

MAURER Structural Bearings

State of the art of sustainable solutions



Raymond Barre Bridge, Lyon / France

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Experience in innovation

The MAURER Group is a leading specialist in mechanical engineering and steel construction and has been family-owned since it was formed back in 1876. The MAURER Group is currently one of the global technological leaders in steel and plant construction in various specialist fields. We offer products, solutions and services which are particularly notable for their quality, durability and reliability.

Four areas of application for a customised Structural Protection System

- **Structural Bearings**
- **Expansion Joints**
- **Tuned Mass Dampers**
- **Seismic Devices**



STRUCTURAL BEARINGS



EXPANSION JOINTS



TUNED MASS DAMPERS



SEISMIC DEVICES



MAURER headquarters, Munich / Germany

Traffic, wind, seismic and human-induced movements and rotations in buildings, bridges and complex structures can be controlled through selective use of expansion joints, structural bearings, tuned mass dampers and seismic devices to protect the structures from damage.

We also offer the following services:

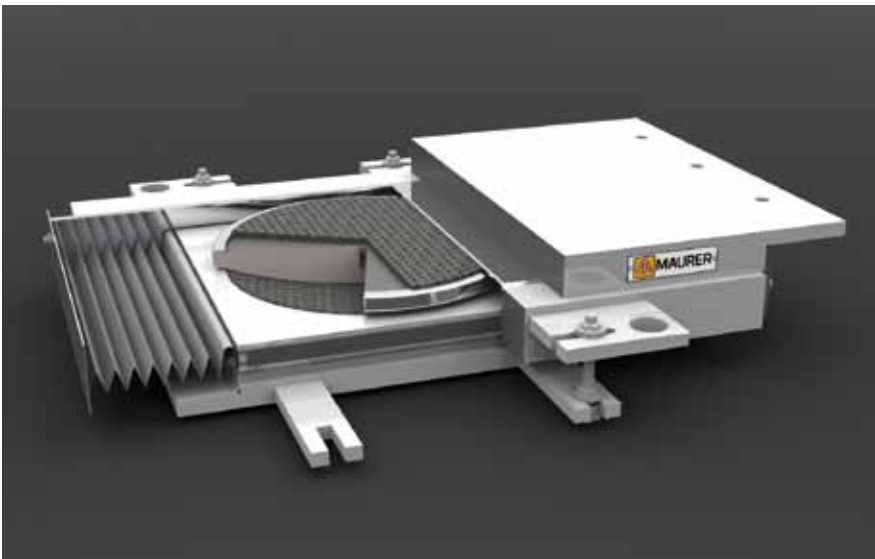
>> SUPERVISION & TRAINING

Inspection
Maintenance
Refurbishments
Training courses

>> STATIC & DYNAMIC ANALYSIS

FE analysis
Component testing
Design planning
Monitoring

MAURER Structural Bearings



Spherical bearing made from MAURER sliding alloy MSA®

Vibrations, rotations and powerful forces – bridges and superstructures may undergo a turbulent life. MAURER Structural Bearings ensure at any place that these impacts remain as long as possible without consequences. In order to guarantee the quality and longevity of our products, we strive for highest precision, continuous monitoring and close cooperation with the official material testing institutes during the production process.

Bearings transmit vertical and horizontal loads from the superstructure into the bottom structure allowing for rotations and relative displacements where necessary.

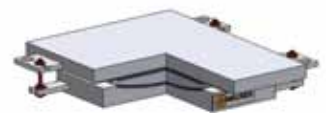
Depending on their ability to compensate for displacements and transmit horizontal forces, all types of bearings can be divided into:




>> FIXED:
The bearing transmits external horizontal forces both in longitudinal and transversal direction, rotations enabled, whereas displacements are not allowed.




>> GUIDED-SLIDING:
The bearing accommodates for displacements in one plane direction and transmits external horizontal forces in the other, rotations enabled.



>> FREE-SLIDING:
The bearing accommodates for displacements in both plane directions, rotations enabled, and does not transmit any horizontal forces.

 All types of bearings can be designed to be connected to a concrete interface by means of dowels or studs, or to a steel interface by means of screws or shear keys. On demand, the bearings can be supplied with anchor plates to ease future replacements.

 All our bearings are CE-marked according to EN 1337 and ETA-06/0131 as a sign that they fulfil all the requirements of the standards and that they are manufactured in facilities under continuous surveillance. We also supply bearings compliant to AASHTO, the German and several other national standards and project requirements as well as for nuclear applications.

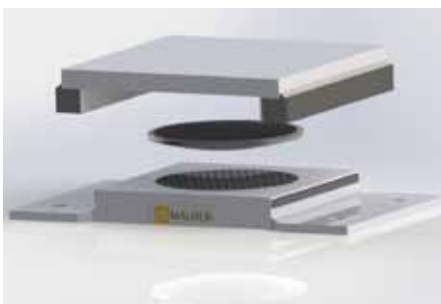
>> MAURER MSM® / MSA® Spherical Bearings

For nearly 50 years, MAURER has been the market leader in design and production of spherical bearings. Resembling the construction principle of a hinge, spherical bearings enable reaching the smallest possible footprint and very high rotations with low resistance.

A spherical calotte which rotates with low friction on an MSM® layer allows for rotations around the main axes. The displacements are achieved by a second MSM® layer sliding on a stainless steel or coated mating surface, while lateral forces are transmitted by suitable guides.

To achieve low friction coefficients, the MSM® discs are provided with dimples storing grease to guarantee a permanent and continuous lubrication of the sliding surfaces, whilst the mating surfaces are finished with the smallest surface roughness. The sliding material is mechanically recessed to secure its position.

Another innovation from MAURER, MSA® calotte (spherical part), is made from MAURER Sliding Alloy. MSA® is a corrosion resistant material and allows to reduce the tolerances on the calotte surface compared to the chrome machined calotte surface. This leads to an increased life time of the completed bearing.



MAURER Guided Spherical Bearing, exploded view



MAURER MSM® Spherical Bearing for 220,000 kN vertical load

>> COMPONENTS

KF/KGA

- A steel lower part with a concave seat for the sliding material and suitable connections to the structure
- A convex calotte sliding on a layer of sliding material at the top and the bottom
- A stainless steel sliding sheet fastened on an upper steel plate with suitable connections to the structure
- Restraining ring for KF

KGE/KGEQ

- A steel lower part with a concave seat for the sliding material and suitable connections to the structure
- A calotte sliding on a layer of sliding material at the top and the bottom
- A stainless steel sliding sheet fastened on an upper steel plate with suitable connections to the structure
- Guides with MSM®

>> **LEGEND:**  Road bridges  Railway bridges  Building construction

>> Key characteristics of MAURER Spherical Bearings

- ✓ Lowest friction (low rotational and sliding resistance)
- ✓ Ideal solution in terms of sliding properties, bearing surface and service life
- ✓ Ageing-resistant thanks to the use of MSM®, corrosion-free MSA® and structural steel
- ✓ Adjustment of rotations and extreme vertical and horizontal loads without gapping
- ✓ Smallest possible footprint
- ✓ Suitable for a temperature range from -50 °C to +70 °C from polar region to desert climate
- ✓ According to ETA-06/0131, EN 1337 or AASHTO
- ✓ Service life of 50 years plus
- ✓ Working in harsh atmospheric conditions
- ✓ Possibility of rotation and displacement presetting
- ✓ Maintenance-free



Allianz Arena, Munich / Germany

>> What is MSM®?

MSM® stands for MAURER Sliding Material. The name is a registered brand.

MSM® is a patented, high-performance sliding material for structural bearings. An ultra high molecular polyethylene modified with various additives, featuring enhanced sliding characteristics. In comparison to usual PTFE, MSM® is characterised by substantially higher durability, twice as high allowable pressure and therefore smaller dimensions as well as lower sliding resistance.

MSM® does not contain regenerated or filling material or any environmentally hazardous components, like fluorine or chlorine.

MSM® is insensitive to chemical contamination and ageing.

MSM® is exclusively produced for MAURER products.



MAURER MSM®

>> MSM® material characteristics

MSM® is particularly suitable for high-speed motion, displaying less wear at a 7.5-fold displacement speed compared to PTFE.

MSM® can take high loads (in comparison to PTFE double contact pressure).

