor application) as well as high performance applications (load rising or lifting).
- Totally-enclosed casing (IP40) (up to 25kW as standard).
- Optional IP20 enclosure available for 30kW or larger models.

Applicable motor		Inverter type
Standard applications	High performance applications	
0,55	0,4	GVX2000-0,55-T
1,1	0,75	GVX2000-1,1-T
2,2	1,5	GVX2000-2,2-T
3,0	2,2	GVX2000-3,0-T
5,5	4,0	GVX2000-5,5-T
7,5	5,5	GVX2000-7,5-T
11	7,5	GVX2000-11-T
15	11	GVX2000-15-T
18,5	15	GVX2000-18,5-T
22	18,5	GVX2000-22-T
25	22	GVX2000-25-T
30	25	GVX2000-30-T
37	30	GVX2000-37-T
45	37	GVX2000-45-T

Applicable motor		Inverter type
Standard applications	High performance applications	
55	45	GVX2000-55-T
75	55	GVX2000-75-T
90	75	GVX2000-90-T
110	90	GVX2000-110-T
132	110	GVX2000-132-T
160	132	GVX2000-160-T
200	160	GVX2000-200-T
220	200	GVX2000-220-T
280	220	GVX2000-280-T
315	280	GVX2000-315-T
400	315	GVX2000-400-T
450	355	GVX2000-450-T
500	400	GVX2000-500-T

Standard applications are considered:
- constant torque load (not heavy, conveyors)
- variable torque loads (pumps, fans)
- multimotor applications

High performance applications are considered:
- constant torque load (heavy)
- load lifting, high performance positioning (axis)

How to read the model number

GVX2000-4.0-T

Series name

Development code
Product name

Nominal applied motor
0,55 kW
0,75 kW
1,5 kW
to
500 kW

Input power source
T = Three-phase 400V

GVX2000

COMMON SPECIFICATIONS (0.55 - 25 kW)

Type	GVX2000-□□-T		0.55	1.1	2.2	3.0	5.5	7.5	11	15	18.5	22	25
Applied motor	Standard application 1) [kW]		0.55	1.1	2.2	3.0	5.5	7.5	11	15	18.5	22	25
	High performance application 1) [kW]		0.4	0.75	1.5	2.2	4.0	5.5	7.5	11	15	18.5	22
Output ratings	Rated capacity 2) [kVA]		1.0	1.7	2.6	3.9	6.4	9.3	12	17	21	28	32
	Rated voltage 3) [V]		3-phase 320 to 480 V (output voltage cannot exceed the power supply voltage)										
	Rated current 4) 5) [A]	Standard applications	1.9	3.1	4.6	6.8	11.2	16.5	23	30	37	44	54
		High performance application	1.5	2.5	3.7	5.5	9	13	18	24	30	39	45
	Torque overload	Standard applications	150% of motor rated torque for 1 min. 9) 200% of motor rated torque on the short period										
		High performance application	150% of motor rated torque for 1 min. 250% of motor rated torque on the short period										
Input ratings	Rated frequency [Hz]		50, 60Hz										
	Phase, voltage, frequency		3-phase 380 to 480 V 50/60 Hz										
	Voltage/frequency variation		Voltage: +10 to -15% (voltage unbalance 2% or less) 6) Frequency: +5 to -5%										
	Momentary voltage dip capability 7)		When the input voltage is 310 V or more, the inverter can be operated continuously. When the input voltage drops below 310 V from rated voltage, the inverter can be operated for 15 ms. The smooth recovery method is selectable.										
	Rated current [A]	(With DCR)	0.62	1.5	2.9	4.2	7.1	10.0	13.5	19.8	26.8	33.2	39.3
		(Without DCR)	1.8	3.5	6.2	9.2	14.9	21.5	27.9	39.1	50.3	59.9	69.3
	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
Control	Starting torque	Standard applications	150%										
		High performance application	200% (with dynamic torque-vector control selected)										
Braking	Standard	Braking torque	150%		100%					20% 8)			
		Time [s]	5		5					No limit			
		Duty cicle [%]	5	3	5	3	2	3	2	No limit			
	Braking torque (Using Option)		150%										
	Dc injection braking		Starting frequency: 0.1 to 60.0 Hz Braking time: 0.0 to 30.0 s Braking level: 0 to 100% of rated current										
Enclosure (IEC605297)			IP40										
Coooling method			Natural cooling		Fan cooling								
Standars			- UL/cUL - CE Marking (EM, Low Voltage) -EN 61800-2 - EN 61800-3 - T ÜV - C-Tick										
Mass [kg]			2.2	2.5	3.8	3.8	3.8	6.5	6.5	10	10	10.5	10.5

Notes:

1) **Standard applications are considered:**
- constant torque load (not heavy, conveyors)
- variable torque loads (pumps, fans)
- multimotor applications

High performance applications are considered:
- constant torque load (heavy)
- load lifting, high performance positioning (axis)

2) Inverter output capacity [kVA] at 415 V.
3) Output voltage is proportional to the power supply voltage and cannot exceed the power supply voltage.
4) When selecting an inverter, the rated current of the motor applied, shall be equal or lower than this output current value. If this condition cannot be applied, use the motor under a load factor (%) calculated as follows: load factor (%) = [inverter output current] / [Motor output current] x 100.
5) Current derating may be required in case of low impedance load such as high frequency motor.
6) Refer to the EN61800-3 (5.2.3).
7) Tested at standard load condition (85% load).
8) With a nominal applied motor, this value is average torque when the motor deceierates and stops from 60 Hz (it may change according to motor loss).
9) With the setting of carrier frequency (motor sound) at less than 8 kHz and maximum temperature 40 °C.

COMMON SPECIFICATIONS (30 - 500 kW)

Type	GVX2000-□□-T		30	37	45	55	75	90	110	132	160	200	220	280	315	400	450	500
	FUJI FRN□□G11S-4EN		30 EV	30	37	45	55	75	90	110	132	160	200	220	280	315	400	450
Applied motor	Standard application 1) [kW]		30	37	45	55	75	90	110	132	160	200	220	280	315	400	450	500
	High performance application 1) [kW]		25	30	37	45	55	75	90	110	132	160	200	220	280	315	355	400
Output ratings	Rated capacity 2) [kVA]		32	43	53	65	80	107	126	150	181	218	270	298	373	420	467	532
	Rated voltage 3) [V]		3-phase 320 to 480 V (output voltage cannot exceed the power supply voltage)															
	Rated current 4) 5) [A]	Standard applications	50	75	91	112	150	176	210	253	304	377	415	520	585	650	740	840
		High performance application	-	60	75	91	112	150	176	210	253	304	377	415	520	585	650	740
	Torque overload	Standard applications	150% of motor rated torque for 1 min. 10) 200% of motor rated torque on the short period															
		High performance application	150% of motor rated torque for 1 min. 250% of motor rated torque on the short period															
Input ratings	Rated frequency [Hz]		50, 60Hz															
	Phase, voltage, frequency		3-phase 380 to 480 V 50/60 Hz															
	Voltage/frequency variation		Voltage: +10 to -15% (voltage unbalance 2% or less) 7) Frequency: +5 to -5%															
	Momentary voltage dip capability 7)		When the input voltage is 310 V or more, the inverter can be operated continuously. When the input voltage drops below 310 V from rated voltage, the inverter can be operated for 15 ms. The smooth recovery method is selectable.															
	Rated current [A]	(With DCR)	54	54	67	81	100	134	160	156	232	282	352	385	491	552	624	704
		(Without DCR)	86	86	104	124	150	-	-	-	-	-	-	-	-	-	-	-
	Required power supply capacity (with DCR) [kVA]		38	38	47	57	70	93	111	136	161	196	244	267	341	383	432	488
Control	Starting torque	Standard applications	150%															
		High performance application	200% (with dynamic torque-vector control selected)															
Braking	Standard	Braking torque	15 to 10% 9)															
		Time [s]	No limit															
		Duty cicle [%]	No limit															
	Braking torque (Using Option)		100%															
	Dc injection braking		Starting frequency: 0.1 to 60.0 Hz Braking time: 0.0 to 30.0 s Braking level: 0 to 100% of rated current															
Enclosure (IEC605297)			IP00 (IP20: option)															
Coooling method			Fan cooling															
Standars			- UL/cUL - CE Marking (EM, Low Voltage) -EN 61800-2 - EN 61800-3 - T ÜV - C-Tick															
Mass [kg]			31	31	36	41	42	50	73	73	104	104	145	145	250	250	360	360

