voith.com

VOITH

Products and Services for Commercial Vehicles

Drive New Ways

For the mobility of the future

Today's global challenges are defining tomorrow's mobility. Sustainable concepts are required to respond to the issues of continued population growth worldwide and increasing urbanization. As a reliable partner, Voith is helping its customers in the mobility sector with this fundamental development. With a view to an efficient and climate-neutral future, we are already offering cutting-edge drive technologies for the safe transport of people and freight.

Your partner for groundbreaking mobility solutions

For more than 150 years, Voith's constant objective has been to offer the best possible combination of performance and efficiency. Today, we are driving forward the key technologies of the future with our innovative drive solutions. With products for the resource-efficient operation of public transit buses, freight transport by truck, and heavy agricultural machinery, we help vehicle manufacturers, municipalities, logistics companies and agricultural businesses optimize their individual applications.

Integrated system expertise

You'll find our innovations along the entire drivetrain of commercial vehicles. All components are precisely matched to one another. In the process we combine high efficiency with performance and proven concepts with innovative technologies. We satisfy individual requirements through precisely tailored solutions.

A product portfolio fit for the future

Thanks to the growing use of sustainable alternatives, an unprecedented range of drive concepts is available. The Voith portfolio, which is tailored to industry needs, is already contributing to this diversity and helps our customers not just survive the mobility transition but also to systematically exploit the new opportunities it offers.

Digital concepts for more efficient fleet operation

As a manufacturer of systems for the entire drivetrain, we create the perfect symbiosis of physical components and digital applications. Thanks to more effective management of your vehicle fleet, data-based platforms and systems considerably improve the availability and maximize the efficiency of your fleet.

DR

VE

Products and services for commercial vehicles

Contents

Maintain & optimize

Voith Service – Your partner for maximum availability

Our mission is to keep your vehicles running. Through our customized services and smart service solutions, we give our all every single day to achieve this goal. Being a part of your company and helping you run your operations efficiently are what drive us.

As a full-line supplier, Voith supports you with comprehensive services for our own or third-party products, leaving you free to concentrate on your core business. To make this happen, our service experts are available on site for you 24/7 and are dedicated to ensuring the availability of your fleet.

This focus on customer needs and our experience as an established system and component supplier for rail vehicles make Voith your ideal partner for efficient operation. With our more than 150 years of reliability and quality we are a partner you can depend on.

Spare parts & units

From the smallest exchangeable components to assemblies and functional units, we combine certified Voith quality with cutting-edge technology.

Exchange units

Voith's exchange concept is the right option for you to ensure the fastest possible replacement of entire units.

Retrofits & upgrades

We offer you various optimization options to ensure your fleet meets the highest standards.

MRO & field service

Whether in our own workshops or on your premises, our teams provide you with their expertise all around the world.

- DIWA & Dampers
- Retarders & VIAB
- Air Compressors

Service packages

Thanks to our service packages, you can access exactly the Voith services you need to ensure maximum availability of your fleet.

Digital services

With Voith's digital services you can optimize maintenance processes and fleet availability while minimizing running costs.

Consulting & training

From consulting to training, we share with you our many years of experience across a range of products and you benefit from individualized and competent support.

Technical support

With Voith's engineering services you can reap the benefits of our extensive system and technical expertise and needs-based solutions.


Drive


BAHNHOF POTSDAMER PLATZ
BAHNHOF POTSDAMER PLATZ
DB

Voith Electrical Drive System – Complete system approach

The steady progress of climate change is increasing public pressure to reduce CO_2 emissions in cities and municipalities as quickly as possible. For this reason, local public transport should dispense with internal combustion engines altogether in the future and switch to zero-emission drives instead.

With over 30 years of electric drive developments, Voith's latest innovative drive system offers an extremely quiet, low energy consumption system with water-cooled componentry.

In addition to extending your range, the Voith Electrical Drive System (VEDS) has the full electric drivetrain suitable for solo, articulated, double decker busses as well as coaches operating in challenging topographies.

