

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

Installation and maintenance

LSA 36 - 4-POLE - SINGLE-PHASE 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 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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All brands and models have been registered and patents applied for.

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 alternator, you can look forward to many years of trouble-free operation.

1 - RECEIPT

1.1 - Standards and safety measures	3
1.2 - Inspection.....	3
1.3 - Identification.....	3
1.4 - Storage	3

2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics	4
2.2 - Mechanical characteristics.....	4

3 - INSTALLATION - COMMISSIONING

3.1 - Assembly	5
3.2 - Coupling.....	5
3.3 - Checks prior to commissioning	5
3.4 - Terminal connection diagrams.....	6
3.5 - Commissioning and set-up	6

4 - SERVICING - MAINTENANCE

4.1 - Safety measures	7
4.2 - Routine maintenance	7
4.3 - Fault detection	7
4.4 - Mechanical faults	8
4.5 - Electrical faults.....	8
4.6 - Dismantling, reassembly.....	10

5 - SPARE PARTS

5.1 - First maintenance parts	11
5.2 - Technical support service	11
5.3 - Parts list, exploded view	12

LSA 36 - 4-POLE - SINGLE-PHASE 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 34-1, (EN 60034)

- The recommendations of the

International Standards Organisation ISO 8528

- The European Community directive 89/336/EEC on Electromagnetic Compatibility (EMC)

- **The European Community directives**

73/23/EEC and 93/68/EEC (Low Voltage Directive)

They are CE marked with regard to the LVD (Low Voltage Directive) in their role as a machine component. A declaration of incorporation can be supplied on request.

Before using your generator for the first time, read carefully the contents of this installation and maintenance manual, supplied with the machine. All operations performed on the generator should be undertaken by qualified personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components. This maintenance manual should be retained for the whole of the machine's life and be handed over with the contractual file.

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.

1.2 - Inspection

On receipt of your alternator, check that it has not suffered any damage in transit. If there are obvious signs of damage, contact the transporter (you may be 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 glued to 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: **LSA 36 L12 A1/4**

- LSA: Name used in the PARTNER range
 - 36: Machine type
- L12: Model
- A: Excitation system (ACC)
- 1/4: Winding number/number of poles

1.3.1 - Nameplate

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

1.4 - Storage

Prior to commissioning, machines should not be stored in humid conditions: at relative humidity levels greater than 90%, the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.

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 every two weeks to avoid marking the bearing rings.

ALTERNATEURS PARTNER ALTERNATORS

LSA Date

N Hz

Min⁻¹/R.P.M. Protection

Altit. ≤ m Masse / Weight

Rlt AV/D.E bearing

Rlt AR/N.D.E bearing

PUISSANCE / RATING (S1)

kVA CosØ/P.F.

kW

Voltage Amps

kVA CosØ/P.F.

