



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 'V' shaped groove at the exterior contour of the disc is like a reinforcing shim of an elastomeric bearing, preventing excessive shear deformation. A shear pin placed in the centre of the rotational element absorbs the horizontal forces and keeps the disc 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 5 ksi (34.5 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.

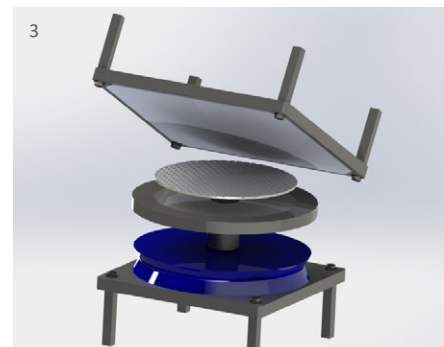
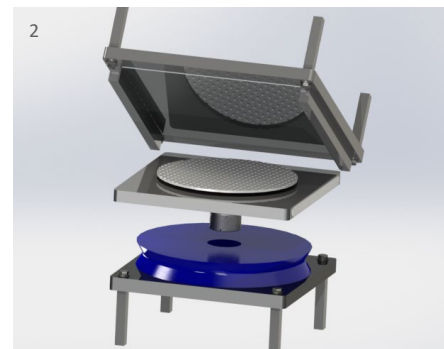
Since the design load on the PU material is low compared to its ultimate strength capacity, the long-term creep of the elastomer is very low.

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 non-frequent uplift as well as normal downward forces; it can be executed as fixed, guided sliding or free sliding. For frequent uplift (large number of tension-compression cycles) applications, please contact us for selection of an appropriate bearing type.

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 or 316 of ASTM A240
- Polyether-Urethane rotational disc as per AASHTO LRFD Bridge Construction Specifications
- PTFE sliding material as per ASTM D4894/ D3294 or mageba ROBO®SLIDE high grade sliding material

PU Rotational Disc

The Polyether-Urethane material used in the disc remains flexible within a wide range of temperatures, from -94 °F to 250 °F (-70 °C to 121 °C). Therefore, under normal atmospheric conditions there are no issues with softening or crystallizing 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 offers two options for sliding materials:

- PTFE for standard applications with small accumulated movements (< 10 miles total during the bearing service life), and relaxed bearing size requirements
- mageba's high grade ROBO®SLIDE for demanding applications like low friction, large accumulated movements (> 10 miles), high durability, and stringent bearing size requirements

mageba ROBO®SLIDE offers:

- Accumulated movement capacity about 2.5x larger than PTFE (Increased durability)
- Allowable stress capacity about 2.7x larger than PTFE (Reduced bearing size)
- Lower friction and larger operating temperature range (More versatile and less demanding for structures)

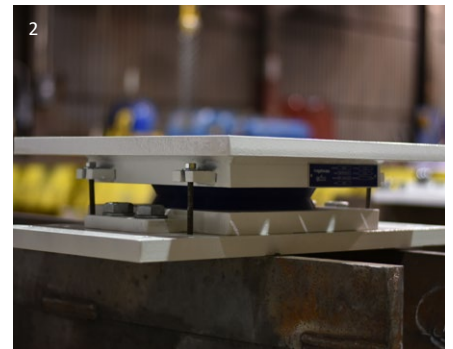
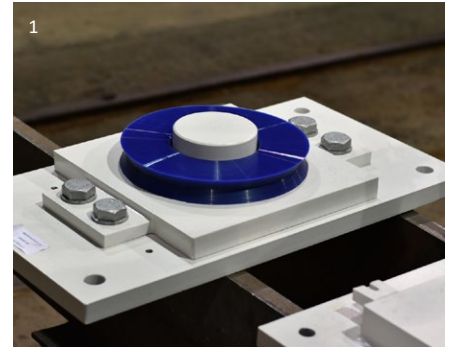
Please refer to our website, or contact us for more information on ROBO®SLIDE.

To keep the frictional resistance as low as possible, both sliding materials are used with silicone grease, and with a mating stainless steel surface polished to a mirror finish.

Design

Due to its high compressive strength, the rotational element requires no confinement. Dimensioning of the PU disc is based on the behavior 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 center 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

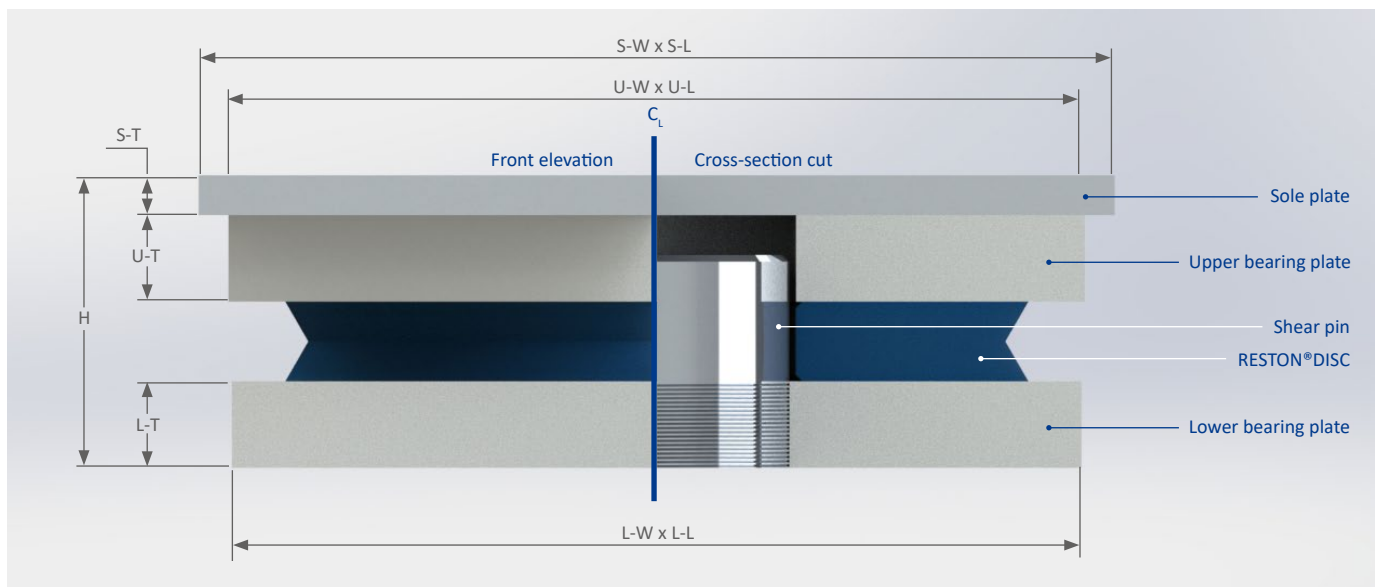


Structural bearings

RESTON[®] DISC Fixed Series (DF)

