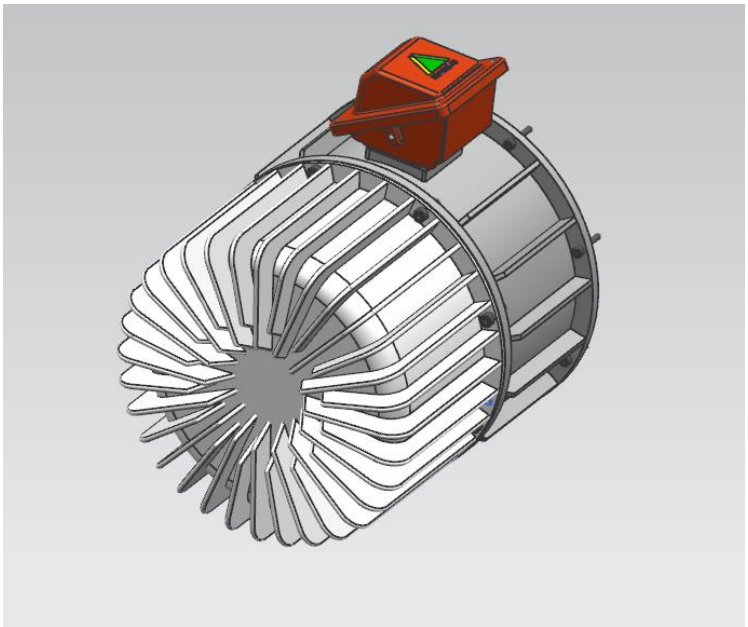
Permanent Magnet Generator (PMG)
User's Manual for HSJ9 TYPE



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Important Notice

Hyundai electric and energy system Co., Ltd cannot accept any responsibility for damage incurred as a result of mishandling the equipment regardless of whether particular reference is made in this instructions or not.

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1. GENERAL INFORMATION

1.1 Safety Notes

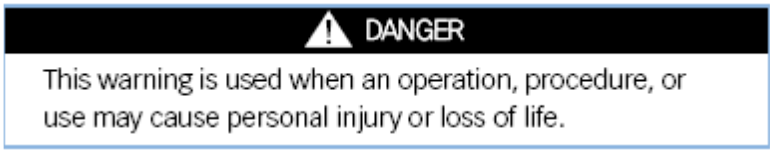
This manual concerns the Permanent Magnet Generator (PMG) which is installed on the generator's shaft end and non drive-end side bearing.

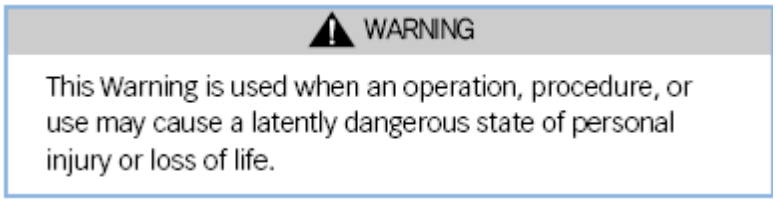
Before using the generator, it is important to read the whole of this user's manual.

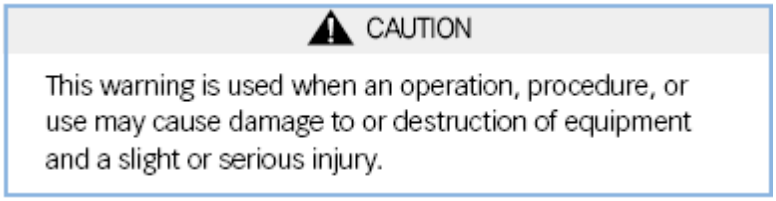
All necessary operations and interventions on this machine should be performed by a qualified technician.

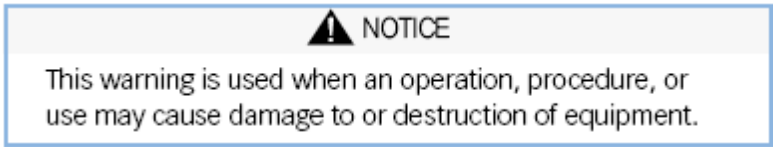
Our technical support will be provided any additional information if required.

