



MarelliMotori
Powering the future®

MJB 355 ÷ 630 SERIES

Low Voltage

MJH 400 ÷ 800 SERIES

Medium/High Voltage

Caterpillar Energy Solutions

INSTALLATION, OPERATION & MAINTENANCE MANUAL

3-phase synchronous generator

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MJB 355 ÷ 630 SERIES – Low Voltage – Caterpillar Energy Solutions – Marelli Motori
MJH 450 ÷ 800 SERIES – Medium/High Voltage – Caterpillar Energy Solutions – Marelli Motori

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EN

INSTALLATION, OPERATION & MAINTENANCE MANUAL
3-phase synchronous generator

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1 GENERAL SAFETY WARNINGS

The electrical machines are components designed to operate in industrial areas (incorporated in machinery/systems); as a consequence, they cannot be managed as retail products.

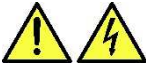
The instructions provided herein, therefore, contain instructions which are suitable to be used by qualified personnel.

In order to ensure safety, the instructions in question must be combined with the provisions set out by the laws and by the technical standards in force.

Any special versions or variations of the electrical machines may change in some detail from the ones described herein. If you have any questions, please contact Marelli Motori s.r.l., specifying:

- Serial number
- Full machine code
- Machine type

Some recommendations contained in this manual are preceded by the following symbols, which are aimed at alerting you of possible accident risks:

WARNING!	It refers to checks and operations which may result in damages to the product, to accessories or to components connected to it.
	It refers to procedures and operations which may result in serious injuries or death.
	It refers to immediate electrical dangers which may result in the death of people.
	It points out a hazardous situation.

Electrical machines have parts which are dangerous, as they are under voltage or move during operation. As a consequence:

- any improper use,
- the removal of protections,
- the disconnection of protection devices,
- any failure to perform inspections and maintenance operations,

may result in serious injuries or damages.

For the chemical products mentioned/used in maintenance, refer to the safety data sheets for the individual products

The safety manager, therefore, must verify and assure that the electrical machine is exclusively handled, installed, commissioned, managed, inspected, serviced and repaired **by qualified personnel**, which shall be provided with:

- specific technical education and experience,
- awareness of the applicable technical standards and laws,
- awareness of the national and local general safety provisions and of the characteristics of the system,
- ability to identify and avoid any possible danger.



Works on the electrical machine must be authorised in advance by the safety manager, and be carried out with the electrical machine stopped and disconnected from the mains (including the auxiliary devices, like for example the anti-condensation heaters).

Since the electrical machine included in the supply is a product designed to be used in industrial areas, **additional safety measures must be taken and assured by the person in charge of the installation in case any stricter protection conditions are required.**

The electrical machine is a component which is mechanically coupled with another machine (standalone or included in a system); during service, therefore, the installer must ensure an appropriate degree of protection against the danger of contacts against any exposed moving parts and prevent people or objects from getting dangerously close to the machine.

Should any operating fault occur (output voltage too high or too low, excessive temperature increase, noise emission, vibrations), promptly inform the technicians in charge of maintenance operations.

2 DESCRIPTION

The instructions contained in this manual refer to **MJ** series alternators.

The description of the different models refers to the following table.

MJ	B	Alternators for low voltage industrial applications
	H	Alternators for medium/hig voltage industrial applications
	R	Alternators with air-water exchanger IP44 or IP55
	V	Alternators with air-air exchanger IP44 or IP55

The **MJ** series electrical machines are self-excited, self-regulated brushless alternators, manufactured in compliance with the standards IEC 60034-1.

2.1 GENERAL INFORMATION

This User Manual contains information about transport, storage, installation, commissioning, operation and maintenance of the alternator manufactured by Marelli Motori.

Data concerning any aspect of operation, maintenance and supervision of the alternator is provided herein. To ensure the correct operation and a long lifecycle of the alternator, a careful study of the contents of the manual and of all the documentation related to the alternator is required before undertaking any action.-

NOTE: Some customer specific items may not be included in this User Manual, yet, in that case, additional documentation will be annexed to the project documentation.

Only suitably trained personnel, with previous experience in similar assignments and authorized by the customer, can perform the operations explained in the manual.

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NOTE: To ensure that the installation, operation and maintenance of the alternator are performed correctly and safely, it is mandatory to follow these instructions, which for this purpose must be made available to those who install, supervise and maintain the system. Non-compliance with the instructions voids the warranty.

2.2 IMPORTANT NOTE

The information in this document in some cases can be of general scope and thus applicable to different alternators produced by Marelli Motori.

The safety cautions indicated in the GENERAL SAFETY WARNINGS at the beginning of the manual must always be respected.

The safety depends on the awareness, promptness and prudence of all those who operate the alternators and carry out their maintenance. Taking the utmost care near the plant is as essential as the respect of all the safety procedures.

NOTE: To avoid accidents, the safety provisions and the devices required at the installation site must comply with the instructions and rules drafted to ensure work safety. They include the general safety standards of the Country in question, the specific agreements entered into for each yard, the safety instructions in this manual and the additional safety instructions delivered with the alternator.

2.3 LIMITATION OF LIABILITY

Marelli Motori shall not be liable for direct, indirect, special, occasional or consequent damages of any nature or type due to the use of this document.

The warranty issued covers manufacturing and material defects, yet it does not cover any damage caused to the alternator, to the personnel or to third parties due to improper storage, non correct installation or operation of the alternator. The warranty terms are detailed in the sales terms.

NOTE: The warranty issued is not valid if the operating conditions of the alternator change or if its structure has been altered, or if alternator repair works have been carried out without written authorization by Marelli Motori.

Our contact information is provided on the rear of this User Manual. Always indicate the serial number of the alternator when dealing with communications about it.

- Protection Degrees - specifications

The protection degree and the rating values are listed on the rating plate.

- Frequency



The alternator is designed to operate at a frequency of 50 or 60 Hz according to the data shown on the rating plate. To ensure proper operation for either frequency, the operator needs to verify that the voltage regulator calibration is appropriate for the intended use and that the alternators are used in accordance with the rating plate data. Also pay attention to the lubrication intervals of the bearings as with the transition from 50 to 60Hz lubrication intervals decrease (see table in section 7.2).

- Accessories

Alternator may be equipped with accessories (anti-condensation resistances, Pt100, etc.) as requested in the order.

3 TRANSPORT

We recommend that you thoroughly inspect it on arrival, to verify that it hasn't got damaged during transport. Any visible damages must be directly pointed out to the carrier and to Marelli Motori, if possible providing photographic evidence. In case of alternator shipped inside a close package, we recommend to accept with a reserve the goods and inspect and report to Marelli Motori any eventual transport damage occurs during transport within 7 days from arrival.



To lift and handle the alternator, use the relevant eyebolts.

The eyebolts on the alternator are suitable for the lifting of the alternator only and must not be used to lift the whole unit.

Also check that the lifting means capacity is appropriate for the weight of the alternator and that all safety measures relevant to handling have been taken.

4 WAREHOUSE STORAGE

4.1 SHORT TERM STORAGE (LESS THAN THREE MONTHS)

The alternator shall be stored in a suitable warehouse with controllable environment. A good warehouse or storage point features:

- A stable temperature, preferably between 10°C and 50°C.
- Low relative humidity of the air, possibly below 75%. The alternator temperature must be kept above the dew point to avoid humidity condensation inside the alternator. Anti-condensation heaters (if any) must be energized and their operation must be periodically checked. In case of alternators without anti-condensation heaters, it is necessary to use an alternative heating method to avoid the formation of condensation in the alternator.
- A steady support without excessive vibrations and shocks, below 1mm/s. Position two suitable rubber wedges under the feet of the alternator to isolate it, if you reckon that the vibrations are too intense.
- Ventilated, clean air, without dust and corrosive gases.
- Protection from noxious insects and parasites.

4.2 LONG TERM STORAGE (MORE THAN THREE MONTHS)

Besides the provisions described at the paragraph concerning short term storage, it is necessary:

- To measure periodically the insulation resistance of the windings with related temperature (see paragraph 5.2).
- To check the conditions of the varnished surfaces every six months. If corrosion signs are detected, remove the varnish and restore it.
- To check the conditions of the anti-corrosion varnish on bare metallic surfaces (such as shaft ends) every six months. If corrosion signs are detected, remove them with emery paper and repeat the anti-corrosion treatment.
- To execute openings for ventilation when the alternator is stored in a wood crate and prevent water, insects and parasites from entering the crate (see Picture 1).



Picture 1

Alternator stored in wooden crate

Grease lubricated bearings:

The grease lubricated bearings do not require maintenance during warehouse storage; the periodical rotation of the shaft helps to prevent the corrosion due to contact and grease hardening.



For storage longer than 3 months, every three months perform 5 rotations of the alternator shaft, stopping it at 90° with respect to the start position.

NOTE: If the storage time exceeds 6 months, when the alternator is started or installed for the first time you need to perform the first lubrication (see paragraph 7.2).

For inactivity over 2 years we recommend to replace the grease performing a visual check of the bearings, in case of trace of oxidations or any doubts, replace the bearings.



Should the alternator have to be stored for a prolonged time in a non-controlled environment (or should the warehouse storage provisions listed in paragraph 4.2 fail to be met), we recommend that you reduce the grease replacement interval from 2 years to 1.



Sleeve bearing and oil bath bearings

The machines with sliding bearings are provided without lubricant.

Verify that on the components of the bearing there is a layer of protective oil. When the storage period exceeds two months, apply on the bearing an anticorrosion substance through the filling hole (refer to the specific manual of the support), repeating the anti-corrosion treatment every six months for a period of two years. If the storage period is over two years, the bearing must be disassembled and treated separately.

The bearing must be disassembled and all the components inspected after storage and before commissioning, making sure to remove any trace of corrosion with fine emery paper.

The machines with sliding bearings are equipped with a rotor lock bracket which protects the bearings from any damage during transport. Periodically check the device and tighten it depending on the type of bearing in axial position.

4.3 OUTDOOR STORAGE

If it is necessary to store the alternator outdoor, it must not be left in the packaging used for transport. Instead:

- It must be removed from the packaging
- It must be covered to prevent rain from entering into the alternator, but at the same time the covering must allow alternator ventilation.
- It must be placed on stiff supports at least 100 mm high, in order to minimize the risk of possible water infiltration.
- It must be well ventilated. If the alternator is left in the packaging used for transport, openings big enough to allow ventilation must be executed.
- It must be protected from insects and parasites.

5 INSTALLATION AND COMMISSIONING

5.1 PRELIMINARY CHECKS

Before commissioning, verify that the data indicated on the alternator rating plate are suitable for the characteristics of the power grid and of the intended service and that the installation of the alternator complies with the provisions of the manufacturer.

Make sure that on the alternator which must operate in specific environments, the most suitable solutions to ensure a correct operation have been prepared: tropicalization treatments, protections against direct sunrays, etc.

Make sure that during operation the maximum speed envisaged by the manufacturer is not exceeded (if necessary, provide control and safety devices).

Measure the insulation resistance of the windings before proceeding with other preliminary tasks, as described in paragraph 5.2 Insulation Test.

5.2 INSULATION TEST

At the group manufacturer, before its commissioning it is highly recommended to perform an insulation test to ground of the main stator windings. Detailed instructions are provided in the international standard IEEE 43.

Before performing such test, it is necessary to disconnect the connections which go to the control devices (voltage controller or other devices).

The measurement of the insulation resistance between the windings and the ground is performed with a specific measurement device (Megger or equivalent) powered by direct current and with output voltage (test voltage) equal to 500 V for low voltage alternators. The value of the insulation resistance is to be recorded after 1 minute from the application of the test voltage.

For the insulation resistance value see the table paragraph 5.4.



Do not touch the winding terminals during and just immediately after the measurement because they are live.

For the measurement of the insulation resistance, proceed as indicated below:

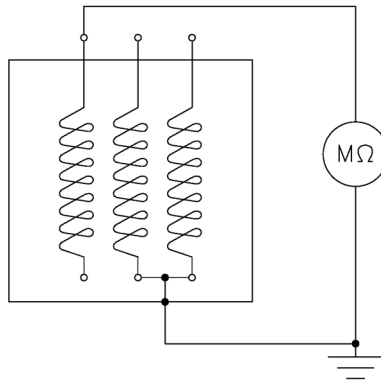
- Main stator: the measurement of the insulation resistance shall be executed after disconnecting the connections which go to the Automatic Voltage Regulator or other electronic cards. The measurement shall be executed between a phase and ground with the remaining two phases connected as well to ground (operation to be repeated for all three phases) (see Picture 2).
- Exciter stator: disconnect the cables (+) and (-) from the Automatic Voltage Regulator and measure the insulation resistance between one of these two terminals of the winding and the ground.

- Main rotor winding: measure the insulation resistance between the terminal of the main rotor winding on the rotating rectifier and the rotor ground (shaft) (see Picture 3).

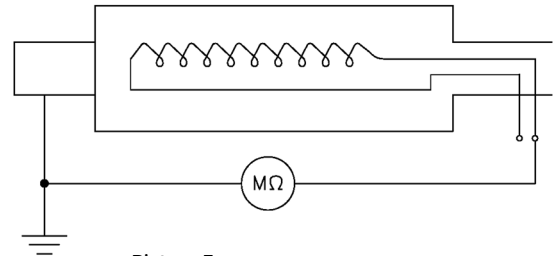
The measured values shall be recorded. According instruction of paragraph 5.3, eventually measure the polarization index. (see paragraph 5.5).



In order to avoid electrocution dangers, connect the windings to ground for a short time just after the measurement.



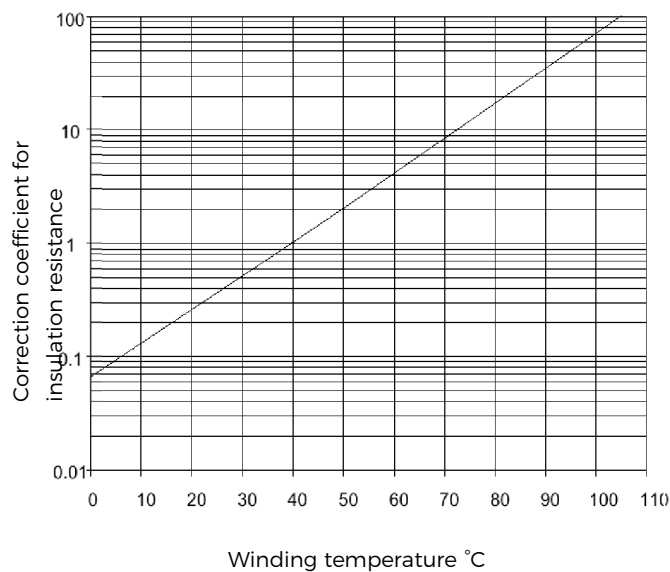
Picture 2
Main stator insulation test



Picture 3
Main rotor insulation test

5.3 CONVERSION OF THE MEASURED INSULATION RESISTANCE VALUES

In order to compare the measured insulation resistance values, these are established at 40°C; with the aid of the graph in Picture 4. The actual measured data is then converted to a value corresponding to 40°C. The application of this graph should be limited to temperatures near the standard value of 40°C because more significant variations may cause errors.



Picture 4
Correlation between insulation resistance and temperature

$$RC = k \times RT$$

RT Value of the insulation resistance at a specific temperature

RC Equivalent insulation resistance at 40°C

K Correction coefficient for insulation resistance

Example:

RT = 400 MΩ measured at 20°C

k = 0,25

RC = 0,25 x 400 MΩ = 100 MΩ

To verify the quality of the insulation resistance of the alternator, refer to the tables paragraph 5.4.

5.3.1 General considerations

Please, take note of the following considerations, before deciding the actions to be undertaken based on the insulation resistance tests.

- If the measured value is considered too low, the winding must be cleaned and/or dried. If that is not enough, it is necessary to refer to experts
- The alternators about which you suspect a humidity issue must be dried with the utmost care, regardless of the insulation resistance value measured

5.4 VALUES FOR THE INSULATION RESISTANCE

Generally, the insulation resistance values for dry windings must considerably exceed the minimum values; definite values cannot be provided since the resistance varies according to the type of alternator and local conditions. The insulation resistance is also affected by the age and use of the alternator; the following values should thus be followed only as a guideline.

The minimum insulation resistance value is one of the basic requirements for the electric safety of the stator. It is absolutely not recommended to start the alternator if the values are lower than the minimum value.

The insulation resistance limits indicated below are valid at 40°C and when the voltage test has been applied for more than one minute (and anyhow no more than 10 minutes).

- Rotor to 40°C:

$$R_c > 5 \text{ M}\Omega$$

- Stator to 40°C:

Table for new alternator (less than three months):

Insulation level	Poor	Check with PI	Acceptable	Good
Stator Insulation resistance at 40°C	$R_c < 10 \text{ M}\Omega$	$10 \text{ M}\Omega < R_c < 200 \text{ M}\Omega$	$200 \text{ M}\Omega < R_c < 1000 \text{ M}\Omega$	$R_c > 1000 \text{ M}\Omega$

Table for used alternator:

Insulation level	Poor	Check with PI	Acceptable
Stator Insulation resistance at 40°C	$R_c < 10 \text{ M}\Omega$	$10 \text{ M}\Omega < R_c < 100 \text{ M}\Omega$	$R_c > 100 \text{ M}\Omega$

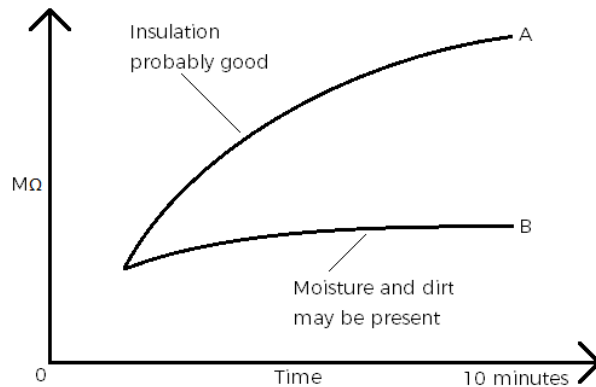
NOTE: If the indicated values are not reached, it is necessary to establish the cause of the insulation resistance low value: often the reason is an excess of humidity or dirt, even if the actual insulation is not affected.

The coefficients of Picture 4 are applied in the case of temperature of the windings other than 40°C.

5.5 POLARIZATION INDEX (PI)

Measuring the polarization index according to the standard IEEE 43, it is possible to test the insulating system of the alternator.

Measure and record the insulation resistance at environment temperature at different times: T1', T2', ...T10'. The measurements interval is conventional (e.g. 1 minute).



Picture 5
 Quality trend of the insulation resistance in function of time

The following ratio is defined as the **Polarization Index PI**

Polarization Index	Criteria	
$PI = \frac{R_{isol\ T10'}}{R_{isol\ T1'}}$	PI < 1.5	Bad - Unsatisfactory
	1.5 < PI ≤ 2.0	Good enough
	2.0 < PI < 4.0	Good
	PI > 4.0	Very good

The previous chart shows the insulation resistance as a function of the test voltage application time, from a qualitative point of view.

The minimum PI value for the new windings of the stator is higher than 2.

High temperatures can cause unpredictable changes in the polarization index, so the test cannot be used at temperatures over 50°C.

Dirt and humidity accumulated in the winding reduce the insulation resistance and the polarization index, as well as their dependence on the temperature. Windings with open heads are more sensitive to the effects of dirt and humidity.

There are different rules to establish the lowest acceptable value with which it is possible to start the alternator in safety. For the polarization index (PI), the values usually vary from 1 to 4, where 1 indicates that the windings are wet and dirty.

NOTE: If the insulation resistance of the winding is higher than 1GΩ, the polarization index is not a significant factor of the insulation conditions and cannot be taken into account.

