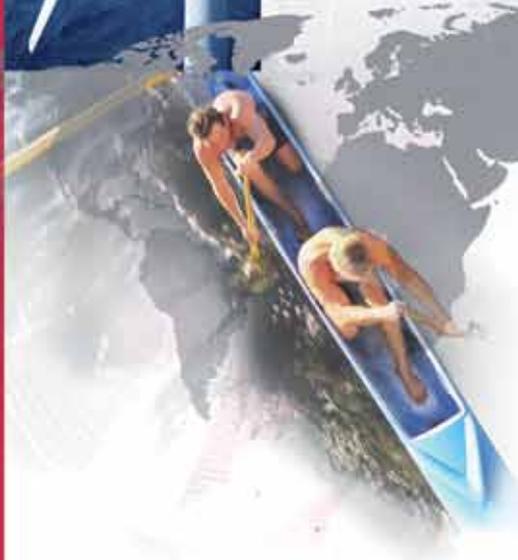


INDAR ELECTRIC



ELECTRIC
MACHINES

Indar

ELECTRIC
MACHINES

Indar

Wind power

Hydro power

Power Generation

Industry

Marine



Indar

Spirit of adaptability



Indar Electric designs, manufactures and supplies electric machines. Thousands of motors and generators produced over a period of more than sixty years have led it to create a strong basis of experience and know-how.

Today Indar Electric, a company of Ingeteam Group, is the largest Spanish manufacturer of electric motors and generators.

Our machines are renowned and appreciated for their sturdiness, quality and maximum reliability.

The corporate philosophy and products aim to give a differentiated personal treatment and custom-built solutions.

This spirit of adaptability, is the force behind our own advanced technology which, in turn, allows a strong position in the international markets.



Resources

The different sections are equipped with cutting-edge technological resources - R+D+innovation, sheet metal cutting, machining, winding, assembly, test bench and deliveries. These installations are 40,000 m². In line with Indar's commitment to the environment, the company has been certified in accordance with the EN ISO 14.001 Environmental Management System.



1

Lamination manufacturing

This section is housed in a soundproof building and is equipped with cutting lines, automatic numerical control punch presses and an enamelling line. Here the sheet is stamped with maximum precision, thus guaranteeing optimum quality during the useful life of the electrical machine.

2

Machining centres

Equipped with the most advanced systems and equipment, such as vertical lathes, boring mills, axle lathes and grinding machines, CNC machining centres, especially designed for the manufacture of large machines.

3

Coil manufacture and windings

The winding section consists of two areas, one for coil manufacturing and the other for the insertion of coils and for connections.

The first area is isolated from the other working areas, with constant temperature and humidity control and modern means of production to guarantee maximum quality when preparing the coils.

The second area is equipped with abundant resources to allow the machines to be manipulated carefully in the different winding stages.

Test are carried out to ensure perfect quality throughout the process.



4

Impregnation

The VPI impregnation process consists of two cycles. The first of these consists of creating a vacuum, removing the air and all humidity from the insulating material, then injecting resin under pressure into the windings. Finally, they are placed in the oven for the resin to polymerize, resulting in optimum insulation and solidity.

This section consists of the Vacuum Pressure Impregnation (VPI) tanks, from which we obtain insulation class H machines, immersion tanks (static and dynamic) and curing ovens.

5

Machine assembly

The assembly area has a crane capacity of up to 240 tons. There is also an area specifically prepared for the assembly of vertical machines.

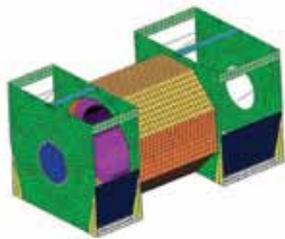
6

Test center

At Indar Electric we test asynchronous, synchronous and d.c. machines in compliance with such International Standards as IEC, NEMA, etc. Data gathering is automated during these tests.

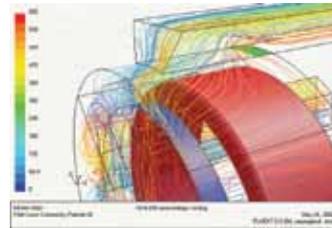
If the client wishes, the machines can be certified in accordance with the requirements of official classifying societies such as Lloyds Register, Bureau Veritas, Norske Veritas, etc.