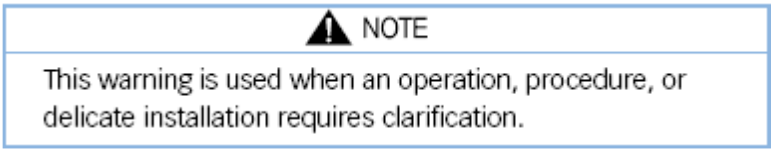
The warnings (DANGER, WARNING, CAUTION, NOTICE, NOTE) are used to draw the user's attention different points:











1.2 Description

The Permanent Magnet Generator (PMG) is a system which is used to supply the stable and reliable electric power for Automatic Voltage Regulator (AVR) regardless of the generator's terminal voltage and to supply at least 300% rated current to the generator during short circuit of the generator terminals, which occurs for 2 ~ 10 seconds.

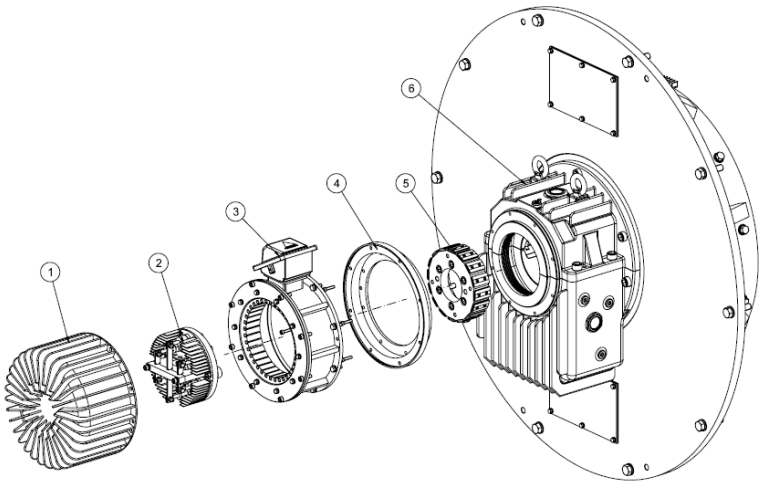
The output AC voltage of PMG is increased proportionate to the speed. The output of it is connected to AVR's input power terminals. The required field excitation power is supplied to the generator by the AVR.

⚠ WARNING

A PMG has a strong magnetic field that could interfere with an implanted medical device, such as a pacemaker. Do not go near the PMG if the worker has and implanted medical device.

1.3 Construction

The PMG consists of stator and rotor part. The detailed components are shown in the below figure. The stator part having the 3 phase windings is bolted on the bearing housing of non drive-end side. The rotor part having the permanent magnets for magnetic field is bolted on the shaft end.



1. Rectifier Cover
2. Rectifier Assembly
3. PMG Stator Assembly
4. PMG Adaptor Ring
5. PMG Rotor
6. Bearing (Non Drive-end Side)

<Figure 1 PMG Construction>

1.4 Operation Temperature

Since the performance of permanent magnet is sensitivity to the high temperature, draw attention to storage and operational conditions as follows:

