



Cogeneration

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The company

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Vision

To become the global market leader of electric rotating machines in all our core markets.

Mission

Our mission is to aid the sustainable growth of our customers' businesses.

We will provide innovative solutions inspired by relentless efforts to understand our customers' needs and their specific applications.

We will leverage our extensive technical knowledge, product performance and service to increase the competitiveness, efficiency and productivity of our partners worldwide.

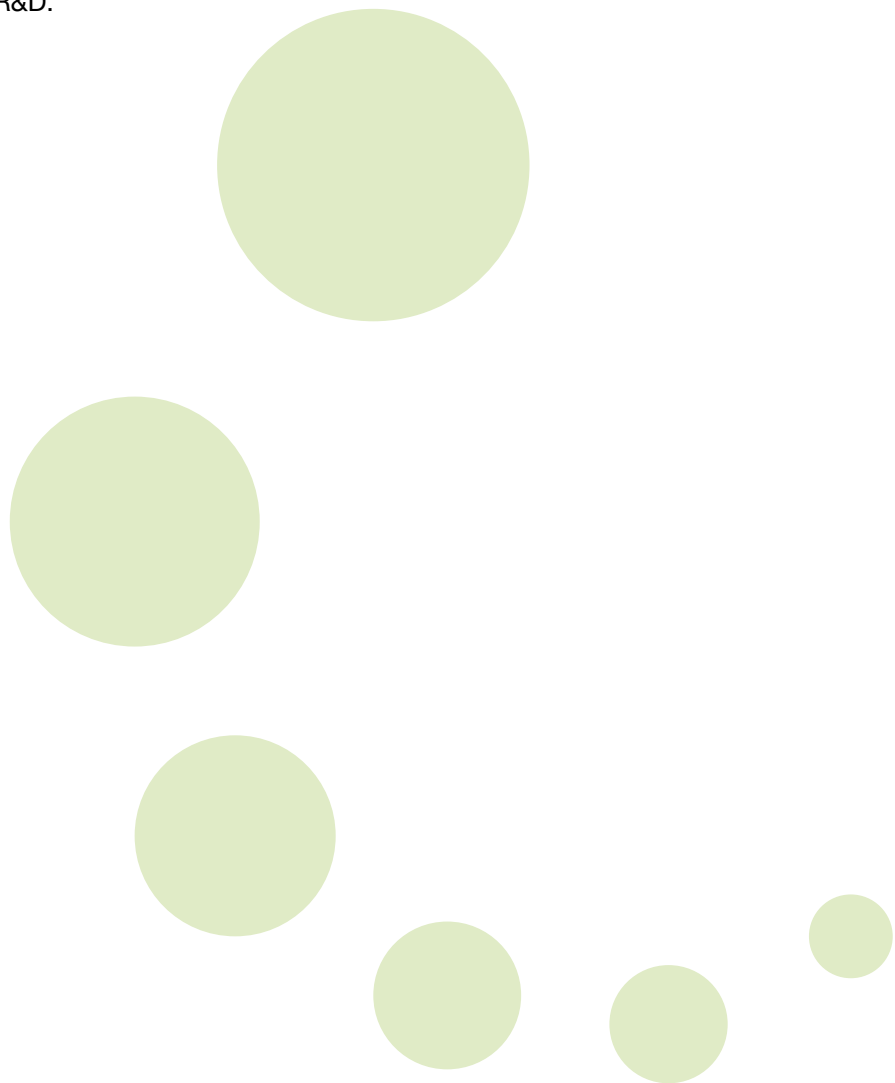


Marelli Motori Group of Companies

The Marelli Motori Group is one of the world's leading designers and manufacturers of generators and electric motors. The company was founded in 1891 and nowadays enjoys worldwide brand recognition thanks to its extended sales, distribution and service networks across four continents and two manufacturing facilities, based in Italy and Malaysia, which produce technologically advanced products sold in more than 120 countries.

Our business model is based on a successful combination of four key elements that enable Marelli Motori to offer innovative and inspired solutions which create value for our customers:

- wide range of innovative products
- skilled people providing sales & support globally
- local for local approach
- continuous investment in R&D.





Core markets

Marelli Motori operates in six key markets:



Marine

Marelli Motori manufactures electric motors and generators for all marine applications where power is required.

Our product applications include:

- propulsion, thrusters, FI-FI system, auxiliaries, dredge pumps, winch and PTO-PTI system
- shaft generators, hybrid machines, offshore, generators at variable speed and emergency.

Motors up to 10.000 kW

Generators up to 12.500 kVA



Power generation

Marelli Motori manufactures generators for all applications where energy is required.

Our product applications include:

- Prime Rated Power (PRP) and Continuous Operating Power (COP)
- stand by
- emergency
- Uninterruptible Power Supply (UPS)
- telecom.

Generators up to 12.500 kVA



Cogeneration (CHP)

Marelli Motori manufactures electric generators for combined heat and power applications.

Our product applications include:

- internal combustion (diesel and gas) engines
- steam and gas turbines.

Generators up to 12.500 kVA



Oil & Gas

Marelli Motori manufactures electric motors and generators for the oil and gas market.

Our product applications include:

- power generation, auxiliary generators and emergency
- centrifugal & reciprocating compressor motors
- heat exchangers & blowers
- pumps (pipeline, water, transfer, cooling, booster)
- extruders / expanders, conveyor system
- mixers, mills and cranes.

Motors up to 1.600 kW

Generators up to 12.500 kVA



Hydropower

Marelli Motori manufactures electric synchronous and a-synchronous generators for hydro power plants which can be utilized in any turbine installation.

Our product applications include:

- Pelton turbines
- Francis turbines
- Kaplan turbines
- Turgo turbines
- Cross-Flow turbines.

Asynchronous generators up to 2.800 kW

Synchronous generators up to 9.000 kVA



Industrial

Marelli Motori manufactures electric motors for a wide variety of industrial applications.

Our product applications include:

- power
- metals
- pulp and paper
- cement
- sugar mill
- water pumping and treatments
- manufacturing processes
- mining
- chemical.

Motors up to 10.000 kW

Our commitment to quality

Quality certifications

The Marelli Motori Group uses an Integrated Management System (IMS) which monitors quality, safety, health and safety and environment standards according to ISO 9001, ISO 14001 and OHSAS 18001.

Our quality certifications guarantee the highest standards in all areas of our operations to ensure:

- outstanding product quality allied to best-in-class service performance
- market leading customer satisfaction by ensuring compliance with all customer requirements from product reliability through to durability and ease of maintenance
- a safe place to work in
- minimal environmental impact in all our operations.

