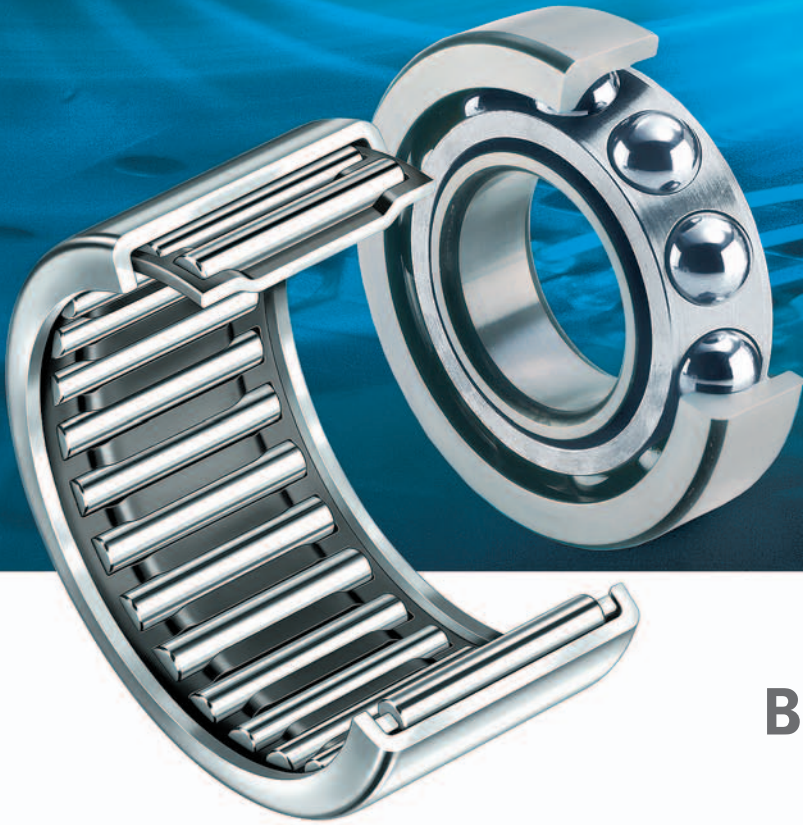


**SCHAEFFLER**



**Bearing Technology  
for Compressors,  
Fans and Centrifuges**



## Expertise through knowledge and experience

FAG Kugelfischer was the pioneer of the rolling bearing industry. In 1883, Friedrich Fischer designed a ball grinding machine. This idea is regarded as the historic beginning of the rolling bearing industry. INA's success story began in 1949 with the development of the needle roller and cage assembly by Dr. Georg Schaeffler, an ingenious idea that helped the needle roller bearing achieve an industrial breakthrough. With our two strong product brands INA and FAG, we currently have a high-performance range of rolling bearings as well as products and services

of unsurpassed quality due to the joint research and development activities of both brands.

Bearings and components for compressors, fans and centrifuges must fulfill high requirements in relation to functional reliability and cost-efficiency. Schaeffler has a team of dedicated rolling bearing experts who are responsible for meeting these requirements in the best possible manner with customer-specific developments and sophisticated standard bearings.

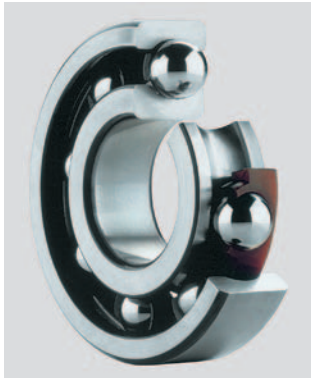
### Schaeffler – Your powerful partner

- Expert support
- Complete bearing product range
- Customized bearing systems with tighter tolerances
- Extended service life
- Higher cost-effectiveness and operational reliability with X-life
- Optimized bearing, seal and housing combinations
- Binding quality and environmental policy worldwide (ISO 9000/QS 9000, ISO/TS 16949:2002, ISO 14001)
- BEARINX® calculation program for the best possible product selection
- Good availability
- Services for all rolling bearing products and applications



