LEROY SOMER®

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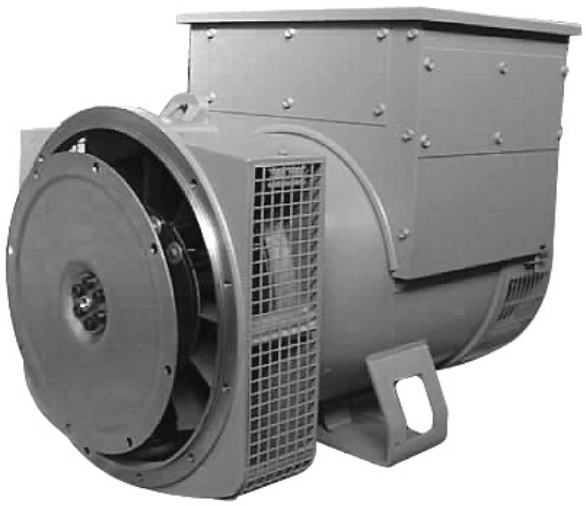
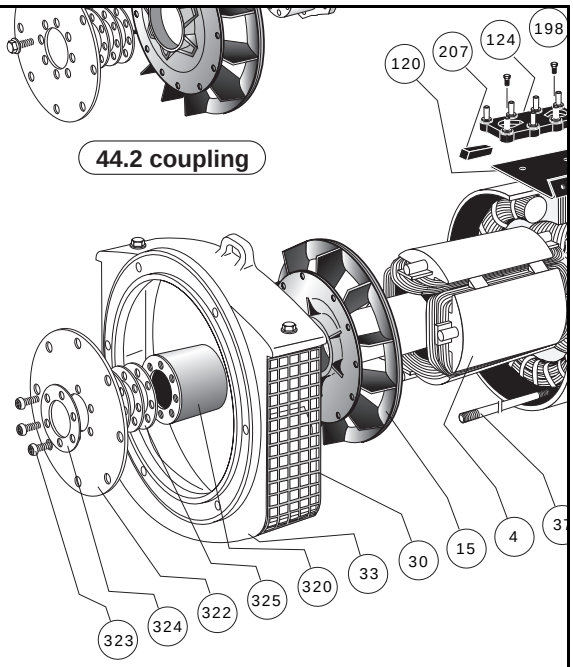


This manual is to be given to the end user



LSA 43.2/44.2 - 4-POLE

ALTERNATORS

Installation and maintenance

LSA 43.2/44.2 - 4-POLE
ALTERNATORS

This manual concerns the alternator which you have just purchased.

The latest addition to a whole new generation of alternators, this range benefits from the experience of the world's leading manufacturer, using advanced technology and incorporating strict quality control.

We wish to draw your attention to the contents of this maintenance manual. By following certain important points during installation, use and servicing of your alternator, you can look forward to many years of trouble-free operation.

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 risk of accident. It is vital that you understand and take notice of the different warning symbols used.

CAUTION

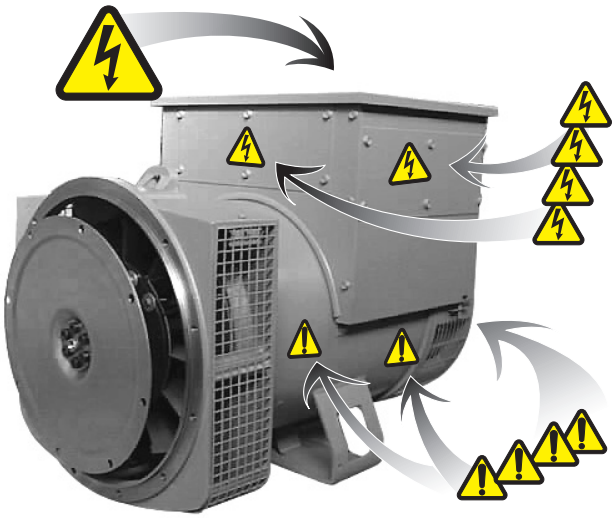
Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.

Warning symbol for general danger to personnel.

Warning symbol for electrical danger to personnel.

WARNING SYMBOLS

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.



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

LSA 43.2/44.2 - 4-POLE
ALTERNATORS

CONTENTS

LSA 43.2/44.2 - 4-POLE
ALTERNATORS
RECEIPT

1 - RECEIPT

1.1 - Standards and safety measures

Our alternators comply with most international standards and are compatible with:
- the recommendations of the
International Electrotechnical Commission
IEC 34-1, (EN 60034)
- the recommendations of the
International Standards Organisation ISO 8528
- the European Community directive 89/336/EEC on Electromagnetic Compatibility (EMC)
- the European Community directives
73/23/EEC and 93/68/EEC (Low Voltage Directive)
They are CE marked with regard to the LVD (Low Voltage Directive) in their role as a machine component. A declaration of incorporation can be supplied on request.
Before using your generator for the first time, read carefully the contents of this installation and maintenance manual, supplied with the machine. All operations performed on the generator should be undertaken by qualified personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components. This maintenance manual should be retained for the whole of the machine's life and be handed over with the contractual file.
The various operations described in this manual are accompanied by recommendations or symbols to alert the user to potential risks of accidents. It is vital that you understand and take notice of the different warning symbols used.

1.2 - Inspection

On receipt of your alternator, check that it has not suffered any damage in transit. If there are obvious signs of knocks, contact the transporter (you may able to claim on their insurance) and after a visual check, turn the machine by hand to detect any malfunction.

1.3 - Identification

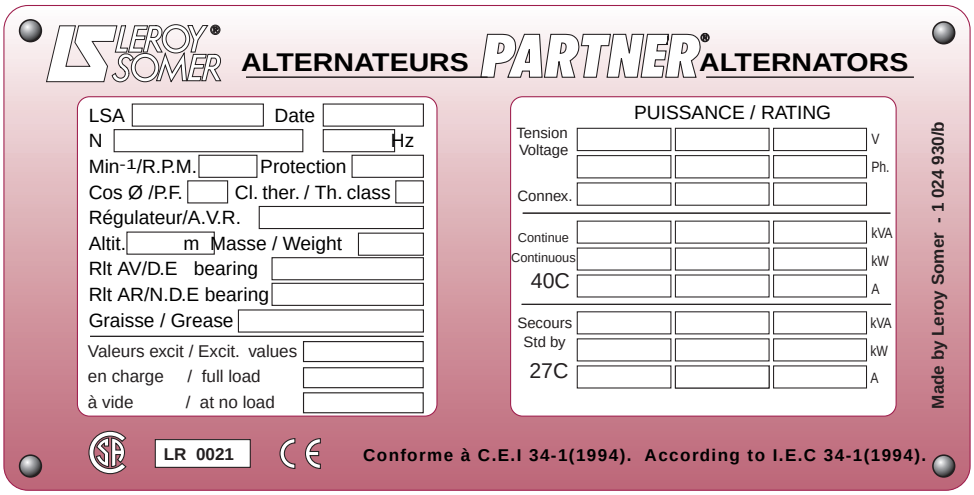
The alternator is identified by means of a nameplate glued to the frame.
Make sure that the nameplate on the machine conforms to your order.
The machine name is defined according to various criteria (see below).
Example of description: **LSA 43.2 M45 J6/4**
- LSA: Name used in the PARTNER range
- M: Marine
- C: Cogeneration
- T: Telecommunications
- 43.2: Machine type
- M45: Model
- J: Excitation system (C: AREP/J: SHUNT or PMG/ E: COMPOUND)
- 6/4: Winding number/number of poles

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 not be stored in humid conditions: at relative humidity levels greater than 90%, the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.
For storage over an extended period, the machine can be placed in a sealed enclosure (heatshrunk plastic for example) with dehydrating sachets inside, away from significant and frequent variations in temperature to avoid the risk of condensation during storage.
If the area is affected by vibration, try to reduce the effect of these vibrations by placing the generator on a damper support (rubber disc or similar) and turn the rotor a fraction of a turn once a fortnight to avoid marking the bearing rings.