5.6 ADDITIONAL DIAGNOSTIC TESTS ON MV/HV GENERATORS

5.6.1 TAN DELTA

Measuring the Tan Delta Index according to the standard IEEE 286-2000 – IEEE Recommended Practice for Measurement of Power Factor Tip-Up of Electric Machinery Stator Coil Insulation

When a perfect insulating material is stressed by an alternated voltage it behaves as an ideal capacitor, i.e. current flowing through it has only the capacitive component.

Impurities such as moisture, dust, etc. and/or brittle due to aging of insulation, act as an imperfect insulator; consequently, a resistive component of current can be observed, bringing the material away from this ideal conditions

The Tan Delta method can measure the resistive current effects, due to the aging and impurities, out of the total current through the insulating material.

Test are carried using AC voltage with amplitude growing step by step and applied to windings voltage up to 120% the rated voltage.

Benefits

As the measurement of insulation resistance the TanDelta method provides information about insulation material bonding the windings.

In case of MV and HV generators and motors, only this investigation method can provide information about residual quality of insulating wall.

This test is specific for form wound windings and it is not applicable on wire windings LV machines.

In other terms, the Tan Delta test is recommended / applicable on MV/HV machines.

5.6.2 PARTIAL DISCHARGES

Measuring the Partial Discharge according to the standard IEC 60270 High-voltage test techniques – Partial discharge measurements Recommended Practice for Measurement of Power Factor Tip-Up of Electric Machinery Stator Coil Insulation

Any insulating material can include, inside itself, micro bubbles of air. Electric field induced by applied voltage on active parts, can achieve strength high enough to start discharges inside these bubbles.

These discharges can be observed as current pulses with short duration (microsecond) and high frequency.

Partial discharges are measured at same time TanDelta test are carry on.

When partial discharge activities shows increasing trend along the time a definitive damage of insulating material is already achieved

Benefits

Once partial discharge activity is occurring at rated voltage, the effect should be considered degenerative due to discharges eroding the insulating material between active parts and ground.

Periodic monitoring of partial discharge will avoid sudden catastrophic damages.

5.7 RECOVER OF STATOR WINDING INSULATION RESISTANCE

Even if the alternator is provided with anti-condensation heaters, they are not effective as devices to dry the winding. The anti-condensation heaters must be energized during the usual stops of the alternator only in order to avoid condensation.

The stator can be heated and dried by:

1) DC current circulating in it (using, for instance, an industrial DC welder)

In that case we recommend that the current circulating in the windings should be about 25% of the rated current of the alternator, controlled in order to achieve the desired temperature.

2) Using of hot air blowers

The active parts can also be dried by a flow of hot air. The hot air flow must be directed as much as possible toward the winding heads. In this case the electric machine must be covered with thermal insulation barriers to avoid the complete dispersion into the environment of the heat produced. At the same time, when possible, doors must be opened in the top side of the main frame in order to allow the emission of the removed humidity.

By inserting a thermometer on the active parts, it is possible to ensure that the winding temperature does not exceed 100°C. The recommended temperature for drying is 80÷100°C.

3) Running in short-circuit operation and separate manual excitation

Short circuit drying process requires:

- Realize a short-circuit between the 3 main power terminals of the alternator using cables or bars that have a total section suitable to withstand the nominal current of the alternator (it is recommended not to exceed the value of 5A/mm² of current density).
- The load and also all electronic excitation control devices (AVR, Varicomp, etc.) must be disconnected.
- The (+) and (-) terminal of the exciter stator must be connected to an external device (at customer care) suitable for obtaining an excitation system capable of delivering about 15Vdc and 5A, manually adjustable.
- So, start the engine and run the alternator at the nominal speed. Manually excite it until will reach approximately 80% of the rated current. Use the central-star CTs or, if not available, a clamp meter, for metering purposes of the main stator winding current.
- Also, use the temperature sensors (PT100) of the stator winding, for winding temperature monitoring. Do not exceed an absolute value of 110°C +/-5°C.

- Reduce the value excitation if current or temperature values exceed the above limits.
- Usually a drying process in short circuit operation, takes about 4-6 hours to achieve satisfactory results.

If after drying the insulation values remain low and unsatisfied, contact the Marelli Motori Service.

5.8 BALANCING

The alternator rotor is dynamically balanced (ISO 1940-1).

5.9 INSTALLATION CONDITIONS

The alternator shall be installed in a site large enough to allow air to be directly exchanged with the atmosphere. Minimum distance air inlet about 500mm.

It is essential that the air intake and discharge openings are not obstructed; in addition, the alternator position must be such that hot air is not directly sucked in.

Make sure that inspections (like vibration and noise) can be performed while the alternator is running.

The alternator operating environment must be clean and dry.

5.10 ALIGNMENT

5.10.1 Guidelines

A correct operation without vibrations both in the driven (alternator) and the driving machine (engine) is the result of their correct alignment that means that the deviation, either radial or angular, between the two shafts of the machines is minimized.

The alignment must be carried out with great care because any error may cause damages to the bearings and shafts.

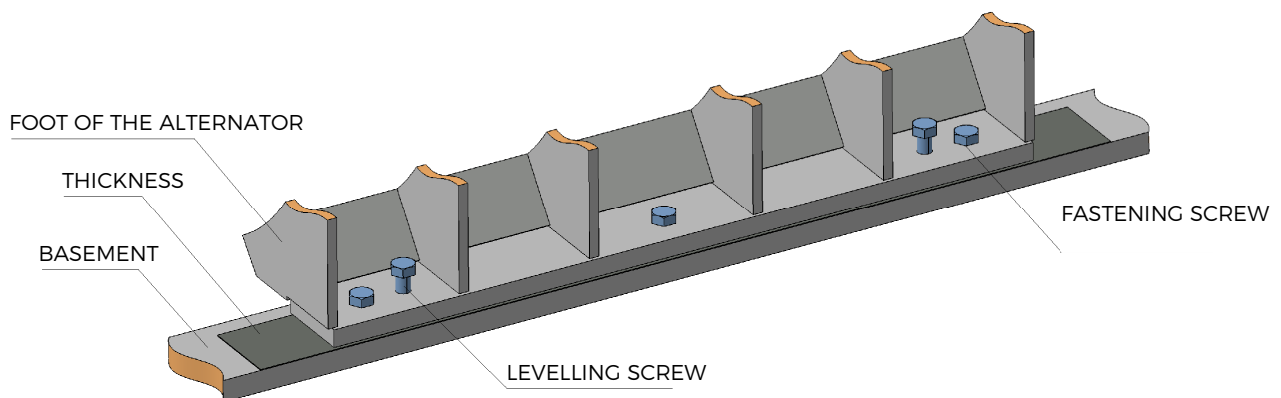
It is necessary to check as well that the torsional features of the alternator and of the engine are compatible. To enable the compatibility check (at customer care), Marelli Motori can provide drawings of the rotors for torsional checks.

Install the half-couplings before starting the alignment procedure. The half-couplings of the alternator and of the engine must be bolted among them in a loose manner to enable freedom of movement during alignment.

5.10.2 Approximate levelling

For an easy alignment and positioning of the shims, properly threaded holes are machined into the feet of the alternator for lifting purpose, see Picture 6. It is possible to obtain this just using a standard set of bolts.

Verify that the alternator is levelled in vertical, radial and axial direction. For the horizontal levelling of the alternator is possible to use a tool such as a bubble level.



Picture 6
Vertical
positioning of the
alternator foot

5.10.3 Radial and angular alignment

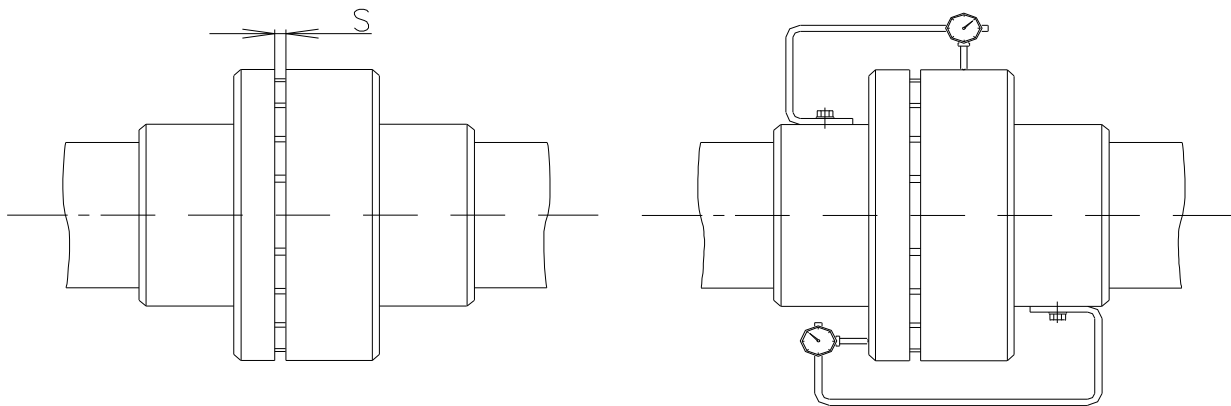
After positioning the alternator in an approximate manner, as described in paragraph 5.10.2, the final alignment can start. This step must be executed with the utmost care.

Otherwise heavy vibrations may occur, which would damage both the alternator and the engine.

The alignment must be carried out following the recommendations of the manufacturer of the coupling. There are standards which provide indications to carry out the alignment of a coupling, for instance BS 3170:1972 "Flexible couplings for energy transmission".

The alignment of the machine is performed as follows:

- The machine must rest on the levelling screws.
- Using an alignment equipment, measure and record the parallel, angular and axial misalignment in four different angular positions (every 90°).
- Align the height of the machine using the levelling screws, see Picture 7.
- Mount the shims under the feet of the machine. Loosen the levelling screws and tighten the fastening bolts.
- Check again the alignment, correct if necessary.
- Draft a report for later checks.
- Tighten again the nuts and mark their position.
- Anchor the foot of the machine to ease possible future reinstallations.



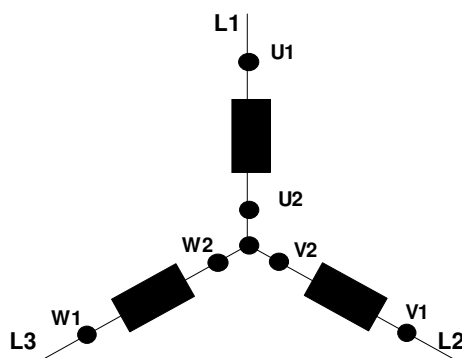
Picture 7

Check of the alignment with comparators

5.11 ELECTRICAL CONNECTION

The alternators are designed with six terminals and star connection, see Picture 8.

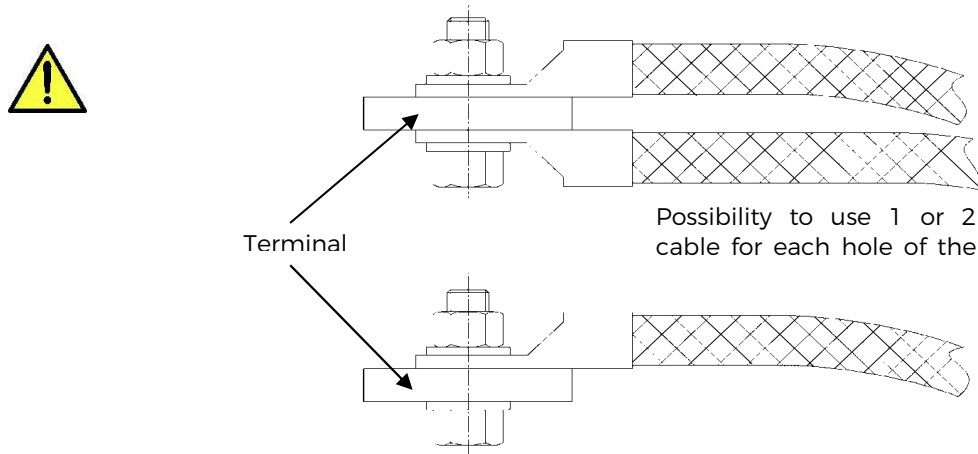
As per standard configuration, the cables entering is set up on right of the terminal box facing D-end side.



Picture 8

STAR connection diagram

Load power cables have to be fixed on the terminals of the alternator as shown in the Picture 9.



Picture 9

Load power cables terminals

For the recommended tightening torque values, see table in paragraph 7.3.8

5.11.1 Rotating direction

The alternator can operate in **clockwise and anticlockwise direction** seen facing D-end side. Refer to the dimensional drawing of the machine.

For all alternators that operate at 60Hz, under the cover of the terminal box there is a sticker with the note on the operation with counter clockwise rotation.

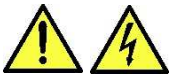
Attention:



IF THE ROTATION OF THE ALTERNATOR IS CCW (COUNTERCLOCKWISE), TAKE CARE THAT:

- The sequence of phases is W – V – U
- Reverse the connections of the terminals A1 - B of the TA current transformer

5.11.2 Connection to ground



Inside the terminal box there is a terminal for ground connection, while a second terminal is located on a foot of the alternator.

Perform grounding with a copper wire of suitable section, according to the applicable standards.

5.12 COMMISSIONING

Before starting up the alternator, check the insulation resistance between the windings and ground. See paragraph 5.2.

Before the first start-up, perform the following checks:

➤ Mechanic checks

Verify that:

- Bolts and Screws are properly tightened.
- Coupling is correct.
- External cooling systems are connected and properly working.

➤ Electric checks

Verify that:

- The system is equipped with appropriate electrical protections, in accordance with the applicable law provisions.
- The connections to the terminal panel terminals have been performed properly (check that terminals are properly tightened).
- There are no inverted connections or short-circuits between the alternator and external switches: it should be reminded that normally there are no protections against short-circuits between the alternator and external switches.



It is recommended to comply with the requirements in paragraph 4.1, 4.2 and 4.3 regarding start up after storage.



To prevent damages to the current transformers and to the alternator, all the current transformers installed on the alternator must be connected to their load. Even if the current transformers will be unused, their secondary circuits must be shorted.



During commissioning the first lubrication must be carried out. For this purpose, Marelli Motori recommends for the first re-lubrication to increase by three times the amount of grease indicated on the rating plate (also to fill any of the lubricator pipe).

6 TEMPERATURE SENSORS PT100

6.1 GENERAL FEATURES

The thermometers with resistance are essential components in the monitoring and protection system of the machine conditions and they are used to measure the temperatures of windings, bearings and cooling air. To measure the temperature, the sensor Pt100 uses a thin platinum element that can be damaged by incorrect handling or excessive vibrations.

The symptoms below could indicate a problem of the Pt100 sensor:

- Infinite or null resistance through the sensor.
- Disappearance of the measurement signal during or after start.
- A significantly different resistance value toward a single sensor.

6.2 PT100 CALIBRATION

The calibration values indicated in the table below are recommended values for an environment temperature of 40°C.

Position	Over temperature	Alarm temperature	Release temperature
Winding	$\Delta T B$	125°C	140°C
	$\Delta T F$	145°C	155°C
	$\Delta T H$	165°C	175°C
Bearings	/	85°C	95°C
Warm air	/	75°C	/
Cold air	/	45°C	/

NOTE: Always verify the operating conditions in case of significantly over temperature readings.

7 MAINTENANCE FOR GENERATORS MJB AND MJH



Any operation on the alternator must be authorized in advance by the safety manager, and be carried out with the alternator stopped, at ambient temperature, and disconnected from the system or from the mains (including the auxiliary devices, such as the anti-condensation heaters). You will also have to take all the precautions required to ensure that the genset cannot be accidentally restarted while maintenance operations are in progress. The alternator operating environment must be clean and dry.

7.1 INSPECTION AND MAINTENANCE INTERVALS

Marelli Motori recommends to carry out preventive maintenance on generator regularly, in order to maintain the equipment in proper conditions for operators.

It is recommended to align the in any case, maintenance plans to the prime mover intervals, major activities to be carried out are:

- Major overhaul: not later than 80.000 oh
- Ball/roller bearings replacements: not later than 50.000 oh
- Predictive diagnostics (mechanical and electrical tests): during commissioning every 8000 hr or at least once a year

On MV/HV generators, along with the standard diagnostic practices, it would be advisable to perform the TanDelta and Partial Discharges tests, since these techniques allow the assessing of the windings insulation degradation and predict the effect of aging.

Some mechanical and electrical tests must be carry out on a regular basis, according to the following list:

								Description
as specified	before commissioning	1 x after 50 oh	after every 24h (daily)	after every 4000 oh	after every 8000 oh at least once a year	after every 16000 oh	after every 48000 oh	
								Maintenance Work on Marelli Generator
								<i>*The maintenance interval schedule refers to Low / Medium / High voltage applications equipped with roller/ball bearings the generator stops must not go beyond the indicated times and it is recommended to make them coincide with those of the first mover</i>
X	X							Relubrication of the Generator bearings as per Par. 7.2-relubricating table* (only Generators with ball- or rollerbearings) - keep a record with the information of running hours and amount of grease, During the first relubrication at commissioning Marelli Motori recommends to increase by three times the amount of grease indicated on the relubricating table (also to fill any of the lubricator pipe)
	X		X					Visual Inspection and check of the operating data - check the winding temperatures - check the bearing temperatures - check the electrical data
	X		X					Check Generator for smooth running and noise
	X		X					Check Airinlets, if necessary clean
				X				Generators with Airfilters - Clean Airfilter, if necessary replace
	X	X		X				Check internal Cabeling and the electrical connections of all components incl. a visual inspection (consider the right torque) - Main terminal box (Power cables, Measuring lines, Transformers, etc.) - Auxiliary terminal box (AVR, Varicomp, Fuses, Connecting terminals, etc.) - Rotating rectifier (Diodes, Filter, Surge Surpressor, etc.) - each electrical connection (PMG, etc.) - check the isolators for cracks - if earthing brush is used check abrasion, if necessary replace
	X	X		X				Check Power cabeling - check that there is no tension on the power cables - check the cable entry - check the stain-relief of the power cables
	X	X		X				Check Generator mounting and all mechanical connections (consider the right torque)
	X			X				Check Anticondensationheaters - check the functionality and the electrical connection - clean the heaters if necessary
	X				X			Clean Generator, Bearing covers and seals - remove of the emerged bearing grease - clean the terminal boxes - clean the winding overhang
	X				X			Vibration Measurment
	X			X**	X			Insulation Measurment and low resistance measurment (keep a record) - Main stator, Main rotor, Exciter stator, Exciter rotor, etc. - Polarisation Index is also required
	X				X			Additional diagnostic tests*** - TanDelta and Partial Discharges
	X					X		Check the alignment of the genset
							X	Renew the Generator bearings (only Generators with ball- or rollerbearings)
							X	Major overhaul and funtional tests

* The lubrication intervals are defined for an operating temperature of the bearing of 70°C; if the temperature is lower or higher, it is necessary to change the interval accordingly. High operating temperatures cause a reduction of the interval.

** depending on the environmental conditions it can be essential to measure the insulation resistance every half a year, or even less than that, to determine when some type of corrective action must be taken.