MSM® is suitable for use within a temperature range from -50 °C to +70 °C (whereas PTFE is suitable only from -35 °C to +48 °C with decreasing load bearing capacity at temperatures above 30 °C).

MSM® causes little friction: The design value of friction is < 1.5% at -5 °C, < 2% at -35 °C and < 3% at -50 °C effective bearing temperature.

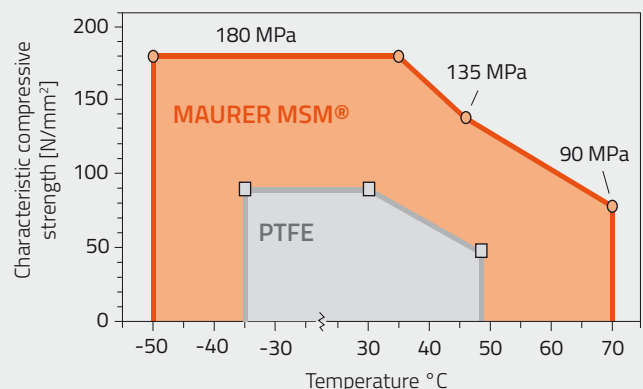
MSM® reaches an extremely long service life (compared to PTFE, 5-fold accumulated sliding displacement without visible signs of wear).

MSM® can accommodate for concrete setting and evenness deviations due to its elastoplastic behaviour (whereas rigid sliding materials may lead to local overstress and wear).

>> The compression at ULS shall be at least 1.0 mm.

>> Thus, MAURER MSM® Spherical Bearings achieve a drastic footprint reduction especially at high loads and make relevant structural savings possible.

MSM®	PTFE	MAURER MSM®
Certified sliding distance	10 km	50 km
Certified sliding speed	2 mm/s	15 mm/s
Design friction	3%	2%
Design life	10 years	50 years



>> MAURER Pot Bearings

The structural rotations are adjusted thanks to an elastomeric pad, which responds with high vertical stiffness and low rotation resistance, confined into a steel pot.

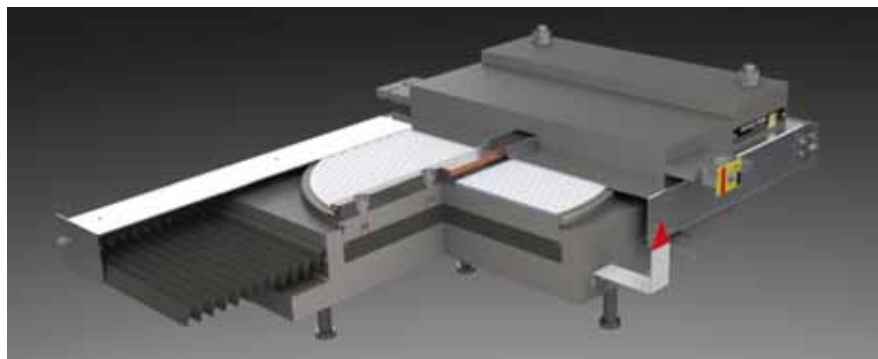
The displacements are adjusted by a PTFE layer sliding on a stainless steel sheet.

For guided or fixed bearings, external lateral forces are transmitted by suitable restraints or guides.

The durability of the internal seal is a crucial point. Our patented PTFE/carbon internal seal has been tested for 2 km accumulated rotations without wear.



MAURER Pot Bearing



MAURER Pot Bearing TGE

>> COMPONENTS

TF

- A steel pot with suitable connections to the structure
- An elastomeric pad, which is confined in the steel pot
- A patented Carbon/PTFE or MSM® seal ensures that the elastomeric pad cannot flow out of its seat
- An upper steel piston with suitable connections to the structure

TGA – TGE – TGEQ

- A steel pot with suitable connections to the structure
- An elastomeric pad, which is confined in the steel pot
- A patented seal ensures that the elastomeric pad cannot flow out of its seat
- A piston with a PTFE layer on top and a guiding system for the guided bearings TGE and TGEQ
- A mating surface or a stainless steel sliding sheet fastened on an upper backing plate with suitable connections to the structure

>> Key characteristics of MAURER Pot Bearings

- ✓ Cost-effective solution for moderate and small horizontal loads
- ✓ Use of highest quality seals according to EN1337-5
- ✓ Service life of 10 – 25 years
- ✓ Allowable temperatures from -35 °C to +50 °C
- ✓ Available in accordance with EN 1337-5 and AASHTO



Rhine Bridge, Wesel / Germany

>> MAURER Elastomeric Bearings



MAURER Elastomeric Bearing

MAURER Elastomeric Bearings are available in natural or chloroprene rubber with steel reinforcement plates. Depending on their type, they can also transmit external forces by means of guides or restraints.

When the rubber pad undergoes a displacement, it generates an elastic force proportional to the displacement.

Our elastomeric bearings are produced at our own facilities.

The regular shear modulus (Gg) of elastomeric bearings is 0.9 MPa. On request, we supply bearings with other shear moduli and according to requirements of the project or other standards, e.g. AASHTO.

In case the horizontal displacements exceed the design limits of the elastomeric bearing, an additional sliding plate permits displacements without shear deformation of the bearing.

>> COMPONENTS

Type A/B/C/B-C/D/E/F Reinforced rubber pad V/V1/V2

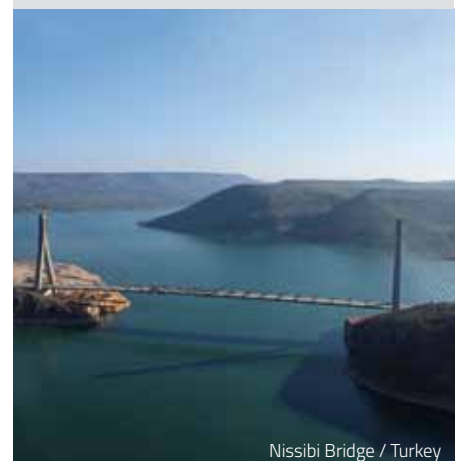
- A lower steel plate with suitable connections to the pad and to the structure
- A reinforced rubber pad
- An upper steel plate with suitable connections to the pad and to the structure
- Lead rubber bearings used for higher energy dissipation



Volmetal Bridge, Hagen / Germany

>> Key characteristics of MAURER Elastomeric Bearings

- ✓ Cost-effective solution for minor loads, movements and rotations
- ✓ CR and NR design, round and square layouts
- ✓ Special forms and different shear moduli available on demand
- ✓ Service life of 10 – 25 years
- ✓ For use within a temperature range from -40 °C to +50 °C
- ✓ Available in accordance with EN 1337-3 or AASHTO



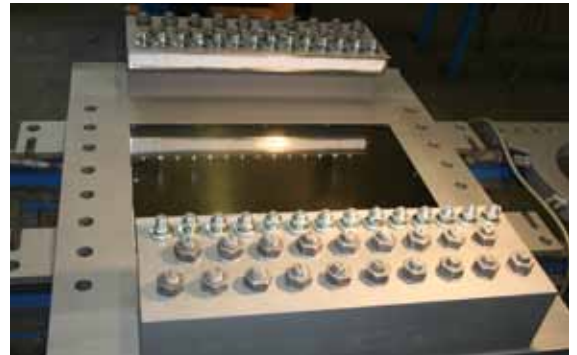
Nissibi Bridge / Turkey

>> MAURER Special Bearings

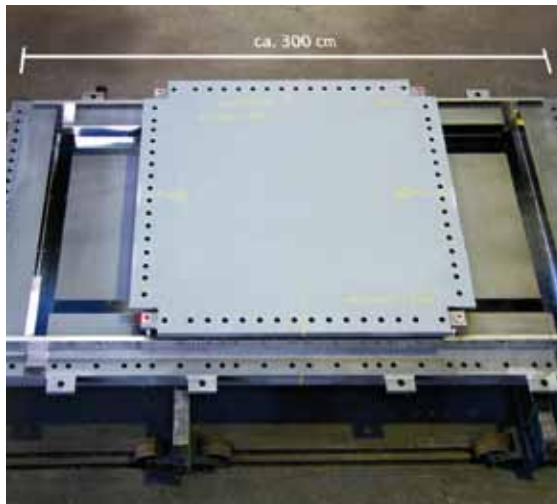
MAURER also delivers structural bearings for special applications and extraordinary areas of use. The solutions we offer are individual and highly efficient, exceeding by far the common types of structural bearings.

