

USER MANUAL-EN

AC SMALL STANDARD MOTORS

TERMINAL BOX TYPE MOTOR

0171-00



SPG Co., Ltd.
http://www.spg.co.kr



Table of Contents

1. Safety Precautions
2. Checking Contents
3. Duty of Motor
4. Installation
5. Assembly a Gearhead with O-ring
6. Connection
7. Structure of Terminal Box
8. Overheat Protection
9. Mounting onto Brackets
10. Troubleshooting
11. Warranty Information

1. Safety Precautions

1.1 General Precautions

The precautions indicated below are intended to prevent danger or injury to the user and to display the correct use of the product. Failure to read and understand these precautions can result in serious, or possibly even fatal, injury and/or damage to the product, related equipment, and systems.

- Only qualified personnel should work on installing, wiring, operating, handling and inspecting the product.
- Do not use the product in explosive, flammable, or corrosive environments.
- Do not use in areas exposed to splashing water or near combustibles.
- Do not forcibly bend, pull, or pinch the cable.
- Only use the motor for class 1 equipment to prevent the risk of electric shock.
- For the Safety measure against electric shock, install the product within an 'enclosure' in order to avoid direct contact with hands.
- Always connect the protective earth terminals of the motor to the protective earth and ground securely to prevent electric shock.

1.2 Operating Precautions

- The surface of the motor may exceed 70°C (58°F) under normal operating conditions.
- Display the following warning sign where it is clearly visible to any personnel at all times. Failure to do so may result in electric shock or burn.
- Always turn off the power before performing maintenance/ inspection of the thermally-protected (TP) installed motor. If the motor is left on, the motor may automatically begin operating when the temperature falls because the motor is thermally protected.
- When the power is off, the electromagnetic brake attached to the motor is designed to "Hold" the load securely (current is still running), rather than stop a load in motion. The brake should not be used as a safety brake.
- A secondary brake should be installed to completely stop loads in motion.

2. Checking the Contents

2.1 Inspection

Inspect contents of the package thoroughly to ensure that all items below have been received:

- Motor 1 piece

- Capacitor (For single-phase motor only) 1 piece
 - User Manual 1 copy
- Check the nameplate to verify that the specifications of the motor are in accordance with the power supply and equipment, including the correct part number, speed, voltage, and phase. If there are any missing items and/or considerable damage has been discovered, contact a sales representative from whom the motor was purchased or the sales agent for assistance.

2.2 Product Features

- SPG offers 3 types of Terminal box motors: Terminal block motor (T), PCB Terminal block motor (T1), and the Conduit box motor (T2), all with the following features:
- T, T1 Type: The power cable is fixed with a cable clamp and seal connector and no terminal crimping is needed as the lead wires are directly inserted into the terminal block T2 Type: It includes a capacitor in the conduit box for a single phase motor. No further wiring for capacitor is required.
- A gasket is built-in to the motor for airtight secureness (IP54)
- The motor is good for use in the aggressive environments of the industry
- Compact style
- The protective earth (PE) terminal is built-in to the terminal box (Not available for the 60 and 70mm frame size motor)
- Maximizes work efficiency with ease of use wiring and connection
- Offers high tensile strength due to secureness of cables

3. Duty of Motor

3.1 Terminal Box Type AC Induction Motor

The induction motor runs continuously in one direction

3.2 Terminal Box Type AC Reversible Motor

The reversible motor is designed to optimally perform for no more than 30 minutes at a time. If ran continuously, the motor will burn out.

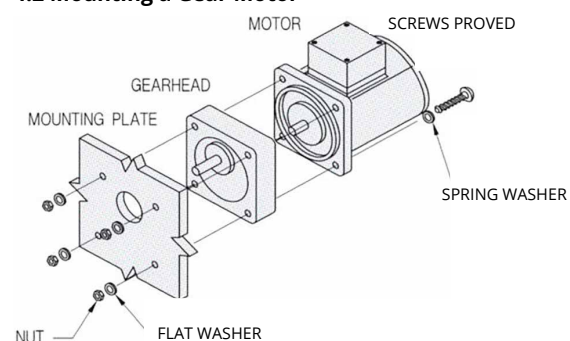
4. Installation

4.1 Installation Conditions

To avoid failures, mechanical damages, and injuries, install products in areas under the following conditions:

