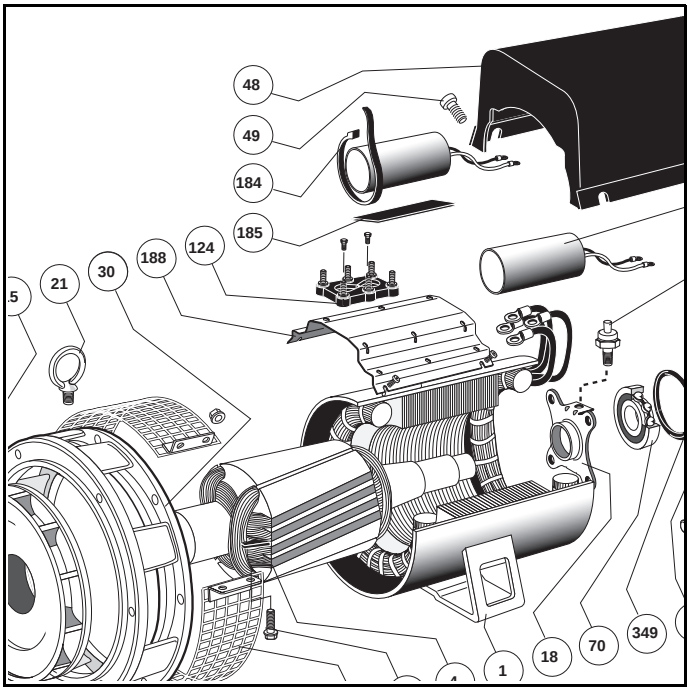
LEROY SOMER

3664 en - 01.2008 / c

This manual must be supplied to the end user



LSA 37 - 2 POLE - ACC

ALTERNATORS

Installation and maintenance

LSA 37 - 2 POLE - ACC
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 potential risks of accidents. It is vital that you understand and take notice of the following warning symbols.

ATTENTION

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.

WARNING SYMBOLS

We draw your attention to the following 2 safety measures which 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 machine has been fully installed.

LSA 37 - 2 POLE - ACC
ALTERNATORS
CONTENTS

LSA 37 - 2 POLE - ACC
ALTERNATORS
RECEIPT

1 - RECEIPT

1.1 - Standards and safety measures

Our alternators comply with most international standards and are compatible with :
- the recommendations of the
International Electrotechnical Commission
IEC 60034-1, (EN 60034).
- The European Community directive 89/336/EC on Electromagnetic Compatibility (EMC).
- The European Community directives 73/23/EC and 93/68/EC (Low Voltage Directive).
They are CE marked with regard to the LVD (Low Voltage Directive) in their role as a machine component.

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 machine by hand to detect any malfunction.

1.3 - Identification

The alternator is identified by means of a nameplate fixed on the frame.
Make sure that the nameplate on the machine conforms to your order.
The machine name is defined according to various criteria (see below).
Example of description for : **LSA 37 M7 A1/2**
- LSA : name used in the PARTNER range
  M : Marine / C : Cogeneration / T : Telecommunications.
- 37 : machine type
- M7 : model
- A : field excitation system
  (ACC)
- 1/2 : winding number / number of poles.

1.3.1 - Nameplate

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

1.4 - Storage

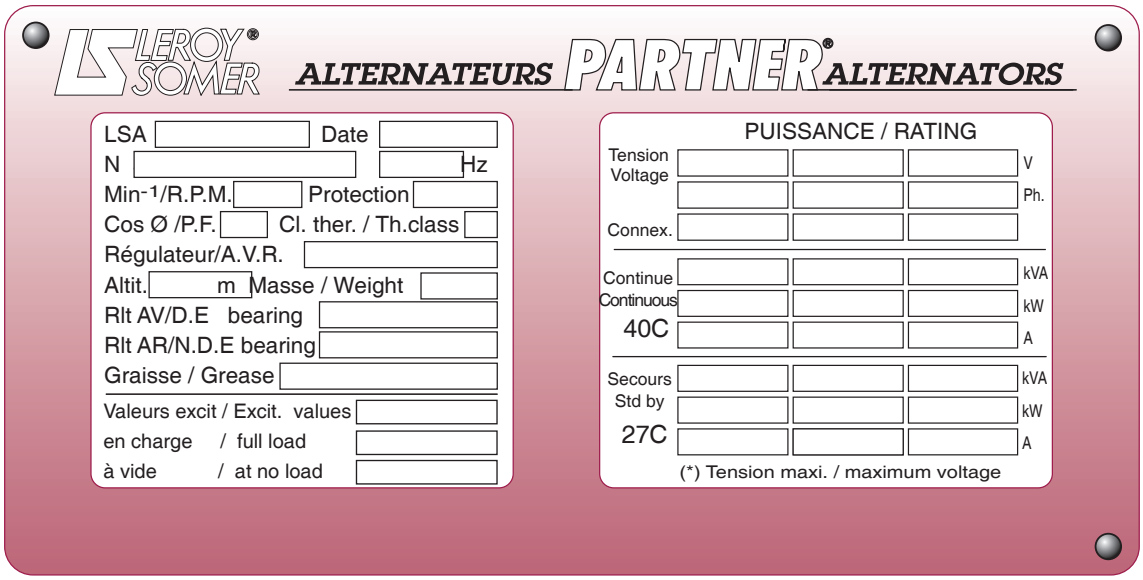
Prior to commissioning, machines should be stored :
- Away from humidity : in conditions of relative humidity of more than 90%, the machine insulation can drop very rapidly, to just above zero at around 100%; monitor the state of the anti-rust protection on unpainted parts.
For storage over an extended period, the machine 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

