



**INGEDRIVE MV 300**

Frequency Converters

MEDIUM VOLTAGE — AIR COOLED

250 to 1250 kW  
335 to 1675 HP

4.16 kV / 6.6 kV



***Ingeteam***

# Frequency Converters

air cooled, medium voltage

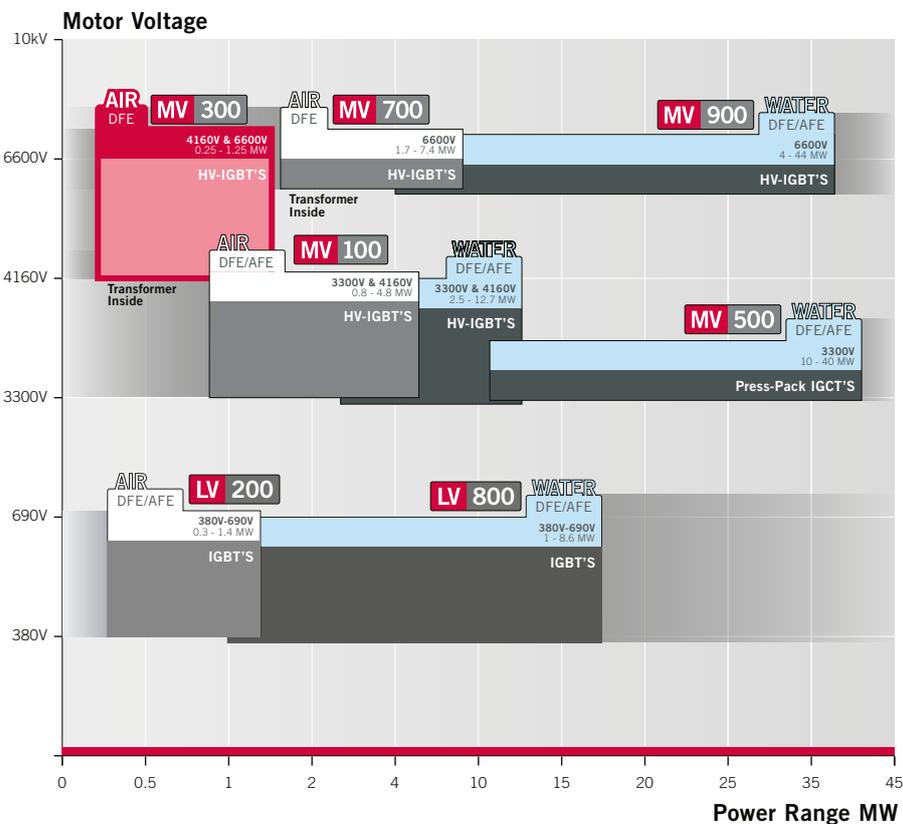
## INGEDRIVE™ MV300

### The most compact and robust solution for medium-voltage applications

The INGEDRIVE™ MV300 frequency converter range has been designed to efficiently control energy consumption in any sector requiring high levels of exchange with minimal space and maintenance. Ingeteam has invested more than four decades of experience in designing and manufacturing power converters, applying all of its know-how and including the latest advances in control electronics, with the most reliable semiconductors and passive elements on the market. The result is a robust, compact and reliable family of frequency converters.

Based on the concept of modular design and thanks to the built-in transformer, INGEDRIVE™ MV300 medium-voltage converters cover a wide range of power supply voltages for the most demanding applications in sectors including mining, steelmaking and water pumping amongst others. Likewise, its versatile control architecture together with its powerful CPU (Converter Processing Unit) makes it possible to control any type of electrical rotary machine (be it induction, synchronous or permanent magnet) with the best possible performance in terms of speed and torque precision.

The INGEDRIVE™ MV300 frequency converter range extends up to 1.25 MW and is available in 4.16kV and 6.6kV.



- Sectors**
- Marine & Offshore
  - Oil & Gas
  - Power Generation
  - Mining, Cement, Materials Handling
  - Steelmaking
  - Water Treatment
  - Test Benches and Wind Tunnels





## Main Benefits

### **Robustness and Integrity**

The topology used in the MV300 range based on a 24-pulse rectifier, DFE, and 3L-NPC inverter, with HV-IGBTs, provides this range with a high level of robustness.

