



SENSORLESS SERVO MOTOR SERIES MITSUBISHI S-PM GEARED MOTOR

TYPE:

GV-S Parallel Shaft type

GV-SSY Right-Angle Shaft type

GV-SHY Right-Angle Shaft type

INSTRUCTION MANUAL

- Before you operate the S-PM Geared Motor, read carefully this manual, and use correctly the motor. Be sure to read the "Precautions Regarding Safety" described in this manual to ensure safety during operation.
- After reading, should store this manual at an appropriate place so that everyone can read the manual whenever necessary.
(Be sure to hand this manual to the operator.)

SAFETY PRECAUTIONS

Carefully operate the S-PM Geared Motor. An operation error may cause injury or electric shock.


To ensure operator safety, the safety precautions are ranked as "DANGER" and "CAUTION" in this instruction manual.



When a dangerous situation may occur if handling is mistaken leading to fatal or major injuries.



When a dangerous situation may occur if handling is mistaken leading to medium or minor injuries or physical damage.

Note that some items described as  may lead to major results depending on the situation. In any case, must follow instructions because important information described.



DANGER

General

- Before starting use of this S-PM Geared Motor always read this manual and the nameplate.
- Do not use a S-PM Geared Motor in an application where a motor is driven by its load and runs at a speed higher than the maximum rotation speed.

Operation conditions and ambient conditions

- Do not place any inflammable near the S-PM Geared Motor. Failure to observe this warning may cause fire or explode. A place to use the explosive powder or organic solvents, do not use the S-PM Geared Motor.
- Do not use the S-PM Geared Motor as elevator for human transport. Use of a S-PM Geared Motor for such a purpose is prohibited by the Building Standard Law of Japan.
- If the equipment is to be used with an elevator, be sure to attach a safety device to prevent the elevator from accidental fall. Failure to observe this warning may cause physical injury and damage to the equipment.

Wiring

- Never connect a S-PM Geared Motor to the commercial power supply. There is a possibility of motor burnout.
- Be sure to ground the S-PM Geared Motor, and install a circuit breaker for each motor. Without grounding or circuit breaker, you may get an electric or physical injury.
- To wire the S-PM Geared Motor, be sure to observe the technical standards for electric equipment or interior wiring code by the corresponding electric power company.
- Be sure to supply the specified voltage to the S-PM Geared Motor. If the voltage is too high, a fire may be caused.
- The S-PM Geared Motor is a synchronous motor with embedded magnets. High-voltage is generated at motor terminals while the motor is running even after the drive unit power is turned OFF. Before wiring or inspection, the motor must be confirmed to be stopped. For applications where the S-PM Geared Motor is driven by the load, the low-voltage manual contactor, which is installed at the drive unit's output side, must be opened before wiring or inspection. Failure to observe this warning may get an electric shock.

Operation

- If a load is lifted up, do not release the brake using the manual brake release unit. The load may be dropped.
- Always operate the motor within prescribed rotation speed range. Operating the motor outside the prescribed speed range could cause a motor explosion and damage.
- Never go near and touch the rotating parts (shaft, etc) during operation. Failure to observe this warning may be injured.
- Before starting operation, each parameter must be confirmed and adjusted. Failure to observe this warning may cause some machines to make unexpected motions.



CAUTION

General

- If the S-PM Geared Motor is equipped with a hoisting accessory, be sure to use the hoisting accessory to lift and transfer a load.

Operation conditions and ambient conditions

- If the S-PM Geared Motor malfunctions, the grease may leak from the motor. To protect the environment from the grease, place an oil pan at the leak point.
- Be sure to attach safety covers to the belts, chains, gears, etc.
- Do not use the indoor type S-PM Geared Motor outdoors.
- Use care to keep small foreign matter particles from entering the output shaft oil seal as this could cause water encroachment and rusting, resulting in grease leakage. Also avoid using the motor in areas where it could be exposed to water.
- Keep the area around the motor free of objects which could obstruct ventilation. Such objects could hinder cooling, possibly causing motor burn damage from overheating.
- For elevator applications, etc., which require a high-torque mechanical HOLD, or a HOLD during power OFF, use either the S-PM Geared Motor with brake, or a mechanical brake.

Wiring

- If an electromagnetic contactor (MC) is used at the drive unit's input side, this MC must not be started up in a frequent manner. Failing to do so may cause drive unit damage.
- For motors with brake, be sure to use Separate braking method or Direct current (quick) braking method for the brake wiring.
- For elevator or high accuracy positioning drive, please use direct current (quick) braking method.
- The total wiring length between the S-PM Geared Motor and the drive unit must not exceed 30m.

Operation

- Always operate within the allowable torque range.
- Do not use the S-PM Geared Motor in applications where it is subjected to excessive impact torques (striking a stopper at high speed, etc.) while in a stopped condition.
- During operation, if the motor generates an abnormal noise, vibrates extremely, or shows abnormal characteristics, be sure to stop the motor, and inspect the motor.
- During operation, keep your body away from the S-PM Geared Motor. If you touch the S-PM Geared Motor during operation, you may be injured or get burned.
- The motor with a manual brake release unit be sure to lock the lever in the holder before starting operation.
- When using Separate braking method, be sure that the motor and brake operation timing is simultaneous. If timing of operation differs, there is a possibility of a fall, collisions and damaging the brake.

Combined motor and drive unit operation

- Use one dedicated S-PM Geared Motor for one drive unit. Multiple S-PM Geared Motors cannot be connected to a drive unit.
- A drive unit is exclusively for a S-PM Geared Motor. Do not use a synchronized, induction, or induced synchronized motor, that is not a dedicated PM motor.

Maintenance and modification

- The S-PM Geared Motor is equipped with an internal magnet, and maintenance should therefore be performed only by the sales outlet where purchased. Unauthorized disassembly could result in the permanent magnet rotor becoming stuck to other metal parts of the motor, making the maintenance task difficult, and possibly causing injuries. Moreover, a poor work environment could result in other metallic scraps and chips, etc., becoming adhered to the magnet, resulting in motor failure. Never attempt unauthorized motor modifications.
- Voltage is generated at the motor terminals while the motor is rotating. Therefore, always verify that the motor is stopped or that the power has been shut off before performing maintenance.
- The S-PM Geared Motor will become quite hot during operation. Take care not to touch the S-PM Geared Motor with your hands or body. Failure to observe this could lead to burns etc.

Disposal

- Treat the motor as general industrial waste when disposing of it.

Model name description

●Parallel shaft type

■GV-S series (uniform load)

GV S-PM Geared Motor	-	S S:S series	F Blank:Foot mounting type F:Flange mounting type	B Blank:Without brake B:With brake	Blank:Normal type W:Water proof type
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●Right-angle shaft type

■GV-SSY series (uniform load)

GV S-PM Geared Motor	-	SSY SSY: SSY series	F F:Flange/Face mounting type	B Blank: Without brake B:With brake	Blank:Normal type W:Water proof type	-	R R:Right-angle shaft type	H H:Hollow shaft
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■GV-SHY series (medium load)

GV S-PM Geared Motor	-	SHY SHY: SHY series	F Blank : Foot mounting type F : Flange mounting type M : Face mounting type	B Blank: Without brake B:With brake	Blank:Normal type W:Water proof type	-	R R:Right-angle shaft type	H L : Left shaft R : Right shaft T : Both shafts H : Hollow shaft
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When ordering

When making an order or an inquiry, please inform us of the following basic specifications.

Model name	Output	Rated rotation speed (Speed at output shaft) ^{*Note}	Voltage
GV-SB	0.75kW	300r/min	200V class

Note: The rated rotation speed for the S-PM series motor is 3000 r/min. Because this differs from the 1500 r/min (50Hz) and 1800 r/min (60Hz) speeds of 3-phase induction motors, the output shaft speed will be different even if the reduction ratio is the same. Please specify the output shaft speed.

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1. Product Check

- (1) Check that the model number, output, Rated rotation speed, etc. You specified are written on the nameplate.
- (2) Check that the product is not damaged during transportation.
- (3) Check the screws and bolts for looseness.

2. Operation Conditions and Ambient Conditions

- (1) Do not place any inflammable near the S-PM Geared Motor. Failure to observe this warning may cause fire or explode.
- (2) Do not use the S-PM Geared Motor as elevator for human transport. Use of a S-PM Geared Motor for such a purpose is prohibited by the Building Standard Law of Japan.
- (3) If the equipment is to be used with an elevator, be sure to attach a safety device to prevent the elevator from accidental fall. Failure to observe this warning may cause physical injury and damage to the equipment.
- (4) Do not use a S-PM Geared Motor in an application where a motor is driven by its load and runs at a speed higher than the maximum rotation speed.
- (5) Do not use the indoor type on moist place and the outdoors. Dew condensation or permeation of water may cause rust and the fall of insulation resistance. Please use outdoor type, when you use in such environment.

