



INGEDRIVE MV 700

Frequency Converters

MEDIUM VOLTAGE — AIR COOLED

1700 to 11100kW
6 to 6.9kV

Ingeteam

Frequency Converters

air cooled, medium voltage

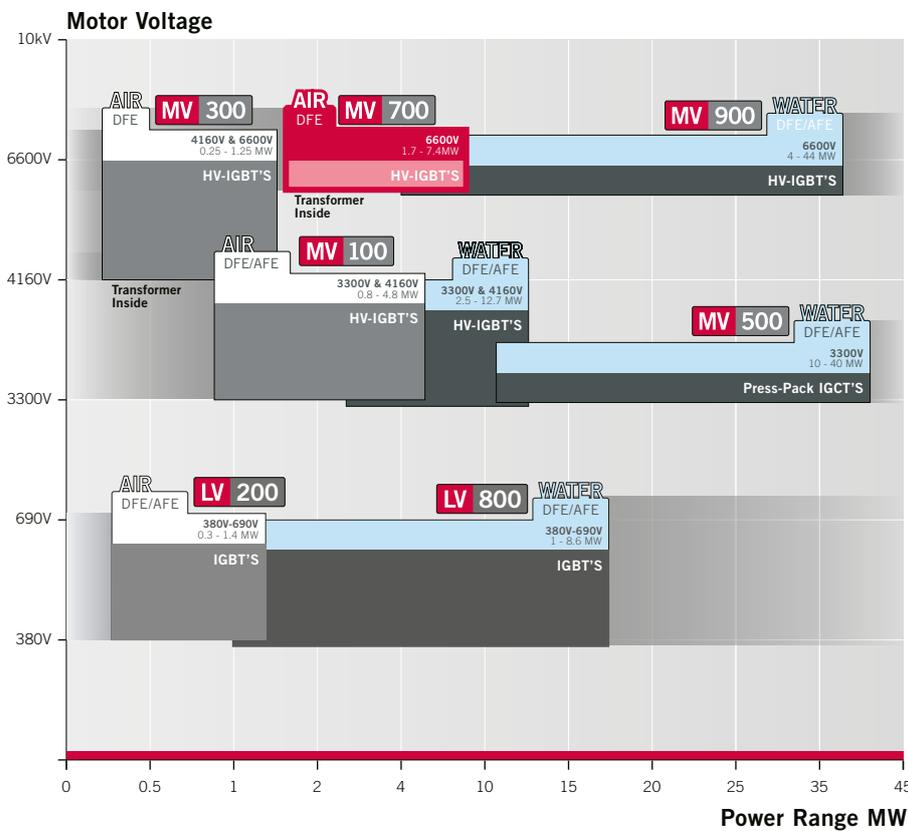
INGEDRIVE™ MV700

The most compact and robust solution for medium-voltage applications

The INGEDRIVE™ MV700 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™ MV700 medium-voltage converters cover a wide range of power supply and output power 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™ MV700 air-cooled frequency converter range extends up to 11.1 MW and is available in 6 to 6.9kV voltage configurations.



Sectors
 Energy Generation
 Mining, Cement, Materials Transport
 Steelmaking
 Water Treatment and Distribution.
 Test Benches and Wind Tunnels.





Main Benefits

Robustness and Reliability

The topology used in the MV700 range based on multi-pulse rectifiers, DFEs, and 5L-HB-NPC inverters, with HV-IGBTs, provides this range with a high level of robustness and reliability.

Extensive Range

Its modular design enables it to cover a wide range of powers up to 11.1 MW with a control system capable of controlling any type of motor.

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 optional built-in sinusoidal filter at the converter outlet.

Designed to Work at Heights

The INGEDRIVE™ MV700 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.

Frequency Converters

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Modular and scalable based on a tested and validated high-performance design

It includes advanced control, protection and communications functional features.

