

voith.com

VOITH

Products and services for rail vehicles Drive New Ways



We are laying the tracks for the future

Today's global challenges are defining tomorrow's mobility. Sustainable concepts for meeting the needs of a globally rising population and increasing urbanization are required. We at Voith are reliable partners that can help you master this fundamental transition.

From electrification of public transport to automation of long-distance freight transport – with our innovations, we contribute today to efficient and climate-neutral rail transport. We not only get the future of mobility rolling; we also help lay the tracks. As a constant partner in times of change, we can be relied on for system expertise and professional advice.

We face climate change head on

Climate change is the most pressing concern of our time. We pursue a common goal with industry partners and operators: to slash emissions from transport. For this, we offer not only alternative drive solutions and ideas for resource-conserving transport but also a sustainable partnership – because climate change can only be controlled if we work side by side.

We facilitate railway transport 4.0

We combine more than 150 years of experience in the production of drive technologies with targeted digital innovations. Our data-supported systems give our customers a decisive advantage in the global mobility transition: maximum availability, resource-conserving vehicle operation, and safe transport of people and goods throughout the world.

We bank on the human factor

Our success in the development of innovative technologies has taught us one thing: that people make the difference. Because it is people who make new ideas possible with their experience, passion, and dedication. Personal relationships with our customers are especially important to us as a family-owned company. Our experts are there for you – in more than 60 countries around the world.

We offer everything from a single source

We strive to offer a perfect synergy between all components. We live this mission both in the development of our products and in the optimization of your fleet's availability. Attaining success with our partners is and will always be what drives us. To that end, we support you as a full-line supplier.

DR



An aerial photograph of a high-speed rail station with multiple tracks. Several sleek, white high-speed trains are visible, some stopped at the platform and others in motion. The tracks are laid out in a grid pattern, and the surrounding area is dark and textured. A large, bright green 'VE' is superimposed over the center of the image, partially overlapping the tracks and the trains.

VE



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A photograph of a server rack with the text "Maintain & optimize" overlaid. The image shows a close-up of a server rack with several rows of server units. The focus is on the front of the rack, showing the metal frame and the server units. The background is blurred, showing other server racks in a data center. The text is in a large, white, sans-serif font, centered in the upper half of the image.

**Maintain &
optimize**

Voith Service

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 business and helping you run your operations efficiently are what drives 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. For this, our service experts are available for you on site 24 hours a day – keeping an eye on 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 partners you can depend on.



Spare parts & units

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



Exchange units

If you want the fastest possible replacement of entire units, then Voith's manufacturer-independent exchange concept is right for you.



Retrofit & modernization

With our offering of various optimization options, you can make sure your fleet satisfies the highest demands.



MRO & field service

Whether in our workshops or at your site – our employees support you with their expertise all over the world.



Service packages

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

- Front end systems
- Couplers
- RailPacks
- Automatic and turbo transmissions
- Gear units
- Bogies
- Complete wheelsets
- Vehicles



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.



Stop-start system for locomotives

Loading, unloading and bottlenecks mean long waits every day in freight transport by rail. More than 30 % of a locomotive's lifetime is spent in this idle state. This is where we come in with OnEfficiency.StopStart.

With the engine switched off during the waiting periods, significant efficiency gains and an increase in vehicle availability can be realized. Thanks to simultaneous monitoring of the

auxiliary operations by our system, there is nothing stopping the journey from continuing. We support you every step of the way – from preliminary design to certification.

Higher availability



With a shorter engine running time, maintenance intervals are extended and fuel consumption is reduced. As fewer pit stops for servicing and refueling are needed, you profit from higher fleet availability.

Cost-efficient operation



The life cycle costs of your fleet are dramatically lowered through the minimized maintenance, idle time, and fuel requirements. This allows you to realize more cost-efficient operation.

Energy-efficient operation



Reduced engine operating hours result in reduced fuel consumption. This helps you realize more energy-efficient operation and reduce your carbon footprint to a minimum.



Drive



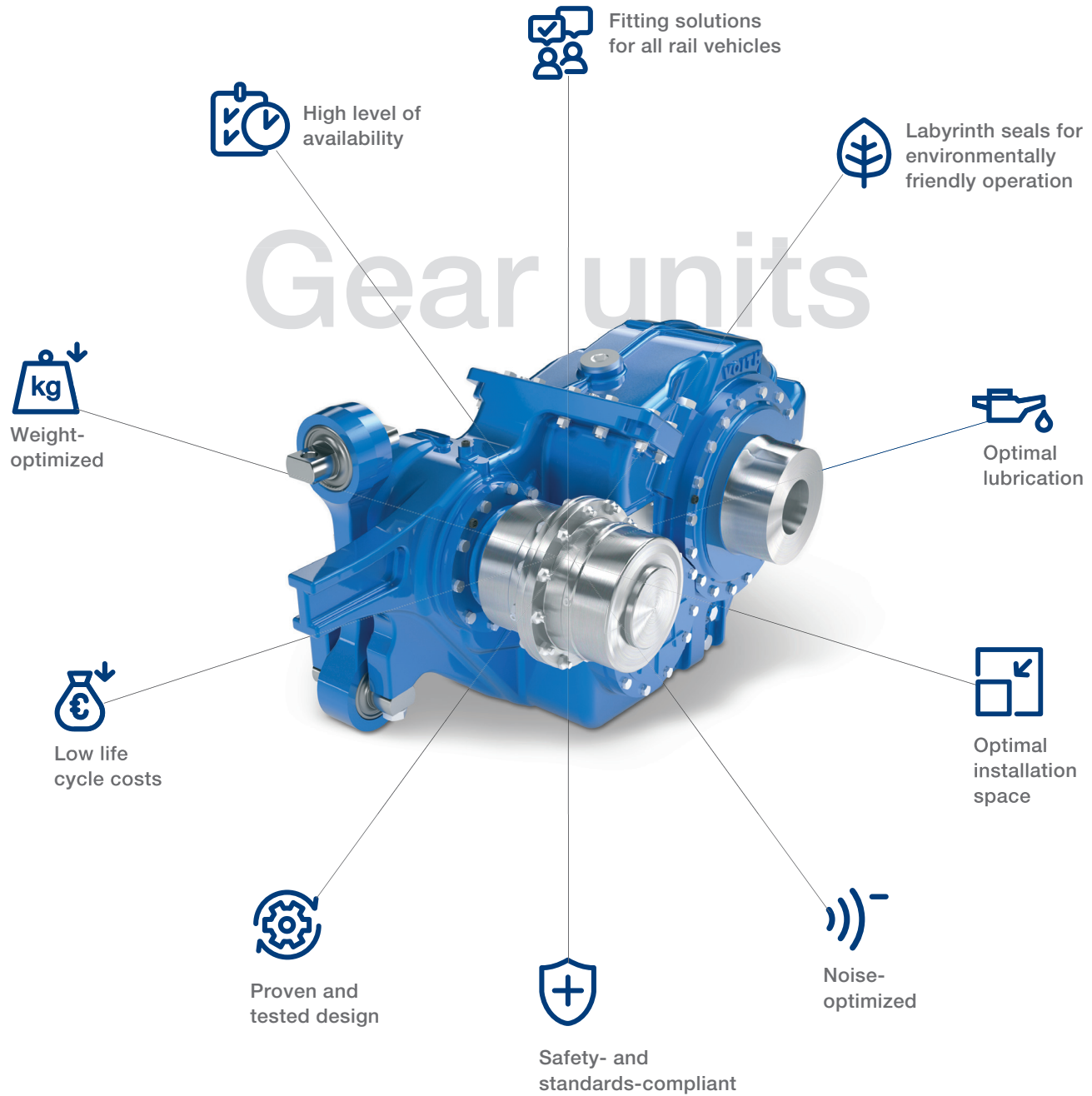
Solutions for electrically driven vehicles



