LEROY SOMER®

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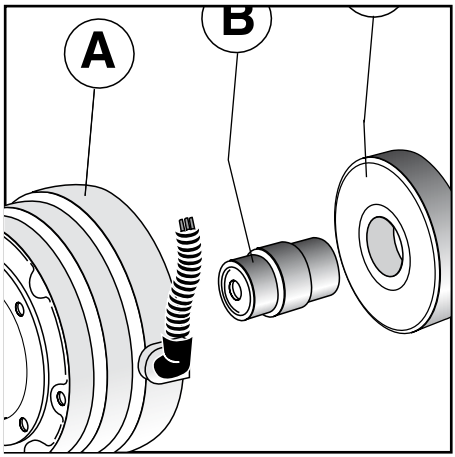


*This manual is to be given to the end user*

# P.M.G. / 0 - 1 - 2 - 3 - 4 - 5

## ALTERNATORS

## PARTNER®

**Installation and maintenance**

# P.M.G. / 0 - 1 - 2 - 3 - 4 - 5
# ALTERNATORS

**This manual concerns the PMG which you have just purchased.**

**We wish to draw your attention to the contents of this maintenance manual. By following certain important points during installation, use and servicing of your AVR, you can look forward to many years of trouble-free operation.**

## SAFETY MEASURES

Before using your alternator for the first time, it is important to read the whole of this installation and maintenance manual.

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

Our technical support service will be pleased to provide any additional information you may require.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to the potential risk of accidents. It is vital that you understand and take notice of the following warning symbols.

CAUTION

**Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.**

**Warning symbol for general danger to personnel.**

**Warning symbol for electrical danger to personnel.**

Note: LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

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# ALTERNATORS

**CONTENTS**



**All servicing or repair operations carried out on the PMG and the alternator should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components; they must wear personal protective equipment appropriate for mechanical and electrical hazards.**

# P.M.G. / 0 - 1 - 2 - 3 - 4 - 5
# ALTERNATORS

## 1 - GENERAL INFORMATION

### 1.1 - Description

The PMG (Permanent Magnet Generator) is a system which is used to supply the short-circuit current to the alternator.
The PMG produces an AC current proportional to the speed, used as field excitation power by the AVR.
The PMG assembly forms a rotating part which can be fitted at the rear of the alternator as required.
Operating temperature:
- 20°C to + 70°C
Storage temperature:
- 55°C to + 85°C

### 1.2 - Identification

There are 5 types of PMG suitable for the PARTNER range of alternators.

PMG 0 for LSA 42.3
PMG 1 for LSA 43.2/44.2
PMG 2 for LSA 46.2/47.2
PMG 3 for LSA 49.1
PMG 4 for LSA 51.2
PMG 5 for LSA 50.2

The PMG 0, 1, 2, 3, 4 and 5 kits consist of a housing (A), a dummy shaft extension (B), a PMG rotor (C), a PMG stator (D), a cover plate (E) and a bag of accessories for mounting and electrical connection.

