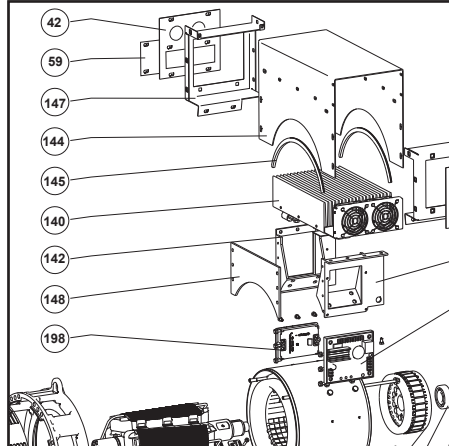




This manual is to be given to
the end user



LSA VS 40 ALTERNATORS

Installation and maintenance

LSA VS 40 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 interventions 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.

WARNING SYMBOLS

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

a) During operation, do not allow anyone to stand in front of the air outlet guards, in case anything is ejected from them.

b) Do not allow children younger than 14 to go near the air outlet guards.

A set of self-adhesive stickers depicting the various warning symbols is included with this maintenance manual. They should be positioned as shown in the drawing below once the machine has been fully installed.

WARNING

The alternators must not be commissioned 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.

Note: 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.

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LSA VS 40 ALTERNATORS

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 damage, contact the carrier (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.

The machine name is defined according to various criteria, for example:

LSA VS 40 S3 J44-30/4

- LSA: Name used in the PARTNER range

- VS: Variable speed

- 40 : Machine type

- S3: Model

- J: Excitation system (J: SHUNT)

- 44-30/4 : Winding number/number of poles

1.3.1 - Nameplate

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

1.4 - Storage

Prior to commissioning, machines should be stored:

- Away from humidity (< 90%); after a long period of storage, check the machine insulation (section 3.2.1). To prevent the bearings from becoming marked, do not store in an environment with significant vibration.

1.5 - Applications

These alternators are mainly designed to produce direct current electricity in the context of applications involving the use of generators for charging batteries.

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 :		
rpm	Hz	Weight :	kg
PF :	Ins.class :	Altitude :	
AVR excitation :			
Excitation	load :	A	
400V/40°C	no load :	A	
DE bearing :			
NDE bearing :			

RATINGS			
Voltage			V
Phase			
Conn.			
Cont.			kVA
BR			kW
40°C.			A
Std by			kVA
PR			kW
27°C.			A

IEC 60034-1 & 5

NEMA MG1-32 & 33

www.leroy-somer.com

Ref :

LSA VS 40 ALTERNATORS

2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

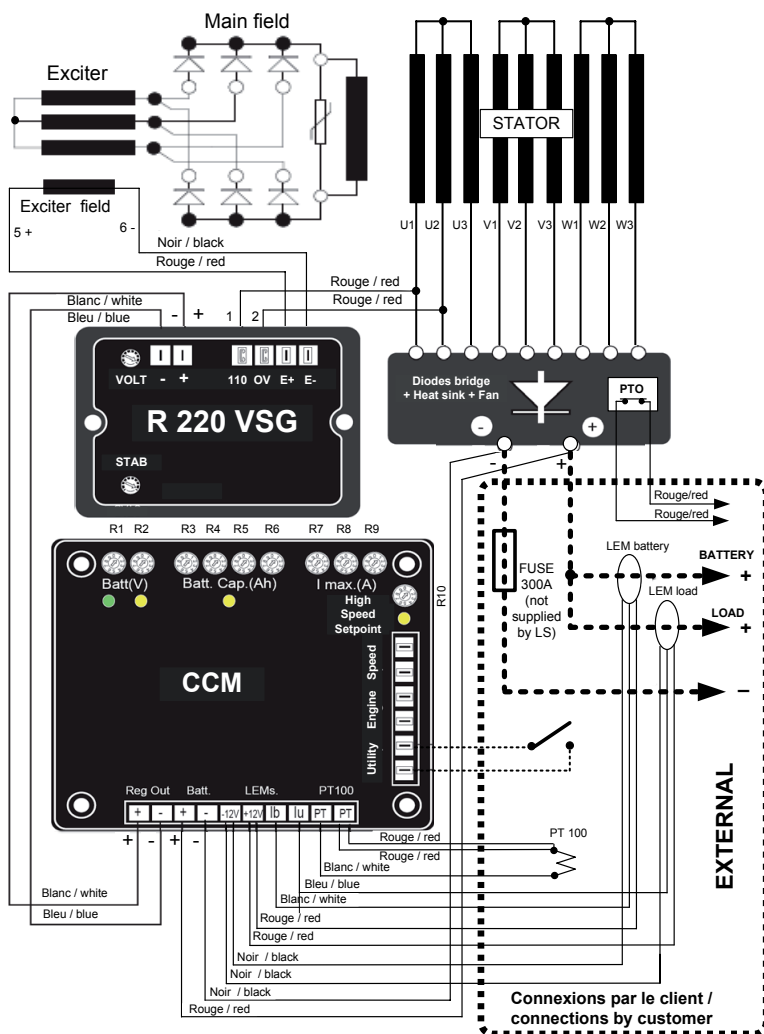
The PARTNER LSA VS 40 alternator is an alternator without sliprings or revolving field brushes.