Design assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. 15 % horizontal load case => unfactored horizontal load = 10 % of service vertical load / factored horizontal load = 15 % of service vertical load
- C. 30 % horizontal load case => unfactored horizontal load = 20 % of service vertical load / factored horizontal load = 30 % of service vertical load
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress.
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing

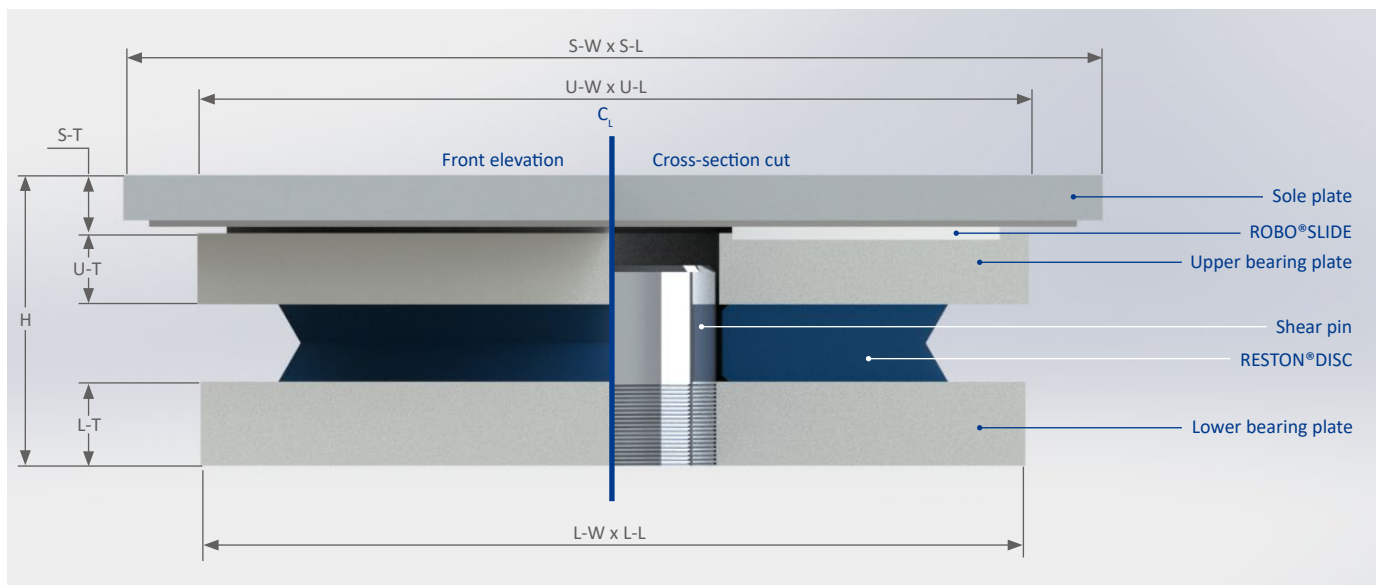


		Bearing Dimensions (inches)																					
		15 % Horizontal Load									30 % Horizontal Load												
mageba Bearing Model	Service Vertical (kips)	Factored Horizontal (kips)	H	S-W	S-L	S-T	U-W	U-L	U-T	L-W	L-L	L-T	Factored Horizontal (kips)	H	S-W	S-L	S-T	U-W	U-L	U-T	L-W	L-L	L-T
DF100	100	15	3.75	8.50	8.50	0.50	8.00	1.75	8.00	0.50	30	4.00	8.50	8.50	0.50	8.00	1.75	8.00	0.75				
DF200	200	30	4.25	11.00	11.00	0.50	10.50	1.75	10.50	0.75	60	4.50	11.25	11.25	0.50	10.75	2.00	10.75	0.75				
DF300	300	45	4.25	12.75	12.75	0.50	12.25	1.75	12.25	0.75	90	5.00	12.75	12.75	0.50	12.25	2.00	12.25	1.25				
DF400	400	60	4.75	14.00	14.00	0.50	13.50	2.00	13.50	0.75	120	5.25	14.25	14.25	0.50	13.75	2.00	13.75	1.25				
DF500	500	75	5.25	15.50	15.50	0.50	15.00	2.00	15.00	1.25	150	5.50	15.75	15.75	0.50	15.25	2.25	15.25	1.25				
DF600	600	90	5.25	16.00	16.00	0.50	15.50	2.00	15.50	1.25	180	6.25	17.75	17.75	0.75	17.25	2.25	17.25	1.50				
DF700	700	105	5.75	17.50	17.50	0.50	17.00	2.25	17.00	1.25	210	6.25	18.50	18.50	0.75	18.00	2.25	18.00	1.50				
DF800	800	120	6.00	18.50	18.50	0.75	18.00	2.25	18.00	1.25	240	6.50	19.00	19.00	0.75	18.50	2.50	18.50	1.50				
DF900	900	135	6.50	19.50	19.50	0.75	19.00	2.25	19.00	1.50	270	6.75	20.50	20.50	0.75	20.00	2.50	20.00	1.50				
DF1000	1000	150	6.75	21.00	21.00	0.75	20.50	2.50	20.50	1.50	300	7.50	22.00	22.00	0.75	21.50	2.75	21.50	1.75				
DF1150	1150	173	7.00	22.00	22.00	0.75	21.50	2.50	21.50	1.50	345	7.75	23.00	23.00	0.75	22.50	2.75	22.50	2.00				
DF1300	1300	195	7.25	23.50	23.50	0.75	23.00	2.75	23.00	1.50	390	7.50	24.25	24.25	0.75	23.75	2.75	23.75	1.75				
DF1450	1450	218	7.75	24.75	24.75	0.75	24.25	2.75	24.25	1.75	435	8.25	25.75	25.75	0.75	25.25	3.00	25.25	2.00				
DF1600	1600	240	8.00	26.00	26.00	0.75	25.50	3.00	25.50	1.75	480	8.50	27.00	27.00	1.00	26.50	3.00	26.50	2.00				
DF1800	1800	270	8.50	27.25	27.25	1.00	26.75	3.00	26.75	1.75	540	9.75	29.25	29.25	1.00	28.75	3.25	28.75	2.50				
DF2000	2000	300	8.75	28.75	28.75	1.00	28.25	3.00	28.25	2.00	600	9.75	30.25	30.25	1.00	29.75	3.25	29.75	2.50				

RESTON® DISC Free Series (DA 1)

Design assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. Horizontal load => friction only [< 3 %]
- C. Longitudinal movement capacity = + / - 1". transverse movement capacity = + / - 0.50"
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing