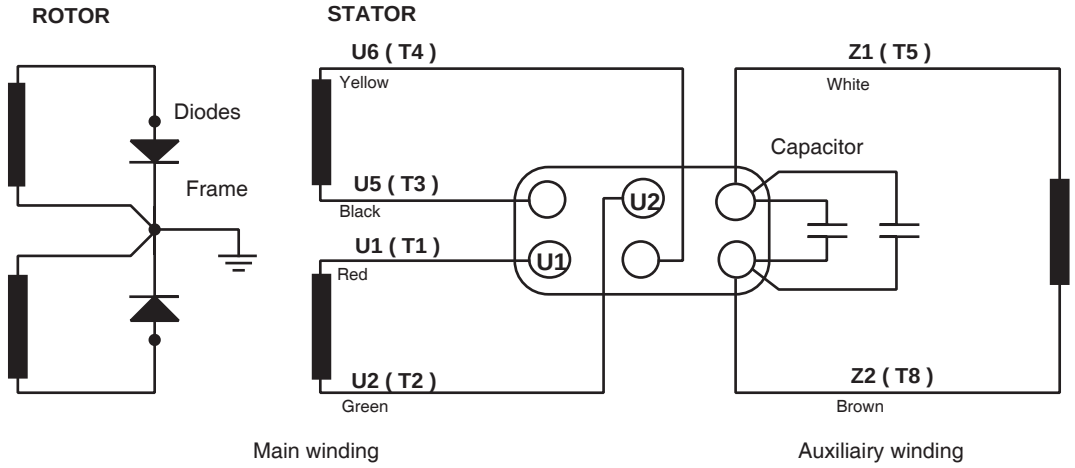
Use of the machine is restricted to operating conditions (environment, speed, voltage, power, etc) compatible with the characteristics indicated on the nameplate.



2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

The PARTNER LSA 37 alternator is a machine without sliprings, using auxiliary phase capacitor to provide the self excitation (ACC system).
Interference suppression conforms with standard EN 55011, group 1, class B.



2.2 - Mechanical characteristics

- Steel frame
- End shields in aluminium
- Ball bearings greased for life
- Mounting arrangement

IM 1201: (MD 35)
Single-bearing with standard feet and SAE flanges/coupling discs

S.A.E. J 609a - flange B - ext 6 - Cone ∅ 35

IM 1001: (B 34)
Two-bearing with SAE flange and standard cylindrical shaft extension

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

3 - INSTALLATION

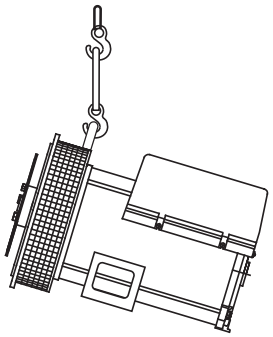
Personnel undertaking the various operations indicated in this section must wear personal protective equipment appropriate for mechanical and electrical hazards.

3.1 - Assembly

All mechanical handling operations must be undertaken using approved equipment and the machine must be horizontal. Check how much the machine weighs (see 4.5.5.) before choosing the lifting tool.

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 alternators.



During this operation, do not allow anyone to stand under the load.

3.1.2 - Coupling

3.1.2.1 - single bearing alternator

Before coupling to the prime mover, check that both are compatible by:
- Undertaking a torsional analysis of the transmission.
-Checking the dimensions of the flywheel and its housing, the flange, coupling discs and offset.

ATTENTION

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

Tighten the coupling discs screws to the recommended torque (see section 4.6.2.) and check that there is lateral play on the crankshaft.

3.1.2.2 - two-bearing alternator

- Semi-flexible coupling

Careful alignement of the machines by measuring the concentricity and parallelism of the two parts of the coupling is recommended, the difference between the teadings should not exceed the specified values (say 0,1 mm).

ATTENTION

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 above 40°C, apply a derating coefficient). Fresh air, free from damp and dust, must be able to circulate freely around the air input louvres on the opposite side from the coupling. It is essential to prevent not only the recycling of hot air from the machine 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 isolation is less than 1 megohm for the stator and 100,000 ohms for the other windings.

There are two possible methods for restoring the above minimum values.

a) Dry out the machine for 24 hours in a drying oven at a temperature of approximately 110 °C.