Notes:

1) **Standard applications are considered:**
- constant torque load (not heavy, conveyors)
- variable torque loads (pumps, fans)
- multimotor applications

High performance applications are considered:
- constant torque load (heavy)
- load lifting, high performance positioning (axis)

2) Inverter output capacity [kVA] at 415 V.
3) Output voltage is proportional to the power supply voltage and cannot exceed the power supply voltage.
4) When selecting an inverter, the rated current of the motor applied, shall be equal or lower than this output current value. If this condition cannot be applied, use the motor under a load factor (%) calculated as follows: load factor (%) = [inverter output current] / [Motor output current] x100.
5) Current derating may be required in case of low impedance loads such as high frequency motor.
6) When the input voltage is between 440 and 480 V / 50Hz, the tap of the auxiliary transformer must be changed
7) Refer to the EN61800-3 (5.2.3).
8) Tested at standard load condition (85% load).
9) With a nominal applied motor, this value is average torque when the motor deceierates and stops from 60 Hz (it may change according to motor loss).
10) With the setting of carrier frequency (motor sound) at less than 8 kHz and maximum temperature 40°C.

COMMON SPECIFICATIONS

Item		Explanation
Output frequency	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)	0.75 to 15kHz (55kW or smaller)*3) - 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 freq. 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 (*)
	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: FWD or REV key, STOP 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) and any open bus.
	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 frequ. 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) and any open bus Programmed PATTERN operation: Max. 7 stages
	Jogging operation	FWD or REV 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 limiter can be preset.
	Bias frequency	Bias frequency can be preset.
	Gain for frequency setting	Gain for freq. setting can be preset. (0.0 to 200.0%) ex.) Analog input 0 to +5V DC with 200% gain results in max. frequ. 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 min. (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 frequ. 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 4-pole standard motor. Slip compensation can be preset for the second motor.
	Droop operation	The motor speed droops in proportional 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

<table>
<tr><th colspan="2">Item</th><th colspan="2">Explanation</th></tr>
<tr><td rowspan="11">Control</td><td>PID control</td><td colspan="2">This function can control flowrate, pressure, etc. (with an analog feedback signal.)
• Reference signal · KEYPAD operat. (▲ 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 polar. (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 frequ. setting : Setting freq./Max.
RS485 : Setting freq./Max. freq. X 100 (%) ·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)</td></tr>
<tr><td>Automatic deceleration</td><td colspan="2">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 frequ. is increased and tripless operation is active.</td></tr>
<tr><td>Second motor's setting</td><td colspan="2">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.</td></tr>
<tr><td>Energy saving operation</td><td colspan="2">This function minimizes inverter and motor losses at light load.</td></tr>
<tr><td>Fan stop operation</td><td colspan="2">This function is used for silent operation or extending the fan's lifetime.</td></tr>
<tr><td>Universal DI</td><td colspan="2">Transmits to main controller of LINK operation.</td></tr>
<tr><td>Universal DO</td><td colspan="2">Outputs command signal from main controller of LINK operation.</td></tr>
<tr><td>Universal AO</td><td colspan="2">Outputs analog signal from main controller of LINK operation.</td></tr>
<tr><td>Zero speed control (*)</td><td colspan="2">The motor speed is controlled with the speed reference of zero.</td></tr>
<tr><td>Positioning control (*)</td><td colspan="2">The SY option card can be used for positioning control by differential counter method.</td></tr>
<tr><td>Synchronized operation (*)</td><td colspan="2">This function controls the synchronized operation between 2 axes with PGs.</td></tr>
<tr><td rowspan="3">Indication</td><td></td><td>LED monitor</td><td>LCD monitor
(English, German, French, Spanish, Italian, Japanese)</td></tr>
<tr><td>Operation mode (Running)</td><td>· 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.)</td><td rowspan="3">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)
· Output current (A)
· Output voltage (V)
· Torque calculation value (%)
· Setting frequency (Hz)
· Operation condition (FWD / REV, IL, VL / LU, TL)
· Motor synchronous speed (r/min)
· Load shaft speed (r/min)
· Line speed (m/min)
· PID reference value
· PID feedback value
· Driving torque limiter setting vaiue (%)
· 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)
· DC link circuit voltage (V)
· Temperature at inside air / heat sink (°C)
· Maximum current (A)
· Main circuit capacitor life(%)
· Control PC board life (h)
· Cooling fan operation time (h)
· Communication error times (KEYPAD, RS485, Option)
· ROM version (Inverter, KEYPAD, Option)</td></tr>
<tr><td>Stopping</td><td>Selected setting value or output value</td></tr>
<tr><td>Trip mode</td><td>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)</td></tr>
</table>

Common Specifications (continued)

Item		Explanation	
Indication	Trip mode	**LED monitor**	**LCD monitor (English, German, French,Spanish, Italian, Japanese)**
		· 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)	**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
	Charge lamp	When the DC link circuit voltage is higher than 50V, the charge lamp is ON.	
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 (11kW or smaller). · Prevents DB resistor overheating by external thermal overload relay attached to DB resistor (15kW 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/s2 at from 9 to less than 20Hz 2m/s2 at from 20 to less than 55Hz, 1m/s2 at from 55 to less than 200Hz	
Storage condition		-Temperature : –25 to +65 °C, -Humidity : 5 to 95%RH (non-condensing)	

NOTES: (*) Option
*1) For application at 120Hz or above, please contact Silectron Sistemi
*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.

TERMINAL FUNCTIONS

Terminal Functions

	Symbol	Terminal name	Function	Remarks	Fun. cod.
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 11kW 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.	1,1kW 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 estimate 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:250kΩ · Allowable maximum input current: 30mA DC · If input current is 20 to 30mA DC , the inverter estimates it to20mA 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 command	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 command	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.	· OFF state maximum input voltage: 2V (maximum source current : 5mA) · ON 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 freq. are selectable. (SS1,SS2) : 4 (0 to 3) different freq. are selectable. (SS1,SS2,SS4) : 8 (0 to 7) different freq. are selectable. (SS1,SS2,SS4,SS8) :16 (0 to 15) different freq. 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.	