2.2 - Mechanical characteristics

- Steel frame
- Aluminium end shields
- Protected ball bearings, greased for life
- Mounting arrangement

MD 35:

- Single-bearing with standard feet and SAE flanges/coupling discs
- Drip-proof machine, self-cooled
- Degree of protection: IP 23



LSA VS 40 ALTERNATORS

3 - INSTALLATION

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

3.1 - Assembly

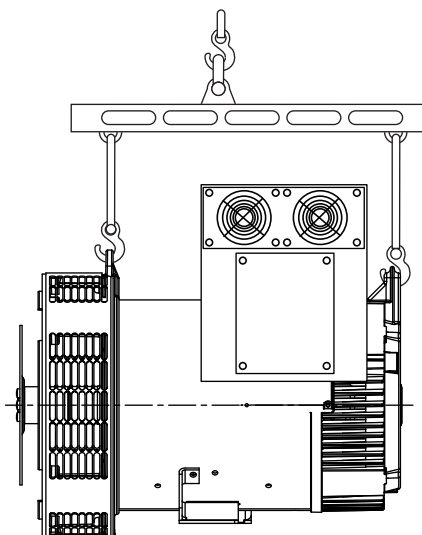


All mechanical handling operations must be undertaken using approved equipment and the alternator must be horizontal. Check how much the alternator weighs (see 4.7) before choosing the lifting tool.

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

3.1.1 - Handling

The generously-sized lifting rings are for handling the alternator alone. They must not be used to lift the genset. The choice of lifting hooks or handles should be determined by the shape of these rings. Choose a lifting system which respects the integrity and the environment of the alternators.



3.1.2 - Coupling

3.1.2.1 - Single-bearing alternator

Before coupling the alternator and the heat engine, check 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 rotor.

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

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

Check that there is lateral play on the crankshaft.

3.1.2.2 - Twin-bearing alternator

- Semi-flexible coupling

Careful alignment of the machines is recommended, checking that the 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.

3.1.3 - Location

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

WARNING

The heatsink cooling fans must be protected from any external items to ensure their nominal operation

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3.2 - Checks prior to first use

3.2.1 - Electrical checks



Under no circumstances should an alternator, new or otherwise, be operated if the insulation is less than 1 megohm for the stator and 100,000 ohms for the other windings.

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

- a) Dry out the machine for 24 hours in a drying oven at a temperature of 110°C (without the AVR, the rectifier and the CCM).
- b) Blow hot air into the air inlet, 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.

3.2.2 - 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 guards 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)

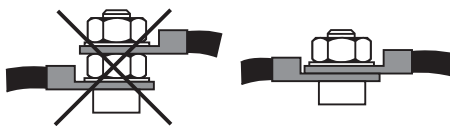
3.2.2 - Connection checks



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. (In this case, disconnect the wire from 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 between phase or phase-neutral between the alternator output terminals and the genset control cabinet (part of the circuit not protected by circuit-breakers or relays in the cabinet).
- The machine has been connected with the busbar separating the terminals as shown in the terminal connection diagram.



WARNING

The PTO placed under the heatsink must be connected to the genset safety system (contact characteristics : 240 V max - 10A on resistance)

LSA VS 40 ALTERNATORS

3.3 - 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 4.2.2).

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 (see section 3.4). If the machine still operates incorrectly, the cause of the malfunction must be located (see section 4.4).

