



Structural bearings

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 consist of 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, due 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

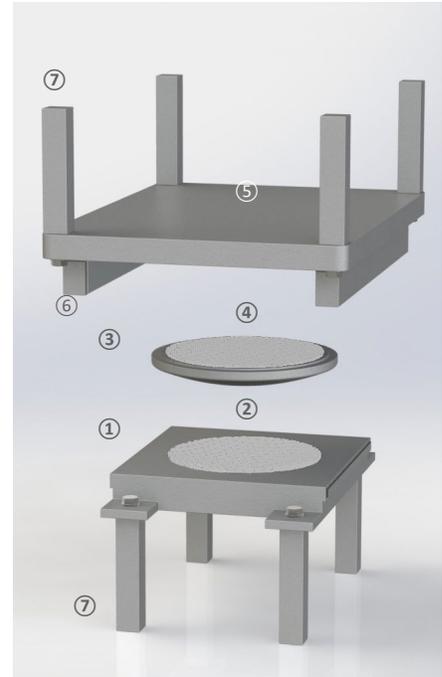
RESTON®SPHERICAL bearings are designated KF, KE or KA depending on their ability to accommodate sliding movements:

- 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 the 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 the 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 cases 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

Made of patented modified ultra-high molecular weight polyethylene, ROBO®SLIDE 75 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.

In addition to its excellent physical properties, such as high resistance to wear and a high characteristic load capacity of 26 ksi (180 N/mm²), ROBO®SLIDE 75 can also be used at very low temperatures (as low as -58 °F / -50 °C), and at high temperatures (up to approximately 176 °F / 80 °C).

Due to its high durability, the use of ROBO®SLIDE 75 greatly reduces maintenance and replacement costs in comparison to 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 pressures. At high

pressures, the coefficients were shown to be significantly less than the maximum values allowed.

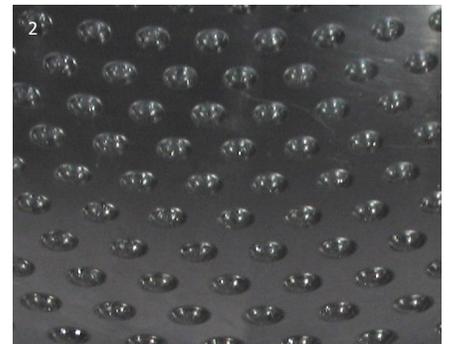
The tested ROBO®SLIDE 75 samples also showed virtually no signs of wear after a sliding distance of 47 mi (75 km), which represents more than twice the life expectancy of a standard sliding material such as PTFE.

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, but anchor dowels and threaded sockets are generally delivered separately in order to optimize volume for transport and to minimize 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 fabrication begins, 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 2 inches (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 material
 4 Optional console for 3-point levelling surface



Structural bearings

Quality & 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 our well-proven product properties, but also by the extensive experience of our personnel.

mageba has a process-orientated quality system. In addition, its quality is regularly inspected by independent testing institutes. mageba factories are AISC certified for Major Bridges (CPT, STD, SPE) and also maintain AWS certifications for D1.1 and D1.5.

CE Conformity

mageba RESTON®SPHERICAL bearings are designed and manufactured in accordance with "AASHTO LRFD Bridge Construction Specifications".

Alternatively, RESTON®SPHERICAL bearings can also be designed and manufactured in accordance with European Standard EN 1337 and the product specific European approval (ETA-23/0831). Bearings are then marked with the CE mark of conformity, which confirms that they satisfy all requirements of this standard, without exception.

All necessary type testing performed on RESTON®SPHERICAL devices are carried out at an independent testing facility and fully supervised by a certified body.

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 leveling surface for precise leveling 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 and data sheets with standard bearing dimensions at mageba-group.com.

Project References – RESTON®SPHERICAL Bearings



IJssel Bridge (NL)



Irtysh River Bridge (KZ)



Dubai Sports Complex (AE)



Da Nang Bridge (VN)



Revere Bridge (US)



Conference Centre (HK)

mageba Structural Bearings



Pot Bearings



Deformation Bearings



Lifting/Measuring Bearing



ILM Bearing



engineering connections®