*** For generator MV/HV (>1000V)

as specified	before commissioning	1 x after 300 oh	after every 24h (daily)	after every 4000 oh	after every 8000 oh at least once a year	after every 16000 oh	after every 80000 oh	Description
								Maintenance Work on Marelli Generator <i>*The maintenance interval schedule refers to Low / Medium / High voltage applications equipped with sleeve bearings the generator stops must not go beyond the indicated times and it is recommended to make them coincide with those of the first mover</i>
	x				x			Oil refill / exchange of the Generator bearings (only Generators with sleeve bearings) - check the bolts for the right torque regarding SM 0299-44-06621
	x		x					Visual Check of the Sleeve bearings - check the oil level - check for leakages
	x		x					Visual Inspection and check of the operating data - check the winding temperatures - check the bearing temperatures - check the electrical data
	x		x					Check Generator for smooth running and noise
	x		x					Check Airinlets, if necessary clean
				x				Generators with Airfilters Clean Airfilter, if necessary replace
	x	x		x				Check internal Cabeling and the electrical connections of all components incl. a visual inspection (consider the right torque) - Main terminal box (Power cables, Measuring lines, Transformers, etc.) - Auxilary terminal box (AVR, Varicomp, Fuses, Connecting terminals, etc.) - Rotating rectifier (Diodes, Filter, Surge Surpressor, etc.) - each electrical connection (PMG, etc.) - check the isolators for cracks - if earthing brush is used check abrasion, if necessary replace
	x	x		x				Check Power cabeling - check that there is no tension on the power cables - check the cable entry - check the stain-relief of the power cables
	x	x		x				Check Generator mounting and all mechanical connections (consider the right torque)
	x			x				Check Anticondensationheaters - check the functionality and the electrical connection - clean the heaters if necessary
	x				x			Clean Generator, Bearing covers and seals - remove of the emerged bearing grease - clean the terminal boxes - clean the winding overhang
	x				x			Vibration Measurment
	x			x**	x			Insulation Measurment and low resistance measurment (keep a record) - Main stator, Main rotor, Exciter stator, Exciter rotor, etc. - Polarisation Index is also required
	x				x			Additional diagnostic tests*** - TanDelta and Partial Discharges
	x					x		Check the alignment of the genset
							x	Major overhaul and funtional tests

** depending on the environmental conditions it can be essential to measure the insulation resistance every half a year, or even less than that, to determine when some type of corrective action must be taken.

*** For generator MV/HV (>1000V)



Any irregularity or deviation detected during the checks shall be promptly corrected.

7.2 BEARING MAINTENANCE

The re-greasable type bearings are provided with UNI 7662 hexagonal head lubricator for routine maintenance.

The theoretical lifecycle of the bearings L10h, according to the standard ISO 281/1, of the alternator bearings, with horizontal construction, with no additional radial and axial loads is higher than 50.000 hours.

The actual lifecycle of the bearings depends on several elements, and in particular:

- On the grease life and quality.
- On the environment conditions and on the operating temperature.
- On external loads and vibrations.

All the alternators are provided with a rating plate including bearings data, such as:

- Type of bearing.
- Lubricant used.
- Lubrication interval.
- Amount of lubricant.

When you perform re-lubrication (machine stopped), always clean the head lubricator, remove the grease discharge, plug on the shield and rotate the shaft during lubrication so that the grease is evenly distributed in the bearing.

If grease drain is present, the bearings can be lubricated with the generator in motion. It is possible also to relubricate with the generator in motion having only NDE grease drain.

General rules for relubrication:

D.E. Side: is possible to open the plug during first relubrication and leave it open. It is necessary to close the grease discharge hole with grease in order to avoid that moisture enter into bearing housing.

N.D.E. Side (only with grease drain pipe): is possible to open the plug during first relubrication and leave it open. It is necessary to close the grease discharge hole with grease in order to avoid that moisture enter into bearing housing.

During the first relubrication at commissioning Marelli Motori recommends to increase by three times the amount of grease indicated on the relubricating table (also to fill any of the lubricator pipe).

In the operating period immediately after the lubrication, the bearing temperature increases slightly for a transitional period, then it returns to standard values after the grease has uniformly distributed and any excess is expelled from the tracks.

At the end of the re-lubrication, refit the closing plug of the grease discharge.

NOTE: Remember to inspect the exhausted grease chamber during the bearing lubrication or at least once a year, unless otherwise specified and empty it.

LUBRICATION DATA								
	Amount of grease type KLÜBERQUIET BQ 72-72						Lubrication interval	
	MJB 355	MJB 400	MJB 450	MJB 500	MJB 560	MJB 630	1500 rpm	1800 rpm
D-end bearing	60 g	70 g	80 g	85 g	110 g	/	4000 h	3500 h
N-end bearing	45 g	50 g	50 g	85 g	110 g	/	4000 h	3500 h
D-end bearing	/	/	/	/	/	140 g	1700 h	1400 h
N-end bearing	/	/	/	/	/	70 g	1700 h	1400 h

LUBRICATION DATA						
	Amount of grease type KLÜBERQUIET BQ 72-72				Lubrication interval	
	MJH 450	MJH 500	MJH 560	MJH 630	1500 rpm	1800 rpm
D-end bearing	80 g	85 g	110 g	/	4000 h	3500 h
N-end bearing	50 g	85 g	110 g	/	4000 h	3500 h
D-end bearing	/	/	/	140 g	1700 h	1400 h
N-end bearing	/	/	/	70 g	1700 h	1400 h

LUBRICATION DATA FOR MJH 710 AND 800 WITH ROLLING BEARINGS					
Amount of grease type KLÜBERQUIET BQ 72-72 and lubrication intervals					
	MJH 710 6 poles 1000 rpm	MJH 710 8 poles 900 rpm	MJH 800 6 poles 1000 rpm		
DE end bearing	230 g 2300 h	230 g 2600 h	110 g 2200 h		
NDE end bearing	90 g 2300 h	90 g 2600 h	180 g 2200 h		

LUBRICATION DATA FOR MJH 800 WITH SLEEVE BEARINGS						
	Amount of oil type ISO-VG 46				Oil change	
	MJH 800	-	-	-	900/1000 rpm	
DE end bearing	21 litres	-	-	-	8000 h	
NDE end bearing	21 litres	-	-	-	8000 h	



The mix of different greases (thickener, type of base oil) reduces its quality and must be avoided.

Excess lubrication may cause bearing overheating.

If the bearing has been disassembled, always use a new one.

The first lubrication must be performed during commissioning see paragraph 5.11.

We recommend for the first re-lubrication to increase by three times the amount of grease indicated on the rating plate (also to fill any of the lubricator pipe).

The lubrication intervals indicated refer to an average operating temperature of the bearing of 70°C.



With higher temperatures, halve the lubrication interval for each 15°C increase. Furthermore, in case of hard operating conditions, this interval should be further reduced (in this case, we recommend to contact Marelli Motori Service).

NOTE: Regardless of the planned lubrication interval, the bearings must be lubricated at least once a year.

7.3 DISASSEMBLY OPERATIONS



Before disassembling the alternator, please refer to the exploded drawings. Check that the lifting capacity is appropriate for the weight of the alternator to be handled (see nameplate info). Check that all safety measures have been taken.

We recommend to mark the components during disassembly, to be able to later reinstall them in the proper position.

Then uncouple the alternator from the engine, removing the fixing nuts of the feet and from the SAE adaptor (if any) and disconnecting the terminal panel, power cables, etc.. Then move the alternator away from the engine. Refer to the exploded drawings in paragraph 13 during disassembly and reassembly operations.

7.3.1 ALTERNATOR MJB 355

- Disassemble the coupling from the shaft and remove the key (223) from the shaft extension (D-end side).
- Remove the screws securing the inner cover (131) of the D-end bearing.
- Remove the air outlet protections (48) from the D-end shield.
- Disconnect the cables of the D side bearing Pt100.
- Remove the PMG if present.
- Remove the N side 45 protection
- Remove the screws securing the inner cover (142) of the N-end bearing.
- Disconnect the wires (+) and (-) connect the exciter stator, removing the locking clamps.
- Disconnect the cables of the bearing Pt100 on side N and the power cable of the anti-condensation heaters..
- Remove the screws securing the D-end and N-end shields (4-5) from the frame, then remove the shields taking care that the rotor does not fall heavily on the stator.
- Remove the D side rotary lubrication valve (132), pre-heating it.



WARNING! Take into account that the exciter stator is fixed to the N-end shield: as a consequence, you must take care to ensure that the exciter windings are not damaged during the disassembly operations.

For the disassembly of the bearings use an appropriate puller.

7.3.2 ALTERNATOR MJB 400 – 450 / MJH 400 - 450

- Disassemble the coupling from the shaft and remove the key (223) from the shaft extension (D-end side).
- Remove the screws securing the inner cover (131) of the D-end bearing.
- Remove the D side air outlet protections (48 – 49)
- Disconnect the cables of the D side bearing Pt100.
- Remove the PMG if present.
- Remove the N side 45 protection
- Remove the screws securing the inner cover (142) of the N-end bearing.
- Disconnect the wires (+) and (-) that connect the regulator and the exciter stator, removing the locking clamps.
- Disconnect the cables of the bearing Pt100 on side N and the power cable of the anti-condensation heaters..
- Remove the screws securing the D-side and N-side shields (4 – 5) from the frame, then remove the shields taking care that the rotor does not fall heavily on the stator.
- Remove the D side rotary lubrication valve (132), pre-heating it.



WARNING! Take into account that the exciter stator is fixed to the N-end shield: as a consequence, you must take care to ensure that the exciter windings are not damaged during the disassembly operations.

For the disassembly of the bearings use an appropriate puller.

7.3.3 ALTERNATOR MJB 500 – 560 / MJH 500 – 560

- Disassemble the coupling from the shaft and remove the key (223) from the extension of the D side shaft.
- Remove the screws securing the inner cover (131) of the D-side bearing.
- Remove the screws securing the D side shield (4) to the frame.
- Remove the D side air outlet protections (48).
- Disconnect the cables of the D side bearing Pt100.
- Remove the PMG if present.
- If present, remove the N side greasing tube and grease discharge
- Remove the main case (33).
- Disconnect the wires from the rotating rectifier (119) and remove the rotating rectifier.
- Disconnect from the auxiliary terminal box (on the exciter stator) the excitation circuit terminals that go to the terminal boxes, remove the terminals of the anti-condensation heaters (329)
- Remove the exciter stator (110) after removing the screws securing it to the shield. Make sure that the exciter stator does not damage the rotor windings during this operation.
- Remove the seeger ring (500) and the grub screw (504, present only in MJB/MJH 560 and MJB/MJH 630) of the exciter rotor.
- Remove the exciter rotor (100) using suitable tie rods (M12)
- Remove the screws securing the inner cover (142) of the N-side bearing.
- Remove the screws securing the N side shield (5) to the frame.
- Extract the D-end shield (4). At this stage you must take care to support the main rotor (3) of the alternator so that it does not fall heavily on the stator.
- Remove the spring ring (305) fastening the rotary lubrication valve (143) to the shaft and remove the lubrication valve, pre-heating it.
- Disassembly of D side shield, Remove the screws securing of the external cover (132) of the D side bearing (201). Disconnect the connections of the temperature sensor (if any).
- Extract the external cover (132).
- Remove the screws securing the D side shield (4) to the frame.
- Extract the coupling side shield (4). At this stage you must take care to support the main rotor of the generator so that it does not fall heavily onto the stator. In order to support the rotor, it may be advisable to insert appropriate spacers into the air gap between rotor and stator, before withdrawing the D side shield (**DURING REASSEMBLY YOU MUST THEN REMEMBER TO REMOVE THE SPACERS IN QUESTION**).
- Extract the D side bearing (201) by using appropriate tie rods on the inner cover
- The rotor cannot be extracted from the side opposite to the coupling due to the presence of the cooling fan.
- To remove the bearings (201, 202), use a suitable puller, taking care that the anchoring points of the puller arms are on the inner ring of the bearing; the support point of the base of the puller (on shaft end) shall be positioned so that it cannot damage the cables exiting from the shaft end (interpose if necessary a suitable spacer, so that the cables are not subjected to compressions).
- Inside the N side bearing there are 4 bearing pre-loading springs. Check that their position is correct when reinstalling the shield.

7.3.4 ALTERNATOR MJB 630 / MJH 630 – 710

- Disassemble the coupling from the shaft and remove the key (223) from the extension of the D side shaft.
- Remove the screws securing the inner cover (131) of the D side bearing.
- Remove the screws securing the D side shield (4) to the frame.
- Remove the D side air outlet protections (48 – 49).
- Disconnect the cables of the D side bearing Pt100.
- Remove the PMG, if any.
- If present, remove the N side greasing tube and grease discharge
- Remove the main case (33).
- Disconnect the wires of the rotating rectifier (119) and remove it.
- Disconnect from the auxiliary terminal panel (on the exciter stator) the excitation circuit terminals that go to the terminal boxes; remove the anti-condensation heater terminals (329)
- Remove the exciter stator (110) after removing the screws securing it to the shield. Make sure that the exciter stator does not damage the rotor windings during this operation.
- Remove the headless screw (504) of the exciter rotor.
- Remove the exciter rotor (100) using suitable tie rods (M12).
- Remove the screws securing the inner cover (142) of the N side bearing.
- Remove the screws securing the N side shield (5) to the frame.
- Extract the shield (4) from the N side. Now you must take care to support the main rotor (3) of the alternator, to ensure that it does not fall onto the stator.
- Remove the pins securing the rotary lubrication valve (132) to the shaft and remove the lubrication valve, pre-heating it.
- Disassemble of the D side shield. Remove the screws securing of the external cover (132) of the D side bearing (201). Disconnect the connections of the temperature sensor (if any).
- Extract the external cover (132).
- Remove the screws securing the D side shield (4) to the frame.
- Extract the coupling side shield (4). At this stage you must take care to support the main rotor of the generator so that it does not fall heavily onto the stator. In order to support the rotor, it may be advisable to insert appropriate spacers into the air gap between rotor and stator, before withdrawing the D side shield (**DURING REASSEMBLY YOU MUST THEN REMEMBER TO REMOVE THE SPACERS IN QUESTION**).
- Extract the D side bearing (201) by using appropriate tie rods on the inner bearing cap
- The rotor cannot be extracted from the side opposite to the coupling due to the presence of the cooling fan.
- To remove the bearings (201, 202), use a suitable puller, taking care that the anchoring points of the puller arms are on the inner ring of the bearing; the support point of the base of the puller (on shaft end) shall be positioned so that it cannot damage the cables exiting from the shaft end (interpose if necessary a suitable spacer, so that the cables are not subjected to compressions).
- Inside the D-end side internal bearing cap of 630 size there are 4 bearing pre-loading springs (8 springs on 710). Check that their position is correct when reinstalling the shield.



WARNING! For the disassembly of the bearings use an appropriate puller.

7.3.5 ALTERNATOR MJH 800 WITH ANTIFRICTION BEARINGS

- Disassemble the coupling from the shaft and remove the key from the extension of the D side shaft.
- Remove the screws securing the inner cover of the D side bearing.
- Remove the screws securing the D side shield (300) to the frame.
- Remove the D side air outlet protections (542-543).
- Disconnect the cables of the D side bearing Pt100.
- Remove the PMG, if any.
- If present, remove the N side greasing tube and grease discharge
- Remove the main case (539).
- Disconnect the wires of the rotating rectifier (260) and remove it.
- Disconnect from the auxiliary terminal panel (on the exciter stator) the excitation circuit terminals that go to the terminal boxes; remove the anti-condensation heater terminals (155)
- Remove the exciter stator (170) after removing the screws securing it to the shield. Make sure that the exciter stator does not damage the rotor windings during this operation.
- Remove the headless screw (504) of the exciter rotor.
- Remove the exciter rotor (250) using suitable tie rods (M12).
- Remove the screws securing the inner cover (4401-4402) of the N end bearing.
- Remove the screws securing the N side shield (400) to the frame.
- Extract the shield (400) from the N side. Now you must take care to support the main rotor (200) of the alternator, to ensure that it does not fall onto the stator.
- Remove the pins securing the rotary lubrication valve to the shaft and remove the lubrication valve, pre-heating it.
- Disassemble of the D side shield. Remove the screws securing of the external cover (132) of the D side bearing (201). Disconnect the connections of the temperature sensor (if any).
- Extract the external cover (132).
- Remove the screws securing the D side shield (4) to the frame.
- Extract the coupling side shield (4). At this stage you must take care to support the main rotor of the generator so that it does not fall heavily onto the stator. In order to support the rotor, it may be advisable to insert appropriate spacers into the air gap between rotor and stator, before withdrawing the D side shield (**DURING REASSEMBLY YOU MUST THEN REMEMBER TO REMOVE THE SPACERS IN QUESTION**).
- Extract the D side bearing (201) by using appropriate tie rods on the inner bearing cap.
- The rotor cannot be extracted from the side opposite to the coupling due to the presence of the cooling fan.
- Disassembly of the D side shield, and disassembly of the D side lubrication valve.
- To remove the bearings (340-440), use a suitable puller, taking care that the anchoring points of the puller arms are on the inner ring of the bearing; the support point of the base of the puller (on shaft end) shall be positioned so that it cannot damage the cables exiting from the shaft end (interpose if necessary a suitable spacer, so that the cables are not subjected to compressions).
- Inside the N-end side internal bearing cap there are 8 bearing pre-loading springs. Check that their position is correct when reinstalling the shield.

7.3.6 ALTERNATOR MJH 800 WITH SLEEVE BEARINGS

- Remove the oil from the bearings.
- Disassemble any external accessories connected to the generator and remove the external accessory connecting systems, if any. Refer to the manuals of the relevant accessories.

- Remove the rectifier disc protection (539).
- Disconnect the wires from the disk rectifier (260) and remove the disk rectifier.
- Remove the N side protection.
- Disconnect from the auxiliary terminal box (on the exciter stator) the excitation circuit terminals that go to the terminal box.
- In order to proceed further, you need to disassemble the N bearing; for information on the disassembly procedure, please refer to the relevant manual.
- While disassembling the bearing, take care to support the generator rotor, for easier disassembly and to ensure that the rotor weight does not rest on the bearing labyrinth seals or on the intake prevention seal to the generator.
- After disassembling the bearing, remove the screws securing the N side shield (400) to the frame.
- Extract the opposite side shield (400). At this stage you must take care to support the main rotor (200) of the generator so that it does not fall heavily onto the stator (102). In order to support the rotor, it may be advisable to insert appropriate spacers into the air gap between rotor and stator, before withdrawing the N side shield (DURING REASSEMBLY YOU MUST THEN REMEMBER TO REMOVE THE SPACERS IN QUESTION). DO NOT REMOVE THE BUSHING FROM THE SHIELD.
- Remove the grub screw of the exciter rotor and disconnect the exciter rotor.
- Remove the exciter rotor (250) using suitable tie rods. The support point of the base of the puller (on shaft end) shall be positioned so that it cannot damage the cables exiting from the shaft (interpose if necessary a suitable spacer, so that the cables are not subjected to compressions).

7.3.7 PROCEDURE FOR ROTOR EXTRACTION FROM THE COUPLING SIDE

- The operation can only be performed if the generator has been fully extracted from the unit and if the components have been disassembled from the N side; it requires appropriate lifting equipment and tools.
- The extraction technique depends on the lifting equipment available. If needed, feel free to contact Marelli Motori.
- Take care to ensure that the rotor does not come into contact with the windings during the extraction.
- **CAUTION! For the disassembly of the bearings use a suitable puller.**



On 630/710/800 generators with rolling bearings, the NDE support unit is insulated.

The greasing and grease discharge points must be appropriately insulated at the contact points with other parts of the generator.

(See Picture 11 and 12)



Picture 11



Picture 12

7.3.8 REASSEMBLY OPERATIONS

Perform the disassembly operation sequence in reverse order.

Use screws that are not soiled with oil / grease (possibly using solvent Loctite® 7063 or equivalent). Refer to the exploded views in paragraph 13 during reassembly operations.

The table below indicates the use of Loctite® 243 Threadlocker or similar.

