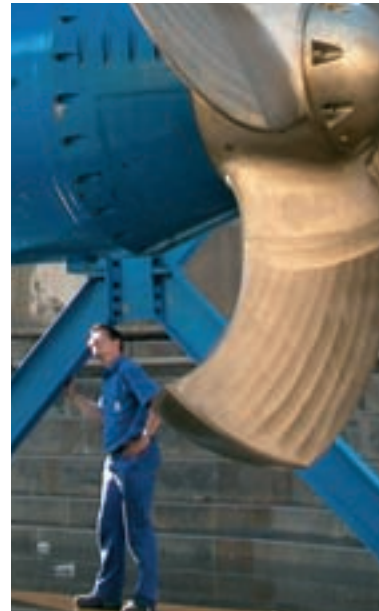


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At the forefront of Technology

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Integrated Marine Solutions

Turnkey electric and control systems
for the Marine sector.

Ingeteam

Our Mission

Apply engineering to investigation, design, manufacture and sale of products and services in fields where a great exchange of energy is performed, both generation and consumption, in an attempt to help the change of the current energy model and contribute towards man's wellbeing.

Ingeteam Marine:

Spirit of adaptability

Ingeteam Marine leads in the turnkey supply of complete or partial electrical projects for the marine sector, both automation and control as well as generation, power plants, variable frequency drives and electric propulsion.

We propose solutions that meet the exact needs of the client, by making use of the equipment and machines developed and manufactured within the Ingeteam Group.

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.

That is the only way to win, to break limits and reach new goals.

Adding value through integration

Solutions for generation, distribution, propulsion and automation system to ensure the availability of safe energy on board.



At the forefront of Technology

Ingeteam Group has been supplying technological products and systems for electrical and electronic applications since 1972.

Our organization consists of 28 companies, with significant references worldwide, and leads the way in the industry, marine, rail, and energy generation sectors.

Technological innovation and the development of our own products are key factors behind our success.

The companies in Ingeteam Group providing services in the marine sector are:

Ingeteam Marine

- ❖ Provider of electrical engineering services.

Ingeteam Technology

- ❖ Developer and manufacturer of power and control electronics.
- ❖ Electrical machine manufacturer for industry and shipbuilding.
“Turnkey Projects”

Ingeteam Service

- ❖ Provides erection and installation services.
- ❖ Designs and manufactures electric switchboards.