>> MAURER UPLIFT SPHERICAL BEARINGS

MAURER Uplift Spherical Bearings enable the transfer and support of vertical compressive and tractive forces without slack and in combination with any rotation and displacement. The uplift forces can also occur with the combination of rotation in SLS case. MAURER Uplift Spherical Bearings are particularly suitable for complex structures with strongly varying loads and deformations, e.g. railroad bridges. As an alternative, all our bearings can be equipped with simple side clamps against uplift.



MAURER Uplift Spherical Bearing



MAURER Shear Keys

>> SHEAR KEYS

MAURER Shear Keys comply with EN 1337-8 and transfer horizontal forces while accommodating for rotations and, if necessary, displacements.

>> SPECIAL LAUNCHING BEARINGS

MAURER Special Launching Bearings enable launching the structure with the lowest possible friction thanks to MSM® and can be directly connected to the launching presses.



Balancelles Viaduct, Millau / France

>> MAURER ROLLER BEARINGS

Roller bearings are only used in exceptional cases, e.g. maintenance work, since they can only rotate around one axis. MAURER Roller Bearings are available in structural steel with CE marking according to EN 1337-4 or in a compact design with an overlay-welded outer surface according to the General Technical Approval of DIBt (Deutsches Institut für Bautechnik).



MAURER Roller Bearings



MAURER Bearings with Load Measurement

>> MAURER BEARINGS WITH LOAD MEASUREMENT

In order to survey load modifications, our bearings can be equipped with sensors to continuously monitor the load. MAURER Bearings with Load Measurement are available as pot bearings, elastomeric bearings and spherical bearings.



MAURER Spherical Segment Bearing

>> MAURER SPHERICAL SEGMENT BEARINGS

MAURER MSM®/MSA® Spherical Segment Bearings can be designed to suit complex geometries on site and are primarily used for the refurbishment of roller bearings, combining the possibility of rotating around any axis with the superior performances of MSM® and MSA®.

>> Key characteristics of MAURER Structural Bearings

- ✓ Comprehensive analysis of technical requirements
- ✓ 140 years of manufacturer responsibility and experience
- ✓ Selection of convenient products
- ✓ Broad knowledge of local and international standards
- ✓ High experience in technical design and development
- ✓ Over 30,000 references with bridge bearings in 65 countries
- ✓ Long-lasting certified material components
- ✓ Enhanced production techniques
- ✓ Quality assurance and third-party control
- ✓ Inhouse research and development

PARAMETER	MSM® SPHERICAL	PTFE POT	ELASTOMERIC
Design pressure on the bearing	128 N/mm ²	46 N/mm ²	15–30 N/mm ²
Size requirement	small	medium	large
Movement	no limitation	no limitation	shear of rubber
Rotation capacity	No limitation	limited	limited
Temperature	-50 °C – +70 °C	-35 °C – +48 °C	-40 °C – +50 °C
Speed	15 mm/s	2 mm/s	Depends on stiffness
Forces caused by a displacement	low	medium	high
Ageing	no ageing	yes	yes
Lifetime expectation	> 50 years	10 – 25 years	10 – 25 years

MAURER Services



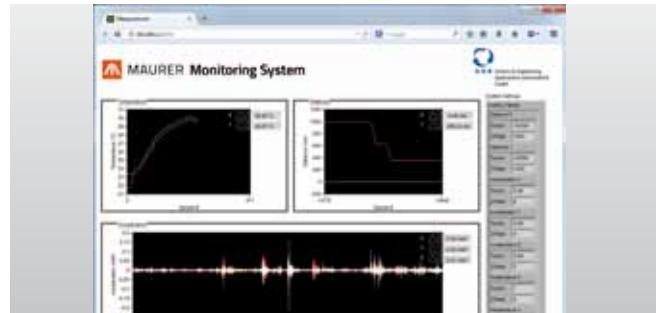
Installation Botlekbrug, Netherlands

>> INSTALLATION

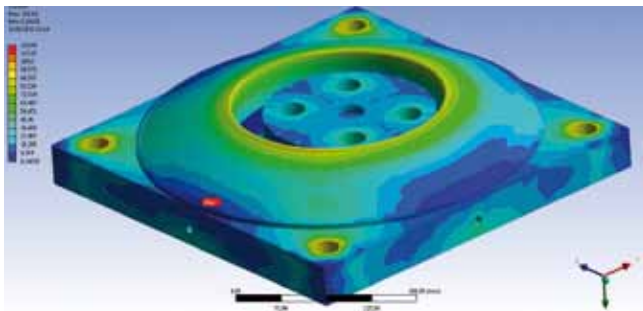
Our specialists are ready to advise and assist the customer in every project phase. We professionally install our systems in new and existing structures with special attention to refurbishments. We coordinate the supervision or train others to become certified installation personnel.

>> MONITORING

Our monitoring system can be used to permanently record and monitor forces, displacements, accelerations and temperatures, which have an impact on the structure and its structural protection system. This data provides the basis for documenting loads, carrying out inspections and further enhancing the protection system.



MAURER Monitoring System



Finite element analysis

>> CONSULTING

The exceptional strength of our team is its comprehensive technical expertise and its extensive experience. Our engineers have proven that we understand the causes of complex situations and develop the best possible solutions for projects with extraordinary requirements around the world.

>> INSPECTION

Regular inspections of our products located in the structure increase the service life and safety for the user, because any damage can be detected at an early stage. It is therefore possible to identify in good time whether there is any need for refurbishment and repairs can be carried out at at low cost.



Inspection of bridge bearings



MAURER Certificates

>> MAURER bearings withstand the world's toughest certification processes.



The CE marking ensures certified quality and compliance with the European Standards. Third-party control is required, e. g. by the Materials Testing Institute (MPA) of Stuttgart University or other notified, independent institutions.

>> MAURER type plate

 MAURER	TYP	1.	kN	R-NR	6.	 0672-CPD-001			
	A-NR	2.		R-NR	7.				
	K-NR	3.		ORT	8.				
	$v_x \pm$	4.	e_{vx}	5.	$v_y \pm$		9.	e_{vy}	10.

- | | | |
|------------------------|----------------------------|----------------------------|
| 1. Storage type | 4. Displacement | 7. Set of Rules Standard 2 |
| 2. Job number and year | 5. Presetting | 8. Installation location |
| 3. Page number | 6. Set of Rules Standard 1 | 9. + 10. Presetting |

>> Excerpt from certificates and European Technical Approvals for

MAURER MSM® Spherical and Cylindrical Bearings
MAURER MSM® Spherical and Cylindrical Bearings
MAURER Elastomeric Bearings
MAURER Lead Rubber Bearings (MLRB)

European Technical Approval ETA-06/0131 DIBT
 EC Certificate of Conformity MPA Stuttgart 0682-CPD-005.2
 EC Certificate of Conformity MPA Stuttgart 0672-CPD-005.5
 Certificate of Constancy of Performance 0672-CPR-0362

MAURER Spherical Bearing Dimensions

The dimensions given on the following pages are based on ETA-06/0131 design requirements. Any variations in assumptions given below will be designed upon special request and project requirements. The following three variations are selected upon frequency of technical requests with the intention to guide designers for a rough estimation of required space for the sub- and superstructure. Smaller dimensions can be achieved depending on higher concrete pressure and verification according to EN1992 (partially loaded areas).

>> MAURER MSM®-MSA® Spherical Bearings with anchor plates based on German market requirements

Description of design assumptions:

- Sub- and superstructure: concrete
- Concrete pressure: 45 MPa ULS eccentric
- Rotation: ± 0.010 rad
- Horizontal load transmission with consideration of friction

General note for all variations:

The sketches are for illustration only. The number of screws/dowels/studs must be taken from the tables. Please I, J, F, and G dimensions to consider the number of anchors. Example = $J = 1 \times 110$ means two screws /dowels /studs on each side with a distance of 110 mm. For the scope of configuration, the offer description is relevant. Dust protection, scale, and tilting bars will be provided on demand and depending on the requirements of the design.