				Bearing Dimensions (inches)															
				Sliding Material → PTFE								Sliding Material → ROBO®SLIDE							
mageba Bearing Model	Service Vertical (kips)	Longitudinal Movement +/- (inches)	Transverse Movement +/- (inches)	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T
DA100	100	1.00	0.50	3.25	10.00	12.00	0.50	8.50	1.00	8.00	0.50	3.25	9.50	11.50	0.50	8.00	1.00	8.00	0.50
DA200	200	1.00	0.50	3.25	12.00	14.00	0.50	10.50	1.00	9.25	0.50	3.25	10.75	12.75	0.50	9.25	1.00	9.25	0.50
DA300	300	1.00	0.50	4.00	14.00	16.00	0.75	12.50	1.25	11.25	0.50	3.75	12.75	14.75	0.50	11.25	1.25	11.25	0.50
DA400	400	1.00	0.50	4.50	16.00	18.00	0.75	14.50	1.25	12.75	0.75	4.50	14.25	16.25	0.75	12.75	1.25	12.75	0.75
DA500	500	1.00	0.50	5.00	17.00	19.00	0.75	15.50	1.50	14.00	1.00	5.00	15.50	17.50	0.75	14.00	1.50	14.00	1.00
DA600	600	1.00	0.50	5.25	19.00	21.00	0.75	17.50	1.50	15.75	1.00	5.25	17.25	19.25	0.75	15.75	1.50	15.75	1.00
DA700	700	1.00	0.50	5.25	20.00	22.00	0.75	18.50	1.50	17.00	1.00	5.25	18.50	20.50	0.75	17.00	1.50	17.00	1.00
DA800	800	1.00	0.50	5.75	21.00	23.00	1.00	19.50	1.50	18.00	1.00	5.50	19.50	21.50	0.75	18.00	1.50	18.00	1.00
DA900	900	1.00	0.50	6.25	22.00	24.00	1.00	20.50	1.75	19.25	1.25	6.25	20.75	22.75	1.00	19.25	1.75	19.25	1.25
DA1000	1000	1.00	0.50	6.50	23.00	25.00	1.00	21.50	1.75	20.25	1.25	6.50	21.75	23.75	1.00	20.25	1.75	20.25	1.25
DA1150	1150	1.00	0.50	6.50	24.00	26.00	1.00	22.50	1.75	21.50	1.25	6.50	23.00	25.00	1.00	21.50	1.75	21.50	1.25
DA1300	1300	1.00	0.50	6.75	26.00	28.00	1.00	24.50	1.75	22.50	1.25	6.75	24.00	26.00	1.00	22.50	1.75	22.50	1.25
DA1450	1450	1.00	0.50	6.75	27.00	29.00	1.00	25.50	1.75	24.25	1.25	6.75	25.75	27.75	1.00	24.25	1.75	24.25	1.25
DA1600	1600	1.00	0.50	7.75	28.00	30.00	1.25	26.50	2.25	25.25	1.25	7.50	26.75	28.75	1.00	25.25	2.25	25.25	1.25
DA1800	1800	1.00	0.50	8.00	29.00	31.00	1.25	27.50	2.25	26.50	1.50	8.00	28.00	30.00	1.25	26.50	2.25	26.50	1.50
DA2000	2000	1.00	0.50	8.00	31.00	33.00	1.25	29.50	2.25	27.50	1.50	8.00	29.00	31.00	1.25	27.50	2.25	27.50	1.50

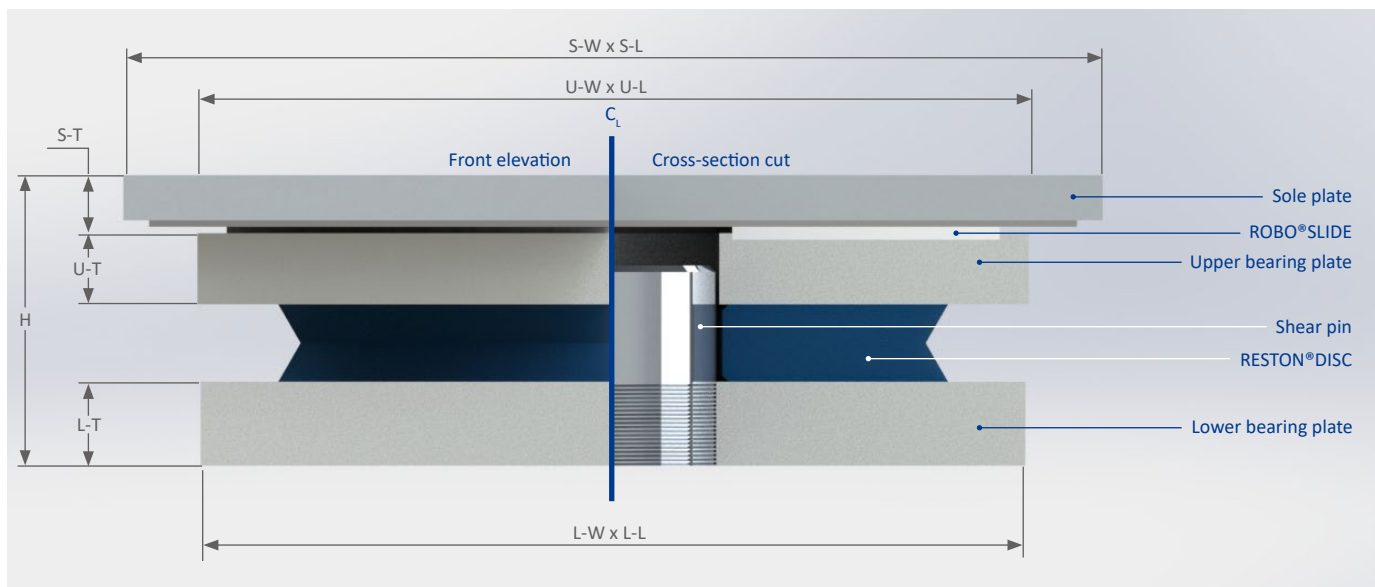


Structural bearings

RESTON® DISC Free Series (DA 3)

Design assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. Horizontal load => friction only [< 3%]
- C. Longitudinal movement capacity = + / - 3". transverse movement capacity = + / - 0.50"
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing

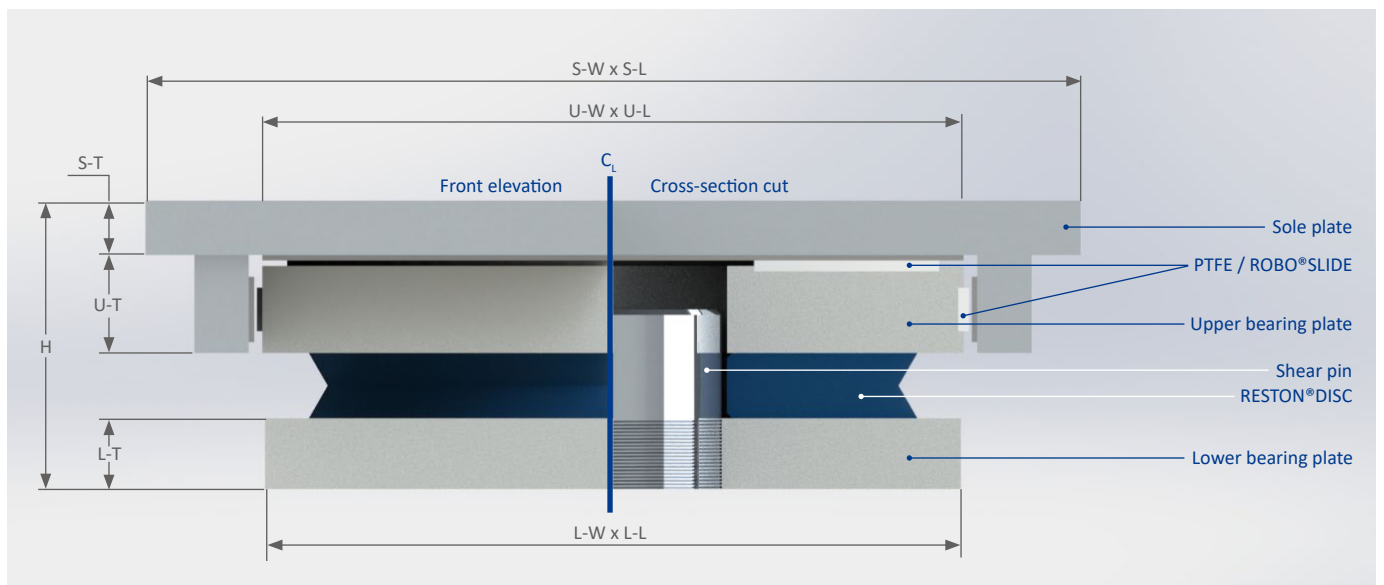


				Bearing Dimensions (inches)															
				Sliding Material → PTFE								Sliding Material → ROBO®SLIDE							
mageba Bearing Model	Service Vertical (kips)	Longitudinal Movement +/- (inches)	Transverse Movement +/- (inches)	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T
DA100	100	3.00	0.50	3.25	10.00	16.00	0.50	8.50	1.00	8.00	0.50	3.25	9.50	15.50	0.50	8.00	1.00	8.00	0.50
DA200	200	3.00	0.50	3.50	12.00	18.00	0.75	10.50	1.00	9.25	0.50	3.25	10.75	16.75	0.50	9.25	1.00	9.25	0.50
DA300	300	3.00	0.50	4.00	14.00	20.00	0.75	12.50	1.25	11.25	0.50	4.00	12.75	18.75	0.75	11.25	1.25	11.25	0.50
DA400	400	3.00	0.50	4.50	16.00	22.00	0.75	14.50	1.25	12.75	0.75	4.50	14.25	20.25	0.75	12.75	1.25	12.75	0.75
DA500	500	3.00	0.50	5.00	17.00	23.00	0.75	15.50	1.50	14.00	1.00	5.00	15.50	21.50	0.75	14.00	1.50	14.00	1.00
DA600	600	3.00	0.50	5.50	19.00	25.00	1.00	17.50	1.50	15.75	1.00	5.25	17.25	23.25	0.75	15.75	1.50	15.75	1.00
DA700	700	3.00	0.50	5.50	20.00	26.00	1.00	18.50	1.50	17.00	1.00	5.50	18.50	24.50	1.00	17.00	1.50	17.00	1.00
DA800	800	3.00	0.50	5.75	21.00	27.00	1.00	19.50	1.50	18.00	1.00	5.75	19.50	25.50	1.00	18.00	1.50	18.00	1.00
DA900	900	3.00	0.50	6.25	22.00	28.00	1.00	20.50	1.75	19.25	1.25	6.25	20.75	26.75	1.00	19.25	1.75	19.25	1.25
DA1000	1000	3.00	0.50	6.50	23.00	29.00	1.00	21.50	1.75	20.25	1.25	6.50	21.75	27.75	1.00	20.25	1.75	20.25	1.25
DA1150	1150	3.00	0.50	6.50	24.00	30.00	1.00	22.50	1.75	21.50	1.25	6.50	23.00	29.00	1.00	21.50	1.75	21.50	1.25
DA1300	1300	3.00	0.50	7.00	26.00	32.00	1.25	24.50	1.75	22.50	1.25	7.00	24.00	30.00	1.00	22.50	2.00	22.50	1.25
DA1450	1450	3.00	0.50	7.00	27.00	33.00	1.25	25.50	1.75	24.25	1.25	7.00	25.75	31.75	1.25	24.25	1.75	24.25	1.25
DA1600	1600	3.00	0.50	7.75	28.00	34.00	1.25	26.50	2.25	25.25	1.25	7.75	26.75	32.75	1.25	25.25	2.25	25.25	1.25
DA1800	1800	3.00	0.50	8.00	29.00	35.00	1.25	27.50	2.25	26.50	1.50	8.00	28.00	34.00	1.25	26.50	2.25	26.50	1.50
DA2000	2000	3.00	0.50	8.00	31.00	37.00	1.25	29.50	2.25	27.50	1.50	8.00	29.00	35.00	1.25	27.50	2.25	27.50	1.50

RESTON® DISC Guided Series (DG 1–15 %)

Design assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. Unfactored horizontal load = 10 % of service vertical load / factored horizontal load = 15 % of service vertical load
- C. Horizontal force in sliding direction => friction only [< 3 %]
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing



mageba Bearing Model	Service Vertical (kips)	Factored Horizontal (kips)	Longitudinal Movement +/- (inches)	Bearing Dimensions (inches)															
				Sliding Material → PTFE								Sliding Material → ROBO®SLIDE							
				H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T
DG100	100	15	1.00	3.75	11.75	12.00	1.00	8.50	1.00	8.00	0.50	3.75	11.25	11.00	1.00	8.00	1.00	8.00	0.50
DG200	200	30	1.00	4.50	14.25	14.50	1.00	11.00	1.25	11.00	0.50	4.50	14.25	14.00	1.00	11.00	1.25	11.00	0.50
DG300	300	45	1.00	4.75	16.25	16.00	1.00	12.50	1.50	12.50	0.50	4.75	16.25	15.50	1.00	12.50	1.50	12.50	0.50
DG400	400	60	1.00	5.00	18.25	18.00	1.00	14.50	1.50	13.50	0.75	5.00	17.25	16.50	1.00	13.50	1.50	13.50	0.75
DG500	500	75	1.00	5.50	19.25	19.00	1.00	15.50	1.75	15.50	0.75	5.50	19.25	18.50	1.00	15.50	1.75	15.50	0.75
DG600	600	90	1.00	6.00	21.75	20.50	1.00	17.50	1.75	17.50	1.00	6.00	21.75	20.50	1.00	17.50	1.75	17.50	1.00
DG700	700	105	1.00	6.25	22.75	21.50	1.25	18.50	1.75	18.50	1.00	6.25	22.75	21.50	1.25	18.50	1.75	18.50	1.00
DG800	800	120	1.00	6.75	23.25	22.50	1.25	19.00	1.75	19.00	1.25	6.75	23.50	22.00	1.25	19.00	1.75	19.00	1.25
DG900	900	135	1.00	7.00	24.50	23.50	1.25	20.00	1.75	19.50	1.50	7.00	24.00	22.50	1.25	19.50	1.75	19.50	1.50
DG1000	1000	150	1.00	7.50	25.50	24.50	1.50	21.00	2.00	21.00	1.50	7.50	25.50	24.00	1.50	21.00	2.00	21.00	1.50
DG1150	1150	172	1.00	8.25	27.50	26.50	1.50	23.00	2.25	23.00	1.75	8.25	27.50	26.00	1.50	23.00	2.25	23.00	1.75
DG1300	1300	195	1.00	8.75	29.00	27.50	1.50	24.00	2.25	24.00	2.00	8.75	29.00	27.00	1.50	24.00	2.25	24.00	2.00
DG1450	1450	217	1.00	8.75	30.00	28.50	1.50	25.00	2.25	24.50	2.00	8.75	29.50	27.50	1.50	24.50	2.25	24.50	2.00
DG1600	1600	240	1.00	9.25	31.00	29.50	1.75	26.00	2.50	25.50	2.00	9.25	30.50	28.50	1.75	25.50	2.50	25.50	2.00
DG1800	1800	270	1.00	9.50	32.50	31.00	1.75	27.50	2.50	26.50	2.25	9.50	31.50	29.50	1.75	26.50	2.50	26.50	2.25
DG2000	2000	300	1.00	9.75	34.00	32.00	1.75	28.50	2.50	27.50	2.25	9.75	33.00	30.75	1.75	27.50	2.50	27.50	2.25

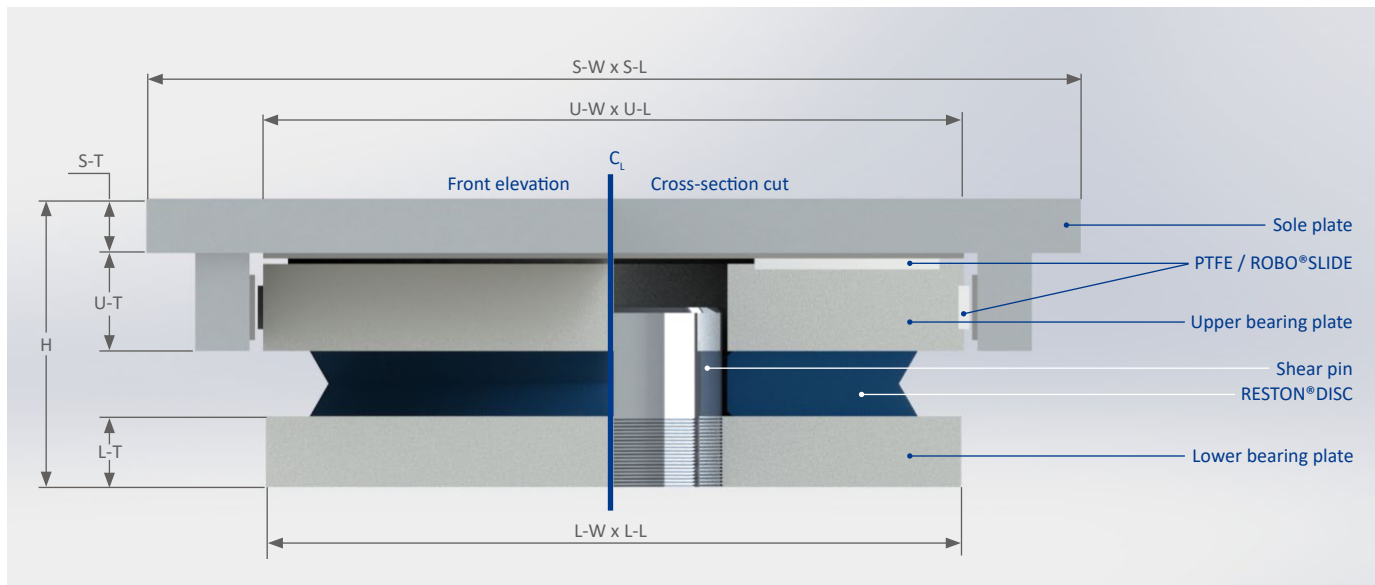


Structural bearings

RESTON® DISC Guided Series (DG 3–15 %)

Design assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. Unfactored horizontal load = 10 % of service vertical load / factored horizontal load = 15 % of service vertical load
- C. Horizontal force in sliding direction => friction only [< 3 %]
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing

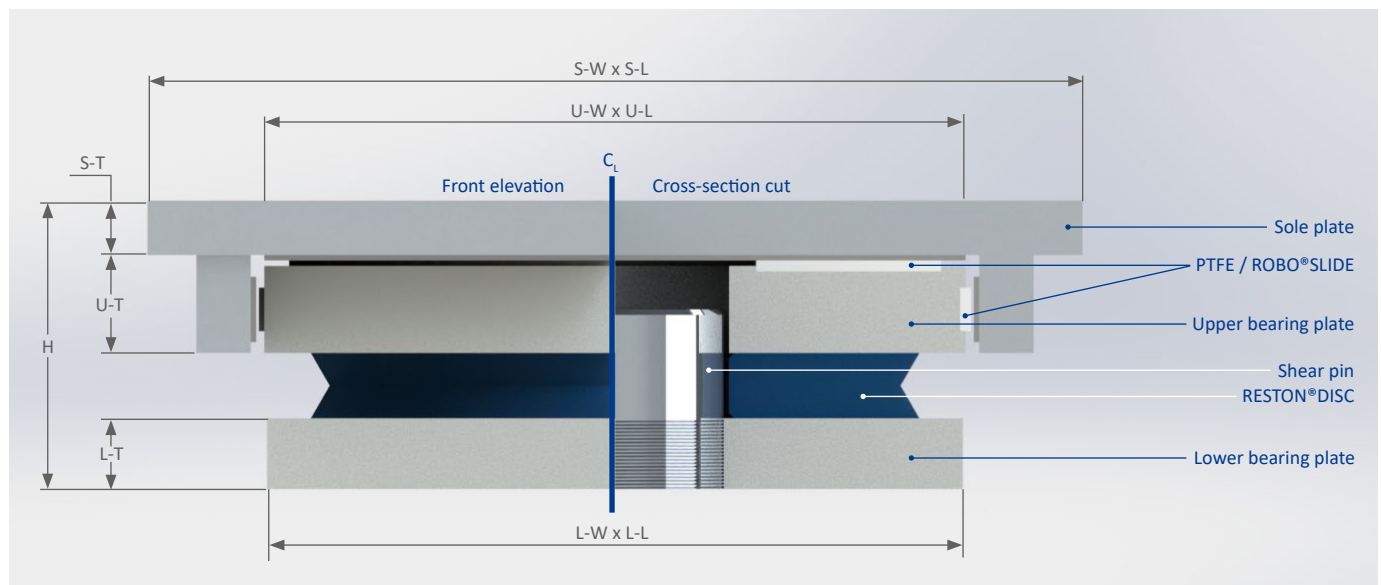


mageba Bearing Model	Service Vertical (kips)	Factored Horizontal (kips)	Longitudinal Movement +/- (inches)	Bearing Dimensions (inches)															
				Sliding Material → PTFE								Sliding Material → ROBO®SLIDE							
				H	S-W	S-L	S-T	U-W	U-L	L-W	L-L	L-T	H	S-W	S-L	S-T	U-W	U-L	L-W
DG100	100	15	3.00	3.75	11.75	16.00	1.00	8.50	1.00	8.00	0.50	3.75	11.25	15.00	1.00	8.00	1.00	8.00	0.50
DG200	200	30	3.00	4.50	14.25	18.50	1.00	11.00	1.25	11.00	0.50	4.50	14.25	18.00	1.00	11.00	1.25	11.00	0.50
DG300	300	45	3.00	4.75	16.25	20.00	1.00	12.50	1.50	12.50	0.50	4.75	16.25	19.50	1.00	12.50	1.50	12.50	0.50
DG400	400	60	3.00	5.00	18.25	22.00	1.00	14.50	1.50	13.50	0.75	5.00	17.25	20.50	1.00	13.50	1.50	13.50	0.75
DG500	500	75	3.00	5.50	19.25	23.00	1.00	15.50	1.75	15.50	0.75	5.50	19.25	22.50	1.00	15.50	1.75	15.50	0.75
DG600	600	90	3.00	6.00	21.75	24.50	1.00	17.50	1.75	17.50	1.00	6.00	21.75	24.50	1.00	17.50	1.75	17.50	1.00
DG700	700	105	3.00	6.00	22.75	25.50	1.00	18.50	1.75	18.50	1.00	6.00	22.75	25.50	1.00	18.50	1.75	18.50	1.00
DG800	800	120	3.00	6.75	23.25	26.50	1.25	19.00	1.75	19.00	1.25	6.75	23.50	26.00	1.25	19.00	1.75	19.00	1.25
DG900	900	135	3.00	7.00	24.50	27.50	1.25	20.00	1.75	19.50	1.50	7.00	24.00	26.50	1.25	19.50	1.75	19.50	1.50
DG1000	1000	150	3.00	6.75	25.50	28.50	1.25	21.00	2.00	21.00	1.00	6.75	25.50	28.00	1.25	21.00	2.00	21.00	1.00
DG1150	1150	172	3.00	7.25	27.50	30.50	1.25	23.00	2.00	23.00	1.25	7.25	27.50	30.00	1.25	23.00	2.00	23.00	1.25
DG1300	1300	195	3.00	7.75	29.00	31.50	1.50	24.00	2.25	24.00	1.25	7.75	29.00	31.00	1.50	24.00	2.25	24.00	1.25
DG1400	1450	217	3.00	7.75	30.00	32.50	1.50	25.00	2.25	24.50	1.25	7.75	29.50	31.50	1.50	24.50	2.25	24.50	1.25
DG1600	1600	240	3.00	8.50	31.00	33.50	1.50	26.00	2.25	25.50	1.75	8.50	30.50	32.50	1.50	25.50	2.25	25.50	1.75
DG1800	1800	270	3.00	9.25	32.50	35.00	1.75	27.50	2.50	26.50	2.00	9.25	31.50	34.00	1.75	26.50	2.50	26.50	2.00
DG2000	2000	300	3.00	9.75	34.00	36.00	1.75	28.50	2.50	27.50	2.25	9.75	33.25	34.50	1.75	27.50	2.50	27.50	2.25

RESTON® DISC Guided Series (DG 1–30 %)

Design assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. Unfactored horizontal load = 20 % of service vertical load / factored horizontal load = 30 % of service vertical load
- C. Horizontal force in sliding direction => friction only [< 3 %]
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing



mageba Bearing Model	Service Vertical (kips)	Factored Horizontal (kips)	Longitudinal Movement +/- (inches)	Bearing Dimensions (inches)															
				Sliding Material → PTFE								Sliding Material → ROBO®SLIDE							
				H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T
DG100	100	30	1.00	4.00	12.75	12.50	1.00	9.00	1.25	8.00	0.50	4.00	11.75	11.00	1.00	8.00	1.25	8.00	0.50
DG200	200	60	1.00	4.75	14.75	14.50	1.00	11.00	1.25	11.00	0.75	4.75	14.75	14.00	1.00	11.00	1.25	11.00	0.75
DG300	300	90	1.00	5.50	17.25	16.50	1.25	13.00	1.50	12.50	1.00	5.50	16.75	15.50	1.25	12.50	1.50	12.50	1.00
DG400	400	120	1.00	5.75	19.00	18.00	1.25	14.50	1.75	13.50	1.00	5.50	18.00	16.50	1.25	13.50	1.50	13.50	1.00
DG500	500	150	1.00	6.75	20.50	19.00	1.50	15.50	2.00	15.50	1.25	6.50	20.50	18.50	1.50	15.50	1.75	15.50	1.25
DG500	600	180	1.00	7.50	22.50	20.50	1.50	17.50	2.00	17.50	1.75	7.25	22.50	20.50	1.50	17.50	1.75	17.50	1.75
DG700	700	210	1.00	8.00	24.00	21.50	1.75	18.50	2.25	18.50	1.75	7.75	24.00	21.50	1.75	18.50	2.00	18.50	1.75
DG800	800	240	1.00	8.50	25.00	22.50	1.75	19.50	2.25	19.50	2.00	8.25	25.25	22.50	1.75	19.50	2.00	19.50	2.00
DG900	900	270	1.00	8.50	26.00	24.00	2.00	20.50	2.25	20.00	1.75	8.25	25.75	23.00	2.00	20.00	2.00	20.00	1.75
DG1000	1000	300	1.00	8.75	27.25	25.00	2.00	21.50	2.50	21.00	1.75	8.50	26.75	24.00	2.00	21.00	2.25	21.00	1.75
DG1150	1150	345	1.00	9.50	29.25	26.50	2.25	23.00	2.50	23.00	2.00	9.00	29.25	26.00	2.00	23.00	2.25	23.00	2.00
DG1300	1300	390	1.00	10.25	30.25	27.50	2.25	24.00	2.75	24.00	2.50	9.75	30.25	27.00	2.25	24.00	2.25	24.00	2.50
DG1450	1450	435	1.00	10.50	31.25	28.50	2.38	25.00	2.75	24.50	2.50	9.75	30.75	27.50	2.25	24.50	2.25	24.50	2.50
DG1600	1600	480	1.00	11.00	32.75	29.50	2.50	26.00	3.00	25.50	2.50	10.50	32.50	28.50	2.50	25.50	2.50	25.50	2.50
DG1800	1800	540	1.00	11.25	34.50	31.00	2.75	27.50	3.00	27.00	2.50	10.75	34.00	30.00	2.75	27.00	2.50	27.00	2.50
DG2000	2000	600	1.00	12.00	37.00	32.50	2.75	29.50	3.25	29.50	2.75	11.25	37.00	32.50	2.75	29.50	2.50	29.50	2.75