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

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

3.2.2 - Mechanical checks

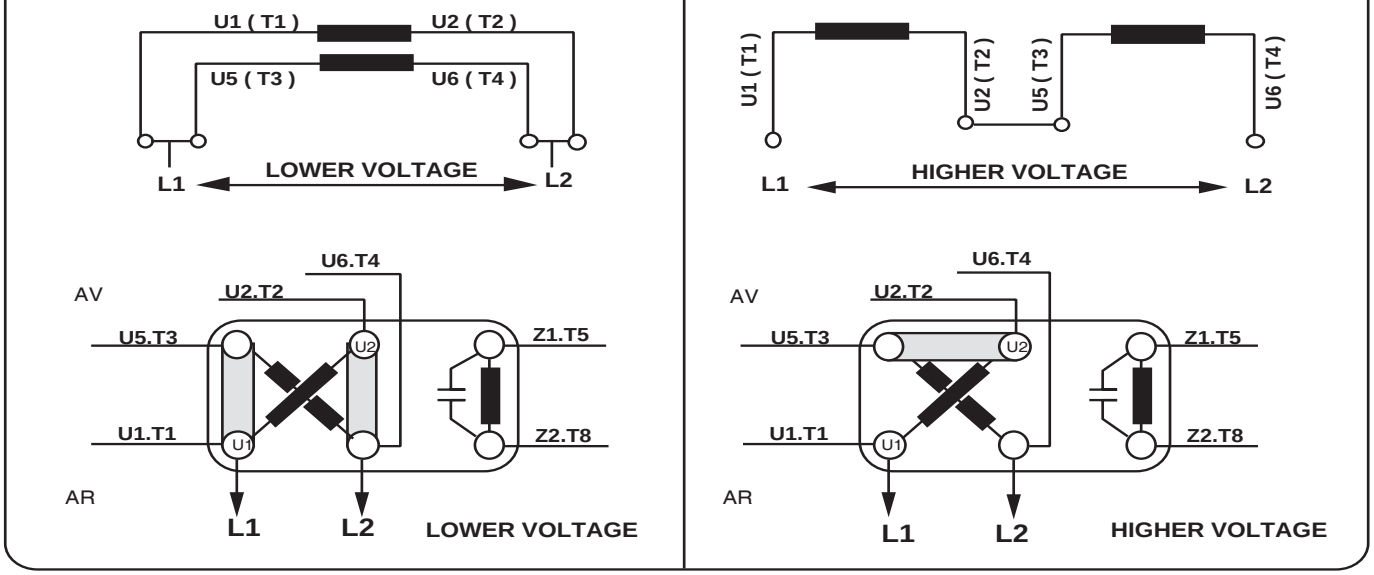
Before starting the machine for the first time, check that:
- The winding connection corresponds to the site operating voltage (see section 3.3)
- The fixing bolts on the feet are tight
- The cooling air is drawn in freely
- The protective guards and housing are correctly in place

3.3 - Terminal connection diagrams

To modify the connection, change the position of the terminal cables. The winding code is specified on the nameplate.

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

PARALLEL CONNEXION	SERIE CONNEXION
110 V - 50 Hz / 120 V - 60 Hz	230 V - 50 Hz / 240 V - 60 Hz

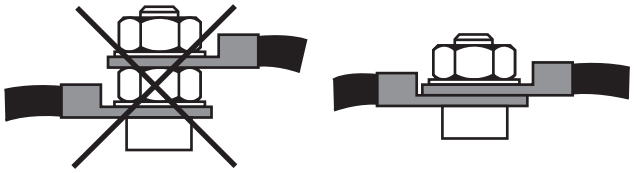


3.3.1 - Connection checks

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

Check that :

- the differential 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. (Disconnect the blue wire of the R 791 interference suppression module linking the neutral).
- the machine should be connected with the terminal lugs on top of one another as shown in the terminal connection diagrams.



- any protective devices in place have not tripped,
- 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)

3.4 - Commissioning

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

The machine 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 machine should maintain its rated speed and voltage; however, if the machine still operates incorrectly, the cause of the malfunction must be located (see section 4.4).

3.5 - Setting up

The various adjustments during tests must be made by a qualified engineer. Take care that the drive speed specified on the nameplate is reached before commencing adjustment. 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 machine 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 personal protective equipment appropriate for mechanical and electrical hazards.
Before any intervention on the machine, ensure that it cannot be started by a manual or automatic system and that 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 machine are still tight, plus the general state of the machine 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 greased for life: approximate life of the grease (depending on use) = 20,000 hours or 3 years. Monitor the temperature rise in the bearings, which should not exceed 50°C above the ambient temperature. Should this value be exceeded, the machine must be stopped and checks carried out.

4.2.4 - Electrical servicing

Cleaning product for the windings

Do not use : trichlorethylene, perchlorethylene, trichloroethane or any alkaline products.

Certain strictly defined pure volatile degreasing products can be used, such as :
- Normal petrol (without additives) ; inflammable
- Toluene (slightly toxic); inflammable
- Benzene (or benzine, toxic); inflammable
- Ciclohexare (non toxic); inflammable

Cleaning of the stator, rotor, exciter and diode bridge

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

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 machine.

