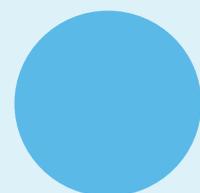
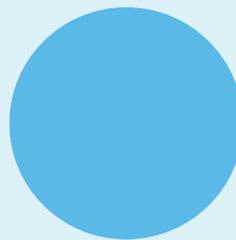
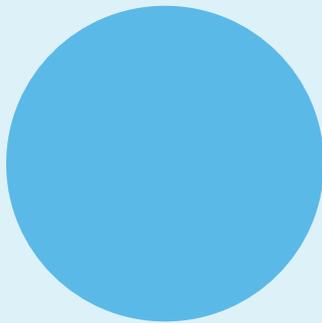
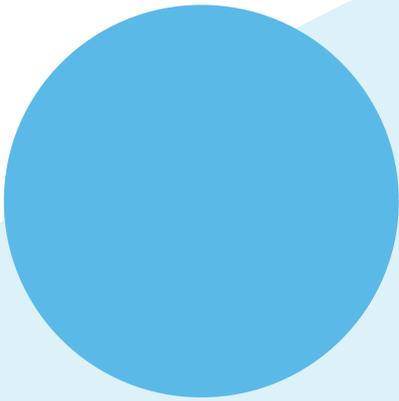




MarelliMotori
Inspired solutions



Hydropower

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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.

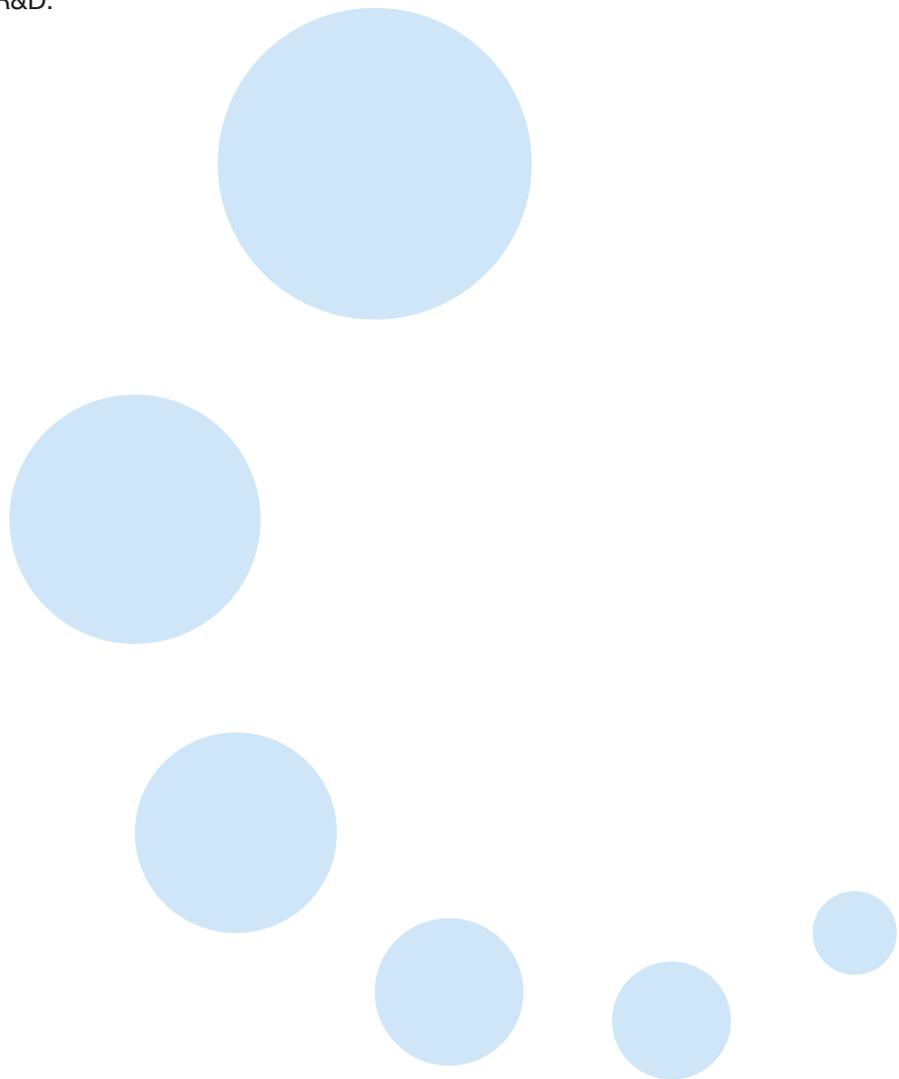


Marelli Motori Group of Companies

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:

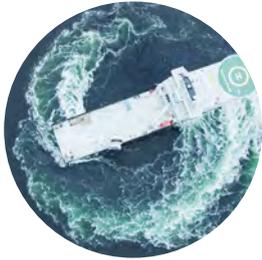
- wide range of innovative products
- skilled people providing sales & support globally
- local for local approach
- continuous investment in R&D.





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 asynchronous 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, 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.