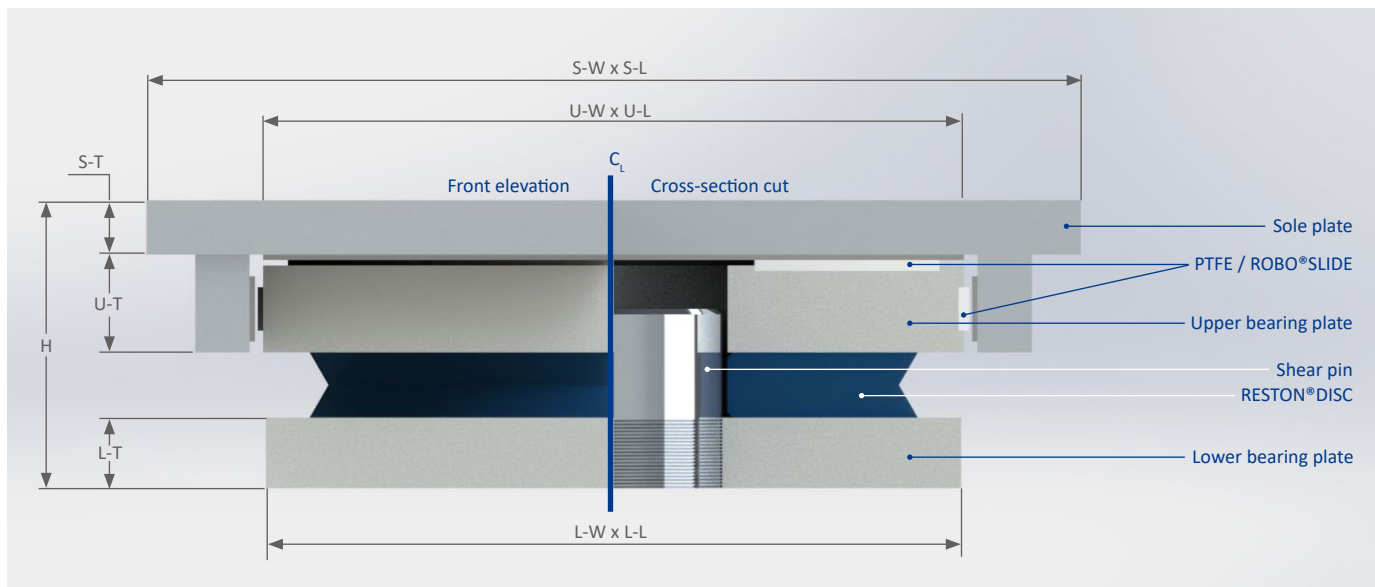


Structural bearings

RESTON® DISC Guided Series (DG 3–30 %)

Design Assumptions:

- A. Design basis => AASHTO LRFD 7th edition, with 2016 Interims
- B. Unfactored horizontal load = 20 % of service vertical load / factored horizontal load = 30 % of service vertical load
- C. Horizontal force in sliding direction => friction only [< 3 %]
- D. Service rotation = 0.02 rad [+ 0.005 rad added for the factored vertical load case per LRFD 14.4.2.2.2, for tolerances]
- E. Minimum vertical load => 40 % of maximum service vertical load
- F. Superstructure => steel, substructure => concrete 4,500 psi
- G. Polyether urethane disc = 5 ksi allowable stress
- H. Steel => ASTM A709 Gr.50, corrosion protection => 3 coat paint OR zinc metalizing



mageba Bearing Model	Service Vertical (kips)	Factored Horizontal (kips)	Longitudinal Movement +/- (inches)	Bearing Dimensions (inches)															
				Sliding Material → PTFE								Sliding Material → ROBO®SLIDE							
				H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T	H	S-W	S-L	S-T	U-W U-L	U-T	L-W L-L	L-T
DG100	100	30	3.00	4.00	12.75	16.50	1.00	9.00	1.25	8.00	0.50	4.00	11.75	15.00	1.00	8.00	1.25	8.00	0.50
DG200	200	60	3.00	4.75	14.75	18.50	1.00	11.00	1.25	11.00	0.75	4.75	14.75	18.00	1.00	11.00	1.25	11.00	0.75
DG300	300	90	3.00	5.25	17.25	20.50	1.00	13.00	1.50	12.50	1.00	5.25	16.75	19.50	1.00	12.50	1.50	12.50	1.00
DG400	400	120	3.00	5.75	19.00	22.00	1.25	14.50	1.75	13.50	1.00	5.50	18.00	20.50	1.25	13.50	1.50	13.50	1.00
DG500	500	150	3.00	6.50	20.50	23.00	1.25	15.50	2.00	15.50	1.25	6.25	20.50	22.50	1.25	15.50	1.75	15.50	1.25
DG600	600	180	3.00	7.50	22.50	24.50	1.50	17.50	2.00	17.50	1.75	7.25	22.50	24.50	1.50	17.50	1.75	17.50	1.75
DG700	700	210	3.00	8.00	24.00	25.50	1.75	18.50	2.25	18.50	1.75	7.50	24.00	25.50	1.50	18.50	2.00	18.50	1.75
DG800	800	240	3.00	8.50	25.00	26.50	1.75	19.50	2.25	19.50	2.00	8.25	25.25	26.50	1.75	19.50	2.00	19.50	2.00
DG900	900	270	3.00	8.50	26.00	28.00	1.75	20.50	2.25	20.00	2.00	8.25	25.75	27.00	1.75	20.00	2.00	20.00	2.00
DG1000	1000	300	3.00	9.00	27.00	29.00	2.00	21.50	2.50	21.00	2.00	8.50	26.75	28.00	1.75	21.00	2.25	21.00	2.00
DG1150	1150	345	3.00	9.25	29.00	30.50	2.00	23.00	2.50	23.00	2.00	9.00	29.25	30.00	2.00	23.00	2.25	23.00	2.00
DG1300	1300	390	3.00	10.25	30.25	31.50	2.25	24.00	2.75	24.00	2.50	9.50	30.25	31.00	2.00	24.00	2.25	24.00	2.50
DG1450	1450	435	3.00	10.25	31.25	32.50	2.25	25.00	2.75	24.50	2.50	9.75	30.75	31.50	2.25	24.50	2.25	24.50	2.50
DG1600	1600	480	3.00	11.00	32.75	33.50	2.50	26.00	3.00	25.50	2.50	10.50	32.50	32.50	2.50	25.50	2.50	25.50	2.50
DG1800	1800	540	3.00	11.00	34.50	35.00	2.50	27.50	3.00	27.00	2.50	10.50	34.00	34.00	2.50	27.00	2.50	27.00	2.50
DG2000	2000	600	3.00	12.00	36.50	37.00	2.75	29.50	3.25	29.50	2.75	11.00	36.50	36.50	2.50	29.50	2.50	29.50	2.75