LSA 43.2/44.2 - 4-POLE
ALTERNATORS
TECHNICAL CHARACTERISTICS

2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

PARTNER LSA 43.2/44.2 alternators are machines without sliprings or revolving field brushes, wound as "2/3 pitch", 12-wire; the insulation is class H and the field excitation system is available in either "SHUNT", "AREP" or "PMG" versions (see AVR manual).

2.1.1 - Options

- Stator temperature detection probes
- Space heaters

Interference suppression conforms to standard EN 55011, group 1, class B. (Europe).

2.2 - Mechanical characteristics

- Steel frame
- Cast iron end shields
- Protected ball bearings, greased for life
- Mounting arrangements:

IM 1201 (MD 35) foot and flange mounted, single-bearing with SAE coupling disc.
IM 1001 (B 34) double-bearing with SAE flange and standard cylindrical shaft extension.

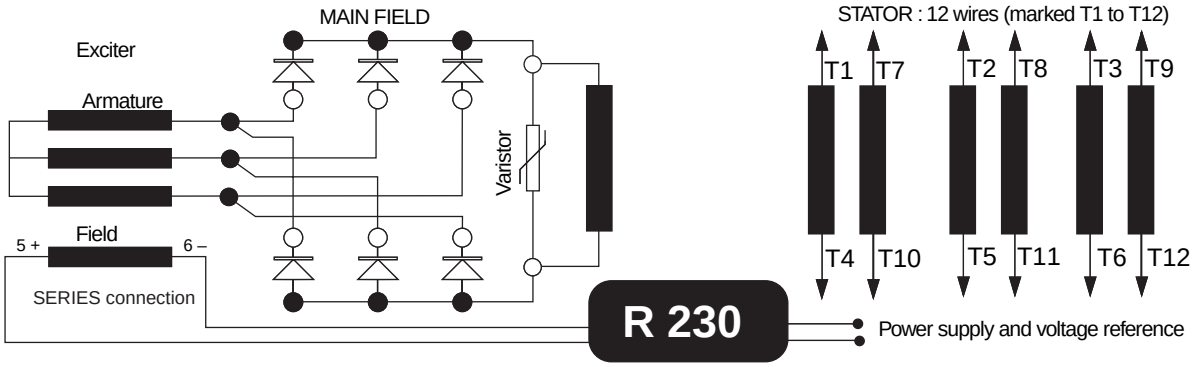
- Drip-proof machine, self-cooled
- Degree of protection: IP 23

2.2.1 - Mechanical options

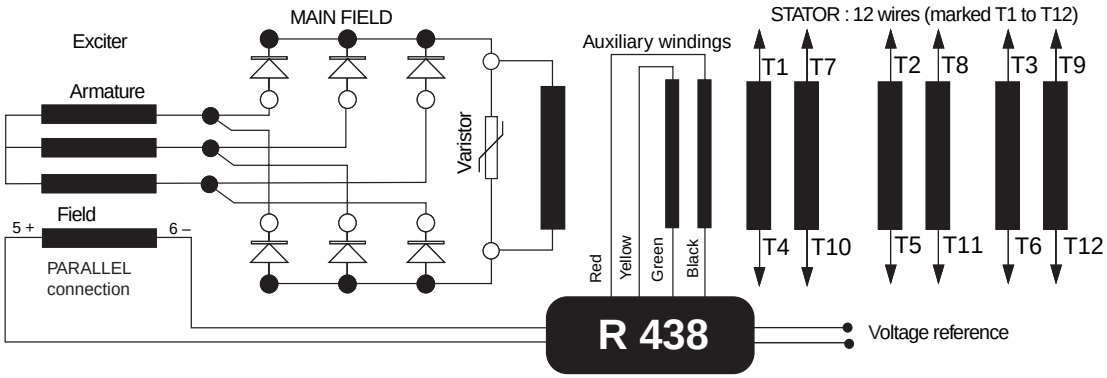
- Air inlet filter
- Regreasable ball bearings
- IP 44 protection

2.1.2 - SHUNT system with R 230 AVR

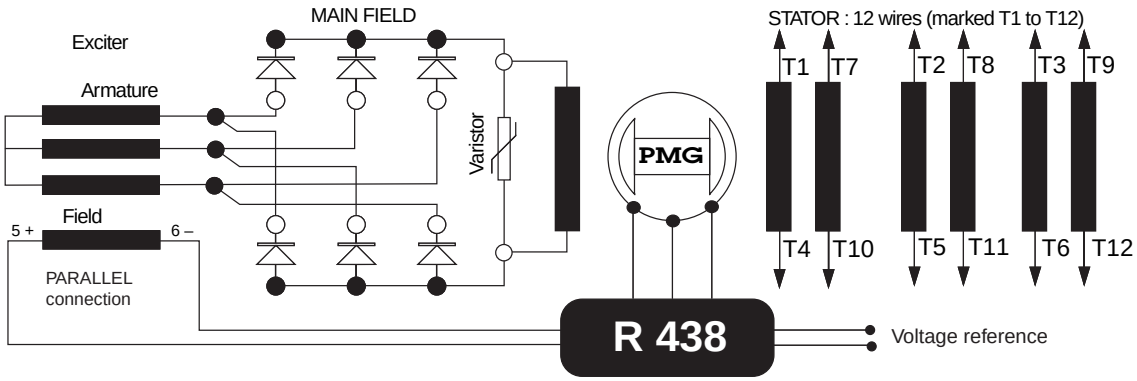
Other version R 231 AVR for dedicated single-phase or R 448 for additional function



2.1.3 - AREP system with R 438 AVR



2.1.4 - PMG system with R 438 AVR



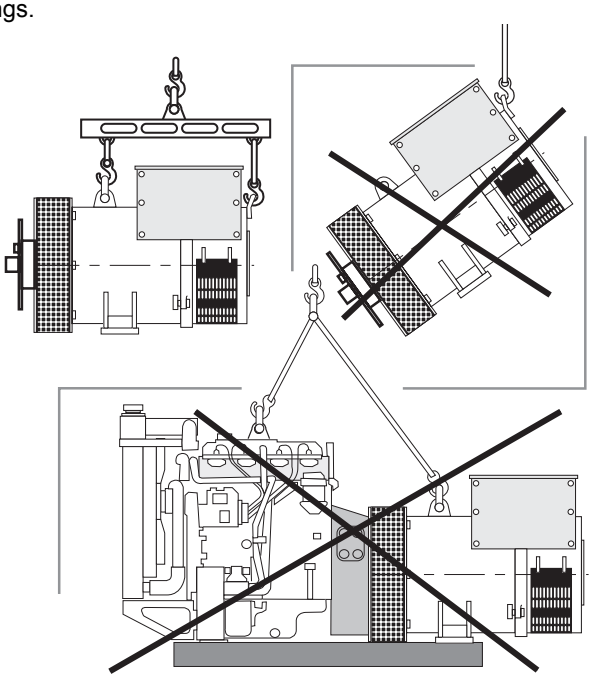
3 - INSTALLATION

3.1 - Assembly

All mechanical handling operations must be undertaken using approved equipment.
Whilst being handled, the machine should remain horizontal.

3.1.1 - Handling

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



3.1.2 - Coupling

3.1.2.1 - Single-bearing alternator

Before coupling the two machines, check that both are compatible by:
- undertaking a torsional analysis of the transmission on both units
- checking the dimensions of the flywheel and its housing, the flange, coupling discs and offset

CAUTION

When coupling the alternator to the prime mover, the holes of the coupling discs should be aligned with the flywheel holes by cranking the engine.
Do not use the alternator fan to turn the rotor.
Tighten the coupling disc screws to the recommended torque (see section 4.6.2) and check that there is lateral play on the crankshaft.

3.1.2.2 - Two-bearing alternator

- Semi-flexible coupling

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

CAUTION

This alternator has been balanced with a half-key.

