

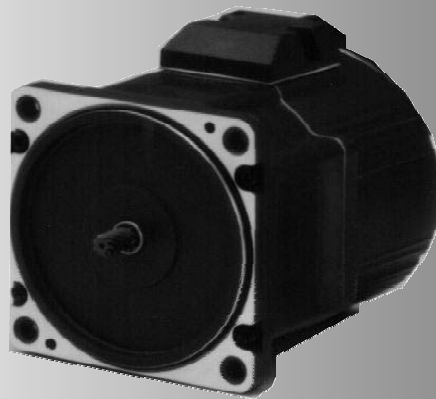
Panasonic

Circuit Integrated Brushless Motor B1-G Series Instruction Manual

Thank you very much for buying Panasonic Brushless Motor.

Read this instruction manual carefully for proper use. **In particular, be sure to read "Safety precautions" before use for safety.** Keep this manual with care after reading, and read as necessary.

- This product is for industrial equipment. Do not use this product at general household.



Be sure to give this manual to an end user.

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Safety precautions

Important

See the following precautions in order to avoid damages on machinery and injuries among the operators and other people during the operation.

The following symbols are used to indicate the level of danger possibly occurred when you fail to observe the safety precautions.

! DANGER

Indicates a potentially hazardous situation, which if not avoided will result in death or serious injury.

! CAUTION

Indicates a potentially hazardous situation, which if not avoided, will result in minor injury or physical damage.

The following symbols indicate what you must do.
(Shown below is an example of symbols.)



Indicates that the operation is prohibited to do



Indicates that the operation must be done.



DANGER

Do not touch the rotating part of the motor while operating.



The failure could result in injuries.

Do not use in corrosive atmosphere, flammable gas atmosphere, or near combustible substance.



Incompliance could result in failure.

Do not expose the cables to sharp objects, excessive pressing or pinching forces, and heavy loads.



The failure could result in electric shocks, damages, or malfunction.

Install an external emergency stop device to shut down the main power source in any emergency.



The failure could result in electric shocks, injuries, fire, damages or malfunction.

Install the product properly to avoid personal accidents or fire in case of an earthquake.



The failure could result in electric shocks, injuries, fire, damages or malfunction.

An over-current protection, earth leakage breaker, over temperature protector and emergency stop device must be installed.



The failure could result in electric shocks, injuries, or fire.

Make sure to secure the safety after the earthquake.



The failure could result in electric shocks, injuries, or fire.

Wiring must always be performed properly and reliably by a professional electric worker.



The failure could result in electric shock, injury, fire, malfunction, and damage.

Be sure to ground the grounding wire of motor.



The failure could result in electric shock.



CAUTION

Do not drive the motor shaft from the outside.



The failure could result in fire, electric shocks, or damages.

Do not block the dissipation hole of brushless inverter.



The failure could result in fire, electric shocks, or malfunction.

Do not modify, dismantle or repair the product.



The failure could result in electric shocks, injuries, or fire.

Do not hold the cables or motor shaft when transporting the motor.



The failure could result in injuries.

Never start and stop the motor by magnet contactor, etc. which is provide on the main line.



The failure could result in damages.

Do not place any obstacle that blocks ventilation around the motor.



The failure could result in burns or fire.

Do not touch the motor, since they become hot.



The failure could result in burns.

Do not approach to the equipment after recovery from the instantaneous stop because they may restart suddenly.



The failure could result in injuries.

Install a safety device against idling or locking of gear head, and leakage of grease.



The failure could result in injuries, damages, and contaminations.

Attach to inflammable matter such as metal.



The failure could result in electric shocks, injuries, or fire.

If trip occurs, remove the causes of the trip and secure the safety before restarting.



The failure could result in injuries.

Execute the trial-operations with the motor fixed and a load unconnected. Connect a load to the motor after the successful trial-operations.



The failure could result in injuries.

This product should be treated as an industrial waste when it is disposed.

Maintenance and check must be performed by an expert.



The failure could result in injuries and electric shock.

Use the specified voltage on the product.



The failure could result in electric shocks, injuries, or fire.

Introduction/Name of each part/Cautions

After unpacking

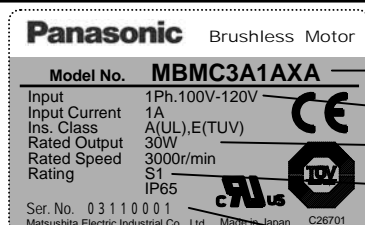
Make sure that the model is what you have ordered.

Check whether the product has been damaged or not during transportation.

If any deficiency should be found, contact the dealer store where you bought this product.

Checking the model of brushless motor

Nameplate



Model name

Rated input voltage

Rated output

S1: Continuous rating,

S2: Short time rating

Serial Number

Check the Model Name

MBMC

Series name

Output

3A: 30 W

5A: 50 W

9A: 90 W

1E: 130 W (Rating 30 min)

3A

1

A

X

A

Blank

Set specification (Blank): Console A attached

P: Console A attached

Function **A**: Standard

Shaft specification

X: For gear head MX8G

Z: For gear head MZ9G

S: Round shaft

Structure **A**: Standard

Input power supply

1: Single phase AC100 – 120 V

2: Single phase AC200 – 240 V

Check the Serial Number

* **03** **11** **0001** *

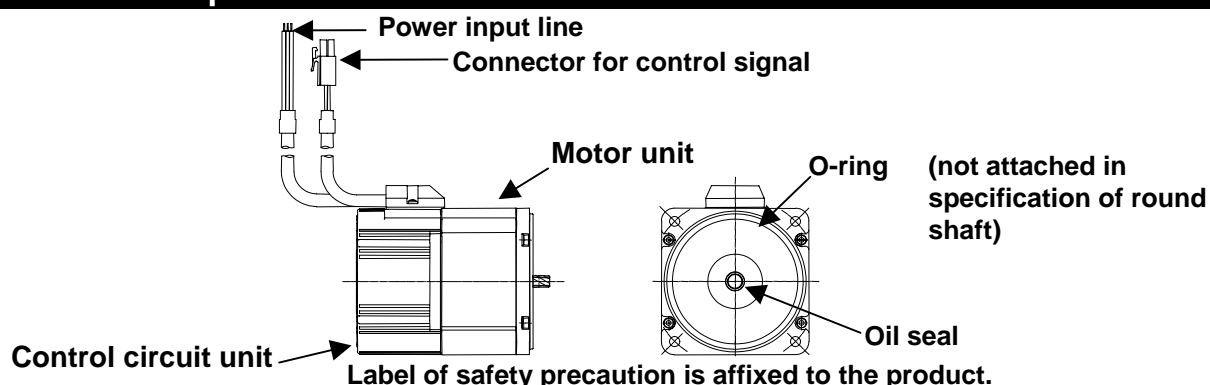
Manufacturing
year
(Lower 2 digits of Christian Era)

Serial Number

Manufacturing month

* Indicates production in November 2003, serial number 0001.

Name of each part



Precaution for proper use

1. This motor incorporates control circuit. Control circuit is sensitive to temperature and impact, therefore read this instruction manual carefully for proper installation.
2. This motor is controlled by switching the power element at a high speed. Therefore, when the motor runs, leaking current may increase, which activates the leakage breaker. In such a case, use a leakage breaker which is provided with measure against high frequency for inverter.
3. In starting and stopping the motor, use the operation instruction input "I1" or RUN/STOP switch of console A and digital key pad. When the motor is turned on and off by turning on and off power supply, the life of inner circuit may be shortened.

Installation

Installation

Install the brushless motor properly for preventing failure and accident.

Transport

Use caution enough in transporting the unit to prevent injury by drop or fall, and avoid damage to the equipment.

Storage

Keep the unit indoors in a clean and dry place free from vibration with little change of temperature. In keeping a gear head alone, direct the output shaft down.

(Otherwise, grease leaking is possible.)

Location

Location gives great influence upon the life of brushless motor, therefore choose a place in conformance with the conditions below:

- (1) Indoors where the motor is not subjected to rain water and direct sun beam.
- (2) Do not use the motor in corrosive atmosphere such as hydrogen sulfide, sulfurous acid, chlorine, ammonia, sulfur, gas chloride, gas sulfide, acid, alkali, and salt, in the atmosphere of combustible gas, or in the vicinity of flammables.
- (3) Place not exposed to grinding liquid, oil mist, iron powder, and cutting particle.
- (4) Well-ventilated place with little moisture, oil, or inundation, and place far from heat source such as a furnace.
- (5) Place easy to check and clean
- (6) Place free from vibration
- (7) Do not use the unit in an enclosed environment. Enclosing may raise the temperature of motor, and shorten their life.

Caution in Installing Gear Head

Idling by damaged tooth, locking by bite, grease leakage, and the like are possible on the life end of gear head. Install a safety device in order to ensure safety even if such trouble should be found.

- Install a device for preventing drop by damaged teeth on a lifter or the like.
- As for application such as opening and closing of door, install a release device against locking by gear biting.
- As for food or textile equipment, install an oil pan for measure against grease leakage.
- Do not install an encoder, sensor, contact, etc in the proximity of gear head. If you should install such devices, take measures against their grease leakage.
- Be sure to perform daily check in order to prevent unexpected accident.

Environmental condition

Item		Condition
Ambient temperature	Brushless motor	-10°C - 40°C (free from freezing) *1
	Console A, Digital key pad (optional)	-10°C - 50°C (free from freezing)
Ambient humidity		85% RH or below (free from condensation)
Storage temperature		-20°C - 60°C (free from freezing) *2
Protection structure	Brushless motor	IP65 (excluding output shaft rotating area, and tip of lead) • This motor conforms to test condition specified in EN standard (EN60529 and EN60034-5). This motor is not applicable to the use which requires long-term waterproof performance, such as the case where the motor is always washed with water.
	Console A, Digital key pad (optional)	Equivalent to IP20
Vibration		Not greater than 4.9 m/s ² (10 – 60 Hz)
Altitude		Not greater than 1000m

*1 Ambient temperature is measured at a distance of 5cm from the motor.

*2 Temperature which is acceptable for a short time, such as during transportation.

Installation/System configuration and wiring

Others

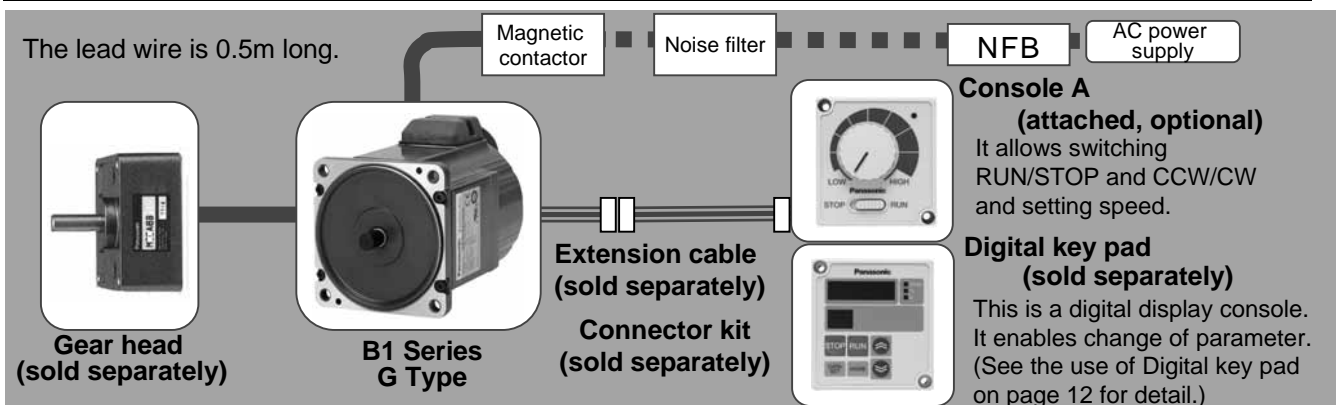
Oil and water protections

- (1) Direct down the lead of cable as far as possible.
- (2) Avoid use in such an environment where motor is always exposed to oil and water.
- (3) Avoid use with cable immersed in oil and water.

Cable: stress relieving

- (1) Make sure that stress is not applied to the lead or connection of cable due to bending or dead weight.
- (2) In installation where the motor moves, fix the cable of motor, incorporate the extension cable connected beyond in the cable carrier to reduce stress by bending as small as possible.
- (3) Allow the bending radius of cable as large as possible.

System configuration/general wiring diagram



Wiring work must always be performed by a professional electric worker.
Do not turn on power before finishing wiring for avoiding electric shock.