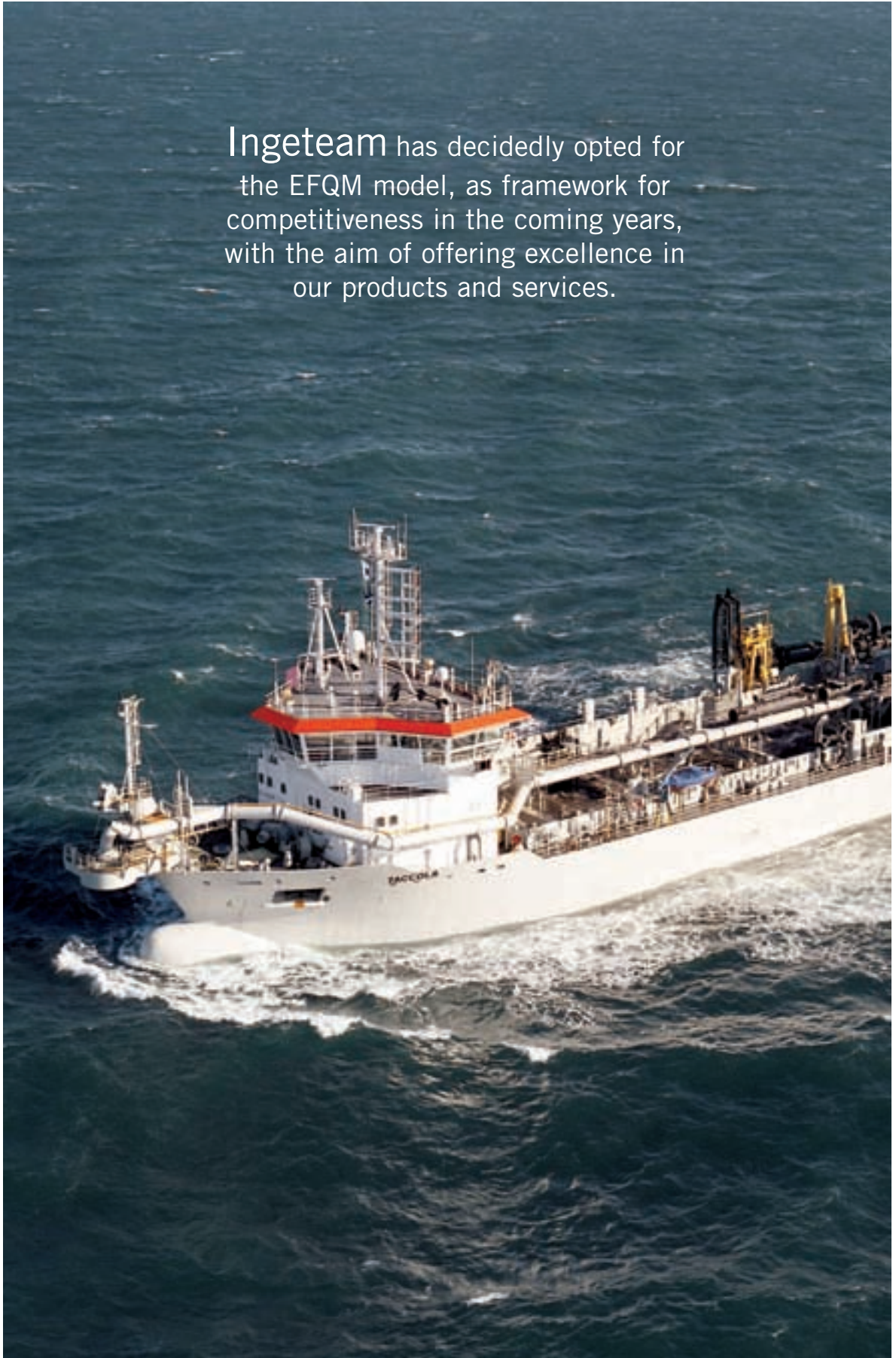
Ingeteam Marine - Adding Value Through Integration

Since its foundation in 1972 Ingelectric has been providing complete and specific solutions for the drive systems of electric motors and industrial plant process automation for the industry sector.

At Ingeteam Marine, we offer completely integrated solutions for the marine sector. Inside Ingeteam Group, we are the company leading the supply of turnkey electric projects, combining our electric engineering expertise with equipment supplied by other companies in the group.

We complement our products and systems with first-rate customer service, based on continuous collaboration with the Group, from the moment each system is designed and throughout the whole of its life cycle. This integrated approach allows us to deliver solutions adapted to each customer's exact needs.

Ingeteam has decidedly opted for the EFQM model, as framework for competitiveness in the coming years, with the aim of offering excellence in our products and services.



Complete Marine Solutions



Following expansion and growth, in 1997 we broaden our scope of activity, to start providing best quality solutions to the highly demanding marine sector. Our experience in the design of installations and equipment, our capacity to integrate other manufacturer's equipment, our proposals' flexibility, and a permanent coordination between our departments, enable us to attain the optimal solution for our customers. We are well-known in the market for providing customized solutions to meet the particular needs of each vessel.

Our investments and projects in R&D+I allow us to maintain our technological position in the market.

Our activity is directed towards achieving a robust and easy to maintain product. In this sense we direct much of our efforts to a continuous evaluation of our suppliers, and an adequate elaboration of our operation and maintenance manuals.

