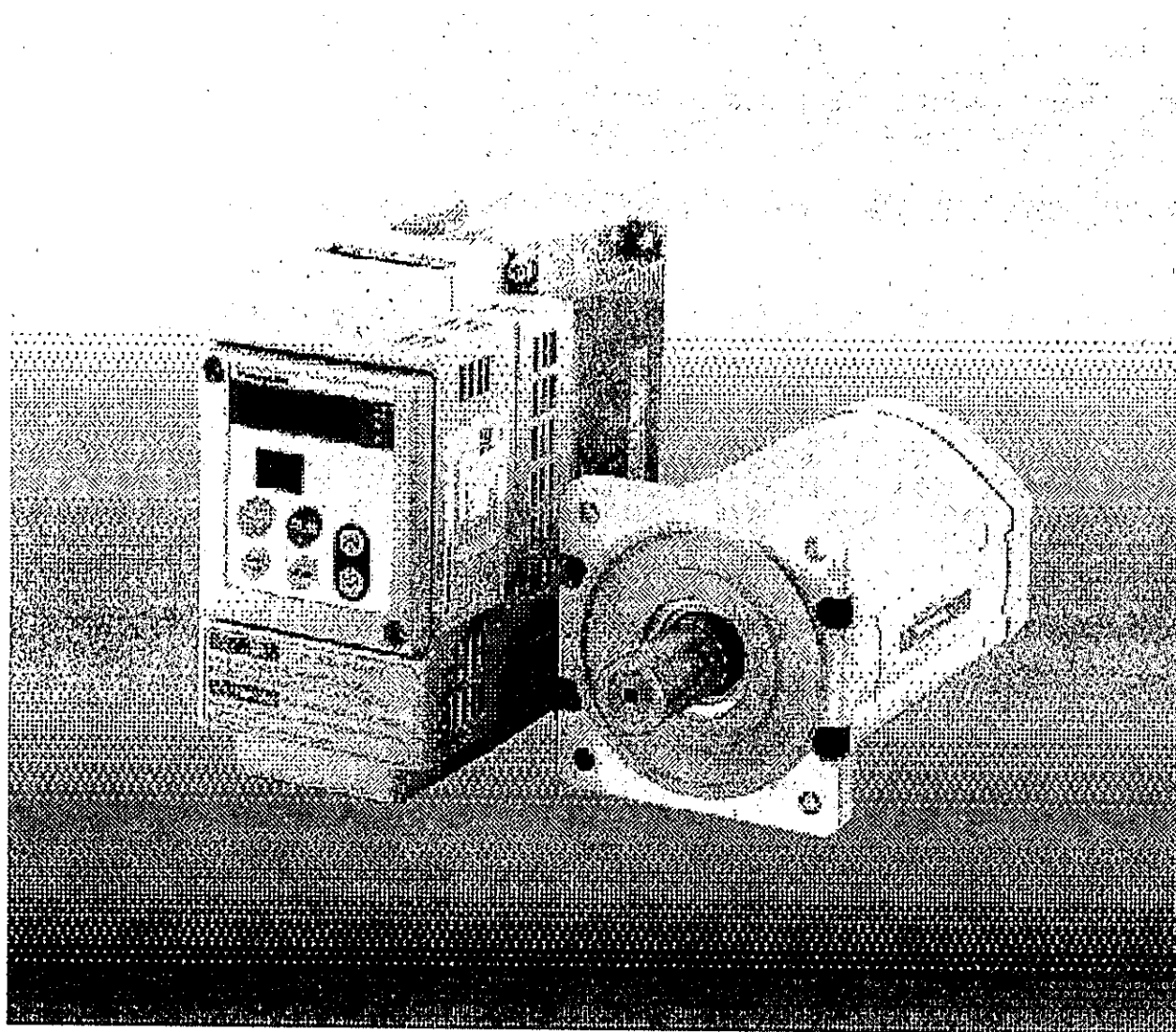# Panasonic

Brushless Inverter MBS Series
Operating Instructions

Be sure to provide the customer with a copy of this manual.

● Thanks you for purchasing a Panasonic Brushless Inverter • Brushless motor.
● Be sure to read the instruction thoroughly before attempting to operate the Inverter. After reading, be sure to keep in a safe place for future reference.

Industrial and Appliance Motor Division, Motor Company

Matsushita Electric Industrial Co., Ltd.

Contents

Before startup

Preparation and Adjustment

If necessary

Application

Spec.

Safety Precautions

Precautions that must be heeded in order to protect the user and others from harm and prevent property loss or damage are as follows:

■ **The extent of injury or damage that could be suffered by improper use contrary to directions is ranked as follows:**

⟡ **DANGER**	Situation involving danger which could result in death or serious injury if equipment is handled incorrectly.
⚠ **CAUTION**	Situation involving danger which could result in medium to light injury, or property damage if equipment is handled incorrectly.

Items labeled as ⚠ CAUTION could be connected with core serious consequences, depending upon the circumstances. These instructions are extremely important and should be observed in all cases.

■ **Installation**

⚠ CAUTION

● Install on non-combustible material such as metal.
Failure to do so could result in fire.

● Do not locate near combustibles.
Doing so could result in fire.

● Do not carry by the front case when moving the inverter.
Doing so is dangerous and could result in injury if dropped.

● Do not allow foreign material such as metal chips to get inside the inverter.
Doing so could result in fire.

● Be sure to install on a base capable of supporting the inverter's weight in accordance with the directions given in the instruction manual.
Failure to do so could result in the inverter dropping or falling.

■ Wiring

◇ DANGER

● Make sure the power is cut off before handling wiring.
Failure to do so could result in electrical shock or fire.

● Be sure to install a no-fuse breaker (NFB) or an earth leakage breaker.
Failure to do so could result in fire.

● Be sure to ground the GND terminal.
Failure to do so could result in electrical shock or fire.

● Have wiring work done a licensed electrician.
Failure to do so could result in electrical shock or fire.

● Be sure to install the inverter before wiring.
Failure to do so could result in electrical shock or fire.

⚠ CAUTION

● Do not ground the AC power source with the output terminals (U/T1, V/T2, W/T3).
Doing so could result in injury or fire.

● Make sure the voltage of the AC power source agrees with the rated voltage of the inverter.
If not, it could result in injury or fire.

Safety Precautions

■ **Operation**

◇ DANGER

● Be sure to mount the case and cover before turning the power on. Never remove the case or cover while the inverter is receiving power.
Failure to mount or removing the case/cover could result in electric shock.

● The operator should secure the area before turning the power on or off.
Failure to do so could result in injury.

● Never operate the switches with wet hands.
Doing so could result in electric shock.

● Never touch the terminals of the inverter when it is charged with power, even when it is not running.
Doing so could result in electric shock.

● If the retry function is selected, the inverter could unexpectedly start operating again if tripped. Do not approach the inverter in the condition.
Doing so could result in injury.

● If trip reset is carried out with the operate signal ON, the inverter could unexpectedly start operating again. Do not approach the inverter in the condition.
Doing so could result in injury.

● Never copy inverter parameters without first stopping operation.
Doing so could result in injury.

● Never copy inverter parameters to any other models of different specifications (output, power supply), even if in the same series.
Doing so could result in injury.

⚠ CAUTION

● The radiator and regenerative resistor become very hot.
Touching these parts could result in skin burning injury.

● The inverter can be easily set to operate at speeds ranging from low to high. Set the operating speed so that the motor and machine tolerance is not exceeded.
Failure to do so could result in injury.

■ Maintenance/inspection

⚠ DANGER

- Wait for at least 5 minutes after turning off the power to perform inspections.
  Failure to do so could result in electric shock.
- Maintenance and inspection should not be performed by anyone except a qualified repairman.
  The repairman should remove all metallic objects (watch, rings, etc.) before performing maintenance or inspection.
  Use only insulated tools when performing maintenance or inspection.
  Failure to do so could result in electric shock or injury.

■ Other

⚠ DANGER

- Absolutely DO NOT modify the inverter in any way.
  Doing so could result in electric shock, injury or fire.

GENERAL PRECAUTIONS

The diagrams given in this instruction manual may show the cases, covers or safety breakers removed in order to show details.
When operating, be sure to return the cases, covers or safety breakers and operate as specified in the manual.

When disposing of the inverter, handle it as an industrial waste.

For the earth connection avoid direct contact between aluminum and copper. Tinplated cable lugs can be used if the plating does not contain zinc. When tightening the screws take care not to damage the thread in the aluminum frame.

Where residual-current-operated protective device (RCD) is used for protection in case of this Electric Equipment(EE). Otherwise, another protective measure shall be applied such as separation of the EE from environment by double reinforced or isolation of EE and supply system by transformer.

When you use a regenerative resister, enclose it with something incombustible so that your hands can not touch it.

- 7 -

Introduction

- Examine the cartons for transit damage.
- If cartons are damaged and the unit within it appears to have sustained damage, notify your local agent.

> Also check the unit model against your order sheet.

Brushless Inverter Model Number

Legend on the nameplate

Panasonic

Model No. MBSK083CSA —————— Model number

Power	750W
Motor	MBMK082B**
Input	3PH AC200 ∿ 230V 50/60Hz
	3.8A
Output	159V
	4.0A
	3000r/min
Ser.No.	99080001

Rated input ——— (Input row)

Rated output ——— (Output row)

Matsushita Electric Industrial Co.,Ltd. Made in Japan ——— Production number (serial number)

Model number

MBSK | 0 8 | 3 | C | S | A

Series

Code	Applicable motor capacity
5A	50W
01	100W
02	200W
04	400W
08	750W

Code	Supply voltage
1	Single phase 100 V
2	Single phase 200 V
3	Three phase 200 V
5	Single phase 100 V (3 φ 200V output)

Code	Suffix for interface spec.
A	Standard (NPN logic)

Code	Operation panel specification
S	Without control dial (standard)
V	With control dial
N	Blank cover

Code	Regenerative braking
A	Without regenerative braking circuit
C	With internal regenerative braking circuit

Internal regenerative braking circuit is installed on a model having motor capacity of 200 W or more.
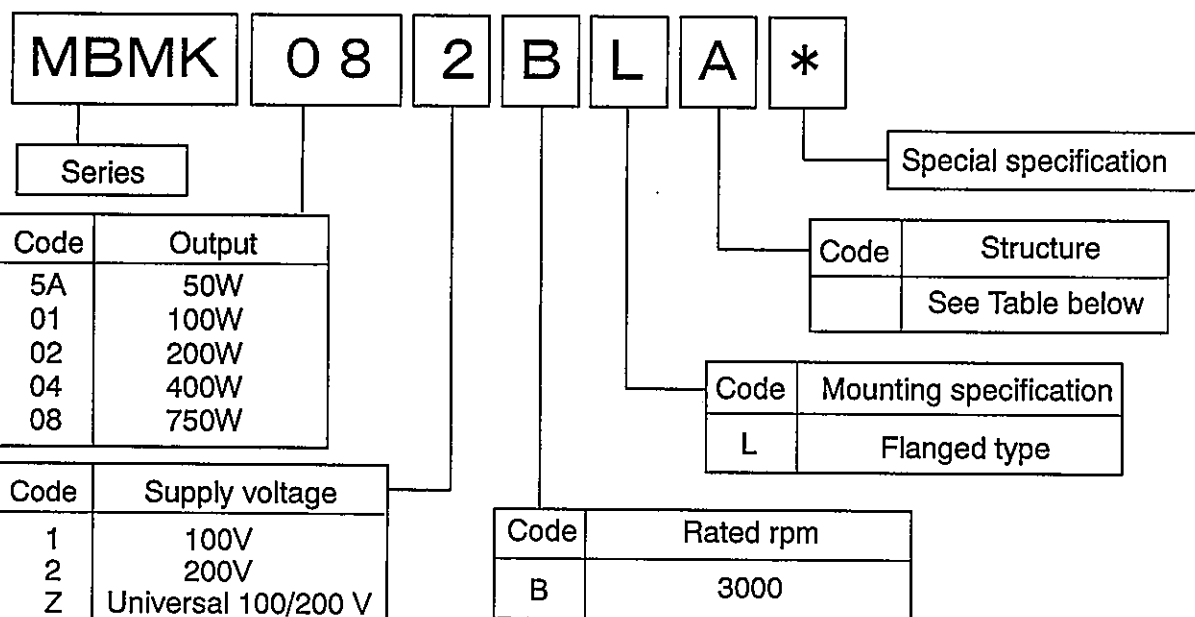
Brushless Motor Model Number

Legend on the nameplate

MODEL MBMK082BLA ——— Model number
Panasonic
SER No. 99100001 —— Made in Japan

Production number
(serial number)

Model number

| MBMK | 08 | 2 | B | L | A | * |

Series

Code	Output
5A	50W
01	100W
02	200W
04	400W
08	750W

Code	Supply voltage
1	100V
2	200V
Z	Universal 100/200 V

Code	Rated rpm
B	3000

Code	Mounting specification
L	Flanged type

Code	Structure
	See Table below

Special specification
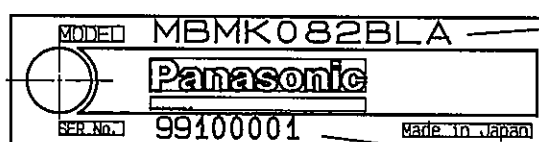
Brushless inverter list

Inverter	Capacity (W)	Input Voltage (V)	Output Voltage (V)	Rated current (A) [1]	Rated rpm
MBSK5A1***	50	100	100	1.2	
MBSK011***	100	100	100	2.3	
MBSK021***	200	100	100	2.9	
MBSK5A3***	50	200	200	1.2	
MBSK013***	100	200	200	1.1	
MBSK023***	200	200	200	1.8	3000
MBSK043***	400	200	200	2.9	
MBSK083***	750	200	200	4.0	
MBSV3A5***	25	100	200	0.8	
MBSV5A5***	50	100	200	0.8	
MBSV015***	100	100	200	0.7	
MBSV025***	200	100	200	1.5	

[1] When the carrier frequency is set at 8 kHz or higher, then the current must be derated to 80%.
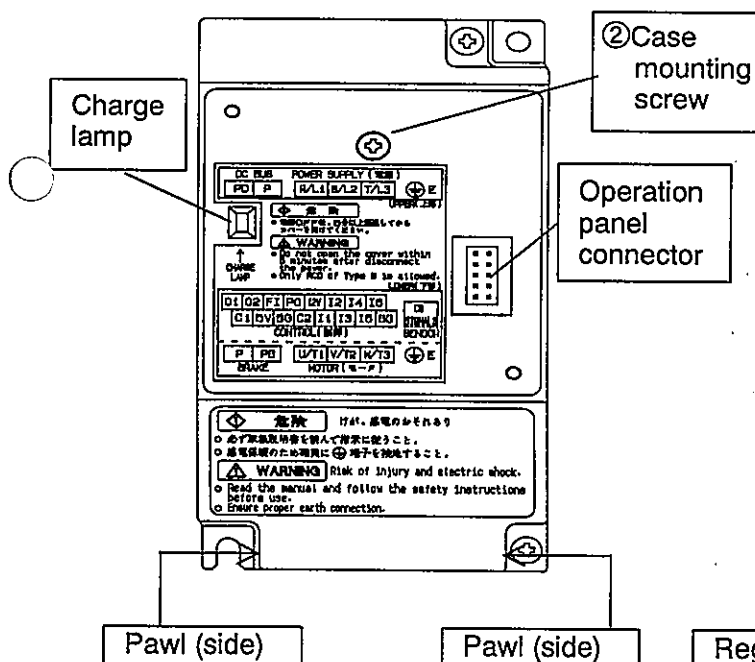
Panel description

Outline

① Operation panel mounting screws
To remove the operation panel, unscrew and remove these screws.

