

Ingeteam

Variable Speed Drives

INGEDRIVE MV 100



Air Cooled

800 to 4.800 kW
3.3 kV / 4.16 kV Medium Voltage

Ingeteam

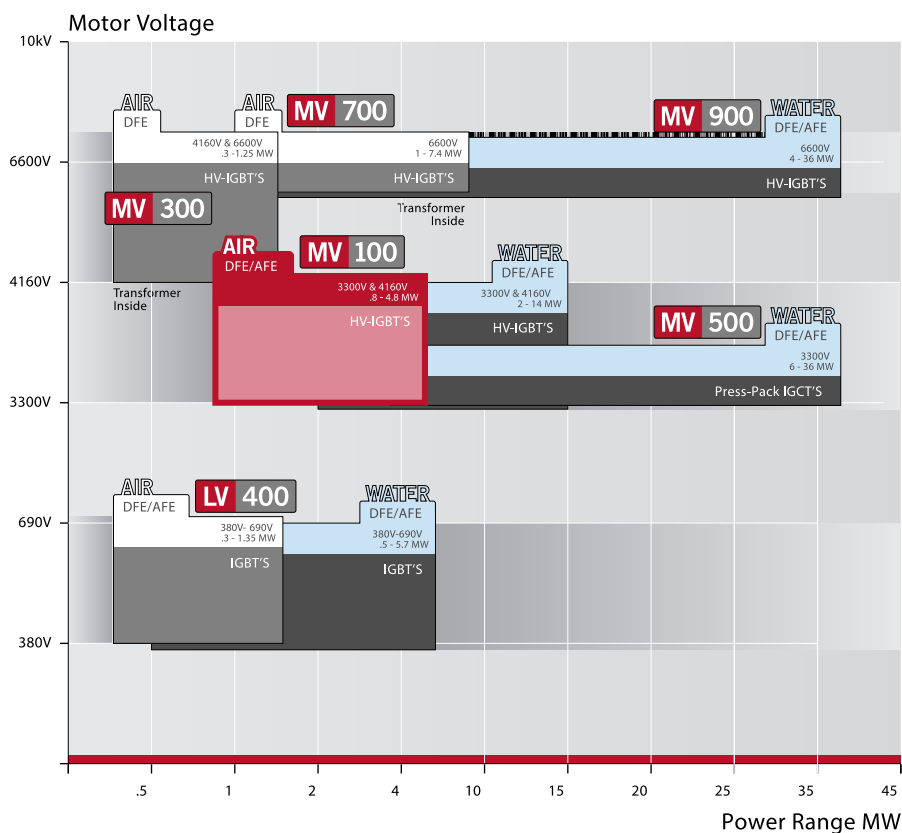
INGEDRIVE™ MV100

The most versatile and compact solution for medium-voltage applications

The INGEDRIVE™ MV100 frequency converter range in its air version has been designed to efficiently control power generation and control 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 latest semiconductors and passive elements on the market. The result is a compact, versatile and reliable family of frequency converters.

Based on the concept of modular design, INGEDRIVE™ MV100 medium-voltage converters cover a wide range of powers and voltages for the most demanding applications in sectors including power generation, mining, steelmaking and water pumping amongst others. Preferably, its versatile control architecture together with its powerful CCU (Converter Control 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 as well as dynamic response.

The INGEDRIVE™ MV100 air-cooled frequency converter range extends up to 4.8 MW and is available in 3.3 kV and 4.16 kV.



Main Benefits

Huge Versatility

The MV100 range is available with different rectifier configurations, both for simple topologies for one single inverter as well as for configurations with a common DC bar in multi-drive solutions.

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.

Extensive Range

Its modular design enables it to cover a wide range of powers up to 4.8 MW with a control system capable of controlling any type of motor and generator.

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™ MV100 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 5000 m.a.s.l.

A proven, scalable, modular architecture with a configurable, high performance design

Powerful protective, communication and control functionalities

Control Cabinet and fans

Cooling System

- High efficient design
- Redundant variable speed fans (optional)
- Low noise level
- Air input filters

High quality enclosure

- Full front access
- Protection degree from IP21 to IP42

Converter Control Unit

- Powerful CPU for regulation & control with an integrated PLC logic
- Remote diagnostics, monitoring and control via Web Application without an extra software
- Extra accessible cabinet for Control Components
- Modular and scalable Control Topology
- Robust and certified control design

Extra features included as Standard

- Insulation monitoring system
- UPS system and galvanic isolation with external cabling to ensure maximum control operability

Incoming & Control Cabinet

- 12/ 24-pulse input transformer included in extra cabinet as an option



Input Cabinet

Grid & Motor user friendly

- Standard dv/dt filter included, allowing high cable lengths between converter and motor
- Sinusoidal filter integration in the same cabinet as an option

Accessible input cabinet

- For control and power cabling
- Top and bottom cabling entry

Conexions

- Separated control cabling, power cabling, PE (Protection Earth) and PG (Power Ground).

