Self-regulating alternators

ECO47 LV

Installation, Use and Maintenance Manual

Translation of the original instructions

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1 General Information

This instruction manual is an integral part of the Self-regulating alternators ECO47LV, successively also defined as "machine" or "product" and must always be available for consultation by users.

1.1 Responsibility of the user

- The product to which this documentation refers is envisioned for use by personnel instructed in its use. Such instruction must impart sufficient knowledge of the machine and the installation, maintenance and manoeuvre operations required during use to ensure operation in conditions of complete safety.
- All personnel trained to operate with the machine must read this manual carefully in all its parts and thoroughly understand its content.
- It is very important that personnel be informed of the importance of safety, the use of Personal Protective Equipment and the general safety rules required to ensure the protection of personnel, the machine, and the surrounding environment.
- Only the correct use of the machine in accordance with the instructions provided can ensure long-term, efficacious operation in complete safety for the operators and the machine itself.
- This documentation is protected by copyright. Translations, re-issues and copies of this manual even in only partial and/or other form are prohibited without the previous written consent of Mecc Alte S.p.a.

1.2 Warranty

The following conditions invalidate the terms of Warranty provided by Mecc Alte S.p.a.:

- Inappropriate use, or in other words, the use of the machine other than as described in Point *2.1 Intended Use*.
- Use by unauthorised or untrained personnel.
- Partial or total failure to comply with these instructions.
- Defective electric power supply.
- Inadequate maintenance, incorrect maintenance, or maintenance performed by untrained personnel.
- Pollution from outside the machine.
- Unauthorised modifications or repairs.
- Use of unauthorised spare parts.
- Unforeseeable circumstances such as earthquakes, flood or fire (whenever not directly caused by the machine).

1.3 After-sales assistance

After commissioning of the Self-regulating alternators, the Mecc Alte S.p.a. after-sales assistance can be contacted for questions regarding the following:

- Problems during operation
- The supply of spare parts
- Inspections and repair operations

1.3.1 Information required to obtain after-sales assistance

Whenever Mecc Alte S.p.a. after-sales assistance is required, the following data must be provided regarding the Self-regulating alternators (see also *1.5 Machine identification details*):

- Type and model of the alternator.
- Description of the problem and parts involved.

1.4 Addressees of the manual

This Installation, Use and Maintenance manual has been prepared for all authorised users qualified for the operations and maintenance of the machine.

All such users must carefully read and comprehend the contents of this manual. Such content must be respected during all operations with the machine.

This manual specifies which users must perform certain types of operation. Refer to paragraph *2.3.1 Users and their roles* for the definition of the types of user and their tasks.

The following points must also be considered:

- This manual is an integral part of the machine to which it refers and must be preserved for the latter's entire working life.
- In case of transfer or sale of the machine, this manual and all its related or enclosed documentation must be delivered together with the machine.

1.5 Machine identification details

These instructions refer to the following Self-regulating alternators models:

Name:	Self-regulating alternators
Models:	ECO47LV

An identification plate listing its main characteristics has been applied to the machine. See also *1.5.1 Description of the product code*.

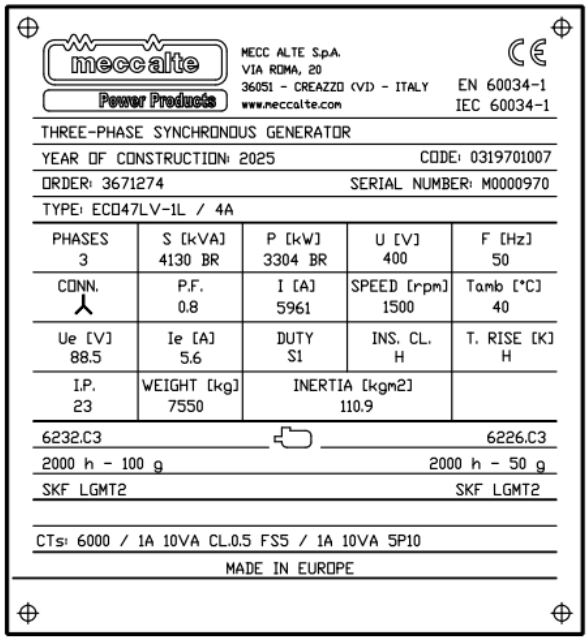


Figure 1- Data plate example

Phases	Number of phases	I [A]	Rated current
S [kVA]	Apparent power	SPEED [rpm]	Rated speed
P [kW]	Active power	Ie [A]	Excitation current
U [V]	Nominal voltage	DUTY	Duty cycle
F [Hz]	Frequency	INS. CL.	Class of isolation
Ue [V]	Excitation voltage	T RISE [K]	Temperature rise
CONN.	Type of connection, Star or Delta	IP	Class of protection
P.F.	Power factor	WEIGHT [kg]	Weight
INERTIA [kgm^2]	Moment of inertia		

Table 1 - Generator plate data

The lubrication intervals of the bearings , type of lubricant and if measurement transformers are present are indicated on the lower part of the plate.

1.5.1 Description of the product code

Every alternator is identified by a unique code made up as described below.

Code example: ECO47LV-1L/4A

Description:

ECO47	Type of alternator	
LV	Voltage range	LV: < 1kV
1L	Alternator model. Identifies the work power in class H	**ECO47** 1S 2S 2M 1L
4	Number of poles	
A	Current version of the machine	A B

Table 2 - Description of the product code

1.6 CE certificate

The machines to which reference is made in this manual are compliant with the Directives in force. The original CE certificate is supplied on delivery.

1.7 Manufacturer's identification details

Below find the information of the manufacturer:

Mecc Alte S.p.a.

Registered office: Via Roma, 20 - 36051 Creazzo (VI)

Tel. +39-0444-396111

www.meccalte.com - e-mail: info@meccalte.it

Tax identification code and VAT code n. 01267440244

1.8 Structure of documentation

1.8.1 Composition of the documentation

The machine documentation when shipped is comprised of:

- This document, known as Installation, Use and Maintenance manual:

Document code	MAOMAPPA027-GB
Revision	0
Date	03/06/2025

- The auxiliary schematics "SEEMAPPA0xxx".
- The testing certificates of CTs and VTs (if applicable).
- CE Declaration

Contact Mecc Alte S.p.a. if in doubt regarding the structure and use of such documentation.

1.8.2 Content of the manual

This manual and its enclosed documentation enclosed provide information on the following aspects.

General information and safety information are contained in the following chapters:

1 General Information

2 Safety

Description of the machine and the operation of its composite parts, transport and installation methods, and methods of use:

3 Description and features

4 Transport and installation

5 Operation

Maintenance and troubleshooting for machine operation and spare parts:

6 Maintenance

7 Troubleshooting

8 Spare parts

Instructions necessary for the interruption of the service, the disposal of the machine and its storage:

9 Decommissioning, Dismantling and Disposal

Lists of enclosed documentation, such as diagrams, drawings and documentation for the components installed:

10 Enclosed documentation

1.9 Symbols and conventions used in this manual

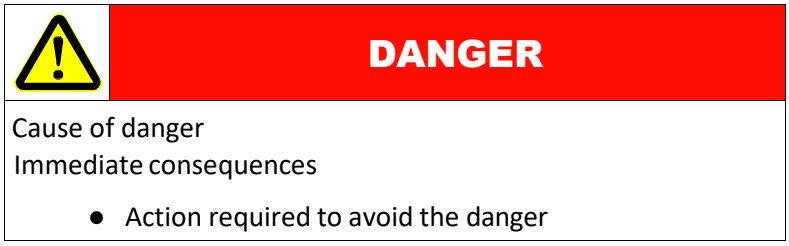
Several conventions are used in this manual to provide the necessary information. The conventions used are explained below.

1.9.1 Definition of warning levels

Notices containing warnings and explanations are used to warn users of potential dangers or draw attention to particularly dangerous or risky operations.

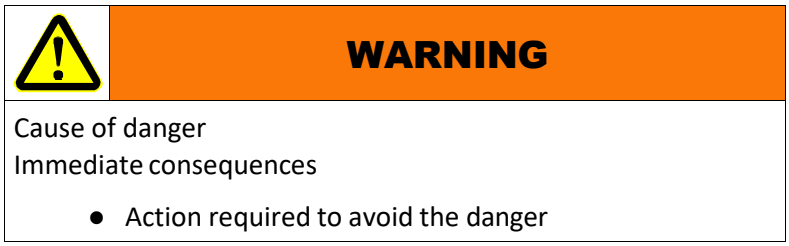
Danger

A notice of this type identifies a situation of immediate danger, which if not avoided, will produce immediate consequences such as serious injury or even death to personnel.



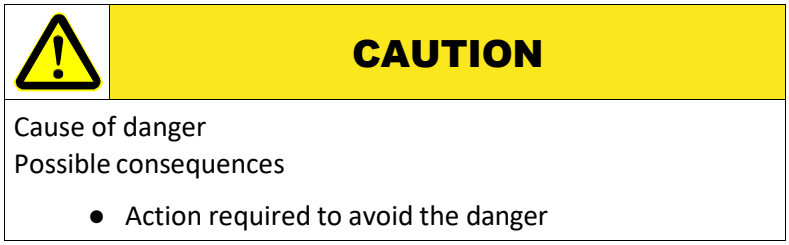
Warning

A notice of this type identifies a situation of potential danger, which if not avoided, could produce immediate consequences such as serious injury or even death to personnel.



Caution with danger symbol

Notices of this type identify a situation of potential danger, which if not avoided, could produce consequences such as injury or damage to property.



Notice

Notices of this type identify a situation of potential danger, which if not avoided, could produce damage to property.

NOTICE
Cause of danger Possible consequences ● Action required to avoid the danger

Note

NOTE

This notice provides useful information regarding the safe and efficacious use of the machine.

1.9.2 Conventions used in the text

Texts preceded by one of the following symbols:

➔ Text preceded by this symbol indicates an action to be taken.

✓ Text preceded by this symbol describes the requisites that must be met before an action can be taken.

➢ Text preceded by this symbol describes the result achieved after one or more actions have been taken.

✗ Text preceded by this symbol indicates a particular condition that may occur. This is followed by a description of how to proceed whenever such condition occurs.

Every operation to be performed in a certain order is indicated by the corresponding order number:

1- first operation

2- second operation

3- third operation

A generic list of components is indicated as follows:

- Component on list
- Component on list
- Component on list

2 Safety

2.1 Intended Use

The Self-regulating alternators ECO47LV are brushless synchronous alternators used to produce continuous electric energy or in the case of an emergency.

The use for purposes other than those indicated or to obtain production values higher than the limits prescribed will be considered “inappropriate use”.

2.2 Importance of the manual

This manual provides information and technical data regarding the Self-regulating alternators ECO47-LV.

The manual enables users and technicians to intervene with accuracy and maximum safety in all routine maintenance operations.

This manual is an integral part of the supply of which this machine is a part and must therefore be carefully kept in easy reach for consultation whenever required in any moment for the operation and maintenance of the machine.

2.3 Responsibility of the user

- The end user of the machine is responsible for setting up all protections necessary, such as isolating devices, protection against direct and indirect contact, protections against over-currents and over voltages, emergency stop devices, at the place of installation of the machine.
- The plant in which the machine is installed must be compliant with regulations in force in the country of installation.
- Prior to commissioning the machine, the user must have first carefully read this manual and the necessary enclosures and have acquired detailed knowledge of its technical specifications and controls.
- All maintenance operations and control must be performed solely by technical personnel trained for the purpose.
- If in doubt or you have problems understanding this manual or any of its parts, we recommend contacting Mecc Alte S.p.a.
- Contact Mecc Alte S.p.a. exclusively for any type of technical assistance required.

2.3.1 Users and their roles

In order to ensure the maximum safety, only personnel with certain requisites can work on the Self-regulating alternators ECO47LV.

All personnel assigned to operations on the machine are referred to as Users.

Users are divided into different classes on the basis of the different tasks to be performed and the different abilities required.

Operator at the lifting devices

The operator at the lifting devices is an educated and skilled person, assigned to lifting maneuvers and moving loads using lifting devices and means.

This user is the only person authorized for loading, unloading and moving operations using means such as cranes, hoists, overhead cranes, lifting trucks or others, including devices necessary such as ropes, chains and straps for lifting.

Machine operator

The machine operator is a person designated by the company that has purchased the alternator.