Terminal Functions (continued)

	Symbol	Terminal name	Function	Remarks	Fun. cod.
Digital input	(BX)	Coast-to-stop	(BX): ON ..... Motor will coast-to-stop. (No alarm signal will be output.) command (FWD or REV) ON.	· The motor restarts from 0Hz by turning off BX with the command operation · 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 / 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 /1	(TL2/TL1): ON ..... Torque limiter 2 is effective.		E16,E17 F40,F41
	(SW50)	Switching operation between line and inverter	(SW50(SW60)): ON .....The motor is changed from inverter operation to line operation.	Main circuit changeover signals are output through Y1 to Y5 terminal.	
	(SW60)		(SW50(SW60)): OFF ..... The motor is changed from line operation to inverter operation.		
	(UP)	UP command	(UP): ON ..... The output frequency increases.	When UP and DOWN commands are simultaneously ON, DOWN signal is effective.	F01,C30
	(DOWN)	(DOWN) command	(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.		
	(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 v) 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 sig. 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)	Synchronization 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 Deceleration time4.	(STOP2): OFF ..... The motor decelerates and stops with with Deceleration time 4		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)		

	Symbol	Terminal name	Function	Remarks	Fun. cod.
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.	· OFF state maximum output voltage : 3V (Allowable maximum sink current : 50mA) · ON 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 equi-valence 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/Inverter changeover for 88)	Outputs 88's ON signal for Line/Inverter changeover operation.		
	(SW52-2)	Line/Inv changeover (for 52-1)	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

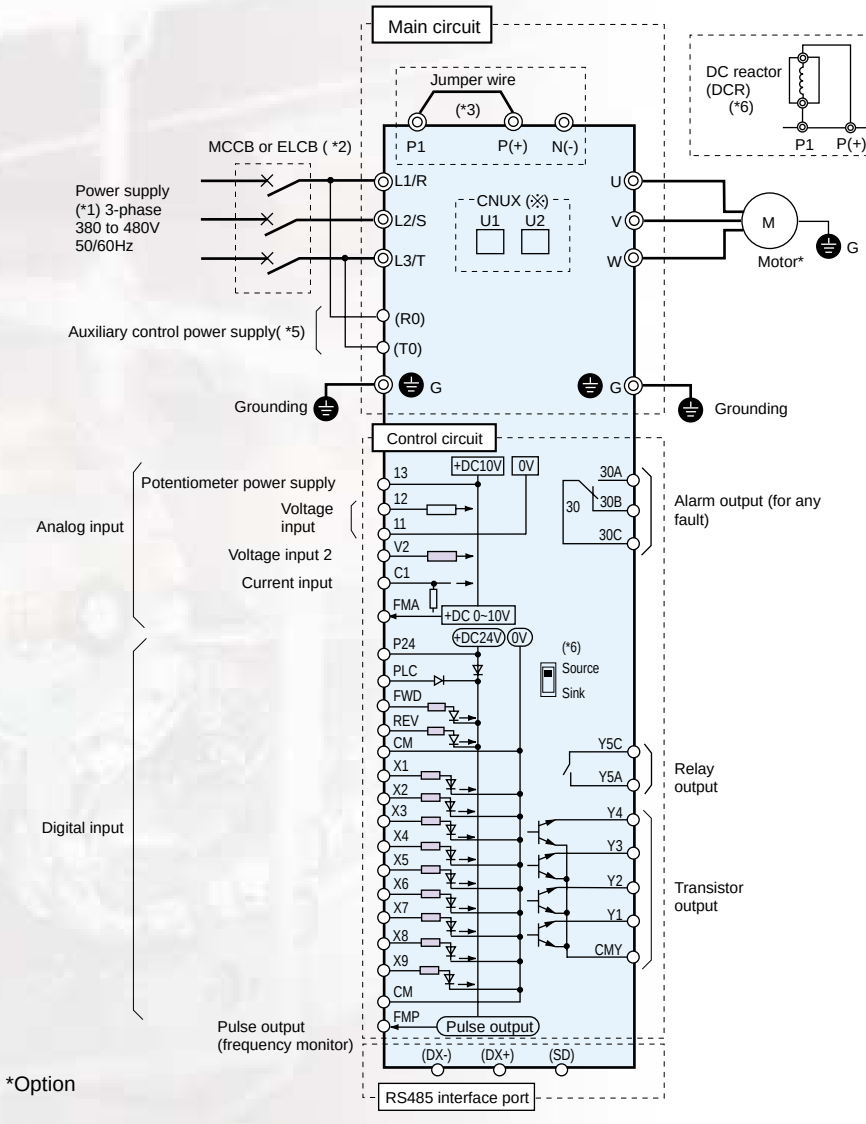
Terminal Functions (continued)

	Symbol	Terminal name	Function	Remarks	Fun. cod.
Transistor output	(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.		
	(N-EX)	Speed existence signal	Outputs ON signal when motor speed is larger than stop speed* on vector control with PG.	* stop speed = stop frequency (F25) 120/pole [r/m]	F25
	CMY	Common (transistor output)	Common for transistor output signal.	Isolated from teminals 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, cosΦ=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	Funcntions can be selected the same as Y1 to Y4.		
			Changeable exciting mode active or non-exciting mode active by function "E25".		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.



*Option

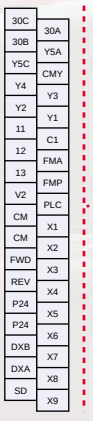
NOTE:
Common terminals [11], (CM), and <CMY> for control circuits are

*1) Use the inverter whose rated input voltage matches the power supply voltage.
*2) Use this peripheral device when necessary.
*3) 75kW 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 0.55 to 11kW, a built-in braking resistor (DBR) is connected to the inverter before shipping. (DBR is not mounted on models 15kW or larger.)
*5) Terminals [R0] and [T0] are provided for models 2,2kW or larger. These terminals are not provided for models 1,1kW or smaller. Even if these terminals are not powered, the inverter can be operated.
*6) Digital input common switching:
Source (P24 terminal)
Sink (CM terminal).