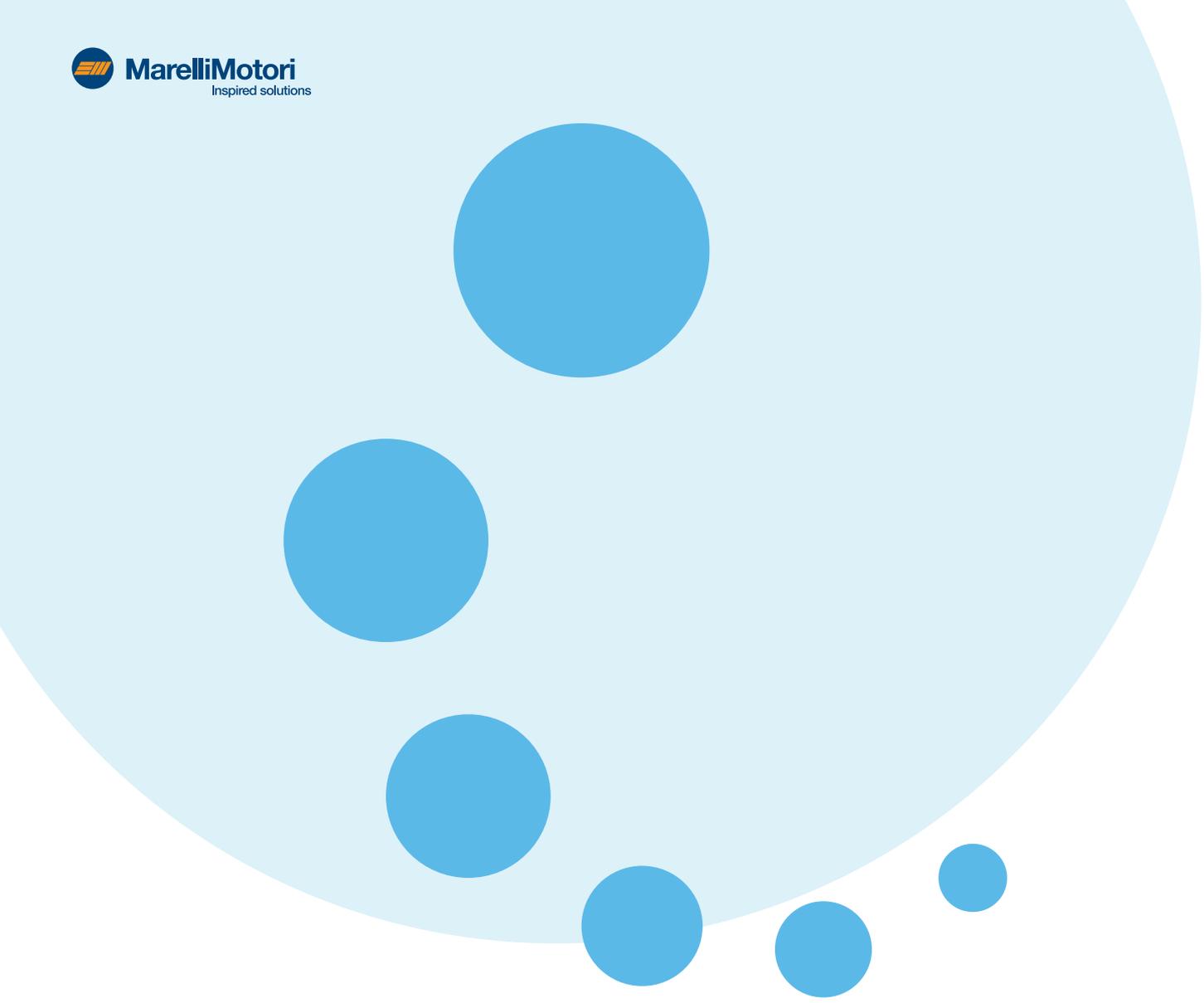


Our quality strategy

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.

Low vibration levels

Rotor balancing procedures are strictly in accordance with International Standards to ensure extremely low vibration levels.

Outstanding high overspeed resistance

We have developed sturdier rotor mechanical designs able to withstand high overspeed in accordance to specific turbine applications.

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 efficiency standards at different load conditions.

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. We can supply also optionals such as oil lube system, brake system, flywheel and neutral earthing resistors, customised to customer's specific application.

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 optimising the integrated system to avoid critical resonances.

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

Non-stop operations can be undertaken during ancillaries replacement and mirror system devices for back-up are standard features.

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

We can test all our machines at full load both in horizontal and vertical position so that the actual working conditions are recreated during testing procedures.

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.





Hydropower

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Generator applications

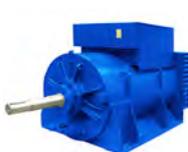
Our synchronous and asynchronous generators are suitable for the following hydropower applications:

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

Synchronous generators for hydropower applications



TEWAC
MJRT
up to 5.000 kVA



ODP
MJT
up to 5.200 kVA



TEWAC
MJHRT
up to 9.200 kVA



ODP
MJHT
up to 9.500 kVA

Asynchronous generators for hydropower applications



ODP
C3G - C4G
up to 2.800 kW

Key

ODP Open Drip Proof

TEWAC Totally Enclosed Water to Air Cooled

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 AVR systems 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 AVR systems flexible and suitable for a wide range of applications, including marine, hydro and cogeneration.

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 AVR systems can work both for single and three phase operations.