The machine operator must be provided with technical instruction, be professionally trained in his specific sector, such as an electrician, mechanic or fitter and be instructed in the use of this machine.

Service technician

The Service technician is a person designated by the company that has purchased the alternator or by the company that manages the plant in which the alternator operates.

The Service technician must be provided with technical instruction, be professionally trained in his specific sector, such as an electrician, mechanic or fitter and be instructed in the maintenance operations to be performed on the machine.

After-sales Service technician

The Mecc Alte S.p.a. After-sales Service Technician is an appropriately trained and authorized person who responds directly to Mecc Alte S.p.a. and can perform maintenance and repair operations on the machine.

2.4 Safety rules

The Self-regulating alternators ECO47LV have been manufactured in compliance with current Safety Standards. In spite of this, during operation several regulations must be complied with, in order to ensure safe operation for the users, the surrounding environment and the machine itself.
Read the following safety rules carefully before proceeding with any operation on the machine.

- Use the machine only if it is in perfect working order, making sure all the instructions provided in this manual are respected and never exceeding the operating limits prescribed therein.
- Keep this manual in an accessible place for the operator at all times, for quick consultation when doubts may arise regarding operation.
- Avoid any action or type of behaviour that may compromise the operation of the machine or pose a risk to personnel or property.
- Every user must be provided with the PPE necessary, according to the operations to perform.
- In case of malfunction, stop the machine in any of the ways foreseen and have the cause of malfunction eliminated only by specialised personnel trained for the purpose.
- Whenever doubts arise in regard to operation, do not intervene directly but contact the manufacturer Mecc Alte S.p.a.
- In addition to the product documentation enclosed with the machine, also respect the standards and regulations in force governing accident prevention and safety in the workplace.

2.5 Residual risks

The Self-regulating alternators have been manufactured in compliance with current safety criteria. In spite of this, residual risks linked to their operation remain that may cause injury to personnel or damage to property in particular cases.



DANGER

Moving mechanical parts.
Risk of crushing, dragging or entrapment.

- Remain at a safe distance from all moving generator parts.



CAUTION

Parts of the alternator at high temperature.
Burns hazard during contact with very hot surfaces.

- Wear protective gloves before coming into contact with the overheated machine parts.

NOTICE

Presence of magnetic fields in proximity of the alternator during operation.
Possibility of damage to magnetic medium or equipment sensitive to magnetic fields.

- Do not introduce equipment or objects that are sensitive to magnetic fields in the vicinity of the alternator.

The general safety and accident-prevention regulations must be respected and the Personal Protection Equipment provided must be worn at all times.

3 Description and features

3.1 Description of the Self-regulating alternators ECO47LV

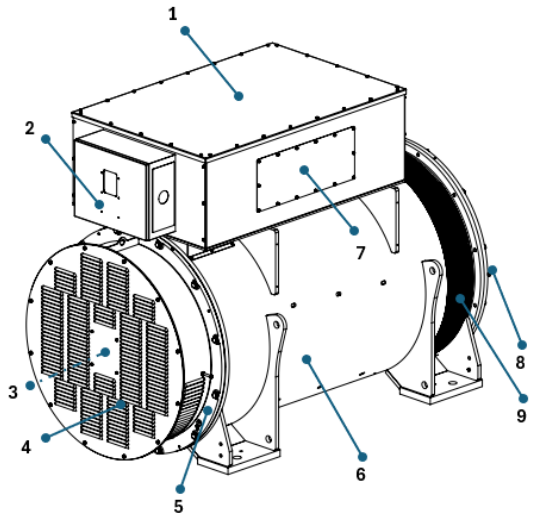


Figure 2- Alternator ECO47

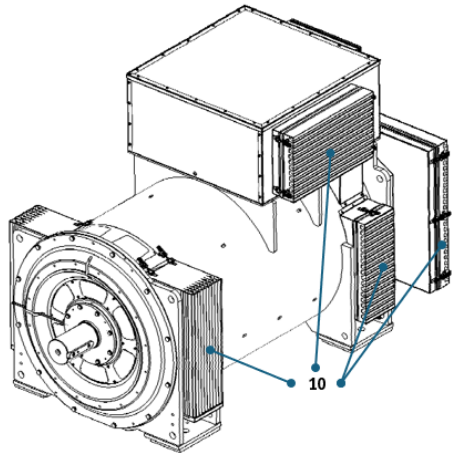


Figure 3- Alternator ECO47 in IP45 configuration

1- Terminal boxes
2- Aux. box
3- PMG is present as a standard, mounted inside the IP rear guard.
4- Alternator cooling air inlet / rear IP guard
5- NDE shield
6- Casing
7- Cables passage aperture in non-magnetic material.
8- DE shield
9- Protection grid
10- IP45 filters when provided

The Self-regulating alternators ECO47LV are brushless synchronous alternators with a rotating inducer with damping cage and stationary armature with skewed slots. The windings have 2/3 pitch in order to reduce the harmonic content.

The alternators are manufactured in compliance with the directives in force and relative amendments. The electromagnetic compatibility tests have been performed in the conditions prescribed by the regulations.

Executions in agreement with other specifications can be performed on customer request.

The mechanical construction gives good access to the connections and allows easy inspection of the various components.

The shaft is in C45 steel with lock-set fan. The standard protection rating is IP23. As an option it can be performed in IP45 configuration.

The insulation is class H with vacuum impregnation in epoxy resin.

3.1.1 Temperature probes

Two PT100 temperature probes are mounted on every phase of the alternator winding. To set the alarm and stop temperatures, refer to *4.4.5 Setting the alarm and stop temperature*.

The auxiliary electric scheme is provided for each alternator.

3.1.2 Heat exchangers

The alternator can be combined with a heat exchanger, which has the purpose of cooling the stator and rotor windings and provide higher IP grade (IP54-IP55).

Refer to the documentation of the heat exchanger manufacturer (see *10 Enclosed documentation*).

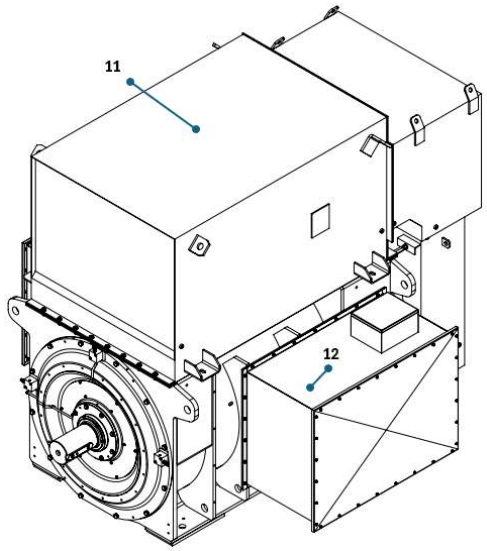


Figure 4- Alternator ECO47 with heat exchanger

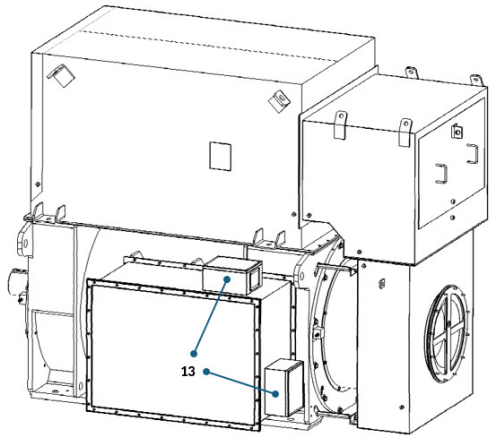


Figure 5- Alternator ECO47 with heat exchanger

11- Heat Exchanger

12- Main terminal boxes

13- Auxiliary terminal boxes

NOTICE
Check that the heat exchanger is free of obstructions and clean • Clean the heat exchanger if necessary

3.1.3 Measurement and protection sensors

Usually, generators are supplied with a voltage transformer (VT) and a current transformer (CT).

Standard current transformers supply a current on the secondary that is proportional to the current circulating in the primary. They have 15 VA performance, class 0.5 FS10 for the measurement sensors or 5P10 for the protection sensors (or differential protection). They can be single or double secondary winding.

Standard voltage transformers supply a voltage on the secondary that is proportional to the voltage in the primary. They have 15 VA performance, class 0.5 FS10 for the measurement sensors, or 3 P for the protection sensors. They can be single or double secondary winding.

3.1.4 Anti-condensation heaters

The anti-condensation heaters are installed in the alternator stator case or winding based on the model. They prevent the formation of condensate inside the alternator when the machine is at a standstill.

3.1.5 Bearing temperature probes

Temperature probes are mounted on each bearing on the alternator. To set the alarm and stop temperatures, refer to *4.4.5 Setting the alarm and stop temperature*.

3.2 Technical features

Below find the technical features of the Self-regulating alternators.

3.2.1 Alternator electric data

Refer to the data plate fixed to the machine (see Figure 1-)

3.2.2 Alignment with the motor

Alignment tolerances of the alternator with the prime engine.

Alternators coupling single support

Alternator	SAE	L (mm)
ECO47	18	15.7
	21	0

Table 4 - Alignment - Individual support

Alternators coupling dual support

The alternator can be coupled with the engine following the below tolerance for a rating velocity of 1500/1800 rpm:

- Soft Foot alignment: 0.05 [mm]

- Radial tolerance: 0.05 [mm]

- Angular tolerance: 0.05 [mm/100mm]

Refer also to Figure 11- and Figure 12- on page 34.

These values represent the maximum limits. Lower values are recommended to minimize misalignment and ensure optimal operation of the genset.

Tolerance applies only to the alignment between the engine shaft and the generator shaft during operation.

During operation consider a vertical offset increase of the high of the shaft due to oil thickness of 0.066mm.

The coupling joint is not included in the scope of the furniture. Please refer to the coupling joint manufacturer's specifications if lower values are indicated.

The coupling joint should not transmit axial forces to the generator and must permits axial displacement, Drive end bearing is axial fixed.

3.2.3 Noise in dB (A)

Alternator	50 Hz		60 Hz	
	1 m	7 m	1 m	7 m
ECO47	103	91	107	95

Table 5 – Noise of the alternator in IP23 configuration

3.2.4 Volume of air required (m^3/min)

Alternator	50 Hz	60 Hz
ECO47 4A	300	360

Table 6 - Volume of air required

3.2.5 Installation altitude

The performance of the alternator is affected by the installation altitude and the temperature. Refer to the following table.

	Environment temperature °C					
Altitude m	**22**	**40**	**45**	**50**	**55**	**60**
<= 1,000	1.07	1	0.96	0.93	0.91	0.89
> 1,000 <= 1,500	1.01	0.96	0.92	0.89	0.87	0.84
> 1,500 <= 2,000	0.96	0.91	0.87	0.84	0.83	0.79
> 2,000 <= 3,000	0.9	0.85	0.81	0.78	0.76	0.73

Table 7 - Derating coefficients

3.2.6 Clearance and weights

Below the dimensions of the standard IP23 version. Based on different configurations (IP45, IP55 etc.) and customer requests, dimensions may vary. In this case check the custom drawing.

