



Moving the big things

ZF Industrial Drives





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Industrial gearboxes must withstand heavy duty operating conditions and at the same time be compact, precise and efficient. Reliability and safety are also essential aspects. With its large gearboxes for industrial applications and large movable machines ZF fulfils these requirements. Thanks to a modular gearbox design approach, an extremely wide spectrum of applications can be served – from sugar mills and tunnel boring machines to 800 tonnes mining excavators, for example. A wide product range, combined with a high level of engineering expertise, decades of experience, the highest production quality and global services make ZF a valuable partner for applications in the industrial gearbox sector.

ZF offers planetary gearboxes in many versions for a large number of industrial applications, such as continuous casting plants where absolute robustness and reliability are needed.

Technology for a world in motion

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. ZF products contribute substantially to comfortable, safe and sustainable mobility.



As one of the world's largest automotive suppliers ZF will continue to focus on innovations, quality and sustainable growth in order to expand its worldwide presence.



Sales 2017 in billion €

36.4

R&D spendings 2017
in billion €

2.2

Locations

230



Employees

146,000



Countries
approx.

40



Status 2017

Top performance for driveline and chassis technology – with this goal ZF Friedrichshafen AG became a much-demanded partner to the automotive industry at the dawn of the last century. ZF technology can be found in innumerable cars, vans, trucks, buses – and is moving people throughout the whole world. Furthermore, the non-automotive industry has become an important corporate pillar and will be expanded even further in the future.

The off-road specialists

ZF bundles its activities for “Off-Road” applications in the division Industrial Technology. These include the development and production of transmissions and axles for agricultural and construction machines, as well as driveline technology for material handling systems, rail and special vehicles. The division is also responsible for the worldwide business of marine propulsion systems, aviation technology as well as the development and production of wind power gearboxes. The division's portfolio also includes test systems for a wide range of applications.

Merging of two global players

The takeover of the large gearbox business of Bosch Rexroth marks ZF's entry into the market for industrial transmissions. A total of 900 employees of the new company ZF Industrieantriebe Witten GmbH will be reinforcing one of the world's leading technology group in its division Industrial Technology. The large-transmission sector constitutes the new Industrial Drives Business Unit with headquarters in Witten (Germany).

The merger combines the expertise and the experience of both partners in the development and production of driveline technology. Hence a clear objective arises: As one of the world's leading suppliers of transmission technology, ZF intends to focus even more on industrial applications and to offer solutions for the mega-trends of the future to existing and new customers.



Get a new or better view of ZF –
a technology-based company.



Partner for large driveline solutions

With our many years of experience we know all about the requirements of planetary gearboxes. We will gladly accept major challenges as we know exactly what it takes to make equipment and machines operate reliably and economically.

The Industrial Drives Business Unit offers more than half a century of experience in the manufacture of planetary transmissions for industrial applications, an indication of know-how, quality and reliability. Together with the 100 years of transmission expertise from the ZF Group this assures even further innovative technologies and drive concepts for the future.

ZF's know-how covers the complete process of transmission manufacture. The process chain extends from mechanical machining and heat treatment to the assembly and subsequent tests, painting and shipment. For us, perfect quality management not only includes the systematic planning and monitoring of quality features, but also comprises striving for continuous improvement – along the whole value creation chain. We are responding to the growing importance of industry-specific solutions with market-orientated international R&D-centres. Our product specialists are not only experts in the field of driveline technology, they are also familiar with the special features of each application.

Engineering expertise

The ZF engineering expertise provides support right from the start. Long before a complex component takes shape we will have already carried out complicated calculations, such as those involving the finite element method (FEM).

The expertise in development is supplemented by unequalled competence in dynamic simulation and testing. Our testing technologies and computation techniques are the basis for the development of competitive and marketable products.

Another strength of ZF is customer-specific engineering: ZF customer support co-operate closely with their colleagues from R&D. The results are innovations which set global benchmarks and which convince our customers.



Purchasing

The metals and materials we use must meet the same quality standards that we have set for ourselves. For torque-transmitting parts we use highly annealed, forged steel from approved suppliers. Our forged spindles, planet carriers and ring gears have excellent strength qualities leading to compact gearbox designs with small space requirements.



Heat treatment

Modern heat treatment methods have a significant impact on the quality of gears and components. The external teeth of sun wheels and planetary gears are case-hardened and the internal teeth of ring gears are nitrided. Our vast in-house experience in hardening technology is a decisive quality factor for maximum standards in terms of strength, load-carrying capacity, compactness and service life of our gearboxes.



Mechanical machining

The know-how we have accumulated over several decades with respect to turning, milling and grinding of gearbox components and gears forms the basis of the highest possible manufacturing quality. ZF invests systematically in advanced production machinery to ensure maximum quality and economic efficiency.