Selection of wiring equipment

Recommended noise filter

Option part number: DVOP3611-5

(Okaya Electric Industries Co., Ltd)

Manufacturer's part number: SUP-EQ5-ER-6

Selection of non-fuse breaker (NFB), magnetic contactor (made by Matsushita Electric Works, Ltd), and electric wire (wiring within equipment)

(See "Adaptation to overseas standard" for compatibility with overseas standard.)

Voltage	Capacity (w)	NFB (rated current)	Magnetic contactor (contact structure)	Electric wire (mm ²)	
				Main circuit/ Grounding wire	Control circuit
Single phase 100V	30 - 90	BBC25N(5A)	BMFT61041N(3P+1a)	0.5(AWG20)	0.13(AWG26)
Single phase 200V	30 - 130	BBC25N(5A)	BMFT61042N(3P+1a)	0.5(AWG20)	0.13(AWG26)

Be sure to ground the grounding terminal.

In wiring to power supply (outside of equipment) from NFB, use an electric wire of 1.6 mm diameter (2.0 mm²) or more both for main circuit and grounding. Apply grounding class D (100 ohms or below) for grounding.

Selection of relay

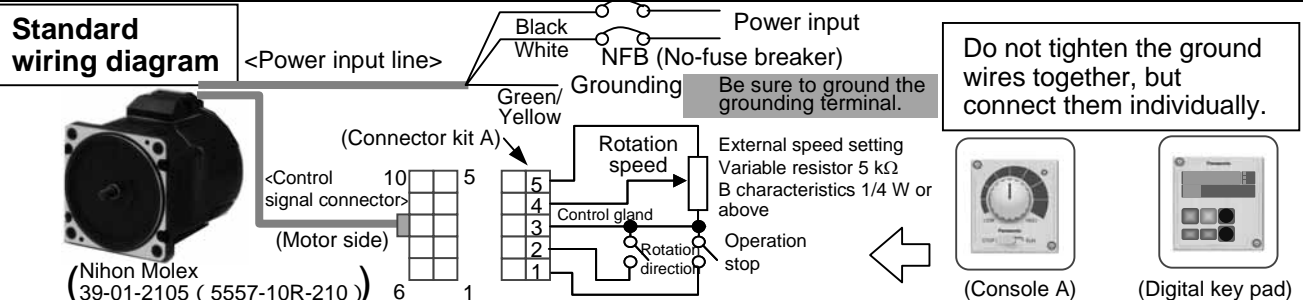
As for use for control circuit such as control input terminal, use a relay for small signal (minimum guarantee current 1 mA or less) for preventing poor contact. <Reference example> Matsushita Electric Works, Ltd: DS type, NK type, HC type, OMRON: G2A type

Control Circuit Switch

When using a switch instead of relay, use one for minute current in order to prevent poor contact.

<Example> Nihon Kaiheiki: M-2012J-G

Wiring



Wiring/Test run

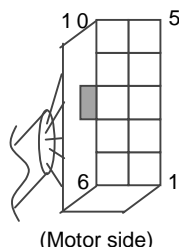
Function of terminal

<Power input line>

Wire color	Name	Description of function
White/Black (L1, L2)	Power input line	Connect the terminal to commercial power supply conforming to voltage specification.
Green/Yellow (E)	Grounding wire	Wire for grounding the motor

<Control signal connector>

Nihon Molex 39-01-2105 (5557-10R-210)



(Motor side)

Terminal number	Terminal symbol	Terminal name	Description of function	Wire color
1	I1 *1	Operation instruction input	Motor runs when "I1" and "GND" are shorted, and stops when they are opened.	Brown
2	I2 *1	Rotation speed changeover input	CW operation when "I2" and "GND" are shorted, and CCW operation when they are opened. *2	Red
3	GND	Control ground	Common ground terminal for control signal. *3	Orange
4	FIN	Analog speed command input	Speed can be set by applying voltage DC0 – 5V. Input impedance 100 kΩ.	Yellow
5	+ 5 V	External speed setting power supply	Power output dedicated when connecting an external variable resistor (5 kΩ, B characteristics) to FIN input (Cannot be used for any other purpose.)	Green
6	O1 *1	Trip output	Trip signal output. *1 "L" in trip (Contact ON) Open collector Vce max: DC30V, Ic max: 50mA	Blue
7	SCK	Digital key pad I/F	Interface for digital key pad	Purple (Pink)
8	SIN			Gray
9	SOT			White
10	(N/A)	-	(Do not connect anything.)	Black

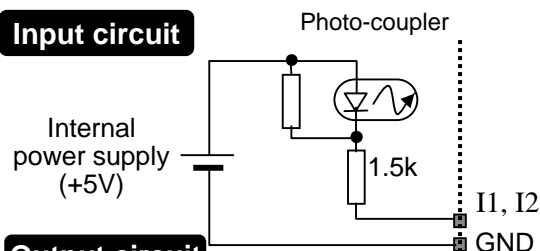
*1 Function of input/output can be changed by the Digital key pad. Default is shown.

*2 Rotation direction is that on motor shaft. When gear head is incorporated, the rotation direction of motor and that of gear output shaft are reversed for some gear reduction ratio. See the allowable shaft torque table on page 8.
(CW: Rotation clockwise when seen from the motor shaft, CCW: Rotation counterclockwise when see from the motor shaft)

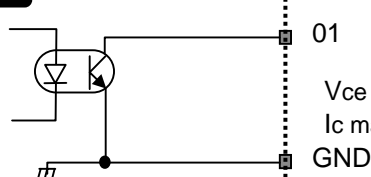
*3 When resistor and control GND are disconnected in use of external variable resistor, 5V is input to FIN irrespective of setting of variable resistor, and upper speed limit is directed; therefore use caution enough for connecting GND.
See the optional connector kit A (DVOP3600) for compatible connector.

In extending the control signal wire, keep it below 5m long, and use wire rod above AWG26 (0.12mm²).

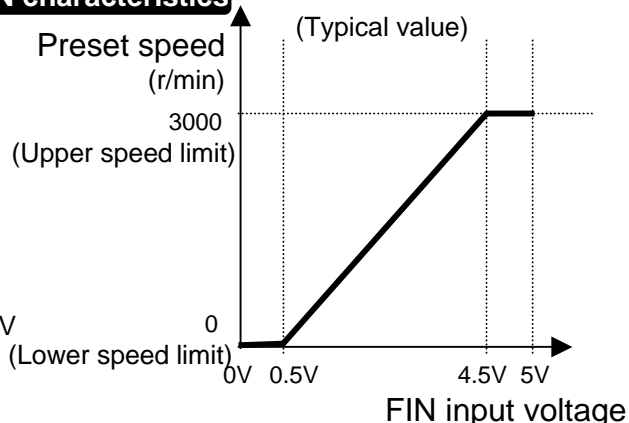
Input circuit



Output circuit

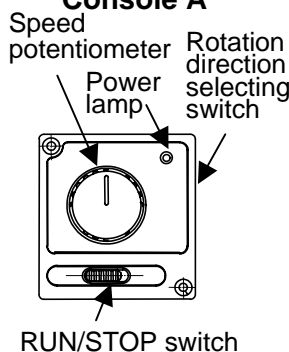


FIN characteristics



Inspection prior to test run (Console A)

• Connect the Console A



(Check before operation)

(1) Any mistake found in wiring? (2) Input power supply conforms to rating?

(Test run)

When RUN/STOP switch is changed to RUN, the motor rotates, and when the switch is returned to STOP, the motor stops.

Rotation direction can be changed by rotation direction selecting switch on the side of console.

When the rotation direction is changed in RUN, the motor is inverted suddenly, and the motor may trip due to some inertia of load.

Rotation speed can be adjusted by the speed potentiometer.

Turn off power when the motor is to be stopped for a long time.

When power is turned off with RUN/STOP switch on RUN side, and power is turned on again, the motor may start again, which is dangerous. In turning on power, always make sure that the switch is on STOP side.

When a gear head is incorporated, rotation direction of gear head output shaft may be inverted for some gear reduction ratio. See the table of allowable shaft torque on page 8.

Checking the load and use condition

Check use condition for eternal use of this product. Some use conditions may possibly lead to heating or damage to the shaft. Fully check use conditions, and use the motor in a permissible range.

Standard life

Standard life is 5,000 hours for the motor equipped with gear head (MB8G and MB9G). Standard life is the same 10,000 hours for motor alone (round shaft). (Standard life of sealing performance of oil seal is 5,000 hours.)

Standard life refers to design life for operation 8 hours per day (service factor: $S_f = 1.0$) at a normal temperature and humidity, under uniform load (permissible shaft torque of gear head and rated torque of motor).

Service factor (S_f)

$$\text{Expected of life} = \frac{\text{Standard life}}{\text{Service factor (Sf)}}$$

Service factor (S_f) depends on the magnitude of shock of load or operating time. Service factor is shown below for different load conditions:

Type of load	Example of load	Service factor		
		5 hours/day	8 hours/day	24 hours/day
Uniform load	One direction continuous operation	0.8	1.0	1.5
Light shock	Start, stop, or cam shock	1.2	1.5	2.0
Middle shock	Instantaneous rotation/reverse rotation and instantaneous stop	1.5	2.0	2.5
Heavy shock	Middle shock at a high frequency	2.5	3.0	3.5

Permissible shaft torque

Required shaft torque T_A of gear head can be obtained from service factor and actual load torque T_1 .

$$T_A = T_1 \times S_f$$

Select a gear head and motor to ensure that required torque (continuous) is within permissible shaft torque in the table below. Here, the torque T_1 must not exceed permissible shaft torque T_A irrespective of S_f .

Unit: N m

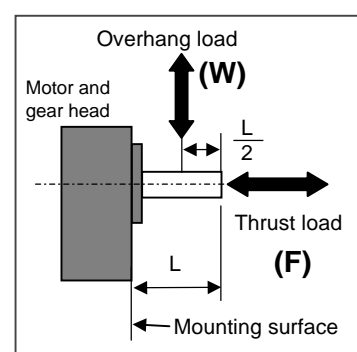
Model name	Reduction ratio	3	3.6	5	6	7.5	9	10	12.5	15	18	20	25	30	36	50	60	75	90	100	120	150	180	200
MBMC3A MX8G	AXA B	0.23	0.28	0.38	0.46	0.58	0.69	0.77	0.96	1.15	1.39	1.55	1.93	2.16	2.60	3.55	4.36	5.43	6.45	6.99	7.84	7.84	7.84	-
MBMC5A MX8G	AXA B	0.39	0.46	0.64	0.77	0.96	1.16	1.29	1.61	1.92	2.33	2.59	3.23	3.61	4.33	5.93	7.29	7.84	7.84	7.84	7.84	7.84	7.84	-
MBMC9A MZ9G	AZA B	0.67	0.81	1.12	1.34	1.69	2.02	2.28	2.54	3.06	3.72	4.11	5.27	6.22	6.96	9.81	11.7	14.7	17.3	19.0	19.6	19.6	19.6	19.6
MBMC1E MZ9G	AZA B	1.01	1.21	1.69	2.02	2.54	3.04	3.42	3.82	4.59	5.58	6.17	7.91	9.34	10.5	14.7	17.5	19.6	19.6	19.6	19.6	19.6	19.6	19.6

* Rotation direction is the same as that of motor in shaded portion, and reverse for others.

Permissible shaft load

Use the permissible shaft load within the load shown below:

	Model name	Permissible overhang (w)	Permissible thrust (F)
Motor alone	MBMC3A ASA	100N	10N
	MBMC5A ASA	100N	10N
	MBMC9A ASA	150N	20N
	MBMC1E2ASA	150N	20N
Gear head	MX8G type	294N	49N
	MZ9G type	588N	147N



Permissible load inertia moment

Set the acceleration/deceleration time 0.3 seconds or longer.

Apply permissible load inertia moment within the value shown below:

(Acceptable value on round shaft applies when stopping operation in free-run stop. In speed reduction stop, the value is 1/4 of indication below only on round shaft due to regeneration. Set a longer speed reduction time if the inertia is not to be lessened.)