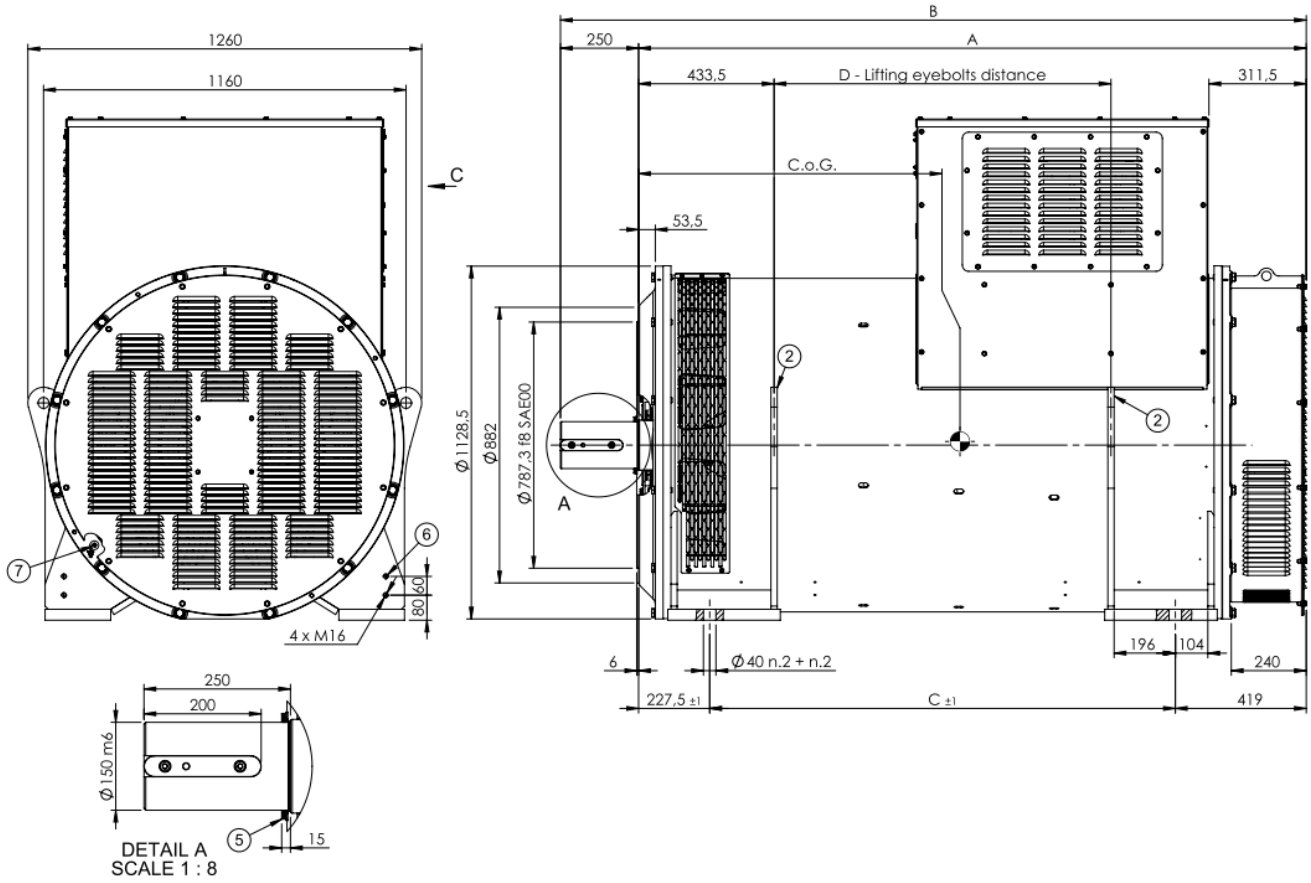


Figure 6- ECO47LV main dimensions B3B14

TYPE	C.o.G.	A [mm]	B [mm]	C [mm]	D [mm]	Weight [kg]
ECO47 - 1S/4B	962	2036,5	2286,5	1390	978	6050
ECO47 - 2S/4B	980					6271
ECO47 - 2M/4B	1028	2136,5	2386,5	1490	1078	6841
ECO47 - 1L/4B	1090	2246,5	2496,5	1600	1188	7447

Table 8 - Clearance and weights B3B14

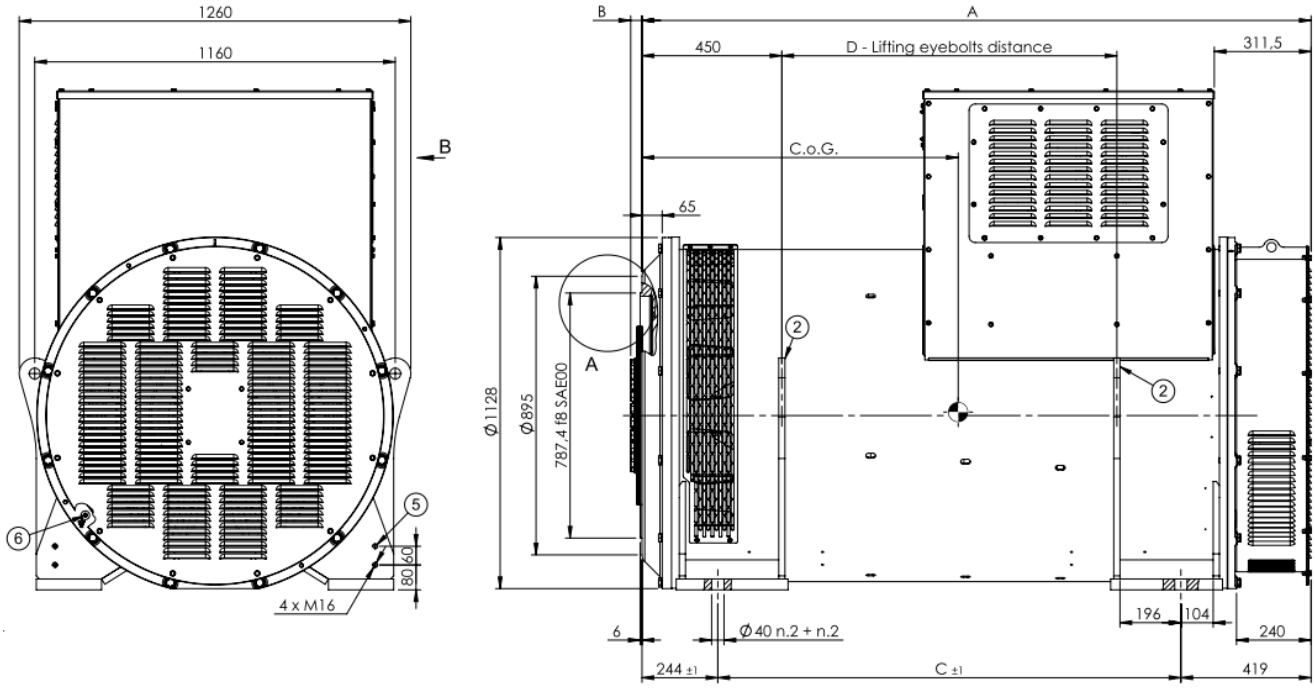


Figure 7- ECO47LV main dimensions MD35

TYPE	C.o.G.	A [mm]	C [mm]	D [mm]	Weight [kg]
ECO47 - 1S/4B	969.8	2053	1390	978	6112
ECO47 - 2S/4B	988	2053	1390	978	6333
ECO47 - 2M/4B	1036	2153	1490	1078	6908
ECO47 - 1L/4B	1085.9	2263	1600	1188	7348

SAE N.	Disc Coupling							
	d [mm]	B [mm]	L [mm]	M [mm]	Q [mm]	S [mm]	N	α [°]
18	571.5	36.4	15.7	16	542.92	16.5	6	60
21	673.1	30	0	20	641.35	16.5	12	30

Table 9 - Clearance and weights B35

4 Transport and installation

4.1 Transport

Barring other agreements between Mecc Alte S.p.a. and the customer, the transport of the components necessary for the machine and all other complementary equipment required for operation is the responsibility of Mecc Alte S.p.a.

Transport must be performed using suitable means and in compliance with the regulations in force.

4.1.1 Packaging

The alternators are transported in the following way:

1- Using a wooden pallet (Figure 8-)

The generators are fixed to the pallet using screws (2) and fastened to the loading deck of the means of transport by ropes or straps fixed to the 4 points (1) indicated.

NOTE

Do not fix cords or straps to the painted surface of the alternator. Use the holes envisioned (1) in order not to use the external finish.

2- By means of a pallet covered with a wooden crate in the case of shipping by sea (Figure 9-).

In the single support alternators, the rotor is fixed using relevant support equipment.

NOTICE

The rotor can slip during handling if not withheld by the support equipment.
Possible damage to the rotor.

- Do not remove the rotor support equipment before handling.

4.1.2 Lifting and handling

Responsibility: Operator at the lifting devices

Prerequisites: The following must be available:

- Suitable lifting equipment such as a crane, hoist, lifting truck or trans-pallet.
- Cables, chains, clevis, eyebolts as required

DANGER

Beware of suspended loads.
Risk of death due to crushing by falling loads following release or breakage of lifting ropes or hooks.

- Never stand or transit beneath suspended loads.
- Always check to make sure that the lifting ropes, eyebolts and all the other lifting equipment is in perfect working order.
- It is mandatory to ensure that the devices to be used are suitable to support the loads to be lifted.

➔ Lift the alternators using the relevant lifting points (1).

➔ Handle as shown in Figure 8- and Figure 9- .

The lifting truck forks must be inserted in the points indicated by the arrows.

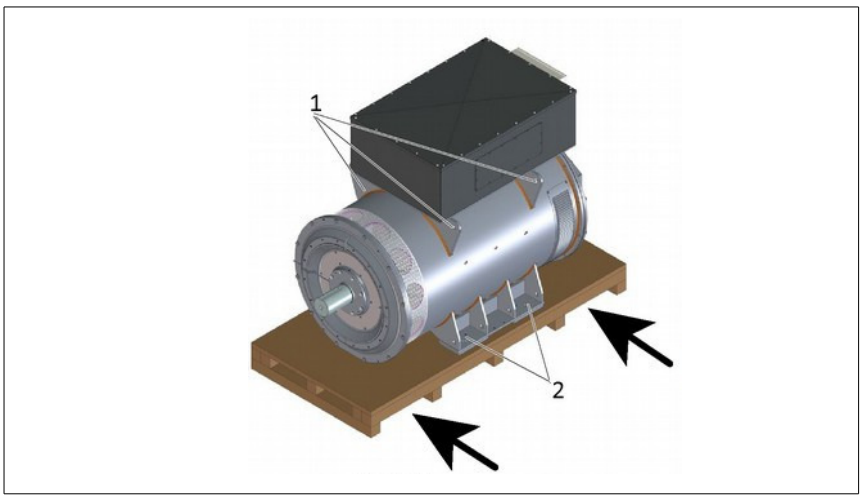


Figure 8- Transport on pallet

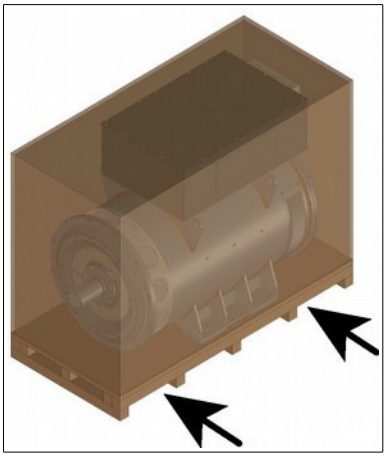


Figure 9- Transport on pallet covered with crate

NOTE

Lifting devices such as ropes or straps can damage the alternators terminal board box if the fixing angle is too acute.
Make sure that the lifting devices do not touch the terminal board box during operations.

NOTICE

Once coupled, the alternator cannot be lifted with the prime motor.
Possibility of damage to the alternator and the prime engine coupled.

- Do not use the eyebolts provided to lift the coupled alternator.
- Lift the assembly using the specific means envisioned.

4.1.3 Storage

Store the alternators in a closed, cool, dry place without vibrations.

NOTE

After long periods of storage or in the presence of traces of humidity, check the status of isolation (see 4.1.4 Measuring the insulation resistance).

In the case of storage longer than three months, refer to *9.3 Storage*

4.1.4 Measuring the insulation resistance

If the alternator has been inactive for a period exceeding two months, the insulation resistance of the alternator main stator to earth must be measured. The measurement must be made in compliance with the IEEE 43-2000 Standard.

Take the measurement as indicated in *6.3 Measuring the insulation resistance.*

4.2 Checking the supply

At the moment of delivery of the machine components and everything else agreed, the customer must make sure that everything specified in the contractual terms has been effectively delivered and is perfectly integral.

Mecc Alte S.p.a. will not accept any subsequent claims in regard.

4.3 Characteristics of the installation site

The Self-regulating alternators ECO47LV must be installed in an environment that has the following features:

- Closed environment protected from atmospheric agents;
- Temperature between 5 °C and 40 °C (unless otherwise specified in the nameplate) ;
- Installation altitude (see also *3.3.5 Installation altitude*): < 1,000 m (unless otherwise specified in the nameplate);
- The support surface must be well levelled.

Respect also the following conditions.

- Install the alternator leaving sufficient space to perform maintenance;
- Make sure that the cooling air inlets and vents are always free (check the volumes of air required in *3.3.4 Volume of air required (m3/min)*);
- The inlet side must not be near heat sources. In all cases, unless specifically agreed, the temperature of the cooling air must be that of the environment and however not over 40 °C. The alternator can work at higher temperatures with appropriate derating (*3.3.5 Installation altitude*).