Flexible assembly

Our industrial customers expect not only compact and economic gearbox- and drive solutions, they rely on the delivery of application-specific variants in small and medium lots. ZF meets these demands with an intelligent modular system and a flexible assembly.



Test benches

Prior to shipment, all planetary gear units are tested to the most stringent quality standards on our test benches. In addition to the actual functional test, the gearboxes are subjected to a leakage test. Depending on the specification, the test runs also take place under load. Modern test programs are used to record the relevant parameters.



Environment and quality management

Our quality management system according to DIN EN ISO 9001:2015 is the base and guarantor of a consistently high quality level. Another area of importance to ZF is environmental protection. Therefore, ZF Industrieantriebe Witten GmbH has implemented an environment management system according to DIN EN ISO 14001:2015.



Learn more about
ZF Industrial Drives



Versatile product range for numerous applications

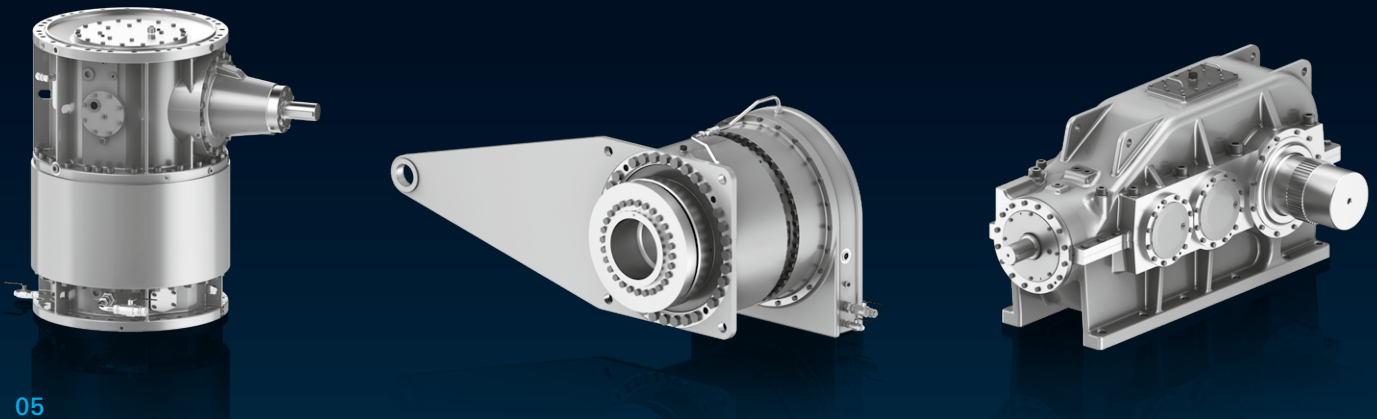
ZF offers a complete range of planetary gearboxes for a wide scope of applications which are tailor-made for each specific application.

Drive gearboxes from ZF are ideal driveline components for wheel, track or roller-driven mining applications and large construction machines. As sprocket transmission in a crawler chassis or as wheel transmission in a hub drive, they provide the necessary tractive power in any terrain.

Winch gearboxes supply the required cable force for precise lifting and lowering of loads. Their extremely compact design makes them ideal for the direct, and therefore space-saving, installation in the cable drum. Swing gearboxes from ZF are suitable for usage in large excavators and all types of cranes – onshore or offshore – wherever rotary movement in combination with precise positioning is needed and high acceleration and braking torques prevail.

ZF industrial gearboxes are reliable drive components which have proven their reliability under a wide range of conditions. Due to a flexible modular system a wide range of transmission and dimensional variants is available and ideally suited for a large number of different applications like offshore platforms, apron feeders, sugar mills, ropeways, shredders, tunnel boring machines, continuous casting plants, flood barriers and many more.

All planetary gearboxes are designed for low-noise operation, high power density and robustness. The high quality of the individual components ensures a long service life with low maintenance as well as reliable and efficient operation. Optimal application-orientated dimensions and the compact design substantially reduce the complexity of installation.



05

Gearboxes for mining, offshore, marine applications and cranes

(01) DRIVE GEARBOXES GFA/GPT

- Drive gearboxes for wheel, track or roller-driven machines with a weight of up to 800 tonnes
- Two or three-staged planetary gearboxes; with spur-gear stage if required
- Output torques from 160 kNm
- Full-complement bearing on planetary wheels (GFA) or robust main bearing (GPT)
- Low-noise operation
- Integrated spring-applied multiple-disc brake

(03) SWING GEARBOXES GFB

- Compact gearbox for all types of excavators and cranes
- Two or three-staged planetary gearboxes
- Output torques from 50 kNm
- Easy assembly
- Convenient oil change procedure
- Integrated spring-applied multiple-disc brake
- Certified by classification companies for offshore deployment

