

# LSA 49.1 - 4 POLES ALTERNATORS

Installation and maintenance

# LSA 49.1 - 4 POLES ALTERNATORS

This manual concerns the alternator which you have just purchased.

We wish to draw your attention to the contents of this maintenance manual.

## 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 wish to 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.

## 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 EC and plus any other directives that may be applicable.

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## EC declaration of incorporation

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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 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 fixed on the machine (see drawing).

Make sure that the nameplate on the machine conforms to your order.

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, machines should be stored :

- away from humidity (< 90%); after a long period of storage, check the machine insulation. To prevent the bearings from becoming marked, do not store in an environment with significant vibration.

### 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.



## PARTNER

## ALTERNATORS

LSA		IP	
N°:		Date :	
r.p.m.	Hz	Weight : kg	
P.F. :	Th.class.	Altitude : m	
A.V.R.		Excit.	
Excit. values	full load : V / A		
	at no load : A		
D.E. bearing			
N.D.E. bearing			
C 166631			

RATINGS			
Voltage			V
Phase			
Conn.			
Contin.			kVA
B.R.			kW
40°C.			A
Std by			kVA
P.R.			kW
27°C.			A
ISO 8528-3		Made in .....	

IEC 60034-1 &amp; 5

NEMA MG1-32 &amp; 33

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# LSA 49.1 - 4 POLES ALTERNATORS

## 2 - TECHNICAL CHARACTERISTICS

### 2.1 - Electrical characteristics

PARTNER LSA 49.1 alternator is a machine without sliprings or revolving field brushes, wound as "2/3 pitch"; 6 or 12-wire, with class H insulation and a field excitation system available in either AREP or "SHUNT+PMG" version (see diagrams and AVR maintenance manual).

#### • Options

- Stator temperature detection sensors
  - Space heaters
  - Terminal box with connector links for mounting protection or measurement C.T.
- In order to conform to standard EN 61000-6.3, EN 61000-6.2, the R 791 interference suppression kit is needed.

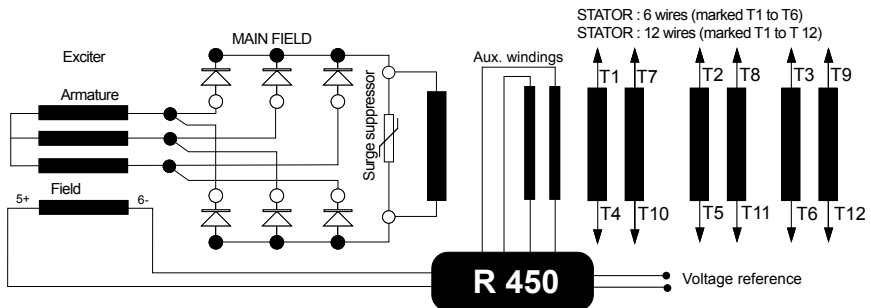
### 2.2 - Mechanical characteristics

- Steel frame
- Cast iron end shields
- Greasable ball bearings
- Mounting arrangement  
IM 1201 (MD 35): Single-bearing with feet and SAE flanges/coupling discs  
IM 1001 (B 34): Twin-bearing with SAE flange and standard cylindrical shaft extension
- Drip-proof machine, self-cooled
- Degree of protection: IP 23

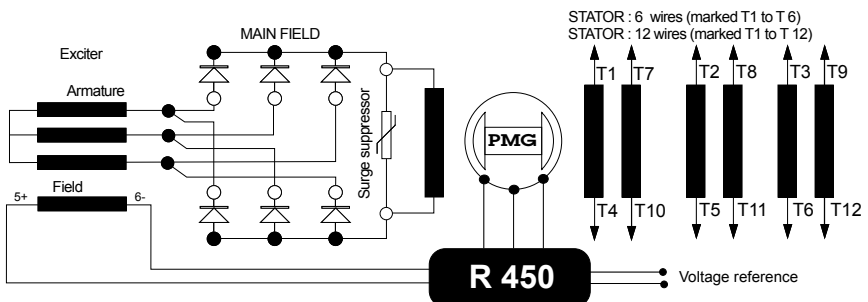
#### • Options

- Protection against harsh environments
  - Air inlet filter, air outlet labyrinth seals: IP 44
- To prevent excessive temperature rise caused by clogged filters, it is advisable to monitor the stator winding with thermal sensors (PTC or PT100).

### AREP system with R 450



### SHUNT + PMG system with R 450



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### 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

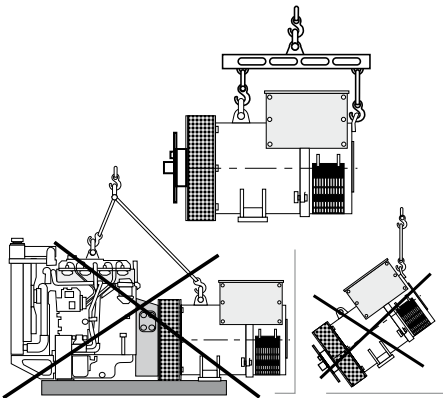


All mechanical handling operations must be undertaken using suitable equipment and the machine must be horizontal. Check how much the machine weighs (see 4.8) before choosing the lifting tool. During this operation, do not allow anyone to stand under the load.