Gear units transmit the drive torques from the electric traction motor to the wheelsets and are therefore key components of the electric drivetrain. You are sure to find an ideal product version in our range for your application and vehicle requirements.

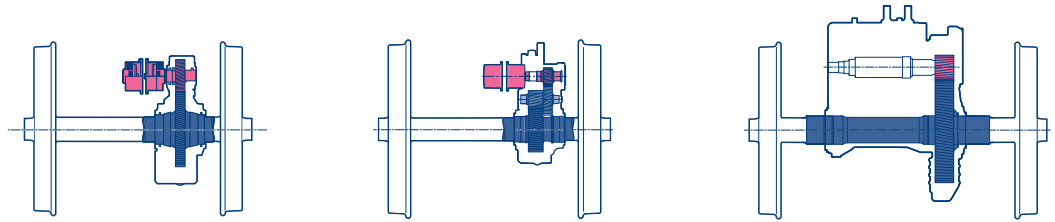


Gear units



Gear units

Product range



Technical specifications

Type	SE*	SZ*	SET
Drive arrangement	Transverse drive	Transverse drive	Transverse drive
Gear type	Helical gear	Helical gear	Helical gear
Gear stages	Single-stage	Double-stage	Single-stage
Mounting type	Axle-mounted	Axle-mounted	Axle-mounted

Application area



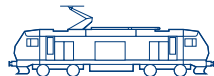
Metros



High-speed trains



Electric multiple units



Locomotives (E)



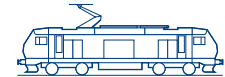
Metros



High-speed trains



Electric multiple units

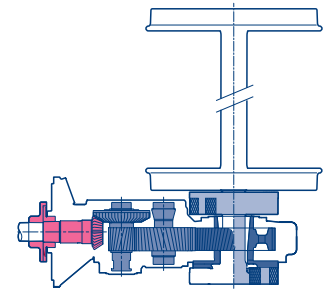
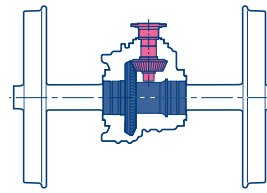
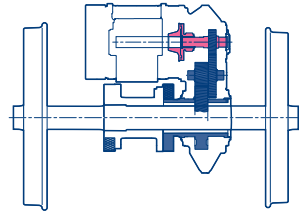
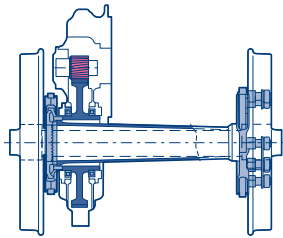


Locomotives (E)



Electric multiple units

* This model is also available in a modular version.



SEH

Transverse drive

Helical gear

Single-stage

Fully sprung

SZH

Transverse drive

Helical gear

Double-stage

Fully sprung

SK/KE

Longitudinal drive

(Helical-)bevel gear

Single-stage/double-stage

Axle-mounted

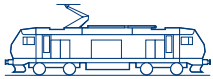
KSH

Longitudinal drive

Bevel-helical gear

Double-stage

Fully sprung



Locomotives (E)



Light rails and trams



High-speed trains



Light rails and trams



High-speed trains

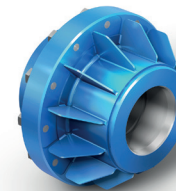
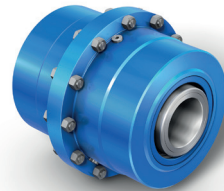


Electric multiple units











Electric multiple units

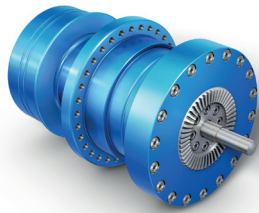
Couplings for gear units



Product range

Technical specifications

Type		Gear couplings (input)	Membrane couplings (input)
Designs		<ul style="list-style-type: none"> • With metal bellow seal • With flexible seal 	<ul style="list-style-type: none"> • Membrane coupling • Double membrane coupling • Membrane coupling with fan
Max. speed	[rpm]	up to 5500	up to 5000
Operation torque	[Nm]	up to 5500	up to 10500
Short-circuit torque	[Nm]	up to 17000	up to 25000
Application area		 Metros	 Metros
		 High-speed trains	 High-speed trains
		 Electric multiple units	 Electric multiple units
		 Diesel multiple units (DE)	 Diesel multiple units (DE)