(02) WINCH GEARBOXES GPT-W

- Installation in winch drums on all types of lifting equipment
- Two or three-staged planetary gearboxes
- Output torques from 140 kNm
- Cable forces from 373 kN
- Compact, space-saving planetary design
- Robust bearings for absorption of cable forces
- Low-noise operation
- Integrated spring-applied multiple-disc brake
- Certified by classification companies for offshore deployment

(04) PUMP DISTRIBUTION GEARBOXES GFC

- Special versions for large hydraulic excavators with engine ratings from 350 kW
- Helical gearbox with integrated roller bearings
- Direct fitting of hydraulic pumps
- Oil splash lubrication
- Direct flange-mounting on diesel or electric engine

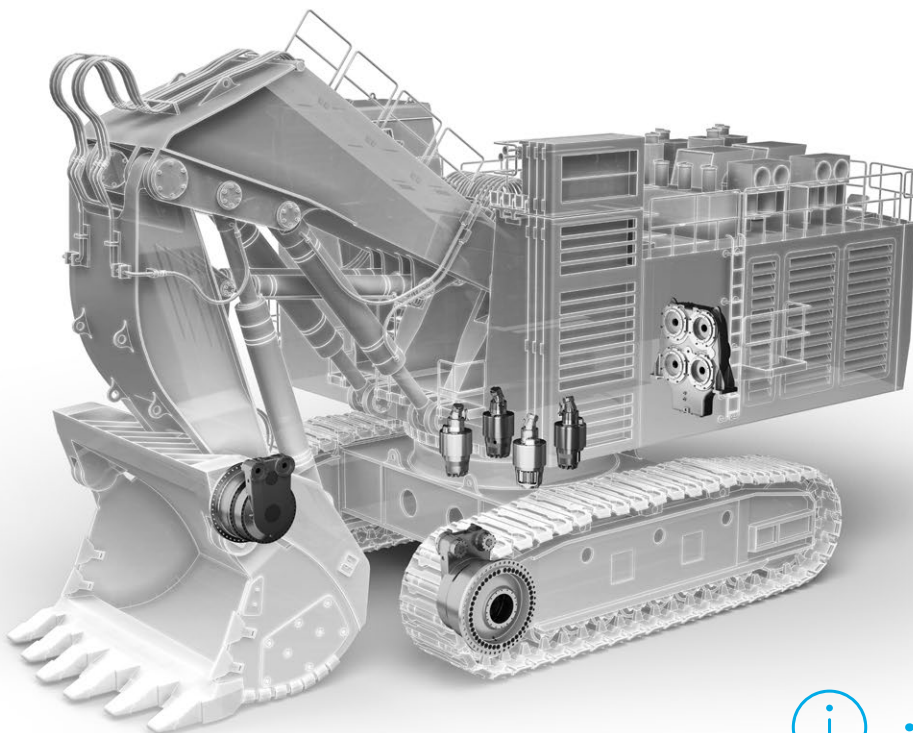
Gearboxes for industrial machinery, equipment and ropeways

(05) INDUSTRIAL GEARBOXES GMH/GME/IMK

- Multi-staged planetary gearboxes
- Optionally with angular or spur-gear prestage
- Combination with hydraulic or electric motors possible
- Output torques up to 8,000 kNm
- Horizontal or vertical installation position
- Large number of transmission and dimensional variants due to intelligent modular system
- High reliability
- Multi-stage spur-gear or helical-bevel gear units on request

Gearboxes for mining applications and large construction machines

In open pit mines heavy-duty equipment is needed, where thirty cubic metres of material might need to be loaded in one pass, or over 350 tonnes of load might have to be transported. Here, the giant machines must move forcefully, but delicately. The robust ZF gearboxes ensure the machine remains reliably in motion.



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Applications e.g.:

Excavators (> 60 t), loaders, crawler equipment (> 60 t), road rollers, road finishers, road milling machines, mobile and tracked cranes, bucket-wheel reclaimers, railway cranes, lifting working platforms, drilling equipment, special vehicles and many more

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ZF drive, swing and winch gearboxes take up the heaviest loads, they are extremely compact and combine precise machine control with high power transmission.



ZF has an unequalled, wide range of gearboxes for mining applications and large construction machines:

- **Drive gearboxes** for moving wheel-, track- or roller-driven machines with a weight of up to 800 tonnes
- **Swing gearboxes** for positioning cranes with millimetric accuracy and for a fast and reliable rotary movement on excavators
- **Winch gearboxes** for lifting heavy components from high lifting heights and a safe distance exactly to the intended spot

- **Pump distribution** gearboxes for large hydraulic excavators which drive many different hydraulic pumps simultaneously.

ZF planetary gearboxes for mining applications are characterised by their compact and space-saving design and are extremely resilient and robust. We know what is really needed to get the optimum performance from your machines.



