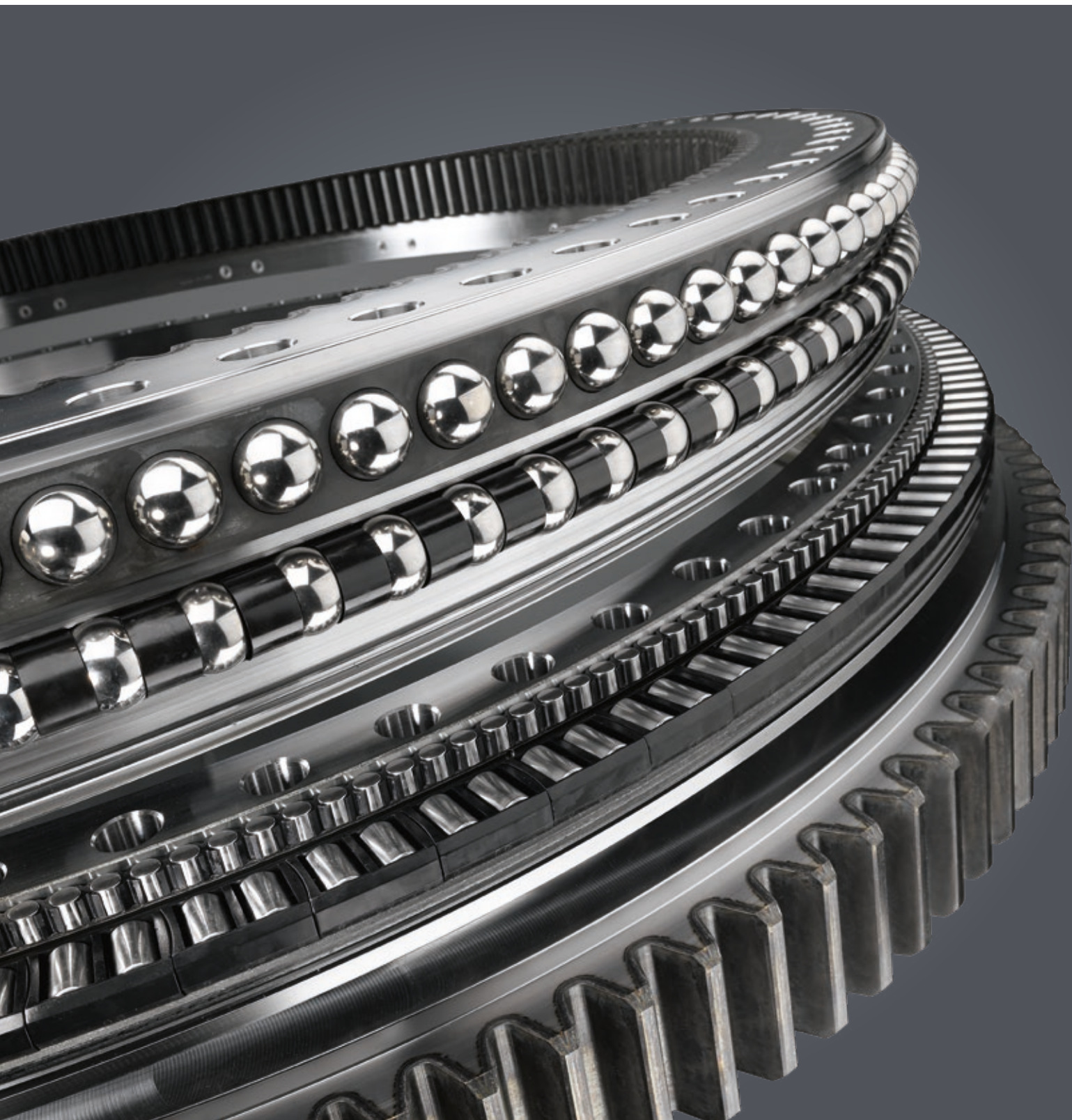


Application-optimised, reliable and robust

Slewing Bearings by Liebherr



LIEBHERR

Slewing Bearings by Liebherr





The Liebherr Group is one of the leading global manufacturers of slewing bearings and has more than 60 years experience in the development, design and manufacture of ball and roller bearing slewing rings.

More than 350,000 large diameter bearings have been produced for use worldwide. The bearings are produced in the factories at Biberach an der Riss, Germany, in Monterrey, Mexico and in Guaratinguetá, Brazil, in various dimensions and versions in accordance with customer specifications.

Advantages

Liebherr manufactures slewing bearings for a wide range of applications, in all weight and diameter classes. Aside from the breadth of the product spectrum, customers value the application-specific engineering and the outstan-

ding quality of large diameter bearings by Liebherr in particular. The slewing bearings prove themselves day in, day out in diverse areas of application and under the toughest of environmental conditions.