Security

- Door Security Interlock System
- Ground Switch and keys sequence for full security, including control interlock



Power Cabinet

3-Level voltage source inverter using HV-IGBT power semiconductors

Human Machine Interface (HMI) on door

- Powerful and easy to use interface
- Remote and local control available

Basic Power Modules

- Based on 4.5 kV / 6.5 kV HV-IGBTs
- Easy access, maintenance and replacement
- Fiber optic control cable

Power Management Module

integration in the Power Cabinet, isolated from basic control electronics via Fiber Optic

Key and control Interlocked earthing switch Compact & Modular

- Up to 7 BPMs in the same cabinet for AFE+Inverter+Chopper solution
- 12P / 24P DFE Available in the same dimensions that AFE Solution

Pre-charge Module

Emergency Pushbutton



Control features

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



HMI and Operator Panel

The whole INGEDRIVE family has powerful, user-friendly interface tools developed for parameterisation, 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, parameterisation, with user level definition.
- Operator Panel: User-friendly tool with a touchscreen containing important information such as the general status, measurements, 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 tool package for developing and customising HMIs: Both the Web Application and the Operator Panel are easily customisable so that they can be adapted to client requirements, including the client's own development.

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 CCU [Converter Control Unit] which permit a multi-drive configuration and can be used for different topologies.

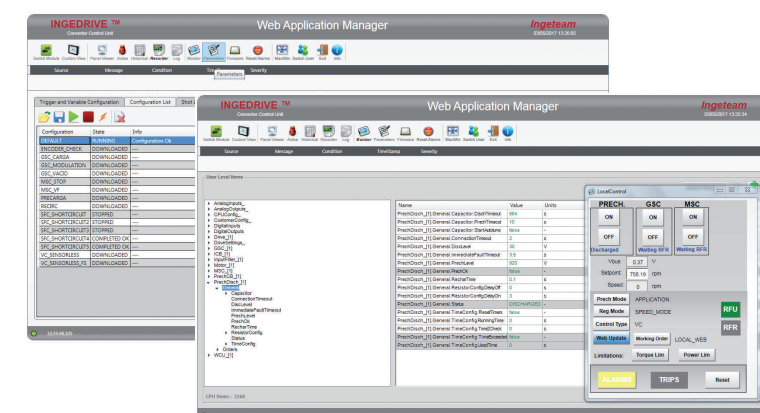
The main characteristics are as follows:

- 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 61131-3 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 not only managing single-drive but also multi-drive configurations, adapting itself to the requirements of different applications with the following functional features:
- Multidrive topology adapted to the application's requirements.
- DC bus voltage regulation using DFE or AFE technology
- Redundant DC bus option using two AFE rectifiers connected to different power networks
- 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
Vector control
Encoderless vector control
Synchronous motor (brushed and brushless control)
Permanent magnet motors
- Battery control for hybrid topologies
- Redundant topologies using doubly-fed motors. Synchronous and asynchronous.

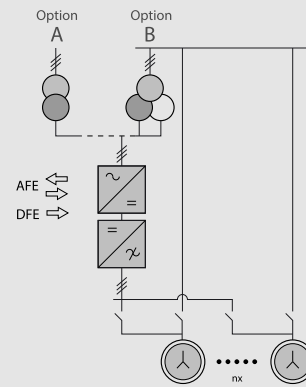




Topologies

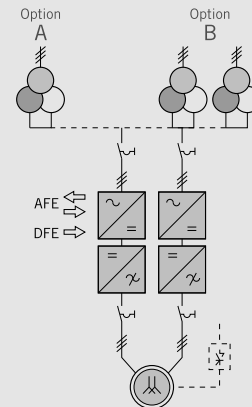
Single-drive solution:

a standard application consisting of one motor with a winding fed through a DFE or AFE converter. Sequential synchronous start as an option.

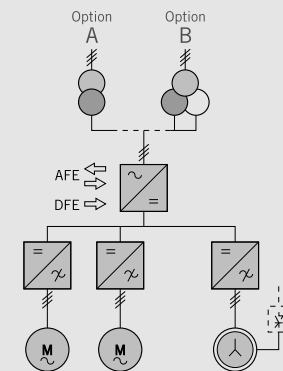


Redundant single-drive solution:

an application consisting of a motor with two windings fed by two inverters. The rectifier side can be DFE or AFE.