The VEDS core products (electric motor, inverter and control software) have been designed to work seamlessly together as a single drive system. The components have been optimized to deliver best-in-class efficiency as well as highest peak and continuous power considering automotive standards.

The direct drive concept requires no additional gearbox, reducing weight and complexity while increasing driveline efficiency through optimized recuperation and exceeding top speed, gradeability and acceleration requirements.

VEDS supports battery systems from a wide range of manufacturers and is also enabled for use in fuel cell electric vehicles. VEDS requires no additional installation space in the chassis designed for combustion engines. This simplifies converting existing vehicle fleets with conventional diesel, hybrid or gas drives to electric vehicles.

With the modular VEDS approach, Voith's experts support you to configure a tailor-made solution for your vehicle application.

Client benefits and advantages

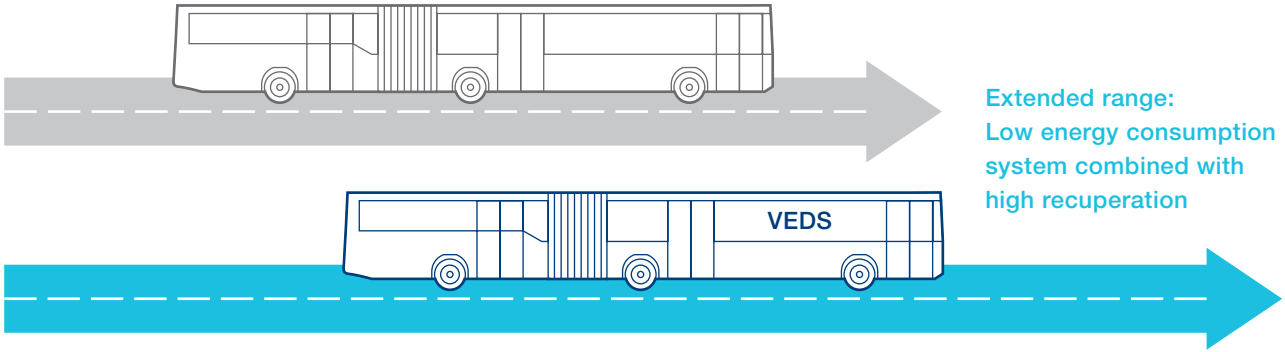
- **+ High reliability**
- **+ Most efficient electric drivetrain in the market**
- **+ Highest continuous power available**
- **+ One-stop-shop solution from components to complete systems**
- **+ High recuperation rates, low noise and compact design**
- **+ Advanced energy management**
- **+ ISO 26262 compliance**
- **+ Modular approach for battery electric and fuel cell application**
- **+ Customer support over the whole product life cycle**

Voith Electrical Drive System at a glance

Modular motor concept, suitable for all bus classes. Optimized range thanks to high efficiency and low system weight

Safe and easy entry into E-Mobility for environmentally and citizen-friendly local public transport

Complete system approach for minimum integration effort and maximum reliability



Extended range: Low energy consumption system combined with high recuperation

Supports all common battery systems on the market and can be integrated into any vehicle type

Minimal noise level inside and outside the bus thanks to direct drive and water cooling

No local emissions of NO_x and particulate matter thanks to recuperation braking and energy management

Voith Electrical Drive System – Choice between two motor types

Individually tailored to your requirements and applications, for buses or trucks, you have the choice between two motor types in different power classes. And thanks to our practical retrofit option, the VEDS can also be integrated into your existing (ICE) fleet.

Besides the two motor concepts, you can choose between the small scope (core products: motor, inverter, Drive Management Unit) and the extended scope where additional components (e.g. cables, dcdc converter, power distribution box, …) can be selected.

