LEROY SOMER®

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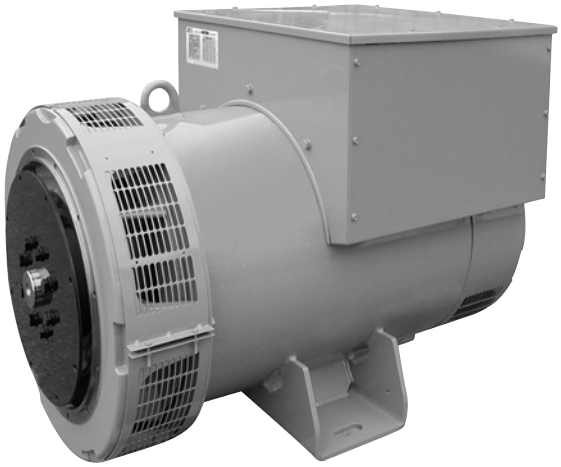
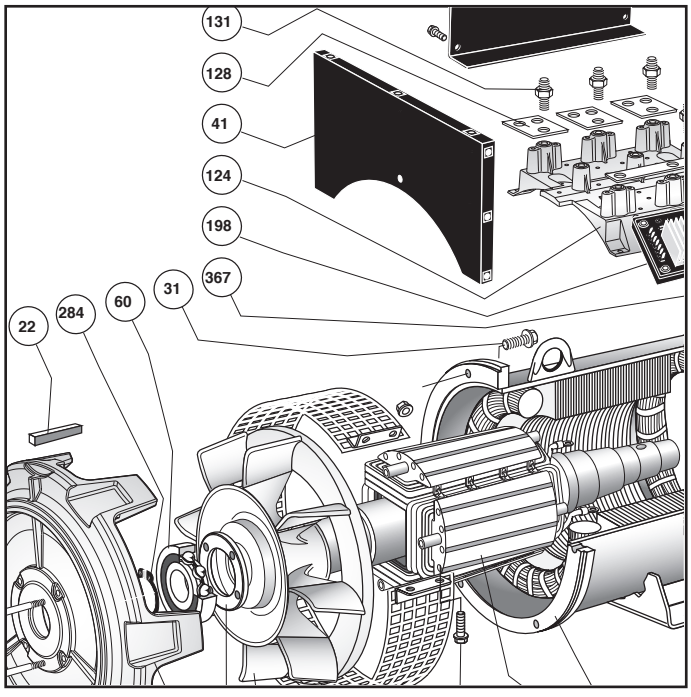


This manual is to be given to the end user



LSA 47.2 - 4P

ALTERNATORS

Installation and maintenance

LSA 47.2 - 4P
ALTERNATORS

This manual concerns the alternator which you have just purchased.

The latest addition to a whole new generation of alternators, this range benefits from the experience of the leading manufacturer worldwide, using advanced technology and incorporating strict quality control.

SAFETY MEASURES

Before using your machine 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 different warning symbols used.

WARNING

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.

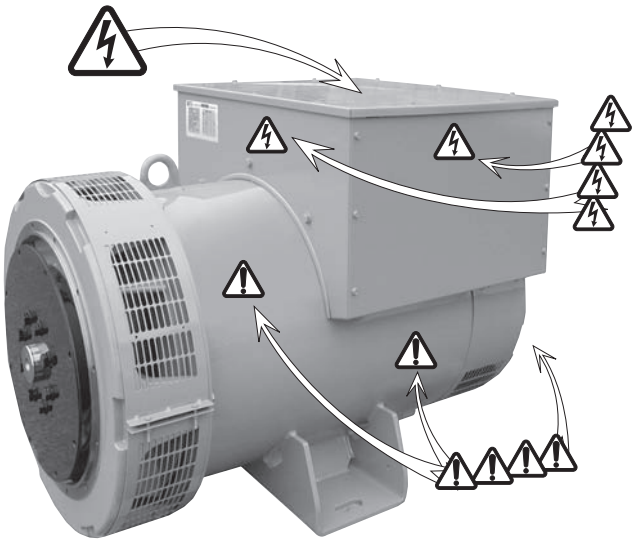
WARNING SYMBOLS

We would like to draw your attention to the following two safety measures that must be complied with:

a) During operation, do not allow anyone to stand in front of the air outlet guards, in case anything is ejected from them.

b) Do not allow children younger than 14 to go near the air outlet guards.

A set of self-adhesive stickers depicting the various warning symbols is included with this maintenance manual. They should be positioned as shown in the drawing below once the alternator has been fully installed.



WARNING

The alternators must not be put into service until the machines in which they are to be incorporated have been declared compliant with Directives 98/37/EC and 2004/108/EC plus any other directives that may be applicable.

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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1 - RECEIPT

1.1 - Standards and safety measures

Our alternators comply with most international standards.
See the EC Declaration of Incorporation on the last page.

1.2 - Inspection

On receipt of your alternator, check that it has not suffered any damage in transit. If there are obvious signs of knocks, contact the transporter (you may able to claim on their insurance) and after a visual check, turn the alternator by hand to detect any malfunction.

1.3 - Identification

The alternator is identified by means of a nameplate glued to the frame.
Make sure that the nameplate on the alternator conforms to your order.
The alternator name is defined according to various criteria (see below).
Example of description for : **LSA 47.2 M7 C6/4 -**

- LSA : name used in the PARTNER range
  M : Marine / C : Cogeneration / T : Telecommunications.
- 47.2 : alternator type
- M7 : model
- C : Excitation system (C : AREP / J : SHUNT+ PMG / E : COMPOUND)
- 6/4 : winding number / number of poles.

1.3.1 - Nameplate

So that you can identify your alternator quickly and accurately, we suggest you fill in its specifications on the nameplate below.

1.4 - Storage

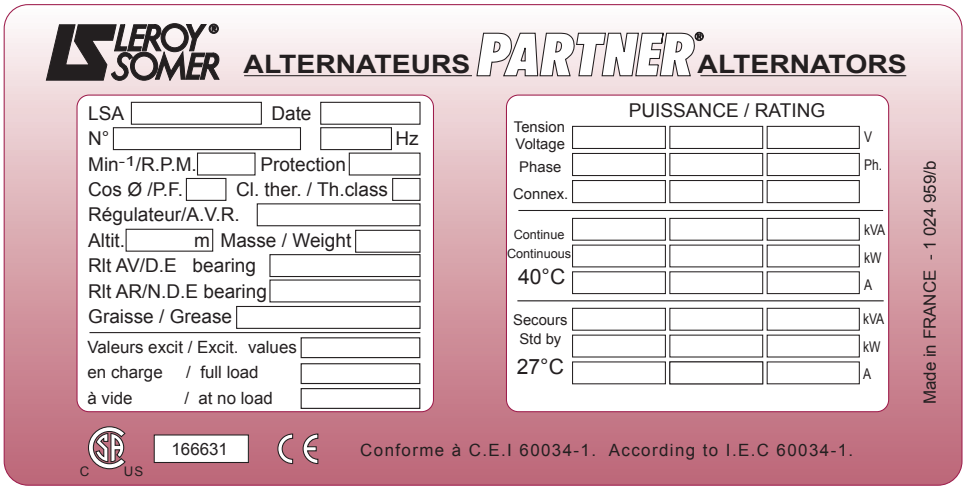
Prior to commissioning, alternators should be stored :
- Away from humidity : in conditions of relative humidity of more than 90%, the alternator insulation can drop very rapidly, to just above zero at around 100%; monitor the state of the anti-rust protection on unpainted parts.
For storage over an extended period, the alternator can be placed in a sealed enclosure (heatshrunk plastic for example) with dehydrating sachets inside, away from significant and frequent variations in temperature to avoid the risk of condensation during storage.
- If the area is affected by vibration, try to reduce the effect of these vibrations by placing the generator on a damper support (rubber disc or similar) and turn the rotor a fraction of a turn once a fortnight to avoid marking the bearing rings.

1.5 - Application

These alternators are mainly designed to produce electricity in the context of applications involving the use of generators.

1.6 - Contraindications to use

Use of the alternator is restricted to operating conditions (environment, speed, voltage, power, etc) compatible with the characteristics indicated on the nameplate.