Multi-drive solution: Multi-drive application in which several inverters are connected to one single DC bus. While some motors can be braking, others can be motoring, thus transferring energy between themselves through the DC bus (i.e. tension reels on reversing cold mills in the metal industry and test bench applications).



Why Ingeteam?

flexible + customized

One of Ingeteam's cornerstones and hallmarks by which our clients recognise us is our flexibility and ability to customise 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.

Customisation: Taking the core of any INGEDRIVE device, namely the power stack, Ingeteam's design and engineering department adapts the final product to comply with the client's 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 90% of our clients rate us as being flexible and as providing highly-customisable solutions. These two cornerstones are complemented with demanding quality standards which all of our products are subjected to, allowing Ingeteam to offer:



3 Year / 5 Year Warranty

Ingeteam offers a standard 3-year warranty for converters and a 5-year warranty for power stacks, carrying out necessary operations on-site wherever the equipment is installed. We also offer the option of expanding the warranty period as well as maintenance service contracts.



More than 35 years' experience in drives with in-house technology

Over 35 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 not only advise our clients on the best option but also to adapt equipment and software to each particular application, thus offering custom-made solutions.



Full current test for all VFDs

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 13,000m², with a capacity for testing equipment over 27 MVA 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. Ingeteam's infrastructure allows us to offer combined or specific tests as well as rated current tests which are performed on all INGEDRIVE equipment, the testing capacity being up to 6.9 kV and 5,000 amps.



100% European/USA Made

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

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


Certification

The MV100 series complies with the IEC standards for low-voltage equipment as well as having the following specific certification:

- CE marked certification
- Marine application certification: ABS, BV, DNV-GL, LR, etc.
- UL Listed
- Asbestos Free
- Green Passport


Variable Speed Drives **MV 100** **INGEDRIVE**

3300 Vac			With dV/dt output filter		With Sinusoidal output filter		
Rectifier Type	Power kW	Current A	Width mm	Weight Kg	Width mm	Weight Kg	
<div> DFE</div>	12 Pulse $V_{IN}=2\times 1,850\text{ V}_{AC}$	800	161	1810	1410	1810	1780
		1100	222				
		1500	302				
		1800	363				
	24 Pulse $V_{IN}=4\times 1,850\text{ V}_{AC}$	800	161	1810	1600	2010	2000
		1100	222				
		1500	302				
		1800	363				
		2250	453	3610	3000	3610	3700
		2750	554				
		3240	653				
		3600**	725				
36 Pulse $V_{IN}=6\times 1,850\text{ V}_{AC}$	4200	846	5410	4500	5410	5500	
	4800	967					

 <div>With ext. transformer (Xsc 15%) VIN=3,300 VAC</div>	800	161	1810	1700	2010	2100
	1100	222				
	1500	302				
	1800	363				
	2250	453	3610	3400	4010	4100
	2750	554				
	3240	653				
	3600**	725				
	4200	846	5410	5100	6010	6100
	4800	967				
<div>With ext. transformer and input LC filter (Xsc 7%) VIN=3,300 VAC</div>	800	161	2610	2300	2610	2700
	1100	222				
	1500	302				
	1800	363				
	2250	453	5210	4600	5210	5300
	2750	554				
	3240	653				
	3600**	725				
	4200	846	7810	6900	7810	8000
	4800	967				
<div>Transformerless VIN=3,300 VAC</div>	800	161	2610	2500	2610	2900
	1100	222				
	1500	302				
	1800	363				
	2250	453	5210	5000	5210	5700
	2750	554				
	3240	653				
	3600**	725				
	4200	846	7810	7500	7810	8500
	4800	967				

** Double winding motor required when dv/dt output filter is installed (not applicable when using sinusoidal output filter)

4160 Vac		With dV/dt output filter			With Sinusoidal output filter		
Rectifier Type	Power kW	Current A	Width mm	Weight Kg	Width mm	Weight Kg	
<div> DFE</div>	12 Pulse $V_{IN}=2 \times 2,350 \text{ V}_{AC}$	800	128	1810	1500	2010	2150
		1100	176				
		1500	240				
		1800	288				
	24 Pulse $V_{IN}=4 \times 2,350 \text{ V}_{AC}$	800	128	1810	1600	2010	2250
		1100	176				
		1500	240				
		1800	288				
		2250	360	3610	3000	4010	4200
		2750	439				
		3240	518				
		3600**	575				
36 Pulse $V_{IN}=6 \times 2,350 \text{ V}_{AC}$	4200	671	5410	4500	6010	6300	
	4800	767					