Energy-efficient electric motor

Technical data

Type	VEDS MD	VEDS HD
Continuous power	230 kW	310 kW
Peak power	250 kW	410 kW
Max torque	2,850 Nm	3,100 Nm
Max speed	2,500 rpm	3,800 rpm
Isolation class	IP6K9K	IP6K9K
Weight	260 kg	315 kg
Application cycle	Optimized for urban applications, low average speed cycles	Optimized for inter-urban applications, higher average speed cycles
Vehicle class	Solo buses 9 – 12 m	Solo & articulated buses 18 m, double deckers and coaches

Maximum safety due to complete solution from single source

Power Distribution Box (PDB)
- High-voltage and low-voltage cabling
- Max. voltage 800 V
- Aluminum housing
- Output for electric heating

Drive Management Unit (DMU)
- Advanced energy management system
- System diagnostics with just one interface
- Coordination of energy management
- Integrated safety controller

Auxiliary inverters (EACUs)
- 7.5 kW, 15 kW, 30 kW
- DC/DC: 5.5 kW, 11 kW

Drive Inverter System (DIS)
- Modular and water-cooled
- Optimized control algorithm
- Integrated back-up processor
- Best internal thermal management

DCDC Converter
- DCDC converter for 80 / 150 kW fuel cell
- Functional integration

Charge Control Unit
- Control of the process / communication related to the charging process
- Different standards are in the Voith scope available

Central Electric Interface
- Secured control for 7 LV components and DMU incl. CAN
- Power supply 16V – 32V; max. current 30 A
- Temperature range from -20° to +65° C

Button Selector
- Drive selector with different buttons (e.g. forward, backward)
- Three different button selectors are available in the VEDS extended scope

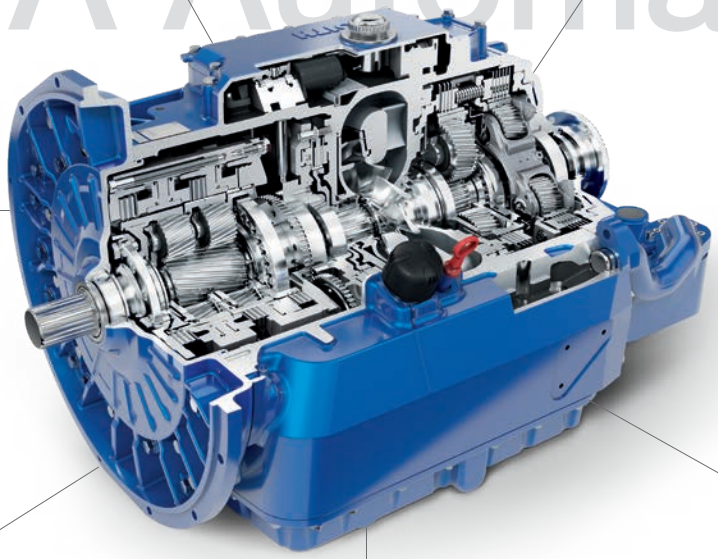
DIWA – Cost effective and eco-friendly solution for automatic bus transmissions

Move off, shift, brake, shift: All these gear changes cause particular challenges for bus transmission systems in scheduled services. As a bus manufacturer or bus service operator, you can meet these challenges with Voith's globally successful DIWA automatic transmission system.

The proven DIWA principle of power splitting allows a smooth startup in a speed range that requires other transmissions to shift gears two to three times. A total of up to 50 % fewer gear shifts means less wear and a more comfortable ride.

When the bus brakes are applied, the unique principle of the DIWA transmission, the differential converter, acts as a retarder. It therefore relieves the load on the service brakes and increases braking power at medium and high speeds by up to 30 %.

DIWA Automatic



Optimized TCO thanks to low fuel consumption and low maintenance costs

Reduced pollutant and noise emissions

Maximum comfort for passengers

Minimal installation work

CNG

Maximum efficiency in CNG applications

Perfect for challenging BRT lines

DIWA NXT – The mild hybrid transmission for city, regional and intercity buses and coaches

With more than 70 years of experience in the market, we understand the challenges and needs of our partners. The DIWA NXT for city, regional and intercity buses and coaches has been built on the basis of this experience and expertise. The DIWA NXT bridges the gap between diesel drive systems and alternative technologies.