4.2.5 - Mechanical servicing

Cleaning the machine using water or a high-pressure washer is strictly prohibited.
Any problems arising from such treatment are not covered by our warranty.
Degreasing : Use a brush and detergent (suitable for paintwork).
Dusting : Use an air gun.
If filters have been added to the machine after manufacture and do not have thermal protection, the service personnel should clean the air filters periodically and systematically, as often as necessary (every day in very dusty atmospheres).
Cleaning can be performed using water for dry dust or in a bath containing soap or detergent in the case of greasy dust. Petrol or chloroethylene can also be used.
After cleaning the alternator, it is essential to check the winding insulation (see sections 4.5.1).

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 machine
- the speed of the unit is correct (see section 1.3).
Repeat the operations defined in section 3.

4.4 - MECHANICAL FAULTS

Fault		Cause
Bearing	Excessive overheating of one or both bearings (bearing temperature 50°C above the ambient temperature) (With or without abnormal bearing noise)	- If the bearing has turned blue or if the grease has turned black, change the bearing. - Bearing not fully locked (abnormal play in the bearing cage) - End shields incorrectly aligned
Abnormal temperature	Excessive overheating of alternator frame (more than 40° C above the ambient temperature)	- Air flow (inlet-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
Vibrations	Too much vibration	- Misalignment (coupling) - Defective mounting or play in coupling - Rotor balancing fault (Engine - Alternator)
	Excessive vibration and humming noise coming from the machine	- Phase imbalance - Stator short-circuit
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration	- System short-circuit - Misparalleling Possible consequences - Broken or damaged coupling - Broken or bent shaft end - Shifting and short-circuit of main field - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes

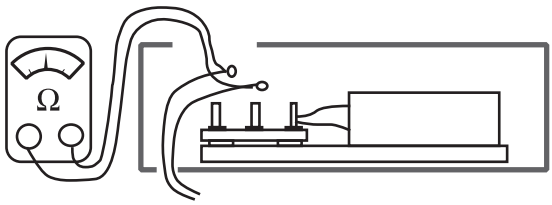
4.5 - Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Apply 6 v D.C. for 1 second on one of the capacitors	The alternator builds up and voltage is correct after battery removal	- Lack of residual magnetism - Check capacitor voltage. (correct value 10 to 15 v across auxiliary winding terminals, with capacitor(s) disconnected)
		The alternator builds up but voltage does not reach nominal value after battery removal	- Check if the circuit is broken in relation to either of the capacitors
		The alternator builds up but voltage collapses after battery removal	- Voltage too low : fault in rotation diodes
		No voltage output	- Auxiliary winding break - Rotating diodes burnt (check diodes) - Main field winding open circuit
Voltage too high	Reduce speed		Genset speed to high
Voltage correct on no- load, too low on load			- Too high speed drop on load - Check speed- Genset overload - Short circuit in main field, check resistance

4.5.1 - Measurement of resistance windings stator.

During this procedure, make sure that the alternator is disconnected from any external load.

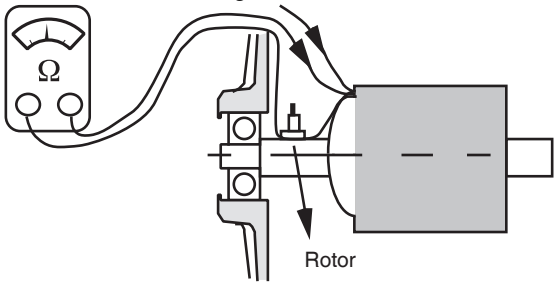
- Unscrew the top cover
- Disconnect capacitors leads in order to read auxiliary winding resistance
- Disconnect leads from terminal plate in order to read main winding resistances.



Resistance Ω Stator 2 P	Main winding		Auxiliary winding	
	50 Hz	60 Hz	50 Hz	60 Hz
	230 V	240V	110V	120V
LSA 37 M7	0,5	0,4	1,7	0,9
LSA 37 M8	0,3	0,3	1	0,6
LSA 37 L6	0,2	0,16	0,6	0,4
LSA 37 VL11	0,12	0,11	0,4	0,26

4.5.2 - Measurement of ROTOR winding resistances.

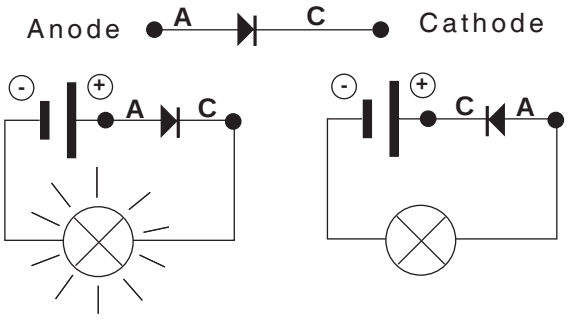
During this procedure, make sure that the alternator is disconnected from any external load.
- Unscrew the 6 cover fixing screws.
- Remove the NDE shield
- Unsolder the wires on the diodes in order to read the resistance of each winding.



