

INGETRAC

Power Converters

High Power | Medium Power | Low Power

Traction Technology applied in Ad-hoc Client Solution

Ingeteam

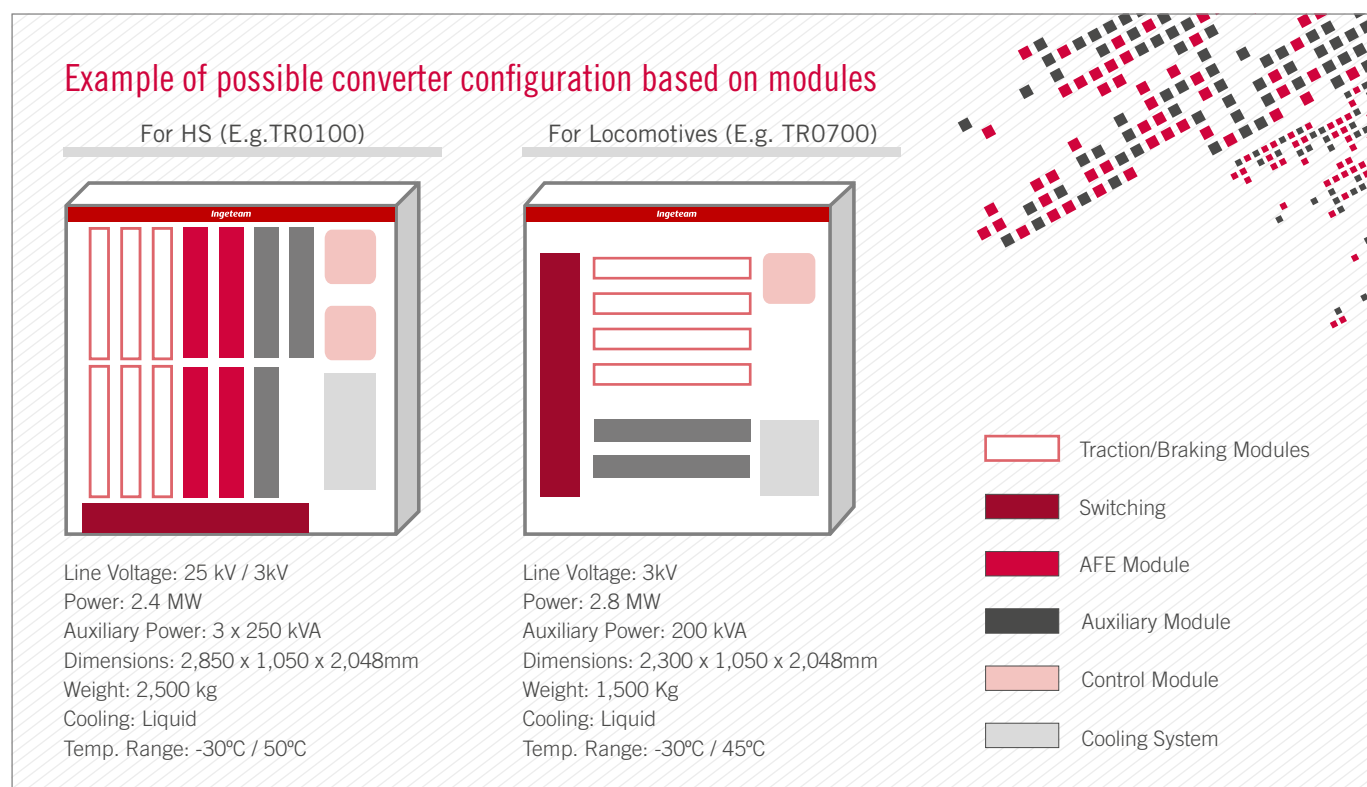
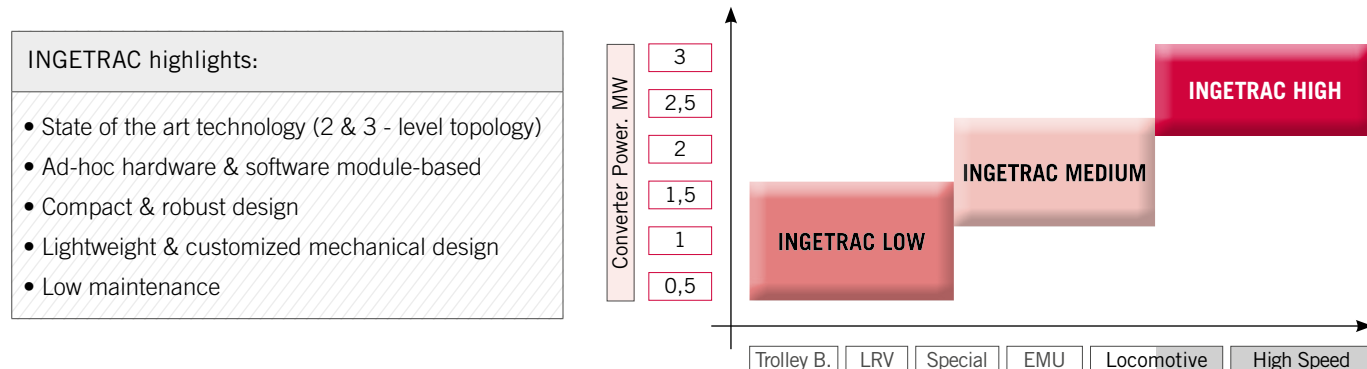
READY FOR YOUR CHALLENGES



Traction Converter Concept

Our concept is based on setting up the traction converters INGETRAC as an smart integration of extensively proved Power Modules. They are comprised of all necessary elements to be fully operational, on each required application. E.g. traction inverter, brake chopper, active front end, traction/auxiliary battery charger and auxiliary inverter when necessary.