- Indoors (The products are designed to attach to machines)
- Operating ambient temperature: -10 ~40°C (+ 14 ~ 104°F)
- Operating ambient humidity: under 85%
- No exposure to explosive, inflammable or corrosive gases
- No exposure to continuous vibration or excessive impact.
- No exposure to direct sunlight
- No exposure to splashing water, oil, or dust
- No exposure to radiation
- The maximum height must not exceed 1000m

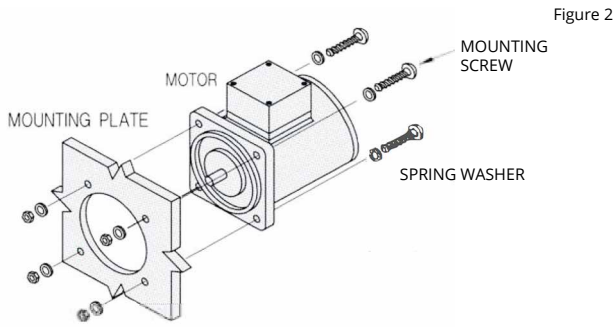
4.2 Mounting a Gear Motor



- Drill holes in the mounting plate
- Align the gearhead and motor prior to mounting
- Assemble the gearhead and motor using the screws provided by the gearhead, and connect onto the mounting plate
- Secure all parts tightly by closing all gaps between the motor flange surface and the gearhead surface
- Refer to the gearhead operation manual for further details concerning mounting

[Note] Choose a gearhead with the same type of gear screw shaft as the motor.

4.3 Mounting a Motor

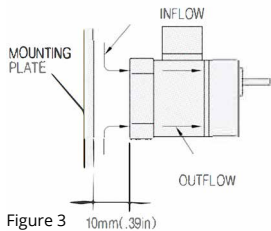


- Drill holes in the mounting plate
- Assemble the motor onto the mounting plate (screws are not provided)
- Secure all parts tightly by closing all gaps between the motor flange surface and the mounting plate surface, using the tightening torque values as shown in the table below

[Note] Do not attempt to forcefully insert the motor onto the mounting plate.

Motor Frame Size (in)	Screw		Recommended Tightening Torque
	Standard motor	Global Type Motor	
60mm (2.36)	M4	M4	2.0N · m (20kgf · cm)
70mm (2.75)	M5	M6	2.5N · m (25kgf · cm)
80mm (3.15)	M5	M6	2.5N · m (25kgf · cm)
90mm (3.54)	M6	M8	3.0N · m (30kgf · cm)
100mm (4.09)	M8	-	3.0N · m (30kgf · cm)

4.4 Mounting a Motor with A Cooling Fan

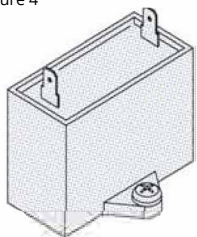


- Mount a motor with a cooling fan 10mm from the surface of the equipment, like a mounting plate, or make a ventilation hole at the rear of the motor to ensure that the cooling inlet in the back of the motor cover is not blocked.

[Caution] Blocked cooling inlets shorten motor life and cause damages to the motor.

4.5 Mounting a capacitor (For single-phase motor only)

Figure 4



- Prior to mounting, check the capacitor nameplate to make sure that it matches with the motor's capacitance to be applied.
- Use M4, or an equivalent screw to mount the capacitor. (screws not provided)

[Note]

- Tightening torque for the installation of a capacitor has a maximum value of 1N · m (10kgf · cm)

- Distance from the capacitor to the motor should be a minimum of 10cm (3.94 in). If placed closer, the capacitor's lifespan can be shortened.

5. Assembly a Gearhead with O-ring

5.1 Pre-assembly

- Make sure that the O-ring is inserted between the gearhead and motor, and is placed firmly in position
- Remove any particles of dust or other waste that may be clinging onto the O-ring or the pinion section of the motor and gearhead
- Do not pinch the O-ring when assembling the motor and gearhead