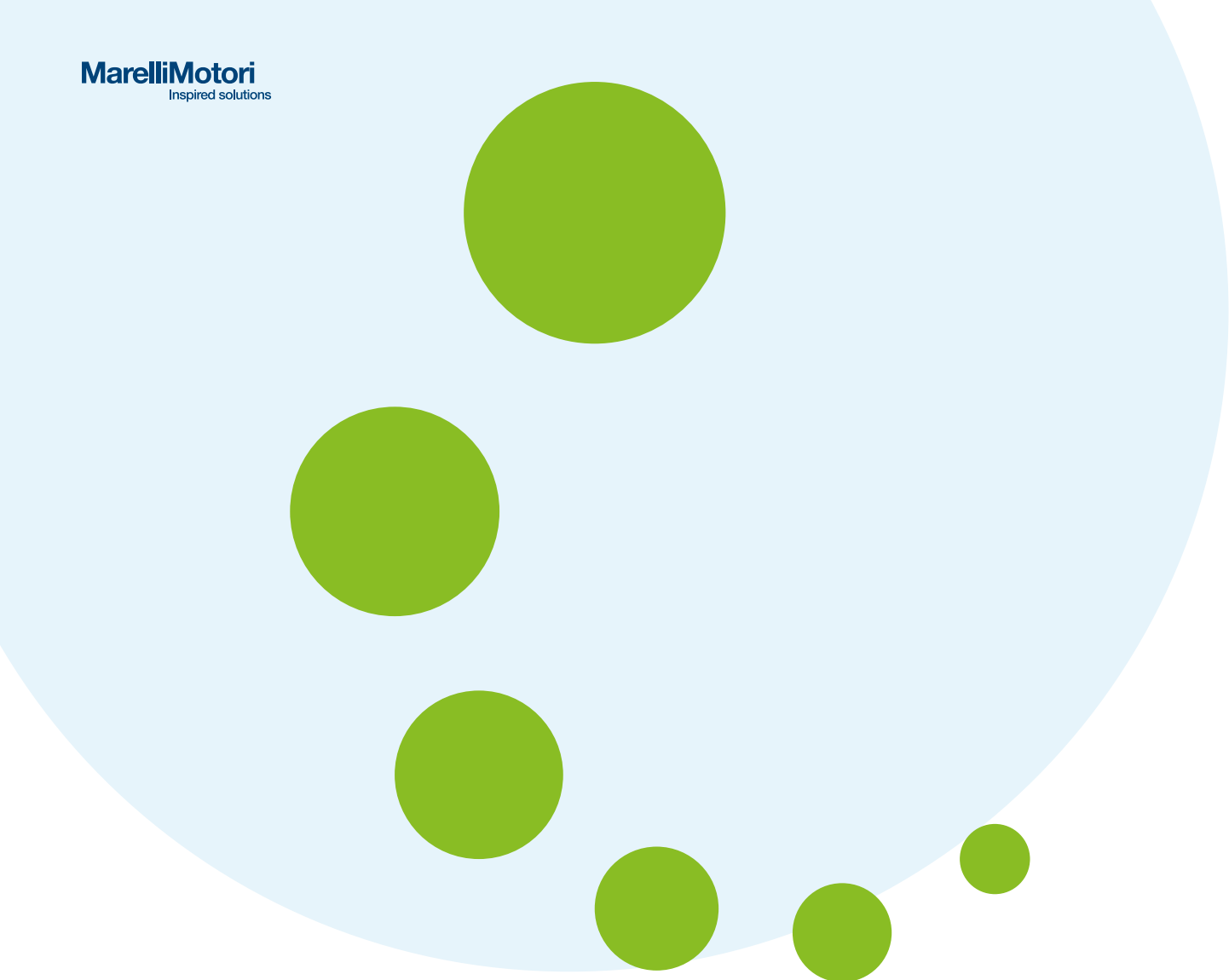


Our quality strategy

The Marelli Motori commitment to quality involves all employees from the boardroom to the shopfloor. Our aim is to help our employees to:

- develop a culture of quality, heightening awareness of quality issues, skills with appropriate and information
- ensure all employees comply with relevant quality regulations and procedures for the highest product quality, health and safety, and environmental standards
- plan and organise their activities with customer-oriented logic with customer satisfaction the ultimate goal at all times
- continuous evaluation of employee proposals for the improvement of processes defining key objectives and goals for the minimisation of environmental impact and health and safety risks of the personnel involved
- develop a culture where individual behavior leads to a safer and healthier workplace
- increase the awareness and involvement of all employees in work-related safety issues
- promote the Marelli Motori commitment to health and safety amongst the entire supply base ensuring a mutually beneficial relationship, enhancing the ability of both to create value.





Inspired solutions

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No compromise on quality

Vertical manufacturing

Marelli Motori's manufacturing process is vertically integrated which ensures we retain control of our supply chain both upstream and downstream.

High quality materials

Our products are manufactured using the highest quality materials and components from internationally recognised brands which are regularly audited to maintain standards.

Our electrical machines are designed and engineered to ensure a long production life, using components, such as bearings, which have been developed for the most demanding customer requirements.

Special impregnation process

The durability of our electrical core components is vitally important in maintaining uptime and productivity. As a result we have developed our own VPI (Vacuum Pressure Impregnation) process in-house, which ensures that the machine windings are sealed against moisture and vibration, in turn aiding mechanical strength and reliability.

Highest efficiency standards

We specialise in offering our customers the highest levels of generator efficiency via the use of technologically advanced solutions.

Our generators are specifically designed to reach exceptionally high performance standards at any speed and during partial load operations.

Machine arrangements offer best-in-class efficiency levels to maximise the cogeneration system energy production.

Marelli Motori dedicated solutions can in fact exceed 98% efficiency.

Reliable expertise

Extensive and diverse product range

Our comprehensive range of generators have been specifically designed to match the diverse requirements of our customers, offering state-of-the-art solutions backed by outstanding application expertise.

Continuous enhancement through R&D

Our R&D focus is driven by a deep customer understanding which is then converted into product development and continuous range enhancement. We often develop projects in partnership with customers, for example by reducing the generator mechanical losses.

Design flexibility

Our flexibility even reaches final assembly, a point at which customers are still able to adapt a design to meet the requirements of their specific application.

Once in the field, our products can be equipped with a range of retrofit devices enabling the continuous refinement and upgrading of machine performance.

Reliable performance

All of our products are extensively tested in our in-house laboratories, to ensure the correct evaluation of electrical and mechanical performances in any working conditions.

Serviceability

Our generators have been specifically designed for ease-of-maintenance, offering quick access to key components to facilitate MRO activities and reduce servicing costs.

All of our products have a friendly user-interface which, together with a global service network available worldwide, ensures best-in-class performance and high ROI.

Sustainable approach

Safety first

All Marelli Motori manufacturing sites comply with the International Standards for Safety OH SAS ISO 18000 (Occupational Health and Safety Assessment Series).

Low carbon footprint

Marelli Motori products are designed to deliver maximum performance and high energy efficiency to achieve the lowest carbon footprint possible.

For example, the energy recovery process in place during test room activities enables us to reduce the impact on the environment and mitigate global warming.

Social responsibility

Marelli Motori's approach to social responsibility is based upon minimising our impact on the environment and preserving the world's natural resources.

A key part of this approach is engage, with all of our stakeholders, including our supply chain and customers, partnering with universities for research and development and supporting local communities with charity activities.





Cogeneration (CHP)

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Generator applications

Steam & GAS Turbines



ODP
MJH
up to 12.500 kVA



TEWAC
MJHR
up to 12.500 kVA



ODP
MJB
up to 6.500 kVA



TEWAC
MJR
up to 6.000 kVA

Internal combustion engines



ODP
MJH
up to 12.500 kVA



ODP
MJB
up to 6.500 kVA

Key

TEWAC Totally Enclosed Water to Air Cooled

ODP Open Drip Proof

AVRs

Digital Regulators

Marelli Motori digital regulation systems provide functional and reliable solutions for the excitation control of synchronous generators. These highly integrated and robust AVRs are fully configurable and guarantee easy commissioning, monitoring and maintenance by user-friendly proprietary HMI (human-machine interface) software.

A wide range of built-in control functions, protections and operating modes make Marelli Motori digital AVRs flexible and suitable for a wide range of applications, including marine, hydro and cogeneration. Our automatic voltage regulator, MEC 100 is DNV type approved.

MEC 100

MEC 20
Three Phase

Analogue Voltage Regulators

Marelli Motori analogue regulation systems are suitable for low and medium voltage machines. The regulators are fully insulated in order to maintain high reliability also with severe ambient conditions (high level of humidity, dust, salt atmosphere) and in case of high vibration level. The AVRs can work both for single and three phase operations.