>> MAURER MSM®-MSA® Spherical Bearings with anchor plates

Description of design assumptions:

- Sub- and superstructure: concrete
- Concrete pressure: 30 MPa ULS eccentric
- Rotation: ± 0.02 rad
- Horizontal load transmission without consideration of friction
- Transversal movement e_y is considered as ± 20 mm for KGEQ and KGA bearing

>> MAURER MSM®-MSA® Spherical Bearings without anchor plates

Description of design assumptions:

- Concrete sub- and superstructure
- Concrete pressure: 45 MPa ULS eccentric
- Rotation: $\pm 0,012$ rad
- Horizontal load transmission with consideration of friction

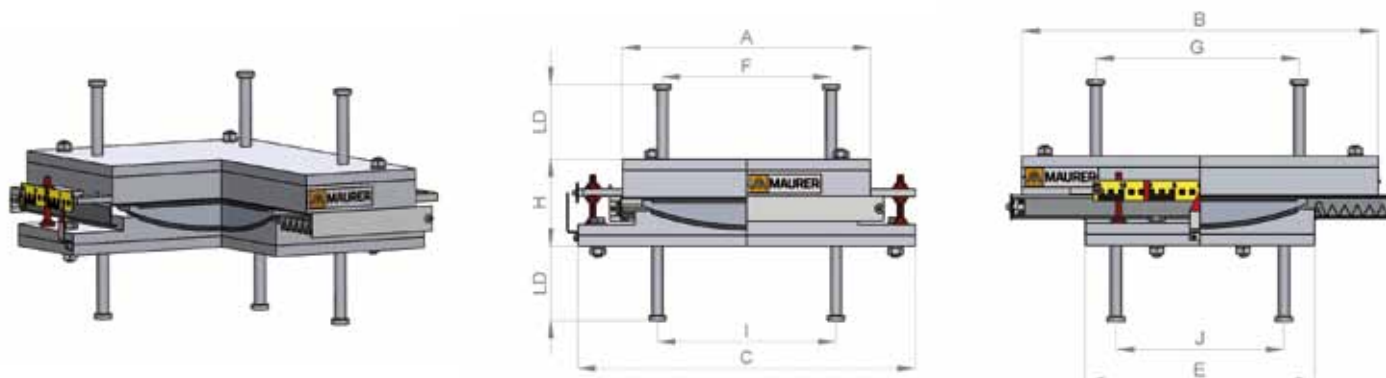
All other equipment (i.e. dust protection systems, movement indicators, tilting bars, measuring plane, and tension anchors) can be delivered on request.

>> Abbreviations

KGA:	Spherical Bearing – free sliding (multidirectional)
KGE and KGEQ:	Spherical Bearing – sliding and guided (unidirectional)
KF:	Spherical Bearing fixed
max. N_{zd}:	Maximum vertical design load in Ultimate Limit State (ULS)
min. N_{zd}:	Minimum vertical design load in Ultimate Limit State (ULS)
max. $V_{x,Ed}$:	Maximum horizontal longitudinal design load in Ultimate Limit State (ULS)
max. $V_{y,Ed}$:	Maximum horizontal transversal design load in Ultimate Limit State (ULS)
max. $u_{x,d}$:	Maximum longitudinal design displacement in Ultimate Limit State (ULS) (\pm)
max. $u_{y,d}$:	Maximum transversal design displacement in Ultimate Limit State (ULS) (\pm)

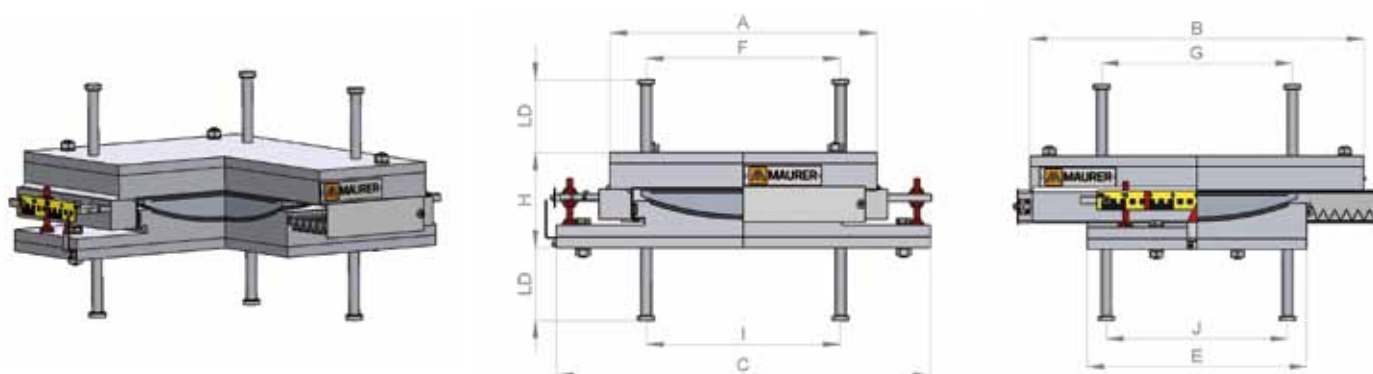
MAURER MSM®-MSA® Spherical Bearings with anchor plates based on German market requirements

>> KGA with anchor plates based on German market requirements



Type	max. N_{zd}	min. N_{zd}	max. $u_{x,d}$	max. $u_{y,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGA 1	1000	400	100	10	250	520	400	220	1 x 110	1 x 110	160	1 x 110	1 x 110	150
KGA 2	2000	800	100	10	300	570	460	280	1 x 110	1 x 110	160	1 x 110	1 x 110	150
KGA 3	3000	1200	100	10	350	620	500	340	1 x 110	1 x 110	160	1 x 110	1 x 110	150
KGA 4	4000	1600	100	10	380	650	530	390	1 x 110	1 x 110	160	1 x 110	1 x 110	150
KGA 5	5000	2000	100	10	460	680	570	430	1 x 220	1 x 220	160	1 x 220	1 x 220	150
KGA 6	6000	2400	100	10	480	700	590	470	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 7	7000	2800	100	10	510	730	610	510	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 8	8000	3200	100	10	550	760	660	540	1 x 220	1 x 220	180	1 x 220	1 x 220	150
KGA 9	9000	3600	100	10	580	780	680	580	1 x 220	1 x 220	190	1 x 220	1 x 220	150
KGA 10	10000	4000	100	10	600	800	710	610	1 x 330	1 x 330	195	1 x 330	1 x 330	150
KGA 11	11000	4400	100	10	630	830	740	640	1 x 330	1 x 330	205	1 x 330	1 x 330	150
KGA 12	12000	4800	100	10	660	850	760	660	1 x 330	1 x 330	210	1 x 330	1 x 330	150
KGA 13	13000	5200	100	10	680	860	790	690	1 x 330	1 x 330	220	1 x 330	1 x 330	150
KGA 14	14000	5600	100	10	700	880	810	710	1 x 330	1 x 330	230	1 x 330	1 x 330	150
KGA 15	15000	6000	100	10	730	900	840	740	1 x 330	1 x 330	235	1 x 330	1 x 330	150
KGA 16	16000	6400	100	10	750	920	860	760	1 x 330	1 x 330	255	1 x 330	1 x 330	150
KGA 17	17000	6800	100	10	790	940	900	780	1 x 330	1 x 330	265	1 x 330	1 x 330	150
KGA 18	18000	7200	100	10	800	950	900	800	1 x 330	1 x 330	265	1 x 330	1 x 330	150
KGA 19	19000	7600	100	10	830	970	920	820	1 x 330	1 x 330	270	1 x 330	1 x 330	150
KGA 20	20000	8000	100	10	840	980	940	960	1 x 330	1 x 330	280	1 x 330	1 x 330	150