5.2 Assembly

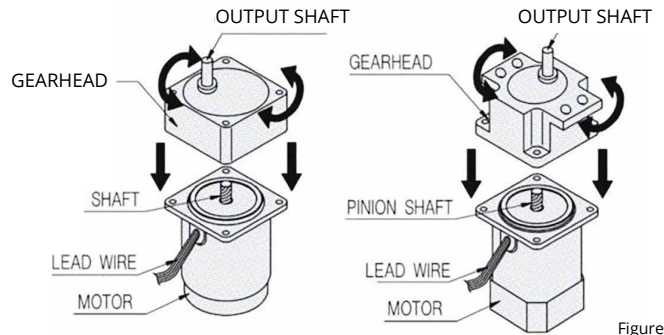


Figure 5

- Place the gearhead & motor faced upward and orient the motor with consideration to the direction of the lead wire to the equipment
- Insert the gearhead output shaft onto the motor pinion. Align the motor flange mounting holes with the gearhead flange.
- Ensure that the tip of the motor does not make contact with the teeth of the gearhead, and slightly turn the motor pinion clockwise and counterclockwise gently during assembly.
- Attach the gearhead and motor to the equipment using the mounting screws provided by the gearhead, as shown in the figure to the right.
- Rotate the motor clockwise and counterclockwise until there is no gap present between the motor flange and the gear flange.

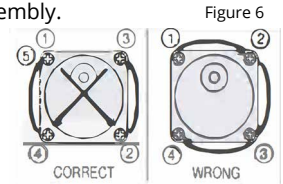


Figure 6

- 4 screws are used to connect the gearhead to the motor flange. Slowly hand-tighten the screws in a diagonal sequence with care so as to not pinch the O-ring.
- Because the O-ring is placed onto the top of the motor, a small gap between the motor and gearhead is normal.

[Note] Excessive tightening of the screws can cause incomplete assembly, as shown in the figure to the right. To correctly assemble the apparatus, loosely attach all screws from the gearhead to the motor before securing all screws in place.

[Caution] Forced assembly of the motor and gearhead may cause erroneous noise or shorten the lifespan of the product.

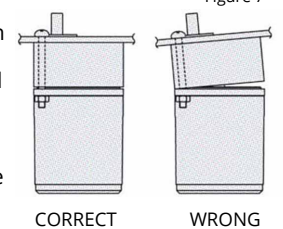


Figure 7

6. Connection

6.1 Grounding

6.1.1 A Motor containing a Protective Earth (PE)

- Connect the ground wire to the protective earth terminal inside the terminal box (T, T1).
- Connect the ground wire to the green lead wire in the conduit box (T2)
- Figure 8 below shows the grounding method for the terminal box motor of the 60mm frame size motor (3w, 6w) and the 70mm frame size motor (15w), for which the flat head holt (PE holt) is on the side.
- Loosen the flat head PE holt and insert the earth terminal into the holt, and tighten the PE holt securely.

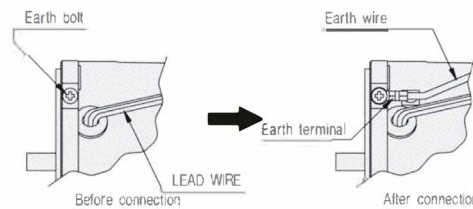


Figure 8

[Note] The earth wire is provided for free with purchase of a motor

6.1.2 A Motor without a Protective Earth (PE)

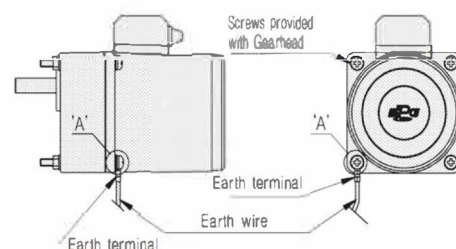
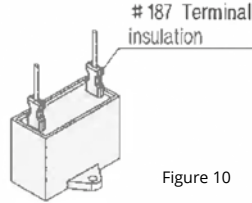


Figure 9

- Any one of the four mounting bolts can be used to attach the ground wire to the motor case.
- Prior to connecting the earth terminal, all protective coatings or paintings should be removed from the mounting hole areas around part 'A', which is where the earth terminal is located; otherwise, grounding will be interfered.
- No earth wire is provided for the motors without PE; for use, purchase a grounding wire thicker than A WG 18.

6.2 Connecting a Capacitor

- Connect the lead wire of the motor to the capacitor as shown in the figure to the right.
- To prevent electric shock, all connectors, including the lead wire power and capacitor terminal connectors, should be insulated.
- Preserve capacitor when it is discharged.



Caution! Do not wire any connections or insulate the capacitor while the power is on. To observe maximum safety procedures, always turn the power off before carrying out these operations. Failure to do so may result not only in faulty operations and damage to equipment, but also in personal injury.