Gearboxes for offshore and marine applications

Oil platforms are continuously exposed to wind and weather. High waves batter their legs. The positioning of the platforms requires power and precision and therefore reliable and safe gearboxes are vital. The requirements on ZF gearboxes for usage on work boats are similarly high.

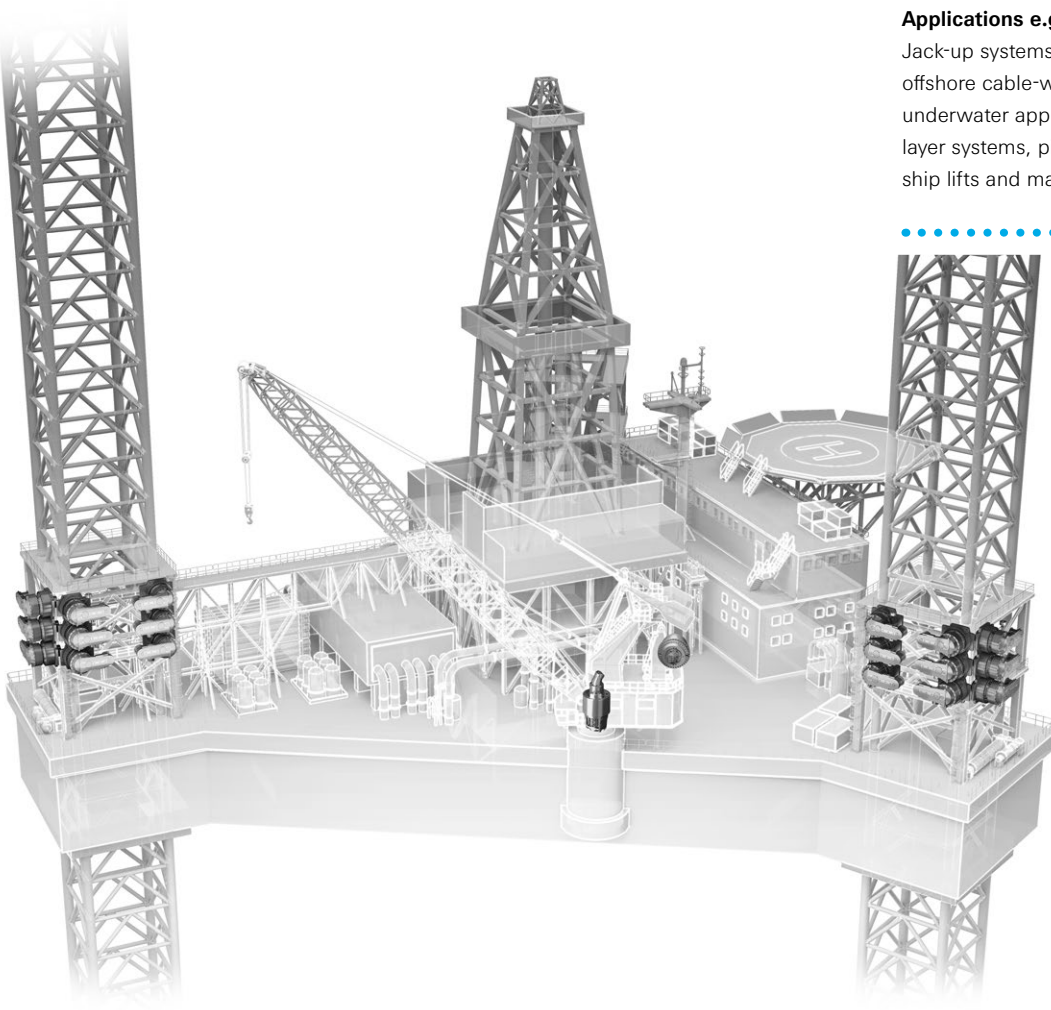


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Applications e.g.:

Jack-up systems, ship & offshore cranes, offshore cable-winches for deck machinery, underwater applications, mud pumps, cable layer systems, pipe-handling equipment, ship lifts and many more

