

## LSA 36 - 2-POLE - 3-PHASE ALTERNATORS

Installation and maintenance

# LSA 36 - 2-POLE - 3-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.

**CAUTION**

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



Warning symbol for general danger to personnel.



Warning symbol for electrical danger to personnel.

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

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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 - Inspection prior to first use.....	5
3.3 - Terminal connection diagrams.....	5
3.4 - Commissioning .....	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 .....	12
5.2 - Technical support service .....	12
5.3 - Parts list, exploded view .....	12

# LSA 36 - 2-POLE - 3-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 knocks, 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 L7 G6/2**

- LSA: name used in the PARTNER range
- 36 : Machine type
- L7: Model
- G: Excitation system: COMPOUND
- 6/2: 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 (heatshrink 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.

## ALTERNATEURS PARTNER ALTERNATORS

LSA  te  Da

N°

Min-1/R.P.M.  direction

Altitude  m above / Weigh

Rlt AV/DE bearing

Rlt AR/N.D. bearing

PUISSANCE / RANG (S1)

kVA  CoS $\phi$ /P.F.

kW

Voltage  Amps

---

kVA  CoS $\phi$ /P.F.

kW

Voltage  Amps

---

Temp.  Phase

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

Made in France - 1 024 949

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS

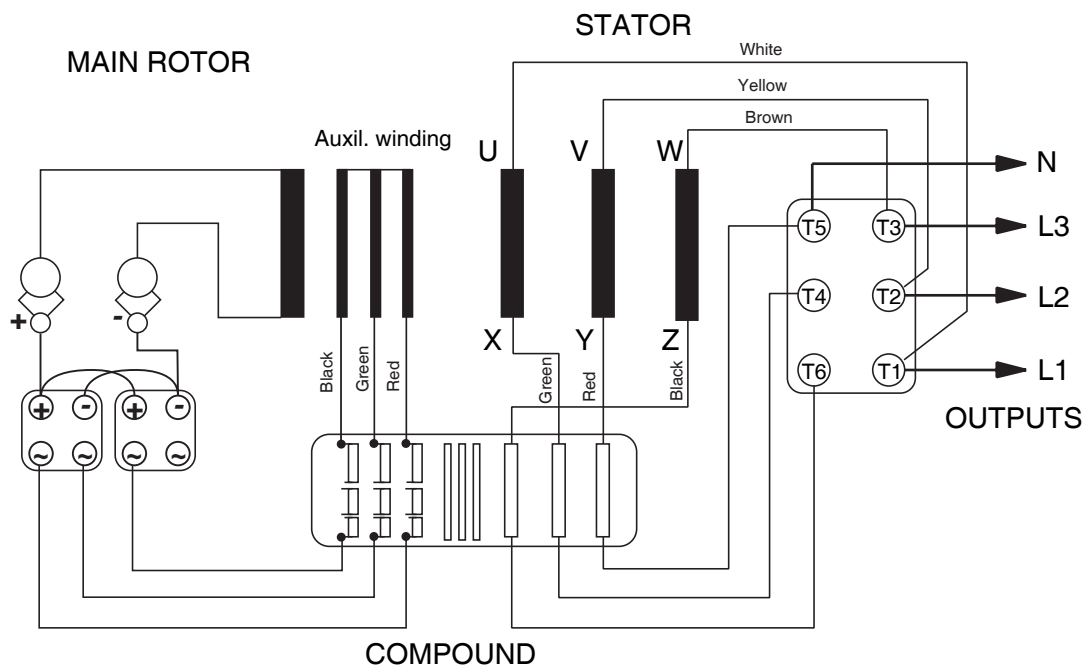
## TECHNICAL CHARACTERISTICS

## 2 - TECHNICAL CHARACTERISTICS

### 2.1 - Electrical characteristics

The PARTNER LSA 36 3-phase alternator is a machine with slip-rings and brushes. It is self-excited by a compound system. Interference suppression conforms to standard EN 55011, group 1, class B.