Sturdiness, quality and maximum reliability



Mechanical Finite elements calculations

Calculation of shafts, finite element simulations of the stresses supported by critical parts (frames, base-plates, covers, shafts, etc.).



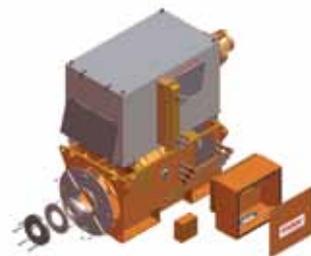
Fluid dynamic simulations, Thermal & CFD calculation

Model of current practice in the calculation and design.



FEM Magnetic design

Optimise the electro-magnetic design of our machines and thus obtain higher performance.



3-D Drawing System

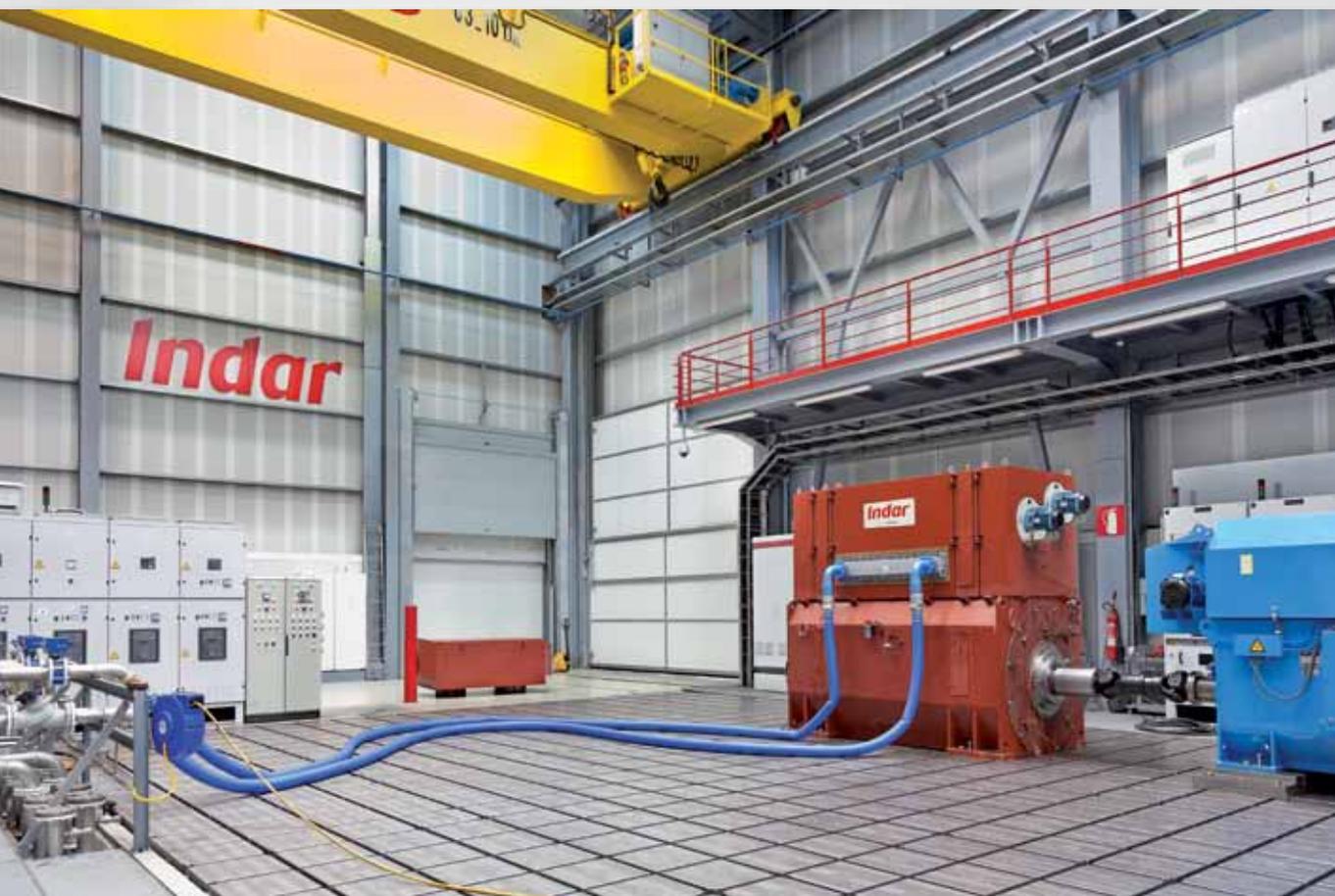
The main structural components are analyzed by means 3-D Drawing System.