3. Installation and Adjustment

- (1) If the S-PM Geared Motor is equipped with a hoisting accessory, be sure to use the hoisting accessory to lift and transfer a load.
- (2) If the S-PM Geared Motor malfunctions, the grease may leak from the motor. To protect the environment from the grease, place an oil pan at the leak point.
- (3) Be sure to attach safety covers to the belts, chains, gears, etc.
- (4) The grease lubrication is the method adopted by all the models. The models of grease lubrication method can be installed in any direction. (The grease is filled at the factory.)
- (5) Install the motor in appropriate place where humidity is low, and with a little dust. Check that the ambient temperature is from 0 to +40°C and the relative humidity is 90% or less, does not freeze. In addition, please check that installed place is good cooling condition.
- (6) Install the motor on a rigid and thermal conductive base with bolts having strength of 8.8 or above. Adjust the flatness of the installation surface to 0.2mm or less.
- (7) To mount a Flange mounting (Face mounting) type or Foot mounting type geared motor, be sure to use the bolts of the corresponding size as shown in Table 1.
- (8) The installation of GV-SSY type must use the size shown in Table 2 respectively bolt. Please use a special washer of the attachment at the Flange installation. Moreover, the pitch of Flange installation, please design within the range shown in Table 2.

Table 1. Various Gear Sizes and Corresponding Bolt Sizes (GV-SHY type)

Gear ratio Output (kW)	1/5, 1/7.5	1/10 to 1/60	1/80 to 1/240	1/300 to 1/1440	Gear size	Size of bolt	
						Foot mounting type	Flange mounting type /Face mounting type
0.1 / 0.2	AT	A	AT	CM	A,AT	Hexagon (socket head) bolt M8	Hexagon socket head bolt M8
0.4	AT	A	BT	DM	B,BT	Hexagon (socket head) bolt M10	Hexagon socket head bolt M10
0.75	BT	B	CT	DM ^{*Note}	C,CT,CM	Hexagon (socket head) bolt M12	Hexagon socket head bolt M12
1.5	C	C	DT	—	D,DT,DM	Hexagon (socket head) bolt M12	Hexagon socket head bolt M16
2.2	DT	D	ET	—	E,ET	Hexagon (socket head) bolt M16	Hexagon socket head bolt M20

Note: The range of the gear ratio of 0.75kW shows 1/300~1/480.

Table 2. Various Gear Sizes and Corresponding Bolt Sizes (GV-SSY type)

Output (kW)	Gear ratio	Gear size	Flange installation		Face mount installation
			Size of bolt	Installation pitch tolerance	Size of bolt
0.1 / 0.2	1/7.5 to 1/60	20	Hexagon socket head bolt M6	±0.4	Hexagon (socket head) bolt M8
0.4	1/7.5 to 1/30				
0.4	1/40 to 1/60	25	Hexagon socket head bolt M8	±0.4	Hexagon (socket head) bolt M10
0.75	1/7.5 to 1/30				
0.75	1/40 to 1/60	30	Hexagon socket head bolt M10	±0.4	Hexagon (socket head) bolt M12
1.5	1/7.5 to 1/30				
1.5	1/40 to 1/60	35	Hexagon socket head bolt M12	±0.5	Hexagon (socket head) bolt M16
2.2	1/7.5 to 1/30				

4.Connection

4.1 For Parallel shaft type and Right-angle shaft type (Solid shaft)

- (1) To properly connect the S-PM Geared Motor to the machine, reduce the eccentricity between the motor and machine to 0.05mm or less. Use the flexible coupling to easily connect the motor to the machine.
- (2) Adjust deflection amount of the chain to 4% of the span. (refer to Fig.1). The deflection amount is too large, give a great shock to the S-PM Geared Motor at starting. The results, the S-PM Geared Motor may be damaged.
- (3) To prevent damage caused by the overhang load, adjust the positions of the sprocket, gear, pulley, etc. decide the loading position as close as possible to the joint of the output shaft and the gear case. (refer to Fig. 2).
- (4) The tolerance for the holes of the sprocket, coupling, etc. is H8 degree. Using the tap on the output shaft, smoothly install the sprocket, coupling, etc. (refer to Fig. 3). Please use shock-less hammer for those install. An iron hammer may be damaged the bearing, gear, etc., by a strong impact.

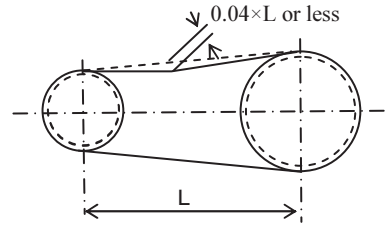


Fig.1 deflection amount of chain

Adjust the loading position closer to the S-PM Geared Motor.

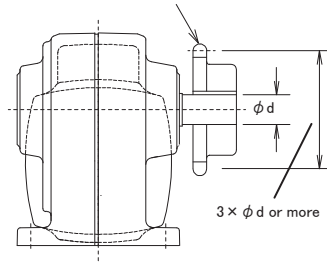


Fig.2 Sprocket position

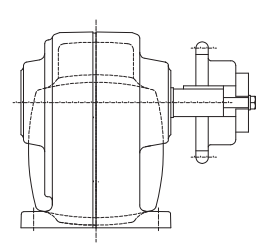


Fig.3 Sprocket installation

* Although Figs. 2 and 3 show the right-angled shaft series examples, the same conditions apply to the parallel shaft series.

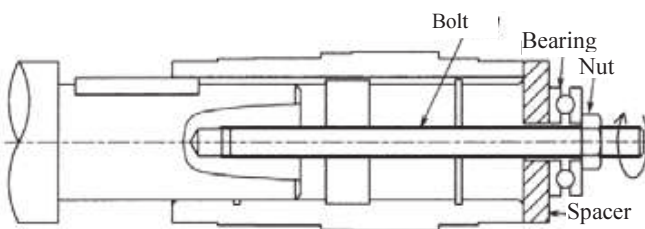
4.2 For Right-angle shaft type (Hollow shaft)

Please prepare the tools shown in Fig.4 to easily connect the motor.

We do not supply tools necessary for attachment or removal. Please you prepare these tools.

Attach an attached protective cover in an opposite drive side. (Insert striking lightly into a slot that is machined into the flange face.)

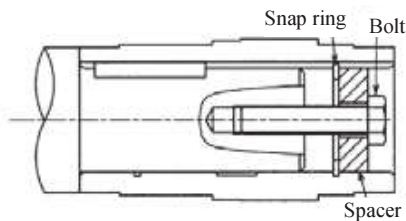
1.Connection to hollow shaft



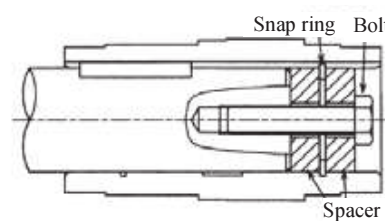
- Before connection, please spreading the sticking-prevention lubricants(molybdenum disulfide etc.) on the driven shaft and inside diameter of the hollow shaft.
- If the shafts are too tight to be engaged each other, tap the hollow shaft (output shaft) with a shock-less hammer. If use the jigs shown in the figure, you can connect the shafts more easily.
- The inside diameter of the hollow shaft is H8 tolerance. For general engagement, the tolerance of h7 is recommended for the driven shaft. If a large shock or a large radial load is to be applied to the shafts, please the engagement of an shafts more tight .

2. Fixing of hollow shaft

(a) If driven shaft has steps

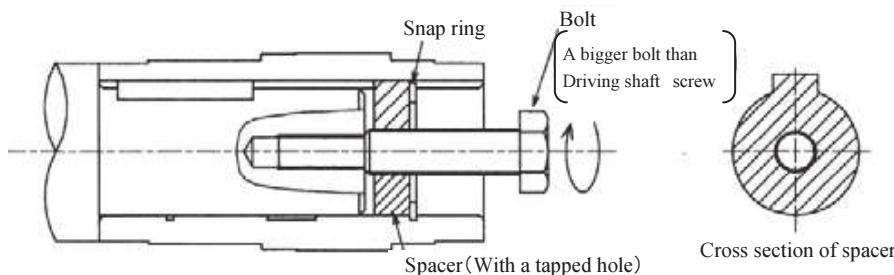


(b) If driven shaft does not have any steps



- Firmly fix the driven shaft to the hollow shaft.

3. Removal from hollow shaft



- If you manufacture the tools shown in the figure, the shaft can be smoothly removed.

Fig.4 Hollow shaft and driven shaft

4.3 Installation of torque arm (Hollow-shaft only)

The torque arm is normally used for detent of the hollow shaft type S-PM Geared Motor. The torque arm can prevent unexpected S-PM Geared Motor by the reaction force of the driven machine.

- ① In consideration of the shock at the time of the start or the brake, be sure to select a board thickness and bolts with enough strength. (refer to Fig. 5).
- ② Move the end face of the hollow shaft close to section A (torque arm whirl-stop) as far as possible.
- ③ Check that forces unnecessary for stopping the whirl cannot be applied to the torque arm whirl-stop.
- ④ Please design as long as possible the dimensionsr. (refer to Fig. 6).