4.4 Installation

Responsibility: Service technician

Prerequisites: All components necessary are available and ready for installation; the equipment necessary for installation

- Make sure that the base onto which the alternator is fixed is stable and able to support the weight.
- Before installation, check that the data indicated on the alternator plate are suitable for the features of the mains electricity of the service envisioned.
- Measure the insulation resistance of the windings before starting commissioning.
- Make sure that any mechanical blocks present on the alternator for transport, such as blocking clamps or other, have been removed.

4.4.1 Direction of rotation of the alternator

The alternator rotor must turn clockwise, looking at the alternator from the coupling side. Refer to the following figures.

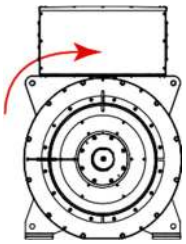


Figure 10- Direction of rotation of the alternators

4.4.2 Coupling the alternator with the prime engine

The Mecc Alte Power Products rotors and alternators comply with the ISO 1940-1 Standard. Any excessive vibrations are to be blamed therefore on the drive engine or incorrect motor-alternator coupling and could lead to damage or breakage of the bearings.

The fitter is responsible for following the regulation regarding assessment and measurement of vibrations on the final machine, in compliance with ISO 8528-9.

The alternators can be coupled with the prime engine as indicated below.

NOTE

Make sure the rotor does not slip. Keep the alternator in the horizontal position.

Coupling with joint - Dual support alternators

- Make sure that the support base where the alternator and the prime engine are installed is able to support the weight and not deform.
- In engine-alternator coupling, respect the assembly tolerances indicated in *3.3.2 Alignment with the motor*.

NOTICE

Possible damage to the shafts or bearing due to misalignment.

- Respect the radial and angular tolerances between the shafts given in *3.3.2 Alignment with the motor*.

➔ Remove the flange protection paint;

✗ If the alternator has been stored for 18 months or more:

➔ Replace the grease in the bearings before commissioning (see *6.4.2 Replacing grease in the bearings*).

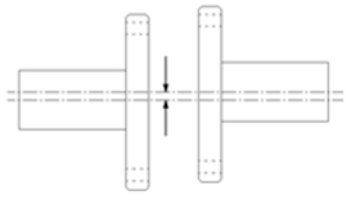


Figure 11- Radial tolerance

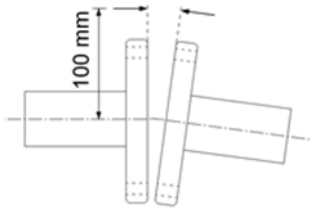


Figure 12- Angular tolerance

Refer to *Table 5 - Alignment - Dual support* on page 23.

Coupling via SAE flange- Single support alternators

This coupling must be performed by the customer and must be made in compliance with the safety regulations in force via an appropriately dimensioned joint. Also comply with the following.

- The alternator with single support requires a solid flat base in a way to perform correct alignment.
- Bending on the alternator coupling flange can cause strong vibrations and, in the worst case, even mechanical breakage. Check the correctness of the L Quota given in *Table 12 - Shaft projection*.

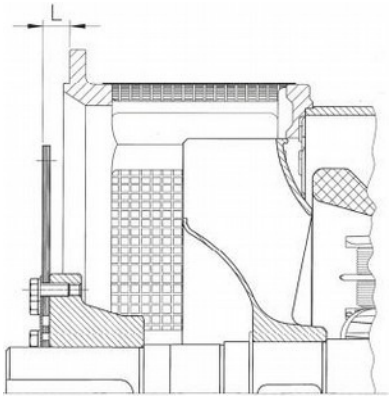


Figure 13- Configuration for coupling with rotor

Type	SAE	L
ECO47	18	15.7
	21	0

Table 10 - Shaft projection

Compensation for thermal dilation

Regarding alignment of the cold machine, the alternator and the engine can have different thermal dilation coefficients, which when hot can cause different dimensional changes between these parts. The operating temperatures have a significant effect on the alignment tolerances and must be taken into consideration.

Due to this, during operation the alternator shaft may be in a different position with respect to the condition when cold. Alignment compensation may therefore be necessary and depends on the operating temperature, the type of coupling, the distance between the two machines, etc...

The two types of important thermal dilation to be taken into consideration are the vertical and axial types.

Vertical thermal dilation

This thermal dilation can make the radial tolerance vary and can be calculated using the following formula:

$$\Delta H = \alpha \, \Delta T \, H$$

where:

ΔH = Variation of the height

α = Thermal dilation coefficient (use the value $\alpha = 10 \times 10\text{-}6$ K-1)

ΔT = Difference between the alignment temperature and the operating temperature

H = Axis height

To calculate the variation of radial tolerance, the thermal dilation coefficient of the alternator must be related to that of the engine.

Axial thermal dilation

The axial thermal dilation value can decrease the axial tolerance between two shafts. It is a very important value, since when all the system is at temperature, a very narrow tolerance when cold can lead to an axial force that can burden the bearings, damaging them or breaking them.

It can be calculated using the following formula:

$$\Delta L = \alpha \, \Delta T \, L$$

where:

ΔL = Variation of shaft length

α = Thermal dilation coefficient (use the value $\alpha = 10 \times 10\text{-}6$ K-1)

ΔT = Difference between the alignment temperature and the operating temperature

L = Length of the shaft, calculated between the bearing and the coupling discs with the engine (see Figure 14-)

The variation of axial tolerance must be calculated by confronting the axial thermal dilation of the alternator and that of the engine.

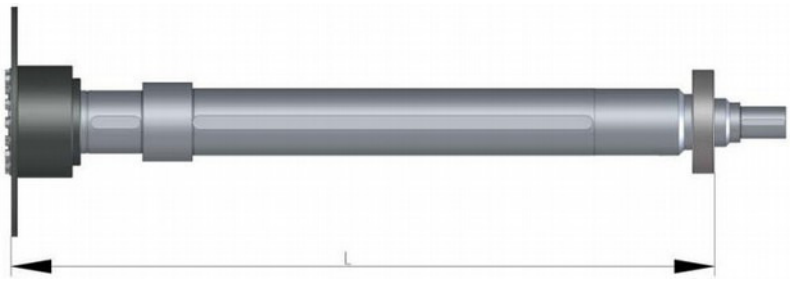


Figure 14- L dimension

4.4.3 Fixing the alternator to the base

	CAUTION
Inaccurate fixing cause operating problems. Possibility of damage to the alternator or the prime engine due to vibrations and movement of the alternator. ● Make sure that the alternator is correctly fixed to the surface. ● Make sure that the alternator and prime engine mounting surface can sustain the weight.	

➔ Fix the alternator to the base using the screws with the dimension indicated:

- ECO47: 4 x M30 (class 8.8)

Respect the correct coupling torque, see *4.5.4 Coupling torques.*

4.4.4 Electric connection



DANGER

Presence of dangerous electric voltage.
Risk of death following electric shocks caused by contact with uncovered electric cables or live parts.

- Remove the voltage before proceeding with the job.
- Always use suitable Individual protection Equipment.



DANGER

Presence of voltage generated by the movement of the alternator engine.
Risk of death caused by electric shocks.

- Block the alternator rotor before making the electric connection.

General indications

- For entry into the terminal box use cable glands and cable ties that comply with the regulations in force in the country of destination. Only use the cables passage aperture in the envisioned non-magnetic material.
- Connect the alternator to earth using a wire with suitable section, using one of the two appropriate terminals present inside the terminal board box or outside the machine (see *Alternator connection to earth* on page 43).
- The power cables for connection to the user must be wired and supported suitably so that they do not cause mechanical stress on the alternator terminal board.
- Refer also to the wiring diagram provided with the alternator, see *10 Enclosed documentation.*
- Consider the coupling torques envisioned, stated in *4.5.4 Coupling torques*.

Terminals box connection

Connect the alternator to the utility, making reference to Figure 15-.

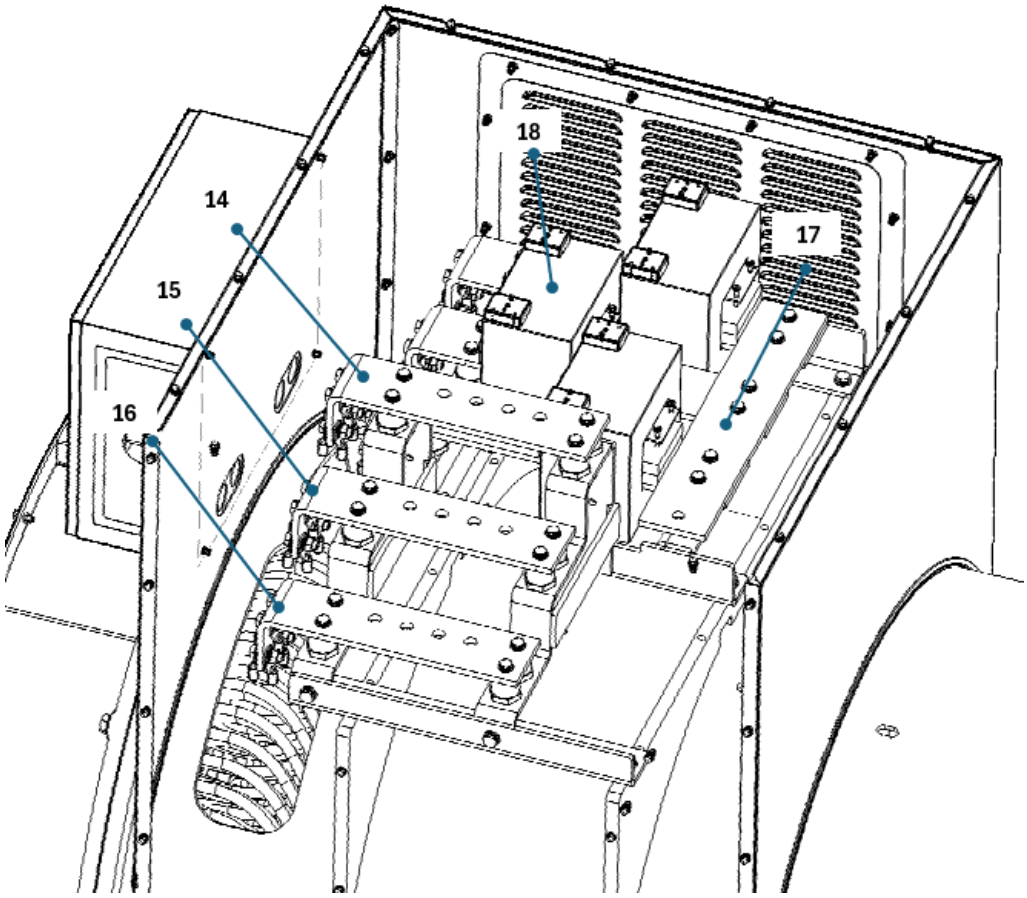


Figure 15- ECO47 terminals box

14- Phase U
15- Phase V
16- Phase W
17- Star point
18- CTs

Auxiliaries box connection

Make the connections in the auxiliaries box in compliance with the *Auxiliaries box wiring diagram*.

4.4.5 Setting the alarm and stop temperature

The probes mounted on the alternator detect the temperature of the winding phases and the bearings (see also *3.1 Description of the Self-regulating alternators ECO47-49 MV-HV*).

Refer to the following tables for the correct temperature setting values.

Isolation class of the windings	Rated continuous temperature °C	Alarm temperature °C	Stop temperature °C
Class B	130	135	140
Class F	155	160	165
Class H	180	185	190

Table 11 - Alarm and stop temperature for the windings

Bearings	Alarm temperature °C	Stop temperature °C
Drive End (DE)	100 °C	110 °C
Non Drive End (NDE)	100 °C	110 °C

Table 12 - Alarm and stop temperature for the bearings

4.4.6 Alternator connection to earth

Connect the alternator to earth in the points indicated in the below images. The earthing points can be found in the shield and in the foots. The earth plate to which the alternator is connected must be compliant to that envisioned by the laws in force.

