



Modula BDD

Technical Data

Hybrid locomotive for hauling freight

Small Battery + 2 Diesel Engines

Hybrid locomotive **Modula BDD**

The Modula is a hybrid locomotive concept with different traction modules on a standardised centre-cab locomotive platform. These systems have the same interfaces so that, for example, the two diesel engine unit can be replaced by a two battery unit.

Variants:

- **BDD** (small battery + two diesel engines),
- **EDD** (electric traction + two diesel engines) and
- **EBB** (electric traction + two larger batteries).
- In addition a **BFC** (Fuel Cell traction system) is in development as a further traction variant.

This modularity allows the operator to adapt the locomotive quickly and easily to changing requirements. It offers a range of standardised functions and systems that can be assembled into customised 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 benefits of a BDD at a glance

- Sturdy, mid-cab construction, excellent shunting locomotive qualities and a wide range of operational applications
- Optimised vehicle design that takes into account the full range of customer requirements
- Power at the wheel for line use in Diesel mode up to 750 kW and in battery mode up to 300 kW
- Simple and flexible integration of current and future energy storage and electricity generation technologies (also hydrogen-based systems)
- The BDD variant has 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



approx. **50%**

more power at the wheel
compared to the DE 18

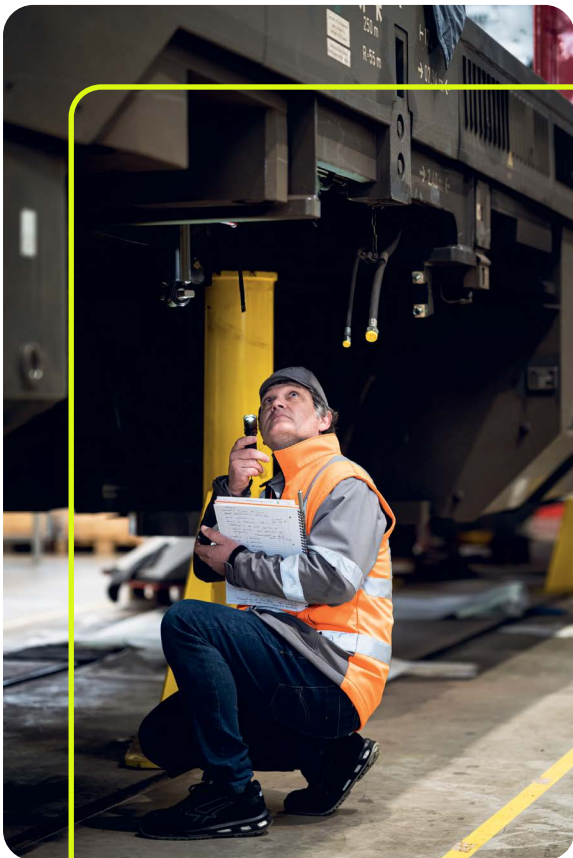
The first variants are the **Modula-EBB**, **Modula-EDD** and **Modula-BDD**. The bogies, locomotive frame, driver's cab, pneumatics, air-conditioning and inverter are all identical and constitute the basic configuration. And each **Modula** variant is powerful with a high starting tractive effort.

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 traction modules 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. 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 DE 18. The **Modula** stands for higher output during line operation, more flexibility and more energy-saving options.

The **Modula-BDD** variant is centered around two diesel engines supplemented by a small battery, providing a balance between conventional diesel power and limited energy storage for light traction purposes.

While the BDD is designed primarily for non-electrified areas, the small battery allows for energy-efficient operation in low-power scenarios, such as shunting or low-speed movements.

Its sturdy construction, excellent shunting performance, and the ability to maintain power across varied terrains make it a versatile option for operators that prioritise diesel power with supplementary energy efficiency.



Maintenance

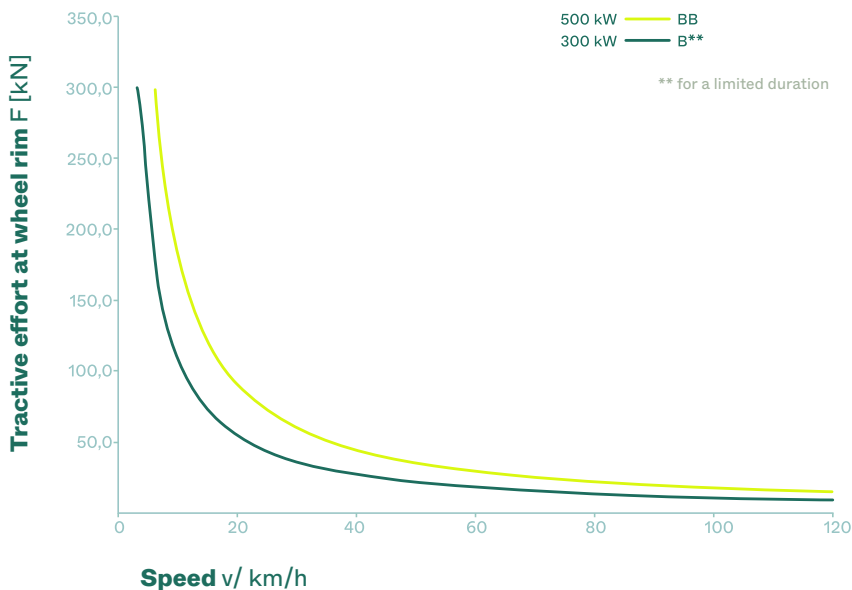
There's a focus on maintenance with the **Modula** platform because an electric locomotive also has to operate reliably. Consequently, every **Modula** variant is designed for easy maintenance. The continuous analysis of sensor data allows maintenance work to be predicted and planned better, which means 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.

Modula BDD 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
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 technology	LTO
Power transmission	AC/AC wheelset-selective control
Converter	IGBT-inverter
Power at the wheel DD	750 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 to +40°C
Tunnel classification	Category B (20 km) as per TSI SRT
Homologation	As per TSI initially planned in Germany, Austria and the Netherlands

Modula BDD

Power at the Wheel



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