3.4 - Setting up

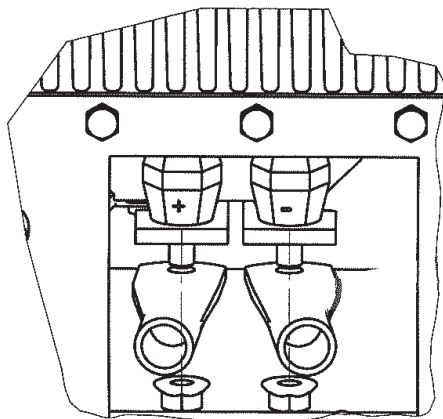


The various adjustments during tests must be made by a qualified engineer. It is essential that the drive speed specified on the nameplate is reached before commencing adjustment.

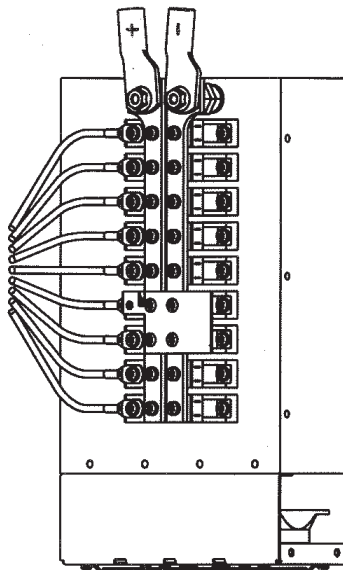
After operational testing, replace all access panels or covers.

Only the AVR and the CCM capacitor charging module should be used to make any adjustments to the machine.

3.5 - Recommended wiring



Recommended power output terminals :
type : 120 - 8
bar width \approx 30 mm.



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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 alternator 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 work is carried out 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: After a period of operation, some parts of the alternator can reach high temperatures which may cause burns.

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 - Bearings

The bearings are permanently greased: approximate life of the grease (depending on use) = 20,000 hours or 3 years. Monitor the temperature rise in the bearings, which should not exceed 90°C. Should this value be exceeded, the alternator must be stopped and checks carried out.

4.2.3 - 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, wiping away the excess. Dry the winding with a dry cloth. Allow it to evaporate before reassembling the machine.

4.2.4 - Mechanical servicing

WARNING

Cleaning the machine using water or a high-pressure washer is strictly prohibited. Any problems arising from such treatment are not covered by our warranty.

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

Dusting: Use compressed air.

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 4.5).

4.3 - Fault detection

If, when commissioned, the alternator does not work normally, the source of the malfunction must be identified (see sections 4.4 and 4.5).

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<h1>LSA VS 40</h1> <h1>ALTERNATORS</h1>		

4.4 - Mechanical faults

Fault		Action
Bearing	Excessive overheating of one or both bearings (temperature > 80°C on the bearing retainers with or without abnormal noise)	<ul style="list-style-type: none"> - If the bearing has turned blue or if the grease has turned black, change the bearing - Bearing not properly seated - End shields misaligned (flanges not properly fitted)
Temperature abnormal	Excessive overheating of alternator frame (more than 40°C above the ambient temperature)	<ul style="list-style-type: none"> - Air flow (intake-outlet) partially clogged or hot air is being recycled from the alternator or heat engine - Alternator operating at too high a voltage (> 105% of Un on load) - Alternator overloaded
Vibration	Excessive vibration	<ul style="list-style-type: none"> - Misalignment (coupling) - Defective mounting or play in coupling - Rotor balancing fault
	Excessive vibration and humming noise coming from the alternator	<ul style="list-style-type: none"> - Alternator operating in single-phase mode (single-phase load or faulty contactor or installation fault) - Stator short-circuit
Abnormal noise	Alternator damaged by a significant impact, possibly followed by humming and vibration	<ul style="list-style-type: none"> - System short-circuit - Mis-parallelism - Possible consequences - Broken or damaged coupling - Shifting and short-circuit of revolving field coil - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes, AVR or surge suppressor

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 on the AVR, 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 - Revolving field coil open circuit. Check the resistance
Voltage too low	Check the drive speed	Correct speed	- Check the AVR connections (or AVR failure) - Check the CCM connections (or CCM failure) - Field windings short-circuited - Rotating diodes burnt out - Revolving field coil 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 the pot. AVR voltage	Adjustment ineffective	- Faulty AVR - Faulty CCM
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- SHUNT < 6V - AREP < 10V	- Check the speed (or LAM set too high)
		Voltage between E+ and E- SHUNT > 10V - AREP > 15V	- Faulty rotating diodes - Short-circuit in the revolving field coil Check the resistance - Faulty exciter armature
(*) Caution: For single-phase operation, check that the sensing wires coming from the AVR are correctly connected to the operating terminals.			
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 field open circuit - Faulty exciter armature - Faulty AVR - Revolving field coil open circuit or short-circuited
(**) Caution: Internal protection may be activated (overload, open circuit, short-circuit)			

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4.5.1 - Checking the winding

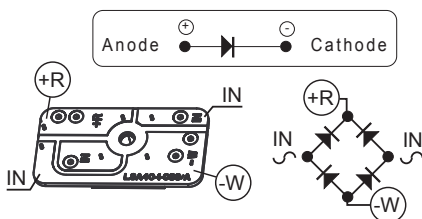
You can check the winding insulation by performing a high voltage test. In this case, you must disconnect all the AVR and CCM wires.