Engineering partners for slewing bearings

Competent design and calculation reduces project costs

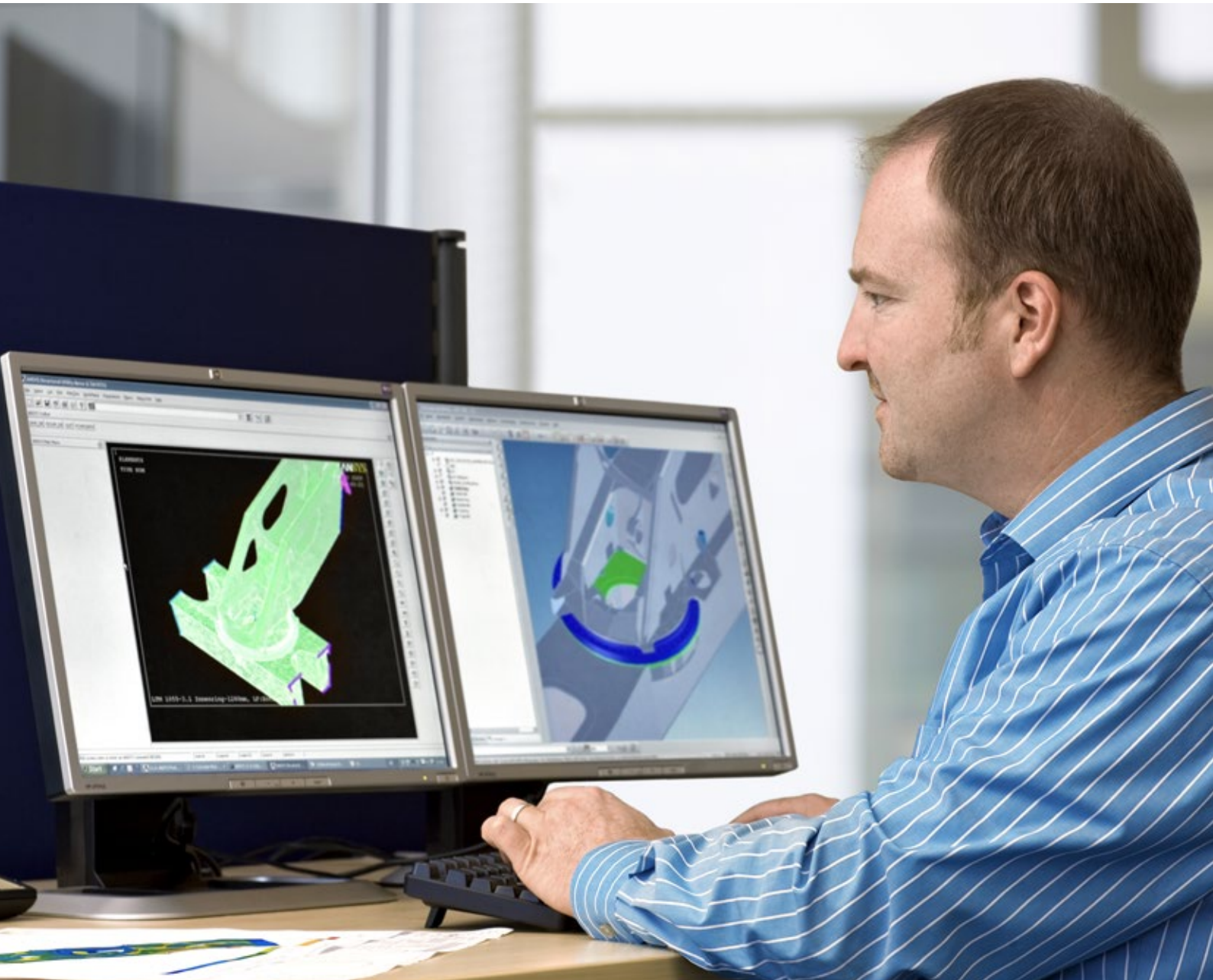
Sophisticated quality management

Complete quality control for high reliability and longevity

Large diameter range

Your comfort and our flexibility thanks to a broad application spectrum

Engineering partners for slewing bearings



Over 15,000 large diameter bearings leave our factories every year. Moreover, the Group has 60 years of experience in the design of slewing bearings. As a competent partner in engineering and production, we are therefore on hand to assist our customers worldwide. Our standard range from our own calculation models to state-of-the-art quality management.

Competent design and calculation reduces project costs

All influencing variables at a glance

The optimal design and calculation of the components is decisive for the reliability and longevity of Liebherr slewing bearings. Every single bearing is therefore comprehensively checked and evaluated for specific requirements in the development and prototype stage.

Modern processes and methods

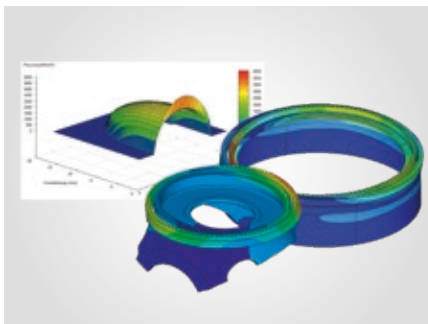
The latest construction processes, simulation methods, as well as quality management tools, are used in the design and calculation of Liebherr large diameter bearings. Our own calculation models round off the spectrum of methods. Application-specific criteria are always the focus in making the design a reality. Our customers benefit from our complex application expertise.

High level of vertical integration and professional know-how

Liebherr impresses with a high level of vertical integration when it comes to quality-related process steps. This ranges from the machining and inductive hardening of the bearing raceways to the gearing of slewing bearings through to the surface coating in-house. Professional know-how and our modern machine fleet characterise the entire manufacturing process.

Calculations according to the Finite Element Method

At the customer's request, the calculations can also include adjacent structures. Individual calculations can also be carried out.



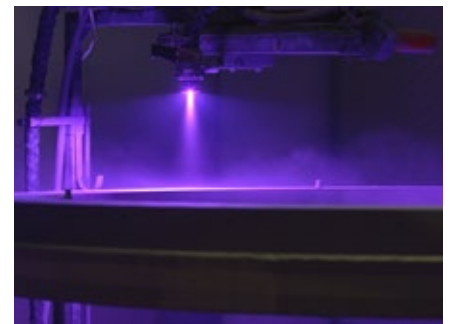
Specially developed test bench

Among other things, deformations calculated by means of FEM are verified here, and friction and breakaway torque are examined.



Reliable corrosion protection

To protect against environmental and climate influences, the slewing bearings are galvanised at the customer's request.



Sophisticated quality management



Liebherr bearings are characterised by their high quality and reliability. To assure and further enhance our high standards, all of the company processes at Liebherr are orientated around quality. This begins with selection of the raw materials and suppliers and continues through to the after-sales service.

Complete quality control for high reliability and longevity

Regular audits and internal company standards

Each individual component of the slewing bearing is subject to strict quality requirements. This is why Liebherr only works with selected suppliers who are audited on a regular basis. Internal company standards apply to certain raw materials, for e.g. rolled steel rings. These standards contain requirements, which go beyond the common industry standards.

Ultramodern measurement methods

Liebherr not only makes regular use of traditional computer-aided measurement methods. The Liebherr Group also possesses numerous highly specialised measuring devices. In recent years, for example, the company has invested in a state-of-the-art crack detection system using high frequency magnetisation and a fully climate-controlled large diameter bearing measuring chamber. 3D measurements of large diameter bearings with a diameter up to 6,000 mm can be effected. This type of measurement is unique worldwide.

Long service life

The service life of a slewing bearing is largely determined by the execution of the tempering process. With state-of-the-art system technology and in-house-developed inductors, Liebherr consistently achieves a high level of quality even for bearings with very large diameters. The degrees of hardness and the depths of hardness are subject to continuous quality testing.

Many years of collaboration with certification and inspection authorities

Certification and classification by internationally recognised approval authorities serve as an external benchmark of quality for Liebherr. Classifications and certifications of components and complete systems are common in the area of maritime applications and in the wind industry. If certain products are prescribed for this purpose, we assure on request that the necessary documents are provided.

Examination of hardness and hardness depth

- By means of 100 % measurements
- In-house-developed inductors



Innovative testing methods

- 3D measurement
- High-frequency magnetisation



Classification companies

- Bureau Veritas
- Lloyd's Register of Shipping
- Det Norske Veritas
- and others



Large diameter range



Liebherr manufactures slewing bearings for a wide range of applications, in all weight and diameter classes. We supply all common as well as special gear modules – with external or internal gear or without teeth.

Your comfort and our flexibility thanks to a broad application spectrum

Large range of dimensions

State-of-the-art production facilities provide for efficient manufacture of all design sizes, both in small and large batch production. Slewing bearings by Liebherr are available in a diameter range from 800 to 7,500 mm. Larger sizes possible in a segmented design. The internal and external gear teeth of the bearings, which weigh up to 25 t, can be designed with a gear module of up to 50. Other gear versions are available on request. Balls, cylinder rollers or tapered rollers are used as rolling elements.

All large diameter bearings are carried out with induction hardened, finely machined raceways and, depending on the application, also with induction hardened gear teeth. They have a sealed raceway system with grease lubrication.

The most varied of designs

The current product range includes ball bearing slewing rings, which can be designed as single-row or double-row, triple-row roller bearing slewing rings as well as combined ball and roller bearing slewing rings with or without internal or external gear teeth. Besides standard designs, a large variety of special customer and application-based models have already been made. In addition to anti-friction bearings, geared rings and ring segments as well as high-precision worm gears for machine tools, made from composite materials, are also available.

Diverse slewing bearings

The diameter range is between 800–7,500 mm (segmented above this).



Ball and roller bearing slewing rings

The dimension of the rolling elements is based on the bearing loads.

