

Your ticket to ride

Gear units for rail vehicles





Worldwide on track: Drive systems for rail applications



Double decker train of Metra Chicago, built by Nippon Sharyo, Japan.

Urban railways or trams, metros, regional railcars, locomotives or high-speed trains and special rail vehicles: Voith offers drive components and systems solutions for all rail vehicles.

The Voith portfolio covers all components of the drivelines: from a wide range of transmissions, diesel engines, cardan shafts and couplers to traction inverters and cooling systems to motor-gear units, RailPacks and energy absorption elements. No other supplier has such a comprehensive overall competency in the driveline. Decades of experience and meticulous research make us an expert partner for individual requirements.



OARIS high-speed train,
built by CAF Beasain, Spain.

Internationally networked for excellent service

Voith meets local production demands – in Europe, as well as in China, USA and India. Whatever the country of application, our customers receive local service and support – be it during construction, maintenance and service or repairs of their vehicles. Our spare parts are available quickly and all over the world.

Systems supplier – everything from one single source

As a systems supplier we offer complete solutions to our customers. Voith looks after the complete design, assumes systems responsibility and is thus the sole contact. Apart from logistics benefits, this also results in shorter delivery times. Reduced interfaces ensure fewer adaptation processes.

Maximum speeds of up to 700 km/h

Worldwide trains with our transmissions achieve maximum scheduled speeds. The current top speed with a Voith transmission achieved in trial operation on a test stand is at 700 km/h.

Current top speed with a Voith transmission
achieved in trial operation on a test stand:

700 km/h



Production surface of

15 000 m²

Gear units per year:

10 000

Hi-tech engineering, measuring and production methods

Reliability is what drives us

On a production surface of 15 000 square meters Voith produces mechanical drives for rail vehicles at the location Heidenheim. The assembly runs in a strict cycle: every 1.2 hours a complete gear unit leaves the production hall. Worldwide, Voith has assembly capacities for over 10 000 gear units per year.

Engineering methods for optimum design

We use state-of-the-art CAD-3D for the design of the gear units, and optimize interfaces to adjoining components in the bogie. The finite element method helps us to determine loads within the component and to achieve targeted perfection of all structures. With this and other engineering processes, for example multi-body simulation, we develop products that meet all anticipated stress loads and have an optimum weight.

Prototypes tested under maximum load

Prototypes are tested intensively. This includes tests under load, as well as measurements of the noise and vibration behavior. In the environmental chamber, the transmissions are put on the test stand and are examined under extreme temperatures. Each transmission undergoes a series test run before it leaves the Voith plant.

Competency in material use

For special applications that require an even lower transmission weight, Voith produces gear units with weight-saving aluminum housings. Many of our components also undergo special surface and hardness treatments, in order to ensure optimum strength and wear characteristics. Be it for specific customer requirements or for standard applications – our materials meet the highest demands.



- 1 The tilting test stand is used to test gear units for leaks.
- 2 Service: the Voith wheelset press is designed for gauge width of 750 to 1676 millimeter.

Voith offers complex engineering services already during the planning stage of the driveline. Our products meet the highest demands on quality, safety and reliability.

Seamless dynamics

Motor-gear units for all applications

We offer complete electric drivelines as motor-gear units (MGU) for all trams, urban and standard-gauge railways.

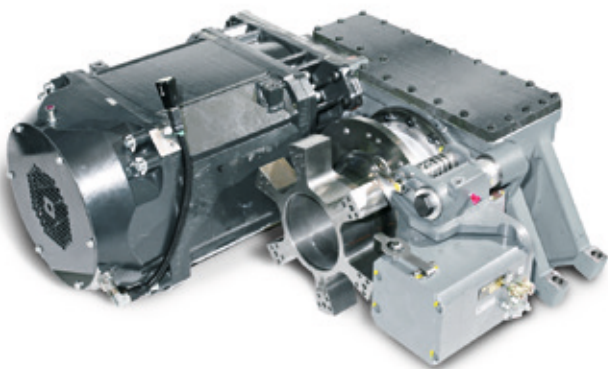
We implement individual solutions and, apart from providing the electric know-how, utilize our comprehensive experience with transmissions.