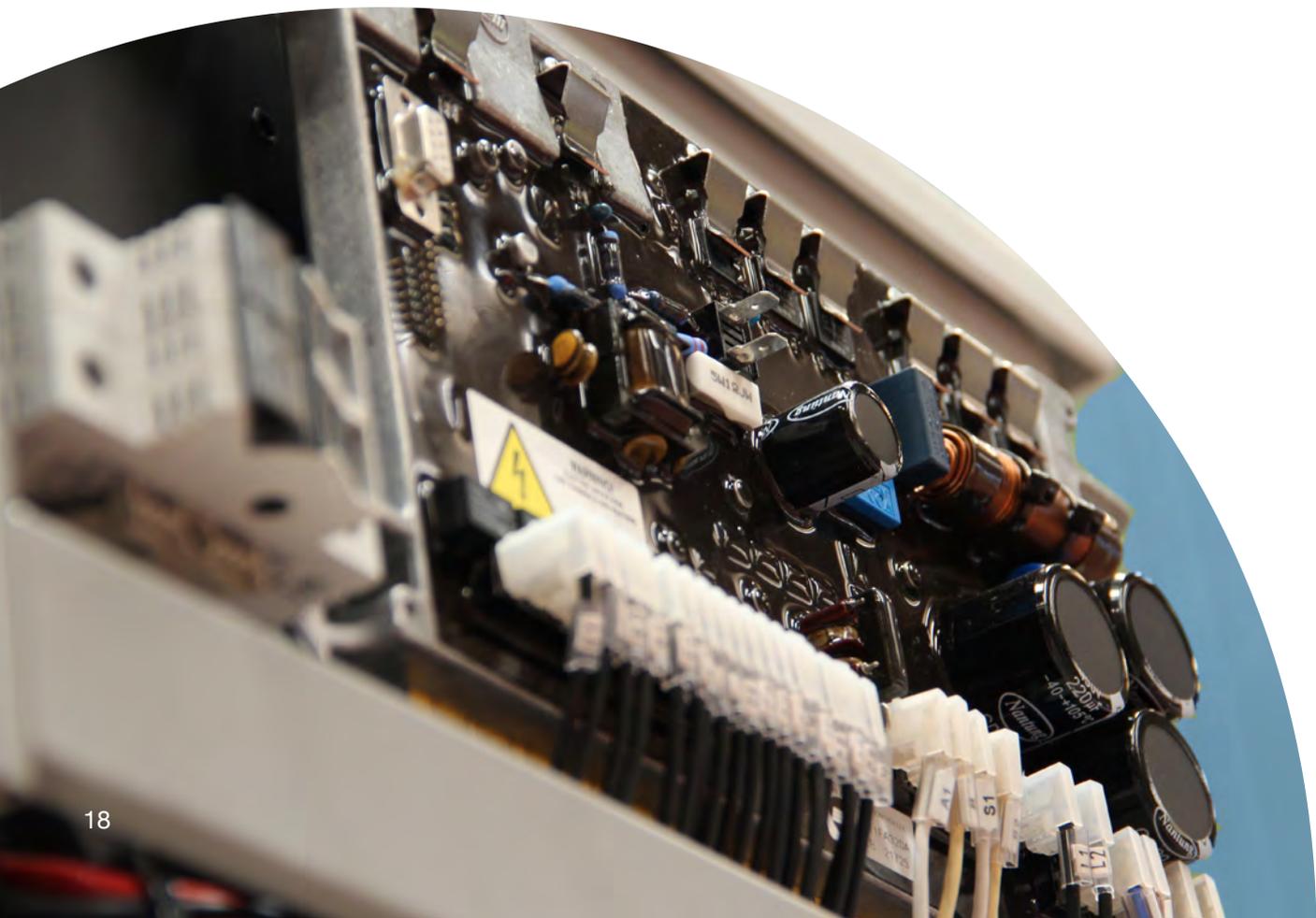
MARK V
Single Phase

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		<p>Code II: IM 1001 Bearings: 2 Feet: With feet Flange: - Details: - Mounting: Mounting by feet (Feet down)</p>
IM B34		<p>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)</p>
IM B35		<p>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)</p>
IM B20		<p>Code II: IM 1101 Bearings: 2 Feet: With raised feet Flange: - Details: - Mounting: Mounting by feet (Feet down)</p>
IM V1		<p>Code II: IM 3011 Bearings: 2 Feet: - Flange: with flange Details: vertical shaft - two bearing Mounting: Mounted on: D - end side of flange, D - end down</p>
IM V10		<p>Code II: IM 4011 Bearings: 2 Feet: - Flange: with flange Details: Special flange at D-end Mounting: Mounted on: D - end side of flange, D - end down</p>



Synchronous generator applications

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Product map

Product	Pelton turbines	Francis turbines	Kaplan turbines	Turgo turbines	Cross-Flow turbines
TEWAC MJRT	●	●	●	●	●
ODP MJT	●	●	●	●	●
TEWAC MJHRT	●	●	●	●	●
ODP MJHT	●	●	●	●	●

Synchronous generator range

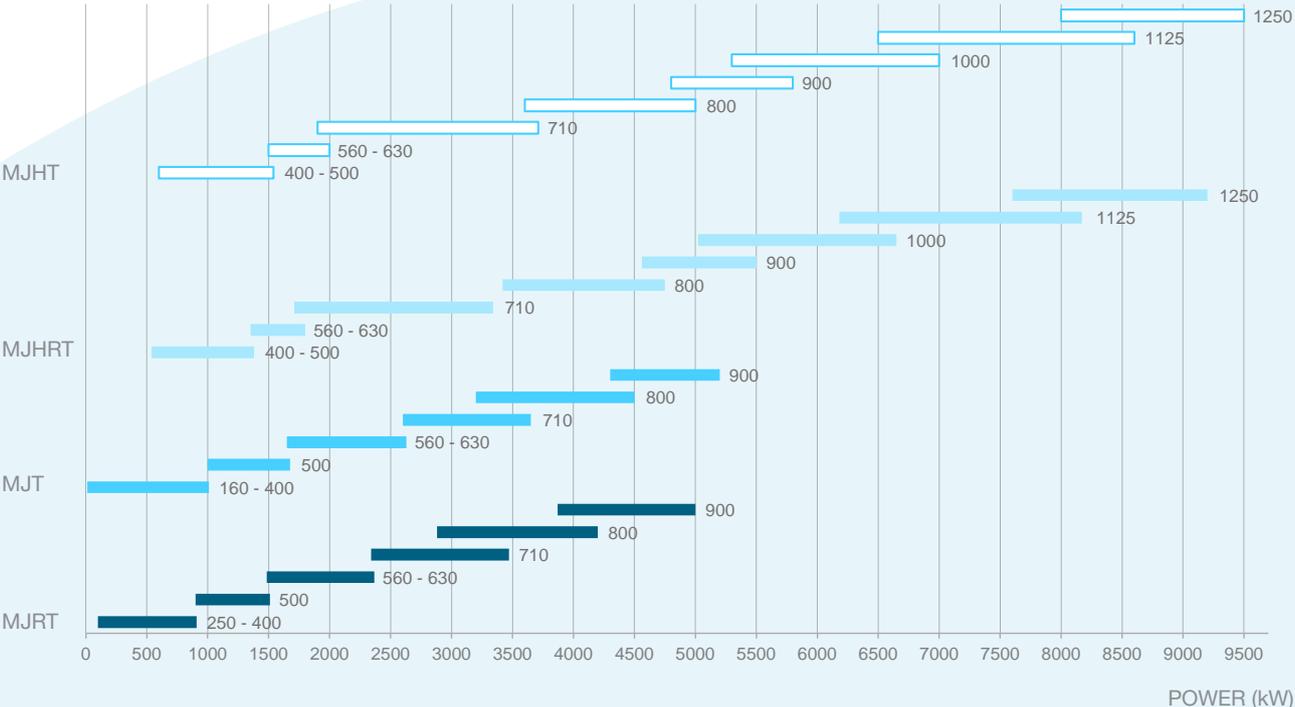
Key

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

Model

- MJRT
- MJT
- MJHRT
- MJHT

FRAME SIZE (mm)



TEWAC synchronous generators: MJRT



Model	MJRT
Power	Up to 5.000 kVA
Voltages	Up to 1.000 V
Frame	250 ÷ 900
Pole	From 4 to 20 poles (over contact MM)
Cooling	IC 81W / IC 86W
IP	IP 44. Available up to IP 56.