Our experience on designing and building high power modules assures that all electrical and mechanical parts have already been proven, to assure the reliability and the quality of the complete system.



Control Module ELECTRA

ELECTRA control, manages logic and regulates the variables needed for the whole traction system to operate, fulfilling the most severe requirements of the railway sector (EN 50155 certified).

The Control Module is formed by main TCU, this is optimized for controlling IGBT based inverters / choppers, and a Computer Module is in charge of diagnostic and data logging functions.



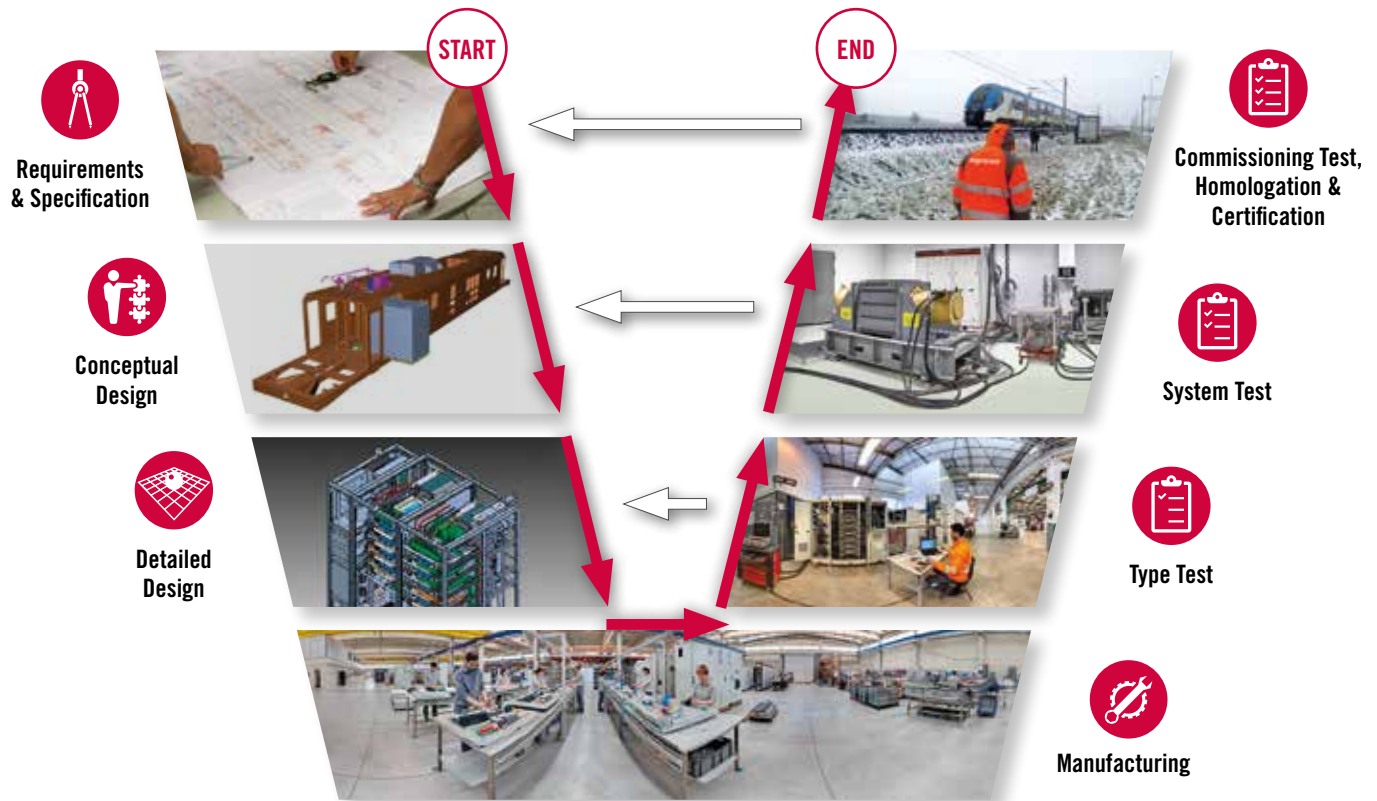
Main functions	Control of Power Modules Protections Communication (CAN, MEVB, Ethernet) Measurements of encoders I/O fiber optics Remote connection Slip/Slide Control Traction cut off	Additional functions	Preventive maintenance Self-diagnosis of problems Analysis of energy balance on-line Control of power factor Registers of working conditions
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Approach to Projects

Our vocation is to work side-by-side with our customers, developing the complete and optimal system solution.