Coupling combinations (output)

- Gear coupling – Gear coupling

up to 900

up to 7 000

up to 23 000



Light rails and trams



High-speed trains

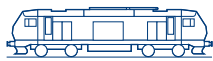
Lamella couplings (input/output)

- Gear coupling – Lamella coupling
- Lamella coupling – Lamella coupling

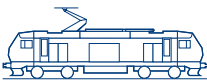
up to 4 500

up to 11 000

up to 28 000



Locomotives (DE)

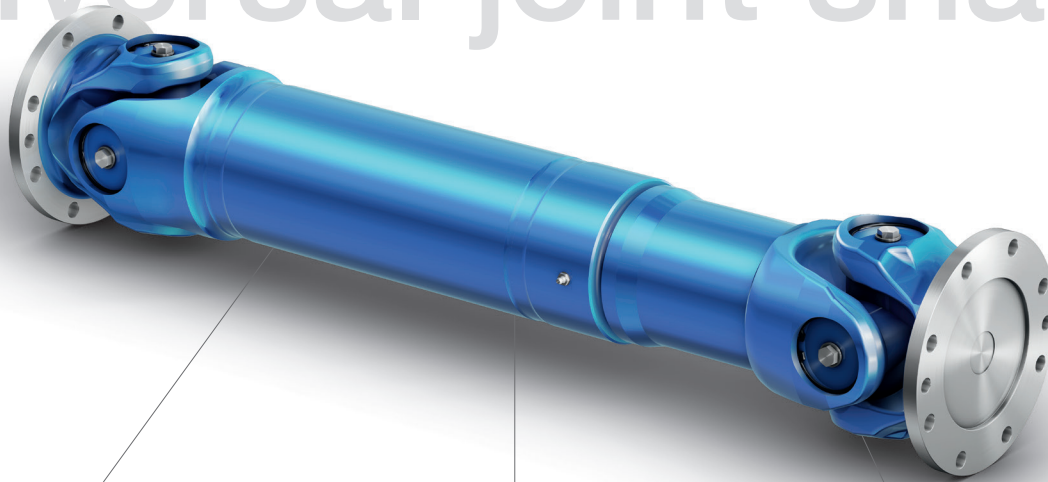


Locomotives (E)

In the electric drivetrain, cardan shafts transmit the torque from the drive to the output, for example, from the electric motor to the gear unit. For maximum functional reliability in continuous operation, we supply reliable high-performance cardan shafts that perfectly match your vehicle, drive, and application conditions.



Universal joint shafts



Robust and durable
drive components



High level
of reliability



Long maintenance
intervals

Universal joint shafts

Our universal joint shafts optimally tailored to your application – that's our goal. We can combine cardan shafts with torque-limiting as well as vibration-damping drive components on request and support you with a complete range of engineering services.

Our services at a glance

- Customized solutions (special cardan shafts)
- Preliminary design and dimensioning of cardan shafts and connection components
- Torsional and bending vibration calculations

Product range

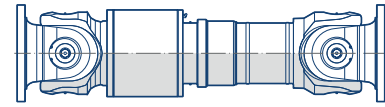
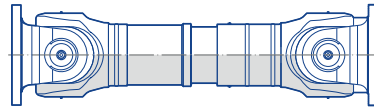
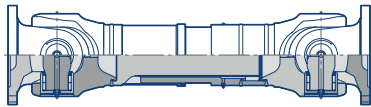
Technical specifications

Series

Torque capacity MZ [kNm]

Flange diameter a [mm]

Features



ST

0,25 to 275

58 to 435

- Basic version of Voith's universal joint shaft
- Nonsplit bearing eyes through one-piece forged flange yokes
- Length compensation with involute profile

RT

32 to 143

225 to 350

- High torsional and bending stiffness at a low weight
- Especially suited to high-speed drives
- Low-maintenance length compensation with low-friction plastic (Rilsan) coating
- Involute profile

RTR

Values available on request

225 to 435

- Length compensation with rolling bearing support
- Low, nearly constant axial displacement forces over the entire torque range
- High torsional and bending stiffness
- Also ideally suited to high-speed drives

With the SafeSet coupling, we offer you maximum protection for your drivetrain. Thanks to a precisely adjustable, temporally constant disconnect torque, the safety coupling protects against serious damage in the event of an impermissible torque increase and component failure. We design couplings specifically for your application in the torque range between 5 and 100 kNm.



Torque-limiting couplings



Compact and
lightweight
design



Higher
availability



Maximum
passenger and
operational
safety



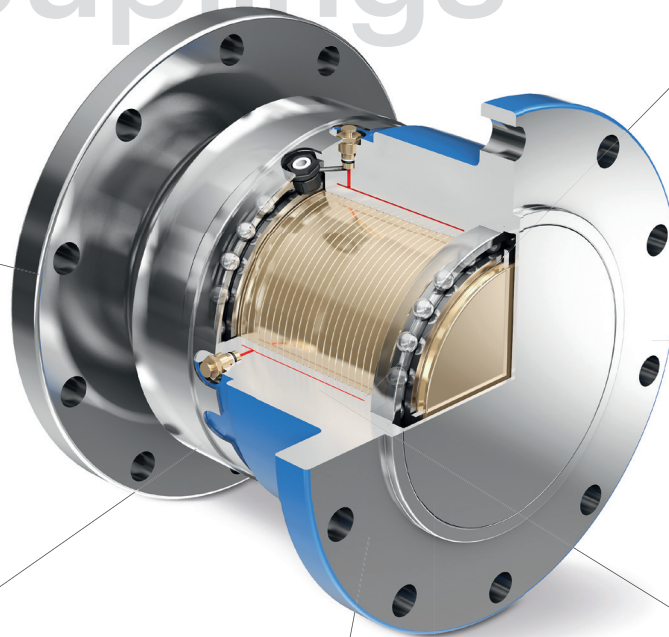
Backlash-free
force transmission



Minimal maintenance
outlay



Fast release and
reactivation



Voith Hirth serrations combine the components of the electric drivetrain with maximum precision and torque capacity. The connection components have a positive-locking fit and are clearance-free and self-centering. You benefit from minimal alignment requirements and high operational reliability.



