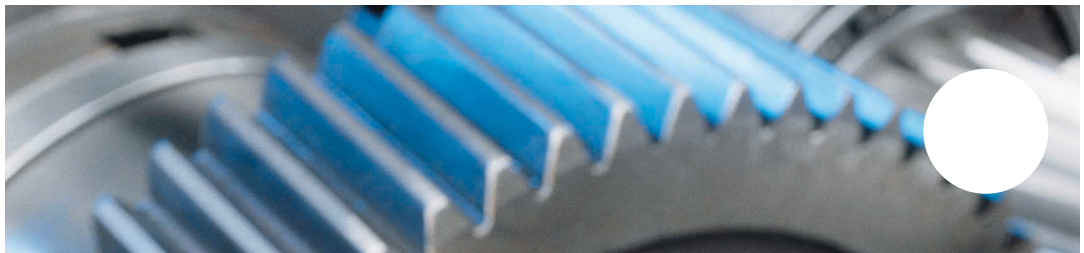


GEARBOXES NEED ROLLING BEARINGS



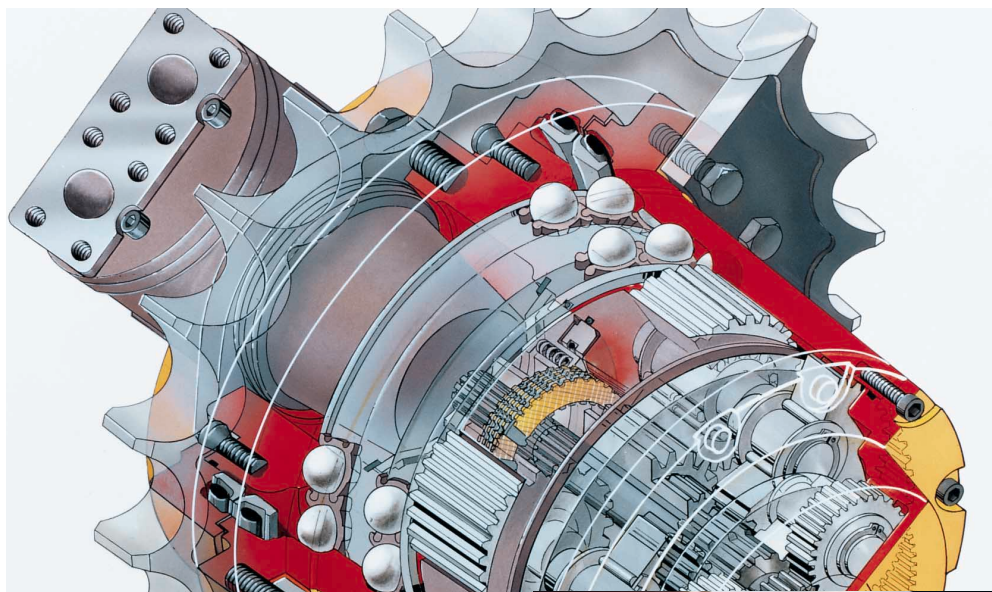
JUST A MOMENT!

FAG OEM und Handel AG

FAG Rolling Bearings are the Ideal Choice ...



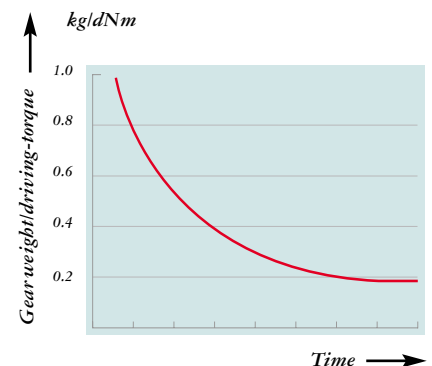
Innovation continuously increases the standard of technically based products. Product life cycles are getting markedly shorter, and technological leaps are getting greater – a development which is also taking place in the gear construction sector. An increasing precision of calculation methods, constantly increasing computing power and improved technological know-how – e.g. in the fields of materials technology, strength and tribology – have utilised reserve capacities: The gear-weight/driving-torque ratio has been reduced by 80% over the last 20 years.



Rolling bearings have contributed considerably to these developments. Through targeted research and development, constant increases in quality and an intensive exchange of experience with gear manufacturers and users, we have increased our bearings' functionality and operational reliability and at the same time minimized power losses. Gearboxes that are fitted with high-quality rolling bearings have become generally more efficient and more reliable, and as a result more competitive.

Sprocket gears transmit very high power in an extremely confined space – they are used in difficult ambient conditions, e.g. on building sites, in open-pit mining and in special-purpose vehicles.