Throughout this process, we carry out all the simulations & tests required to guarantee the correct specification of all embedded electrical systems. This will assure a successful integration into the vehicle's engineering.



Benefits for your projects:

- Quality: ISO/TS 22163 + ISO 9001:2015
- Possibility of full traction chain specification
- GATES project management methodology
- Engineering capacity, incl. TCMS



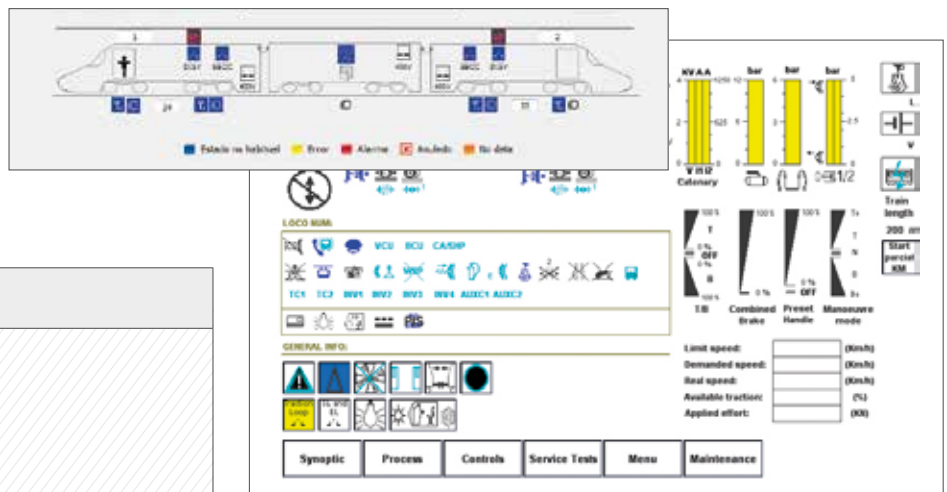
Maintenance

INGETRAC modular solutions and their integration guarantee an easy performance of all preventive and corrective maintenance tasks without the need for special tools.

Our INGETEAM licensed software allows free access to traction system parameters for diagnosis and data analysis providing a comprehensive maintenance solution.

Key factors:

- Low operating Life Cycle Cost (LCC)
- Predictive Maintenance (PdM)
- Maximum availability
- Focused on safety and reliability





Main References: INGETRAC High Power



DIESEL-ELECTRIC LOCOMOTIVES

Poland

Vehicles: 11
Power: 2.4 MW



HIGH SPEED POWER HEADS

Uzbekistan

Power Heads: 8
Power: 2.4 MW



ELECTRIC LOCOMOTIVES

Poland

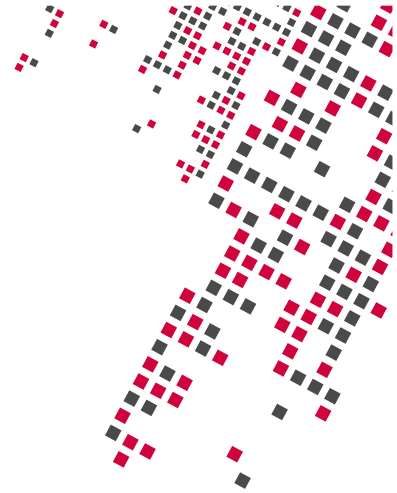
Vehicles: 21
Power: 5.6 MW



MULTIVOLTAGE HS LOCOMOTIVE

Spain

Vehicles: 1
Power: 3.6 MW



Key Technology Assets

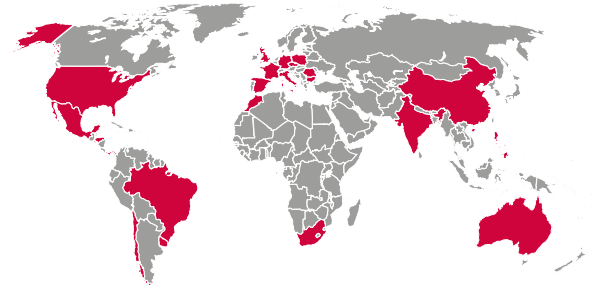
- INGETEAM Group in-house R&D resources
- One of most advanced power laboratories in Europe (up to 13 MW)
- Test facilities for the complete traction chain system test validation (EN61377)



Worldwide Presence

Internationalization is a vehicle for future progress.