#### 2.1.1 - Schematic diagram



### 2.2 - Mechanical characteristics

- Aluminium frame
- Steel or aluminium shields
- Protected ball bearings, greased for life
- Mounting arrangement
  - Single-bearing with cone: SAE J 609a B ext 6
  - Single-bearing with cone: VAIT 23 & 30
  - Single-bearing with SAE disc: IM 1201 (MD 35 )
  - Double-bearing with IEC flange: IM 1001 (B 34 )
- Open drip-proof machine, self-cooled
- Degree of protection: IP 23
- Speed of rotation: 3000 min<sup>-1</sup> / 3600 min<sup>-1</sup>
- Clockwise

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS INSTALLATION

## 3 - INSTALLATION

### 3.1 - Assembly

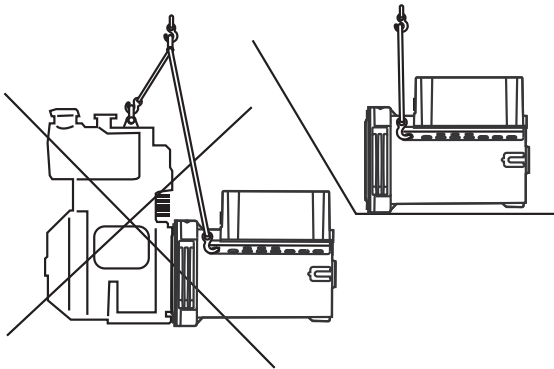


All mechanical handling operations must be undertaken using approved equipment.

Whilst 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 integrity and the environment of the alternators.



### 3.2 - Coupling

**CAUTION**

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

#### 3.2.1 - Assembly of the single-bearing version SAE J 609a B ext 6

- 1 - Mount the flange adaptor (265) on the motor, screw tightening torque: 40 N.m.
- 2 - Mount the rotor (4) and stator (1) assembly on the flange adaptor using the 4 screws (31) with 26 N.m torque and on the motor shaft using the rod (13) with 10 N.m torque.
- 3 - Insert the plug (53).

#### 3.2.2 - Assembly of the single-bearing disc version IM1201 - (MD35)

**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 alternator fan to turn the rotor.

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

#### 3.2.3 - Assembly of the double-bearing version IM 1001 (B34)

##### 3.2.3.1 - Pulley and belt coupling

The slide rails used to tighten the belts must be installed before fitting the alternator.

The tension screws must only be applied to the metal parts, and located with care.

Max. recommended radial force 85 kg for a DE bearing life of 10,000 hours.

- Bearings used:
- DE 6206 - C 3 protected 120°C
- NDE 6204 - C 3 protected 120°C
- Shaft diameter: Ø 28 mm
- Shaft length: 60 mm

Please follow carefully the manufacturer's recommendations for the belt and pulley dimensions.

##### 3.2.3.2 - Double-bearing alternator

- Semi-flexible coupling

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

#### 3.2.4 - 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 - Inspection prior to first use

#### 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 two possible methods for restoring these 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 3.3)

#### 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 - 2-POLE - 3-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.**

**(D)**  
3 phases

Winding	50 Hz	60 Hz
<b>6 S</b>	380 - 420	-
		-
		-

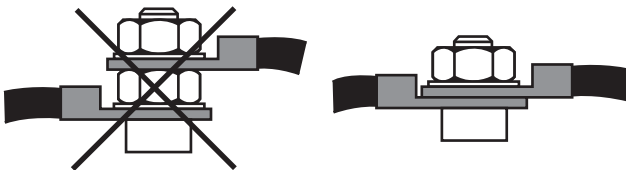
### 3.4.1 - Connection checks



**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 setting 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 - 2-POLE - 3-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. Monitor the temperature rise in the bearings, which should not exceed 90°C. Should this value be exceeded, the machine must be stopped and checks carried out.

##### 4.2.4 - Electrical servicing

Checking the wear of the brushes.

Periodically check the wear of the brushes:

- Every 750 hours.

A brush is considered to be worn when only 5 mm projects from the brush holder when the machine is idle.

##### 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. Check that the degreasing agent will not affect the paint.

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 set 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 - 2-POLE - 3-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).
Abnormal temperature	Excessive temperature rise 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 voltage (> 105% of Un on load) - Alternator overloaded
Vibration	Excessive vibration	- Misalignment (coupling) - Defective 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, possibly 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	Check/Cause
No voltage at no load on start-up	Apply 6 V DC to the (+) and the (-) at the bridge output for 1 second	- Check that there are no disconnected wires or breaks on the circuits. - Check the brushes (continuity of the + and - at the diode bridge output and condition of the brushes) - Build up with a voltage of 6 V between the + and the - of the diode bridge
Voltage too low	Check the drive speed	- Adjust the speed of the genset. - Check the resistance of the revolving field winding. - Check the connections of the compound and the tightening of the yoke.
Voltage too high	Reduce the speed	- Adjust the speed of the genset. - Check the tightening of the yoke and the adjustment of the compound.
Voltage correct at no load and too low when on load		- Check the connections of the compound, ensure that they are not reversed.
Voltage unbalanced	Unbalanced resistances	- Check the stator resistances.