For us it is also important to work side by side with our customers in the follow-up of the project, supervision of manufacturing processes, integral test and sea trials.

Our turnkey deliveries include both basic and detailed engineering, as well as commissioning, and comprise all electric components of the vessel, such as:

- ❖ Electric Generation and Distribution.
- ❖ Electric Propulsion.
- ❖ Azimuth Electric Podded Propulsion - POD PISCISTM.
- ❖ Submersible motors.
- ❖ Integrated Automation, Control and Monitoring systems.
- ❖ Remote Assistance - IngeRASTM.



All of the generators and
the motors installed
throughout the world are
a clear exponent of our
competitiveness and
productive capability.

Generation and Distribution



We provide **Generation and Distribution** for both conventional and diesel-electric propulsion. Our products are designed specifically for marine power applications and in close cooperation with the diesel engine / gas turbine manufacturer, so they can be adapted to the technical and mechanical requirements of each particular plant and customer.

The wide range of products available covers all the needs for electric drives existing aboard ship.

Given the modular design of our generators we are able to supply standard generators, adapted to the specific needs of our customer, and deliver them within a minimum period of time.

- ❖ The range of power available for Synchronous Generators varies from 1.250 kVA up to 35.000 kVA and voltage from 690 Vac up to 15 kVac.
- ❖ Can be coupled to any type of motor (diesel, fuel, gas, oil).
- ❖ High capacity for withstanding overloads and vibrations caused by the drive.
- ❖ High-performance.
- ❖ Mechanical configuration, degree of protection, and type of cooling studied in each case according to clients specifications.
- ❖ International standards such as CEI, NEMA, VDE and the special requirements of main certifying bodies such as BV, LR, DNV, GL, RINA, etc.

As part of the integrated solution for the engine room, we build and deliver all types of electric switchboard, both low and medium voltage, using in-house designed sheetmetal fabrication to maximize the robustness of our equipment.

The quality of our products and services is backed by the careful design and construction of equipment, test carried out and certifications obtained, as well as the experience acquired over 30 years of activity in the field.

The most well-know switchboards developed are:

- ❖ Medium voltage switchboards in fixed, modular or withdrawable units for power distribution.
- ❖ Low voltage switchboards in fixed, modular or withdrawable units, with certification of up to 70 kA short circuit power.
- ❖ Direct starters, autotransformers, soft starters, etc.
- ❖ Control switchboards for protection and measurement, regulation and control, automation panels (PLC) and distributed control, control desks, consoles and synoptic for automatic synchronization of generators.