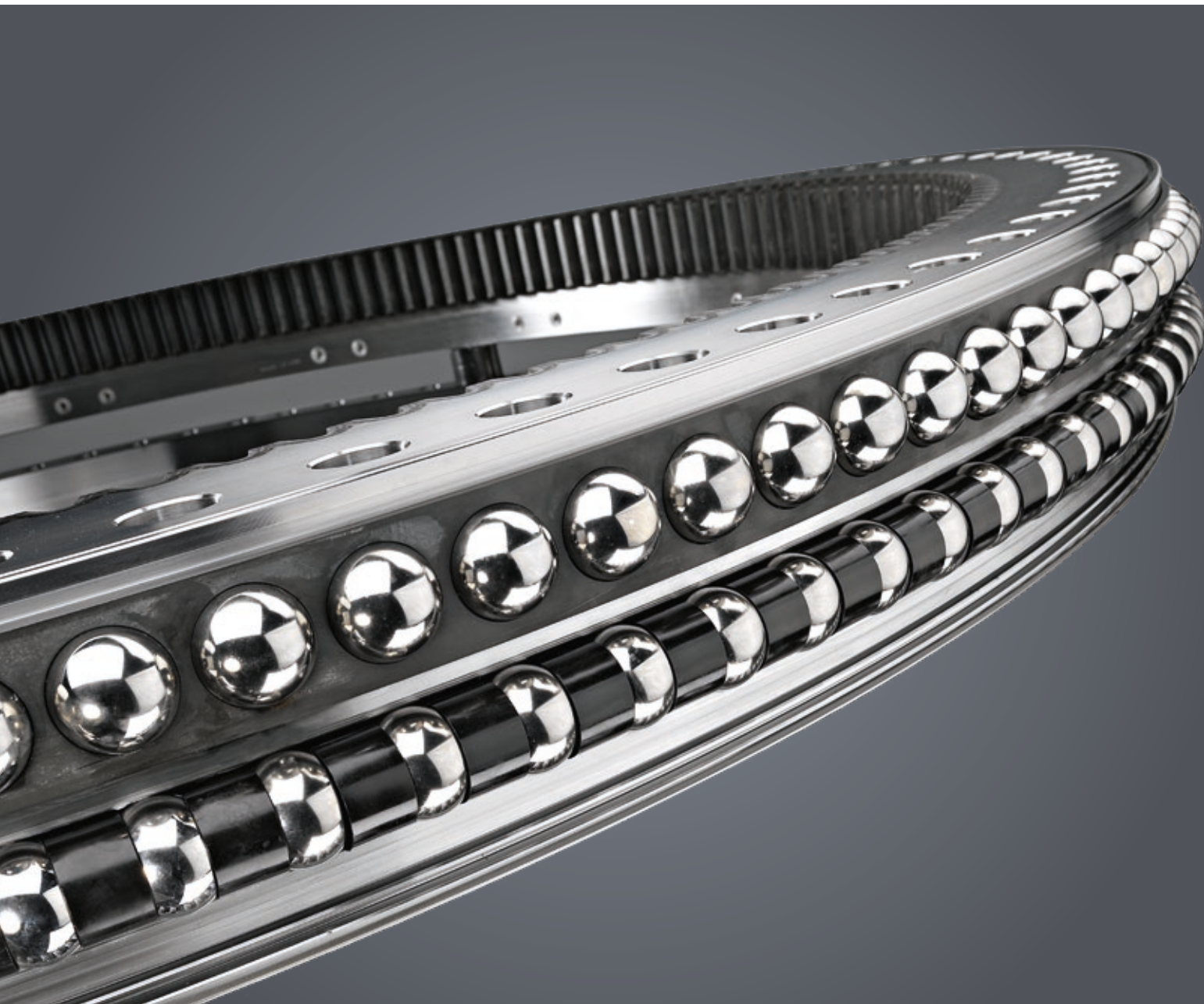


State-of-the-art production systems

Economic production of all sizes.



Ball bearing slewing rings



Ball bearing slewing rings by Liebherr are available in single-row and double-row models, both with external or internal gears as well as without teeth. The ball bearing slewing rings have either four-point or two-point contact. Thanks to their simple design, four-point bearings are an efficient solution for various applications with small to medium-sized loads.

For small to medium loads

Single-row four-point bearings

Single-row four-point bearings are used, among others, for the swivelling motion of excavators, for the extension motion of tower cranes and also as drive components in large rope winches.

Double-row four-point bearings

Two-row four-point bearings with the same diameter can take significantly higher loads than single-row four-point bearings. They are in use in applications with high static loads and limited installation space, e.g. rotor blade adjustment in wind turbines.

Double-row ball bearing slewing rings

Double-row ball-bearing slewing rings are distinguished by high cost effectiveness and a solid design. They are used, for example, in crane and conveyor technology.

Polymer spacers are conventionally used as intermediate pieces between the rolling elements, however there are also bearing models with steel or brass bearing cages available.