### **Reliable and User Friendly**

Since it is designed with a minimum number of components, the 3L-NPC topology with HV-IGBTs makes it highly reliable and user friendly.

### **Easy Maintenance**

It has been designed to minimise and facilitate maintenance and user tasks.

### **Highly Compatible**

Designed for both new and existing motors thanks to its built-in sinusoidal filter at the converter outlet.

### **Designed to Work at Heights**

The INGEDRIVE™ MV300 family has been specially designed to work under the most harsh environmental conditions and in the most extreme applications including installations at heights up to 5,000 m.

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## High-performance design tested and validated

It includes advanced control, protection and communications functional features.

## Control and cooling cabinet

### Cooling outlet

- Highly-efficient design
- Redundant cooling with variable speed (optional)
- Low noise level

### High-quality enclosure

- Front access for all user and maintenance actions
- Protection degree from IP21 to IP42

### Air inlet filter

- Air inlet filter which can be replaced from the outside without the need to open doors or equipment. (optional)



**Emergency stop button**

**Touch screen for local control [HMI]**

- Powerful user-friendly interface
- Accessible remote and local control

**Input switch and control with built-in earthing**

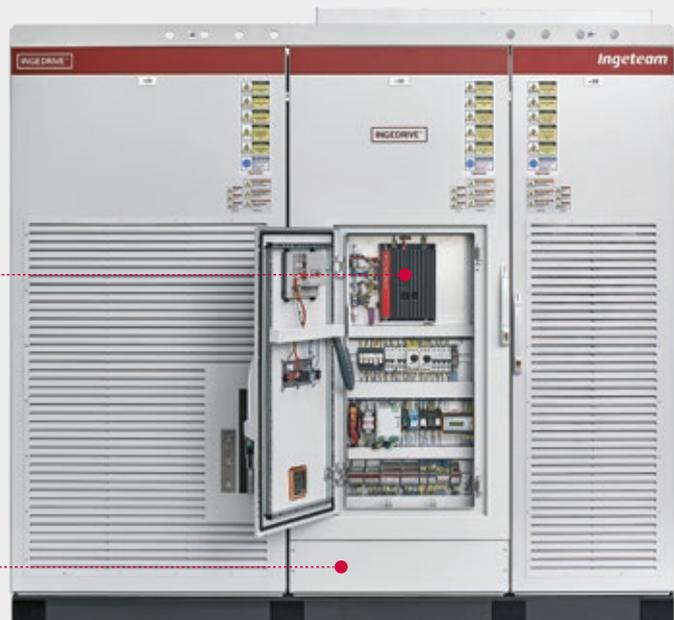
## Control cabinet

### Control Unit

- Powerful CPU for regulation and control, with a built-in PLC for basic control logic.
- Remote, diagnostics, monitoring and control via a web application without the need to install any additional software.
- Easily accessible cabinet and main components.
- Modular and scalable control topology.
- Robust, certified control design.

### Control connection with the client

- Control connection terminals with the client easily accessible from the outside without the need to open power cabinets.



## Power cabinets

### Input/Output Cabinets

#### High compatibility with the motor

- Sinusoidal filter included as standard, permitting long distances between the motor and the converter or connection to the old motor.

#### Easily-accessible cabinets

- For control and power cabling.
- Available with upper or lower inlet.

#### Safety

- Grounding switch and key interlock for maximum safety including door blocking.
- Built-in power fuses in the transformer's primary circuit (optional 6.6 kV).
- Switch + contactor with no need for dedicated input switch (optional 6.6 kV).

### Inverter with 3L-NPC topology based on HV-IGBT semiconductors Basic power modules [BPM]

- Based on HV-IGBTs .
- Easy access, maintenance and exchange.
- Control via fibre optic.

