Always Ahead of Time.
Diesel Drive Systems for Rail Vehicles
Into the Future with Reliable Systems.
Hydrodynamic Drive Solutions

Economical train operations on the rails of the world call for vehicles that are reliable, robust and durable – with drive components and solutions that on which customers can rely 100 percent. With drives from Voith you will always be on step ahead – now and in the future. Because they ensure maximum operating safety and availability, even under the toughest conditions – be it at minus 25 or plus 45 °C.

**Overall know-how that saves money**
As a systems partner, Voith offers you everything your vehicle needs to be optimally suited to its respective application. Voith not only supplies the transmission but also the complete periphery – from cooling system, cardan shafts and final drives up to electronic control systems – from one single source. Your advantage: systems that are perfectly adapted to each other, fewer interfaces and, last but not least, significantly lower service and fuel costs across the entire service life.

With a comprehensive after sales and service portfolio ranging from original spare parts to expert maintenance and overhauls you are always on the safe side with Voith – for up to 30 years and more.

**Advantages you can count on**
Snow and ice, sand and heat, salt and humidity, dust and dirt – drive components and solutions from Voith have proven themselves in diesel vehicles even in the toughest conditions. Power densities and efficiencies have been significantly increased over the last few decades. Reliability and economy – and hence the value of ownership of the vehicle – were continuously improved.

Other benefits:
- Worldwide proven, reliable technology
- High failure safety and economy
- Low procurement and life-cycle cost
- Low operating and maintenance cost
- Longer-term spare parts availability, low depreciation
- Flexibility to suit customer-specific special designs
- Comprehensive systems know-how and consultation expertise
- Close contacts to users and OEMs.
Robust and Virtually Wear-Free. Railcar Transmissions with Extremely High Mileages

Drive solutions from Voith are robust, reliable and virtually wear-free – at extremely high mileages. In many cases, operators are able to exceed the mileage limits up to the first recommended major overhaul quite considerably. The maintenance requirements largely consist of regular transmission oil checks.
Voith offers a wide range of turbo transmissions in the power range up to 650 kW. The DIWARail transmission derives from the 100,000-times proven DIWA bus transmission and offers an input power of up to 320 kW. The world’s best-selling railcar transmission, the T 211 re.4 for up to 350 kW, is internationally established. The T 212 bre is suitable for high-speed railcars with input powers of up to 450 kW. The robust T 311 bre rated at 650 kW has proven itself in thousands of applications. And the T 312 transmission is state-of-the-art in applications up to 650 kW.

Exemplary for low wear:
The DIWARail transmission, sold more than 4,000 times
Originally designed for citybuses, DIWARail is the most successful and best-selling hydromechanical transmission in the 320 kW class. With its contra-rotating differential converter acting as a hydrodynamic brake, it significantly reduces wear across the entire speed range. With the power-split principle in first gear (achieved by a differential converter), as well as mechanical power transmission up to 4th gear, the DIWARail is ideal for rail vehicles in the lower output range. The latest version with reinforced PTO, secondary lube pump and integrated reversing gear also allows towing while the engine is switched off.

The champion on the rails:
The T 211 re.4 turbo transmission
Insensitive to climatic influences, isolated from vibrations, low life-cycle costs – with 7,500 units sold, the world’s best-selling railcar transmission has just been launched with further improved input powers: with a transmission input power of 350 kW, the T 211 re.4 has been adapted to the new generation of 6-cylinder diesel engines. The new VTDC drive control with monitoring and diagnosis function as well as an operating data storage facility is directly installed to the transmission. Available as an option: a hydrodynamic brake that can be integrated into the vehicle braking system (blending).

The universal transmission:
The T 312 bre turbo transmission
With its high efficiency and a maximum input power of 650 kW, the T 312 bre is ideal for high-speed railcars up to 220 km/h or multiple units with high driving outputs. The 3-speed transmission with hydrodynamic torque converter, two hydrodynamic couplings, an integrated retarder and a mechanical reversing gear excels by smooth, virtually wear-free starting. At the same time it adapts the tractive effort automatically and steplessly to the prevailing rolling resistance. The transmission is insensitive to vibrations and thermal or mechanical overloads – and all this with mileages of over 1.2 million km before the next major overhaul (depending on operating conditions).
For Every Tractive Effort.