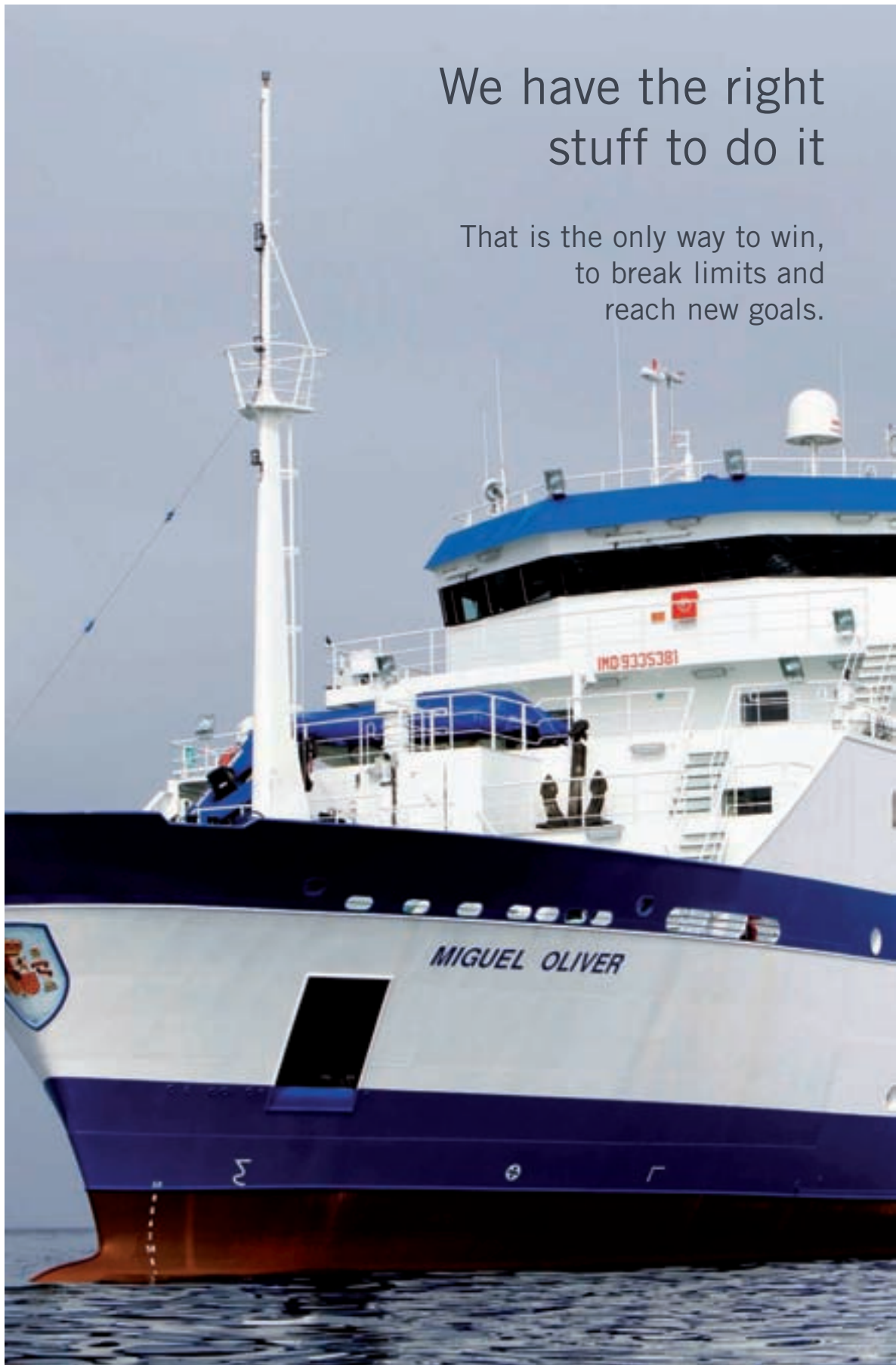
Main Generator

10.250 kVA / 1.200 rpm / 6`6 kV.



We have the right
stuff to do it

That is the only way to win,
to break limits and
reach new goals.