Be it in the city or in the country: The DIWA NXT is much more than the latest generation of Voith's tried-and-tested automatic transmission. With its recuperation unit, it offers bus manufacturers a simple and comprehensive option for rapid hybridization of their vehicles. Operators can use the system to make a sustainable contribution to significantly more environmentally friendly local, regional and intercity transportation – and greatly reduce their operating costs thanks to fuel savings of up to 16 percent. Even on long journeys and at high speeds.

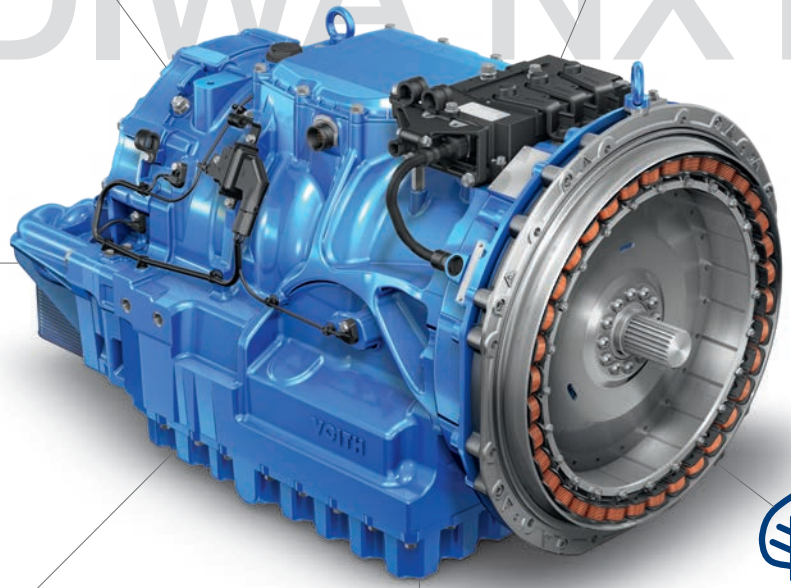
The seven-gear mild hybrid transmission features a second overdrive, a separate retarder and a central processing unit (CPU), which keeps fuel consumption as low as possible with the help of the 48V technology – especially for regional and intercity bus services.

With continuous power of 25 kW and peak power of 35 kW, the central recuperation unit (CRU) supports the vehicle’s on-board power supply. It is mounted on the flywheel housing and requires almost no additional installation space in axial direction.

Optimized differential converter

Separate retarder with a braking torque of up to 1800 Nm

DIWA NXT



Greater comfort for passengers and drivers thanks to gentle start-up management and optimized software – even over long distances

Low CO_2, NO_2, particulate and noise emissions thanks to seven-gear transmission and mild hybrid system

Up to 16% reduction in fuel consumption help reduce operating costs and make local, regional as well as intercity transportation more environmentally friendly

48V mild hybrid system to support on-board electrical supply and active stop-start functionality

DIWA
Product overview

Whatever your requirements as a bus manufacturer or operator, we can offer you a suitable DIWA automatic transmission with low fuel consumption and low emissions. Discover our DIWA product range.

DIWA automatic transmission

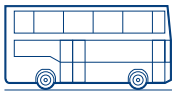
Technical specifications

Type			
Input power P_{1max}			
Input torque M_{1max}			
Input speed n_{1max}			
Retarder braking torque MBR*			
Transmission mass (dry) incl. retarder			
Max. vehicle weight			
Main areas of application			
			
Midi buses	**Standard public transit buses** **Solo buses**	**Articulated buses**	

DIWA.6	DIWA NXT
200 – 320 kW	200 – 320 kW
800 – 1 900 Nm	800 – 1 900 Nm
2 200 – 2 500 rpm	2 300 – 2 800 rpm
1 800 – 2 000 Nm	1 800 Nm
329 – 344 kg	329 – 344 kg
15 – 34 t	15 – 37 t

Public transit buses with high transmission input torque; also for long-distance and intercity buses

Coaches



Double-decker buses

DIWA Add-ons

DIWA.6 stop-start technology

Our stop-start technology for your DIWA.6 transmission delivers extra benefits to the environment. City buses spend up to 40 % of their operating time in idling mode. Voith's stop-start technology, which has proven effective worldwide, exploits these stop times to obtain a significant reduction of fuel consumption and emissions. It allows you to make an important contribution to protecting the environment and helping improve the appeal of public transport.