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2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

The LSA 47.2 alternator is a machine without sliprings or revolving armature brushes, wound as “2/3 pitch”, 6 or 12-wire, with class H insulation and a field excitation system available in either SHUNT, AREP or «PMG» version (see diagrams). Interference suppression conforms to standard EN 55011, group 1, class B.

2.1.1 - Electrical options

- Stator temperature detection sensors
- Bearing sensors (PTC, PT100, etc)
- Space heater

2.2 - Mechanical characteristics

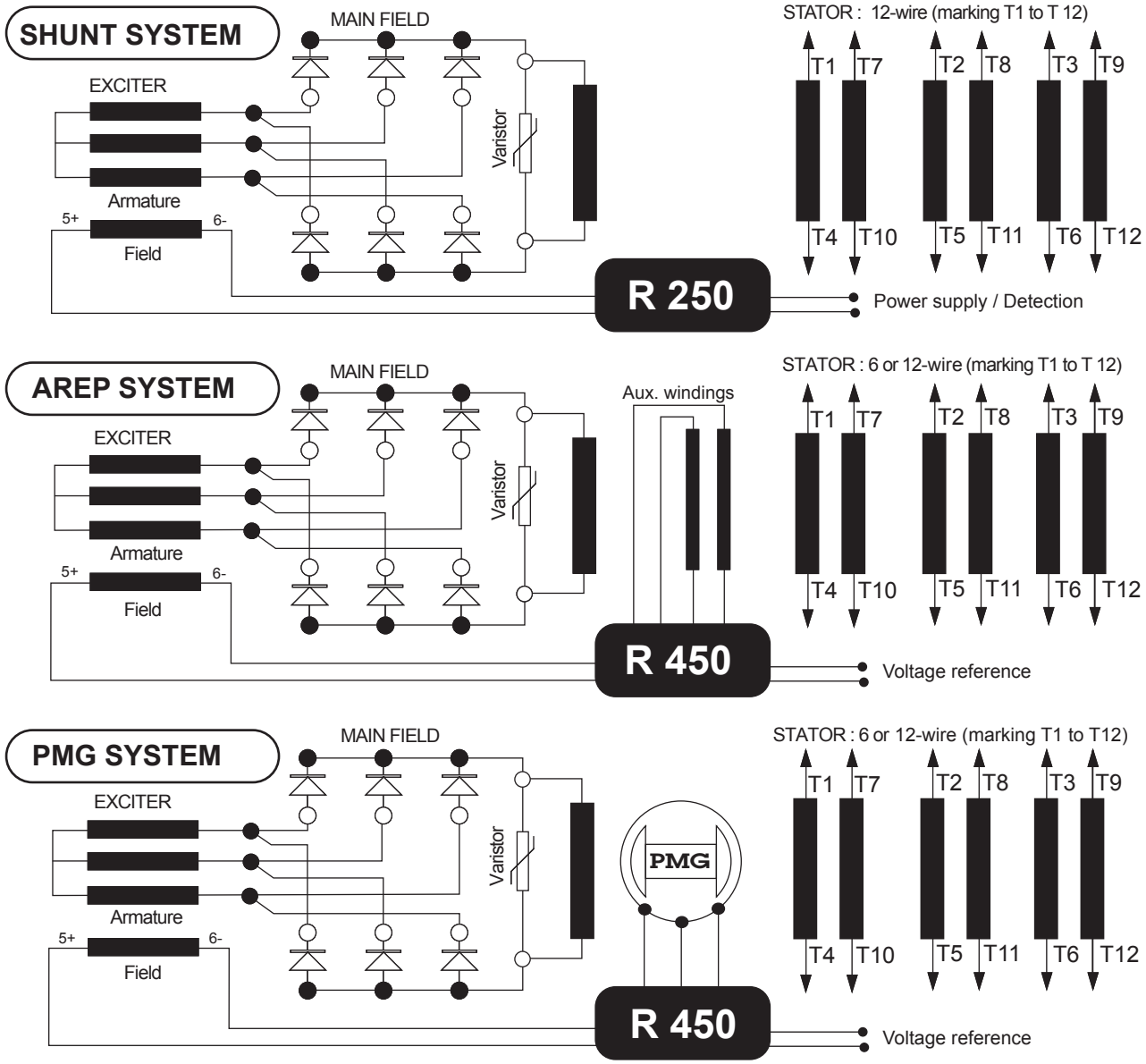
- Steel frame
- Cast iron end shields
- Protected ball bearings, greased for life
- Mounting arrangements:

IM 1201 (MD 35) foot and flange mounted, single-bearing with SAE coupling disc.
IM 1001 (B 34) double-bearing with SAE flange and standard cylindrical shaft extension.

- Drip-proof machine, self-cooled
- Degree of protection: IP 23

2.2.1 - Mechanical options

- Air inlet filter
- Regreasable ball bearings
- IP 44 protection



3 - INSTALLATION

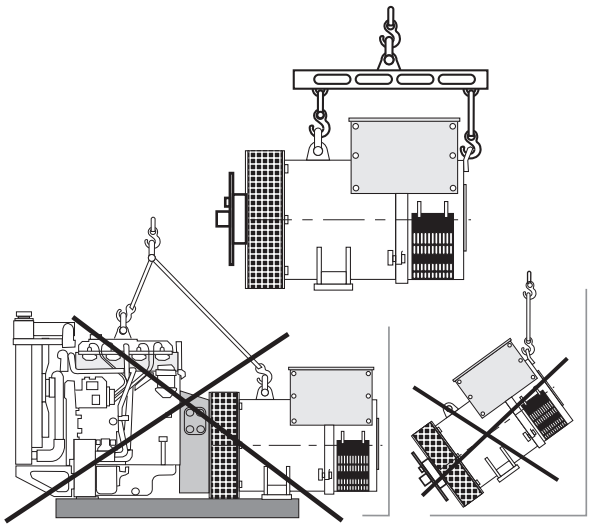
Personnel undertaking the various operations discussed in this section must wear the appropriate personal protective equipment for mechanical and electrical hazards.

3.1 - Assembly

All mechanical handling operations must be undertaken using approved equipment and the alternator must be horizontal. Check how much the alternator weighs (see 4.8.5.) before choosing the lifting tool. During this operation, do not allow anyone to stand under the load.

3.1.1 - Handling

The generously-sized lifting rings are for handling the alternator alone. They must not be used to lift the genset. The choice of lifting hooks or handles should be determined by the shape of these rings. Choose a lifting system which respects the integrity and the environment of the alternator.



3.1.2 - Coupling

3.1.2.1 - Single bearing alternator

Before coupling the two alternators, check that both are compatible by :

- undertaking a torsional analysis of the transmission on both units
- checking the dimensions of the flywheel and its housing, the flange, coupling discs and offset.

WARNING

When coupling the alternator to the prime mover, the holes of the coupling discs should be aligned with the flywheel holes by rotating the engine flywheel.
Do not use the fan to turn the alternator rotor.
Make sure the alternator is securely bedded in position during coupling.

3.1.2.2 - Two-bearing alternator

- Semi-flexible coupling

Careful alignment of the alternators is recommended, checking that the concentricity and parallelism of both parts of the coupling do not exceed 0.1 mm.

WARNING

This alternator has been balanced with a 1/2 key.

3.1.3 - Location

Ensure that the ambient temperature in the room where the alternator is placed cannot exceed 40°C for standard power ratings (for temperatures > 40°C, apply a derating coefficient). Fresh air, free from damp and dust, must be able to circulate freely around the air intake grilles on the opposite side from the coupling. It is essential to prevent not only the recycling of hot air from the alternator or engine, but also exhaust fumes.

3.2 - Inspection prior to first use

3.2.1 - Electrical checks

Under no circumstances should an alternator, new or otherwise, be operated if the insulation is less than 1 megohm for the stator and 100,000 ohms for the other windings.

There are three possible methods for restoring these minimum values.

a) Dry out the alternator for 24 hours in a drying oven at a temperature of approximately 110°C (without the AVR).

b) Blow hot air into the air intake, having made sure that the alternator is rotating with the exciter field disconnected.

c) Run in short-circuit mode (disconnect the AVR) .