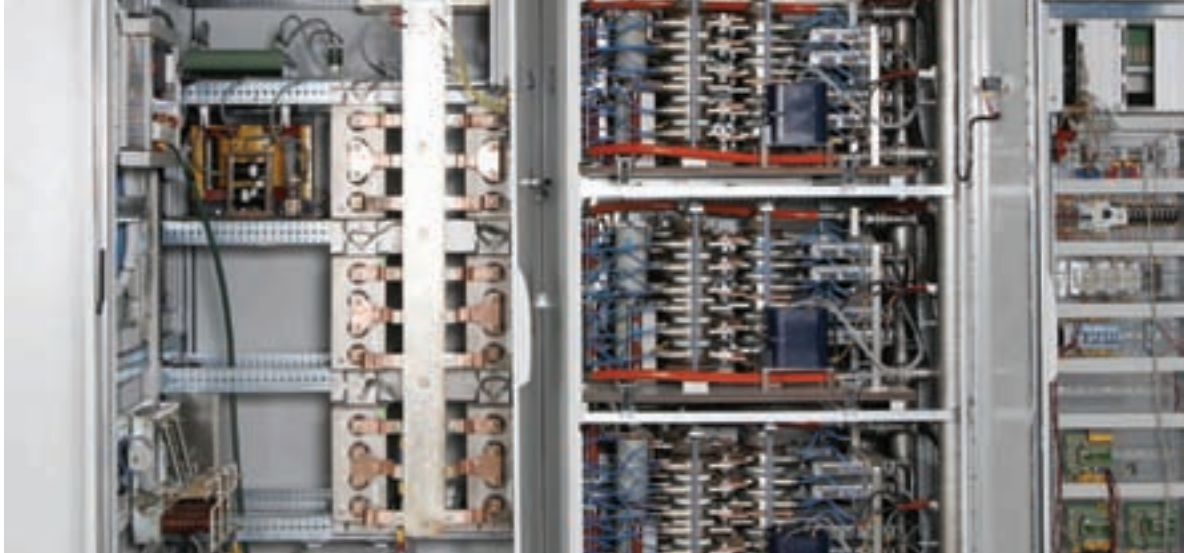




Our electrical propulsion can guarantee tailor-made solutions.

Every ship type calls for an individual solution

Electrical Propulsion



Ingeteam Group manufactures electric propulsion motors as well as other types of motors for marine industry.

The benefits of electric propulsion for Vessels are numerous:

- ❖ Optimal performance of the propeller.
- ❖ Availability of the maximum torque at every speed.
- ❖ Optimal acceleration response.
- ❖ Minimal vibration, noise, and smoke emissions.
- ❖ Savings in hull space.
- ❖ Optimization of power installed on board.
- ❖ Power provided up to 15.000 kW.
- ❖ Low operating cost.
- ❖ Layout flexibility.
- ❖ Reduced maintenance.



*Low speed Double Propulsion Motors
1.320 kW / 353 rpm / 690 Vac.*

For more than fifty years, the shipbuilding industry has been trying and testing the sturdiness of INDAR machines, and, over that period of time, INDAR has won recognition and prestige for the reliability of its machines in the most adverse working conditions.

Such long experience in the supply of equipment all kind of craft, e.g. fishing vessels, offshore ships, cargo liners, dredges, ferries, etc proves the users' trust in our machines.

The modular design of these machines makes them easily adaptable to the requirements of our clients, allowing us to supply highly-reliable and easily maintainable motors.

- ❖ Asynchronous motors with power from 400 kW up to 15.000 kW and voltage from 690 Vac to 15 kVac. Horizontal or vertical. Different degrees of protection and refrigeration. Direct power supply or with converters. Application in main electrical propulsion and bow thrusters, pump drives, deck machinery, etc.
- ❖ DC motors with power from 400 kW up to 4.000 kW. Extremely precise speed regulation. For fishing machinery, propulsion with low noise emission (especially designed for oceanographic vessels).
- ❖ International standards such as CEI, NEMA, VDE and the special requirements of main certifying bodies such as BV, LR, DNV, GL, RINA, etc.

Ingeteam Basic Technologies provides the frequency converters for low and high voltage. Years of experience have enabled Ingeteam Basic Technologies to combine progress in vector control, which controls three-level rectifiers and inverters via optic fibre, with the latest high-voltage semiconductors, HVIGBTs. The result is a safe and flexible solution with a user-friendly interface.

Main features of the converters are:

Ingedrive

Family of AC/AC or DC/AC frequency converters, as well as medium and high power AC/DC converters.

Ingedrive MV

Three level medium voltage NPC type converters based on three types of semiconductors (HV-IGBTs, press-pack IEGTs and press-pack IGCTs)

which rise to the MV100, MV300 and MV500 series, respectively, covering the entire power range from 750 KVA to 27 MVA, with voltages of 2'3 kV, 3'3 kV and 4'16 kV.