- Operation temperature : Max. 75℃
- Storage temperature : Max. 85℃

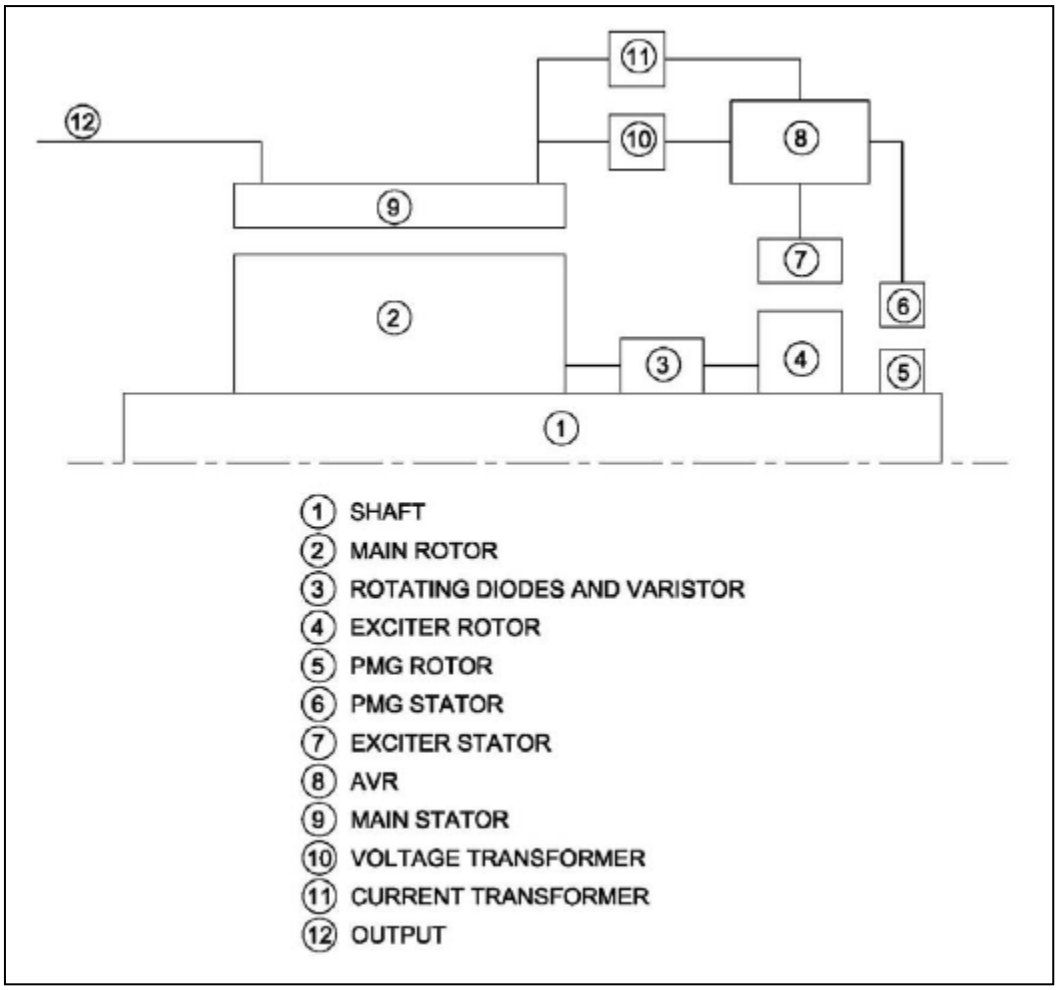
2. OPERATION

2.1 Connection

The output terminals (2 or 3 phases) of PMG are brought out to the auxiliary terminal blocks of the generator. The PMG connections between generator terminal block and AVR should be correctly made as per AVR Connection diagram which is included in final drawing of generator.

⚠ NOTE *For the arrangement of auxiliary terminal blocks of the generator, please refer to the specification of generator.*

The schematic diagram of PMG excitation system is as below figure.



<Figure 2 PMG Excitation system>

2.2 Operation

The typical operation range of PMG is as follows:

- Output Voltage : 150 ~ 260Vac depending on the applied AVR Model.
- Frequency : 150Hz ~ 250Hz depending on the No. of Pole and speed.

3. INSTALLATION

3.1 Components

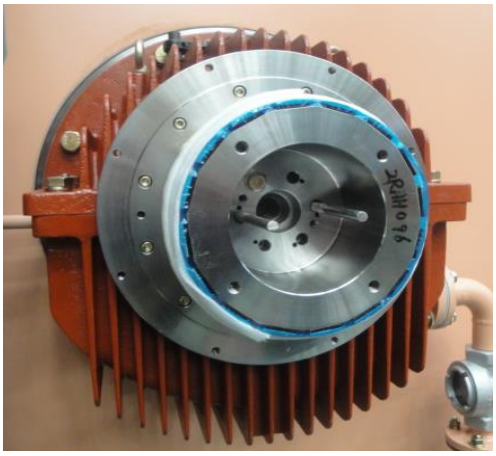
- PMG Rotor Ass'y
- PMG Stator Ass'y
- PMG Housing Cover

3.2 Mounting process

3.2.1 Mounting PMG Rotor Ass'y

3.2.1.1 Case 1 : Without Adaptor Ring

- Install the PMG Rotor at the end of Shaft by using stud bolts.<Figure 3>
- Put the tongue washers on the hole of the PMG rotor, then tighten 6 pcs of hexagonal screws on the washer.<Figure 4>
- Bend the 6 pcs of tongue washers to fix the fastened bolts and washers.<Figure 5>
- Check the appearance of magnets and remove impurities on the surface of magnets.



<Figure 3 Installation of PMG Rotor>

<Figure 4 Bending tongue washer>

<Figure 5 Assembly of tongue washer and screw>

3.2.1.1 Case 2 : With Adaptor Ring

- Install the Adaptor ring on the Bearing.<Figure 6>
- Install the PMG Rotor at the end of Shaft by using stud bolts.<Figure 3>
- Put the Tongue Washers on the hole of the PMG rotor, then tighten 6 pcs of hexagonal screws on the washer.<Figure 4>
- Bend the 6 pcs of tongue washers to fix the fastened bolts and washers.<Figure 5>
- Check the appearance of magnets and remove impurities on the surface of magnets.

⚠ CAUTION

Because of Rotor's magnets, the worker should not have the thing like credit card during PMG rotor assembly work.