- With the alternator stopped, short-circuit the three output power terminals using connections capable of supporting the rated current (try not to exceed 6 A/mm^2).
- Insert a clamp ammeter to monitor the current passing through the short-circuit connections.
- Connect a 12 Volt battery to the exciter field terminals, respecting the polarity, in series with a rheostat for adjusting the resistance in order to obtain an excitation current equal to the rated stator current (eg : 10Ω/50W),
- Open fully all the alternator openings.
- Run the alternator at its rated speed, and adjust the exciter field current using the rheostat to obtain the rated output current in the short-circuit connections.

Note : Prolonged standstill : In order to avoid these problems, we recommend the use of space heaters, as well as turning over the alternator from time to time. Space heaters are only really effective if they are working continuously while the alternator is stopped.

WARNING

Ensure that the alternator has the degree of protection matching the defined environmental conditions.

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3.2.2 - Mechanical checks

Before starting the alternator for the first time, check that :
- the winding connection corresponds to the site operating voltage (see section 3.3),
- all fixing bolts and screws are tight,
- cooling air is drawn in freely,
- the protective grilles and housing are correctly in place,
- the standard direction of rotation is clockwise as seen from the shaft end (phase rotation in order 1 - 2 - 3).

For anti-clockwise rotation, swap 2 and 3 and derate the machine by 5%.
If mounting a C.T. for parallel operation, reverse the secondary wires S1, S2 on the AVR.

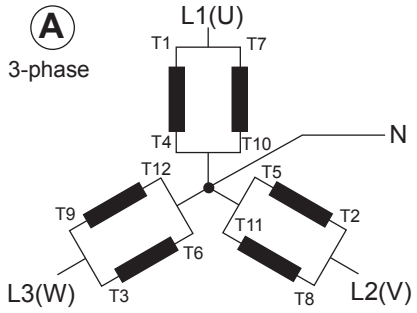
3.3 - Terminal connection diagrams

A standard alternator is fitted with 3 phase coppers and 1 neutral connection terminal. The winding code is specified on the nameplate.

Any intervention on the alternator terminals during reconnection or checks should be performed with the alternator stopped.

3.3.1 - Standard terminal connection 12 wire

Connection code A — 3-phase

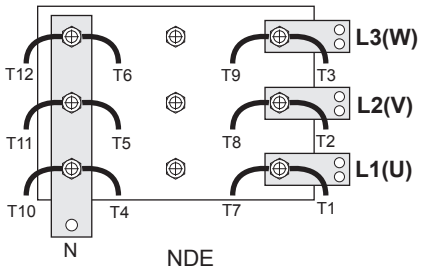


Winding	50 Hz	60 Hz
6	190 - 208	190 - 240
7	220	-
8	-	190 - 208

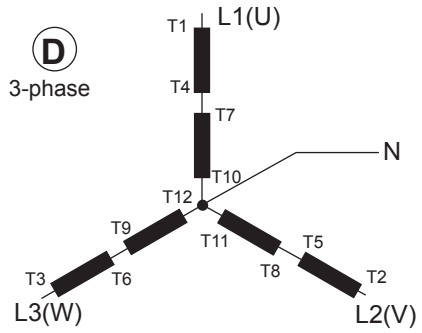
R 250 voltage sensing:
0 => (T8) / 110 V => (T11)

R 450 voltage sensing:
0 => (T3) / 220 V => (T2)

Factory connection



Connection code D — 3-phase



Winding	50 Hz	60 Hz
6	380 - 415	380 - 480
7	440	-
8	-	380 - 416

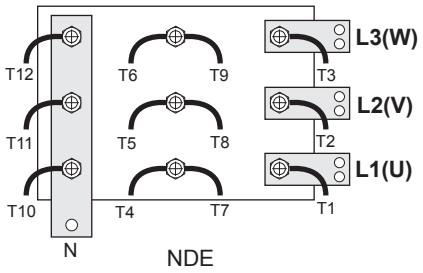
R 250 voltage sensing:
0 => (T8) / 110 V => (T11)

R 450 voltage sensing:
0 => (T3) / 380 V => (T2)

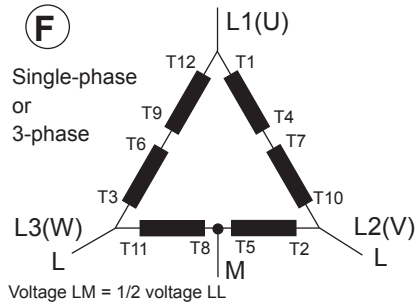
9	-	600

Winding 9: R 450 voltage sensing + transformer (Diagram on request)

Factory connection



Connection code F — Single-phase or 3-phase



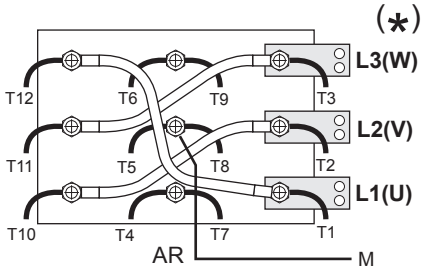
Voltage LM = 1/2 voltage LL

Winding	50 Hz	60 Hz
6	220 - 240	220 - 240
7	240 - 254	-
8	-	220 - 240

R 250 voltage sensing:
0 => (T8) / 110 V => (T11)

R 450 voltage sensing:
0 => (T3) / 220 V => (T2)

Factory connection



Operating phases L2 (V), L3 (W)
single phase

In case of reconnection, ensure that AVR voltage sensing is correct!
The factory can supply a set of flexible shunts and special connection links as an option for making these connections (*).

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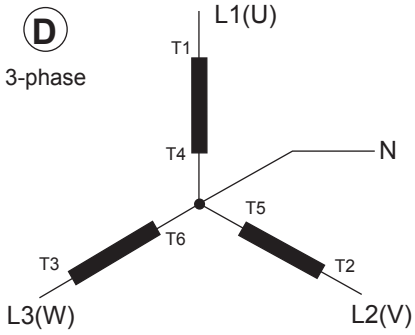
3.3.2 - Standard terminal connection 6 wire

Connection code D — 3-phase



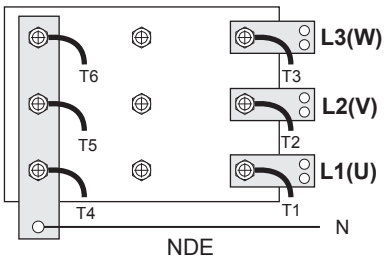
Winding	50 Hz	60 Hz
6S	380 - 415	380 - 480
7S	440	-
8S	-	380 - 416

⚠ R 450 voltage sensing:
0 => (T3) / 380 V => (T2)

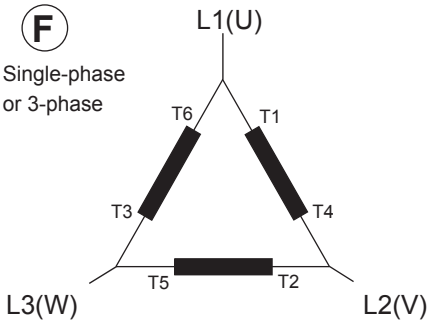
9S	-	600

Winding 9: R 450 voltage sensing + transformer (Diagram on request)

Factory connection



Connection code F — Single-phase or 3-phase

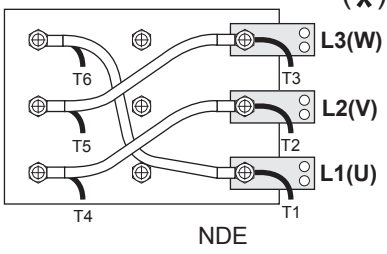


Winding	50 Hz	60 Hz
6S	220 - 240	220 - 277
7S	240 - 254	-
8S	-	220 - 240

⚠ R 450 voltage sensing:
0 => (T3) / 220 V => (T2)