Ingedrive LV


Low voltage frequency converters, the LV200 and LV400 series with a two level topology based on IGBTs with power ranging from 250 kW to 4 MW, air-cooled and water-cooled, respectively, and the LV600 series of direct converters based on thyristors with power of up to 15 MW.

Ingedrive DC

Medium and high power direct-current converters for the control of excitations (DC100 series), control of single-direction or reversible motors based on thyristors (DC300 series) or based on IGBTs (DC200 series).

*Asynchronous motors fed by PWM
1.650 kW / 900 rpm / 660 V.*





Our success depends of the success of our customers

Cooperation with the customers 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”.

POD PISCIS™ Podded Propulsion & Submersible motors



POD PISCIS™ Podded Propulsion

Ingeteam Group and **Navantia** Shipyards have joined forces on an ambitious project to develop the Electric Azimuthed Propulsion System POD PISCIS™. The result is a propulsion system offering major advantages in improved manoeuvrability and hydrodynamic efficiency.

The product range includes pushing and pulling configurations, with power up to 7 MW.

PISCIS™ incorporates the INDAR electric motor in a hydrodynamic outboard frame, with the propeller directly mounted on the axis. This solution improves the propeller performance and manoeuvrability, saves space and weight, reduces noise and vibrations and enhances the flexibility of operations.

Submersible Motors

The experience built up in the Group has allowed us to tackle these solutions with induction motors with power from 1.000 kW up to 10.000 kW and voltage from 690 Vac up to 15 kVac, used as direct or indirect pump drives in dredgers and cutters. Degree of protection IP68 (the design of the cover, connection box and bearing box is of fundamental importance). Different types of cooling (oil, water or air). Submersible up to a depth of 1.000 meters.

INDAR is a world leader in this line of hi-tech equipment, having manufactured and installed the highest range power submersible motor currently in the world, on Vasco de Gama dredge vessel.

Integrated automation systems (IAS)

Integrating the different functions into the Integrated Automation System the overall need for software and hardware functions required is reduced. Integrated systems offer a greater degree of redundancy.



Integrated Automation Systems



Ingeteam Marine supplies integrated automation and alarm systems. Completely integrated buses, a system hierarchy that guarantees maximum operability, distribution of control with redundancy of CPUs and/or communication buses, are the standards that shipbuilding industry demands, and Ingeteam Marine develops, applies and supplies.

Ingeteam Marine provides systems which allow control over the following functions:

- ❖ Power and Propulsion.
- ❖ Gen-Set Control System.
- ❖ Power Management Systems (PMS).
- ❖ Integrated Alarm and Monitoring Control Systems (IACMS).
- ❖ Ship Auxiliaries.
- ❖ Tank Level Monitoring System.
- ❖ Dead Man and patrol Systems.

We also provide process control for the specific needs of different types of vessels, including:

- ❖ Cargo control.
- ❖ Dredger control.
- ❖ Tanker control for chemical and crude oil tankers and LNGs.

Process control:

The use of remote peripheral I/Os for the distribution of inputs and outputs along the vessel result in an efficient interface between the process components and the control units. The connection between these two elements is achieved through redundant field buses. This solution translates into a high degree of flexibility in the I/O configurations as well as big savings in erection and installation.



We are always there, wherever you need us

Customer services are designed to provide global support whenever and wherever it is need with easy access.



Remote Assistance IngeRAS™ Fleet



IngeRAS™ Fleet is an innovative solution, directed at the marine sector, developed by INGETEAM MARINE engineers, fruit of their experience and R&D+I work.

IngeRAS™ Fleet offers fast and safe assistance via VPN. It uses the latest security systems, available in the market for this type of application, to create dedicated lines between the server and the installations.

The system is composed of a main server that centralizes all vessel accesses and data using the IngeRAS™ Fleet solution.

IngeRAS™ Fleet integrates advanced computer and telecommunication services directed at the marine sector.