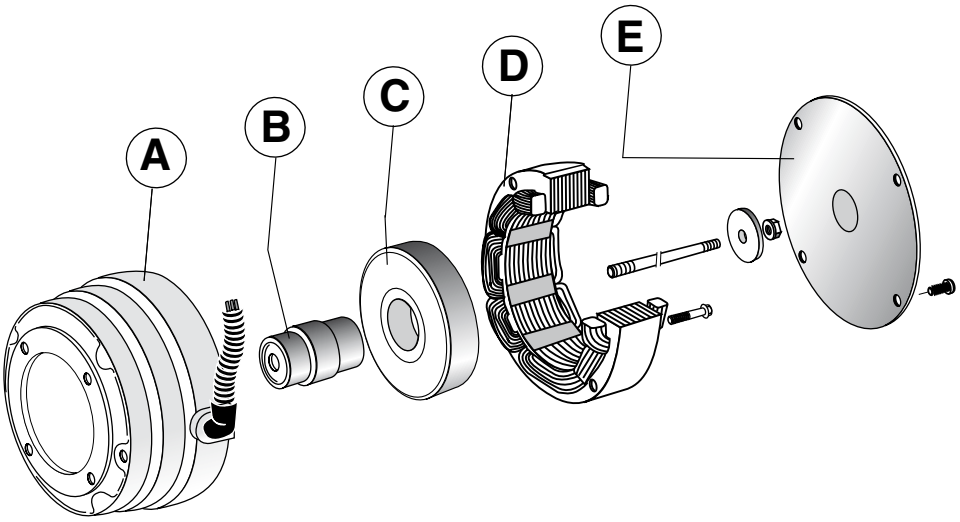
**CAUTION**

**If mounting a PMG 0 on a SHUNT LSA 42.3 alternator, choose a «PMG 0 + R438» kit.**

**If mounting a PMG 1 on a SHUNT LSA 43.2 or LSA 44.2 alternator, choose a «PMG 1 + R438 AVR» kit.**

**If mounting a PMG 2 on a SHUNT LSA 46.2 or LSA 47.2 alternator, choose a «PMG 2 + R450 AVR» kit.**

**The «Regreasable bearing» and «PMG» options are not compatible on LSA 442 (PMG 1).**



## 2 - OPERATION

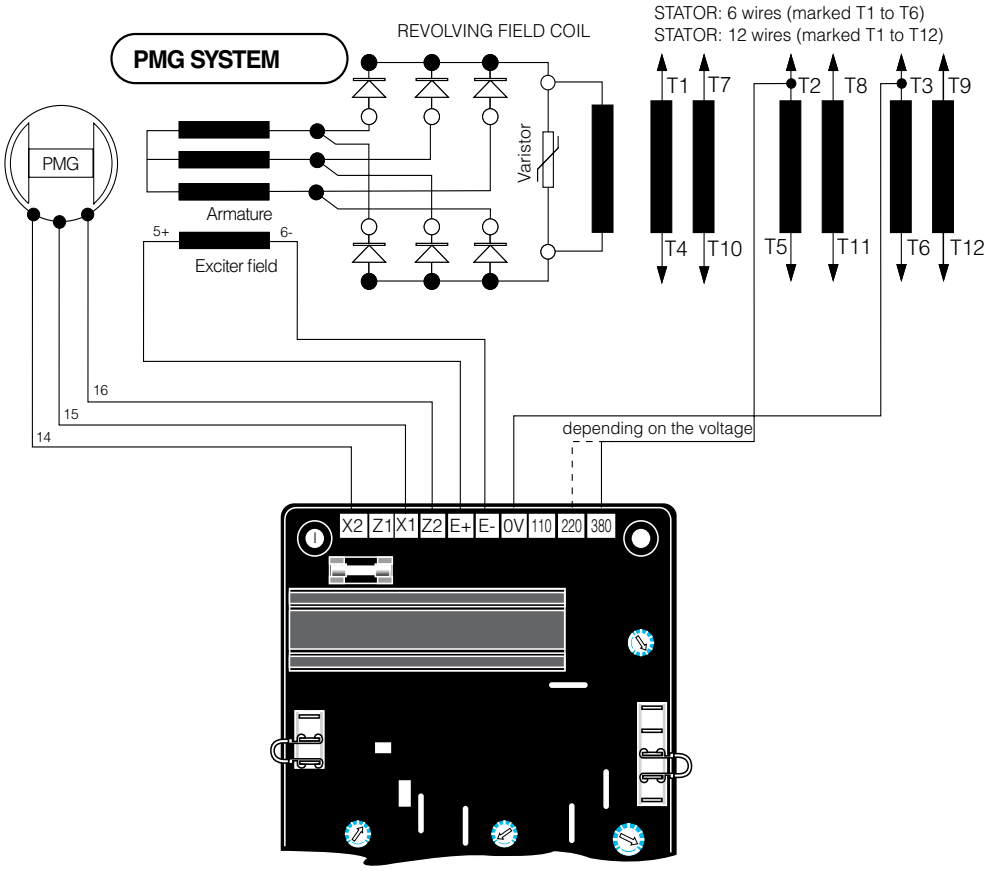
### 2.1 - PMG excitation system

With **PMG** excitation, the permanent magnet generator (PMG) added to the alternator supplies the AVR with voltage which is independent of the main alternator winding. It is fitted at the rear of the machine and connected to the AVR (the ST9 jumper must be disconnected).
As a result the machine has a short-circuit current capacity of 3 IN for 10 s.

The AVR monitors and corrects the alternator output voltage by adjusting the excitation current.