3.1.3 - Location

Ensure that the ambient temperature in the room where the alternator is placed cannot exceed 40 °C for standard power ratings (for temperatures > 40 °C, apply a derating coefficient). Fresh air, free from damp and dust, must be able to circulate freely around the air intake grilles on the opposite side from the coupling. It is essential to prevent not only the recycling of hot air from the machine or engine, but also exhaust fumes.

3.2 - Inspection 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 three possible methods for restoring the above minimum values.
a) Dry out the machine for 24 hours in a drying oven at a temperature of approximately 110 °C (without the AVR).
b) Blow hot air into the air inlet, having made sure that the machine is rotating with the exciter field disconnected.
c) Run in short-circuit mode (disconnect the AVR):
- Short-circuit the three output terminals (power) using connections capable of supporting the rated current (try not to exceed 6 A/ mm^2)
- Insert a clamp ammeter to monitor the current passing through the short-circuit connections
- Connect a 48 Volt battery in series with a rheostat of approximately 10 ohms (50 W) to the exciter field terminals, respecting the polarity
- Open all the alternator openings fully
- Run the alternator at its rated speed, and adjust the exciter field current using the rheostat to obtain the rated output current in the short-circuit connections

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.

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INSTALLATION

3.2.2 - Mechanical checks

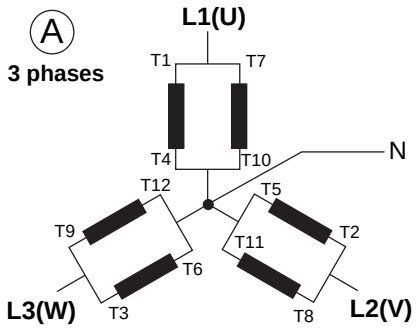
Before starting the machine for the first time, check that:
- the fixing bolts on the feet are tight
- the cooling air is drawn in freely
- the protective grilles and housing are correctly in place
- the standard direction of rotation is clockwise as seen from the shaft end (phase rotation in order 1-2-3). 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 terminal cables. The winding code is specified on the nameplate.

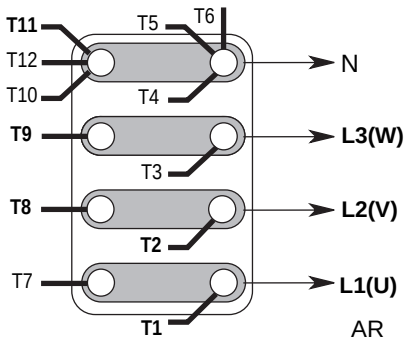
Any intervention on the alternator terminals during reconnection or checks should be performed with the machine stopped.

A — 3 phases

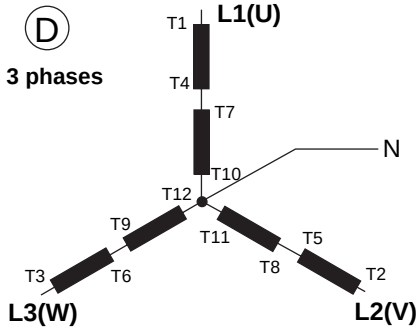


Winding	50 Hz	60 Hz
6	190 - 208	190 - 240
7	220 - 230	-
8	-	190 - 208

R 230 voltage sensing:
0 => (T8) / 110 V => (T11)
R 438 voltage sensing:
0 => (T3) / 220 V => (T2)

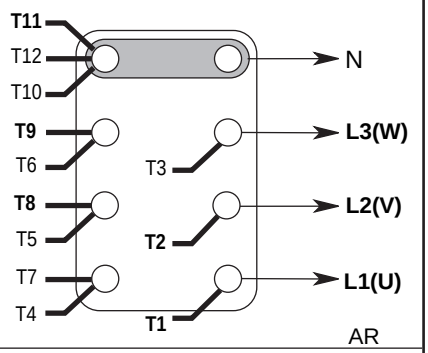


D — 3 phases

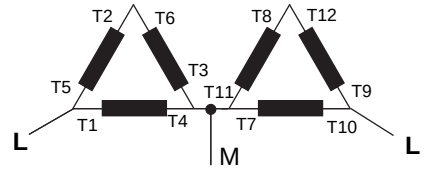


Winding	50 Hz	60 Hz
6	380 - 415	380 - 480
7	440 - 460	-
8	-	380 - 416

R 230 voltage sensing:
0 => (T8) / 110 V => (T11)
R 438 voltage sensing:
0 => (T3) / 380 V => (T2)



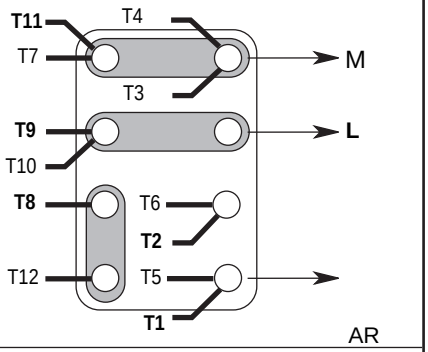
FF — 1 phase



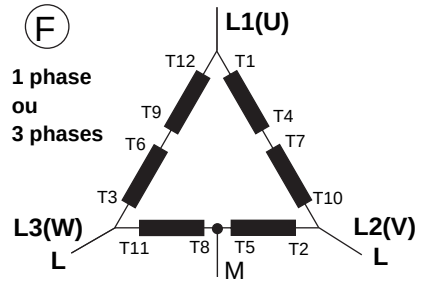
LM voltage = 1/2 LL voltage

Winding	50 Hz	60 Hz
6	220 - 240	220 - 240
7	250 - 260	-
8	200	220 - 240

R 230 voltage sensing:
0 => (T1) / 110 V => (T4)
R 438 voltage sensing:
0 => (T10) / 220 V => (T1)



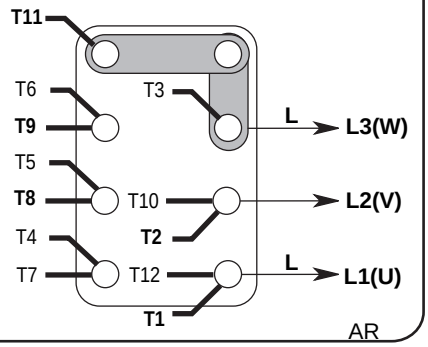
F — 1 phase ou 3 phases



LM voltage = 1/2 LL voltage

Winding	50 Hz	60 Hz
6	220 - 240	220 - 240
7	250 - 260	-
8	200	220 - 240

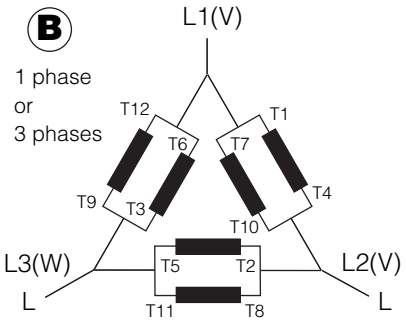
R 230 voltage sensing:
0 => (T8) / 110 V => (T11)
R 438 voltage sensing:
0 => (T3) / 220 V => (T2)



LSA 43.2/44.2 - 4-POLE
ALTERNATORS
INSTALLATION

Connection codes

B

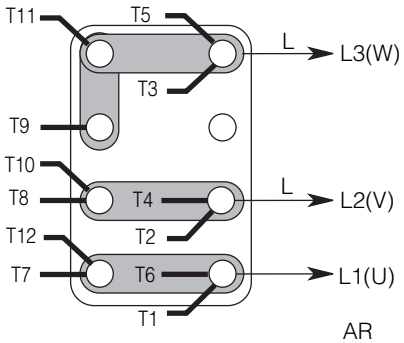


L.L voltage

Winding	50 Hz	60 Hz
6	110 - 120	120
7	120 - 130	-
8	-	110 - 120

R 230 voltage sensing:
0 => (T8) / 110 V => (T11)
R 438 voltage sensing:
0 => (T3) / 110 V => (T2)