#### 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 wires in order to read the auxiliary phase resistance.
- Disconnect the wires from the winding to the terminal block and the compound in order to read the resistance of the main phases.

Resistances $\Omega$	Main winding RP1	Auxil. winding RP2
2 P stator	50 Hz	50 Hz
LSA 36 L1	3.15	2.07
LSA 36 L35	2.3	2.01
LSA 36 L5	1.97	2.28
LSA 36 L7	1.26	1.68
LSA 36 L8	1.19	1.86



# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS

SERVICING - MAINTENANCE

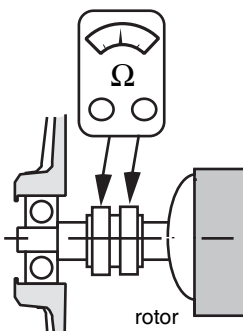
## 4.5.2 - Measurement of ROTOR winding resistances



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

- Unscrew the 4 cover fixing screws.
- Unsolder the wires on the diodes in order to read the resistance of each winding

Resistances Ω	RP1 - 50 Hz
2 P rotor	
LSA 36 L1	4.72
LSA 36 L35	5.58
LSA 36 L5	5.94
LSA 36 L7	7.02
LSA 36 L8	7.79



## 4.6.1 - Tools required

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

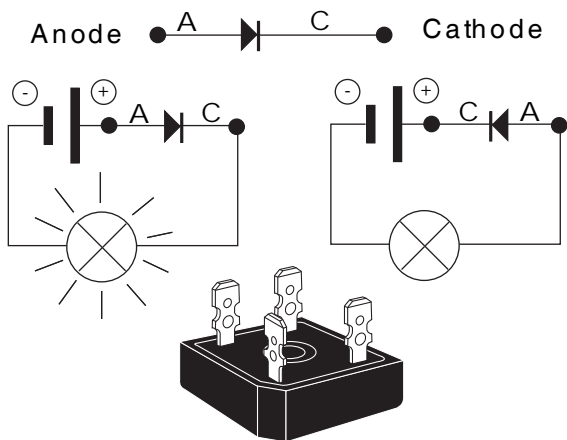
- 1 ratchet spanner
- 1 torque wrench
- 1 x 8 mm / 13 mm / 7 mm sockets
- 1 TORX T20 bit
- 1 puller

## 4.6.2 - Screw tightening torque

IDENTIFICATION	Screw Ø	Torque N.m
Flange adaptor screw (31 frame)	M8	26 N.m
Flange adaptor screw (VAIT)	M8	26 N.m
DE flange screw (31 frame)	M8	26 N.m
Tie rod (SAE J609)	5/16 - UNF	10 N.m
Tie rod (VAIT 23)	5/16 - UNF	10 N.m
Tie rod (VAIT 30)	M 14	10 N.m
Cover fixing	M5	4 N.m
Brush holder fixing	M4	3 N.m

## 4.5.3 - Checking the diode bridges

A diode in good working order should allow the current to flow only in the anode-to-cathode direction.



## 4.6 - Dismantling, reassembly (see sections 5.3.1, 5.3.2 & 5.3.3)



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**

Whilst being handled, the machine should remain horizontal (rotor not axially secured).

**CAUTION**

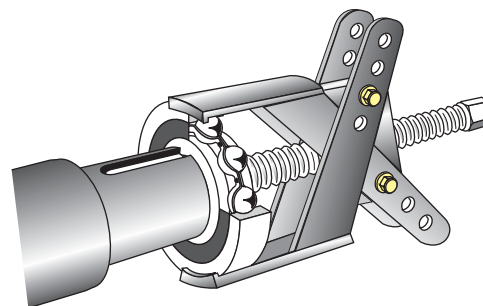
Before carrying out any work which requires the removal of the stator or the rotor, refit the brush holder.