##### • 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 machine.

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



##### • Single-bearing coupling

Before coupling the machines, check that they 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.

#### WARNING

When coupling the alternator to the prime mover, do not use the fan to turn the alternator or rotor.

The holes of the coupling discs should be aligned with the flywheel holes by cranking the engine.

Make sure the machine is securely bedded in position during coupling.

Check that there is lateral play on the crankshaft.

##### • Double-bearing coupling

- 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.

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

##### • Location

The room where the alternator is placed must be ventilated to ensure that the ambient temperature cannot exceed the data on the nameplate.

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### 3.2 - Checks prior to first use

#### • 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 2 possible methods for restoring the above minimum values.

- Dry out the machine for 24 hours in a drying oven at a temperature of 110 °C (without the regulator).
- Blow hot air into the air intake, having made sure that the machine is rotating with the exciter field disconnected.

#### **Note : 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.

**WARNING**

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

#### • Mechanical checks

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

- all fixing bolts and screws are tight,
- the 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.

- the winding connection corresponds to the site operating voltage (see section 3.3).

### 3.3 - Terminal connection diagrams

To modify the connection, change the position of the stator cables on the terminals. 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.**

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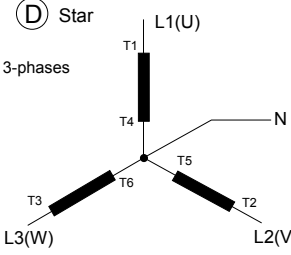
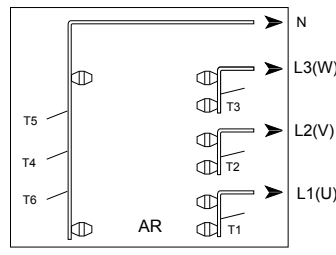
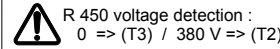
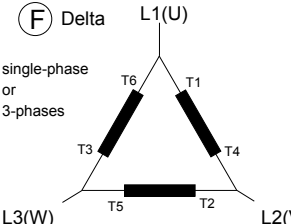
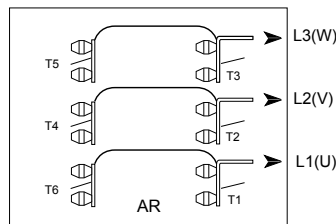
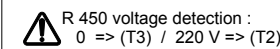
• Terminal connection : 12-wire

Connection code	Voltage L.L			Factory connection
<b>(A)</b> 3-phases 	Winding	50 Hz	60 Hz	
	6	190 - 208	190 - 240	
	7	208 - 220		
	8		190 - 208	
R 450 voltage detection : 0 => (T3) / 220 V => (T2)				
<b>(D)</b> 3-phases 	Winding	50 Hz	60 Hz	
	6	380 - 415	380 - 480	
	7	415 - 440		
	8		380 - 416	
R 450 voltage detection : 0 => (T3) / 380 V => (T2)				
Winding 9 : R 450 voltage detection + transformer (See specific diagram AREP or PMG)				
<b>(F)</b> 3-phases 	Winding	50 Hz	60 Hz	
	6	220 - 240	220 - 240	
	7	240 - 254		
	8		220 - 240	
R 450 voltage detection : 0 => (T3) / 220 V => (T2)				
Delta / Edison 	R 450 voltage detection : 0 => (T3) / 220 V => (T1)			
	Caution : M point connection is a factory modification.			

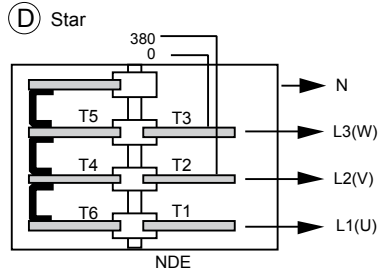
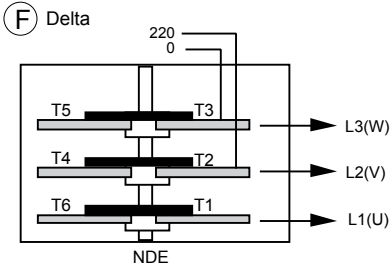


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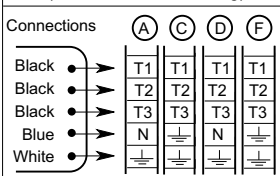
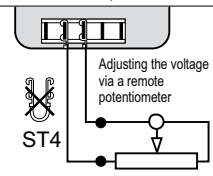
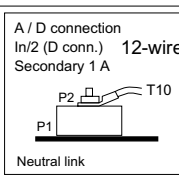
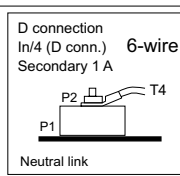
## • Terminal connection : 6-wire version