### 24-pulse rectifier

### Power management module

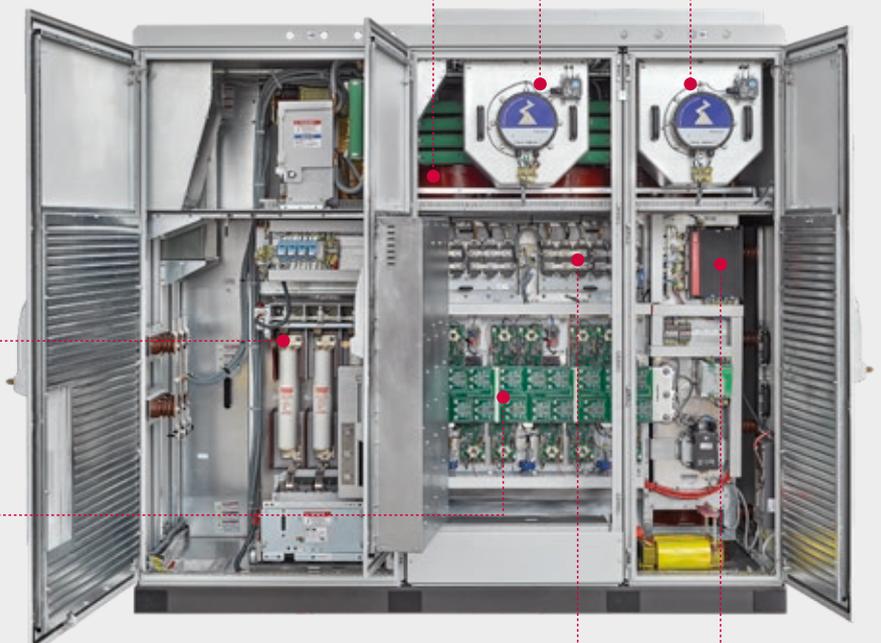
- Built into the power cabinet and communication with the CPU via fibre optic.

### Fans

- Built-in fans.

### Transformer

- Multi-pulses, VPI in the rear part.

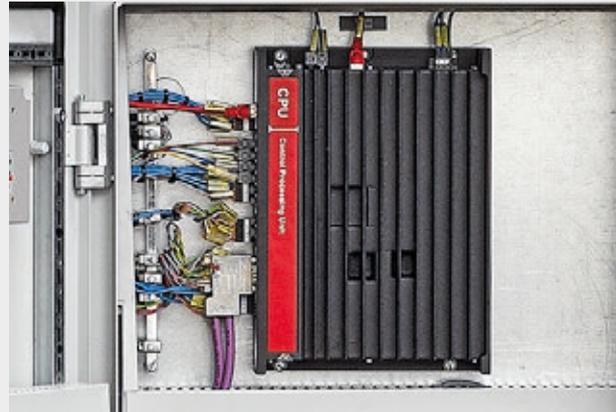


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## Control Features

In order to analyse the potential, architecture and adaptability of the control system offered by INGEDRIVE™ equipment, the following three areas need to be considered:



## HMI and Operator Panel

The whole INGEDRIVE™ family has powerful, user-friendly interface tools developed for parametrisation, commissioning, use and maintenance and for users of all levels, using the following:

- Web Application: Embedded in the CPU with functional features such as software updating, alarms log, parametrisation, with user level definition.
- Operating panel: user-friendly tool with a touch screen containing important information such as the general status, measurement, alarms and basic local control functional features.
- Remote Diagnosis, Control and Log: The whole INGEDRIVE™ family offers clients powerful tools for commissioning and support based on web technology. This server technology only requires a web browser, allowing remote access via Ethernet to all enabled functional features.
- Customized panels: Ingeteam offers a package of tools for developing and customizing the HMI: both the web application and the operating panel are easily customizable so that they can be adapted to client requirements, permitting customized development according to the client's own requirements.

## Hardware Architecture

The control hardware is based on standard shared modules for the whole INGEDRIVE™ family, both in low and medium voltage. The control system consists of the following main modules: PMM [Power Management Module] and CPU [Converter Processing Unit] which permit a multi-drive configuration and can be used for different topologies.