Spherical roller bearing

## The product range



• Deep groove ball bearings



• Angular contact ball bearings



• Four point contact bearings



• Cylindrical roller bearings



• Tapered roller bearings



• Self-aligning ball bearings



• Needle roller bearings



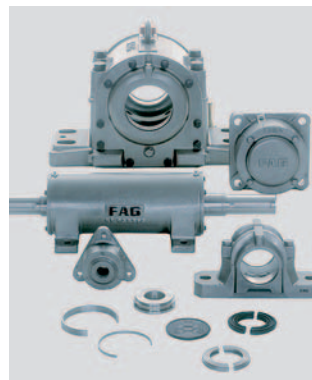
• Axial spherical roller bearings



• Inner rings



• Radial insert ball bearings



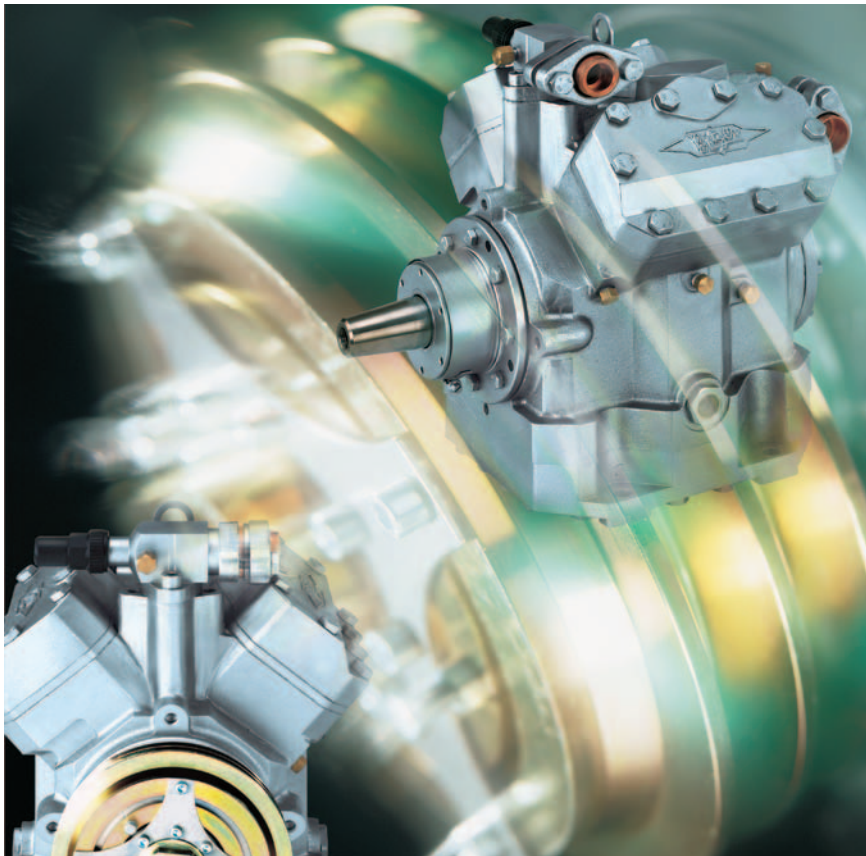
• Bearing housings



• Fine-blanked parts



## Condensing and cooling



Piston compressor for refrigeration applications (Image courtesy of Bitzer, Sindelfingen)

Compressors are used in nearly all industrial sectors: in manufacturing companies, in environmental protection, in building and air conditioning technology, on ships and in medical applications. They serve an important function, condensing and transporting air, gases or air/gas mixtures continuously and efficiently.

To increase the efficiency in rotary compressors, a very small gap is required between the rotors and the housing and a tight guide clearance is required for the rolling bearings. Condensing is often

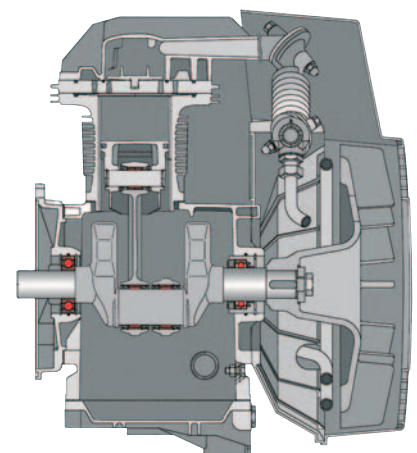
performed at very high speeds, which means the speed capacity of the bearings has to be increased. These requirements are primarily met by four point contact bearings, cylindrical roller bearings, angular contact ball bearings and needle roller bearings.