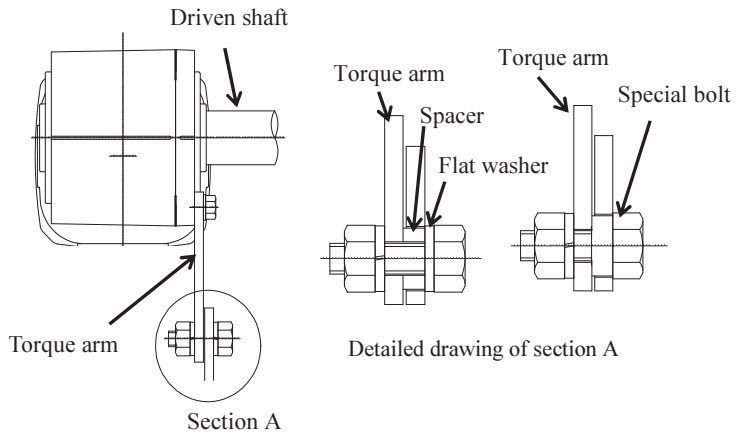


Fig.5

5. Wiring

- (1) S-PM Geared Motor is permanent magnet motor. Please connect this motor to a dedicated drive unit for operation. Driving the motor with a commercial power source might be damaged by burnout.
- (2) Be sure to ground the S-PM Geared Motor, and install a circuit breaker on each motor. Without grounding or circuit breaker, you may get an electric shock.
- (3) To wire the S-PM Geared Motor, use high-quality wiring parts, and be sure to observe the technical standards for electric equipment and the regulations for internal wiring specified by the corresponding electric power company. The outline is shown in Table 3. If the wiring distance is long, adjust the voltage drop to 2% or less.
- (4) Install an optimum motor protector on each motor. Without any protector, the motor may cause a fire at the time of a problem.
- (5) Be sure to supply the specified voltage to the S-PM Geared Motor. If the voltage is too high, a fire may be caused.

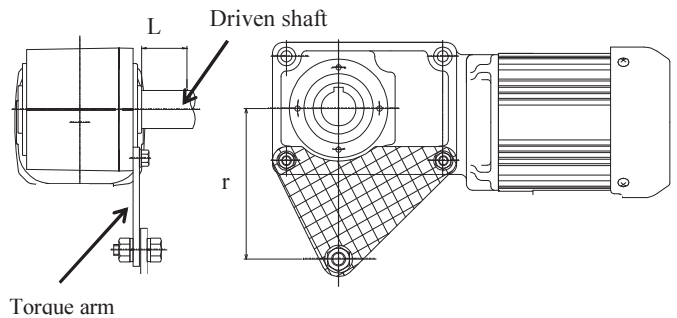


Fig.6

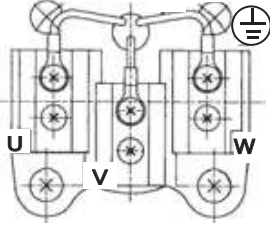
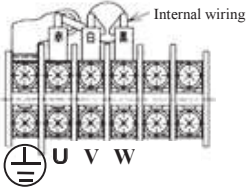
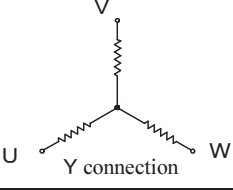
Table 3. Motor Wiring

Output (kW)	Over scale ammeter (A)		Minimum wire thickness *Note		Minimum grounding wire thickness	
	200V	400V	200V	400V	200V	400V
0.1 / 0.2	5	5	1.6mm	1.6mm	1.6mm	1.6mm
0.4	5	5	1.6mm	1.6mm	1.6mm	1.6mm
0.75	5	5	1.6mm	1.6mm	1.6mm	1.6mm
1.5	10	5	1.6mm	1.6mm	1.6mm	1.6mm
2.2	10	5	1.6mm	1.6mm	1.6mm	1.6mm

Note: The “minimum wire thickness” is for when three wires are place in a conduit.

6. Motor Wiring and Output Shaft Rotational Direction Viewed from Output Shaft

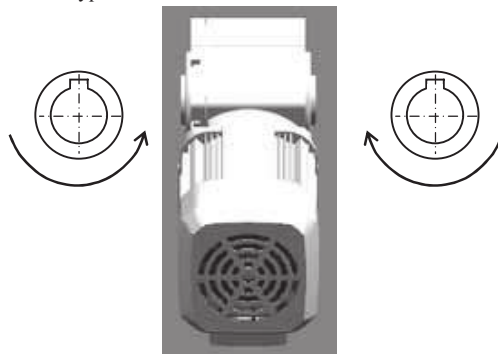
Motor rotation can be reversed by switching any 2 wire of the U,V,W connections, or by executing the drive unit's REVERSE command.

Output (kW)	Terminal connection		Wire connection method																			
	Standard	Special	Connection diagram	Connection method																		
0.1 to 2.2		<p>* With special-purpose item's plastic terminal box. However, in the case of 0.1 to 0.4kW, certain restrictions apply to the position of the terminal box.</p> <p>Internal wiring</p> 	 <p>Y connection</p>	<p>Drive unit</p> <table style="display: inline-table; vertical-align: middle;"> <tr><td>U</td><td>V</td><td>W</td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td>U</td><td>V</td><td>W</td></tr> </table> <p>Motor</p> <table style="display: inline-table; vertical-align: middle;"> <tr><td>U</td><td>V</td><td>W</td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td>U</td><td>V</td><td>W</td></tr> </table>	U	V	W				U	V	W	U	V	W				U	V	W
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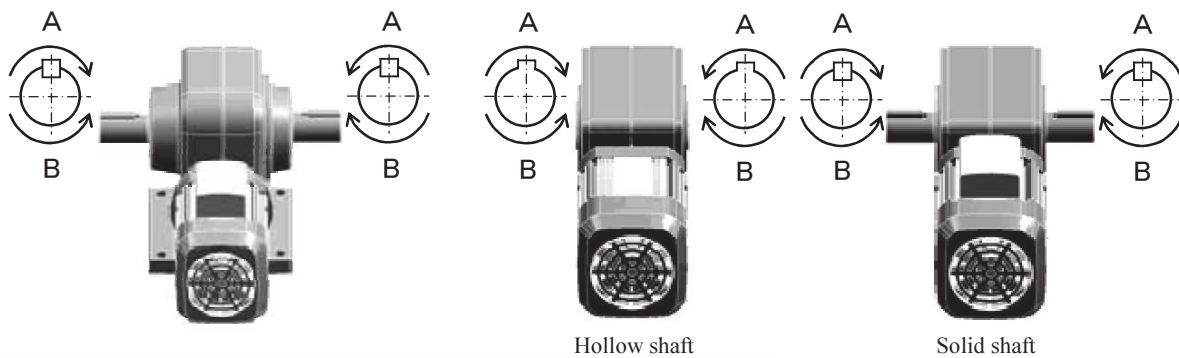
● The rotation direction of GV-S Type

Output (kW)	Gear ratio	Stage of gear units	Rotation direction (viewed from output shaft end)
0.1 to 2.2	1/5 to 1/30	2	Counter Clockwise
	1/40 to 1/200	3	Clockwise
	1/270 to 1/1200	4	Counter Clockwise

● The rotation direction of GV-SSY type



● The rotation direction of GV-SHY type



【Foot mounting type】

Output (kW)	Gear ratio	Rotational direction
0.1 to 0.75, 2.2	1/5, 1/7.5, 1/80 to 1/240	B
	1/10 to 1/60, 1/300 to 1440 ^{*Note}	A
1.5	1/5 to 1/60	A
	1/80 to 1/240	B

【Flange/Face mounting type】

Output (kW)	Gear ratio	Rotational direction
0.1 to 0.75, 2.2	1/5, 1/7.5, 1/80 to 1/240	A
	1/10 to 1/60, 1/300 to 1440 ^{*Note}	B
1.5	1/5 to 1/240	A

Note: The range of the deceleration ratio of 0.75kW becomes 1/300~1/480.

7. Specifications

(1) Standard specifications of S-PM Geared Motor

Standard specifications of S-PM Geared Motor are shown Table 4.

Table 4. Standard specifications of S-PM Geared Motor

Item	Standard specifications								
	Parallel shaft type : GV-S			Right-angle shaft type : GV-SSY, GV-SHY					
Rated output	0.1kW	0.2kW	0.4kW	0.75kW	1.5kW	2.2kW			
200V	Rated input AC voltage Three-phase 200 to 240 V								
	Rated Voltage/current	155V/0.55A	150V/1.05A	175V/1.6A	175V/2.8A	180V/5.5A	155V/9.4A		
400V	Rated input AC voltage Three-phase 400 to 480 V ^{*Note1}								
	Rated Voltage/current	300V/0.5A	355V/0.75A	340V/1.4A	375V/2.8A	315V/4.7A			
Common specification	Rated torque operation range	300 ~ 3000 r/min ^{*Note2}							
	Rated rotation speed	3000 r/min ^{*Note2}							
	maximum rotation speed	3000 r/min ^{*Note2}							
	Rating	Continuous							
	Maximum torque	150% 60s							
	Protective construction	Indoor (IP44)							
	Paint	Metallic gray (Munsell N4.5)							
Specifications of motor portion	Type of motor	Surface Permanent Magnet motor							
	Structure	Totally enclosed self-cooling (0.1 to 0.75kW) ^{*Note3} / Totally-enclosed fan-cooled (1.5, 2.2kW)							
	Thermal class	130(B)							
	Number of poles	4P(0.1 to 1.5kW), 6P(2.2kW)							
Specifications of gear box portion	Type of gear box	Parallel shaft type		Right-angle shaft type					
		GV-S		GV-SSY	GV-SHY				
	Output shaft type	Solid shaft		Hollow shaft	Solid shaft		Hollow shaft		
	Mounting	Foot	Flange	Flange and Face	Foot	Flange	Face	Flange	Face
	Mounting direction	Universal direction							
	Gear ratio	1/5 to 1/1200 ^{*Note4}		1/7.5 to 1/60 ^{*Note5}	1/5 to 1/1440 ^{*Note6}				
Lubrication	Grease lubrication (No condensing)								
Environment	Ambient temperature	0 to +40°C (No freezing)							
	Ambient humidity	90%RH or less							
	Elevation	1000m or less above sea level							
	Vibration	4.9m/s ² (0.5G) for continuous operation, 9.8m/s ² (1G) for instantaneous operation							
	Installation place	Indoors (without corrosive gas, oil mist, flammable gas, dust and dirt etc.)							