② Case mounting screw
To remove the case, loosen this screw and press the portion below pawl (marked by a circle with slash marks, 2 positions).]
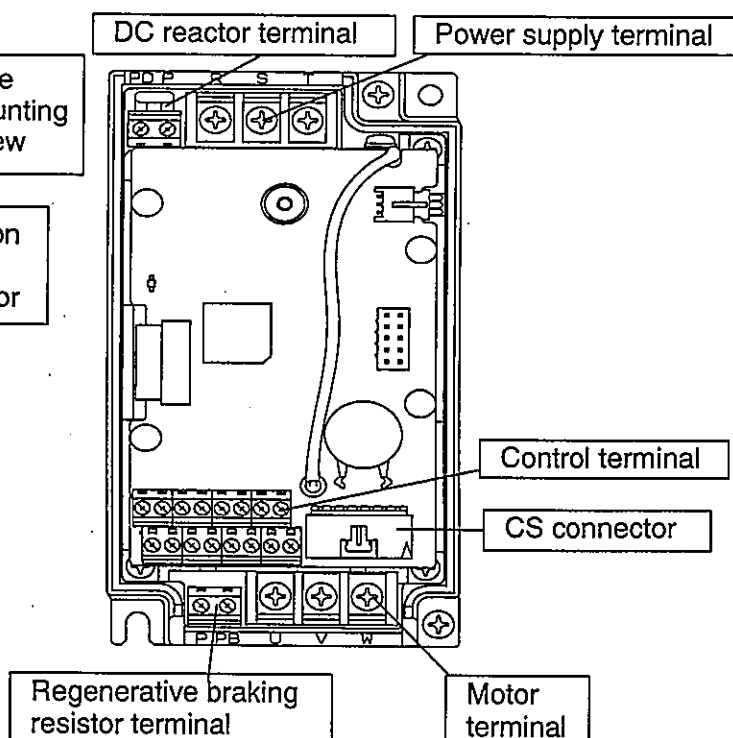
Side view

Front view

GND terminal

Operation panel

Control dial
(Control dial model only)

① Operation panel mounting screws

Case

GND terminal
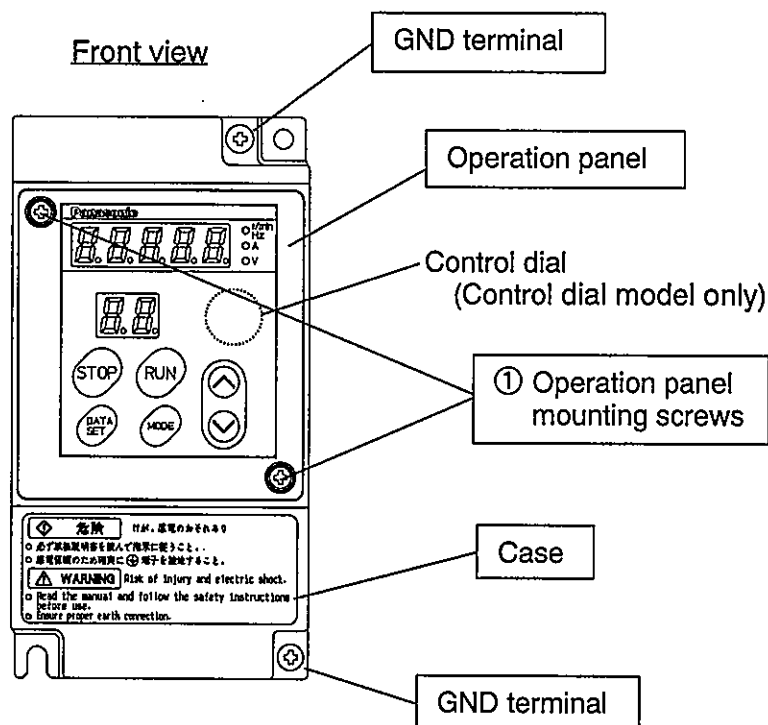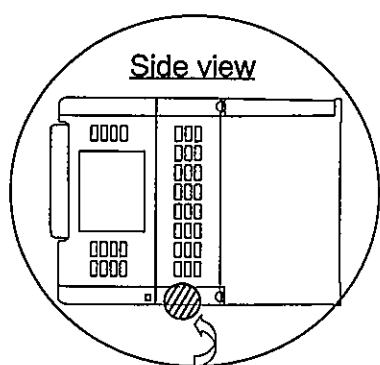
Example: MBSK083CSA

Operation panel removed

Charge lamp

②Case mounting screw

Operation panel connector

Pawl (side)

Pawl (side)

Case removed

DC reactor terminal

Power supply terminal

Control terminal

CS connector

Regenerative braking resistor terminal

Motor terminal

- Consider effects of electrostatic during wiring work.
- Do not touch operation panel connectors or control circuitry.
- After wiring be sure to reinstall the case and operation panel as before.

CAUTION

Instructions for safe and correct operation

Take necessary precautions to eliminate operation error and damage to the inverter. Observe the instructions described below.

1. When not to use the inverter for a long period, turn off power supply to the unit to prevent accidental operation and electrical shock.
2. The capacity of the power source must be in the range 1.5 times the inverter capacity to 500 kVA. If the power source has 500 kVA or higher capacity and the length of the cable between it and the inverter is 100 m or less, or if the power source has a phase advancing capacitor selector, excessive peak current will flow into the power source input circuit and may damage the converter. If this is the case, install power factor improvement AC reactor at the input of each inverter.
3. Do not connect the phase advancing capacitor to the inverter output. Otherwise, the capacitor may be damaged.
4. Do not install an electromagnetic contactor between the inverter and motor. Run/stop the motor from inverter operation panel using the RUN switch or control input terminal. Do not operate the electromagnetic contactor installed on the power source more often than actually required.
5. The life expectancy of the inverter heavily depends on the ambient temperature. Use the inverter at near lower limit of the specified ambient temperature range.
6. Do not operate the inverter and the motor under overloaded condition which they cannot meet.
7. Operating the motor through the inverter increase leakage current that may trip the leakage breaker. If this the case, use leakage breaker of high frequency proof type (designed for use with inverter) on both the system causing the problem and system affected.
8. The total cable length of the inverter and motor must be shorter than 20 m.
9. During motor operation, inverter and motor themselves, terminals and input and output lines, all may generate radio noises, causing interference on susceptible electronic devices. If this is the case, connect a filter to the input of the inverter or run the cables through a conduit, which will reduce unwanted radio energy to some extent.
10. To avoid accidental unsafe condition, perform trial run the machine before production operation (see section, trial run). Use the free run instruction to activate double stopping mechanism to assure safety. An emergency stop switch is recommended to isolate the power source.
11. Connect cables to the motor in the correct phasing (U/T1, V/T2, W/T3). It is not possible to have reversed rotation by simply changing phase connections.
12. Secure installation and mount against earthquake damage and personal injury.
13. After an earthquake, check the inverter, motor and machine for installation condition and safety before starting them.

Appricatable standards   Compliance with the EMC requirements need to be shown on system level after installation of the equipment.

Subjedt	Applicable standard	
Motor and Driver	EN50178	Standards Referenced by Low-Voltage Directive
	EN55011 Radio Disturbance Characteristics of Indaustrial. Science and Medical (ISM) Radio-Frequency Equipment	Standard Referenced by EMC Directives (IEC61000-6-2)
	EN61000-4-2 Electrostatic Discharge Immunity Test	
	EN61000-4-3 Radio-Frequency Electromagnetic Field Immunity Test	
	EN61000-4-4 Electric High-speed Transition Phenomenon-Burst Immunity Test	
	EN61000-4-5 Lightning Surge Immunity Test	
	EN61000-4-6 High Frequency Conduction-Immunity Test	
	EN61000-4-11 Instantaneous Outage-Immunity Test	

Installation

Brushless inverter

Install the inverter properly to prevent equipment failure or accidents.

Installation location

① Install the inverter indoors in a place not exposed to rain or direct sunlight. The inverter is not waterproof.
② Install in a place not exposed to corrosive/flammable gases, grinding fluid, oil mist, metal powder or chips.
③ Place with adequate ventilation, which is not exposed to excessive humidity, dirt or dust.
④ Place not subject to vibration.

Environmental conditions

Item	Conditions
Ambient temperature	-10 to 50℃ (no freezing) -10 to 40℃ (single phase power input)
Ambient humidity	Max. 90%RH (no dewing)
Storage temperature	-20℃ to 65℃ (no freezing) *
Storage humidity	Max. 90 %RH (no dewing)
Protective construction	IP20 (panel specification)
Vibration	Max. 5.9 m/s^2 (10 to 60Hz)
Elevation	Max. 1000 m

* For a shorter period in transit.

Mounting direction and clearance

• Provide sufficient clearance for effective cooling.
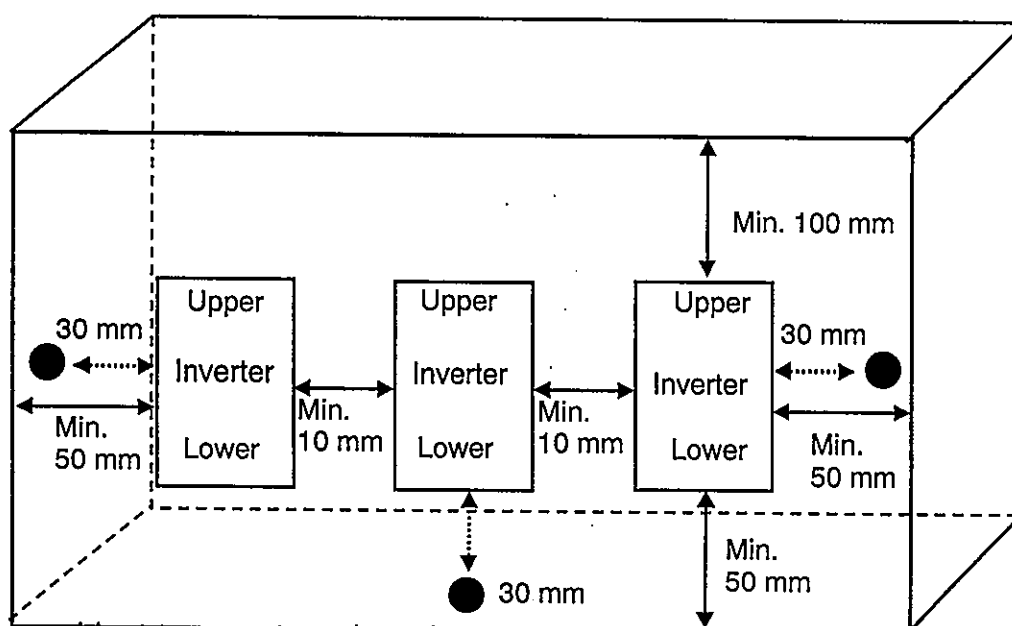
Make sure ambient temperature doesn't exceed allowable temperature at position indicated by ● in the figure above.

Brushless motor

Install the inverter properly to prevent equipment failure or accidents.

Installation location

① Install the inverter indoors in a place not exposed to rain or direct sunlight.
② Install in a place not exposed to corrosive/flammable gases, grinding fluid, oil mist, metal powder or chips.
③ Place with adequate ventilation, which is not exposed to excessive humidity, dirt or dust.
④ Place that allows for easier checking and cleaning.

Environmental conditions

Item	Conditions
Ambient temperature	0 to 40℃ (no freezing)
Ambient humidity	Max. 85%RH (no dewing)
Storage temperature	-20℃ to 80℃ (no freezing) *
Storage humidity	Max. 85 %RH (no dewing)
Vibration	Max. 24.5 m/s^2

* For a shorter period in transit.

Mounting considerations

The motor can be horizontally or vertically provided that the following instructions are observed.

① Horizontal mounting
Lead wires must face down to avoid entry of foreign materials including dust.
② Vertical mounting
When installing a motor with speed reducer vertically with the shaft facing up, prevent the oil from the speed reducer from entering the motor.
③ Mounting flanged motor
The size of the face plate holding the motor is a deterring factor of temperature rise. The size of plate shown below must be observed.

| Motor		Panel dimensions (A×B×C)	Material
MBMK5AZBL**	□38	100×80×t10	Aluminum
MBMK011BL** MBMK012BL** MBMK021BL** MBMK022BL** MBMk042BL**	□60	130×120×t12	Aluminum
MBMK082BL**	□80	170×160×t12	Aluminum

Installation

Mounting panel dimensions
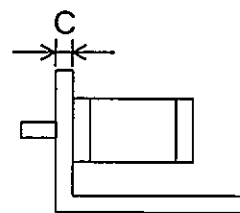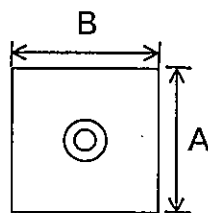
Protection against oil and water

① Do not use the motor in a location where it may be exposed to oil or water.
② When using a motor in conjunction with a speed reducer, select a motor equipped with oil seal, to prevent oil from entering along the shaft.
③ Do not use the motor with the cable immersed in water or oil.
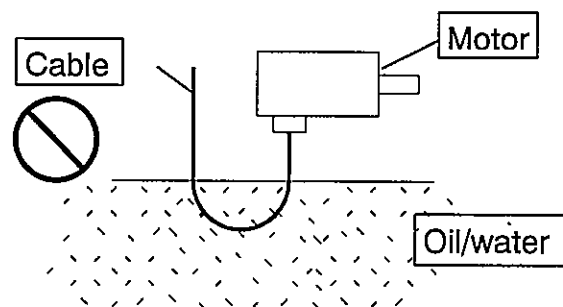
Stress on the cable

① Avoid exertion of stress on the cable lead wires and connections due to bending and dead weight.
② When the motor is used without permanently fixed at a place, firmly secure the motor cable on the body and store the extension cable in the cable bearer to minimize stress due to bending.
③ Make the radius of cable curvature as large as possible.

Allowable load on output shaft

① When installing and operating the motor, make sure that the machine system will not apply the radial load and thrust load exceeding the model specific allowable load, to the motor shaft.
② Do not use a rigid coupling, otherwise, excessive bending load will cause damage to or shorten the life of the shaft or bearing.
③ Use a flexible coupling of material that possesses high stiffness to have a radial load below the allowable limit even if small eccentricity occurs.

Installing considerations

① When attaching (detaching) the coupling to the motor shaft, do not directly hit the tool (e.g. a hammer) against the shaft. The sensor on the opposite shaft end may be damaged.
② Centering must be precisely performed to avoid vibration that will damage the bearing.
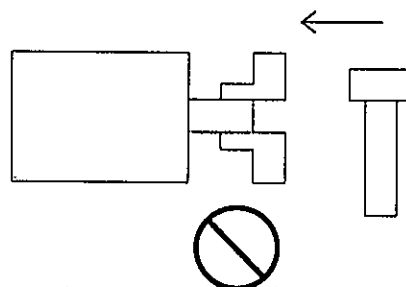
System Configuration and Wiring

● Wiring must be performed by a qualified electrician.
● To avoid electric shock, do not connect the power supply to the unit.

No-fuse breaker (NFB)
or earth leakage breaker

Used to protect the power line.
Interrupts the circuit in the case of excessive current.
Note: Use a high frequency proof earth leakage breaker for the inverter.

Noise filter (NF)

Blocks noise from the power line.
Also reduces effect of noise from the servomotor.