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.

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 – 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. Dedicated shaft design available on request. Special shaft design for direct coupling with runner are available on request.</p>
Main terminal box	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.
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 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. Vertical IM 3011 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

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.

Bearing

General data

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.

For vertical mounting the locating bearings are on the ND end side

Bearing selection

Antifriction bearings up to 900 frame size included depending on nominal speed, overspeed and mechanical load on the shaft.

Sleeve bearings available from 400 frame size.

Regreasing system:

Generators in horizontal mounting and equipped with antifriction bearing include a regreasing system.

	ANTIFRICTION BEARINGS		SLEEVE BEARINGS	
	HORIZONTAL MOUNTING	VERTICAL MOUNTING	HORIZONTAL MOUNTING	VERTICAL MOUNTING
AVAILABLE LUBRICATION TYPE D-END / ND-END	BOTH GREASE WITH REGREASING SYSTEM	BOTH GREASE WITH REGREASING SYSTEM	BOTH NATURAL OIL LUBRICATED	BOTH NATURAL OIL LUBRICATED
	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL WITH OIL REFILL SYSTEM (ONLY FOR SPECIAL LOW SPEED CONSTRUCTION)	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL BATH OIL REFILL SYSTEM	BOTH OIL FORCED LUBRICATED	BOTH OIL FORCED LUBRICATED
AVAILABLE LUBRICATION TYPE D-END / ND-END	NATURAL	NATURAL	NATURAL LUBRICATED ARE COOLED BY WATER	
			OIL FORCED LUBRICATED ARE COOLED BY AN EXTERNAL OIL LUBE SYSTEM	

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:

- 4, 6 poles: insulated ND end bearing from 630 frame size
- 8 poles: insulated bearing from 400 frame size
- 10 poles and above: insulated bearing from 500 frame size

All ND end sleeve bearings are insulated as standard.

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

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.

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>
<hr/>	
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>
<hr/>	
Transient ratings	<p>All generators can be designed to meet specific SCR. Values can be confirmed by contacting Marelli Motori.</p>
<hr/>	
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> $I_{cc} > 300\% I_n$
<hr/>	
Radio interference	<p>All generators are equipped with Class B Group 1 radio interference filters as defined by EN 55011.</p>
<hr/>	
THD (Total Harmonic Distortion)	<p>The no-load voltage wave form is sinusoidal with THD content less than 2%.</p>
<hr/>	
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>
<hr/>	
Inertia	<p>All generators can be designed to meet specific inertia value also through flywheel. Values can be confirmed by contacting Marelli Motori.</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

On request:

	SIZE	TYPE
LOW VOLTAGE	250 - 450 (4 POLES)	AUXILIARY WINDING
	400 - 450 (>4 POLES)	VARICOMP
	500 - 710 (ALL POLARITIES)	VARICOMP
	800 - 900	VARICOMP

Space heaters

HEATERS INSTALLED AT ND END SIDE	
SIZE	POWER (W)
400 - 560	400
630 - 710	600
800 - 900	800

RTD - PT100

RTD devices in standard configuration:

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

Terminals in auxiliary terminal box.

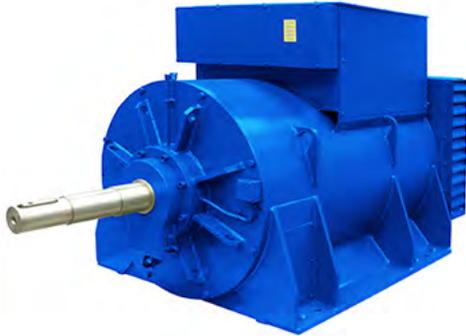
Other configurations available:

- DUPLEX type
- RTD for inlet / outlet air

Optional features

- Reinforced construction for high linear vibrations
- flanged shaft for direct coupling with runner
- 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
- increase protection degree up to IP 44 with filters
- dedicated design to couple the generator with existing baseframe
- air duct system to convey inlet / outlet cooling air
- 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
- arrangement for vibration sensors
- lubrication system for sleeve bearing
- flywheel and locking device for dedicated inertia value
- brake system
- other options available on request.

ODP synchronous generators: MJT



Model	MJT
Power	Up to 5.200 kVA
Voltages	Up to 1.000 V
Frame	160 ÷ 900
Pole	From 4 to 20 poles (over contact MM)
Cooling	IC 01
IP	IP 23. Available up to IP 44 with filters.

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.

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	<p>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.</p>
Shield	<p>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.</p>
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. Dedicated shaft design available on request. Special shaft design for direct coupling with runner are available on request.</p>
Main terminal box	<p>Mounted on top up to 900 frame size. Made of formable steels EN 10130.</p>
Fan	<p>Made of aluminum alloy (EN 1706) or structural steel (EN 10025–S235 JR) depending on application requirements.</p>
Construction	
Enclosure	<p>ODP - Open Drip Proof</p>
Cooling system	<p>IC 01 as per IEC60034-6</p>
Degree of protection	<p>IP 23 as per IEC60034-5</p>
Mounting	<p>Horizontal - IM 1001 or IM 1101 as per IEC 60034-7. Vertical IM 3011 as per IEC 60034-7 Other mounting available on request.</p>

Technical data

Stator/Rotor core Laminated and enamel-insulated on both sides to minimise eddy-current losses

Rotor

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.