### Schaeffler develops and manufactures rolling bearings and components for

- Screw compressors
- Piston compressors
- Roots-type superchargers
- Vacuum pumps

### Benefits

- High degree of operational reliability due to durable, economical standard bearings and/or modified bearing solutions developed in cooperation with customers
- All bearing variations from one source
- Optimum design using BEARINX® calculation software
- Easy to handle and install thanks to customized bearing units with defined axial internal clearance
- Higher compressor efficiency due to precise guidance of the rotors
- Very high speeds are manageable as a result of new developments in bearing and lubrication technology
- Proven and tested bearing cages, including cages for aggressive pumped media

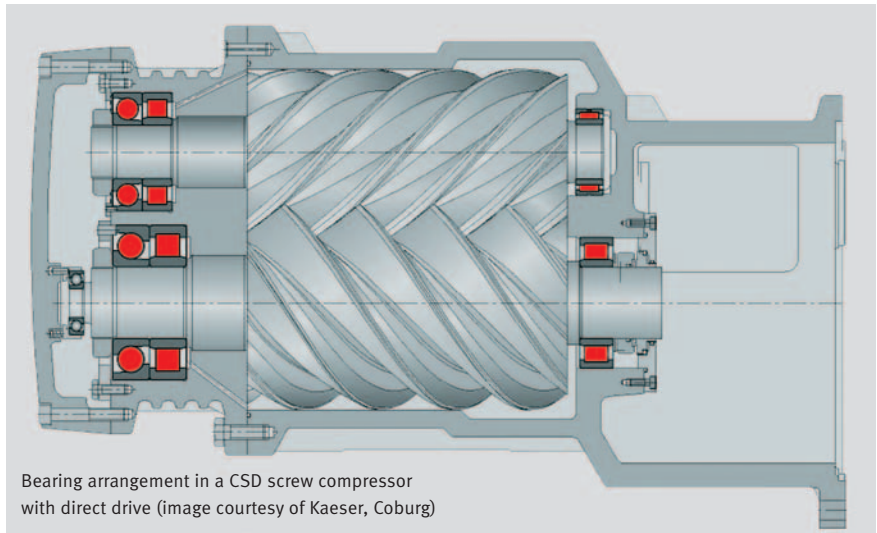


Piston compressor with deep groove ball bearings, cylindrical roller bearings and needle roller bearings

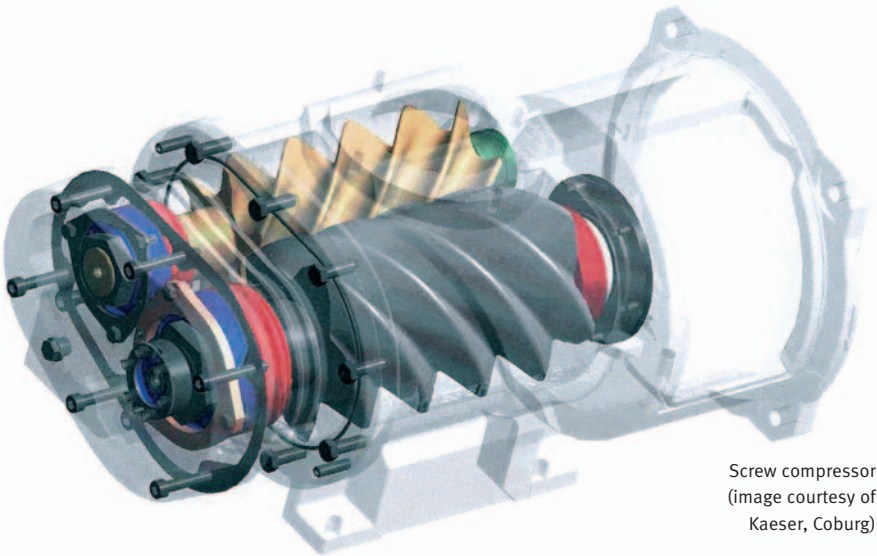
**Example: Screw compressor**

A screw compressor pumps and condenses air through two rotors running in opposite directions. The smaller the gap between the rotors and the housing, the higher the degree of efficiency. This is why bearing manufacturers are expected to dimension radial and axial clearances as small as possible. Generally, bearings must provide reliable support for the axial and radial forces resulting from the buildup of pressure.