kW

Voltage Amps

Temp. Phase

166631 Conforme à C.E.I 60034-1. According to I.E.C 60034-1.

Made in France - 1 024 959/a

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

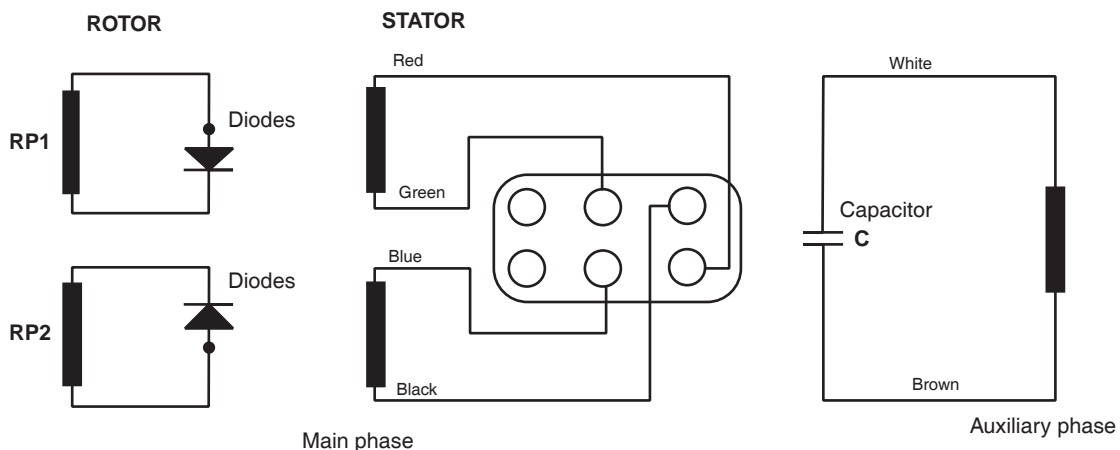
TECHNICAL CHARACTERISTICS

2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

The PARTNER LSA 36 single-phase alternator is a machine without slip-rings or brushes. It is self-excited by an auxiliary phase with capacitor (ACC system). Interference suppression conforms to standard EN 55011, group 1, class B.

2.1.1 - Outline diagram



2.2 - Mechanical characteristics

- Aluminium frame
- Steel or aluminium shields
- Protected ball bearings, permanently greased
- Mounting arrangement

Single-bearing with SAE disc: IM 1201 (MD 35)

- Open drip-proof machine, self-cooled
 - Degree of protection: IP23
- If mounting horizontally: 90° in relation to the original position, the degree of protection is IP21
- Speed of rotation: 1500 min⁻¹ or 1800 min⁻¹ depending on type
 - Clockwise

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS INSTALLATION

3 - INSTALLATION

3.1 - Assembly

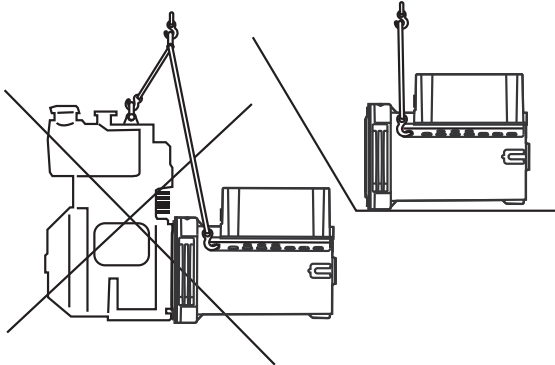


All mechanical handling operations must be undertaken using approved equipment.

While being handled, the machine should remain horizontal.

3.1.1 - Handling

The lifting points are for handling the alternator alone. They must not be used to lift the genset. Choose a lifting system which respects the positioning of the rings.



3.2 - Coupling

CAUTION

Before coupling the machines, check that they are compatible by checking the dimensions, the flywheel and its housing, the flange, coupling discs and offset.

- Mount the rotor (4) and stator (1) assembly on the flange adaptor using the 4 screws (31) torque (see section 4.6.2)
- Screw the tie rod (13) onto the motor shaft, tighten the nut to the required torque (see section 4.6.2) and insert the plug (53).

After tightening the screws, check that there is lateral play on the crankshaft.

3.2.1 - Assembly of the single-bearing disc version IM1201 (see section 5.3.1)

CAUTION

When coupling the alternator to the prime mover, the holes of the coupling discs should be aligned with the flywheel holes by cranking the engine.

Do not use the fan to turn the alternator rotor.

- Fit the tapered shaft disc kit on the motor flywheel.
- Mount the flange adaptor on the motor tightening torque (see section 4.6.2).
- Mount the rotor (4) and stator (1) assembly on the flange adaptor using the 4 screws (31) torque (see section 4.6.2)

- Screw the tie rod (13) onto the motor shaft, tighten the nut to the required torque (see section 4.6.2) and insert the plug (53).

After tightening the screws, check that there is lateral play on the crankshaft.

3.2.2 - 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 machine or engine, but also exhaust fumes.

3.3 - Checks prior to commissioning

3.3.1 - 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 several possible methods for restoring the above minimum values.