Terminal Arrangement

• Main circuit terminals

• Control circuit terminals



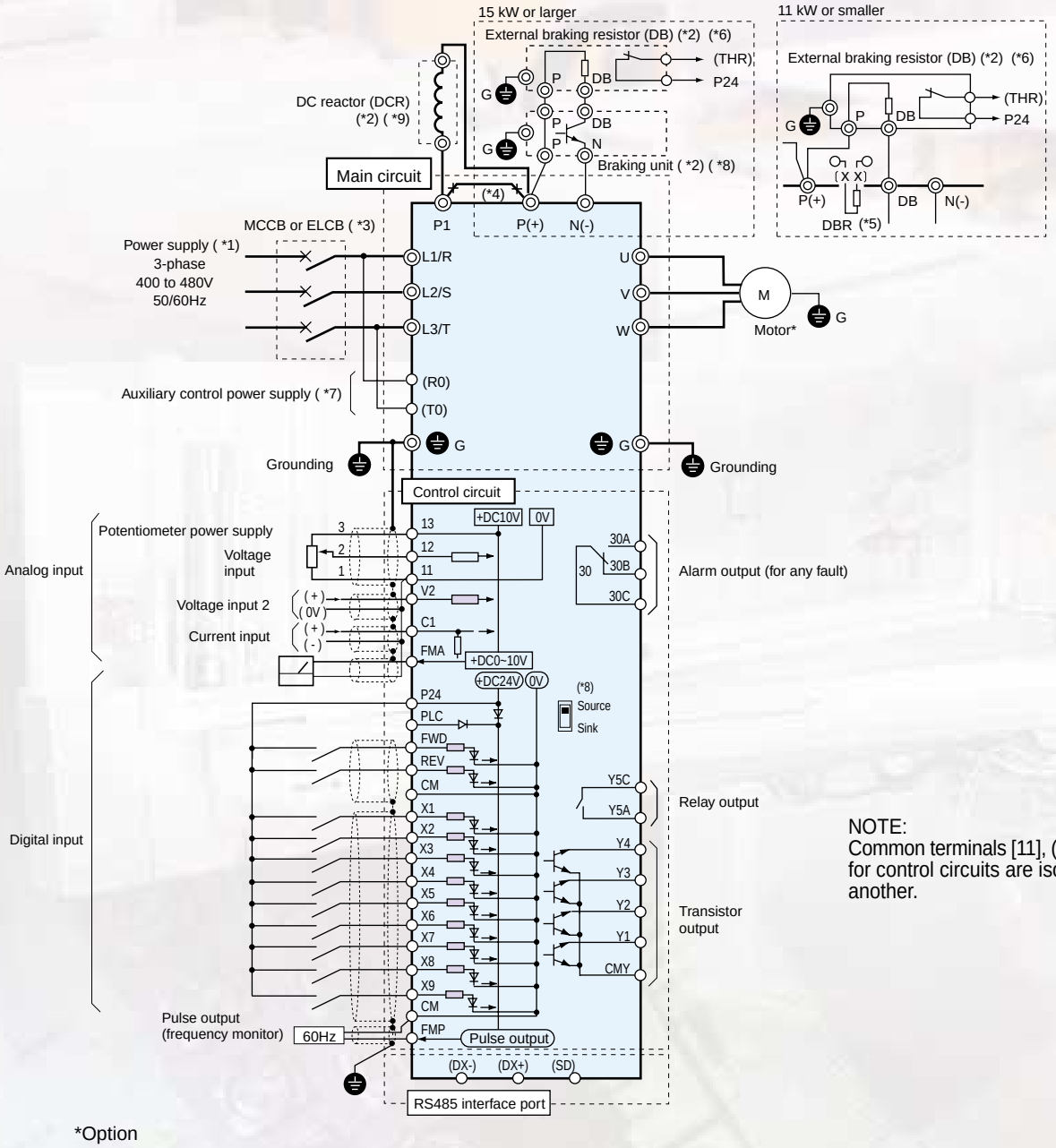
L1/R	L2/S	L3/T	DB	P1	P(+)	N(-)	U	V	W
G									
G									

(Up to 11kW)

GVX2000

External signal input 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.

*Option

*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 11kW, a built-in braking resistor (DBR) is connected to the inverter before shipping. (DBR is not mounted on models 15kW 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 2.2kW or larger. These terminals are not provided for models 1.1kW or smaller. Even if these terminals are not powered, the inverter can be operated.
*8) Digital input common switching:
Source (P24 terminal)
Sink (CM terminal).

KEYPAD PANEL FUNCTIONS AND OPERATIONS

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.

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.

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.

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

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.

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).

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

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

```
F00 DATA PRTC
F01 FREQ COM 1
F02 OPR METOD
F03 MAX Hz-1
```

4 Press the FUNC DATA key to show the actual function setting. 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 COM 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 METOD
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 torque %, in this order in accordance with the displayed value.

FUNCTION SETTINGS

Fundamental 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			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
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 v 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 (FWD or REV or STOP 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 overload relay for motor 1 (Select)	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	[11kW or smaller] 0 : Inactive 1 : Active (for built-in braking resistor) 2 : Active (for external braking resistor)	-	1	
				[15kW or larger] 0 : Inactive	-	0	
	F14	Restart mode after momentary power failure	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 limiter (High)	F15 H LIMITER	0 to 400Hz	1Hz	70	
	F16	(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	

Fundamental functions (continued)

	Function			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
Basic Functions	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 6.0Hz	0.1Hz	0.2	
	F26	Motor sound (Carrier freq.)	F26 MTR SOUND	0.75 to 15kHz (Up to 75kW) 0.75 to 10kHz (90kW and above)	1kHz	15(Up to 75kW)* 10(90kW 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 limiter 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	

Extension Terminal 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			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	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	
				0 : Multistep freq. selection (1 to 4 bit) [SS1] 1 : [SS2] 2 : [SS4] 3 : [SS8] 4 : ACC / DEC time selection (1 to 2 bit) [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]			
ACC 2, 3, 4 DCE 2, 3, 4	E10	Acceleration time 2	E10 AAC 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 limiter 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%	180	100

Extension Terminal Functions (continued)

	Function			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
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	
Y1-Y5C Terminal				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] (For Line / Inverter changeover operation) 12 : Line/Inv changeover (for 52-2) [SW52-2] (For Line / Inverter changeover operation) 13 : Line/Inv changeover (for 52-1) [SW52-1] (For Line / Inverter changeover operation) 14 : Motor 2 / Motor 1 [SWM2] (For Line / Inverter changeover operation) 15 : Auxiliary terminal (for 52-1) [AX] 16 : Time-up signal [TU] (For PATTERN operation) 17 : Cycle completion signal [TO] (For PATTERN operation) 18 : Stage No. indication 1 [STG1] (For PATTERN operation) 19 : Stage No. indication 2 [STG2] (For PATTERN operation) 20 : Stage No. indication 4 [STG4] (For PATTERN operation) 21 : Alarm indication 1 [AL1] (For Alarm signal output) 22 : Alarm indication 2 [AL2] (For Alarm signal output) 23 : Alarm indication 4 [AL4] (For Alarm signal output) 24 : Alarm indication 8 [AL8] (For Alarm signal output) 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 : Lifetime alarm [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]			
	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	E0 to 400 Hz36	1Hz	50	
	E37	OL2 function (Level)	E37 OL2 LEVEL	Approx. 5 to 200% of rated current	0.01A	*1	

Extension Terminal Functions (continued)

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			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
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 LED 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	

Control Functions of Frequency

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			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
Jump Hz Control	C01	Jump frequency (Jump freq. 1)	C01 JUMP Hz 1	0 to 400Hz	1Hz	0	
	C02	(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 frequency setting (Freq. 1)	C05 MULTI Hz 1	0.00 to 400.00Hz	0.01Hz	0.00	
	C06	(Freq. 2)	C06 MULTI Hz 2				
	C07	(Freq. 3)	C07 MULTI Hz 3				
	C08	(Freq. 4)	C08 MULTI Hz 4				
	C09	(Freq. 5)	C09 MULTI Hz 5				
	C10	(Freq. 6)	C10 MULTI Hz 6				
	C11	(Freq. 7)	C11 MULTI Hz 7				
	C12	(Freq. 8)	C12 MULTI Hz 8				
	C13	(Freq. 9)	C13 MULTI Hz 9				
	C14	(Freq.10)	C14 MULTI Hz 10				
	C15	(Freq.11)	C15 MULTI Hz 11				
	C16	(Freq.12)	C16 MULTI Hz 12				
	C17	(Freq.13)	C17 MULTI Hz 13				
	C18	(Freq.14)	C18 MULTI Hz 14				
	C19	(Freq.15)	C19 MULTI Hz 15				
	C20	JOG frequency	C20 JOG Hz	0.00 to 400.00Hz	0.01Hz	5.00	