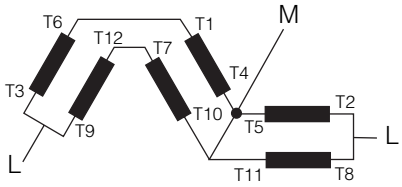
Factory connection



⚠ FOR LSA 44.2, THE COUPLING **B** IS NOT POSSIBLE

G Connection not recommended

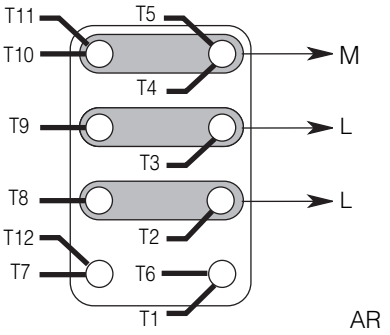
1 PH



LM voltage = 1/2 LL voltage

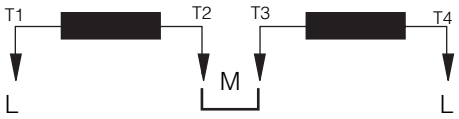
Winding	50 Hz	60 Hz
6	220 - 240	220 - 240
7	250 - 260	-
8	200	220 - 240

R 230 voltage sensing:
0 => (T8) / 110 V => (T11)
R 438 voltage sensing:
0 => (T3) / 220 V => (T2)



SINGLE-PHASE 4-WIRE - type M or M1 DEDICATED WINDING

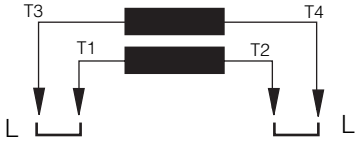
SERIAL CONNECTION



Voltage 50/60 Hz			Output		
L - L	L - M	Link	L	L	M
220 230 240	110 115 120	T2 - T3	T1	T4	T2 - T3

R 231 voltage sensing: 0 => (T1) / 110 V => (T2)

PARALLEL CONNECTION (Not possible with LSA 44.2)

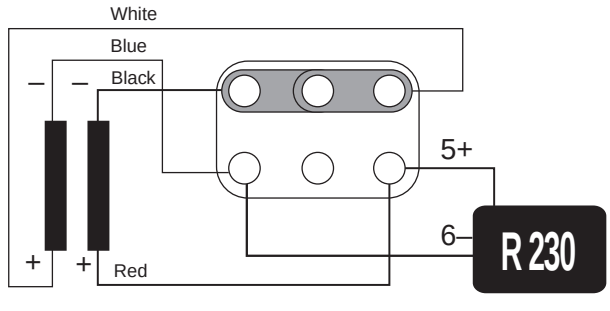


Voltage 50/60 Hz			Output		
L - L	L - M	Link	L	L	M
110 115 120	- - -	T1 - T3 T2 - T4	T1-T3	T2 - T4	-

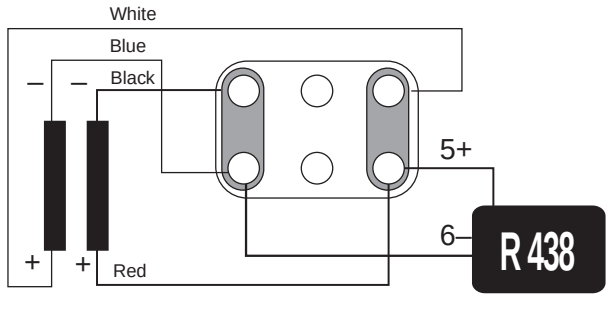
R 231 voltage sensing: 0 => (T1) / 110 V => (T2)

3.3.1 - Exciter field connection

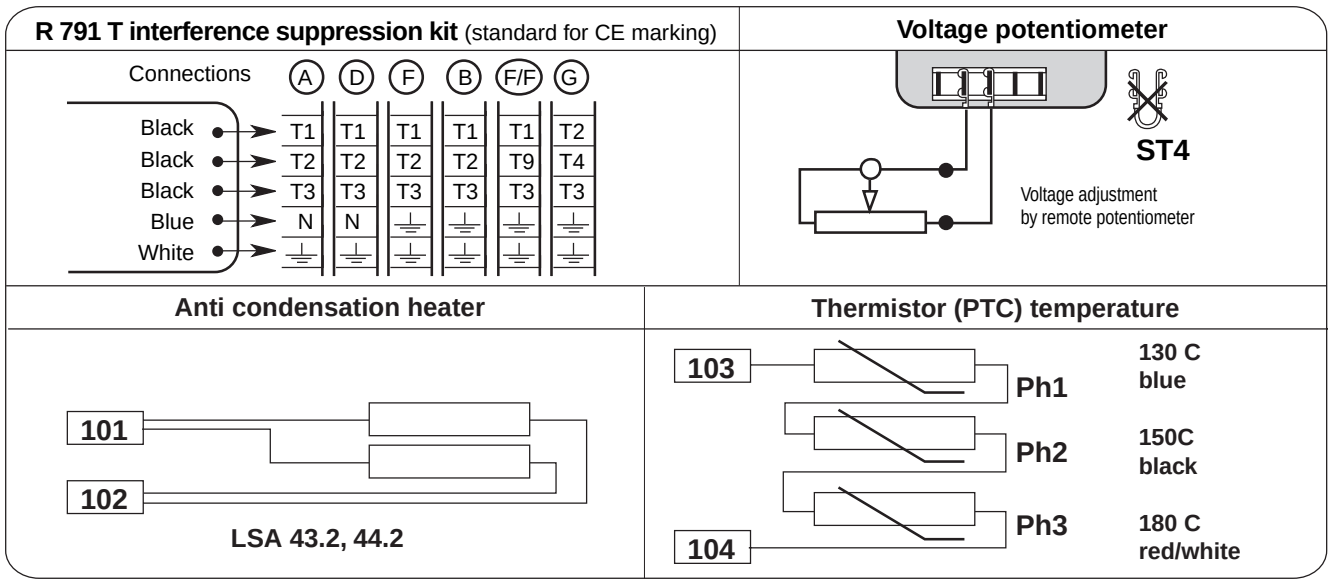
Series connection (shunt excitation)



Parallel connection (AREP or PMG excitation)



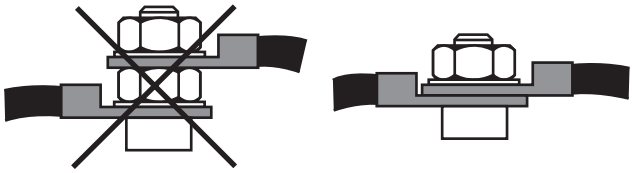
3.3.2 - Option connection diagram



3.3.3 - Connection checks

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

Check that:
- The residual circuit-breaker complies with 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 blue wire of the R 791 interference suppression module linking the neutral)
- Any protective devices in place have not tripped
- If there is an external AVR, the connections between the alternator and the cubicle 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 generator set control cabinet (part of the circuit not protected by circuit-breakers or cubicle relays)
- The machine has been connected with the busbar separating the terminals as shown in the terminal connection diagram



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 at the factory. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate). On application of the load, the machine should achieve its rated speed and voltage; however, in the event of abnormal operation, the machine setting can be altered (follow the adjustment procedure: see 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. Take care 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.

4 - SERVICING / MAINTENANCE

4.1 - Safety measures

Servicing or troubleshooting must be carried out strictly in accordance with instructions so as to avoid the risk of accidents and to maintain the machine in its original state.

All such operations performed on the alternator should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components.
Before any intervention on the machine, ensure that it cannot be started by a manual or automatic system and that you have understood the operating principles of the system.

4.2 - Regular maintenance

4.2.1 - Checks after start-up

After approximately 20 hours of operation, check that all fixing screws on the machine are still tight, plus the general state of the machine and the various electrical connections in the installation.