OnEfficiency.SmartAccelerate

Digital support: The integration of our OnEfficiency.Smart Accelerate software offers public transport operators significant benefits. The digital DIWA technology upgrade reduces fuel consumption and improves ride comfort thanks to optimum acceleration.

OnEfficiency.SmartAccelerate gives drivers better control over the maximum power of the vehicle. OnEfficiency.Smart Accelerate limits the maximum admissible engine torque depending on the current driving parameters. Thanks to our expertise in the vehicle drivetrain domain and long-standing experience in the public transport segment, we have sound knowledge of the maximum power needed in the various driving situations. This results in a significant reduction in fuel consumption as well as CO_2.

On-board IT systems and applications

Improve efficiency and lower emissions: The technology and domain expertise of Pilotfish complements Voith's activities in the mobility segment. As one of the leading European suppliers of cloud-based solutions for public transport, Pilotfish has installed its systems in over 7 000 buses in multiple countries.

The various applications are based on an open standard vehicle communication platform according to the international ITxPT standard. From the very outset, Pilotfish was instrumental in developing this standard, which resulted from various EU activities in the public transport domain.

A central application is "Fuel Economy", which supports the driver in daily use to improve his driving behavior and thus helps to save up to 10 % fuel. An important pillar for maintenance and service is the "Bus Insight" application: the data from the CAN bus is read out via the FMS interface. As a result, the workshop is always up to date on current fault reports or warnings, but also receives crucial information for predictive maintenance. This increases vehicle availability and reduces costs – an important contribution to greater efficiency in public transport.

DIWA EfficiencyPro

Your smart route to even lower fuel consumption. DIWA EfficiencyPro is a software enhancement that enables even more eco-friendly driving and reduces fuel consumption. Bus operators can instantly experience additional fuel savings of up to 4 %.

Control unit E300.1/E310

Voith's transmission control unit meets all current automotive standards and is ideally adapted to DIWA requirements in city buses. Processing power and memory are perfectly balanced against great value and performance.

The tilt sensor captures the grade of the road, laying the foundation for the topography-dependent shifting software program SensoTop.

SensoTop

SensoTop has already proven effective in numerous applications worldwide. Depending on topography and vehicle deployment, fuel savings of up to 7 % are achievable in practice compared with an optimized, acceleration-dependent gear shifting program.

This leads to a noticeable reduction in operating costs. At the same time, SensoTop actively helps protect the environment due to the sustained reduction of CO_2 emissions and particulate load.


Driving &
Braking

Voith retarders – Greater safety, cost-effectiveness and sustainability

The economic pressure on the transport industry has been building for years, resulting in demand for greater payloads, higher mileage and higher average speeds. The result has been a continuous increase in engine performance.

This development has pushed service brakes to their limits and has led to a lack of safety for drivers, vehicles and loads. With Voith retarders, up to 90 % of all braking operations are wear-free, with the associated benefits for the environment. This offers clear added value in terms of safety while reducing emissions. In addition, Voith retarders reduce the stress on the service brakes, which in turn cuts the cost of spare parts and maintenance.

Less fuel consumption due to more consistent speeds

Constant driving speed thanks to v-constant function

Voith Retarder

Up to 80 % fewer brake dust emissions

Greater safety throughout entire speed range

Optimal use of load limits due to low net weight of retarder

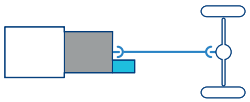
Lower operating costs thanks to much longer service brake operating life and thus lower maintenance costs

Greater transport capabilities due to higher average speed

Retarder & VIAB
Product overview

Voith retarders for commercial vehicles

Technical specifications

Type	VR 115 DT	VR 115 CT	VR 115 HV
Max. retarder rated braking torque at cardan shaft	4 000 Nm	3 200 Nm	3 500 Nm
Max. speed at cardan shaft	2 480 rpm	2 500 rpm	2 480 rpm
Weight excluding operating medium	approx. 55,5 kg	approx. 52 kg	approx. 62 kg
Specific braking torque	72 Nm / kg	62 Nm / kg	56 Nm / kg
Retarder principle	 Offline retarder		

Drawing on our broad experience, we have developed a range of retarders that always offers you the ideal solution for all well-known makes of commercial vehicle. We are the only manufacturer to offer both inline and offline retarders.