Specifications with PTFE or ROBO®SLIDE

SECTION I. – Design

- A. Disc Bearings shall be designed in accordance with AASHTO LRFD Design Specifications – Section 18, 7th Edition.
- B. The bearing supplier shall be certified by the American Institute of Steel Construction (AISC) Standard for Bridge & Highway Metal Component Manufacturers (AISC 204-08).
- C. Prior to start of fabrication of bearings, the bearing supplier shall submit structural calculations and drawings of bearings to the Engineer for review & approval.
- D. The polyether urethane rotational disc element shall be designed for a maximum average compressive stress of 5 ksi. The area considered for compressive stress calculation shall exclude the outer V notch of the disc.
- E. The central shear resisting element shall be designed to withstand the horizontal forces provided on the contract plans. Adequate clearance shall be provided between the shear resisting element and the bearing plate, to accommodate rotations specified on the contract plans.

F. In case of PTFE sliding material:

The PTFE sliding material shall be designed such that the maximum stresses do not exceed allowable values specified in section 14.7.2.4 and table 14.7.2.4-1 of AASHTO LRFD Design Specifications.

In case of mageba ROBO®SLIDE sliding material:

The sliding material shall be designed such that the maximum stresses do not exceed the allowable values established through manufacturer's testing of the material. Testing report showing the allowable stresses shall be submitted to the engineer for review and acceptance. See sections 2.D, 5.C, 5.D for additional requirements.

SECTION II. – Materials

Materials shall conform to the following standards:

- A. **Steel:** ASTM A709/A572/A588 - Grade 50
- B. **Stainless steel mating surface:** ASTM A240 - Type 304, with number 8 mirror finish on sliding face
- C. **Rotational disc:** Polyether urethane with properties meeting requirements of table 18.3.2.8-1 of AASHTO LRFD Construction specifications.

D. Sliding material:

In case of PTFE sliding material:

- Bearing sliding material shall meet the requirements of section 14.7.2 of AASHTO LRFD Design Specifications.

In case of mageba ROBO®SLIDE sliding material:

Bearing sliding material shall meet following requirements:

- Characteristic permissible pressure $f_k > 26$ ksi
- Minimum thickness $> 1/4"$
- Friction coefficient $\mu < 0.046$ with $\sigma > 2.9$ ksi, and $\mu < 0.030$ with $\sigma > 5.6$ ksi at temperature $> -31^\circ\text{F}$
- Accumulated sliding path > 30 miles with no greater than 5 % loss of material thickness.

Test certificates stamped by an independent agency shall be provided to show compliance of sliding material to the above four requirements.

SECTION III. – Fabrication

- A. Fabrication tolerances shall be as per table 18.1.4.2-1 of AASHTO LRFD Construction specifications.
- B. General shop practices shall be governed by ANSI/AASHTO/AWS D1.5 Bridge Welding Code, except for stainless steel welding which shall conform to AWS D1.6 Structural Welding Code – Stainless Steel.
- C. All sharp edges shall be broken, to $1/16"$ radius.
- D. Bearings shall be provided with temporary lifting device to hold the entire bearing as a single unit, for safe transport & lifting.
- E. Stainless steel shall be minimum 14 gauge thick and shall be seal welded all around the supporting steel plate by gas tungsten arc welding (GTAW) process.

In case of PTFE sliding material:

Sliding material shall be recessed into a sharp-edged recess of a depth equal to half of the sliding material thickness.

In case of mageba ROBO®SLIDE sliding material:

Sliding material shall be shrink fitted into a sharp-edged recess of a depth equal to $5/8$ th of the sliding material thickness.

SECTION IV. – Corrosion Protection

Corrosion protection of steel components shall be **one** of the following:

- A. Three (3) coat paint system with total dry film thickness of 8-13 mils.
- B. Zinc metalizing per AWS C2.23M/NACE No.12 SSPC-CS 23.00, with total thickness between 10-16 mils.

Prior to application of coatings, all mill scale shall be removed from the steel surfaces, by grit blasting in accordance with SSPC-SP10.

SECTION V. – Testing

Upon completion of fabrication, bearings shall be sampled in accordance with AASHTO LRFD Construction Specifications – Sections 18.3.4.1 & 18.3.4.2.

Prior to beginning of testing, the bearing supplier shall submit the testing protocol and procedures, meeting the requirements specified below, to the Engineer for review and approval.

Following testing shall be performed on the sampled bearings:

- A. Short term proof load test in accordance with section 18.3.4.4.4
- B. Coefficient of friction test in accordance with section 18.1.5.2.6

The following testing shall be performed on 1 sample bearing, unless such testing has been conducted by the bearing supplier in past, in presence of an independent agency. If waiver of this test is being requested, the bearing supplier shall submit the test report for review and approval. Report submitted without the sign and stamp of an independent agency shall not be accepted.

In case of PTFE sliding material:

Long term deterioration testing in accordance with section 18.1.5.2.7. The test may be conducted on a scaled down sample.

In case of mageba ROBO®SLIDE sliding material:

Long term deterioration testing in accordance with section 18.1.5.2.7. The test may be conducted on a scaled down sample.

Sliding material durability testing to meet requirement of 30 miles of accumulated sliding path with no greater than 5% loss of material thickness.

The above two tests may be combined, by extending the 1,000 cycles of flat sliding in the long term deterioration test, to reach 30 miles of total accumulated sliding path.



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 their 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.

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:

- Surface preparation: SSPC-SP10 (near white condition)
- Zinc paint primer or 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 on past projects:

- 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.



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

Reference Projects – RESTON®DISC Bearings



St. Croix Bridge (US)



Bayonne Bridge (US)



Ohio River Bridge (US)



Atlanta Airport (US)

mageba Structural Bearings



Pot Bearings



Deformation Bearings



Spherical Bearings



Lifting/Measuring Bearings

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