Note: 1) With brake type is 400 to 460 V.

2) Rotation speed of the motor shaft.

3) The 0.75kW motor with brake is a totally enclosed fan cooled motor.

4) For 1.5kW motor: 1/5 to 1/450; for 2.2kW: 1/5 to 1/200.

5) For the 2.2kW motor: 1/7.5 to 1/30.

6) For the 0.75kW motor: 1/5 to 1/480; 1.5 and 2.2kW: 1/5 to 1/240.

(2) Motor torque characteristic

The operating torque characteristics are as follows.

The low-speed (less than 300 r/min) operation characteristics vary according to the drive unit's PM control torque boost (Pr.785) setting value.

* 100% setting (Pr.785 = 9999 (default setting)) : Operation at 100% torque is possible for the short-time rating. (See Fig.A)

* 50% setting (Pr.785 = 50) : Continuous operation at a speed lower than 300 r/min is possible with a setting of 50% or less (80% or less for 0.1 to 0.75kW). However, the short-time load torque must be lower than the Pr.785 setting value. (See Fig.B)

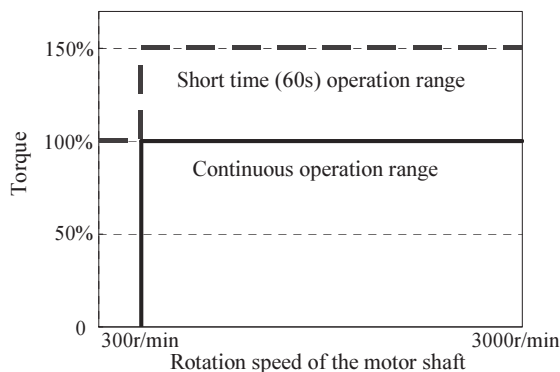


Fig A. Setting Pr.785 PM control torque boost = 100%

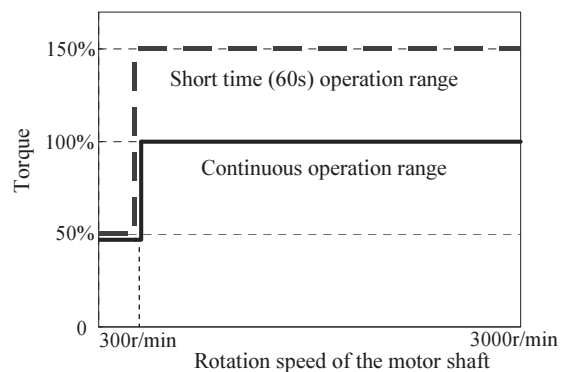


Fig B. Setting Pr.785 PM control torque boost = 50%

Note: 1) The continuous operation torque is the maximum permissible load torque at which the S-PM Geared Motor can be run within the permissible temperature range.

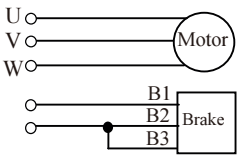
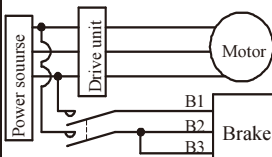
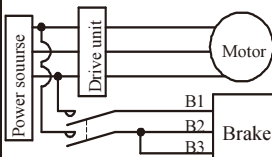
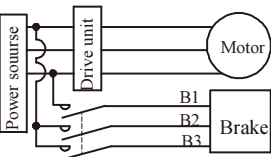
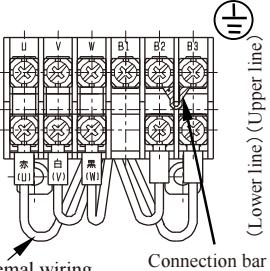
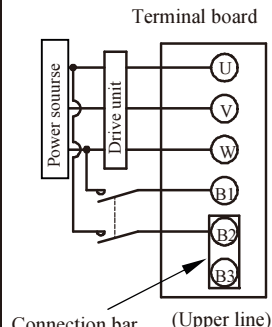
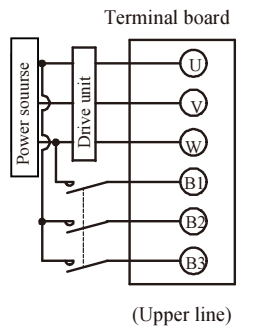
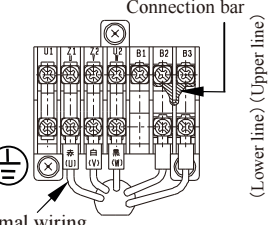
2) The short time torque is the S-PM Geared Motor's maximum generated torque, and represents the short time rating (60s). Note that frequent operation at the short time could shorten the motor's life.

3) The torque (%) represents the percentage of the motor's rated torque (100% when the motor is running at a speed of 3000 r/min).

4) When the input voltage is low, the torque may be reduced.

8. Brake Wiring

- (1) The brake motion delay time (the time before brake start to operate after turning off the power) depends on brake connection method and load specifications. Please do the best connection depending on the application.
- (2) Braking wires are connected to "Separate braking method" at the time of factory shipment
- (3) For details regarding the RUN command and brake ON/OFF timing, refer to the drive unit's operation manual.

Motor		Connection (factory shipment)	Simultaneous braking method	Separate braking method	Direct current (quick) braking method		
Input	Output						
Drive unit driving	0.1 to 2.2kW						
		 <p>Internal wiring</p> <p>Connection bar</p> <p>* With special-purpose item's plastic terminal box. However, in the case of 0.1 to 0.4kW, certain restrictions apply to the position of the terminal box.</p>				 <p>Terminal board</p> <p>Connection bar (Upper line)</p>	 <p>Terminal board</p> <p>(Upper line)</p>
		 <p>Internal wiring</p> <p>Connection bar</p> <p>(Lower line) (Upper line)</p>				<p>Motion Delay time</p>	<p>0.1 ~ 0.3 sec</p>

Notes:

- 1) For elevator or high accuracy positioning drive, please use direct current (quick) braking method.
- 2) Direct current (quick) braking method remove a connection bar according to the upper figure.
- 3) When using separate braking method, be sure that the motor and brake operation timing is synchronized. Unsynchronized timing could cause falls, collisions, and possible brake damage. For details regarding the brake ON/OFF timing, refer to the drive unit's operation manual.
- 4) For 0.1 to 2.2kW model, terminal block has 2 lines of terminals (upper and lower line). Be sure to connect power supply wires to upper line terminals according to the upper figure. If connect to the lower line, brake will not be released.
- 5) Squeaking sound, generated from brake lining, is not malfunction and does not affect to performance. However, if installed in a vertical posture, the wear particles must be removed periodically (every 6 months).
- 6) Please connect the brake to the power source side of the Drive unit. Connecting the brake to the drive unit's output side could damage the power unit.
- 7) At low frequency, the noise may be slightly louder. This noise is not malfunction and does not affect to performance.
- 8) A capacitor for power factor improving cannot be connected to the motor circuit.
- 9) Set so that the brake is applied after deceleration to 1800 r/min (Rotation speed of the motor shaft) or less.
- 10) Please select the switch in the brake part by the current of 200V class:DC110V and the DC13(L/R=10ms) class ratings when you switch off direct current.
- 11) Connect only brake power without power the motor may deteriorate the motor.
- 12) Because the brake's input voltage is restricted according to the power unit's withstand voltage amount, the following operation range should be used: 200V class...200 to 230V.

9. Brake (0.1 to 0.75kW)

1) Structure and operation

Fig.7 shows the structure of the brake. The non-excitation braking method (spring-driven braking method) is used for all the models.