### The main characteristics are as follows:

- Reliable hardware based on standard modules.
  - Versatile modular design
  - Validated in different application sectors
- Advanced processing capacity
  - DSP processor for regulation and control functions
  - PLC microprocessor for control logic functions
- Powerful interface for inputs and outputs
  - High-resolution measurements
  - Option for digital/analog input/output expansion
  - Permits communication with multiple field buses
- High electromechanical resistance
  - Robust design with metal casing
  - EMC-certified (IEC 60092 / IEC 61800)

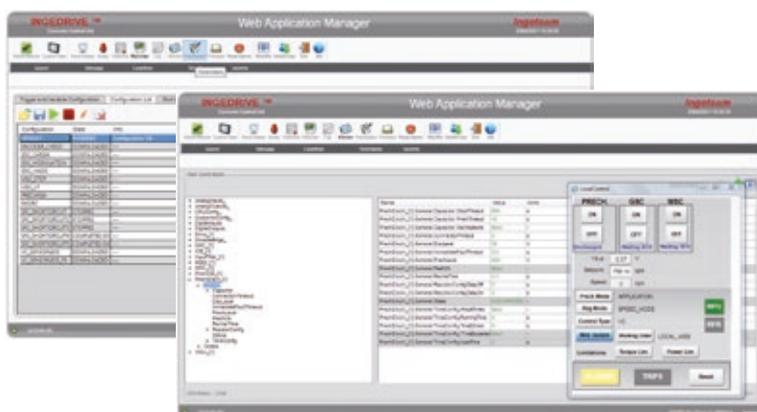
## PLC and Control Software

Standard INGEDRIVE™ devices contain a PLC whose programming is based on the IEC61131-3 standard, allowing the client to use their own logic and program their own signals and communication according to their needs. The INGEDRIVE™ family's control system is so powerful and versatile that it can be adapted to the different converter topologies of the whole range, such as the following:

- Two-level inverter.
- Three-level NPC inverter with vector modulation or selective harmonic elimination.
- 5-level inverters with H-Bridge topology.

Furthermore, the control system is capable of managing not only single-drive but also multi-drive configurations, adapting itself to the requirements of different applications with the following functional features:

- DC bus voltage regulation using DFE or AFE technology.
- Frequency converter for hybrid topologies: Static Frequency Converter.
- Option to control multiple types of machine with auto-tuning control algorithms developed for each type of motor.
  - Asynchronous motor
  - Synchronous motor (brush / brushless)
  - Permanent magnet motors
  - Vector control
  - Encoderless vector control (sensorless)
- Redundant topologies using doubly-fed motors: Synchronous and Asynchronous.



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## Certification

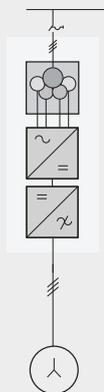
The MV300 series complies with the IEC standards for medium-voltage equipment as well as having certifications such as the following:

- CE marked certificates
- IEEE344/1987 seismic certification
- UL Certification
- Asbestos Free
- Green Passport

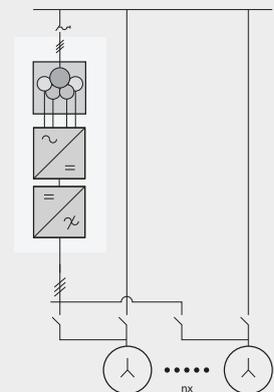


## Topologies

**Single-Drive Solutions:**  
standard applications based on a single motor fed by a DFE converter.



**Sequential startup:**  
sequential startup option of several motors.





## Why Ingeteam?

### *flexible + customized*

One of Ingeteam's cornerstones and hallmarks by which our clients recognise us is our flexibility and ability to adapt our products, services and solutions which, together with the high standards of quality in our products, make INGEDRIVE™ a leading reference in the major sectors where we are present.

**Flexibility:** Adapting ourselves to design requirements, adapting our products to specific applications, offering flexible service and support whenever and wherever our clients need it.