7. Structure of Terminal Box

7.1 Types of Terminal Boxes

[NOTE] For descriptions of the different types of terminal box motors, refer to section 2.2 Product Features.

- Terminal Block Box Type (T Type)

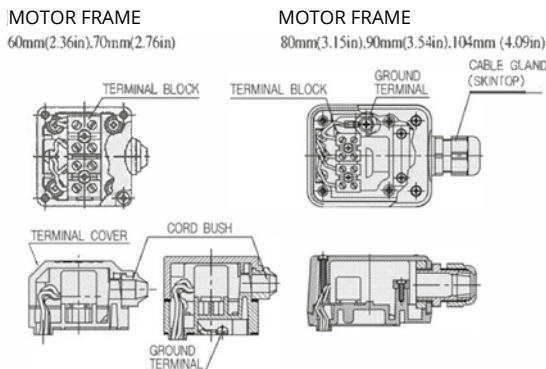


Figure 11

PCB Terminal box Type (T1 Type)

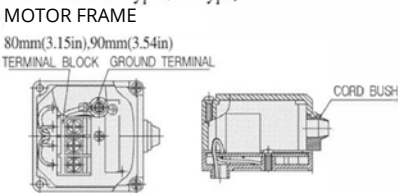


Figure 12

Conduit Box Type (T2 Type)

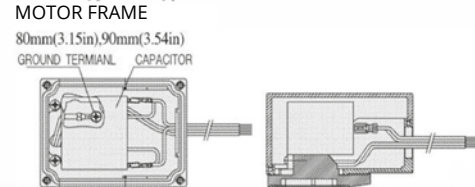


Figure 13

7.2 Connection Diagrams

The direction of motor rotation is viewed from the output shaft of the motor. CW represents the clockwise direction, while CCW represents the counterclockwise direction. Single-phase Induction Motor 4-wire Motor

Single-phase Induction Motor 4-wire Motor

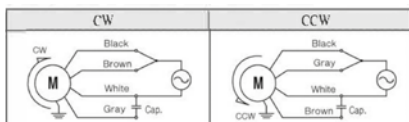


Figure 14

Single-phase 3-wire motor

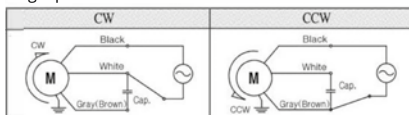


Figure 15

Three-phase Induction Motor

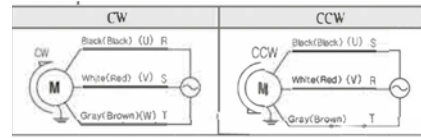


Figure 16

[Note] The colors in O are for the 400V motor.

[Caution] All SPG motors are either class 'E' or class 'B' motors:

- Make sure that the motor temperature does not exceed 90°C (194°F) during operation, or the life of the coils and the ball bearings will be shortened because of overheating of the motor. Check and measure the motor temperature by fixing a thermometer to the motor's surface or by using thermos-tape.
- To change the rotation direction of the induction single phase motor, wait until the motor stops completely; otherwise, the direction may not change or take too much time to change.
- Connect the capacitor to the single-phase motor per connection diagram, and while in use, the capacitor must be connected to the motor at all times.

7.3 Assembly

- Terminal Block Box Type (T Type)

- The T Type box, which cannot change the cable outlet position by rotating the terminal cover, can only be attached in one direction, as shown in the figure below.
- The strip length of the lead wire, which is inserted into the terminal block, is 5-8mm

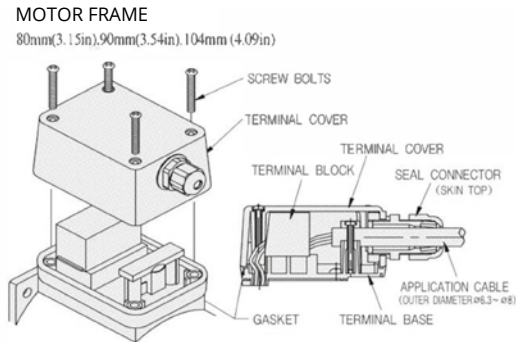


Figure 17

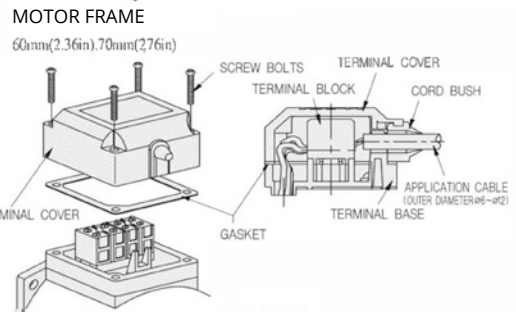


Figure 18

- PCB Terminal Box Type (T1 Type)

- Depending on use, the cable outlet position can be changed by rotating the terminal cover and fixed in 4 different 90-degree directions.
- The strip length of the lead wire, which is inserted into the terminal block, is 5-8mm.