Rolling elements for ball bearing slewing rings

Balls with intermediate pieces



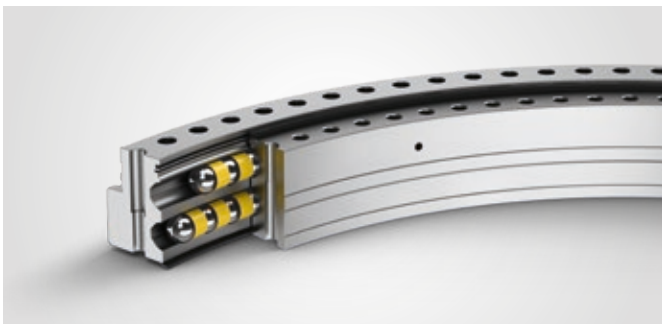
Single-row four-point bearings

Four-point contact – with external gear/internal gear/no gear



Double-row four-point bearings

Double four-point contact – with external gear/internal gear/no gear

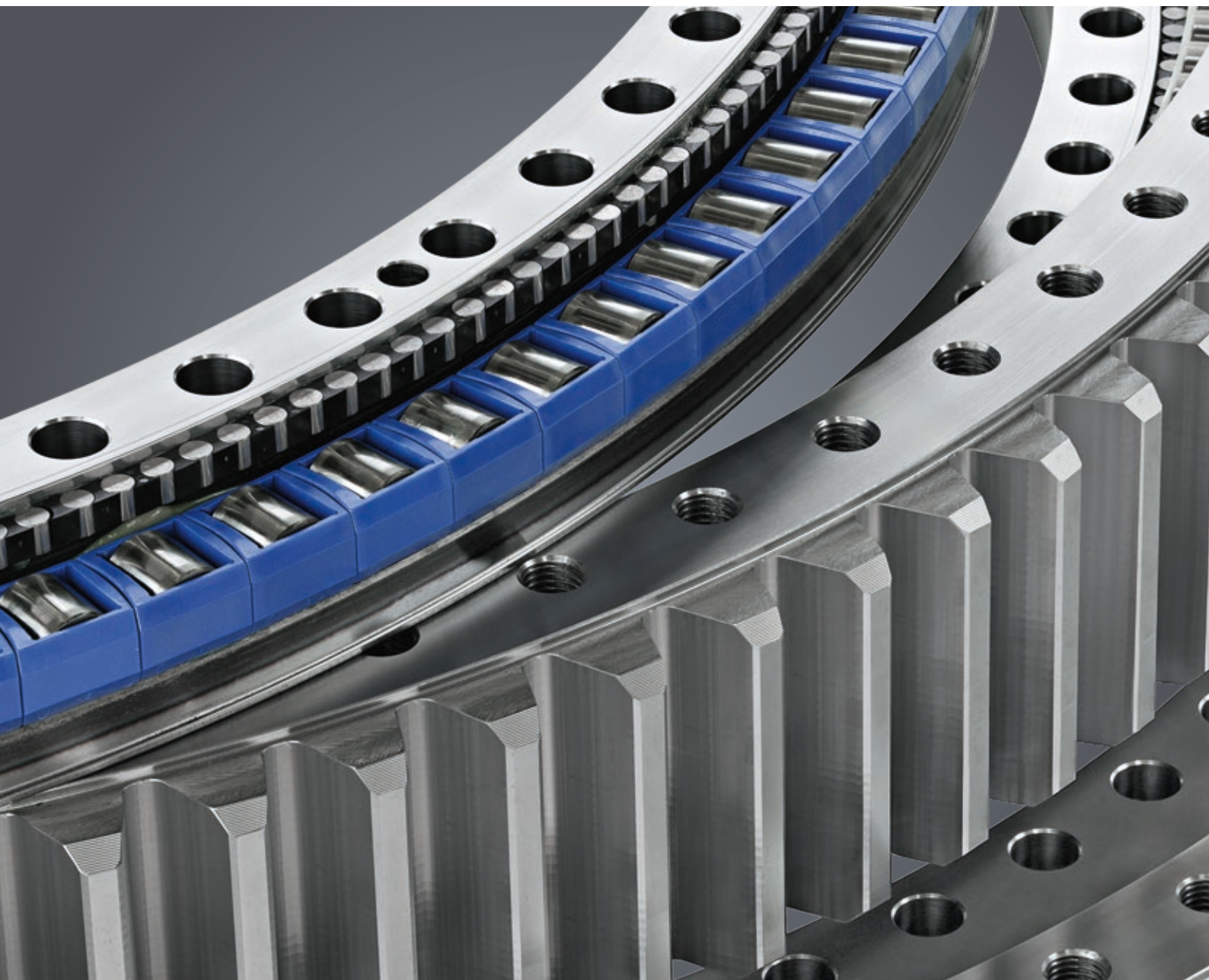


Double-row ball bearing slewing rings

Two-point contact – with external gear/internal gear/no gear



Roller bearing slewing rings



Liebherr roller-bearing slewing rings are suitable for medium to high loads. They are designed in a triple-row model with two axial and one radial roller raceway as standard, but other designs and variants are also possible depending on the application.

For medium to high loads

Sturdy, strong, space-saving

The linear load transfer allows them to transfer much higher forces in the same installation space compared to four-point bearings and makes them particularly suitable for larger diameters. Roller bearing slewing rings are distinguished by a high power density but tend to place higher demands on the stiffness of adjacent structures.

Variants and deployment areas

Roller bearing slewing rings by Liebherr can be supplied in all teeth versions. Typical applications are mining excavators or large crawler cranes, offshore and mobile harbour cranes. Roller bearings by Liebherr have also been tried and tested in drilling rigs and deep foundation machines.

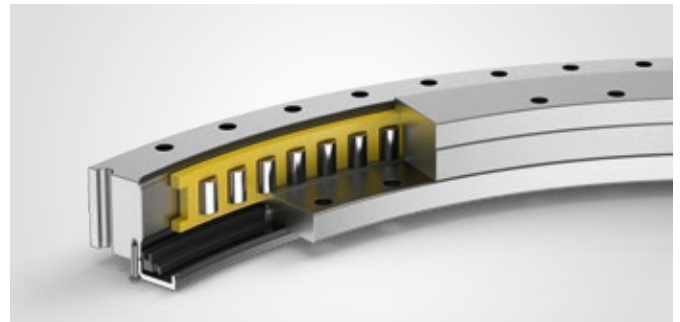
Rolling elements for roller bearing slewing rings

Rolls with intermediate pieces



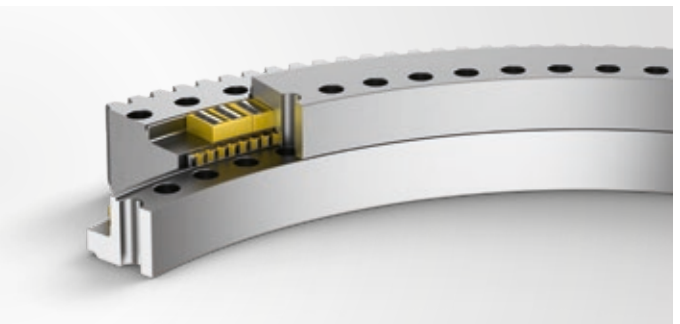
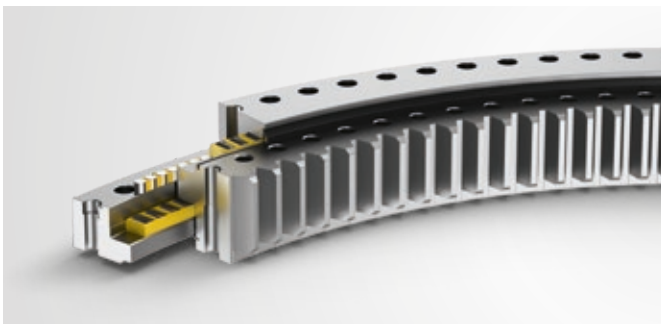
Radial roller bearing