- ❖ Optimized Communications and Remote Data Acquisition, with redundant connection system via GPRS / UMTS / HSDPA / INMARSAT Satellite / VSAT Satellite. Vessels position tracking data (geographic coordinates, speed, direction, miles travelled, miles to destination port, etc..). Data of the vessel's movements (balance angles,

shifting, vertical acceleration, etc..). Operation Data (propulsion power, revolutions, fuel,...) Engine room data (temperatures, flows, pressures, alarms, etc..).

- ❖ Management of Fleets and marine transportation logistic; state of the Fleet, navigation assistance, traffic management, reports with navigation conditions, security, management of goods, intermodality, traceability, etc.
- ❖ Remote marine maintenance services; historical records of works, better control of associated costs, equipment operation availability. Plan and manage assistance maintenance, assistance reports available at any time and from anywhere in the world.
- ❖ Remote technical assistance services to any equipment installed in the vessel, in a fast and safe manner. It is possible to solve problems or install updates of systems installed by various suppliers.
- ❖ Value-added services (meteorological integration, documental portals, message service, etc..).

Technical assistance services around the world

We offer a wide variety of services
to meet individual customer's operational needs.



Additional Services



Our technical staff permanently provides direct assistance and support to our clients for the equipment that we supply. We provide this support during the project development as well as after the contractual guarantees have expired.

These services include:

Engineering and supply: Design and execution of basic and detail engineering of the whole vessel's electrical installation, including the supply of all the required and related equipment.

Installation and assemblies: following a previously developed project and in compliance with agreed upon regulations, between the ship owner and classification entities, the execution and supervision of the assembly works is carried out by specialist personnel, who have participated in the elaboration of the engineering.

Commissioning: carried out by our technical personnel that actively participated in the elaboration of the project. Before commissioning the systems installed in the vessel functional test are carried out at our premises. These tests reduce costs and the execution delay of this part of the project.

Training: carried out at our headquarters or the ship owner's and/or shipyard installations,

through tested-out courses adaptable to each type of vessel.

After-sale assistance, maintenance and spare part management: the required assistance is carried out by establishing a connection between our headquarters and the different communication solutions, IngeRAS™ Fleet, which incorporate a satellite link and cover technical assistance of up to 24 hours/365 days a year.

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 machines and equipment allows us to develop personalised maintenance programmes.

Through our spare parts service, we establish calendars and specific initiatives in close coordination with our technical assistance team.

