



# LSA PMR 320

## Alternator for Rail Application - 8 poles

**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 potential risks of accidents. It is vital that you understand and take notice of the following warning symbols.

#### 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.**

### SAFETY INSTRUCTIONS

We wish to draw your attention to the following 2 safety measures which must be complied with:

#### **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 EC Directives plus any other directives that may be applicable.**

**This manual is to be given to the end user.**

**The range of electric alternators and their derivatives, manufactured by us or on our behalf, comply with the technical requirements of the customs Union directives.**

**The alternator is a sub-assembly delivered without a system of protection against short-circuits. The protection must be provided by the circuit-breaker of the generator, sized to interrupt the fault current.**

© 2024 Moteurs Leroy-Somer SAS

Share Capital: 32,239,235 €, RCS Angoulême 338 567 258.

We reserve the right to modify the characteristics of this product at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

This document may not be reproduced in any form without prior authorization.

All brands and models have been registered and patents applied for.

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### CONTENTS

<b>1 - RECEIPT</b>	<b>4</b>
1.1 - Standards and safety measures	4
1.2 - Inspection	4
1.3 - Identification	4
1.4 - Storage	4
1.5 - Applications	4
1.6 - Usage restrictions	4
<b>2 - TECHNICAL CHARACTERISTICS</b>	<b>5</b>
2.1 - Electrical characteristics	5
2.2 - Mechanical characteristics	5
<b>3 - INSTALLATION</b>	<b>5</b>
3.1 - Assembly	5
3.2 - Checks prior to first use	5
3.3 - Terminal connection diagrams	6
3.4 - Commissioning	7
<b>4 - SERVICING - MAINTENANCE</b>	<b>8</b>
4.1 - Safety measures	8
4.2 - Routine maintenance	8
4.3 - Bearings	9
4.4 - Mechanical defects	9
4.5 - Electrical faults	9
4.6 - Dismantling, reassembly	10
4.7 - Table of characteristics	10
<b>5 - SPARE PARTS</b>	<b>11</b>
5.1 - First maintenance parts	11
5.2 - Technical support service	11
5.3 - Accessories	11
5.4 - Exploded view, parts list and tightening torque	12

### Disposal and recycling instructions

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### 1 - RECEIPT

#### 1.1 - Standards and safety measures

Our alternators comply with most international standards.

#### 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).

#### 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 (see sections 3.2 and 4.5).

To prevent the bearings from becoming marked, do not store in an environment with significant vibration.

For prolonged storage, please follow the recommendations in the storage manual ref 4954 available on our website:

[www.nidecpower.com/downloads](http://www.nidecpower.com/downloads)

#### 1.5 - Applications

This alternator is mainly designed to produce electricity in the context of applications involving the use of generators.

#### 1.6 - Usage restrictions

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

# Leroy-Somer

LSA PMR 320	
IP	P
No :	
Date :	
Weight	
Th. Class	
Altid. / Water temp.	
Connection :	
D.E. bearing :	
N.D.E. bearing :	

IEC 60034 - 1 & 5. / ISO 8528 - 3. / NEMA MG1 - 32 & 33.

RATINGS			
Speed			rpm
Freq			Hz
Volt.			Vphph
BR			kVA
BR			kW
P.F.			
Current			A



Moteurs Leroy-Somer - Boulevard Marcellin Leroy,  
CS 10015 - 16915 Angoulême Cedex 9 - France

LSA 000-1-006 e

# LSA PMR 320

## Alternator for Rail Application - 8 poles

## 2 - TECHNICAL CHARACTERISTICS

### 2.1 - Electrical characteristics

This alternator is a machine with permanent magnets, wound as full pitch, 12-wire, with class H insulation.

- 4 PT 1000 stator temperature detection sensors connected to a fast-on connector

### 2.2 - Mechanical characteristics

- Steel frame
- Steel DE and NDE shields
- Regreasable insulated ball bearings
- Mounting arrangement: two-bearing with SAE flange and standard cylindrical shaft extension
- Water-cooled enclosed machine
- Degree of protection: IP 69

## 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 before choosing the lifting tool. During this operation, do not allow anyone to stand under the load.

### • Handling

The generously-sized lifting eyes are for handling the alternator only. They must not be used to lift the genset. The choice of lifting hooks or handles should be determined by the shape of the lifting eyes. 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.**

### • 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.

### 3.2 - Checks prior to first use

#### • Electrical checks

Disconnect the three phases at the generator terminals.