Cooperation with the customer is part of the company's philosophy, with personal treatment and attention as the basis for the relationship and a key joint objective: **to develop products and services that adapt to the characteristics of each project.**

To this end INDAR has **one of the best test benches in the world** which allows us to fully test the designs for all kind of environmental conditions and to guarantee the best quality products.

The main capabilities are:

- On load tests up to 8 MW.
- Back to back configuration testing up to 65 MW.
- LVRT (low voltage ride through) testing capability.
- Self generated grid of 50/60 Hz 20 MVA.
- Combined tests of electrical and thermal insulation ageing.
- Climatic chamber (-30°C to 80°C) extreme ambient conditions.



World class testing facilities

Range of products

Indar Electric offers a wide range of products designed to meet the most varied needs of our customers, from the energy, marine, and industrial sectors.

All the machines have been integrally developed with our own technology to provide maximum sturdiness and quality.



Wind generators

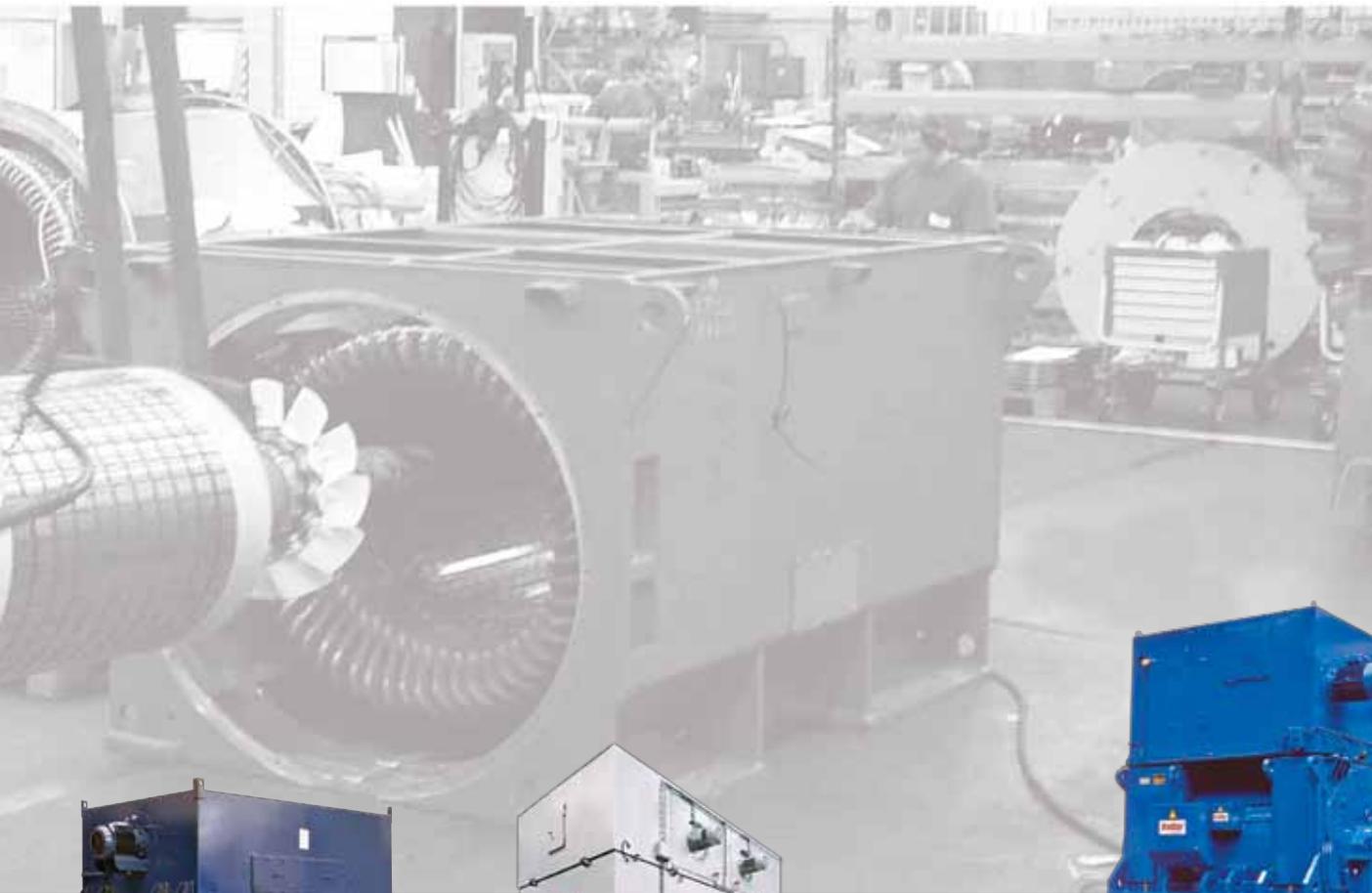
Synchronous and Asynchronous Generators from 800 kW up to 8 MW and voltages from 690 V up to 15 kV. For all machines insulation class H, IP23 to IP56 and horizontal.

