



Structural bearings

Infrastructure | Buildings | Industrial structures

mageba structural bearings – mastering loads and movements



IJssel Bridge, Holland

RESTON® SPHERICAL bearings

well-designed, compact, durable



mageba



Design and types

Principle

mageba RESTON®SPHERICAL bearings ensure the controlled transfer of loads between a structure's superstructure and its substructure. They also accommodate rotations about any axis and – where appropriate – movements of the superstructure. Vertical and horizontal forces are transmitted to the substructure, while rotations are facilitated by a spherical calotte in a matching concave lower part.

RESTON®SPHERICAL bearings are suitable for use in structures with medium to high loads, and structures with limited space for bearings.

The design of RESTON®SPHERICAL bearings fulfills the requirements of the European norm for structural bearings, EN 1337, in combination with the European Technical Approval ETA-23/0831.

Components

RESTON®SPHERICAL bearings possess a concave lower part ① which has a ROBO®SLIDE 75 sliding sheet ② on its upper curved surface. A convex calotte ③ is placed on top of this, which, thanks to its polished hard-chromium plated surface, can slide within the lower part with low friction, thus facilitating rotations about every axis.

A second sliding sheet of ROBO®SLIDE 75 ④ is recessed into the upper surface of the calotte. Together with the sliding plate ⑤ above it, this accommodates longitudinal and/or transverse sliding movements of the superstructure, if required. To reduce sliding resistance to a minimum, the lower surface of the sliding plate features a polished stainless steel sheet. In the case of bearings which should allow movement along one axis only, the direction of movement is controlled by guide bars ⑥. The sliding surface can, if desired, be protected from dust and debris by a rubber apron, which can be easily removed for inspections. Alternatively, a horizontal protective cover (concertina type with folding sheet) can be used.

In the case of fixed bearings, a cover plate is placed on top of the calotte instead of a sliding plate.

The bearing is connected to the superstructure and the substructure by means of anchor dowels ⑦ or threaded sleeves (depending on design), or alternatively by means of separate anchor plates with shear studs.

Sliding bearings, whether accommodating movements in one direction only or in all directions, also feature external movement scales. These indicate the horizontal movement of the bearing, and thus also that of the superstructure.

Types

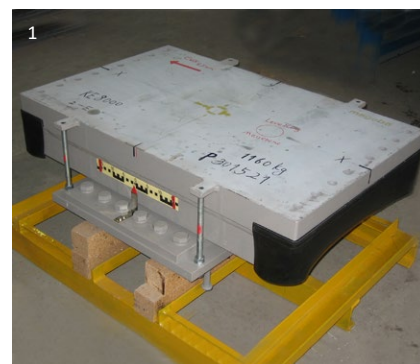
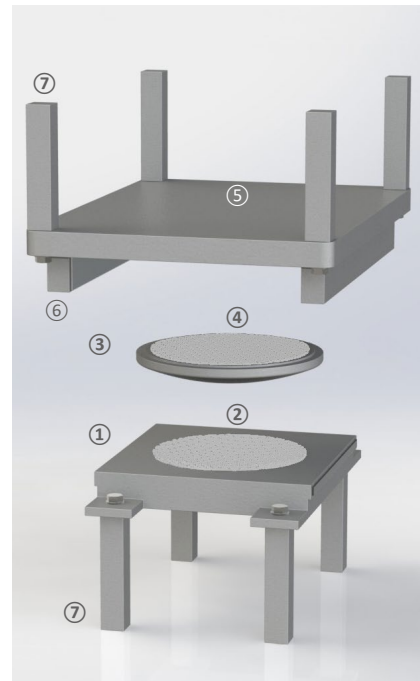
RESTON®SPHERICAL bearings are designated KF, KE or KA depending on their ability to accommodate sliding movements:

- KF: "Fixed" – The bearing resists horizontal forces in every direction, allowing no sliding movements
- KE: "Guided sliding" – The bearing allows sliding movements along one horizontal axis, and resists forces in a perpendicular direction
- KA: "Free sliding" – The bearing allows horizontal sliding movements in all directions, transmitting no external horizontal forces

Materials

The following high-quality materials are used in the manufacture of RESTON®SPHERICAL bearings:

- Steel parts of Grade S355 steel
- Certified ROBO®SLIDE 75 sliding material with grease dimples
- Certified silicone grease as lubricant
- Hard chromium plating of the calotte's surface
- Sliding sheet of polished, certified austenitic stainless steel (grade 1.4404)
- Sliding strips of 3-layer CMI material (DUB)
- Corrosion protection according to environmental conditions and customer requirements



1 KE bearing showing dust protection apron and movement indicator, ready for installation
2 Installed KA bearing with dust protection apron temporarily removed

Properties and installation

Anchoring

Depending on design, bearings are connected to the superstructure and substructure by means of anchor dowels or threaded sockets, or by anchor plates with shear studs. Anchor dowels are suitable for the transmission of horizontal forces in the case of guided sliding (KE) and fixed (KF) bearings. Threaded sockets are suitable for free sliding (KA) bearings without anchor plates.

The use of anchor plates simplifies future bearing replacement. The number of shear studs on each anchor plate depends on static design requirements. Mixed designs, with anchor plates only above or below, or anchor plate strips, are also possible, as are designs for connection to steel structures.

ROBO®SLIDE 75 sliding material

ROBO®SLIDE 75, of modified ultrahigh molecular weight polyethylene, offers increased wear-resistance and load capacity, and is thus particularly suitable for use in sliding bearings for bridges and buildings. With grease dimples and high performance grease, a durable, low-friction sliding surface is ensured.