4.2.2 - Cooling circuit

It is advisable to check that circulation of air is not reduced by partial blocking of the air intake and outlet grilles: mud, fibre, grease, etc.

4.2.3 - Bearings

The bearings are permanently greased: approximate life of the grease (depending on use) = 20,000 hours or 3 years. Monitor the temperature rise in the bearings, which must not exceed 60 °C above the ambient temperature. Should this value be exceeded, the machine must be stopped and checks carried out.

4.2.4 - Electrical servicing

Cleaning product for the windings

CAUTION

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

Certain strictly defined pure volatile degreasing agents can be used, such as:
- Normal petrol (without additives); inflammable
- Toluene (slightly toxic); inflammable
- Benzene (or benzine, toxic); inflammable
- Ciclohexare (non toxic); inflammable

Cleaning of the stator, rotor, exciter and diode bridge

The insulating components and the impregnation system are not at risk of damage from solvents (see the list of authorized products).
Avoid letting the cleaning product run into the slots. Apply the product with a brush, sponging frequently to avoid accumulation in the housing. Dry the winding with a dry cloth. Let any traces evaporate before reassembling the machine.

4.2.5 - Mechanical servicing

CAUTION

Cleaning the machine using a water spray or a high-pressure washer is strictly prohibited.
Any problems arising from such treatment are not covered by our warranty.
The machine should be cleaned with a degreasing agent, applied using a brush. Check that the degreasing agent will not affect the paint.
Compressed air should used to remove any dust.
If filters have been added to the machine after manufacture and do not have thermal protection, the service personnel should clean the air filters periodically and systematically, as often as necessary (every day in very dusty atmospheres).
Cleaning can be performed using water for dry dust or in a bath containing soap or detergent in the case of greasy dust. Petrol or chloroethylene can also be used.
After cleaning the alternator, it is essential to check the winding insulation (see sections 3.2 and 4.8).

4.3 - Fault detection

If, when commissioned, the alternator does not work normally, the source of the malfunction must be identified.
To do this, check that:
- the protective devices are fitted correctly
- the connections comply with the diagrams in the manuals supplied with the machine
- the speed of the unit is correct (see section 1.3)

Repeat the operations defined in section 3

4.4 - Mechanical defects

Fault		Action
Bearing	Excessive overheating of one or both bearings (temperature > 80 °C on the bearing retainers with or without abnormal noise)	- If the bearing has turned blue or if the grease has turned black, change the bearing. - Bearing not properly seated. - End shields misaligned (flanges not properly fitted).
Temperature abnormal	Excessive overheating of alternator frame (more than 40 °C above the ambient temperature)	- Air flow (intake-outlet) partially clogged or hot air is being recycled from the alternator or engine - Alternator operating at too high a voltage (> 105% of Un on load) - Alternator overloaded
Vibration	Excessive vibration	- Misalignment (coupling) - Defective mounting or play in coupling - Rotor balancing fault
	Excessive vibration and humming noise coming from the machine	- 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, followed by humming and vibration	- System short-circuit - Mis-paralleling Possible consequences - Broken or damaged coupling - Broken or bent shaft end - Shifting and short-circuit of main field - Fan fractured or coming loose on shaft - Irreparable damage to rotating diodes or AVR

4.5 - Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Connect between E- and E+ a new battery of 4 to 12 volts, respecting the AVR polarities, 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
Voltage oscillations	Adjust AVR stability potentiometer	If no effect: try normal/rapid 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 < 20 V - AREP/PMG < 10 V	- Check the speed (or LAM set too high)
		Voltage between E+ and E- SHUNT > 30 V - AREP/PMG > 15 V	- Faulty rotating diodes - Short-circuit in the main field. 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 winding open circuit - Faulty exciter armature - Faulty AVR - Main field open circuit or short-circuited
(**) Caution: Internal protection may be activated (overload, open circuit, short-circuit)			

4.5.1 - Checking the winding

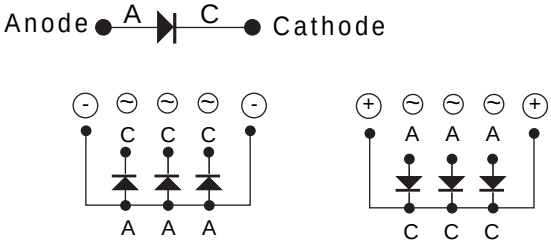
You can check the winding insulation by performing a high voltage test. In this case, you must disconnect all AVR wires.

CAUTION

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

4.5.2 - Checking the diode bridge

LSA 43.2 / 44.2 Diode bridge



A diode in good working condition allows the current to flow in only one direction, from anode to cathode.

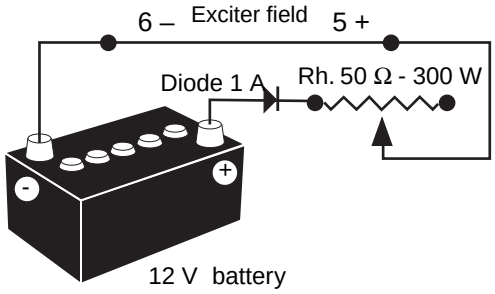
4.5.3 - Checking the windings and rotating diodes using separate excitation

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-).

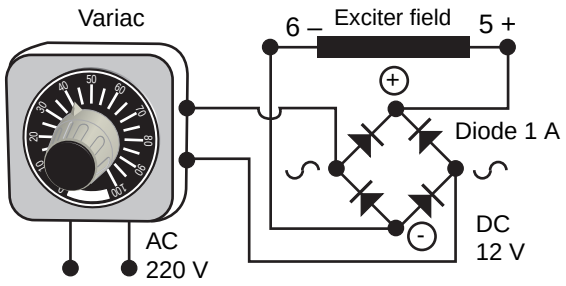
Both these systems should have characteristics which are compatible with the field excitation power of the machine (see the nameplate).

3) Run the unit at its rated speed.

4) Gradually increase the exciter field supply current by adjusting the rheostat or the Variac and measure the output voltages on L1 - L2 - L3, checking the excitation voltage at no load and at full load (see machine nameplate or ask for the factory test report).

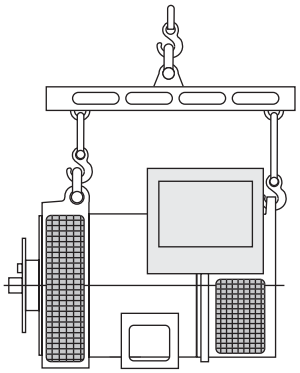
When the output voltage is at its rated value and balanced within 1% for the rated excitation level, the machine is in good working order. The fault therefore comes from the AVR or its associated wiring (ie. sensing, auxiliary windings).

ASSEMBLY B



4.6 - Dismantling, reassembly (see sections 5.5.1/5.5.2)

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 when moved).



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

4.6.2 - Screw tightening torque

IDENTIFICATION	screw Ø	Torque N.m
Field terminal block screw	M4	4 N.m
Field screw	M6	10 N.m
Diode bridge/RP	M6	5 N.m
Diode nut	M5	4 N.m
43.2 tie rod	M12	57 Nm
44.2 tie rod	M14	90 Nm
Earth screw	M8	26 Nm
43.2 disc/shaft screw	M12	110 Nm
44.2 disc/shaft screw	M16	250 Nm
44.2 turbine screw	M6	5 Nm
Grille screws	M6	5 Nm
Cover screws	M6	5 Nm
Terminal block nut	M10	20 Nm

4.6.3 - Access to connections and the regulation system

The terminals are accessed directly by removing the terminal box lid [48].
To access the AVR adjustment potentiometers, the side plate [367] should be removed.