Connection code	Voltage L.L.			Factory connection
<b>(D)</b> Star 3-phases 	Winding	50 Hz	60 Hz	
	6S	380 - 415	380 - 480	
	7S	415 - 440		
	8S		380 - 416	
				
9	500 - 525	600	Winding 9 : R 450 voltage detection + transformer (See specific diagram AREP or PMG)	
<b>(F)</b> Delta single-phase or 3-phases 	Winding	50 Hz	60 Hz	
	6S	220 - 240	220 - 240	
	7S	240 - 254		
	8S		220 - 240	
				

Optional 6-wire terminal box with connector links for mounting protection and (or) measurement C. Ts.

<b>(D)</b> Star 	<b>(F)</b> Delta 
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## • Option connection diagram

R 791 T interference suppression kit (standard for CE marking)	External voltage potentiometer or ext. source 1V (resistance 1.5 KΩ)	Connection of the optional current transformer	
Connections 		A / D connection In/2 (D conn.) 12-wire Secondary 1 A 	D connection In/4 (D conn.) 6-wire Secondary 1 A 

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### • Connection checks



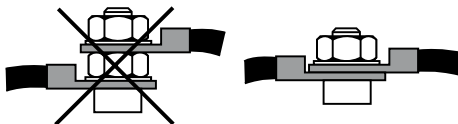
**Electrical installations must comply with the current legislation in force in the country of use.**

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 protection devices in place have not been tripped.
- If there is an external AVR, the connections between the alternator and the cabinet are made in accordance with the connection diagram.
- There is no short-circuit phase-phase or phase-neutral between the alternator output terminals and the generator set control cabinet (part of the circuit not protected by circuitbreakers or relays in the cabinet).
- The machine should be connected with the busbar separating the terminals as shown in the terminal connection diagram.



- The alternator earth terminal inside the terminal box is connected to the electrical earth circuit
  - The earth terminal (ref 28) is connected to the frame.
- The connections inside the terminal box must never be subjected to stress due to cables connected by the user.



### 3.4 - Commissioning



**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). With the regreasable bearing option, we recommend greasing the bearings at the time of commissioning (see section 4.3).

On application of the load, the machine should achieve its rated speed and voltage; however, in the event of abnormal operation, the machine setting can be altered (follow the adjustment procedure in section 3.5). 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. Ensure that the drive speed specified on the nameplate is reached before commencing adjustment. After operational testing, replace all access panels or covers. The AVR is used to make any adjustments to the machine.**

## LSA 49.1 - 4 POLES ALTERNATORS

### 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.



**Warning :** During and after running, the alternator will reach temperatures hot enough to cause injury, such as burns.

#### 4.2 - Routine maintenance

##### • 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.

##### • Electrical servicing

Commercially-available volatile degreasing agents can be used.

### WARNING

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



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. 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.

##### • Mechanical servicing

### WARNING

Cleaning the machine using water or a highpressure 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 the machine is fitted with air inlet and outlet filters, the maintenance personnel should clean them routinely at regular intervals. In the case of dry dust, the filter can be cleaned using compressed air and/or replaced if it is clogged.

After cleaning the alternator, it is essential to check the winding insulation (see sections 3.2 and 4.8).

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### 4.3 - Bearings

As an option, the bearings are regreasable	Regreasing interval: 4500 hrs of operation DE bearing: Amount of grease: 60 gr NDE bearing: Amount of grease: 50 gr
Standard grease	LITHIUM - standard - NLGI 3
Grease used in the factory	ESSO - Unirex N3
 It is imperative to lubricate the alternator during operation and on first use. Before using another grease, check for compatibility with the original one.	

### 4.4 - Mechanical defects

Fault		Action
Bearing	Excessive overheating of one or both bearings (bearing temperature 80°C above the ambient temperature) (With or without abnormal bearing noise)	<ul style="list-style-type: none"> <li>- If the bearing has turned blue or if the grease has turned black, change the bearing.</li> <li>- Bearing not fully locked (abnormal play in the bearing cage)</li> <li>- End shields incorrectly aligned</li> </ul>
Abnormal temperature	Excessive overheating of alternator frame (more than 40° C above the ambient temperature)	<ul style="list-style-type: none"> <li>- Air flow (inlet-outlet) partially clogged or hot air is being recycled from the alternator or engine</li> <li>- Alternator operating at too high a voltage (&gt;105% of Un on load)</li> <li>- Alternator overloaded</li> </ul>
Vibrations	Too much vibration	<ul style="list-style-type: none"> <li>- Misalignment (coupling)</li> <li>- Defective mounting or play in coupling</li> <li>- Rotor balancing fault (Engine - Alternator)</li> </ul>
	Excessive vibration and humming noise coming from the machine	<ul style="list-style-type: none"> <li>- Phase imbalance</li> <li>- Stator short-circuit</li> </ul>
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration	<ul style="list-style-type: none"> <li>- System short-circuit</li> <li>- Misparalleling</li> </ul> <p>Possible consequences</p> <ul style="list-style-type: none"> <li>- Broken or damaged coupling</li> <li>- Broken or bent shaft end</li> <li>- Shifting and short-circuit of main field</li> <li>- Fan fractured or coming loose on shaft</li> <li>- Irreparable damage to rotating diodes/AVR, surge suppressor</li> </ul>