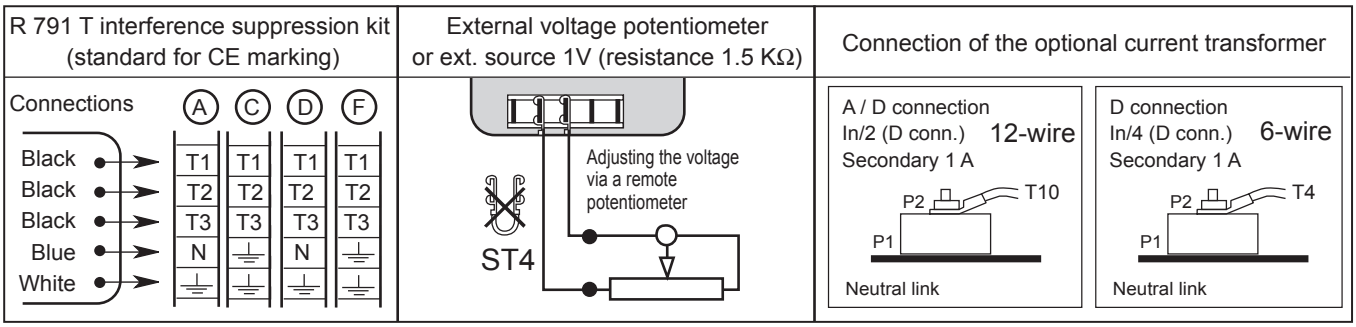
Operating phases: L2 (V), L3 (W) single phase

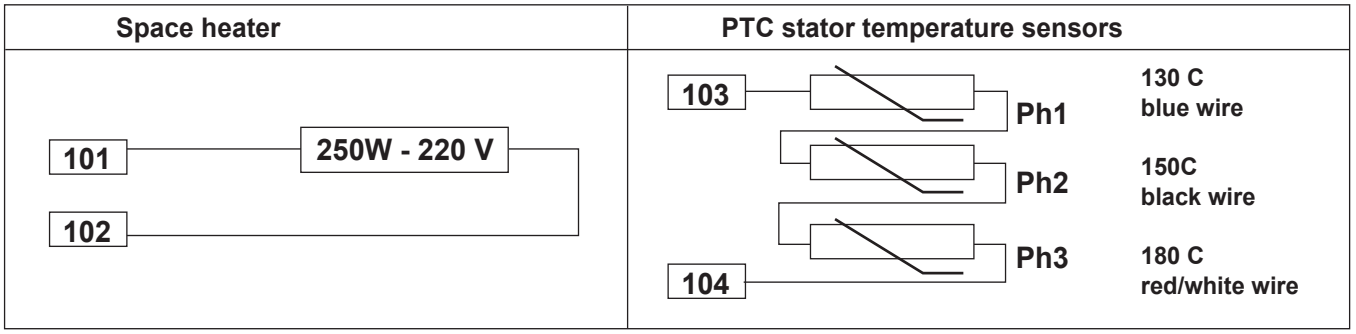
(*)



⚠ **In case of reconnection, ensure that AVR voltage sensing is correct!**
The factory can supply a set of flexible shunts and special connection links as an option for making these connections (*).

3.3.3 - Option connection diagram



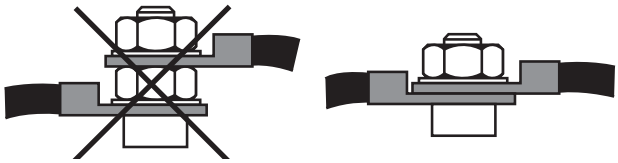


3.3.4 - Connection checks

Electrical installations must comply with the current legislation in force in the country of use.

Check that :

- The residual circuit-breaker conforms to legislation on protection of personnel, in force in the country of use, and has been correctly installed on the alternator power output as close as possible to the alternator. (In this case, disconnect the wire of the interference suppression module linking the neutral).
- Any protective devices in place have not been tripped.
- If there is an external AVR, the connections between the alternator and the cubicle are made in accordance with the connection diagram.
- There is no short-circuit between phase or phase-neutral between the alternator output terminals and the generator set control cabinet (part of the circuit not protected by circuit-breakers or cubicle relays).
- The alternator should be connected with the busbar separating the terminals as shown in the terminal connection diagram.



- The equipotential earth links have been implemented correctly (cross-section and continuity of the earths).

3.4 - Commissioning

The alternator can only be started up and used if the installation is in accordance with the regulations and instructions defined in this manual.

The alternator is tested and set at the factory. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate). On application of the load, the alternator should achieve its rated speed and voltage; however, in the event of abnormal operation, the alternator setting can be altered (follow the adjustment procedure in section 3.5). If the alternator still operates incorrectly, the cause of the malfunction must be located (see section 4.4).

3.5 - Settings

The various adjustments during tests must be made by a qualified engineer. The screwdriver for making adjustments must be suitable for use with electrical equipment. It is essential that the drive speed specified on the genset nameplate is reached before commencing adjustment. The AVR is used to make any adjustments to the alternator. Access to the AVR adjustments is via the panel provided for this purpose.

After operational testing, replace all access panels or covers.

4 - SERVICING - MAINTENANCE

4.1 - Safety measures

Servicing or troubleshooting must be carried out strictly in accordance with instructions so as to avoid the risk of accidents and to maintain the alternator in its original state.

All such operations performed on the alternator should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components, who must wear the appropriate personal protective equipment for mechanical and electrical hazards.

Before carrying out any work on the alternator, ensure that it cannot be started by a manual or automatic system by isolating the power in any cabinet or enclosure and make sure you have understood the operating principles of the system.

4.2 - Regular maintenance

4.2.1 - Checks after start-up

After approximately 20 hours of operation, check that all fixing screws on the alternator are still tight, plus the general state of the alternator and the various electrical connections in the installation.

4.2.2 - Cooling circuit

It is advisable to check that circulation of air is not reduced by partial blocking of the air intake and outlet guards: mud, fibre, soot, etc, and to check whether the ventilation guards are corroded or scratched.

4.2.3 - Bearings

The bearings are permanently greased and they have a life of (20,000 hrs) or 3 years.

NDE/DE bearing	6318 2Z C3	6315 2RS C3
Replacement	20 000 hrs or 3 yrs	20 000 hrs or 3 yrs

The bearings are regreasable (option). It is advisable to lubricate the alternator during operation and when it is first commissioned. The lubrication characteristics are given in the table below.

NDE/DE bearing	6318 C3	6315 C3
Quantity of grease	41 gr or cm^3	30 gr or cm^3
Lubrication interval	3500 h	4500 h

Lubrication intervals are given for grease type
LITHIUM - standard - NLGI 3
The factory lubrication is performed with grease :
ESSO UNIREX N3.
Before using another grease, check for compatibility with the original one. Monitor the temperature rise in the bearings, which should not exceed 60°C above the ambient temperature. Should this value be exceeded, the alternator must be stopped and checks carried out.

4.2.4 - Electrical servicing

Cleaning product for the windings

WARNING

Do not use : trichlorethylene, perchlorethylene, trichloroethane or any alkaline products.
Certain strictly defined pure volatile degreasing agents can be used, such as :
- Normal petrol (without additives); inflammable
- Toluene (slightly toxic); inflammable
- Benzene (or benzine, toxic); inflammable
- Ciclohexare (non toxic); inflammable

to clean the stator, rotor, exciter and diode bridge.
The insulating components and the impregnation system are not at risk of damage from solvents (see the above list of authorised products).
Avoid letting the cleaning product run into the slots. Apply the product with a brush, sponging frequently to avoid accumulation in the housing. Dry the winding with a dry cloth. Let any traces evaporate before reassembling the alternator.

These operations must be performed at a cleaning station, equipped with a vacuum system that collects and flushes out the products used.

4.2.5 - Mechanical servicing

WARNING

Cleaning the alternator using water or a high-pressure washer is strictly prohibited.
Any problems arising from such treatment are not covered by our warranty.
The alternator should be cleaned with a degreasing agent, applied using a brush. Check that the degreasing agent will not affect the paint.
Compressed air should used to remove any dust.
If filters have been added to the alternator after manufacture and do not have thermal protection, the service personnel should replace the air filters periodically and systematically, as often as necessary (every day in very dusty atmospheres).
After cleaning the alternator, it is essential to check the winding insulation (see sections 3.2 and 4.8).

4.3 - Fault detection

If, when commissioned, the alternator does not work normally, the source of the malfunction must be identified. To do this, check that :
- the protective devices are fitted correctly,
- the connections comply with diagrams in the manuals supplied with the alternator,
- the speed of the unit is correct (see nameplate).

Repeat the operations defined in section 3.