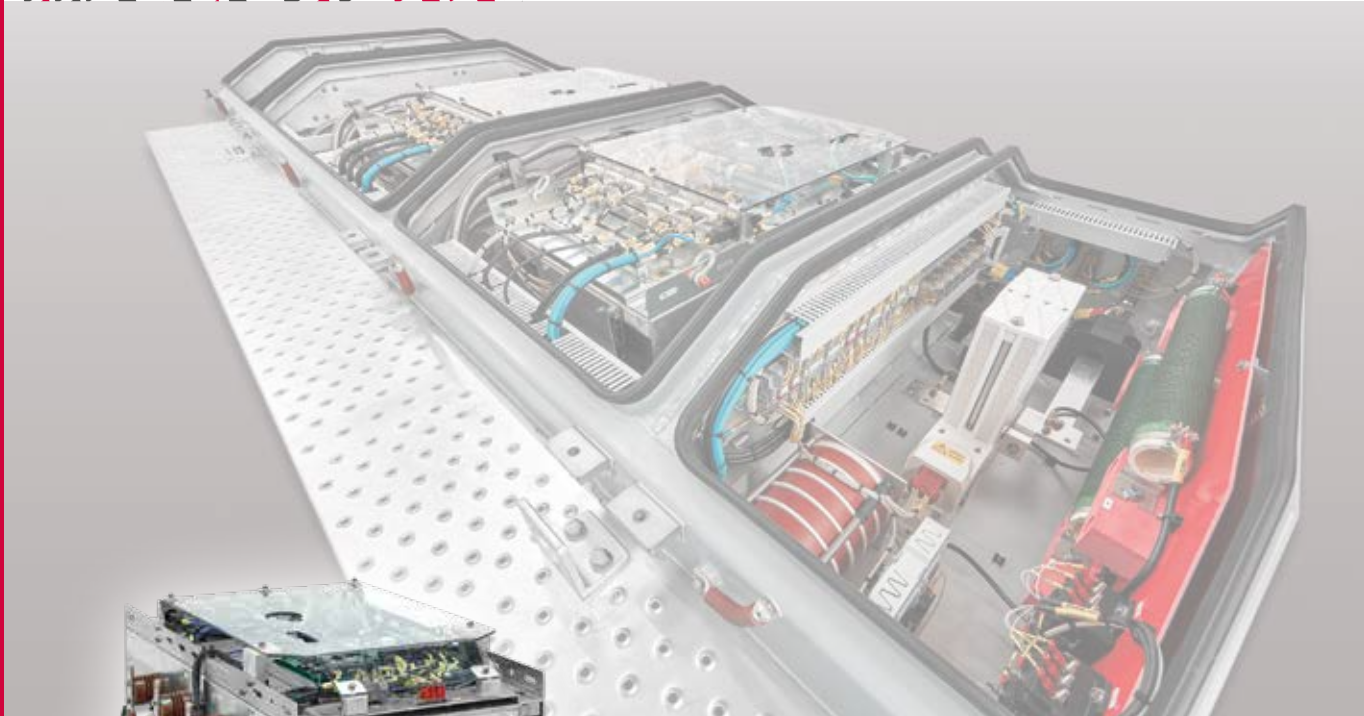
At present we have production, commercial and service establishments in more than 22 countries.



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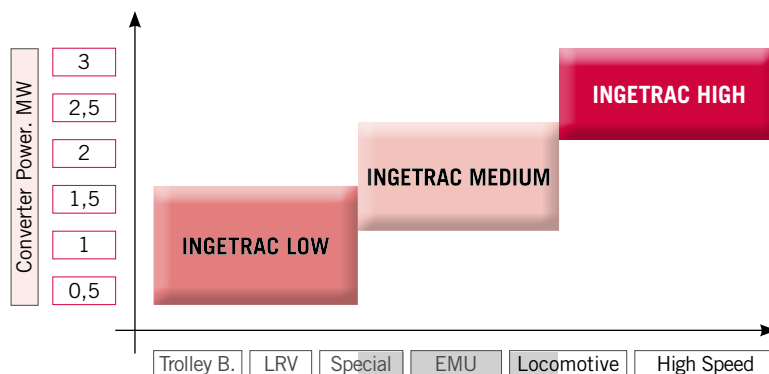


Traction Converter Concept

Our concept is based on setting up the traction converters INGETRAC as an smart integration of extensively proved Power Modules. INGETRAC Medium Power traction converter, thanks to its modularity and compact design, can be fitted on roof, under-frame or machine room cabinets to assure integration in different vehicles designs and requirements.

INGETRAC highlights:

- State of the art technology (2 & 3 - level topology)
- Ad-hoc hardware & software module-based
- Compact & robust design
- Lightweight & customized mechanical design
- Low maintenance



Example of possible converter configuration based on modules

EMU, On-roof configuration (TF0610.2)

Voltage line: 3,000 Vdc

Power: up to 2,6 MW

Auxiliary Power: 250 kVA

Dimensions: 3,330 x 1,760 x 512 mm

Weight: 730 kgs

Cooling: Liquid

Temp. Range: -35° / 40°C

EMU, Under- frame configuration (AN 9500)

Voltage line: 3,000 Vdc

Power: 1 MW

Auxiliary Power: 124 kVA

Dimensions: 1,600 x 655 x 1,800 mm

Weight: 1,500 kgs

Cooling: Forced Air

Temp. Range: -30° / 45°C

Battery charger & Precharge

Traction/Braking Modules

Switching Elements

Auxiliary Module

Control Module

Cooling System

Basic Power Module

This Basic Power Module for Medium Power INGETRAC is prepared as almost independent element [including ELECTRA, traction capacitor, IGBTs, etc...], which assures higher reliability, cost effectiveness and lower maintenance once integrated.

This BPM could be placed in parallel [e.g. TF610 includes 2x BPM] into more complex traction converter INGETRAC. Includes INGEMASTER diagnosis tools for preventive and corrective maintenance.