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### 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- AREP / PMG < 10V	- Check the speed (or LAM set too high)
		Voltage between E+ and E- AREP / PMG > 15V	- Faulty rotating diodes - Short-circuit in the main field. Check the resistance - Faulty exciter armature.
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

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### • Checking the winding

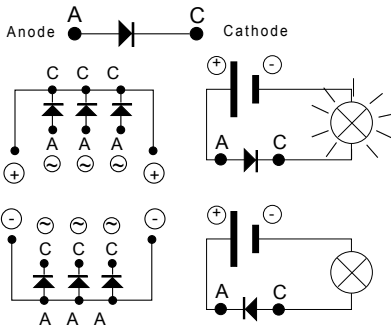
You can check the winding insulation by performing a high voltage test. In this case, you must disconnect all AVR wires.

### WARNING

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

### • Checking the windings and rotating • Checking the diode bridge

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



### diodes using separate excitation

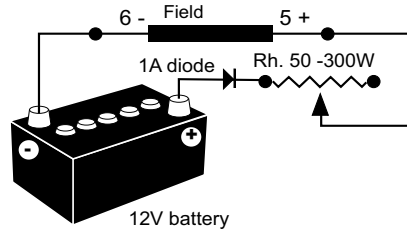


During this procedure, make sure that the alternator is disconnected from any external load and inspect the terminal box to check that the connections are fully tightened.

- 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-).

ASSEMBLY A



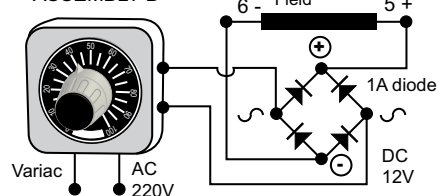
**Assembly B:** Connect a “Variac” variable power supply and a diode bridge on both exciter field wires (5+) and (6-).

Both these systems should have characteristics which are compatible with the field excitation power of the machine (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 machine 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 machine is in good working order. The fault therefore comes from the AVR or its associated wiring (ie. sensing, auxiliary windings).

ASSEMBLY B



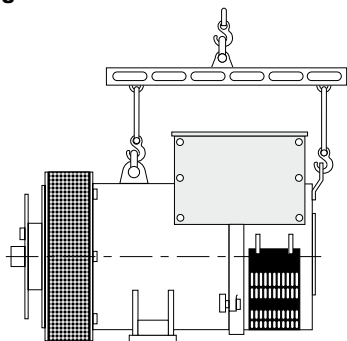
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### 4.6 - Dismantling, reassembly

#### WARNING

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

Whilst being handled, the machine should remain horizontal (rotor not locked in position). Check how much the machine weighs before choosing the lifting method.



#### • Tools required

To fully dismantle the machine, 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)

#### • Screw tightening torque

See section 5.4.

#### • Access to diodes

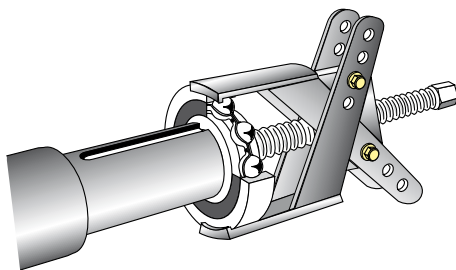
- Open the air intake grille (51).
- Disconnect the diodes.
- Disconnect the diodes using an ohmmeter or a battery lamp.
- Remove the surge suppressor (347).
- Remove the 6 "H" mounting nuts for the diode bridges on the support.
- Change the fitted caps, respecting the polarity.

#### • Access to connections and the regulation system

Access directly by removing the box lid (48) or the AVR access door (466).

#### • Replacing the NDE bearing on alternators connected to a diesel engine

- Remove the lid of the protective cover (48) and the AVR inspection door (466).
- Disconnect the AVR.
- Take off the panels (367 and 368) and the grilles (254 and 255).
- Disconnect the stator connections (T1 to T12).
- Remove the neutral link (278).
- Take out the connector link assembly (281 + 279).
- Take out the connection plate assembly (281 + 270).
- Remove the rear cross-member (269) and the rear panel (365).
- Remove the air intake grille (51).
- Remove the 4 bearing thrust screws (78).
- Remove all 4 screws (37).
- Take out the bearing (36).
- Remove the ball bearing (70) using a puller with a central screw (see fig. below).



- Check the state of the "O" ring (349) and, if necessary, change it.
- Fit the new bearing, after heating it by induction at approximately 80°C.