4.4 - Mechanical defects

Fault		Possible causes
Bearing	Excessive overheating of one or both bearings (temperature > 80°C on the bearing retainers with or without abnormal noise)	- End shields incorrectly aligned (flanges not properly fitted). - If the bearing has turned blue or if the grease has turned black, change the bearing.
Abnormal temperature	Excessive overheating of alternator housing (more than 40 °C above the ambient temperature)	- Air flow (intake-outlet) partially clogged or hot air is being recycled from the alternator or engine - Alternator operating at too high a voltage (> 105% of Un on load) - Alternator overloaded
Vibration	Excessive vibration	- Misalignment (coupling) - Defective mounting or play in coupling - Rotor balancing fault
	Excessive vibration and humming noise coming from the alternator	- Alternator operating in single-phase mode (single-phase load or faulty contactor or installation fault) - Stator short-circuit
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration	- System short-circuit - Mis-paralleling Possible consequences - Broken or damaged coupling - Broken or bent shaft end. - Shifting and short-circuit of main field winding - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes or AVR.

4.5 - Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Connect a new battery of 4 to 12 volts to terminals E- and E+, respecting the polarity, for 2 to 3 seconds	The alternator builds up and its voltage is still correct when the battery is removed.	- Lack of residual magnetism
		The alternator builds up but its voltage does not reach the rated value when the battery is removed.	- Check the connection of the voltage reference to the AVR - Faulty diodes - Armature short-circuit
		The alternator builds up but its voltage disappears when the battery is removed	- Faulty AVR - Field windings disconnected - Main field winding open circuit - check the resistance
Voltage too low	Check the drive speed	Correct speed	Check the AVR connections (AVR may be faulty) - Field windings short-circuited - Rotating diodes burnt out - Main field winding short-circuited - Check the resistance
		Speed too low	Increase the drive speed (Do not touch the AVR voltage pot. (P2) before running at the correct speed.)
Voltage too high	Adjust AVR voltage potentiometer	Adjustment ineffective	- Faulty AVR - 1 faulty diode
Voltage oscillations	Adjust AVR stability potentiometer	If no effect : try normal / fast recovery modes (ST2)	- Check the speed : possibility of cyclic irregularity - Loose connections - Faulty AVR - Speed too low when on load (or LAM set too high)
Voltage correct at no load and too low when on load (*)	Run at no load and check the voltage between E+ and E- on the AVR	Voltage between E+ and E- SHUNT / AREP / PMG < 10V	- Check the speed (or LAM set too high)
		Voltage between E+ and E- SHUNT / AREP / PMG > 15V	- Faulty rotating diodes - Short-circuit in the main field. Check the resistance - Faulty exciter armature.
(*) Caution : For single-phase operation, check that the sensing wires coming from the AVR are correctly connected to the operating terminals			
Voltage disappears during operation (**)	Check the AVR, the surge suppressor, the rotating diodes, and replace any defective components	The voltage does not return to the rated value.	- Exciter winding open circuit - Faulty exciter armature - Faulty AVR - Main field open circuit or short-circuited
(**) Caution : Internal protection may be activated (overload, open circuit, short-circuit)			

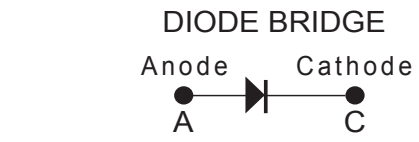
4.5.1 - Checking the winding

You can check the winding insulation by performing a high voltage test. In this case, you must disconnect all AVR wires.

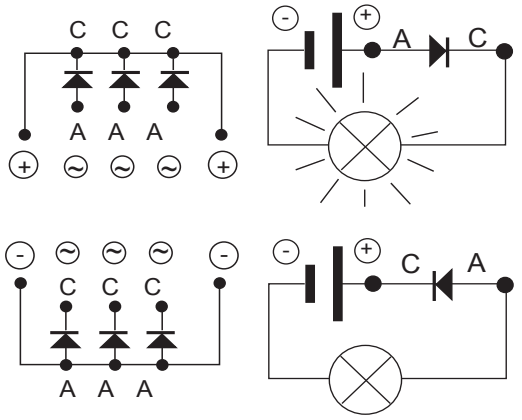
WARNING

Damage caused to the AVR in such conditions is not covered by our warranty.

4.5.2 - Checking the diode bridge



A diode in good working order must allow the current to flow from the anode to the cathode.



4.5.3 - Checking the windings and rotating diodes using separate excitation

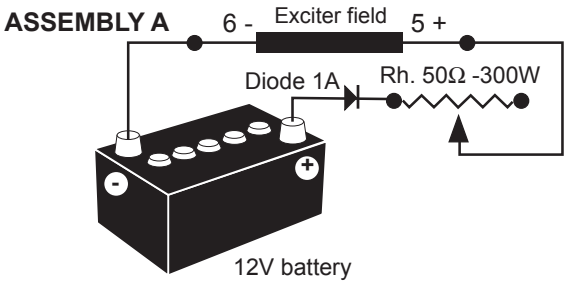
During this procedure, make sure that the alternator is disconnected from any external load and inspect the terminal box to check that the connections are fully tightened.

1) Stop the unit, disconnect and isolate the AVR wires.

2) There are two ways of creating an assembly with separate excitation.

Assembly A : Connect a 12 V battery in series with a rheostat of approximately 50 ohms - 300 W and a diode on both exciter field wires (5+) and (6-).

WARNING : Adapt the diode to the rated excitation current of the alternator (see nameplate).



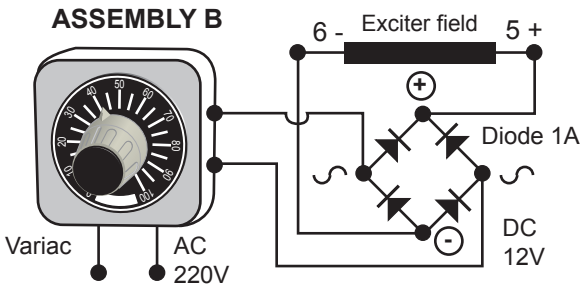
Assembly B : Connect a “Variac” variable power supply and a diode bridge on both exciter field wires (5+) and (6-).

Both these systems should have characteristics which are compatible with the alternator field excitation power (see the nameplate).

3) Run the unit at its rated speed.

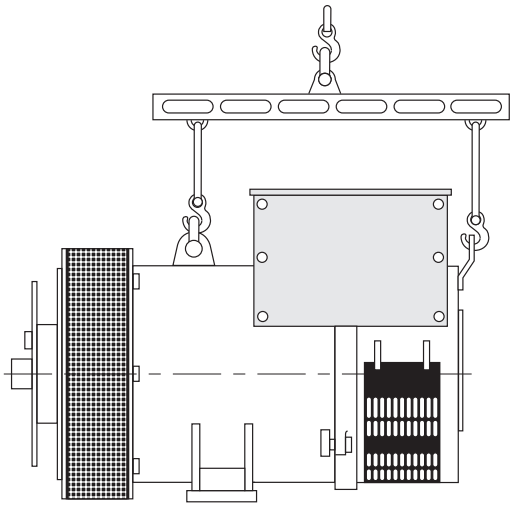
4) Gradually increase the exciter field current by adjusting the rheostat or the variac and measure the output voltages on L1 - L2 - L3, checking the excitation voltage and current at no load (see the alternator nameplate or ask for the factory test report).

When the output voltage is at its rated value and balanced within <1% for the rated excitation level, the alternator is in good working order. The fault therefore comes from the AVR or its associated wiring (ie. sensing, auxiliary windings).



4.6 - Dismantling, reassembly (see sections 5.4.1. & 5.4.2.)

During the warranty period, this operation must only be carried out in an approved workshop or in our factory, otherwise the warranty may be invalidated.
Whilst being handled, the alternator must remain horizontal (rotor not locked when moved). Check how much the alternator weighs (see 4.8.5.) before choosing the lifting method.
The choice of lifting hooks or handles should be determined by the shape of the lifting rings.