Bearing

General data
 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.
 For vertical mounting the locating bearings are on the ND end side

Bearing selection

Antifriction bearings up to 900 frame size included depending on nominal speed, overspeed and mechanical load on the shaft.
 Sleeve bearings available from 400 frame size.

Regreasing system:

Generators in horizontal mounting and equipped with antifriction bearing include a regreasing system.

	ANTIFRICTION BEARINGS		SLEEVE BEARINGS	
	HORIZONTAL MOUNTING	VERTICAL MOUNTING	HORIZONTAL MOUNTING	VERTICAL MOUNTING
AVAILABLE LUBRICATION TYPE D-END / ND-END	BOTH GREASE WITH REGREASING SYSTEM	BOTH GREASE WITH REGREASING SYSTEM	BOTH NATURAL OIL LUBRICATED	BOTH NATURAL OIL LUBRICATED
	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL WITH OIL REFILL SYSTEM (ONLY FOR SPECIAL LOW SPEED CONSTRUCTION)	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL BATH OIL REFILL SYSTEM	BOTH OIL FORCED LUBRICATED	BOTH OIL FORCED LUBRICATED
AVAILABLE BEARING COOLING SYSTEM	NATURAL	NATURAL	NATURAL LUBRICATED ARE COOLED BY WATER	
			OIL FORCED LUBRICATED ARE COOLED BY AN EXTERNAL OIL LUBE SYSTEM	

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:

- 4, 6 poles: insulated ND end bearing from 630 frame size
- 8 poles: insulated bearing from 400 frame size
- 10 poles and above: insulated bearing from 500 frame size

All ND end sleeve bearings are insulated as standard.

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
 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.

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 SCR. Values can be confirmed by contacting Marelli Motori.

Three phase short circuit current

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

$I_{cc} > 300\% I_n$

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.

Inertia

All generators can be designed to meet specific inertia value also through flywheel. Values can be confirmed by contacting Marelli Motori.

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	VARICOMP

Space heaters

HEATERS INSTALLED AT ND END SIDE	
SIZE	POWER (W)
400 - 560	400
630 - 710	600
800 - 900	800

RTD - PT100

RTD devices in standard configuration:

- 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

- Reinforced construction for high linear vibrations
- flanged shaft for direct coupling with runner
- neutral point terminals in separate terminal box
- increase protection degree up to IP 44 with filters
- dedicated design to couple the generator with existing baseframe
- air duct system to convey inlet / outlet cooling air
- 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
- arrangement for vibration sensors
- lubrication system for sleeve bearing
- flywheel and locking device for dedicated inertia value
- brake system
- other options available on request.



TEWAC synchronous generators: MJHRT



Model	MJHRT
Power	Up to 9.200 kVA
Voltages	Up to 15.000 V
Frame	400 ÷ 1.250
Pole	From 4 to 20 poles (over contact MM)
Cooling	IC 81W
IP	IP 44. Available up to IP 56.

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.

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 – 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. Dedicated shaft design available on request. Special shaft design for direct coupling with runner are available on request.</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 upon application requirements.
Heat Exchanger	<p>Construction</p> <ul style="list-style-type: none"> • Mounted on top of alternator • double tube made of CuNi 90/10 • copper fins housing • equipped with water leakage detector. <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 • Flanges: PN6 – PN10 – Special (ANSI) • Position can be adjusted to site conditions.
Construction	
Enclosure	TEWAC - Totally Enclosed Water to Air Cooled
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.
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. Vertical IM 3011 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 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.

Bearing

General data
 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.
 For vertical mounting the locating bearings are on the ND end side

Bearing selection

Antifriction bearings up to 900 frame size included depending on nominal speed, overspeed and mechanical load on the shaft.
 Sleeve bearings available from 400 frame size.

Regreasing system:

Generators in horizontal mounting and equipped with antifriction bearing include a regreasing system.

	ANTIFRICTION BEARINGS		SLEEVE BEARINGS	
	HORIZONTAL MOUNTING	VERTICAL MOUNTING	HORIZONTAL MOUNTING	VERTICAL MOUNTING
AVAILABLE LUBRICATION TYPE D-END / ND-END	BOTH GREASE WITH REGREASING SYSTEM	BOTH GREASE WITH REGREASING SYSTEM	BOTH NATURAL OIL LUBRICATED	BOTH NATURAL OIL LUBRICATED
	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL WITH OIL REFILL SYSTEM (ONLY FOR SPECIAL LOW SPEED CONSTRUCTION)	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL BATH OIL REFILL SYSTEM	BOTH OIL FORCED LUBRICATED	BOTH OIL FORCED LUBRICATED
AVAILABLE BEARING COOLING SYSTEM	NATURAL	NATURAL	NATURAL LUBRICATED ARE COOLED BY WATER	
			OIL FORCED LUBRICATED ARE COOLED BY AN EXTERNAL OIL LUBE SYSTEM	

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:

- 4, 6 poles: insulated ND end bearing from 630 frame size
- 8 poles: insulated bearing from 400 frame size
- 10 poles and above: insulated bearing from 500 frame size

All ND end sleeve bearings are insulated as standard.

Impregnation system Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.

Insulation system Stator: F class insulated with a synthetic enamel.
 Rotor: H class insulated with a synthetic enamel.

Protective treatments 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.

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 SCR. Values can be confirmed by contacting Marelli Motori.

Three phase short circuit current

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

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.

Inertia

All generators can be designed to meet specific inertia value also through flywheel. Values can be confirmed by contacting Marelli Motori.



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 - 1.250	MEC 100 DIGITAL
DIGITAL AVR AVAILABLE FOR ALL SIZES ON REQUEST.	

