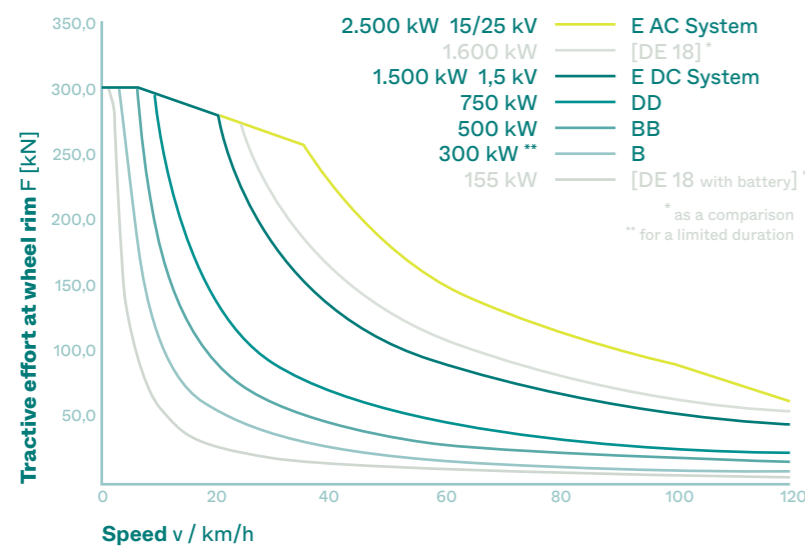


Modula Technical Data

Wheel arrangement	Bo'Bo'
Length over buffers	18.700 mm
Min. curve radius	75 m
Vehicle mass	84 – 90 t
Fuel tank capacity	1,500 l – 2,300 l depending on the version
Diesel engine output	2 x 480 kW
Diesel engine in EDD	MAN D3876 6-cylinder, in-line engine
Exhaust emission restriction	EU 2016/1628 Stage V as per EU Regulation 2016/1628
Battery capacity (BDD)	160 kWh
Battery capacity (EBB)	2 x 175 kWh
Battery technology	LTO
Power transmission	AC/AC wheelset-selective control
Converter	IGBT-inverter
Power at the wheel E AC system	2.500 kW 15/25 kV
Power at the wheel E DC system	1.500 kW 1,5 kV
Power at the wheel DD	750 kW
Power at the wheel BB	500 kW
Power at the wheel B	300 kW (limited duration)
Tractive effort	300 kN starting tractive effort
Top speed	120 km/h
Ambient conditions	T1 -25°C bis +40°C
Tunnel classification	Category B (20 km) as per TSI SRT
Homologation	As per TSI initially planned in Germany, Austria and the Netherlands

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Modula
Technical Data

Modula
Power at the Wheel

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Dual-mode locomotive for hauling freight

Dual-mode locomotive for hauling freight

The **Modula** is a comprehensive platform concept offering a range of standardized functions and systems that can be assembled into customized versions to suit the customer's specific requirements. With its high proportion of identical parts, the platform concept provides synergy effects and simplifies the management of replacement parts. The **Modula** combines the characteristics of a main-line locomotive with those of a classical shunting locomotive, and the focus here is on flexible power sources. The customer's application profile can be used to combine two power sources to make a single variant.

The benefits at a glance

- Sturdy, mid-cab construction, excellent shunting locomotive qualities and a wide range of operational applications.
- Optimized vehicle design that takes into account the full range of customer requirements.
- Power at the wheel increases for line use by up to 2,500KW – in 15/25 kV E-Mode approx. 50% more output than a DE 18.
- Simple and flexible integration of current and future energy storage and electricity generation technologies (also hydrogen-based systems).
- The EDD and EBB variants (draw power from the overhead catenary system) have considerable potential for savings in maintenance and energy costs.
- High level of reliability through the use of high-quality components.
- High availability thanks to a redundant drive configuration and two drive systems.
- Remote Cloud access to data and the locomotive's condition enables its deployments to be precision-planned (an advantage when refueling or when replacing parts subject to regular wear and tear).
- Design and safety aspects structured according to the CSM and EN 50126 V-Model process.
- TSI approval allows the locomotive to be used in many European countries.



* compared to the DE 18

approx. **50%**
more power at the wheel*

The first variants are the **Modula-EBB**, **Modula-EDD** and **Modula-BDD**. The bogies, locomotive frame, driver's cab, pneumatics, air-conditioning and inverter are all identical and constitute the basic configuration. And each **Modula** variant is powerful with a high starting tractive effort.

The **Modula** offers a lot more in Dual-Mode operation compared to the DE 18. A freight train can be picked up in an area with no catenary and transported to its destination (2 power sources per variant provides more flexibility and makes best use of the line infrastructure available). Consequently, an additional locomotive for hauling without catenary is not required (except the BDD). The EDD or the EBB, however, can use inexpensive, carbon-neutral electricity as soon as catenary becomes available. The **Modula's** power at the wheel can be increased by 50% in comparison to the DE18. The **Modula** stands for higher output during line operation, more flexibility and more energy-saving options.

The **Modula** also provides good visibility, excellent shunting performance, lower sustained speeds and unlimited continuous tractive effort.

The control system in the **Modula** is designed with the future in mind; it can be upgraded with new functionality even years after delivery. It can also be equipped with a digital automatic coupling, a camera to identify obstacles or Augmented Reality applications for servicing. And if the loco-motive's intended use changes in the future, modifications can also be carried out accordingly.

Energy can be recovered during dynamic braking (recuperation) either in the battery or in the catenary with the EDD and EBB variants.

In order to select the optimum **Modula** variant, Vossloh Rolling Stock configures a simulation that is based on the timetable, train weight and future route characteristics and analyzes energy use, costs and operating range.

Maintenance

There's a focus on maintenance with the **Modula** platform because an electric locomotive also has to operate reliably. Consequently, every **Modula** variant is designed for easy maintenance.

The continuous analysis of sensor data allows maintenance work to be predicted and planned better, which means that downtime can be reduced considerably. What's more, the modular system also allows the user to completely remove a diesel engine or battery unit, replace it with one that has already been serviced and go straight back into operation. This opens up completely new possibilities in the area of maintenance and service.