**Customization,** taking the main element of any INGEDRIVE™ equipment which is the BPM (Basic Power Module) or power module. Ingeteam's design and engineering department adapts the final product to comply with each client's specific requirements, without compromising reliability or robustness and increasing usability and optimisation for each application. We not only manufacture devices but also personalise them to offer the best solution in a wide range of sectors including the marine sector, industry, mining, and oil & gas. Perhaps this is why over 90% of our clients rate us as being flexible and as providing highly-customizable solutions. These two cornerstones are complemented with demanding quality standards which all of our products are subjected to, allowing Ingeteam to offer:



#### **More than 45 years' experience in power converters**

Over 45 years' experience in power electronics for applications in a wide range of sectors including energy generation, industry, mining and the marine sector have created an extensive, solid knowledge base. This enables our design and engineering department to advise our clients on the best option and adapt equipment and software to each particular application, thus offering custom-made solutions.



#### **Load tests of all equipment at rated current**

With the aim of including the latest advances in power electronics in INGEDRIVE™ equipment, Ingeteam boasts the largest power electronics laboratory in southern Europe and one of the biggest in the world. The testing and validating facilities cover a surface area of 13.000 m<sup>2</sup> with a capacity for testing equipment over 40MVA and with voltages up to 6.6 kV and a team of international engineers and researchers.

Hence, Ingeteam offers combined or specific tests, besides the routine tests carried out on all INGEDRIVE™ equipment.



#### **Manufactured 100% in Europe**

Ingeteam designs and manufactures the entire INGEDRIVE™ range in its logistics and manufacturing centres in Europe. Ingeteam always works with mainly european leading brands and directly controls the entire manufacturing process to thus ensure the final quality of its products.

Hence, the flexibility, development capacity, customization and quality of our products are key points which make our clients consider us as technological partners.

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|  |             | 4160 Vac    |                       |      | 6600 Vac    |             |                       |      |
|--|-------------|-------------|-----------------------|------|-------------|-------------|-----------------------|------|
| Rectifier Type   | Power<br>kW | Curent<br>A | Width Weight<br>mm kg |      | Power<br>kW | Curent<br>A | Width Weight<br>mm kg |      |
| <br>24 Pulse<br>DFE | 250         | 40          | 2410                  | 4150 | 250         | 25          | 2210                  | 4000 |
|  | 500         | 80          |                       |      | 500         | 50          |                       |      |
|  | 750         | 120         |                       |      | 750         | 75          |                       |      |
|  | 1000        | 160         |                       |      | 1000        | 100         |                       |      |
|  | 1250        | 200         |                       |      | 1200        | 120         |                       |      |