- a) Dry out the machine without the cover for 24 hours in a drying oven at a temperature of approximately 80°C.
- b) Blow hot air into the air intake, having made sure that the machine is rotating.

- Check that the winding connection corresponds to the site operating voltage (see section 3.4).

3.3.2 - Mechanical checks

Before starting the machine for the first time, check that:

- The feet fixing screws and nuts are tightened to the correct torque
- The cooling air is drawn in freely
- The coupling is correct

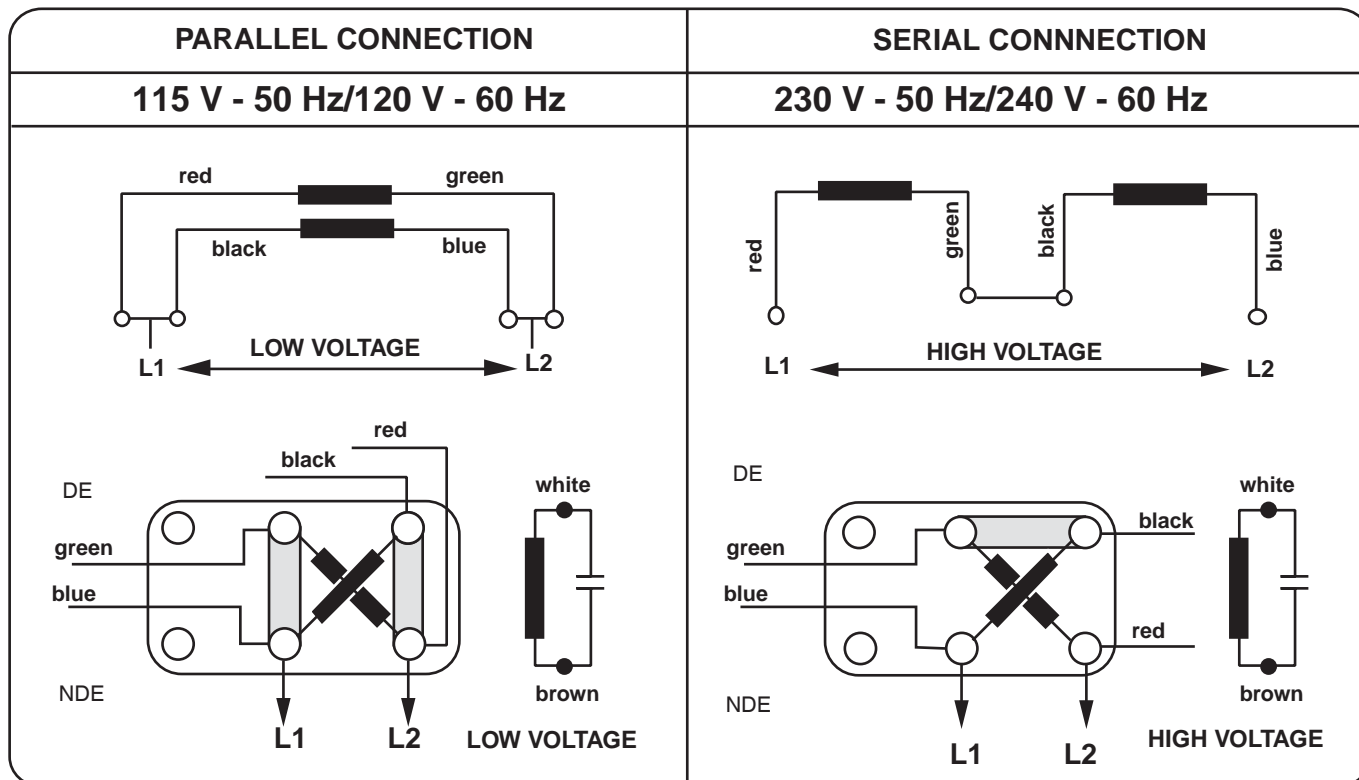
LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS INSTALLATION

3.4 - Terminal connection diagrams

To modify the connection, change the position of the terminal links. 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.