4.6.1 - Tools required

To fully dismantle the alternator, we recommend using the tools listed below :
- 1 ratchet spanner + extension
- 1 torque wrench
- 1 set of flat spanners : 8 mm, 10 mm, 18 mm
- 1 socket set : 8, 10, 13, 16, 18, 21, 24, 30 mm
- 1 puller (U35) / (U32/350)

4.6.2 - Screw tightening torque

IDENTIFICATION	screw Ø	Torque N.m
Field screw	M 6	10
Diode nut	M 6	4
Flange/frame screw	M 12	69
NDE shield/frame screw	M 12	69
Disc/Sleeve screw	M 16	170
Earth screw	M 10	20
Grille screws	M 6	5
Cover screws	M 6	5
Terminal block nut	M 12	35
Earth screw	M 12	35

4.6.3 - Access to diodes

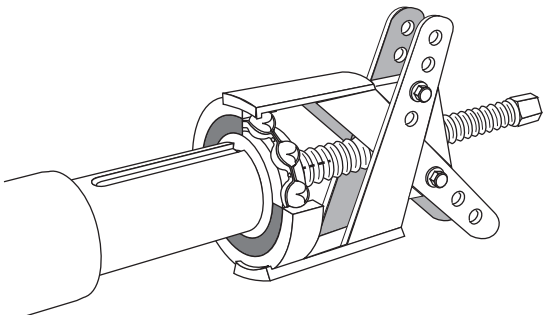
- Open the air intake grille (51).
- Disconnect the diodes.
- Check the 6 diodes using an ohmmeter or a battery lamp (see section 4.5.2).
If the diodes are faulty,
- Remove the surge suppressor (347).
- Remove the 6 «H» nuts for mounting the diode bridges on the support.
- Change the crescents, respecting the polarity.

4.6.4 - Access to connections and the regulation system

Access directly by removing the top of the cover (48) or the AVR access door (466).

4.6.5 - Replacing the NDE bearing

- Remove the air intake grille (51).
- Remove the lid of the protective cover (48) and the side panels (366) and (367).
- Remove the hook (21) and the cover rear panel (365).
- Replace the hook (21) in order to manipulate the flange.
- Disconnect the exciter wires (5+,6-).
If using a single-bearing or double-bearing machine with the regreasable bearing option:
- Remove the bearing thrust screws (78).
- Remove all 5 screws (37).
- Remove the shield (36).
- Take out the antifriction bearing (70) using a puller with a central screw (see drawing below).



- Fit the new antifriction bearing onto the shaft after heating it by induction to approximately 80 °C.
- Mount the new preloading (wavy) washer (79) + the new “O” ring seal (349) in the shield (36).
If using a single-bearing or double-bearing machine with the regreasable bearing option:
- Screw a threaded rod into the thrust bearing (78).
- Refit the end shield on the machine using a dowel and nut in the shaft extension (see drawing).
- Slide the threaded rod into the shield hole to make it easier to assemble (see basic diagram).
- Fit the thrust bearing screws (78), remove the threaded rod, fit the other screw and tighten up the assembly.
- Tighten the 5 bearing screws (37).
- Reconnect exciter wires E+, E-.
- Finish reassembling the cover.

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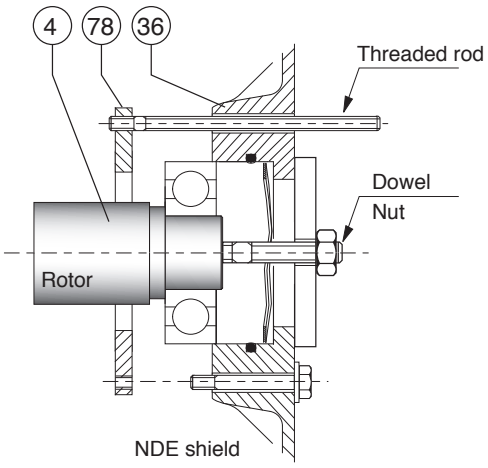


WARNING

When dismantling the shields, you will need to change the antifriction bearings, the "O" ring seal and the preloading (wavy) washer.

4.6.6 - Replacing the DE bearing

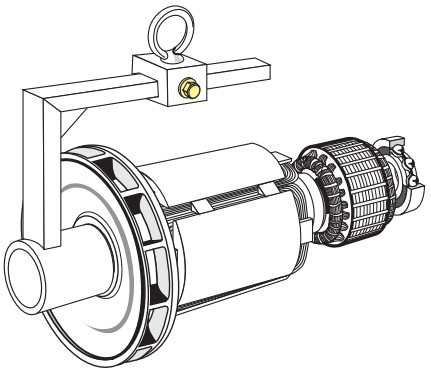
- Remove the air outlet grille (33).
- Remove the 6 screws (31) from the DE shield and the 4 screws (62) from the inner bearing retainer.
- Remove the shield (30).
- Take out the ball bearing (60) using a puller with a central screw (see section 4.6.5).
- Fit the new bearing, after heating it by induction to approximately 80 °C.
- Screw a threaded rod into the thrust bearing (68).
- Refit the shield (30) on the machine.
- Slide the threaded rod into the shield hole to make it easier to assemble (see basic diagram).
- Tighten the bottom thrust bearing screws (68), remove the threaded rod and fit the other screws.
- Tighten the 6 shield screws (31).
- Refit the air outlet grille (33).

WARNING

When dismantling the machine, always change the antifriction bearings.

4.6.7 - Dismantling the rotor assembly

- Remove the NDE shield (36) as described in section 4.6.5.
- Remove the DE shield (30) as described in section 4.6.6 if it is a double-bearing machine
- Support the DE rotor (4) with a strap or with a support constructed in accordance with the following drawing.
- Move the strap as the rotor moves in order to distribute the weight over it.



WARNING

When dismantling the rotor involves changing parts or rewinding, the rotor must be rebalanced.

4.6.8 - Reassembling the machine

- Mount the rotor (4) in the stator (1) (see drawing above) taking care not to knock the windings.

If using a single-bearing or double-bearing machine with the regreasable bearing option:

- Mount the new preloading (wavy) washer (79) + the new "O" ring seal (349) in the shield (36).

- Screw a threaded rod into the thrust bearing (78).

- Refit the shield (36) on the machine using a dowel and nut in the shaft extension (see diagram).

- Slide the threaded rod into the shield hole to make it easier to assemble (see diagram).

- Fit the thrust bearing screws (78), remove the threaded rod, fit the other screw and tighten up the assembly.

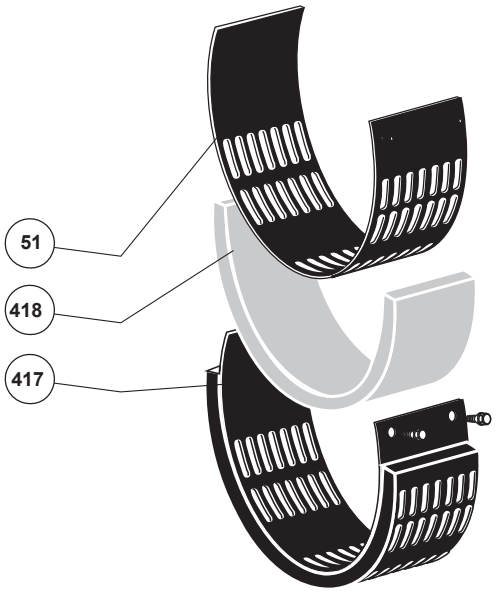
- Tighten the 5 bearing screws (37).
- Reconnect exciter wires E+, E-.
- Finish reassembling the cover.
- Refit the flange (30) on the stator (1).
- Tighten the screws (31).

If using a double-bearing machine:

- Mount the new preloading (wavy) washer (79) + the new "O" ring seal (349) in the shield (36).
- Refit the shield (36) on the machine using a dowel and nut in the shaft extension (see diagram).
- Tighten the 5 shield screws (37).
- Reconnect exciter wires E+, E-.
- Finish reassembling the cover.
- Screw a threaded rod into the thrust bearing (68).
- Refit the shield (30) on the machine.
- Slide the threaded rod into the shield hole to make it easier to assemble (see basic diagram).
- Fit the thrust bearing screws (68), remove the threaded rod, fit the other screw and tighten up the assembly.
- Tighten the 6 shield screws (31).
- Refit the air outlet grille (33).
- Check that the machine assembly is correctly mounted and that all screws are tightened.

4.6.9 - Dismantling and reassembly of the filters

- Remove the grille (417) then take out the filter (418).
Change the filter if necessary; please refer to section 4.2.5 for cleaning the filter.
To replace, follow the instructions in reverse order.



4.7 - Installation and maintenance of the PMG

For the LSA 47.2, the PMG reference is : PMG 3.
See the PMG manual ref : 4211.