Hydro

Synchronous generators from 1,250 kVA up to 70,000 kVA and voltage from 690 V up to 15 kV. For all machines insulation class H, IP23 to IP56 and IP68 (bulbs), vertical and horizontal.

Power Generation

Synchronous generators for steam turbines, gas and diesel engines from 1,250 kVA up to 35,000 kVA from 400 V up to 15 kV. For all machines insulation class H, IP23 to IP56 and horizontal.



Asynchronous motors

Squirrelcage and slip ring motors from 400 kW up to 11,000 kW and voltage 400 V up to 15 kV. For all machines insulation class H, IP23 to IP56, vertical and horizontal.



Synchronous motors

From 1,000 kW up to 35,000 kW and voltage 400 V up to 15 kV. For all machines insulation class H, IP23 to IP56 and horizontal.



DC Machines

From 400 kW up to 4,000 kW.



Submersible Motors (IP68)

From 400 kW up to 6,500 kW and voltages from 400 V up to 3,300 V (oil filled) and 11,000 V (air filled) with submergence capacity of 300 m.

Custom-built solutions

- The experience acquired during this time allows us to provide a wide range of products, developed from our own technology, placing us in a **position of leadership both in the Spanish and international markets.**
- All of the **generators and the motors installed** throughout the world are a clear exponent of our competitiveness and productive capability.
- At Indar Electric, the quality of our products and services, respect for the environment, and occupational hazard prevention are all essential to our work. With this in mind, we have achieved management systems certification in compliance with the **ISO-9001, ISO-14001 and OHSAS-18001** international standards, with the aim of establishing continuous improvement bases on the involvement of all parties.
- In this context, the Ingeteam company has decidedly **opted for the EFQM model**, as a framework for competitiveness in the coming years, with the aim of offering excellence in our products and services.



Bussines areas



INDAR WIND POWER

Wind Power

INDAR HYDRO

Hydro Power

INDAR CIM

Power Generation

Industry

Marine

Hydro Power

Wind Power



Cooperation with the client is part of company philosophy, with a personal treatment as the cornerstone of the relationship. Also with a clear common aim - to develop products and services tailored to the characteristics of each project.

Indar Electric has allocated a production line with full technical, productive and after-sales capacity exclusively to the manufacture of wind generators. The mechanical and electrical software applied to the design are based on own technology together with advanced electrical and mechanical simulation tools (mechanical calculation using finite elements, magnetic flow measurement, etc.).

The wind generator range has been designed to cover all the energy needs of the market. Indar Electric supplies generators with the required output powers, from 100 kW up to 8 MW and voltages from 690 V up to 15 kV.

Asynchronous double fed or synchronous with permanent magnets and the technology xDFM, Clean Power Series.

The generators are manufactured in accordance with internationally approved quality assurance standards, using the highest quality materials, as insulation and impregnation systems, resulting in machines that are very reliable, due to their low maintenance requirements and high efficiency.