The example of a CSD screw compressor shown here includes three FAG cylindrical roller bearings, one INA needle roller bearing, and three FAG angular contact ball bearings. The axial load occurring on one side is supported by the large angular contact ball bearing. On the main rotor, any axial counterforces generated by the coupling on start and shutdown are supported by an additional, small angular contact ball bearing. This bearing is spring preloaded to prevent slippage.



Bearing arrangement in a CSD screw compressor with direct drive (image courtesy of Kaeser, Coburg)



Screw compressor (image courtesy of Kaeser, Coburg)



Four point contact ball bearing



Inner ring with ceramic-coated seal surface



## Circulation and ventilation

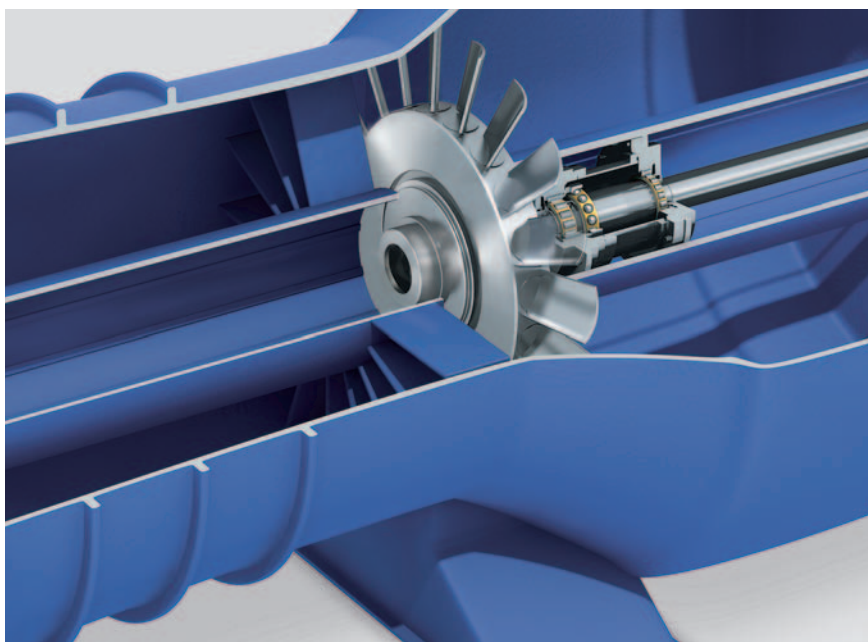
Fans, also called ventilators or blowers depending on their function, are used in nearly all sectors of industry. A distinction is made between radial and axial fans, depending on the direction of the stream of air or gas. One of their features is that they improve the climate in rooms and ventilate manufacturing halls, tunnels and mines. They accelerate combustion, extract exhaust fumes or start process engineering facilities and use gas mass flow to keep them in operation.

### Safety with the right bearing

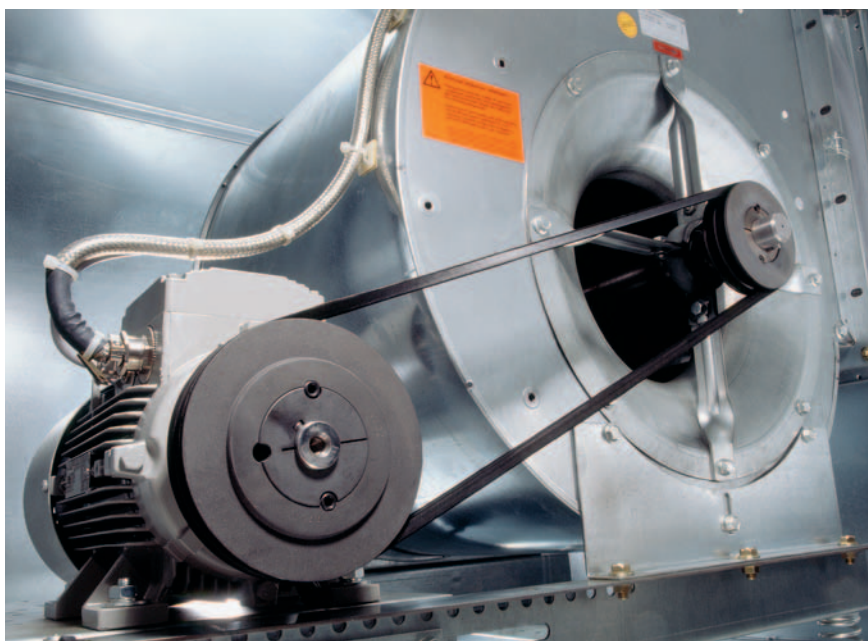
Fans require quiet rolling bearings with a long life and offering easy maintenance due to their continuous operation. Pumped media such as hot gas or coal dust must be taken into consideration in advance.