4.8 - Table of characteristics

Table of average values.
Alternator - 4 poles - 50 Hz - Standard winding No. 6.
(400V for the excitation values).
The voltage and current values are given for no-load operation and operation at rated load with separate field excitation. All values are given at ± 10% and may be changed without prior notification (for exact values, consult the test report).

4.8.1 - Average values for the LSA 47.2

Resistances at 20 °C (Ω)

LSA 47.2	L/N stator	Rotor	Field	Armature
VS2	0.0081	0.77	10.2	0.128
VS3	0.0081	0.77	10.2	0.128
S4	0.0063	0.88	10.2	0.128
S5	0.0063	0.88	10.2	0.128
M7	0.0045	0.98	10.2	0.128
M8	0.0047	1.03	10.2	0.128
L9	0.0039	1.1	10.2	0.128
LSA 47.2 - 6 wire				
L9	**0.0039**	**1.1**	**10.2**	**0.128**

Resistance of AREP auxiliary windings at 20°C (Ω)

LSA 47.2	Auxil wdg: X1, X2	Auxil wdg: Z1, Z2
VS2	0.2	0.38
VS3	0.2	0.38
S4	0.195	0.40
S5	0.195	0.40
M7	0.165	0.33
M8	0.17	0.35
L9	0.168	0.34
LSA 47.2 - 6 wire		
L9	**0.168**	**0.34**

Field excitation current i exc (A)
Symbols: “i exc”: excitation current of the exciter field.

LSA 47.2	No load	At rated load
VS2	1	4
VS3	1	4
S4	0.9	3.4
S5	0.9	3.8
M7	1	3.65
M8	0.85	3.7
L9	0.95	3.75
LSA 47.2 - 6 wire		
L9	**0.95**	**3.7**

For 60 Hz machines, the “i exc” values are approximately 5 to 10% lower.

4.8.2 - Voltage of auxiliary windings at no load

LSA 47.2	Auxil wdg: X1, X2	Auxil wdg: Z1, Z2
50 Hz	70 V	10 V
60 Hz	85 V	12 V

4.8.3 - Table of weights

LSA 47.2	Total weight	Rotor
VS2	1000	390
VS3	1000	390
S4	1130	445
S5	1130	445
M7	1255	495
M8	1300	515
L9	1400	550

5 - SPARE PARTS

5.1 - First maintenance parts

Emergency repair kits are available as an option.
They contain the following items :

Emergency kit SHUNT	**ALT 472 KS 001**
AVR R 250	AEM 110 RE 019
Diode bridge assembly	ALT 421 KD 002
Surge suppressor	AEM 000 RE 126

Emergency kit AREP	**ALT 461 KS 001**
AVR R 450	AEM 110 RE 031
Diode bridge assembly	ALT 421 KD 002
Surge suppressor	AEM 000 RE 126

Single-bearing kit	**ALT 471 KB 002**
Non drive end bearing	RLT 075 TS 030
«O» ring	JOI 160 TB 002
Preloading (wavy) washer	RLT 160 RB 005

Double-bearing kit	**ALT 471 KB 001**
Non drive end bearing	RLT 075 TS 030
Drive end bearing	RLT 090 TS 030
«O» ring	JOI 160 TB 002
Preloading (wavy) washer	RLT 160 RB 005

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 complete machine type, its serial number and the information given on the nameplate.

Address your enquiry to your usual contact.

Part numbers should be identified from the exploded views and their description from the parts list.
Our extensive network of service centres can dispatch the necessary parts without delay.
To ensure correct operation and the safety of our machines, we recommend the use of original manufacturer spare parts.
In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

5.3 - Accessories

5.3.1 - Space heater for use when stopped

The space heater must run as soon as the alternator stops. It is installed at the rear of the machine. Its standard power is 250W with 220V or 250W with 110V on request.

Warning: the power supply is present when the machine has stopped.

5.3.2 - Temperature sensors with thermistors (PTC)

These are thermistor triplets with a positive temperature coefficient installed in the stator winding (1 per phase). There can be a maximum of 2 triplets in the winding (at 2 levels: warning and trip) and 1 or 2 thermistors in the shields.
These sensors must be linked to adapted sensing relays (supplied optionally).
Cold resistance of cold thermistor sensors: 100 to 250 Ω per sensor.

5.3.3 - Connection accessories

- 6-wire machines

Requirements for coupling (F):
- 3 flexible shunts

- 12-wire machines

Requirements for coupling (F):
- 3 flexible shunts

After operational testing, replace all access panels or covers.

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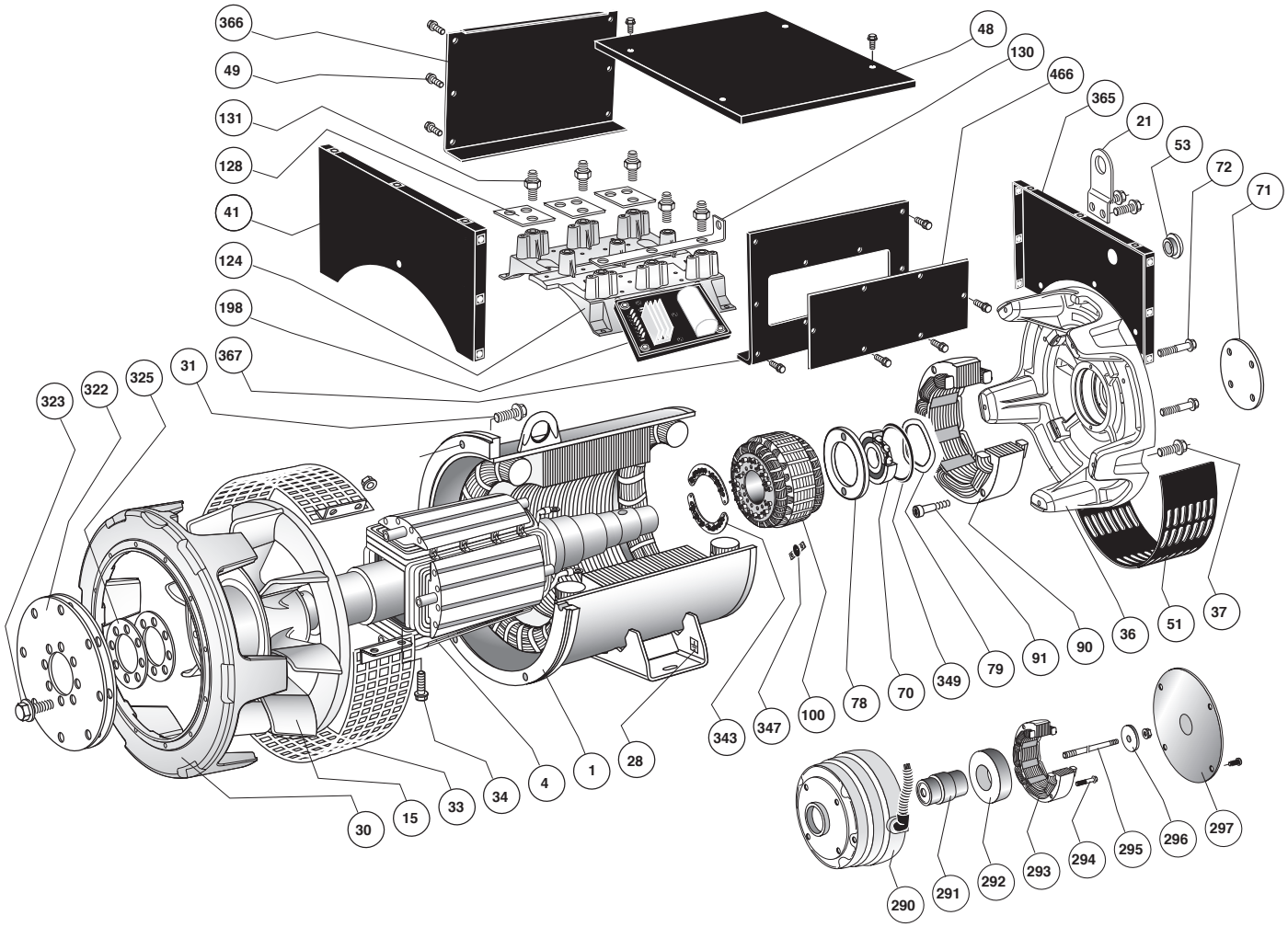
5.4 - Exploded view, parts list