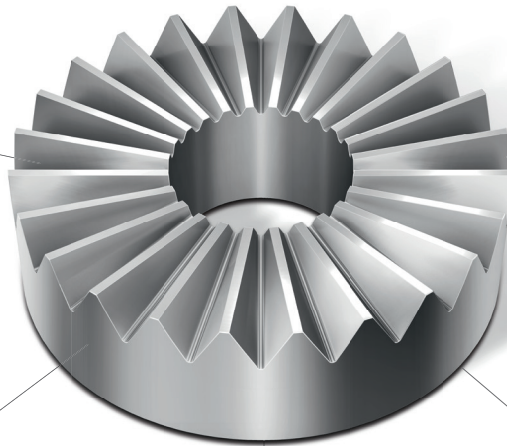
Hirth serrations



Compact and lightweight design



Long service life



High torque capacity



Wear- and maintenance-free



Fast installation, removal, and reinstallation

Hirth serrations

In order to ensure that our Hirth serrations meet your needs, we focus on fast and precise production as well as holistic service.

Our experts support you when you need them the most. From the product development stage onward, our engineers are there for you with their specialized knowledge.

Our services at a glance

- **Design and engineering design consulting**
 - **Calculations**
 - **Manufacturing consulting**
 - **Quality control**
-

Product range

Technical specifications

Type

Torque

Part diameter

Part weight

Part length

Number of teeth

Indexing accuracy

Repeat accuracy

Radial and axial runout

**Standardized Voith
Hirth serrated rings****Customized
Hirth serrations****Tailored serration
service**

–

Up to 15 000 kNm

Up to 15 000 kNm

50–900 mm

Up to 1 600 mm

Up to 1 600 mm

–

Up to 4 500 kg

Up to 4 500 kg

–

Up to 4 500 mm

Up to 4 500 mm

24–720

Max. 720

Max. 720

1–2 arc seconds

1–2 arc seconds

1–2 arc seconds

<0.001 mm

<0.001 mm

<0.001 mm

<0.01 mm

<0.01 mm

<0.01 mm">

Solutions for diesel-driven vehicles



The rail engine is at the heart of the drivetrain. The Voith Rail Engine was designed specifically to meet the latest requirements of the rail industry. With a state-of-the-art exhaust gas aftertreatment system, the energy-efficient powerhouse meets the latest emissions standards. To ensure that our engine perfectly matches your vehicle, you can choose between vertical and horizontal versions as well as among different performance levels.



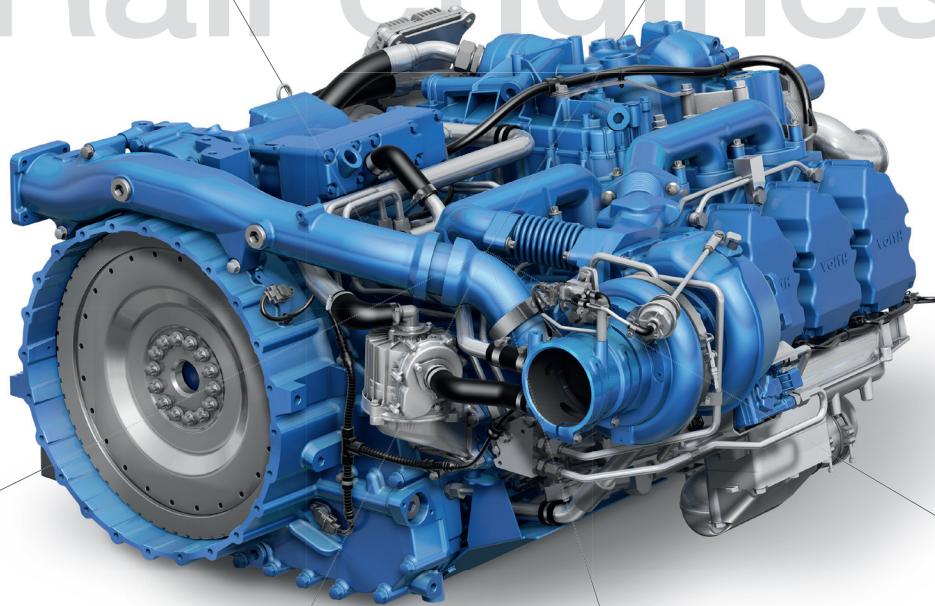
Rail engines



Compact design



Long spare parts availability



Meets the latest emissions requirements



Extended service intervals



Energy-efficient



Powerful

Rail engines

Voith Rail Engine

Product range

Technical specifications

Type	Voith Rail Engine I6H135 – horizontal
Cylinders	6
Size [L]	13.5
Emissions standard according to 2016-1628 and 97/68 EC	Stage V and Stage IIIB
Power [kW]	400 / 450 / 480
Speed [rpm]	2 100
Torque [Nm]	2 400 / 2 600 / 2 800
Bore / stroke [mm]	135 / 157
Compression ratio	17 : 1
Dry weight [kg]	1 270
Versions	–

Application area



Diesel multiple units (DE, DM, DH)

Technical specifications preliminary

Voith Rail Engine I6V135 – vertical

6

13.5

Stage V and Stage IIIB

400 / 450 / 480

2 100

2 400 / 2 600 / 2 800

135 / 157

17 : 1

1 150

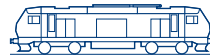
Other versions possible (with flat oil pan, with additional auxiliary drives, etc.)