Our wide range of bearing designs and housings makes planning easier and ensures operation. Small fans with higher speeds are usually equipped with deep groove ball bearings and angular contact ball bearings as well as cylindrical roller bearings in two-bearing housings (VR, VO) or radial insert ball bearing units.

In large ventilators and blowers, proven products include spherical roller bearings and self-aligning ball bearings in plummer block housings SNV, LOE, or LOU. Operating conditions determine whether grease or oil lubrication is used.



Single-stage large axial fan with locating/non-locating bearing support



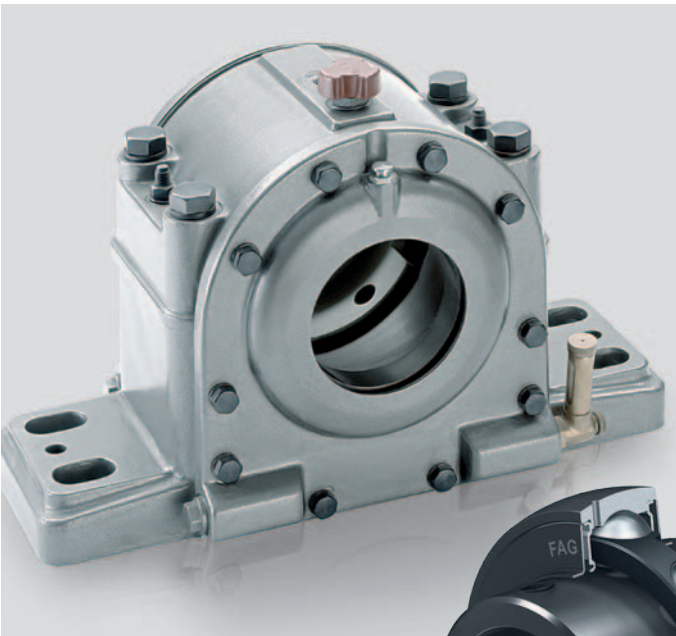
Radial fan with radial insert ball bearing housing unit



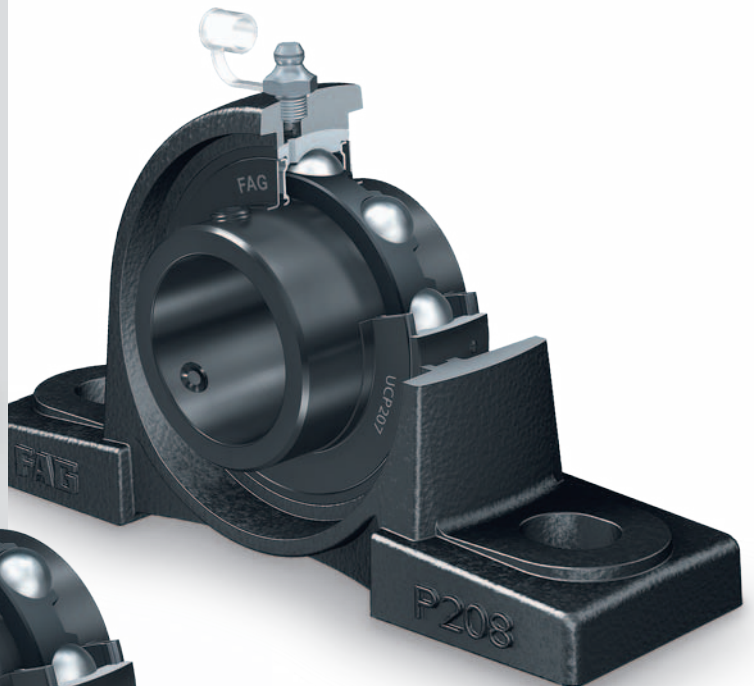
Radial fan with bearing unit VRE

### Benefits

- Efficient thanks to sophisticated standard bearings and housings that can be supplied quickly
- The best-suited bearing, seal and housing combinations for every application
- Design using BEARINX® calculation software
- Housings with optimized stability made from various cast materials, marked connections for lubrication and bearing monitoring systems