### WARNING

**All accessories must be disconnected (AVR, EMC filter, etc.). Refer to the electrical schematics to identify the accessories to disconnect.**

# LSA PMR 320

## Alternator for Rail Application - 8 poles

The measurement has to be taken between one phase and the earth. The reading is taken after 1 minute of test.

	Test voltage (VDC)	Criteria (MΩ ; 40°C)
Stator: U ≤ 1 kV	500	5
Rotor	500	5
Exciter (stator and rotor)	500	5
Excitation auxiliary windings (AREP)	250	5
PMG (stator)	100	5
Heating element	500	5
Temperature sensors	500	5

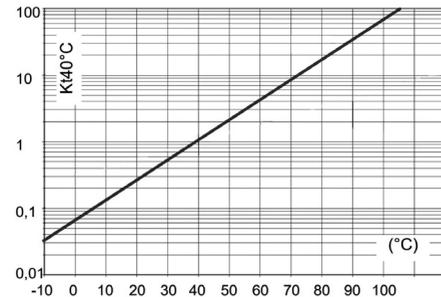
IEEE 43 recommendations

If the insulation resistance is not measured with a tested element à 40°C, a corrective factor has to be used.

$$R_m 40^\circ\text{C} = R_t \times K_{t40}$$

$R_t$  Measured insulation resistance

$K_{t40}$  Corrective factor



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

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

b) 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 dismantled bolts are tight,
- the length and tightening torque of the added bolts are correct,
- the cooling air is drawn in freely,
- the protective grille and housing are correctly in place,
- the standard direction of rotation is clockwise as seen from the drive 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.

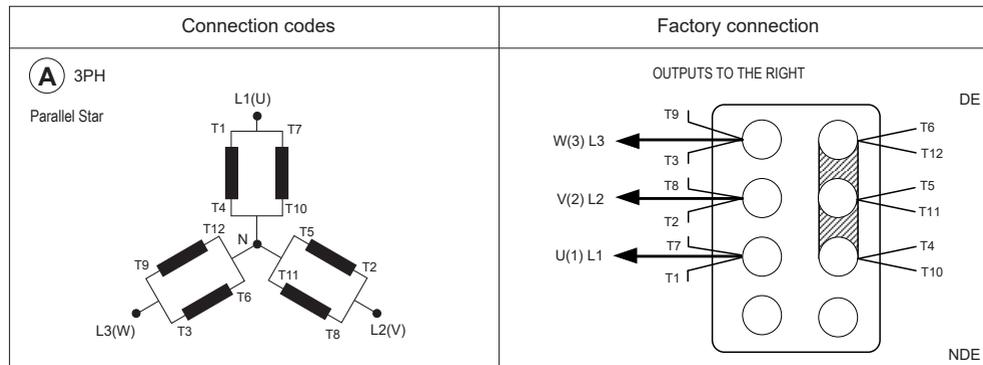


**Any intervention on the alternator terminals during reconnection or checks should be performed with the machine stopped. In no case should the internal connections in the terminal box be subjected to stresses due to cables connected by the user.**

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### • Three-phase 12-wire



### • 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.
- Any protection devices in place have not been tripped.
- 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 cabinet.
- The machine should be connected with the busbar separating the terminals as shown in the terminal connection diagram.



- The earth terminal is connected to the frame.

The connections inside the terminal box must never be subjected to stress due to cables connected by the user.



Diameter	M6	M8	M10	M12
Torque	4 Nm	10 Nm	20 Nm	35 Nm
Tolerance	± 15%			

### Important points for all reconnection operations:

- Use polyamide plastic clamps 105°C minimum, 550 N minimum.
- Group the cables: three maximum.
- Do not cross cables if possible.
- Leave enough space to allow cooling.

### 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 at the factory.

When first used with no load, see table section 4.7.

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### 4 - SERVICING - MAINTENANCE

#### 4.1 - Safety measures

Service 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 inside the machine by the terminal box.

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 before closing the terminal box.

##### • Mechanical servicing

### WARNING

**Cleaning the machine using water or a high-pressure washer is permitted, provided it is done in accordance with EN 60529.**

Degreasing: use a brush and detergent (suitable for paintwork).

Dusting: use an air gun.

After cleaning the alternator, it is essential to check the winding insulation (see sections 3.2 and 4.5).