#### WARNING

Replace the dismantled bearing with a new one.

## LSA 49.1 - 4 POLES ALTERNATORS

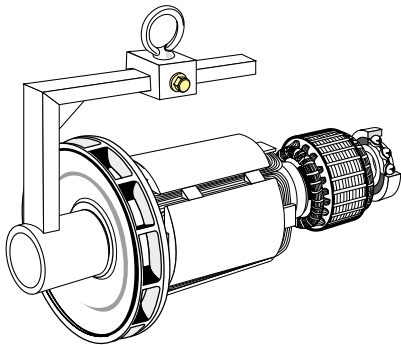
### • Replacing the DE bearing

- Take out the screws (31) and (62).
- Take out the bearing (30).
- Take out the circlips (284).
- Remove the ball bearing (60) using a puller with a central screw.
- Fit the new bearing, after heating it by induction at approximately 80°C.

### Replace the dismantled bearing with a new one.

### • Complete dismantling

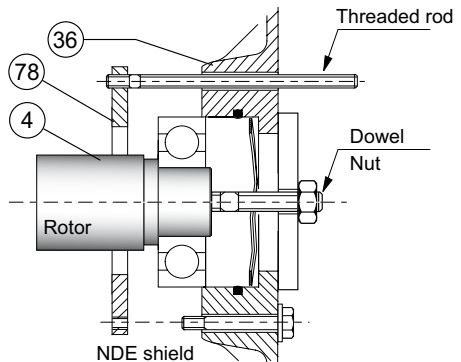
- Take out the DE bearing (30) as described in section 4.6.6.
- Support the DE rotor (4) with a strap or with a support constructed following the drawing below.



- After extracting the rotor, be careful not to damage the fan and place the revolving field on special V-blocks.
- Remove the NDE bearing ball bearing cover.
- Knock lightly on the shaft end on the opposite side from the coupling using a small mallet.
- Move the strap as the rotor moves in order to distribute the weight over it.
- Remove the NDE bearing following the instructions in section 4.6.5.

### • Reassembling the bearings

- Place the "O" ring seal (349) and the preloading wavy washer (79) in the bearing seat (36).
- Position on the stator (1), bearings (30) and (36).
- Tighten screws (31) and (37).
- Tilt the inner bearing retainer (78) upwards in order to lubricate the bearing.
- Tighten the 4 HM10 screws on the inner bearing retainer (78).
- Fit the air intake grille (51).
- Replace the rear cross-member (269) and the rear panel (365).
- Replace the connection plate assembly (281 + 270).
- Replace the connector link assembly (281 + 279).
- Replace the neutral link (278).
- Connect the stator connections (T1 to T12) and the sensing wires.
- Refit the panels (367) and 368) and the grilles 254 and 255).
- Reconnect the AVR.
- Refit the lid of the protective cover (48) and the inspection door of the AVR (466).





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### • Reassembling the rotor

On single bearing alternators :

- Slide the rotor into the stator and position it as shown in fig above.
- Tilt the inner bearing retainer (78) upwards in order to lubricate the bearing.
- Tighten the 4 HM10 screws on the inner bearing retainer (78).
- Fit the flange and check that the alternator assembly is correctly mounted and that all screws are tightened.

On two-bearing alternators :

- Slide the rotor into the stator and position it as shown in the figure above.
- Tilt the inner bearing retainer (78) upwards in order to lubricate the bearing.
- Tilt the inner bearing retainer (68) upwards in order to lubricate the bearing.
- Tighten the 4 HM10 screws on the inner bearing retainer (68 and 78).
- Fit the circlips (284).
- Check that the alternator assembly is correctly mounted and that all screws are tightened.

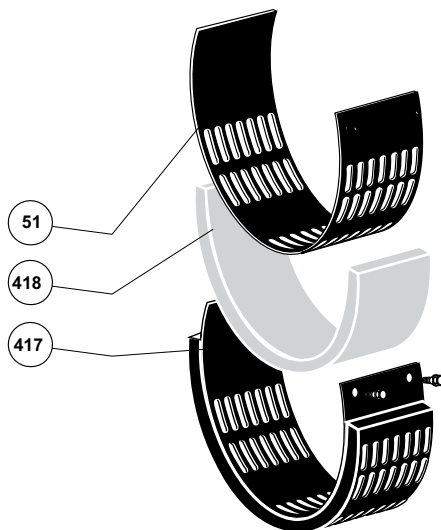
**NOTE : If the rotor has been fully rewound, it must be rebalanced.**



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

### Dismantling and reassembly of the filters

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



### 4.7 - Installation and maintenance of the PMG

For the LSA 49.1, the PMG reference is : PMG 3.

See the PMG manual ref : 4211.

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### 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  $\pm 10\%$  and may be changed without prior notification (for exact values, consult the test report).