Overboosting device

On request:

	SIZE	TYPE
MEDIUM VOLTAGE	ALL	CT + OVERBOOSTING DEVICE
HIGH VOLTAGE	ALL	VT + CT + OVERBOOSTING DEVICE

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

RTD - PT100

RTD devices in standard configuration:

- 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

- Reinforced construction for high linear vibrations
- flanged shaft for direct coupling with runner
- 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
- increase protection degree up to IP 44 with filters
- dedicated design to couple the generator with existing baseframe
- air duct system to convey inlet / outlet cooling air
- 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
- arrangement for vibration sensors
- lubrication system for sleeve bearing
- flywheel and locking device for dedicated inertia value
- brake system
- other options available on request.

ODP synchronous generators: MJHT



Model	MJHT
Power	Up to 9.500 kVA
Voltages	Up to 15.000 V
Frame	400 ÷ 1.250
Pole	From 4 to 20 poles (over contact MM)
Cooling	IC 01
IP	IP 23. Available up to IP 44 with filters.

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.

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 – 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. Dedicated shaft design available on request. Special shaft design for direct coupling with runner are available on request.</p>
Main terminal box	Mounted on top up to 900 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. Vertical IM 3011 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

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.

Bearing

General data

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.

For vertical mounting the locating bearings are on the ND end side.

Bearing selection

Antifriction bearings up to 900 frame size included depending on nominal speed, overspeed and mechanical load on the shaft.

Sleeve bearings available from 400 frame size.

Regreasing system:

Generators in horizontal mounting and equipped with antifriction bearing include a regreasing system.

	ANTIFRICTION BEARINGS		SLEEVE BEARINGS	
	HORIZONTAL MOUNTING	VERTICAL MOUNTING	HORIZONTAL MOUNTING	VERTICAL MOUNTING
AVAILABLE LUBRICATION TYPE D-END / ND-END	BOTH GREASE WITH REGREASING SYSTEM	BOTH GREASE WITH REGREASING SYSTEM	BOTH NATURAL OIL LUBRICATED	BOTH NATURAL OIL LUBRICATED
	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL WITH OIL REFILL SYSTEM (ONLY FOR SPECIAL LOW SPEED CONSTRUCTION)	D-END: GREASE WITH REGREASING SYSTEM ND END: OIL BATH OIL REFILL SYSTEM	BOTH OIL FORCED LUBRICATED	BOTH OIL FORCED LUBRICATED
AVAILABLE BEARING COOLING SYSTEM	NATURAL	NATURAL	NATURAL LUBRICATED ARE COOLED BY WATER	
			OIL FORCED LUBRICATED ARE COOLED BY AN EXTERNAL OIL LUBE SYSTEM	

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:

- 4, 6 poles: insulated ND end bearing from 630 frame size
- 8 poles: insulated bearing from 400 frame size
- 10 poles and above: insulated bearing from 500 frame size

All ND end sleeve bearings are insulated as standard.

Impregnation system

Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.

Insulation system

Stator: F class insulated with a synthetic enamel.

Rotor: H class insulated with a synthetic enamel.

Protective treatments

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.

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>
<hr/>	
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>
<hr/>	
Transient ratings	<p>All generators can be designed to meet specific SCR. Values can be confirmed by contacting Marelli Motori.</p>
<hr/>	
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): $I_{cc} > 300\% I_n$</p>
<hr/>	
Radio interference	<p>All generators are equipped with Class B Group 1 radio interference filters as defined by EN 55011.</p>
<hr/>	
THD (Total Harmonic Distortion)	<p>The no-load voltage wave form is sinusoidal with THD content less than 2%.</p>
<hr/>	
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>
<hr/>	
Inertia	<p>All generators can be designed to meet specific inertia value also through flywheel. Values can be confirmed by contacting Marelli Motori.</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	VT + CT + OVERBOOSTING DEVICE

Space heaters

HEATERS INSTALLED AT ND END SIDE	
SIZE	POWER (W)
400 - 560	400
630 - 710	600
800 - 900	800

RTD - PT100

RTD devices in standard configuration:

- 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

- Reinforced construction for high linear vibrations
- flanged shaft for direct coupling with runner
- neutral point terminals in separate terminal box
- increase protection degree up to IP 44 with filters
- dedicated design to couple the generator with existing baseframe
- air duct system to convey inlet / outlet cooling air
- 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
- arrangement for vibration sensors
- lubrication system for sleeve bearing
- flywheel and locking device for dedicated inertia value
- brake system
- other options available on request.