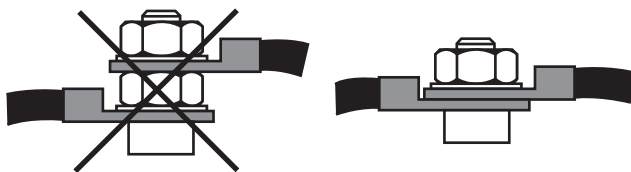
3.4.1 - Connection checks



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

Check that:

- The residual circuit-breaker, in compliance with the legislation on protection of personnel in force in the country of use, has been correctly installed on the alternator power output as close as possible to the alternator.
- The machine has been connected with the busbar separating the terminals as shown in the terminal connection diagram.



- Any protection devices in place have not been tripped.
- There is no short-circuit between phases between the alternator output terminals and the generator set control cabinet (part of the circuit not protected by the circuit-breakers or relays in the cabinet).

3.5 - Commissioning and set-up



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

The machine is tested and set up 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 achieve its rated speed and voltage; however in the event of abnormal operation, a search for the fault must be instigated (see section 4.4).

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

SERVICING - MAINTENANCE

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.

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 - Routine 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 grilles: mud, fibre, grease, etc.

4.2.3 - Bearings

The bearings are permanently greased.

4.2.4 - Electrical servicing

Cleaning product for the windings

CAUTION

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
- Cyclohexane (non toxic); inflammable

Stator, rotor cleaning

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

CAUTION

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.

The machine should be cleaned with a degreasing agent, applied using a brush. Compressed air should be used to remove any dust.

After cleaning the alternator, it is essential to check the winding insulation (see section 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 protection devices are fitted correctly
- The connections comply with the diagrams in the manuals supplied with the machine
- The genset speed is correct (see section 1.3)

Repeat the operations defined in section 3.

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

SERVICING - MAINTENANCE

4.4 - Mechanical faults

Fault		Action and possible consequences
Bearing	Excessive temperature rise in one or both bearings (temperature > 80°C on the antifriction bearings with or without abnormal noise)	- If the bearing has turned blue or if the grease has turned black, change the bearing - Bearing not properly seated - End shields misaligned (flanges not properly fitted)
Temperature abnormal	Excessive temperature rise of alternator frame (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) - Faulty mounting or play in coupling
	Excessive vibration and humming noise coming from the machine	- Stator short-circuit
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration	- System short-circuit - Broken or damaged coupling - Broken or bent shaft end - Shifting and short-circuit of revolving field winding - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes

4.5 - Electrical faults

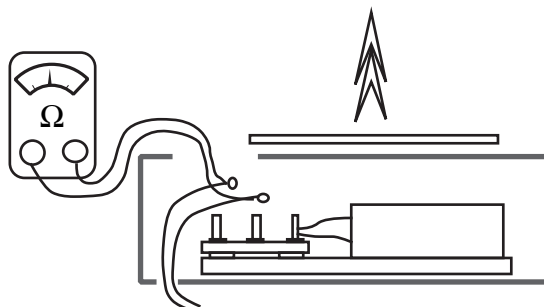
Fault	Action	Effect	Check/cause
No voltage at no load on start-up	Apply 6 V DC to one of the capacitors for 1 second	The alternator builds up and its voltage is still correct when the battery is removed	- Lack of residual magnetism - Check the capacitor voltage (approximately 10 to 15 V at the auxiliary winding terminals, with the capacitor disconnected)
		The alternator builds up but its voltage does not reach the rated value when the battery is removed	- Check whether there is a break in the capacitor circuit or one of the capacitors
		The alternator builds up but its voltage disappears when the battery is removed	- If the voltage is too low, the diodes are faulty.
Voltage too low	Check the drive speed	Correct speed	- Disconnection of the auxiliary winding - Rotating diodes burnt out - Main field winding short-circuited - check the resistance
		Speed too low	Increase the drive speed
Voltage too high	Reduce the speed		Genset speed too high
Voltage correct at no load and too low when on load			- Speed drop too great when on load - Check the speed - Genset overloaded - Short-circuit in the revolving field coil. Check the resistance

4.5.1 - Measurement of STATOR winding resistances



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

- Unscrew the 4 cover fixing screws.
- Disconnect the capacitor wires in order to read the auxiliary phase resistance.
- Disconnect the wires from the winding to the terminal block in order to read the main phase resistance.



LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

SERVICING - MAINTENANCE

Resistances Ω	Main stator winding			
	50 Hz		60 Hz	
	110 V	230 V	120 V	240 V
4 P stator				
LSA 36 L12	0.23	0.9	0.17	0.67

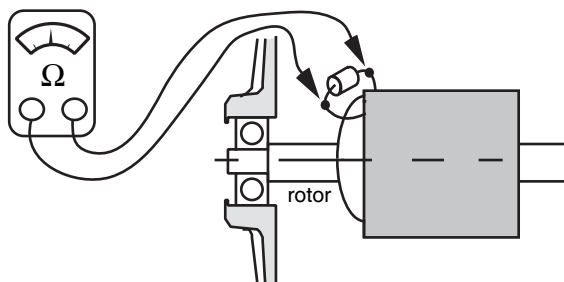
Resistances Ω	Auxiliary stator winding	
	50 Hz	60 Hz
	4 P stator	
LSA 36 L12	1.64	1.46

4.5.2 - Measurement of ROTOR winding resistances



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

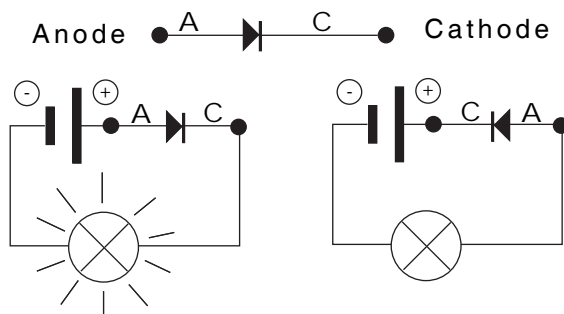
- Unscrew the 4 fixing screws (31) on the flange adaptor (265).
- Remove the stator (1), taking care with the windings, then access the diodes (110).



Resistances Ω	Rotor winding 50/60 Hz		
	RP1	RP2	Total
	4 P rotor		
LSA 36 L12	3.2	3.2	6.4

4.5.3 - Checking the diodes

- 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.

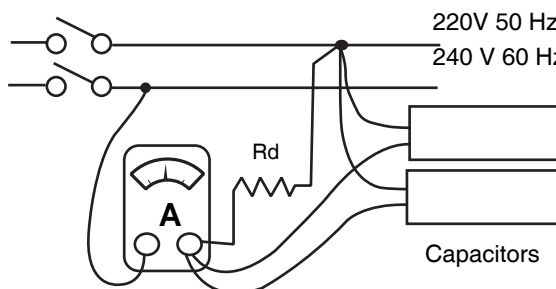


4.5.4 - Checking the capacitors



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

- Unscrew the 4 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 Ω - 20 W)
The currents are indicated at ±10%

Capacitor (...μF-450V - 3000H)	50 Hz		60 Hz	
	220 V	240 V	220 V	240 V
4 poles	μF	I (A)	μF	I (A)
LSA 36 L12	2 x 22.5	10.0	2 x 22.5	11.8

4.6 - Dismantling, reassembly (see section 5.3.1)



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

CAUTION

While being handled, the machine should remain horizontal (rotor not locked when moved).