Depth: 1295 mm    Height: 2300 mm

## Considerations

**Motor Type:** Squirrel Cage Induction

**Performance:** 96.5%

**Power Factor:** 0.90

**Ambient Temperature:** 0 °C to 40 °C (max.). Up to 50 °C with reduction factor

**Load Type:** Variable Torque

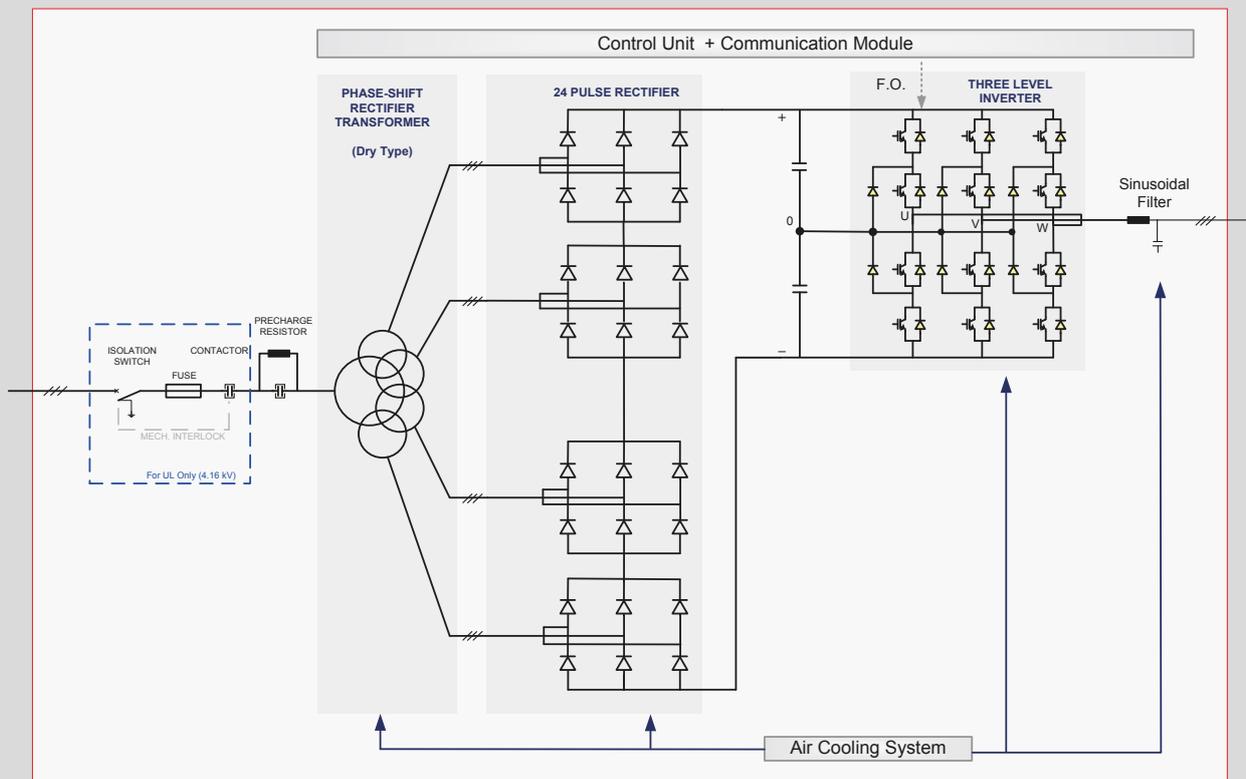
**Grid voltage:** Motor Voltage

**Overload:** 115% for 60 s every 10 min.

**Altitude:** < 1000 m (Metres above sea level)

Up to 5000 m above sea level with reduction factor

## Electrical Drawing





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| Standard Characteristics                    |   |
|---|---|
| <b>Hardware Interface</b>                   | Analog Inputs: 2  |
|   | Analog outputs: 2   |
|   | Digital inputs: 9   |
|   | Digital outputs: 10   |
|   | Emergency control with cable breakage detection: 4                                      |
|   | Basic control panel: E-Stop, access to the CPU and local-remote switch                  |
|   | Redundant Encoder (Except for sensorless control) [Encoder not supplied with the drive] |
| <b>Various</b>                              | Colour touch screen (HMI) - 7"  |
|   | Heating resistor (to prevent condensation)  |
|   | Varnished PCBs  |
|   | Support bars and door retainers (only marine applications)                              |
|   | Lifting supports  |
|   | RAL7035 colour  |
|   | IP21 protection degree  |
|   | CE marking and Green Passport certification   |
|   | UL-Listed certificate (only 4.16 kV)  |
|   | Halogen-free and flame-retardant materials  |
|   | Lower access to control and power cables  |
|   | <b>Electrical Components</b>  |
| Ground isolation monitoring system          |   |
| Preloading and unloading internal system    |   |
| Long-lasting polypropylene capacitors       |   |
| Switch + contactor + fuses (only UL option) |   |
| <b>Functional Features</b>                  | Flying start functional feature   |
|   | Encoder / encoderless vector control  |
| <b>Software</b>                             | Programming + remote Ingewebapp access- No licence required                             |
| <b>Documentation</b>                        | Documentation (2 printed copies + 2 digital copies) in English or Spanish               |