Parts	Threadlocker (Loctite® 243) or similar
Fastening of the lugs to the terminals	Yes
Fastening of the terminals to the support bar	Yes
Fastening of the support bar of the terminals to the frame	Yes
Fastening of the headers and TA of Varicomp to the frame	Yes
Fastening of the star centre bridge	No
Fastening of the shields and covers	No
Fastening of the exciter stator	No
Fastening of the panels of the main terminal box, auxiliary and junction box	No
Fastening of air inlet and outlet guards	No
Fastening of regulation panels / regulators and rotating rotating rectifier	No

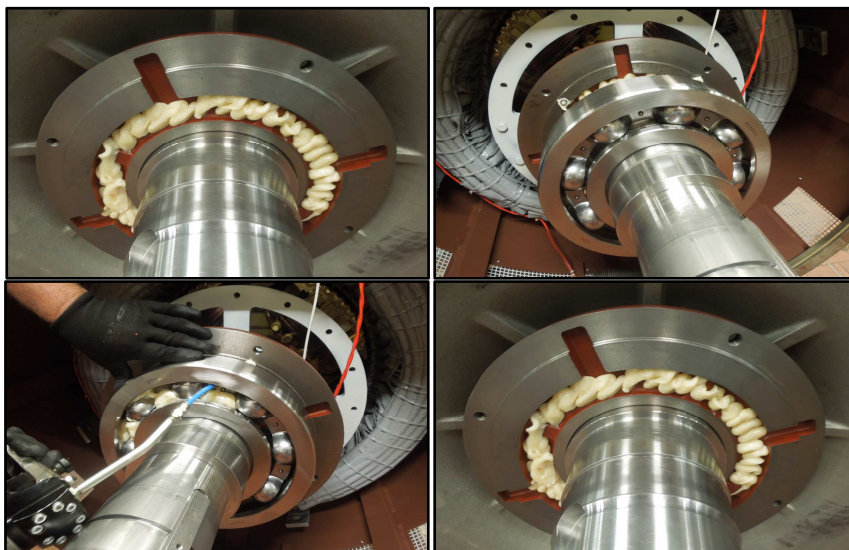
WARNING! In case of electrical connections, the Loctite must not come into contact with the electrical rest surfaces!

If the bearing has been disassembled, always use a new one.

For easier assembly, the bearings must be heated to about 100°C +/-5°C.

WARNING! The bearings must be assembled with the utmost care.

Once the bearings are cool, fill the pre-chamber and the bearings as per attached sequence of pictures (see Picture 10) with grease KLÜBERQUIET BQ 72-72. If in doubt please contact our Marelli Motori Service.



Picture 10
Sequence

8 GREASE FILLING FOR MJB/H WITH BALL BEARINGS

TYPE	FR	SPEED	SIDE	BEARING TYPE 1	Bearing 1st Filling Kluber [g]	Internal bearing cap 1st Filling Kluber [g]	Total 1st Filling Kluber [g]
MJB 355	50 Hz	1500	D.E.	6322-C3	364	109	723
			N.D.E.	6317-C3	226	24	
MJB/MJH 400	50 Hz	1500	D.E.	6324-C3	417	129	825
			N.D.E.	6318-C3	245	34	
MJB/MJH 450	50 Hz	1500	D.E.	6326-C3	472	226	1112
			N.D.E.	6320-C3	309	105	
MJB/MJH 500	50 Hz	1500	D.E.	6328-C3	436	133	1167
			N.D.E.	6326-C3	472	126	
MJB/MJH 560	50 Hz	1500	D.E.	6332-M-C3	258	304	1289
			N.D.E.	6330-C3	467	260	

9 GREASE FILLING FOR MJB/H WITH ROLLER AND BALL BEARINGS

TYPE	FR	SPEED	SIDE	BEARING TYPE 1	Bearing1st Filling Kluber [g]	BEARING TYPE 2	Bearing1st Filling Kluber [g]	Internal bearing cap 1st Filling Kluber [g]	Total 1st Filling Kluber [g]
MJB/MJH 630	50 Hz	1500	D.E.	NU 234-EC-M-C3	140	6234-M-C3	180	241	943
			N.D.E.	NU 234-EC-M-C3	140			242	
MJH 710 6 POLES	50 Hz	1000	D.E.	NU 244-EC-M	275	6244-M-C3	453	339	1672
			N.D.E.	NU 240-EC-M-C3	282			323	
MJH 710 8 POLES	60 Hz	900	D.E.	NU 244-EC-M	394	6244-M-C3	572	339	1953
			N.D.E.	NU 240-EC-M-C3	325			323	
MJH 800 MB 6	50 Hz	1000	D.E.	NU 1052-M-C3	262			291	1104
			N.D.E.	NU 240-EC-M-C3	282	6240-M-C3	410	270	

For the first re-lubrication, see paragraph 5.11 (commissioning). **If any fastening item needs to be replaced, make sure that its type and resistance class are the same as those of the original one.**

The following are the tightening torques applying to the fastening screws and nuts:

Tightening torques of screws cl.8.8 in Nm (0/+5%)														
Application	Screw thread diameter cl.8.8													
	M5	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30	1/4"
Fastening of connection between steel components like covers, feet, etc.	5.8	10	25	48	85	130	200	290	400	560	700	1050	1400	/
Fastening of connection between components with at least one in cast iron like shields, etc.	5.2	9	22	42	75	115	180	260	360	500	600	900	1250	/
Fastening of connection between with at least one in aluminium like covers, PMG, etc. Fastening of electrical connections between copper bars and lugs	4.6	8	20	38	65	100	160	230	320	440	550	800	1100	/
Fastening of components of rotating rectifier (plastic material and screws in brass M6 - fastening of diodes 1/4")	4.4	6	18	32	50	65	75	/	/	/	/	/	/	3.4
Fastening of Isores IGN insulators	/	10	20	30	50	/	60	/	100	/	/	/	/	/
Fastening of Freer insulators	/	/	10	20	34	/	/	/	/	/	/	/	/	/
Fastening of FTM T.A.	/	4	/	18	28	/	/	/	/	/	/	/	/	/
Fastening of FTM T.V.	/	3	/	13	/	/	/	/	/	/	/	/	/	/

10 PERIOD OF INACTIVITY

When the alternator is off, the heating elements must be powered. If the alternator is inactive for more than a month, before restart provide for a measurement of insulation resistances (see paragraph 5.2).

For periods of inactivity of more than three months, provide for the appropriate interventions for "long term storage" (paragraph 4.2).



If in doubt, contact Marelli Motori.

11 SPARE PARTS GENERATORS MJB

MJB 355			
Position in Section	Description	Code	General Data
6	Voltage regulator MARK I	10005634 M40FA640A	Manual code 963857132 10008497
	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Power factor regulator PFC	10001786 M50FA400A	Manual code 963857130 10008865
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
45	N-end screen protective	10006004 M22DW000CPA	
48	D-end air outlet protections	10006198 M35DW000A	
100	Exciter rotor	11004291 M35FA100A	
110	Exciter stator	11004517 M35FA000A	
119	Rotating rectifier	10001633 M40FA500A	
201	D.E bearing	10002008 346151110	6322 – C3
202	N.D.E bearing	10003291 346151085	6317 – C3
309	Rotating diode (reverse)	10003693 963821170	(n°3) 71 HFR 120
310	Rotating diode (direct)	10003694 963821171	(n°3) 71 HF 120
311	Surge suppressor A.D.R. (rotating rectifier)	10001110 M40FA990A	
329	Heater	11000632 M31FA507A	
-	D.E. bearing	10009185 963759910 10008793 963759711	PT100 PT 100 – L2150 cable extension
-	N.D.E. bearing	10014783 963757034	PT100

MJB 400			
Position in Section	Description	Code	General Data
6	Voltage regulator MARK I	10005634 M40FA640A	Manual code 963857132 10008497
	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Power factor regulator PFC	10001786 M50FA400A	Manual code 963857130 10008865
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
45	N-end screen protective	10005150 M40DV980B	
48	D-end air inlet protections	10001104 M40DW475B	
49	D-end air outlet protections	10000900 M40DW476A	
100	Exciter rotor	11004291 M35FA100A	

110	Exciter stator	11004517 M35FA000A	
119	Rotating rectifier	10001633 M40FA500A	
201	D.E bearing	10002009 346151120	6324 - C3
202	N.D.E bearing	10003421 346151090	6318 - C3
309	Rotating diode (reverse)	10003693 963821170	(n°3) 71 HFR 120
310	Rotating diode (direct)	10003694 963821171	(n°3) 71 HF 120
311	Surge suppressor A.D.R. (rotating rectifier)	10001110 M40FA990A	1
329	Heater	11000721 M40FA903A	N° 2
-	D.E. bearing	10009185 963759910 10008793 963759711	PT100 PT 100 - L2150 cable extension
-	N.D.E. bearing	10014783 963757034	PT100

MJB 450			
Position in Section	Description	Code	General Data
6	Voltage regulator MARK I	10005634 M40FA640A	Manual code 963857132 10008497
	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Power factor regulator PFC	10001786 M50FA400A	Manual code 963857130 10008865
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
45	N-end screen protective	10005150 M40DV980B	
48	D-end air inlet protections	10001104 M40DW475B	
49	D-end air outlet protections	10000900 M40DW476A	
100	Exciter rotor	11006002 M45FA105A	
110	Exciter stator	11005793 M45FA001A	
119	Rotating rectifier	10007136 M45FA500C	
201	D.E bearing	10002898 346151130	6326 - C3
202	N.D.E bearing	10002007 346151100	6320 - C3
	N.D.E. springs	10004437 963365007	n. 4
311	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	n.1
315	Surge suppressor (rotating rectifier)	10003986 963820007	n°2
313	Surge suppressor support	10003103 963335067	n. 3
309	Rotating diode (direct)	10003774 963821057	(n°3) 71 HF 120
310	Rotating diode (reverse)	10003467 963821056	(n°3) 71 HFR 120
329	Heater	11005681 M45FA700A	N° 1
-	D.E. bearing	10007617 963759610 10008585 963759810	PT100 PT100-L3000 cable extension
-	N.D.E. bearing	10014783 963757034	PT100

MJB 500			
Position in Section	Description	Code	General Data
6	Voltage regulator MARK I	10005634 M40FA640A	Manual code 963857132 10008497
	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Power factor regulator PFC	10001786 M50FA400A	Manual code 963857130 10008865
	Varicomp	10001368 or 10004384 M40FA620A M40FA621A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
13	C.T. Overexcitation	10004277 M50FA900A	
33	N-end air outlet protections	10007691 M50DW507A	
48	D-end air outlet protections	10007036 M50DW500B	
49	D-end air outlet protections	10007213 M50DW501A	
100	Exciter rotor	11006002 M45FA105A	
110	Exciter stator	11005793 M45FA001A	
119	Rotating rectifier	10007136 M45FA500C	
201	D.E bearing	10008930 346151141	6328 - C3
202	N.D.E bearing	10009169 346151131	6326 - C3
	N.D.E. springs	10003920 963365006	n. 4
315	Surge suppressor (rotating rectifier)	10003986 963820007	n°2
313	Surge suppressor support	10003103 963335067	n. 3
310	Rotating diode (direct)	10003774 963821057	(n°3) 71 HF 120
309	Rotating diode (reverse)	10003467 963821056	(n°3) 71 HFR 120
311	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	1
329	Heater	11000817 M50FA810A	1
-	D.E. bearing	10007617 963759610 10008585 963759810	PT100 PT100-L3000 cable extension
-	N.D.E. bearing	10014783 963757034	PT100

MJB 560			
Position in Section	Description	Code	General Data
6	Voltage regulator MARK I	10005634 M40FA640A	Manual code 963857132 10008497

	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Power factor regulator PFC	10001786 M50FA400A	Manual code 963857130 10008865
	Varicomp	10001368 or 10004384 M40FA620A M40FA621A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
13	C.T. Overexcitation	10004277 M50FA900A	
33	N-end air outlet protections	10010011 M63DW473A	
48	D-end air outlet protections	10008902 M63DW469B	n°2
100	Exciter rotor	11004232 M56FA104A	
110	Exciter stator	11004263 M56FA002A	
119	Rotating rectifier	10001250 M50FA301A	
201	D.E bearing	10006856 346151160	6332 - M - C3
202	N.D.E bearing	10006855 346151150	6330 - C3
	N.D.E. springs	10003920 963365006	n. 4
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10003986 963820007	n°2
127	Surge suppressor support	10003103 963335067	n. 3
310	Rotating diode (direct)	10003774 963821057	(n°3) 71 HF 120
309	Rotating diode (reverse)	10003467 963821056	(n°3) 71 HFR 120
329	Heater	11000817 M50FA810A	
-	D.E. bearing	10007617 963759610 10008585 963759810	PT100 PT100-L3000 cable extension
-	N.D.E. bearing	10014783 963757034	PT100

MJB 630			
Position in Section	Description	Code	General Data
	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 M40FA620A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
13	C.T. Overexcitation	10004277 M50FA900A	
33	N-end air outlet protections	10010011 M63DW473A	
48	D-end air outlet protections	10008902 M63DW469B	n°2
100	Exciter rotor	11003611 M63FA129A WITH MEC100	

		11008598 M63FA150A WITH ABB Unitroll 1005	
110	Exciter stator	11004263 M56FA002A with MEC100 11032405 M63FA061B With ABB Unitroll 1005	
119	Rotating rectifier	10001129 M63FA300A	
201	D.E bearing	10003029 346540170 10001785 346110171	NU 234-EC-M-C3 6234-M-C3
	D.E. springs	10003920 963365006	n. 4
202	N.D.E bearing	10003029 346540170	NU 234-EC-M-C3
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10004104 963820010	n°1
310	Rotating diode (direct)	10004683 963821081	(n°3) 86 HF 140
309	Rotating diode (reverse)	10004434 963821080	(n°3) 86 HFR 140
329	Heater	11000817 M50FA810A	
-	D.E. bearing	10014783 963757034 10008585 963759810	PT100 PT100-L3000 cable extension
-	N.D.E. bearing	10014783 963757034	PT100

12 SPARE PARTS GENERATORS MJH

MJH 400			
Position in Section	Description	Code	General Data
6	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 M40FA620A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
45	D-end air inlet protections	10001104 M40DW475B	
48	D-end air outlet protections	10000900 M40DW476A	N°2
100	Exciter rotor	11004291 M35FA100A	
110	Exciter stator	11004517 M35FA000A	
119	Rotating rectifier	10001633 M40FA500A	
201	D.E bearing	10002009 346151120	6324 - C3
202	N.D.E bearing	10005175 346260090	6318M - C3
310	Rotating diode (direct)	10003693 963821170	(n°3) 71 HF 120
309	Rotating diode (reverse)	10003694 963821171	(n°3) 71 HFR 120

311	Surge suppressor (rotating rectifier)	10001101 M40FA990A	N°2
329	Heater	11005681 M45FA700A	
-	D.E. bearing	10016740 963757042	PT100
-	N.D.E. bearing	10016740 963757042	PT100

MJH 450

Position in Section	Description	Code	General Data
6	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 M40FA620A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
45	N-end air inlet protections	10007129 M45DV000B	
48	D-end air outlet protections	10007147 M45DW405C	N°2
100	Exciter rotor	11006002 M45FA105A	
110	Exciter stator	11005793 M45FA001A	
119	Rotating rectifier	10007136 M45FA500C	
201	D.E bearing	10002898 346151130	6326 - C3
202	N.D.E bearing	10007019 346260100	6320 M/C3 VL 0241 isolated
	N.D.E. springs	10004437 963365007	n. 4
310	Rotating diode (direct)	10003774 963821057	(n°3) 71 HF 120
309	Rotating diode (reverse)	10003467 963821056	(n°3) 71 HFR 120
308	Surge suppressor (rotating rectifier)	10003986 963820007	N°2
313	Surge suppressor support	10003103 963335067	n. 3
329	Heater	11005681 M45FA700A	
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
-	D.E. bearing	10004003 963759145	PT100
-	N.D.E. bearing	10004003 963759145	PT100

MJH 500

Position in Section	Description	Code	General Data
6	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 M40FA620A	Manual code 963857128

MJH 500			
			10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
33	N-end air outlet protections	10007691 M50DW507A	
48	D-end up air outlet protections	10007036 M50DW500B	
49	D-end air outlet protections	10007213 M50DW501A	
100	Exciter rotor	11006002 M45FA105A	
150	Exciter stator	11005793 M45FA001A	
119	Rotating rectifier	10007136 M45FA500C	
201	D.E bearing	10008930 346151141	6328 - C3
202	N.D.E bearing	10007359 34626300	6326M-C3 VL2071 isolated
	N.D.E. springs	10003920 963365006	n. 4
310	Rotating diode (direct)	10003774 963821057	(n°3) 71 HF 120
309	Rotating diode (reverse)	10003467 963821056	(n°3) 71 HFR 120
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10003986 963820007	n°2
313	Surge suppressor support	10003103 963335067	n. 3
329	Heater	11000817 M50FA810A	
-	D.E. bearing	10004003 963759145	PT100
-	N.D.E. bearing	10004003 963759145	PT100

MJH 560			
Position in Section	Description	Code	General Data
6	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 M40FA620A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
33	N-end air outlet protections	10007691 M50DW507A	
48	D-end up air outlet protections	10007036 M50DW500B	
49	D-end air outlet protections	10007213 M50DW501A	
100	Exciter rotor	11004232 M56FA104A	
150	Exciter stator	11004263 M56FA002A	
119	Rotating rectifier	10001250 M50FA301A	

MJH 560			
201	D.E bearing	10006856 346151160	6332-M- 3
202	N.D.E bearing	10007264 346260150	6330-C3 VL2071 isolated
	N.D.E. springs	10003920 963365006	n. 4
310	Rotating diode (direct)	10003774 963821057	(n°3) 71 HF 120
309	Rotating diode (reverse)	10003467 963821056	(n°3) 71 HFR 120
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10003986 963820007	n°2
127	Surge suppressor support	10003103 963335067	n. 3
329	Heater	11000817 M50FA810A	
-	D.E. bearing	10016740 963757042	PT100
-	N.D.E. bearing	10016740 963757042	PT100

MJH 630				
Position	in	Description	Code	General Data
6		Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
		Varicomp	10001368 or 10004384 M40FA620A M40FA621A	Manual code 963857128 10008891
		Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
33		N-end air inlet protections	10010011 M63DW473A	
48		D-end air outlet protections	10008902 M63DW469B	n°2
100		Exciter rotor	11004028 M63FA133A	Same for MEC100 and ABB Unitrol
110		Exciter stator	11000681 M63FA010A with MEC100 11032405 M63FA061B With ABB Unitroll 1005	
119		Rotating rectifier	10001129 M63FA300A	
201		D.E bearing	10003029 346540170 10001785 346110171	NU 234-EC-M-C3 + 6234-M-C3
		D.E. springs	10003920 963365006	n. 4
202		N.D.E bearing	10003029 346540170	NU 234-EC-M-C3
307		Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308		Surge suppressor (rotating rectifier)	10004104 963820010	n°1

MJH 630			
310	Rotating diode (direct)	10004683 963821081	(n°3) 86 HF 140
309	Rotating diode (reverse)	10004434 963821080	(n°3) 86 HFR 140
127	Surge suppressor support	10003103 963335067	n. 3
329	Heater	10007896 387452100	
-	D.E. bearing	10016740 963757042	PT100
-	N.D.E. bearing	10016740 963757042	PT100

MJH 710			
Position in Section	Description	Code	General Data
6	Digital voltage regulator MEC 100	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 or 10004384 M40FA620A M40FA621A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500V (dim. 10.3x38)
33	N-end air inlet protections	10010011 M63DW473A	
48	D-end air outlet protections	10008902 M63DW469B	n°2
100	Exciter rotor	11003569 M71FA105A	
110	Exciter stator	11004317 M71FA021A	
119	Rotating rectifier	10001129 M63FA300A	
201	D.E bearing	10006847 346540220 10007674 346110220	NU 244-EC-M-C3 + 6244-M-C3
	D.E. springs	10003920 963365006	n. 8
202	N.D.E bearing	10003347 346540200	NU 240-EC-M-C3
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10004104 963820010	n°1
310	Rotating diode (direct)	10004683 963821081	(n°3) 86 HF 140
309	Rotating diode (reverse)	10004434 963821080	(n°3) 86 HFR 140
127	Surge suppressor support	10003103 963335067	n. 3
329	Heater	10007896 387452100	
-	D.E. bearing	10004003 963759145	PT100
-	N.D.E. bearing	10004003 963759145	PT100

MJH 800 WITH ROLLING BEARINGS			
Position in section	Description	Code	General Data:
6	MEC 100 voltage regulator	10009784 M71FA320A	Manual code 963857137 10008518