## 4.6.3 - Access to the connections

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

## 4.6.4 - Replacing the NDE bearing

- Unscrew the 4 fixing screws (31) on the flange adaptor (265) for the single-bearing version or on the shield (30) for the double-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).



## 4.6.5 - Replacing the DE bearing

- Loosen the tie rod (13).
  - Unscrew the 4 fixing screws (31) from the DE bearing (30).
  - Remove the rotor assembly from the stator (take care with the windings and the brushes).
- Extract the bearing assembly (30) + and the shaft extension

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS

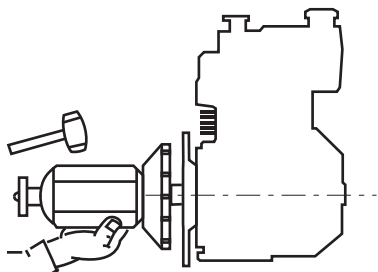
## SERVICING - MAINTENANCE

(23) from the rotor (4) by knocking the end of the tie rod (13) with a mallet.

- Remove the circlip (412).
- Knock out the shaft extension (23) and the bearing (60) from the shield (30).
- Remove the circlip (284).
- Extract the ball bearing (60) using a puller.
- Replace the antifriction bearing.

### 4.6.6 - Dismantling the rotor with conic coupling

- Unscrew the 4 fixing screws (31) on the flange adaptor (265).
- Remove the stator (1), taking care of the windings.
- Unscrew the armature rod (13) from the rotor (4). Using a mallet, hold the rotor in one hand and use the other hand to tap the salient pole firmly with the mallet in order to remove the rotor from the motor shaft (see drawing).



### 4.6.7 - Replacing the brushes

- Unscrew the brush holder.
- Unscrew the four fixing screws on the plate without disconnecting it, and move it in order to take out the brush holder.

### 4.6.8 - COMPLETE REASSEMBLY

- Simply reverse the dismantling procedure.

**CAUTION**

**NOTE :** After the various maintenance operations, check that the 'O' ring seal is present in the bearing housing of the stator housing. When the machine is replaced in position, take care to return the brush holder to its correct position.

# LSA 36 - 2-POLE - 3-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.	Description	Code
48	Kit: cover + plain faceplate	-
47	Kit: complete prewired faceplate	-
265	Kit: SAE J 609a Bext6 flange	-
-	Kit: VAIT flange	-
110	Kit: NDE bearing	-
-	Kit: SAE 5 flange	-
30	Kit: B3 with fitted bearing	-
-	Kit: B34 with fitted bearing	-