#### • Resistances of main windings at 20°C ( $\Omega$ )

Average values for 6S winding - (6 wires)

LSA 49.1	Stator L/N	Rotor	Field	Armature
S4	0,0037	0,33	12	0,08
M6	0,0029	0,38	12	0,08
M75	0,0029	0,38	12	0,08
L9	0,0021	0,43	12	0,08
L10	0,0021	0,43	12	0,08
L11	0,0021	0,5	12	0,08

Average values for 6 winding - (12 wires)

LSA 49.1	Stator L/N	Rotor	Field	Armature
S3	0,0051	0,33	12	0,08
M5	0,0044	0,38	12	0,08
M7	0,0036	0,38	12	0,08
L9	0,0023	0,43	12	0,08

#### • Resistance of AREP auxiliary windings 20°C ( $\Omega$ )

LSA 49.1	Auxil wdg : X1, X2	Auxil wdg : Z1, Z2
S4	0,23	0,34
M6	0,2	0,27
M75	0,2	0,27
L9	0,18	0,29
L10	0,18	0,29
L11	0,18	0,29

#### • Field excitation current $i_{exc}$ (A) 50 - 60 Hz

LSA 49.1	No load	At rated load
S4	0,9	3,6
M6	0,9	3,2
M75	0,9	3,5
L9	0,9	3,3
L10	0,9	3,4
L11	0,8	3,2

#### • Voltage of auxiliary windings at no load

LSA 49.1	X1, X2	Z1, Z2
50 Hz	90...100 V	10 V
60 Hz	108...120 V	12 V

#### • Table of weights

LSA 49.1	Total weight (kg)	Rotor (kg)
S4	1420	540
M6	1620	620
M75	1620	620
L9	1820	700
L10	1820	700
L11	1970	750



**After operational testing, it is essential to replace all access panels or covers.**

## LSA 49.1 - 4 POLES ALTERNATORS

### 5 - SPARE PARTS

#### 5.1 - First maintenance parts

Emergency repair kits are available as an option.

They contain the following items :

Emergency kit AREP	ALT 491 KS 001
AVR R 450	-
Diode bridge assembly	-
Surge suppressor	-

Single-bearing kit	ALT 491 KB 002
Non drive end bearing	-
«O» ring	-
Preloading (wavy) washer	-

Double-bearing kit	ALT 491 KB 001
Non drive end bearing	-
Drive end bearing	-
«O» ring	-
Preloading (wavy) washer	-

Double-bearing kit L11	ALT 491 KB 003
Non drive end bearing	-
Drive end bearing	-
«O» ring	-
Preloading (wavy) washer	-

#### 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.



**After operational testing, it is essential to replace all access panels or covers.**

#### 5.3 - Accessories

##### • Space heater when stopped

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



**Caution : the power supply is present when the alternator has stopped.**

##### • Temperature probes 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 bearings.

These sensors must be linked to adapted sensing relays (supplied optionally).

Cold resistance of cold thermistor sensors : 100 to 250  $\Omega$  per probe.