**CAUTION**

**The PMG only works with R438, R450, R449 or D510 (incompatible with the R250).**



## 3 - TECHNICAL CHARACTERISTICS

### 3.1 - Electrical characteristics

| Type | PMG 0 |
|---|---|
| Stator phase/phase resistance at 20°C: | 0.77 ohms |
| No-load voltage at 1500 $min^{-1}$ | 85 V |
| No-load voltage at 1800 $min^{-1}$ | 105 V |

| Type | PMG 1 |
|---|---|
| Stator phase/phase resistance at 20°C: | 0.7 ohms |
| No-load voltage at 1500 $min^{-1}$ | 73 V |
| No-load voltage at 1800 $min^{-1}$ | 88 V |

| Type | PMG 2 |
|---|---|
| Stator phase/phase resistance at 20°C: | 2.1 ohms |
| No-load voltage at 1500 $min^{-1}$ | 125 V |
| No-load voltage at 1800 $min^{-1}$ | 150 V |

| Type | PMG 3 |
|---|---|
| Stator phase/phase resistance at 20°C: | 2.1 ohms |
| No-load voltage at 1500 $min^{-1}$ | 125 V |
| No-load voltage at 1800 $min^{-1}$ | 150 V |

| Type | PMG 4 |
|---|---|
| Stator phase/phase resistance at 20°C: | 1.4 ohms |
| No-load voltage at 1500 $min^{-1}$ | 204 V |
| No-load voltage at 1800 $min^{-1}$ | 245 V |

| Type | PMG 5 |
|---|---|
| Stator phase/phase resistance at 20°C: | 0.87 ohms |
| No-load voltage at 1500 $min^{-1}$ | 130 V |
| No-load voltage at 1800 $min^{-1}$ | 156 V |

**CAUTION**

**The «Regreasable bearing» and «PMG» options are not compatible on LSA 442 (PMG 1).**

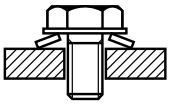
## 4 - INSTALLATION - COMMISSIONING

Before working on the alternator, ensure that it cannot be started by a manual or automatic system by isolating the power (disconnection of all electrical, mechanical power, etc) in any cabinets and that you have understood the system operating principles.

### 4.1 - Mounting the PMG 0, 1, 2 and 3

**CAUTION**

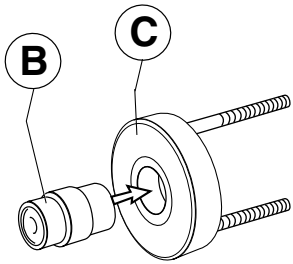
**Make sure the bevel washers are fitted the right way round.**



- Remove the alternator NDE shield seal.
- Mount the PMG housing assembly [A] on the shield, take care to position the cable through-holes at 9 o'clock as seen from the non-drive end, and tighten the 4 HM6 screws to a torque of 8.3 Nm (PMG 0, self-tapping screws tightened to 10 Nm).
- Put a coating of anti-vibration adhesive on the tie rod and screw it tight on the alternator shaft extension.
- Mount the magnetised rotor [C] on the shaft adapter [B].

**WARNING: magnetic force (risk of pinching).**

- Using 2 M10 threaded rods screwed into the rotor, slide the assembly onto the tie rod.




- Once the rotor is in position, remove the M10 tie rods.
- Mount the cable gland washer.
- Lock the assembly with the M10 nut (PMG 0, 1) to a torque of 30 Nm or the M16 nut (PMG 2 and 3) to a torque of 116 Nm.
- Pierce the cover (Ø 21 hole) or remove the plastic plug on the NDE panel.
- Fit the plastic sheath and its two ferrules, while inserting the 3 PMG wires.
- Close the PMG with the cover [E].
- Connect the PMG to the AVR (section 4.1.1.)

#### 4.1.1 - Electrical connection of a PMG on a Shunt machine.

**CAUTION**

**If mounting a PMG 0, the R220 must be replaced by R438.**
**If mounting a PMG 1, the R250 must be replaced by R438.**
**If mounting a PMG 2, the R250 must be replaced by R450.**

- Disconnect the connection wires from the R250 and remove the AVR.
- Take out both the R250 voltage reference wires, marked 2 and 3, by removing them from the terminals (T8 and T11) in which they are inserted.
- Use these same wires for voltage sensing on the R438/R438 by inserting them in terminals T2 (wire 2) and T3 (wire 3).
- Fit the AVR support plate fitted with the R438/R438 (2 HM6 screws tightened to 10 N.m / PMG 0, 4M5 self-tapping screws tightened to 6 Nm)).
- In the terminal box, stick the self-adhesive bases on the NDE shield and on the terminal

block to bring the PMG wires into the AVR.
- Next, attach the sheath with the PMG wires to the self-adhesive bases using plastic clamps.
- Make a bridge around the shield spigot to avoid the sheath quickly becoming damaged and the risk of a short-circuit.
- Connect the 3 PMG wires (14/15/16), the 2 exciter field wires (5/6) and the 2 previously mentioned voltage sensing wires (2/3) according to the internal connection diagram in the alternator maintenance manual.
- Modify the connection by replacing the single jumper on the connector located on the terminal box rear panel with 2 jumpers (except PMG 0).

(See the internal connection diagram in the alternator maintenance manual).