Diesel multiple units (DE, DM, DH)



Locomotives (DH)



Locomotives (DE)

Our transmissions have been converting engine power into wheel power for 85 years now. We develop our technology continuously so that you can reliably satisfy traction requirements for your rail vehicles now and in the future. Whether you need a hydrodynamic or a hydromechanical transmission, you are sure to find the optimal solution for your application from among our range of products.



Transmissions



Long-term spare parts availability



Robust and resistant to all climate conditions



Long service life



Proven reliability



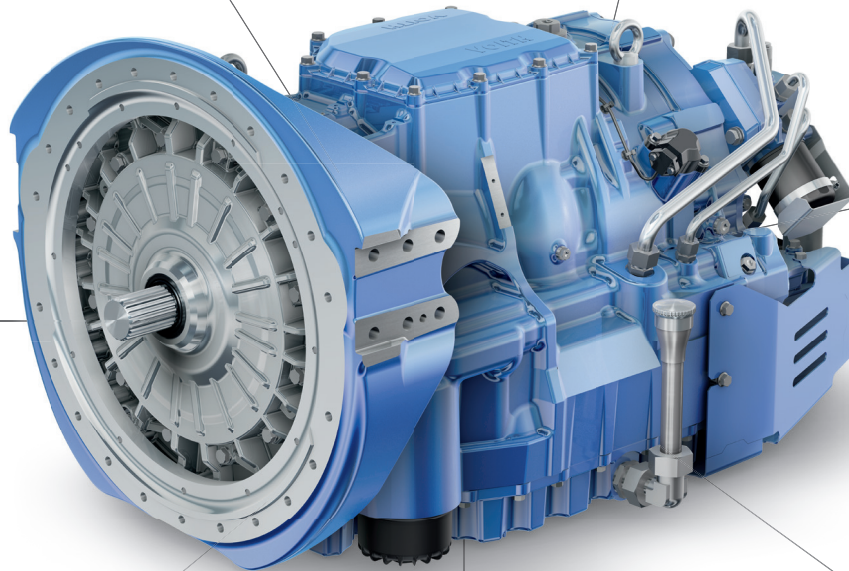
High power density



Integrated control system for diagnostics and data acquisition



Minimal maintenance outlay



Hydromechanical transmissions DIWARail

DIWARail automatic transmissions from Voith are based on proven bus technology. With reinforced output bearings and a secondary-side driven lubrication pump, which enables towing operation, this type of transmission is optimal for use in rail vehicles.

Product range

Technical specifications

Type

Identification number

Max. transmission input power $P_{1\max}$ [kW]

Transmission input torque $M_{1\max}$ [Nm]

Transmission input speed $n_{1\max}$ [min⁻¹]

Retarder braking torque M_{BR} [Nm]

Number of gears

Weight (dry) incl. retarder [kg]

Reversing gear

Application area

DIWARail***DIWARail NXT**

D 884.6

D 885.8R

320

340

1900

2000

2200

2200

1000

1800

4

5

540

450

x

-

**Diesel multiple units (DM)****Diesel multiple units (DM)**

* The enhancements from the proven DIWA.5 automatic transmission can be realized at the customer's request.

Hydrodynamic transmissions

Automatic multicircuit transmissions from Voith, each comprising a torque converter, a hydrodynamic coupler, and a retarder as basic hydrodynamic components, are ideally adapted to your application.

Product range

Technical specifications

Type

Max. input power	[kW]
------------------	------

Input speed	[rpm]
-------------	-------

Weight (dry)	[kg]
--------------	------

Oil capacity	[l]
--------------	-----

Application area

L 220 reV2

350

1 800–2 400

1 310

80

**Special purpose vehicle****L 311 reV2**

600

1 800–2 300

1 950

125

T 211 re.4

350

1 800–2 400

760

75

T 212 bre

450

1 800–2 400

1 200

95

T 312 bre

650

1 800–2 400

1 510 (1 521)