Apart from its excellent physical properties, such as high resistance to wear and a high characteristic load capacity of 180 N/mm², ROBO®SLIDE 75 can also be used at very low temperatures (as low as -50 °C), and at high temperatures (up to approximately 80 °C).

Thanks to its high durability, the use of ROBO®SLIDE 75 greatly reduces maintenance and replacement costs in comparison with other sliding materials such as PTFE.

Further information about the sliding material can be found in the ROBO®SLIDE 75 brochure.

Testing of ROBO®SLIDE 75

Extensive testing has been carried out by the independent materials testing institute (MPA) of the Karlsruhe Institute of Technology (KIT) in accordance with the European Assessment Document EAD-050004-00-0301. The testing clearly demonstrated coefficients of sliding friction which are within the limits allowed by EN 1337, even at low temperatures and low pres-

ures, and which, at high pressures, are significantly less than the maximum values allowed.

The tested ROBO®SLIDE 75 samples also showed virtually no signs of wear after a sliding distance of 75 km, which represents multiple times the life expectancy of a standard sliding material such as PTFE.

Installation

RESTON®SPHERICAL bearings must be handled with proper care during unloading and installation. Sliding surfaces, movement indicators and corrosion protection are particularly susceptible to damage and must be protected accordingly.

Bearings are pre-assembled in the factory. Anchor dowels and threaded sockets are generally delivered loose, to optimise volume for transport and to minimise the risk of damage. The bearing's lower part, calotte and sliding plate are bolted together for transport by means of temporary fittings.

- **Pre-setting:** The exact pre-setting values must be made known before commencement of fabrication, because pre-setting always takes place in the factory. Only trained experts may adjust the pre-setting on site.
- **Positioning:** The bearing location plan is the key element in the correct installation of the bearings. The structure's axes are marked on the bearings by grooves. This enables the bearings to be positioned precisely. The height is adjusted and horizontalness ensured by means of regulating screws. The reference point for the installation height is the middle of the cover or sliding plate.
- **Fixing:** After positioning, the anchor recesses (if any) are concreted. The subsequently placed mortar bed should not be more than 50 mm thick; the use of mortar which is able to flow beneath the bearing is recommended.
- **Taking into service:** The bearing must be able to move freely as soon as it is connected to both superstructure and substructure. This requires the temporary transport fittings to be cut and removed.



1 Anchor studs on anchor plate
 2 ROBO®SLIDE 75 sliding material
 3 Application of lubricating grease
 4 Optional console for 3-point levelling surface



Quality and support

Quality

Over the past five decades, mageba has supplied over 50,000 structural bearings for projects all around the world. The quality and durability of mageba bearings is thus ensured not only by their well-proven product properties, but also by the extensive experience of our personnel.

mageba operates a process-oriented quality system that is certified in accordance with ISO 9001. Quality is also regularly checked by independent bodies such as the materials testing institute (MPA) of the University of Stuttgart. mageba factories are approved for welding in accordance with ISO 3834-2, and certified in accordance with the current steel construction standard EN 1090.

CE conformity

RESTON®SPHERICAL bearings with ROBO®SLIDE 75 that are designed and manufactured in accordance with EN 1337 are marked with the CE label. This indicates that they fulfil all requirements of the standard (or of ETA-23/0831 as appropriate) and that the manufacturing facilities are systematically and regularly inspected by an independent certification body. RESTON®SPHERICAL bearings can also be manufactured in accordance with German standards (and marked with a Ü-label), or Austrian standards.

Certification of ROBO®SLIDE 75

RESTON®SPHERICAL bearings with ROBO®SLIDE 75 are certified (ETA 23/0831) for use in Europe by the Austrian Institute for Construction Technology (OIB), on behalf of the European Organisation for Technical Approvals (EOTA).

Optional features

Depending on customer and national requirements, RESTON®SPHERICAL bearings can additionally be equipped with the following features:

- 3-point levelling surface for precise levelling of the bearing
- Folding sheet as horizontal dust protection for the sliding surface instead of a rubber apron

Special solutions

For special requirements, mageba offers the following bearing variations:

- **RESTON®ILM** Incremental Launch Method bearings: Facilitating construction of the bridge by the incremental launch method, and also serving as permanent bearings following completion of construction
- **RESTON®SPHERICAL UPLIFT** pressure/tension bearings: Allow temporary load reversal by preventing uplift

Offers

Quotations are provided on the basis of the types and numbers of bearing required. If desired, mageba can determine the types of bearing required, if provided with the following information:

- Maximum, minimum and permanent vertical loads and corresponding horizontal loads (ULS)
- Displacements and rotations in the structure's longitudinal and transverse directions
- General information about the structure (concrete strength, available space for bearings, etc.)

Support

Our product specialists are always ready to advise you in selecting the optimal solution for your project, and to provide you with quotations for supply.

You can also find further product information, including data sheets with standard bearing dimensions and reference lists, at mageba-group.com.

Project references – RESTON®SPHERICAL bearings



Ijssel Bridge (NL)



Fehmarn Sound Bridge (DE)



Dubai Sports Complex (AE)



Tran Thi Ly Bridge (VN)



Danube Arena (HU)



Conference Centre (HK)

mageba structural bearings



Pot bearings



Deformation bearings



Lifting/measuring bearing



ILM bearing



engineering connections®