With external gear/internal gear/no gear

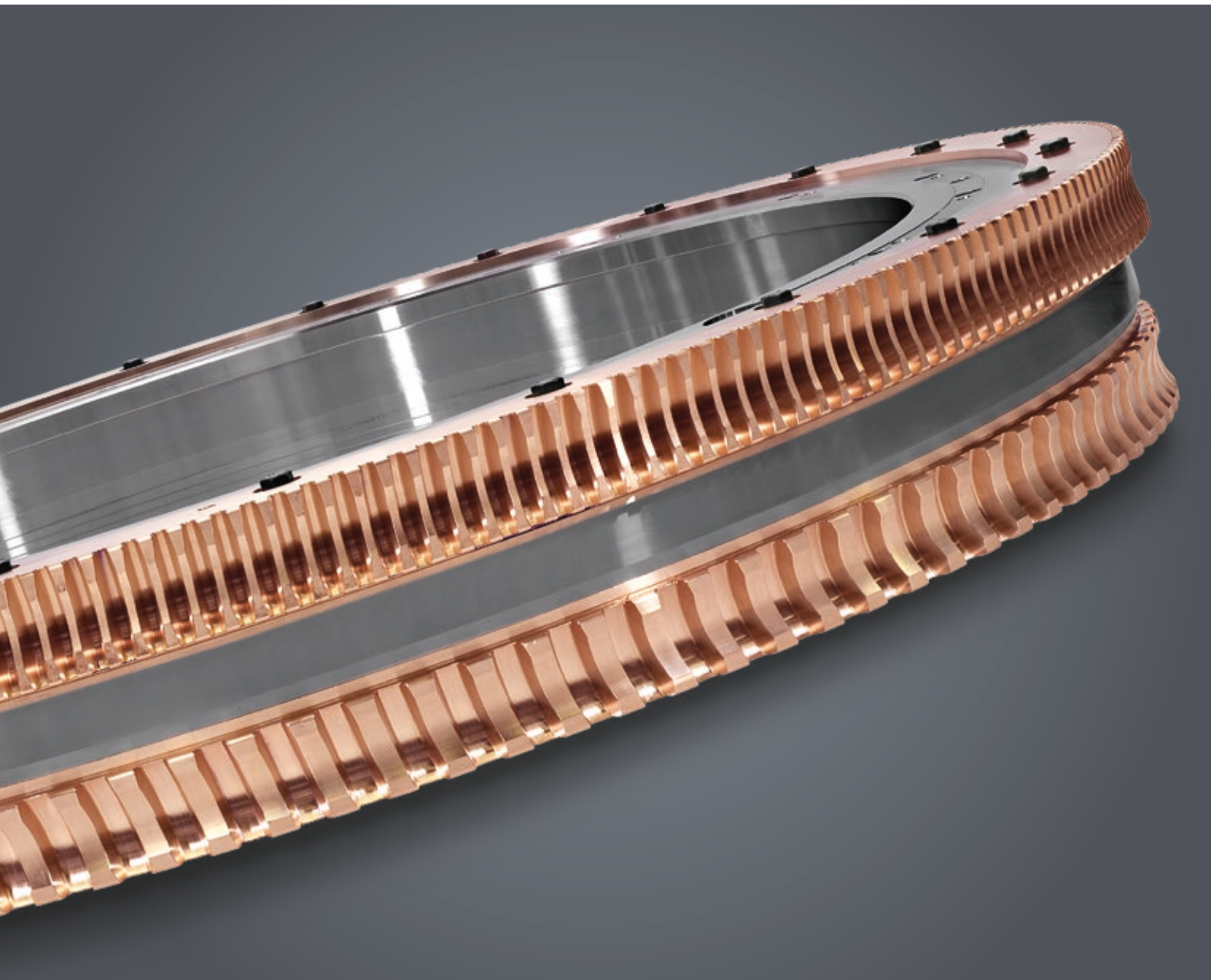


Triple-row roller bearing

With external gear/internal gear/no gear



Other types



These include four-point and roller-bearing slewing rings with special adjacent structures, segmented versions or special, application-specific designs and raceway systems. Furthermore, gear rings and ring segments are produced in our factories. Liebherr also manufactures worm wheels for the table drive in gear cutting machines, which comprise several bronze and steel rings that are connected to each other.

Solutions for every requirement

Special adjacent constructions

Roller bearing slewing rings with bolt connection or bayonet connection are available for special adjacent structures. For maritime applications are special, multi-level sealing packages possible.

Special raceway systems and designs

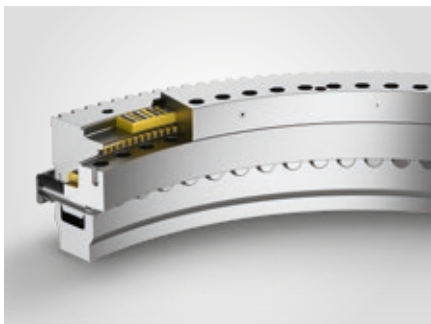
The raceway systems of ball and roller bearing slewing rings can also be adapted to specific applications. Slewing bearings are also available as ball bearings with adjusted contact angle for large radial loads.

Gear rings and ring segments

Instead of anti-friction bearings, Liebherr also produces geared rings which are used for applications such as driving rope winches or for yaw adjustment of wind turbines. The gear rings are also available in segments at the customer's request.

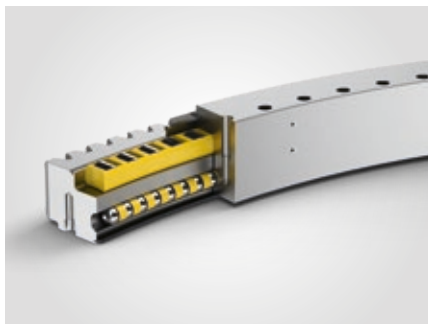
Slewing rings with special adjacent constructions