Resistances (ohms)	Main phase	Auxiliary phase
LSA 37 M7	0.37	0.5
LSA 37 M8	0.4	0.6
LSA 37 L6	0.5	0.7
LSA 37 VL11	0.6	0.8

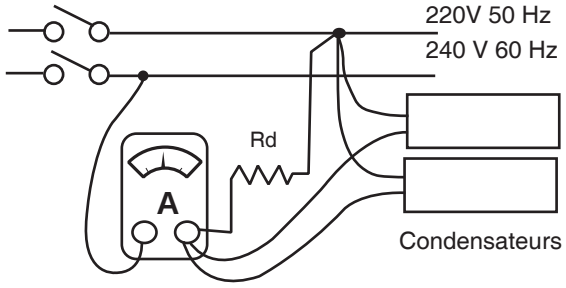
4.5.3 - Checking the diode bridge

- Proceed in the same way as for reading the rotor resistance by unsoldering a single side of the diodes.
A diode in good working order should allow the current to flow only in the anode-to-cathode direction.



4.5.4 - Checking the capacitor

During this procedure, make sure that the alternator is disconnected from any external load.
- Unscrew the 6 cover fixing screws.
- Disconnect the capacitor wires and connect it to an AC supply in series with a switch and an ammeter.



Rd: discharging resistor (5000 ohms - 20 W)
The currents are indicated with ±10% tolerance

Capacitor (...µF-450V - 3000H)				
	50 Hz	220 V	60 Hz	240 V
2 poles	µF	I (A)	µF	I (A)
LSA 37 M7	70	4.8	80	7.2
LSA 37 M8	100	6.9	120	10.8
LSA 37 L6	130	9	160	14.5
LSA 37 VL11	180	12.4	220	20

4.5.5 - Weight tables

Type	Total weight (kg)
LSA 37 M7	80
LSA 37 M8	95
LSA 37 L6	100
LSA 37 VL11	120

4.6 - Dismantling, reassembly (see section 5)

During the warranty period, this operation should only be carried out in an approved workshop or in our factory, otherwise the warranty may be invalidated.

ATTENTION

Whilst being handled, the machine should remain horizontal (rotor not locked when moved).
Check how much the machine weighs (see 4.5.5.) before choosing the lifting tool. The choice of lifting hooks or handle should be determined by the shape of the lifting rings.

4.6.1 - Tools required

To fully dismantle the machine, we recommend using the tools listed below **:**
- 1 ratchet spanner + extension
- 1 torque wrench
- 1 flat spanner set
- 1 socket set
- 1 Allen key set
- 1 TORX bit set
- 1 puller.

LSA 37 - 2 POLE - ACC
ALTERNATORS
SERVICING - MAINTENANCE

4.6.2 - Screw tightening torque

IDENTIFICATION	Screw Ø	Torque (Nm)
Diode nut	1/4 - 28 threads	3
Tie rod	M8	23
Disc/shaft screw	M10	66
Cover screws	M5	5
Armature rod	M8-5/16 UNF	17

4.6.3 - Access to diodes

--Unscrew the 6 cover fixing screws (only on L version)
- Remove the NDE shield and access the diodes (110)

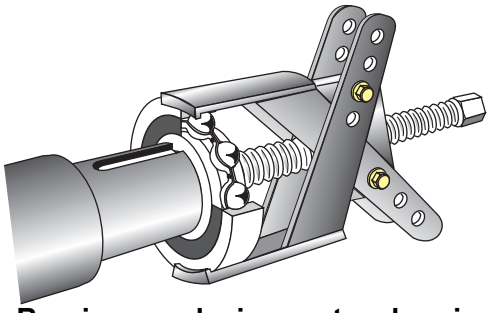
4.6.4 - Access to capacitor and connection

- Unscrew the 6 screws (49), then remove the cover (48)

4.6.5 - Dismantling

4.6.5.1 - N.D.E. bearing replacing on single bearing alternator

- Remove rotor (4) from stator (take care not to damage windings and diodes)
- Extract bearing (70) with a bearing puller



4.6.6 - Bearings replacing on two bearing alternator

- Un bolt D.E. bracket
- Pull out rotor + D.E. bracket (careful of demage to windings and diodes
- Remove circlips (284)
- Remove from rotor (4) D.E. bearing set (410) + (60)
- Remove D.E. bearing (60)
- Remove N.D.E. bearing (70) with a bearing puller

4.6.7 - Complete disassembly

- Un bolt D.E. bracket (410) (only two bearings alternators)
- Pull out rotor + D.E. bracket (careful of demage to windings and diodes)
- Unscrew (49) and take off top cover (48)
- Disconnect connections
- Unscrew 4 nuts (38)
- Separate brackets (30) and (36) from stator (1)