The more than 15,000 generators for wind application, more than 16,5 GW of installed power, throughout the world are a clear exponent of our competitiveness and productive capability and the trust Indar's clients have shown in the company.



3,200 kW

1,000 - 2,000 rpm (50 Hz)
810 - 1,740 rpm (60 Hz)
1,000 V.

Wind Power



Wind applications

**Doubly Fed, xDFM
& Squirrel cage**
(Asynchronous)



3,150 kW

650 - 1,350 rpm (50 Hz)
780 - 1,620 rpm (60 Hz)
12,000 V.

Wind power generation

- Generators of power outputs **from 100 kW up to 8 MW.**
- Asynchronous doubly fed or synchronous with permanent magnets or excitation and technology xDFM, Clean Power Series.
- Direct Drive, medium or high speed.
- **Air or water cooled.**
- For all machines up to insulation H.
- Voltages **from 690 V up to 15 kV** for DFM Technology.
- Voltages **from 690 V to 6.6 kV** for PMG Technology.
- Frequency: **50 Hz and 60 Hz.**
- **Onshore & Offshore** applications.
- Various mounting topologies.
- Sound level adjusted to client needs.
- Compliance with international standards: IEC, UL, CSA, USTC, etc.



2,520 kW

690 - 1,300 rpm (50 Hz)
815 - 1,531 rpm (60 Hz)
690 V.



2,070 kW

1,000 - 2,050 rpm (50 Hz)
1,200 - 2,460 rpm (60 Hz)
690 V.

Customized design solutions

for different environment applications:

- Cold Temperatures: **-30°C, 50°C**
- High Corrosion Resistant **up to C5M**
- Desert Conditions: **Sandstorm**
- Frequency: **50 Hz / 60 Hz.**

Power ranges from:

- from 800 kW to 6 MW (direct drive or medium or high speed) with **LV- PMG (< 1 kV).**
- from 800 kW to 8 MW (direct drive or medium or high speed) with **MV-PMG (< 15 kV).**

Wind applications

**Permanent Magnet
Generators (PMG)
or Excitation**
(Synchronous)



3,200 kW

1,000 - 2,000 rpm (50 Hz)
810 - 1,740 rpm (60 Hz)
1,000 V.

PMG
2,670 kW

500 - 1,900 rpm
(50 Hz / 60 Hz)
690 V.



PMG
100 kW

60 rpm (50 Hz / 60 Hz)
400 V.



PMG
2,100 kW

500 - 2,000 rpm (50 Hz / 60 Hz)
690 V.

1,545 kW

700 - 1,300 rpm (50 Hz)
840 - 1,560 rpm (60 Hz)
12,000 V.

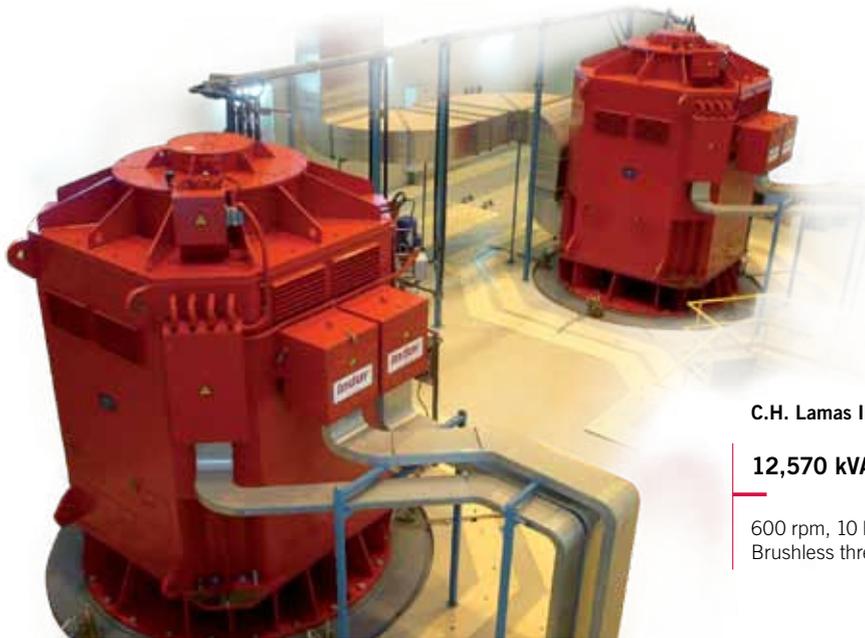


- from 70 kW to 300 kW (direct drive) with LV and MV - PMG.
- DFM systems: from 660 kW to more than 6 MW.