Control Functions of Frequency (continued)

	Function			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
PATTERN Operation	C21	PATTERN (Mode select) operation	C21 PATTERN	0.00 to 400.00Hz 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 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	

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			Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor			-25kW	30kW-
Motor 1	P01	Number of motor 1 poles	P01 M1 POLES	2 to 14	2	4	
	P02	Motor 1 (Capacity)	P02 M1-CAP	25kW 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	0.01Hz	0.00	

High Performance 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				Setting range	Min. unit	Factory setting	
	Code	Name	LCD monitor				-25kW	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 : Linear 1 : S-curve (weak) 2 : S-curve (strong) 3 : Non-linear (For variable torque load)	-	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% / Frequency 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) (Frequ. command) (Oper. command) 0 : X - - X = Valid 1 : X X - - = Invalid 2 : X - X 3 : X X X	-	0	

High Performance Functions (continued

	Code	Name	LCD monitor	Setting range	Min. unit	Factory setting -25kW	Factory setting 30kW-
Serial Link	H31	RS 485 (Address)	H31 485 ADDRESS	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 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.

	Code	Name	LCD monitor	Setting range	Min. unit	Factory setting -25kW	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	A06 ELCTRN OL2	0 : Inactive 1 : Active (for 4-pole standard motor) 2 : Active (for 4-pole inverter motor)	-	1	
	A07	for motor 2 (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	25kW 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 4 poles 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.

PROTECTIVE FUNCTIONS

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.	• 400V series : 800V DC or more • Protection is not assured if excess AC line voltage 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.	• 400V series : 400V DC or less		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.	11kW 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 a by 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

Protective functions (continued)

Function	Description		LED monitor
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
Forced stop	• Error when using the forced stop command.		Er6
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

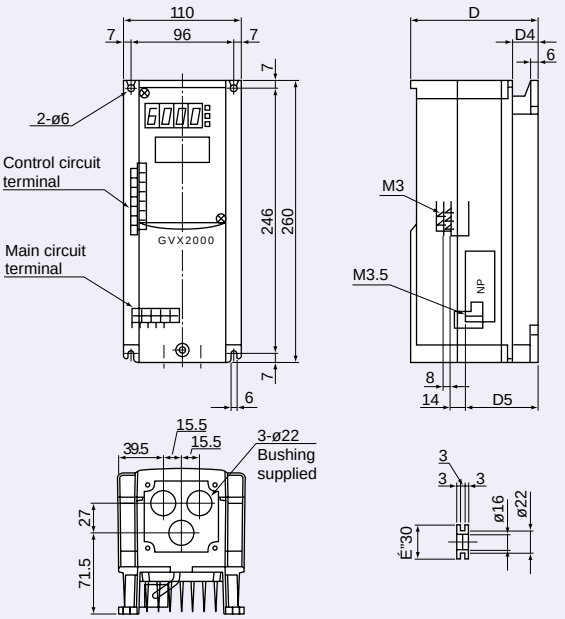
NOTES :
1)Retaining alarm signal when auxiliary controll power supply is not used :
If the inverter power supply is cut off while an internal alarm signal is being output, the alarm signal cannot be retained.
2)To issue the RESET command, press the PRG RESET key on the KEYPAD panel or connect terminals RST and CM and disconnect them afterwards.
3)Fault history data is stored for the past four trips.

Standards

Accordance with directives and their amendments:
EMC directive 89/336/EEC (Eelectromagnetic - Compatibility)
Low Voltage Directive 73/23/EEC (LVD)
For assesment of conformity the following relevant standards have been taken into consideration: EN61800-3 :1997
EN50178 :1997

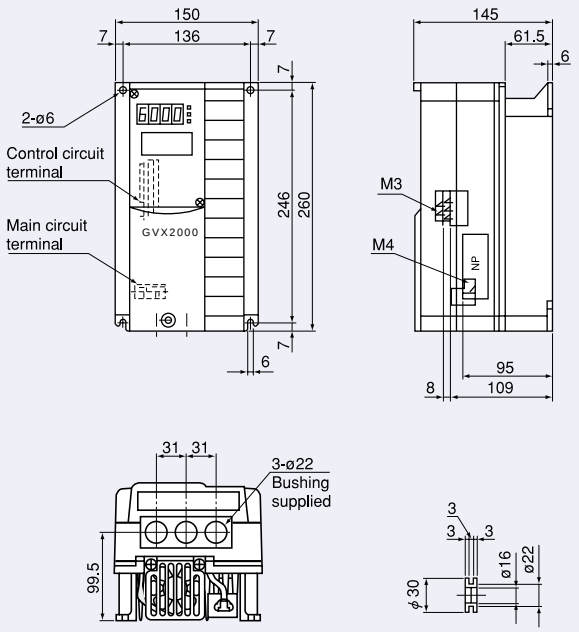
EXTERNAL DIMENSIONS (0.55 TO 25 kW)