4.6.8 - REASSEMBLY

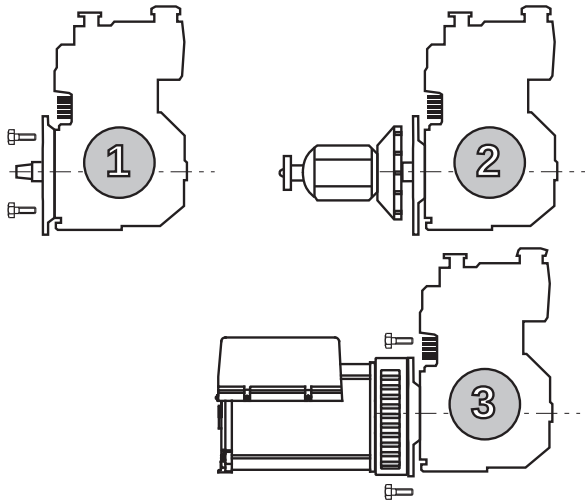
Reverse procedure of disassembly.
(Check that the preloading wavy washer (79) is at the right place in the N.D.E. bracket).

ATTENTION

NOTE: If intervention is required on the main field (rewinding, replacement of components), the rotor assembly must be rebalanced.

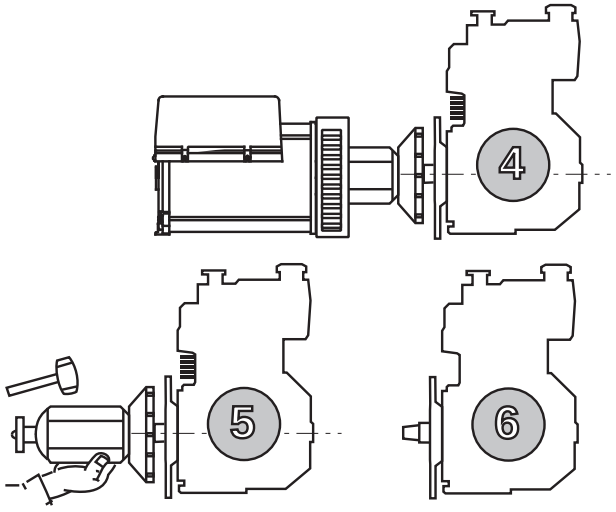
4.6.9 - ASSEMBLY OF SINGLE-BEARING VERSION SAE J 609b

1 - Mount the shield on the motor, screw tightening torque: 22 Nm.
2 - Mount the rotor assembly on the motor shaft extension and fix the assembly by means of the rod (13) with a torque of 17 Nm.
3 - Mount the stator assembly and fix it using the 4 screws on the DE shield. Recommended tightening torque: 20 Nm.



4.6.10 - DISMANTLING OF SINGLE-BEARING VERSION SAE J 609b

4 - Unscrew the 4 stator screws on the DE shield.
Carefully take out the stator assembly.
5 - Unscrew the armature rod from the rotor. Using a mallet, hold the rotor in one hand and use the other hand to tap a salient pole firmly with the mallet in order to remove the rotor from the motor shaft.
6 - Unscrew the 4 screws of the shield on the motor.



5 - SPARE PARTS

5.1 - First maintenance parts

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

No.	Description	Qty	LSA 37	Coding
110	Diode	2	80A -700 V	ESC 070 DC 001
183	Capacitor	-	-	-

5.1.1 - Description of bearings

No.	Description	Qty	LSA 37	Coding
60	D.E. bearing	1	6208 2Z/C3	RLT 040 BH 020
70	N.D.E. bearing	1	6207 2Z/C3	RLT 035 BH 020

5.2 - Technical support service

Our technical support service will be happy to provide any information you require.

When ordering spare parts, you should indicate the complete machine type, its serial number and the information indicated on the nameplate.

Address your enquiry to your usual contact.