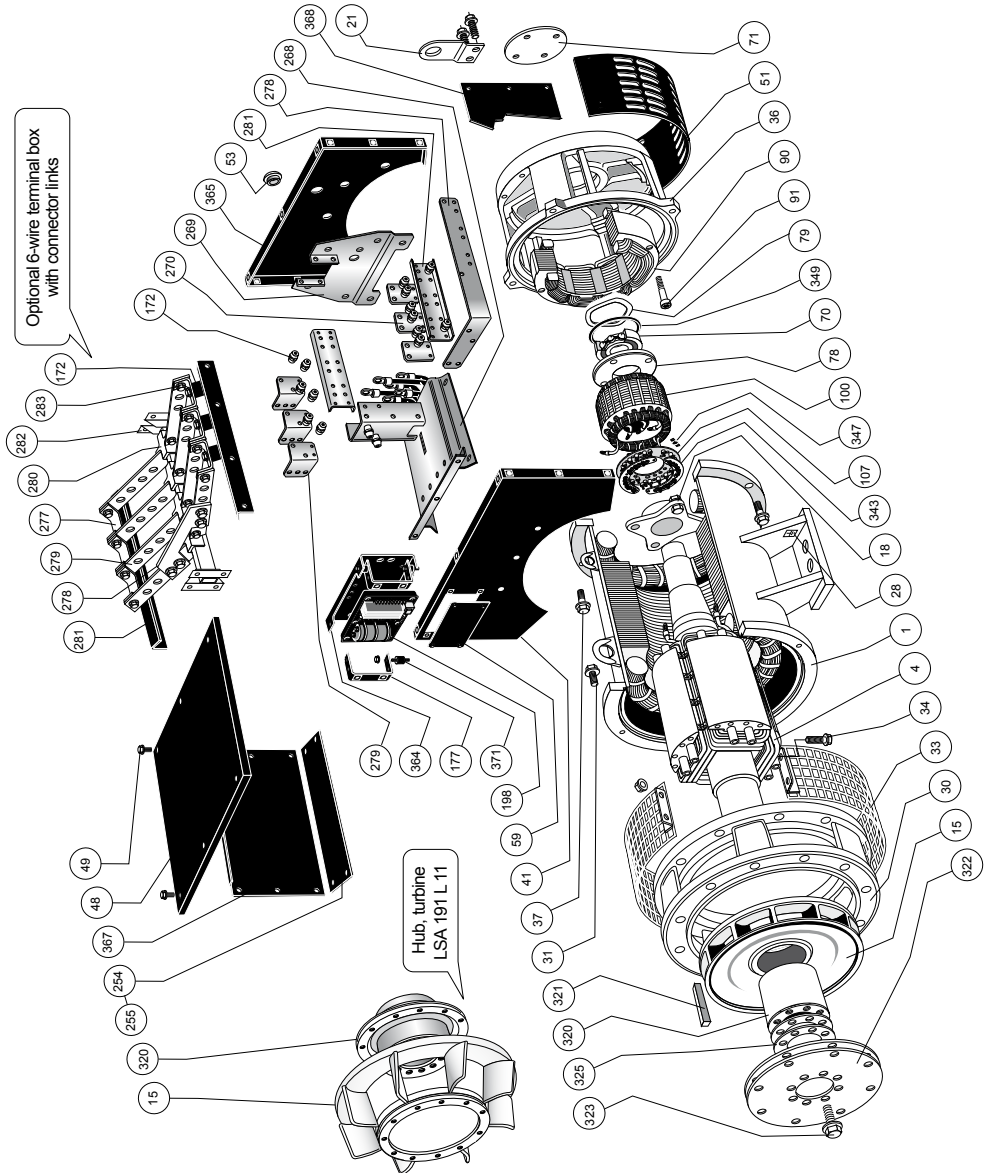


**After operational testing, it is essential to replace all access panels or covers.**

# LSA 49.1 - 4 POLES ALTERNATORS

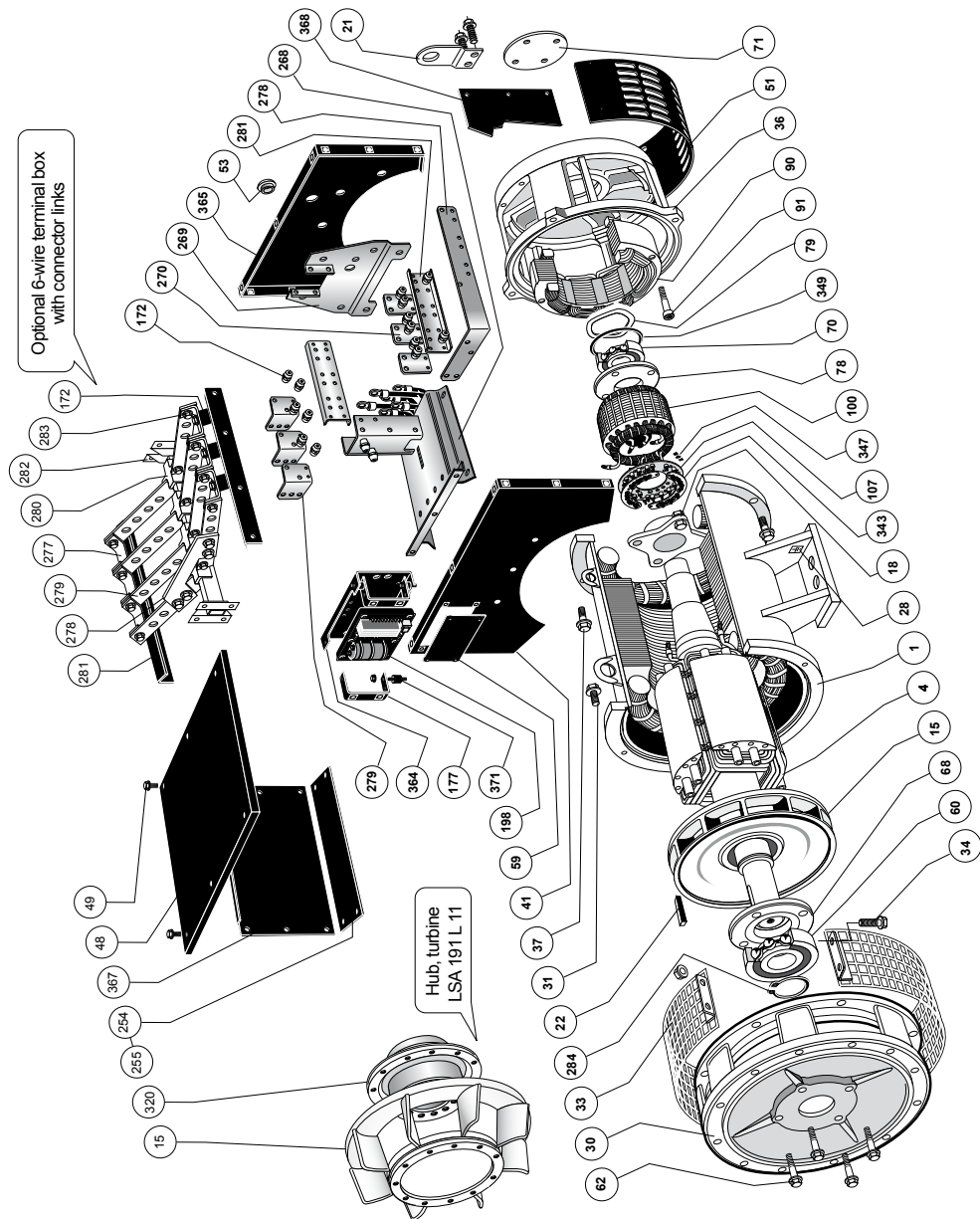
## 5.4 - Exploded view, parts list

### • Single-bearing



# LSA 49.1 - 4 POLES ALTERNATORS

• Two-bearing



## LSA 49.1 - 4 POLES ALTERNATORS

Ref.	Qty	Description	Screw Ø	Torque N.m	Ref.	Qty	Description	Screw Ø	Torque N.m
1	1	Stator assembly	-	-	177	2	AVR support stirrup	-	-
4	1	Rotor assembly	-	-	198	1	AVR	-	-
15	1	Turbine	-	-	254	1	Right air intake guard	-	-
18	1	Balancing disc	-	-	255	1	Left air intake guard	-	-
21	1	Lifting ring	-	-	268	1	DE cross-member	-	-
22	1	Key	-	-	269	1	NDE cross-member	-	-
28	1	Earth terminal	M12	35	270	3	Connection plate	-	-
30	1	Drive end shield	-	-	277	3 / 4	Copper bar support	-	-
31	6	Fixing screws	M14	110	278	1	Neutral link	-	-
33	1	Protective guard	-	-	279	6 / 8	Connection bar	-	-
34	2	Fixing screws	M6	4	280	3 / 4	Plastic bar support	-	-
36	1	Exciter end shield	-	-	281	2	Cover crosspiece	-	-
37	4	Fixing screws	M14	110	282	2	Cover spacer	-	-
41	1	Front panel	-	-	283	4 / 6	Plastic or copper support	-	-
48	1	Top panel	-	-	284	1	Circlip	-	-
49	-	Cover screws	M6	5	320	1	Coupling sleeve	-	-
51	1	Air intake guard	-	-	321	1	Sleeve key	-	-
53	1	Plug	-	-	322	3	Coupling disc	-	-
59	1	Cover inspection door	-	-	323	8	Fixing screws	M20	340
60	1	DE bearing	-	-	325	-	Spacer shim	-	-
62	4	Fixing screws	M12	69	343	1	Diode bridge assembly	M6	10
68	4	Inner bearing retainer	-	-	347	1	Surge suppressor (+ PCB)	-	-
70	1	NDE bearing	-	-	349	1	O ring seal	-	-
71	1	Outer bearing retainer	-	-	364	1	AVR support	-	-
78	1	Inner bearing retainer	-	-	365	1	Cover rear panel	-	-
79	1	Preloading (wavy) washer	-	-	367	1	Left side panel	-	-