WARNING

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

4.5.2 - Checking the rotating diode bridge

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

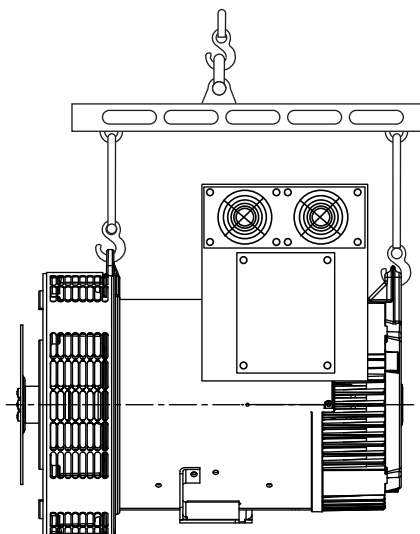


4.6 - Dismantling, reassembly (see sections 5.4.1. & 5.4.2.)

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.

Whilst being handled, the machine should remain horizontal (rotor not axially secured). Check how much the machine weighs (see 4.7) before choosing the lifting method.



4.6.1 - Tools required

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

- 1 ratchet spanner + extension
- 1 torque wrench
- 1 set of flat spanners: 8 mm, 10 mm, 12 mm
- 1 socket set: 8, 10, 13 mm
- 1 T20, T30 TORX bit
- 1 puller (eg. Facom: U35, U32/350)

4.6.2 - Screw tightening torque

See section 5.3.



The screws for fixing the feet on the housing and immobilising the stator must not be removed (screws in the bottom of the stator).

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4.6.3 - Access to connections and the regulation system

The terminals and AVR are accessed directly by removing the terminal box lid [41].

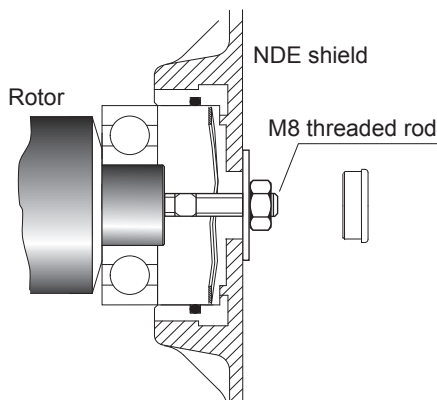
4.6.4 - Accessing, checking and replacing the diode bridge

4.6.4.1 - Dismantling

- Remove the terminal box lid [144].
- Cut the fixing clamps on the exciter cables, disconnect E+, E- from the exciter.
- Remove the 4 nuts on the tie rods.
- Remove the NDE shield [36] using a puller: eg. U.32 - 350 (Facom).
- Unsolder the connections.
- Check the bridge using an ohmmeter or a battery lamp (see section 4.5.1.).

4.6.4.2 - Reassembly

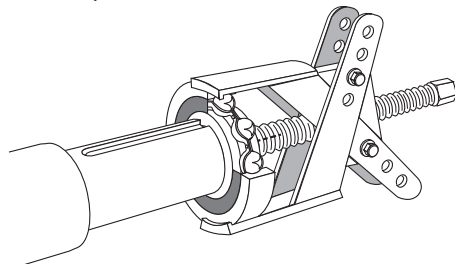
- Replace the bridges, respecting the polarity (see section 4.5.1.).
- Resolder the connections.
- Fit a new O ring seal in the shield.
- Refit the NDE shield and pass the bundle of wires between the top bars of the shield.
- Replace the fixing clamps on the cables.
- Replace the terminal box lid [48]



4.6.5 - Replacing the NDE bearing on single-bearing machines

4.6.5.1 - Dismantling

- Remove the NDE shield [36] (see section 4.6.4.1.).
- Remove the antifriction bearing [70] using a screw puller.