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### 4.3 - Bearings

The bearings are regreasable	Life of the grease = 700 hours or 1 year Grease: Mobil Polyrex EM NLG12 Amount of grease at each regreasing = 51 g minimum
------------------------------	----------------------------------------------------------------------------------------------------------------------------------

### 4.4 - Mechanical defects

Fault		Action
Bearing	Excessive overheating of one or both bearings (temperature above 125°C)	- If the bearing has turned blue or if the grease has turned black, change the bearing - Bearing not fully locked (abnormal play in the bearing cage) - End shields incorrectly aligned
Abnormal temperature	Excessive overheating of alternator PT 1000 sensors (more than 190°C)	- Alternator overloaded
Vibrations	Too much vibration	- Misalignment (coupling) - Defective mounting or play in coupling - Rotor balancing fault
	Excessive vibration and humming noise coming from the machine	- Phase imbalance - Stator short-circuit
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration	- System short-circuit  Possible consequences - Broken or damaged coupling - Broken or bent shaft end - Rotor magnets are demagnetised

### 4.5 - Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Check the connections in the terminal box	-	-
Voltage too low	Check the drive speed	Correct speed	Magnets demagnetised following a stator short-circuit
		Speed too low	Increase the drive speed
Voltage oscillations	Check the stability of the motor speed	-	-
Voltage disappears during operation	Check the connections in the terminal box	-	-

#### • Checking the winding

You can check the winding insulation by performing a high voltage test.

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### 4.6 - Dismantling, reassembly

#### WARNING

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

**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: 7, 8, 10, 12 mm
- 1 socket set: 8, 10, 13, 16, 18, 21, 22, 24 mm
- 1 Allen key: size 5 (eg. Facom: ET5), size 6 (ET6), size 10 (ET10, size 14 (ET14)
- 1 T20 and T30 TORX bit
- 1 puller (U35)/(U32/350)

#### • Screw tightening torque

See section 5.4.

#### • Access to connections

The terminals are accessed directly by removing the terminal box cover (136).

#### • Replacing the DE bearing

- Remove the alternator from the genset.
- Remove the air outlet grille (33).
- Remove the screws holding the bearing retainer (68) in place.
- Remove the screws holding the DE shield (30) on the frame.
- Pull on the DE shield to separate it from the frame with a suitable tool (which we can provide).
- The rotor will stick to the stator, and is likely to make a noise.
- Remove the circlips (67) from the DE bearing (60).
- Push the bearing retainer (68) back along the shaft.
- Pull out the DE bearing (60).
- Fit the new DE bearing, taking care not to overheat it.
- Refit the DE shield (30) by repeating these steps in reverse order.
- Grease and fit a new seal.

#### • Replacing the NDE bearing

- Remove the alternator from the genset.
- Remove the cover plate from the NDE shield (73).
- Open the terminal box (132).
- Undo the power connections (124) and sensors (197).
- Detach the clamps holding the wiring in the terminal box and the NDE shield (36).
- Undo the screws holding the bearing retainer (68) in place.
- Remove the screws holding the shield (36) on the frame.
- Remove the DE shield with a suitable tool (which we can provide).
- The rotor will stick to the stator, and is likely to make a noise.
- Push the bearing retainer (68) back along the shaft.
- Pull out the NDE bearing (60).
- Fit the new NDE bearing, taking care not to overheat it.
- Refit the NDE shield (36) by repeating these steps in reverse order.

### 4.7 - Table of characteristics

Table of average values:

Alternator - 8-pole - 800 rpm to 2000 rpm

All values are given to within  $\pm 10\%$  and may be changed without prior notification (for exact values, consult the test report).

#### • Resistance at 20°C - L/N stator:

0.0245 ohms

#### • No-load voltage as a function of the speed

Speed (rpm)	U1-2 (V)
800	590
1000	730
1200	885
1400	1020
1600	1180
1800	1330
2000	1470

#### • Total weight: 900 kg - Rotor: 330 kg

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### 5 - SPARE PARTS

#### 5.1 - First maintenance parts

Emergency repair kits are available as an option.

Two-bearing kit: consult us.

#### 5.2 - Technical support service

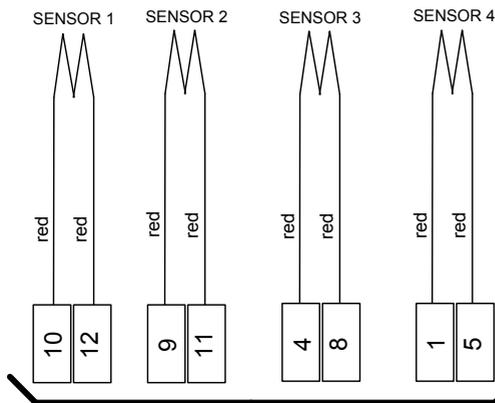
Our technical support service will be pleased to provide any additional information you may require.