The interface transmission-motor is perfectly adapted and allows dynamic drive characteristics at all operating conditions. The motor-gear units are particularly reliable and allow easy maintenance. Due to their compact design, they can be easily installed and removed.

Service across the entire product life cycle

Voith assumes the complete engineering of the motor-gear unit from systems design, calculation of the operating cycle and systems specification to construction, verification, testing and integration into the vehicle bogie. In addition, we carry out the service and the maintenance of the units, for which Voith is the sole contact rather than several different suppliers.

Motor-gear unit for urban railways



Artic low-floor tram

Motor-gear unit MGU65-SV-KSH216

OEM	Transtech/Škoda, Finland
Operator	Helsinki City Transport, Finland
Maximum speed	80 km/h
Axle load	8,1 t
Ratio	6,699



Diesel-electric regional railcar

Motor-gear unit MGU142-SV-SZH455

OEM	Thangshan Railway Vehicle, China
Operator	Ghana Railways, Ghana
Maximum speed	80 km/h
Axle load	12.5 t
Ratio	7.48



Manchester tram

Motor-gear unit MGU120-SV-SZH418

OEM	Consortium Bombardier Transportation and Vossloh Kiepe, Germany
Operator	Manchester Metrolink, UK
Maximum speed	80 km/h
Axle load	11 t
Ratio	6.29



Designed for maximum performance

Gear units for any application

We offer gear units that are optimally adapted to individual axle loads, speeds and tractive efforts for all rail vehicles – urban railways and trams, metros, regional railcars, locomotives, high-speed trains and special rail vehicles.

Gear units from Voith are operating reliably all over the world. They are weight and noise-optimized and allow speeds of over 400 km/h. The reduced weight comes from the housing designs in aluminum and the patented bionic toothing.

High-performance components for any drive

Our gear units for transversal or longitudinal drives excel by quality, reliability, high power density and proven design. Voith offers single and double-stage helical and bevel gears. They are available in axle mounted and, for extra protection of vehicle and track bed, also in fully sprung design.

Gear unit with aluminum housing for modern high-speed trains



Diesel-hydraulic shunting locomotive Gravita 10 BB

SK-630 gear unit

OEM	Voith Turbo Lokomotivtechnik Germany
Operator	Panlog Switzerland
Maximum speed	100 km/h
Axle load	22.5 t
Ratio	5.023



Metro RS6

SE-344 gear unit

OEM	BEML India
Operator	Delhi Metro Rail Corporation India
Maximum speed	90 km/h
Axle load	17 t
Ratio	6.65



EMU BR 440

SZ-400 gear unit

OEM	Alstom
Operator	DB
Maximum speed	160 km/h
Axle load	20 t
Ratio	5,555



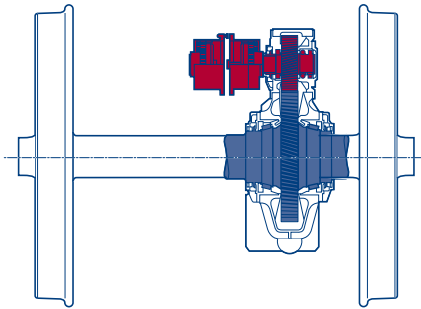
Perfectly adapted

Overview of gear units

Voith offers a wide range of different transmission types for highly diverse rail vehicle application profiles. They differ by type, number and arrangements of gears, motor position, as well as by coupling design.

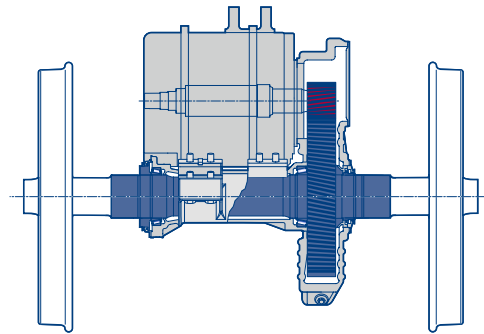
Single-stage helical gear (SE)