Unit: $\times 10 \text{ kg} \cdot \text{m}^2$

Model name	Reduction ratio	3	3.6	5	6	7.5	9	10	12.5	15	18	20	25	30	36	50	60	75	90	100	120	150	180	200	Round shaft
MBMC3A MX8G	AXA B	1.25	1.79	3.42	4.90	7.72	11.2	13.8	21.6	30.6	45.2	55.8	86.9	127	183	342	342	342	342	342	342	342	342	-	2.5
MBMC9A MBMC1E MZ9G	AZA B	5.93	8.47	16.4	23.6	37.3	53.4	67.6	98.3	142	211	257	423	589	847	1684	1684	1684	1684	1684	1684	1684	1684	1684	5.6

Maintenance and inspections/Assembling of Gear Head

Assembling of Gear Head

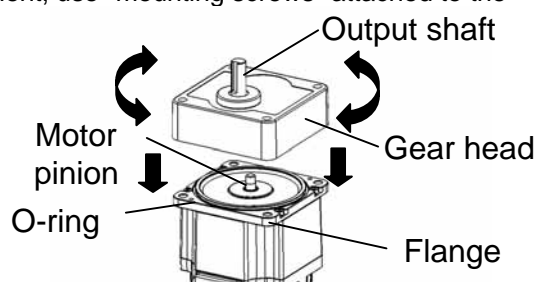
Preparation before assembling

- (1) Compatible gear head described on this instruction manual is MX8G B (for 30, 50W) and MZ9G B (for 90, 130W). Never combine anything other than compatible gear head in use. Failure to observe this direction may result in malfunction. (represents speed reduction ratio.)
- (2) Make sure that the O-ring is attached to the bottom of motor flange.
If the gear head is assembled with O-ring floating, it may result in grease leakage.
- (3) When grease adheres to the end surface of gear head, wipe off sufficiently.
If the gear head is assembled with grease adhered, it may cause grease to exude.

Assembling

- (1) Direct the motor pinion upward, and make sure that the relation between direction of motor lead wire and output shaft matches with the equipment.
- (2) Turn the motor pinion finely clockwise and counterclockwise for assembling, ensuring that the tip of motor pinion does not hit the tooth of gear head.
- (3) In installing the motor and gear head to the mating equipment, use "mounting screws" attached to the gear head, tighten them sufficiently to eliminate clearance between the motor flange surface and gear head end surface while paying attention to bite of O-ring.
Recommended tightening torque is shown below:

Mounting Angle dimension	Type of gear head	Screw size	Tightening torque	Mounting pitch diameter
80	MX8G	M5	2.45N·m	94mm
90	MZ9G	M6	2.94N·m	104mm



Note) Excessive force to assemble the motor and gear, or damage to the tip of motor pinion or tooth of gear head may generate abnormal noise or reduce the life.

Maintenance and inspection

Routine maintenance and inspection are essential for proper and satisfactory operation of the motor.

Notes to Maintenance/Inspection Personnel

Power-on/off operations should be done by the operators themselves for ensuring safety in checking.
Do not touch the motor while power on.

In performing the measuring insulation resistance, remove all connections. Measuring insulation resistance with connection can cause motor failure.

Maintenance/ Inspection item

Maintenance/ Check item	Inspection procedure	Condition
Input voltage	Voltmeter	Must be within $\pm 10\%$ of rating.
Input current	Ammeter	Must be within rated input current described on nameplate.
Insulation resistance	Insulation resistance tester	Measure the insulation resistance of motor with 500V Megger. It must be above 1Mohm. Measuring position: Between power input line (L1, L2) and grounding wire
Noise	Hearing	Noise level must not be different from the usual level. In addition, abnormal noise such as rumbling noise must not be heard.
Vibration	By hand	Free from abnormal vibration.
Grease leakage	By sight	Check that periphery of motor or gear head is not wet by grease or oil. Protect them with a cover etc. in application which is deteriorated by grease leakage.
Installation bolt	Torque wrench	Check for loosening of bolt, and tighten additionally as necessary.
Use environment	By sight	Check the ambient temperature and humidity, and make sure that dirt, dust, or foreign substance is not found. Make sure that the opening of brushless inverter is free from lint.

Be sure to contact our service division or sales agent for disassembling and repairing of the motor.

Protective functions/How to clear trip

Protective functions

When the protection function is activated, motor stops and trip signal output turns on.



Description of trip can be displayed only when the Digital key pad (option) is connected.





Protection function works even when the Digital key pad is not connected, but it is not displayed.

Protective item	Description	Measure	Display on Digital key pad
Undervoltage warning (default)	When the internal DC voltage is below specified value, operation is stopped; when voltage is recovered, operation is started again. (This is not trip, and no trip output is made.) Trip can be set by parameter 50. 100V product: Approx DC100V, 200V product: Approx DC200V	Investigate the condition of wiring and circumstances of power supply.	L
Undervoltage error	The motor trips when internal DC voltage is below specified value only if trip is set by parameter 50. 100V product: Approx DC100V, 200V product: Approx DC200V		E-LV
Overload warning (Electronic thermal)	When load factor exceeds specified value, the electronic thermal relay operates and monitor display flashes. It is a warning for electronic thermal trip. 30-90W: 100% 130W : 80%	Reduce the load. Check the load factor in monitor mode.	5-digit LED flashes.
Overload error (Electronic thermal relay)	The motor trips when motor torque is output continuously above specified value. 30-90W: 115% 130W : 105%	Investigate the cause of overload, and reduce the load, change the operating pattern by making acceleration and deceleration time longer, or apply design to increase the capacity of motor.	THr
Overcurrent error	The motor trips when the motor current exceeds specified current.	Excessive acceleration/deceleration setting or gain setting is possible. Set the longer acceleration/deceleration time and the smaller gain. If this trip should occur as soon as the unit is started, failure is possible.	E-OC
Overvoltage error	The motor trips when internal DC voltage (voltage of smoothing function of power supply) rises and exceeds specified value. Product of 100V: Approx DC200V, Product of 200V: Approx DC400V	If the motor should trip in running, too short deceleration time is one of the causes. Adjust deceleration time. No measure can be taken in continuous regenerative operation such as lowering.	E-OV
User parameter error	Parameter data saved in EEPROM is abnormal.	Check all parameters again and set them again. If this protection works frequently, failure is possible	E-UPr
System parameter error	Internal parameter data saved in EEPROM is abnormal.	Failure is possible.	E-SPr
System error	The motor trips when trouble of control microcomputer is detected.	Malfunction due to external noise is possible. Investigate for noise source in the vicinity and eliminate such source. Internal circuit may be in failure.	Err
Sensor error	The motor trips when trouble of CS sensor signal is detected.		E-CS
Overspeed error	The motor trips when rotation speed (actual speed) exceeds specified value. Approx 4500r/min	Ensure that the actual speed does not exceed rated rotation speed, such as overshooting by unmatching between load and gain.	E-OS
Overheat error	The motor trips when the temperature in control section rises above specified value. Approx 105	Check the ambient temperature and cooling condition of motor. Check the load factor. If the ambient temperature is low enough, and the protection occurs soon after power-on, failure is possible.	E-OH
Setting change warning	The motor trips when any important parameter such as "30 Run command selection" is changed	This is not abnormal. Trip reset in order to make change effective.	CAU





How to clear trip

If the motor should trip, eliminate the cause and use any of the procedures [1] – [3] below for clear.

- [1] Turn off power, and when power LED has gone out, turn on power again.
- [2] Press the switch  and  of the Digital key pad simultaneously for one second or more with present trip state displayed.
- [3] Input the trip reset signal.

(When  or  is chosen in "33 I1/I2 function selection", enter "I1" and "I2" at the same time; when  or  is chosen, enter "I2" for trip reset.

Trip reset signal, when continued to be input, is designed to become ineffective in order to prevent inadvertent restarting. Enter trip reset signal only when necessary.)

Note: As for overcurrent error , sensor error , System error , and user parameter error , reset them by turning off power as shown in [1] above. No other procedure is effective.

(Caution) In clear trip, be sure to find and remove the trip factor before clear.

Troubleshooting

If any trouble should be found, follow the steps below for check and countermeasure.

If the cause cannot be found, it is recommended to use the Digital key pad and check the detail of trip. If failure is likely, or when any part is damaged, or when you are in any other trouble, contact the sales agent of purchase or our company.

Phenomenon	Detail of checking	Measure, etc
Motor does not rotate.	Check for abnormality of wiring.	Apply proper wiring.
	Check whether protective function is activated.	Check the detail of trip by the Digital key pad. Turn off power once, and turn on again.
	(Only when the motor is connected to the key pad) Check whether 7-segment LED of on the key pad is lighted up.	If the LED is off when power is input to the motor, failure is possible. Contact us for repair.
	Check whether voltage on input power is normal.	Check the supply voltage.
	Check whether operation start signal is input.	Check the condition of operation instruction.
	Check whether Analogue speed instruction is set at 0V.	Raise the analogue speed instruction little by little.
Motor does not rotate or stops during operation.	Check whether protective function is activated.	Overload is possible. Reduce the load or increase the output capacity.
Motor stops during deceleration.	Check whether the inertia of load is too large.	Regenerative voltage protection may have worked. Decrease the inertia. Turn off power once, and turn on again, and reset the trip state. Make deceleration time longer by the Digital key pad. Alternatively, apply free-run stop.
Motor does not stop quickly when stop command is input.	The motor with large inertia does not stop quickly because default stop mode is Free-run stop.	Stop motor by 0V analogue speed command. Change stop mode to deceleration stop by Digital key pad .
Large vibration or noise.	Output shaft of motor (gear head) and shaft of load are not aligned.	Check the joint between the output shaft and load shaft of the motor (gear head).
	Motor and gear head are not assembled correctly.	Check the assembling condition between motor and gear head, and their combination, and assemble them properly.
	Damage to gear head or bearing.	Contact us for repair.
Motor rotates reversely.	Check whether Setting of rotation direction changeover input is wrong.	Check the position of rotation direction choosing switch for the console A. As for others, check the status of "I2".
	Rotation direction of the motor and gear output shaft may be reversed for some gear reduction ratio of gear head.	Check the gear ratio and rotation direction. See the list of permissible shaft torque on page 8.
Rotation speed is unstable during operation (actual speed).	Check whether the load fluctuates greatly.	Reduce the fluctuation of load. Increase the output capacity.
Parameter dose not change.	Check whether operation start signal is input.	Some parameters cannot be changed when operation instruction is on. (See the check column of parameter list on page 18.) Turn off operation instruction before changing.

How to use Digital key pad

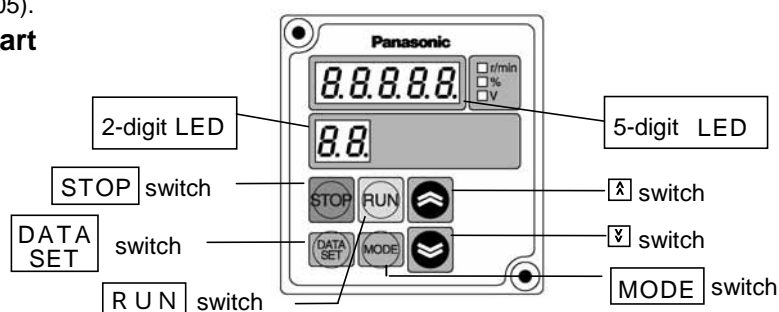
Name of each part and Installation

What can be done by Digital key pad

- Monitoring of rotation speed (actual speed) and load factor, etc
(Rotation speed can be displayed being multiplied by the factor set by parameter **47** and **48**.)
- Display detail of trip, and trip history. Trip reset by pressing **[Δ]** and **[▽]**.
- Parameter setting, initialization, and copying function at the same time.
- Start and stop of motor by **[RUN]/[STOP]** switch (Setting of parameter "**30** Run command selection" is required.)

When using the digital key pad and control signal input at the same time, buy an optional control signal branch cable (DVOP37505).