### 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, or to:

#### MOTEURS LEROY-SOMER

Usine de Sillac/Alternateurs

**CAUTION**

**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.**

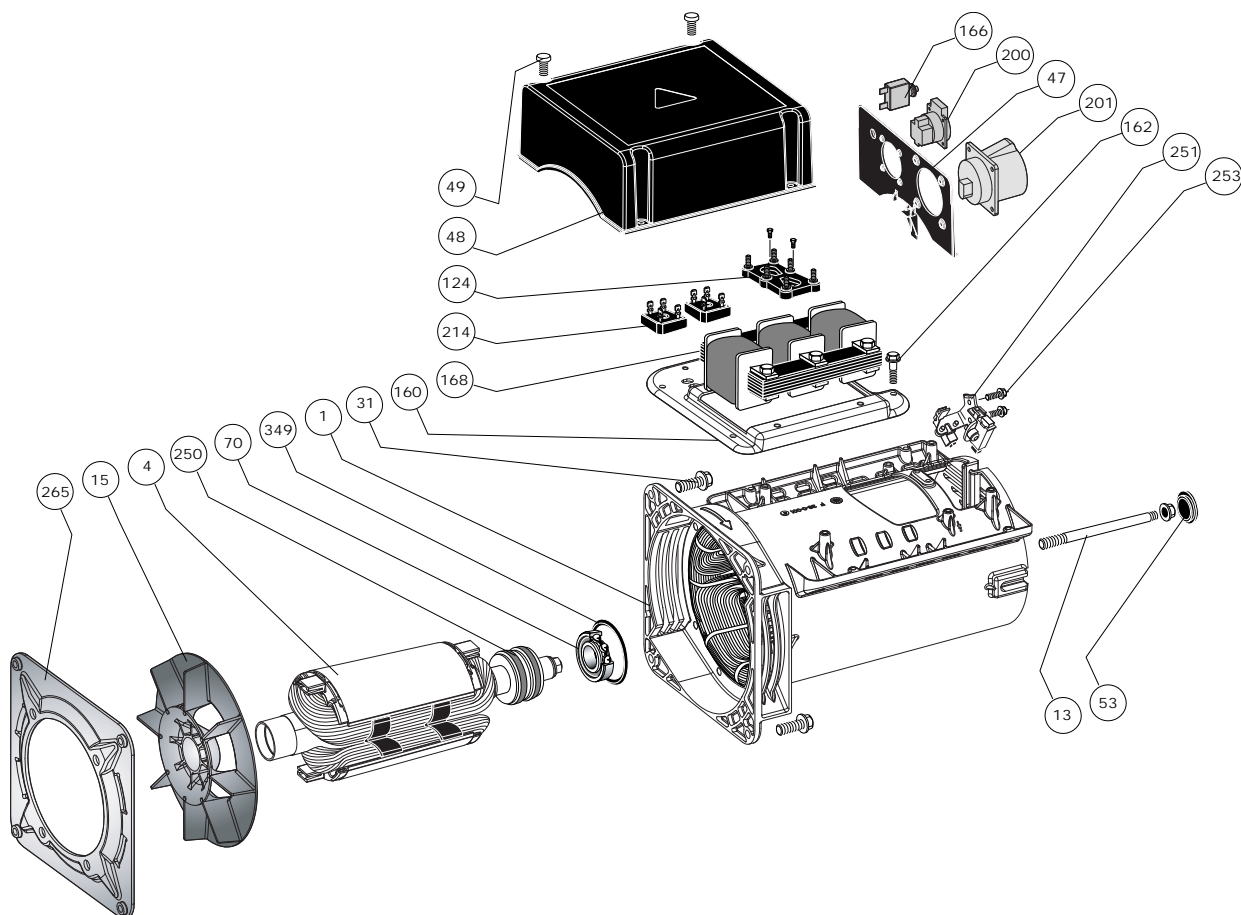
**To ensure correct operation and the safety of our machines, we recommend the use of original manufacturer spare parts.**