Control and cooling cabinet

Cooling system

- Highly-efficient design.
- Redundant cooling with variable speed (optional).
- Low noise level.
- Air inlet filters.

High-quality packaging

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

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.

Key and control of grounding switch

Touch screen for local control [HMI]

- Powerful, user-friendly interface.
- Remote and local accessible control.

Emergency stop button



Power Cabinet

24-pulse DFE rectifier
 Precharge module
 Multi-pulse transformer, VPI

Inverter with 5L HB-NPC topology based on HV-IGBT semiconductors
Basic Power Modules [BPMs]

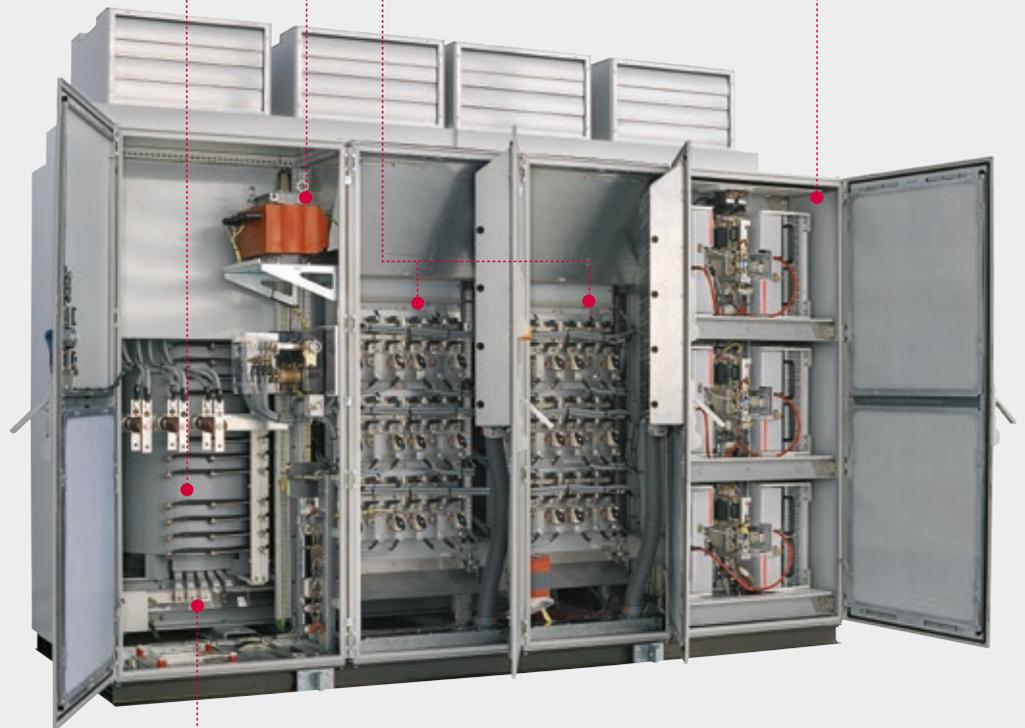
- Based on 4,500 V HV-IGBTs.
- Easy access, maintenance and exchange
- Control via fibre optic.

Compact and modular

- Possibility of duplicating the inverter for higher powers.

Power management module

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



Input/output cabinet

High compatibility with the motor

- dv/dt filter included as standard, permitting long distances between the motor and the converter.
- Sinusoidal filter integration in the same cabinet (optional).

Easily-accessible cabinets

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

Connections

- Ground connection and capacity for EMC cable feeders .
- Control cabling, power cabling, protection earth and power ground.

Safety

- Earthing switch and keys sequence for maximum safety including door blocking.