Magnetic contactor (MC)

Turn main power to servomotor on/off.
Used with surge absorber mounted.

AC reactor (AC-L)

Reduces harmonic current of the power source.
Refer to "Option."

DC reactor (DC-L)

Reduces the high frequency current of the power source.

Inverter

GND
Grounding

Be sure to connect GND wire to the earth to avoid electric shock.

Improves regenerative braking capability.

Only for a model with built-in regenerative braking circuit.
Refer to "Options."

Motor

Preparation and Adjustment

System Configuration and Wiring

Brushless inverter and applicable peripheral equipment

Wiring apparatus selection

(1) Selection of no-fuse breaker, magnetic contactor, thermal relay, and wiring

Inverter No.	Applicable motor (W)	No-fuse breaker (Rated current)	Magnetic contactor (Contact configuration)	Thermal relay (Current adjustment range)	Wiring (mm²)		
					Main circuit	Control circuit	CS wire
MBSK5A1***	50	BBC25 (5A)	BMFT61041N (3P+1a)	BMF902E (0.95~1.45A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK011***	100	BBC25 (5A)	BMFT61041N (3P+1a)	BMF904E (1.7~2.6A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK021***	200	BBC25 (5A)	BMFT61041N (3P+1a)	BMF907E (2.8~4.2A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK5A3***	50	BBC35 (5A)	BMFT61042N (3P+1a)	BMF902E (0.95~1.45A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK013***	100	BBC35 (5A)	BMFT61042N (3P+1a)	BMF902E (0.95~1.45A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK023***	200	BBC35 (5A)	BMFT61042N (3P+1a)	BMF903E (1.4~2.2A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK043***	400	BBC35 (5A)	BMFT61042N (3P+1a)	BMF907E (2.8~4.2A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)
MBSK083***	750	BBC310 (10A)	BMFT61042N (3P+1a)	BMF907E (2.8~4.2A)	0.75 (AWG18)	0.75 (AWG18)	0.2 (AWG24)

The cable connected to the earth terminal (⊕) must be of the same size as the cable used in the main circuit.

No-fuse breaker, electromagnetic contactor and thermal relay: Matsushita Electric Works

(2) Relay selection

For relays used in control circuits such as the control input terminal, you should use a small signal relay (min. guaranteed current of 1mA or less) in order to prevent poor contact.

<Examples>　Matsushita Electric Works:　DS type, NK type, HC type
　　　　　　　　Omron:　　　　　　　　　　G2A type

(3) Control circuit switch selection

If using a switch instead of a relay, use a switch for extremely small current in order to prevent poor contact.

<Example>　Nihon Kaiheiki:　M-2012J-G

Wiring

Standard wiring diagram

Short (direct current reactor connection terminal)

Power source 50/60 Hz
Single phase 100-120 V or
Three phase 200-230 V

● If a single phase, connect it across R/L1 and S/L2.

External speed setting potentiometer 1/4W 5kΩ B curve

Revolution pulse signal

Control GND

CCW/stop switch *
CW/stop switch *
Speed setting selection (1)
Speed setting selection (2)
Free-run‡
Trip reset*

To regenerative resistor (200 W or higher)

Motor

(collector) Trip signal*

(collector) Arrival signal*

(Emitter)
VcE max =DC24V
Ic max =50mA

Be sure to provide proper treatment for the shielded wire terminals.

Be sure to connect to the earth with 100Ω or lower grounding resistance.

Asterisk (*) indicates factory-set function.

In case of MBSK083CSA

System Configuration and Wiring

(1) Main circuit terminal

Upper | P D | P | | R/L1 | S/L2 | T/L3 | E ⊚ ⏚   Lower | P | P B | | U/T1 | V/T2 | W/T3 | E ⊚ ⏚
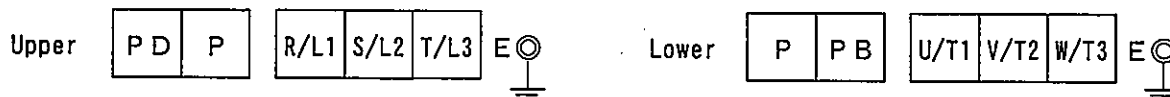
Terminal No.	Terminal name	Function description	Terminal screw size	Tightening torque N·m
R,S,T / L1,L2,L3	Power source input terminal	Connect to three- or single-phase power source: connect only R/L and S/L2 to the power source, if a single-phase	M3.5	0.8 ~ 1.0
U,V,W / T1,T2,T3	Output terminal	Connect to brushless motor	M3.5	0.8 ~ 1.0
E	GND terminal	Connect to the base of brushless inverter	M4	1.0 ~ 1.2
PD, P	Reactor terminal	DC reactor connection terminal	M2.5	0.3 ~ 0.5
P, PB	Regenerative resistor terminal	Regenerative resistor connection terminal*	M2.5	0.3 ~ 0.5

* Not provided on a model, 100 W or smaller.
* Choose from our optional regenerative resistors to avoid failure, heat generation and fire.

(2) Control terminal

01	02	FI	PO	12V	I2	I4	I6
C1	5V	SG	C2	I1	I3	I5	SG

<Terminal screw size M2, Tightening torque 0.20-0.25N·m>
* Use screwdriver with No.0 tip (bit).

Terminal No.		Terminal name	Function description
12V		12 V power supply	+12 V, Imax. = 20 mA
5V		Speed setting power supply	+5 V, Imax. = 20 mA.
SG		Signal ground	Ground reference for speed setting input.
Input terminal	FI	Speed setting input	The speed can be adjusted by applying DC voltage of 0 to +5 V on this pin with respect to SG and also by changing [1 7 Speed command selection] to 0 - 5 .
	I1	CCW/stop command	Connect I1 to SG for CCW and open this pin for stop. Connect I2 to SG for CW and open this pin for stop.
	I2	CW/stop command	By changing [4 6 I1/I2 Function selection], the toggle switching function of both pins can be changed: I1: run/stop; I2: CW/CCW.

Terminal No.	Terminal name	Function description
Output terminal I3 I4 I5 I6	Frequency setting selection terminal	You can select the following functions by "operation mode selection." <table><tr><td>Operation mode</td><td>I3</td><td>I4</td><td>I5</td><td>I6</td></tr><tr><td>2-speed operation mode</td><td rowspan="4">Frequency setting selection</td><td>Trip reset</td><td colspan="2">Select from among free-run, external forced trip, No. 2 acceleration/deceleration, trip reset</td></tr><tr><td>4-speed operation mode</td><td></td><td colspan="2"></td></tr><tr><td>8-speed operation mode</td><td></td><td colspan="2"></td></tr><tr><td>16-speed operation mode</td><td></td><td colspan="2"></td></tr></table>
SG	Contact input GND	Ground reference common to NPN logic specification (standard). Same as signal ground, SG.
Input terminal PO C2	Revolution pulse signal output	This open collector outputs a pulse whose frequency represents the number of motor revolutions (active while power is on). The pulses/revolution can be selected using [**d 4** PO output pulse selection]. For example, when [**d 4** PO output pulse select] is [**0**], then pulse width is 500 μ s and, Ic max. = 50 mA, Vce max. = 24 VDC Vce (L) = 1 V or below (at Ic = 10 mA, Ta = 25°C)
01 C1 02	Output signal	Open collector output (active while power is on). The following output signals can be selected from [**5 1** output signal (1) selection] (01) and [**5 2** output signal (2) selection] (02): CW/CCW, trip output, arrival, run/stop, free-run, braking, trip event output, revolution speed detect, overload detect, motor current pulse. Default settings are: [01] - trip signal; [02] – arrival signal. (Signal is generated when transistor is on.) [01] and [02]: collector; [C1]: emitter Ic max. = 50 mA, Vce max. = 24 VDC Vce (L) = 1 V or below (at Ic = 10 mA, Ta = 25°C)

(3) CS connector

Connector: Japan Molex 53103-0750

Terminal No.	Terminal name	Function description
1: 12V	CS supply voltage	+12 VDC
2: CS1	CS1	CS1 signal input
3: CS2	CS2	CS2 signal input
4: CS3	CS3	CS3 signal input
5: SG	CS GND	CS signal ground reference
6: NC	Unused	
7: FG	Frame ground	Connected to motor frame

System Configuration and Wiring

Internal circuits retain high voltage for a certain period time after power is off. Wait at least for 5 minutes after power off before starting any wiring.

Main circuit

(1) The inverter will be damaged if you invert the connections of the power input terminal and motor output terminal (U/L1, V/L2, W/L3). Absolutely do not invert connections.

(2) Do not ground the main circuit terminal.

(3) Do not short motor output terminals (U/L1, V/L2, W/L3) together.

(4) The GND terminal (E) is the frame ground (FG) for the inverter. Ground with at least ground (max.100Ω).

(5) Conductors to be terminated on the main circuit must be connected through an eyelet terminal coated with insulating material.

Control circuit

(1) When connecting a control circuit conductor, strip off a suitable length of insulation: too long bare conductor will touch with another conductor; too short bare conductor will easily pull off the connection. When connecting two more conductors together, twist them before wiring or connecting.

5.5 mm ± 1 mm
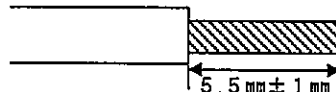
(2) When using a bar terminal or solid conductor, select one having a diameter equal to 0.9 mm or less. Fastening screw may be damaged.

(3) Do not apply more than 24VDC, 50mA to the output terminals (O1, O2, C1), or apply voltage to terminal in reverse.

(4) Input terminal (standard, NPN logic circuit) has an internal pull-up resistor (3.9 kΩ) connected to approx. +12 VDC supply. The terminal function can be controlled through a contact or open collector output. Do not apply external voltage to this terminal. Refer to the standard wiring diagram.

(5) Never connect the speed setting terminal (5 V) to control GND terminal (SG).

(6) To directly drive the relay by the output terminals (O1, O2, C1), mount a flywheel diode (FD).
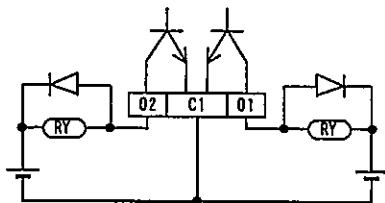
<Examples> Fuji Electric ERA15-01
ERB12-01

Pay attention to polarity of diode.

(7) Use shielded wires for the cable to be connected to the control circuit.

(8) Do not touch the live control terminals. Otherwise, electrostatic may lead to improper operation.

Parameter Setting

Operation Panel
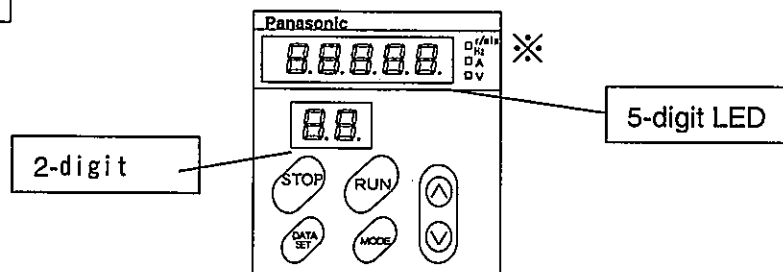
2-digit

5-digit LED

* The panel reads rpm instead of frequency in the monitoring mode.
* The readings are just for reference and cannot be an alternative to that on an instrument. Parameter [6 1 Display scale factor] can be applied to the values to be displayed.

5-digit LED	Reads rpm, set speed, cause of problem or parameter.
2-digit LED	Indicates parameter number. Shows the direction of rotation viewed from the motor shaft during operation. [F] ... CCW; [r] ... CW.
MODE switch	Selects the target of monitoring. When repeatedly pressed, cycles from "r/min", "converter voltage" to "output current" and then back to "r/min".
DATA SET switch	Switch for selecting parameter No. mode and parameter value mode, setting parameter value.
△ ▽ switch	Use to select, set and modify a parameter. Can be held down for continuous changing.
RUN switch	Commands the inverter to run. If [1 6 Run command selection] is PnL, bOTH.
STOP switch	Commands the inverter to stop. If [1 6 Run command selection] is PnL, bOTH.

● Mode description

Monitor mode	**Default mode.** Displays revolutions, converter DC voltage, output current on the 5-digit LED. Displays the set speed with parameter [6 0 Monitor mode selection]. Pressing MODE button while in the parameter number mode or parameter value setting mode returns to this mode.
Parameter number mode	**Flashes** a parameter number (0 0 - 9 9). Pressing DATA SET switch in the monitor mode enters this mode.
Parameter value setting mode	**Flashes** content (settings) of a parameter. Use △ and ▽ buttons to change the setting and then press DATA SET switch to save the changes. MODE switch has no memory storage function.

Parameter Setting

Power ON → Monitor mode

r/min
r/min · ○○ H z
↑ ●
MODE
↑
Current ○ A MODE
● ○
MODE
↑
Converter voltage ○○ V
●

Direct speed setting of No.0. Use $\wedge$ and $\vee$.

Note: When [1 7 Speed setting selection] is P n L.

MODE   DATA SET

$\wedge$ $\vee$

Simplified setting [0 0] only

Parameter No. mode

MODE   DATA SET   DATA SET

Storage

To monitor mode

Parameter value mode

Pressing DATA SET switch in the parameter value mode stores the data. If MODE switch, the data will be saved upon power off.

● Parameter LED will blink
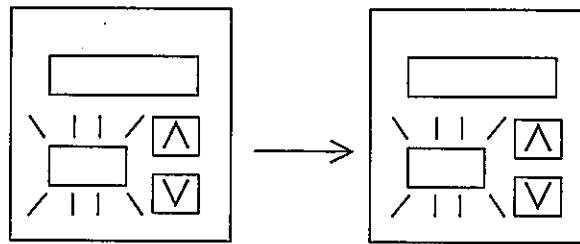
Select the desired parameter No. using $\wedge$ and $\vee$.

● Parameter LED will blink
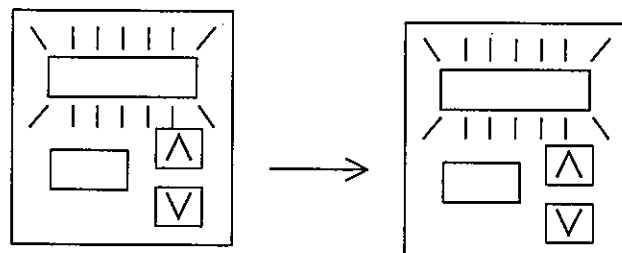
Select the desired parameter No. using $\wedge$ and $\vee$.

Simplified setting

● Pressing $\wedge$ and $\vee$ in the monitor mode blinks the settings of [0 0 Set speed (No.0 speed)], which can be changed using $\wedge$ and $\vee$.