5.4.1 - Single-bearing



Ref.	Qty	Description	Ref.	Qty	Description
1	1	Stator assembly	124	1	Terminal block
4	1	Rotor assembly	128	3	Starting range
15	1	Fan	130	1	Neutral link
21	1	Lifting ring	131	9	Terminal block terminal screws
28	1	Earth terminal	198	1	Voltage regulator (AVR)
30	1	DE flange	290	1	PMG housing
31	6	Fixing screws	291	1	Shaft adapter
33	1	Protective grille	292	1	Magnetic rotor
34	2	Fixing screws	293	1	Stator
36	1	Exciter end shield	294	2	Fixing screws
37	5	Fixing screws	295	1	Tie rod
41	1	Cover front panel	296	1	Cable gland washer + nut
48	1	Cover top panel	297	1	End plate
49	-	Cover screws	322	3	Coupling disc
51	1	Air intake grille	323	8	Fixing screws
53	1	Plug	325	-	Spacer shim
70	1	Non drive end bearing	343	1	Diode bridge assembly
71	1	Cover	347	1	Protection varistor (+ PCB)
72	2	Fixing screws	349	1	«O» ring
78	1	Inner bearing retainer	365	1	Cover rear panel
79	1	Preloading (wavy) washer	366	1	Side panel
90	1	Exciter field	367	1	Side panel with inspection door
91	4	Fixing screws	466	1	AVR inspection door
100	1	Exciter armature			

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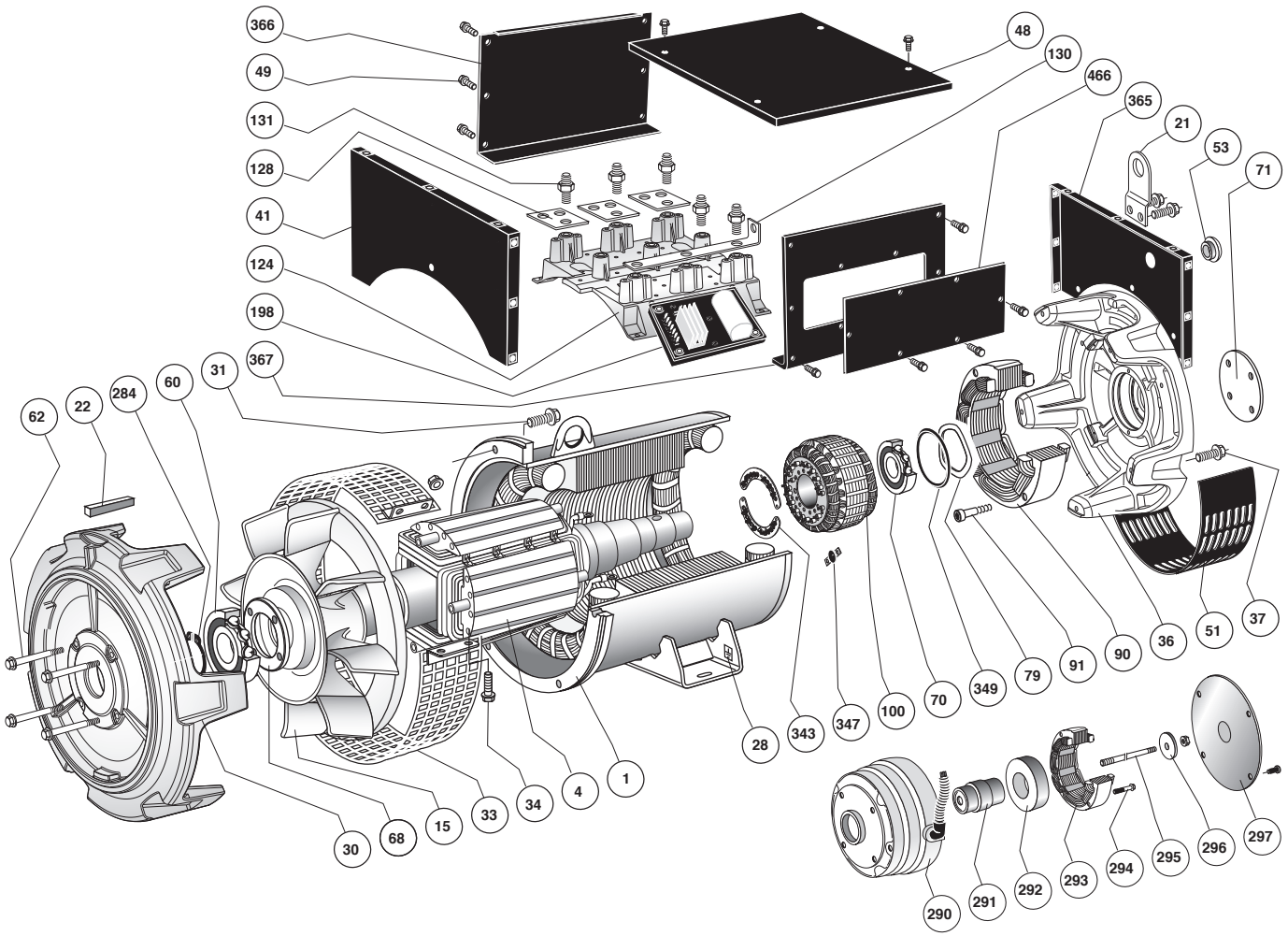
5.4.2 - Two-bearing



Ref.	Qty	Description	Ref.	Qty	Description
1	1	Stator assembly	100	1	Exciter armature
4	1	Rotor assembly	124	1	Terminal block
15	1	Fan	128	3	Starting range
21	1	Lifting ring	130	1	Neutral link
22	1	Key	131	9	Terminal block terminal screws
28	1	Earth terminal	198	1	Voltage regulator (AVR)
30	1	DE flange	284	1	Circlips
31	6	Fixing screws	290	1	PMG housing
33	1	Protective grille	291	1	Shaft adapter
34	2	Fixing screws	292	1	Magnetic rotor
36	1	Exciter end shield	293	1	Stator
37	5	Fixing screws	294	2	Fixing screws
41	1	Cover front panel	295	1	Tie rod
48	1	Cover top panel	296	1	Cable gland washer + nut
49	-	Cover screws	297	1	End plate
51	1	Air intake grille	343	1	Diode bridge assembly
53	1	Plug	347	1	Protection varistor (+ PCB)
60	1	DE bearing	349	1	«O» ring
62	4	Fixing screws	365	1	Cover rear panel
68	1	Inner bearing retainer	366	1	Side panel
70	1	Non drive end bearing	367	1	Side panel with inspection door
71	1	Cover	466	1	AVR inspection door
79	1	Preloading (wavy) washer			
90	1	Exciter field			
91	4	Fixing screws			

Electric Power Generation

DECLARATION of COMPLIANCE
related to CE marking

This Declaration applies to the generators designed to be incorporated into machines complying with the Machine Directive Nr 2006/42/CE dated 17 May 2006.

MOTEURS LEROY-SOMER
Boulevard Marcellin Leroy
16015 ANGOULEME (France)

Declares hereby that the electric generators of the ranges " PARTNER", Industrial and Professional, as well as their derivatives, manufactured by Leroy Somer or on Leroy Somer's behalf, comply with the following International Standards and Directives :

- EN et CEI 60034 -1 et 60034 -5
- ISO 8528 – 3 " Reciprocating internal combustion engine driven alternating current generating sets. Part 3. Alternating current generators for generating sets "
- The Low Voltage Directive Nr 2006/95/CE dated 12 December 2006.

Furthermore, these generators, designed in compliance with the Machine Directive Nr 2006/42, are therefore able to be incorporated into Electrical Gen-Sets complying with the following International Standards and Directives :

- The Machine Directive Nr 2006/42/CE dated 17 May 2006
- The EMC Directive Nr 2004/108/CE dated 15 December 2004, as intrinsic levels of emissions and immunity are concerned

WARNING :

The here above mentioned generators should not be commissioned until the corresponding Gen-Sets have been declared in compliance with the Directives Nr 2006/42/CE et 2004/108/CE, as well as with the other relevant Directives.

Technical Managers

P Betge – O Cadel

4152 en – 12.2009 / c

LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE
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