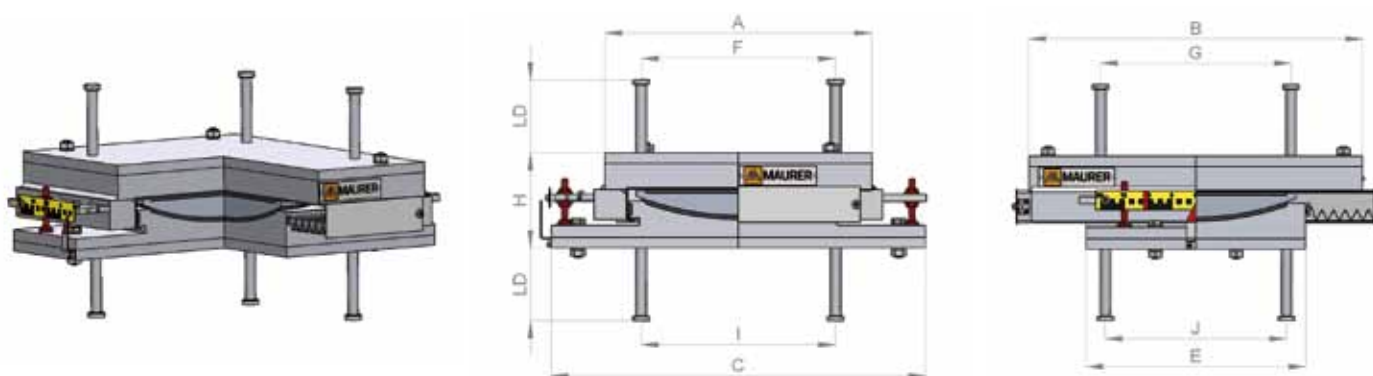
>> KGE with anchor plates
based on German market requirements



Type	max. N_{zd}	min. N_{zd}	max. $V_{y,Ed}$	max. $u_{x,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGE 1	1000	400	100	100	270	490	540	190	1 x 110	1 x 110	185	1 x 110	1 x 110	150
KGE 2	2000	800	200	100	320	540	500	230	1 x 110	1 x 110	185	1 x 110	1 x 110	150
KGE 3	3000	1200	300	100	360	580	540	320	1 x 110	1 x 110	185	1 x 110	1 x 110	150
KGE 4	4000	1600	400	100	390	610	570	350	1 x 110	1 x 110	185	1 x 110	1 x 110	150
KGE 5	5000	2000	500	100	420	640	600	380	1 x 220	1 x 220	185	1 x 220	1 x 220	150
KGE 6	6000	2400	600	100	440	650	620	400	1 x 220	1 x 220	185	1 x 220	1 x 220	150
KGE 7	7000	2800	700	100	470	690	650	430	1 x 220	1 x 220	185	1 x 220	1 x 220	150
KGE 8	8000	3200	800	100	500	720	680	460	1 x 220	1 x 220	185	1 x 220	1 x 220	150
KGE 9	9000	3600	900	100	530	740	710	490	1 x 220	1 x 220	190	1 x 220	1 x 220	150
KGE 10	10000	4000	1000	100	550	750	730	510	1 x 330	1 x 330	190	1 x 330	1 x 330	150
KGE 11	11000	4400	1100	100	580	780	760	540	1 x 330	1 x 330	190	1 x 330	1 x 330	150
KGE 12	12000	4800	1200	100	600	790	780	560	1 x 330	1 x 330	190	1 x 330	1 x 330	150
KGE 13	13000	5200	1300	100	620	810	800	580	1 x 330	1 x 330	195	1 x 330	1 x 330	150
KGE 14	14000	5600	1400	100	640	820	820	600	1 x 330	1 x 330	195	1 x 330	1 x 330	150
KGE 15	15000	6000	1500	100	660	850	860	620	1 x 330	1 x 330	205	1 x 330	1 x 330	150
KGE 16	16000	6400	1600	100	690	860	890	650	1 x 330	1 x 330	215	1 x 330	1 x 330	150
KGE 17	17000	6800	1700	100	710	890	910	670	1 x 330	1 x 330	215	1 x 330	1 x 330	150
KGE 18	18000	7200	1800	100	730	900	940	690	1 x 330	1 x 330	225	1 x 330	1 x 330	150
KGE 19	19000	7600	1900	100	740	930	950	700	1 x 330	1 x 330	225	1 x 330	1 x 330	150
KGE 20	20000	8000	2000	100	760	930	970	720	1 x 330	1 x 330	225	1 x 330	1 x 330	150

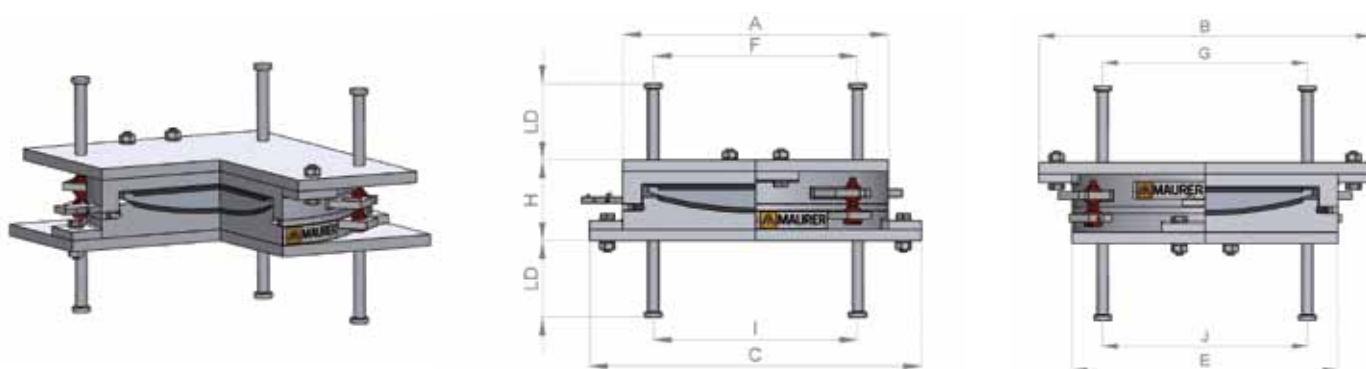
MAURER MSM®-MSA® Spherical Bearings with anchor plates based on German market requirements

>> KGEQ with anchor plates based on German market requirements



Type	max. N_{zd}	min. N_{zd}	max. $V_{x,Ed}$	max. $u_{y,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGEQ 1	1000	400	100	10	300	490	470	190	1 x 110	1 x 110	190	1 x 110	1 x 90	150
KGEQ 2	2000	800	200	10	350	540	520	230	1 x 110	1 x 110	195	1 x 110	1 x 90	150
KGEQ 3	3000	1200	300	10	390	580	560	320	1 x 110	1 x 110	195	1 x 110	1 x 110	150
KGEQ 4	4000	1600	400	10	420	610	590	350	1 x 110	1 x 110	195	1 x 110	1 x 110	150
KGEQ 5	5000	2000	500	10	450	640	620	380	1 x 220	1 x 220	195	1 x 220	1 x 220	150
KGEQ 6	6000	2400	600	10	470	650	660	400	1 x 220	1 x 220	195	1 x 220	1 x 220	150
KGEQ 7	7000	2800	700	10	500	690	690	430	1 x 220	1 x 220	195	1 x 220	1 x 220	150
KGEQ 8	8000	3200	800	10	530	720	720	460	1 x 220	1 x 220	195	1 x 220	1 x 220	150
KGEQ 9	9000	3600	900	10	550	740	730	490	1 x 220	1 x 220	195	1 x 220	1 x 220	150
KGEQ 10	10000	4000	1000	10	570	750	750	510	1 x 330	1 x 330	200	1 x 330	1 x 330	150
KGEQ 11	11000	4400	1100	10	590	780	780	540	1 x 330	1 x 330	200	1 x 330	1 x 330	150
KGEQ 12	12000	4800	1200	10	610	790	800	560	1 x 330	1 x 330	200	1 x 330	1 x 330	150
KGEQ 13	13000	5200	1300	10	620	810	820	580	1 x 330	1 x 330	205	1 x 330	1 x 330	150
KGEQ 14	14000	5600	1400	10	640	820	840	600	1 x 330	1 x 330	205	1 x 330	1 x 330	150
KGEQ 15	15000	6000	1500	10	660	850	850	630	1 x 330	1 x 330	220	1 x 330	1 x 330	150
KGEQ 16	16000	6400	1600	10	680	860	870	650	1 x 330	1 x 330	220	1 x 330	1 x 330	150
KGEQ 17	17000	6800	1700	10	700	890	890	670	1 x 330	1 x 330	220	1 x 330	1 x 330	150
KGEQ 18	18000	7200	1800	10	710	900	920	690	1 x 330	1 x 330	220	1 x 330	1 x 330	150
KGEQ 19	19000	7600	1900	10	730	930	930	700	1 x 330	1 x 330	230	1 x 330	1 x 330	150
KGEQ 20	20000	8000	2000	10	740	930	950	720	1 x 330	1 x 330	230	1 x 330	1 x 330	150