Photo: Courtesy Transmittal Bonfiglioli, ForlilItaly



The gear-weight/driving-torque ratio has reduced significantly in the course of 20 years.

... for Advanced Bearings in the Gearbox Construction Sector

- **High operational reliability**
- **High load carrying capacity and small dimensions**
- **High-precision guidance**
- **Low friction**
- **Resistance to high temperatures**
- **Low wear**
- **Simple mounting**
- **Low lubricant consumption**
- **Minimum maintenance**
- **High level of availability**
- **Cost-effectiveness**



in all Industry Sectors ...

In every sector of industry gears have to meet special requirements. This of course, means that the bearings for these gears have to meet the most diverse criteria as well.

Bearings for industrial gears

- High efficiency
- Simple design
- Minimum maintenance requirements
- As many identical bearings as possible
- Harmonized service lives of all bearings

Bearings for rolling mill gears

- High operational reliability
- High load carrying capacity
- Low friction
- Exact radial and axial guidance of the shafts for exact meshing

Rolling bearings for gears – for all industrial sectors

- Mining
- Metallurgical works
- Foundries
- Drawing shops
- Rolling mills
- Chemical industry
- Oil refining
- Vehicle construction
- Shipbuilding
- Aerospace engineering
- Power generation
- Electrical industry
- Machine construction
- Structural steel and light metal engineering
- Vessel and tank construction

Bearings for marine gears

- High operational reliability
- Good sealing with outboard drives

Bearings for machine tool gears

- High precision
- High rigidity
- Excellent suitability for high speeds

Bearings for wind turbine gears

- High operational reliability
- High load carrying capacity
- Low friction
- Exact radial and axial guidance of the shafts for exact meshing

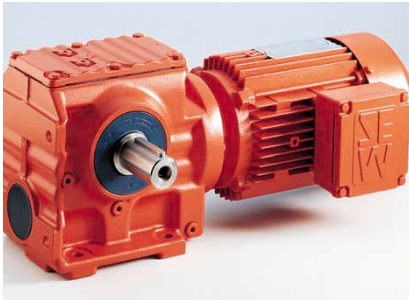
We are familiar with the various industrial sectors and their requirements – thanks both. To development partnerships formed with our customers, we know the technological trends and thanks to close contacts with universities.

We are therefore, able to always offer our customers the right bearings for their gears – plus all the services that go with them. For every industrial sector and for every purpose.



...and for all Types

No matter how large the number of industrial sectors, how varied their requirements and the types of gears used – bearing dimensions and design must always be based on the intended purpose.



*Gearmotors are compact drive units in which motor and gear form a single unit.
Photo: Courtesy SEW-EURODRIVE, Bruchsal/Germany*

The main criteria are:

- Loads
- Speed
- Required service life
- Lubrication
- Shaft arrangement
- Other conditions

These design criteria determine the type and dimensions of the bearings to be used. Designers can choose from a multitude of existing types, designs and sizes. And since rolling bearings are the ideal choice for application in nearly all types of gears all these bearings are part of the FAG standard programme.

Rolling bearings for all types of gears

- Spur gear transmissions
- Bevel gear transmissions
- Bevel spur gear transmissions
- Worm gears
- Planetary gears
- Eccentric gears
- Low-clearance and low-noise special gears
- Continuously variable mechanical gears
- Belt or chain gears
- Roller transmissions
- Intermittent and oscillating drives and linear gears
- Gearmotors



Planetary gears are characterized by a small size, low weight and small revolving masses.

Photo: Courtesy DESCH Antriebstechnik, Arnsherg/Germany

Modern industrial gears combine utmost efficiency with a low weight and compact dimensions.

Photo: Courtesy Eickhoff Maschinenfabrik, Bochum/Germany

Our Offer

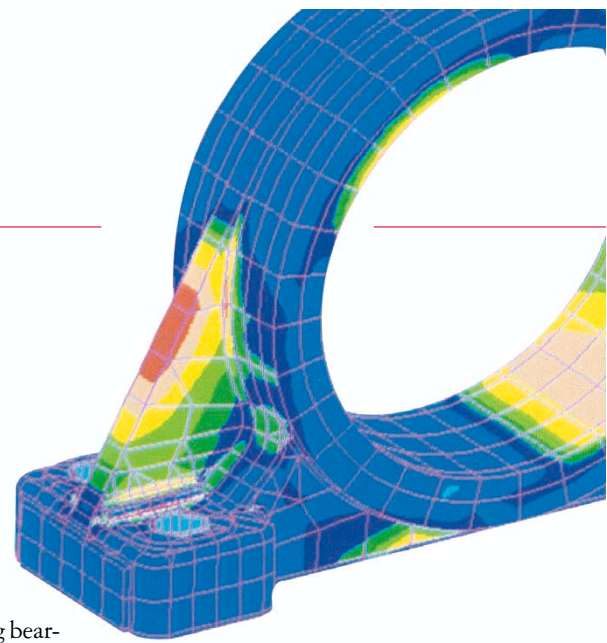
Application Engineering

Development cycles for gears are getting shorter. Cost pressure and the risk of designing unsuitable bearings are immense. To reduce design cycles and field tests it is vital to have a partner with the entire know-how of rolling bearing engineering.