	Varicomp	10001368 M40FA620A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500 V (dim. 10,3x38)
155	Heater	10007896 387452100	
170	Exciter stator	11004317 M71FA021A	
250	Exciter rotor	11003569 M71FA105A	
539	N end main case	10009516 M80DV800D	
260	Rotating rectifier	10001129 M63FA300A	
3401	D.E. bearing	10004355 346530260	NU 1052 M C3
4401-4402	N.D.E. bearing	10003347 346540200 10002872 346110200	NU 240-EC-M-C3 + 6240 M C3
	N.D.E. springs	10004437 963365007	n. 8
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10004104 963820010	n°1
127	Surge suppressor support	10003103 963335067	n. 3
310	Rotating diode (direct)	10004683 963821081	(no. 3) 86 HF 140
309	Rotating diode (reverse)	10004434 963821080	(n°3) 86 HFR 140
-	D.E. bearing	10004003 963759145	PT100
-	N.D.E. bearing	10004003 963759145	PT100

MJH 800 WITH SLEEVE BEARINGS

Position in section	Description	Code	General Data:
6	MEC 100 voltage regulator	10009784 M71FA320A	Manual code 963857137 10008518
	Varicomp	10001368 M40FA620A	Manual code 963857128 10008891
	Fuse	10003782 963823110	10A-500 V (dim. 10,3x38)
155	Heater	10007896 387452100	
170	Exciter stator	11012157 M80FA011A	
250	Exciter rotor	11009728 M80FA113A	
260	Rotating rectifier	10001129 M63FA300A	
307	Filter protector A.D.R. (rotating rectifier)	10004464 M50FA873A	
308	Surge suppressor (rotating rectifier)	10004104 963820010	n°1
127	Surge suppressor support	10003103 963335067	n. 3

310	Rotating diode (direct)	10004683 963821081	(no. 3) 86 HF 140
309	Rotating diode (reverse)	10004434 963821080	(n°3) 86 HFR 140
300	D.E. shield	11007857 M80DF007B	
355	D.E. BRG EFWLK 22-225	10008570 347069325	
400	N side shield	11009675 M80DF042C	
455	N.D.E. BRG EFWLQ 22-225	11012308 ZBR22000A	
-	D.E. bearing	10005877 963759460	PT100
-	N.D.E. bearing	10005877 963759460	PT100
SPARE PARTS	D.E. bearing	10006421	Internal labyrinth diam. 250 mm
	D.E. bearing	10013752	External labyrinth diam. 280 mm
	N.D.E. bearing	10006421	Internal floating labyrinth diam. 250 mm
	N.D.E. bearing	10006421	External floating labyrinth diam. 250 mm
	D.E. bearing	10016681	Shell EF_LK 22/225
	N.D.E. bearing	10006127	Shell EF_LQ 22/225
	D.E. bearing	10017633	LOOSE OIL RING
	N.D.E. bearing	10017633	LOOSE OIL RING

For technical information about regulation (voltage regulator, power factor regulator, Varicomp, PMG, etc.), see the manual of the product indicated in General Data.

13 PMG GENERAL INFORMATIONS

STANDARD ALTERNATORS UL				
Alternator type	AVR type	AVR Code	PMG Code	General Data
MJB 355	Digital voltage regulator DECS 100 B15 & EDM - 200	10006891 M50FA433A & 10004389 M50FA424A	11024448 M22FA328A	AVR manual code 963857138 10008519 PMG manual code 963857120 10008589
MJB 400				
MJB 450/ MJH 450				
MJB 500/ MJH 500			11017631	
MJB 560/ MJH 560			M00FA009A	
MJB 630/ MJH 630				
MJH 710			11010717 M00FA004A	
MJH 800			11010717 M00FA004A	

For spare parts of UL generators please contact Marelli Motori Service department with alternator Serial Number.

STANDARD ALTERNATORS WITH AVR MEC 100			
Alternator type	PMG Code	AVR Code	General Data
MJB 355	M22FA310A 11024446	M71FA320A 10009784	PMG manual code 963857120 10008589 AVR manual code 963857138 10008519
MJB 400/ MJH 400			
MJB 450			

STANDARD ALTERNATORS WITH AVR ABB UNITROL 1005			
Alternator type	PMG Code	AVR Code	General Data
MJB 355	M22FA329A 11024449	M50FA475A 10024951	PMG manual code 963857120 10008589
MJB 400 / MJH 400			
MJB 450/ MJH 450			
MJB 500/ MJH 500	M00FA006A 11012222		AVR manual code 963857193 10025240
MJB 560/ MJH 560			
MJB 630/ MJH 630			
MJH 800	M00FA009A 11017631		

BEARINGS AND COUPLING FOR PMG INSTALLED ON GENERATORS WITH FRAME SIZE >=500 (TO BE REPLACED MAXIMUM AFTER 30'000 HOURS)			
MJB / MJH	BEARING 6008-2Z	346111440	10002368
	BEARING 6010-2Z	346111450	10005720
	COUPLING SLEEVE	342478001	

For detailed information on PMG refer to dedicated instruction manual 963857120.

14 AIR FILTER KIT FOR MJB AND MJH

SIZE	CODE COVER	NOTE	CODE PROTECTION	CODE FILTER	CODE SHIELD
MJB 355	10006862 - M35DV000C	only without PMG	n°1 10005967 - M35DW003B	n°2 10005722 - 963831028	same
	10011076 - M35DV009C	only with PMG			
MJB 400	10006381 - M40DV985B	only without PMG	n°2 10012986 - M40DW531C	n°2 10006015 - 963831030	11006526 - M40DF120B
	10023585 - M40DV006C	only with PMG			
MJB 450	10008913 - M45DV021C	with and without PMG	n°2 10008914 - M45DW411B	n°2 10007608 - 963831034	11006442 - M45DF011B
MJB 500	11016180 - M50DVA76B	with and without PMG	n°2 10016193 - M50DW547C n°2 10016194 - M50DW548C	n°4 10007749 - 963831032 n°2 10008013 - 963831035	same
MJB 560	11009556 - M56DV822B	with and without PMG but probable different different coupling	n°4 10011372 - M56DW423C	n°12 10005455 - 963831020	same
MJB 630	11009543 - M63DV992C	with and without PMG	n°4 10011552 - M63DW497D	n°12 10012722 - 963831019	same
MJH 800	/	with and without PMG	n°1 10012946 - M80DW431D n°1 10012805 - M80DW432D n°4 10012948 - M80DW434C	n°2 10013263 - 963831011 n°4 10013802 - 963831014	same

15 PART NAME GENERATORS MJB / MJH

Position	Part name
2	Main stator
3	Main rotor
4	D-end shield
5	N-end shield
6	Voltage regulator
13	C.T. for overexcitation
33	Guard N-end
41	Terminal box
45	N-end air outlet protections
46	N-end air outlet protections
48 - 49	D-end air outlet protections
60	Auxiliary terminal box of regulation
100	Exciter rotor
110	Exciter stator
119	Rotating Rectifier
131	Inner D-end bearing cap
132	Grease slinger D-end
133	Spacer Ring
142	Inner N-end bearing cap
143	Grease slinger N-end
144	Outer N-end bearing cap
155	Heaters MJ_ 800
329	Heaters MJ_ 355 to 710
170	Exciter stator MJ_ 800
200	Rotor MJ_ 800
201	D-end bearing
202	N-end bearing
210 - 223	Key
250	Exciter rotor MJ_ 800
260	Rotating Rectifier MJ_ 800
300	Shield D.E. MJ_ 800

3401	Rolling bearing D.E. MJ_ 800
305	Seeger
329	Space heater
345	C.T. for parallel operation
355	Sleeve bearing D.E. MJ_ 800
400	Shield N.D.E. MJ_ 800
4401/4402	Rolling bearings N.D.E. MJ_ 800
455	Sleeve bearing N.D.E. MJ_ 800
500	Seeger
501	Filter MJ_ 800 WITH Sleeve bearing
530	Cover MJ_ 800 WITH Rolling bearing
545	Filter MJ_ 800 WITH Sleeve bearing
543	Filter MJ_ 800 WITH Rolling bearing
544	Filter MJ_ 800 WITH Rolling bearing
670	Spring ring

16 ALARMS AND INTERVENTIONS FOR INCIDENTS OR DISTURBANCES

16.1 ELECTRICAL FAULTS

Refer to the following table in the case of digital regulation Marelli Motori (MEC-100 10009784).

16.1.1 Digital regulation

PRELIMINARY NOTES:

- In the event one of the problems described below occurs, it is assumed you search for the possible fault/cause of the problem by disconnecting any devices (over-excitation device, external remote controls, etc.) connected to the regulator.
If the problem found does not occur again with only the voltage regulator working, you are advised to connect again the accessory devices one by one, according to the diagrams provided, and identify which one of them is causing the problem. Then consult the Use Manual for the identified device.
- In all cases where changes must be made to the regulator settings via the MEC-100 Interface System, the acronym "MIS" will be indicated corresponding to each instructions sequence described.
- Checking and/or modification of the connections must always reference the connection diagrams supplied by Marelli Motori along with the generator.
- Control of the MIS settings must always reference the instructions contained in the User Manual 963857137.
- Changing the MIS settings must always comply with the instructions contained in the User Manual 963857137.
- The reference specifications are always those indicated in the User Manual 963857137.

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
With the generator at nominal speed, with no load, the voltage to the generator output terminals is equal to the residual voltage	1. Wrong connections 2. De-excitation contact failed 3. Wrong de-excitation operation 4. Voltage transformer ratio 5. Wrong power supply voltage transformer 5a. PMG issues 6. Fuse blown	1. Check the connections. In the event of wrong or missing connections, re-connect according to the diagrams supplied with the generator. Otherwise, go to step 2. 2. Check the de-excitation contact (if present - part not supplied by Marelli). Replace the contact if the latter is not intact/working. Otherwise, go to Step 3. 3. Check if the de-excitation contact was opened by the relevant command system, in particular as alarm reaction on the MEC-100. In the latter case, identify what alarm has activated (this can only take place using command system diagnostics). If opening of the de-excitation contact has been caused by an alarm on the MEC-100, follow the use instructions relating to the specific alarm, contained in the User Manual 963857137. Carefully also read Steps 10, 11 and 12 relating to alarm intervention on the MEC-100. For intervention reasons not related to the MEC-100, refer to the use manual for the contact command system (parts not supplied by Marelli). Otherwise, go to Step 4. 4. Check the transformer on the power supply of the MEC-100 (if present) has the correct coil ratio and is dimensioned appropriately for the specifications of the generator and the regulator. If not, replace the transformer. Otherwise, go to Step 5. 5. To power the MEC-100 through auxiliary winding or the main terminals on the generator, check the residual magnetism of the machine is sufficient for self-excitation. If at nominal speed the residual power supply voltage is lower than 5V, increase the residual magnetism of the generator by following the instructions contained in the Use and Maintenance Manual of the generator. Otherwise, go to Step 6. 5a. To power the MEC-100 through the PMG auxiliary exciter, check if the PMG specifications are suitable for the specifications of the generator and the MEC-100. Also check if the PMG, at the nominal speed of the generator, supplies an output voltage equal to that indicated in the relevant specifications and is suitable for correct functioning of the MEC-100. If the PMG is not suitable or is faulty, replace the PMG or refer to the relevant manual to detect the fault and any repairs to make. Otherwise, go to Step 6. 6. Check the fuse on the power supply is not blown. If blown, replace with a new fuse of equal specifications. Otherwise, go to Step 7.

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	7. Wrong START/STOP command	NOTE: If on re-starting the generator, the new fuse immediately blows, go directly to Step 14. 7. Check if the MEC-100 receives the excitation enabling command. In particular, check the Operating Status LED in the Status window on the System Monitoring area (MIS) is green. If the LED is green, go to Step 8. If not, run a functional test of the START (C1) and STOP (C2) contacts using the following procedure: - completely disconnect the MEC-100 from the rest of the system; - insert a bridge between C1 and M and power the MEC-100 from an external source, according to specifications; - check the colour of the Operating Status LED. In case of: - white LED: the Operating Status remains forced to zero, even if the START contact is closed; go to Step 14. - green LED: the Operating Status becomes correctly active, with the START contact closed; therefore you should check correct functioning of the command system (part not supplied by Marelli) of the START (C1) and STOP (C2) contacts.
	8. Wrong generator data setting	8. Check the MEC-100 settings. In particular, check via MIS that: - the Rated Voltage setting in Generator Data, on the System Parameters page, is consistent with the generator plate data; - the Primary Voltage and Secondary Voltage settings in Generator VT, Sensing page, are consistent with the data on the generator plate and the MEC-100 specifications; - the Voltage in Generator Voltage Setpoint, on the Setpoint page, is the operational voltage required. Change any incorrect settings.
	9. Wrong soft start setting	9. Check the soft start ramp is not too long. A ramp time that is too long can give the appearance the generator is not self-excited. Change any incorrect settings. Otherwise, go to Step 10.
	10. Wrong loss of sensing setting	10. Check if the loss of sensing protection has activated: in this case, the <i>Loss of Sensing Protection</i> item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing (the <i>Enable Protection</i> and <i>Shutdown</i> items in <i>Loss of Sensing</i>, on the <i>Generator Protections</i> page are enabled). If the loss of sensing protection has activated, check: the connections are correct;

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	11. Wrong diode monitoring setting	b) the <i>Voltage Sensing</i> setting in <i>System Options</i>, on the <i>System Parameters</i> page is consistent with the connection diagrams supplied for the generator. Then check for any incorrect connections and/or settings. Otherwise, go to Step 11. 11. Check if the protection for faulty diodes has activated: in this case, the <i>Diode Monitoring - High Level</i> item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing (the <i>Enable Monitoring</i> and <i>Enable Shutdown</i> items in <i>Protection Options</i>, on the <i>Diode Monitoring</i> page are enabled). If the protection for faulty diodes has activated, check: - the rectifier bridge diodes of the generator are intact and working (see Use and Maintenance Manual of the generator); - that the <i>Maximum Ripple of High Level</i>, on the <i>Diodes Monitoring</i> page is consistent with the specifications of the machine and the application. Repair the rectifier bridge, if necessary, and/or change any incorrect settings.
	12. Wrong over-excitation limiter setting	Otherwise, go to Step 12. 12. Check if the over-excitation limiter has activated: in this case, the <i>Over-Excitation Limiter</i> item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing (the <i>Enable Limiter</i> item in <i>Over-Excitation Limiter</i>, on the <i>Limiters</i> page is enabled). If the over-excitation limiter has activated, check the <i>Max Continuable Current</i> setting in <i>Over-Excitation Limiter</i> on the <i>Limiters</i> page is consistent with the specifications of the machine and the application. Change any incorrect settings.
	13. Wrong FCR setting	Otherwise, go to Step 13. 13. Check if FCR mode is enabled: in this case the <i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i> (MIS) is green. If the FCR mode is disabled, go to Step 14. Otherwise, use the following procedure to check if the <i>FCR</i> digital contact (C8) is controlled incorrectly or is faulty: - completely disconnect the MEC-100 from the rest of the system; - power the MEC-100 using an external source, according to specifications, and check the colour of the <i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i>. In case of: - green LED: <i>Field Current Regulation FCR</i> is enabled also with the <i>FCR</i> contact open; go to Step 14.

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	14. Faulty unit	white LED: <i>Field Current Regulation FCR</i> is correctly disabled with the <i>FCR</i> contact open; then check the command system is working correctly (part not supplied by Marelli) on contact C8. 14. Replace the regulator.
With the generator at nominal speed, with no load, the voltage to the output terminals is lower than the nominal value, but higher than the residual voltage of the generator.	1. Wrong generator data setting 2. Wrong over-excitation limiter setting 3. Wrong under-frequency limiter setting 4. Wrong FCR setting	1. Check the settings via MIS, in particular that: - the <i>Rated Voltage</i> setting in the <i>Generator Data</i>, on the <i>System Parameters</i> page, is consistent with the generator plate data; - the <i>Primary Voltage</i> and <i>Secondary Voltage</i> settings on the <i>Generator VT, Sensing</i> page, are consistent with the data on the generator plate and the MEC-100 specifications; - the <i>Voltage</i> for <i>Generator Voltage Setpoint</i>, on the <i>Setpoint</i> page, is the operational voltage required. Change any incorrect settings. Otherwise, go to Step 2. 2. Check if the over-excitation limiter has activated: in this case, the <i>Over-Excitation Limiter</i> item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing (the <i>Enable Limiter</i> item in <i>Over-Excitation Limiter</i> , on the <i>Limiters</i> page is enabled). If the over-excitation limiter has activated, check the <i>Max Continuable Current</i> setting in <i>Over-Excitation Limiter</i> on the <i>Limiters</i> page is consistent with the specifications of the generator and the application. Change any incorrect settings. Otherwise, go to Step 3. 3. Check if the under-frequency limiter has activated: in this case, the <i>Under-Frequency Limiter</i> item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing. If the under-frequency limiter has activated, check the <i>Corner Frequency</i> setting in <i>Under-Frequency Limiter</i> on the <i>Limiters</i> page is consistent with the specifications of the generator and the application. Change any incorrect settings. Otherwise, go to Step 4. 4. Check if FCR mode is enabled: in this case the <i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i> (MIS) is green. If the FCR mode is disabled, go to Step 5. Otherwise, use the following procedure to check if the <i>FCR</i> digital contact (C8) is controlled incorrectly or is faulty: - completely disconnect the MEC-100 from the rest of the system; - power the MEC-100 using an external source, according to specifications, and check the colour of the

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	5. Analogue input E1/E2-M issue 6. Digital input UP/DOWN issue 7. Faulty unit	<i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i>. In case of: - green LED: <i>Field Current Regulation FCR</i> is enabled also with the <i>FCR</i> contact open; go to Step 7. - white LED: <i>Field Current Regulation FCR</i> is correctly disabled with the <i>FCR</i> contact open; then check the command system is working correctly (part not supplied by Marelli) for contact C8. 5. Use MIS to check if the voltage setpoint was changed by analogue input (E1/E2-M), if used: in this case, in the <i>Other Data</i> window of <i>System Monitoring</i> (MIS), the <i>Analogue Input 1</i> and/or <i>Analogue Input 2</i> values are different from those consistent with the nominal voltage setpoint. If the voltage setpoint was changed by analogue input (E1/E2-M), check the command system (part not supplied by Marelli Motori) for analogue input. Otherwise, go to Step 6. 6. Check if the voltage setpoint was changed by digital input <i>DOWN</i> (C4) or rather if the digital input <i>DOWN</i> (C4) is incorrectly controlled. In particular, run a functional test of the <i>DOWN</i> (C4) contact using the following procedure: - with the generator stopped, disconnect the cable connected to C4; - bring the generator to nominal speed and measure the output voltage (with voltage setpoint equal to the nominal voltage on the generator). If the voltage corresponds to the nominal voltage, check correct functioning of the command system (part not supplied by Marelli) on the <i>DOWN</i> contact (C4). If the voltage stays lower than the nominal voltage, go to Step 7. 7. Replace the regulator.
With the generator at nominal speed, with no load, the voltage to the output terminals is over the nominal value	1. High over-excitation 2. Wrong generator data setting	1. If the voltage to the output terminals is over 130% of the nominal voltage of the generator, IMMEDIATELY STOP THE GENERATOR and check ALL the connections, in particular those on the sensing terminals S1 – S2 – S3. In the event of wrong or missing connections, re-connect according to the diagrams supplied with the generator. If the problem persists after re-starting the generator, go to Step 6. If the voltage to the output terminals is equal or lower than 130% of the nominal voltage, go to Step 2. 2. Check all the settings via MIS, in particular that: the <i>Rated Voltage</i> setting in the <i>Generator Data</i>, on the <i>System Parameters</i> page, is consistent with the generator plate data;

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	3. Wrong FCR setting	b) the <i>Primary Voltage</i> and <i>Secondary Voltage</i> settings on the <i>Generator VT, Sensing</i> page, are consistent with the data on the generator plate and the MEC-100 specifications; c) the <i>Voltage for Generator Voltage Setpoint</i>, on the <i>Setpoint</i> page, is the operational voltage required. Change any incorrect settings. Otherwise, go to Step 3. 3. Check if FCR mode is enabled: in this case the <i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i> (MIS) is green. If the FCR mode is disabled, go to Step 4. Otherwise, use the following procedure to check if the <i>FCR</i> digital contact (C8) is controlled incorrectly or is faulty: - completely disconnect the MEC-100 from the rest of the system; - power the MEC-100 using an external source, according to specifications, and check the colour of the <i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i>. In case of: - green LED: <i>Field Current Regulation FCR</i> is enabled also with the <i>FCR</i> contact open; go to Step 6. - white LED: <i>Field Current Regulation FCR</i> is correctly disabled with the <i>FCR</i> contact open; then check the command system is working correctly (part not supplied by Marelli) for contact C8.
	4. Analogue input E1/E2-M issue	4. Use MIS to check if the voltage setpoint was changed by analogue input (E1/E2-M), if used: in this case, in the <i>Other Data</i> window of <i>System Monitoring</i> (MIS), the <i>Analogue Input 1</i> and/or <i>Analogue Input 2</i> values are different from those consistent with the nominal voltage setpoint. If the voltage setpoint was changed by the analogue input (E1/E2-M), check the command system (part not supplied by Marelli Motori) on analogue input. Otherwise, go to Step 5.
	5. Digital input UP/DOWN issue	5. Check if the voltage setpoint was changed by digital input <i>UP</i> (C3) or rather if the digital input <i>UP</i> (C3) is incorrectly controlled. In particular, run a functional test of the <i>UP</i> (C3) contact using the following procedure: - with the generator stopped, disconnect the cable connected to C3; - bring the generator to nominal speed and measure the output voltage (with voltage setpoint equal to the nominal voltage on the generator).