Asynchronous generator applications

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Product map

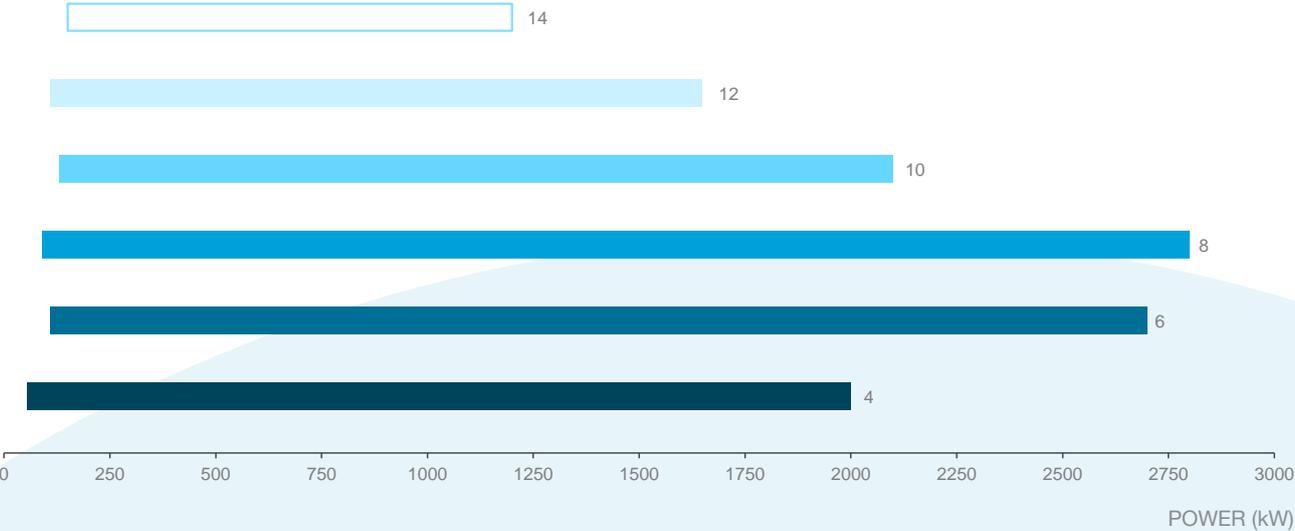


Asynchronous generator range

Key

- C3G - C4G 14 POLES
- ◐ C3G - C4G 12 POLES
- ◑ C3G - C4G 10 POLES
- ◒ C3G - C4G 6 POLES
- C3G - C4G 4 POLES

POLES



Three phase asynchronous generators: C3G - C4G



Model	C3G - C4G
Power	Up to 2.800 kW
Voltages	Up to 6.600 V
Frame	315 ÷ 710
Pole	From 4 to 16 poles (over contact MM)
Cooling	IC 01
IP	IP 23. Available up to IP 56.

Certificates and testing

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. 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 grey cast-iron (EN 1561 – GJL 200) up to 500 frame size asynchronous generators. Made of hot-rolled structural steel (EN 10025 – S235 JR) from size 560 and above.
Shaft	General data Made in carbon steel (EN 10083 – 2 C40 – TN) up to 450 frame and hot-rolled structural steel from 500 frame (EN 10025 – S355 JR). Shaft design Cylindrical shaft with key. The shaft can be designed to install the flywheel, the brake or the specific client's requirements (hollow shaft)
Main terminal box	Usually mounted on top can be located on the sides of the frame. Made of cold-rolled formable steels EN 10025 – S235JR. An oversized terminal box can be supplied according to customer requirements.
Internal fan	Made of aluminum alloy up to 400 frame. Made of hot-rolled structural steel above (EN 10025 – S235 JR).

Construction

Enclosure	ODP – Open Drip Proof
Cooling system	IC 01 as per IEC60034-6 Free circulation. Internal air is flowing by a fan mounted on the shaft of the asynchronous generators at the driven side. The cooling air is taken on the ND-end, the air outlet is on the D-end. On request for variable speed application an external ventilation unit can be supplied to get the IC 06 cooling type.
Degree of protection	IP 23 as per IEC60034-5. The series can be supplied with air inlet filters to achieve the IP 44 rating. Higher IP is available on request with different construction (TEFC, TEAAC, TEWAC)
Mounting	IM B3, V1 and V10 as per IEC60034-7.

Technical data

Stator/Rotor core	<p>Laminated and enamel-insulated on both sides to minimise eddy-current losses.</p> <p>The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack with housing is thereby impregnated in an epoxy-resin VPI. The subsequent heat treatment hardens the resin.</p>
Rotor	<p>Short circuit rotor type.</p> <p>Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft.</p> <p>The rotor winding can be either a pressure die cast aluminum or a copper bar construction.</p> <p>Full shaft or drilled shaft according to turbine type. The rotor is dynamically balanced with half a key.</p>
Bearing	<p>General data</p> <p>Asynchronous generators are supplied with rolling bearing as standard.</p> <p>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.</p> <p>Usually locating bearing is on the D end side and floating bearing on the ND end side on horizontal machines.</p> <p>Both bearings are fitted with a regreasing system. The used grease is removed through a valve locked in the outer bearing cover.</p> <p>Where special design is requested the proper types and sizes of bearings are selected according to customer requirements, turbine type and loads and confirmed by proven calculations .</p> <p>Using cylindrical roller bearings high radial forces can be supported at the generator shaft end. Radial forces below the minimum value can lead to bearing damages within a few hours.</p> <p>Rolling bearings are lubricated with grease or oil; sliding bearings are lubricated with internal oil or with oil circulated by an external lubrication unit specially developed for hydro generators.</p>
Impregnation system	<p>Stator is VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.</p>
Insulation system	<p>Low voltage.</p> <p>Stator: F class insulated with a synthetic enamel. (H class insulation available on request)</p>
Protective treatments	<p>Dedicated protective enamel is applied on the winding.</p>
Parallel operation	<p>The most common operation for the asynchronous generators is connected with the electrical grid.</p> <p>In this case the generator takes the necessary reactive power from the mains, and additional excitation systems are not necessary.</p> <p>The mains maintains voltage and frequency so that separate regulators are not necessary.</p>
Isolated operation	<p>When using asynchronous generators in isolated operation, the excitation is realized through the parallel connection of a capacitor bank.</p> <p>Its dimensioning depends on the generator power and on the generator parameters.</p> <p>The operating mode is considerably more expensive than the parallel operation with the mains and is only used for lower outputs.</p>

Isolated operation

When compared to a synchronous generator, the induction generator has several advantages:

- No voltage regulator is required, nor the exciter. Voltage and frequency are controlled by the electrical grid.
- Exciter is not required. Reactive power is provided by the grid.
- Simple construction; no brushes, diodes, or collector rings.
- Lower maintenance costs.

Optional features

- RTD's on winding, bearings and air / water circuit
- flanged shaft or special shaft end on both sides
- increase protection degree up to IP 56
- speed measurement (encoder or tachogenerators)
- vibration sensors
- special bearings
- dedicated design for variable speed applications
- anticondensation heaters
- flywheel
- hydraulic brake
- oil lube system
- filters on air inlet / outlet
- 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

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

Routine test (standard test included)

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

Type test (routine test included)