VR 3250	ECO Retarder
3 250 Nm	3 500 Nm
2 500 rpm	2 480 rpm
approx. 59 kg	approx. 62 kg
55 Nm / kg	56 Nm / kg

VIAB for trucks

	VIAB
VIAB is an integrated acceleration and braking system	
Max. starting torque	3 000 Nm
Max. braking torque	2 400 Nm
Input speed	2 500 rpm
Weight (without operating medium)	130 kg

Another highlight is our VIAB turbo retarder clutch. With this wear-free integrated startup and braking system, even heavy-duty trucks can start up powerfully, maneuver with millimeter precision and brake safely, sustainably and without wear. This results in considerably longer service lives for friction clutches and service brakes as well as greater safety and ride comfort.


Damping
& Cooling

Voith Hydrodamp – Vibration dampers for modern commercial vehicles

Modern, high-torque, fuel-efficient engines are much more demanding on the drivetrain than before. Our Hydrodamp vibration damper range protects the drivetrains of tractors, construction machinery, buses, trucks and rail vehicles from overload and extends the service life of the individual components.

The Hydrodamp is a highly flexible vibration damper with a spring-mass system and separately arranged hydraulic damping system. The low spring stiffness combined with favorable mass ratio shifts critical resonances into areas below the operating speed range.

Regardless of this, the hydraulic operation principle for vibration damping and isolation is designed to match your vehicle's operating speed ranges.

Hydrodamp

No stick-slip phases followed by breaking free, i.e., no vibration excitation as experienced with conventional friction damping

The damping effect can be systematically adjusted to different operating ranges by means of the torsional angle, gap geometries and viscosity of the damping medium

The damping force is proportional to the velocity, which means that high frequencies or amplitudes will result in greater damping

The damping is wear-free

Hydrodamp
Product overview

The Hydrodamp product ranges are modular. The connection to the customer's own drivetrain is effected by means of primary- or secondary-side solutions such as SAE centering flanges, hubs and cardan shaft connections.

Within the series, the Hydrodamp can be adapted to the precise requirements of the drivetrain by adjusting the characteristic curve and damping characteristics. There are separate Hydrodamp ranges for offroad, road and rail applications.

Voith
Hydrodamp

Technical specifications

Type	300 / 300 LS
For vehicles with powershift and automatic transmissions	Light- to medium-weight tractors and special-purpose vehicles
For hybrid drive vehicles	Buses, trucks and special-purpose vehicles
Engine torque	Up to 1 650 Nm
Hydraulic damping system with damping grease	•
Hydraulic damping system with damping oil	–
Connection to transmission	Hub or cardan shaft
Special features	Weight-optimized sheet metal forming technology
Main areas of application	  