**CAUTION**

**With PMG excitation, check that the ST9 jumper on the AVR is open.**

**After operational testing, replace all access panels or covers.**

#### 4.1.2 - Electrical connection of a PMG on an AREP machine.

- In the terminal box, stick the self-adhesive bases on the NDE shield and on the terminal block to bring the PMG wires into the AVR.
- Next, attach the sheath with the PMG wires to the self-adhesive bases using plastic clamps.
- Make a bridge around the shield spigot to avoid the sheath quickly becoming damaged and the risk of a short-circuit.
- Connect the 3 PMG wires (14/15/16), to terminals X1, X2, Z2 on the AVR. The 4 auxiliary winding wires X1.X2.Z1.Z2 should be isolated using the domino fitting supplied with the kit. Both the field wires (5/6) and the voltage sensing wires (2/3) remain in place.

**CAUTION**

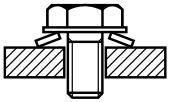
With PMG excitation, check that the ST9 jumper on the AVR is open.

**After operational testing, replace all access panels or covers.**

### 4.2 - Mounting the PMG 4

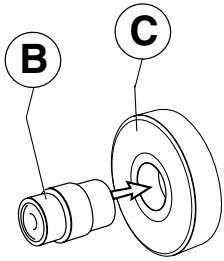
**CAUTION**

**Make sure the bevel washers are fitted the right way round.**



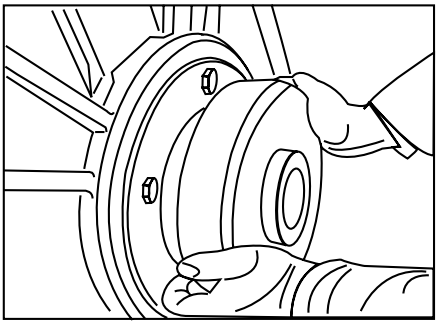
- Remove the air intake grille from the alternator NDE shield.
- Put a coating of anti-vibration adhesive on the tie rod and screw it tight on the alternator shaft extension.
- Mount the magnetised rotor [C] on the shaft adapter [B].

**WARNING: magnetic force (risk of pinching).**




**For initial assembly, provide the mounting flange and spacer (see spare parts list)**

- Position the assembly on the alternator NDE shaft extension.



- Mount the cable gland washer.
- Lock the assembly with the M20 nut (torque of 254 Nm).
- Mount the stator in the PMG housing and tighten the HM 6 screws to a torque of 8 Nm.
- Fit the PMG stator assembly on the alternator NDE shield.
- Tighten the five HM 10 stator assembly screws to a torque of 20 Nm.
- Connect the PMG to the AVR (section 4.2.1.).
- Finally, fit the air intake grille.

#### 4.2.1 - Electrical connection

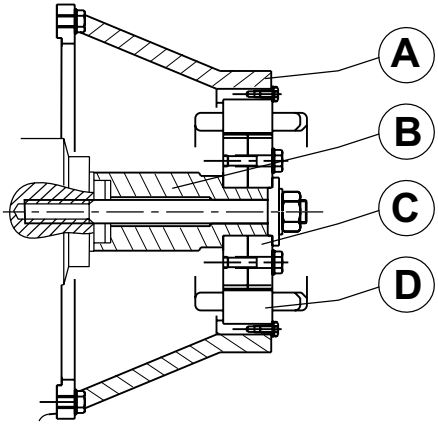
- In the terminal box, stick the self-adhesive bases on the NDE shield and on the terminal block to bring the PMG wires into the AVR.
- Next, attach the sheath with the PMG wires to the self-adhesive bases using plastic clamps.
- Make a bridge around the shield spigot to avoid the sheath quickly becoming damaged and the risk of a short-circuit.
- Connect the 3 PMG wires (14/15/16), to terminals X1, X2, Z2 on the AVR. The 4 auxiliary winding wires X1.X2.Z1.Z2 should be isolated using the domino fitting supplied with the kit. Both the field wires (5/6) and the voltage sensing wires (2/3) remain in place.