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	6. Faulty unit	If the voltage is equal to the nominal voltage, check correct functioning of the command system (part not supplied by Marelli) on the <i>UP</i> contact (C3). If the voltage stays over the nominal voltage, go to Step 6. 6. Replace the regulator.
With the generator in stand-alone mode, at nominal speed, the voltage regulation is not accurate and/or unstable.	1. Wrong connections 2. Wrong stability setting 3. Faulty unit	1. Check the connections, in particular the power supply and sensing connections. Change any incorrect connections. Otherwise, go to Step 2. 2. Check the stability set-up using MIS. In particular, run a step voltage test or on application/rejection of the load, as described in the MEC-100 manual. If necessary, change the MIS settings until you achieve the precision, stability and response you want. Otherwise, go to Step 3. 3. Replace the regulator.
With the generator in stand-alone mode, at nominal speed, the voltage regulation is incorrect and/or absent.	1. Wrong connections 2. Digital contact issue 3. Wrong over-excitation (or under-excitation) limiter setting	1. Check the connections, in particular the power supply and sensing connections. Change any incorrect connections. Otherwise, go to Step 2. 2. Check the AVR mode is that selected, or rather check that none of the digital contacts <i>PAR</i> (C5), <i>PF/VAR</i> (C6), <i>VMATCH</i> (C7) and <i>FCR</i> (C8) are closed. If none of the LED associated with the aforementioned <i>Status</i> in <i>System Monitoring</i> (MIS) are green, go to Step 3. Otherwise, implement the following procedure: - completely disconnect the MEC-100 from the rest of the system; - power the MEC-100 using an external source, according to specifications, and check the colour of the <i>Reactive Droop Compensation</i>, <i>Parallel with Line</i>, <i>Voltage Matching</i> and <i>Field Current Regulation FCR</i> LED in the <i>Status</i> window of <i>System Monitoring</i>. If: - one or more than one of the 4 statuses has a green LED, go to Step 4; - all the LED are white, then there is a command error on one or more of the digital inputs among the aforementioned; it is therefore necessary to change the relevant command system (part not supplied by Marelli). 3. Check if the over-excitation (or under-excitation) limiter has activated: in this case, the <i>Over-Excitation Limiter</i> (or <i>Under-Excitation</i>) item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing (the <i>Enable Limiter</i> in <i>Over-Excitation Limiter</i> (or <i>Under-Excitation</i>) item, on the <i>Limiters</i> page is enabled).

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	4. Faulty unit	If this occurred, check the settings of the limiters are consistent with the generator and application specifications. Change any incorrect settings. Otherwise, go to Step 4. 4. Replace the regulator.
With the generator on and functioning in stand-alone mode, the generator voltage goes below the nominal value as soon as the load is applied, or if the load is increasing (within the nominal limits of the generator).	1. Droop mode issue 2. Over-excitation limiter issue 3. Faulty unit	1. Check the regulator is not operating in Droop mode or rather in the <i>Status</i> window of <i>System Monitoring</i> (MIS) the <i>Reactive Droop Compensation</i> LED is white. If the LED is white, go to Step 2. Otherwise, run a functional test of the <i>PAR</i> (C5) contact using the following procedure: - completely disconnect the MEC-100 from the rest of the system; - power the MEC-100 using an external source, according to specifications, and check the colour of the <i>Reactive Droop Compensation</i> LED in the <i>Status</i> window of <i>System Monitoring</i>. In case of: - green LED: the status of the <i>Reactive Droop Compensation</i> is enabled also with the <i>PAR</i> (C5) open; go to Step 3. - white LED: <i>Reactive Droop Compensation</i> is correctly disabled with the <i>PAR</i> (C5) contact open; then check the command system is working correctly (part not supplied by Marelli) for the <i>PAR</i> contact (C5). 2. Check if the over-excitation limiter has activated: in this case, the <i>Over-Excitation Limiter</i> item in the <i>Alarms</i> window of <i>System Monitoring</i> (MIS) is red and flashing (the <i>Enable Limiter</i> item in <i>Over-Excitation Limiter</i>, on the <i>Limiters</i> page is enabled). If the over-excitation limiter has activated, check the <i>Max Continuable Current</i> setting in <i>Over-Excitation Limiter</i> on the <i>Limiters</i> page is consistent with the specifications of the generator and the application. Change any incorrect settings. Otherwise, go to Step 3. 3. Replace the regulator.
Generators parallel operation – the reactive power is not correctly shared between two or more paralleled generators.	1. Droop mode issue	1. Check if the Droop function is enabled: if the command system forces closure of the <i>PAR</i> (C5) contact, in the <i>Status</i> window of <i>System Monitoring</i> (MIS), the <i>Reactive Droop Compensation</i> LED must be green. If the Droop function is enabled, go to Step 2. Otherwise, run a contact test on the <i>PAR</i> (C5) contact using the following procedure: completely disconnect the MEC-100 from the rest of the system;

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	2. Wrong Droop mode setting 3. Current transformer CT issue 4. CT reversed 5. Wrong connections 6. Faulty unit	b) insert a bridge between C5 and M and power the MEC-100 from an external source, according to specifications; c) check the colour of the <i>Reactive Droop Compensation</i> LED, in the <i>Status</i> window of <i>System Monitoring</i>. In case of: - white LED: go to Step 6. - green LED: the status of the <i>Reactive Droop Compensation</i> is correctly enabled with the <i>PAR</i> (C5) contact closed; then check the command system is working correctly (part not supplied by Marelli) for the <i>PAR</i> contact (C5). 2. Check if the settings are correct using MIS. In particular, check the <i>Reactive Droop</i> value in <i>Droop Settings</i>, on the <i>Other Settings</i> page (MIS) are different from zero. Change any incorrect settings. Otherwise, go to Step 3. 3. Check that the current transformer (CT) is not shorted or disconnected. Change any incorrect connections. Otherwise, go to Step 4. 4. Invert the CT connection on terminals A1 (A5) – B. If this operation has no effect, restore the previous connection and go to Step 5. 5. Check the voltage and current sensed are correct. The sensing is correct if: - the U and V phases are connected to the terminals S1 and S2 of the regulator; - the CT is on the W phase. Change any incorrect connections. Otherwise, go to Step 6. 6. Replace the regulator.
Generators parallel operation – regulation of the power factor (or the reactive power) is imprecise, unstable or absent	1. Digital contact issue	1. Check if the PFR mode (or VAR) is enabled: if the command system forces closure of the <i>PF/VAR</i> (C6) contact, in the <i>Status</i> window of <i>System Monitoring</i> (MIS), the <i>Parallel with Line</i> LED must be green. If the PFR mode (or VAR) is enabled, go to Step 2. Otherwise, run a contact test on the <i>PF/VAR</i> (C6) contact using the following procedure: a) completely disconnect the MEC-100 from the rest of the system; b) insert a bridge between C6 and M and then power the MEC-100 from an external source, according to specifications; c) check the colour of the <i>Parallel with Line</i> LED, in the <i>Status</i> window of <i>System Monitoring</i>. In case of: white LED: go to Step 10.

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	2. Wrong generator data setting 3. Current transformer CT issue 4. CT reversed 5. Wrong connections 6. Wrong stability setting 7. Analogue input E1/E2-M issue	- green LED: the status of the <i>Parallel with Line</i> is correctly enabled with the <i>PF/VAR</i> (C6) contact closed; then check the command system is working correctly (part not supplied by Marelli) for the <i>PF/VAR</i> contact (C6). 2. Check the settings via MIS, in particular that: - the <i>Generator Data</i>, on the <i>System Parameters</i> page is consistent with the plate data on the generator. - Selecting <i>PF/VAR</i> in the <i>System Options</i>, on the <i>System Parameters</i> page is the operating system requested. - the <i>Primary Voltage</i> and <i>Secondary Voltage</i> settings on the <i>VT Generator, Sensing</i> page, are consistent with the data on the generator plate and the MEC-100 specifications. - the <i>Primary Current</i> and <i>Secondary Current</i> settings on the <i>CT Generator, Sensing</i> page, are consistent with the data on the generator plate and the MEC-100 specifications. - the <i>Power Factor (Reactive Power)</i> in the <i>Power Factor Setpoint (Reactive Power)</i>, on the <i>Setpoint</i> page is the operational setting required. Change any incorrect settings. Otherwise, go to Step 3. 3. Check that the current transformer (CT) is not shorted or disconnected. Change any incorrect connections. Otherwise, go to Step 4. 4. Invert the CT connection on terminals A1 (A5) – B. If this operation has no effect, restore the previous connection and go to Step 5. 5. Check the voltage and current sensed are correct. The Sensing is correct if: - the U and V phases are connected to the terminals S1 and S2 of the regulator; - the CT is on the W phase. Change any incorrect connections. Otherwise, go to Step 6. 6. Check the regulation stability set-up using MIS. In particular, run a step test of the power factor (or the reactive power) as described in the MEC-100 manual. If necessary, change the settings until you achieve the precision, stability and response you want. Otherwise, go to Step 7. 7. Use MIS to check if the power factor (or reactive power) setpoint was changed by analogue input (E1/E2-M), if used: in this case, in the <i>Other Data</i> window in the <i>System Monitoring</i> (MIS) area, the <i>Analogue Input 1</i> and/or

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	8. Digital input UP/DOWN issue 9. Wrong over-excitation (or under-excitation) limiter setting 10. Faulty unit	<i>Analogue Input 2</i> values are different from those consistent with the power factor (or the reactive power) setpoint. In the latter case, change the command system (part not supplied by Marelli Motori) to the analogue input. Otherwise, go to Step 8. 8. Check if the power factor (or reactive power) setpoint was changed incorrectly by the digital input <i>UP</i> (C3) and/or <i>DOWN</i> (C4) or if the digital input <i>UP</i> (C3) and/or <i>DOWN</i> (C4) are incorrectly controlled. In particular: a) with the generator stopped, disconnect the cables connected to C3 and C4; b) bring the generator to nominal speed and measure the power factor (or the reactive power). If the power factor (or reactive power) value measured is equal to that set, check the command system is working properly (part not supplied by Marelli) for the <i>UP</i> (C3) and/or <i>DOWN</i> (C4) contacts. Otherwise, go to Step 9. 9. Check if the over-excitation limiter has activated (or under-excitation): in this case, the <i>Over-Excitation Limiter</i> (or <i>Under-Excitation</i>) in the <i>Alarms</i> window of <i>System Monitoring</i> is red and flashing (the <i>Enable Limiter</i> item in <i>Over-Excitation Limiter</i> (or <i>Under-Excitation</i>) on the <i>Limiters</i> page is enabled). If one of the two limiters activates, check the settings of the limiters are consistent with the generator and application specifications. Change any incorrect settings. Otherwise, go to Step 10. 10. Replace the regulator.
Voltage Matching not working	1. Wrong connections 2. Digital contact issue	1. Check the connections, in particular the generator sensing connections (terminals S1 – S2 – S3) and the line sensing (terminals L1 – L2). Change any incorrect connections. Otherwise, go to Step 2. 2. Check if the voltage matching function is enabled: if the command system forces closure of the <i>VMATCH</i> (C7) contact, in the <i>Status</i> window of the <i>System Monitoring</i> (MIS) area, the <i>Voltage Matching</i> LED must be green. If the voltage matching function is enabled, go to Step 3. Otherwise, run a contact test on the <i>VMATCH</i> (C7) contact using the following procedure: a) completely disconnect the MEC-100 from the rest of the system; b) insert a bridge between C7 and M and power the MEC-100 from an external source, according to specifications;

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION
	3. Faulty unit	c) check the colour of the <i>Voltage Matching</i> LED, in the <i>Status</i> window of <i>System Monitoring</i>. In case of: - white LED: go to Step 3. - green LED: the status of <i>Voltage Matching</i> is correctly enabled with the <i>VMATCH</i> (C7) contact closed; then check the command system is working correctly (part not supplied by Marelli) for the VMATCH contact (C7). 3. Replace the regulator.

16.2 MECHANICAL FAULTS

MALFUNCTION	POSSIBLE CAUSE	INTERVENTION (always to be performed while the machine is not running)
Winding high temperature High cooling air temperature	- Excessive grid unbalance - Overload - Defective measurement system - Too high environment temperature - Air reflow toward the interior of the machine - Nearby heat source - Defective cooling system - Blocked air intakes - Clogged air filters - Reduced air flow	- Verify if grid balance complies with the requirements - Check control system setting, remove the overload - Check the sensors - Ventilate to reduce environment temperature - Create enough free space around the machine - Move away the heat sources and check the aeration - Inspect the conditions of the system - Free the intakes from any debris - Clean or replace the filters - Remove the obstacles, make sure that the air flow is adequate
Noise Vibration	- Not correct fastening to the bedplate - Rotor to be rebalanced - Excessive grid unbalance - Foreign material inside the machine - Machine misalignment - Bearing malfunction	- Verify the correct tightening of the screws by checking the tightening torque - Check and rebalance the fan and the balancing ring - Verify if grid balance complies with the requirements - Inspect and clean inside the machine - Check machine alignment - Check the conditions of the bearing and replace it if necessary
Bearing high temperature	- Insufficient or excessive lubricant - Bearing malfunction	Verify that you have met the lubrication intervals and the amounts of grease. Verify the correct re-lubrication (remove the cap of the grease drain, grease and refit the cap). 8. Check the conditions of the bearing and replace it if

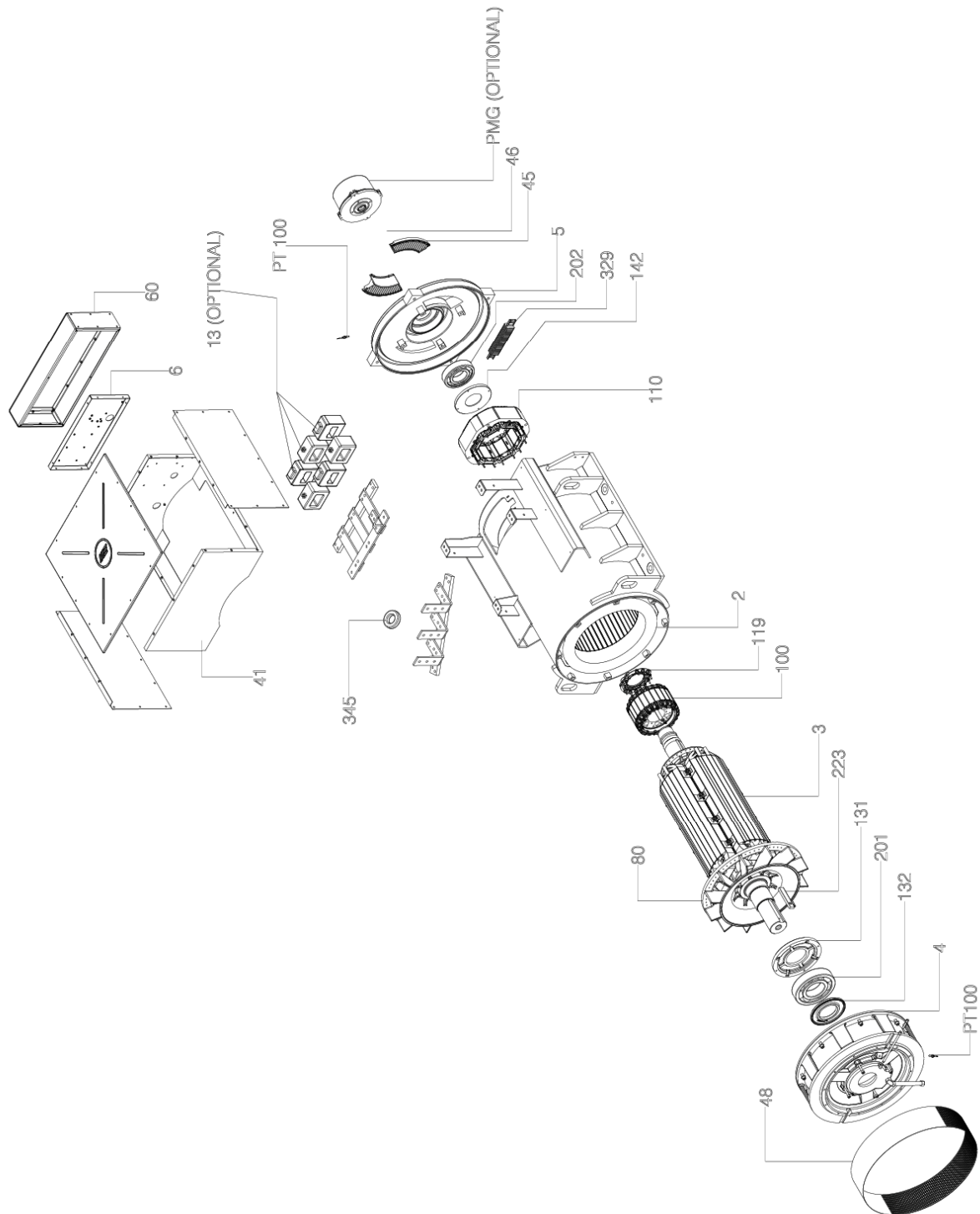
MALFUNCTION	POSSIBLE CAUSE	INTERVENTION (always to be performed while the machine is not running)
	9. Machine misalignment	necessary 9. Check machine alignment