Name of each part



5-digit LED	Displays rotation speed (actual speed), commanded speed, trip history, setting of parameter, and the like.
2-digit LED	Displays the number of parameter (in editing parameter). Displays the rotation direction in operation. Displays 00 when the motor is stopped. (CCW as viewed from the output shaft of motor ... F and CW ... r) Rotation direction of gear head output shaft may be reversed for some gear reduction ratio when gear head is incorporated. See the table of acceptable shaft torque on page 8.
[MODE] switch	Switch for changing monitor mode. Whenever this switch is pressed, the mode changes in this sequence: Rotation speed (actual speed) → Internal DC voltage (voltage of smoothing capacitor of power supply) → Load factor → Torque → Commanded speed → Rotation speed (actual speed) → * When you press this switch in the parameter setting mode, setting is stored.
[DATA SET] switch	This is a switch for changing between parameter number mode and parameter setting mode, and for storing parameter setting.
[Δ] [▽] switch	This switch enables selection of parameter, and setting and changing of contents. When the motor is tripped, pressing [Δ] and [▽] at the same time enables clear of trip.
[RUN] switch	This switch is for instruction of operation. (Only when " 30 Operation instruction selection" is [PnL]) See " 33 Choosing I1/I2 function" (2) on page 23 for rotation direction.
[STOP] switch	This switch is for instruction of stopping. (Only when " 30 Choosing operation instruction" is [PnL])

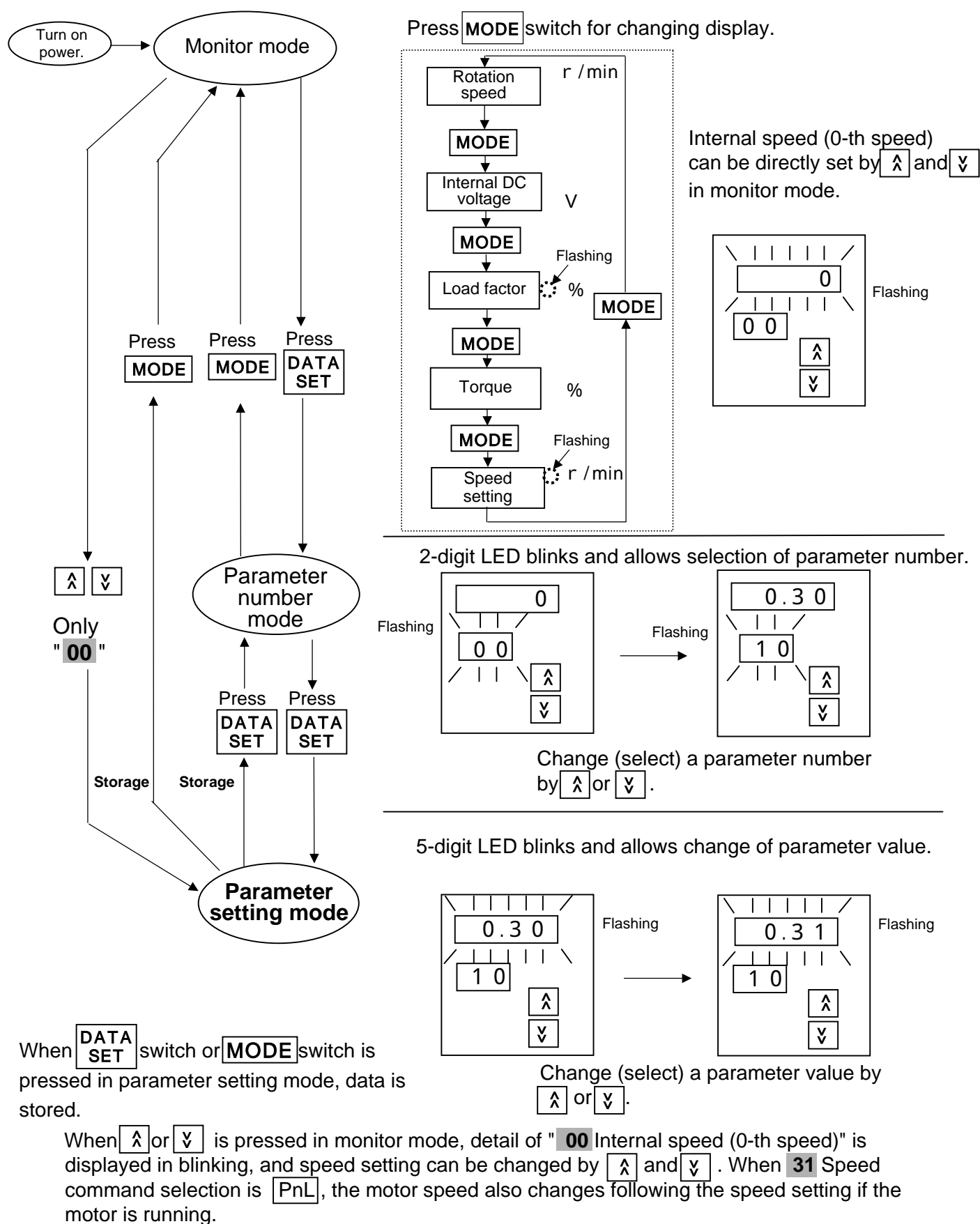
Description

Monitor mode	Displays rotation speed (actual speed), command speed, internal DC voltage, load factor, and torque on 5-digit LED. When power is turned on, this mode is set. This mode is set when power is turned on. Control changes to this mode when [MODE] switch is pressed in parameter number mode, parameter setting mode.
Parameter number mode	Displays a parameter number (00 - F0) in flashing. Control changes to this mode when [DATA SET] switch is pressed in parameter number mode. Parameter number can be changed and selected by [Δ] and [▽] switch.
Parameter setting mode	Displays the detail of parameter (setting) in flashing. Control changes to this mode when [DATA SET] switch is pressed in monitor mode. Change setting by [Δ] and [▽] switch. When [DATA SET] switch is pressed after change of setting, it is saved in EEPROM.

* Displays rotation speed r/min in normal monitor mode. Displays torque and load factor assuming the rated motor torque at 100%.

* Display is just a guide. Do not use the Digital key pad for a measuring instrument.

Operating Instruction



Data is stored only when **DATA SET** switch is pressed. Note that data returns to settings when power is turned off.

Test run (Digital key pad)

Inspection prior to test run

(Inspection prior to test run)

(1) Make sure that all wiring is correct. (2) Make sure that input power supply conforms to rating.

(Test run)

Test run procedure by the Digital key pad is as follows:

An example is introduced here where the motor runs CW at 1800r/min with the Digital key pad.

(1) Be sure to first perform the work below for safety.

Separate the motor from machine or equipment, and make sure that the motor alone can be operated.

(2) Then turn on power and follow the step below for test run.

Description of operation	Digital key pad	
	Switch	LED display
[1] Turn on power		<div>0</div> <div>00</div>
[2] Change of initial setting (Change the choice of operation instruction from I1/I2 TEr to the Digital key pad PnL)	Press DATA SET	<div>0</div> <div>TEr</div>
	Press ▲ several times to choose parameter number 30 .	<div>00</div> Flashing <div>30</div> Flashing
	Press DATA SET	<div>TEr</div> Flashing <div>PnL</div> Flashing
	Press ▼ to change parameter value.	<div>30</div> <div>CAU</div>
	Store by DATA SET .	<div>30</div> <div>30</div>
	Setting change warning is issued because setting of operation instruction has been changed.	
[3] Trip reset	Press ▲ and ▼ at the same time.	<div>CAU</div> <div>0</div> <div>00</div>
[4] Change of initial setting 2 (Change the choice of speed instruction from analogue speed instruction input to "00 Speed setting (the 0-th speed)" to enable use of Digital key pad.)	Press DATA SET	<div>0</div> <div>VoL - A</div>
	Press ▲ several times to choose parameter number 31 .	<div>00</div> Flashing <div>31</div> Flashing
	Press DATA SET	<div>VoL - A</div> Flashing <div>PnL</div> Flashing
	Press ▼ to change parameter value.	<div>31</div> <div>CAU</div>
	Store by DATA SET .	<div>31</div> <div>31</div>
	Setting change warning is issued because setting of operation instruction has been changed.	
[5] Trip reset	Press ▲ and ▼ at the same time.	<div>CAU</div> <div>0</div> <div>00</div>

Description of operation	Digital key pad		
	Switch	LED display	
[6] Choosing rotation direction* (This operation is not required for rotation forward [CCW].)	Press DATA SET	0	r S. F r
	Press ▲ several times to choose parameter number 33 .	0 0 Flashing	3 3 Flashing
	Press DATA SET	r S. F r	r - F
	Press ▼ to change parameter value.	3 3 Flashing	3 3 Flashing
	Store by DATA SET .		
	Setting change warning is issued because setting of operation instruction has been changed.	C A U	
[7] Trip reset	Press ▲ and ▼ at the same time.	C A U	0 0 0
[8] Speed setting	Press ▲	0 0 0 Flashing	• Internal speed (0-th speed) is displayed (setting at 0r/min).
	Press ▲ to set a speed.	1 8 0 0 0 0 Flashing	• Set the Internal speed (0-th speed) at 1800 r/min.
[9] Reset to monitor mode.	Press MODE	0 0 0	• Data is still stored if power is cut off here.
[10] Operation instruction	Press RUN	1 8 0 0 r	• Display of rotation speed changes little by little toward 1800 r/min • Display of rotation direction * (r indicates that the motor is rotating CW.)
[11] Stop instruction	Press STOP	0 0 0	• Display of rotation speed changes little by little toward 0 r/min.
[12] Power OFF			

<Checkpoint in Test run>

- (1) Check whether the motor rotates smoothly. Check for abnormal noise and vibration.
- (2) Check whether the motor is accelerated and decelerated smoothly.
- (3) Rotation direction and rotation speed of the motor are matched?

- * Rotation direction of gear head output shaft may sometimes be reversed due to reduction gear ratio when gear head is installed.
(See the list of permissible shaft torque on the page 8)
- * Rotation direction can also be changed by use of "I2". See " 33 I1/I2 function selection " (2) on page 23. Setting is still stored when power is turned off. When operating the motor with Digital key pad only in trial run, either reset the setting or initialize parameters after completion of trial run. (Parameter 54)
Here, note that all parameters return to default when parameters are initialized.

How to copy parameter

1. Reading a parameter value from motor to the Digital key pad

Once parameters are read into the console, their details are stored in the Digital key pad.

Description of operation	Digital key pad	
	Switch	LED display
[1] Turn on power.		<div>0</div> <div>0 0</div>
[2] Call 57 Parameter Copy.	Press DATA SET Hold down ^ to choose parameter number 57 .	<div>Parameter value</div> <div>0 0</div> <div>Flashing</div> <div>→</div> <div>n 0</div> <div>5 7</div> <div>Flashing</div>
[3] P.LOAd Choose reading a parameter into the Digital key pad.	Press DATA SET Press ^ twice to choose P.LOAd .	<div>n 0</div> <div>5 7</div> <div>Flashing</div> <div>→</div> <div>P. LOAd</div> <div>5 7</div> <div>Flashing</div>
[4] Read a parameter into the Digital key pad.	Press DATA SET for 1 second while holding down STOP .	<div>P. LOAd</div> <div>5 7</div> <div>Flashing → Slow flashing (once per second)</div>
[5] Wait about 30 seconds.		P. E n d
[6] Reading of parameter into the Digital key pad completed	Press STOP	<div>0</div> <div>0 0</div>

2. Copy a parameter value saved in the Digital key pad onto the motor.

Description of operation	Digital key pad	
	Switch	LED display
Turn on power. Call out 57 Parameter. (Same operation as 1. [1] and [2])		
[1] P.P r O G Choose writing a parameter to the motor.	Press DATA SET twice. Press ^ three times to choose P.PrOG .	<div>n 0</div> <div>5 7</div> <div>Flashing</div> <div>→</div> <div>P. PrOG</div> <div>5 7</div> <div>Flashing</div>
[2] Write a parameter to the motor.	Press DATA SET for 1 second while holding down STOP .	<div>P. PrOG</div> <div>5 7</div> <div>Flashing → Slow flashing (once per second)</div>
[3] Wait about 10 seconds.		P. E n d

Description of operation	Digital key pad	
	Switch	LED display
[4] Completion of writing a parameter from the Digital key pad to the motor		<div>C A U</div> <div></div>
[5] Reset to monitor mode.	Press and at the same time for clear trip.	<div>0</div> <div>0 0</div>

Error while copying a parameter

P.Err1 : Data is abnormal while copying.

→ Press **STOP** switch for clearing, and then copy data again. If data is still abnormal, initialize the Digital key pad and retry.

P.Err2 : Copy error

→ This error occurs in an attempt to copy data between products of different function. Press **STOP** switch for clear.

Parameters can be copied between the same models (B1-G Series standard unit), but parameters should be copied between the same output in principle because gain setting is different.

3. Initializing of data of Digital key pad

When any trouble occurs during copying, it can be often solved by initializing the Digital key pad.
(Stored data is cleared by initializing.)

Description of operation	Digital key pad	
	Switch	LED display
Turn on power and call 57 Parameter. (Same operation as 1. [1] and [2])		
[1] P. I n I T Choose initialization of data of Digital key pad.	Press . Press once and choose P.InIT .	
[2] Initialization of Digital key pad	Press for 1 second while holding down STOP .	<div>P. I n I T</div> <div>5 7</div> Flashing → Continuous lighting LED display changes from flashing to continuous lighting during initializing operation.
[3] Wait about 30 seconds.		P. E n d
[4] Initializing of data of Digital key pad completed	Press STOP	<div>0</div> <div>0 0</div>

Do not turn off power or disconnect the cable of Digital key pad during operation such as "Reading a parameter from the motor to the Digital key pad", "Copying a parameter value stored in the Digital key pad to the motor", and "Initializing the data of Digital key pad".