Test Operation

Pre-operation inspections

After installing and wiring, inspect the following before running the inverter.
(1) Review the wiring: thoroughly recheck power supply input terminals R/L1, S/L2 and T/L3 and output terminals U/T1, V/T2 and W/T3 for improper connection, short-circuited load or earth fault.
(2) Does input power comply with the rating?
(3) Are there any places that could be shorted by wire cuttings, etc?
(4) Are any screws or terminals loose?
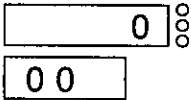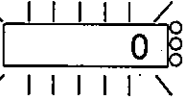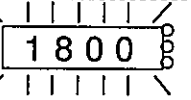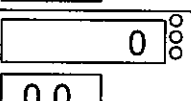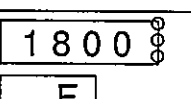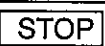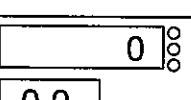
Test run

(1) Preparation for safety operation
　① Set the motor so that it can be independently operated.
　② Turn off all the inputs on the control terminal block.
(2) Follow the test procedure:
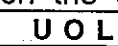
Step	Operation panel		Remarks
	Switch	Display on LED	
① Power ON		0 0 0	• Monitor mode upon power-up Speed display: r/min
② Set the speed (See Note)	Press [∧].	0 0 0	• No.0 speed is displayed (0 r/min)
	Press [∧] and set speed.	1 8 0 0 0 0	• No.0 speed is set to 1800 r/min
③ Return back to the monitor mode	Press [MODE]	0 0 0	• When power is turned off, the data is stored in memory.
④ Run (forward) command	Press [RUN]	1 8 0 0 F	• r/min reading gradually increases toward 1800 r/min • Direction is indicated
⑤ Stop command	Press [STOP]	0 0 0	• r/min M reading gradually decreases toward 0 r/min
⑥ Power OFF			• Reset to initial value before power off.

<Operation check>

① Smooth motor rotation. No unusual sound. No excessive vibration.
② Smooth acceleration and deceleration.
③ Motor direction and speed.

Note: When setting the speed from the control dial on the operation panel, set the parameter [1 7　Speed command selection] to [U O L] Operation panel dial].

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Operation Function

Selection of the run command

The inverter can be controlled by using speed and run commands, either from the operation panel or terminal block. Any one of the six operating modes can be selected.

	Speed command		Run command		Parameter	
	From operation panel, or control dial	Terminal block [FI]	Operation panel	Terminal block	1 7 Speed command	1 6 Run command
1	O		O *1*2	O *1	P n L or U O L	b O , H
2		O	O *1*2	O *1	0 - 5	b O , H
3	O		O *2		P n L or U O L	P n L (panel)
4		O	O *2		0 - 5	P n L (panel)
5	O			O	P n L or U O L	, E r (terminal block)
6		O		O	0 - 5	, E r (terminal block)

Default settings: 1 7 Speed command [P n L], 1 6 Run command [b O , H]

Changing speed command

Example: Change 1 7 Speed command - from [P n L] to [U O L]

Step	Operation panel	
	Switch	LED display
① Power ON		0 / 0 0
② Parameter number mode	Press [DATA SET]	0 / P n L
	Using [∧], select the parameter No.	0 0 / 1 7
③ Parameter set value mode	Press [DATA SET]	
	Using [∧], select the parameter value	P n l / U O L
	Press [DATA SET] to save the value	1 7 / 1 7
④ Trip reset	Simultaneously press [∧] and [∨]	C A U / 0 0 0 / 0 0

---

*1 The run command from the terminal block overrides the command from the operation panel, if both are enabled.
The RUN switch on the operation panel is active only when CCW/stop switch [I1] and CW/stop switch [I2] on the terminal block are off. If both or one of [I1] and [I2] are turned on while the RUN switch is active, the operation mode set from RUN switch is cancelled.
*2 Run command from the operation panel causes the motor to rotate in the direction as with [I1] command from the terminal block.

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The inverter has the following control functions that are made active from the operation panel and terminal block.

Operation control	Description
Free-run stop	• Turns off power supply to the motor allowing it to coast. This feature is useful when the motor is mechanically braked. Remember that touching motor output terminals (U/T1, V/T2, W/T3) during this mode will cause electric shock.
Deceleration stop	• Slows down the motor according to the specified time delay.
Braking at stop	• Braking can be started in the 3-phase lower side short-circuit mode upon stopping of the inverter. • The speed at which braking starts can be set in the parameter. • This function is enabled while in the deceleration stop mode. • Disabled upon tripping, changing to the free-run stop mode.

<Braking at stop timing chart>

Run command

Preset deceleration time

Time set in [2 6 Brake time upon stop]

Specified speed

Time set in [2 9 Brake start speed]

Time determined by GD^2 and torque of the load

Motor speed vs brake

Regenerative braking   Braking at stop

- 25 -
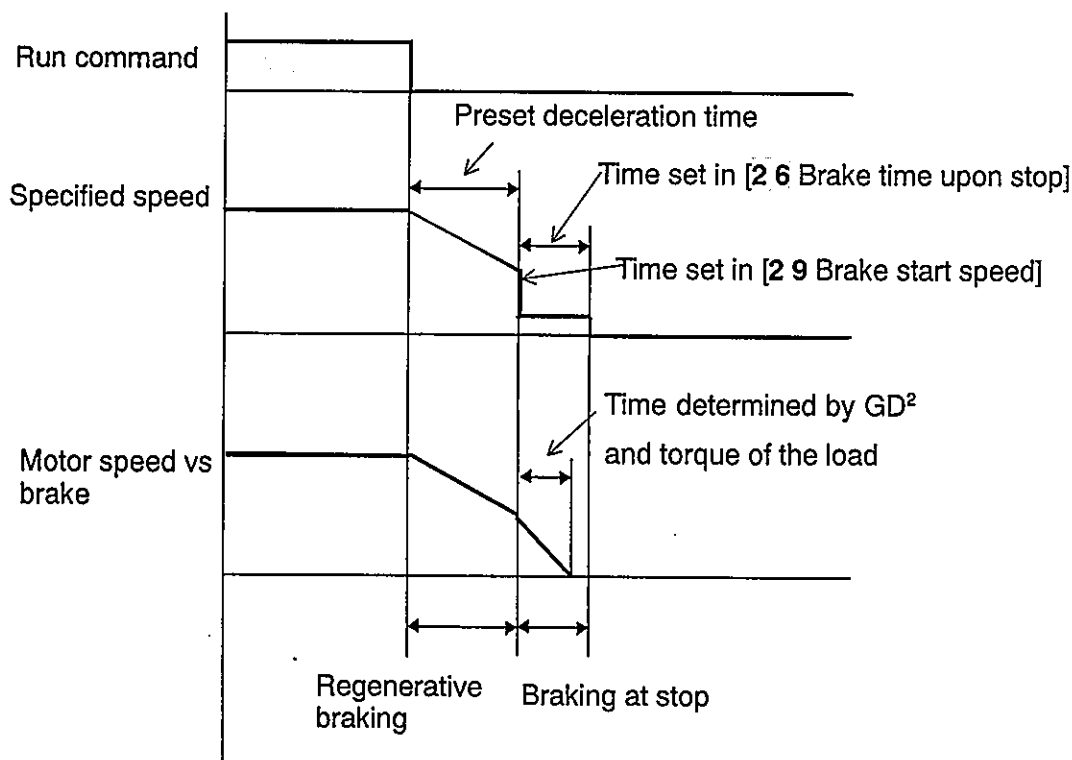
Operation Function

Run mode

The inverter operates in the following two run modes.

Select the desired mode in the parameter [1 8 ： Run mode selection].

Mode	Function of terminal block						Setting in[1 8 ： Run mode selection].
	l 1	l 2	l 3	l 4	l 5 [*1]	l 6 [*1]	
2-speed	C C W [*2]	C W [*2]	Speed selection	Trip reset command	Free-run stop External forced trip command No.2 acceleration/ deceleration time selection Trip reset command		[2]
4-speed	C C W	C W	Speed selection .		Free-run stop (l5) External forced trip command No.2 acceleration/ deceleration time selection Trip reset command (l6)		[4] Default setting
8-speed	C C W	C W	Speed selection		Free-run stop External forced trip command No.2 acceleration/ deceleration time selection Trip reset command		[8]
16-speed	C C W	C W	Speed selection				[1 6]

In the 4-, 8- or 16-speed mode, the following multispeed operation is made possible by connecting/disconnecting speed setting selection terminals. If all the terminals are open, then No.0 speed is selected, enabling either the parameter [0 0 Set speed (No.0 speed)], external speed setting, or the control dial on the operation panel.

Set the parameter [1 7 Speed command selection] to No.0 speed; or select external speed setting (analog command, external speed setting dial); or set from the control dial on the operation panel.

■ Input terminal description

(1) Input terminals are given the following priority.

| Braking at stop < normal operation < free-run stop < external forced trip |

Example:

① Operation continues upon the run command while in braking at stop.

② The motor cannot return to the normal mode even if it is given the run command once it has received the free-run command.

Conflicting commands (e.g. CCW and CW commands at the same time) are ignored and automatically replaced by free-run stop command.

(2) Trip can be cancelled by issuing CCW and CW commands after removing the cause.

[*1] [4 7 － l5 Function selection], [4 8 － l6 Function selection]

[*2] When viewed from motor output shaft.

■Selecting the speed in multispeed operation

◆ In the tables below, ON indicates that the terminal is connected to [SG] and OFF indicates both the terminal and [SG] are open. X indicates ON or OFF will do.

(1) When [4 9 Multispeed input selection] is [I b I ,] (1 bit): 1-bit input, one speed setting can be assigned for each [Speed setting selection terminal].
In the 4-speed mode the speed can be changed three times, in 8-speed mode 4 times and in 16-speed mode, 5 times.

Example: 16-speed mode

Control terminal number				Speed setting
I 3	I 4	I 5	I 6	
OFF	OFF	OFF	OFF	0th speed
ON	X	X	X	1st speed
OFF	ON	X	X	2nd speed
OFF	OFF	ON	X	3rd speed
OFF	OFF	OFF	ON	4th speed

(2) When [4 9 Multispeed input selection] is [b I n] (binary): binary input, the desired speed can be selected by setting a binary number on the [Speed setting selection terminal].

<2-speed mode>

I 3	Speed setting
OFF	0th speed
ON	1st speed

<4-speed mode>

I 3	I 4	Speed setting
OFF	OFF	0th speed
ON	OFF	1st speed
OFF	ON	2nd speed
ON	ON	3rd speed

<8-speed mode>

I 3	I 4	I 5	Speed setting
OFF	OFF	OFF	0th speed
ON	OFF	OFF	1st speed
OFF	ON	OFF	2nd speed
ON	ON	OFF	3rd speed
OFF	OFF	ON	4th speed
ON	OFF	ON	5th speed
OFF	ON	ON	6th speed
ON	ON	ON	7th speed

Preparation and Adjustment

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Operation Function

<16-speed mode>

I 3	I 4	I 5	I 6	Speed setting
OFF	OFF	OFF	OFF	0th speed
ON	OFF	OFF	OFF	1st speed
OFF	ON	OFF	OFF	2nd speed
ON	ON	OFF	OFF	3rd speed
OFF	OFF	ON	OFF	4th speed
ON	OFF	ON	OFF	5th speed
OFF	ON	ON	OFF	6th speed
ON	ON	ON	OFF	7th speed
OFF	OFF	OFF	ON	8th speed
ON	OFF	OFF	ON	9th speed
OFF	ON	OFF	ON	10th speed
ON	ON	OFF	ON	11th speed
OFF	OFF	ON	ON	12th speed
ON	OFF	ON	ON	13th speed
OFF	ON	ON	ON	14th speed
ON	ON	ON	ON	15th speed

■Operation pattern in 2-speed mode - Example:

[4 7   I5 Function selection] and [4 8   I6 Function selection] are [U - d]: No.2 acceleration/deceleration time
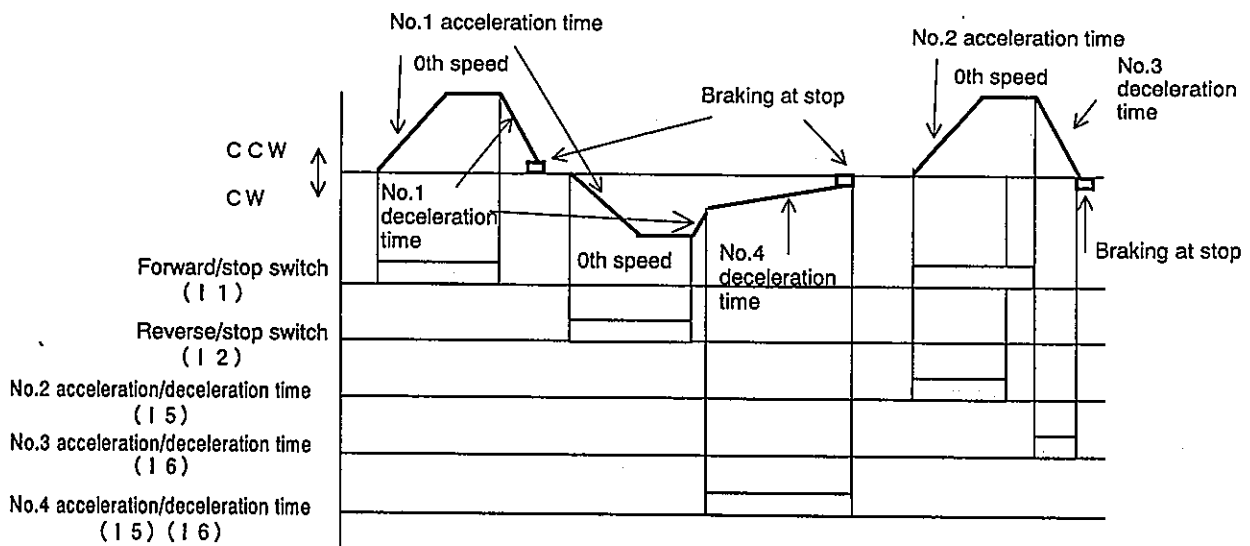
■ Operation pattern in 4-speed mode (default) - Example:

Labels in figure: Acceleration time, 0th speed, 1st speed, 3rd speed, Braking at stop, 2nd speed, CCW, CW, Deceleration time, 3rd speed, Acceleration time, Deceleration time

Forward/stop switch (I 1)
Reverse/stop switch (I 2)
Speed setting selection (1) (I 3)
Speed setting selection (2) (I 4)
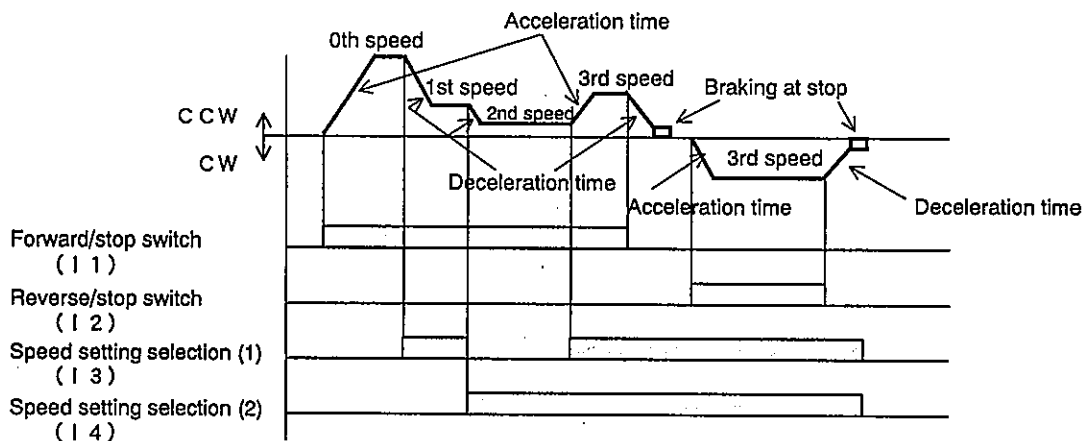
■ Selecting function of [I5] and [I6]

[4 7　I5 Function selection] and [4 8 　 I6 Function selection] select the following [I5] and [I6] function, respectively.