4.6.1 - Tools required

To fully dismantle the machine, we recommend using the tools listed below:

- 1 ratchet spanner
- 1 torque wrench
- 1 8 mm/13 mm socket
- 1 TORX T20 bit
- 1 puller

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

SERVICING - MAINTENANCE

4.6.2 - Screw tightening torque

IDENTIFICATION	Screw Ø	Torque N.m
Flange adaptor screw (31 frame)	M8	20 N.m
Tie rod (SAE J609)	5/16 - UNF	17 N.m
Cover fixing	M5	4 N.m

4.6.3 - Access to diodes

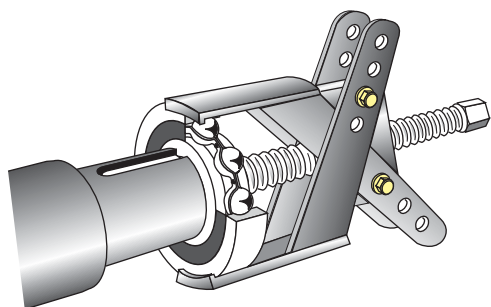
- Unscrew the 4 fixing screws (31) on the flange adaptor (265).
- Remove the stator (1), taking care with the windings, then access the diodes (110).

4.6.4 - Access to connections and capacitors

Unscrew the 4 fixing screws (49), then remove the cover.

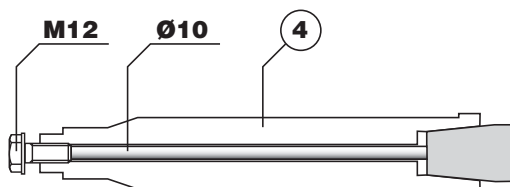
4.6.5 - Replacing the NDE bearing

- Unscrew the 4 fixing screws (31) on the flange adaptor (265) for the single-bearing version.
- Remove the stator (1), taking care with the windings.
- Extract the antifriction bearing (70) using a puller with a central screw (see drawing).
- Replace the antifriction bearing and the 'O' ring seal (349).



4.6.6 - Dismantling the rotor

- Unscrew the 4 fixing screws (31) on the flange adaptor (265)
- Remove the stator (1), taking care with the windings
- Unscrew the armature rod (13) and remove it from the rotor (4)
- Insert a Ø10 tie rod in the rotor
- Position it in contact with the face of the motor shaft end (determine the length of the tie rod which should be 10 mm less than the rotor)
- Using an M12 screw, remove the rotor assembly (4)



4.6.7 - COMPLETE REASSEMBLY

- Simply reverse the dismantling procedure.

CAUTION

NOTE: When performing the various maintenance operations, check that the 'O' ring seal is present in the stator housing.

LSA 36 - 4-POLE - SINGLE-PHASE ALTERNATORS

SPARE PARTS

5 - SPARE PARTS

5.1 - First maintenance parts

Emergency repair kits are available as an option.

They contain the following items:

Ref.	Designation	Code
183	Kit: capacitor + 4 clamps	-
48	Kit: cover + plain faceplate + 4 screws	-
31	Kit: motor coupling fixing screws	-
109	Kit: diode support + NDE bearing	-
-	Kit: SAE 5, 6 1/2 flange + rod + coupled disc	-

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 inquiry to your usual contact, or to:

LEROY-SOMER

Usine de Sillac/Alternateurs

16015 ANGOULEME CEDEX - FRANCE

Tel.: (33) 05.45.64.45.64

Technical Support Service:

(33) 05.45.64.43.66 - (33) 05.45.64.43.67 -

(33) 05.45.64.43.68 - (33) 05.45.64.43.69

Fax: (33) 05.45.64.43.24

email: sat.sil@leroy-somer.com

CAUTION

Part numbers should be identified from the exploded views and their description from the parts list.

Our extensive network of service centers 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.