>> KF with anchor plates based on German market requirements

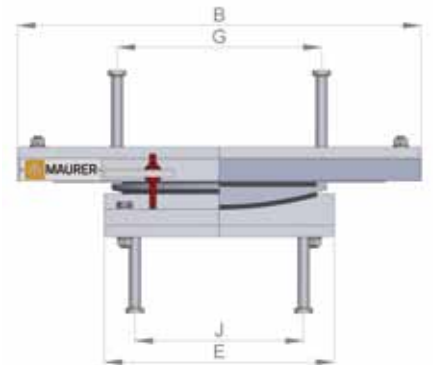
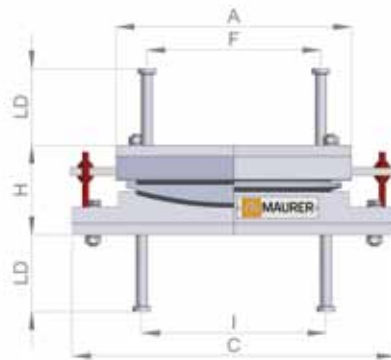
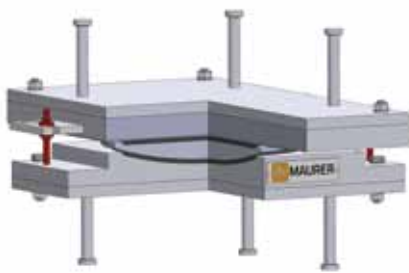


Type	max. N_{zd}	min. N_{zd}	max. $V_{x,Ed}$	max. $V_{y,Ed}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KF 1	1000	400	100	100	240	370	370	240	1 x 110	1 x 110	125	1 x 110	1 x 110	150
KF 2	2000	800	200	200	310	440	440	310	1 x 110	1 x 110	130	1 x 110	1 x 110	150
KF 3	3000	1200	300	300	360	490	490	360	1 x 110	1 x 110	135	1 x 110	1 x 110	150
KF 4	4000	1600	400	400	400	530	530	400	1 x 110	1 x 110	140	1 x 110	1 x 110	150
KF 5	5000	2000	500	500	430	560	560	430	1 x 220	1 x 220	145	1 x 220	1 x 220	150
KF 6	6000	2400	600	600	460	590	590	460	1 x 220	1 x 220	145	1 x 220	1 x 220	150
KF 7	7000	2800	700	700	490	630	630	490	1 x 220	1 x 220	150	1 x 220	1 x 220	150
KF 8	8000	3200	800	800	520	660	660	520	1 x 220	1 x 220	155	1 x 220	1 x 220	150
KF 9	9000	3600	900	900	550	690	690	550	1 x 220	1 x 220	155	1 x 220	1 x 220	150
KF 10	10000	4000	1000	1000	580	760	760	580	1 x 330	1 x 330	160	1 x 330	1 x 330	150
KF 11	11000	4400	1100	1100	610	790	790	610	1 x 330	1 x 330	170	1 x 330	1 x 330	150
KF 12	12000	4800	1200	1200	630	810	810	630	1 x 330	1 x 330	170	1 x 330	1 x 330	150
KF 13	13000	5200	1300	1300	690	820	820	690	1 x 330	1 x 330	175	1 x 330	1 x 330	150
KF 14	14000	5600	1400	1400	720	850	850	720	1 x 330	1 x 330	175	1 x 330	1 x 330	150
KF 15	15000	6000	1500	1500	740	950	950	740	1 x 330	1 x 330	180	1 x 330	1 x 330	150
KF 16	16000	6400	1600	1600	760	970	970	760	1 x 330	1 x 330	185	1 x 330	1 x 330	150
KF 17	17000	6800	1700	1700	780	990	990	780	1 x 330	1 x 330	185	1 x 330	1 x 330	150
KF 18	18000	7200	1800	1800	800	1010	1010	800	1 x 330	1 x 330	190	1 x 330	1 x 330	150
KF 19	19000	7600	1900	1900	820	1030	1030	820	1 x 330	1 x 330	190	1 x 330	1 x 330	150
KF 20	20000	8000	2000	2000	830	1040	1040	830	1 x 330	1 x 330	200	1 x 330	1 x 330	150

The horizontal loads in each direction have been considered to be 10% of the vertical force. The resulting horizontal force is 14% of the maximum vertical load.

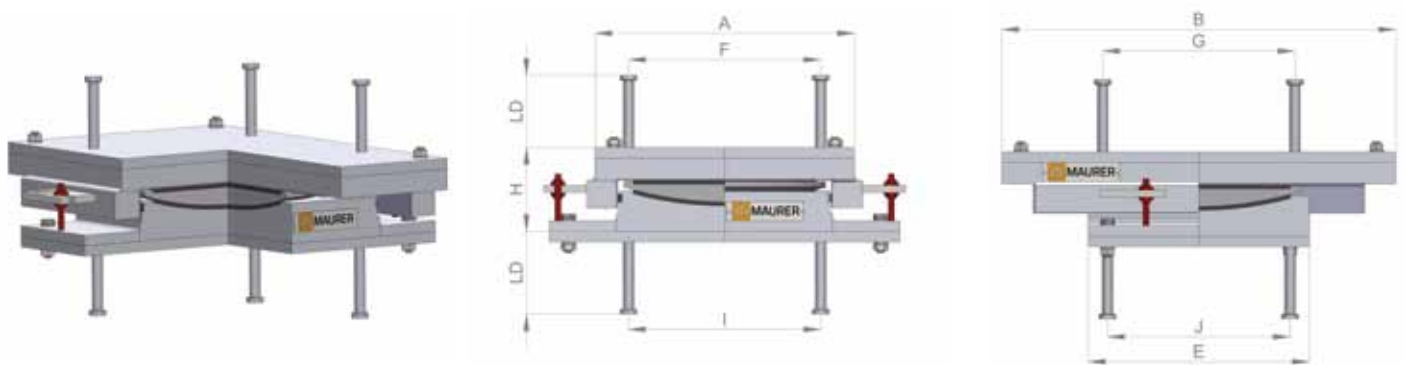
MAURER MSM®-MSA® Spherical Bearings with anchor plates

>> KGA with anchor plates



Type	max. N_{zd}	min. N_{zd}	max. $u_{x,d}$	max. $u_{y,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGA 1	1000	400	100	10	220	430	400	180	1 x 90	1 x 90	165	1 x 90	1 x 90	150
KGA 2	2000	800	100	10	270	480	450	220	1 x 90	1 x 90	165	1 x 90	1 x 90	150
KGA 3	3000	1200	100	10	310	520	490	310	1 x 110	1 x 110	165	1 x 110	1 x 110	150
KGA 4	4000	1600	100	10	340	550	520	340	1 x 110	1 x 110	165	1 x 110	1 x 110	150
KGA 5	5000	2000	100	10	370	580	550	370	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 6	6000	2400	100	10	390	600	570	390	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 7	7000	2800	100	10	420	630	600	420	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 8	8000	3200	100	10	450	660	630	450	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 9	9000	3600	100	10	480	690	660	480	1 x 220	1 x 220	165	1 x 220	1 x 220	150
KGA 10	10000	4000	100	10	500	710	680	500	1 x 330	1 x 330	165	1 x 330	1 x 330	150
KGA 11	11000	4400	100	10	520	730	700	520	1 x 330	1 x 330	165	1 x 330	1 x 330	150
KGA 12	12000	4800	100	10	550	760	730	550	1 x 330	1 x 330	165	1 x 330	1 x 330	150
KGA 13	13000	5200	100	10	570	780	750	570	1 x 330	1 x 330	170	1 x 330	1 x 330	150
KGA 14	14000	5600	100	10	590	800	770	590	1 x 330	1 x 330	170	1 x 330	1 x 330	150
KGA 15	15000	6000	100	10	610	820	790	610	1 x 330	1 x 330	180	1 x 330	1 x 330	150
KGA 16	16000	6400	100	10	630	840	810	630	1 x 330	1 x 330	180	1 x 330	1 x 330	150
KGA 17	17000	6800	100	10	650	860	830	650	1 x 330	1 x 330	190	1 x 330	1 x 330	150
KGA 18	18000	7200	100	10	670	880	850	670	1 x 330	1 x 330	195	1 x 330	1 x 330	150
KGA 19	19000	7600	100	10	690	900	870	690	1 x 330	1 x 330	195	1 x 330	1 x 330	150
KGA 20	20000	8000	100	10	710	920	890	710	1 x 330	1 x 330	205	1 x 330	1 x 330	150