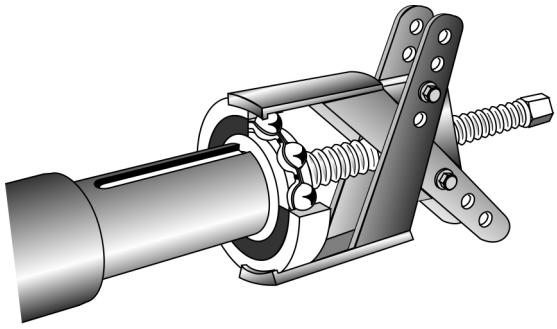
4.6.4 - Accessing, checking and replacing diodes

4.6.4.1 - Dismantling
- Remove the air intake grille [51]
- Remove the surge suppressor [347]
- Disconnect the 6 diodes using an ohmmeter or a battery lamp (see section 4.5.2)

4.6.4.2 - Reassembly
- Replace the bridges, respecting the polarity (see section 4.5.1)
- Replace the surge suppressor [347]
- Refit the air intake grille [51]
- Replace the terminal box lid [48]

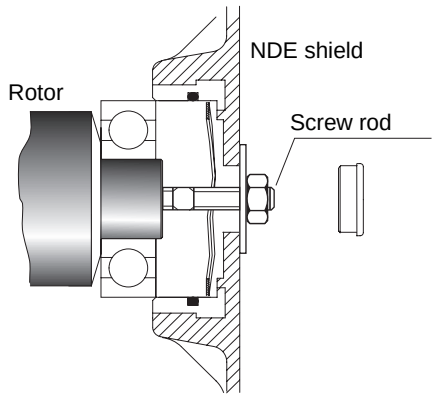
4.6.5 - Replacing the NDE bearing on single-bearing machines

4.6.5.1 - Dismantling
- Remove the terminal box lid [48]
- Remove the air intake grille [51]
- Unscrew the fixing clamps on the power output cables, remove the connector from the exciter and the R 791 module.
- Remove the 4 nuts on the tie rods
- Remove the NDE shield [36] using a puller: eg. U.32 - 350 (FACOM)
- Remove the ball 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].
Refit the NDE shield and pass the bundle of wires between the top bars of the shield.
- Refit the fixing clamps on the cables, the R 791 module and the exciter connector.

- Refit the air intake grille [51].
- Replace the terminal box lid [48].



4.6.6 - Replacing the bearings on two-bearing machines

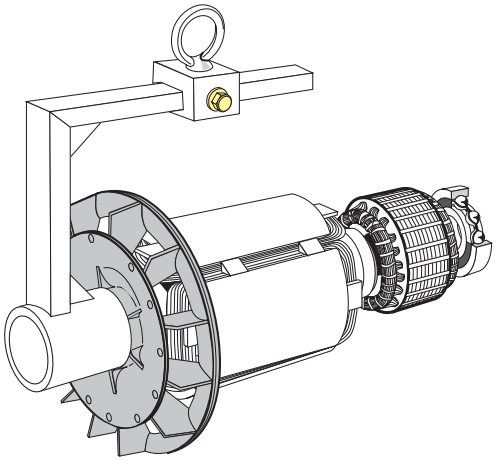
4.6.6.1 - Dismantling
- Uncouple the alternator from the prime mover.
- Remove the 8 assembly screws.
- Remove the DE shield [30].
- Remove the NDE shield (see section 4.6.5.1)
- Remove both ball bearings [60] and [70] using a puller with a central screw.

4.6.6.2 - Reassembly
- Heat the new bearings by induction or in a drying oven at 80 °C (do not use an oil-bath) and fit them to the machine.
- Check that both the preloading wavy washer [79] and the new O ring seal [349] have been fitted on the NDE shield [36]. Refit the NDE shield and pass the bundle of wires between the top bars of the shield.
- Refit the DE shield [30] and tighten the 4 fixing screws.
- Check that the machine assembly is correctly mounted and that all screws are tightened.

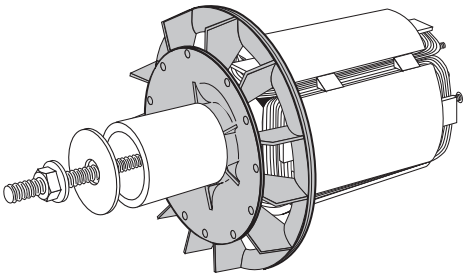
4.6.7 - Accessing the main field and stator

4.6.7.1 - Dismantling
Follow the procedure for dismantling the bearings (see sections 4.6.5.1 and 4.6.6.1)
- 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 end or a support made according to the following diagram.
- Rest the rotor on one of its poles, then slide it out. Use the tube as a lever arm to assist dismantling.
- After extraction of the rotor, be careful not to damage the fan. If the fan is dismantled, it is essential that it is replaced for the 43.2.

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



4.6.7.2 - Reassembling the main field
- 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 on the 43.2, assemble the parts as shown in the following diagram. Fit a tube and a threaded screw. On the 44.2 the fan is fixed by screws on the hub.



Follow the procedure for reassembling the bearings (see sections 4.6.5.2 and 4.6.6.2).

After operational testing, replace all access panels or covers.

4.7 - Installation and maintenance of the PMG

For the LSA 43.2 and LSA 44.2, the PMG reference is PMG 1.

4.7.1 - Mechanical characteristics

The components are:
- An adaptation shaft (to position the rotor on the shaft extension)
- A tie rod and nut for assembling the rotor on the shaft
- A rotor with 16 magnets
- An assembly consisting of: housing + wound stator + plastic connection sheath + plastic ferrules
- The housing closure cover (4 CBLXS M5 screws)
- 4 HM6 screws (for fixing the housing to the NDE shield)

If mounting in kit form, follow the following instructions (see section 5.4):
1 - Remove the PMG cover [297] and the alternator NDE shield seal.
2 - Mount the PMG housing assembly [290] on the shield using the 4 HM6 screws.
3 - Put a coating of anti-vibration adhesive on the tie rod [295] and fix it on the alternator shaft extension.
4 - Mount the magnetized rotor on the adaptation shaft, then using 2 threaded rods screwed into the rotor, slide the assembly onto the tie rod.
5 - Install the cable gland washer [296].
6 - Tighten the assembly with the M10 nut.
7 - Close the PMG with the cover [297].
8 - Pierce the cover (Ø 21 hole) and insert the plastic sheath and its ferrule.
9 - Connect the PMG to the AVR (see sections 2.5 and 4.7.2).

4.7.2 - Electrical connection

Mounting the PMG-1 on a SHUNT machine
(when using an R438):
- Disconnect the connection wires from the R 230 and remove the AVR.
- Take out both the R 230 voltage reference wires, marked 2 and 3, by removing them from the terminals (T8 and T11) in which they are inserted.
- Use these same wires for voltage sensing on the R 438 by inserting them in terminals T2 (wire 2) and T3 (wire 3).
- Fit the AVR support plate fitted with the R 438 (2 HM6 screws tightened to 10 Nm).
- Connect the 3 PMG wires (14/15/16), the 2 exciter field wires (5/6) and the 2 previously mentioned voltage sensing wires (2/3) according to the connection diagram no. 2725-02-98.
- Modify the connection by replacing the single jumper on the connector located on the terminal box rear panel with 2 jumpers (see internal connection diagram).
Mounting the PMG-1 on an AREP machine
- Connect the 3 PMG wires (14/15/16), to terminals X1, X2, Z2 on the AVR. The 4 auxiliary winding wires X1.X2.Z1.Z2 should be isolated using the domino fitting supplied with the kit. Both exciter field wires (5/6) and the voltage sensing wires (2/3) remain in place.

Electrical characteristics of the PMG
Stator phase/phase resistance 20 °C: 0.7 Ω
No-load voltage : 73 V

4.8 - Electrical characteristics

Table of average values:
Alternator - 2 and 4 poles - 50 Hz/60 Hz - Winding n° 6 and M or M1 connected in dedicated single-phase. (400 V 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 ± 10% (for exact values, consult the test report) and are subject to change without prior warning. For 60 Hz machines, the resistance values are the same and the excitation current "i exc" is approximately 5 to 10% weaker.