ATTENTION

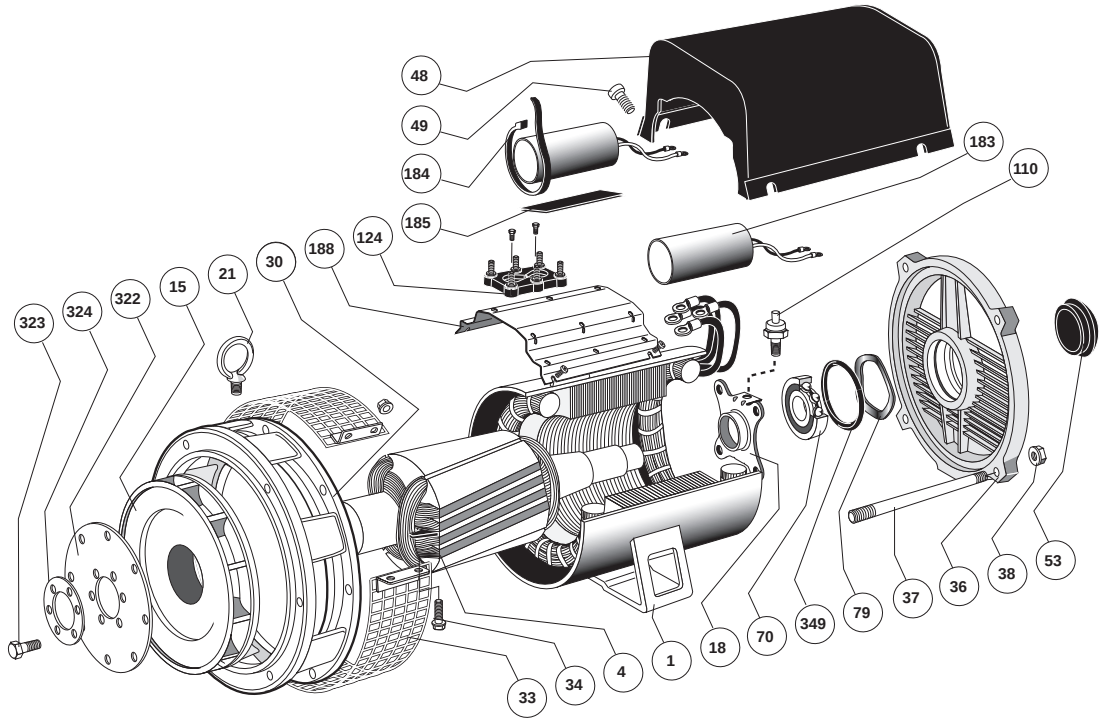
Part numbers should be identified from the exploded views and their description in the parts list.
Our extensive network of "service stations" can dispatch the necessary parts without delay.
To ensure correct operation and the safety of our machines, we recommend the use of original manufacture spare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

5.3 - Exploded view, parts list

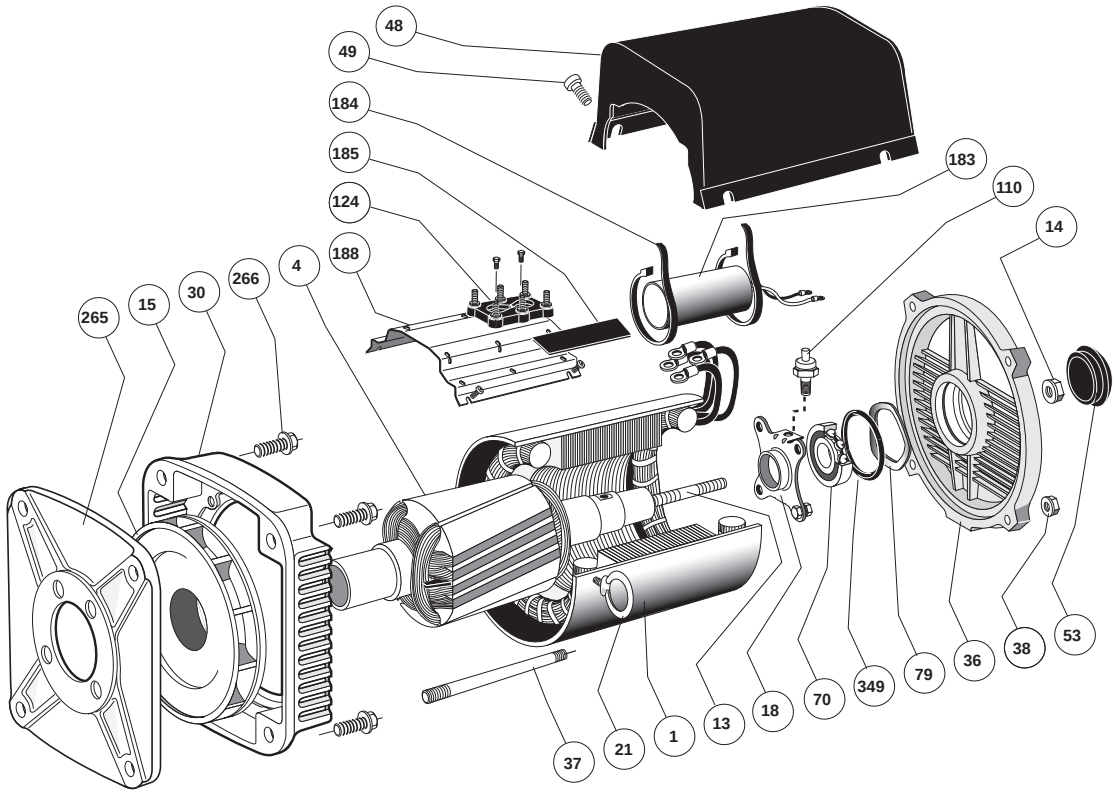
No.	Qty	Description
1	1	Stator assembly
4	1	Rotor assembly
13	1	Tie rod
14	1	Rod nut
15	1	Fan
18	1	Balancing disc
21	1 - 2	Lifting ring
22	1	Key
30	1	DE shield
33	1	Protective guard
34	2	Fixing screws
36	1	NDE shield
37	4	Tie rod
38	4	Nut
43	1	Cable gland
48	1	Cover top panel
49	13	Fixing screws
53	1	Plug
60	1	Drive end bearing
70	1	NDE bearing
79	1	Spring washer
110	2	Direct diode
124	1	Terminal block
183	-	Capacitor
184	-	Clamp
185	-	Adhesive
188	1	Capacitor support
265	1	Flange adaptor
266	4	Fixing screws
284	1	Circlip
322	1	Coupling disc
323	6	Fixing screws
324	1	Clamping washer
349	1	'O' ring seal
410	1	DE end shield