- xDFM technology: from 1.5 MW to 6 MW.
- Synchronous and asynchronous generators up to 8 MW.



Hydro Power



C.H. Lamas III

12,570 kVA

600 rpm, 10 kV.
Brushless three-phase synchronous.

Indar Electric has been extremely active in this field for several decades now, supplying synchronous generators from 1,250 kVA up to 70,000 kVA and voltages from 690 V to 15 kV to suit the needs of each customer.

Design flexibility extends to all the peripherals that can practically be incorporated into these machines, like controllers, fireproofing systems, lubrication equipment, temperature probes, brakes, inertia flywheels, etc.

Today Indar Electric is the leader of the European market with a strong foothold in other geographies. This leading position is just the logical result both of our continuous effort to give customers and users individualized solutions and the close co-operation with hydraulic turbine manufacturers.

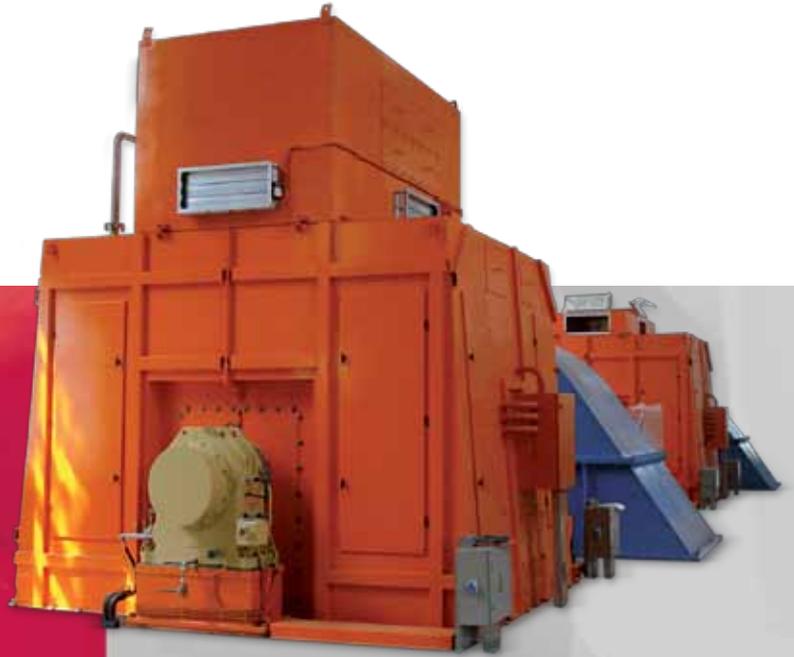
Collaboration in developing the projects from their initial stage, with the input of the know-how gathered from countless dealings in all types of turbines and hydraulic jumps world-wide.

Extremely reliable machines specially designed for hydro power generation, that ensure maximum availability at high efficiency throughout the year.

Installation and start-up or supervision of these processes in hydraulic plants anywhere in the world.

Hydro power generation

- Synchronous generators from 1,250 kVA up to 70,000 kVA.
- For all machines up to insulation H, IP23 to IP56 and IP68 (bulbs).
- Air and water cooled.
- Manufactured in different voltages, from 690 V to 15,000 V.
- For hydraulic turbines of different types, Pelton, Francis and Kaplan.
- Different forms of construction, vertical and horizontal.
- International standards: IEC, NEMA, etc.



25,000 kVA

500 rpm, 15,000 V.
Italy



18,000 kVA

166 rpm, 6,000 V.
Spain





10,000 kVA

600 rpm, 13,800 V.
Costa Rica

14,750 kVA

330 rpm, 6,600 V.
Spain

10,600 kVA

428 rpm, 6,600 kV.
Spain



32,000 kVA

600 rpm, 12,000 V.
Italy

4,700 kVA

166 rpm, 6,000 V.
Italy



Maximum availability at high efficiency



Power Generation

Power Generation plants demand the highest possible full-capacity utilisation rate from the installed equipment. Indar Electric has been at the forefront of providing high quality products to the customers for many years, based on the high reliability and sturdiness standards applied to the design and manufacture of the generators.