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

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS SPARE PARTS

## 5.3 - Parts list, exploded view

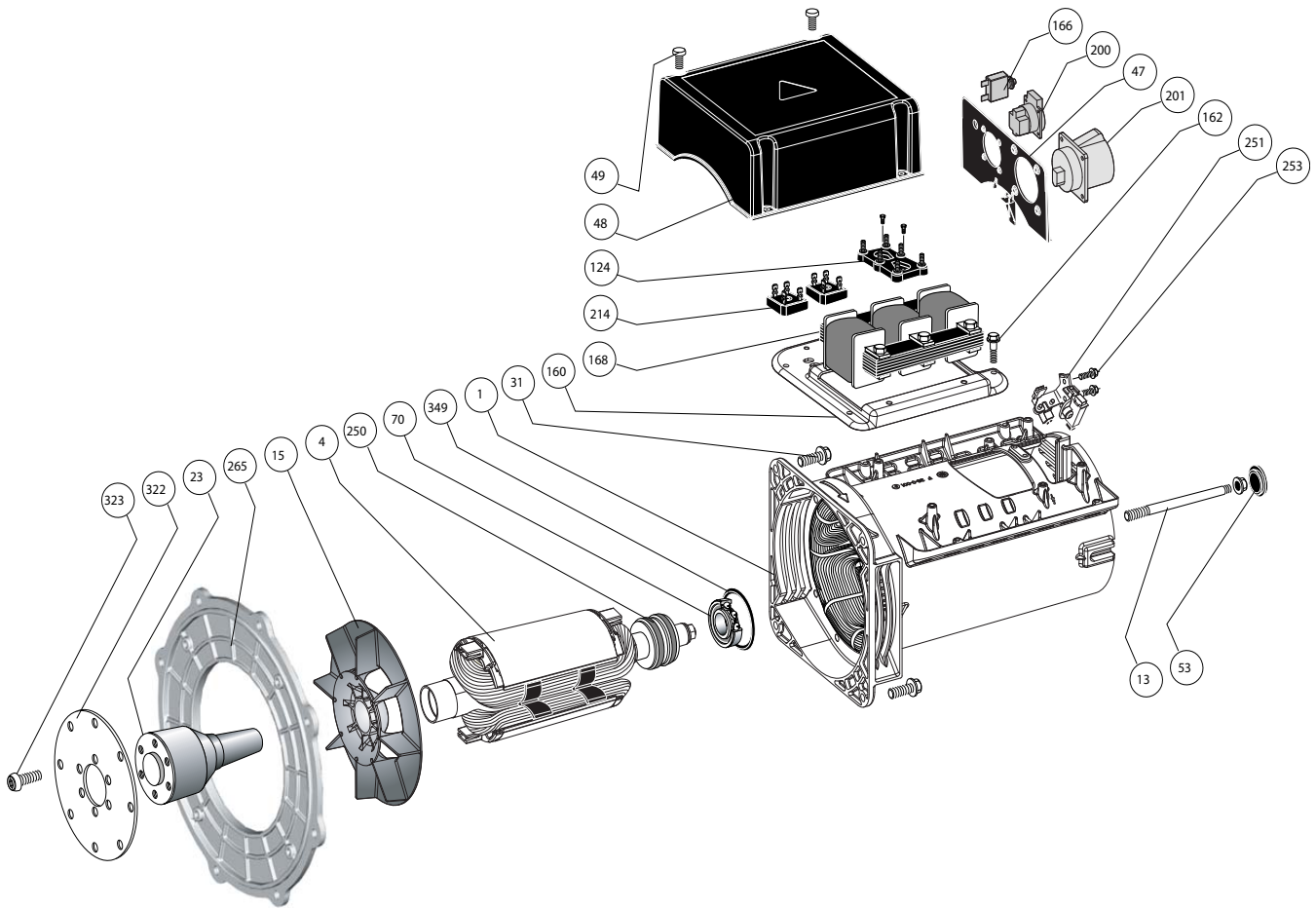
### 5.3.1 - LSA 36 - SAE J 609 single-bearing



N°	Nbr	Description	N°	Nbr	Description
1	1	Stator assembly	251	1	Brush holder
4	1	Rotor assembly	253	1	Fixing screws
13	1	Tie rod	265	1	Flange adapter
15	1	Fan	349	1	'O' ring seal
31	4	Fixing screws			
47	1	Faceplate			
48	1	Cover			
49	4	Cover screws			
53	1	Plug			
70	1	Non drive end bearing			
124	2	Terminal block with terminals			
160	1	Compounding plate			
166	1	Circuit-breaker			
168	1	Compounding transformer			
200	1	Single-phase socket			
201	1	3-phase socket			
214	2	Supply bridge			
250	1	Sliprings			