4.6.5.2 - Reassembly

- Heat the inner slipring of a new bearing by induction or in a drying oven at 80°C (do not use an oil-bath) and fit it to the machine.
- Place the preloading wavy washer [79] in the shield and fit a new O ring seal [349].
- Replace the NDE shield [36] (see section 4.6.4.2.).

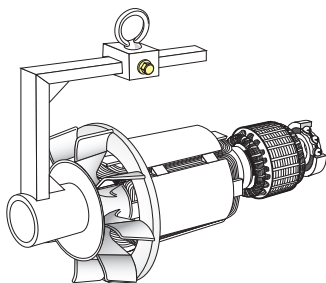
4.6.7 - Accessing the revolving field coil and stator

4.6.7.1 - Dismantling

Follow the procedure for dismantling the bearings (see section 4.6.6).

- Remove the coupling disc (single-bearing machine) or the DE end shield (two-bearing machine) and insert a tube of the corresponding diameter on the shaft extension or a support made according to the following diagram.

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- Rest the rotor on one of its poles, then slide it out. Use the tube as a lever arm to assist dismantling.

- After extracting the rotor, be careful not to damage the fan. If the fan is dismantled, it is essential that it is replaced.

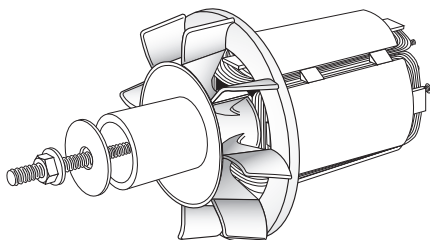
NOTE: If intervention is required on the revolving field coil (rewinding, replacement of components), the rotor assembly must be rebalanced.

4.6.7.2 - Reassembling the revolving field coil

- Follow the dismantling procedure in reverse order.

Take care not to knock the windings when refitting the rotor in the stator.

- If the fan is being replaced, assemble the parts as shown in the following diagram. Fit a tube and a threaded screw.



Follow the procedure for reassembling the bearings (see section 4.6.6).

4.6.8 - Accessing, checking and replacing the nanophase rectifier

4.6.8.1 - Dismantling

- Remove the inspection and access doors [59] and [42].
- Remove the cover [144].
- Remove the cover supports [146] and [147].
- Cut the fixing clamps on the cables and bundles.
- Disconnect the R220 AVR and the CCM module.
- Remove the 8 screws from the supports [141] and [142].
- Remove the nanophase rectifier [140] and disconnect the power cables.

4.6.8.2 - Reassembly

- Reconnect the power cables to the rectifier making sure they are in the correct position (T1 to T9).
- Fix the rectifier on the supports [141] and [142] using the 8 screws.
- Reconnect the R 220 VS AVR and the CCM module.
- Place the fixing clamps on the cable bundle.
- Replace the cover supports [146] and [147].
- Replace the cover [144].
- Replace the inspection and access doors [59] and [42].



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

4.7 - Characteristics table

Table of average values:
Alternator - 4 pole - 30 Hz/67 Hz - Winding 44 / 30.

The voltage and current values are given for no-load operation and operation at rated load with separate field excitation. All values are given to within ± 10% (for exact values, consult the test report) and may be changed without prior notification.

4.7.1 - Resistance at 20°C (Ω)

LSA 40	L/N stator	Rotor	Exciter field	Armature
S3	0.06	3.5	12.5	1.4

Field excitation current i exc (A)

44.1 V - 50 Hz

“i exc”: excitation current of the exciter field

LSA 40	No load (50 Hz)	At rated load (15.8 kVA, 66.7 Hz)
S3	0.3	2.1

4.7.4 - Table of weights

(values given for information only)

LSA 40	Total weight (kg)	Rotor (kg)
S3	110	35



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

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5 - SPARE PARTS

5.1 - First maintenance parts

Emergency repair kits are available as an option.

They contain the following items:

Repair kit	ALT 040 KS 003
R 220 VSG AVR	-
Diode bridge assembly	-
Surge suppressor	-

Bearing kit	ALT 422 KB 002
Non-drive end bearing	-
O ring seal	-
Preloading (wavy) washer	-

CCM module	AEM 056 CT 001
Nanophase rectifier	ESC 400 MP 000



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

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.