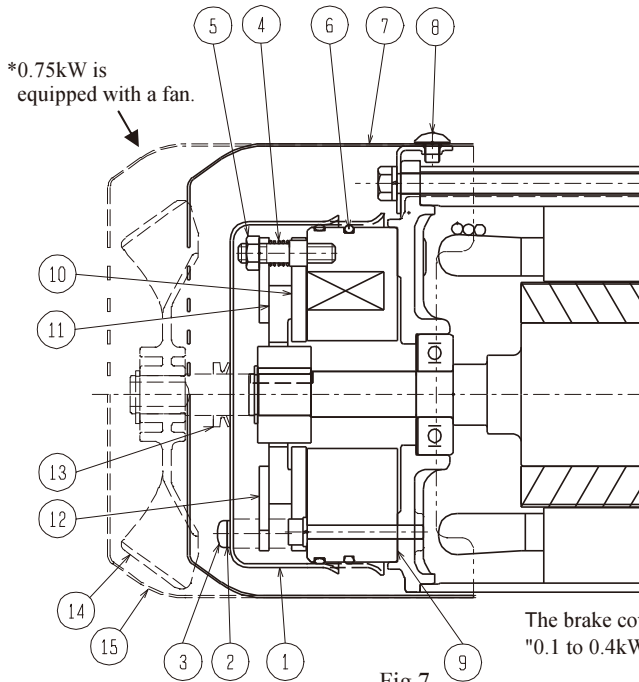


Fig.7

Item	DESCRIPTION
1	Brake cover
2	Seal washer
3	Screw
4	Spring
5	Hexagon bolt
6	O-ring
7	Final cover(0.1 to 0.4kW)
8	Clamp screw
9	Field core
10	Armature
11	Brake lining
12	Side plate
13	End-face V seal (Outdoor type(0.75kW))
14	Fan(0.75kW)
15	Fan cover(0.75kW)

2) Gap adjustment procedure (Refer to the structural drawing of the brake. (Fig.7))

If the brake is abraded due to long use, the gap between the field core and Armature will be larger than the limit gap specified in Table 5. Such a large gap may cause a braking operation error or brake releasing error. For this reason, if the gap is larger than the limit gap, adjust the gap by following the procedure below.

Step 1 <0.1to 0.4kW>

Loosen the Final cover clamp screws (4 screws), and then remove the Final cover.
Loosen screws (item 3) to remove the brake cover (item 1)

<0.75kW>

Loosen the Fan cover clamp screws (4 screws), and then remove the Fan cover.
The fan is fixed by a C-shaped snap ring. Remove the fan and End-face V seal (outdoor type), and then loosen screws (item 3) to remove the brake cover (item 1).

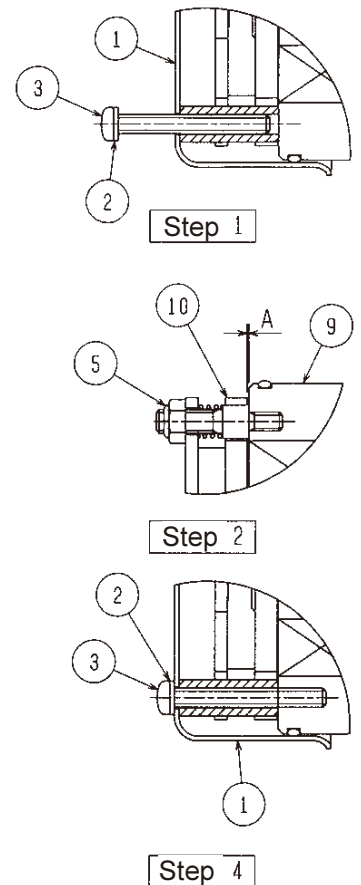
Step 2 Equally adjust the gap (A) between the field core and Armature to the initial gap (refer to Table 5) by tightening the outer hexagon bolt (item 5).

Step 3 Use the specified thickness gauge (initial thickness gauge) to measure the gap. If the lower limit thickness gauge can be inserted into the gap but the upper limit thickness lower limit thickness gauge cannot be inserted into the gap at any point around the cores, judge that gap is properly adjusted.

Step 4 Attach the brake cover, and then tighten the screws (item 3) through the sealwashers(item 2).

Notes: To adjust the gap, observe the following items.

- Adjust the gap so that the gap difference (difference between the maximum gap and minimum gap) is reduced to 0.05 mm or less.
- Periodically check the gap.
- Be careful not to damage the O-ring (item 6) during adjustment. The waterproofing or soundproofing function may be deteriorated.
- If the thickness of the brake lining is reduced to the limit value specified in Table5, replace the lining.



3) Brake specifications

Table 5 shows the standard specifications for the brake. (Table 5 is a standard specification 200V(400V))

Table 5. Standard Specifications for Brake

Brake model	Output (kW)	Brake power supply voltage(V)	Braking voltage DC(V)	Braking current (A)	Braking torque (Nm) *Note 1 and 2	Gap(mm)		Lining thickness	
						Initial gap	Limit gap	Initial gap	Limit gap
SBM 0.2	0.1 to 0.4	200(400)	90(180)	0.16(0.08)	1.91	0.15(inserted) to 0.25 (not inserted)	0.4	6.0	5.3
SNB 0.4	0.75			0.18(0.09)	3.82			5.9	4.9

Note: 1) The braking torque values shown in the above table are the static friction torque values. Dynamic friction torque values will be approximately 80% of the static friction torque values.

2) At starting first operation or after replacing the brake lining, the braking torque may be less than the specified torque. In this case, fit the friction surfaces of the brake by applying the brake several times with a light load

4) Rectifier specifications

Table 6 shows the standard specifications for the rectifier (Table 6 is a standard specification 200V(400V))

Table 6. Standard specifications for Rectifier

Output (kW)	Power supply voltage (V)	Output voltage DC(V)	Control method	Rating	Ambient temperature and humidity	Installation
0.1 to 0.75	200(400V)	90(180)	Half wave rectification method	Continuous	0 to +40°C 90%RH or less	On terminal block

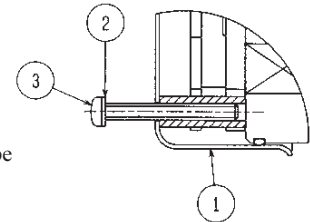
5) Manual brake releasing procedure

a) Simplified manual brake releasing

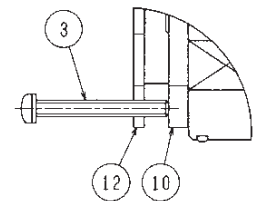
Step 1 Remove brake cover (item 1) in the same manner as described in Step 1 of the gap adjustment procedure.

Step 2 Screw the machine screws(item 3) into the threaded holes of the side plate(item 12). The machine screws will push the Armature to release the brake. At the completion of manual brake releasing, be sure to reset the brake.

* 2 Phillips screws(item 3) are used on the 0.1kW to 0.4kW. Please prepare one separate M4 × 35(recommended) screw.



Step 1



Step 2

Notes: To manually release the brake, observe the following items:

- Be sure to check that the brake is properly released. Basically, reducing the gap to zero will release the brake. To check whether the brake is released, manually turn the motor shaft. If you can turn the shaft, judge that the brake is released.
- If a large tightening force is applied to the simplified manual brake release bolt, the Armature or side plate may be distorted or damaged, and normal operation may not be possible. For this reason, carefully tighten the manual release bolt.
- If the manually released brake is not reset, do not operate the motor. Before starting full-scale operation, be sure to check that the brake functions properly.
- For simplified manual brake releasing, up to 50 times of releasing is allowable.

b) Manual brake release unit (optional)

- On the top of the final cover (or fan cover), there is a brake release lever. Turn the lever 90° to release the brake. (Do not turn the lever more than 90°. The brake may not be released.) At the completion of manual brake releasing, be sure to return the lever to the initial position.
- For manual brake release unit, up to 100 times of releasing is allowable.

【The resolution point at the time of the gap adjustment】

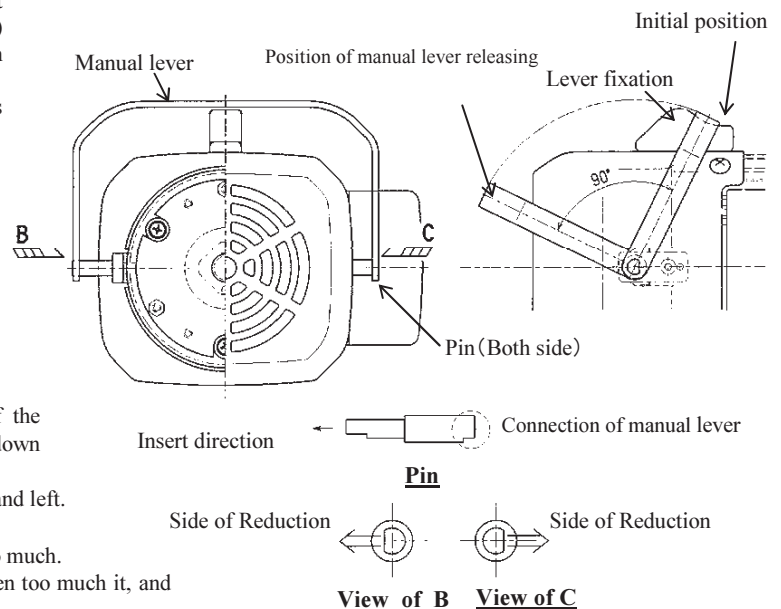
- ① Open a manual lever and exclude combination with the pin of right and left.
- ② Each right and left pulls up pin.
- ③ Please refer to the gap adjustment point for the following work.

【The point to reassemble after the maintenance】

- ① Confirm it so that a D cut parallelism department of the manual lever combination department turns to the slowdown machine side and insert it from a fan cover hole.
- ② Open a manual lever and combined with the pin of right and left.

