

# Ingeteam

## TD2000. Metric gauge, dual traction locomotives



**Ingeteam**

**Ingeteam Traction has won a contract to design and supply a new family of metric-gauge, dual-traction locomotives for EuskoTren. This new family of locomotives offers the versatility that the client requires for its freight operations, given that it can circulate on both electrified and non-electrified lines.**

**Within this project, Ingeteam Traction has developed the comprehensive electrical engineering of the locomotive, supplying the control system, the electrical and diesel-electric dual-traction system, and the auxiliary systems.**

**The locomotive offers the operator great versatility since it is able to operate both on electrified and non-electrified lines with high ratios of availability. The operating costs are minimized due to the high efficiency of the installed systems as well as the reduced maintenance costs, thanks to the modularity of the system and advanced diagnostic equipment.**

### Traction system

The traction system has been fully developed and manufactured by Ingeteam Traction, keeping in mind minimization of life cycle cost. The adopted solution allows for high reliability and premium performance thanks to the use of the most advanced components in the market.

The locomotive traction system allows it to be able to develop a start-up torque of 260 kN, and it can reach a commercial operating speed of 80 km/h, either operating from a 1,500 Vdc catenary, or powered by the on-board diesel generator set when catenary is not available.

The traction system is composed by two on-board traction converters and two asynchronous motors under the chassis of the vehicle. The traction system is completed with the diesel generator set for the case of non-electrified lines.

The 1,500 kW powered turbo-diesel engine carries a synchronous alternator, which works as a generator set with a rectifier on its output, feeding the traction converter in non-electrified lines.

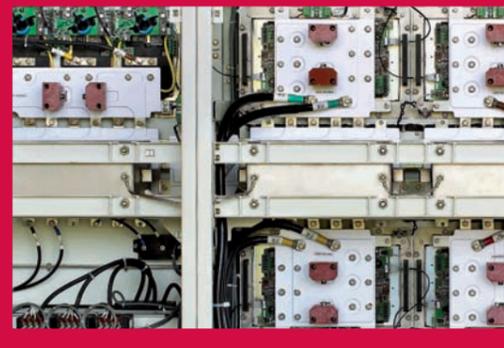
The IGBT based traction converter has been designed with a modular concept, and together with the advanced diagnosis tools developed by Ingeteam, provides great ease of maintenance. Each of the converters have one air-cooled variable-voltage variable-frequency (VVVF) inverter, each of the inverters feeding one traction motor.

The locomotive is equipped with two asynchronous electric traction motors, situated under the chassis of the vehicle, suspended lengthwise beneath the box in the central part and connected to the four axles by a driveshaft and connector set.

### Auxiliary converters

With the aim of reducing space and increasing redundancy, the locomotive is equipped with two auxiliary converters, integrated within the traction converters.

Finally, the locomotive is also equipped with two high frequency battery chargers.



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### Control system

The in-house developed SISTEAM VCU decentralized control system operates the complete vehicle. This system has been implemented with a redundancy concept, thus the reliability of the locomotive reaches highest standards.

The control system communicates to the various sub-systems of the locomotive by means of a MVB and WTB TCN network (according to IEC 61.375-1 standard), allowing the locomotive to operate on its own or in connection to another locomotive to work in tandem.

The signalling devices implemented in the locomotive (ASFA and

Euroloop, according to the client's needs) are integrated within the control system, so their inputs are taken into consideration in the vehicle control.

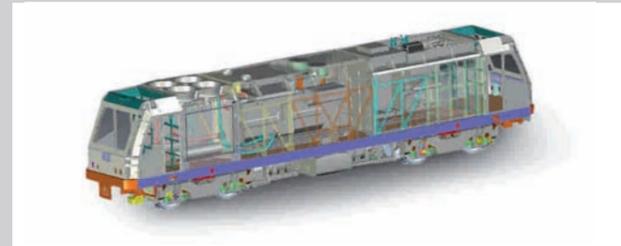
The locomotive includes various communication systems both for voice communication such as land-train radio, PMR radio and GSM as well as data communication: GPRS and WiFi.

Likewise, the system has been equipped with a video surveillance system, communicated with the land station through an on-board data management system and data communication devices.