With external gear/internal gear/no gear



Combined roller-ball bearing

With external gear/internal gear/no gear



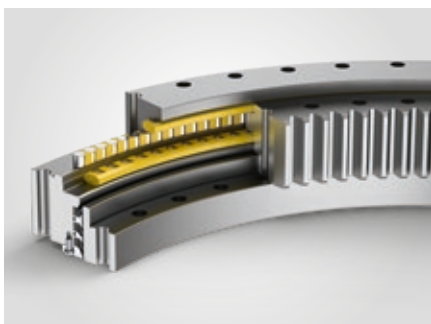
Tapered roller bearing

With external gear/internal gear/no gear



Three-row roller bearing

With special seals – with external gear/internal gear/no gear



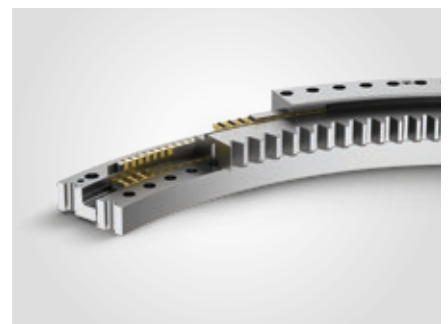
Gear ring

With external gear/internal gear



Segmented bearing

All diameter ranges – with external gear/internal gear/no gear



Design of slewing bearing - Ball bearing slewing ring

**Double-row four-point bearing
with external gear**

Rolling element

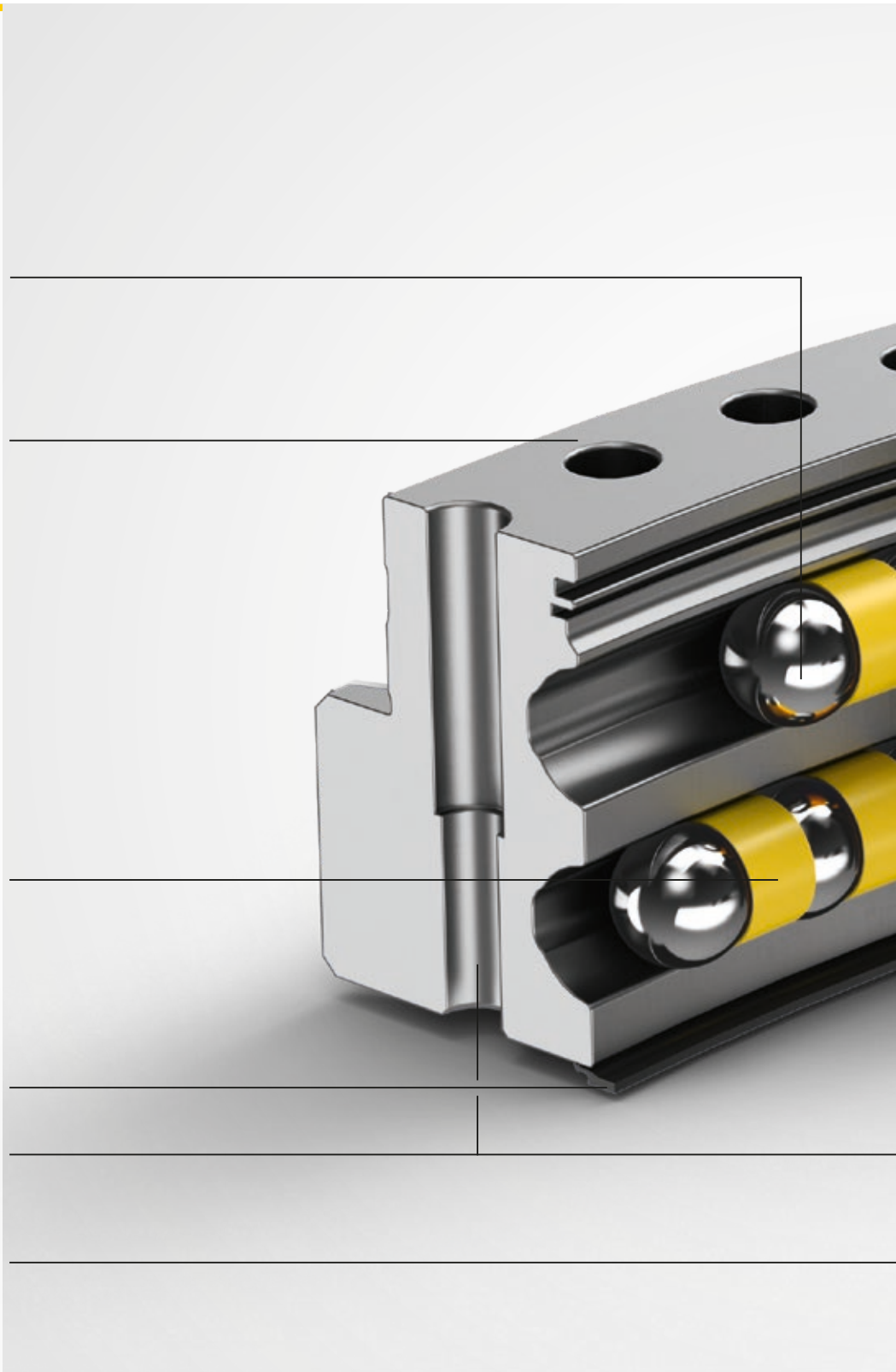
External ring

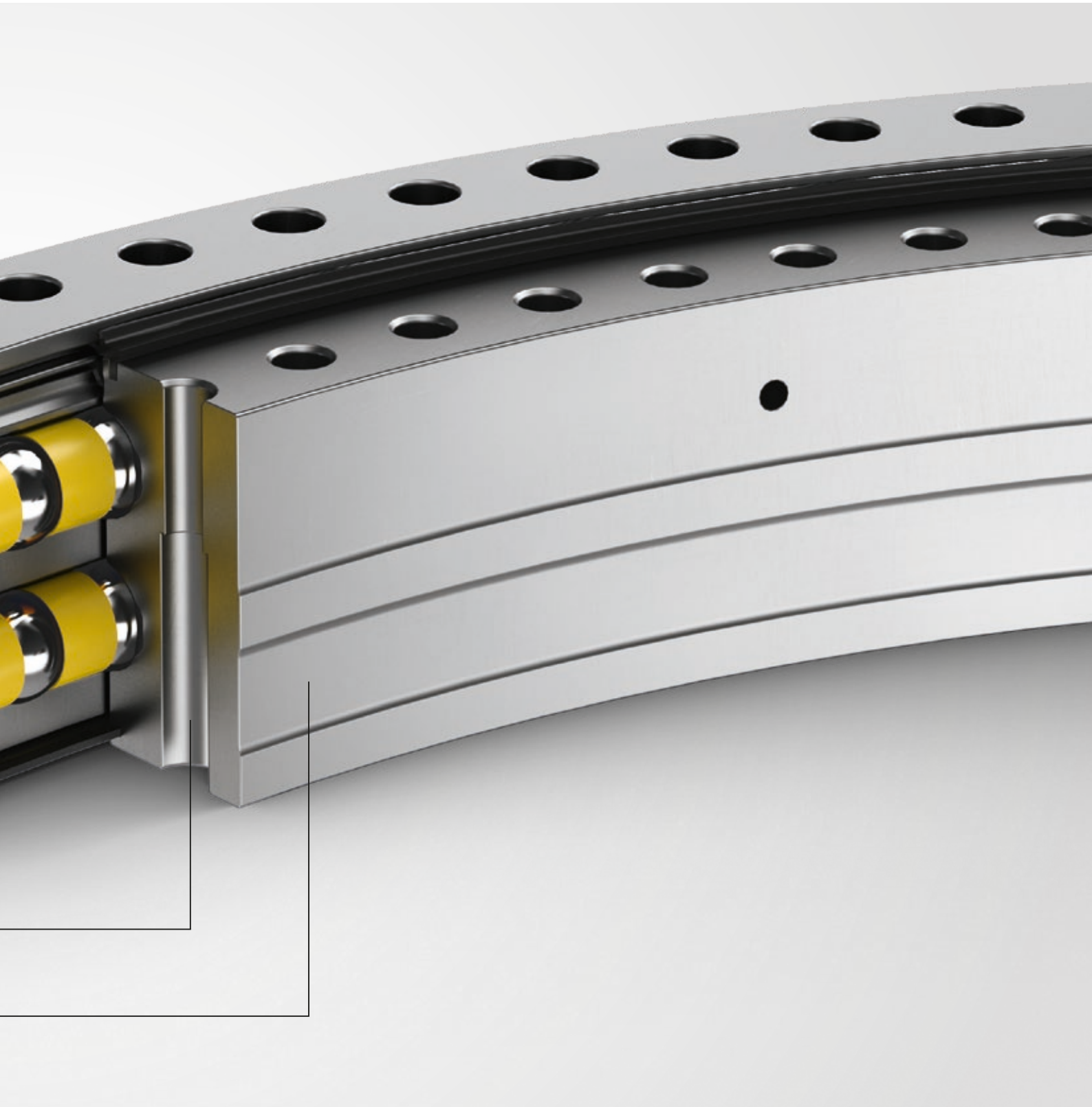
Intermediate piece

Lip seals

Fastening holes

Internal ring