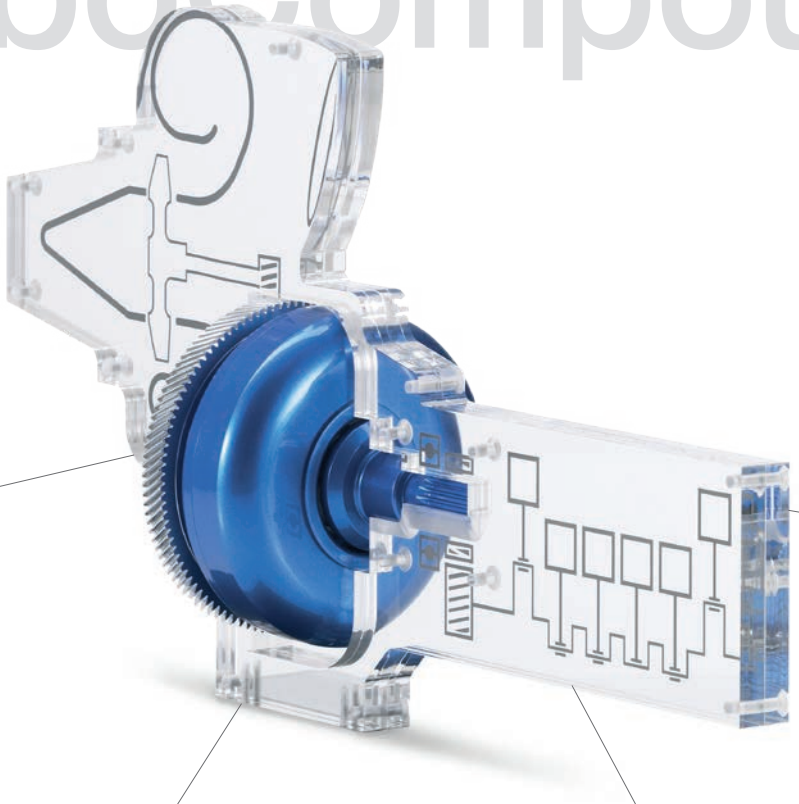
365	365 P	400	365 AG
City buses and rail vehicles	Special-purpose vehicles	Rail vehicles and special-purpose vehicles	Heavy-duty agricultural tractors
Buses, trucks and special-purpose vehicles	Trucks and special-purpose vehicles	Trucks and special-purpose vehicles	–
Up to 2650 Nm	Up to 2900 Nm	Up to 3700 Nm	Up to 3000 Nm
•	•	•	•
•	–	•	–
Hub or cardan shaft	Hub or cardan shaft	Hub or cardan shaft	Hub or cardan shaft
Weight-optimized sheet metal forming technology	Weight-optimized sheet metal forming technology	–	Weight-optimized sheet metal forming technology

Voith TurboCompound – Using exhaust gases to systematically reduce fuel consumption

As a manufacturer of commercial vehicles, you need to meet increasingly stricter emission regulations like the current Euro 6 and future Euro 7 standards. At the same time, your customers are looking for increasingly more efficient engines with low fuel consumption. Voith's hydrodynamic couplings and transmissions, which have been ensuring the smooth operation of TurboCompound systems for years now, offer a solution.

Just 44 % of the fuel's energy actually reaches the drivetrain. The rest dissipates as thermal, friction and exhaust energy. TurboCompound engines convert the thermal energy from exhaust gases into mechanical energy. Our transmission solution with its hydrodynamic coupling transfers this energy effectively to the engine's crankshaft. The result is an up to 6 % decrease in fuel consumption and CO_2 emissions.

TurboCompound



Greater
energy efficiency

Increase in
engine output
at all speeds

Reduced fuel
consumption

Lower exhaust gas
emissions

Voith fans – high performance aggregates for off-road applications

The design and dimensioning of the fan regarding blade type, blade angle and number of blades; outer and hub diameter; installation position; etc., is at least as decisive for its noise levels as its integration into the overall system. Voith therefore offers you an individual fan concept that is precisely matched to your requirements.

Our high-performance fan aggregates are suitable for all off-road applications. Thanks to our deep and long-standing aerodynamic know-how, Voith fans require less drive power and are therefore more fuel efficient and up to 8 db(A) quieter than standard fans.

Voith Fan

Technical specifications

Fan aggregate for engines	100 – 700 kW
Fan diameter	500 – 1 000 mm
Maximum peripheral fan speed	100 m/s

High-performance fan

Optimization of the overall efficiency of up to 75% with Voith fans; high fuel efficiency due to reduced drive power

100% customized solutions for all off-road applications; compact design and high power density

Up to 8 db (A) reduction in noise emission through optimal system design for the application