LSA 37 - 2 POLE - ACC
ALTERNATORS
SPARE PARTS

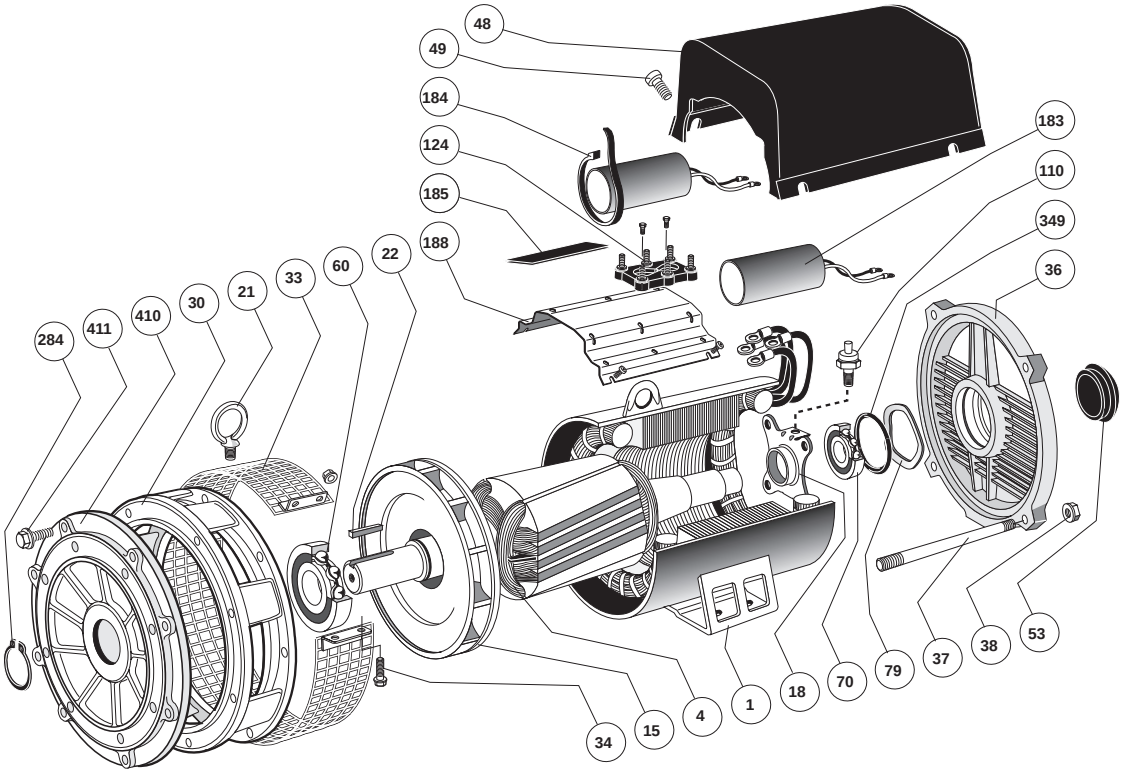
5.3.1 - LSA 37 - Single-bearing - IM 1201



5.3.2 - LSA 37 - Single-bearing - SAE J609a



5.3.3 - LSA 37 - Two-bearing- IM 1001



Alternator Division

6 June 2007

EC DECLARATION OF INCORPORATION

Concerns electric generators designed to be incorporated in machines subject to Directive no. 98/37/EC.

The manufacturer : Moteurs LEROY-SOMER
Boulevard Marcellin Leroy
16015 ANGOULEME (France)

Herein declares that the electric generators in the PARTNER range (low voltage) and those series based on them conform to the following standards and directives:

- EN and IEC 60034-1 and 60034-5

- ISO 8528-3 (Design of alternators for generator applications)

- Low Voltage Directive no. 73/23/EC dated 19 February 1973, modified by Directive no. 93/68/EC dated 22 July 1993

These generators are designed to be used in complete power generating sets which must comply with the following standards and directives:

- Machinery directive no. 98/37/EC

- EMC directive no. 89/336/EC modified by Directives nos. 92/31 EC dated 28 April 1992 and 93/68/EC dated 22 July 1993, concerning the intrinsic characteristics of emission and immunity levels.

- Standard EN 60204-1 (Electrical Equipment of Industrial Machines)

WARNING:

The above-mentioned generators must not be commissioned until the machines in which they are to be incorporated have been declared as conforming to Directives nos. 98/37/EC and 89/336 EC and any other directives that may be applicable.

Ref : 4152 en – 06.2007/a

ALTERNATOR DIVISION

LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

RCS ANGOULÊME N° B 671 820 223
S.A. au capital de 62 779 000 ¤

www.leroy-somer.com