Design of slewing bearing - Roller bearing slewing ring

Roller bearing with internal gear

Carrier ring

Fastening holes

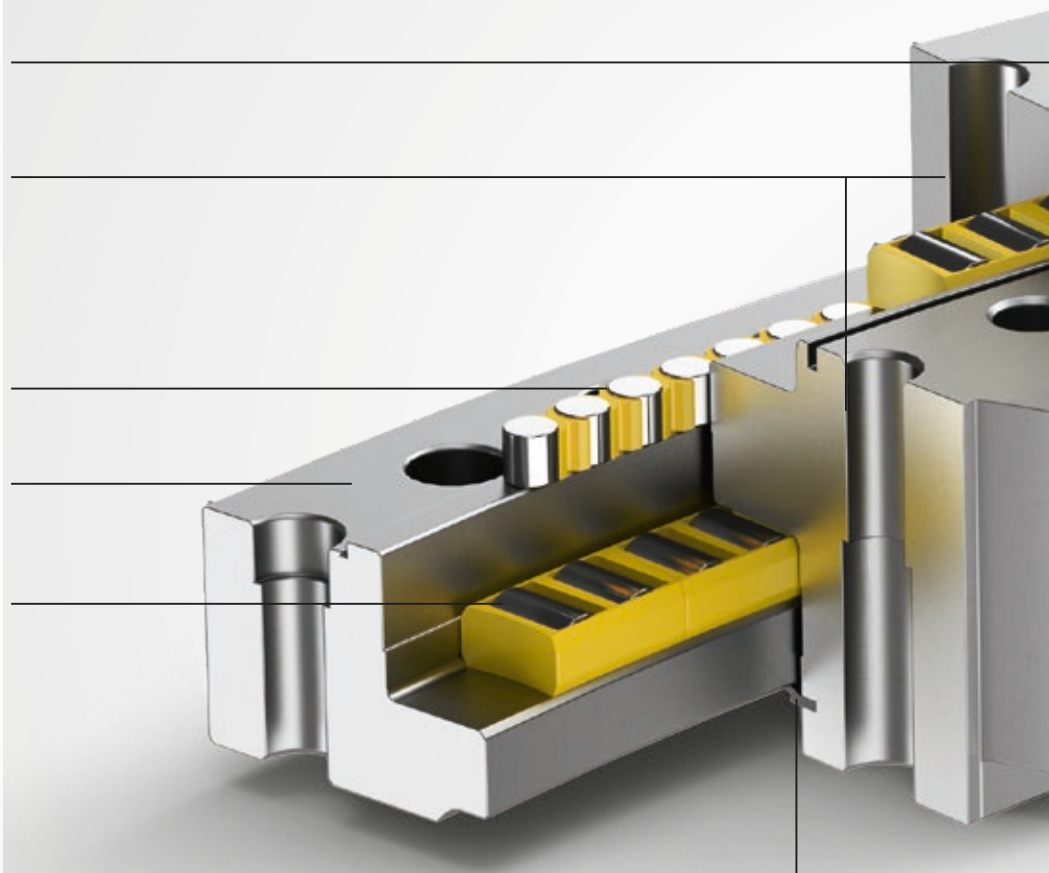
Radial rollers

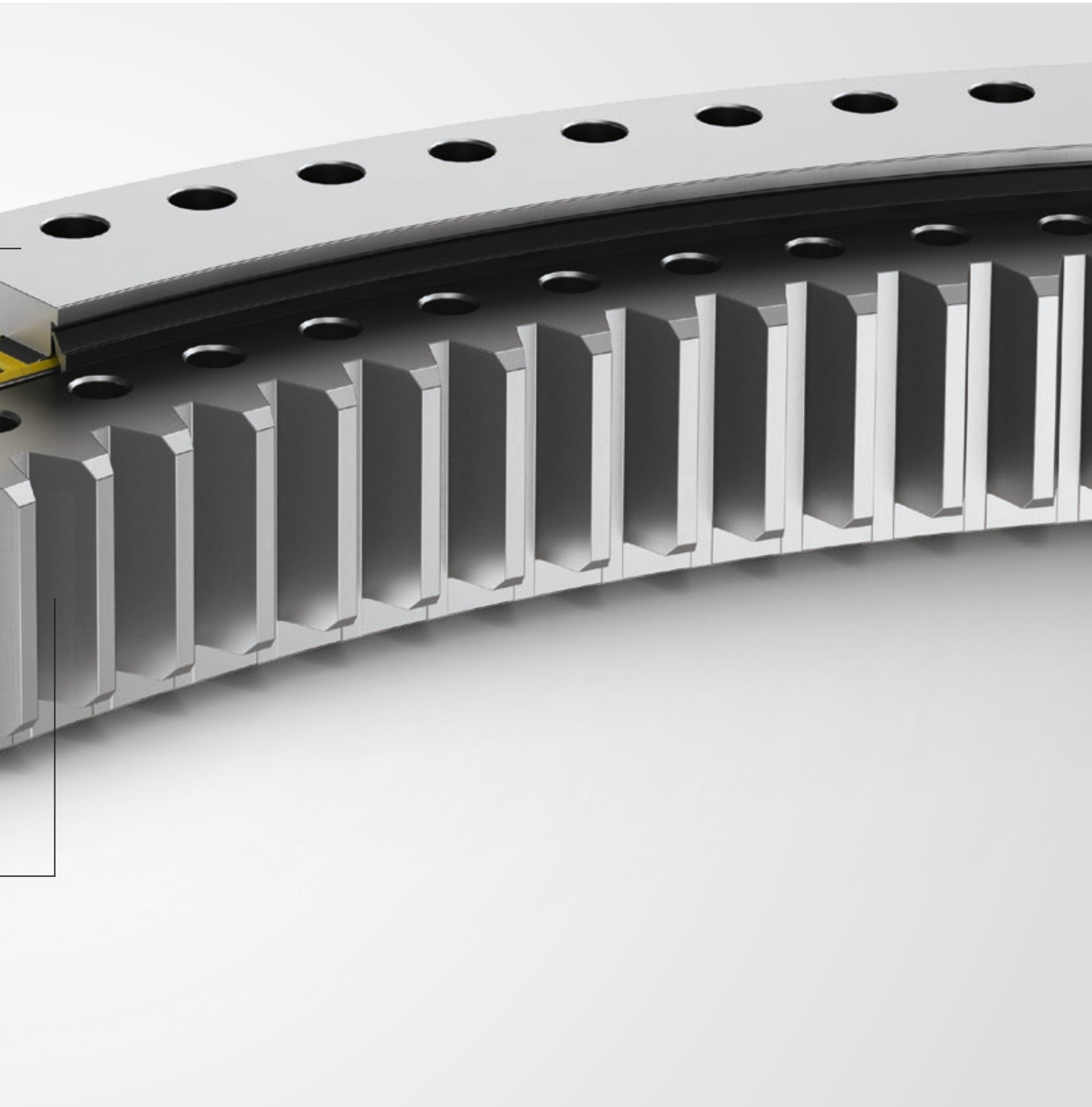
Retaining ring

Axial rollers

Lip seals

Lower ring





Examples of use



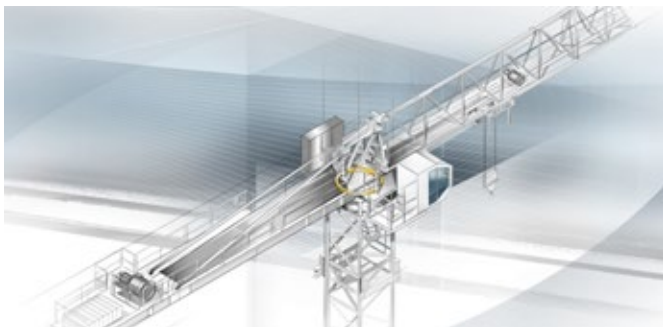
Earthmoving and deep foundation machines

- Use in mobile and crawler excavators, duty-cycle crawler cranes and drilling rigs
- Contain mainly ball bearing slewing rings for slewing equipment

Slewing bearings from Liebherr prove themselves in diverse application areas day in, day out. The hard wearing materials enable optimum use under difficult conditions, which makes these exceptionally well suited for building construction and civil engineering.