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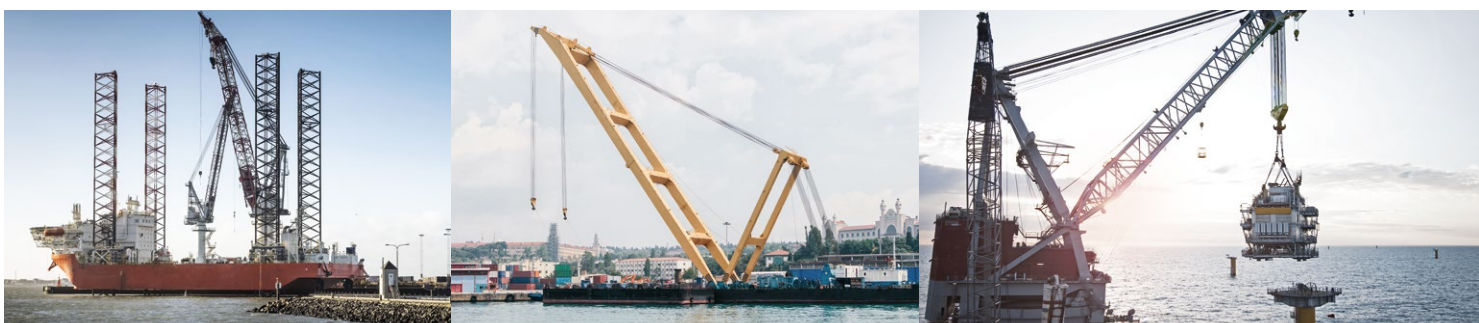
ZF industrial, swing and winch gearboxes for offshore and marine applications are specially designed for usage in the most challenging environments and are suitable for numerous installation situations.



ZF offers a wide range of gearboxes versions for the offshore and marine sector which are tailor-made for each application:

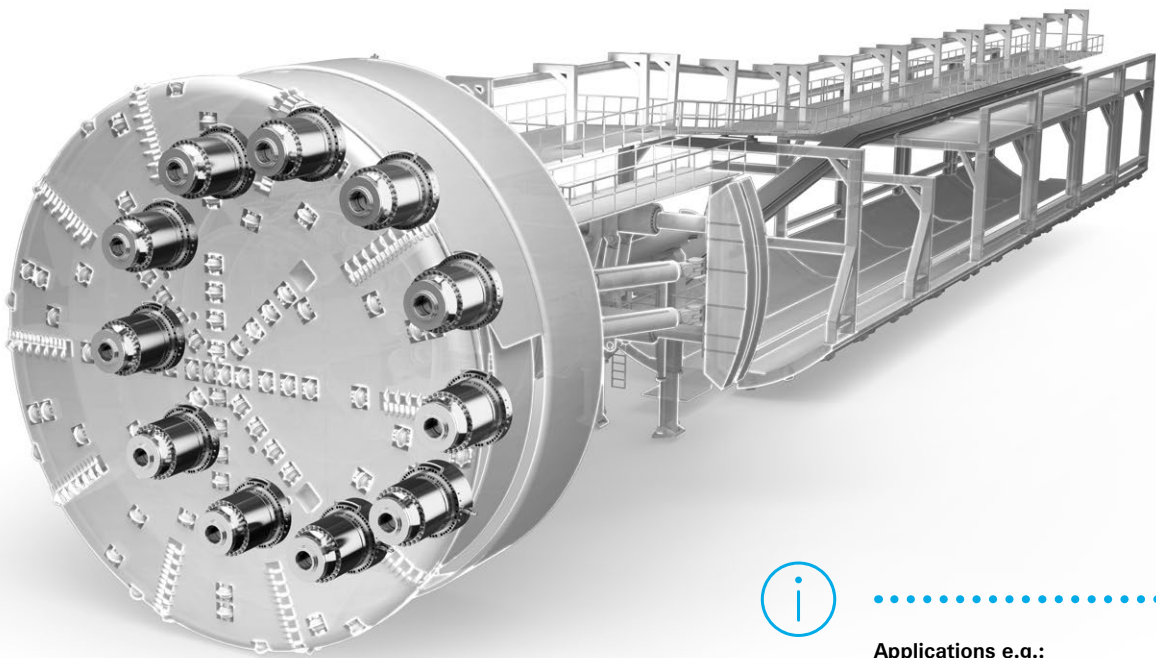
- **Industrial gearboxes** for jack-up systems move and fix oil-drilling platforms and supply boats to the required height above the waves.
- **Swing gearboxes** to position on-board cranes with millimetric accuracy
- **Winch gearboxes** for lifting heavy components exactly to the planned location at sea

ZF gearboxes for offshore and marine applications fulfil the special requirements which are necessary for use in this particular environment. For example, special seals are used or coatings are applied which provide improved protection against corrosion, so that the gearboxes can also be used underwater. All ZF gearboxes for offshore and marine applications are certified by classification companies such as ABS or DNV GL.



Gearboxes for industrial machinery and equipment

Tunnel boring machines of up to 19 metres diameter and 32 tonnes applied pressure per cutting roller are only one example of many applications in the industrial field where ZF transmissions are employed. Here enormous forces are involved which signify huge challenges for personnel and machines. The reliability and robustness of ZF gearboxes are a major advantage.