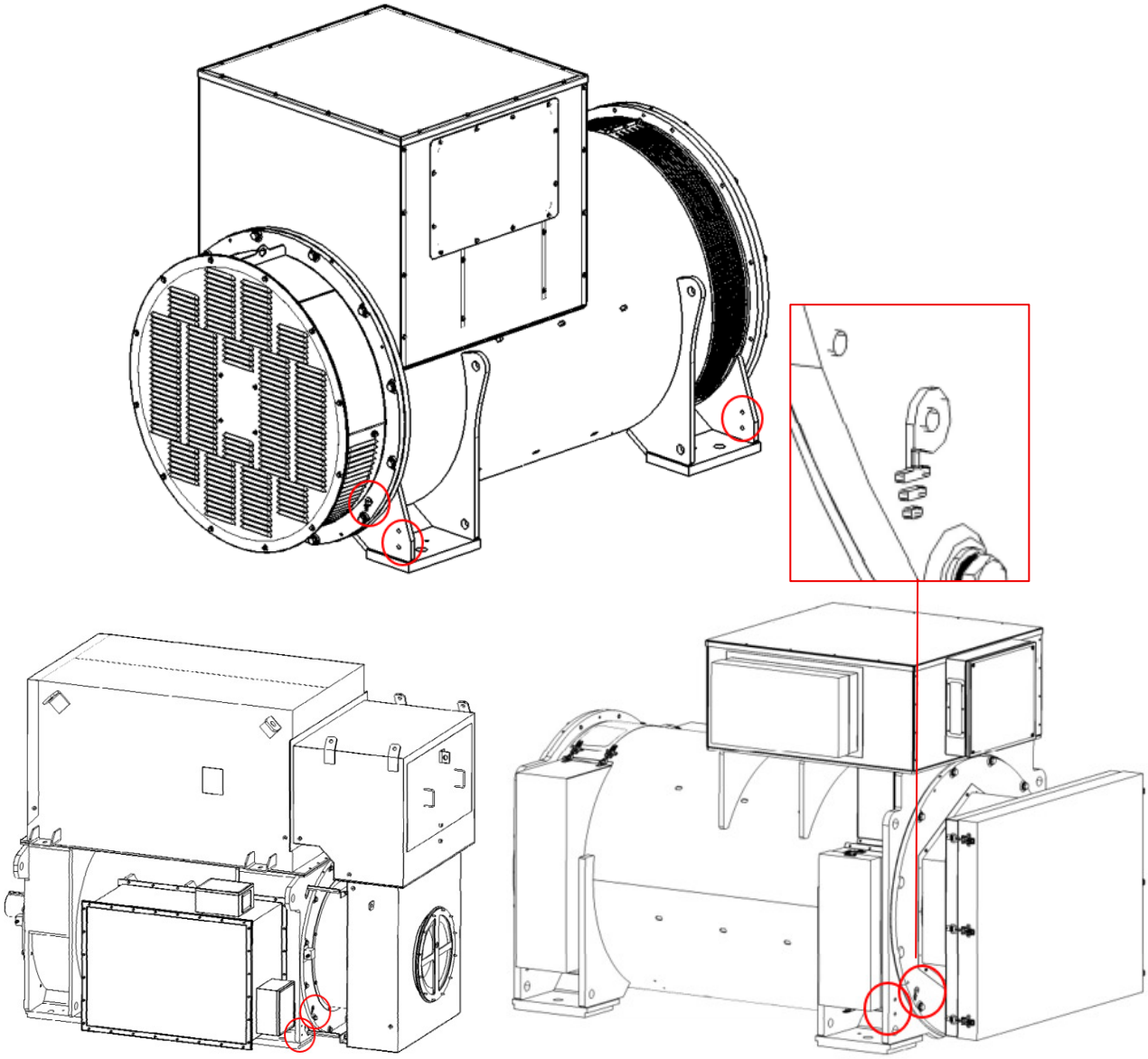


Figure 16- Earth connections

4.5 Checks after installation

Responsibility: Service technician

Prerequisites: Installation of the alternator is concluded

- ➔ Perform commissioning at low speed
- ➔ Check for the presence of abnormal noise or vibrations that may indicate mechanical coupling problems

NOTICE
Possible damage to the shafts or bearing due to misalignment. • Stop the alternator in the case of excessive noise or vibrations and check alignment.

NOTE

The fitter is responsible for respecting the regulation regarding the measurement and assessment of mechanical vibrations.

- ➔ Check the temperature of the windings.

4.5.1 Voltage regulator

The ECO47LV series can be supplied with different AVRs. Below a list:

- Mecc Alte DER2
- Mecc Alte MK3
- Basler DECS100, DECS150
- ABB UNITROL 1005, 1010, 1020.

The Mecc Alte AVRs manuals are available in the Mecc Alte website in the download area:

https://www.meccalte.com/en/download-area

Other manuals are available in the manufacturer's website (Basler, ABB…).

Follow the instructions in the AVR manuals.

4.5.2 Checking the alternator output voltage

Responsibility: Service technician

Prerequisites: The alternator has been correctly installed and is at a standstill

Refer to the auxiliaries wiring diagram, see *10.1.1 List of diagrams and drawings*.

➔ Check the voltage ratio of the voltage sensor in the terminal box according to that stated on the plate affixed to the sensor;

➔ Identify the terminals that refer to the secondaries of the voltage sensors in the auxiliaries box;

➔ Rotate the alternator.



DANGER

Hazardous voltage inside the alternator terminals box.
Electric shock and electrocution hazard.

- Do not touch components contained in the auxiliaries box.
- Wear suitable protective gloves.



DANGER

Generator operating, rotating parts in movement.
Risk of crushing, dragging or entrapment.

- Remain at a safe distance from all moving alternator parts.

➔ Measure the voltage at the terminals of the auxiliaries box connected to the voltage sensor;

✓ If a voltage of 100 V or 110 V is detected at the terminals, according to that detected by the plate present on the sensor, the machine operates correctly.

✗ If the voltage detected is not correct:

➔ Refer to *7.1 Problems of an electrical nature*.

4.5.3 Coupling torques

Respect the coupling torques listed for the screws indicated.

Alternator ECO47 B3B14	Thread	Material	Coupling torque [Nm] ±7%
Balancing template on rotor	Convex cylindrical head with hexagon socket M8x20	8.8	22
Protection net IP23	Hex head M5x25	4.8	3
DE Bearing cover	Hex head M6x100	8.8	9
DE Shield on stator	Hex Head M16x60	8.8	180
NDE Shield on stator	Hex Head M16x60	8.8	180
NDE Bearing cover	Hex head M6x85	8.8	9
Rear lid mass	M16x30	8.8	180
Exciter stator on NDE shield	Hexagon socket head cap screw M8x140	8.8	22
Exciter rotor on rotor ECO47	Hexagon socket head cap screw M8x40	8.8	22
Diodes bridge on rotor ECO47	Hex head M5x20	4.8	3
Diodes bridge connection	Hex head M5x25	Brass	3
PMG rotor at rotor ECO47	M14		120
PMG cover plate stator	Hexagon socket head cap screw M6x80	8.8	9
PMG protection	Hex head M6x20	4.8	5
PMG shield	Hex head M6x16	8.8	12
Terminal board support brackets	Hex head M8x30	8.8	22
Terminal board plate on brackets	Hex head M12x30	8.8	75
Terminal board cover ECO47	Hex head M6x16	8.8	12
Machine cover	TEF M6x12	4.8	5
Cable on tie-rod M12	NUT M12	Brass	40

Table 13 - Alternators coupling torque ECO47 B3B14

Alternator ECO47 MD35	Thread	Material	Coupling torque [Nm] ±7%
Flexible discs	Hex head M16x40	8.8	200
Balancing template on rotor	Convex cylindrical head with hexagon socket M8x20	8.8	22
Protection net IP23	Hex head M5x25	4.8	3
DE Shield on stator	Hex head M14x70	8.8	120
NDE Shield on stator	Hex head M14x70	8.8	120
NDE Bearing lid	Hex head M6x85	8.8	9
Rear lid mass	M16x30	8.8	180
Exciter stator on NDE shield	Hexagon socket head cap screw M8x140	8.8	22
Exciter rotor on rotor ECO47	Hexagon socket head cap screw M8x40	8.8	22
Diodes bridge on rotor ECO467	Hex head M5x20	4.8	3
Diodes bridge connection	Hex head M5x25	Brass	3
PMG rotor at rotor ECO47	M14		120
PMG cover plate stator	Hexagon socket head cap screw M6x80	8.8	9
PMG Protection	Hex head M6x20	4.8	5
PMG Shield	Hex head M6x16	8.8	12
Terminal board support brackets	Hex head M8x30	8.8	22
Terminal board plate on brackets	Hex head M12x30	8.8	75
Terminal board cover ECO47	Hex head M6x16	8.8	12
Machine cover	TEF M6x12	4.8	5
Cable on tie-rod M12	NUT M12	Brass	40

Table 14 - Alternators coupling torque ECO47 MD35

5 Operation

5.1 Commissioning of the alternator

Responsibility: Machine operator

Prerequisites: The installation has been completed correctly and the alternator is ready to function

NOTE

The cooling air intake and discharge apertures must always be free. For the volumes of cooling air necessary, see 3.3.4 Volume of air required (m3/min).

The inlet side must not be near heat sources. In all cases, the temperature of the cooling air must be that of the environment and however not over 40 °C. The alternator can work at higher temperatures with appropriate derating.

NOTE

If the alternator has been inactive for a period exceeding two months, the insulation resistance must be measured, see 6.3 Measuring the insulation resistance. If the resistance value measured is less than 400 MΩ the winder must be reconditioned.

The alternator is started along with the engine to which it is connected.

5.2 Stopping the alternator

The alternator is stopped along with the engine to which it is connected.

	CAUTION
Possibility of formation of condensate inside the alternator. ● Make sure that the anti-condensation heaters remain on during the period of inactivity of the alternator.	

Open master switch of the utilities connected before stopping the prime motor.

The alternator voltage regulator has protection in the event of low speed. The low speed protection intervenes instantly and causes the alternator voltage to lower when the frequency drops below 4% (± 1%) of the nominal value.

6 Maintenance

The maintenance operations that the user can perform are described in this chapter. Other operations mentioned but, without description of execution, are the responsibility of the Mecc Alte S.p.a. after-sales service.

Any operation on electrical parts, even not live, must be performed by specialised personnel with knowledge of the regulations and safety standards regarding work on electric components.

If in doubt regarding any questions regarding maintenance, contact Mecc Alte S.p.a.



DANGER

Moving mechanical machine parts!
Risk of dragging or entrapment.

- Stop the machine before proceeding to any maintenance operations.



DANGER

Live machine parts!
Risk of death following electric shocks caused by contact with live parts.

- Disconnect the voltage to the plant before working on parts that are usually live.
- Make sure no one can connect the voltage to the plant by blocking the master switch using a padlock.



CAUTION

Components on the alternator at high temperature.
Burns hazard due to contact with very hot surfaces.

- Wear Personal Protective Equipment (PPE).
- Wait for the alternator to cool down before any intervention.



CAUTION

Do not allow unauthorised personnel to perform maintenance interventions.
Possible injury to personnel or damage to the machine.

- For the maintenance interventions not described in this manual, request the intervention of the machine manufacturer.
- Whenever signs of decreased performance are noted, promptly contact Mecc Alte S.p.a. Service.

NOTICE

Risk of damage to the machine caused by the use of non-original spare parts.
Always use spare parts and consumables in compliance with the information provided by the component's manufacturer.

NOTE

During machine downtime exceeding one month, the anti-condensate heaters must be on in order to prevent the formation of condensate in the windings.

6.1 Maintenance intervals

These intervals must be respected in order to keep the machine in the safe and efficient working order required for complete warranty coverage.

All maintenance operations must be performed by a person (type of user) trained in the tasks required as indicated in *2.3 Responsibility of the user*.

Table 15 - Maintenance intervals for the alternator

Interval	Subject of the intervention	Type of intervention
ECO47: every 2,000 operating hours or once a year ECO49: every 2,000 operating hours or once a year	NDE and DE supports	Lubrication (see *6.4 Maintenance of the supports*)
Every six months	Generator shaft	Manual rotation of 1/4 rev. *6.5.1*
Every six months	Air filters	Check and clean if necessary *6.5.2*
Every 8,000 operating hours or once a year	Auxiliary circuits connection cables (probes, anti-condensation heaters if present)	● Check general conditions ● Appropriate fixing of the clamps ● Check for the presence of any oxidation and clean, if necessary
After machine standstill over 2 months or once a year	Windings	Check insulation resistance (see *6.3 Measuring the insulation resistance*).
Every 2,500 operating hours	Windings	● Check conditions of the windings *6.2.1, 6.2.2* ● Cleaning the windings *6.2.4* ● Resistance/continuity test *6.2.5*
Every 8,000 operating hours or once a year	Stator and rotor connection cables	Check correct fixing and general conditions
After machine standstill over 2 weeks or once a year	Anti-condensation heaters (if present)	● Check the operation and resistance value, cleaning and any replacement ● Check the insulation resistance of the heaters
According to that defined by the manufacturer	Heat exchanger (if present)	Refer to the documentation of the heat exchanger manufacturer
In the case of a fault	Rectifier bridge	Replacement (see 6.5.5)

6.2 Maintenance of the stator and rotor windings

The duration of the electric machine is affected by the duration of the windings insulation.