Mobile cranes, erection cranes and hoists

- Use in mobile, fast-erecting, mobile and crawler cranes
- Depending on the size and design, four-point bearings, roller bearing slewing drives or special bearings are used for the turning motion



Mining-Equipment

- Use in mining excavators
- Predominantly use roller bearing slewing rings owing to high loads



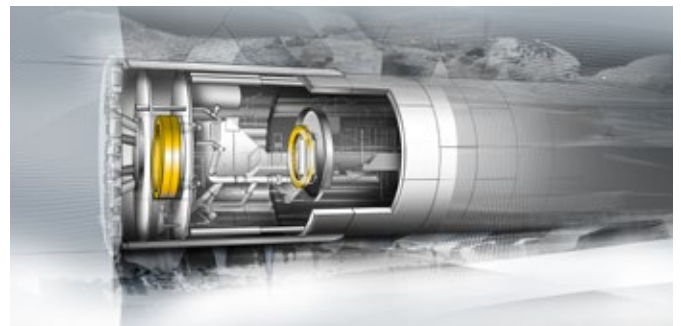
Material handling technology

- Use in conveyor belts, spreaders, stacker/reclaimers or bucket wheel excavators
- Ball and roller bearing slewing rings enable slewing motion of the uppercarriage and conveyor arms

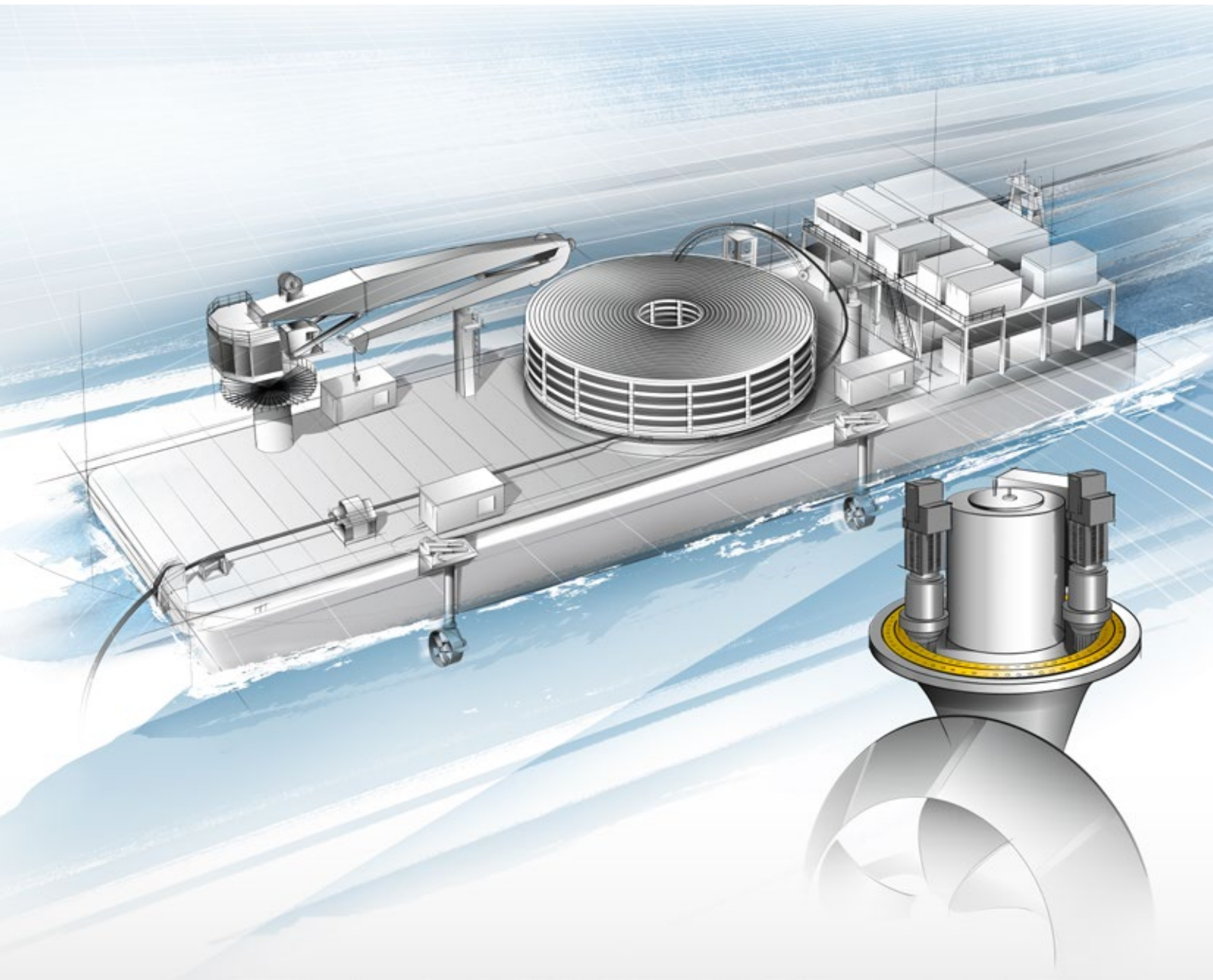


Tunnel boring machines

- Use in tunnel boring machines
- Use of roller bearing slewing rings with special sealing systems owing to higher dust exposure



Examples of use



Maritime applications

- Use in slewing mechanisms of harbour, ship and offshore cranes
- Special bearings are also used in Azipod® ship propulsion systems

The application opportunities for Liebherr slewing bearings are diverse. They range from crawler cranes to road transport and drilling rigs. Liebherr bearings have been tried and tested in the harshest environmental conditions, in a wide temperature range (-50 to +80 °C) and under the strictest mechanical loads in both dusty and maritime environments.

Energy technology

- Use in wind turbines
- Four-point bearings are employed for rotor blade and yaw adjustment



Machine tools

- Use of worm wheels to drive the tool table
- The tool magazines rotate with the aid of four-point bearings

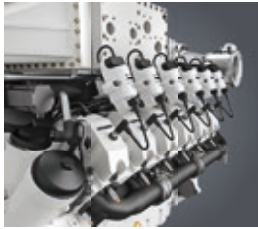


Special vehicles and machines

- Other areas of use in a whole variety of special applications and special-purpose vehicles
- For example, ball bearing slewing rings are used for undercarriage of special vehicles



Liebherr Components



Gas engines



Diesel engines



Fuel injection systems



Axial piston hydraulics



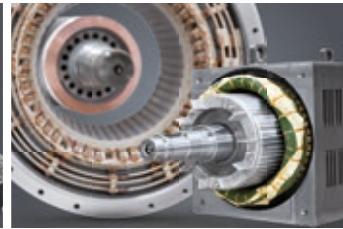
Hydraulic cylinders



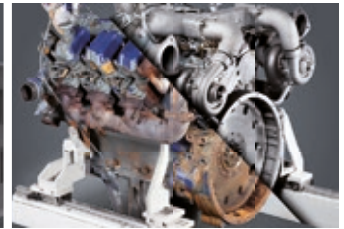
Slewing bearings



Gearboxes and winches



Electric machines



Remanufacturing



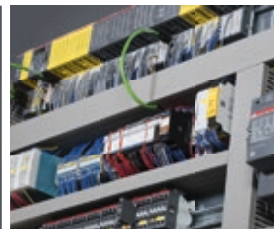
Human-machine interfaces and gateways



Control electronics and sensor technology



Power electronics



Control cabinets



Software

From A to Z – the components division of the Liebherr Group offers a broad range of solutions in the area of mechanical, hydraulic, electric and electronic drive system and control technology. The efficient components and systems are produced at a total of ten production sites around the world to the highest standards of quality. Central contact persons for all product lines are available to our customers at Liebherr-

Components AG and the regional sales and distribution branches.

Liebherr is your partner for joint success: from the product idea to development, manufacture and commissioning right through to customer service solutions like remanufacturing.

components.liebherr.com

Liebherr-Components AG

Post box 222, CH-5415 Nussbaumen/AG
☎ +41 56 296 43 00
✉ components@liebherr.com

Liebherr USA, CO.

1465 Woodland Drive, Saline, MI 48176, USA
☎ +1 734 944 63 34
✉ components.usa@liebherr.com