Locomotive Transmissions from Voith

Turbo transmissions from Voith are synonymous with unparalleled performance, operating safety and availability. Mainline locomotives, shunting locomotives and multi-purpose locomotives – Voith has the ideal transmission for any locomotive and any application: from the LS 640, the world’s most powerful turbo transmission, to the L 530 and the L 620 with an transmission input power of 2 700 kW.
A perfect example for more flexibility:
The new L 530 bre transmission

A particular example of flexibility is the new modular L 530 bre turbo transmission from the Turbo-Flexx family with VTDC drive control and CAN interfaces. It offers high tractive efforts and optimum efficiency across the entire driving and output range from 1 000 kW to 1 700 kW. There is no need for a range-change gear. The transmission can be easily adapted to changing engine outputs or special operating conditions.

The world's most powerful locomotive transmission:
The LS 640 reU2

The most powerful locomotive transmission in the world, the LS 640 reU2 TurboSplit transmission with an input power of up to 4 200 kW, has been designed for six-axle diesel locomotives like the Voith Maxima 40 CC. The LS 640 can be fitted with two hydrodynamic brakes that operate independently from each other. Its high power density and the fully decoupled drive units allow optimum starting and driving characteristics. The transmission has a long service life, is insensitive towards climatic influences and also excels by its extremely low maintenance requirements.

100-times proven reliability:
The L 620 reU2

The L 620 reU2 turbo transmission has proven itself 100-times – literally. Because this is how often it has been installed within only a few years. All of these aspects are important for operators when they develop new four-axle standard locomotives have been achieved with this turbo transmission: high reliability and availability, as well as outstanding efficiency. For this reason, proven components were combined with new assemblies. The transmission, which features two hydrodynamic torque converters and a hydrodynamic brake, allows automatic speed changes without interrupting the tractive effort – smoothly, jolt- and wear-free. An additionally installed retarder brakes the vehicle virtually without wear.

The transmission for the most powerful 3-axle shunting locomotive – the L3r4 zseU2.

The L3r4 zseU2 turbo reversing transmission has been designed for diesel locomotives with maximum speeds of up to 60 km/h. The version with range-change gear is capable of up to 100 km/h. The transmission allows precise speed maintenance – constant speeds of 2 to 5 km/h are possible. The turbo reversing transmission has two torque converters for each driving direction. The converters for the opposite driving direction can be used for dynamic braking up to 300 kW and short-term braking up to 380 kW. The range-change gear allows two speed ranges. In normal position, the locomotive can be towed without any time limits.
Our Challenges are Specific Solutions.

Transmissions for Special Vehicles

Components and systems for special vehicles have to meet highly specific requirements. Track and rail embankment repairs or overhead wire modernizations do not only require lengthy low-speed trips and frequent shunting, they also need readily available machine powers for external operations.
For this reason, transmissions that have been developed especially for such applications, for example the L 220 rseV2 or the L 311 reV2, feature numerous PTOs for the installation of hydrostatic components that support low-speed trips. Via connectable hydrostatic pumps, external machines such as tamping devices, compressors, platforms and cranes can be operated. Within this heavy-duty portfolio, Voith is the world’s number one transmission supplier.

The number one for construction vehicles and small locomotives: L 311 reV2 turbo transmission
The L 311 turbo transmission was developed especially for the main drives of track construction and special vehicles, as well as small locomotives with a maximum speed of 120 km/h and transmission input powers of up to 650 kW. Depending on the application, up to eight PTOs are available. During operation, the PTOs can provide the full engine power. If required, there is also a drive shaft that can be utilized for transmitting the engine output to other components. For extremely low-speed operation, the L 311 reV2 offers a flange option for a hydrostatic motor at the low output gearbox. Control functions are assumed by the VTDC drive control.