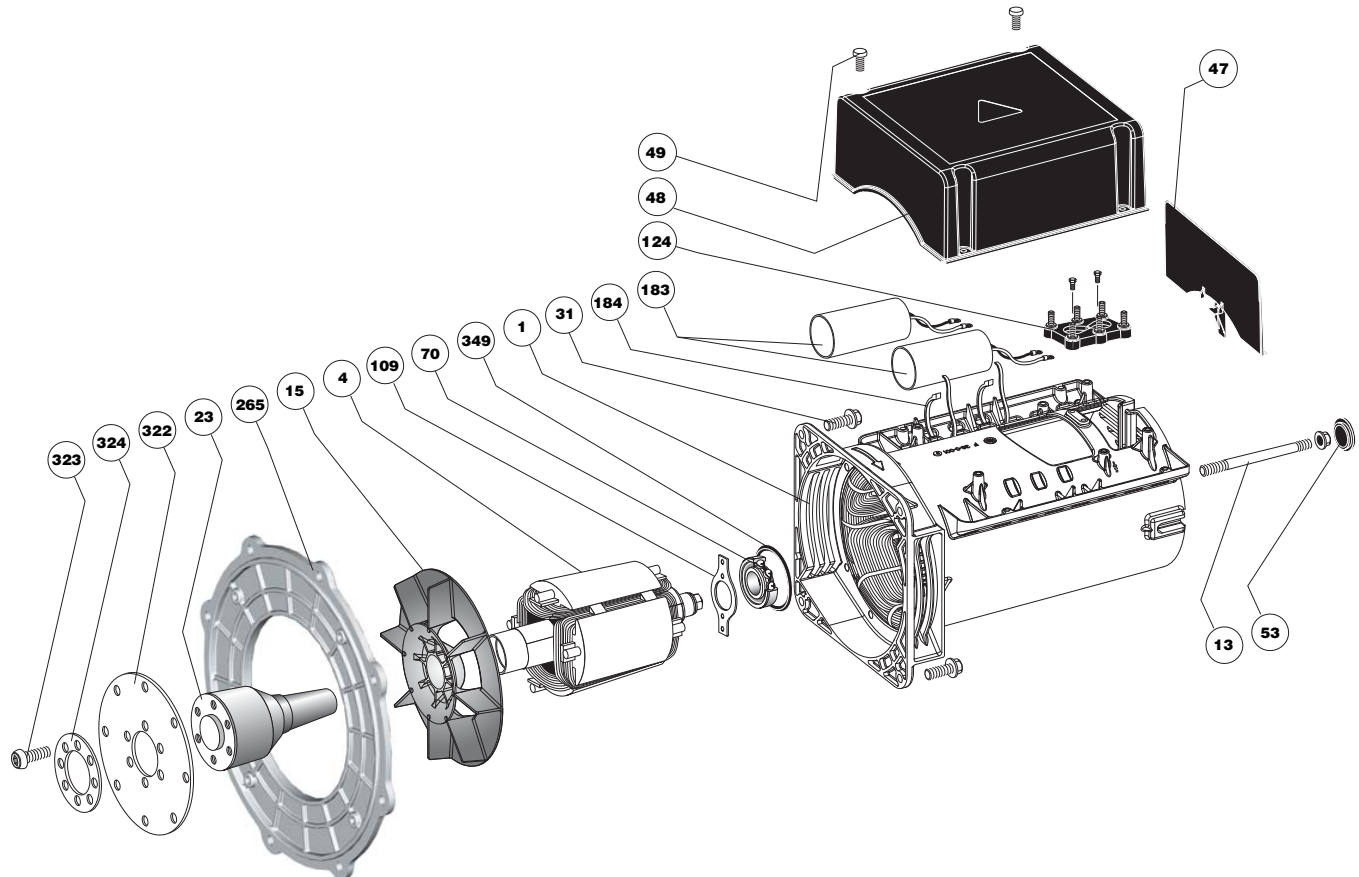
In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

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SPARE PARTS

5.3 - Parts list, exploded view

5.3.1 - LSA 36 - single-bearing with coupling disc



No.	Nbr	Description	No.	Nbr	Description
1	1	Stator assembly	265	1	Flange adaptor
4	1	Rotor assembly	322	1	Coupling disc
13	1	Tie rod + nut	323	6	Fixing screws
15	1	Fan	324	1	Clamping washer
23	1	Shaft end	349	1	'O' ring seal
31	4	Fixing screws			
47	1	Faceplate			
48	1	Cowling			
49	4	Cover screws			
53	1	Plug			
70	1	NDE bearing			
109	1	Diode support			
124	1	Terminal block			
183	2	Capacitor			
184	4	Clamp			

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