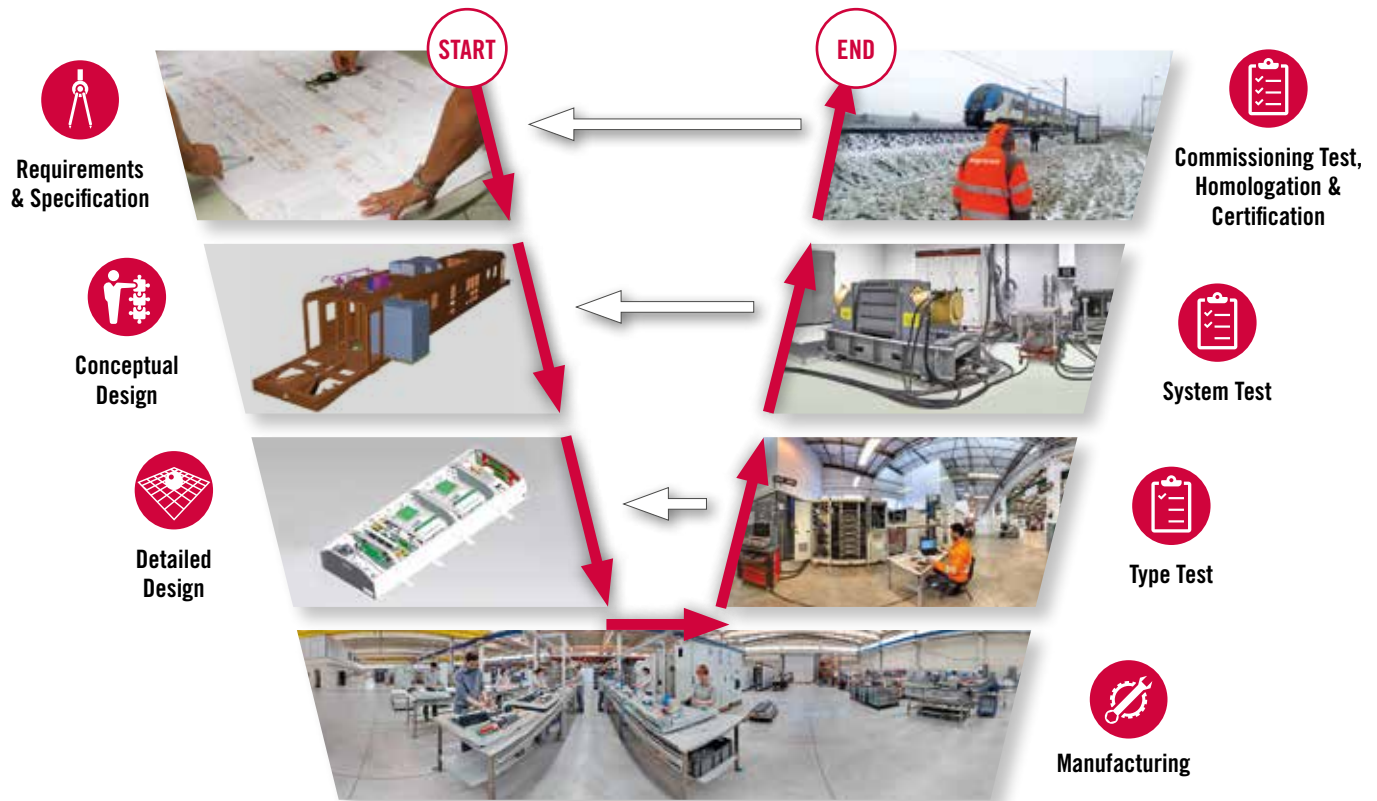
Main Characteristics	<div> <div>ELECTRA control board integrated</div> <div>Maximum Power: 1,3 MW Input</div> <div>Voltage: 3kV</div> <div>Output Voltage: 0-2340Vrms</div> <div>2-level topology [IGBT 6,5kV]</div> <div>Weight: 170kg</div> <div>Dimensions: 1005 x 718 x 460mm</div> <div>Liquid Cooled</div> </div>
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Benefits for your projects:

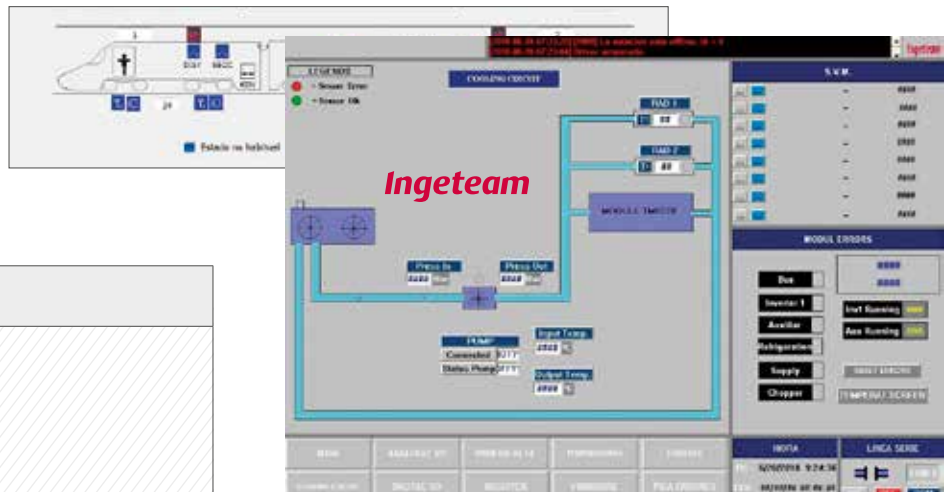
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Maintenance

INGETRAC modular solutions and their integration guarantee an easy performance of all preventive and corrective maintenance tasks without the need for special tools.