| Optional Features                          |   |
|--|---|
| Hardware Interface                         | Extended hardware interface package   |
|  | Analog outputs: +2  |
|  | Digital inputs: +3  |
|  | Digital outputs: +3   |
|  | Emergency control extension with cable breakage detection: +5               |
|  | Emergency control with cable breakage detection and short-circuit detection |
|  | BCP control panel + NFU control and equipment connection                    |
|  | I/O module for additional connectivity                                      |
|  | External heating resistors, control and power supply (up to 300 W)          |
| External cooling: control and power supply |   |
| External PT100 meters ( up to 8 channels)  |   |
| Communications                             | Fibre Optic Adaptor   |
|  | Profibus-DP, Modbus TCP, CAN Open, Modbus RTU, DeviceNet                    |
|  | Other field communications protocols  |
| Various                                    | Special protection degree (up to IP 42)                                     |
|  | Special RAL paint   |
|  | Upper access to network cables  |
|  | Upper access to motor cables  |
|  | Upper access to control cables  |
|  | Customized indicators in the cabinet  |
|  | Seaworthy packing   |
|  | MCT sealing modules   |
| Electrical Components                      | Output switch*  |
|  | Excitation module for synchronous motors (Ref.: MC9101-A)*                  |
|  | Auxiliary power supply source   |
|  | Grid voltage > 6.9 kV, but < 11 kV*   |
|  | Redundant cooling   |
| Documentation                              | Additional documentation and in other languages                             |
| Certification                              | DNV-GL  |
|  | CCS   |
|  | RINA  |
|  | RRR   |
|  | TL  |
|  | Others  |

\*Only for 6.6kV

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**CRS  
360°**

**CUSTOMER  
RELATIONSHIP  
SERVICE**

## INGEDRIVE™ Support

In our commitment to offering our clients complete and personalised solutions, Ingeteam offers a 360° CRS (Customer Relationship Service) with all of our product range, providing you with comprehensive consultancy, direct technical support, training and maintenance services throughout the lifetime of our products.

360° CRS is a dynamic, personalised service that covers all of stages and contact points between Ingeteam and our clients. The 360° CRS programme is supported by a professional technical team whose goal is client satisfaction and continuous improvement of products and services, always hand in hand with the latest advances and technologies in each application sector.



## The following services are part of the 360° CRS programme



### Support with technicians and engineers. Direct access to design engineers and R+D

During the warranty period, in the event of an incident, Ingeteam guarantees assistance with key technicians and engineers providing advice and high-quality support to our clients.

Additionally, Ingeteam offers its clients the option to extend out-of hours customer support services provided by the Ingedrive technical support team by means of customized contracts to suit the needs of our clients.



### 25-year life cycle incl. service + spares

Ingeteam guarantees the repair service of the entire INGEDRIVE™ family for a period of 25 years as of the date of purchase of our equipment.



### Remote Access

INGEDRIVE™ products are ready to be monitored remotely which enables Ingeteam's technical team to offer our clients the option to track and analyse any incident in a device remotely.



### Commissioning

The commissioning of INGEDRIVE™ equipment is carried out by highly-qualified, multidisciplinary staff with experience in a wide range of sectors, to ensure your installation has best adaptation and best performance. This, together with the fact that devices leave the factory having been completely tested and verified, makes the commissioning time considerably shorter.



### Spare Parts Stock

Ingeteam has designed the INGEDRIVE™ range based on the concept of power stacks. This enables us to have a permanent stock of main converter components in our logistical and manufacturing centres, reducing the supply times for immediately attending to potential emergencies to a minimum.



### Repairs [Field Service]

Anytime, anywhere. The aim of INGEDRIVE™ Support is to minimise the impact of a potential stoppage or incident in our devices.



### Technical Support and Engineering

Ingeteam offers its clients pre-sales technical and engineering support in order to provide assistance and advice during the initial stages and from the project definition to the commissioning of our equipment and delivery of our installations.



### Training [Training Centre]

Ingeteam's team of course leaders offers comprehensive, customized theory and practical programmes to meet the training requirements of its clients.

Ingeteam has a specific area for providing theory and practical classes where we have specific material and converters with different topologies from the entire INGEDRIVE™ range. The different options can be summarised in two levels in which the subject content and depth of learning is adapted to the student and to the aim of the course.

- User Level Course:  
Explains maintenance and troubleshooting Aimed at users and end users.
- Expert Level Course :  
Aimed at equipment commissioning engineers. Suitable for integrators.

**Ingeteam Power Technology S.A.**  
Parque Tecnológico de Bizkaia, Edificio 110  
48170, Zamudio. Bizkaia. Spain  
[ingedrive.info@ingetteam.com](mailto:ingedrive.info@ingetteam.com)

***Ingeteam***

[www.ingetteam.com](http://www.ingetteam.com)