☐ | F r E E | (FREE)　　[I5]/[I6] and [SG] connected:　free-run stop

☐ | 　 , H r | (THeRmal)　[I5]/[I6] and [SG] disconnected:　external forced stop command

☐ | 　 U - d | (Up-Down)　[I5]/[I6] and [SG] connected:　select No.2 acceleration/ deceleration time

☐ | 　 r S , | (ReSeT)　　[I5]/[I6] and [SG] connected:　trip reset command

* Before selecting | 　 , H r | , connect [I5]/[I6] to [SG]. Otherwise trip occurs.
* By setting [I5 Function selection] and [I6 Function selection] to | 　 U - d | No.2 acceleration/deceleration time, 4 acceleration/deceleration time options are available.

[I5] connected to [SG]	[I6] connected to [SG]	Acceleration/ deceleration time setting
OFF	OFF	Acceleration time Deceleration time
ON	OFF	2nd acceleration/deceleration time
OFF	ON	3rd acceleration/deceleration time
ON	ON	4th acceleration/deceleration time

Protective Function

Protective functions

Your inverter is equipped with the following protective function that:
① displays warning message, or
② displays warning message and turns off inverter output, or
③ trips the inverter (the trip signal will be removed upon power off)

Type	Display on 5-digit LED	Protective function	Corrective action
	Electronic thermal trip Monitor (Flashes)	Monitor display flashes when the output current reaches the electronic thermal trip level and the timer operates.	Check for overloading and reduce the load as necessary.
②	Undervoltage Instantaneous power failure protection L	When the voltage from the converter drops 200 VDC or below (200 VAC version) or 100 VDC or below (100 VAC version), it is regarded as a result of instantaneous power failure and the inverter output is shut off. [*1] If it further drops down below 150 VDC (200 V version) or 75 VDC (100 V version), the control circuit is reset. If the voltage is restored by the time the control circuit is reset, the operation can be continued.[*2]	Check the power source, cabling, wiring, etc.
	Restart prevention when power is restored [*2] r P.	Prevents the inverter from restarting automatically if already given the run command before power is recovered or turned up or it is reset.	Issue the stop command to the inverter and then issue the start command.
③	Overcurrent protection O.C.	Trip occurs when the current from the converter exceeds the limit set to the inverter.	Check for a short-circuiting load or earth failure: locate and remove the cause. Also check the braking start speed. If this the case, lower the speed until OC trip is prevented.

[*1] The inverter can continue normal operation with approx. 15 ms power interruption.
[*2] Enabled when [7 0 Restart prevention upon power recovery] is set to Y E S .

Protective Function

Type	Display on 5-digit LED	Protective function	Corrective action
③	Regenerative overvoltage trip **O U.**	Trips the inverter when the converter output exceeds 400 VDC (200 VAC version) or 200 VDC (100 VAC version).	If trip occurs while the inverter is running, the deceleration time may be too short and should be extended. If the trip occurs upon power-up, the inductance of the power factor improving AC reactor at the input of inverter may be too large, use an AC reactor compatible with the capacity of the inverter.
	Overload trip (electronic thermal) **, H r**	If the motor current continues to exceed the level set in [Electronic thermal], the inverter will be tripped because it may be over-loaded.	Reduce the load, change operating pattern or use larger size inverter.
	CPU error **E r r.**	Trips the inverter if the microcomputer causes an error.	The microcomputer operation may be interfered by external noise. Locate and remove the noise source or reduce the noise level. * To cancel the trip, turn off and then on power.
	Self-diagnosis trip **C A U.**	Trips upon changing in certain parameter, e.g. [1 8 Operation mode selection].	This is normal. Simply reset the trip by referring to the canceling method described on the page that follows. The new parameter settings become effective.
	External forced trip **O. L.**	Trips the inverter when [4 7 I5 Function selection] or [4 8 I6 Function selection] is set to external forced trip and I5/I6 is not connected to [SG]. Connect I5/I6 to [SG], and reset the trip.	Locate the cause of overload and reduce the load, or change the operation pattern. Or use larger inverter and motor.
	Overspeed protection **E - 0. 5.**	Trips the inverter when the speed exceeds 1.5 times the value set in [7 5 Upper speed limit].	Keep the speed up to the rated rpm. This is important when external driving source is used.
	Sensor abnormal protection **E - C 5.**	The sensor will cause trip when it detects abnormal CS signal.	Check CS signal line for discontinuity, etc.

Maintenance/Inspection

Type	Display on 5-digit LED	Protective function	Corrective action
③	Uncontrolled run protection E. r O , .	This protection is active only when [d 2 Uncontrolled run detection] is set to YES and starts tripping in the following case: The motor runs in the direction opposite to the commanded direction at the set speed, or will not stop within 2 times the stop time.	Make sure that CS signal and motor output wires (U/T1, V/T2 and W/T3) are correctly connected. After checking, start a test run. If normal but this protection mechanism still works, set [d 2 Uncontrolled run detec-tion] to n O . * To cancel the trip, simply turn off and then on power.

Canceling trip

First remove the cause and then reset the system by following one of the following steps.

> Note: In the case of trip due to the CPU error E r r . or Uncontrolled run protection E . r O , . , use the step [1]. Steps [2], [3] or [4] will not work.
>
> [1] Turn off the inverter. Wait until the trip message disappears and then power on again.
>
> [2] Leaving the trip message displayed, connect both [I1] and [I2] to [SG] for at least 0.1 seconds. [*1]
>
> [3] Leaving the trip message displayed, press both $\boxed{\wedge}$ and $\boxed{\vee}$ switches on the operation panel for at least 1 second.
>
> [4] Leaving the trip message displayed, issue the trip reset command.
> To use the trip reset command, set [4 7 I5 Function selection]/[4 8 I6 Function selection] to [rS,], and then connect 4 7 / 4 8 to [SG].

* Important!

Trying resetting trip without removing the actual cause results in flashing LED showing the trip and [8 8 8 8 8].

[*1] Enabled when [4 6 I1/I2 Function selection] is set F - r or r - F .

Maintenance/Inspection

You should perform maintenance/inspection on a regular basis in order to ensure safety and keep the inverter in good running order.

Precautions when performing maintenance/inspections

(1) The power should be turned on/off only by the person performing the task.
(2) The internal circuits of the inverter remain charged with high voltage for a short while after power is turned off. To perform inspection, first turn off the power and then wait for the LED display on the front panel to go off (min. 5 minutes).
(3) Do not use a megger for the purpose of measuring insulation resistance. Otherwise, the inverter is damaged.

Inspection items and environment

● Ordinary/normal usage conditions

Ambient conditions: Annual mean temperature 30°C, min. 20 hrs/day at max. load rate 80%

● Perform daily and periodic inspections in accordance with the following items:

Classification	Inspection cycle	Inspection items
Daily inspection	Daily	• Ambient temperature, humidity, dirt, dust, foreign objects, etc. • Is there abnormal vibration/noise? • Is main circuit voltage normal? • Is there strange odor? • Is there lint in the air holes? • Cleanliness of control unit • Is wiring damaged? • Are equipment connections loose or off center? • Are foreign objects lodged in at the load side?
Periodic inspections	1 year	• Are fastened sections loose? • Is there evidence of overheating? • Are terminal blocks damaged?

<Caution>

Inspection cycle for periodic inspections may vary if usage conditions differ from those given above.

Approximate period for part replacement

Period for part replacement varies depending on how the inverter is used. Parts must be replaced or repaired when something is wrong with them.

Product name	Part name	Standard replacement period (hrs)	Remarks
Inverter	Smoothing capacitor	Approx. 5 years	Standard replacement period gives a number of years for reference only. If a part becomes faulty it must be replaced even if the standard replacement period has not yet been reached.
	Aluminum electrolytic capacitor on PCB	Approx. 5 years	
Motor	Oil seal	1 ~ 2 years	
	Bearing	3 years	

Troubleshooting

When a problem occurs, perform the inspections and take the measures prescribed in the following table. If you cannot determine the cause of the problem, if you suspect that the inverter is not working properly, if a part is damaged, or there are any other problems you cannot solve, contact your Panasonic dealer.

Problem	Possible cause	Corrective action
Motor won't run	Improper wiring	Correct wiring.
	Power is not fed to power input terminals.	Turn on power. Turn off and then on power.
	LED on the operation panel is unlit.	Check power supply.
	Not a rated voltage on the supply input terminals.	Check the voltage.
	Error is displayed.	See Section [Protective function].
	Free-run command is issued.	Cancel the command.
	Both CCW and CW switches are on.	Turn off unnecessary one.
	Incorrect speed setting	Check the setting and re-set as necessary.
	Motor is locked or overloaded.	Release the lock or reduce the load.
	One phase is missing.	Check wiring between the inverter and motor.
Motor runs in wrong direction	[4 6 I1/I2 Function selection] is not correctly set.	Correct [4 6 I1/I2 Function selection] setting.
Motor runs but cannot change speed	Motor is overloaded.	Reduce the load.
Motor runs at incorrect speed	No. of phases and voltage of the motor do not match those of power source.	Check the nameplate against [Brushless inverter and applicable motors] and the power source specification.
	Voltage on power input terminal (R/L1, S/L2 or T/L3) is out of spec.	Check the voltage.
	Improper speed range set	Review [7 4 Lower speed limit] and [7 5 Upper speed limit] for setting.
	Motor and inverter are not compatible with each other.	Use the correct inverter for the motor.
	Motor is overloaded.	Reduce the load.
Unstable motor speed	Load varies excessively.	Keep fluctuations in the load at minimum. Replace with larger inverter and motor set.

Parameter Description

Inverters of this series have various parameters that adjust/set characteristics and functions, etc. The objectives and functions of various parameters are described herein. Get a good understanding of the parameters and use to adjust inverter to the best condition for the customer's operating conditions.

Parameter configuration and list of parameters

No.	Parameter name	Parameter setting			Check [1]
		Adjustment range	Min. unit	Factory setting	
0 0	Setting speed (0 speed)	0, 0.6 - upper limit speed	5 r/min	0 r/min	
0 1	1st speed speed	0, 0.6 - upper limit speed	5 r/min	1800 r/min	
0 2	2nd speed speed	0, 0.6 - upper limit speed	5 r/min	1200 r/min	
0 3	3rd speed speed	0, 0.6 - upper limit speed	5 r/min	600 r/min	
0 4	4th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
0 5	5th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
0 6	6th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
0 7	7th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
0 8	8th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
0 9	9th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 0	10th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 1	11th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 2	12th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 3	13th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 4	14th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 5	15th speed speed	0, 0.6 - upper limit speed	5 r/min	0 r/min	
1 6	Run command selection	P n I Operation panel switch , E r Terminal block, b O , H Both		b O , H	

[1] Parameters marked by ▓▓▓▓ in the Check column are tripped for safety if modified or memorized.

Parameter Description

No.	Parameter name	Parameter setting			Check [*1]
		Adjustment range	Min. unit	Factory setting	
1 7	Speed command selection	**P n L** Operation panel **0 - 5** DC0 - 5V **U O L** Control dial on the operation panel (only on the dial version)		**P n L**	
1 8	Operation mode selection	2, 4, 8, 16 speed operation mode		4 speed operation mode	
2 1	Acceleration time	0, 0.01 - 3600 sec ⎡ - 3 sec : in steps of 0.01 sec 3 sec - 30 sec : in steps of 0.1 sec ⎣30 sec - 3600 sec : in steps of 1 sec		1.00 sec	
2 2	No.2 acceleration time			1.00 sec	
2 3	No.3 acceleration time			1.00 sec	
2 4	No.4 acceleration time			1.00 sec	
2 6	Brake time upon stop	0.0 - 6.0 sec	0.1 sec	1.00 sec	
2 9	Brake start speed	60 - 1000 r/min	5 r/min	300 r/min	
3 0	Carrier frequency[*2]	3 - 7 [*3]	1	4	
3 1	Deceleration time	0, 0.01 - 3600 sec ⎡ - 3 sec : in steps of 0.01 sec 3 sec - 30 sec : in steps of 0.1 sec ⎣30 sec - 3600 sec : in steps of 1 sec		1.00 sec	
3 2	No.2 deceleration time			1.00 sec	
3 3	No.3 deceleration time			1.00 sec	
3 4	No.4 deceleration time			1.00 sec	
4 1	Jump speed range	0 to upper limit	5 r/min	0 r/min	
4 2	Jump speed ①	0, 60 to upper limit	5 r/min	0 r/min	
4 3	Jump speed ②	0, 60 to upper limit	5 r/min	0 r/min	
4 4	Jump speed ③	0, 60 to upper limit	5 r/min	0 r/min	
4 5	Jump speed ④	0, 60 to upper limit	5 r/min	0 r/min	

[*1] Parameters marked by ▓▓▓ in the Check column are tripped for safety if modified or saved.
[*2] Cannot be changed while the motor is running.
[*3] The relationship between the settings and resultant carrier frequencies are as shown below:
Higher frequency setting leads to higher inverter temperature.
When operating the inverter at a frequency higher than factory setting, derate the load or current to 80% of the rated value.

Set value	3	4	5	6	7
Carrier frequency	6 kHz	8 kHz	1 0 kHz	1 2 kHz	1 5 kHz

No.	Parameter name	Parameter setting		Factory setting	Check [*1]
		Adjustment range	Min. unit		
46	I1/I2 function selection	F - r I1: CCW/stop I2: CW/stop r - F I1: CW/stop I2: CCW/stop r5.fr I1: Run/stop I2: CW/CCW		F - r	
47	I5 function selection [*2]	F r E E Free-run , H r External forced trip		F r E E	
48	I6 function selection [*3]	U - d 2nd acceleration/deceleration r S , Trip reset		r S ,	
49	Multi-speed input selection	1 b 1 , 1 bit B i n Binary		B i n	
51	Output signal ① selection (01)	, r I P Trip S , b L Arrival r U n Running F r E E Free-run F CCW		, r I P	
52	Output signal ② selection (02)	r CW C A U S Cause of trip C t - 5 Revolution detection d - b Braking in stop C t - L Overload detection C P L S Motor current pulse output [*4]		S , b L	
55	Output signal polarity ① selection	n O r Normal r e U Reverse		n O r	
58	Acceleration mode selection	L I n. Linear S . 1 S curve ①		L I n.	
59	Deceleration mode selection	S . 2 S curve ②		L I n.	

[*1] Parameters marked by ▨▨▨▨ in the Check column are tripped for safety if modified or memorized.
[*2] Enabled only when 2-speed or 4-speed mode is selected.
[*3] Enabled only when 2-, 4- or 8-speed mode is selected.
[*4] The peak to peak motor currents are converted into equivalent duty cycles upon outputting. These values are only for reference and should not be taken as measured readings.