Frequency Converters

air cooled, medium voltage

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

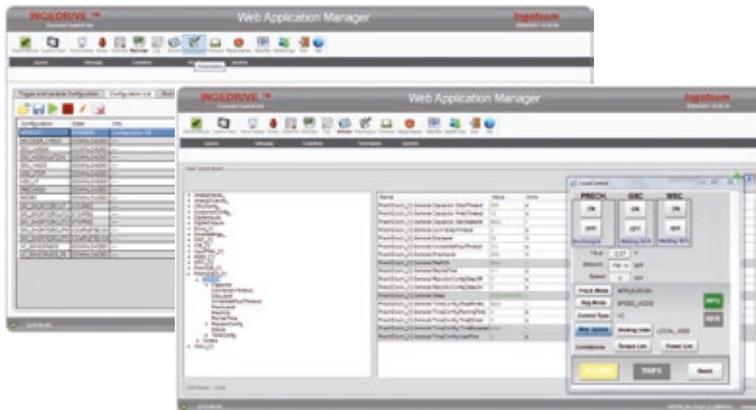
The whole INGEDRIVE™ family has powerful, user-friendly interface tools developed for parametrisation, commissioning, use and maintenance and for users of all levels, using the following:

- 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 Operator Panel are easily customizable so that they can be adapted to client requirements, permitting the 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] with the following characteristics:

- 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. INGEDRIVE™ MV700 makes it possible to control the inverter part based on a 5-level H-Bridge topology, adapting itself to the requirements of different applications with the following functional features:

- 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.
- Redundant topologies using doubly-fed motors: Synchronous and Asynchronous.