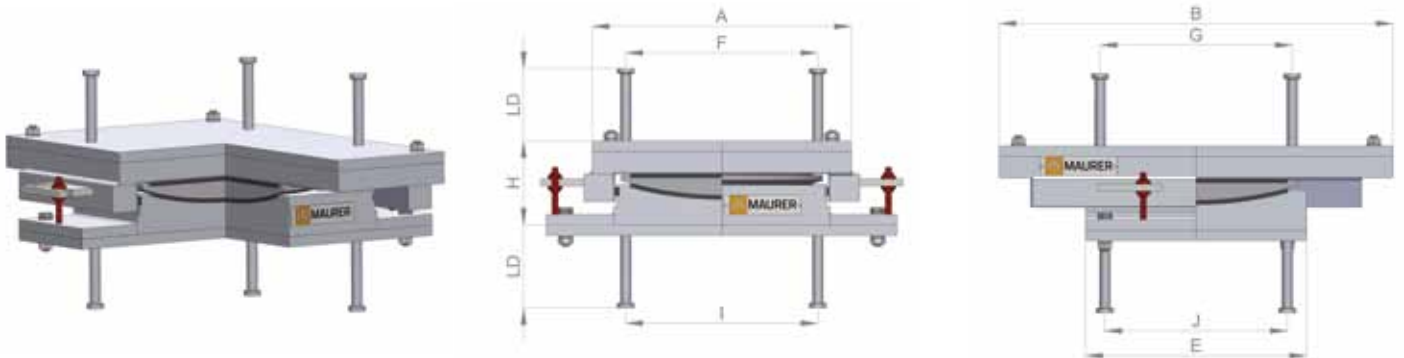
>> KGE with anchor plates



Type	max. N_{zd}	min. N_{zd}	max. $V_{y,Ed}$	max. $u_{x,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGE 1	1000	400	100	100	300	550	470	230	1 x 110	1 x 110	182.4	1 x 110	1 x 110	150
KGE 2	2000	800	200	100	350	610	530	290	1 x 110	1 x 110	183.0	1 x 110	1 x 110	150
KGE 3	3000	1200	300	100	400	670	570	350	1 x 110	1 x 110	189.5	1 x 110	1 x 110	150
KGE 4	4000	1600	400	100	430	770	650	400	1 x 110	1 x 110	189.3	1 x 110	1 x 110	150
KGE 5	5000	2000	500	100	460	810	690	440	1 x 125	1 x 125	194.4	1 x 125	1 x 125	150
KGE 6	6000	2400	600	100	480	850	710	480	1 x 125	2 x 125	204.7	2 x 125	1 x 125	150
KGE 7	7000	2800	700	100	510	890	730	520	1 x 125	2 x 125	204.4	2 x 125	1 x 125	150
KGE 8	8000	3200	800	100	590	930	770	560	1 x 125	2 x 125	223.6	2 x 125	1 x 125	150
KGE 9	9000	3600	900	100	610	1040	860	590	2 x 125	2 x 125	229.3	2 x 125	2 x 125	150
KGE 10	10000	4000	1000	100	630	1070	890	620	2 x 125	2 x 125	229.1	2 x 125	2 x 125	150
KGE 11	11000	4400	1100	100	660	1100	920	650	2 x 125	2 x 125	235.8	2 x 125	2 x 125	150
KGE 12	12000	4800	1200	100	680	1130	930	680	2 x 125	2 x 125	240.1	2 x 125	2 x 125	150
KGE 13	13000	5200	1300	100	700	1160	960	710	2 x 125	3 x 125	245.5	3 x 125	2 x 125	150
KGE 14	14000	5600	1400	100	740	1180	970	730	2 x 125	3 x 125	261.4	3 x 125	2 x 125	150
KGE 15	15000	6000	1500	100	770	1200	980	760	2 x 125	3 x 125	265.1	3 x 125	2 x 125	150
KGE 16	16000	6400	1600	100	790	1220	1000	770	2 x 125	3 x 125	268.7	3 x 125	2 x 125	150
KGE 17	17000	6800	1700	100	810	1250	1020	800	3 x 125	3 x 125	277.7	3 x 125	3 x 125	150
KGE 18	18000	7200	1800	100	830	1270	1040	820	3 x 125	3 x 125	277.1	3 x 125	3 x 125	150
KGE 19	19000	7600	1900	100	850	1290	1060	840	3 x 125	3 x 125	290.8	3 x 125	3 x 125	150
KGE 20	20000	8000	2000	100	870	1320	1080	880	3 x 125	3 x 125	310.2	3 x 125	3 x 125	150

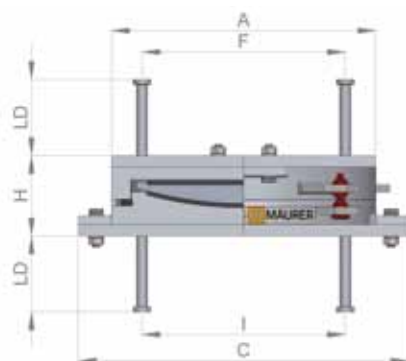
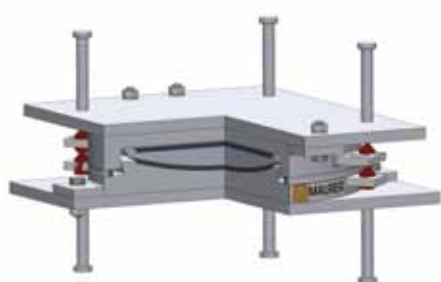
MAURER MSM®-MSA® Spherical Bearings with anchor plates

>> KGEQ with anchor plates



Type	max. N_{zd}	min. N_{zd}	max. $V_{x,Ed}$	max. $u_{y,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGEQ 1	1000	400	100	10	300	440	470	230	1 x 110	1 x 110	190	1 x 110	1 x 90	150
KGEQ 2	2000	800	200	10	350	490	530	290	1 x 110	1 x 110	195	1 x 110	1 x 90	150
KGEQ 3	3000	1200	300	10	400	540	570	350	1 x 110	1 x 110	195	1 x 110	1 x 110	150
KGEQ 4	4000	1600	400	10	430	620	650	400	1 x 110	1 x 110	195	1 x 110	1 x 110	150
KGEQ 5	5000	2000	500	10	460	650	690	440	1 x 125	1 x 125	205	1 x 125	1 x 125	150
KGEQ 6	6000	2400	600	10	480	690	710	480	1 x 125	2 x 125	215	2 x 125	1 x 125	150
KGEQ 7	7000	2800	700	10	510	730	730	520	1 x 125	2 x 125	215	2 x 125	1 x 125	150
KGEQ 8	8000	3200	800	10	590	770	770	560	1 x 125	2 x 125	225	2 x 125	1 x 125	150
KGEQ 9	9000	3600	900	10	610	880	860	590	2 x 125	2 x 125	240	2 x 125	2 x 125	150
KGEQ 10	10000	4000	1000	10	630	910	890	620	2 x 125	2 x 125	240	2 x 125	2 x 125	150
KGEQ 11	11000	4400	1100	10	660	940	920	650	2 x 125	2 x 125	250	2 x 125	2 x 125	150
KGEQ 12	12000	4800	1200	10	680	970	930	680	2 x 125	2 x 125	250	2 x 125	2 x 125	150
KGEQ 13	13000	5200	1300	10	710	1000	960	710	2 x 125	3 x 125	265	3 x 125	2 x 125	150
KGEQ 14	14000	5600	1400	10	730	1020	970	730	2 x 125	3 x 125	265	3 x 125	2 x 125	150
KGEQ 15	15000	6000	1500	10	760	1040	980	760	2 x 125	3 x 125	275	3 x 125	2 x 125	150
KGEQ 16	16000	6400	1600	10	780	1070	1000	780	2 x 125	3 x 125	285	3 x 125	2 x 125	150
KGEQ 17	17000	6800	1700	10	820	1090	1020	800	3 x 125	3 x 125	290	3 x 125	3 x 125	150
KGEQ 18	18000	7200	1800	10	830	1110	1040	820	3 x 125	3 x 125	290	3 x 125	3 x 125	150
KGEQ 19	19000	7600	1900	10	850	1130	1060	840	3 x 125	3 x 125	300	3 x 125	3 x 125	150
KGEQ 20	20000	8000	2000	10	870	1160	1080	880	3 x 125	3 x 125	320	3 x 125	3 x 125	150