Parameters

Overview of parameter

Motor of this series is provided with various parameters for adjusting and controlling its characteristics and function. Purpose and function of respective parameter are described. Understand them well enough and adjust the unit at your optimum operation condition.

List of parameter composition and setting

Parameter No.	Name of parameter	Parameter setting			
		Setting range	Minimum unit	Default	Check * ¹
00	Internal speed (0-th speed)	0 – " 3b Upper speed limit"	1 r/min	0	
10	1st acceleration time	0.01 { - 3 sec : Incremented by 0.01 sec. 3 - 30 sec : Incremented by 0.1 sec. 30 - 3600 sec : Incremented by 1 sec.		0 . 3 0	
12	1st deceleration time	0.01 { - 3 sec : Incremented by 0.01 sec. 3 - 30 sec : Incremented by 0.1 sec. 30 - 3600 sec : Incremented by 1 sec.		0 . 3 0	
14	Acceleration mode selection	<input type="text" value="L I n"/> Linear		<input type="text" value="L I n"/>	
15	Deceleration mode selection	<input type="text" value="S - 1"/> S shape-1		<input type="text" value="L I n"/>	
		<input type="text" value="S - 2"/> S shape-2			
16	Stop mode selection	<input type="text" value="F r E E"/> Free-run stop		<input type="text" value="F r E E"/>	
		<input type="text" value="d E C"/> Speed reduction stop			
17	Free-run waiting time	0.0 - 10.0 sec	0.1 sec	1 . 0	
1A	Velocity loop proportional gain	0 - 10000	1	4 0 0 (8 0 0) * ²	
1b	Velocity loop integration gain	0 - 10000	1	5 0 0 (1 0 0 0) * ²	
30	Run command selection	<input type="text" value="P n L"/> RUN and STOP of Digital key pad <input type="text" value="T E r"/> I1/I2* ³		<input type="text" value="T E r"/>	C
31	Speed command selection	<input type="text" value="P n L"/> " 00 Internal speed (0-th speed)" <input type="text" value="V o L - A"/> FIN* ⁴		<input type="text" value="V o L - A"/>	C
33	I1/I2 function selection	<input type="text" value="F - r"/> { I1: CCW run/stop I2: CW run/stop <input type="text" value="r - F"/> { I1: CW run/stop I2: CCW run/stop <input type="text" value="r S . F r"/> { I1: run/stop I2: CW /CCW direction <input type="text" value="F - r S T"/> { I1: CCW run/stop I2: Trip reset <input type="text" value="r - r S T"/> { I1: CW run/stop I2: Trip reset		<input type="text" value="r S . F r"/>	C
3A	Lower speed limit	0 – " 3b Upper speed limit "	1 r/min	0	C
3b	Upper speed limit	0 - 3000 r/min	1 r/min	3 0 0 0	C
3C	Torque limit	50 - 150	1%	1 5 0	

*¹ When parameter marked with **C** in the check column is changed and stored, the unit is tripped for safety. It is not allowed to change them while the motor is running.

*² Parameter in () is the default of 90W and 130W.

*³ Corresponds to RUN/STOP switch of the console A or signal input.

*⁴ Corresponds to the speed potentiometer or analogue speed instruction of the console A.

Parameter No.	Name of parameter	Parameter setting			
		Setting range	Minimum unit	Default	Check *1
40	O1 function selection	<input type="text" value="T r I P"/>	Trip	<input type="text" value="T r I P"/>	
		<input type="text" value="S T b L"/>	Arriving		
		<input type="text" value="r U n"/>	Running		
		<input type="text" value="F r E E"/>	Free-run		
		<input type="text" value="F"/>	CCW run		
		<input type="text" value="r"/>	CW run		
		<input type="text" value="C k - L"/>	Overload detection		
		<input type="text" value="P O U T"/>	Speed pulse signal		
42	O1 output polarity selection	<input type="text" value="n O r"/>	Normal polarity	<input type="text" value="n O r"/>	
		<input type="text" value="r E V"/>	Reverse polarity		
44	Speed matching range	20 – " 3b Upper speed limit"	1 r/min	5 0	
45	Output pulse count selection	1, 2, 3, 4, 6, 8, 12, 24		2 4	
46	Monitor mode selection	<input type="text" value="O. - r"/>	Rotation speed (Actual speed)	<input type="text" value="O. - r"/>	
		<input type="text" value="O. - L"/>	Torque		
		<input type="text" value="A V. - L"/>	Load factor		
		<input type="text" value="S. - r"/>	Command speed		
		<input type="text" value="d C - V"/>	Internal DC voltage		
47	Numerator of display magnification factor	1 " 48 Denominator of display magnification factor" x 10	1 time	1	
48	Denominator of display magnification factor	1 - 1000	1 time	1	
4A	Trip history clear	<input type="text" value="n O"/>	No operation	<input type="text" value="n O"/>	
		<input type="text" value="Y E S"/>	Clear trip history		
4b	Trip history 1	-		-	
4C	Trip history 2			-	
4d	Trip history 3			-	
4E	Trip history 4			-	
4F	Trip history 5			-	
50	Undervoltage trip selection	<input type="text" value="n O"/>	No trip	<input type="text" value="n O"/>	C
		<input type="text" value="Y E S"/>	Trip		
51	Retrial selection	<input type="text" value="n O"/>	, 1 - 4	<input type="text" value="n O"/>	C
52	Retrial start time	1 - 120 sec	1 sec	5	
54	Parameter initializing	<input type="text" value="n O"/>	No operation	<input type="text" value="n O"/>	
		<input type="text" value="Y E S"/>	Initialize to default		
57	Parameter copy function	<input type="text" value="n O"/>	No copying of parameter	<input type="text" value="n O"/>	
		<input type="text" value="P. I n I T"/>	Initializing the data of Digital key pad		
		<input type="text" value="P. L O A d"/>	Reading a parameter to the Digital key pad		
		<input type="text" value="P. P r O G"/>	Writing a parameter to the motor		
F0	For manufacturer use	-		-	

LED display

LED display

Figures displayed on the 7 segment display of the Digital key pad are shown below:

Alphanumeric	LED display	Alphanumeric	LED display
A	A	S	5
B	b	T	7
C	C	U	U
D	d	V	U
E	E	Y	4
F	F	0	0
G	G	1	1
H	H	2	2
I	I	3	3
K	k	4	4
L	L	5	5
N	n	6	6
O	0, 0 *	7	7
P	P	8	8
Q	q	9	9
R	r		

Example of LED display

Example)

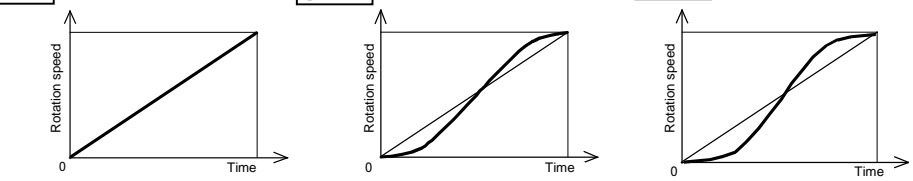
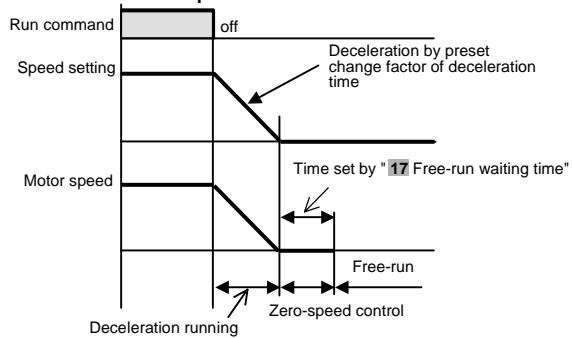
Description in the text	Display on Digital key pad
「P n L」	「P n L」
「T E r」	「7 E r」
「F r E E」	「F r E E」
「r S T」	「r 5 7」

* LED display of "0" is available in two types.

Example)

Description in the text	Display on Digital key pad
「V o L - A」	「U 0 L - A」
「n O」	「n 0」

Detail of parameter

Parameter No.	Name of parameter	Description
00	Internal speed (0-th speed)	Desired running speed can be set. This is effective when " 31 Speed instruction selection" is P n L (PANEL). Upper limit is limited by " 3b Upper speed limit".
10	1st acceleration time	The change factor of output speed in acceleration can be determined. • Set by time for changing 1000r/min. When it is 0.3 sec (default), time taken for accelerating from 0 to 3000 r/min is 0.9 sec. • Time can be incremented by 0.01 sec for below 3 sec, by 0.1 sec from 3 sec up to 30 sec exclusive, and by 1 sec from 30 sec upward.
12	1st deceleration time	The change factor of output speed in deceleration can be determined. • Set by time for changing 1000r/min. When it is 0.3 sec (default), time taken for decelerating from 0 to 3000 r/min is 0.9 sec. • Time can be incremented by 0.01 sec for below 3 sec, by 0.1 sec from 3 sec up to 30 sec exclusive, and by 1 sec from 30 sec upward.
14 15	Acceleration mode selection Deceleration mode selection	Straight line acceleration/deceleration and curve (S-shape) acceleration and deceleration can be chosen individually for acceleration and deceleration. L I n LINEAR S - 1 "S"SHAPE-1 S - 2 "S"SHAPE-2  Straight line up to speed setting. Standard mode for accelerating and decelerating. Relaxes the speed change in start and end of acceleration and deceleration. Curve is emphasized more than S shape-1.
16	Stop mode selection	You can select how to stop the motor. F r E E (FREE) Power supply to the motor is cut off and the motor is stopped naturally when stop command is input (free-run stop). It takes longer for the motor to completely stop when load inertia is big. d E C (DECEL) When stop command is input, the motor reduces its speed according to preset deceleration time, Electric-brake is performed by Zero-speed control, and then power is cut off to the motor after elapse of time set by " 17 Free-run waiting time", and the motor is set in free-run state. <Example of running pattern in deceleration stop>  The motor is servo-locked in Zero-speed control. (Electrically controlled so that motor speed is Zero)
17	Free-run waiting time	When " 16 Stop mode selection" is set to d E C (DECEL) deceleration stop, servo lock time(Zero-speed control)after deceleration can be adjusted. (Free-run state is set after that.)
1A	Velocity loop proportional gain	Enables setting of proportional gain of velocity amplifier. It need not be changed normally. When this value is made greater, gain is increased, which improves responsiveness of the motor. When this value is made too large, operation is vibratory. Setting range: 0 – 10000, Setting resolution: 1
1b	Velocity loop integration gain	Enables setting of integration gain of velocity amplifier. It need not be changed normally. When this value is made greater, gain is increased, which improves rigidity of the motor (strength of servo lock). When this value is made too large, overshooting becomes greater, and the motor is vibratory. Setting range: 0 – 10000, Setting resolution: 1
30	Run command selection	Run Command can be chosen from the following: P n L (PANEL) : command the motor to stop with RUN STOP switch of Digital key pad. The motor cannot be operated by signal input "I1" and "I2". Signal input is effective only in setting rotation direction, etc. See " 33 I1/I2 function selection". T E r (TERMINAL) : Only the input terminal "I1" and "I2" are effective. (Corresponds to RUN/STOP, rotation direction selection switch of Console-A.)