GVX2000-0.55-T
GVX2000-1.1-T

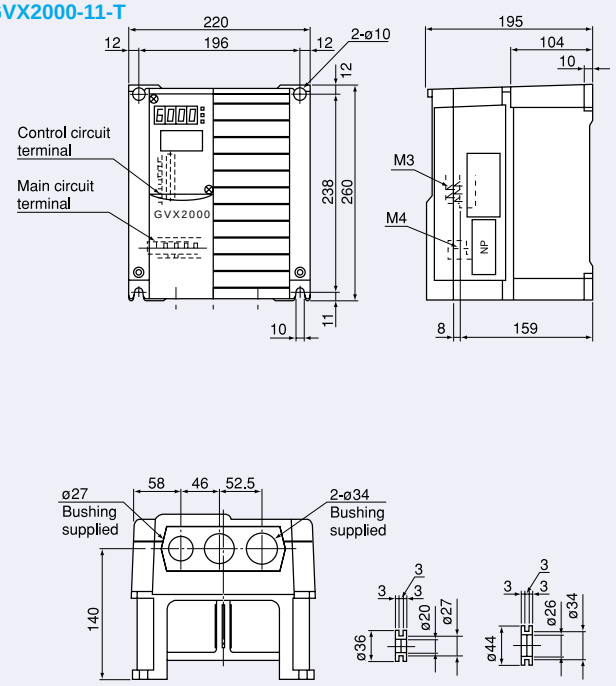


Type	D	D4	D5
GVX2000-0.55-T	130	36.5	80
GVX2000-1.1-T	145	51.5	95

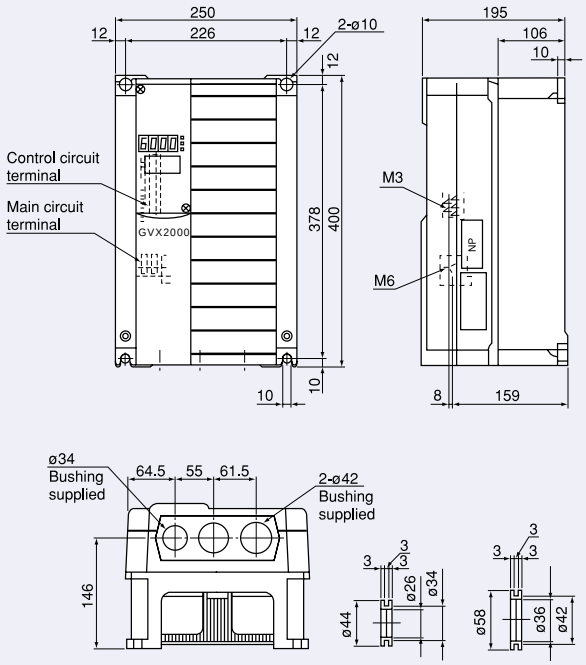
GVX2000-2.2-T to GVX2000-5.5-T



GVX2000-7.5-T
GVX2000-11-T

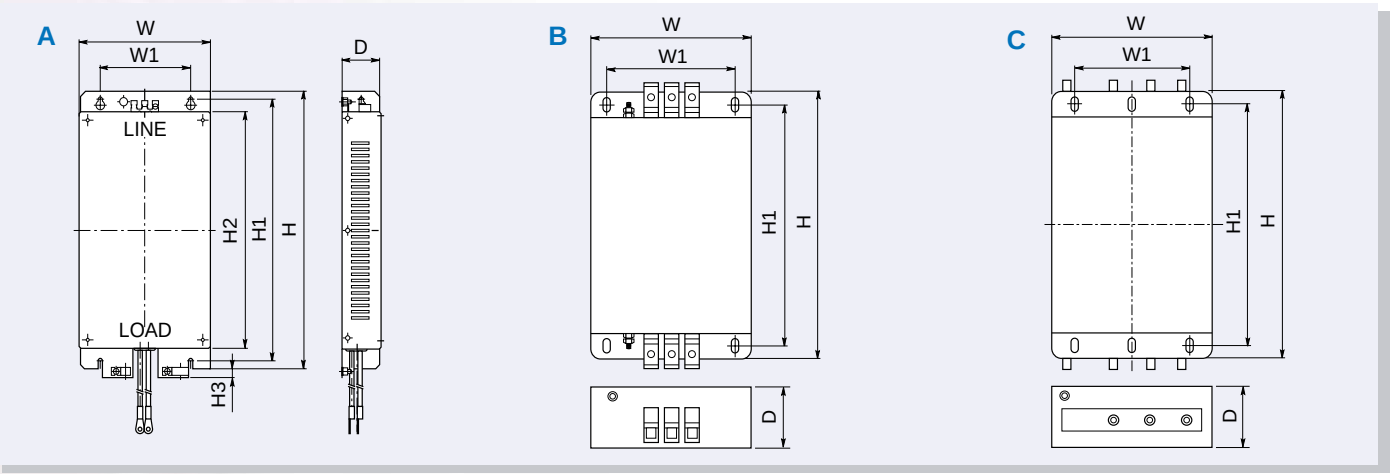


GVX2000-15-T to GVX2000-25-T



GVX2000

EMC filters

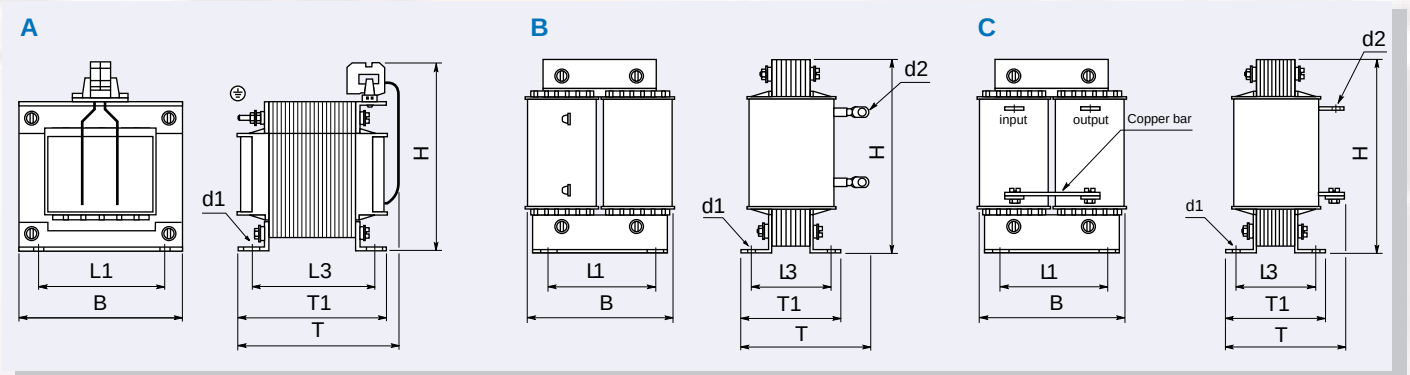


P (kW)		Inverter type	EMC filter type	In (A)	Fig.	Dimensions, mm							
ST	HP					W	W1	H	H1	H2	H3	D	Mtg. bolt
0.55	0.4	GVX2000-0.55-T	FT2000-1.1-T (EFL-0.75G11-4)	5	A	116	90	310	293	265	10	42	M5
1.1	0.75	GVX2000-1.1-T											
2.2	1.5	GVX2000-2.2-T	FT2000-5.5-T (EFL-4.0G11-4)	12		155	105					45	
3.0	2.2	GVX2000-3.0-T											
5.5	4.0	GVX2000-5.5-T											
7.5	5.5	GVX2000-7.5-T	FT2000-11-T (EFL-7.5G11-4)	35		225	167	331	311	260		47.5	M8
11	7.5	GVX2000-11-T											
15	11	GVX2000-15-T	FT2000-18.5-T (EFL-15G11-4)	50		250	185	480	449	400	20	70	
-	15	GVX2000-18.5-T											
18.5	-	GVX2000-18.5-T											
22	18.5	GVX2000-22-T	FT2000-25-T (EFL-22G11-4)	72									
25	22	GVX2000-25-T											
30	-	GVX2000-30-T	FT3100 (RF3100-F11)	100	B	200	166	435	408	-	-	130	M6
-	30	GVX2000-37-T											
37	-	GVX2000-37-T	FT3180 (RF3180-F11)	180				495	468			160	
45	37	GVX2000-45-T											
55	45	GVX2000-55-T											
75	55	GVX2000-75-T											
90	75	GVX2000-90-T											
-	90	GVX2000-110-T											
110	-	GVX2000-110-T	FT3280 (RF3280-F11)	280	C	250	170	587	560			205	
132	110	GVX2000-132-T											
-	132	GVX2000-160-T											
160	-	GVX2000-160-T	FT3400 (RF3400-F11)	400									
200	160	GVX2000-200-T											
220	200	GVX2000-220-T											
-	220	GVX2000-280-T											
280	-	GVX2000-280-T	FT3880 RF3880-F11	880		364	300	688	648			180	
315	280	GVX2000-315-T											

ST= Standard performances (common application).
HP= High performances (lifting, axes, high dynamic applications, etc.).