<Figure 6 Installation of Adaptor ring >

3.2.2 Mounting PMG Stator Ass'y

- Install 2 pcs of guide bolts on the assembling surface of the bearing or on the adaptor ring if it is applied. <Figure 7>
- Locate the guide bolts at 180 degree interval as shown in <Figure 8>.
- Set the terminal box on the PMG stator to be headed upward, and insert the PMG stator along the guide bolts. It is recommended to apply the protection liner made of EGP or non-magnetic material on the outer surface of rotor to avoid damage between the PMG rotor and stator before stator inserting. <Figure 9/10/11>
- Check the air gap between the PMG rotor and the PMG stator. <Figure 12>
- When the PMG stator is handled, it is recommended that the stator should be lifted and installed with 2 people at least.

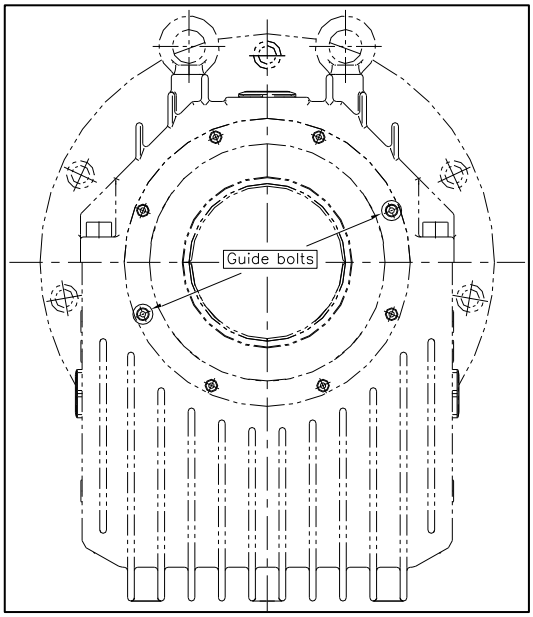
⚠ CAUTION

Because of the Rotor's magnets, the worker should not have the thing like credit card during PMG rotor assembly work.

⚠ DANGER

During the PMG stator assembly work, do not put hands on the bearing side. Because of very powerful magnetic force, the stator assembly may be attached so strongly to the bearing side. It can cause the dangerous state of the injury. Therefore, insert the PMG stator assembly very carefully.