Detail of parameter

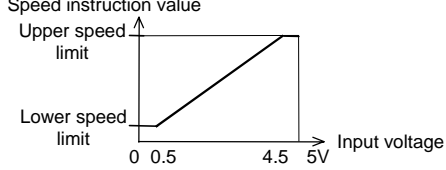
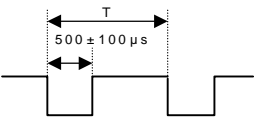
Parameter No.	Name of parameter	Description																																																																					
31	Speed command selection	<p>You can choose whether to use " 00 Internal speed (0-th speed)" or analog input terminal "FIN" for speed command.</p> <p>P n L (PANEL) " 00 Internal speed (0-th speed)"</p> <p>V o L - A (VOL-A) Analog input terminal "FIN" (voltage instruction DC 0-5V) (Corresponds to speed potentiometer of Console-A.)</p>																																																																					
33	I1/I2 function selection	<p>(1) For setting "I1" or "I2" function</p> <p>F - r (FORWARD-REVERSE)</p> <table border="1"> <thead> <tr> <th colspan="2">State of I1 and I2</th><th>Action</th></tr> <tr> <th>I1</th><th>I2</th><th></th></tr> </thead> <tbody> <tr> <td>OFF</td><td>OFF</td><td>Stop Deceleration stop when " 16 Stop mode selection" is d E C</td></tr> <tr> <td>ON</td><td>OFF</td><td>CCW run</td></tr> <tr> <td>OFF</td><td>ON</td><td>CW run</td></tr> <tr> <td>ON</td><td>ON</td><td>Free-run stop Trip reset (which must be retained 0.2 sec or longer) *</td></tr> </tbody> </table> <p>r - F (REVERSE - FORWARD)</p> <table border="1"> <thead> <tr> <th colspan="2">State of I1 and I2</th><th>Action</th></tr> <tr> <th>I1</th><th>I2</th><th></th></tr> </thead> <tbody> <tr> <td>OFF</td><td>OFF</td><td>Stop Deceleration stop when " 16 Stop mode selection" is d E C</td></tr> <tr> <td>ON</td><td>OFF</td><td>CW run</td></tr> <tr> <td>OFF</td><td>ON</td><td>CCW run</td></tr> <tr> <td>ON</td><td>ON</td><td>Free-run stop Trip reset (which must be retained 0.2 sec or longer) *</td></tr> </tbody> </table> <p>r S . F r (RUNSTOP. FORWARD-REVERSE)</p> <table border="1"> <thead> <tr> <th colspan="2">State of I1 and I2</th><th>Action</th></tr> <tr> <th>I1</th><th>I2</th><th></th></tr> </thead> <tbody> <tr> <td>OFF</td><td>OFF</td><td>Stop Deceleration stop when " 16 Stop mode selection" is d E C</td></tr> <tr> <td>ON</td><td>OFF</td><td>CCW run</td></tr> <tr> <td>OFF</td><td>ON</td><td>Stop Deceleration stop when " 16 Stop mode selection" is d E C</td></tr> <tr> <td>ON</td><td>ON</td><td>CW run</td></tr> </tbody> </table> <p>F - r S T (FORWARD-TRIP RESET)</p> <table border="1"> <thead> <tr> <th colspan="2">State of I1 and I2</th><th>Action</th></tr> <tr> <th>I1</th><th>I2</th><th></th></tr> </thead> <tbody> <tr> <td>OFF</td><td>-</td><td>Stop Deceleration stop when " 16 Stop mode selection" is d E C</td></tr> <tr> <td>ON</td><td>-</td><td>CCW run</td></tr> <tr> <td>-</td><td>ON</td><td>Trip reset (which must be retained 0.2 sec or longer) *</td></tr> </tbody> </table>	State of I1 and I2		Action	I1	I2		OFF	OFF	Stop Deceleration stop when " 16 Stop mode selection" is d E C	ON	OFF	CCW run	OFF	ON	CW run	ON	ON	Free-run stop Trip reset (which must be retained 0.2 sec or longer) *	State of I1 and I2		Action	I1	I2		OFF	OFF	Stop Deceleration stop when " 16 Stop mode selection" is d E C	ON	OFF	CW run	OFF	ON	CCW run	ON	ON	Free-run stop Trip reset (which must be retained 0.2 sec or longer) *	State of I1 and I2		Action	I1	I2		OFF	OFF	Stop Deceleration stop when " 16 Stop mode selection" is d E C	ON	OFF	CCW run	OFF	ON	Stop Deceleration stop when " 16 Stop mode selection" is d E C	ON	ON	CW run	State of I1 and I2		Action	I1	I2		OFF	-	Stop Deceleration stop when " 16 Stop mode selection" is d E C	ON	-	CCW run	-	ON	Trip reset (which must be retained 0.2 sec or longer) *
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		(2) When "30 Run command selection" is <div>P n L</div> (PANEL), the motor can be commanded with <div>RUN</div> <div>STOP</div> switch of Digital key pad. Rotation direction in this case can be set by parameter and "I1""I2" state. When only the digital key pad is connected, "I1" and "I2" are set to OFF.																		
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Detail of parameter

Parameter No.	Name of parameter	Description																								
3A	Lower speed limit	<p>When " 31 Speed command selection" is analogue speed instruction V o L - A (VOL-A), motor setting speed at 0V input is set.</p> 																								
3b	Upper speed limit	<p>Upper limit of motor command speed. When " 31 Speed command selection" is analogue speed command V o L - A (VOL-A), motor setting speed at 5V input is set. Further, upper limit of " 00 Internal speed (0-th speed)" is limited by this parameter.</p>																								
3C	Torque limit	<p>Upper limit of motor output torque is set. (No precision is provided because torque is not controlled. Use as a guide.) 100% indicates the rated torque.</p>																								
40	O1 function selection	<p>Output terminal " 01 " can also be selected as follows. Polarity of " 40 O1 function selection " can be inverted by " 42 O1 output polarity selection".</p> <table border="0"> <tr> <td>T r I P</td> <td>(TRIP)</td> <td>: Trip signal (Trip: ON)</td> </tr> <tr> <td>S T b L</td> <td>(STABLE)</td> <td>: Arriving signal (When reached to a command value ON) → See " 44 Speed matching range".</td> </tr> <tr> <td>r U n</td> <td>(RUN)</td> <td>: Run/Stop signal (When running: ON)</td> </tr> <tr> <td>F r E E</td> <td>(FREE)</td> <td>: Free-run signal (During free run: ON)</td> </tr> <tr> <td>F</td> <td>(FORWARD)</td> <td>: CCW run signal (During CCW run: ON)</td> </tr> <tr> <td>r</td> <td>(REVERSE)</td> <td>: CW run signal (During CW run: ON)</td> </tr> <tr> <td>C k - L</td> <td>(CHECK - L)</td> <td>: Overload detection Output when load exceeds 100% (Load exceeds 100%:ON)</td> </tr> <tr> <td>P O U T</td> <td>(PULSE-OUT)</td> <td>: Speed pulse signal → See " 45 Output pulse count selection".</td> </tr> </table>	T r I P	(TRIP)	: Trip signal (Trip: ON)	S T b L	(STABLE)	: Arriving signal (When reached to a command value ON) → See " 44 Speed matching range".	r U n	(RUN)	: Run/Stop signal (When running: ON)	F r E E	(FREE)	: Free-run signal (During free run: ON)	F	(FORWARD)	: CCW run signal (During CCW run: ON)	r	(REVERSE)	: CW run signal (During CW run: ON)	C k - L	(CHECK - L)	: Overload detection Output when load exceeds 100% (Load exceeds 100%:ON)	P O U T	(PULSE-OUT)	: Speed pulse signal → See " 45 Output pulse count selection".
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42	O1 output polarity selection	<p>This is a function for inverting the polarity of signal output between output terminal "O1" and "GND".</p> <table border="0"> <tr> <td>n O r</td> <td>(NORMAL)</td> <td>: Transistor "ON" when activated</td> </tr> <tr> <td>r E V</td> <td>(REVERSE)</td> <td>: Transistor "OFF" when activated</td> </tr> </table>	n O r	(NORMAL)	: Transistor "ON" when activated	r E V	(REVERSE)	: Transistor "OFF" when activated																		
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44	Speed matching range	<p>When " 40 O1 function selection " is set to S T b L (STABLE) Arriving signal, "Speed matching range" for output arriving signal can be adjusted.</p> <ul style="list-style-type: none"> • When difference between actual rotation speed and speed setting is smaller than "Speed matching range", arriving signal is output. • Even if the speed is reached, when speed matching range is set too small, arriving signal may turn on and off due to speed fluctuation. • Arriving signal is not output when CCW/CW changes. 																								
45	Output pulse count selection	<p>When " 40 O1 function selection " is set to P O U T (PULSE-OUT), pulse count is set to be output to "O1" while the motor makes one turn. (To be selected from 1, 2, 3, 4, 6, 8, 12, and 24)</p>  <p>(Ex) When rotation number is 3000 r/min, in the case where " 45 Output pulse selection" is 24,</p> $T = \frac{60}{3000 \times 24} = 0.83\text{ms}$ <p>Frequency $f = 1/T = 1.2\text{kHz}$</p>																								
46	Monitor mode selection	<p>You can choose description to be displayed on 5-digit LED when turning on power.</p> <table border="0"> <tr> <td>O. - r</td> <td>(OUTPUT-REVOLUTION)</td> <td>: Rotation speed</td> </tr> <tr> <td>O. - L</td> <td>(OUTPUT-LOAD)</td> <td>: Torque</td> </tr> <tr> <td>A V. - L</td> <td>(AVERAGE-LOAD)</td> <td>: Load factor (average torque)</td> </tr> <tr> <td>S. - r</td> <td>(SETTING-REVOLUTION)</td> <td>: Speed command</td> </tr> <tr> <td>d C - V</td> <td>(DC-VOLTAGE)</td> <td>: Internal DC voltage (Voltage of smoothing capacitor of power supply)</td> </tr> </table> <p>In speed display mode, the value multiplied by " 47 Numerator of display multiplying factor" / " 48 Denominator of display multiplying factor" is displayed.</p>	O. - r	(OUTPUT-REVOLUTION)	: Rotation speed	O. - L	(OUTPUT-LOAD)	: Torque	A V. - L	(AVERAGE-LOAD)	: Load factor (average torque)	S. - r	(SETTING-REVOLUTION)	: Speed command	d C - V	(DC-VOLTAGE)	: Internal DC voltage (Voltage of smoothing capacitor of power supply)									
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Parameter No.	Name of parameter	Description
47	Numerator of display magnification factor	You can set the multiplying factor of a value displayed on 5-digit LED. Value of 47 ÷ 48 is a display multiplying factor. Set a value in the range where calculated display magnifying factor is 10 – 1/1000. Rotation number of gear output shaft and the speed of line can be displayed.
48	Denominator of display magnification factor	When the display magnifying factor is changed, the parameter relating to speed (below) is displayed by a value multiplied by display multiplying factor. " 00 Internal speed (0-th speed) " " 3A Lower speed limit " " 3b Upper speed limit " " 44 Speed matching range "
4A	Trip history clear	Trip history 1 – 5 can be cleared. <Clearing procedure> Cut off power with <input type="text" value="YES"/> (YES) selection, and turn on power again after display has disappeared, then <input type="text" value="- - - -"/> is displayed, and trip history is cleared. When power is turned on again, normal operation is started.
4b 4C 4d 4E	Trip history 1 Trip history 2 Trip history 3 Trip history 4 Trip history 5	Trip history for 5 times in the past is stored. Trip history 1 is the latest history. See "Protective function" for displayed description. When no history is available, <input type="text" value="- - - -"/> is displayed.
50	Undervoltage trip selection	When <input type="text" value="nO"/> (NO) is selection, the motor is not tripped at insufficient voltage. If voltage should fall and undervoltage status is found while the motor is running, the motor stops after running free, while if operation instruction is input after recovery of power, the motor is restarted automatically. (Be cautious.) When <input type="text" value="YES"/> (YES) is selection, the motor is tripped at undervoltage, and trip signal is output. When normal power is off, trip is not stored in trip history. Trip is stored only when power has stopped instantaneously. (Trip is stored in trip history only when undervoltage once becomes short and then is recovered normal)
51	Retrial selection	Automatic reset in trip (trip retrieval) can be set here. Trip can be is automatically reset to allow operation to continue. Use this function only on such equipment that has no problem of safety even if the motor is automatically restarted. Retrial is impossible if trip is by Overcurrent error <input type="text" value="E - OC"/> , Sensor error <input type="text" value="E - CS"/> , System error <input type="text" value="E r r"/> , User parameter error <input type="text" value="E - UP r"/> , or System parameter error <input type="text" value="E - SP r"/> . When <input type="text" value="nO"/> (NO) is selection, retrial is not effective. When <input type="text" value="1"/> – <input type="text" value="4"/> is selection, retrial is made for the set number of times. When 2 hours has elapsed with no trip, the number of retrying times is initialized to 0. Set the interval between retrials by 52 Retrial start time. When trip occurs in excess of preset number of trials, the motor outputs trip signal and stops. During retrial trip signal is not output (It is stored in trip history.)
52	Retrial start time	You can set waiting time until retrial operation is performed after trip is found. You can set 1 to 120 seconds.
54	Parameter initializing	Parameters can be initialized to the factory default. <Initializing procedure> Cut off power with <input type="text" value="YES"/> (YES) selected, and turn on power again after display has disappeared, then <input type="text" value="- - - -"/> is displayed , and parameters are initialized to the factory default.
57	Parameter copy	Parameters can be copied. <input type="text" value="nO"/> (NO) Parameters are not copied <input type="text" value="P.I n I T"/> (PARAMETER-INITIALIZE) : Initialization of Digital key pad data <input type="text" value="P.L O A d"/> (PARAMETER-LOAD) : Reading parameters into Digital key pad data <input type="text" value="P.P r O G"/> (PARAMETER-PROGRAM) : Writing parameters to the brushless inverter See " How to copy parameter " on page 16 for details.
F0	For manufacturer use	It cannot be changed.