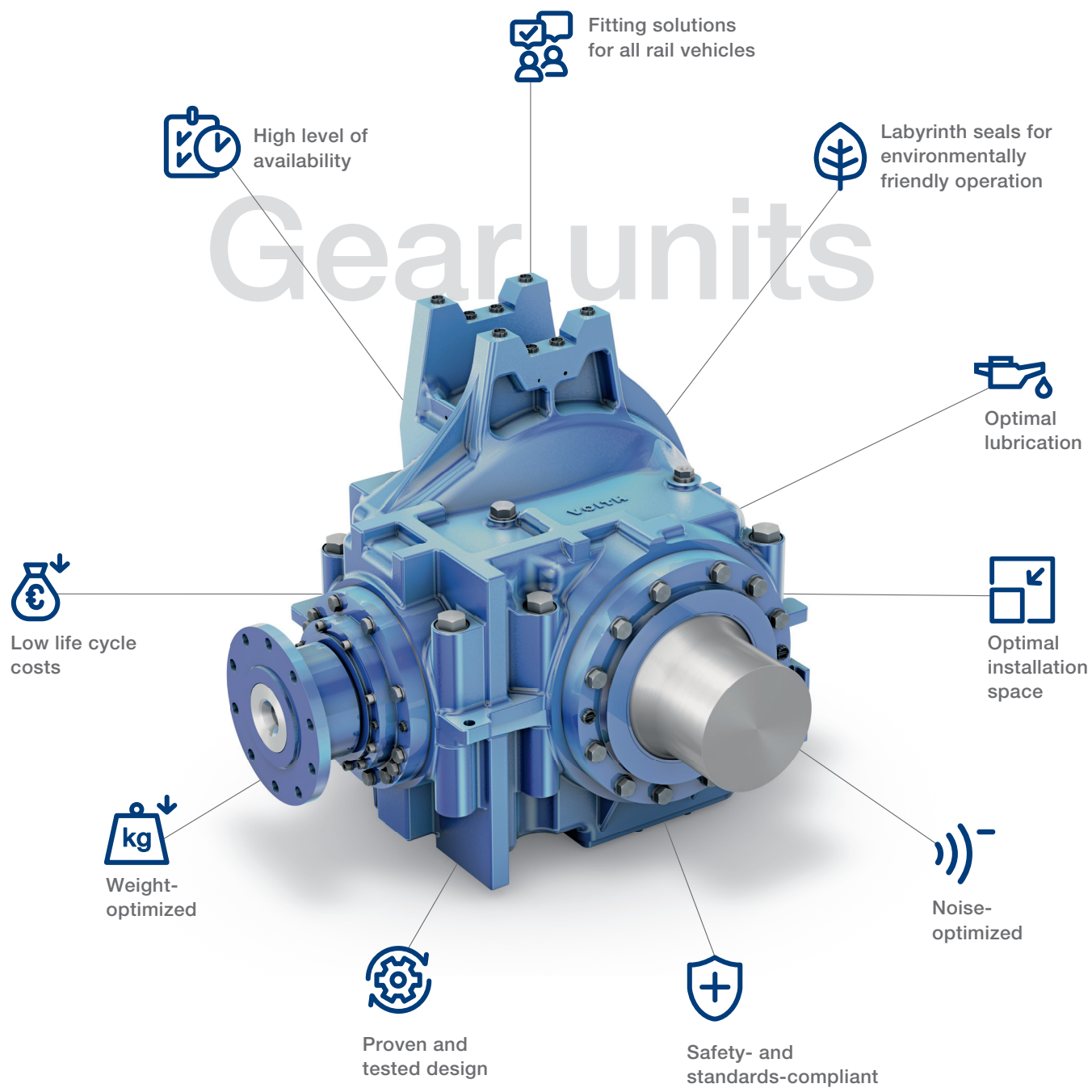
100

**Diesel multiple units (DM, DH)**

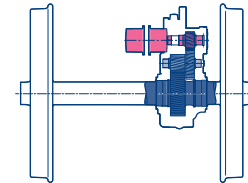
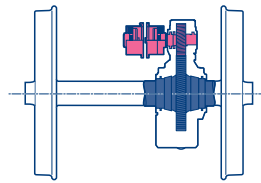
Gear units transmit the drive torques from the engine to the wheelsets and are therefore key components of the drivetrain. You are sure to find an ideal product version in our range for your application and vehicle requirements.



Gear units



Gear units



Product range

Technical specifications

Type	SE	SZ
Drive arrangement	Transverse drive	Transverse drive
Gear type	Helical gear	Helical gear
Gear stages	Single-stage	Double-stage
Mounting type	Axle-mounted	Axle-mounted

Application area



Diesel multiple units (DE)



Locomotives (DE)



Special purpose vehicles



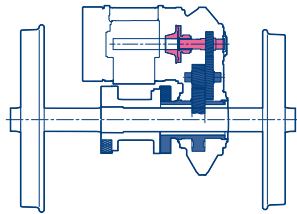
Diesel multiple units (DE)



Locomotives (DE)



Special purpose vehicles



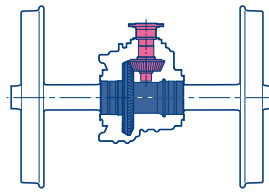
SZH

Transverse drive

Helical gear

Double-stage

Fully sprung



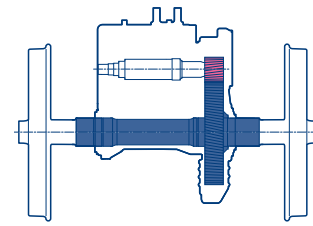
SK/KE

Longitudinal drive

Bevel-helical gear

Single-stage

Axle-mounted



SET

Transverse drive

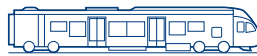
Nose-suspended gear

Single-stage

Axle-mounted



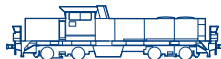
Diesel multiple units (DE)



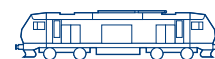
Diesel multiple units (DH/DM)



Diesel multiple units (DE)



Locomotives (DH)



Locomotives (DE)



Special purpose vehicles

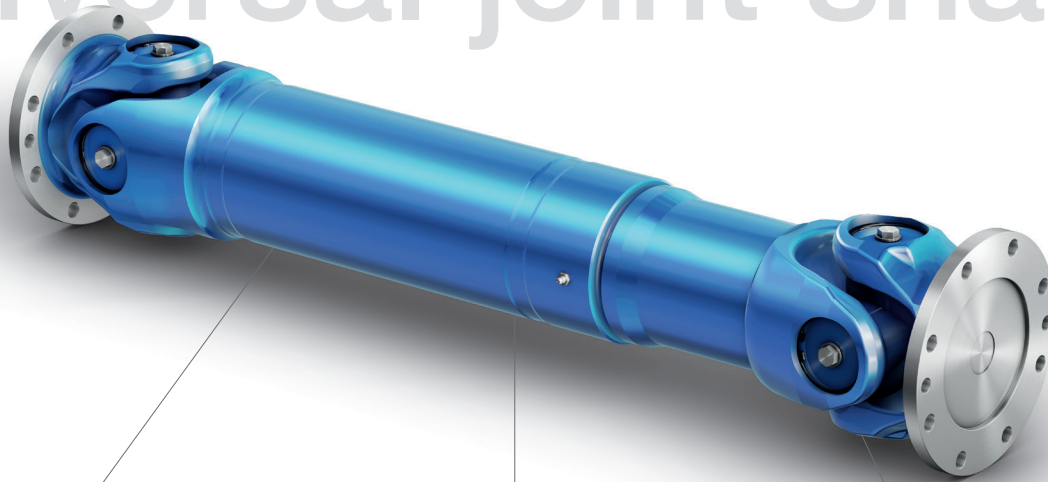


Special purpose vehicles

In diesel-driven rail vehicles, cardan shafts transmit the torque from the drive to the output, for example, from the diesel-mechanical or diesel-hydraulic transmission to the gear unit. For maximum functional reliability in continuous operation, we supply reliable high-performance cardan shafts that perfectly match your vehicle, drive, and application conditions.