Applications e.g.:

Tunnel boring machines, apron feeders, sugar mills, cable conveyors, cement crushers, bulk millers, machines in the recycling & waste industries, hydraulic steelwork, tidal power plants, wave power generators, shredders, seed presses, continuous casters, roller mills, flood barriers, fairground rides, forge manipulators, rubber and plastic machines and many more



ZF industrial gearboxes are available in numerous versions:

- Hydraulic or electrical drive
- Power output through a hollow shaft, keyed shaft or splined shaft
- Two or more planetary stages
- Horizontal and vertical installation position
- Foot-mounted, or flange-mount housing, or shaft-mounted version with torque-arm support
- Coaxial, offset or right-angled drive shaft arrangement

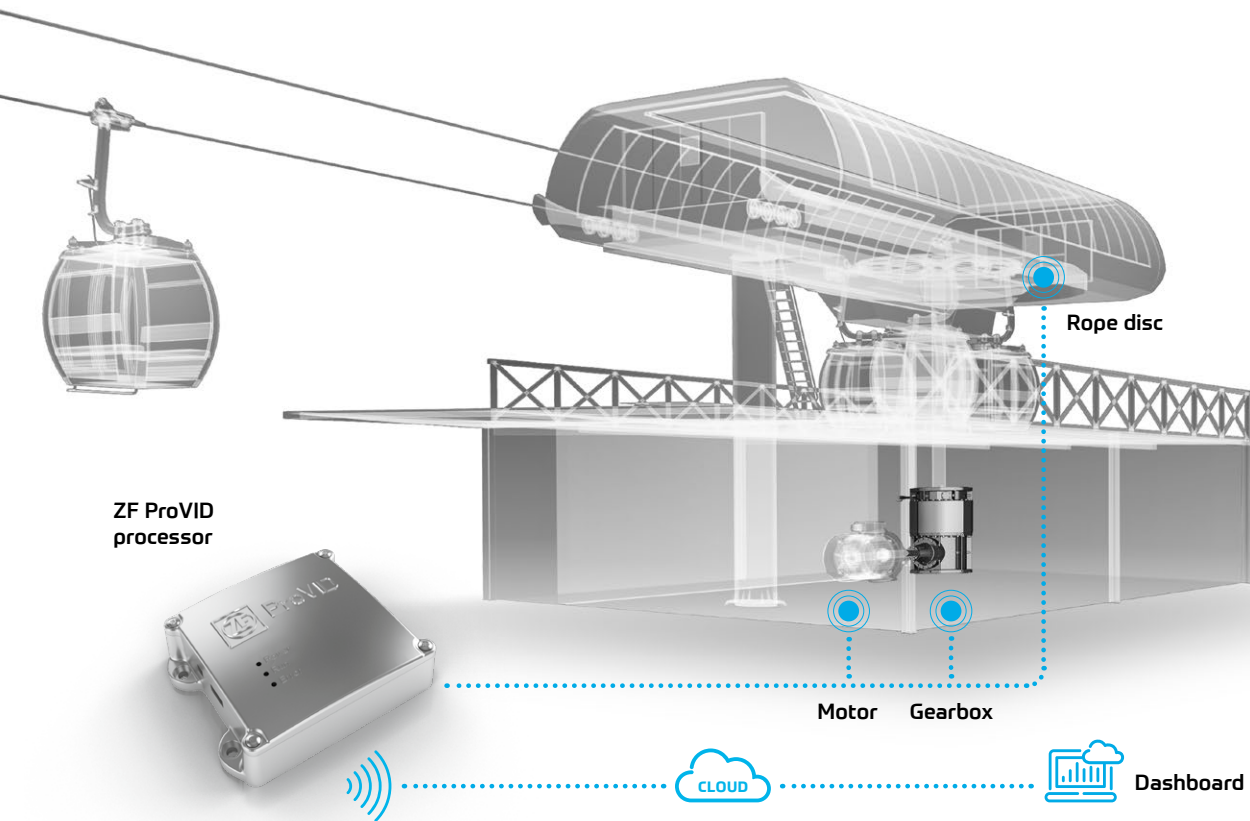
The use of high-quality materials and the precise processing of the gearwheels ensures an extremely quiet and reliable operation of the gearboxes. The output pinion is ground after hardening with tooth corrections in order to achieve maximum results.

Thanks to a flexible modular design ZF industrial gearboxes offer a wide product range of tailor-made gearboxes for specific applications.



Gearboxes for ropeways

Peak season for gondola lifts. Skiers do not want to wait long, but want to reach their destination quickly, comfortably and safely. The ropeway operator also knows their expectations and expects high performance and availability from his ropeway drive throughout the whole season. The low-maintenance ZF gearboxes offer maximum reliability.



ZF ProVID processor

Rope disc

Motor Gearbox

Dashboard

Performance Management System ZF ProVID

ZF ProVID® is the innovative performance management system for the entire driveline. Based on many years of application experience and expertise in the field of vibration measurement and analysis, ZF develops customer-specific algorithms as the prerequisite for a qualified evaluation of operating conditions.