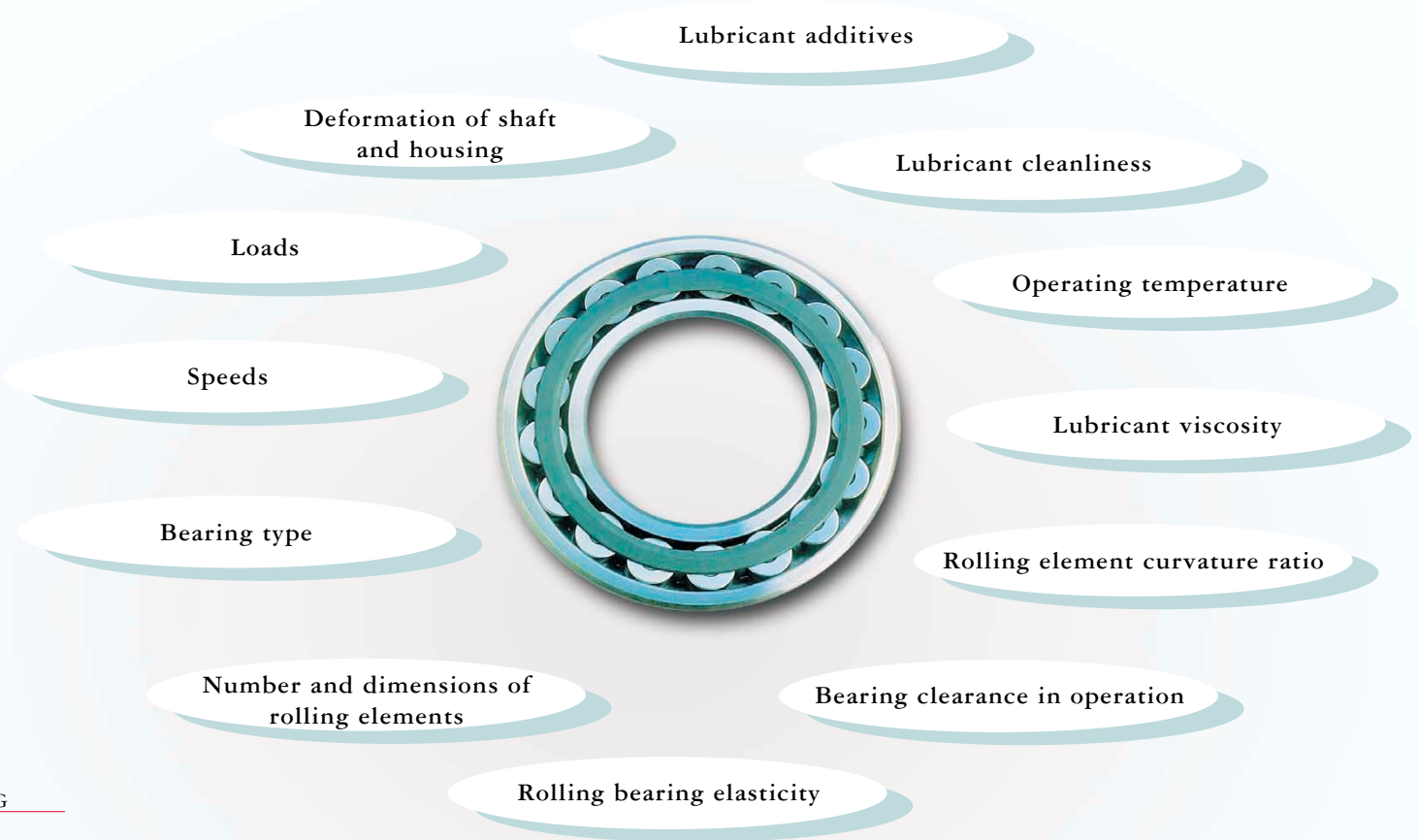
Especially in the industrial gear sector it is vital that bearing life calculations reflect practical conditions as closely as possible since opportunities to test these types of gears are very limited.