Universal joint shafts



Robust and durable
drive components



High level of
reliability



Long maintenance
intervals

Universal joint shafts

Our universal joint shafts optimally tailored to your application – that's our goal. We can combine cardan shafts with torque-limiting as well as vibration-damping drive components on request and support you with a complete range of engineering services.

Our services at a glance

- Customized solutions (special cardan shafts)
- Preliminary design and dimensioning of cardan shafts and connection components
- Torsional and bending vibration calculations

Product range

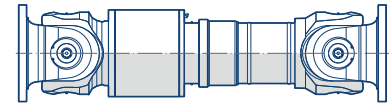
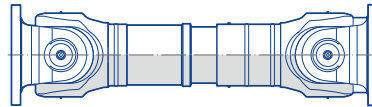
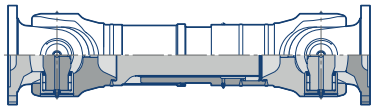
Technical specifications

Series

Torque capacity MZ [kNm]

Flange diameter a [mm]

Features



ST

0.25 to 275

58 to 435

- Basic version of Voith's universal joint shaft
- Nonsplit bearing eyes through one-piece forged flange yokes
- Length compensation with involute profile

RT

32 to 143

225 to 350


- High torsional and bending stiffness at a low weight
- Especially suited to high-speed drives
- Low-maintenance length compensation with low-friction plastic (Rilsan) coating
- Involute profile

RTR

Values available on request

225 to 435

- Length compensation with rolling bearing support
- Low, nearly constant axial displacement forces over the entire torque range
- High torsional and bending stiffness
- Also ideally suited to high-speed drives

A photograph of a railway track at dusk or dawn. The tracks are in the foreground, leading towards the background. A blurred train is visible in the lower right corner, moving towards the viewer. The background shows city lights and a sunset or sunrise sky. The text is overlaid on the upper left portion of the image.

Highly flexible couplings from Voith shift resonance frequencies in the driveline below the idling speed. At the same time, the modular and flexibly integrable type K couplings dampen torsional vibration amplitudes and torque shocks.

Highly flexible couplings



Proven technology



Lower operating costs



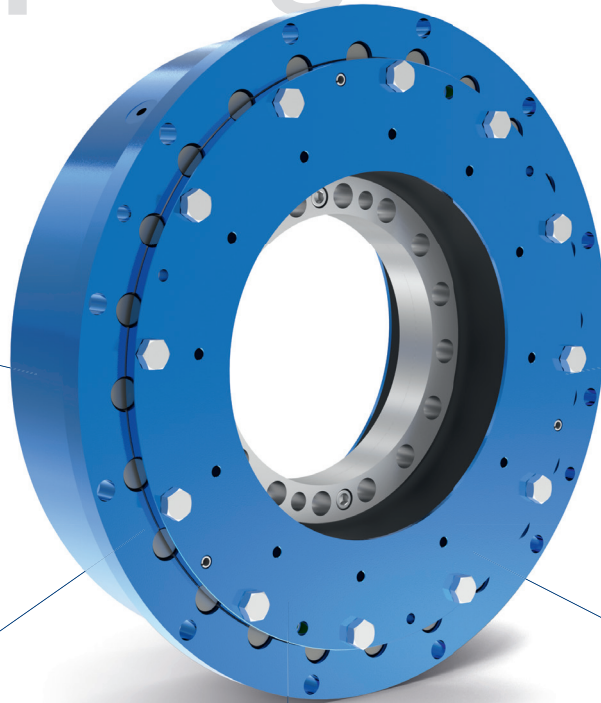
Increased availability of drive components



Extended service life of the drive components improved



Increased ride comfort thanks to reducing vibrations and noise



With the SafeSet coupling, we offer you maximum protection for your drivetrain. Thanks to a precisely adjustable, temporally constant disconnect torque, the safety coupling protects against serious damage in the event of an impermissible torque increase and component failure. We design couplings specifically for your application in the torque range between 5 and 100 kNm.



Torque-limiting couplings



Compact and
lightweight
design



Higher
availability



Maximum
passenger and
operational
safety



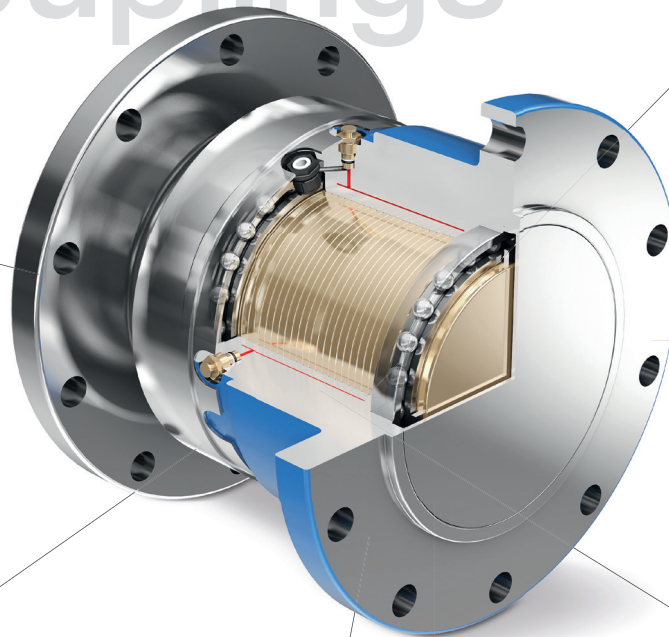
Backlash-free
force transmission



Minimal maintenance
outlay



Fast release and
reactivation



Voith Hirth serrations combine the components of the drivetrain with maximum precision and torque capacity. The connection components have a positive-locking fit and are clearance-free and self-centering. You benefit from the low amount of alignment required and the high operational reliability.