For all spare parts orders or technical support requests, send your request to [service.epg@leroy-somer.com](mailto:service.epg@leroy-somer.com) or your nearest contact, whom you will find at [www.lrsm.co/support](http://www.lrsm.co/support) indicating the complete type of machine, its number and the information indicated on the nameplate.

#### 5.3 - Accessories

##### • PT 1000 temperature sensors

4 PT 1000 temperature sensors at the hottest points on the winding, connected to a fast-on connector.



EXTERNAL SIDE



HARTING CONNECTOR  
09120123101

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

To ensure that our products operate correctly and safely, 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.



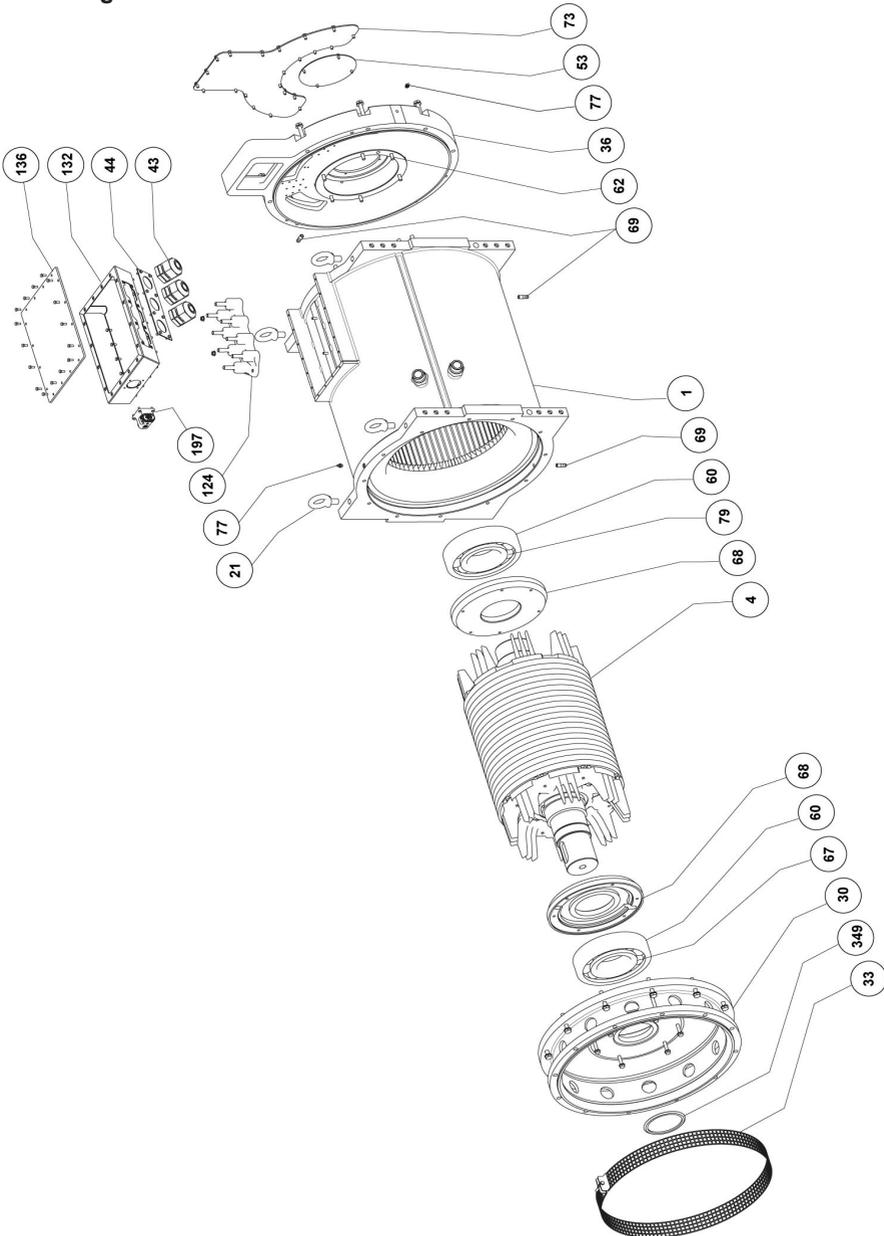
**After wiring up the terminal box, it is essential to replace all access panels or covers.**

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### 5.4 - Exploded view, parts list and tightening torque