Applications e.g.:

Chair lifts, detachable gondola lifts, funicular railways, cable-guided transport and shuttle systems and many more



The modular system of ZF industrial gearboxes also opens up plenty of options for ropeway systems. Consequently, almost all application scenarios are served constructively and efficiently:

- Designed for all installation positions
- Various sizes based on one standard product range
- Operation with or without oil cooling

ZF gearboxes for ropeways are extremely compact, quiet and combine high power density with low weight. They support the operator in fulfilling today's requirements on ropeway systems: Comfort, safety and efficiency. Approximately thirty years of experience and expertise are put into the special ZF gearboxes for ropeway systems. Our global service network ensures trouble-free operation and safe transport.



33

own service
companies

650

service partners
worldwide

Excellent service worldwide

ZF offers a professional service network in almost every region of the world. For the customer this means short distances, fast reaction times and the right experts on short notice.

Complete customer satisfaction is one of the top objectives which ZF wants to achieve with its products and services. This demand determines the quality of all the services linked to our products, starting with development and consultancy through after-sales service.

ZF supports you as a reliable partner over the whole life cycle of your vehicles, machines and equipment and beyond. The core activities in the service of large gear-boxes are co-ordinated and carried out by the Witten location – including the whole spectrum of after-sales services from consultancy to training sessions, from product selection to commissioning, from quality optimisation to documentation.

Furthermore, with the division ZF Aftermarket the group has established a global service organisation which ensures that ZF products operate reliably over the whole life cycle. 33 ZF service companies and over 650 service partners in all the important markets ensure customer proximity and global deployment, combined with regional approaches which take into account the specific requirements of individual markets and applications.

○ = ZF locations

● = Locations Division Industrial Technology

📍 = Witten, headquarters and production location Business Unit Industrial Drives

LOCATION WITTEN

ZF Industrieantriebe Witten GmbH

Employees	900
Area sqm	94,000

Products

Gearboxes for mining applications, large construction machines, offshore and marine applications, industrial machinery and equipment, and ropeways



Important services



Gearbox inspection and early damage detection

Predictive maintenance of the gearbox increases the availability of your machine or plant and improves the efficiency in operation. Our qualified service technicians possess extensive experience in detecting damage at an early stage with the assistance of proven inspection programmes and modern measuring- and testing equipment.



Repair

Our thorough knowledge of gearbox designs ensures a flawless and cost-optimised repair. Overhaul and new production of single parts as well as regrinding of gear teeth are carried out by us according to the original drawings. Prior to shipment, repaired gearboxes are tested according to strictest quality standards on our test benches and all results are recorded in a test protocol.



Spare parts

This service is characterized by speed, competence and worldwide efficient logistics. We supply original manufacturers' spare parts – even after the end of series production – as well as spare part kits and conversion kits for existing equipment.



Documentation and support

Technical information and documentation sustainably ensure that all service activities are carried out with utmost care and competence. Spare-parts catalogues, operating instructions, repair manuals and diagnostic documentation are available.



Field Service

Our qualified and experienced service technicians provide fast support on the spot worldwide, ranging from visual inspection and endoscopy through to structure-borne sound measurement, repair and oil analysis.



Performance Management ProVID

In conjunction with variable sensors, a large number of relevant operating data can be generated. ZF-specific algorithms are used to evaluate the condition of the system and to define measures.

Research and development to secure mobility

Innovations are not an end in themselves, they must pay off: For manufacturers, fleet owners, and drivers, but also for the environment and society. Each new development must prove itself among the conflicting priorities of these criteria.

The ZF Group draws upon an international network of development centers. Each year, ZF invests approximately five percent of its sales in R&D. With success, because innovative products from ZF set the standards for state-of-the-art technology – again and again.

Development work at ZF is organized according to decentralized and corporate functions. The divisions and business units focus on markets and product expertise, ensuring customer-centered, competitive technological product development. Corporate R&D works with a strong emphasis on basic research and theory, and supports the operational development departments in the divisions.

Groundbreaking innovations

Over the past years, this partnership has produced product innovations that have since become benchmarks in the industry: Just some examples are the 8-speed automatic transmission for cars as well as hybrid transmissions and hybrid management for cars and commercial vehicles, or the modular TraXon transmission system for commercial vehicles. Groundbreaking innovations from ZF are in use today not just in passenger cars and commercial vehicles on the road, but also in all kinds of craft on the water and in the air.