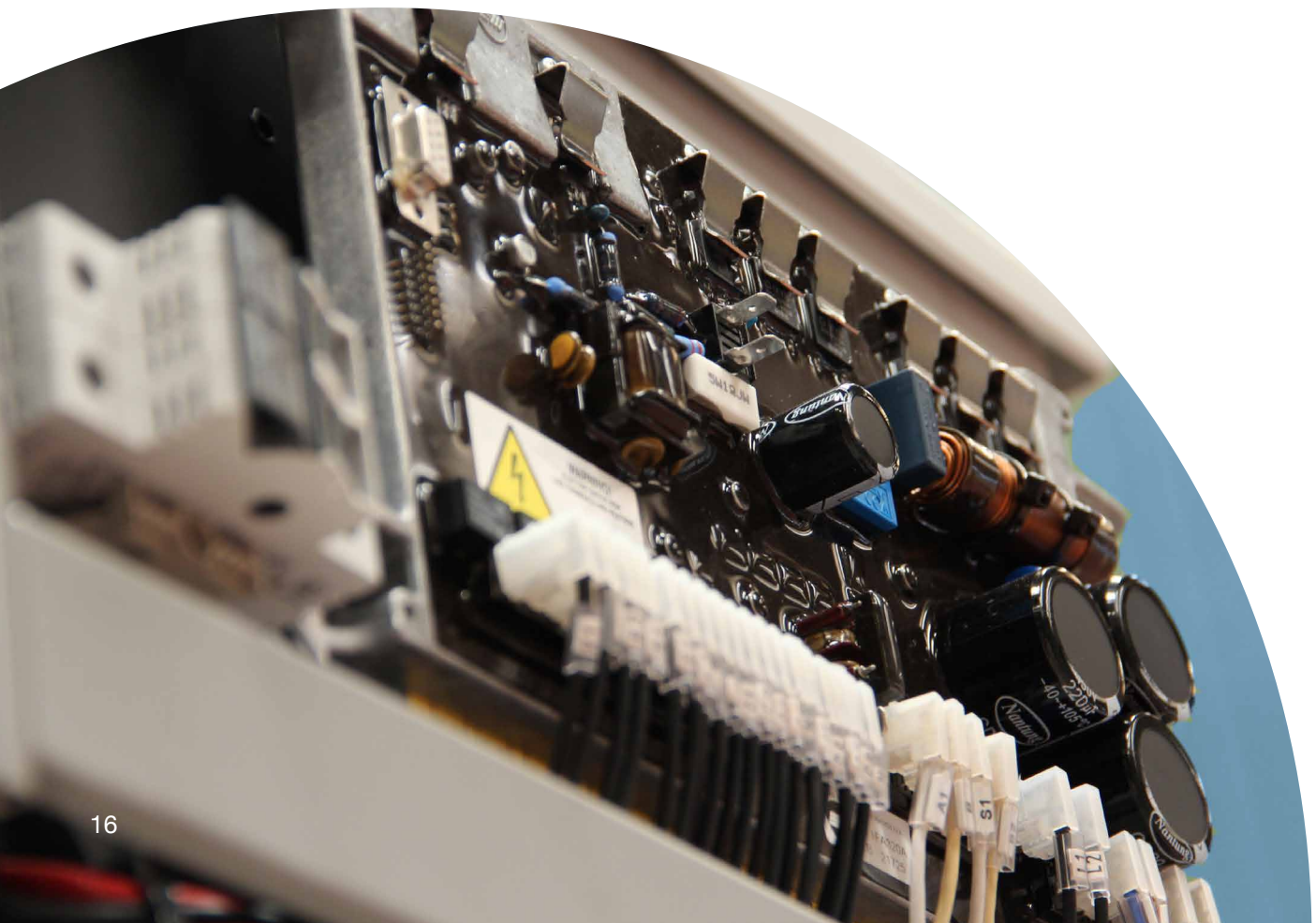
MARK V
Single Phase

MGC I
Single Phase

MGC II
Single Phase

MARK X*
Three Phase

* Dedicated for PMG.



Services

When you partner with Marelli Motori, customers not only gain access to our outstanding portfolio of motors and generators but also world class aftersales support.



Technical support

Marelli Motori prides itself on providing outstanding technical and application support for all its products.

Qualified technical support personnel are always on hand to help with design, retrofitting and revamping solutions for machines and voltage/control systems.



Field Service

Our highly trained aftersales service technicians are capable of deploying, at short notice, anywhere in the world, rapidly diagnosing faults and ensuring fast and efficient maintenance and repair.



Spare parts

Genuine Marelli Motori spare parts are available at the Marelli headquarters, branch offices and service centres located all over the world.



Repairs

When a machine fails it is vital that a repair is performed quickly to ensure a swift return to operation. Marelli Motori can perform repairs of low, medium and high voltage machines either at our manufacturing facility or at the customer premises.



Commissioning

We understand that correct machine commissioning is vital in ensuring that our generators work to the best of their ability from day one.

Marelli Motori provides hands-on assistance during the commissioning phase, guaranteeing that start-up takes place safely and that correct functional parameters for each machine are applied.



Training

Training courses are available all year to users and maintenance people to ensure the correct operation and maintenance of our electrical machines.

Industry standards

IP Code - Degree of protection (IEC - 60034 - 5)

First number		Second number	
2	Machine protected against solid objects greater than 12 mm	2	Dripping water shall have no harmful effect from the vertical up to an angle up to 15°
3	Machine protected against solid objects greater than 2,5 mm	3	Spraying water shall have no harmful effect from the vertical up to an angle up to 60°
4	Machine protected against solid objects greater than 1 mm	4	Splashing water from any direction shall have no harmful effect
5	Machine protected against dust	5	Jets of water from any direction shall have no harmful effect
6	Machine totally protected against tight dust	6	Jets of water from heavy seas from any direction shall have no harmful effect

Example of designation - IP 44

- IP** Code IP
- 4** First number (protection against dust)
- 4** Second number (protection against liquid)

IC Code - Cooling (IEC - 60034 - 6)

Typical fluids

- A** Air
- W** Water

Typical circuit arrangements

- 0** Free circulation
- 4** Machine surface - cooled
- 6** Heat exchanger machine mounted (using the motor surrounding coolant)
- 7** Heat exchanger built in the machine (not using the motor surrounding coolant)
- 8** Heat exchanger machine mounted (not using the motor surrounding coolant)

Typical methods of circulation

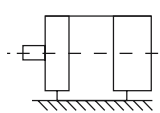
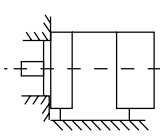
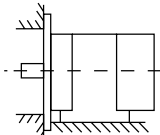
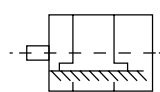
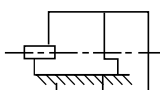
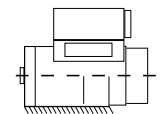
- 0** Free circulation
- 1** Self circulation
- 6** Circulation with independent device

Example of designation - IC 411

- IC** Code IC
- 4** Circuit arrangement
- A** Primary fluid
- 1** Method of circulation for primary fluid
- A** Secondary fluid
- 1** Method of circulation for secondary fluid

Mounting

IEC - 60034 - 7

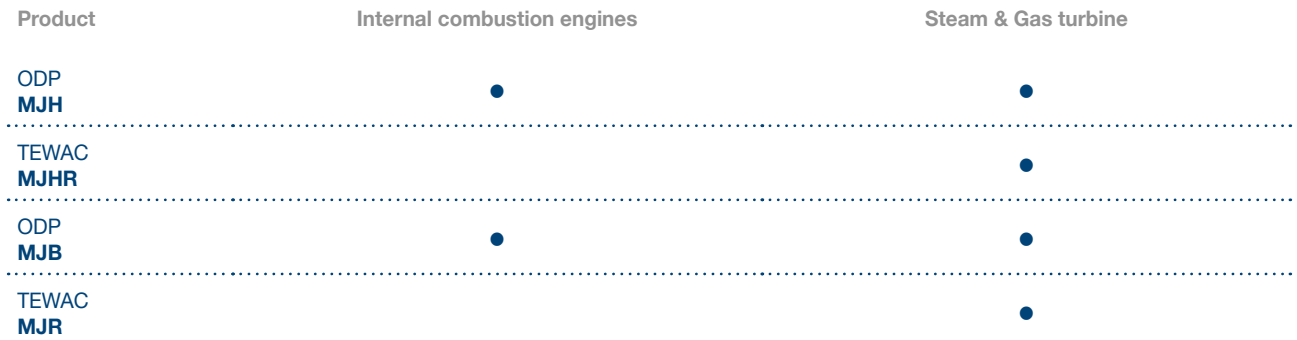
IM B3		Code II: IM 1001 Bearings: 2 Feet: With feet Flange: - Details: - Mounting: Mounting by feet (Feet down)
IM B34		Code II: IM 2101 Bearings: 2 Feet: With feet Flange: With flange Details: End Shield spigot / No access to back / Flange at D - End Mounting: Mounting by feet (Feet down with additional mounting on D - End Side of flange)
IM B35		Code II: IM 2001 Bearings: 2 Feet: With feet Flange: With flange Details: End Shield spigot / No access to back / Flange at D - End Mounting: Mounting by feet / (Feet down with additional mounting on D - End Side)
IM B20		Code II: IM 1101 Bearings: 2 Feet: With raised feet Flange: - Details: - Mounting: Mounting by feet (Feet down)
IM B16		Code II: IM 1301 Bearings: 1 Feet: With raised feet Flange: - Details: Horizontal shaft - One bearing Mounting: -
IM B2		Code II: IM 2105 Bearings: 1 Feet: With feet Flange: With flange Details: - Mounting: -