Compressing

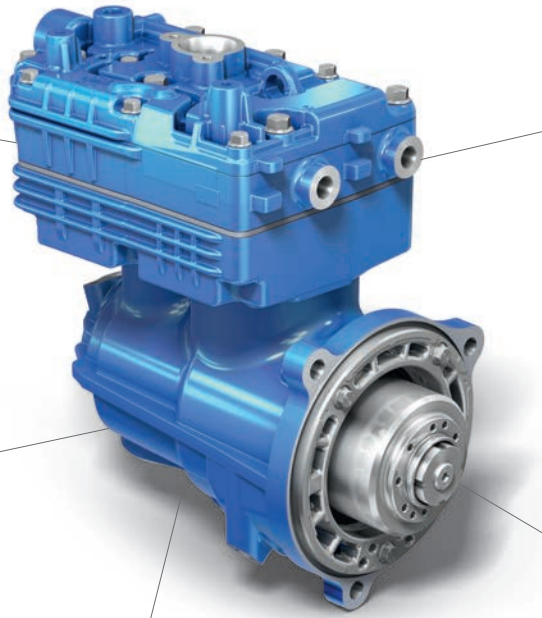
Voith air compressors – Energy efficient on all roads

In trucks and buses, auxiliary units like air compressors make a significant contribution to cost-effective and environmentally friendly road use. A unique feature of Voith air compressors is the two-stage compression with intermediate cooling. As a result, the system needs significantly less power in delivery mode.

Leading technology: Voith air compressors have a two-stage compression with intermediate cooling. Compared with single-stage air compressors, this allows much higher output in delivery mode with significantly lower energy consumption.

Moreover, even in non-delivery mode, Voith air compressors with innovative technologies ensure maximum efficiency and thus make an important contribution to the cost effectiveness and sustainability of combustion engines.

Air compressors



Long duty cycles (up to 85 %) thanks to innovative cooling concept

Better air quality, resulting in higher availability of air system

Significant weight reduction due to use of die-cast aluminum leads to higher load capacity

Low energy consumption in non-delivery mode thanks to innovative idling and clutch systems

Maximum fuel savings due to use of clutch technology

Air compressors
Product overview

Our range comprises pre-charged two- and three-cylinder air compressors in gray cast iron or cast aluminum. The precharging of the system with its unique intermediate cooling allows for a significant reduction in power uptake in delivery mode. The reduced compression temperature allows longer duty cycles and thus increases the delivery capacity per hour with the same cylinder displacement. The lower temperature avoids "cracking" of the oil and occurrence of harmful by-products.

Voith Air compressors

Technical specifications

Type
Cylinder
Compression
Cylinder displacement
Maximum pressure
Idling system
Clutch
Drive-through e.g., for PTO (power take-off)*

*Not for clutch solutions

LP 560	LP 490
2	2
Two-stage	Two-stage
560 cm^3	490 cm^3
15 bar	15 bar
•	•
•	•
•	•

Working together to achieve more. Voith moves people who make things happen.

Even as an innovation driver with a constant focus on technological progress, we never lose sight of the "human factor." That is why, in everything we do, we move people who make things happen. Because progress comes about in response to the changing needs of manufacturers, operators, drivers and last but not least, society. In meeting these requirements, we need to grow together, because the dynamic pace of change in the mobility segment calls for collaboration based on a spirit of trust.

Voith Service: Support you can rely on, delivered with a personal touch

Just like our drive components and systems, Voith Service is also precisely tailored to the goals and requirements of our customers – to ensure that vehicle fleets are fully operational and shipments reach their destinations in good time.

Our global network of qualified service personnel uses the latest digital tools and communication channels, so that the right contact person is always available. At the same time, our fully developed distribution and supply models ensure that replacement parts get to wherever in the world they are needed with an unprecedented speed of response.

The Voith Webshop, with its extensive product range, fast delivery times and user-friendly interface based on the private online retail model, is also available 24/7.

Our individualized contracts and intelligent service solutions offer the highest degree of flexibility and convenience. We support our customers with well-developed concepts, detailed planning and needs-based technical applications.

24 hours a day, 365 days a year, our promise holds: "Our Service – Part of Your Business." Your colleagues at Voith Service are looking forward to getting to know you.

Voith Group
St. Poeltener Str. 43
89522 Heidenheim, Germany

Contact:
Phone +49 7321 37-0
www.voith.com/commercialvehicles