4.8.1 - 3-phase LSA 43.2 4 P, SHUNT excitation

Resistances at 20 °C (Ω)

LSA 43.2	Stator L/N	Rotor	Field	Armature
S1	0,155	1,35	18,4	0,23
S15	0,155	1,35	18,4	0,23
S25	0,155	1,35	18,4	0,23
S35	0,128	1,41	18,4	0,23
M45	0,105	1,57	18,4	0,23
L65	0,083	1,76	18,4	0,23
L8	0,063	1,96	18,4	0,23

Field excitation current i exc (A) - 400 V - 50 Hz
"i exc": excitation current of the exciter field

LSA 43.2	no load	on load
S1	0,5	1,3
S15	0,5	1,5
S25	0,5	1,6
S35	0,5	1,8
M45	0,4	1,6
L65	0,4	1,6
L8	0,4	1,6

4.8.2 - 3-phase LSA 43.2 4 P, AREP excitation

Resistances at 20 °C (Ω)

LSA 43.2	Stator L/N	Rotor	Wind. X1,X2	Widing. Z1,Z2	Field	Armat.
S1	0,155	1,35	0,32	0,52	4,6	0,23
S15	0,155	1,35	0,32	0,52	4,6	0,23
S25	0,155	1,35	0,32	0,52	4,6	0,23
S35	0,128	1,41	0,29	0,5	4,6	0,23
M45	0,105	1,57	0,26	0,51	4,6	0,23
L65	0,083	1,76	0,26	0,44	4,6	0,23
L8	0,063	1,96	0,21	0,4	4,6	0,23

Field excitation current i exc (A) -400 V -50 Hz
"i exc": excitation current of the exciter field

LSA 43.2	no load	on load
S1	1	2,6
S15	1	3
S25	1	3,2
S35	1	3,6
M45	0,8	3,2
L65	0,8	3,2
L8	0,8	3,2

4.8.3 - Dedicated single-phase LSA 43.2: 4-pole, SHUNT excitation (60 Hz only)

Resistances at 20 °C (Ω)

LSA 43.2	Stator L/N	Rotor	Field	Armature
S1	0,058	1,35	13,9	0,23
S25	0,058	1,35	13,9	0,23
S35	0,046	1,41	13,9	0,23
M45	0,037	1,57	13,9	0,23
L65	0,027	1,76	13,9	0,23
L8	0,019	1,96	13,9	0,23

Field excitation current i exc (A) -240 V -60 Hz
"i exc": excitation current of the exciter field

LSA 43.2	no load	on load
S1	0,59	1,44
S25	0,59	1,68
S35	0,66	1,65
M45	0,61	1,48
L65	0,62	1,48
L8	0,74	1,46

4.8.4 - 3-phase LSA 44.2: 4-pole, SHUNT excitation

Resistances at 20 °C (Ω)

LSA 44.2	Stator L/N	Rotor	Field	Armature
VS3	0,046	2,51	18,4	0,5
VS45	0,046	2,51	18,4	0,5
S7	0,036	2,91	18,4	0,5
S75	0,036	2,91	18,4	0,5
M95	0,024	3,32	18,4	0,5
L12	0,019	3,66	18,4	0,5

Field excitation current i exc (A) - 400 V - 50 Hz
"i exc": excitation current of the exciter field

LSA 44.2	no load	on load
VS3	0,5	1,8
VS45	0,5	2,1
S7	0,5	1,9
S75	0,5	2,1
M95	0,6	2
L12	0,6	1,9

4.8.5 - 3-phase LSA 44.2: 4-pole, AREP excitation

Resistances at 20 °C (Ω)

LSA 44.2	Stator L/N	Rotor	Wind. X1,X2	Wind. Z1,Z2	Field	Armat.
VS3	0,046	2,51	0,3	0,5	4,9	0,5
VS45	0,046	2,51	0,3	0,5	4,9	0,5
S7	0,036	2,91	0,21	0,32	4,9	0,5
S75	0,036	2,91	0,21	0,32	4,9	0,5
M95	0,024	3,32	0,17	0,28	4,9	0,5
L12	0,019	3,66	0,16	0,21	4,9	0,5

Field excitation current i exc (A) -400 V -50 Hz
"i exc": excitation current of the exciter field

LSA 44.2	no load	on load
VS3	1	3,6
VS45	1	4,2
S7	1	3,8
S75	1	4,2
M95	1,2	4
L12	1	3,8

4.8.6 - Dedicated single-phase LSA 44.2: 4-pole, SHUNT excitation (60 Hz only)

Resistances at 20 °C (Ω)

LSA 44.2	Stator L/N	Rotor	Field	Armature
VS3	0,0194	2,51	18,4	0,5
VS45	0,0194	2,51	18,4	0,5
S7	0,0140	2,91	18,4	0,5
M95	0,0088	3,32	18,4	0,5

Field excitation current i exc (A) -240 V -60 Hz
"i exc": excitation current of the exciter field

LSA 44.2	no load	on load
VS3	0,44	1,18
VS45	0,44	1,25
S7	0,43	1,2
M95	0,55	1,28

5 - SPARE PARTS

5.1 - First maintenance parts

Emergency repair kits are available as an option.
They contain the following items:

Ref.	Designation	Qty	LSA 43.2/44.2 - SHUNT	Code
198	AVR	1	R 230	AEM 110 RE 001
343	Diode bridge assembly	1	LSA 432 9 03/04	ESC 040 MD 003
347	Surge suppressor	1	LSA 432 1 13	CII 111 PM 002
	AVR fuse	1	250 V - 8 A/slow-blow	

Ref.	Designation	Qty	LSA 43.2/44.2 - AREP 4 P	Code
198	AVR	1	R 438	AEM 110 RE 003
343	Diode bridge assembly	1	LSA 432 9 03/04	ESC 040 MD 003
347	Surge suppressor	1	LSA 432 1 13	CII 111 PM 002
	AVR fuse	2	250 V - 8 A/fast-blow	

5.2 - Bearing designations

Ref.	Designation	Qty	LSA 43.2	Code	LSA 44.2	Code
60	Bearing on shaft extension end	1	6312 2RS/C3	RLT060TS030	6315 2RS/C3	RLT075TS030
70	Bearing on exciter end	1	6307 2RS/C3	RLT080RB002	6309 2RS/C3	RLT100RB005

5.3 - 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.