Working in close collaboration with the supplier of the prime mover permits the production of generators perfectly adapted to its equipment and to the plant.

The flexibility of our organisation also allows us to supply generators within a short delivery period, in a range of powers from 1,250 kVA up to 35,000 kVA and voltages from 400 V up to 15 kV.

6,750 kVA

1,500 rpm, 11 kV.
Prime mover: Gas Turbine.



Power Generation

- Synchronous generators with power from 1,250 kVA up to 35,000 kVA and voltage from 400 V up to 15 kV, 50/60Hz, ≥ 4 poles.
- Indar Electric has been at the forefront for providing high quality products to the customers for many years, based on the **high reliability and sturdiness standards applied to the design and manufacture of the generators.**
- Working in **close collaboration with the supplier of the prime mover (steam turbine, gas turbine, steam motor, gas motor, diesel engine, dual fuel engine)** enables Indar Electric to design and manufacture generators perfectly adapted to its equipment and to the plant.



23,034 kVA

500 rpm, 11 kV.
Primer mover: Diesel Engine.
MAN Diesel & Turbo



5,400 kVA

750 rpm, 6.6 kV.
Primer mover: Diesel Engine.
Wärtsillä





2,333 kVA

1,800 rpm, 480 V.
Primer mover: Steam Turbine.
Dresser Rand



3,434 kVA

1,800 rpm, 13.8 kV.
Primer mover: Steam Turbine.
Siemens Turbomachinery

11,913 kVA

1,500 rpm, 10,5 kV.
Primer mover: Steam Turbine.
Allen Steam Turbine



10,300 kVA

1,500 rpm, 6.3 kV.
Primer mover: Steam Turbine.
M+M Turbinen Technik GmbH

11,250 kVA

1,500 rpm, 10.5 kV.
Primer mover: Steam Turbine.
Fincantieri Navali SpA



10,613 kVA

1,500 rpm, 11 kV.
Primer mover: Steam Turbine.
GE Oil & Gas



Perfectly adapted in a short period



6,000 kW

1,000 rpm, 6 kV.
Application: Cement mill.
Colacem

In-house developed technology enables Indar Electric to customize an initially standard machine to fit the required application or to build a totally customized machine.

In the different sectors of the industry, the characteristics offered by Indar Electric can make the difference:

- Long experience and supplies all over the world.
- Versatility and organizational flexibility to meet customer or plant-specific requirements, owing to high technological standards.
- Sturdiness, reliability and quality as required by the industry for uninterrupted operation.

To satisfy the needs of the industry, Indar Electric offers a complete range of specially designed products from direct-current motors to cycle-converter-fed synchronous motors or PWM-controlled alternating current motors. The design and manufacture of all those machines comply with diverse international standards.

Industry



Industry

- Asynchronous motors with power from 400 kW up to 11,000 kW and voltage from 400 V up to 15 kV, ≥ 4 poles.
- Synchronous motors with power from 1,000 kW up to 25,000 kW and voltage from 400 V up to 15 kV.
- Thanks to the modularity of the new series of motors, Indar Electric motors are a perfect solution for applications as diverse as:
 - Combined cycle plants:** Circulation pumps and condensation pumps.
 - Compressors.**
 - Fan drives:** Wind tunnels, thermal generating stations, smoke extraction, etc.
 - Drives for mills in the paper, cement and industries.**
 - Steel industry:** Milling boxes, winders, unwinders, cutters, etc.



875 kW

500 rpm, 6 kV.
Application: Pump.
Iberdrola

4,500 kW

50 rpm, 1,650 V.
Application: Duo Roughing Mill.
Thyssenkrupp Hoesch





4,450 kW

990 rpm, 6 kV.
Application: Fan.
Enel Power



700 kW

1,200 rpm, 480 V.
Pony motor.
Application: transformers
testing laboratory.
Waukesha

6,700 kW

1,200 rpm, 13.2 kV.
Synchronous motor.

20,000 kVA

1,200 rpm, 13.2 kV.
Synchronous generator.