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS SPARE PARTS

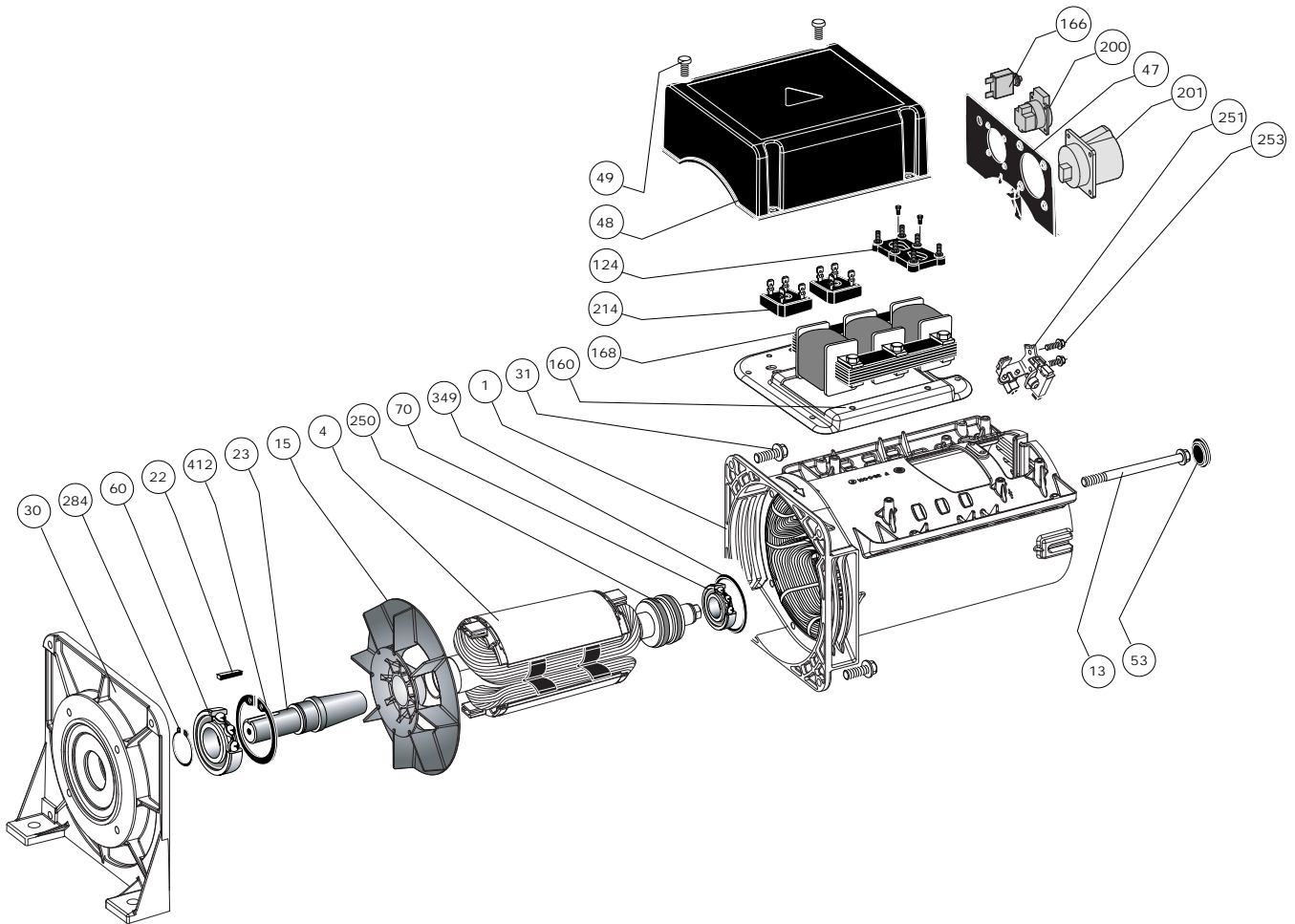
## 5.3.2 - LSA 36 - single-bearing with coupling disc



N°	Nbr	Description	N°	Nbr	Description
1	1	Stator assembly	214	2	Supply bridge
4	1	Rotor assembly	250	1	Sliprings
13	1	Tie rod + nut	251	1	Brush holder
15	1	Fan	253	1	Fixing screws
23	1	Cylindrical shaft extension	265	1	Flange adapter
31	4	Fixing screws	322	1	Coupling disc
47	1	Faceplate	323	6	Fixing screws
48	1	Cover	349	1	'O' ring seal
49	4	Cover screws			
53	1	Plug			
70	1	Non drive end bearing			
124	2	Terminal block with terminals			
160	1	Compounding plate			
162	4	Fixing screws			
166	1	Circuit-breaker			
168	1	Compounding transformer			
200	1	Single-phase socket			
201	1	3-phase socket			

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS SPARE PARTS

## 5.3.3 - LSA 36 - double-bearing



N°	Nbr	Description	N°	Nbr	Description
1	1	Stator assembly	168	1	Compounding transformer
4	1	Rotor assembly	200	1	Single-phase socket
13	1	Tie rod + nut	201	1	3-phase socket
15	1	Fan	214	2	Supply bridge
22	1	Key	250	1	Sliprings
23	1	Cylindrical shaft extension	251	1	Brush holder
30	1	DE shield	253	1	Fixing screws
31	4	Fixing screws	284	1	Circlip
47	1	Faceplate	349	1	'O' ring seal
48	1	Cover	412	1	Circlip
49	4	Cover screws			
53	1	Plug			
60	1	Drive end bearing			
70	1	Non drive end bearing			
124	2	Terminal block with terminals			
160	1	Compounding plate			
162	4	Fixing screws			
166	1	Circuit-breaker			

# LSA 36 - 2-POLE - 3-PHASE ALTERNATORS

NOTES





**LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE**

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

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