* Attention

Of the manual lever please be careful to be able to spread too much. A wobble occurs in the combination with the pin when I open too much it, and a manual lever is easy to come to come off.



10. Brake (1.5kW, 2.2kW)

1) Structure and operation

Fig. 8 shows the structure of the brake. The non-excitation braking method (spring-driven braking method) is used for all the models.

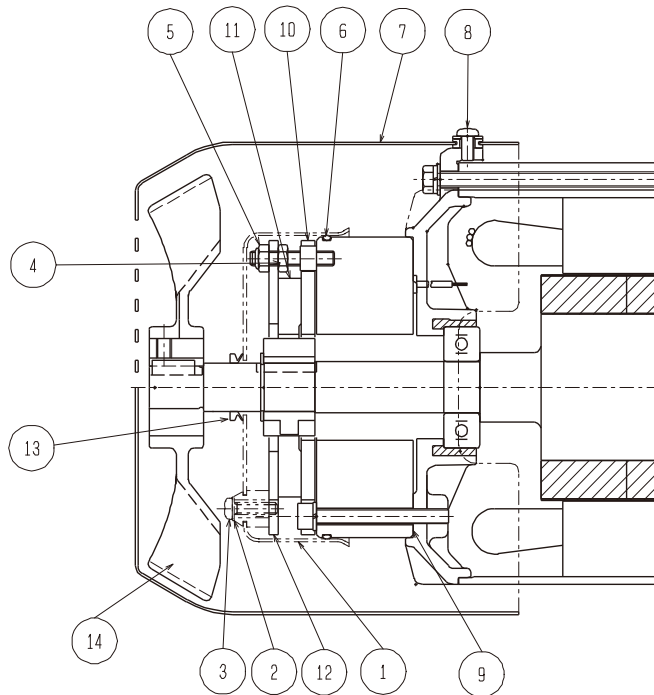


Fig.8

Item	DESCRIPTION
1	Brake cover
2	Flat washer
3	Screw
4	Locknut
5	Hexagon bolt
6	O-ring
7	Fan cover
8	Clamp screw
9	Field core
10	Armature
11	Brake lining
12	Side plate
13	End-face V seal (Outdoor type)
14	Fan

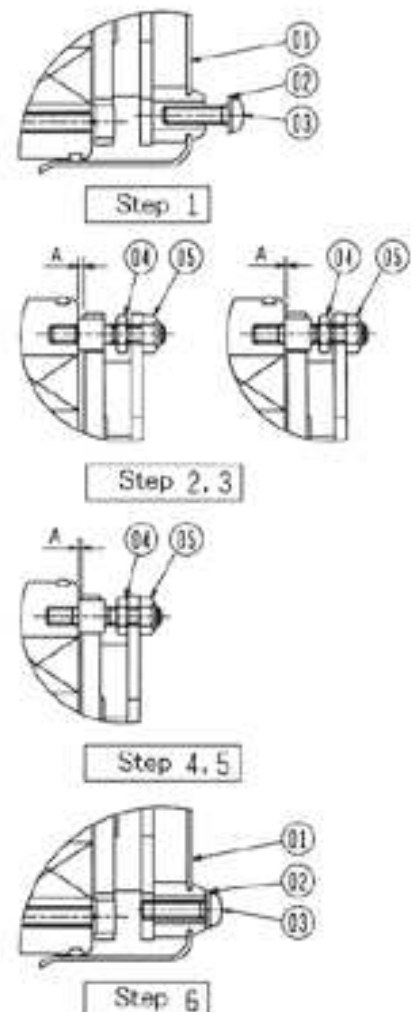
2) Gap adjustment procedure (Refer to the structural drawing of the brake. (Fig.8))

If the brake is abraded due to long use, the gap between the field core and Armature will be larger than the limit gap specified in Table 7. Such a large gap may cause a braking operation error or brake releasing error. For this reason, if the gap is larger than the limit gap, adjust the gap by following the procedure below.

- Step 1** Loosen the fan cover clamp screws (4 screws), and then remove the fan cover.
The fan is fixed by hexagon socket head set screws. Remove the fan and End-face V seal (Outdoor type), and then loosen the screws (item 3) to remove the brake cover (item 1).
- Step 2** Inside the brake cover, loosen 3 locknuts (item 4), and then equally adjust the gap (A) between the field core and Armature to the initial gap (refer to Table 7) by tightening the outer hexagon bolt (item 5).
- Step 3** Use the specified thickness gauge (initial thickness gauge) to measure the gap. If the lower limit thickness gauge can be inserted into the gap but the upper limit thickness gauge cannot be inserted into the gap at any point around the cores, judge that gap is properly adjusted.
- Step 4** Tighten 3 locknuts (item 4)
- Step 5** Finally check the gap (A) in the same way as step 3.
- Step 6** Attach the brake cover, and then tighten the screws (item 3) through the flat washers (item 2).

Notes: To adjust the gap, observe the following items.

- After adjusting the gap, be sure to tighten all the nuts.
- After tightening the locknuts (item 4) at step 4, the gap may be slightly changed. For this reason, be sure to check the gap at step 5.
- Adjust the gap so that the gap difference (difference between the maximum gap and minimum gap) is reduced to 0.05 mm or less.
- Periodically check the gap.
- Be careful not to damage the O-ring (item 6) during adjustment. The waterproofing or soundproofing function may be deteriorated.
- If the thickness of the brake lining is reduced to the limit value specified in Table 7, replace the lining.



3) Brake specifications

Table 7 shows the standard specifications for the brake. (Table 7 is a standard specification 200V(400V))

Table 7. Standard Specifications for Brake

Brake model	Output (kW)	Brake power supply voltage(V)	Braking voltage DC(V)	Braking current (A)	Braking torque (Nm) *Note 1 and 2	Gap(mm)		Lining thickness	
						Initial gap	Limit gap	Initial thickness	Limit thickness
SNB 0.8	1.5	200(400)	90(180)	0.24(0.12)	7.16	0.15(inserted) to 0.25 (not inserted)	0.5	7.7	6.7
SNB 1.5	2.2			0.25(0.12)	14.3	0.20(inserted) to 0.30 (not inserted)	0.5	10	8.5

Note: 1) The braking torque values shown in the above table are the static friction torque values. Dynamic friction torque values will be approximately 80% of the static friction torque values.

2) At starting first operation or after replacing the brake lining, the braking torque may be less than the specified torque. In this case, fit the friction surfaces of the brake by applying the brake several times with a light load.

4) Rectifier specifications

Table 8 shows the standard specifications for the rectifier (Table 8 is a standard specification 200V(400V))

Table 8. Standard specifications for Rectifier

Output (kW)	Power supply voltage (V)	Output voltage DC(V)	Control method	Rating	Ambient temperature and humidity	Installation
1.5, 2.2	200(400)	90(180)	Half wave rectification method	Continuous	0 to +40°C 90%RH or less	On terminal block

5) Manual brake releasing procedure

a) Simplified manual brake releasing (pattern 1)

For this brake releasing method, prepare the brake release bolts shown in Table 9

Step 1 Loosen the fan cover clamp screws (4 screws), and then remove the fan cover. After that, remove the fan and End-face V seal (Outdoor type). (The fan is fixed by hexagon socket head setscrews.)

Step 2 Loosen the screws (item 3), and then remove the brake cover (item 1). Screw the machine screws into the threaded holes of the side plate. The machine screws will push the Armature to release the brake. At the completion of manual brake releasing, be sure to reset the brake.

Table 9 Simplified manual brake release bolt

Brake model	Simplified manual brake release bolt
SNB 0.8	M4×25
SNB 1.5	M6×40

b) Simplified manual brake releasing (pattern 2)

Need not prepare the brake release bolts.

Step 1 Remove brake cover (item 1) in the same manner as described in Step 1 of the gap adjustment procedure.

Step 2 Screw the machine screws(item 3) into the threaded holes of the side plate(item 12). The machine screws will push the Armature to release the brake. At the completion of manual brake releasing, be sure to reset the brake.

c) manual brake release unit (optional)

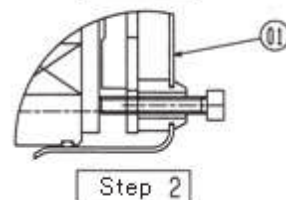
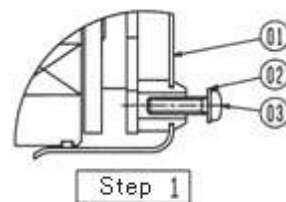
The written contents of manual brake release unit (optional) are the same as that of 0.1 to 0.75kW.

Please refer to P11 (5).