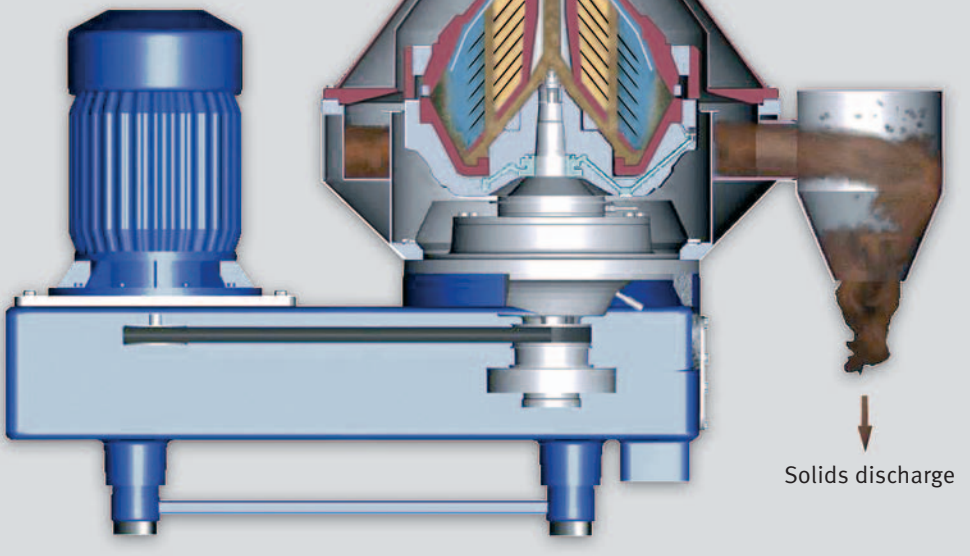
Split plummer block housings LOE for oil lubrication



Black Series radial insert ball bearing and housing unit



## Separation and clarification



Separator (image courtesy of Flottweg, Vilsbiburg)

Separators and decanters are centrifuges that can be used to separate solid materials from liquids or mixtures of liquids with simultaneous separation of solids.

Centrifugal separator and decanter technology performs key functions in many industrial sectors:

- Food, beverages
- Chemicals/pharmaceuticals
- Biotechnology
- Base material recycling
- Environmental protection

### Decisive criteria for selecting the correct rolling bearing:

- Load spectrum
- Minimum load specifications
- Type of load
- Out of balance, vibrations and oscillation
- Speed ranges
- Ambient temperature influences
- Special lubrication requirements
- Shaft deflection