90	1	Exciter field	-	-	368	1	Right side panel	-	-
91	4	Fixing screws	M6	8,3	371	4	Damper	-	-
100	1	Exciter armature	-	-	417	1	Air filter guard	-	-
107	1	Crescent support	-	-	418	1	Filter element	-	-
172	-	Isolator	-	-					

# LSA 49.1 - 4 POLES ALTERNATORS



Electric Power Generation Division

## Declaration of CE compliance and incorporation

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

MOTEURS LEROY-SOMER  
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16015 ANGOULEME  
France

MLS HOLICE STLO.SRO  
SLADKOVSKÉHO 43  
772 04 OLOMOUC  
Czech Republic

MOTEURS LEROY-SOMER  
1, rue de la Buelle  
Boite Postale 1517  
45800 St Jean de Braye  
France

Declares hereby that the electric generators of the types LSA 40 - 42.3 - 44.3 - 46.2 - 47.2 - 49.1 - 50.2 - 51.2 - 52.2 - 53 - 53.1 - 54, as well as their derivatives, manufactured by Leroy-Somer or on Leroy Somer's behalf, comply with the following International Standards and Directive :

- EN and IEC 60034 -1, 60034 -5 and 60034 - 22
- ISO 8528 – 3 " Reciprocating internal combustion engine driven alternating current generating sets. Part 3. Alternating current generators for generating sets "
- 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 Directives :

- Machinery Directive Nr 2006/42/CE dated 17 May 2006
- 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.

Leroy Somer undertakes to transmit, in response to a reasoned request by the national authorities, relevant information on the generator.

### Technical Managers

A. DUTAU - Y. MESSIN

4152 en – 2014.02 / f

*The contractual EC Declaration of Conformity and Incorporation can be obtained from your contact on request.*



[www.leroy-somer.com](http://www.leroy-somer.com)