Our INGETEAM licensed software allows free access to traction system parameters for diagnosis and data analysis providing a comprehensive maintenance solution.



Key factors:

- Low operating Life Cycle Cost (LCC)
- Predictive Maintenance (PdM)
- Maximum availability
- Focused on safety and reliability



Main References: INGETRAC Medium Power



EMUs (On-roof) Poland

Vehicles: 51
Power: From 1.9 MW



EMUs (Under frame) Spain

Vehicles: 13
Power: 1 MW



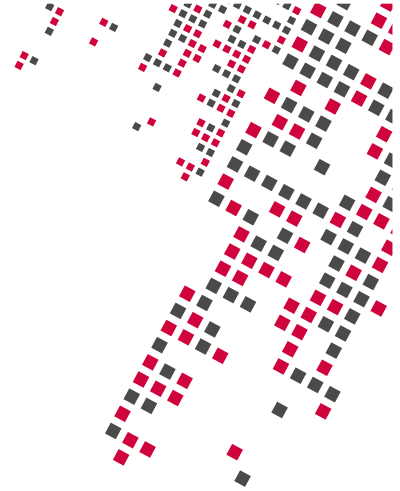
EMUs (On-Board) Poland

Vehicles: 90
Power: 2.1 MW



DIESEL-ELECTRIC LOCOMOTIVE Spain

Vehicles: 12
Power: 1.5 MW



Key Technology Assets

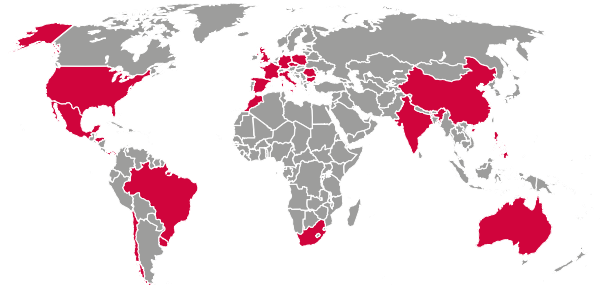
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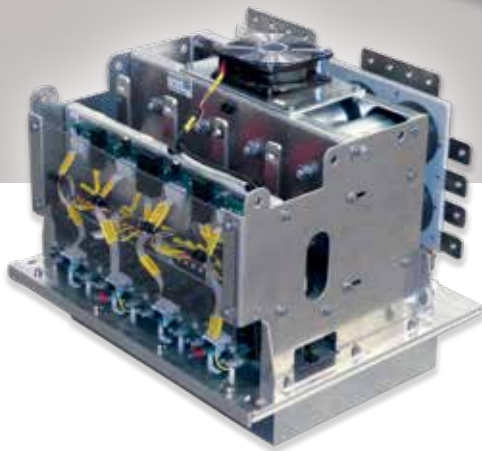
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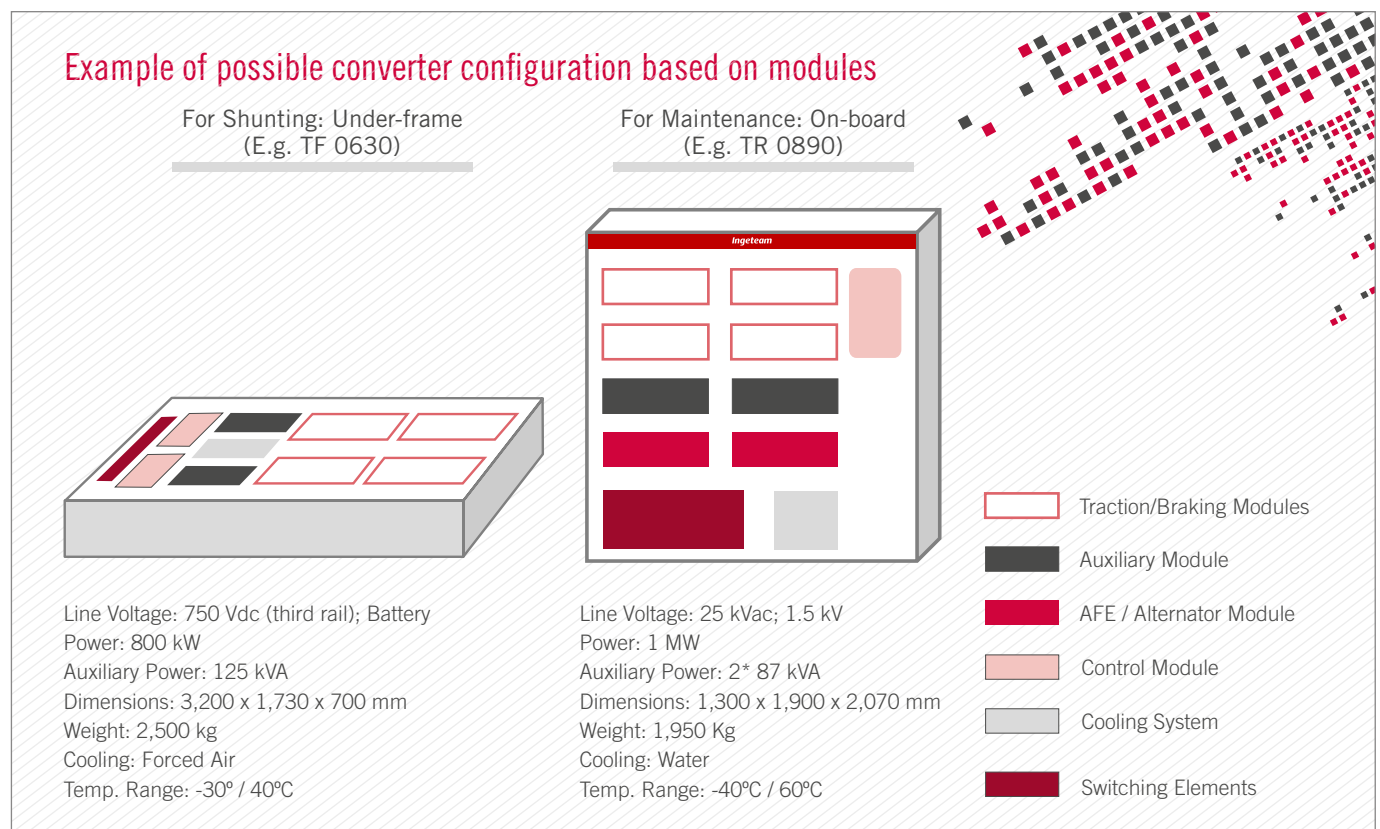
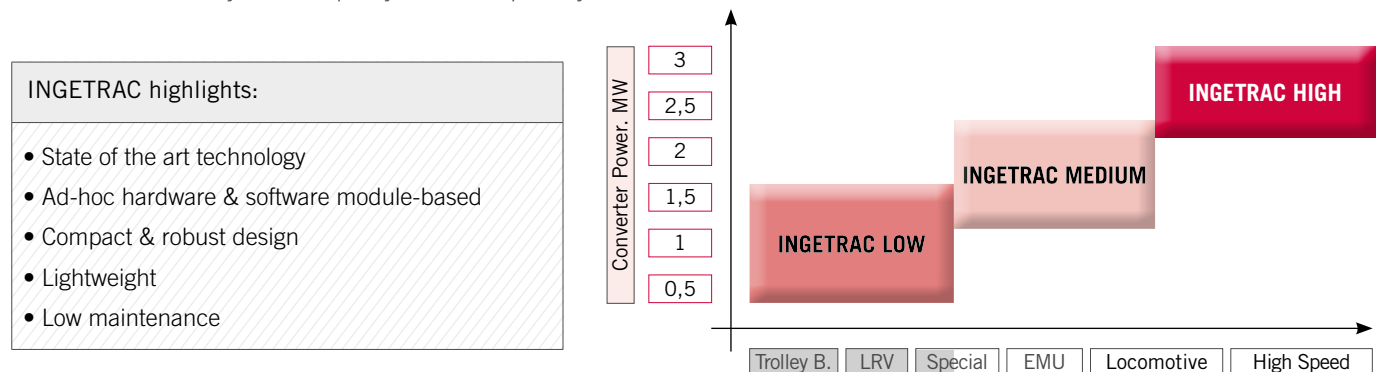
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Our concept is based on setting up the traction converters INGETRAC as an smart integration of extensively proved forced-air or liquid cooled Power Modules. They are comprised of all necessary elements to be fully operational, on each required application.

Our experience on designing and building low power modules assures that all electrical and mechanical parts have already been proven, to assure the reliability and the quality of the complete system.



Basic Power Module

This Basic Power Module for Low Power INGETRAC is prepared with different integration strategy. Its approach, which assures higher modularity concept maintaining high reliability, cost effectiveness and low maintenance, once integrated. It could be mixed and used e.g. as for traction, auxiliary inverter, AFE, alternator module... The rest of converter elements as ELECTRA, traction capacitors, cooling circuit, etc... is integrated directly in the traction converter.