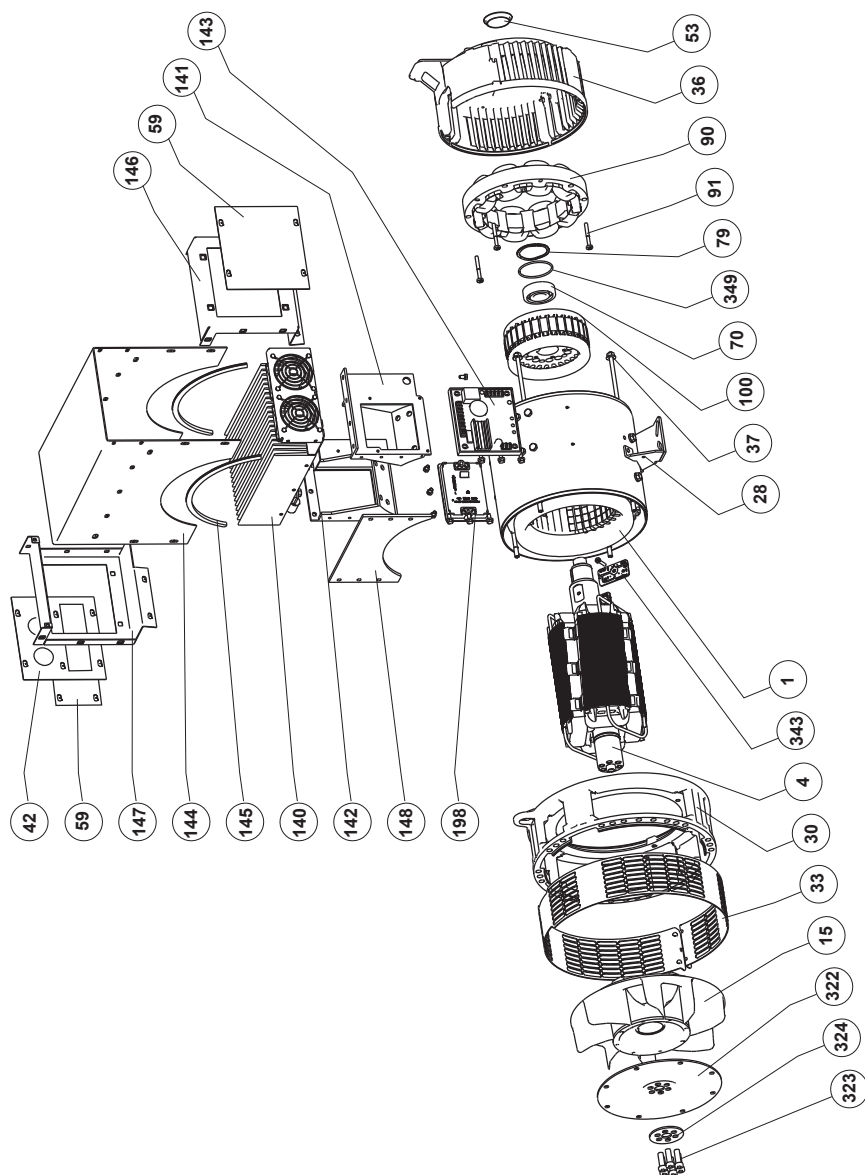
Our extensive network of service centres can dispatch the necessary parts without delay.

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.

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5.3 - Exploded view, parts list and tightening torques



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Ref.	Qty	Description	Screw Ø	Torque N.m	Ref.	Qty	Description	Screw Ø	Torque N.m
1	1	Stator assembly	-	-	140	1	Nonaphase rectifier	-	-
4	1	Rotor assembly	-	-	141	1	Right-hand rectifier support	M6	
15	1	Fan	M5	4	142	1	Left-hand rectifier support	M6	
28	1	Earth terminal	-	-	143	1	CCM control module	M5	
30	1	Shield DE	-	-	144	1	Cover	M6	3.6
33	1	Air outlet guard	M5	4	145	2	Cover seal		
36	1	NDE shield	-	-	146	1	Right-hand cover support	M6	
37	4	Tie rod	M8	20	147	1	Left-hand cover support	M6	
42	1	Cable gland support			148	1	Front cover support		
53	1	End shield plug	-	-	198	1	Voltage regulator (AVR)	M5	-
59	2	Inspection door	M5	3.6	322	1	Disc coupling	-	-
70	1	Non-drive end bearing	-	-	323	6	Fixing screw	M10	66
79	1	Preloading (wavy) washer	-	-	324	1	Clamping washer	-	-
90	1	Exciter field	-	-	343	2	Diode bridge	M5	4
91	4	Field fixing screw	M6	10	349	1	O ring seal	-	-
100	1	Exciter armature	-	-					

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