Generator applications

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• ODP generators: MJB	32
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Product map



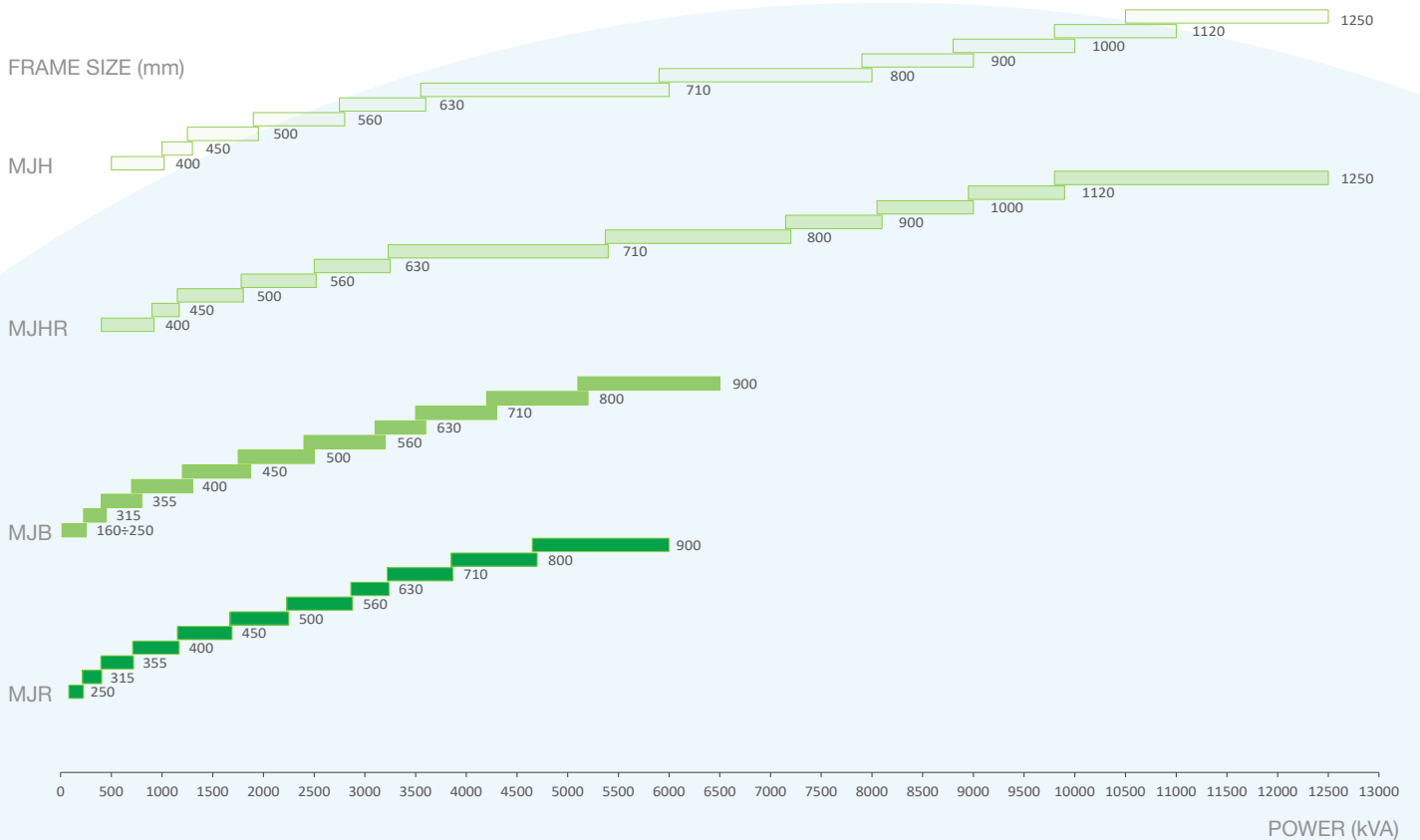
Generator range

Key

- ODP - Open Drip Proof
- ◐ TEWAC - Totally Enclosed Water to Air Cooled
- ODP - Open Drip Proof
- TEWAC - Totally Enclosed Water to Air Cooled

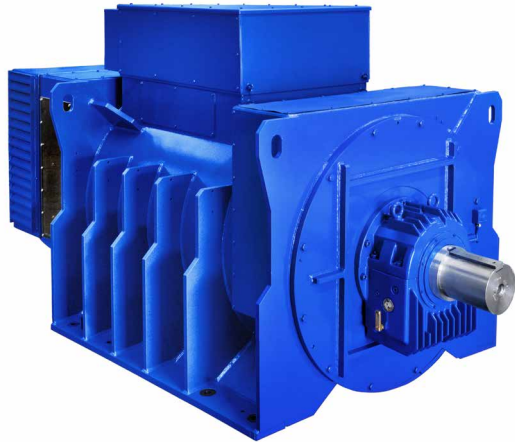
Generator model

- MJH**
- MJHR**
- MJB**
- MJR**





ODP generators: MJH



Model	MJH
Power	Up to 12.500 kVA
Voltages	Up to 15.000 V
Frame	400 ÷ 1.250
Pole	4, 6, and 8 (over contact MM)
Cooling	IC 01
IP	IP 23. Available up to IP 44 with filters
Main applications	Internal combustion engines, Steam & GAS Turbines

	4 POLES	6 POLES	8 POLES
kVA (at 60 Hz)	10.000	12.500	12.500

Certificates and testing

Applicable standards

Generators are designed in compliance with:
IEC EN 60034 - 1
BS 4999 - 5000
VDE 0530
NF 51 - 100
NF 51 - 111
OVE M - 10
NEMA MG 1.32
Generators conform to EU rules.
UL/CSA certifications available on request.
Adherence to ISO 8528 group G performance classes.

Certificate

Test Certificate supplied with the machine.
Material certificates in accordance with EN 10204 : 2001 can be supplied.

Test

See complete list on Test room chapter.

Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Generators for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of spheroidal graphite cast-iron (EN 1563) or grey cast-iron (EN 1561) up to 630 frame size. Made of structural steel (EN 10025 – S235 JR) above.
Shaft	General data Made in carbon steel and obtained by lamination (EN 10083–2 C40–TN). Shaft is obtained by forging from 290 mm diameter and above. The shaft is tested to ensure defect-free performance. Shaft design Double bearing generator: cylindrical shaft with key.
Main terminal box	Mounted on top. Made of formable steels EN 10130.
Fan	Made of aluminum alloy (EN 1706) or structural steel (EN 10025 – S235 JR) depending upon application requirements.

Construction

Enclosure	ODP - Open Drip Proof
Cooling system	IC 01 as per IEC60034-6
Degree of protection	IP 23 as per IEC60034-5
Mounting	Horizontal - IM 1001 or IM 1101 as per IEC 60034-7. Other mounting available on request.



Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses.
<hr/>	
Rotor	<p>Salient pole type. Made by copper flat wire. H class insulated with enamel coating. Winding retaining by pass-through bars of high quality steel. Rotating rectifier: Graetz diode bridge with 6 diodes. Rotors are dynamically balanced with a half key applied to the shaft extension in accordance with IEC 60034-14 to vibration grade normal A. Special vibration level constructions are available.</p>
<hr/>	
Bearing	<p>General data Single or double antifriction bearing grease lubricated (ball or roller type) or oil lubricated sleeve bearing. The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction generators, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours. Locating bearings are on the D end side and floating bearings on the ND end side.</p> <p>Bearing selection Antifriction bearings up to 800 frame size included. Sleeve bearings from 900 frame size included (available for smaller frame sizes)</p> <p>Regreasing system: Up to 400 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is fitted with inner bearing cap and with grease nipple • ND-end bearing is prelubricated with inner bearing cap and without grease nipple <p>450 frame size and above: both bearings are fitted with grease nipple.</p> <p>Bearing insulation ND end bearing can be insulated to prevent any harmful circulating current from passing through the bearing surfaces. Insulated antifriction bearings in standard configuration:</p> <ul style="list-style-type: none"> • 4, 6 poles: insulated ND end bearing from 630 frame size • 8 poles: insulated bearing from 400 frame size <p>All ND end sleeve bearings are insulated as standard.</p>
<hr/>	
Impregnation system	Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerized in an oven.
<hr/>	
Insulation system	<p>Stator: F class insulated with a synthetic enamel Rotor: H class insulated with a synthetic enamel</p>
<hr/>	
Protective treatments	<p>Epoxivinilic and polyacrylic.Total minimum thickness 120 micromillimeters. Epoxivinilic: Epoxy two component products, with vinyl change Polyacrylic: Two components polyurethane product formulated with unmodified hydroxyl acrylic resin.</p>

Operating conditions

Overloads	<p>During continuous duty (S1), the following overloads are allowed:</p> <ul style="list-style-type: none"> 10% for 1 hour 15% for 10 minutes 30% for 4 minutes 50% for 2 minutes <p>These overloads must be occasional and followed by 1 hour of running at normal load or less.</p>
Parallel operations	<p>All generators are provided with an amply sized damper cage and are suitable for parallel operations with other generators, when equipped with the paralleling unit. A power factor regulator (to work in parallel with the main) is available on request.</p>
Transient ratings	<p>All generators can be designed to meet specific reactance values ($x'd$ and $x''d$). Values can be confirmed by contacting Marelli Motori.</p>
Three phase short circuit current	<p>All generators equipped with an overboosting device ensure a three phase short circuit current (I_{cc}) higher than 3 times the rated current (I_n): $I_{cc} > 300\% I_n$</p>
Radio interference	<p>All generators are equipped with Class B Group 1 radio interference filters as defined by EN 55011.</p>
THD (Total Harmonic Distortion)	<p>The no-load voltage wave form is sinusoidal with THD content less than 2%.</p>
Vibrations	<p>Vibration level is in accordance with ISO 10816. Measurement, evaluation and limits of vibration severity are in accordance with IEC 60034-14.</p>



Auxiliary devices

AVR

Automatic voltage regulator mounted on board.

SIZE	TYPE
400 - 450	MEC 20 ANALOG/ DIGITAL
500 - 560	M40FA610A ANALOG
630 - 710	M63FA310A ANALOG
800 - 1250	MEC 100 DIGITAL

Digital AVR available for all sizes on request.

Overboosting device

	Size	Type
Medium voltage	All	CT + Overboosting device
High voltage	All	PMG

Space heaters

Heaters installed at ND-end side (from 500 frame size as standard).

Size	Power (W)
400 - 560	400
630 - 710	600
800 - 900	800
1000	1000
1120	1200
1250	1400

RTD - PT100

RTD devices available (form 630 frame size as standard):

- 1+1 RTD on each phase of stator winding
- 1 RTD on each bearing

Terminals in auxiliary terminal box.

Other configurations available:

- DUPLEX type
- RTD for inlet / outlet air

Optional features

- Low losses magnetic steel
- reinforced construction for high linear vibrations
- flanged shaft for direct coupling with engine flywheel (in case of single bearing solution)
- neutral point terminals in separate terminal box
- increase protection degree up to IP 44 with filters
- lifted feet to couple the generator with engine on existing baseframe
- redundant rotating rectifier with 12 diodes
- insulated bearing and earthing brush
- AVR supplied loose
- automatic power factor control (analog type)
- digital AVR MEC100 for frame 400 – 710 (supplied loose)
- digital AVR MEC100D with diode failure monitoring
- redundant AVR system
- excitation/overboosting PMG mounted on generator
- lubrication system for sleeve bearing
- other options available on request.



TEWAC generators: MJHR



Model	MJHR
Power	Up to 11.000 kVA
Voltages	Up to 15.000 V
Frame	400 ÷ 1.250
Pole	4, 6 and 8 (over contact MM)
Cooling	IC 81W
IP	IP 44. Available up to IP 56.
Main applications	Steam & GAS Turbines

	4 POLES	6 POLES	8 POLES
kVA (at 60 Hz)	10.000	12.500	12.500

Certificates and testing

Applicable standards

Generators are designed in compliance with:
 IEC EN 60034 - 1
 BS 4999 - 5000
 VDE 0530
 NF 51 - 100
 NF 51 - 111
 OVE M - 10
 NEMA MG 1.32
 Generators conform to EU rules.
 UL/CSA certifications available on request.
 Adherence to ISO 8528 group G performance classes.

Certificate

Test Certificate supplied with the machine.
 Material certificates in accordance with EN 10204 : 2001 can be supplied.

Test

See complete list on Test room chapter.



Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Motori generators for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
<hr/>	
Shield	Made of spheroidal graphite cast-iron (EN 1563) or grey cast-iron (EN 1561) up to 630 frame size. Made of structural steel (EN 10025 – S235 JR) above.
<hr/>	
Shaft	<p>General data Made in carbon steel and obtained by lamination (EN 10083–2 C40–TN). Shaft is obtained by forging from 290 mm diameter and above. The shaft is tested at the manufacturer in order to check it is defect-free.</p> <p>Shaft design Double bearing generator: cylindrical shaft with key.</p>
<hr/>	
Main terminal box	Mounted on side (right or left will be selected). Made of formable steels EN 10130.
<hr/>	
Fan	Made of aluminum alloy (EN 1706) or structural steel (EN 10025 – S235 JR) depending upon application requirements.
<hr/>	
Heat Exchanger	<p>Construction Mounted on top of alternator. Double tube made of CuNi 90/10. Copper fins housing. Equipped with water leakage detector.</p> <p>Exchanger data</p> <ul style="list-style-type: none"> • Designed pressure 6 bar • test pressure 10 bar • power: up to 200 kW • water flow: up to 18 m³/h • max glycol: 30% • type of water: fresh water or marine (salt) water • flanges: PN6 – PN10 – Special (ANSI) <p style="padding-left: 40px;">Position can be adjusted to site conditions.</p>
<hr/>	
Construction	
Enclosure	TEWAC - Totally Enclosed Water to Air Cooled.
<hr/>	
Cooling system	IC 81W as per IEC60034-6. Primary fluid (water) is flowing by external water system. Internal air is flowing by a fan mounted on the shaft of the generator at the driven side.
<hr/>	
Degree of protection	IP 44 as per IEC60034-5. (Available up to IP 56)
<hr/>	
Mounting	Horizontal - IM 1001 or IM 1101 as per IEC 60034-7. Other mounting available on request.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses.
Rotor	<p>Salient pole type. Made by copper flat wire. H class insulated with enamel coating. Winding retaining by pass-through bars of high quality steel. Rotating rectifier: Graetz diode bridge with 6 diodes. Rotors are dynamically balanced with a half key applied to the shaft extension in accordance with IEC 60034-14 to vibration grade normal A. Special vibration level construction is available.</p>
Bearing	<p>General data Single or double antifriction bearing grease lubricated (ball or roller type) or oil lubricated sleeve bearing. The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction generators, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours. Locating bearings are on the D end side and floating bearings on the ND end side.</p> <p>Bearing selection Antifriction bearings up to 800 frame size included. Sleeve bearings from 900 frame size included (available for smaller frame sizes)</p> <p>Regreasing system: Up to 400 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is fitted with inner bearing cap and with grease nipple • ND-end bearing is prelubricated with inner bearing cap and without grease nipple <p>450 frame size and above: both bearings are fitted with grease nipple.</p> <p>Bearing insulation ND end bearing can be insulated to prevent any harmful circulating current from passing through the bearing surfaces. Insulated antifriction bearings in standard configuration:</p> <ul style="list-style-type: none"> • 4, 6 poles: insulated ND end bearing from 630 frame size • 8 poles: insulated bearing from 400 frame size <p>All ND end sleeve bearings are insulated as standard.</p>
Impregnation system	Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.
Insulation system	<p>Stator: F class insulated with a synthetic enamel. Rotor: H class insulated with a synthetic enamel.</p>
Protective treatments	<p>Epoxivinilic and polyacrylic. Total minimum thickness 120 micromillimeters. Epoxivinilic: Epoxy two component products, with vinyl change. Polyacrylic: Two components polyurethane product formulated with unmodified hydroxyl acrylic resin.</p>