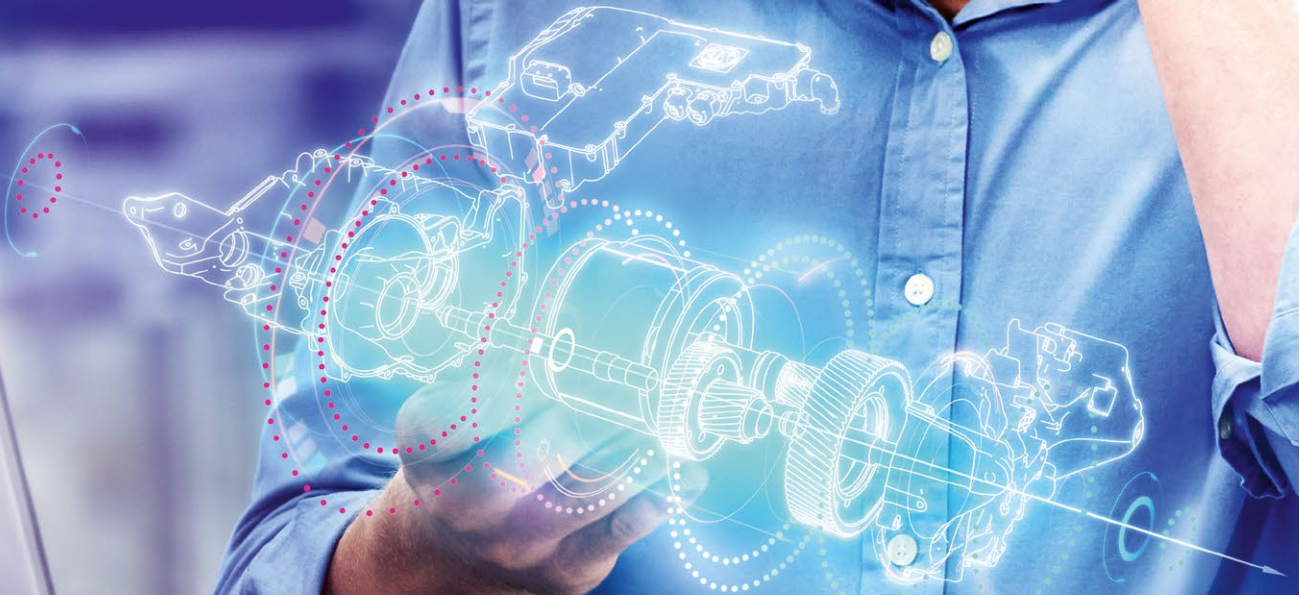
What's more, the innovative power of ZF is set to increase in the future. Proof of this is already provided by the number of patents pending: A look at the statistics of the German Patent and Trademark Register shows that ZF is among the top ten applicants for patents – at eye level with many large automotive manufacturers. Each year, the research departments successfully complete more than 10,000 projects, covering the full range from basic research to product applications. This high project volume is necessary to ensure mobility in the future. The trend toward hybrid solutions already shows that green drive technology is very complex. The same goes for pure electric drives and lightweight design engineering. Currently, ZF engineers are conducting pioneering work on alternative materials, broader approaches in design and testing, and new production processes.

Development location Witten

As the headquarters of the Industrial Drives Business Unit, Witten is also the development location for ZF large gearboxes. Decades of competence and the unique expertise in the development, dynamic simulation and testing of large transmissions as well as the strengths of the customised engineering are backed up by the integration into the global ZF development network.

2.2

R&D spendings 2017
in billion €



The ZF Group

Shaping the future responsibly

ZF Friedrichshafen is a global leader in driveline, chassis and safety technology and its broad portfolio of products and services is advancing mobility in the automobile, truck and industrial technology sectors. Specializing in highly efficient driveline technologies, ZF has expanded into urban mobility solutions which help protect all road users. With its intelligent mechanical systems that combine innovative automotive components and advanced digital technology, ZF is allowing vehicles to see, think and act.

The company is playing a major role in implementing key technologies that are shaping the megatrends of efficiency, safety and autonomous driving in the global automotive industry. Its engineers are currently working on the next generation of advanced safety systems to help enable autonomous driving for both cars and trucks.

ZF focuses on highly efficient driveline solutions with products for E-Mobility and develops solutions for urban mobility and assistance for vulnerable road users. We work on autonomous and remote driving technology for trucks to make the transportation of goods more efficient and safe.

ZF has a global workforce of around 146,000 employees with approximately 230 locations in some 40 countries. In 2017, ZF achieved sales of €36.4 billion. The company supports sustainable business practices and believes in the importance of corporate social responsibility. It annually invests about six percent of its sales in research & development – ensuring continued success through the design and engineering of innovative technologies. ZF is one of the largest automotive suppliers worldwide.

Share **Responsibility** Globally
Improve **Efficiency** Permanently
Leverage **Opportunities** Jointly
Demonstrate **Reliability** Daily



Get a new or better view of ZF – a technology-based company.

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