DC reactors

The inverter input power factor is lowered because of harmonics in input waveform. For power factor correction, a DC reactor can be used in the DC intermediate inverter circuit, connected to P1 and (+) terminal (for models larger than 75 kW standard or high performances the DC reactor is provided as standard).



Power supply	Motor power (kW)	Standard applications	High performance application	DC reactor type	Order code	Fig.	Dimensions, mm								
							B	L1	L3	T1	T	d1	H	d2	Kg
3-Phase 400V	75	GVX2000-75-T	GVX2000-90-T	DCR4-75B	FG-11-0200	A	174	155	150	182	240	7x13	155	13.0	17.0
	90	GVX2000-90-T	GVX2000-110-T	DCR4-90B	FG-11-0238		205		160	200	250		170		21.0
	110	GVX2000-110-T	GVX2000-132-T	DCR4-110B	FG-11-0291	B		140	157	189		11x15	260		24.5
	132	GVX2000-132-T	GVX2000-160-T	DCR4-132B	FG-11-0326	C	240	200	135	172	200		320	11.0	35.4
	160	GVX2000-160-T	GVX2000-200-T	DCR4-160B	FG-11-0395		280	240	132	176	195		395		37.8
	200	GVX2000-200-T	GVX2000-220-T	DCR4-200B	FG-11-0494				138	180	205			14.0	42.7
	220	GVX2000-220-T	GVX2000-280-T	DCR4-220B	FG-11-0557				147	189	218				45.6
	280	GVX2000-280-T	GVX2000-315-T	DCR4-280B	FG-11-0700				157	198	240			18.0	53.0
	315	GVX2000-315-T	GVX2000-400-T	DCR4-315B	FG-11-0770		320	270	180		250	13x18		2x11	54.5
	400	GVX2000-400-T	–	DCR4-400B	FG-11-0980				261	236	330			4x11	79.4

NOTE: For 75 kW or larger (high performances or standard performances application), it's not allowed to operate the inverter without DC reactor connection.

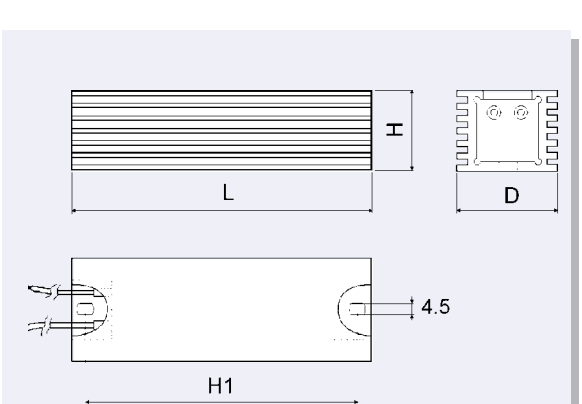
Accessories

- Arrester: suppresses induced lightning surges from power source, thus protecting all equipment connected the power source.
- Output circuit filter: connected to the output circuit of inverters under low-noise operation with carrier frequency from 8 to 15kHz, (6kHz higher for 30kW 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 (400V series).
  ② Suppressing leakage current from output side wiring.
  Reduces the leakage current caused when several motors are operated in parallel or connected with long wiring.
  * Total wiring length should be less than 400m.
  ③ Suppressing radial noise or inductive noise from output side wiring.
  Effective noise suppression device for long wiring applications such as plant.
  Note: When connecting this filter, be sure to set the carrier frequency F26 at 8kHz or over.
- Surge absorber: surge killer are also available.

Braking unit and braking resistor

Inverter type	Braking module (1)	Resistor Code	Q. ty	Brak. torque	Dimensions				Thermal protection
					H	L	D	H1	
GVX2000-0.55-T	-	SR-0.75-T	1	150%	27	90	36	79	-
GVX2000-1.1-T	-								
GVX2000-2.2-T	-	SR-1.5-T				105		94	
GVX2000-3.0-T	-	SR-2.2-T				155		144	
GVX2000-5.5-T	-	SR-4.0-T				105		94	
GVX2000-7.5-T	-	SR-11-T				155		144	
GVX2000-11-T	-								
GVX2000-15-T	BU220	SR-15-T				200		189	with thermostat (70÷180°C)
GVX2000-18.5-T		SR-18.5-T				260		249	
GVX2000-22-T		SR-25-T				320		309	
GVX2000-25-T									
GVX2000-30-T	BU370	SR-15-T	2*	100%		200		189	
GVX2000-37-T									
GVX2000-45-T		SR-18.5-T				260		249	

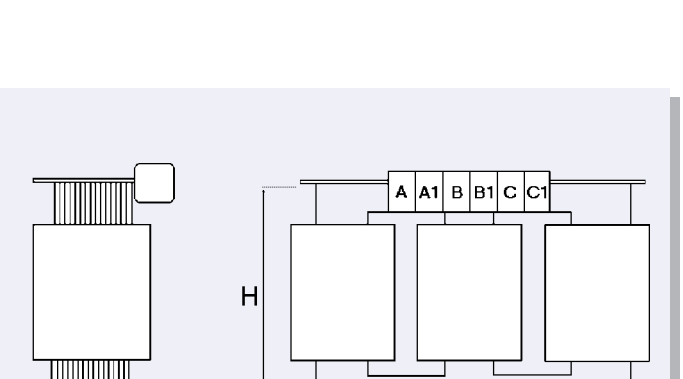
* Parallel connection
(1) See dimensions of braking unit on next page



- Both internal braking resistor and dynamic braking module are provided as standard for inverters of 11 kW or less
- For braking configuration of inverters larger than 45 kW, please contact Silectron sistemi division.
- The resistors are dimensioned exclusively for obtaining the torque performances shown in the table above.
- The braking time considered is 5 sec and the duty cycle is 5%.
- For different braking time applications, duty cycle or for regenerative or stationary braking, please contact Silectron sistemi.
- The manufacturer has the right to modify at any time the dimensions and characteristics of the resistors, without notice.