Conformance to EC directive and UL standard

EC Directives

The EC directives apply to all such electronic products as those having specific functions and directly sold to general consumers in EU countries. These products are required to meet the EU unified standards and to be furnished with CE marking.

Our brushless motor meet the EC Directives for Low Voltage Equipment so that the machine or equipment comprising our AC servo can meet relevant EC Directives.

EMC Directives

Our brushless motor can meet EMC Directives and related standards. However, to meet these requirements, the systems must be limited with respect to configuration and other aspects, e.g. the installation and some special wiring conditions must be met. This means that in some cases machines and equipment comprising our servo systems may not satisfy the requirements for wiring and grounding conditions specified by the EMC Directives. Therefore, conformance to the EMC Directives (especially the requirements for emission noise and noise terminal voltage) should be examined based on the final products that include our system.

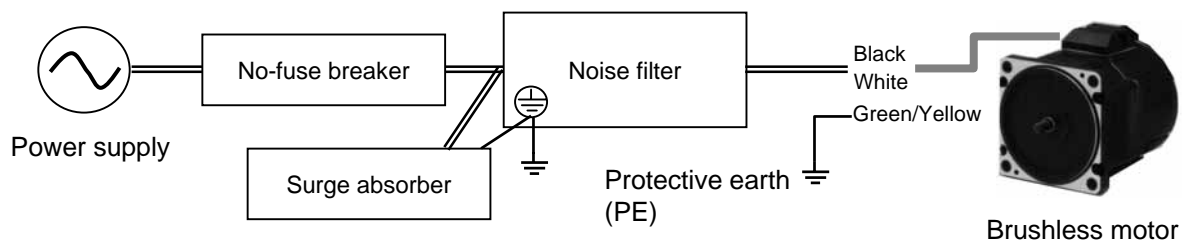
Applicable standard

	Applicable standard		Installation condition
UL	UL1004 UL508C	Standard for electric motor Standard for electric converter equipment	-
CE	EN50178 EN60034-1 EN55011 EN61000-6-2 IEC61000-4-2 IEC61000-4-3 IEC61000-4-4 IEC61000-4-5 IEC61000-4-6 IEC61000-4-11	Electronic and electric equipment used for electric power facilities (low voltage directive) Electric rotation equipment (motor) (low voltage directive) Radio interference wave characteristics of industrial, scientific, and medical high-frequency equipment Standards for immunity in industrial environment (EMC directive) Electrostatics Discharge Immunity Test Radio Frequency Electromagnetic Field Immunity Test Electric high-speed transient phenomenon/burst immunity test Lightening Surge Immunity Test High Frequency Conduction Immunity Test Instantaneous Outage-Immunity Test	Overvoltage category II Class I equipment Pollution degree 2 (circuit assembly)

Configuration of peripheral equipment

Power supply	<ul style="list-style-type: none"> 100 V system: Single phase 100 V – 120 V \pm 10%, 50/60 Hz 200 V system: Single phase 200 V – 240 V \pm 10%, 50/60 Hz Use the equipment under the environment of overvoltage category II specified by IEC60664-1. In order to obtain overvoltage category II, insert a transformer conforming to EN standard or IEC standard to the input of brushless motor. Use an electric wire size suitable to EN60204-1.
Fuse breaker	Be sure to connect a specified no-fuse breaker certified by IEC standard and UL, or a fuse certified by UL between power supply and noise filter. Observance of this condition allows conformance with UL508C (file No. E164620) and UL1004 (file No. E166557).
Noise filter	When installing one noise filter at the power supply for more than one brushless motor used, contact the manufacturer of noise filter.
Surge absorber	Install a surge absorber on the primary side of noise filter. However, in performing the voltage resistance test of machine and equipment, be sure to remove the surge absorber; otherwise, the surge absorber may be ruptured.
Grounding	Be sure to connect the grounding wire E (green/yellow) of brushless motor and protective grounding wire (PE) of system for preventing electric shock. Do not tighten the grounding wires together but connect them individually.

Wiring of peripheral equipment



List of compatible peripheral equipment

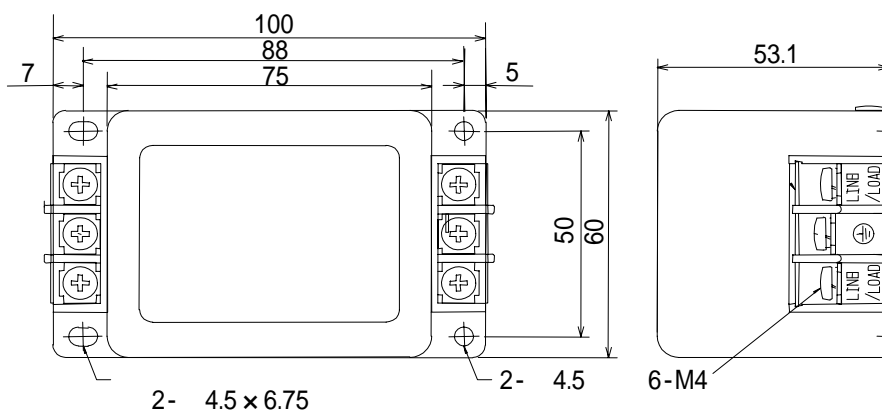
Part name	Optional part number	Manufacturer's part No.	Manufacturer
Noise filter	DV0P3611-5	SUP-EQ5-ER-6	OKAYA ELECTRIC IND. CO., LTD.
Surge absorber	DV0P1450	R.A.V-781BXZ-4	OKAYA ELECTRIC IND. CO., LTD.

Contact: OKAYA ELECTRIC IND. CO., LTD.

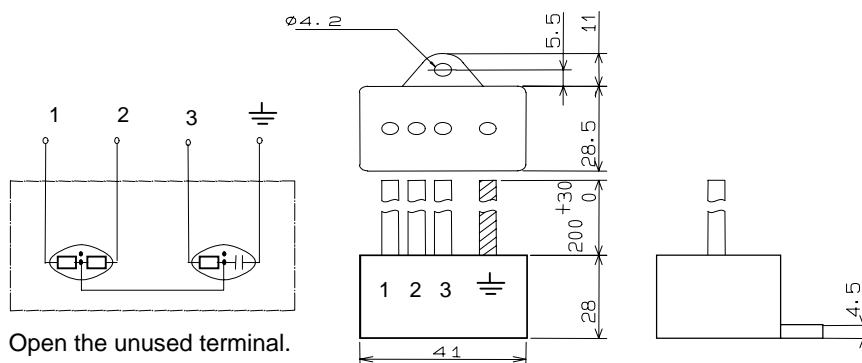
Japan

+81-3-3424-8120

Noise filter



Surge absorber



Recommended circuit breaker

Made by SANKEN AIRPAX CO., LTD.:

Type IELH-1-11-63-5A-M

(Rated current 5A, cutoff characteristics DELAY63)

Recommended cutoff characteristics: DELAY61-63

Contact: Sanken Airpax Co., Ltd.

<http://www.sanken-airpax.co.jp/epage.html>

Specifications

General specification

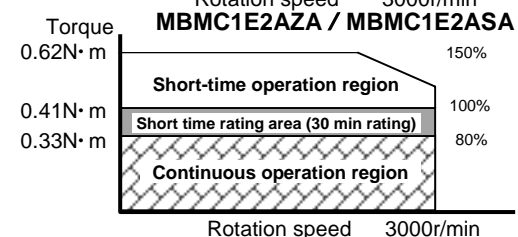
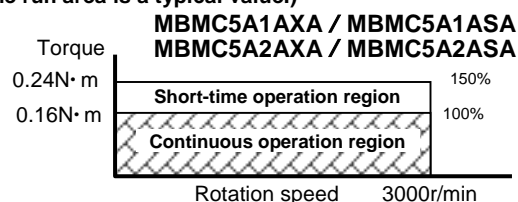
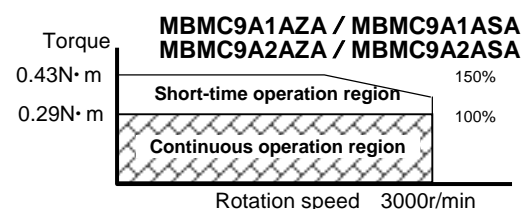
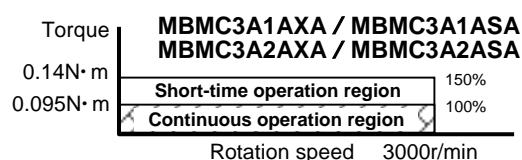
Model name		Rated output (W)	Power input				Rated torque (N·m)	Starting torque (N·m)	Rated rotation speed (r/min)
Toothed shaft	Round shaft		Voltage (V)	Tolerance (%)	Frequency (Hz)	Rated input current (A)			
MBMC3A1AXA	MBMC3A1ASA	30	Single phase 100 - 120	± 10	50/60	1.0	0.095	0.14	3000
MBMC3A2AXA	MBMC3A2ASA		Single phase 200 - 240			0.6			
MBMC5A1AXA	MBMC5A1ASA	50	Single phase 100 - 120			1.5	0.16	0.24	
MBMC5A2AXA	MBMC5A2ASA		Single phase 200 - 240			0.7			
MBMC9A1AZA	MBMC9A1ASA	90	Single phase 100 - 120			2.0	0.29	0.43	
MBMC9A2AZA	MBMC9A2ASA		Single phase 200 - 240			1.1			
MBMC1E2AZA	MBMC1E2ASA	130	Single phase 200 - 240			1.5	0.41	0.62	

Common specifications

Item		Specification			
Product No.		MBMC3A * * * *	MBMC5A * * * *	MBMC9A * * * *	MBMC1E * * * *
Rated output (W)		30	50	90	130
Speed control range		30 – 300 r/min (speed ratio 1: 100)			
Speed fluctuation factor	With load	±1% or below (at 0 – Rated torque, Rated rotation speed)			
	With voltage	±1 % or below (at supply voltage ±10%, rated rotation speed)			
	With temperature	±1% or below (Motor: At -10 – 40°C, rated rotation speed)			
Acceleration/Deceleration time		0.3 sec (time for changing from 0 to 1000 r/min) *			
Stopping procedure		Free-run stop*			
Speed setting		0 – 3000 r/min (analogue voltage (0 – 5 V), console A), Setting selection by parameter on console A and Digital key pad			
Speed setting resolution		Analog: approx. 1/200 of upper speed limit Digital: 1 r/min			
Speed setting precision (at 20°C)		Analogue: ±5% or below of upper speed limit (±150r/min or below at upper speed limit 3000 r/min) [Digital: 1% or below of upper speed limit]			
Protective function		Warning: Undervoltage warning *, Overload warning Protect: Overcurrent, Overvoltage, Undervoltage, Overload, User parameter error, System parameter error, System error, Overspeed, Sensor error, Overheat, and setting change warning			
Motor heat resistance class		E (120°C) (UL certification A (105°C))			
Time rating		Continuous			Rating 30 min or continuous load 80%
		(Continuous regenerative operation is not allowed when motor shaft is rotated from load side, such as lowering load operation.)			
Overload warning level		100%			80%
Overload timing characteristics		150% 60 sec			
Motor mass (kg)		1.1	1.3	2.3	2.3