 <div>With ext. transformer (Xsc 15%) $V_{IN}=4,160\text{ V}_{AC}$</div>	800	128	1810	1700	2010	2300
	1100	176				
	1500	240				
	1800	288				
	2250	360	3610	3400	4010	4600
	2750	439				
	3240	518				
	3600**	575				
	4200	671	5410	5100	6010	6900
	4800	767				
With ext. transformer and input LC filter (Xsc 7%) $V_{IN}=4,160\text{ V}_{AC}$	800	128	2610	2800	2810	3400
	1100	176				
	1500	240				
	1800	288				
	2250	360	5210	5600	5610	6800
	2750	439				
	3240	518				
	3600**	575				
	4200	671	7810	8400	8410	10200
	4800	767				
Transformerless $V_{IN}=4,160\text{ V}_{AC}$	800	128	2610	3100	2810	3700
	1100	176				
	1500	240				
	1800	288				
	2250	360	5210	6200	5610	7400
	2750	439				
	3240	518				
	3600**	575				
	4200	671	7810	9300	8410	11100
	4800	767				

** Double winding motor required when dv/dt output filter is installed (not applicable when using sinusoidal output filter)

Motor: Squirrel Cage Type with Efficiency: 96.5% & Power Factor: 0.90
Ambient Temperature: 0 °C to +40 °C (max) up to 50 °C with derating
Chopper braking resistor excluded & to be placed external to cabinet
Load Type: Variable and/or constant torque
Altitude: < 1,000 m.a.s.l. / Up to 5000 m.a.s.l. with power derating

Hardware Interface	Analog inputs: 2
	Analog outputs: 2
	Digital inputs: 9
	Digital outputs: 10
	Emergency control with wire break detection: 4
	Basic control panel: E-Stop, CPU access and local-remote switch
	Redundant Encoder (Except for sensorless)
Miscellaneous	Lighting and socket in control cabinet
	Color operation touch screen (HMI) - 7"
	Space heaters (to avoid condensation in enclosures)
	Varnished boards
	Fixing rods and door retainers (only marine applications)
	Lifting lugs
	RAL7035 cabinet color
	IP21
	CE Marking and green passport certification
	Halogen free and flame retardant materials
UL Listed for 4,16 kV	
Electric Components	Insulation Monitoring System (Except for transformerless connection)
	Internal Precharge and Discharge System
	Long life Polypropylene Capacitors
	Internal UPS
Functionalities	Black Out Prevention
	Fault Ride Through Capability
	Sensorless vector control
	Flying Start Functionality
Software	Programming plus Ingewebapp Remote Access. No license required.
Documentation	Documentation set (2 printed + 2 digital) in English or Spanish

Interface	Extended hardware interface/package	Analog inputs: +2
		Analog outputs: +2
		Digital inputs: +10
		Digital outputs: +10
	Extended emergency control circuit with wire break detection	
	Emergency control with wire break + short-circuit detection	
	Extended control panel: BCP + drive connection and NFU	
	Expansion IO modules for additional connectivity	
	External heaters control and feeding (up to 300W)	
	External fans control and feeding	
	External Pt100 measurement (up to 8 channels)	
Fieldbus Communications	Profibus-DP, Modbus TCP, DeviceNet, Profibus DP, CAN Open, Modbus RTU, DeviceNet, Other Fieldbus Communication Protocol	
Miscellaneous	Special degree of protection (Up to IP42)	
	Reactive power compensation only for converters with AFE rectifier	
	Special RAL painting	
	Customized cabinet indications (placed on door)	
	Packing for maritime transportation	
	MCT sealing modules	
Electrical Components	Output breaker	
	Output manual switch	
	EMI filter	
	Insulation Monitoring System (Only for transformerless connection)	
	Excitation module for synchronous motors (Ref.: MC9101-A)	
	Special auxiliary supply voltage	
	Grid side top power cable access	
	Motor side top power cable access	
	Control top cable access	
	Over Voltage Limiter Unit (OVLU)	
	Dynamic Braking Chopper	
	Redundant fans	
	Integrated transformer $V_{IN} < 11$ kV	
Documentation	Additional documentation set and language	
Certification	DNV – GL	
	LR	
	BV	
	CCS	
	ABS	
	RINA	
	RRR	
	TL	
	Others	



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:



24/7 support incl. direct access to R&D engineers

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

Once the warrant period has expired, Ingeteam offers its clients the option to extend out-of-hours customer support services provided by the Ingedrive technical support team by means of customised contracts to suit the needs of our clients.



25-year lifecycle 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. Therefore, we offer a global field service within 48 hours anywhere in the world.



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, customised 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 í Designed for maintenance and troubleshooting. Aimed at users and end users.
- Expertise Level Course í Aimed at equipment commissioning engineers. More for integrators.