Main Characteristics	<p>Maximum Power: 500 kW Input Voltage: 1.8kV Output Voltage: 0-1,404Vrms 2-level topology [IGBT 3.3kV] Weight: 33 kg Dimensions: 823 x 455 x 186mm Liquid Cooled</p>
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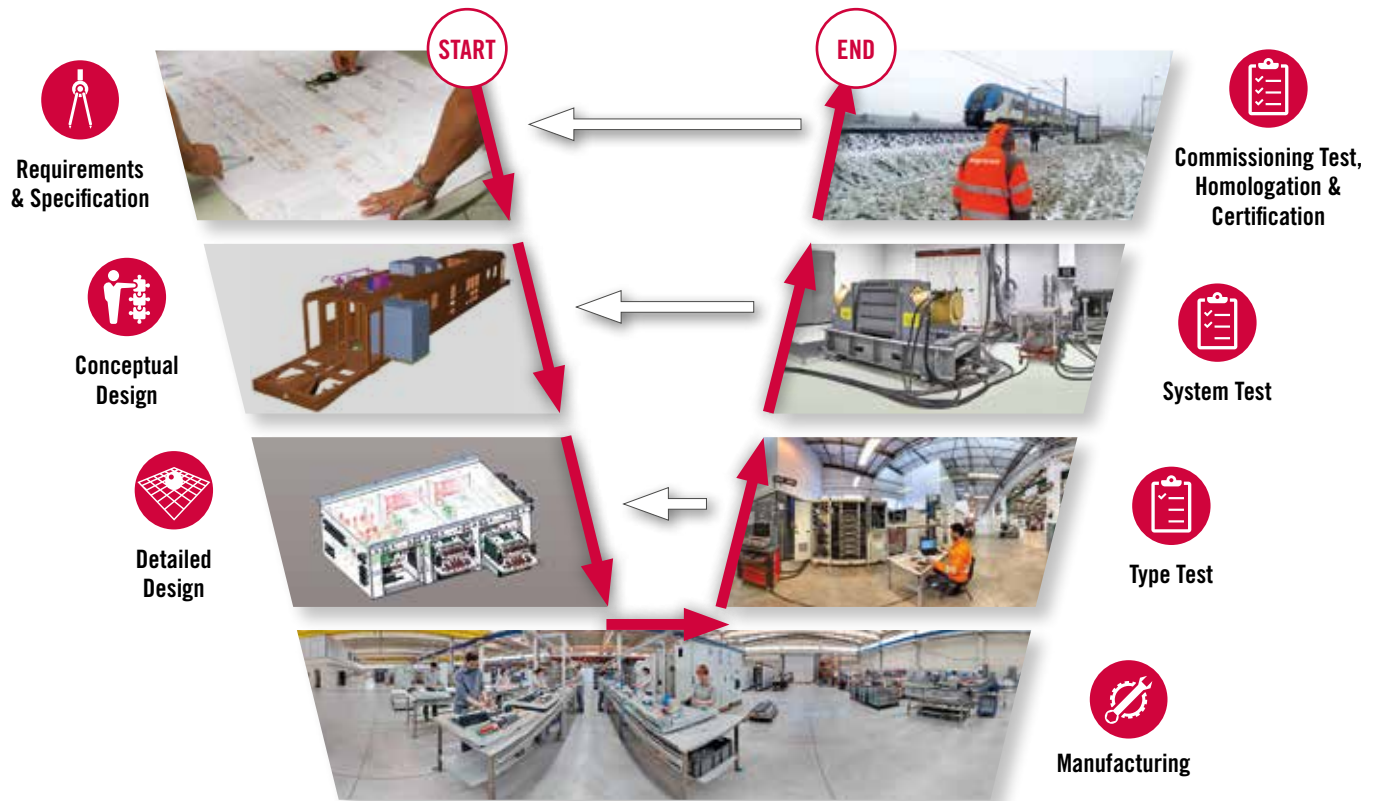




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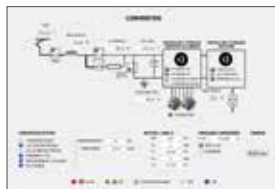
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Shunting Vehicle Germany

Vehicles: 1
Power: 800 kW



Maintenance Vehicle Finland

Vehicles: 1
Power: 800 kW



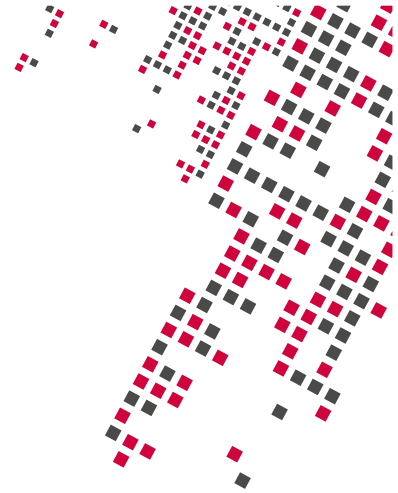
Tramways Spain

Vehicles: 8
Power: 500 kW



TrolleyBus Mexico

Vehicles: 1
Power: 500 kW



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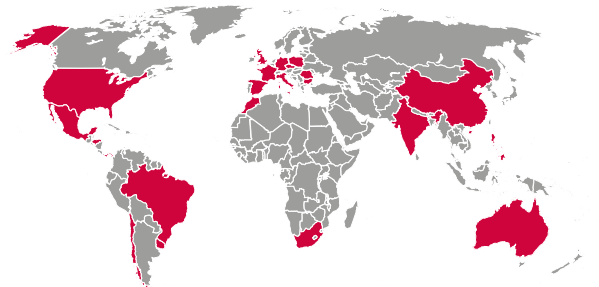
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