High performance for difficult tasks: L 220 rseV2 turbo transmission
The L 220 turbo transmission constitutes the development of a completely new transmission concept for shunting locomotives and special vehicles. With a transmission input power of 350 kW and up to four PTOs it allows the direct installation of high-performance hydrostatic pumps. The range-change gear has been designed for two speed ranges and therefore offers high tractive efforts in shunting mode. Owing to automatic centering of the rangechange gear, towing is possible at 1.6 times the nominal speed. Wearfree braking is available by optional utilization of a hydrodynamic brake with blending properties.
Perfectly Matched and from One Single Source.
Comprehensive Systems Know-How

As the specialist for diesel-driven rail vehicles with more than 80 years of experience on the rails of the world, Voith is the sole supplier in the power class from 300 to 735 kW. There is no other manufacturer with such a selection of in-house produced components – and such a wealth of systems know-how.
One for all – all from one: Voith-Powerpacks

Nobody has more systems know-how for complete drive systems or in the driveline than a manufacturer who produces virtually all components himself. For this reason, Voith-Powerpacks set new standards for drives in diesel railcars.

Apart from basic systems such as the DIWAPack, the RailPack and the TurboPack, Voith also offers customer-specific solutions with a technology that has been proven for years and all over the world.

An example for this is the systems solution CustomPack with a high share of the customer's own products or locally sourced components. Voith carries out the complete engineering, the testing and the pre-assembly for the CustomPack. The customer is responsible for in-house production of components, local procurement of certain units and the final assembly.

With retrofit and/or re-powering projects, Voith even takes one step further: with the ReplacementPack, the complete drive solution is newly integrated into the vehicle, utilizing existing components and units.

Diesel-electric Voith-Powerpacks

All Voith-Powerpacks are also available for electric traction. The electric tractive effort is generated by a motor-side-driven traction generator.

The basis for power in a package: DIWAPack, RailPack and TurboPack

DIWAPack, RailPack and TurboPack are the basic Voith-Powerpacks for various power classes: the DIWAPack with the DIWARail transmission up to 382 kW, the RailPack with T 212 bre transmission in the power class up to 588 kW, and with T 211 re.4 transmission up to 440 kW, the TurboPack with the T 312 bre turbo transmission for input powers up to 735 kW. Completed by cooling systems, final drives, cardan shafts and highly flexible couplings, as well as the control of the systems components, Voith-Powerpacks represent comprehensive drive solutions for the 270 to 735 kW power class.

Compact advantage: Voith-Powerpacks

Voith Powerpacks are installed in the underfloor area of the railcar, thus saving space. They comprise all components required for the drive and the auxiliary systems, for example diesel engine, transmission, power generation and air supply in one compact package. Depending on the application, the cooling system can be configured as a roof-mounted or underfloor unit. An optionally integrated air compressor minimizes the need for extra installations for the generation of pressurized air.

As a matter of course, the construction of the Voith-Powerpacks is carried out in line with customer specifications per UIC directives and in compliance with European norms. Additionally, every Voith-Powerpack is examined in type tests. The complete unit must also pass a series test run after assembly. For our customers, this means maximum safety and reliability of all functions for every Voith-Powerpack – from adjusted hydrostatics to electronic controls and perfect pipe systems – even prior to delivery.
Economy Starts with the Engine. Diesel Engines for Rail Vehicles

Voith is an engine manufacturer, officially approved by the German Federal Motor Transport Authority. The diesel engines, further developed by Voith specifically for the demanding conditions in rail traffic, are economical, robust and highly durable.

The master of thrift: R6 Diesel Engine R2876T3
The R2876T3 diesel engine is a horizontal engine that shows its true class in a wide variety of applications. It is available in three different versions rated at 390 kW / 353 kW / 294 kW. With an output of 390 kW and a maximum torque of 2 300 Nm it meets the emission values (EU Stage IIIB) prescribed since 2012 due to an SCR system (Selective Catalytic Reduction). The 6-cylinder engine is suitable for railcars and special rail vehicles.

The compact performance class:
V8 Diesel Engine V2868T3 / L3
The V2868T3 / L3 diesel engine achieves an output of 520 kW and a maximum torque of 2 750 Nm. Two-stage turbocharging, cooled exhaust gas recirculation and the combination with a maintenance-free catalytic converter for particulates make it possible that the emission values (Stage IIIB) prescribed since 2012 are actually undercut. The fact that his is achieved without an additional fuel medium is an important economic aspect for rail operators.