<Figure 7 Installation of Guide bolts>

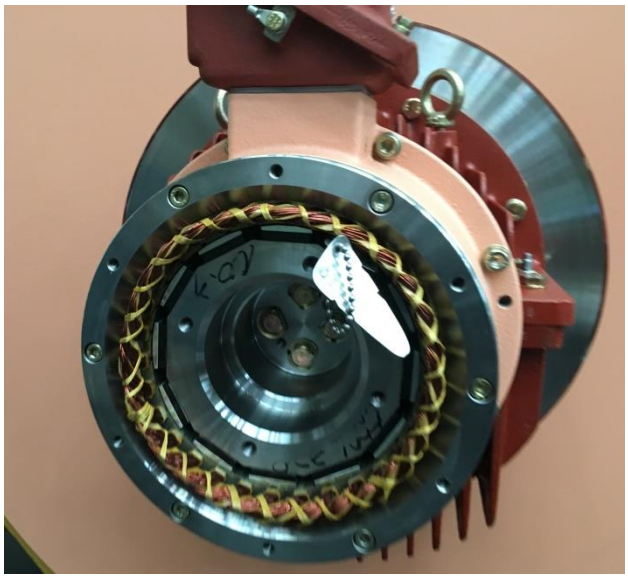


<Figure 8 Location of Guide bolts>

<Figure 9 PMG stator assembly 1>

<Figure 10 PMG stator assembly 2>

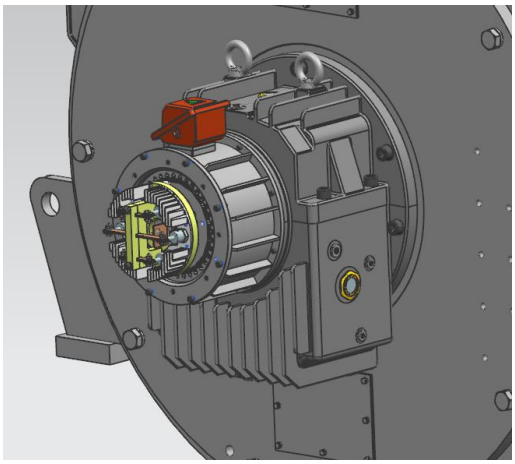
<Figure 11 PMG stator assembly 3>



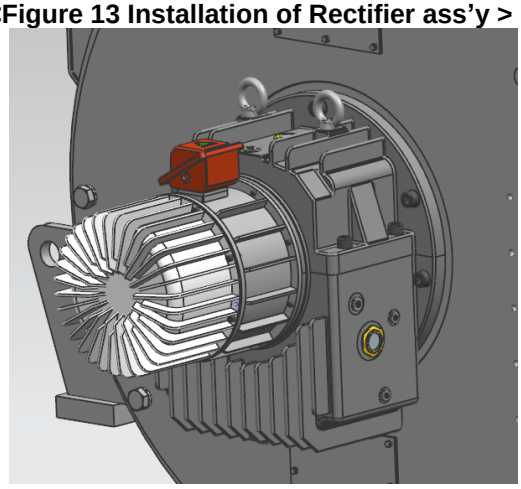
<Figure 12 Air gap check>

3.2.3 Mounting the Rectifier ass'y & Rectifier cover

- Install the Rectifier ass'y and Rectifier cover. <Figure 13 & 14>



<Figure 13 Installation of Rectifier ass'y >



<Figure 14 Installation of Rectifier cover >

3.2.4 Disassembly PMG ass'y

■ **Process**

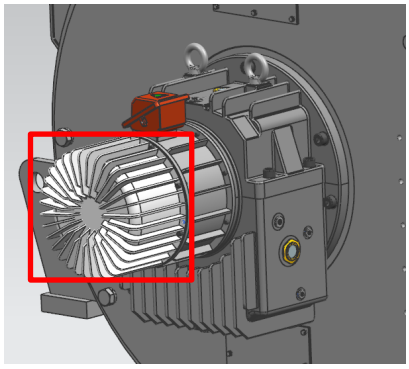
1) Disconnect the wiring of the PMG terminal box.
2) Disassemble the cover of the PMG.
3) Insert the protection liner.
4) Disassemble the PMG stator
5) Disassemble the PMG rotor

1) Disconnect the wiring of the PMG terminal box.

<Figure 15 Disconnection control cable>

- Loosen the bolts to open the cover of the terminal box.
- Open the cover of the terminal box.
- Disconnect the wiring of the terminal block.
- Disassemble the flexible connector for the PMG.

2) Disassemble the rectifier cover & ass'y of the PMG.



<Figure 16 Disassembly of cover>

- Loosen the bolts for the earth cables.
- Loosen the bolts to open the cover of the Rectifier ass'y.
- Open the cover and Loosen the bolts of rectifier ass'y
- Remove the rectifier ass'y

3) Insert the protection liner.

<Figure 17 Inserting protection liner 1>

<Figure 18 Inserting protection liner 2>

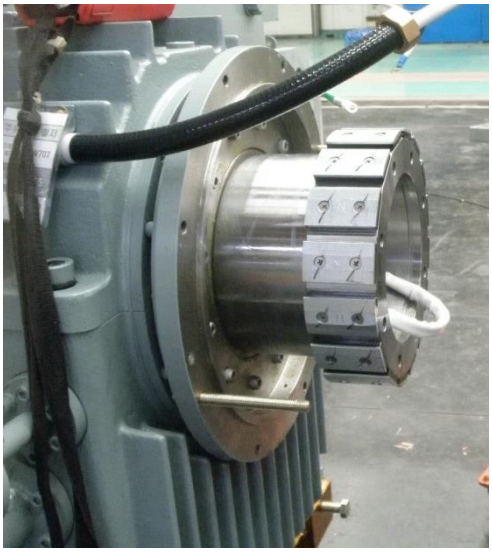
- Insert the protection liner made of EGP (t 0.5) or non-magnetic material between the stator core and the magnets.

4) Disassemble the PMG stator.

<Figure 19 PMG stator disassembly 1>

<Figure 20 PMG stator disassembly 2>

<Figure 21 PMG stator disassembly 3>



<Figure 22 After PMG stator disassembly>

- Pull the PMG stator out of PMG rotor.

DANGER

During the PMG stator disassembly work, do not put hands on the bearing side. Because of very powerful magnetic force, the stator assembly may be attached so strongly to the bearing side. And be careful not to fall over the object on the floor near the workshop. It can cause the dangerous state of the injury.

5) Disassemble the PMG rotor

- Loosen the bolts between the PMG rotor and the shaft and disassemble the PMG rotor from the shaft.

CAUTION

Because of the Rotor's magnets, the worker should not have the thing like credit card during PMG rotor disassembly work.