



Structural bearings

Infrastructure | Buildings | Industrial structures

# mageba structural bearings – mastering loads and movements



Bayonne Bridge, New York

## RESTON® DISC bearings

versatile, flexible, durable



mageba



# Concept

## Principle

mageba RESTON®DISC bearings are uniquely defined by their Polyether-Urethane (PU) rotational element which is placed between two plates, the upper bearing plate and the lower bearing plate. The rotational element's elasticity enables tilting movements of the upper bearing plate around any horizontal axis. The rotational capacity is facilitated by a "V" shaped groove along the exterior contour of the disc. A shear pin placed in the centre of the rotational element absorbs the horizontal forces and keeps the upper and lower bearing plates in position.

Depending on whether it is fixed, guided sliding or free sliding, the bearing can accommodate horizontal forces and movements (longitudinal or transverse) as well as vertical loads.

## Advantages

At the serviceability limit state, the average compressive stress on the PU disc can be as high as 35 MPa.

Extensive load deflection testing has been conducted on the PU rotational element and has proven that the material does not experience plastic deformation until a pressure exceeding 20 times the allowable force.

This provides the RESTON®DISC bearing with a considerable safety factor for vertical loads.

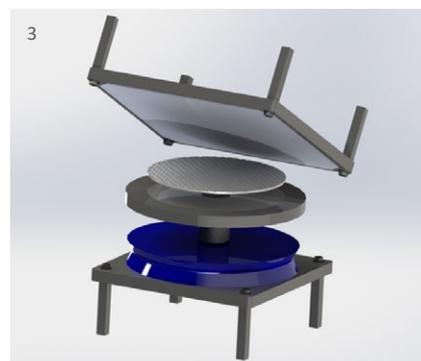
Since the design load on the PU material is low compared to its ultimate strength capacity, the long-term creep of the elastomer is very low.

## Types

The following types of RESTON®DISC bearing are available:

- "Fixed" – The bearing resists horizontal forces in every direction, restricting any sliding movements
- "Guided sliding" – The bearing allows sliding movements along one horizontal axis, and resists forces in a perpendicular direction
- "Free sliding" – The bearing allows horizontal sliding movements in all directions, transmitting no external horizontal forces
- "Uplift restraining" – The bearing is designed to resist uplift as well as normal downward forces; it can be executed as fixed, guided sliding or free sliding

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



- 1 Build-up of a fixed disc bearing
- 2 Build-up of a guided sliding disc bearing
- 3 Build-up of a free sliding disc bearing

# Properties

## Materials

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

- Upper and lower bearing plates are made from carbon steel conforming to ASTM A709 Gr. 36 or Gr. 50
- Stainless steel as per Type 304 of ASTM A167
- Polyether-Urethane rotational disc as per AASHTO LRFD Bridge Construction Specifications
- PTFE sliding material as per ASTM D4894/D3294

## PU rotational disc

The Polyether-Urethane material used in the disc remains flexible within a wide range of temperatures, from  $-70^{\circ}\text{C}$  to  $121^{\circ}\text{C}$ . Therefore, under normal atmospheric conditions there are no issues with softening or crystallising of the rotational element at temperature extremes.

Tests have shown that Polyether-Urethane has excellent weathering properties when subjected to prolonged exposure to seawater, fresh water, ozone or other deleterious chemicals.

This makes the Polyether-Urethane rotational element a highly effective material compared to conventional elastomers and guarantees a long service life of the bearing.

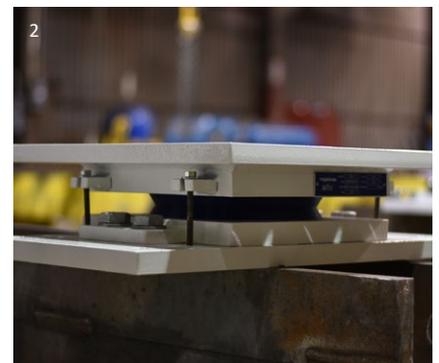
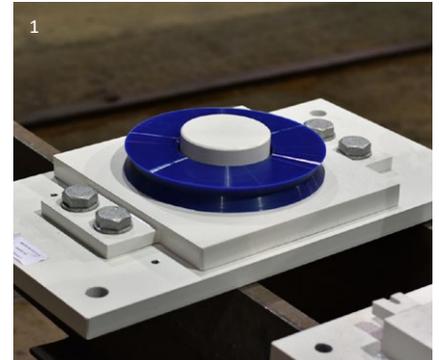
## Sliding material

For sliding bearings, mageba only uses PTFE of certified bridge bearing quality. The sliding surfaces feature grease dimples to enable grease to be stored. Certified silicone grease, which maintains its consistency and remains effective even at  $-35^{\circ}\text{C}$ , is used. To keep frictional resistance as low as possible, the lower surface of the sliding plate features a polished stainless steel sheet.

## Design

Due to its high compressive strength, the rotational element requires no confinement. Dimensioning of the PU disc is based on the behaviour of a linear elastic material, unrestrained laterally at its top and bottom surfaces. The unconfined disc accommodates rotation by the differential deflection of the PU element. The horizontal structural loads are transmitted by a steel pin located at the centre of the disc. It is designed to be fully functional at up to twice the design rotation.

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.



- 1 PU disc with "v" shaped groove
- 2 Assembled disc bearing ready for shipping to jobsite
- 3 RESTON®DISC bearing installed on a bridge



# 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 9001:2008. 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.

## Corrosion protection

All exposed steel components are systematically corrosion protected. mageba adjusts the corrosion protection to suit exposure conditions and customer requirements. Standard corrosion protection is as follows:

- Sandblasting SA 2 ½
- Zinc metal spray galvanizing
- One coat of intermediate epoxy paint
- Top coat of polyurethane paint

## Testing

The following testing of disc bearings in accordance with AASHTO LRFD Bridge Construction Specifications has been successfully carried out:

- Proof load test at 150 % of vertical SLS load
- Coefficients of static and dynamic friction
- Rotational capacity

## Offers

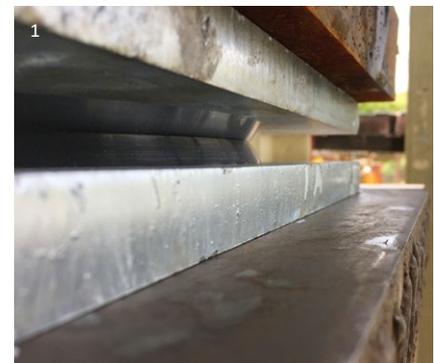
Quotations are provided on the basis of the types and numbers of bearing required. If desired, mageba can determine the types of bearing required, if provided with the following information:

- Maximum, minimum and permanent vertical loads and corresponding horizontal loads (SLS or ULS values)
- Maximum horizontal loads in the structure's longitudinal and transverse directions and corresponding vertical loads (SLS or ULS values)
- 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 experienced product specialists are always ready to provide you with further information and to advise you in selecting the optimal solution for your project.

You can also find further product information, including data sheets with standard bearing dimensions and reference lists, at [mageba-group.com](http://mageba-group.com).



1 Testing of a disc bearing to 150 % proof load, per AASHTO LRFD specifications.

## Project references – RESTON®DISC bearings



Bayonne Bridge (US)



Ohio River Bridge (US)



Atlanta Airport (US)



St. Croix Bridge (US)

## mageba structural bearings



Pot bearings



Deformation bearings



Spherical bearings



Lifting/measuring bearings



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