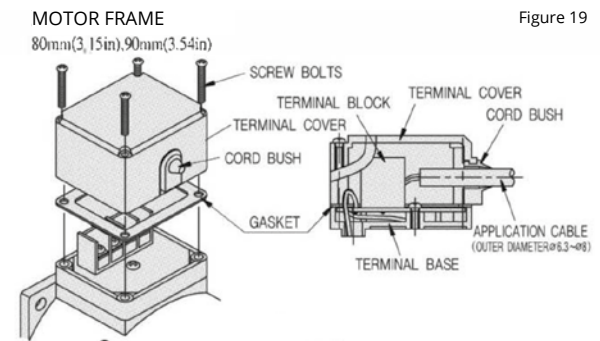
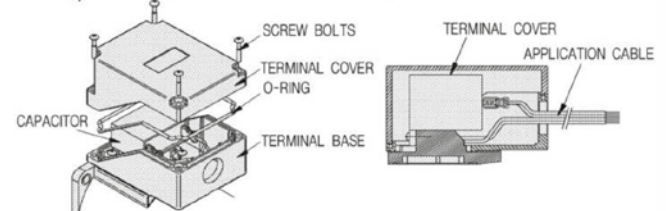
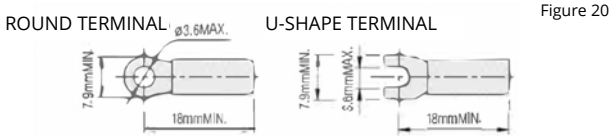


Figure 19



- Applicable Crimp Terminals
When connecting the lead wires to the terminal block, use the crimp terminal. Refer to the crimp terminal figure below.



7.4 Recommended Tightening Screw Torque

- Screw the terminal cover onto the unit using screws and by referring to the recommended tightening torque in the Table below.

Motor Frame Size (in)	Recommended Tightening Torque
60mm (2.36), 70mm (2.76)	0.3N · m (3kgf · cm)–0.6N · m (6kgf · cm)
80mm (3.15), 90mm (3.54)	0.5N · m (5kgf · cm)–0.8N · m (8kgf · cm)

[Note]

- Use the appropriate diameter of cable as per diagram shows. An applicable lead wire is AWG no. 24-10 (0.25mm² ~ 4.0mm²) and a strip length of 5-8mm.
- Keep the space between the terminal cover and terminal base free of foreign substances.
- A rubber gasket is placed between the terminal cover and terminal base to keep this area waterproof.

8. Overheat Protection

SPG motors have one of 2 methods of overheat protection built into the motors to prevent burning from overheating.

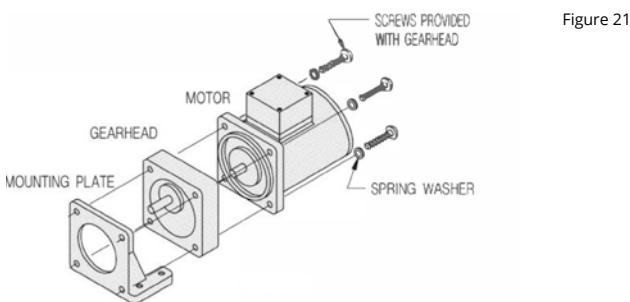
8.1 Thermal Protector (TP)

- When the motor reaches a preset threshold temperature, the thermal protector is activated and the motor stops. With the automatic return feature, the motor automatically restarts when the motor temperature drops.
 - Thermal Protector activates at 120 ±5°C or 130 ±5°C
- [Caution] Always turn off the power before performing inspections. Failure to do so may result in electric shock and/or injury.