The insulation ages because it is subjected to electrical, mechanical and heat phenomena. This process can be slowed down with appropriate maintenance interventions.

6.2.1 Check conditions of the windings

Responsibility: Service technician or machine operator

Frequency: Every 2,500 hours

Prerequisites: The alternator is at a standstill and has cooled down

- ➔ Disconnect the voltage regulator, voltage sensors and any other device connected to the alternator windings;
- ➔ Measure the isolating resistance to earth (see *6.3 Measuring the insulation resistance*). The value measured must exceed 400 MΩ;
- ✗ If the value measured is less than 400 MΩ:
- ➔ Dry the windings (see *6.2.2 Drying the windings*).

6.2.2 Drying the windings

Responsibility: Service technician

Prerequisites: The alternator is at a standstill

Frequency: If machine standstill should last more than one month

If condensate should form, the windings must be dried in one of the ways indicated below.

Using an industrial welder

- ➔ Disconnect the machine from the plant
- ➔ Disconnect the voltage transformers (TV)
- ➔ Power two phases of the alternator with a direct current source like an industrial welder, with a current equal to 25/30% of the machine nominal current
- ➔ Check the temperature of the windings using the temperature sensors PT100. Do not exceed the temperature of 100°C

Using a jet of hot air

- ➔ Direct a jet of hot air at 50-60°C through the alternator air vents.

With batteries or a direct current power supply unit (24 V, 5 A)

	**CAUTION**
Damage to the voltage regulator if there is no connection between regulator and exciter. ● Remove the connection between PMG (permanent magnets alternator that powers the voltage regulator) and the voltage regulator. ● The connection must be removed upstream from the voltage regulator by disconnecting the cables from the terminal board.	

➔ Short circuit the stator windings

➔ Rotate the alternator

➔ Energise the alternator by powering the exciter (see the *Auxiliaries box wiring diagram*) with one 24 V battery or two 12 V batteries in series or use a direct current power supply unit

➔ Keep the alternator rotating for two hours.

6.2.3 Correct operating temperature

The windings are kept at a correct temperature via accurate cleaning during the maintenance interventions and correct temperature control via the Pt100 temperature probe.

Noteworthy differences between the temperatures detected by the probes can be indicative of malfunctioning of the windings.

6.2.4 Cleaning the windings

When the alternator is in IP23 configuration it is suggested to clean the windings. Follow the instructions below:

Responsibility: Service technician

Prerequisites: The alternator is at a standstill

Frequency: Every 20,000 hours or more frequently in the case of dusty environments

NOTE

Contact Mecc Alte S.p.a. for thorough washing in case of windings in a very bad state.

- ➔ Disassemble the alternator (see *6.6 Disassembly of the alternators*)
- ➔ Clean the windings alternator using specific high-evaporation solvents for electric windings
- ➔ Perform the following controls after the cleaning operations:
  - Check for the presence of traces of carbonisation;
  - Check the integrity of the windings insulation;
  - Measure the isolation resistance.

6.2.5 Resistance/continuity test

Responsibility: Service technician

Prerequisites: The alternator and the prime engine are at a standstill; the alternator is disconnected from the energy sources

Perform the test on the rotor windings and the windings of the main stator of the exciter. For the resistance values, refer to *3.3.6 Resistance of the windings*.

Main stator

- ➔ Use a multimeter to measure the resistance/continuity of the phases;

Main rotor

- ➔ Use a multimeter to measure the resistance/continuity of the main rotor winding;

Exciter stator

- ➔ Use a multimeter to measure the resistance/continuity of the exciter stator winding between the positive wire (yellow) and the negative wire (blue).

Exciter rotor

- ➔ Use a multimeter to measure the resistance/continuity of the exciter rotor winding between phase and phase.

6.3 Measuring the insulation resistance

Responsibility: Service technician

Prerequisites: Respect the following conditions:

- The alternator must be at a standstill
- The following must be disconnected:
  - Voltage transformers and current transformers
  - Valve centre
  - Power cables.

Also see *6.6 Disassembly of the alternators*.

Frequency: Once a year or if the machine is at a standstill for more than two weeks

Reference regulation: IEEE STD 43-2000



DANGER

Live windings during and after measurements.
Electric shock hazard.

- Do not touch the windings or connection terminals.
- Use isolated gloves and footwear during the operations.
- After the measurements, connect the windings to earth for a few minutes.



DANGER

During winding measurements they charge electrically.
Electric shock hazard due to contact with the windings or with connection terminals.

- Do not touch the windings.
- Use isolated gloves and footwear during the operations.
- After the measurements, connect the windings to earth for a few minutes.

NOTE

Remove the connection to adjustment devices, before performing the test.

Main stator

The insulation resistance measurement between the windings and earth must be made with the relevant measuring device, powered with direct current and output voltage as near as possible to the machine's nominal voltage.

Proceed as follows to measure the insulation resistance.

- ➔ Remove the electric connection between the adjustment devices or other devices;
- ➔ Take the measurement between the winding and the mass (Figure 24-), if valve centre not available;

or

- ➔ Make the measurement between a phase and earth, with the remaining two phases and auxiliaries connected to earth (Figure 25-) if valve centre is available.

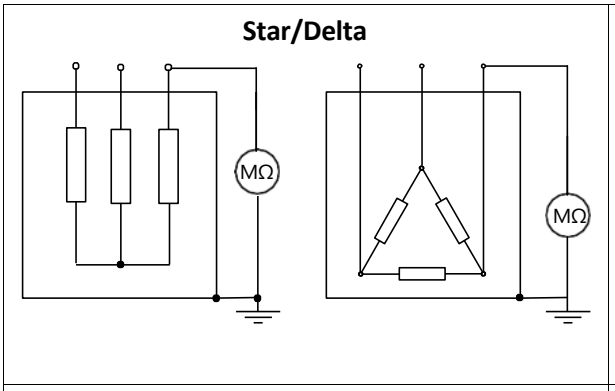


Figure 17- Measurement between winding and earth

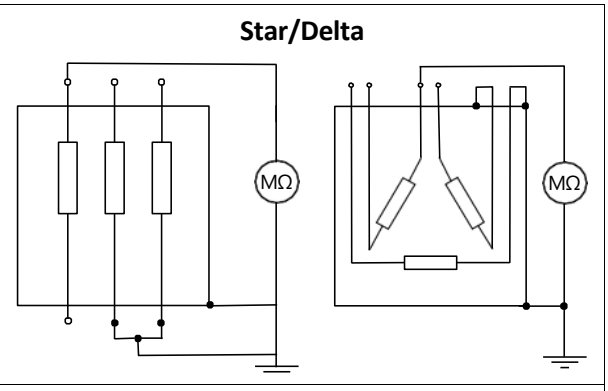


Figure 18- Measurement between every phase and earth

Rotor winding

The insulation resistance measurement between the winding and earth must be made with the relevant measuring device, powered with direct current and output voltage of 500 V.

The insulation resistance must be measured between the positive terminal or the negative terminal of the rotor winding on the rectifier bridge and the earth of the rotor. See Figure 26- and Figure 27- . The minimum isolation value must be 5 MΩ.

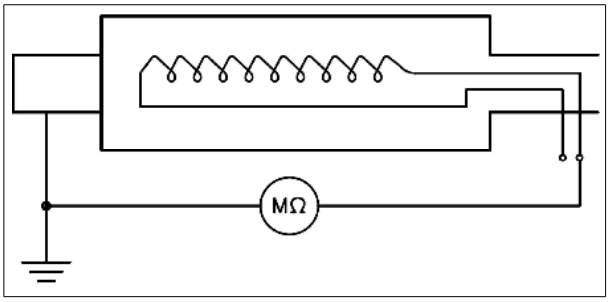


Figure 19- Measuring the isolation resistance on the rotor winding

+ and - terminals of the rectifier bridge

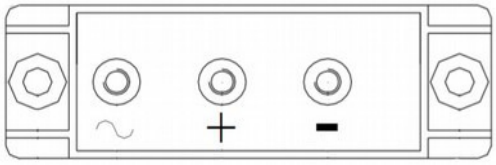


Figure 20- Rectifier bridge

Exciter stator winding

- ➔ Measure the insulation resistance between phase and earth using an insulation tester 500V (megger);
- ✓ The minimum isolation value must be 5 MΩ;
- ✗ If the resistance is lower than 5 MΩ:
- ➔ Clean the stator and, if necessary, paint it again with tropicalising paint;
- ➔ Dry it at 50-60 °C.

If the value remains low even after these operations, the stator must be re-wound or replaced.

Exciter rotor winding

➔ Measure the insulation resistance between phase and earth using an insulation tester 500V (megger)

✓ The minimum isolation value must be 5 MΩ

✗ If the resistance is lower than 5 MΩ

➔ Clean the rotor and impregnate it, if necessary

➔ Dry the rotor at 50-60 °C.

If the value remains low even after these operations, the rotor must be re-wound or replaced.

PMG winding

➔ Measure the insulation resistance between phase and earth using an insulation tester 500V (megger)

✓ The minimum isolation value must be 5 MΩ

✗ If the resistance is lower than 5 MΩ:

➔ Clean the rotor and impregnate it, if necessary

➔ Dry the rotor at 50-60 °C.

6.3.1 Conversion of the values relative to the insulation resistance

The value of the insulation resistance must refer to a temperature of 20°C. It is therefore necessary to convert the data measured to the corresponding value at 20°C, with the aid of a coefficient, by applying the following formula:

$R_{iS\ 20°C} = k * R$

where:

$R_{iS\ 20°C}$ is the resistance value equal to 20 °C

R is the resistance value measured

k is the correction coefficient

T windings in °C	15	20	25	30	35	40
Coefficient k	0.69	1	1.42	2	2.82	4

Table 16 - Temperatures and corrective coefficients

Example:

R = 50 MΩ, with winding at the temperature of 30 °C;

$R_{iS\ 20°C} = 2 * 50 = 100$ MΩ

The following table indicated the quality of the level of insulation on the basis of the resistance measured.

Value of the insulation resistance (MΩ at 20 °C)	Quality of the level of insulation
< 50	Dangerous
from 50 to 200	Level of insulation not safe
from 200 to 1,000	Good
> 1,000	Very good

Table 17 - Level of insulation on the basis of the resistance measured

Notes

- Insulation resistance values that are too low can indicate the presence of humidity or dirt in the winding, contact Mecc Alte S.p.a. to schedule the intervention of a technician.
- The insulation resistance decreases with the increase in temperature.
- The insulation resistance value measured during inspection of the alternator is generally higher than that detected on site.
- An appropriate insulation resistance value is an essential requirement for safety. Do not start the alternator if resistance values are lower than the minimum acceptable.

6.4 Maintenance of the supports

6.4.1 Lubricating the bearings

Responsibility: Service technician

Prerequisites: The alternator is at a standstill



CAUTION

Lubricant grease can pollute the environment.
Possibility of pollution of the land due to the dispersion of grease.

- Always dispose of grease according to the regulations in force or take it to a company specialised in the disposal of special waste.

The NDE and DE supports (Non Drive END and Drive END) of the alternator must be lubricated as indicated in the NAMEPLATE.

General regreasing intervals are indicated in *Table 22 - Intervals of supports lubrication and type of grease.*

Proceed with greasing the NDE bearing as indicated below.

➔ Identify the connection point for the greaser on the side of the alternator of interest;

➔ Introduce the amount of grease indicated by means of a greaser;

➔ Clean any grease escaping.

Generator	Support	Support type	Interval of lubrication	Type of grease	Quantity
ECO47	NDE	626	2,000 h	SKF LGMT 2	50 g
	DE	6232	2,000 h	SKF LGMT 2	100 g

Table 18 - Intervals of supports lubrication and type of grease

6.5 Other maintenance operations

6.5.1 Manual rotation of 1/4 rev.

Responsibility: Service technician or machine operator

Frequency: If machine standstill should last more than six months

Prerequisites: The alternator is at a standstill.