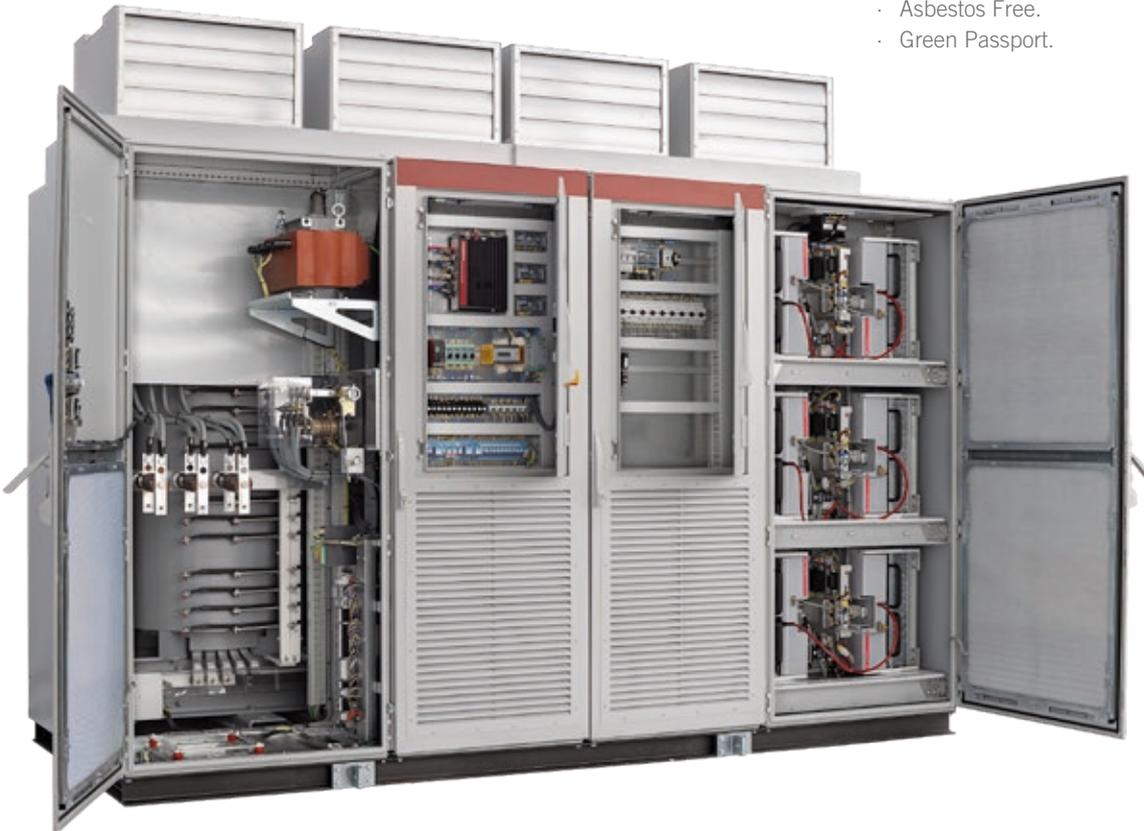
Frequency Converters

air cooled, medium voltage

Certification

The MV700 series complies with the IEC standards for medium-voltage equipment as well as having certifications such as the following:

- CE marked certificates.
- Asbestos Free.
- Green Passport.

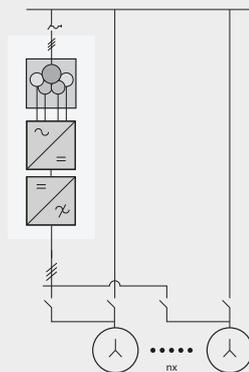


Topologies

Single-Drive Solutions:

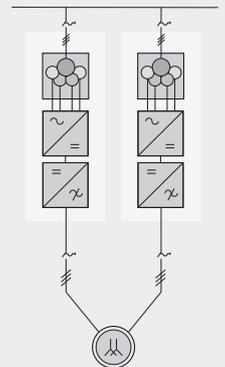
Standard applications based on a single motor fed by a DFE converter.

Sequential startup of several motors



Redundant single-drive solutions:

Applications which consists of motors doubly fed by two converters with DFE rectifier phase.



Why Ingeteam?

flexible + customized

One of Ingeteam's 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 m² 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.

Frequency Converters

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6600 Vac		with dV/dt output filter			With sinusoidal output filter		
Rectifier Type	Power kW	Current A	Width mm	Weight kg	Width ⁽¹⁾ mm	Width ⁽²⁾ mm	Weight kg
 24 Pulse DFE	1700	171	3610	6800	3610		7200
	1900	191	3610	6800		4210	7500
	2100	212	3610	7200		4210	8200
	2500	252	3610	7200		4210	8600
	3000	302	3610	7600		4210	8600
	3400	342	3610	7600		4210	8600
	3700	373	3610	7600		4210	8600
	5000	504	4410	12780	2800*	4410	13330
	5500	554	4410	12780	2800*	4410	13330
	6500	655	4410	14780	2800**	4410	15740
	6900	695			2800**	4410	15740
	7400	745			2800**	4410	16930
	8500	856					
	9000	907			Upon request	Upon request	Upon request
	9500	957					
	10000	1007					
11100	1118						

⁽¹⁾Transformer cabinet ⁽²⁾Converter cabinet Depth:1750 mm – Height:2825 mm *Depth:1200 mm – Height:2825 mm **Depth:1200 mm – Height:3125 mm