Operating conditions

Overloads	During continuous duty (S1), the following overloads are allowed: 10% for 1 hour 15% for 10 minutes 30% for 4 minutes 50% for 2 minutes These overloads must be occasional and followed by one hour of running at normal load or less.
Parallel operations	All generators are provided with an amply sized damper cage and are suitable for parallel operations with other generators, when equipped with the paralleling unit. A power factor regulator (to work in parallel with the main) is available on request.
Transient ratings	All generators can be designed to meet specific reactance values ($x'd$ and $x''d$). Values can be confirmed by contacting Marelli Motori.
Three phase short circuit current	All generators equipped with an overboosting device ensure a three phase short circuit current (I_{cc}) higher than three times the rated current (I_n): $I_{cc} > 300\% I_n$
Radio interference	All generators are equipped with Class B Group 1 radio interference filters as defined by EN 55011.
THD (Total Harmonic Distortion)	The no-load voltage wave form is sinusoidal with THD content less than 2%.
Vibrations	Vibration level is in accordance with ISO 10816. Measurement, evaluation and limits of vibration severity are in accordance with IEC 60034-14.

Auxiliary device

AVR

Automatic voltage regulator mounted on board.

Size	Type
400 - 450	MEC 20 analog/ digital
500 - 560	M40FA610A analog
630 - 710	M63FA310A analog
800 - 1.250	MEC 100 digital

Digital AVR available for all sizes on request.

Overboosting device

	Size	Type
Medium voltage	All	CT + Overboosting device
High voltage	All	PMG

Space heaters

Size	Power (W)
400 - 560	400
630 - 710	600
800 - 900	800
1.000	1.000
1.120	1.200
1.250	1.400

Heaters installed at ND-end side (from 500 frame size as standard).

RTD - PT100

RTD devices available (form 630 frame size as standard):

- 1+1 RTD on each phase of stator winding
- 1 RTD on each bearing

Terminals in auxiliary terminal box.

Other configurations available:

- DUPLEX type
- RTD for inlet / outlet air
- RTD for inlet / outlet water

Optional features

- Low losses magnetic steel
- Reinforced construction for high linear vibrations
- flanged shaft for direct coupling with engine flywheel (in case of single bearing solution)
- neutral point terminals in separate terminal box
- terminal box inside air duct (internal terminal box)
- cooling system IC 86W with additional forced ventilation
- cooler mounted on side
- increase protection degree up to IP 54, IP 55 or IP 56
- lifted feet to couple the generator with engine on existing baseframe
- redundant rotating rectifier with 12 diodes
- insulated bearing and earthing brush
- AVR supplied loose
- automatic power factor control (analog type)
- digital AVR MEC100 for frame 400 – 710 (supplied loose)
- digital AVR MEC100D with diode failure monitoring
- redundant AVR system
- excitation/overboosting PMG mounted on generator
- lubrication system for sleeve bearing
- other options available on request.

ODP generators: MJB

MJB



Model	MJB
Power	Up to 6.500 kVA
Voltages	Up to 1.000 V
Frame	160 ÷ 900
Pole	4, 6 and 8 (over contact MM)
Cooling	IC 01
IP	IP 23. Available up to IP 44 with filters.
Main applications	Internal combustion engines, Steam & GAS Turbines

	4 POLES	6 POLES	8 POLES
kVA (at 60 Hz)	5.000	5.000	6.500

Certificates and testing

Applicable standards

Generators are designed in compliance with:
IEC EN 60034 - 1
BS 4999 - 5000
VDE 0530
NF 51 - 100
NF 51 - 111
OVE M - 10
NEMA MG 1.32
Generators conform to EU rules.
UL/CSA certifications available on request.
Adherence to ISO 8528 group G performance classes.

Certificate

Test Certificate supplied with the machine.
Material certificates in accordance with EN 10204 : 2001 can be supplied.

Test

See complete list on Test room chapter.

Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Generators for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of spheroidal graphite cast-iron (EN 1563) or grey cast-iron (EN 1561) up to 630 frame size. Made of structural steel (EN 10025 – S235 JR) above.
Shaft	General data Made in carbon steel and obtained by lamination (EN 10083 – 2 C40 – TN). Shaft is obtained by forging from 290 mm diameter and above. The shaft is tested at the manufacturer in order to check it is defect-free. Shaft design Double bearing generator: cylindrical shaft with key.
Main terminal box	Mounted on top up to 630 frame size. Mounted on side from 710 frame size. Made of formable steels EN 10130.
Fan	Made of aluminum alloy (EN 1706) or structural steel (EN 10025–S235 JR) depending on application requirements.

Construction

Enclosure	ODP - Open Drip Proof
Cooling system	IC 01 as per IEC60034-6
Degree of protection	IP 23 as per IEC60034-5
Mounting	Horizontal - IM 1001 or IM 1101 as per IEC 60034-7. Other mounting available on request.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses
Rotor	<p>Salient pole type. Made by copper flat wire. H class insulated with enamel coating. Winding retaining by pass-through bars of high quality steel. Rotating rectifier: Graetz diode bridge with 6 diodes. Rotors are dynamically balanced with a half key applied to the shaft extension in accordance with IEC 60034-14 to vibration grade normal. A. Special vibration level construction are available.</p>
Bearing	<p>General data Single or double antifriction bearing grease lubricated (ball or roller type) or oil lubricated sleeve bearing. The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction generators, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours. Locating bearings are on the D end side and floating bearings on the ND end side.</p> <p>Bearing selection Antifriction bearings up to 800 frame size included. Sleeve bearings from 900 frame size included (available for smaller frame sizes).</p> <p>Regreasing system: Up to 250 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is prelubricated with inner bearing cap and without grease nipple • ND-end bearing is with shield (2Z) without regreasing system <p>315 - 355 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is fitted with inner bearing cap and with grease nipple • ND-end bearing is with shield (2Z) without regreasing system <p>400 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is fitted with inner bearing cap and with grease nipple • ND-end bearing is prelubricated with inner bearing cap and without grease nipple <p>450 frame size and above: both bearings are fitted with grease nipple.</p> <p>Bearing insulation ND end bearing can be insulated to prevent any harmful circulating current from passing through the bearing surfaces. Insulated antifriction bearings in standard configuration:</p> <ul style="list-style-type: none"> • 4, 6 poles: insulated ND end bearing from 630 frame size • 8 poles: insulated bearing from 400 frame size <p>All ND end sleeve bearings are insulated as standard.</p>
Impregnation system	Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.
Insulation system	<p>Stator: H class insulated with a synthetic enamel. Rotor: H class insulated with a synthetic enamel.</p>
Protective treatments	<p>Epoxivinilic and polyacrylic. Total minimum thickness 120 micromillimeters. Epoxivinilic: Epoxy two component products, with vinyl change. Polyacrylic: Two components polyurethane product formulated with unmodified hydroxyl acrylic resin.</p>

Operating conditions

Overloads	<p>During continuous duty (S1), the following overloads are allowed:</p> <ul style="list-style-type: none"> 10% for 1 hour 15% for 10 minutes 30% for 4 minutes 50% for 2 minutes <p>These overloads must be occasional and followed by one hour of running at normal load or less.</p>
Parallel operations	<p>All generators are provided with a amply sized damper cage and are suitable for parallel operations with other generators, when equipped with the paralleling unit. A power factor regulator (to work in parallel with the main) is available on request.</p>
Transient ratings	<p>All generators can be designed to meet specific reactance values ($x'd$ and $x''d$). Values can be confirmed by contacting Marelli Motori.</p>
Three phase short circuit current	<p>All generators equipped with overboosting device ensure a three phase short circuit current (I_{cc}) higher than 3 times the rated current (I_n):</p> $I_{cc} > 300\% I_n$
Radio interference	<p>All generators are equipped with Class B Group 1 radio interference filters as defined by EN 55011.</p>
THD (Total Harmonic Distortion)	<p>The no-load voltage wave form is sinusoidal with THD content less than 2%.</p>
Vibrations	<p>Vibration level is in accordance with ISO 10816. Measurement, evaluation and limits of vibration severity are in accordance with IEC 60034-14.</p>



Auxiliary devices

AVR

Automatic voltage regulator mounted on board.