**CAUTION**

**With PMG excitation, check that the ST9 jumper on the AVR is open.**

**After operational testing, replace all access panels or covers.**

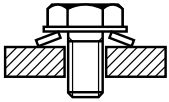
*Sectional diagram of the PMG 4*




### 4.3 - Mounting the PMG 5

**CAUTION**

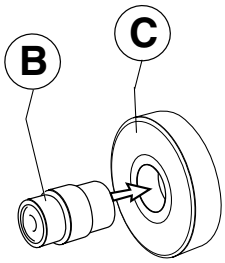
**4.4 - Makesurethebevelwashersarefitted the right way round.**



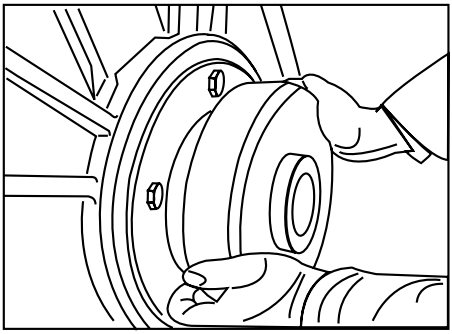
- Remove the alternator NDE shield seal.
- Mount the magnetised rotor [C] on the shaft adapter [B].

**WARNING: magnetic force (risk of pinching).**

# P.M.G. / 0 - 1 - 2 - 3 - 4 - 5
# ALTERNATORS




- Position the assembly on the alternator NDE shaft extension.



- Position the large cable gland washer on the two rotor pins.
- Tighten the M16 screw with its serrated washer to a torque of 170 Nm.
- Screw two 200 mm long M6 threaded rods into the alternator NDE shield on the opposite side.
- Slide and position the PMG housing assembly [A] on the NDE shield spigot, turning the cable exit hole to 9 o'clock as seen from the alternator non-drive end.
- Slide the PMG stator onto the threaded rods, taking care to orient the flying leads opposite the hole in the housing.

**WARNING: magnetic force (risk of pinching)**

- Once the stator has been brought close and correctly oriented, screw two M6x90 screws with the bevel washers and unscrew the M6 tie rods, then finish mounting with the other two M6x90 screws.
- Tighten the four M6 screws in a cross to a torque of 8.3 Nm, taking care to bring the stator close first.
- Remove the plastic plug on the NDE panel.
- Fit the plastic sheath and its two ferrules while inserting the 3 PMG wires.
- Close the PMG with the cover [E].
- Connect the PMG to the AVR (section 4.3.1.).

### 4.4.1 - Electrical connection

- In the terminal box, stick the self-adhesive bases on the NDE shield and on the terminal block to bring the PMG wires into the AVR.
- Next, attach the sheath with the PMG wires to the self-adhesive bases using plastic clamps.
- Make a bridge around the shield spigot to avoid the sheath quickly becoming damaged and the risk of a short-circuit.
- Connect the 3 PMG wires (14/15/16), to terminals X1, X2, Z2 on the AVR. The 4 auxiliary winding wires X1.X2.Z1.Z2 should be isolated using the domino fitting supplied with the kit. Both the field wires (5/6) and the voltage sensing wires (2/3) remain in place.

**CAUTION**

**With PMG excitation, check that the ST9 jumper on the AVR is open.**

**After operational testing, replace all access panels or covers.**

## 5 - SPARE PARTS

### 5.1 - Designation

| Description | Code |
|---|---|
| **PMG 0** | **ALT 423 KP 001** |
| **PMG 0 + AVR R438** | **ALT 423 KP 002** |
| **PMG 1** | **ALT 432 KP 001** |
| **PMG 1 + AVR R438** | **ALT 432 KP 002** |
| **PMG 2** | **ALT 461 KP 001** |
| **PMG 2 + AVR R450** | **ALT 461 KP 002** |
| **PMG 3** | **ALT 491 KP 001** |
| **PMG 4** | **ALT 050 KP 001** |
| **Mounting flange** | **PUS 050 AD 001** |
| **Spacer** | **PMS 050 DI 001** |
| **PMG 5** | **ALT 050 KP 003** |

### 5.2 - Technical support service

Our technical support service will be pleased to provide any additional information you may require.

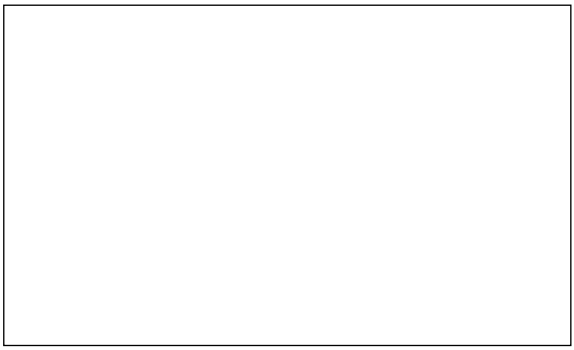
When ordering spare parts, you should indicate the AVR type and code number.

Address your enquiry to your usual contact.

Our extensive network of service centres can dispatch the necessary parts without delay.

**CAUTION**

**To ensure correct operation and the safety of our machines, we recommend exclusive use of our original manufacturer spare parts.**
**In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.**



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