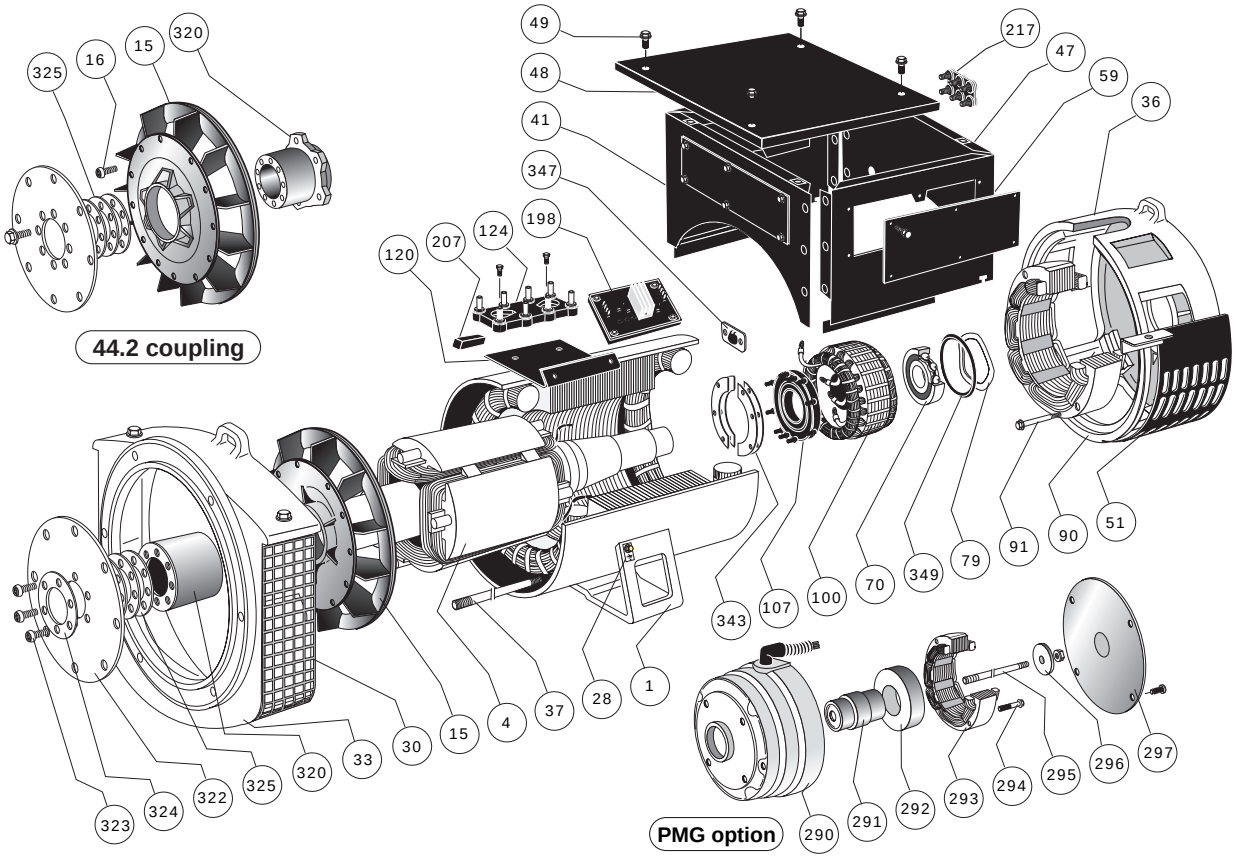
CAUTION

Part numbers should be identified from the exploded views and their description from the parts list.
Our extensive network of service centres can dispatch the necessary parts without delay.
To ensure correct operation and the safety of our machines, we recommend the use of original manufacturer spare parts.
In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

LSA 43.2/44.2 - 4-POLE
ALTERNATORS
SPARE PARTS

5.4 - Exploded views, parts list

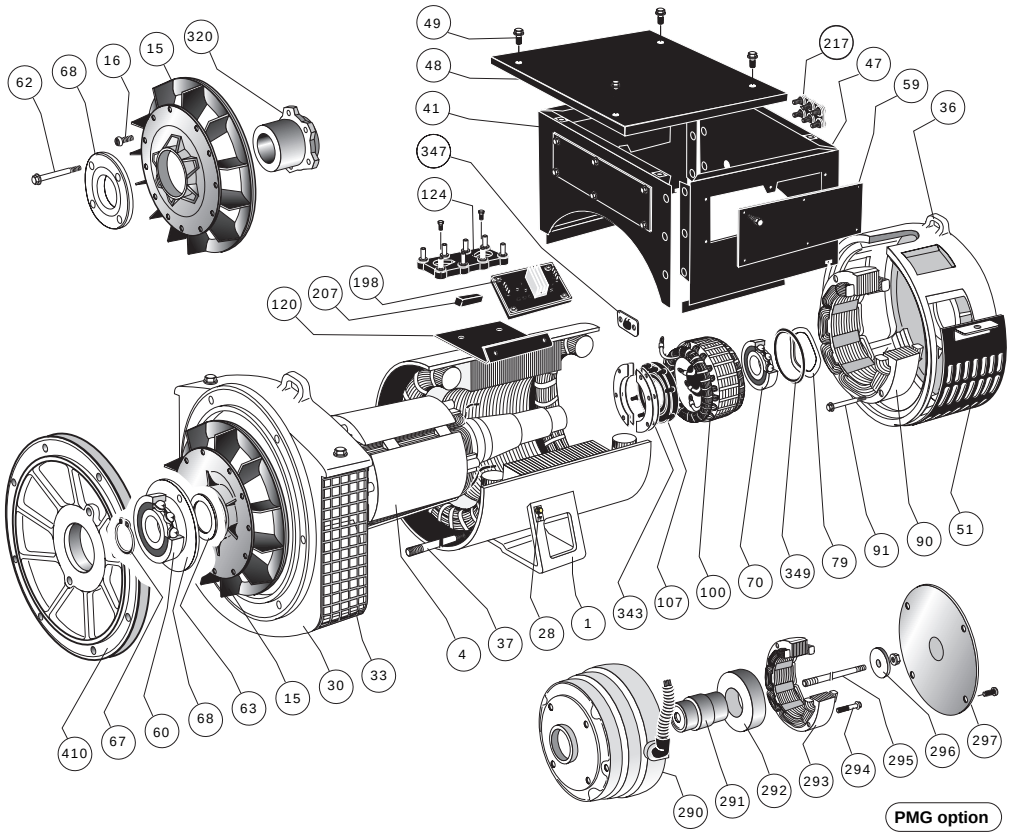
5.4.1 - Single-bearing LSA 43.2/44.2



N°	Nbr	Description	N°	Nbr	Description
1	1	Stator assembly	120	1	Terminal block support (AREP)
4	1	Rotor assembly	124	1	Terminal block
15	1	Fan	198	1	Voltage regulator (AVR)
16	6	Fixing screws (44.2 only)	207	1	AVR damper seal
28	1	Earth terminal	217	1	Terminal block
30	1	DE shield	290	1	PMG housing
33	1	Air outlet grille	291	1	Adaptation shaft
36	1	Shield on exciter end	292	1	Magnetic rotor
37	4	Tie rod	293	1	Stator
41	1	Cover front panel	294	2	Fixing screws
47	1	Cover rear panel	295	1	Tie rod
48	1	Cover top panel	296	1	Cable gland washer + nut
49	34	Fixing screws	297	1	End plate
51	1	Air intake grille	320	1	Hub (43.2 L7 & 44.2 only)
59	3	Inspection door	322	1	Coupling disc
70	1	NDE bearing	323	-	Fixing screws
79	1	Preloading wavy washer	324	1	Clamping washer (43.2 S1 to L6)
90	1	Exciter field	325	-	Spacer shim (43.2 L7 & 44.2 only)
91	4	Exciter field fixing screw	343	1	Diode bridge assembly
100	1	Exciter armature	347	1	Surge suppressor
107	1	Diode crescent support	349	1	"O" ring

LSA 43.2/44.2 - 4-POLE
ALTERNATORS
SPARE PARTS

5.4.2 - Two-bearing LSA 43.2/44.2



N°	Nbr	Description	N°	Nbr	Description
1	1	Stator assembly	91	4	Exciter field fixing screw
4	1	Rotor assembly	100	1	Exciter armature
15	1	Fan	107	1	Diode crescent support
16	6	Fixing screws (44.2 only)	120	1	Terminal block support (AREP)
28	1	Earth terminal	124	1	Terminal block
30	1	DE shield	198	1	Voltage regulator (AVR)
33	1	Air outlet grille	207	1	AVR damper seal
36	1	Shield on exciter end	217	1	Terminal block
37	4	Tie rod	290	1	PMG housing
41	1	Cover front panel	291	1	Adaptation shaft
47	1	Cover rear panel	292	1	Magnetic rotor
48	1	Cover top panel	293	1	Stator
49	34	Fixing screws	294	2	Fixing screws
51	1	Air intake grille	295	1	Tie rod
59	3	Inspection door	296	1	Cable gland washer + nut
60	1	DE bearing	297	1	End plate
62	2/4	Bearing retainer fixing screw	320	1	Hub (44.2 only)
63	1	Cable gland washer (43.2 only)	343	1	Diode bridge assembly
67	1	Circlips	347	1	Surge suppressor
68	1	Inner bearing retainer	349	1	"O" ring
70	1	NDE bearing	410	1	End shield
79	1	Preloading wavy washer			
90	1	Exciter field			

MOTEURS LEROY-SOMER 16015 ANGOULÊME CEDEX - FRANCE

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

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