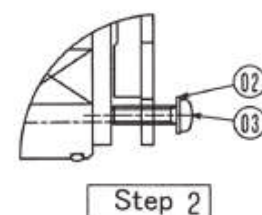
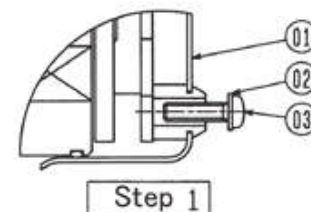
Notes: To manually release the brake, observe the following items:

- Be sure to check that the brake is properly released. Basically, reducing the gap to zero will release the brake. To check whether the brake is released, manually turn the motor shaft. If you can turn the shaft, judge that the brake is released.
- If a large tightening force is applied to the simplified manual brake release bolt, the Armature or side plate may be distorted or damaged, and normal operation may not be possible. For this reason, carefully tighten the manual release bolt.
- If the manually released brake is not reset, do not operate the motor. Before starting full-scale operation, be sure to check that the brake functions properly.
- For simplified manual brake releasing, up to 50 times of releasing is allowable.

a) Simplified manual brake releasing (pattern 1)



b) Simplified manual brake releasing (pattern 2)



11. Dust & Waterproof type

Please confirm the following notes when waterproof GM uses it.



CAUTION

Labyrinth Plate for output shaft

- Labyrinth Plate that rotates with the shaft is installed in the output shaft. Please do not touch Labyrinth board while rotating.

Washing

- Turn off the power supply when you wash it.
- Do not Wash with steam and hot water. Make the warm water washing the warm water of 80°C or less.
- Do not wash the high pressure.
- Do not rub the surface of painting with the hard one such as metallic brushes. It causes the painting peeling off.

Connecting wires

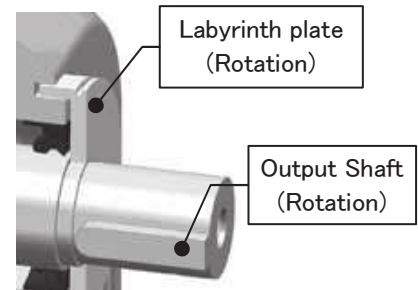
- The cable must use the water-proof type. Water might go into it.
- Do the installation and tightening Water proof connecter surely. Water might go into it.

1. Labyrinth board

- 1) Labyrinth plate is installed in the output shaft. Note the rotation with the shaft.

Refer to a catalog or externals dimensional drawing for details.

- 2) Do not add the outside power to Labyrinth plate. It comes in contact with the case and it is likely to damage it.
- 3) Do not bite the foreign body between Labyrinth plate and the case and do not drive in a crowded state.



2. Inverter driving

The standard and the range of a low torque are different for the magnetic flux vector control method of 0.1 to 0.4kW.

	magnetic flux vector control	
	Standard type	Waterproof type
0.1 to 0.4kW	3 to 60Hz	20 to 60Hz

3. Wiring work

- 1) The cable for wiring must use the water-proof type.
- 2) It must not be confirmed that packing is installed, when you tighten terminal box cover.
- 3) The terminal box cable taking out part installs Water proof connecter OA-W1611-13L (made of ohm electric Ltd.), and note the following.

- The acceptable electric wire diameter is $\Phi 8.5$ to $\Phi 11.5$.

Water is infiltrated when the electric wire not suited is used, and there is a possibility of electric breakdown.

- Tighten the Water proof connecter surely. (recommended tightening torque 1.2 to 1.5N·m)

- Paint the seal medicine (Three bond # 1211 etc.) between the entrance of Water proof connecter and the cable.

Water proof connecter

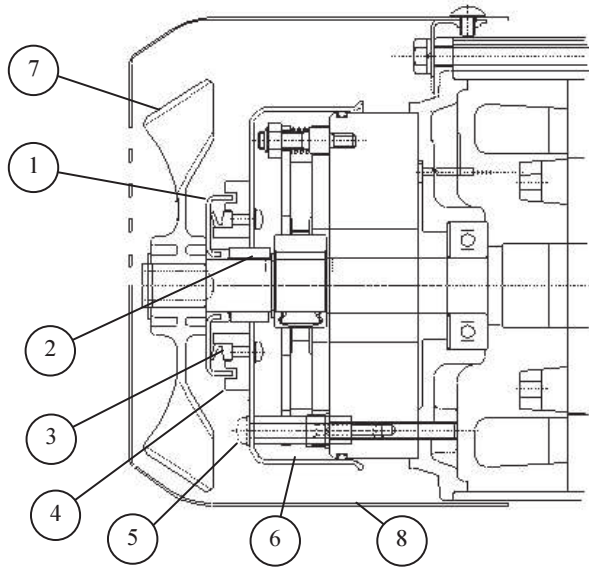


Terminal Box

4. Brake gap adjustment

1) Structure and operation

The figure below shows the structure of the brake. The shaft seal structure are different from standard.



Item	Discription
1	Labyrinth Plate
2	Spacer
3	End-face V seal
4	Seal support
5	Pan small screw
6	Brake cover
7	Fan
8	Fan cover

2) Resolution and assembly

The resolution and the assembly when the brake gap is adjusted are the same to standard points.

Parts only for the waterproof type are installed and note the following point.

Refer to the attached paper manual for the gap adjustment points.

【Resolution】

Detach the Fan cover and the fan. Loose the pan small screw. And detach the Brake cover together with Labyrinth Plate and Seal support.

【Assembly】

It is confirmed that Spacer is installed in the shaft and after installing the brake cover, push the Labyrinth Plate until hitting at Spacer.

5. Others

- 1) When starting and stopping, End-face V seal sound might be generated. (There is no problem on the function.)
- 2) It asks for the maintenance of the output shaft and the output shaft oil seal at our factory or our service center.
- 3) Please confirm there is not loosening in Water proof connecter in the periodical inspection.

12.Operation

- S-PM Geared Motor is permanent magnet motor. Please connect this motor to a dedicated drive unit for operation. Driving the motor with a commercial power source might be damaged by burnout.
- Use one dedicated S-PM Geared Motor for one drive unit. Multiple S-PM Geared Motors cannot be connected to a drive unit.
- Always operate within the prescribed rotation speed range. Operating the motor outside the prescribed rotation speed range could cause motor damage.
- If a load is lifted up, do not release the brake using the manual brake release unit. The load may be dropped.

Before turning on the switch

- (1) Check the bolt tightening condition at each section.
Check that the foundation bolts, sprocket bolts, coupling bolts, etc. are tightened properly.
When using a flange mounting for the GV-SSY type, use the special accessory washer, and verify that the bolt has been tightened.
- (2) Verify that the wiring to the drive unit is correctly connected, that the terminal box cover is attached, and that the breaker capacity and over-current protection relay settings are appropriate.

Operation

- (1) To operate the S-PM Geared Motor, observe the allowable loading torque range.
- (2) During operation, if the motor generates an abnormal noise, vibrates extremely, or shows abnormal characteristics, be sure to stop the motor, and inspect the motor.
- (3) During operation, keep your body away from the S-PM Geared Motor. If you touch the S-PM Geared Motor during operation, you may be injured or get burned.
- (4) Motor operation begins approximately 0.1s (Initial magnetic pole detection time) after the START signal input.

Others

- (1) At starting, apply a light load. When the motor speed is increased to the full speed, apply the specified load.
- (2) To stop operation, be sure to turn off the power switch.

13.Maintenance

- Do not modify the S-PM Geared Motor.
- Be sure to turn off the power before inspecting or repairing the motor.

(1) Daily check

Check item	Check method	Description
Current	Using ammeter	Check that the actual current value is equal to the rated current value specified on the nameplate or less.
Noise	Hearing	Directly check the noise with your ear using a noise detector bar. The motor should not generate any abnormal noise.
Surface temperature	Thermometer	Obtain the motor frame surface temperature rise value by subtracting the ambient temperature value from the motor frame surface temperature value. Without brake:60°C or less, With brake:80°C or less
Vibration	Vibration meter	Check the vibration of the gear case and frame. The obtained vibration values should be 4.9m/s ² or less.
Lubricant leak	Visual check	Check that no grease or oil leaks from the S-PM Geared Motor.
Chain	Visual check	Check that the chain is not extremely sagging or too tight. Also check that the chain moves smoothly.

(2) Periodical inspection

Periodically check the motor and replace the damaged parts while referring to the table below.

Check item	Schedule	Description	
* Grease replacement	Every 10000Hours (4 years)	Replace the grease every 10,000 hours of operation or every 4 or 5 years, whichever is earlier. <Grease> Parallel shaft type : NLGI No.000 of Urea Grease Right-angle shaft type (1)0.1 to 0.75kW : NLGI No.00 of Lithium Complex Grease (2)1.5 to 2.2kW : NLGI No.000 of Urea Grease With Extreme Pressure manufactured by JX Nippon Oil & Energy Corporation	
* Oil seal replacement	Every 8000Hours (3 years)	If the grease leaks from the seal, replace the oil seal.	
Chain tension	Every 6 months	If the chain is loose, readjust the tension.	
Looseness of foundation bolts	Every 6 months	If the foundation bolts are loose, retighten the bolts.	
* Bearing replacement	Every 8000Hours (3 years)	If the bearing generates an abnormal noise, replace the bearing.	
Motor coil insulation resistance	Every 6 months	Check the insulation resistance of the motor coil using a 500V megger. The insulation resistance should be 1 MΩ, dry the coil at 90°C or less in a drying furnace.	
Brake	Gap adjustment	Every 6 months	
	Brake lining thickness	Annually	Adjust the gap to the range specified in Table 5 or Table 7. If the lining thickness is less than the limit thickness specified in Table 5 or Table 7, replace the brake lining.
	O-ring replacement (For brake cover)	Every 8000Hours (3 years)	Periodically check the O-ring. If the O-ring is damaged, replace the O-ring.