Application

Parameter Description

No.	Parameter name	Parameter setting			Check [1]
		Adjustment range	Min. unit	Factory setting	
6 0	Monitor mode selection	O. - r Revolutions C U r Output current [2] S. - r Set speed d C - U Converter DC voltage [2]		O. - r	
6 1	Display scale factor	0.01 - 10.00	0.01	1.00	
6 5	Comparison speed A	0, 60 up to upper limit [3]	5 r/min	0 r/min	
6 6	Comparison speed B	0, 60 up to upper limit [3]	5 r/min	0 r/min	
6 7	Agreement detection width	0 up to upper limit	5 r/min	50 r/min	
6 9	Free-run time at instantaneous power failure	1, 2, 3, 4, 5	1	1	
7 0	Restart prevention upon power recovery	n O Restart Y E S No restart		Y E S	
7 1	Retry selection	n O No retry 1 - 4 Retry up to No. of times set		n O	
7 2	Retry start time	0 - 120 sec	2 sec	4 sec	
7 3	Revolution setting bias	0 up to upper limit	5 r/min	0 r/min	
7 4	Lower speed limit	0, 60 up to upper limit	5 r/min	0 r/min	
7 5	Upper speed limit	60 – 3600	5 r/min	3000 r/min	
7 6	External speed command input filter	(Small) ← 1, 2, 3, 4, 5 → (Large)		1	
7 8	Speed display filter	(Small) ← 0 - 14 → (Large)	1	0	
7 9	Electronic thermal	50 - 100%	5%	100%	
8 0	Trip cause clear	n O Y E S Clear		n O	
8 1	Trip cause①				
8 2	Trip cause②				
8 3	Trip cause③	—	—		
8 4	Trip cause④				
8 5	Trip cause⑤				
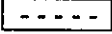
[1] Parameters marked by ▒▒▒▒ in the Check column are tripped for safety if modified or memorized.
[2] For reference only
[3] Toggle between ON and OFF enabled only when the difference between this value and revolutions is greater than 100 r/min.

No.	Parameter name	Parameter setting			Check [1]
		Adjustment range	Min. unit	Factory setting	
86	Parameter initialization	n O Y E S Start initialization [2]		n O	
d 0	Speed loop proportional gain	0 - 500	2	150 [3]	
D 1	Speed loop integral gain	0 - 500	2	20 [4]	
D 2	Uncontrolled run detection selection	Y E S CS signal line and motor wiring are checked upon starting. n O No check		Y E S	
D 3	Stop mode selection	F r E E Free-run stop D E C Deceleration stop		D E C	
D 4	No. of P0 output pulses selection	0, 1, 2, 3, 4, 6, 8, 12 [5]		0	
b b	Copy parameter	n O Parameters not copied P.I n I, Panel data is initialized P.L O A d Parameters are read out to panel P.P r G 1 Parameters are written into inverter		n O	
A A	Parameter lock	n O Parameters are not locked A L L All parameters are locked P A r, Parameters selected by means of parameter [99] are not locked and can be set.		n O	
9 9	Parameter extraction	—		—	

[1] Parameters marked by ▓▓▓▓ in the Check column are tripped for safety if modified or memorized.
[2] Turn off power. Power on power. ▭----▭ will appear. Turn off power again. The next power-on will start initialization.
[3] 80 when 50 W version
[4] 10 when 50 W version
[5] No. of pulses is 24, pulse width is 500s when D4 is set at 0: other D4 settings will result in the pulses and duty ration as shown below.

D4 setting	0	1	2	3	4	6	8	1 2
No. of pulses	2 4	1	2	3	4	6	8	1 2
Duty ratio (pulse width)	(500μs)	50%	50%	50%	50%	50%	33%	50%

Application

Parameter Description
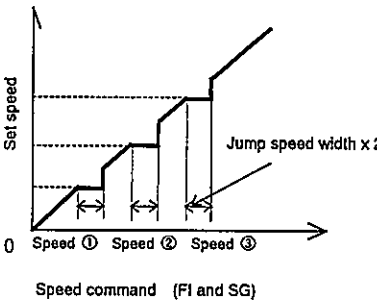
No.	Parameter name	Description
0 0	Set speed (0th speed)	Motor speed can be set when [1 7 Speed command selection] is set to $\boxed{\text{P n L}}$.
0 1 0 2 0 3 0 4 0 5 0 6 0 7 0 8 0 9 1 0 1 1 1 2 1 3 1 4 1 5	1st speed 2nd speed 3rd speed 4th speed 5th speed 6th speed 7th speed 8th speed 9th speed 10th speed 11th speed 12th speed 13th speed 14th speed 15th speed	Can be used to set speed in multispeed mode through [1 8 Operation mode selection]. Table below
1 6	Run command selection	Run command can be selected through the following control facility. ☐ $\boxed{\text{P n L}}$ (panel): $\boxed{\text{RUN}}$ switch on the operation panel • Input terminals cannot be used as command input. ☐ $\boxed{\text{, E r}}$ (terminal): Input terminal [I1]/[I2] ■ $\boxed{\text{b O , H}}$ (both): Both operation panel and input terminals can be used but the input terminals have priority over the command from the panel.
1 7	Speed command selection	Selects among the following speed setting methods when setting No.0 speed. ■ $\boxed{\text{P n L}}$ [0 0 Set speed (0th speed)] ☐ $\boxed{\text{0 - 5}}$ Analog command [F1](voltage command) 0-5 VDC ☐ $\boxed{\text{U O L}}$ Operation panel dial. • This selection is effective only with the dial version. Otherwise, causes operation error.

Table within No. 01–15 Description:

Operation mode	I3	I4	I5	I6
2-speed mode		Trip reset	Select among: free-run, external forced trip, No.2 acceleration/deceleration and trip reset.	
4-speed mode	Speed setting selection			
8-speed mode				
16-speed mode				

■: Factory setting

No.	Parameter name	Description
1 8	Run mode selection	Selects the run mode. ☐ [2] 2-speed mode ■ [4] 4-speed mode ☐ [8] 8-speed mode ☐ [1 6] 16-speed mode
2 1	Acceleration time	Increments of output speed during acceleration can be set as follows: • **Set the time required for revolution to increase by 1000 per minute.** • Unit of increments: in 0.01s steps up to 3s; in 0.1s steps over 3s up to 30s; in 1s steps over 30 seconds.
2 2	No.2 acceleration time	This acceleration time can be set when [4 7 I5 Function selection] is set to [U - d] No.2 acceleration/deceleration.
2 3 2 4	No.3 acceleration time No.4 acceleration time	These acceleration times can be set when [4 7 I5 Function selection] and [4 8 I6 Function selection] are both set to [U - d] No.2 acceleration/ deceleration.
2 6	Brake time upon stop	This parameter sets the time at which the brake is to be applied when the output speed drops below the speed set in [2 9 Brake start speed] during transition of the inverter from driving state to stop state. This parameter is active when [d 3 Stop mode selection] is set to [d E C] deceleration stop. • Brake is 3-phase lower side short circuit mode at stop. • Free-run stop upon tripping.
2 9	Brake start speed	This parameter set the speed at which braking starts during stopping sequence. This parameter is active when [d 3 Stop mode selection] is set to [d E C] deceleration stop. • Braking starts when the speed drops below [Brake start speed] upon deceleration stop command. • If braking sequence starts at a higher speed, OC trip may occur. If this is the case, start the braking at lower speed.
3 0	Carrier frequency	Select one of the following frequencies while the motor is in stop status. Selection made while the motor is running cannot be accepted. |	Set value	Carrier frequency
	3	6 k H z
■	4	8 k H z
	5	1 0 k H z
	6	1 2 k H z
	7	1 5 k H z | Note: When operating at a frequency above 8 kHz, derate the load (current) to 80%.
3 1	Deceleration time	Decrements of output speed during deceleration can be set as follows: • **Set the time required for revolution to increase by 1000 per minute.** • Unit of increments: in 0.01s steps up to 3s; in 0.1s steps over 3s up to 30s; in 1s steps over 30 seconds.

■: Factory setting

Parameter Description

No.	Parameter name	Description
3 2	No.2 deceleration time	This No.2 deceleration time can be set when [4 7 I5 Function selection] is set to [U - d] No.2 acceleration/deceleration.
3 3	No.3 deceleration time	These acceleration/deceleration times can be set when [4 7 I5 Function selection] and [4 8 I6 Function selection] are both set to [U - d]
3 4	No.4 deceleration time	No.2 acceleration/deceleration.

No.	Parameter name	Description
4 1	Jump speed width	To prevent resonance in the mechanical system, any speed setting is inhibited in the region specified by [4 1 Jump speed width] whose center speed is set by [4 2 Jump speed ①] to [4 5 Jump speed ④], respectively.
4 2	Set speed ①	
4 3	Set speed ②	• Speed is output even in the jump region during acceleration or deceleration.
4 4	Set speed ③	• If two jump speed regions overlap, these regions are skipped.
4 5	Set speed ④	

Jump speed width x 2

0   Speed ①   Speed ②   Speed ③

Speed command   (FI and SG)

No.	Parameter name	Description
4 6	I1/I2 Function selection	Command of input terminals [I1] and [I2] can be changed as follows:

Selection	「I1」— 「SG」		「I2」— 「SG」		「R U N」
	Short	Open	Short	Open	Switch
■ [F - r]	CCW	Stop	CW	Stop	CCW
[r - F]	CW	Stop	CCW	Stop	CW
[r S. F r]	Run	Stop	CW	CCW	Run

(F - r : Fwd/Rev, r - F : Rev/Fwd, r S . F r : Run-Stop／Fwd/Rev)

No.	Parameter name	Description
4 7	I5 Function selection	The function of input terminals [I5] and [I6] can be one of the following:
4 8	I6 Function selection	■ [F r E E] (FREE) : [I5]/[I6] connected to [SG] → free-run stop .... [I5]

■ [F r E E] (FREE)   :   [I5]/[I6] connected to [SG]
→ free-run stop .... [I5]

□ [, H r] (THeRmal) :   [I5]/[I6] not connected to [SG]
→ external forced trip command
   • Before setting, connect [I5]/[I6] to [SG], otherwise trip will occur.

□ [U - d] (Up-Down) :   [I5]/[I6] connected to [SG]
→ No.2 acceleration/deceleration time selected

■ [r S ,] (ReSeT)   :   [I5]/[I6] connected to [SG]
→ trip reset command .... [I6]

■: Factory setting
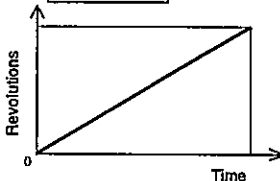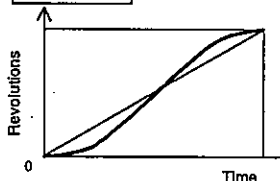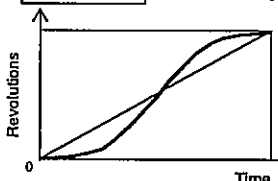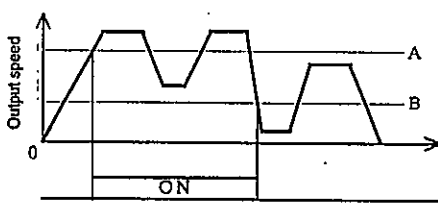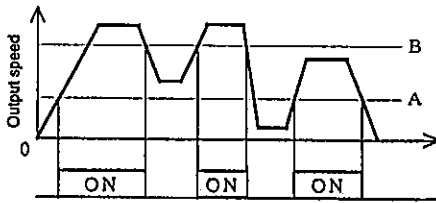
No.	Parameter name	Description
4 9	Multispeed input selection	Speed setting method for multispeed operation can be selected as follows: ☐ [I b I ,] (1 bit): 1-bit input One multispeed can be set for each [Speed setting selection terminal]. In 4-speed mode, 3 speeds can be selected; in 8-speed mode, 4 speeds; and in 16-speed mode, up to 5 speeds. Example: 16-speed mode See table below ■ [b I n] (Binary) : binary input Speed selection can be made by representing a binary number on [Speed setting selection terminal]. See [Operation mode].

5 1
 	
5 2
	Output signal ① selection (01)
	
	Output signal ② selection (02)
		Output signal to terminals [O1]-[C1] and [O2]-[C1] can be selected as shown below.
		The polarity of [5 1 Output signal ① selection] can be reversed by the setting of [5 5 Output signal ① polarity selection]. Exception: [C P L S]
		■ [, r I P] (TRIP) : trip output signal (trip: on) ... [01]
		■ [5 , b L] (STaBLe) : arrival signal (arrive: on) ... [02]
		      → see [6 7 Match detection width]
		☐ [r U n] (RUN) : run/stop signal (run: on)
		☐ [F r E E] (FREE) : free-run signal (free-run: on)
		☐ [F] (Fwd) : running in CCW signal (CCW: on)
		☐ [r] (Rev) : running in CW signal (CW: on)
		☐ [C t - S] (Check – S) : revolutions detect signal
		      → see [6 5 Comparison speed A],
		      see [6 6 Comparison speed B]
		☐ [C t - L] (Check – L) : overload detection (overload: on)
		      Panel also indicates overload by flashing.
		☐ [d - b] (DC-Brake) : braking at stop signal (braking: on)

Example: 16-speed mode

Input terminals				Speed setting
I 3	I 4	I 5	I 6	
OFF	OFF	OFF	OFF	0th speed
ON	×	×	×	1st speed
OFF	ON	×	×	2nd speed
OFF	OFF	ON	×	3rd speed
OFF	OFF	OFF	ON	4th speed

• ON: connected to [SG]
• OFF: not connected to [SG]
• x: Don't care

■: Factory setting

Application

Parameter Description
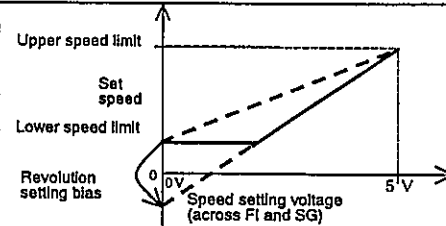
No.	Parameter name	Description
cont'd		☐ **CPLS** (C-Pulse) : motor current pulse output Motor current (peak-to-peak) is converted into pulse train of equivalent duty cycle before output. These pulses are only for reference. Duty 50% - - - - - - - - 0 MBSK083‡‡‡···4.0A MBSK043‡‡‡···2.9A Motor current MBSK021‡‡‡···2.9A MBSK023‡‡‡···1.8A MBSK011‡‡‡···1.8A MBSK013‡‡‡···1.1A MBSK5A‡‡‡‡···1.1A Duty cycle — Transistor OFF / Transistor ON $$\text{Duty cycle} = \frac{\text{OFF}}{\text{ON} + \text{OFF}}$$
		☐ **CAUS** (CAUS) : trip cause output signal The cause of a trip is identified by the following signal.

Trip	ON duration	OFF duration
O . C . constant overcurrent	Continual	–
O . U . overvoltage	1 s	1 s
O . L . external forced trip	0.25 s	0.25 s
, h r . electronic thermal	0.9 s	0.1 s
E r r . CPU error	0.1 s	0.4 s
C A U . self-diagnosis shut-off	0.5 s	0.5 s
E - C S. sensor abnormal	0.4 s	0.1 s
r . P . restart prevention upon power recovery	1.5 s	1 s
E - 0. 5. overspeed	0.1 s	0.9 s
E . r O , . irregular rotation (check wiring)	1 s	1.5 s

No.	Parameter name	Description
5 5	Output signal ① polarity selection	Reverses the polarity of output on output terminals [O1] and [C1]. This function is enabled when [5 1 Output signal ① selection (01)] is set to one other than [CPLS]. ■ **n O r** (NORmal) : transistor: on ... normal polarity ☐ **r E U** (REVerse) : transistor: off ... reversed polarity

■: Factory setting
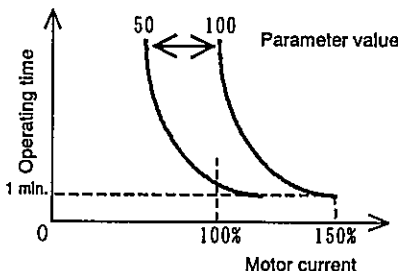
No.	Parameter name	Description
5 8	Acceleration mode selection	Linear acceleration/deceleration or S-curve acceleration/deceleration can be selected.
5 9	Deceleration selection	■ `L i n.` Linear □ `5.-1` S-curve① □ `5.-2` S-curve② Motor increases/ decreases its speed to the set value linearly with time. Motor changes the speed at a higher rate when its torque is high and at a lower rate when torque is low. Motor changes the speed at faster rate than in S-curve ①.
6 0	Monitor mode selection	Selects the opening message that will appear on the 5-digit LED upon power-up. Note that [S.-r] is the speed multiplied by the parameter setting [6 1 Display scale factor]. □ `C u r.` output current □ `d C - U` converter DC output ■ `O. - r` revolutions □ `S. - r` set speed
6 1	Display scale factor	The scale factor set in this parameter can be applied to the desired speed value before outputting it to the 5-digit LED. • Can be applied to No. of revolutions of gear output shaft or line speed • The scale factor of the following parameters can be modified. [0 0 - 1 5 0th-15th speed] [6 7 Match detection width] [2 9 Brake start speed] [7 4 Lower speed] [4 1 - 4 5 Jump speed] [7 5 Upper speed] [6 5 - 6 6 Comparison speed]
6 5	Comparison speed A	These parameters are used to set the desired speed(s) to be detected when [5 1 Output signal ① selection] and [5 2 output signal (2) selection] are set to [revolutions detect signal] `C t - S` .
6 6	Comparison speed B	• When the revolution exceeds [Comparison speed A] [1], output signal is turned ON, and turned OFF as the revolution decreases below [Comparison speed B]. [1] A≧B A＜B [1] By more than 100 r/min.