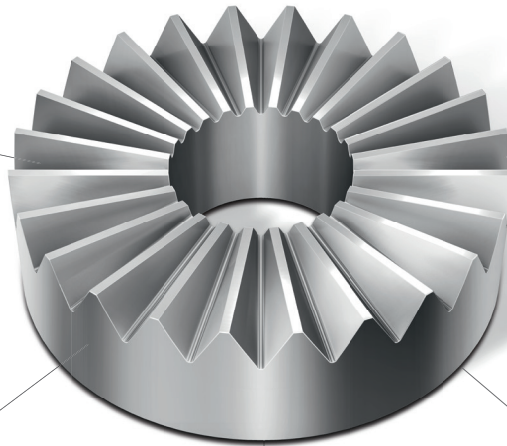
Hirth serrations



Compact and lightweight design



Long service life



High torque capacity



Wear- and maintenance-free



Fast installation, removal, and reinstallation

Hirth serrations

In order to ensure that our Hirth serrations meet your needs, we focus on fast and precise production as well as holistic service.

Our experts support you when you need them the most. From the product development stage onward, our engineers are there for you with their specialized knowledge.

Our services at a glance

- **Design and engineering design consulting**
 - **Calculations**
 - **Manufacturing consulting**
 - **Quality control**
-

Product range

Technical specifications

Type

Torque

Part diameter

Part weight

Part length

Number of teeth

Indexing accuracy

Repeat accuracy

Radial and axial runout

**Standardized Voith
Hirth serrated rings****Customized
Hirth serrations****Tailored serration
service**

–

Up to 15 000 kNm

Up to 15 000 kNm

50–900 mm

Up to 1 600 mm

Up to 1 600 mm

–

Up to 4 500 kg

Up to 4 500 kg

–

Up to 4 500 mm

Up to 4 500 mm

24–720

Max. 720

Max. 720

1–2 arc seconds

1–2 arc seconds

1–2 arc seconds

<0.001 mm


<0.001 mm

<0.001 mm

<0.01 mm

<0.01 mm

<0.01 mm



Connect
& protect



Solutions for passenger transport



Railway couplers and connections

With our range, we protect and connect across all applications. We offer you couplers for every vehicle type, with crash buffers and snow protection on request for maximum reliability at any time of year.

Our versatile offering includes modular adapter couplers for connection of different coupler types.

Product range



Technical specifications

Product

Modular couplers

Product information

- Individual combination of head, electrical contact coupling, rod, and bearing bracket

Application area



Metros



High-speed trains



Multiple units



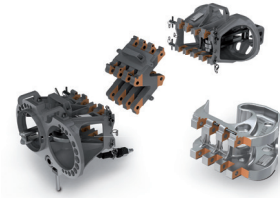
Couplers with individual heads

- Scharfenberg (all types)
- Tomlinson (2.5", 4")
- Georg Fischer
- Janney (types E, F, and H)
- Willison



Articulated couplers

- Scharfenberg (types 530, 430, and 330)
- Articulated rod (manual, electric [single], pneumatic [single])
- Forces (200–600 kN)
- Elastomer spring joint



Modular adapter couplers

- Steps (0–400 mm)
- Forces (400–50 kN)

All applications



Light rails and trams

All applications

Solutions for freight transport



Railway couplers

For climate targets to be achieved, the share of total freight transport made up by rail must increase dramatically. With our proven technology and forward-looking innovations, we contribute to this.

To ensure the future viability of European freight transport, we offer you the digital automatic coupler as a version for freight cars and locomotives based on the Scharfenberg working principle. As service partner, we also support you with migration and maintenance.

The CargoFlex not only enables automation but also additionally forms the basis for diverse digital functions through an integrated electric head.

With its automatic head that can be swiveled up, the CargoFlex Hybrid for locomotives allows successive conversion, because in addition to automatic coupling, connection with UIC drawhooks is also possible.

In addition, our proven couplers for switchers enable reliable operation at the freight yard.

Product range

Technical specifications

Type

Product information

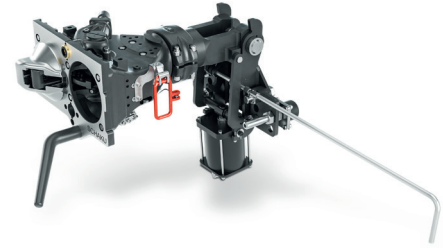
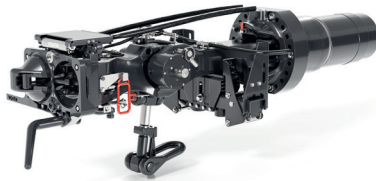
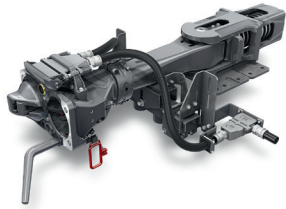
No intervention in car structure

Tensile and impact energy absorption

Power and data transmission possible

Special characteristics

Application area



CargoFlex*

- Automatic Scharfenberg coupler for freight cars
- Can be extended with various modules

X

X

X

- Suitable for UIC-compliant installation spaces
- Weight-neutral system in comparison with screw coupler + buffer



Freight cars

CargoFlex Hybrid*

- Automatic Scharfenberg coupler for locomotives
- Head that can be swiveled up for additional coupling to a drawhook
- Can be extended with various modules

X

X

X

- Swivel device on automatic head enables coupling with a drawhook



Locomotives

Shunting coupler

- Automatic coupler for shunting operation
- Can be coupled with Scharfenberg couplers
- Compatible with existing locomotive drawgear
- Easily exchangeable head

*The couplers are constantly being further developed and improved in close cooperation with operators.

An aerial photograph of a shipping yard filled with rows of colorful intermodal containers in shades of red, blue, yellow, and white. Several yellow gantry cranes are visible, positioned over the stacks of containers. The image is dominated by a large, semi-transparent green watermark consisting of the letters 'D' and 'R' in a bold, sans-serif font, centered horizontally and vertically across the scene.

DR

An aerial photograph of a container yard filled with stacks of colorful shipping containers in various colors including red, blue, white, yellow, and green. Several yellow gantry cranes are visible, positioned over the stacks. A large, semi-transparent green watermark with the letters 'VE' is overlaid in the center of the image.

VE

Please scan the
QR code to obtain
further information:



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our experts:



VOITH