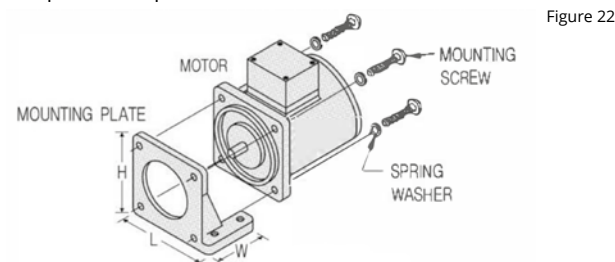
8.2 Impedance Protector

- When the motor is locked for any reason, the impedance of the motor winding enlarges, and does not allow the motor coil from being burnt out.

9. Mounting onto Brackets



[Note] Secure all parts tightly by closing all gaps between the motor flange surface and mounting plate surface. Forced assembly of motor and gear head may cause erroneous noise and/or shorten the lifespan of the product.



[Note] The mounting screws are not provided and should be purchased separately.

Motor Frame Size (in)	Screw				Size L*W*H mm (in)
	Standard Gearhead		Global Type Gearhead		
	Model	Screw	Model	Screw	
60mm (2.36)	SPL-6A	M4	SPL-6A	M4	100*50*68.5 (3.94*1.97*2.70)
70mm (2.75)	SPL-7A	M5	SPL-7B	M6	110*55*78.5 (4.33*2.17*3.09)
80mm (3.15)	SPL-8A	M5	SPL-8B	M6	120*60*88.5 (4.73*2.36*3.48)
90mm (3.54)	SPL-9A	M6	-	-	130*65*98.5 (5.12*2.56*3.88)
	SPL-9SA	M6	-	-	146*65*112 (5.75*2.16*4.41)
	SPL-9SB	M8	SPL-9SB	M8	146*65*112 (5.75*2.16*4.41)

10. Troubleshooting

When the motor is not operating properly, inspect any problems by referring to the table below. If the problem persists, or symptoms not covered in the list occur, contact SPG customer services or the nearest sales agent. **Do not disassemble the motor.**

Symptom	Things to Check
Motor does not rotate or rotates slowly	<ul style="list-style-type: none"> - Is the correct voltage applied to the motor? - Are the lead wires connected correctly and firmly? - Is the load too large? - Is there a faulty contact or connection on the terminal blocks? - Is the capacitor connected correctly as per the wiring diagram, and does the capacitor's capacitance match what is stated on the motor's name plate?
Motor sometimes rotates and stops	<ul style="list-style-type: none"> - Are lead wires connected correctly and firmly? - The gearhead output shaft rotates depending on the input gear ratio of the gearhead. Refer to the gearhead operating manual. - Is the capacitor connected correctly as per the wiring diagram and does the capacitor's capacitance match what is stated on the motor's name plate?
Motor rotates in a wrong direction	<ul style="list-style-type: none"> - Are the lead wires connected correctly and firmly as shown in the diagram 7.2? - The gearhead output shaft rotates depending on the input gear ratio of the gearhead. Refer to the gearhead operating manual. - Is the capacitor connected correctly as per the wiring diagram and does the capacitor's capacitance match what is stated on the motor's name plate? - Looking at the motor from the correct direction? Check rotation from the viewpoint of the motor output shaft.
Excessive rise in motor temperature (exceeds 100°C)	<ul style="list-style-type: none"> - Is the correct voltage applied to the motor? - Is the ambient temperature over 40°C? - Is the capacitor connected correctly as per the wiring diagram and does the capacitor's capacitance match what is stated on the motor's name plate?
Abnormal noise	<ul style="list-style-type: none"> - Are the motor and the gearhead mounted correctly? - Is the connected gearhead the same output shaft as the motor pinion?

11. Warranty Information

11.1 Warranty Period

The SPG limited warranty plan covers the product in the event it fails to operate properly due to defects in material or workmanship. The warranty period shall exist for a period of twelve (12) months from the date of operation provided.

11.2 Warranty Limit

SPG products and parts thereof have been used under normal Operating conditions, or under such conditions specified by the Company, SPG. If any defects appear during the warranty period, SPG shall repair or replace the product under this limited warranty.

This warranty does not cover:

- Misuse, including unsuitable handling of the product
- Modification, or repair done by anyone without the permission of SPG
- Damages not resulting from quality of product itself
- Accident, lighting, or natural causes that do not come under SPG control.

The SPG warranty herein means the warranty of the product. SPG shall not be liable for consequential or incidental damage arising from the failure of any product to operate properly.

The Specifications or designs of SPG products can be changed without any prior notice due to product modification and development. CAD drawings are available for download at our website.