■: Factory setting

Parameter Description

No.	Parameter name	Description
6 7	Match detection width	When [5 1 Output signal ① selection] and [5 2 Output signal ② selection] are set to [arrival signal] 5 , b L , then the condition under which the arrival signal is to be output during acceleration/deceleration can be set using the parameter 6 7 . • Arrival signal will be output when the difference between the revolutions and set speed decreases to a value smaller than that specified by this parameter 6 7 . • No arrival signal will be output when the parameter 6 7 is set to 0 (zero). • No arrival signal will be output when: in stop, braking at stop or CCW to CW (or CW to CCW) transient. • If the parameter 6 7 includes [2 9 Brake start speed], then the output is turned off as the revolution drops below the brake start speed.
6 9	Free-run time at instantaneous power failure	Free-running time upon recovery from instantaneous power interruption can be set. {table below} This setting is effective when [7 0 Restart prevention upon power recovery] is set to n O .
7 0	Restart prevention upon power recovery	When set to Y E S , continuous operation is inhibited even if power is restored after instantaneous interruption.
7 1 7 2	Retry selection Retry start time	These parameters will automatically try to cancel the trip and continue operation after the specified retry start time. The number of reties is initialized if the parameters have not been used for 120 minutes after the previous retry. ■ n O (NO): no retry □ 1 ~ 4 : No. of retries • If [5 1 Output signal ① selection] or [5 2 Output signal ② selection] is set to , r I P , no trip signal is output during try, until the retry is repeated to the set No. of times.
7 3	Revolution setting bias	Sets the [Speed at 0 V input] on the speed setting input terminal [FI]. This parameter setting is enabled when [1 7 Speed command selection] is set to 0 - 5 , analog command [FI].

Table for parameter 6 9:

	Set value	Free-run time	Set value	Free-run time
■	1	0 . 4 s	4	1 . 6 s
	2	0 . 8 s	5	2 . 0 s
	3	1 . 2 s		

Diagram for parameter 7 3: Upper speed limit, Set speed, Lower speed limit, Revolution setting bias, Speed setting voltage (across FI and SG), 0V to 5 V.

■: Factory setting.

No.	Parameter name	Description
7 4	Lower speed limit	Set the lower limit value that can be applied to the speed setting of the inverter. This parameter setting is enabled when [1 7 Speed command selection] is set to 0 - 5 analog command or U O L operation panel dial.
7 5	Upper speed limit	Set the upper limit value that can be applied to the speed setting of the inverter.
7 6	External speed command input filter time constant	Set the internal time constant of the speed setting input terminal [FI]. Note: If excessive noise is disturbing the operation, increase the time constant of the filter. Remember that a larger time constant slows down the filter response.
7 8	Speed display filter	Smoothes speed readings, reducing fluctuations in numbers displayed on 5-digit LED. Remember that a larger time constant slows down the filter response.
7 9	Electronic thermal	Set the range of electronic thermal level. • Set the level by the percent of inverter rated current. • The display on the operation panel starts flashing when the motor current exceeds and stops flashing upon tripping. • If the parameter is set to 100, then trip occurs when the motor current flows for 1 minute at 150% rated current (8 seconds: 50 W version). 50 ↔ 100 Parameter value Operating time 1 min. 0 100% 150% Motor current
8 0	Trip cause clear	Can be used to clear trip causes ① to ⑤. <Procedure> Select Y E S . Press DATA SET . After clearing the causes, the parameter returns back to n O .
8 1 8 2 8 3 8 4 8 5	Trip cause ① Trip cause ② Trip cause ③ Trip cause ④ Trip cause ⑤	Trip causes ① to ⑤ store trip cause, respectively - total 5. For further information, see [Protective function].

Application

Parameter Description

No.	Parameter name	Description
8 6	Parameter initialization	By using this parameter all other parameters can be initialized to the standard factory settings. <Procedure> ① Using [∧] switch, select [Y E S] and then turn off power. ② Wait until the display turns off, and then turn on power. The 5-digit LED displays [- - - -] showing the completion of initialization. ③ The inverter is not yet ready for operation. Simply turn off and on it again.
d 0	Speed loop proportional gain	This parameter sets the proportional gain of the speed amplifier. Higher value means higher gain. Setting range: 0-500 Resolution: 2
d 1	Speed loop integral gain	This parameter sets the integral gain of the speed amplifier. Higher value means higher gain. Setting range: 0-500 Resolution: 2
D 2	Uncontrolled run detection mode selection	When set to [Y E S] , this parameter causes the motor to be tripped when the motor irregular rotation is detected and identified as [E . r O , .]. When set to [n O] , this parameter may cause certain detection mechanism to fail to function: for example, uncontrolled running of the motor due to wrong signal from CS sensor, improper connection of motor outputs (U/T1, V/T2, W/T3) may not be detected.
D 3	Stop mode selection	Directs the motor how to stop when it receives the motor stop command. ☐ [F r E E] Allows the motor to coast to stop. ■ [d E C] Forces the motor to decelerate at the rate specified by the set decelerating time. Brake will be applied when the motor speed drops below the speed specified in [2 9 Brake start speed] and then released after the period specified by [2 6 ꞉ Brake time upon stop] has elapsed, allowing the motor to coast.
d 4	No. of PO output pulses selection	Determines the No. of pulses flowing through [PO] and [C2].
b b	Copy parameter	For copying procedure, refer to [Parameter copying method].

■: Factory setting

No.	Parameter name	Description
A A	Parameter lock	Allows the optional locking of parameters. ■ ⬚ n O Parameters are not locked □ ⬚ A L L All parameters are locked □ ⬚ P A r , Parameters that require no setting are locked. • Selecting [A L L] deactivates [DATA SET] , [∧] and [∨] switches, inhibiting parameter setting procedure. Note: [RUN] and [STOP] switches remain active. • Selecting [P A r ,] allows the parameters selected by means of parameter [9 9] to be set.
9 9	Parameter extraction	Only parameters that can be set are extracted. For further information, refer to the section Extracting and locking parameters.

Principle of proportional and integral gain
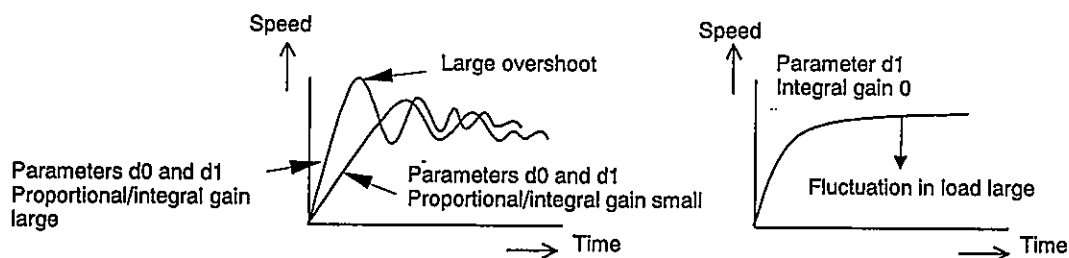
① To improve response against fast load change, increase proportional and integral gain. Remember a larger gain will increase the amplitude of overshoot as shown in the figure above.

② Rapid reduction of the load also increases overshoot amplitude. If this is the case, lower the gain. Remember that lower gain will slow down the motor speed when the load increases again at a faster rate.

Application

Parameter Description

Register numbers of parameters that can be edited. After that, these parameters can be edited by calling the number.

Example: Only [2 1   Acceleration time] can be set with   PAr, .

Step	Operation panel		Remarks
	Switch	Display on LED	
① Turn power on		0 / 0 0	• Default mode: Monitor (reading output speed)
② Select [99]	Press DATA SET	Parameter value / 0 0	• Parameter number mode
	Using ∧ , select [9 9]	0 0 - 0 F / 9 9	
③ Select [21]	Press DATA SET	0 0 - 0 F / 9 9	• Parameter value mode
	Using ∧ , select [2 1]	2 1 - 0 F / 9 9	
④ Register [21]	Press DATA SET	2 1 - 0 F / 9 9	• Parameter value mode
	Press ∧	2 1 - 0 n / 9 9	
	Press DATA SET	2 1 - 0 n / 9 9	• Parameter number mode • Parameter is saved

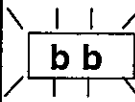| Step	Operation panel		Remarks
	Switch	Display on LED	
⑤ Select [A A]	Press V	n O	• Parameter number mode
		A A	
	Press DATA SET	n O	• Parameter value mode
		A A	
⑥ Select partial lock	Press Λ	P A r,	• Parameter value mode
		A A	
	Press DATA SET	C A U.	• Changes stored
		0 0	
⑦Trip reset	Press Λ and V simultaneously	0	• Monitor mode
		0 0	

When selecting more than one parameters, repeat steps ③ and ④ before proceeding to step ⑤.

Application

Parameter Description

Releasing parameter lock

For the purpose of this procedure, use parameter [A A] Parameter lock].

Example: Release the lock, described in the above example, "Example: Only [2 1 Acceleration time] can be set with [P A r ,].

Step	Operation panel		Remarks
	Switch	Display on LED	
① Turn on power	Press [MODE]	Converter voltage 0 0	• Monitor mode • Turn on power while holding down [MODE]
	Press [DATA SET]	Parameter value 2 1	• Parameter number mode • The parameter having the youngest number among the parameters that can be edited is displayed • If [A L L] (lock all parameters) is enabled, A A is displayed.
② Select [A A]	Press [∧]	P A r , A A	• Parameter number mode • Lock option is displayed
	Press [DATA SET] , [∧] and [∨]	A L L A A	• Parameter value mode
③ No parameter lock Select [n O]	Press [∨]	n O A A	• Parameter value mode
	Press [DATA SET]	C A U 0 0	
④ Trip reset	Press [∧] and [∨] simultaneously	0 0 0	• Monitor mode
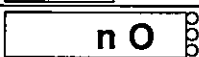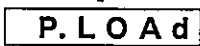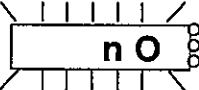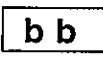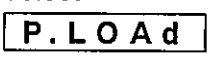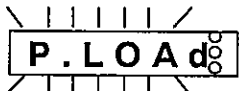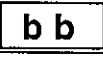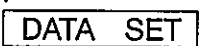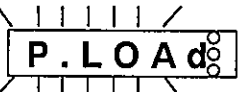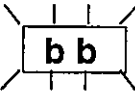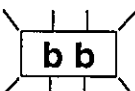
The function [**b b** Copy parameter] copies a parameter(s) to another inverter of the same model.

[1] Producing master panel

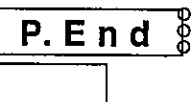| Step	Operation panel		Remarks
	Switch	Display on LED	
<1. Initializing operation panel> * Perform only once at the beginning.			
① Turn power on		`0` `0 0`	• Monitor mode
② Call [**b b** Copy parameter]	Press `DATA SET`	`Parameter value` `0 0`	• Parameter No. mode
	Press and hold `∧`	`n O` `b b`	
③ Select `P. I n I,` initialize panel data	Press `DATA SET`	`h O` `b b`	• Parameter value mode
	Using `∧`, select `P. I n I,`	`P. I h I,` `b b`	
④ Initialize panel	Holding down `STOP` , press `DATA SET` for 1 second	`P. I n I,` `b b`	

Application

– 53 –

Parameter Description

Step	Operation panel		Remarks
	Switch	Display on LED	
⑤ Wait for approx. 10 seconds		P. E n d	
⑥ Panel is initialized	Press [STOP]	n O b b	• Parameter number mode
<2. Reading parameter values from inverter internal circuit to operation panel>			
⑦ Select [Read P.LOAd parameter out to panel]	Press [DATA SET]	n O b b	
	Using [∧], select [P.LOAd]	P.LOAd b b	
⑧ Read parameter out to panel	Holding [STOP], press [DATA SET] for 1 second	P.LOAd b b	• 2-digit and 5-digit LEDs will flash
⑨ Wait for approx. 20 seconds		P. E n d	
⑩ Parameter values have been read from the inverter circuits to the inverter panel	Press [STOP]	n O b b	• Parameter number mode

[2] Copying parameter values to inverter

Step	Operation panel		Remarks
	Switch	Display on LED	
<3. Copying parameter values from operation panel into inverter internal circuit>			
⑪ Select [Write **P. P r G I** parameter into inverter]	Press **DATA SET**	**n O** **b b**	
	Using **∧** , select **P. P r G I**	**P. P r G I** **b b**	
⑫ Write parameter into inverter	Holding **STOP** , press **DATA SET** for 1 second.	**P. P r G I** **b b**	• 2-digit and 5-digit LEDs flash
⑬ Wait for approx. 10 seconds		**P . E n d** *1	• **P. E n d** is displayed for approx. 3 seconds
⑭ Parameter values have been written from the operation panel into the inverter circuits		**C A U.** **0 0**	• Self-diagnosis trip occurs
⑮ Return to monitor mode	Simultaneously press **∧** and **V** to cancel trip	**0** **0 0**	• Monitor mode

To copy parameter values to two or more inverters, use the master panel produced in [1] and repeat the steps of [2].

---

*1 If parameters are not copied correctly, **P. E r r 1** or **P. E r r 2** is displayed followed by no self-diagnosis trip.

To cancel the display, press **STOP** . For corrective action, refer to the description that follows.

Application

Parameter Description

Error message	Description	Corrective action
P.Err1	Parameter values to be copied are invalid.	The parameter values may have been destroyed by external noises. Press STOP and repeat steps starting with <1. Initializing operation panel>.
P.Err2	The copy is attempted between inverters of different serieses.	Be sure to copy between the same series.
	After panel initialization, attempt is made to write parameter value from the operation panel into the inverter without first reading parameter values in inverter out to the panel.	Press STOP and repeat steps starting with <1. Initializing operation panel>.

⊘	Stop operation before starting copy. Doing so could result in injury.
⊘	Never attempt to copy parameters between different serieses (differ in output or power source specifications). Doing so could result in injury.

Prepare operation panel specific to the capacity and power source.