#### • Two-bearing



## LSA PMR 320

### Alternator for Rail Application - 8 poles

Ref.	Qty	Description	Screw Ø	Torque N.m	Ref.	Qty	Description	Screw Ø	Torque N.m
1	1	Stator assembly	-	-	68	2	Inner bearing retainer	M8	20
4	1	Rotor assembly	-	-	69	3	Bleeder	-	-
21	4	Lifting eye	M16	100	73	1	Cover plate	-	-
30	1	Drive end (DE) bracket	M10	40	77	2	Grease nipple	-	-
33	1	Air outlet grille	M6	4	79	1	Preloading (wavy) washer	-	-
36	1	Non drive end (NDE) bracket	M10	40	124	1	Terminal block	M10	24
43	3	Cable gland	-	-	132	1	Terminal box body	-	-
44	1	Cable gland plate	-	-	136	1	Terminal box cover	-	-
53	1	Sealing cap	-	-	197	1	Sensors connector	-	-
60	2	Drive end (DE) bearing	-	-	349	1	O ring seal	-	-
67	1	Circlips	-	-					

# LSA PMR 320

## Alternator for Rail Application - 8 poles

### Disposal and recycling instructions

We are committed to limiting the environmental impact of our activity. We continuously monitor our production processes, material sourcing and product design to improve recyclability and minimise our environmental footprint.

These instructions are for information purposes only. It is the user's responsibility to comply with local legislation regarding product disposal and recycling.

### Recyclable materials

Our alternators are mainly constructed from iron, steel and copper materials, which can be reclaimed for recycling purposes.

These materials can be reclaimed through a combination of manual dismantling, mechanical separation and melting processes. Our technical support department can provide detailed directions on how to dismantle products on request.

### Waste & hazardous materials

The following components and materials require special treatment and must be separated from the alternator before the recycling process:

- major plastic components, such as the terminal box cover and the terminal plate. These components are usually marked with information concerning the type of plastic.

All materials listed above need special treatment to separate waste from reclaimable materials and should be entrusted to specialist recycling companies.

The oil and grease from the lubrication system should be treated as hazardous waste and must be treated in accordance with local legislation.

Our alternators have a specified lifetime of 20 years. After this period, the operation of the product should be stopped, regardless of its condition. Any further operation after this period will be under the sole responsibility of the user.

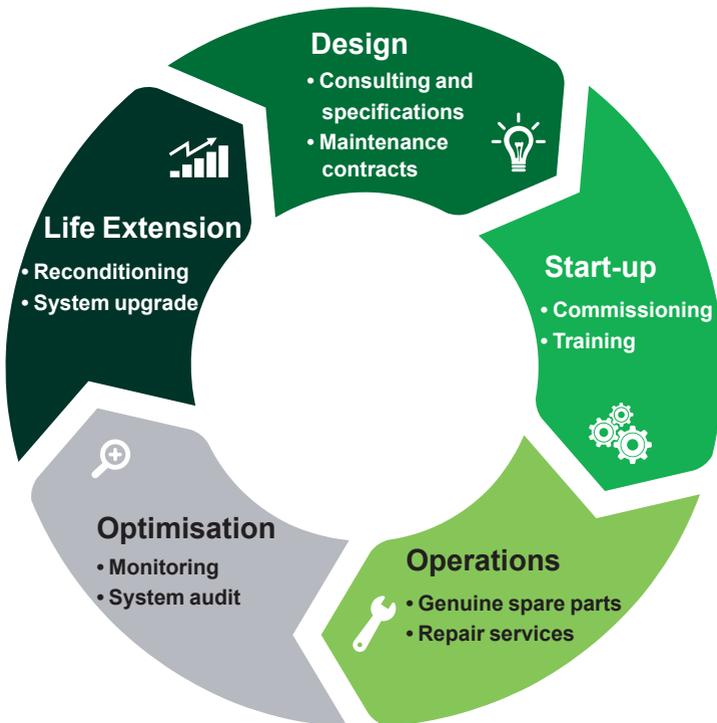
# Service & Support

Our worldwide service network of over 80 facilities is at your service. Our local presence is your guarantee for fast and efficient repair, support and maintenance services.

Trust your alternator maintenance and support to electric power generation experts. Our field personnel are 100% qualified and fully trained to operate in all environments and on all machine types.

We have a deep understanding of alternators operations, providing the best value service to optimize your cost of ownership.

How can we help:



Contact us:

**Americas:** +1 (507) 625 4011

**EMEA:** +33 238 609 908

**Asia Pacific:** +65 6250 8488

**China:** +86 591 8837 3010

**India:** +91 806 726 4867

✉ [service.epg@leroy-somer.com](mailto:service.epg@leroy-somer.com)



Scan the code or go to:  
[www.lrsn.co/support](http://www.lrsn.co/support)



[www.nidecpower.com](http://www.nidecpower.com)

Connect with us at:

