

The design proposed by INGETEAM for these converters optimizes the availability and maintainability of the vehicles.

The integration of the auxiliary converter on the traction converter has optimized space and reduced weight significantly.

The DART vehicles (8-car EMUs) developed by rolling stock manufacturer PESA, with the capacity to circulate at speeds of up to 160 km/h, will be delivered during 2015. INGETEAM supplies the newly designed roof-mounted traction converters optimizing the system in terms of costs, space and weight.

The modular design has optimized their maintenance since it allows power modules to be exchanged in a simple manner, in a reduced period of time. Likewise, diagnostic tools have been developed to minimize maintenance costs. The converters include a regenerative braking system, in an effort to optimize energy consumption, thus reducing operating costs.

### Vehicle Characteristics

Type of Vehicle:	DART
Supply Voltage:	3,000 Vdc
Number of cars:	8
Track Gauge:	1,435 m
Maximum Speed:	160 km/h
Axle Arrangement:	Bo'2Bo2'2'2'2'Bo
Acceleration:	≥ 0.6 sg/ m <sup>2</sup> (0 - 60 km/h)
Traction Converters:	4 (2+2)
Traction Motors:	6
Maximum Power at Wheel:	2,500 kW
Traction Effort:	200 kN



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## Traction Converters

Dimensions:	3300* 1350*570mm + 2460*1346*570 mm
Weight:	850 + 595 kgs
Input Voltage:	3,000 Vdc(EN50163)
Number of inverters:	3 (2+1)
Number of motor per inverter:	2
Inverter Topology:	2 level inverter
Semiconductor Technology:	6,5 kV IGBT-s
Output Variable Nominal Voltage:	0 to 2,339 Vrms
Output Frequency of inverter:	0 to 172 Hz
Output Current per inverter:	240 Arms (nominal)
Cooling system:	Liquid
Deionised water required:	No
Temperature range:	-30°C to 40 °C
Brake method:	Regenerative to catenary
Secondary brake method:	Rheostatic

Modular concept, in order to maximize the availability and maintainability of the system.

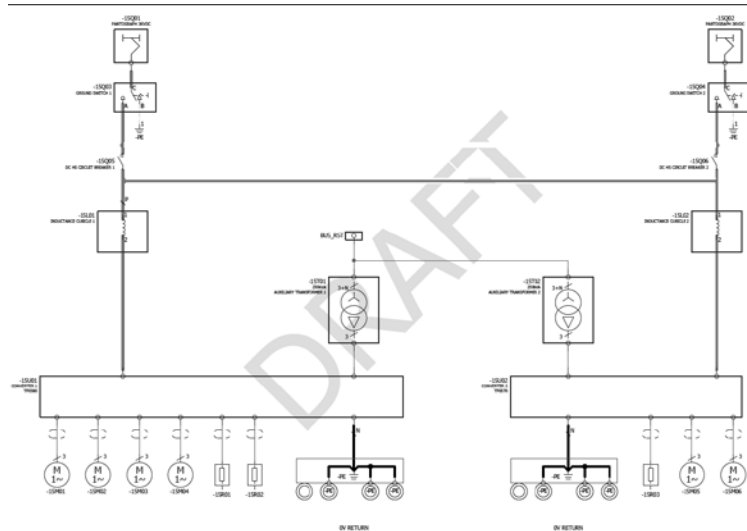
## Auxiliary Converter

Integrated in the traction converter

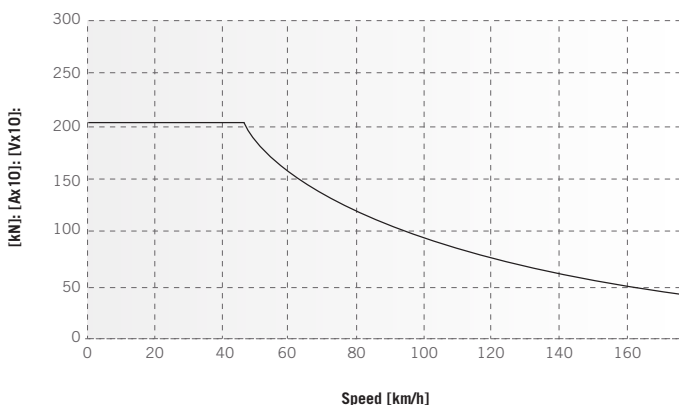
Input Voltage:	3,000 Vdc ( $\pm 1,000$ V)
Output Voltage:	400 Vac $\pm 5\%$
Nominal Power:	250 kVA
Output current per phase:	180 A
Output Voltage Ramp:	Programmable 0 to 5 s
Total Harmonic Distortion (THD):	< 8%



## Power diagram



Traction effort characteristic in train speed function



Maximum braking effort in train speed function