Considerations

Motor Type: Squirrel Cage Induction
Performance: 96.5%
Power Factor: 0.90

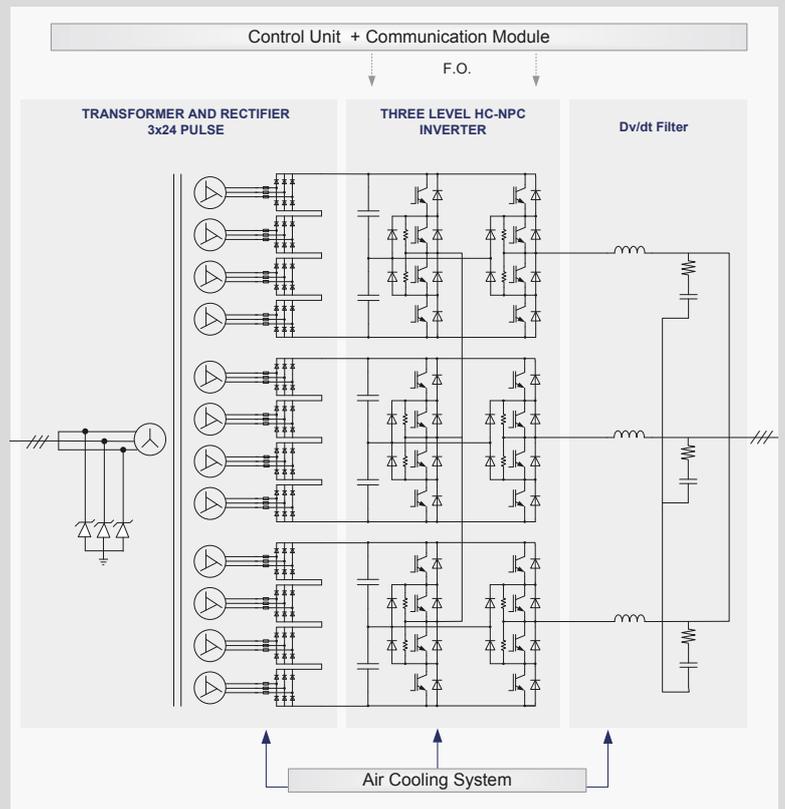
Ambient Temperature: 0 °C to 40 °C (max.)
 Up to 50 °C with reduction factor

Load Type: Constant torque with reduction factor <10Hz

Network voltage: ≤ 13,8 kV

Altitude: < 1000 m above sea level (Metres above sea level)
 Up to 5000 m above sea level with reduction factor

Electrical Drawing



“The use of speed converters for controlling flow allows for energy savings of over 30% compared to conventional systems”

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Standard Characteristics		
Hardware Interface	Analog Input/Output: Inputs: 2 Outputs: 2 (<4MVA) Outputs: 0 (>4MVA)	Digital Input/Output: Inputs: 6 Outputs: 10
	Emergency control: 2	
	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]	
Various	Colour touch screen (HMI) - 7"	
	Varnished PCBs	
	Support bars and door retainers (only marine applications)	
	Lifting supports	
	RAL7035 colour	
	IP21 protection grade	
	CE marking and Green Passport certification	
	Halogen-free and flame resistant materials	
Electrical Components	Dephaser transformer for 24P rectifier	
	Preloading and unloading internal system	
	Long-lasting polypropylene capacitors	
Functional Features	Protection against voltage dips	
	Protection against grid dips	
	Flying start functional feature	
	Encoderless vector control	
Software	Programming + remote Ingewebapp access- No licence required	

Optional Features	
Hardware Interface	Extended hardware interface package Analog Inputs: +2
	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	Profibus-DP, Modbus TCP, CAN Open, Modbus RTU, DeviceNet, O.F. Adaptador
	Other field communications protocols
Various	Special protection level (up to IP42)
	Special RAL paint
	Customized indicators in the cabinet
	Marine packaging
	MCT sealing modules
Electrical Components	Heating resistor (to prevent condensation)
	Monitored output switch
	Input/Output manual switch
	EMI filter
	Internal UPS
	Excitation module for synchronous motors (Ref.: MC9101-A)
	Auxiliary power supply source
	Upper access to network cables
	Upper access to motor cables
	Upper access to control cables
	Grid voltage > 6.9 kV, but < 11 kV
	Redundant cooling
	Ground isolation monitoring system
Auxiliary UPS (Supplied by Customer)	UPS/Frequency: 400 Vac (±10%) / 50/60Hz (±10%)
	UPS/Frequency: 440Vac (±10%) / 50/60 Hz (±10%)
	UPS/Frequency: 480Vac (±10%) / 50/60 Hz (±10%)
Certification	CCS, RINA, RRR, TL
	Others

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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.
- Expertise Level Course:
Aimed at equipment commissioning engineers. Suitable for integrators.

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Ingeteam

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