Angular contact ball bearing with a sheet steel cage

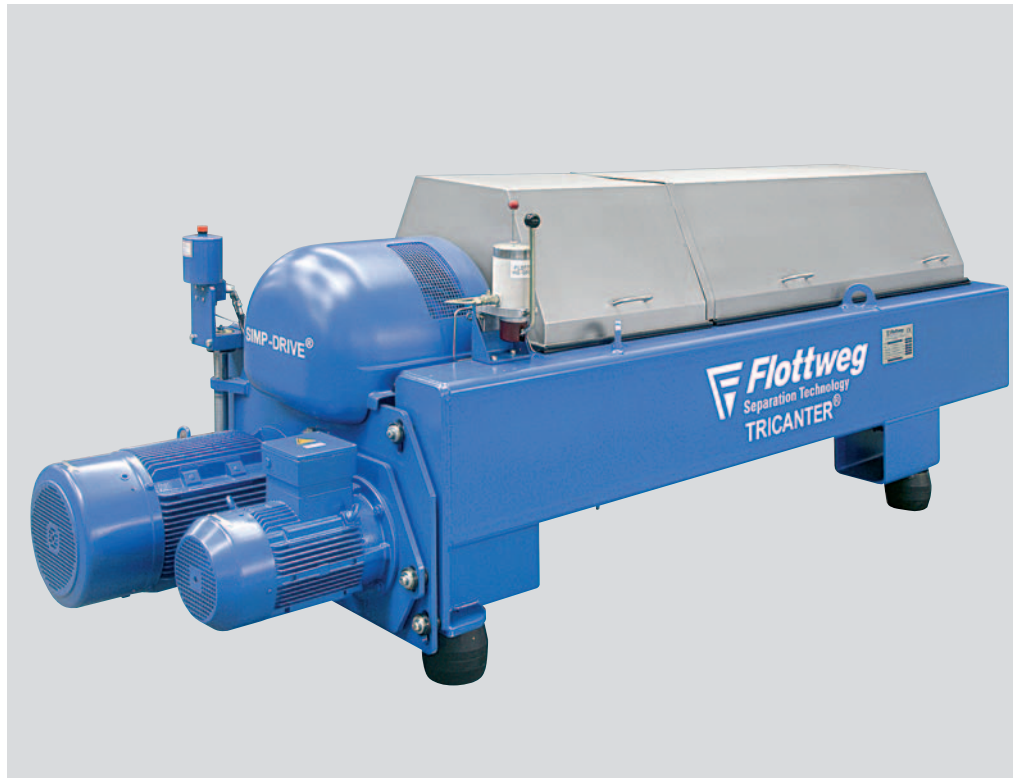


Cylindrical roller bearing with a sheet steel cage



**Benefits of INA and FAG bearings**

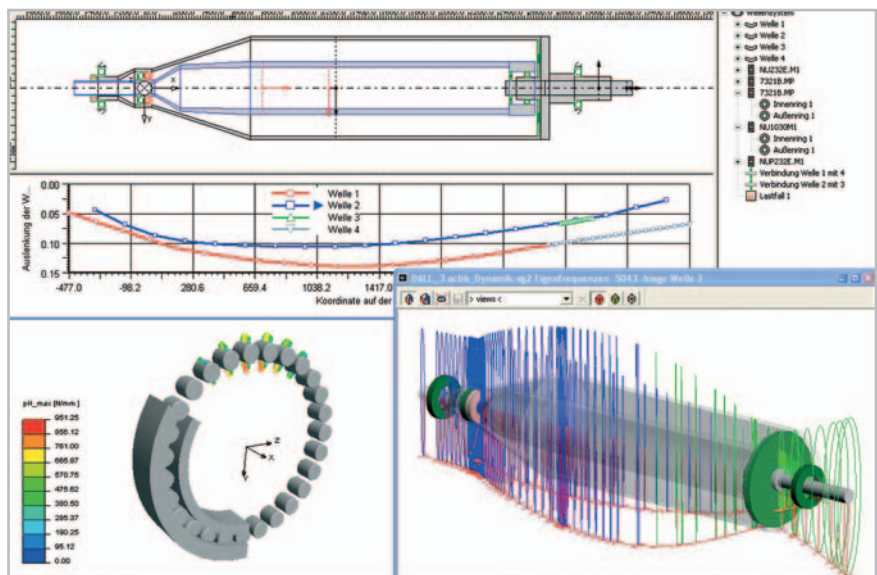
- Cost-effective standard bearings, good availability
- Extreme operating conditions are manageable thanks to optimal product selection using BEARINX® calculation software
- High degree of functional reliability, even for very high acceleration forces
- Challenging tasks are solved in cooperation with our customers



TRICANTER® (image courtesy of Flottweg, Vilsbiburg)