Transversal drive, axle-mounted



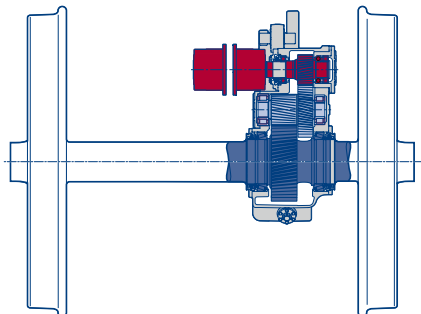
Single-stage helical gear in conon box design (SET)

Transversal drive, axle-mounted



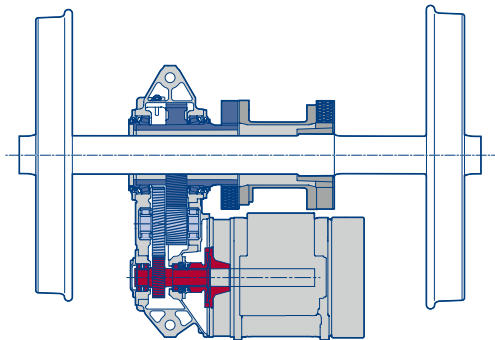
Double-stage helical gear (SZ)

Transversal drive, axle-mounted



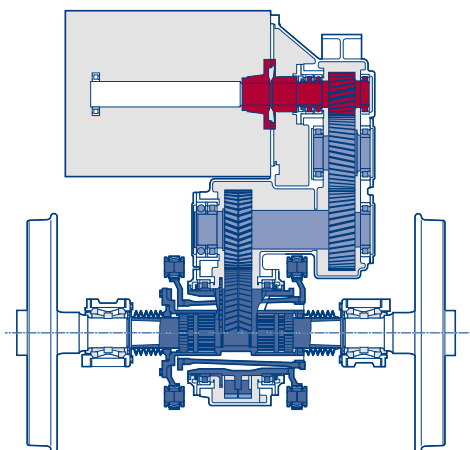
Double-stage helical gear (SZH)

Transversal drive, fully sprung



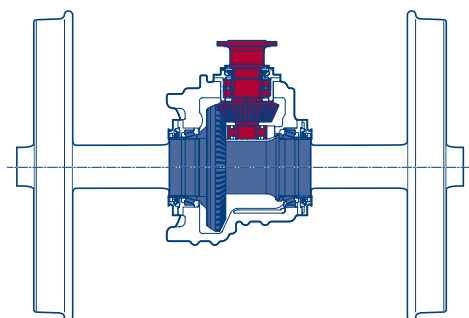
Double-stage helical gear (SZH) in gauge-change design

Transversal drive, fully sprung



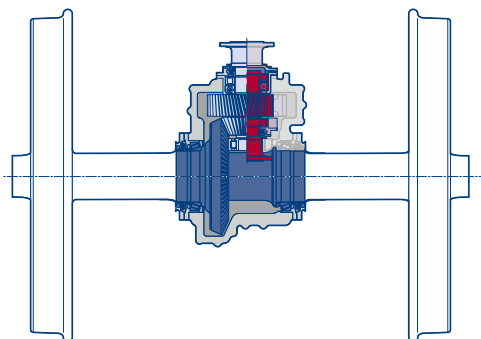
Single-stage bevel gear (KE)

Longitudinal drive, axle-mounted



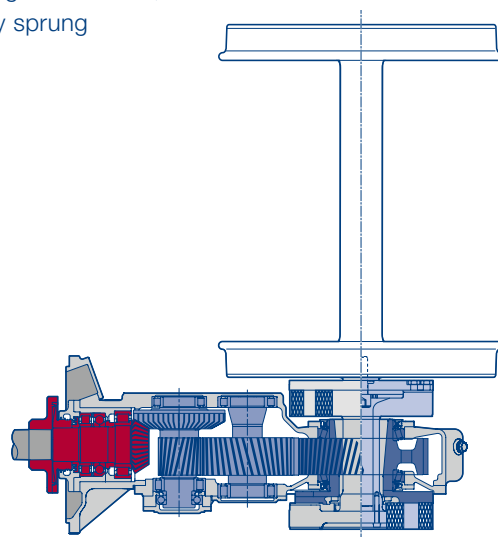
Double-stage helical-bevel gear (SK)

Longitudinal drive, axle-mounted



Double-stage helical-bevel gear (KSH)

Longitudinal drive, fully sprung



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for Generations