If the machine is at a standstill for a period of time exceeding six months, permanent deformations of the rotating parts may occur.

➔ Manually rotate the alternator shaft by 1/4 rev.

6.5.2 Check and clean the air filters

Responsibility: Service technician

Frequency: Every six months

Prerequisites: The alternator is at a standstill

If the alternator is fitted with air filters, their status of cleanliness must be checked.

➔ Remove the filter.

➔ Use a jet of compressed air to clean the filter.

➔ Re-mount the filter.

➔ Replace the filter if it is still clogged.

6.5.3 Visual inspection

Responsibility: Service technician or machine operator

Frequency: Every 2,500 hours

Prerequisites: The alternator is at a standstill and has cooled down

- ➔ Check for the presence of dents, rust or other visible anomalies;
- ➔ Check the conditions of the power connection cables and the regulator cables;
- ➔ Check the correct tightness of all couplings.

6.5.4 Check the alternator operates correctly

Responsibility: Service technician or machine operator

Frequency: Every 2,500 hours

The alternator must operate without abnormal vibrations or noise. If particular noises or an increase in vibrations occur, check the following.

- Alignment of the alternator with the engine;
- The presence of stress in the three-phase engine and the vibration-damping supports;
- The balance of the rotor;
- The status of the alternator bearings.

6.5.5 Checking and replacing the diodes bridge

Responsibility: Service technician

Frequency: In the case of a fault

Prerequisites: The alternator is at a standstill and has cooled down

The diodes bridge is made up from 3 blocks with 2 diodes (see la *Figure 27- Rectifier bridge*).

- ➔ Remove the PMG lid;
- ➔ Remove the PMG;;
- ➔ Access the rectifier bridge (see *Figure 28-*);
- ➔ Check each diode in both directions using a multimeter set for verification of the diodes. If necessary, replace the diodes bridge. Check the spare parts code in *8 Spare parts.*

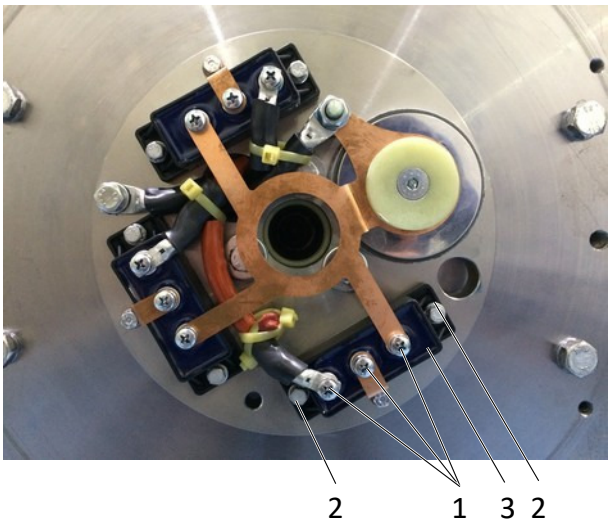


Figure 21- Rotating rectifier

- ➔ Remove the clamping screws (1);
- ➔ Remove the 2 clamping screws (2) of the rectifier block;
- ➔ Remove the rectifier block (3);
- ➔ Install a new rectifier block (3);
- ➔ Re-mount the clamping screws (2) of the rectifier block;
- ➔ Fix the connections to the terminals again;
- ➔ Re-mount the protective grids from the alternator cooling air inlet vents.

6.5.6 Removing the disc holder hub

Responsibility: Service technician or machine operator

Prerequisites: The alternator has been uncoupled from the prime engine

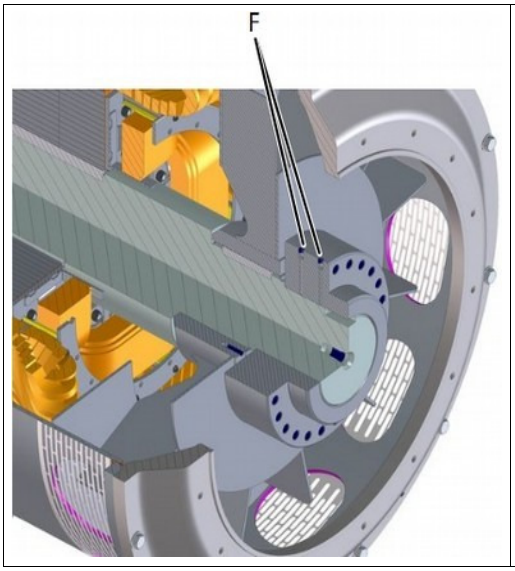
⚠	**CAUTION**
Risk of hub falling. Possibility of injury to operator or damage to the hub. ● Support the hub with suitable lifting equipment during the final extraction phase.	

1- Remove the coupling discs as described in *Removing the SAE 21 discs - Single support alternators.* and *Removing the SAE 18 discs - Single support alternators.* on page 82

There are two different methods for extracting the hub.

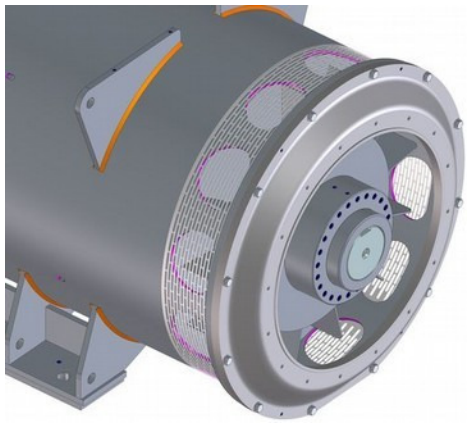
✓ Envision the use of an additional flange of suitable size.

➔ Fix the flange to the hub with at least 6 x M20 Cl. 8.8 screws.



Introducing pressurised oil

1- Use a soft belt, as a loop, to fasten the hub to be removed, in a way to prevent it falling once extracted;
2- Pump oil into the holes (F) indicated, until oil starts to escape from the contact area between shaft and hub;
3- Operate on the additional flange with and extractor to remove the shaft



Heating and extraction

1- Position a three arm extractor and attach it to the additional flange;
2- Heat the hub uniformly using two torches;
3- Pressurise the extractor until the hub is removed completely from the shaft;

6.6 Disassembly and assembly of the alternator

The disassembly and assembly of the alternator has to be done by specialized personnel preferably by Mecc Alte technical people or at least personnel trained by Mecc Alte. In general, below are some recommendations:

1. Always use proper tools and devices to disassemble the alternator.
2. Disconnect the electric connections, accessories and auxiliary circuits.
3. Remove the heat exchanger and filters (if applicable).
4. In order to prevent damage to the rotor, stator lamination or winding coil heads, provide support or suitable device for the shaft in the drive and non-drive ends.
5. When assembling the motor, it is necessary to measure the air gap to check the concentricity between rotor and stator.
6. Table 15 and 16 show the tightening torques that has to be applied.



CAUTION

All the activities related to assembly and disassembly of the alternator must be carried out by qualified personnel; otherwise, damages to property or personal injuries may occur.

6.7 General cleaning

Responsibility: Service technician or machine operator

Frequency: As required at regular intervals

Prerequisites: The alternator is at a standstill and has cooled down

NOTICE

- Do not use water on parts of the alternator.
- Do not use jets of compressed air directly on the windings or inside the terminal board box.

General cleaning concerns the external parts of the alternator and the installation area.

➔ Clean the alternator and the surrounding area.

➔ Check the status of integrity of the alternator parts.

➔ Check the correct tightness of the screws and bolts.

7 Troubleshooting

Below find a series of malfunctioning symptoms of the alternator and possible causes. If the indications provided do not solve the problem, contact the Mecc Alte S.p.a. after-sales service.

The references present in this manual which are useful for solving the problem are shown in this table in brackets.

7.1 Problems of an electrical nature

Symptom	Probable cause	Possible cause
The alternator is not energised	a- Connections interrupted b- Rotating diodes fault c- Driver circuits faulty d- voltage regulator faulty Voltage e- regulator fuse intervention	a- Check and restore the connections (4.4.4) b- Check the diodes and replace them if necessary (6.5.5) c- Check the continuity of the driver circuit d- Check and replace the regulator, if necessary (6.5.6) e- Replace the voltage regulator fuse (6.5.8)
On-load voltage below nominal	a- Speed less than nominal b- Voltage regulator calibrated incorrectly or faulty c- Over-excitation limitation device intervention	a- Check the number of revs. b- Reset the nominal voltage value, modifying the parameters of the regulator or replace it (4.5.1) c- Replace the voltage regulator (6.5.6)
Voltage too high or unstable	Voltage regulator faulty	Replace the voltage regulator (6.5.6)
Temperature of the windings too high	a- Excessive network unbalance b- Winding fault c- Defect in the measuring system	a- Check that the network balance meets requirements b- Check the windings c- Check the sensors

7.2 Problems of a mechanical nature

Symptom	Probable cause	Possible cause
The alternator vibrates and is noisy	a- Incorrect fixing to the base b- Excessive network unbalance	a- Check the fixing screws and tighten if necessary b- Check that the network balance meets requirements
● Excessive supports temperature ● Noisy supports ● Excessive vibrations at the support	a- Problems with lubrication (insufficient or excessive) b- Faulty support c- Machine misalignment d- External loads not envisioned	a- Check that the lubricant corresponds to that indicated by the manufacturer and that the quantity is correct b- Check the status of the support and replace it, if necessary c- Check the alignment d- Check the coupling area

For additional information regarding supports malfunctioning, see also *10.2 Components documentation.*

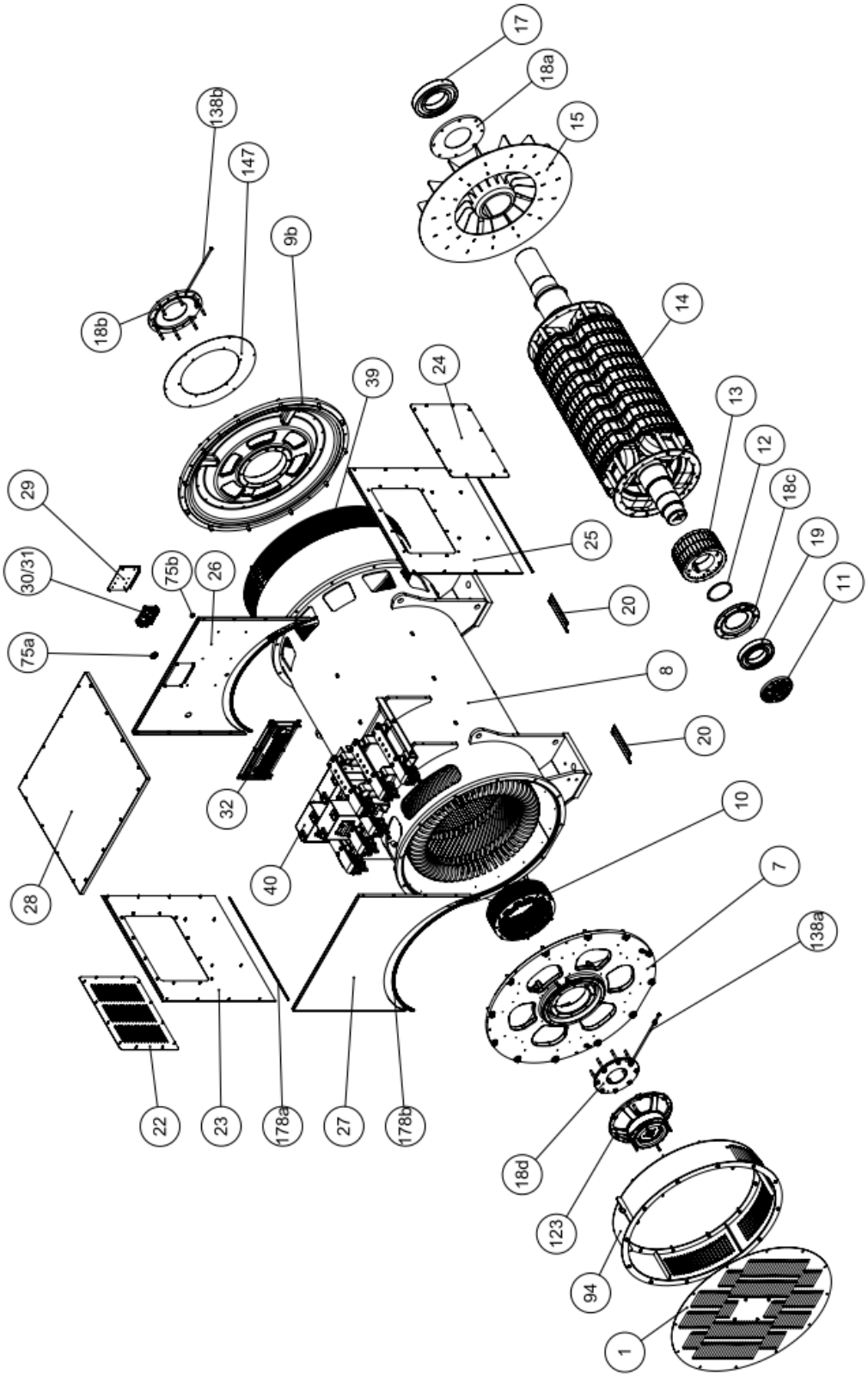
8 Spare parts

8.1 List of recommended spare parts

Below is the list of recommended spare parts for the alternators. Contact the Mecc Alte S.p.a. After-sales service, if necessary. Refer also to the assembly drawing of the alternator, see *10.1 Diagrams and drawings*.