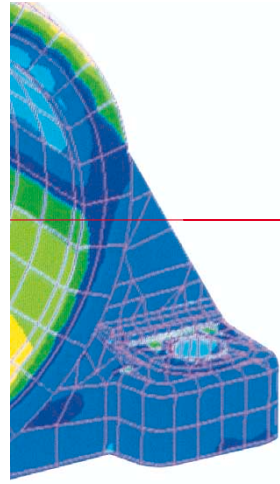
Our engineers are competent rolling bearing experts. They advise our customers on all matters regarding application and design and they offer a calculation service which is tailored to this industry's specific requirements. In addition we develop, together with our customers, individual solutions to their specific problems – solutions which increasingly are aimed not only at the bearings but include the entire gear system.



We use the latest calculation programs to design bearings and housings. The picture shows the result of an FEM calculation for a bearing housing.

When designing and calculating rolling bearings for gears our engineers ensure the proper function and reliability of the bearings by taking into account a multitude of parameters.





Delivery

Standard Types

Almost all types of ball and roller bearings are used in gearbox construction. The bearings mostly used in gearbox construction, as well as their characteristics and their suitability for the different requirements, are listed in the table below; all of them can also be found in the FAG rolling bearing catalogue and of course, on our catalogue CD.



All standard ball and roller bearings, plus housings and accessories, are listed in the printed FAG rolling bearing catalogue and on our catalogue CD.



		Radial loadability	Axial loadability	Length compensation	Length compensation within the bearing	Separability of inner and outer ring	Compensation of misalignment	Suitability for high speeds	Quiet running	Low friction	Locating bearing	Floating bearing
Deep groove ball bearings		●	●	○	●	○	●	●	●	●	●	●
Four-point bearings		●	●	○	○	○	●	●	●	●	○	○
Cylindrical roller bearings		●	●	○	●	●	●	●	●	●	●	●
Tapered roller bearings		●	●	○	●	●	●	●	●	●	●	●
Spherical roller bearings		●	●	○	○	○	●	●	●	●	●	●

Suitability

- very good
- good
- normal/possible
- limited
- not suitable

The characteristics of the rolling bearings most commonly used in gear construction determine their suitability for special requirements.

Special Designs

Standard rolling bearings meet most of the requirements encountered in gear construction so that they can be used to build efficient, reliable and cost-effective gears.

Where special designs regarding size, speed or loadability are required, our customers can select rolling bearings from our target industry programme.

In special cases we also develop special bearings jointly with our customers. And, of course, we build these bearings for them.

Quality Assurance

Throughout the entire process chain, from an innovative idea to the delivery of a new product, all steps have one thing in common: quality. This applies to research and development as well as to designing, production and calculation.

We produce all essential parts of the FAG rolling bearings ourselves, at production sites which are equipped with the latest machines and plant. We subject outsourced parts to the same rigorous quality inspections that would apply to our own products. The purpose of this consistent application of our QA system, is to ensure the high reliability and long service life of our bearings.



*Acid test:
Material inspection of a
ceramic ball for hybrid
rolling bearings at the
FAG research centre.*



Service

We at FAG do not regard service as an optional or temporary extra but as an integral part of our offer portfolio which accompanies the rolling bearings throughout their entire service life. True to our motto "Service for more reliability", we guarantee our customers that they can enlist the following services:

- Personal support and advice in all design-related problems
- Availability of all the instruments and tools they need to perform mounting, measuring, diagnosing and maintenance jobs independently.



Careful mounting is an essential precondition for a long bearing life. FAG offers a comprehensive range of mounting-related services, from actual mounting to technical mounting aids to special seminars for our customers' staff.



Rolling Bearing Services Programme

- Application Engineering
- 24-hour delivery service
- Mounting service
- Mounting aids
- Mounting seminars
- Rolling bearing seminars
- Lubrication recommendations
- Sophisticated diagnostic devices
- Condition-related maintenance
- Online-monitoring
- Comprehensive range of accessories

Special diagnostic systems allow users to perform condition-related maintenance, which is particularly cost-effective.



On-Time Delivery Worldwide

“On-time delivery“ is a decisive yardstick for evaluating the efficiency of a rolling bearing manufacturer. Our sophisticated logistics concept ensures the worldwide availability of FAG products. Our sales companies and trading partners in all the important commercial centres of the world offer a 24-hour delivery service.



**Rolling bearings for gears –
for all industrial sectors,
of all types.
Quality and Service Worldwide.
FAG.**



FAG OEM und Handel Aktiengesellschaft

Postfach 1260
D-97419 Schweinfurt
Georg-Schäfer-Straße 30
D-97421 Schweinfurt
Telephone ++49 97 21/91 -0
Telefax ++49 97 21/91 38 32
E-mail: ohb_e@fag.de
Internet: www.fag.de

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