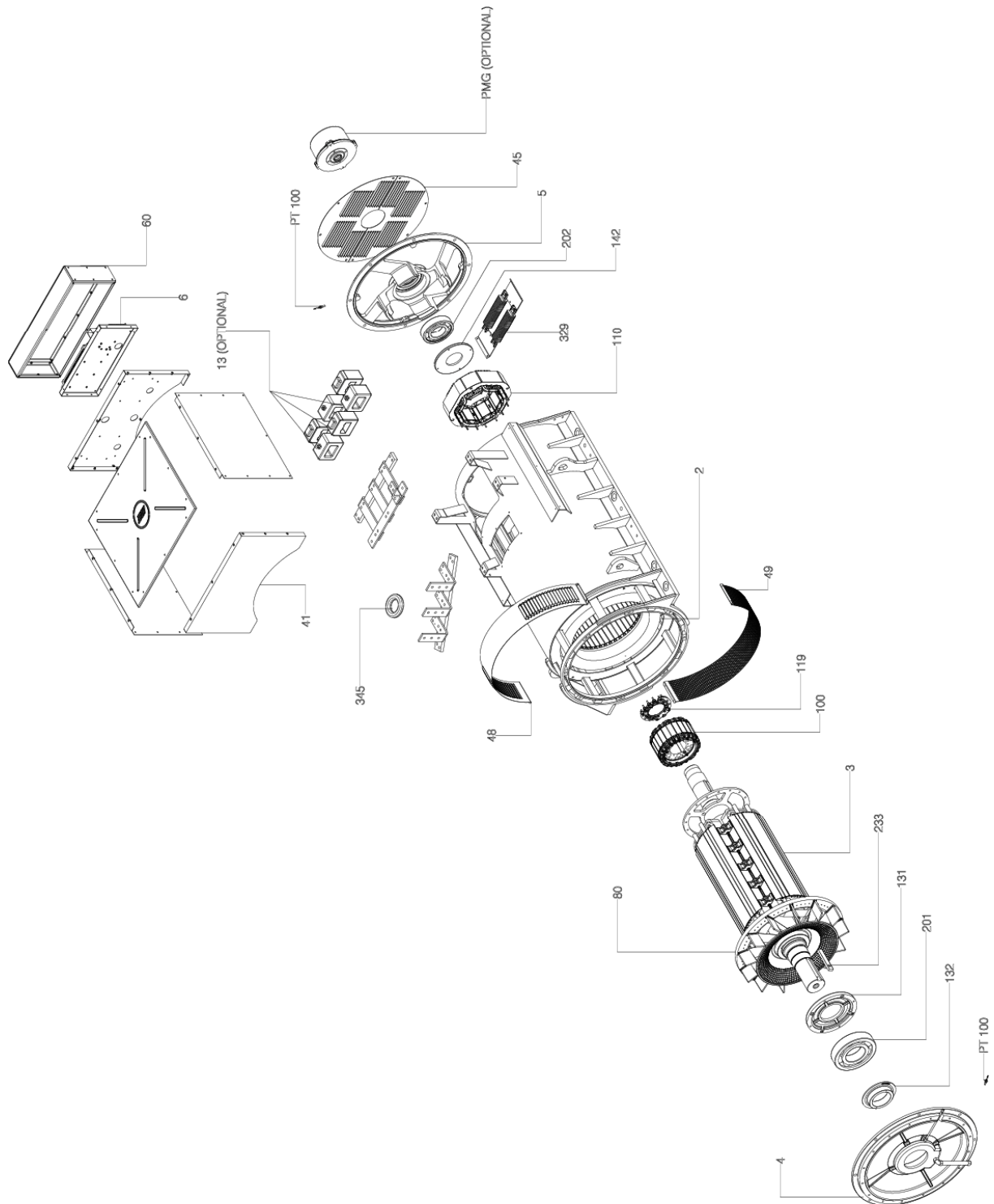
If in doubt, contact Marelli Motori.