The following exploded view refers to the basic IP23 configuration. For higher grades IP (45, 54, 55) contact Mecc Alte offices.

ECO47 B3B14


17
18a
15
138b
147
9b
18b
14
39
24
13
12
18c
19
11
29
30/31
75b
26
25
20
75a
8
20
32
10
40
7
138a
28
22
23
178a
27
178b
18d
123
94
1

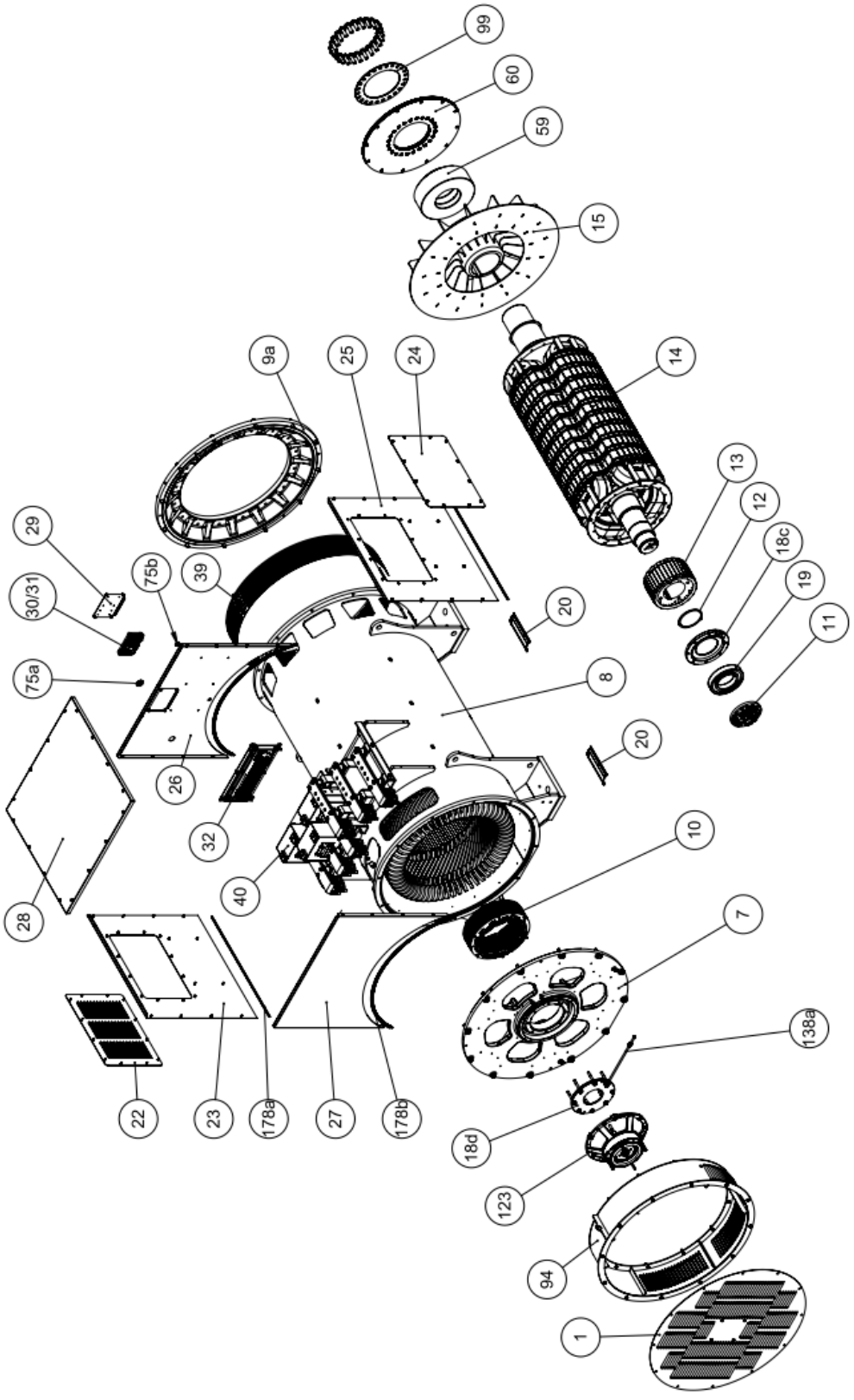

99
60
59
15
14
9a
25
24
13
12
18c
19
11
29
30/31
75b
39
20
75a
8
20
26
32
40
10
28
7
138a
22
23
178a
27
178b
18d
123
94
1

Table 19 - Spare parts ECO47

POS.	CODE	LIST OF SPARE PARTS
1	9810049335	REAR SEAL
7	6801001064	NON DRIVE END BRACKET
8	/	FRAME AND STATOR
9A	6801001075	DRIVE END BRACKET SAE00
9B	6801001076	DRIVE END BRACKET B3B14
10	4500486560	EXCITER STATOR
11	/	ROTATING DIODE BRIDGE
12	9810055011	SEEGER RING
13	6802521188	ROTATING INDUCTOR
14	/	ROTOR ASSY
15	6801005030	FAN
17	9810027048	FRONT BEARING
18a	6801011209	INNER FRONT FLANGE
18b	6801011210	OUTER FRONT FLANGE
18c	6801011212	INNER REAR FLANGE
18d	6801011211	OUTER REAR FLANGE
19	9810027049	REAR BEARING
20	9810051006	ANTI-CONDENSATE HEATER
22	9810018193	IP23 SIDE TERMINAL BOX COVER PANEL
23	9810018190	TERMINAL BOARD RIGHT PANEL
24	9810018192	LH CABLE OUTLER PANEL
25	9810018191	TERMINAL BOARD LEFT PANEL
26	9810018189	TERMINAL BOARD FRONT PANEL
27	9810018194	TERMINAL BOARD REAR PANEL
28	9810018195	TEMRINAL BOX LID
29	9903905602	REGULATOR HOLDING PANEL
30	4505005536	DER2 ELECTRONIC REGULATOR
31	4505005511	M3K - HD REGULATOR
32	/	TERMINAL BLOCK

POS.	CODE	LIST OF SPARE PARTS
39	9810018187	LEFT FRONT PROTECTION SCREEN
7	9810018186	RIGHT FRONT PROTECTION SCREEN
8	9810018185	LOWER FRONT PROTECTION SCREEN
40	/	CURRENT TRASFORMER
59	6801011193	COUPLING HUB FLYWHEEL 18
10	4500486560	COUPLING HUB FLYWHEEL 21
60	/	DISC PLATES SAE 18
12	9810055011	DISC PLATES SAE 21
75a	9909509107	CABLE GROMMET DG29
75b	9909509106	CABLE GROMMET DG16
94	9810049333	REAR CASE
99	9810017426	DISK LOCKING RING
123	/	PERMANENT MAGNET GENERATOR
138a	9911147035	REAR GREASING PIPE
138b	9911147035	FRONT B3B14 GREASING PIPE
147	9810018036	FRONT LID CLOSURE B3B14
178A	9909515360	RUBBER PROFILE EPDM DIM.8.5X5.5mm

9 Decommissioning, Dismantling and Disposal

9.1 Decommissioning and removal

9.1.1 Stopping machine operation

Responsibility: Service technician or Mecc Alte S.p.a. After-sales service technician

Prerequisites: The machine is at a standstill and isolated electrically from the mains

- ➔ Isolate the machine from the electric power supply sources;
- ➔ Remove the mechanical connection of the alternator to the prime engine;
- ➔ Remove the alternator from its seat.

9.2 Disassembly

9.2.1 Disassembly of the machine

Responsibility: Service technician or Mecc Alte S.p.a. After-sales service technician

Prerequisites: The machine is at a standstill and isolated electrically from the mains

Refer also to *6.6 Disassembly of the alternators*.



CAUTION

Lubricant liquids and other process fluids harmful for the environment are contained in the machine and its piping.
Possibility of pollution of the surrounding environment with toxic substances.

- Recover all harmful lubricant liquids and other process fluids and have them eliminated by a specialised company.

➔ Dismantle the machine.

✗ If the machine must be used subsequently:

➔ Carry out the actions necessary for storage, as described in 9.3 *Storage*.

✗ If the machine is to be eliminated definitively:

➔ Perform all the actions necessary for disposal as described in *9.4 Disposal*.

➔ Dispose of all fluids and other materials or substances potentially harmful for the environment as specified by the regulations in force.

9.3 Storage

NOTICE
Possible damage to the alternator is the insulation resistance of the windings does not lie within the values envisioned. Possible consequences ● Check the value of the insulation resistance before commissioning.

9.3.1 Short-term storage

Short-term storage means a period not exceeding three months. The following measures must be complied with during this period.

1- The temperature of the parts must always be such as to prevent the condensation of humidity in the structures.

2- Switch on the anti-condensate heaters (if present) and regularly make sure they function correctly.

3- Provide appropriate protection to prevent the entry of insects and parasites.

4- Storage can be with or without the packaging used for transport.

5- Whenever parts must be kept in their original packaging, suitable aeration slots should be cut into the same.

6- Whenever parts must be stored without packaging, it is indispensable to provide covering that permits aeration while ensuring protection against infiltration by insects and parasites.

9.3.2 Electric and electronic components

It is preferable to position the electric and electronic components in a place with the following features:

- constant temperature in the range of 10°C - 40°C
- relative air humidity below 75%
- good ventilation
- no corrosive gases
- no vibrations
- no dusts

9.3.3 Long term storage

Long term storage means a period exceeding three months. The following measures must be implemented during this period.

1- The temperature of the parts must always be such as to prevent the condensation of humidity in the structures.

2- Check the conditions of the anti-corrosion paint applied to metal parts. All signs of corrosion must be removed as soon as possible and a new anti-corrosion treatment must be applied.

3- Provide appropriate protection to prevent the entry of insects and parasites.

4- The alternator shaft must be made to rotate manually.

- Storage can be with or without the packaging used for transport.
- Whenever parts must be kept in their original packaging, suitable aeration slots should be cut into the same.
- Whenever parts must be stored without packaging, it is indispensable to provide covering that permits aeration while ensuring protection against infiltration by insects and parasites.

Storage for more than 18 months

In the case of storage longer than 18 months, the bearings grease must be replaced before re-starting the alternator. See *6.4.2 Replacing grease in the bearings*.

9.4 Disposal

9.4.1 Disposal of the machine

Responsibility: Operator/user

Prerequisites: The procedure described in *9.2.1 Disassembly of the machine* has been concluded

	**CAUTION**
Lubricant liquids, process fluids or machine components are harmful for the environment. Possibility of pollution of the surrounding environment with toxic substances or materials. • Recover the lubricant liquids, other process fluids and materials and have them disposed of by a specialized company.	

For the correct disposal of the machine, we recommend contacting a specialized company or Mecc Alte S.p.a.

10 Enclosed documentation

Each alternator is managed with its JOB number. Diagrams and drawings are provided with the alternator shipment. Below the list of documents provided:

- CE Declaration;
- Auxiliaries box wiring diagram;
- Measurement transformer data sheet.

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