Notes:
- This manual applies to MBS series only (inverter model MBSK*****).
- Once tripped, parameter copy procedure cannot be continued. Clear the trip before restarting the copy.
- Do not turn off power to the inverter during copy sequence: normal operation will not be assured.
- Observe the time specified in steps <1> ⑤, <2> ⑨ and <3> ⑬.
  If the operation ends immediately after the previous step, or if the operation will not end twice the specified time has elapsed, parameters in the operation panel may be defective. Repeat steps starting with <1>. If error conditions cannot be completely eliminated, try to copy at a location free from external noise. The operation panel should be directly attached to the inverter.
- Parameters [81]-[85], Trip cause are copied. Perform [80 Trip cause clear] from the copy source inverter and then read out parameter values to the operation panel. Self-diagnosis trip occurring after successful parameter copy are not recorded.

Brushless Inverter Specification

|			
Power source	Voltage	200 V version	3-phase 200-230 VAC
		100 V version	1-phase 100-120 VAC
	Frequency		50/60 Hz
	Allowable voltage fluctuation		±10%
	Allowable frequency fluctuation		±5%
Control system	Control method		Speed regulation through CS signal
	Speed setting range		300 to rated r/min
	Speed variation		-3% or less (25±10℃)
	Speed setting resolution		Digital: 5 r/min Analog: Upper speed limit value/250
	Speed setting signal		0 to +5 VDC
	Rated overload		150% 1 minute (50W: 8 sec)
	Regenerative brake		200 W or higher: internal braking circuit (external resistor)
			100 W or lower: no braking circuit
	Braking to stop		In response to stop command (3-phase lower side short-circuit mode)
	Acceleration/deceleration time		0-3600 sec (0-3 sec:0.01s step; 3-30 sec:0.1s step: 30-3600 sec: 1s step) Time required to change by 1000 r/min - up to 4 patterns
	Operation mode		2-speed, 4-speed, 8-speed, 16-speed
	Others		Retry, parameter lock, parameter copy, 24 pulses/rev. output
Protection			Undervoltage, overvoltage, overcurrent, instantaneous power failure, overload limit (current limiter), overload cutout (electronic thermal), restart prevention upon power recovery, self-diagnosis trip (recording of up to 5 trip causes)
Protective construction			Enclosed in panel (IP20)
Cooling			Self-cooled

Spec.

Brushless Motor Specification

Motor shaft permissible load

Unit: N (1 kgf = 9.8N)

Motor	Assembling			Operating	
	Radial load	Thrust load		Radial load	Thrust load
		Direction A	Direction B		
MBMK5AZBL**	1 4 7	8 8	1 1 8	6 9	5 9
MBMK01*BL**	1 4 7	8 8	1 1 8	6 9	5 9
MBMK02*BL**	3 9 2	1 4 7	1 9 6	2 4 5	9 8
MBMK04*BL**	3 9 2	1 4 7	1 9 6	2 4 5	9 8
MBMK08*BL**	6 8 6	2 9 4	3 9 2	3 9 2	1 4 7

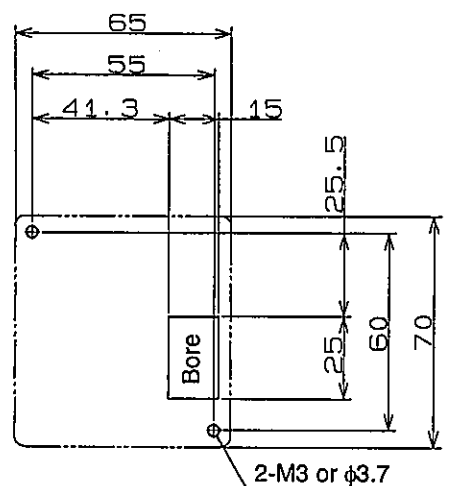Note: Figures in the table above are approximate values and not guaranteed ones.

Radial load (P) position

Direction of thrust load
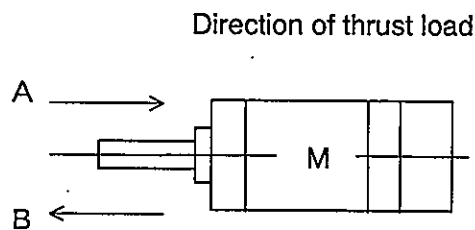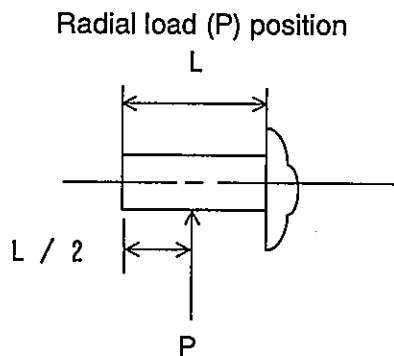
Optional accessories

Operation panel

■ Operation panel

Option part number	Specification
DVOP20704	Standard
DVOP20702	With control dial

■ Operation panel dimensions

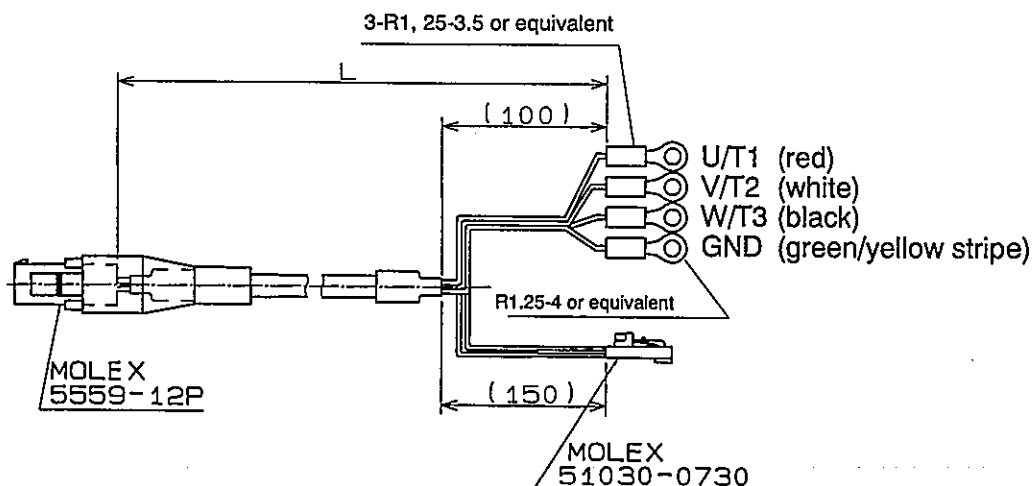* Panel thickness
  t = 13.6

Operation panel remote cable

Option part number	Length (m)
DVOP20801	0. 5
DVOP20802	1. 5
DVOP20803	3. 0

Junction table

Option part number	L (m)
MFECA0010LMC	1
MFECA0020LMC	2
MFECA0030LMC	3
MFECA0050LMC	5
MFECA0100LMC	1 0
MFECA0200LMC	2 0

Connector to motor wiring

Pin No.	Color	Signal
1	Red	U/T1
2	White	V/T2
3	—	NC
4	Red	CS1
5	Blue	CS2
6	Yellow	CS3
7	Grn/Yel	E
8	Black	W/T3
9	—	NC
1 0	Shield	FG
1 1	White	VCC
1 2	Black	GND

Connector to inverter wiring

Pin No.	Color	Signal
1	White	VCC
2	Red	CS1
3	Blue	CS2
4	Yellow	CS3
5	Black	GND
6	—	NC
7	Shield	FG

3-R1, 25-3.5 or equivalent

U/T1 (red)
V/T2 (white)
W/T3 (black)
GND (green/yellow stripe)

R1.25-4 or equivalent

MOLEX
5559-12P
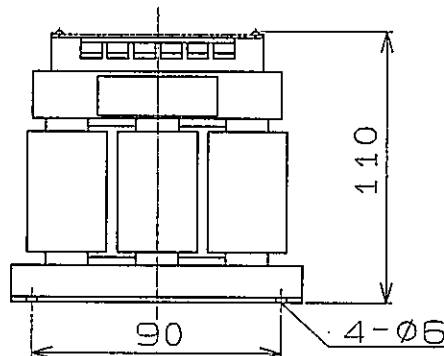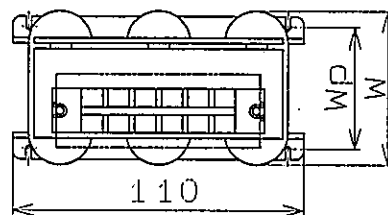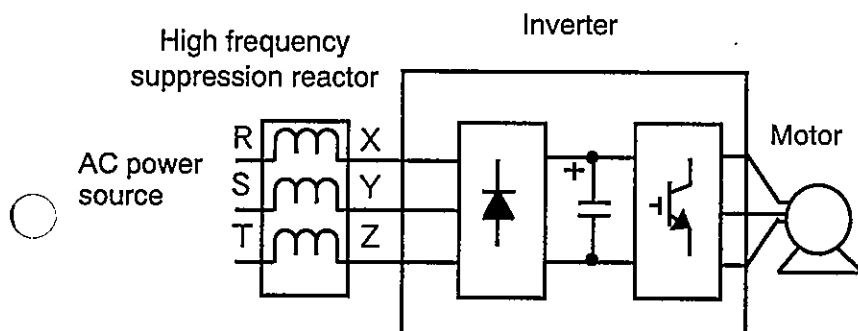
MOLEX
51030-0730

Spec.

Optional accessories

AC reactor

The following AC reactors are available for use with inverters rated 200 V, 3.7 kW or below, to meet stringent high frequency emission regulation.

AC reactor wiring diagram

Option part number	Inverter capacity (kW)	W	W p
		mm	mm
DVOP142-1	0.2／0.4	60	40
DVOP142-2	0.75	70	50

Regenerative resistor

Option part number	Specification	Supply voltage
DVOP23501	60W／200Ω	200V
DVOP23502	60W／50Ω	100V

<CAUTION>
Regenerative resistor becomes hot during operation. Do not place it near flammable materials or easily accessible location.
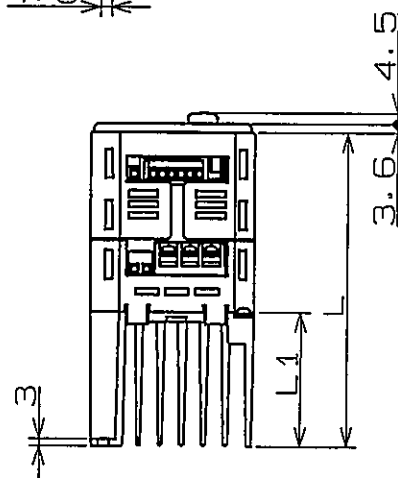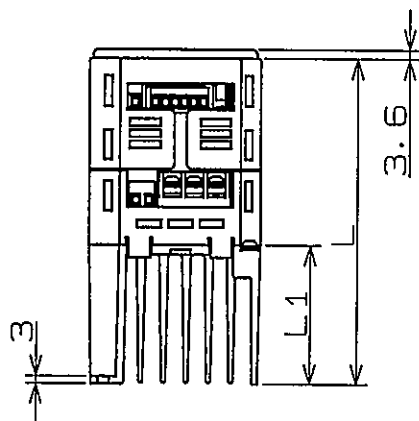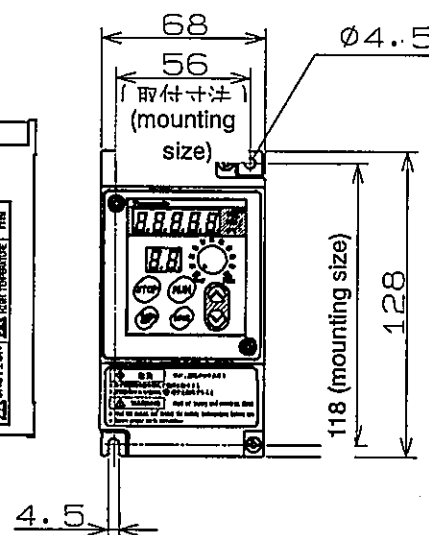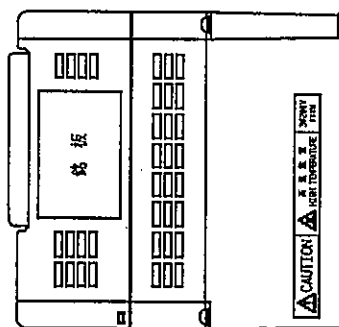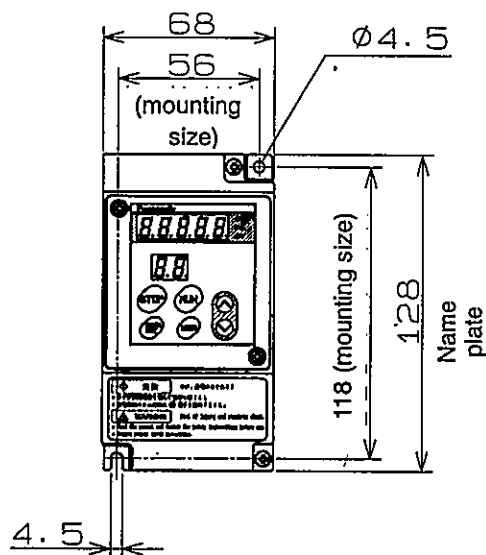
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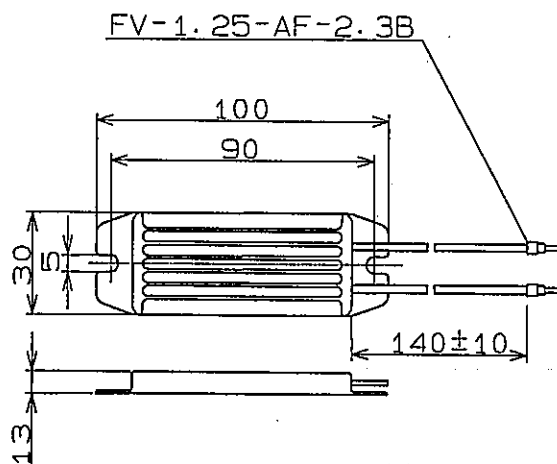
Dimensions (Unit: mm) Tolerance±2mm

Brushless inverter

| Without control dial on operation panel | With control dial on operation panel |

Inverter model No.	Capacity (W)	L 1 mm	L mm	Mass (kg)
MBSK5A1***	5 0	12.5	87	0.6
MBSK011***	1 0 0	37.5	112	0.7
MBSK021***	2 0 0	37.5	112	0.7
MBSK5A3***	5 0	12.5	87	0.6
MBSK013***	1 0 0	12.5	87	0.6
MBSK023***	2 0 0	37.5	112	0.7
MBSK043***	4 0 0	37.5	112	0.7
MBSK083***	7 5 0	55.5	130	0.9
MBSV3A5***	2 5	12.5	87	0.6
MBSV5A5***	5 0	12.5	87	0.6
MBSV015***	1 0 0	12.5	87	0.6
MBSV025***	2 0 0	12.5	87	0.6

Spec.

Servicing (Repair)

| Repair |

● Consult your Panasonic dealer for repairs of your Panasonic inverter.
Consult your machine or device manufacturer when the inverter is installed in a machine or device.

For your convenience: (Please fill in the blank when you need to consult for repairs)

Date purchased	Year/Month/Date	Model number	
Shop purchased			
	Phone number		

Industrial and Appliance Motor Division, Motor Company, Matsushita Electric Industrial Co., Ltd.

7-1-1 Morofuku, Daito-shi, OSAKA, 574-0044 Japan
Phone: 072-871-1212