1,600 kW

428 rpm, 6 kV.
Application: Pump.
Flowserve

9,500 kW

700 rpm, 6 kV.
Application: Fan.
Zitron



Supplied all over the world



Marine

For more than 50 years, the shipbuilding industry has been using Indar machines. Over this period of time, Indar Electric has won recognition for the sturdiness and reliability of its machines in the most adverse working conditions.

Such long experience in the supply of equipment for the marine sector covering fishing ships, offshore vessel, cargo liners, dredgers, ferries, etc., proves the users' trust in our machines.

The wide range of products available covers all the needs for electric drives on board a vessel, for example main and transverse electric propulsion, principal and auxiliary power generation and deck machinery.

Indar Electric have designed and manufactured submersible pump and cutter motor from 400 kW up to 6,500 kW and voltages from 400 V up to 3,300 V (oil filled) and 11,000 V (air filled).

Working in conjunction with the company's R&D team Indar Electric is a world leader in this line of hi-tech equipment able to work as deep as 300 m below sea level.



6,500 kW

253 rpm, 3.1 kV.
Submersible motor.

Ship name: Vasco Da Gama
Ship owner: Jan De Nul

Marine

- Asynchronous motors with power from 400 kW up to 11,000 kW and voltage from 400 V up to 15 kV, ≥ 4 poles.
- Synchronous generators with power from 1,250 kVA up to 25,000 kVA and voltage from 400 V up to 15 kV.
- Synchronous motors with power from 1,000 kW up to 25,000 kW and voltage from 400 V up to 15 kV.
- Submersible motors with power from 400 kW up to 6,500 kW and voltages from 400 V up to 3,300 V (oil filled) and 11,000 V (air filled). Indar is a world leader in this line of hi-tech equipment able to work as deep as 300 m below sea level. The submersible motors of Indar Electric are specially designed for the direct or geared drive for pumps, bucket-wheel excavators, cutters and drive systems. They are compact and robust, heavy duty, enabling customers to work under extreme conditions and at great depths, thus considerably improving the output and reliability of the production processes involved.
- DC motors with power from 400 kW up to 4,000 kW.
- A wide range of products for electric drives existing aboard ship, namely main and transverse electric propulsion, principal and auxiliary power generation, deck machinery, etc.



3,800 kW

1,000 rpm, 3.1 kV.
Main Propulsion.
Self-propelled cutter dredger.
Ship name: JFJ De Nul
Shipowner: Jan De Nul

5,500 kW

500 rpm, 3.1 kV.
Thruster motor.
Heavy lifting vessel.
Ship name: Oleg Strashnov
Ship owner: Seaway Heavy Lifting





1,500 kW

180 rpm, 750 V.
Low Noise Diesel Electric Propulsion.
Research vessel.
Ship name: Celtic Explorer
Ship owner: Irish Government



2,200 kW

1,200 rpm, 660 V.
Main propulsion.
Platform supply vessels.
STX OSV

6,000 kW

253 rpm, 3.1 kV.
Submersible motor.
Trailing suction Hopper dredger.
Ship name: Vox Maxima
Ship owner: Van Oord



1,650 kW

900 rpm, 660 V.
Thruster motor.
Double end ferry.
Ship name: Dokter Wagemaker
Ship owner: Teso



World leader in submersible motors



Technical assistance services

- **Our service**, together with our **workshop network** allows us to offer an effective and agile service. The initial analysis made during the commissioning of our machinery allows us to develop **personalized maintenance programmes**. This involves both preventative and predictive maintenance.
- Through our spare parts service, we establish **calendars and specific initiatives in close coordination with our assistance team**. Manufacturing and supplying our own spare parts as well as third-party ones also forms part of our **Customer Support Service**.
- Common elements that form part of our service include **sets of rings and coils, complete rotors, spare stators, DC poles, shafts, etc.**
- Our **extensive test bench facilities**, together with the support from our machine engineering department, enables us to solve complex problems and guarantee our repairs.
- Our support team has **experience in a wide range of fields of application (marine, hydraulic, cogeneration, etc.) and in all types of mechanical and electrical contingencies**.



around the world



Beasain
(Spain)

- Manufacturing units
- Commercial agencies all over the world
- Service Centres

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www.indar.net

Indar

An ***Ingeteam*** brand