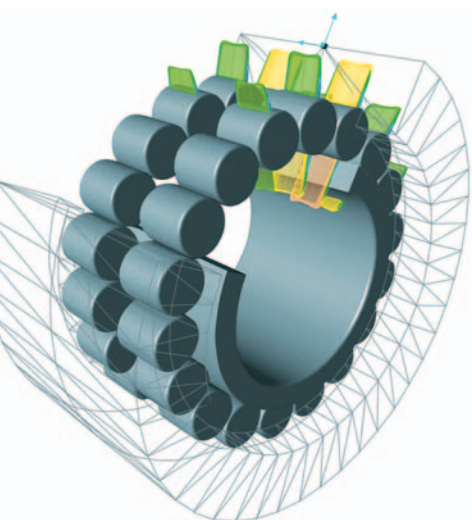
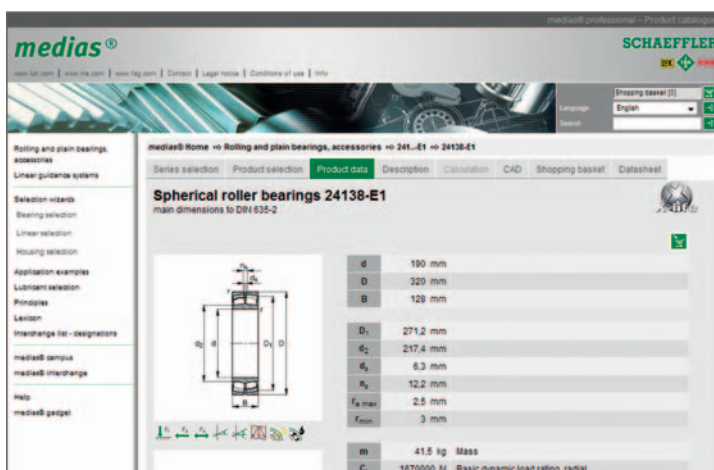
**Reliable calculation with BEARINX®**

BEARINX® can be used to perform detailed analyses on rolling bearings including individual rolling contacts in order to calculate their suitability for each application. Rolling bearing loads in complex machine systems can be calculated, displayed and documented while taking a large number of ambient conditions into account. The same applies for natural frequencies, natural vibration forms, critical speeds and out-of-balance responses for shaft systems.



Decanter calculation model

## Comprehensive service – with in-depth understanding of your sector



### Expert technical consultation

Schaeffler offers technical consultation for all aspects of the lifecycle of rolling and plain bearings as well as all customer-specific components. Our experts possess an outstanding knowledge of compressors, fans, and centrifuges and provide expert advice with bearing design and product selection. This means you receive the best technical and most cost-effective product for every application.

### medias® – much more than just a catalog

Our electronic support and selection system *medias® professional* provides information on more than 40,000 standard products for approximately 60 industrial sectors. For all bearings, *medias® professional* lets you calculate the modified rating life to DIN/ISO 281. You will find the *medias®* product catalog on the internet at:

<http://medias.schaeffler.com>

### X-life. More cost-effectiveness. Higher operational reliability.

X-life stands for premium products made by INA and FAG. The surfaces have been significantly improved by advanced manufacturing methods so that under identical loads there is a reduction in the stress conditions present on the rolling elements and raceway.

### This has several benefits:

- Reduced friction and lower bearing temperatures
- Reduced strain on the lubricant
- A higher basic dynamic load rating
- An increased basic rating life

Therefore, the operating life of X-life bearings is considerably longer under the

same operating conditions. Alternatively, higher loads can now be applied while maintaining the same rating life values.

X-life bearings enable downsizing and the improved price/performance ratio also ultimately increases the overall cost-effectiveness of the bearing support.





**Our range of services – your market success**

Our global network of manufacturing and service locations and consistent application of the total cost of ownership (TCO) principle are milestones on the path to joint business success. As part of its industrial services, Schaeffler offers high-quality products, services and training in the areas mounting, lubrication, condition monitoring and reconditioning of rolling bearings. An example:

**Monitoring ensures safety**

The FAG SmartCheck – intelligent machine monitoring in a new dimension: Easy to handle and operate without expert knowledge. With its new technologies and forward-looking functions, this innovative sensor makes a valuable contribution to

optimizing processes and increases the safety of your machines and systems. In combination with Schaeffler’s unique full service for all aspects of machine diagnostics and rolling bearings, our compact monitor is an important milestone in TCO.

FAG SmartCheck:

The advantages at a glance

- Reliable machine and process monitoring
- Optimization of processes by bundling information
- Reporting provided as a customer service
- Patented, innovative alarm function
- Access concept for data security
- Several years of history data can be stored
- Easy to mount and integrate in your machine control system

You will find further information and publications available for download and to order on the Internet at: [www.schaeffler.de/Pneumatics](http://www.schaeffler.de/Pneumatics)





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