The Voith engine is also suitable for repowering projects. With its dimensions and design, it can be used as a Stage IIIB retrofit solution for rail vehicles that are already in service.

The new dimension: V12 Diesel Engine V2862T3 / L3
The V2862T3 / L3 diesel engine with 12 cylinders is being developed in cooperation with MAN for railcars and locomotives. From as early as 2013, a 12-cylinder diesel engine in the output classes 588 kW / 622 kW / 700 kW will be available for railcar applications. This engine, too, significantly undercuts the currently applicable emission values of Stage IIIB.
More Efficient Vehicles with Fewer Emissions.
Developments for a Better Environment

Higher energy efficiency and environmental protection of rail vehicles – something we put into practice not only by continuously optimizing our turbo transmissions and developing a diesel engine in compliance with future exhaust emission norms, but also with EcoConsult for more economical rail operation, the DIWAHybrid and the waste heat recovery system SteamTrac.

EcoConsult for more efficiency
EcoConsult is a toolbox from Voith for operating diesel and hybrid rail vehicles more efficiently and economically. As a tool for basic analysis, it already helps with the question: which type of vehicle do I use on a specific route? Part of the toolbox consists of transparent operating data. EcoConsult allows to record and evaluate specific operating data (e. g. fuel consumption, etc.), in order to identify savings potentials. Within the context of worldwide route data compilations, drive simulations based on realistic routes help to optimize timetables and reduce energy consumption. The module EcoScout (driver assistance system) is a control and display system that is integrated into the vehicle. It provides locomotive and railcar drivers with recommendations for source-efficient driving. Overall, Voith EcoConsult presents a reliable basis for vehicle configurations and reduces life-cycle costs as well as fuel consumption.

DIWAPack as hybrid variation
With the DIWAPack, Voith has developed a DIWAHybrid variation for rail vehicles. A lowloss asynchronous electric motor supports the diesel engine during starting and accelerating. During braking, the asynchronous machine acts as a generator, and electrical energy is directed into energy storage systems or “Supercaps”. From this storage system, 1.34 kWh of electrical power are available for operating the rail vehicle. The E-machines provides either a continuous output of 85 kW or 150 kW for short-term operations.

SteamTrac: Energy from waste heat
During the combustion of liquid or gaseous fuels in combustion engines, a large proportion of the energy stored in the fuel remains unused. With the SteamTrac system developed by Voith, which is based on a closed steam circuit, some of this energy can now be reconverted into usable torque and redirected into the driveline. Depending on the driving profile, the fuel consumption of diesel-driven rail vehicles can therefore be reduced by 4 to 12 percent and/or the engine output can be boosted without the need for extra fuel.
Driving without Downtimes.
Individual Voith Service Worldwide

With a close network of Marketing Companies we are offering all types of service – worldwide, fast and competently from one single source. For locomotive and railcar transmissions (including repowering), for Voith-Powerpacks, final drives, cooling systems and cardan shafts.
For Voith, service does now only mean comprehensive check-ups, maintenance and repairs, but also competent personal contacts and cost assurance for many years. For example by a spare parts availability guaranteed for at least 30 years. Individual framework agreements give you peace of mind, allowing you to make longterm plans and rely on the service portfolio of Voith.

### Field service
- Preventive maintenance
- Failure elimination
- Repairs at operator’s premises Commissioning / inspection of new vehicles, repowering and rehabilitation
- Installation of Voith components
- Worldwide field assembly
- Software installation und failure elimination

### Our services
- Consultation
- Maintenance recommendations
- Framework and delivery contracts for spare parts
- Service contracts
- Repowering / rehabilitation
- Technical advice
- Material planning / warehousing
- System specifications
- Workshop equipment

### Test stands for operators
- Configuration
- Delivery and commissioning
- Operating instructions
- Safety instructions

### Spare parts supplies and repair service
- Spare parts supplies
- Works repairs
- Central spare parts warehouse
- Special tools for repairs

### Training programs
- Training of operator’s personnel and customers
- Basic product training
- Design and function
- Function and control
- Maintenance
- Fault finding and elimination
- Software handling
- Laptop requirements