



Pitch Control System

***Ingeteam***

The outcome of our experience in the sector, together with an analysis of our customers' requirements and our ongoing endeavour to offer the best solutions for wind turbine electric and control equipment.

A system characterised by its **high reliability** and **precision**, **full adaptability** to customer requirements, **advanced technology**, **compact design** and **ease of maintenance**.



The Electric Pitch System regulates the wind turbine blade pitch angle with total control and precision, to maximize the wind energy harnessed.

With **safety as a key factor**, the Ingeteam Pitch Control System has been designed to operate at high wind speeds and at turbulent sites.

The Ingeteam Pitch Control System is designed to enable the wind turbine to operate in compliance with the grid connection regulations during voltage drops and to perform **controlled stoppages** in emergency situations.

# Ingeteam pitch control system: the best position to

Commonly, the pitch control system consists of three electrical cabinets, one each blade. In case that the customer requires so, it is possible to include an additional central control cabinet.



## Pitch box contents

Ingeteam **MOTOCON®** Controller.

Energy storage system  
(batteries/supercapacitors).

**Battery/Supercapacitor monitoring** (V, I, Temp).

Battery/Supercapacitor charger.

Circuit protections and voltage supply distribution components.

External sectionalizer.

Local/Remote switch.

Manual control pushbuttons.

Emergency pushbutton.

Fast feeding connectors.

Serial line connector.

Temperature sensors and cabinet heating.

Lightning protection.

## Pitch Control Basis

- Individual pitch control.
- Individual emergency system.
- Pitch electric servo motor with gearbox.
- AC or DC MOTOCON® Controller.

## Advanced Features

- High reliability.
- Customized design.
- Compact and robust system.
- Vibration resistance.
- Long lifetime.
- Easy maintenance.
- High dynamic response.
- High positioning accuracy.
- Controlled stoppages for LVRT and emergencies.
- Regenerative braking.
- Self-diagnosis.
- Local and remote operation.
- Monitoring/Supervising tools.
- Communication protocol versatility.



Design at the forefront of technology

## harness wind power

### Features

Frequency: 50/60 Hz.  
 Power: 400 Vca / 230 Vca +/-10%.  
 Protection rating: IP65.  
 Ambient temperature: -30 °C to +50 °C.  
 Altitude: < 2,000 m (6,600 ft).  
 Relative Humidity: 100%.  
 Service life: 20-30 years.  
 CE and comply with UL/CSA standards.

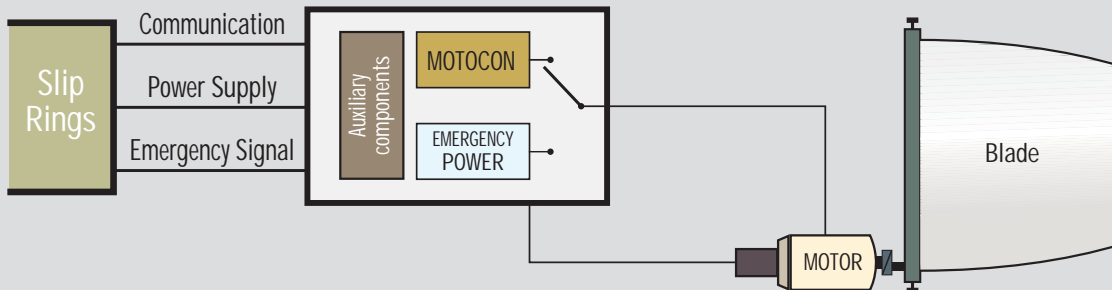
### Motor

DC Motor (series, parallel and compound).  
 AC Motor (synchronous or asynchronous).  
 Optional gearbox.  
 Incremental and/or absolute encoders, resolver.  
 Electro-ventilator.  
 150 °C PTC probe.  
 PT-100 Thermo-probe.  
 Heating Resistances.

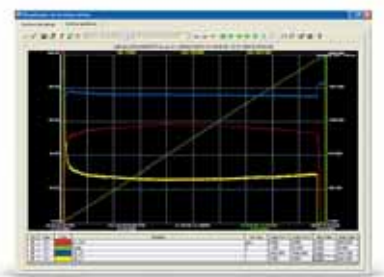
### MOTOCON® Controller

Fully digital 40 MHz microprocessor.  
 Speed control with a precision of more than 0.05% with feedback by using incremental encoder.  
 Automatically adapts to the operating frequency (40 to 70 Hz).  
 Pitch Ingeteam Service tool available to interact with controller.  
 RS-232 communications line for communication with a PC.  
 Communications: RS485, CAN, EtherCAT, Devicenet, Profibus cable or fibre optics.  
 Monitoring, parametrization and control via a PC.  
 Data recording high capacity.

### Basic layout of one single blade



The Ingeteam Pitch Control System makes it possible to monitor the voltage, current and temperature of each one of the batteries or super-capacitors used in the power storage system. In this way, the status of each battery or super-capacitor is known at all times, **always guaranteeing correct system operation.**



### Pitch Ingeteam Servicer

Operate pitch system in local mode.  
 Move the blades in local mode.  
 Display and configure pitch parameters and variables.  
 Display and reset alarms.  
 Allows communication frames monitoring.  
 Record variables of pitch control system.  
 Display the records obtained on graphs.

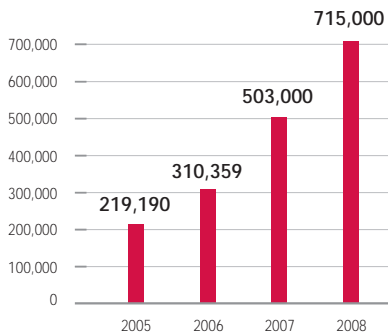
## Innovation and technology at the service of our customers

- A corporation structured into 6 divisions: **Energy, Industry, Marine, Traction, Basic Technologies and Services.**
- Technology and innovation as its growth engine. Investment in **R&D** in 2008: **24,000,000 Euros.**
- **Innovation, service, quality and flexibility.** Total adaptability to our customers requirements.
- More than 60 years' experience in the electrical sector and over 35 years in the electronics sector. Present in the wind sector since **1995.**
- Design and manufacture of power **converters**, electric **generators**, electric **pitch** control systems, **control** electronics and **integrated wind farm management systems.**
- More than **13,700 wind turbines** are equipped with our converters and generators.



### International Presence

Ingeteam's net sales evolution  
(thousands of euros)



***Ingeteam***

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