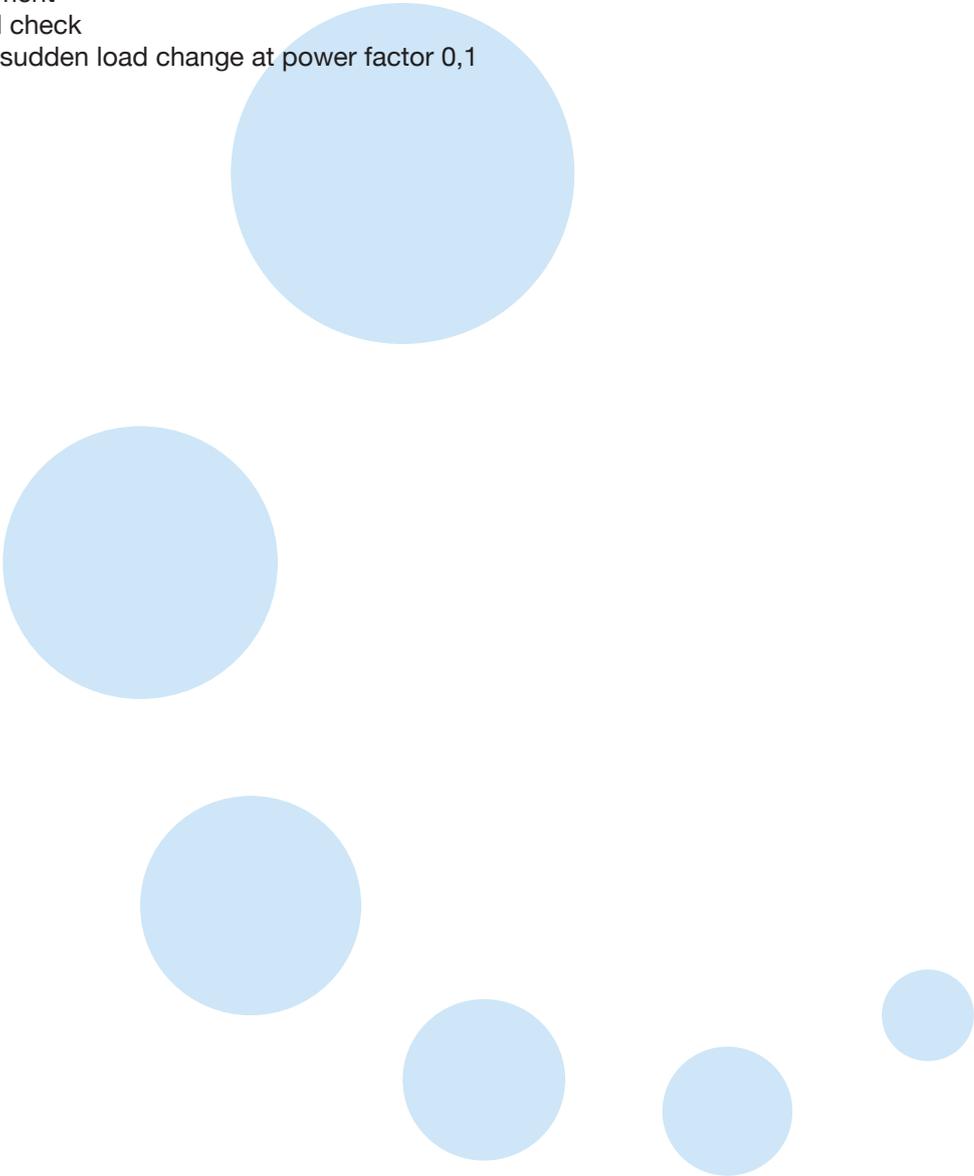
- full load heat run test at power factor 0,1
- vibration
- over speed test
- heat run test

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
- 





Services

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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 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 the 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

Our courses are held in Italian or English (other languages on request) at our headquarters in Arzignano (Vicenza), but it is also possible to arrange them at other locations. At the end of each course you will receive a personalized certificate.

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:

- Operating principles of electric generators and troubleshooting
- Calibration and maintenance of electrical generators
- Digital control with MEC100 AVR
- ATEX Directive for the maintenance of motors for potentially explosive areas
- Use and maintenance - asynchronous motors.

Customized courses are available on request, please contact service@MarelliMotori.com



Contacts

Italy HQ

Marelli Motori S.p.A.
Via Sabbionara 1
36071 Arzignano (VI)
Italy
(T) +39 0444 479 711
(F) +39 0444 479 888
info@MarelliMotori.com
sales@MarelliMotori.com
service@MarelliMotori.com

Asia Pacific

Marelli Asia Pacific Sdn Bhd
Marelli Motori Asia Sdn Bhd
Lot 1-8, Persiaran Jubli Perak,
Seksyen 22, 40300 Shah Alam,
Selangor D.E.
Malaysia
(T) +60 355 171 999
(F) +60 355 171 883
Malaysia@MarelliMotori.com
sales.MY@MarelliMotori.com

Central Europe

Marelli Motori Central Europe GmbH
Heilswannenweg 50
31008 Elze
Germany
(T) +49 5068 462 400
(F) +49 5068 462 409
Germany@MarelliMotori.com
sales.DE@MarelliMotori.com

Middle East

Marelli Motori Middle East
4401-03, 44th Floor, BB2
Mazaya Business Avenue
Jumeirah Lakes Towers
Dubai - UAE
(T) +971 4 426 4263
(F) +971 4 362 4345
UAE@MarelliMotori.com
sales.UAE@MarelliMotori.com

South Africa

Marelli Motori South Africa (Pty) Ltd
Unit 2, corner Director & Megawatt Road
Spartan Ext. 23
Kempton Park 1619 Gauteng
Republic of South Africa
(T) +27 11 392 1920
(F) +27 11 392 1668
SouthAfrica@MarelliMotori.com
sales.ZA@MarelliMotori.com

Spain

Representative Office
08195 Sant Cugat
Barcelona
Spain
(T) +34 664 464 121
Spain@MarelliMotori.com

United Kingdom

Marelli UK
The Old Rectory, Main Street
Glenfield
Leicester LE3 8DG
United Kingdom
(T) +44 116 232 5167
(F) +44 116 232 5193
UK@MarelliMotori.com
sales.UK@MarelliMotori.com

USA

Marelli USA
1620 Danville Road
Harrodsburg, KY 40330
USA
(T) +1 8597 342 588
(F) +1 8597 340 629
USA@MarelliMotori.com
sales.USA@MarelliMotori.com