Size	Type
160 - 250	MARK V analog
315 - 450	MEC 20 analog/ digital
500 - 560	M40FA610A analog
630 - 710	M63FA310A analog
800 - 900	MEC 100 digital

Digital AVR available for all sizes on request.

Overboosting device

	Size	Type
Low voltage	160 - 450 (4 poles)	Auxiliary winding
	160 - 450 (>4 poles)	Varicomp
	500 - 710 (all polarities)	Varicomp
	800 - 900	PMG

Space heaters

Heaters installed at ND-end side (from 500 frame size as standard).

Size	Power (W)
400 - 560	400
630 - 710	600
800 - 900	800

RTD - PT100

RTD devices available (from 630 frame size as standard):

- 1+1 RTD on each phase of stator winding
- 1 RTD on each bearing

Terminals in auxiliary terminal box.

Other configurations available:

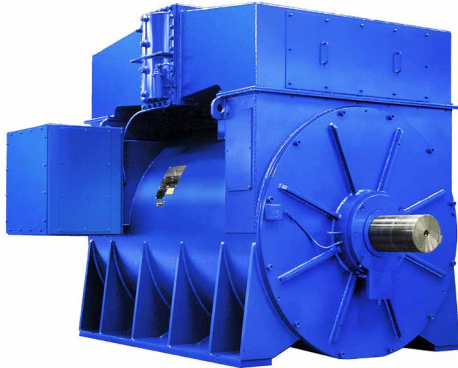
- DUPLEX type
- RTD for inlet / outlet air

Optional features

- Low losses magnetic steel
- reinforced construction for high linear vibrations
- flanged shaft for direct coupling with engine flywheel (in case of single bearing solution)
- neutral point terminals in separate terminal box
- increase protection degree up to IP 44
- lifted feet to couple the generator with engine on existing baseframe
- redundant rotating rectifier with 12 diodes
- insulated bearing and earthing brush
- AVR supplied loose
- automatic power factor control (analog type)
- digital AVR MEC100 for frame 400 – 710 (supplied loose)
- digital AVR MEC100D with diode failure monitoring
- redundant AVR system
- excitation/overboosting PMG mounted on generator
- lubrication system for sleeve bearing
- other options available on request.



TEWAC generators: MJR



Model	MJR
Power	Up to 6.000 kVA
Voltages	Up to 1.000 V
Frame	250 ÷ 900
Pole	4, 6 and 8 (over contact MM)
Cooling	IC 81W/ IC 86W
IP	IP 44. Available up to IP 56.
Main applications	Steam & GAS Turbines

	4 POLES	6 POLES	8 POLES
kVA (at 60 Hz)	4.600	5.000	6.000

Certificates and testing

Applicable standards

Generators are designed in compliance with:
 IEC EN 60034 - 1
 BS 4999 - 5000
 VDE 0530
 NF 51 - 100
 NF 51 - 111
 OVE M - 10
 NEMA MG 1.32
 Generators conform to EU rules.
 UL/CSA certifications available on request.
 Adherence to ISO 8528 group G performance classes.

Certificate

Test Certificate supplied with the machine.
 Material certificates in accordance with EN 10204 : 2001 can be supplied.

Test

See complete list on Test room chapter.

Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Motori generators for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of spheroidal graphite cast-iron (EN 1563) or grey cast-iron (EN 1561) up to 630 frame size. Made of structural steel (EN 10025 – S235 JR) above.
Shaft	<p>General data Made in carbon steel and obtained by lamination (EN 10083–2 C40–N). Shaft is obtained by forging from 290 mm diameter and above. The shaft is tested at the manufacturer in order to check it is defect-free.</p> <p>Shaft design Double bearing generator: cylindrical shaft with key.</p>
Main terminal box	Mounted on side (right or left will be selected). Made of formable steels EN 10130.
Fan	Made of aluminum alloy (EN 1706) or structural steel (EN 10025–S235 JR) depending on application requirements.
Heat Exchanger	<p>Construction Mounted on top of alternator. Double tube made of CuNi 90/10. Copper fins housing. Equipped with water leakage detector.</p> <p>Exchanger data Designed pressure 6 bar. Test pressure 10 bar Power: up to 200 kW Water flow: up to 18 m³/h Max glycol: 30% Type of water: fresh water or marine (salt) water Flanges: PN6 – PN10 – Special (ANSI) Position can be adjusted to site conditions.</p>
Construction	
Enclosure	TEWAC - Totally Enclosed Water to Air Cooled
Cooling system	IC81W as per IEC60034-6. Primary fluid (water) is flowing by external water system. Internal air is flowing by a fan mounted on the shaft of the generator at the driven side.
Degree of protection	IP 44 as per IEC60034-5. (Available up to IP 56)
Mounting	Horizontal - IM 1001 or IM 1101 as per IEC 60034-7. Other mounting available on request.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses.
Rotor	<p>Salient pole type. Made by copper flat wire. H class insulated with enamel coating. Winding retaining by pass-through bars of high quality steel. Rotating rectifier: Graetz diode bridge with 6 diodes. Rotors are dynamically balanced with a half key applied to the shaft extension in accordance with IEC 60034-14 to vibration grade normal A. Special vibration level construction are available.</p>
Bearing	<p>General data Single or double antifriction bearing grease lubricated (ball or roller type) or oil lubricated sleeve bearing. The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction generators, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours. Locating bearings are on the D end side and floating bearings on the ND end side.</p> <p>Bearing selection Antifriction bearings up to 560 frame size included. Sleeve bearings from 630 frame size included (available for smaller frame sizes)</p> <p>Regreasing system: Up to 250 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is prelubricated with inner bearing cap and without grease nipple • ND-end bearing is with shield (2Z) without regreasing system <p>315 - 355 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is fitted with inner bearing cap and with grease nipple • ND-end bearing is with shield (2Z) without regreasing system <p>400 frame size:</p> <ul style="list-style-type: none"> • D-end bearing is fitted with inner bearing cap and with grease nipple • ND-end bearing is prelubricated with inner bearing cap and without grease nipple <p>450 frame size and above: both bearings are fitted with grease nipple.</p> <p>Bearing insulation ND end bearing can be insulated to prevent any harmful circulating current from passing through the bearing surfaces. Insulated antifriction bearings in standard configuration:</p> <ul style="list-style-type: none"> • 4, 6 poles: insulated ND end bearing from 630 frame size • 8 poles: insulated bearing from 400 frame size <p>All ND end sleeve bearings are insulated as standard.</p>
Impregnation system	Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.
Insulation system	Stator: H class insulated with a synthetic enamel. Rotor: H class insulated with a synthetic enamel.
Protective treatments	<p>Epoxivinilic and polyacrylic. Total minimum thickness 120 micromillimeters. Epoxivinilic: Epoxy two component products, with vinyl change. Polyacrylic: Two components polyurethane product formulated with unmodified hydroxyl acrylic resin.</p>

Operating conditions

Overloads

During continuous duty (S1), the following overloads are allowed:

10% for 1 hour

15% for 10 minutes

30% for 4 minutes

50% for 2 minutes

These overloads must be occasional and followed by one hour of running at normal load or less.

Parallel operations

All generators are provided with a amply sized damper cage and are suitable for parallel operations with other generators, when equipped with the paralleling unit. A power factor regulator (to work in parallel with the main) is available on request.

Transient ratings

All generators can be designed to meet specific reactance values ($x'd$ and $x''d$). Values can be confirmed by contacting Marelli Motori.