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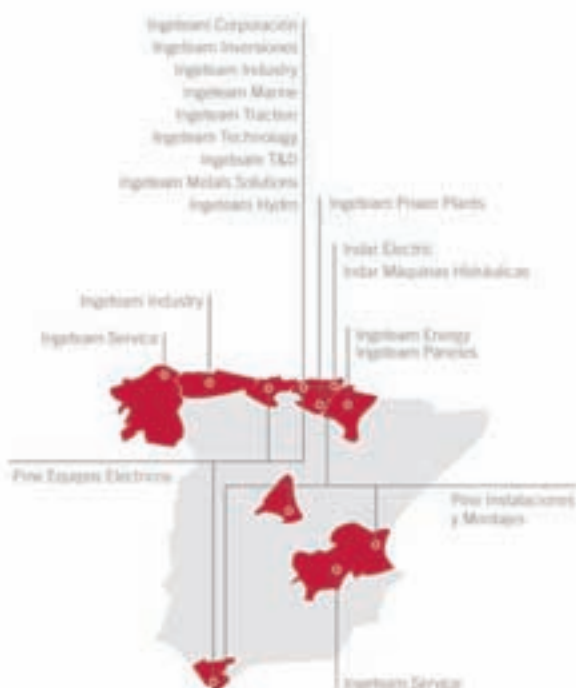
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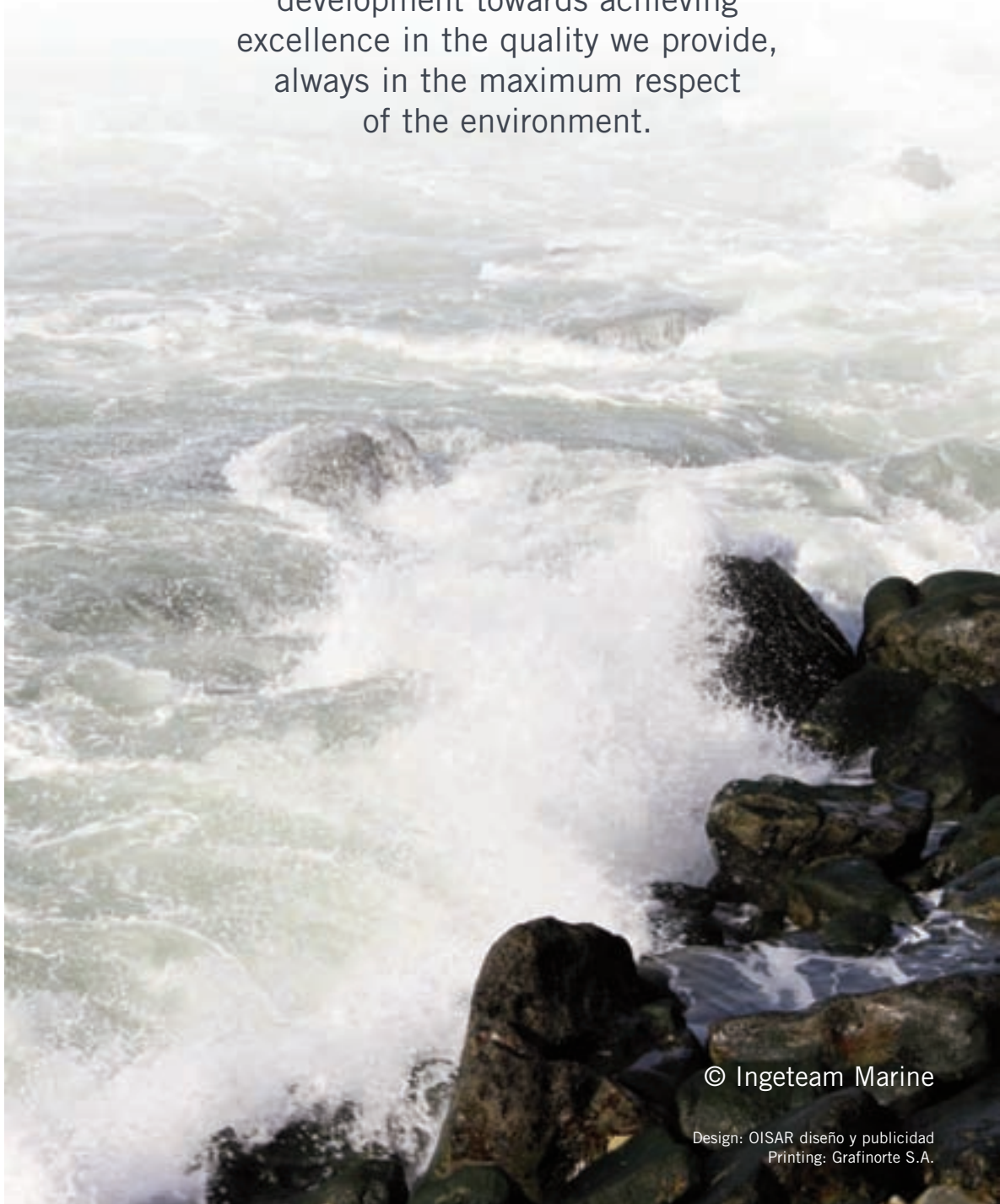
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Committed to the environment

Ingeteam's strategy aims at a continuous development towards achieving excellence in the quality we provide, always in the maximum respect of the environment.



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Ingeteam

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