

INGETEAM supplies the water-cooled on-board traction converters for a newly designed multi-voltage electric locomotive, optimizing the system in terms of costs, space and weight.

Each of the traction converters incorporates two traction inverters, one by each motor, providing redundancy for the vehicle in order to improve availability rates.

The auxiliary converter has a power of 180 kVA and is integrated into traction converter in order to save space and weight.

The modular design has optimized the maintenance since it allows power modules to be exchanged in a reduced period of time, without the need for heavy, special tools and without the need to empty the cooling circuit.

Likewise, diagnostic tools have been developed for the purpose of minimizing maintenance costs.

Ingeteam also supplies the TCMS based on plug & play concept with train (CANOpen) bus, vehicle bus and diagnostic system. The HMI has been designed upon customer requirements.

### Vehicle Characteristics

Client:	PESA
Type of Vehicle:	Electric Locomotive*
Supply Voltage:	3,000 Vdc
Traction distribution:	Push-Pull
Track Gauge:	1,435 mm
Maximum Speed:	190 km/h
Axle Arrangement:	Bo'-Bo'
Acceleration:	$\geq 1 \text{ m/s}^2$
Traction Converters:	2
Traction Motors:	4
Maximum Power at Wheel:	5.6 MW
Traction Effort:	300 kN

\* Diesel traction MARATHON option for this vehicle.



TF 11 DTR 01\_B 08/2012

## Traction Converter

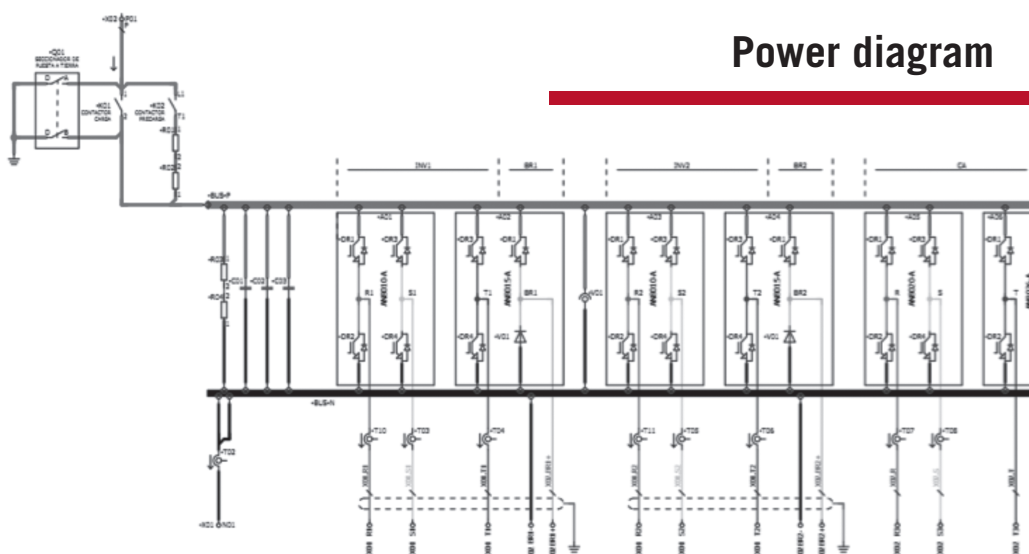
Dimensions:	2,400 x 1,050 x 2,100 mm
Weight:	1,500 kg
Input voltage:	3,000 Vdc (EN50163)
Number of inverters:	2
Number of motors per inverter:	2
Maximum power:	3,000 kW
Inverter topology:	2 level inverter
Semiconductor technology:	6.5 kV IGBT-s
Output voltage of inverter:	0 to 2,346 Vrms
Output frequency of inverter:	0 to 172 Hz
Output current per inverter:	0 to 480 Arms
Cooling system:	Water with anti-freezing
Deionised water required:	No
Temperature range:	-30°C to 45 °C
Brake method:	Regerenative to catenary
Secondary brake method:	Rheostatic

## Auxiliary Converter

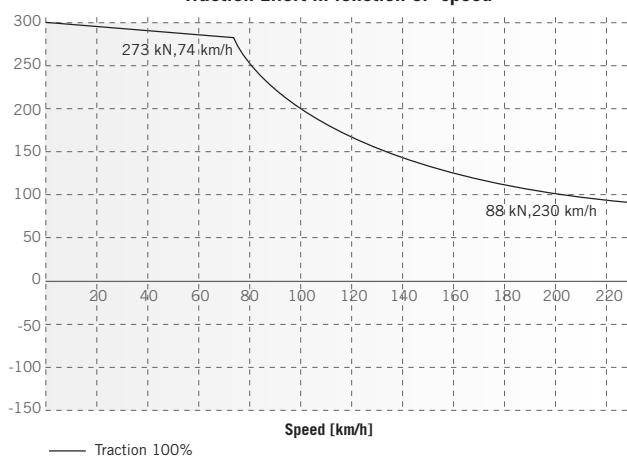
Dimensions:	Integrated in the traction converter
Input voltage:	3,000 Vdc ( $\pm 1,000$ V)
Output voltage:	400 Vac $\pm 5\%$
Maximum power:	250 kVA
Output current per phase:	180 A
Output voltage ramp:	Programmable 0 to 5 s
Total harmonic distortion (THD):	< 8%



## Power diagram



Traction Effort in fonction of speed



Braking Effort in fonction of speed.