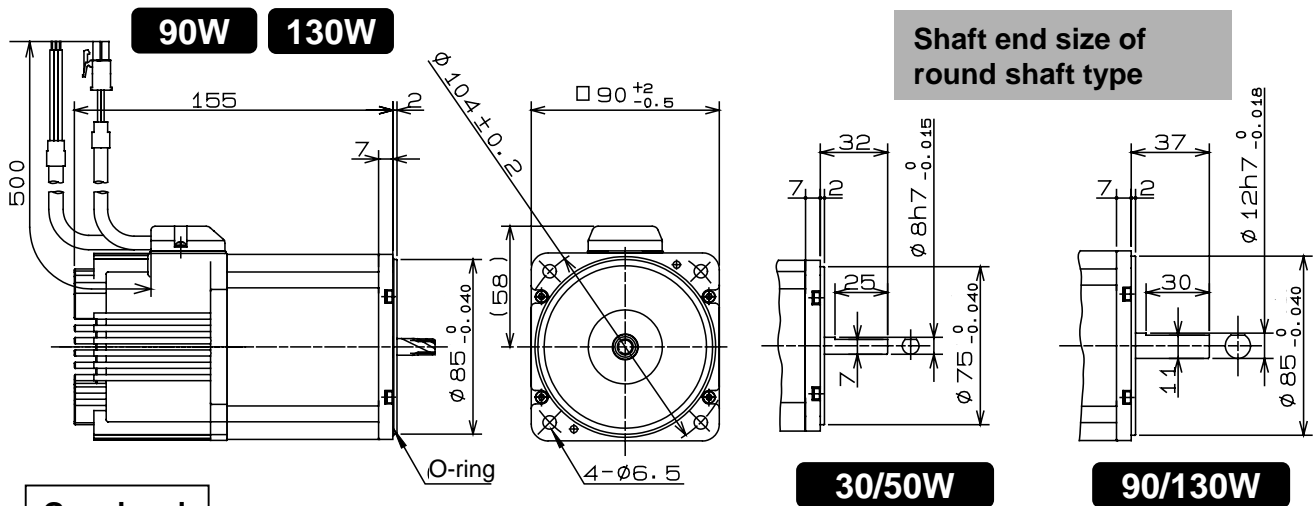
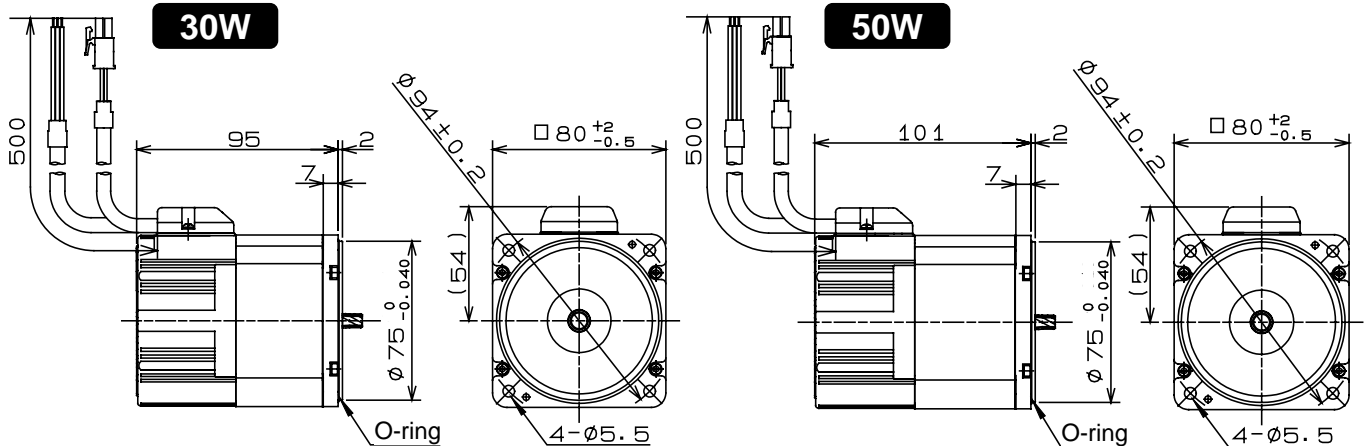
Speed – Torque characteristics (Torque in short-time run area is a typical value.)

*Changeable by Digital key pad



Dimensional Outline Drawing (in mm)

Motor

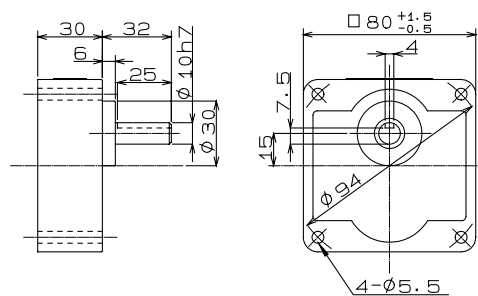


Gear head

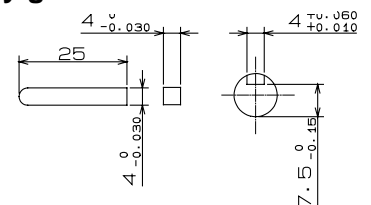
MX8G B

(For 30W/50W motor, sold separately)

- Reduction gear ratio in
- Reduction gear ratio is available in 22 types: 3, 3.6, 5, 6, 7.5, 9, 10, 12.5, 15, 18, 20, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180



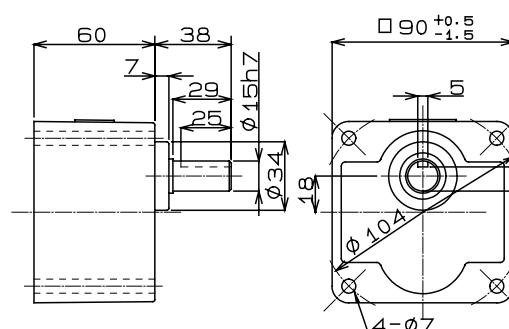
Outer size of key and key groove



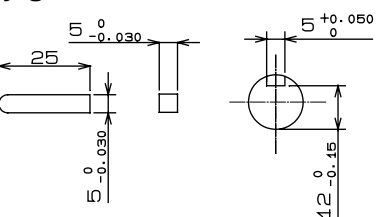
MZ9G B

(For 30W/50W motor, sold separately)

- Reduction gear ratio in
- Reduction gear ratio is available in 23 types: 3, 3.6, 5, 6, 7.5, 9, 10, 12.5, 15, 18, 20, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180, 200



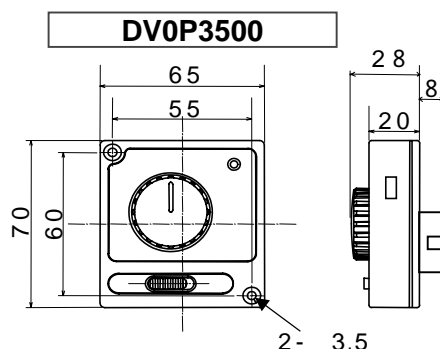
Outer size of key and key groove



Options

Options

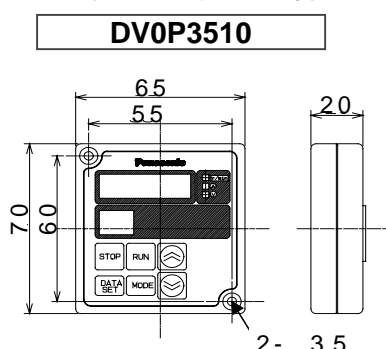
Console A (attached, sold separately)



Console A connector
pin layout

Console A Connector pin No.	Terminal symbol
1	I 1
2	I 2
3	G N D
4	F I N
5	+ 5 V
6	
7	
8	
9	
10	

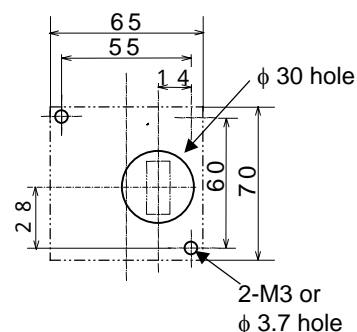
Digital key pad (sold separately)



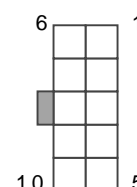
Digital key pad connector
pin layout

Digital key pad Connector pin No.	Terminal symbol
1	
2	
3	G N D
4	
5	+ 5 V
6	
7	SCK
8	SIN
9	SOT
10	

Mounting hole (Console A/Digital key pad)

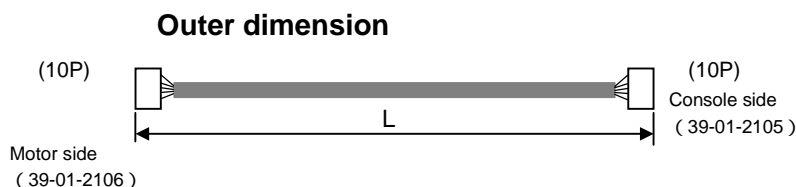


Console A,
digital key pad
connector pin No.



Control signal extension cable (10P) (Optional)

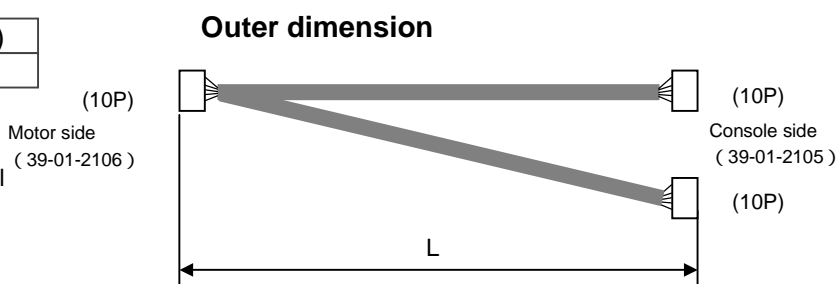
Model name	Length (L)
DV0P35910	1m
DV0P35930	3m
DV0P35950	5m



Control signal branch cable (10P) (Optional)

Model name	Length (L)
DV0P37505	0.5m

- Control signal is branched into two.
(Connected to all pins)
- Use it when you want to input a control
signal (Console A) while using digital
key pad.



Control signal connector kit (optional)

	Model name		Description
A	DV0P3600	Engaged with motor	39-01-2106 (5559-10P-210) X 1, pin 39-00-0049 (5558T2L) X 10 (Nihon Molex)
B	DV0P3610	Engaged with console	39-01-2105 (5557-10R-210) X 1, pin 39-00-0047 (5556T2L) X 10 (Nihon Molex)

- Applicable electric wire size: AWG22 - 26
- Applicable manual pressure bonding tool: 57064-5000 or 57038-5300 (Nihon Molex)

Warranty

Warranty period

Warranty period of this product is 1 year from purchasing, or 1.5 years from our manufacturing month.
However, respective life shall not be exceeded as for standard life describing items.
(See "How to install/Check of load and use condition" on page 12.)

Detail of warranty

If any trouble should be found within warranty period under normal use condition in conformance with this instruction manual, it will be repaired free of charge.

Repair will be chargeable in the following cases even if within warranty period:

- (1) When trouble is caused by wrong use, and inappropriate repair or modification.
- (2) When trouble is caused by dropping after purchase, or damage in transportation.
- (3) When trouble is caused by use out of specification range of the product.
- (4) When trouble is caused by fire, earthquake, lightning stroke, damage by wind and flood, damage by salt, abnormal voltage and any other natural disaster.
- (5) When trouble is caused by entry of water, oil, metal strip, and any other foreign substance.

Warranty covers only the body of delivered product, and damage induced by trouble of delivered products will be excluded from compensation.

Caution in use

If you are planning to use this product under special environment, such as atomic power control, aerospace equipment, traffic organization, medical equipment, various safety systems, and equipment which requires cleanliness, please contact us.

When this product is operated without the shaft electrically grounded, such as in driving the fan, bearing noise may become higher due to the occurrence of electrocorrosion depending on the motor used or setting environment, so confirm and verify the condition on the customer side in such a case.

Although we make efforts as far as possible for ensuring the quality of this product, it may operate out of setting due to external noise and static electricity more than expected, or accidental trouble of power supply, wiring, and components, use caution for ensuring safety in your failsafe design and operable range in moving place.

Motor Company, Matsushita Electric Industrial Co., Ltd. Marketing Group

Tokyo: 4-12-4, Higashishinagawa, shinagawa-ku, Tokyo, 140-8587 (Panasonic Tower 17F)
☎(03)6710-3243 FAX (03)6710-3847

Nagoya: 23-30, Izumi Higashi-ku 1-chome, Nagoya, Aichi, 461-8530
☎(052)951-6217 FAX(052)951-3268

Osaka: 1-1, Morofuku 7-chome, Daito, Osaka, 574-0044
☎(072)870-3065 FAX(072)870-3151

After-sale service (repair)

Repair

- Ask the seller where the product was purchased for details of repair work.
When the product is installed in a machine or device, consult first the manufacturer of the machine or device.

Web site

- Web site of Motor Company, Matsushita Electric Industrial Co., Ltd.
<http://panasonic.co.jp/motor/eng/>

Memorandum (Fill in the blanks for convenience in case of inquiry or repair)

Date of purchase	Date:	Model No.	MBMC□□□A□□
Place of purchase			
	TEL () -		

Motor Company, Matsushita Electric Industrial Co., Ltd.

7-1-1, Morofuku, Daito, Osaka 574-0044, Japan

☎ +81-72-871-1212

IMC63
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