AC reactors

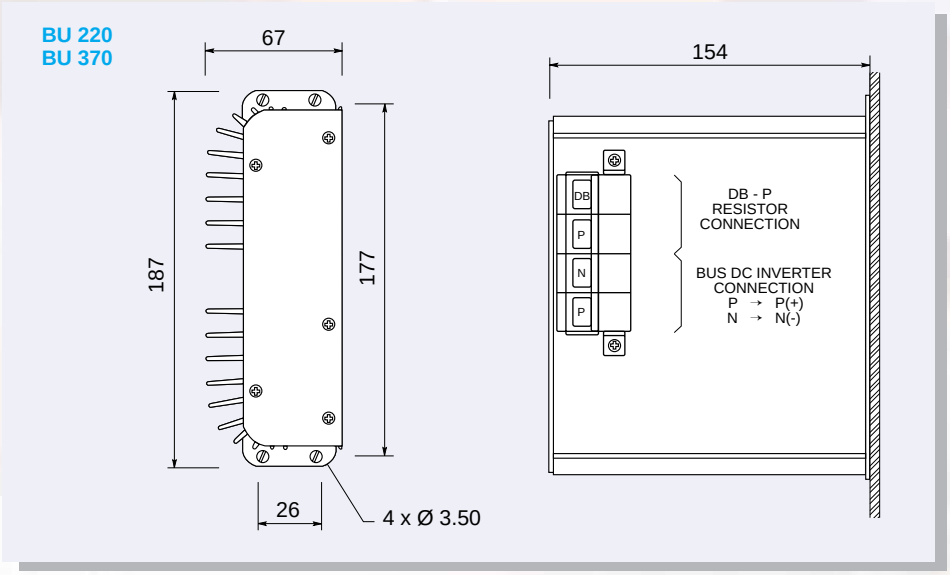
Inverter type	AC reactor In/Out	Dimensions		
		H	L	D
GVX2000-0.55-T	SI-0.75-T	145	140	80
GVX2000-1.1-T				
GVX2000-2.2-T	SI-1.5-T			
GVX2000-3.0-T	SI-2.2-T			
GVX2000-5.5-T	SI-4.0-T			
GVX2000-7.5-T	SI-7.5-T			
GVX2000-11-T	SI-15-T	200	185	120
GVX2000-15-T				
GVX2000-18.5-T	SI-18.5-T			130
GVX2000-22-T	SI-25-T			140
GVX2000-25-T				
GVX2000-30-T	SI-30-T	245	245	145
GVX2000-37-T	SI-37-T	210		190
GVX2000-45-T	SI-45-T			210
GVX2000-55-T	SI-55-T			
GVX2000-75-T	SI-75-T	260	305	230
GVX2000-90-T	SI-90-T	245	245	170
GVX2000-110-T	SI-132-T	260	305	240
GVX2000-132-T				
GVX2000-160-T	SI-160-T			250
GVX2000-200-T	SI-200-T			270
GVX2000-220-T	SI-220-T	315	365	310



- For application on larger models, please contact Silectron sistemi
- The reactors shown above, should be used under the following conditions:
  operating frequency shall be less than 70 Hz;
  two shall be the maximum number of simultaneous motors applied.
- The manufacturer has the right to modify at any time the dimensions and characteristics of the inductors, without notice

Braking unit

BU 220
BU 370



Option cards and other options

Name (type)	Function
Relay output card (OPC-RELÉ)	• Includes 2 relay output circuits. • Converts transistor output signals from inverter control output terminals Y1, Y2 to relay output signals.
Digital I/O interface card (OPC-G11S-DIO)	• 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.
Analog I/O interface card (OPC-G11S-AIO)	• 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.
PG feedback card (OPC-G11S-PG) (OPC-G11S-PG2)	• For performing PG vector control using feedback signals obtained from a rotary encoder. Also pulse train input setting frequency can be performed. Applicable Pulse Encoder specification: 100 to 3000P/R; A, B, Z phase, push-pull, line driver (PG2); power supply 12 or 15V DC.
Synchronized operation card (OPC-G11S-SY)	• Wait-and synchronize mode, simultaneous-start-and-synchronizing mode. • Proportional speed operation. • Speed control by pulse train input can be made.
Extension cable for keypad panel (RC 1.5-3-10)	Connects the keypad panel to an inverter unit. Three cable types are available: 1.5, 3 and 10m.
Mounting adapter for external cooling (PBG11-¤¤)	• Used to put the cooling fan section of the inverter outside the panel. • Only applicable to 25kW and below inverters. (30kW and above inverters can be modified to external cooling type by replacing the mounting bracket, as standard).

Wiring equipment

Power supply voltage	Nominal applied motor (kW)	Inverter type		MCCB or ELCB Rated current (A)		Recommended wire size (mm²)					
						Input circuit [L1/R,L2/S,L3/T]		Output circuit [U.V.W]		DCR circuit [P1,P(+)]	DB circuit [P(+),DB,N(-)]
		High performance application	Standard performance application	With DCR	Without reactor	With DCR	Without reactor	HP	ST		
Three phase 400V	0.55		GVX2000-0.55-T	5	5	2.0	2.0	2.0	—	2.0	
	1.1		GVX2000-1.1-T		10						
	2.2		GVX2000-2.2-T	10	15						
	3.0		GVX2000-3.0-T								
	5.5	GVX2000-7.5-T	GVX2000-5.5-T	15	20				2.0		
	7.5	GVX2000-11-T	GVX2000-7.5-T	20	30		3.5				
	11	GVX2000-15-T	GVX2000-11-T	30	40		5.5			3.5	
	15	GVX2000-18.5-T	GVX2000-15-T	40	50	3.5	8.0	3.5	3.5	5.5	
	18.5	GVX2000-22-T	GVX2000-18.5-T		60	5.5	14	5.5	5.5		
	22	GVX2000-25-T	GVX2000-22-T	50	75			8.0		8.0	
	25	—	GVX2000-25-T	75	100	8.0	22	14	14	14	2.0
	30	GVX2000-37-T	GVX2000-30-T	100	125	14				22	
	37	GVX2000-45-T	GVX2000-37-T		150	22	38	22	22		
	45	GVX2000-55-T	GVX2000-45-T	125	175		60	38	38	38	
	55	GVX2000-75-T	GVX2000-55-T	175	—	38	—	60	60	60	3.5
	75	GVX2000-90-T	GVX2000-75-T	200		60					
	90	GVX2000-110-T	GVX2000-90-T	225				100	100	100	5.5
	110	GVX2000-132-T	GVX2000-110-T	300		100				150	
	132	GVX2000-160-T	GVX2000-132-T	350		150		150	150		8.0
	160	GVX2000-200-T	GVX2000-160-T	400				200	200	200	14
	200	GVX2000-220-T	GVX2000-200-T	500		200				250	
	220	GVX2000-280-T	GVX2000-220-T	600		250			325	325	22
	280	GVX2000-315-T	GVX2000-280-T	Available soon							

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).

BONFIGLIOLI GROUP SERIES GVX2000 INVERTERS CAN BE USED FOR ALMOST ALL INDUSTRIAL PLANT AND EQUIPMENT AREAS

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

Machine tools

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

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

Food processing machines

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

Packaging machinery

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

Paper making/textile machinery

- Spinning machine
- Knitting machine
- Textile printing machine
- Industrial sawing machine
- Synthetic fiber manufacturing plant

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

Other machinery

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

NOTES

Application to standard motors

- **Driving to standard motor**
  When driving a 400V standard motor with an inverter, damange may occur in the insulation of motor. Use the output circuit filter (OFL) if necessary after confirmation with the motor manufacturer.

- **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 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 being 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 Silectron Sistemi 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 motor's thermal time constant 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 Silectron Sistemi for details.

- **Single-phase motors**
  Single-phase motors are not suitable for inverter-driven variable speed operation.
  Use a three-phase motor.
  * 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˚ and 50˚C.
  Install an inverter on non-flammable material.
  The inverter and braking resistor surfaces become hot under certain operating conditions.

- **Installing Auto Breaker (MCCB)**
  Install an 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.

- **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 and stops are required during motor operation, send FWD and REV signals to and from 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 overload relay to each motor and turn on the inverter's electronic thermal relay.

  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 the operator box to 20m or less and use twisted shield 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.
  If 50m must be exceeded, lower the carrier frequency or mount an output circuit filter (OFL).

- **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 inverters

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