Three phase short circuit current

All generators equipped with overboosting device to ensure a three phase short circuit current (I_{cc}) higher than 3 times the rated current (I_n): $I_{cc} > 300\% I_n$

Radio interference

All generators are equipped with Class B Group 1 radio interference filters as defined by EN 55011.

THD (Total Harmonic Distortion)

The no-load voltage wave form is sinusoidal with THD content less than 2%.

Vibrations

Vibration level is in accordance with ISO 10816.

Measurement, evaluation and limits of vibration severity are in accordance with IEC 60034-14.

Auxiliary devices

AVR

Automatic voltage regulator mounted on board.

Size	Type
250	MARK V analog
315 - 450	MEC 20 analog/ digital
500 - 560	M40FA610A analog
630 - 710	M63FA310A analog
800 - 900	MEC 100 digital

Digital AVR available for all sizes on request.

Overboosting device

	Size	Type
Low voltage	250 - 450 (4 poles)	Auxiliary winding
	400 - 450 (>4 poles)	Varicomp
	500 - 710 (all polarities)	Varicomp
	800 - 900	PMG

Space heaters

Heaters installed at ND-end side (from 500 frame size as standard).

Size	Power (W)
400 - 560	400
630 - 710	600
800 - 900	800

RTD - PT100

RTD devices available (form 630 frame size as standard):

- 1+1 RTD on each phase of stator winding
- 1 RTD on each bearing

Terminals in auxiliary terminal box.

Other configurations available:

- DUPLEX type
- RTD for inlet / outlet air
- RTD for inlet / outlet water

Optional features

- Low losses magnetic steel
- Reinforced construction for high linear vibrations
- flanged shaft for direct coupling with engine flywheel (in case of single bearing solution)
- neutral point terminals in separate terminal box
- terminal box inside air duct (internal terminal box)
- cooling system IC 86W with additional forced ventilation
- cooler mounted on side
- increase protection degree up to IP 54, IP 55 or IP 56
- lifted feet to couple the generator with engine on existing baseframe
- redundant rotating rectifier with 12 diodes
- insulated bearing and earthing brush
- AVR supplied loose
- automatic power factor control (analog type)
- digital AVR MEC100 for frame 400 – 710 (supplied loose)
- digital AVR MEC100D with diode failure monitoring
- redundant AVR system
- excitation/overboosting PMG mounted on generator
- lubrication system for sleeve bearing
- other options available on request.



Testing facilities

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Facilities

Testing surface is 2.800 sqm. Load testing capacity up to 8 MW. Voltage range during test from 400 to 15.000 V. Test benches designed for testing machines up to 35 t in horizontal and vertical configuration.

Routine and type test

Routine test and type test are carried out in compliance with all major international standards (IEC60034, IEEE, UNI-EN-ISO, MIL-STD), ATEX rules, UL certification and customer specifications.

Standard test < 500 frame (factory line)

- name plate check
- voltage balance
- phase sequence
- no-load voltage regulation
- load test at power factor 0,1
- quadrature voltage drop test (test for parallel operation)
- low speed protection
- permanent short-circuit test with AVR
- winding insulation resistance test
- high voltage test

Routine test (standard test included)

- no load characteristic (magnetic curve)
- short circuit characteristics
- auxiliary check

Standard test ≥ 500 frame (test room)

- name plate check
- winding resistance measurement at cold
- voltage balance
- phase sequence
- no-load voltage regulation
- load test at power factor 0,1
- quadrature voltage drop test (test for parallel operation)
- low speed protection
- permanent short-circuit test with AVR
- winding insulation resistance test
- high voltage test

Type test (routine test included)

- full load heat run test at power factor 0,1
- vibration
- over speed test
- heat run test

Special testing

Special tests for the measurement of mechanical and structural vibration and overspeed tests for high-voltage machines (dissipation factor and partial discharges).

We are able to test drive-motor systems in-house in order to ensure perfect compatibility to customer site conditions.

Special test for generators

- determination of efficiency and losses
- sudden short-circuit test
- waveform deviation and distortion test
- measurement of noise level
- measurement of dissipation factor
- partial discharge test
- shaft voltage measurement
- visual and dimensional check
- voltage response with sudden load change at power factor 0,1
- overload / overcurrent
- IP test



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Our Service team

Marelli Motori offers all-around support throughout the entire operational life of a product.

Our service team is committed to providing a fast, efficient and reliable service that keeps your motors and generators working productively, minimising downtime and lowering whole life costs.

We work closely with our manufacturing facilities to provide the highest levels of aftersales service worldwide, including commissioning, repairs, spare parts supply, technical support, performance enhancements, training courses and maintenance contracts of electrical machines of all makes.

Our service team offers technical advice to help improve performance, reduce operating costs, improve energy efficiency, minimising downtime and improve reliability.

We operate worldwide and are fully in compliance with the international quality rules, utilising highly skilled technicians and precision instruments to keep your machines working.

Aftersales services

Field service

Marelli Motori service personnel are trained to react quickly to any situation anywhere in the world. We rapidly analyse the source of machine problems and prescribe solutions which can get you 'up and running' quickly, minimising downtime and production losses.

We understand that, for a plant to operate efficiently, disruption must be kept to a minimum and that, when problems do occur, corrective action must be implemented quickly and effectively.

Marelli Motori Service is the solution to electrical machine problems, offering prompt technical support and ultra-fast response no matter where in the world you are located:

- diagnostic and functional tests
- start-up of brand-new machines
- revamping of regulation systems
- on the spot repairs
- custom-made maintenance programmes
- periodical inspections.

Commissioning

The Marelli Motori Commissioning Service includes all activities required for the efficient start-up of the machine during installation, to ensure maximum operational effectiveness from the start.

Our inspection processes during commissioning guarantee that the start-up phase takes place safely and that the correct functional parameters are applied.

The full commissioning option is available to buy with every machine purchase.

Repairs

Marelli Motori Service also offers repairs and complete refurbishing of motors and generators of any make or model.

Repairs of low, medium and high voltage machines can take place at the Marelli Motori manufacturing facility or at customer premises, delivered by our constantly expanding service network.

Our high tech facilities, which include computerised machine centres, VPI plants, 3D measurement systems, digital and infrared diagnostics tools, along with our long experience in designing and manufacturing machines, offer the highest quality of repairs and absolute reliability.

All repairs and testing take place in our modern test room that can handle machines up to 5 MW and a 13.8 kV before issuing functional test certificates and detailed repair reports.

Marelli Motori Service overhauls and tests any rotating electrical machine, including third party machines.

The characteristics of the overhaul procedure are:

- manufacturer know-how
- guarantee on the reparation
- original parts used
- tests in the internal testing room
- reports and about the reparations.

In addition Marelli Motori keeps an available stock of machines with common configurations, which can be supplied to customers for temporary use whilst their own machines are overhauled.

Spare parts

Genuine Marelli Motori spare parts are available at the Marelli headquarters, branch offices, and service centres located all over the world, with specific characteristics:

- original and guaranteed parts.
- branded package.
- major equipment assemblies (complete rotors, stators).
- kits of recommended spare parts.
- spare stocks on Marelli Motori branches.

This policy covers all spare parts manufactured by Marelli Motori.

In the event that a component is out-of-production, Marelli Motori Spa will source and propose the suitable interchangeable spare parts. All spare parts are certified by Marelli Motori Spa for the operating conditions proposed.

Technical support

Marelli Motori customers can access our outstanding technical support at all times to ensure their machines are safety, reliable and productive.

Our service engineers and technicians, from headquarter or subsidiaries, are always at our customer's disposal to assist in solving technical issues by either phone or email.

Training

Training courses are available all year round to users and maintenance personnel to ensure the correct operation and maintenance of machines.

Our customised training sections are tailor-made for:

- customers
- users
- operators for the selection operation and maintenance of electrical equipment.

Training courses

Our training courses include:

- electrical generator working principle and troubleshooting
- electric generator setting and maintenance
- digital voltage regulation with MEC100.
- ATEX directive for maintenance of hazardous area motors.

In addition to the training in this brochure, it is possible to specify customised training based on a customer's own requirements. Training language is either in Italian or English. At the end of each course, each participant will receive a personalised certificate, based on the result of a final test.



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