17 EXPLODED DRAWINGS GENERATORS MJB

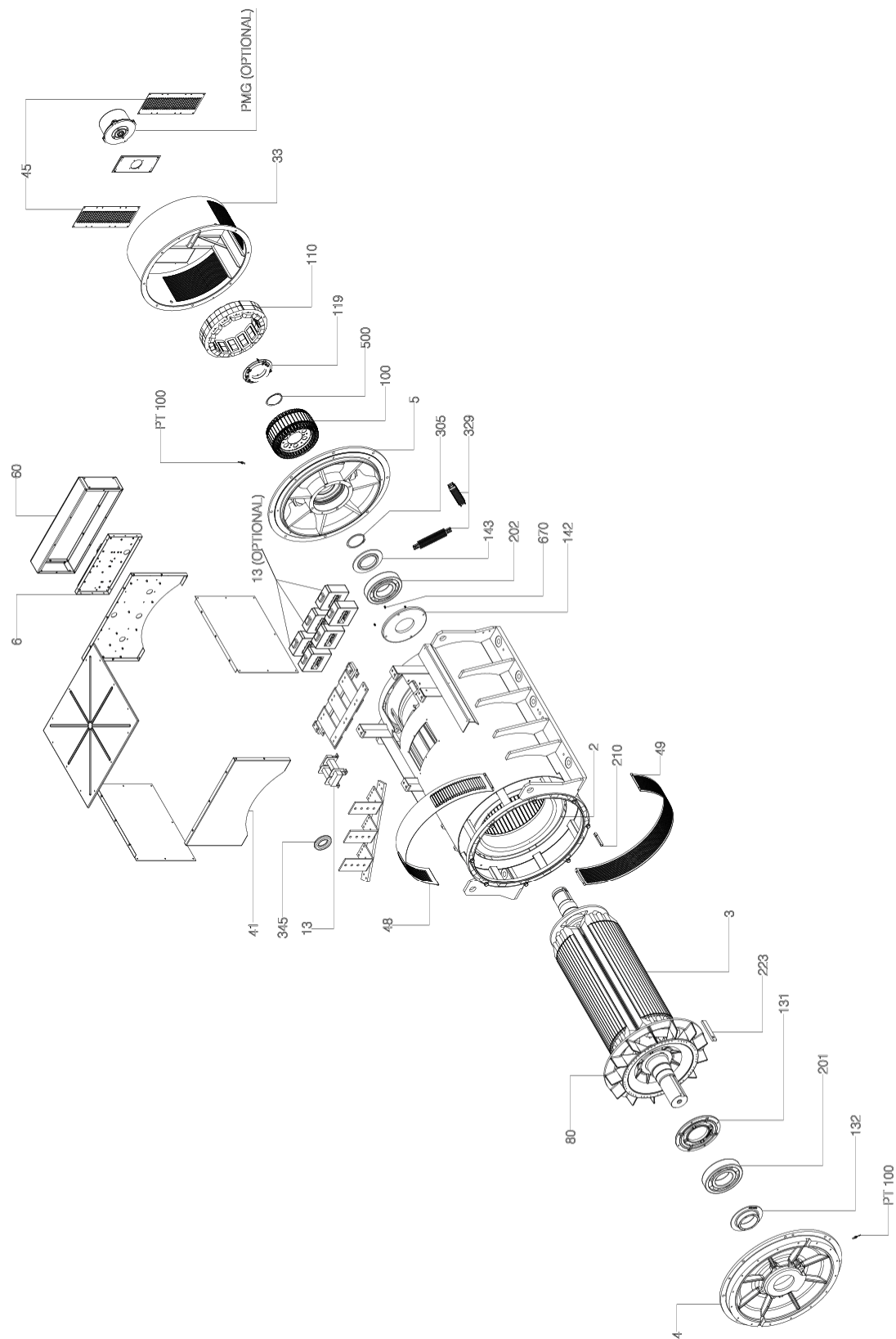
17.1 ALTERNATOR MJB 355



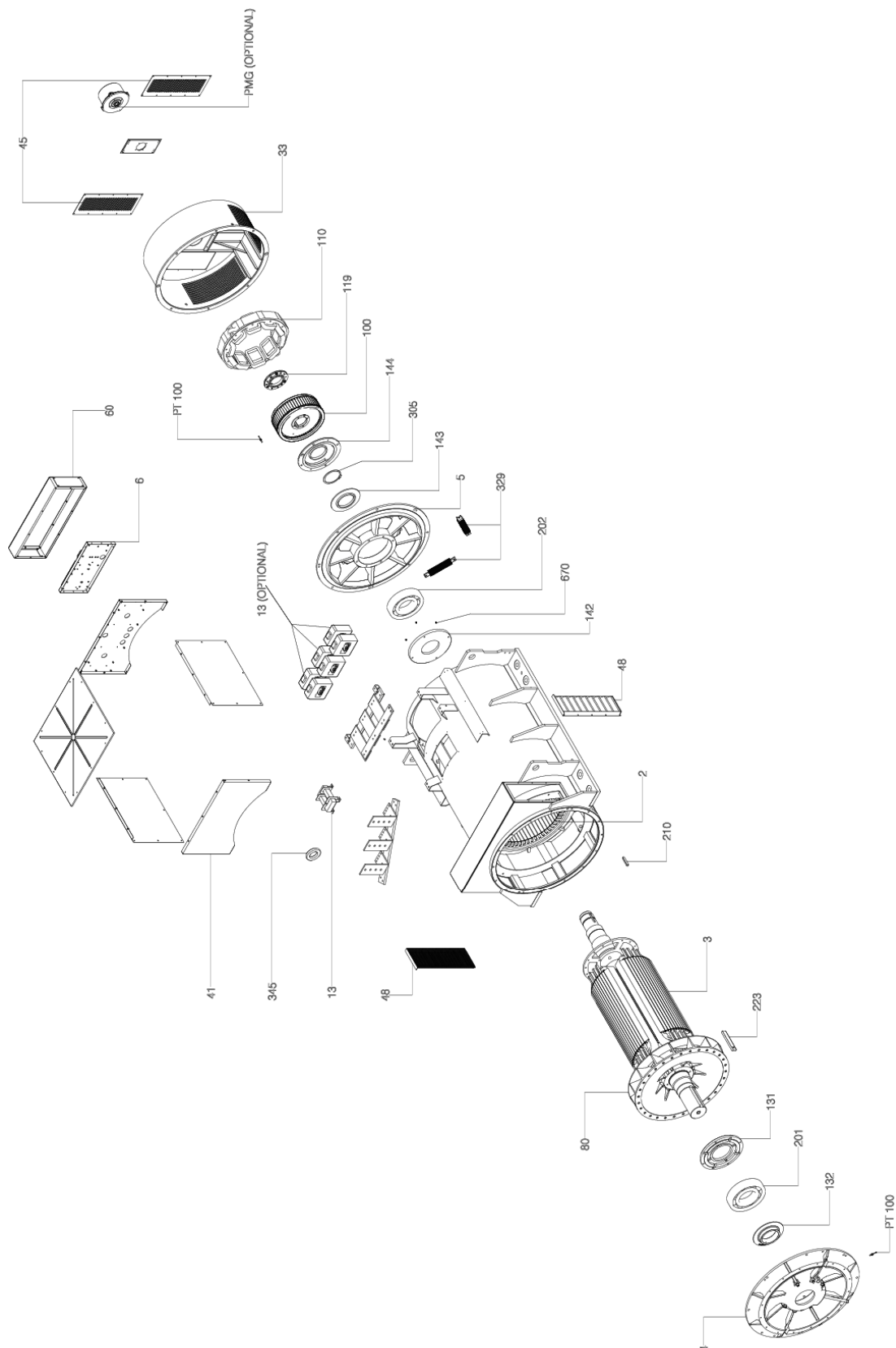
17.2 ALTERNATOR MJB 400 - 450



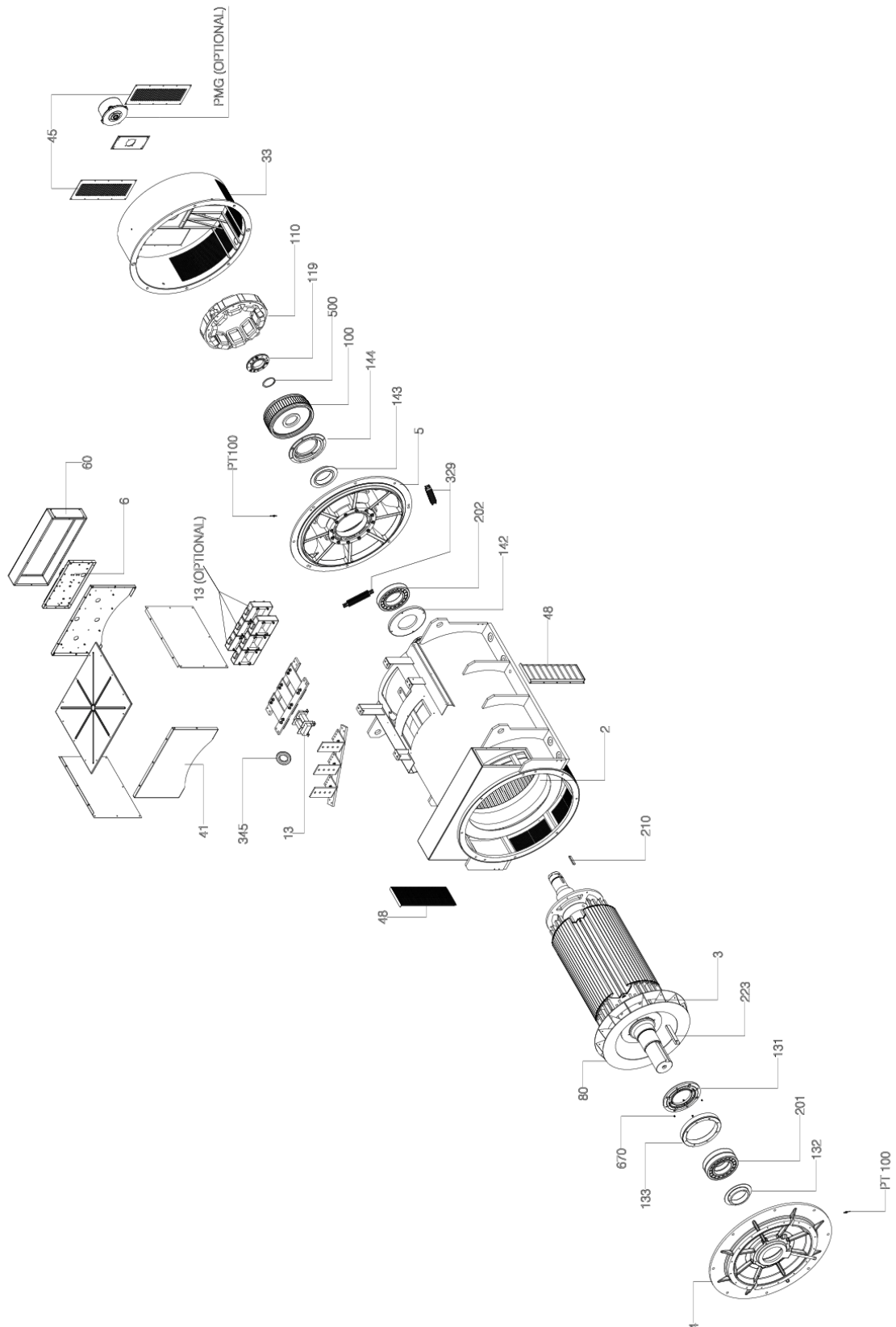
17.3 ALTERNATOR MJB 500



17.4 ALTERNATOR MJB 560

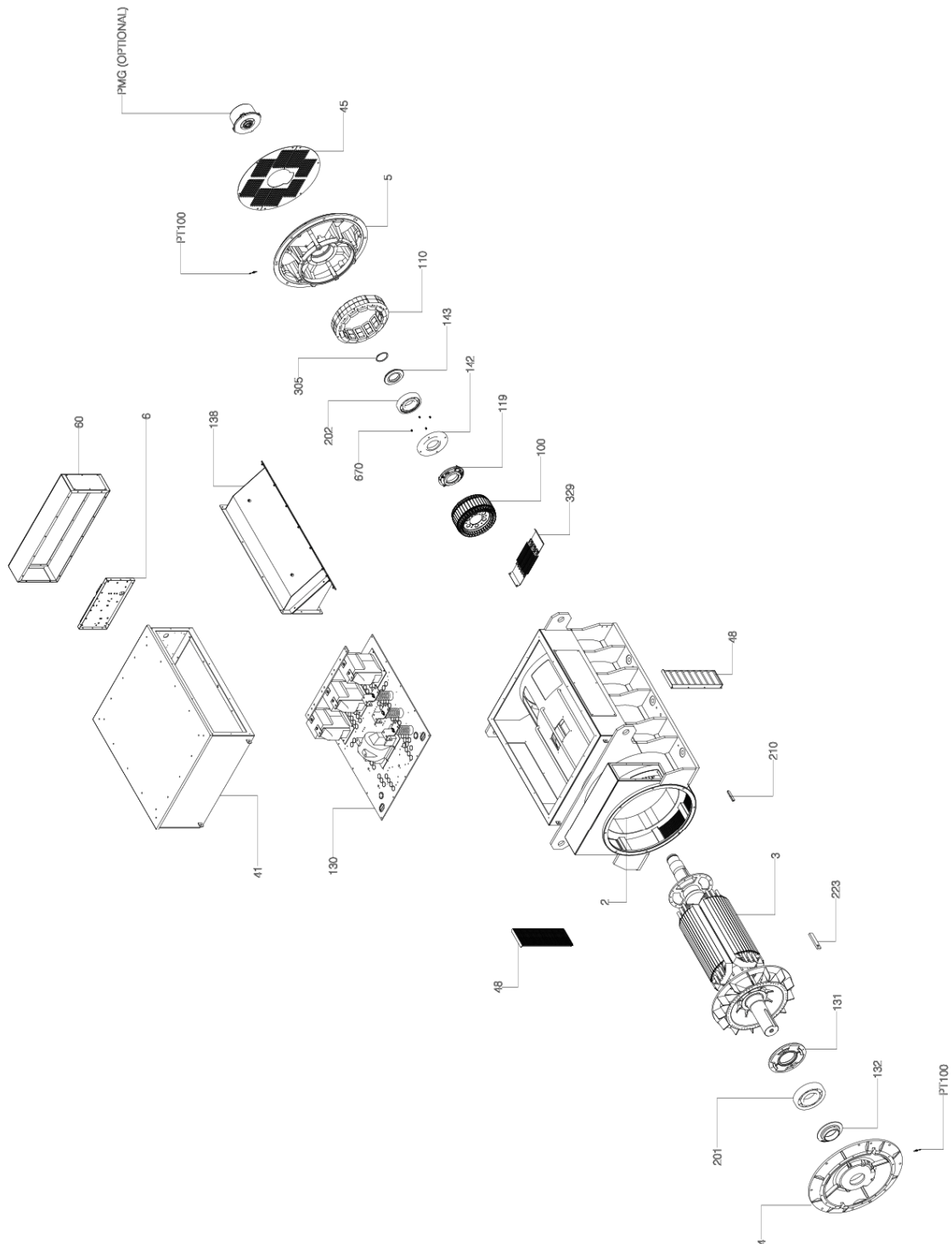


17.5 ALTERNATOR MJB 630

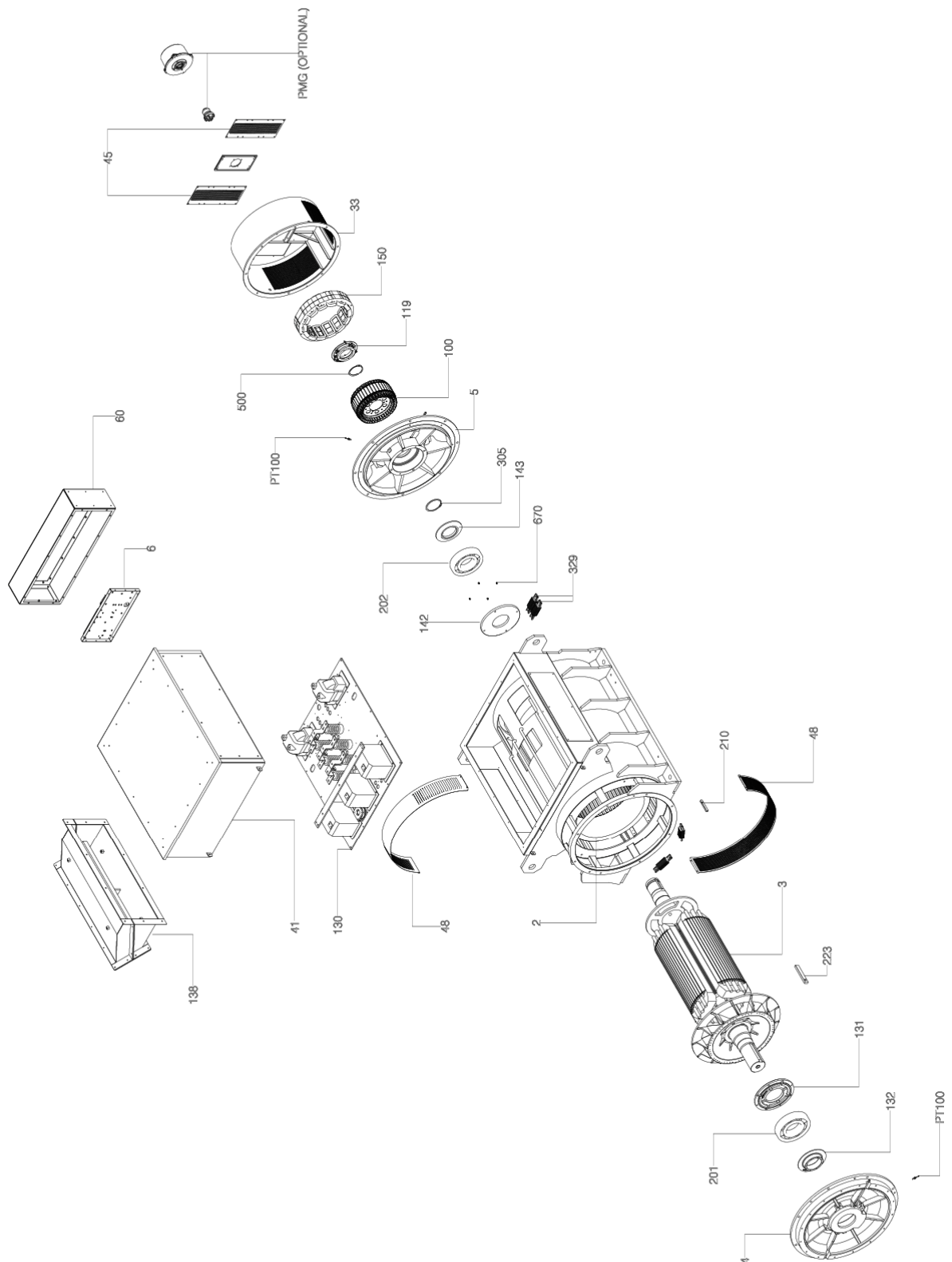


18 EXPLODED DRAWINGS GENERATORS MJH

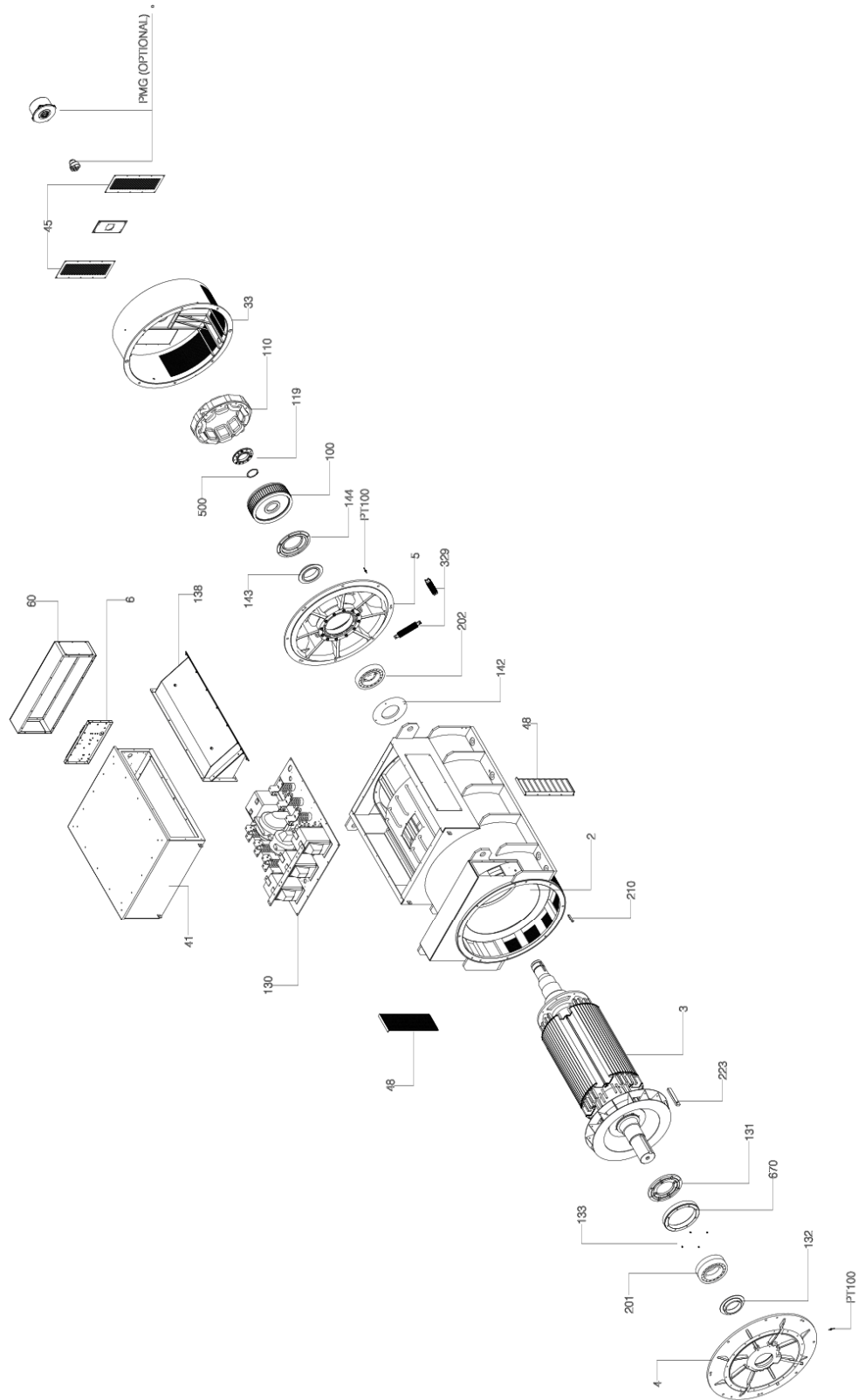
18.1 ALTERNATOR MJH 400 - 450



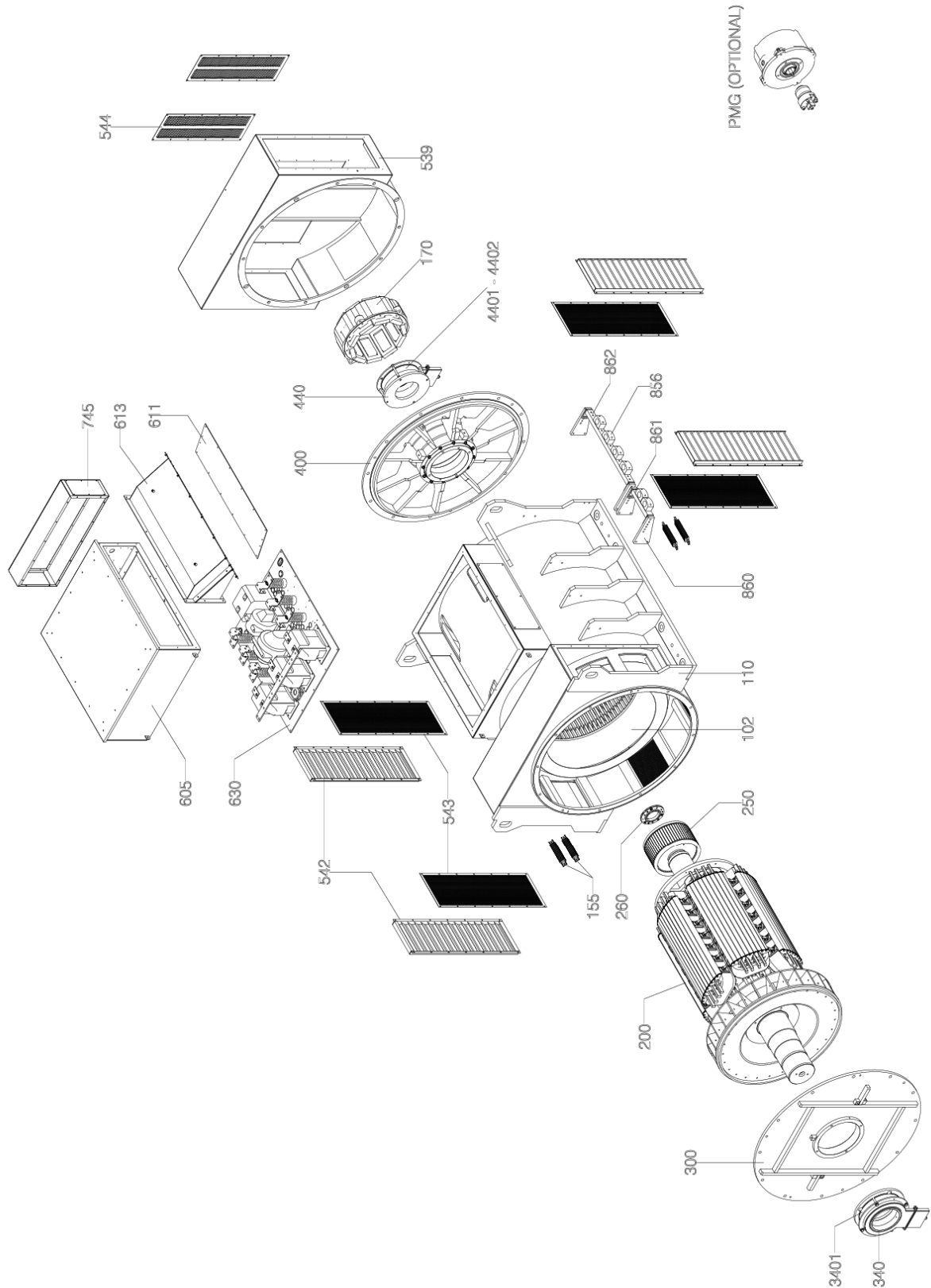
18.2 ALTERNATOR MJH 500 - 560



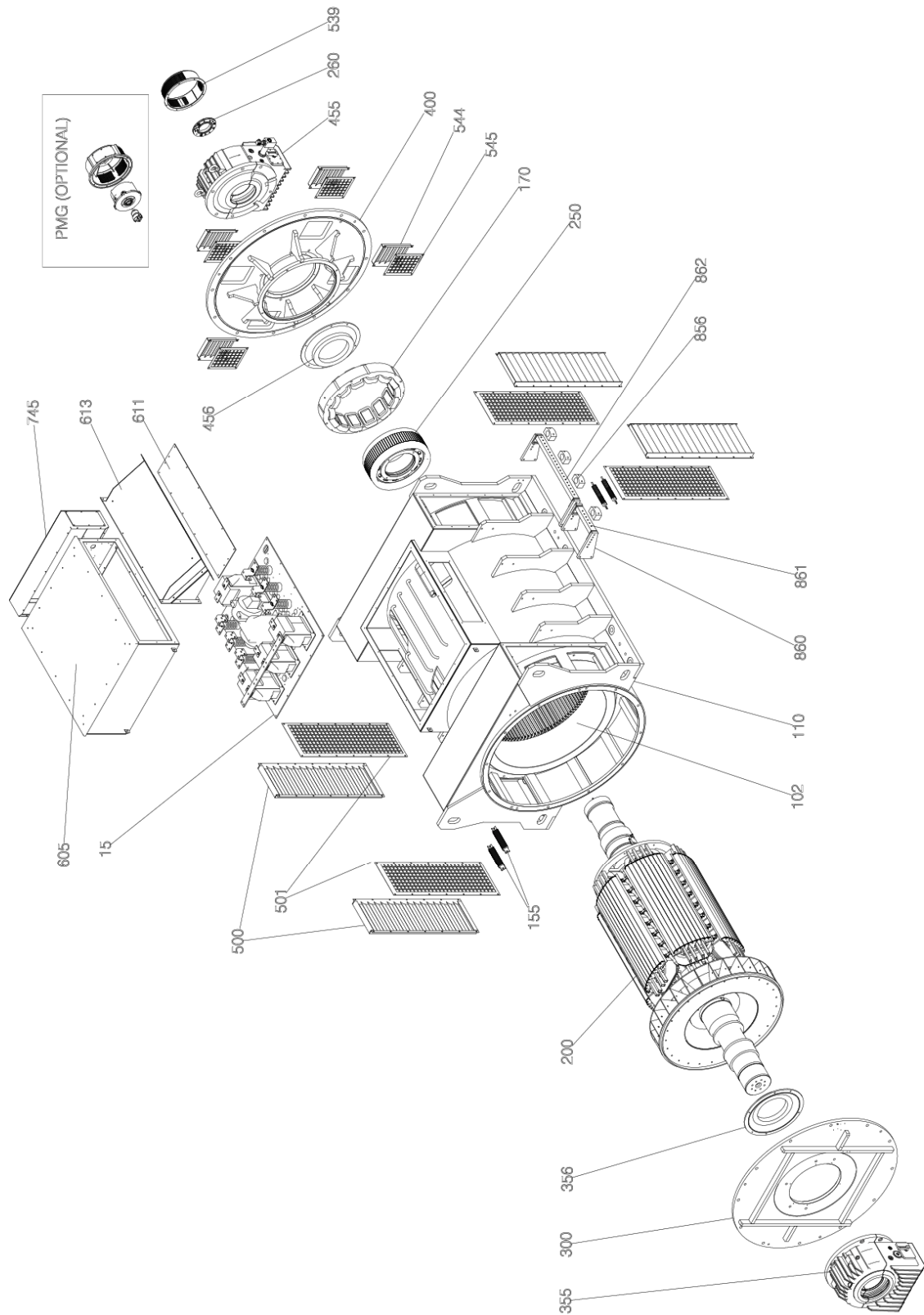
18.3 ALTERNATOR MJH 630 - 710



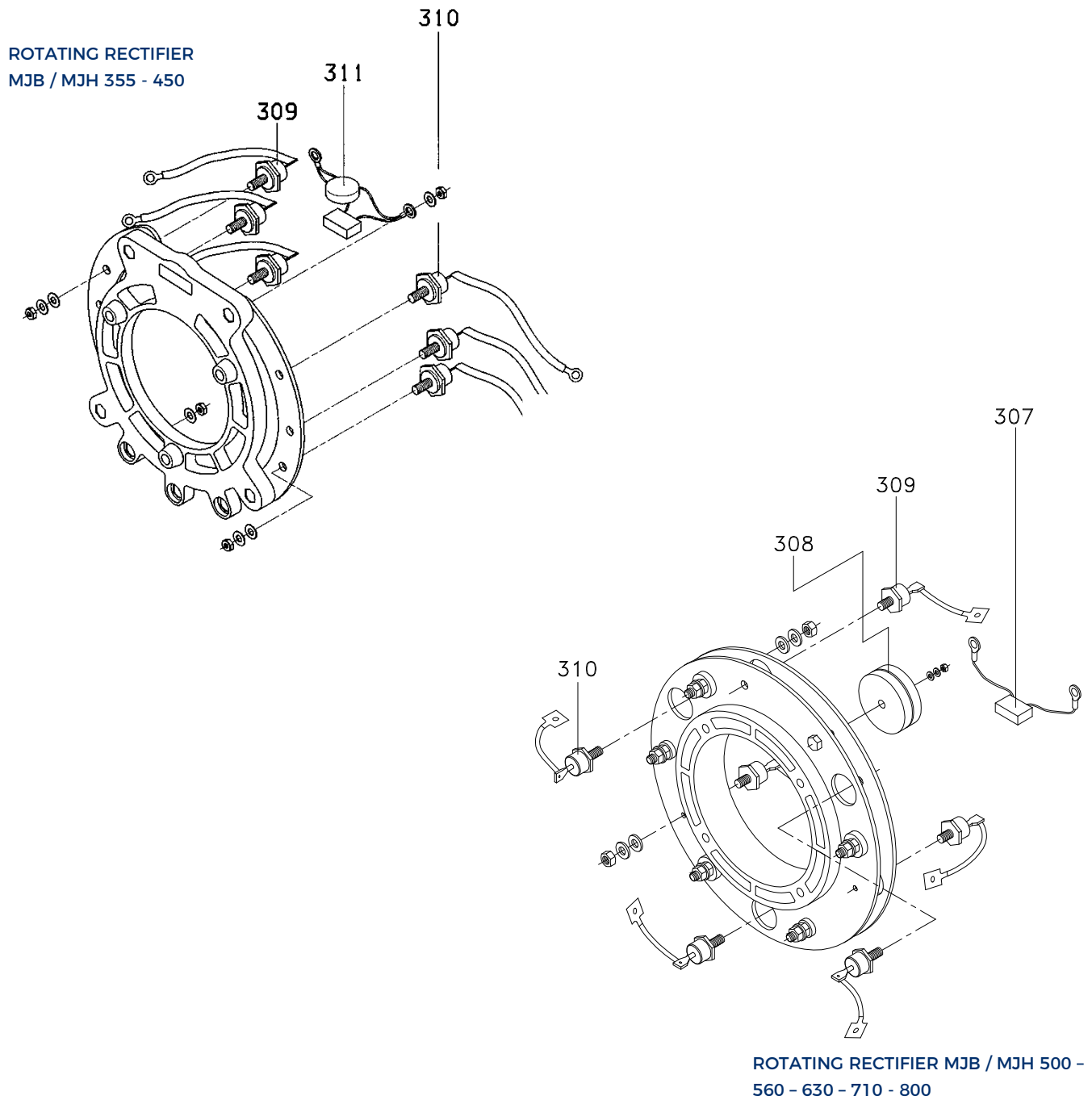
18.4 ALTERNATOR MJH 800 WITH ROLLING BEARINGS



18.5 ALTERNATOR MJH 800 WITH SLEEVE BEARINGS



18.6 EXPLODED DRAWING ROTATING RECTIFIER FOR MJB / MJH



Position	General data
307	Filter protector
308	Surge suppressor
309	Rotating diode (Inverse)
310	Rotating diode (Direct)
311	Surge suppressor + Filter protector

19 DISPOSAL

Packaging - All packaging materials are environment-friendly and recyclable and must be managed in accordance with the regulations in force.

Scrapped alternator - The scrapped alternator includes valuable recyclable materials. In order to properly manage them, contact the municipal administration or the competent authority, that will provide the addresses of the scrapping material collection centres and provide instructions about the recycling procedure.

20 EUROPEAN DIRECTIVES: CE DECLARATION OF CONFORMITY

	Marcatura "CE": conformità alla Direttiva Bassa Tensione (2014/35/UE). Marcatura "CE": compatibilità elettromagnetica (2014/30/UE) Marcatura "CE": direttiva macchine (2006/42/EC) Tali alternatori sono costruiti in osservanza delle norme EN 60034-1 (Norme sulle macchine elettriche rotanti) EN 60204-1 (Norma sulla sicurezza dell'equipaggiamento elettrico delle macchine)
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Each alternator bears the CE marking. The CE declaration of conformity is available on the website Marelli Motori.

The manufacturer is responsible for ensuring that the alternator complies with the following standards:

EN 61000-6-1	Electromagnetic compatibility, Generic standards - Immunity for residential, commercial and light-industrial environments
EN 61000-6-2	Electromagnetic compatibility, Generic standards - Immunity for industrial environments
EN 61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN ISO 12100-1	Safety of machinery, basic concepts, general principles for design - Basic terminology, methodology
EN ISO 12100-2	Safety of machinery, basic concepts, general principles for design - Technical principles
EN ISO 14121-1	Safety of machinery, Risk assessment – Principles
EN 60034-1	Rotating electrical machines
BS ISO 8528-3	Alternating current generators for generating sets or IEC 60034-22
BS 5000-3	Rotating electrical machines - Requirements for resistance to vibration

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