For "*" marked items, contact the sales outlet where purchased.

- Note:
- 1) Just after replacement of the brake lining, the braking torque may be less than the specified torque. In this case, fit the friction surfaces of the brake by applying the brake several times with a light load.
 - 2) The S-PM Geared Motor is equipped with an internal magnet, and maintenance should therefore be performed only by Mitsubishi or by an authorized Mitsubishi service agent. Unauthorized disassembly could result in the permanent magnet rotor becoming stuck to other metal parts of the motor, making the maintenance task difficult, and possibly causing injuries. Moreover, a poor work environment could result in other metallic scraps and chips, etc., becoming adhered to the magnet, resulting in motor failure. Never attempt unauthorized motor modifications.
 - 3) When oil oozes from set field of motor, if it does not develop, it can be used as it is because there is no problem on a performance. When oil poses a problem, use after wiping off oil. This oil is a grease ingredient applied to very small quantity at the time of the assembly in a factory.
 - 4) The "years" periods indicated in parentheses are based on operation which occurs in an ambient temperature of 40°C, at the rated torque, for 300 days per year, 8 hours per day.

14. Troubleshooting

If the S-PM Geared Motor has a problem, determine the cause and solve the problem while referring to the table below:

Problem	Cause	Remedy
Grease leak from oil seal	Damaged oil seal.	*Replace the oil seal.
Oil leak from mating face of gear case etc.	(1) Loose clamp bolt (2) Damaged O-ring	(1) Tighten the clamp bolt (2) Replace the O-ring
Abnormal noise of bearing	Dust or foreign material is in the bearing.	*Replace the bearing.
*Abnormal noise of gear	(1) The gear catches foreign material. (2) The gear is abraded due to overload.	*Contact the sales outlet where purchased.
*Other problems	(1) Resonance is caused because the motor installation base is not rigid. (2) The vibration of the machine is transferred to the motor to cause the problem. (3) The eccentricity between the machine and the motor is too large.	(1) Increase the rigidity of the motor installation base. (2) Increase the rigidity of the motor installation base (3) Readjust the eccentricity to 0.05 mm or less.
*Non-rotating output shaft	(1) Drive unit wiring fault, severed/disconnected wiring. (2) Damaged gear or shaft.	(1) Check the power cable and the control cable wiring. (2) Contact the sales outlet where purchased.
Extreme rise of temperature	(1) Overloaded operation. (2) The starting frequency is too high. (3) The ambient temperature is 40°C or above.	(1) Reduce the load by lowering the current to the rated current value. (2) Lower the frequency. (3) Ventilate the room to reduce the ambient temperature.
Abnormal noise of motor	(1) Foreign material. (2) Damaged bearing. (3) Brake gap adjustment error. (4) Abraded brake lining. (5) Seized brake coil. (6) Broken rectifier.	(1) Remove the foreign material. (2) Contact the sales outlet where purchased. (3) Adjust the brake gap. (4) Adjust the brake gap, or replace the brake lining. (5) Replace the entire brake unit. (6) Replace the rectifier.
Brake malfunction	(1) Foreign material on brake lining. (2) Abraded brake lining. (3) Unevenly adjusted brake gap. (4) Overload. (5) The manually released brake is not reset.	(1) Remove the foreign material. (2) Adjust the brake gap, or replace the brake lining. (3) Adjust the brake gap. (4) Reduce the load by lowering the current to the rated current value. (5) Reset the brake to the initial condition.

For "*" marked items, contact the service site shown below.

15. Contact us

When you contact us, let us know the following items

- | | | |
|------------------------------|-----------------------|-------------------------------------|
| (1) SERIAL No. | } (See the nameplate) | (5) Part name(see the construction) |
| (2) Model number | | (6) Quantity |
| (3) Output | | (7) Desired delivery date |
| (4) Reduction ratio or speed | | |

「Warranty」

1. Warranty term and scope of warranty

When failure by the responsibility by the side of our company occurs for a product during the term of a warranty, our company will fix a product gratuitously through the store or the service company of our company which purchased. However, when the business trip repair to overseas from domestic is required, or when the business trip repair to the remote place according to a detached island and this is required, I do the cost price which engineer dispatch takes as onerousness.

【Warranty term】

The warranty term for the product shall be 18 months after the date of delivery or 12 month from the product starting operation, whether be shorter. Moreover, the term of warranty of a repair products does not become long more than the term of warranty before repair.

【Scope of warranty】

(1) Inspection

Please inspect your product by yourself. Our service personal, however, can inspect your product at your request with change to you. If a problem is detected by the inspection, we will discuss with you to determine whether we are responsible for the problem. If we are responsible for the problem, we will repair your product free of charge.

(2) Repair

In the following cases (①,②,③,④,⑤,⑥,⑦,⑧ and ⑨), we will charge the repair expense, parts replacement expense, and traveling expense to you. In the other cases, we will repair your product free of charge.

- ① The problem is caused due to inappropriate storage or handling of your product, carelessness, negligence, or operation in inappropriate facility or with inappropriate machine, etc
- ② The problem is caused because you have modified our product without our approval.
- ③ The problem is caused because you have used lubricating oil other than recommendation of our products.
- ④ The problem is caused because periodical inspection is not performed
- ⑤ The problem is caused because you have used our product while ignoring the product specifications.
- ⑥ The problem is caused because you have used accepted that the consumable parts (Bearing, oil seal, etc.) specified as the instructions manual etc. even if it was a normal operating condition were able to protect when performed maintenance and inspection normally.
- ⑦ The problem is caused because natural disasters, such as an external factor by inevitability, such as a fire and unusual voltage, and an earthquake, thunder, and storm and flood damages.
- ⑧ The problem is caused because the reason which was not able to be foreseen with the level of the technology at the time of our company shipment.
- ⑨ Other cases where you are responsible for the problem

2. Exclusion

Even if a problem of our product causes damage of other manufacturers' machine, etc., we will not compensate any loss caused by the problem of our product or damaged other manufacturers' machines (loss of your company or your customer), even in the warranty period. Since it may change without a notice, please give beforehand the specification indicated to a catalog, an instructions manual, or technical data every knowledge.

3. Repair after stopping production

Even if production of the same model is stopped, we will repair your product for 7 years from the date of production stoppage.

However, the parts manufactured by casting and mold have a case where allowed to consider it as the alternative parts which have the same function.

The product supply after production stoppage cannot respond including spare parts.

4. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

5. Application and use of the Product

- (1) For the use of the product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in the product, and a backup or fail-safe function should operate on an external system to the product when any failure or malfunction occurs.
- (2) The product is designed and manufactured as a general purpose product for use at general industries. Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used. In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used. We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

16. Labeling (product name) based on the Marking for the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment: Geared Motor

(1) Marking for the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment



This mark indicates the environmental protection use period based on the Administrative Measure on the Restricted Use of Hazardous Substances in Electrical and Electronic Equipment applied to electrical and electronic equipment sold in China. To the extent that this product is used under the instructions on safety and usage, it will not cause any serious impact on the environment, human health, and properties for the indicated number of years from the manufacturing date.

Note:

When disposing of the product after proper use, follow local laws and regulations stipulating how to collect and recycle electrical and electronic devices.

Note: This symbol mark is for China only.

(2) Six hazardous substances, names of parts containing the substances, and the contents

The table below lists the six hazardous substances contained in this equipment, names of parts containing these substances, and the contents.

Names of hazardous substances contained in the equipment and the contents

Part Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Structural parts	×	○	○	○	○	○
Stator	○	○	○	○	○	○
Rotor	○	○	○	○	○	○
Brake	×	○	○	○	○	○
Detector	×	○	○	○	○	○

This table is prepared in accordance with the provisions of SJ/T 11364.

○: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

×: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.

(1) 电器电子产品有害物质限制使用标识



根据《电器电子产品有害物质限制使用管理办法》，该标记适用于在中国销售的电器电子产品，其中的数字为产品的环保使用期限。只要遵守本产品在安全和使用方面的注意事项，在自生产日期算起的该年限内，将不会污染环境，也不会给人身和财产带来严重的影响。

(注) 产品正常使用终结废弃时，有关电子电气产品的回收、再利用等要遵守各自治体的法律法规的要求。

Note: This symbol mark is for China only.

(2) 所含有的6种有害物质的名称, 含有量, 含有部品

本产品中所含有的6种有害物质的名称, 含有量, 含有部品如下表所示。

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
构造部件	×	○	○	○	○	○
转子	○	○	○	○	○	○
定子	○	○	○	○	○	○
制动器	×	○	○	○	○	○
检测器	×	○	○	○	○	○

本表格依据SJ/T11364的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T26572规定的限量要求。

Inspection Certificate

Thank you for selecting a Mitsubishi S-PM geared motor.
This is to certify that your S-PM geared motor has been
accepted by the specified inspection in our factory.

This document was issued in March, 2018.

Note that product specifications may be subject to change without prior notice.

mitsubishi **ELECTRIC FA INDUSTRIAL PRODUCTS CORPORATION**