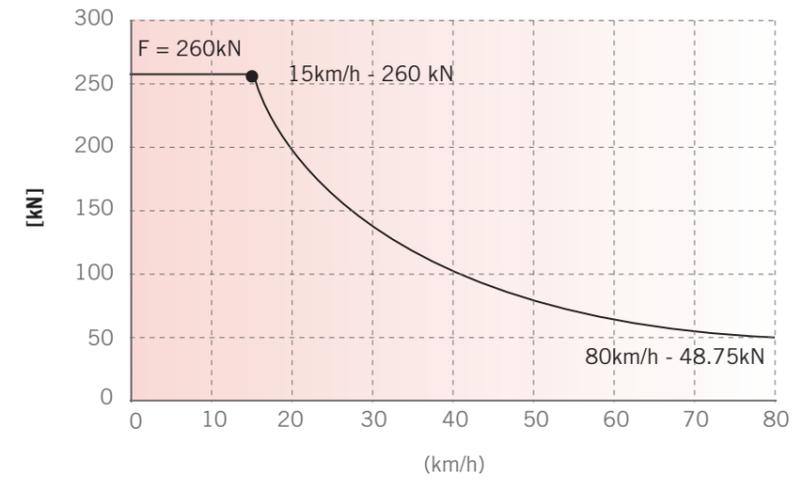
### Driver's cabin

The driver's desk, has been designed to meet UIC standards, with two ergonomic seats and air-conditioning.

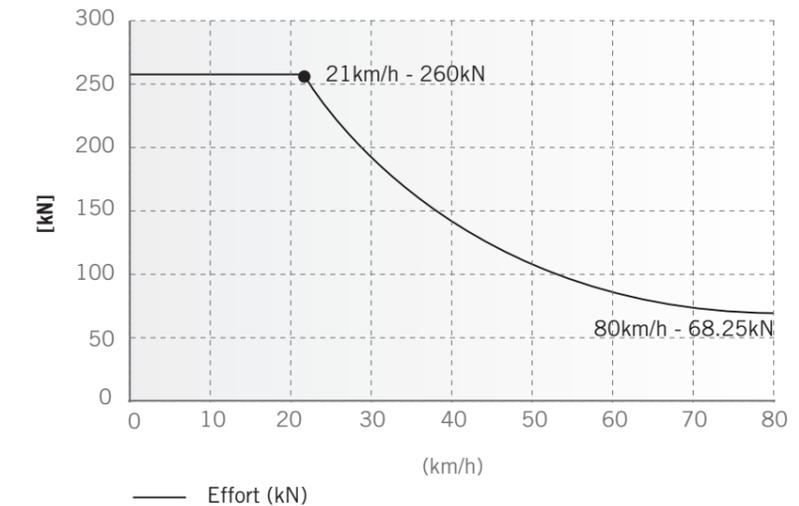
The driver's desk has been designed to allow for more efficient control of the vehicle with a high comfort standard for the driver, and includes an advanced diagnosis interface that allows any system incident to be quickly resolved.



Maximum traction effort characteristic in train speed function



Maximum braking effort characteristic in train speed function



## Technical data

### 1 Vehicle characteristics

Track gauge	1,000 mm
Wheel arrangement	B' - B'
Weight	62 tn / ballasted 80 tn
Max. speed	80 km/h (100km/h)
Length	17,000 mm
Width	2,600 mm
Height	3,700 mm
Wheel diameter	850 - 920 mm
Narrow track radius	70 m
Starting tractive effort	260kN to 15 km/h

### 2 Traction motor

Weight	1,300 Kg
Continuous power	600 kW
Max. torque	6,813 Nm
Nominal voltage	1,170 Veff
Nominal frequency	65.7/141 Hz
Motor speed	1,950/4,180 rpm
Cooling system	Forced Self-ventilation
Insulation class	200

### 3 Traction converter

Dimensions	2,300 x 600 x 1,900 mm Including auxiliary converter, transformer and filter-inductancy
Weight	1,500 kg
Input Voltage	1,350-2,000 Vdc (at 100%)
Number of inverters	2 independent inverters
Number of motors per inverter	1
Inverter topology	2 level inverter
Semiconductor technology	IGBT
Output power per inverter	610 kW
Output voltage of inverter	0 to 1,170 Vrms
Output frequency of inverter	0 to 141 Hz
Output current per inverter	0 to 793 Arms per phase
Output cooling system	Air
Temperature range	-15°C to 45°C
Brake method	Regenerative to catenary
Secondary brake method	Rheostatic

### 4 Auxiliary converter

Integrated in the traction converter.	
Input voltage	1000 Vdc (± 500 V)
Output voltage	400 Vac ± 5%
Nominal power	90 kVA

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

Power diagram