>> KF with anchor plates

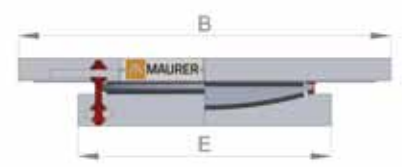
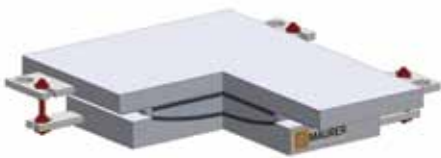


Type	max. N_{zd}	min. N_{zd}	max. $V_{x,Ed}$	max. $V_{y,Ed}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KF 1	1000	400	100	100	250	380	380	250	1 x 110	1 x 110	125	1 x 110	1 x 110	150
KF 2	2000	800	200	200	340	470	470	340	1 x 110	1 x 110	140	1 x 110	1 x 110	150
KF 3	3000	1200	300	300	420	550	550	420	1 x 110	1 x 110	145	1 x 110	1 x 110	150
KF 4	4000	1600	400	400	470	600	600	470	1 x 125	1 x 125	150	1 x 125	1 x 125	150
KF 5	5000	2000	500	500	540	720	720	540	1 x 125	2 x 125	165	2 x 125	1 x 125	150
KF 6	6000	2400	600	600	580	760	760	580	1 x 125	2 x 125	165	2 x 125	1 x 125	150
KF 7	7000	2800	700	700	630	890	890	630	2 x 125	2 x 125	175	2 x 125	2 x 125	150
KF 8	8000	3200	800	800	700	960	960	700	2 x 125	2 x 125	185	2 x 125	2 x 125	150
KF 9	9000	3600	900	900	740	1000	1000	740	2 x 125	2 x 125	185	2 x 125	2 x 125	150
KF 10	10000	4000	1000	1000	760	1020	1020	760	2 x 125	3 x 125	185	3 x 125	2 x 125	150
KF 11	11000	4400	1100	1100	810	1070	1070	810	2 x 125	3 x 125	210	3 x 125	2 x 125	150
KF 12	12000	4800	1200	1200	840	1100	1100	840	2 x 125	3 x 125	210	3 x 125	2 x 125	150
KF 13	13000	5200	1300	1300	890	1150	1150	890	3 x 125	3 x 125	210	3 x 125	3 x 125	150
KF 14	14000	5600	1400	1400	920	1180	1180	920	3 x 125	3 x 125	215	3 x 125	3 x 125	150
KF 15	15000	6000	1500	1500	940	1200	1200	940	3 x 125	3 x 125	220	3 x 125	3 x 125	150
KF 16	16000	6400	1600	1600	1010	1270	1270	1010	3 x 125	3 x 125	220	3 x 125	3 x 125	150
KF 17	17000	6800	1700	1700	1040	1300	1300	1040	3 x 125	3 x 125	220	4 x 125	3 x 125	150
KF 18	18000	7200	1800	1800	1070	1330	1330	1070	3 x 125	4 x 125	240	4 x 125	3 x 125	150
KF 19	19000	7600	1900	1900	1090	1350	1350	1090	3 x 125	4 x 125	240	4 x 125	3 x 125	150
KF 20	20000	8000	2000	2000	1110	1370	1370	1110	3 x 125	4 x 125	240	4 x 125	3 x 125	150

The horizontal loads in each direction have been considered to be 10% of the vertical force. The resulting horizontal force is 14% of the maximum vertical load.

MAURER MSM®-MSA® Spherical Bearings without anchor plates

>> KGA without anchor plates



Type	max. N_{zd}	min. N_{zd}	max. $u_{x,d}$	max. $u_{y,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGA 1	1000	400	100	10	250	390	170	170	-	-	110	-	-	-
KGA 2	2000	800	100	10	300	440	220	220	-	-	110	-	-	-
KGA 3	3000	1200	100	10	340	480	270	270	-	-	110	-	-	-
KGA 4	4000	1600	100	10	370	510	310	310	-	-	110	-	-	-
KGA 5	5000	2000	100	10	390	530	350	350	-	-	110	-	-	-
KGA 6	6000	2400	100	10	430	570	380	380	-	-	115	-	-	-
KGA 7	7000	2800	100	10	450	590	410	410	-	-	115	-	-	-
KGA 8	8000	3200	100	10	480	610	440	440	-	-	120	-	-	-
KGA 9	9000	3600	100	10	500	630	470	470	-	-	125	-	-	-
KGA 10	10000	4000	100	10	530	650	490	490	-	-	130	-	-	-
KGA 11	11000	4400	100	10	550	670	510	510	-	-	135	-	-	-
KGA 12	12000	4800	100	10	580	690	540	540	-	-	140	-	-	-
KGA 13	13000	5200	100	10	600	710	560	560	-	-	140	-	-	-
KGA 14	14000	5600	100	10	620	720	580	580	-	-	150	-	-	-
KGA 15	15000	6000	100	10	640	750	600	600	-	-	155	-	-	-
KGA 16	16000	6400	100	10	660	770	620	620	-	-	155	-	-	-
KGA 17	17000	6800	100	10	680	780	640	640	-	-	160	-	-	-
KGA 18	18000	7200	100	10	690	790	660	660	-	-	165	-	-	-
KGA 19	19000	7600	100	10	720	810	680	680	-	-	175	-	-	-
KGA 20	20000	8000	100	10	730	820	690	690	-	-	175	-	-	-

>> KGE without anchor plates



Type	max. N_{zd}	min. N_{zd}	max. $V_{y,Ed}$	max. $u_{x,d}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KGE 1	1000	400	100	100	270	560	460	180	1 x 110	480	135	390	1 x 110	180
KGE 2	2000	800	200	100	320	610	510	230	1 x 110	530	135	430	1 x 110	180
KGE 3	3000	1200	300	100	370	660	560	280	1 x 110	580	135	480	1 x 110	180
KGE 4	4000	1600	400	100	410	700	600	320	1 x 110	620	135	520	1 x 110	180
KGE 5	5000	2000	500	100	440	730	630	350	1 x 110	650	135	550	1 x 110	180
KGE 6	6000	2400	600	100	480	770	670	390	1 x 110	690	140	590	1 x 110	180
KGE 7	7000	2800	700	100	510	800	700	420	1 x 110	720	140	620	1 x 110	180
KGE 8	8000	3200	800	100	540	830	730	450	1 x 110	750	145	650	1 x 110	180
KGE 9	9000	3600	900	100	570	860	760	480	1 x 110	780	145	680	1 x 110	180
KGE 10	10000	4000	1000	100	590	880	780	500	1 x 220	800	150	700	1 x 220	180
KGE 11	11000	4400	1100	100	610	900	800	520	1 x 220	820	160	720	1 x 220	180
KGE 12	12000	4800	1200	100	640	930	830	550	1 x 220	850	160	750	1 x 220	180
KGE 13	13000	5200	1300	100	660	950	850	570	1 x 220	870	160	770	1 x 220	180
KGE 14	14000	5600	1400	100	680	970	870	590	1 x 220	890	160	790	1 x 220	180
KGE 15	15000	6000	1500	100	700	990	890	610	1 x 220	910	170	810	1 x 220	180
KGE 16	16000	6400	1600	100	720	1010	910	630	1 x 220	930	170	830	1 x 220	180
KGE 17	17000	6800	1700	100	740	1030	950	650	1 x 220	950	170	870	1 x 220	180
KGE 18	18000	7200	1800	100	760	1050	970	670	1 x 220	970	175	890	1 x 220	180
KGE 19	19000	7600	1900	100	780	1070	990	690	1 x 220	990	190	910	1 x 220	180
KGE 20	20000	8000	2000	100	800	1090	1010	710	1 x 220	1010	195	930	1 x 220	180

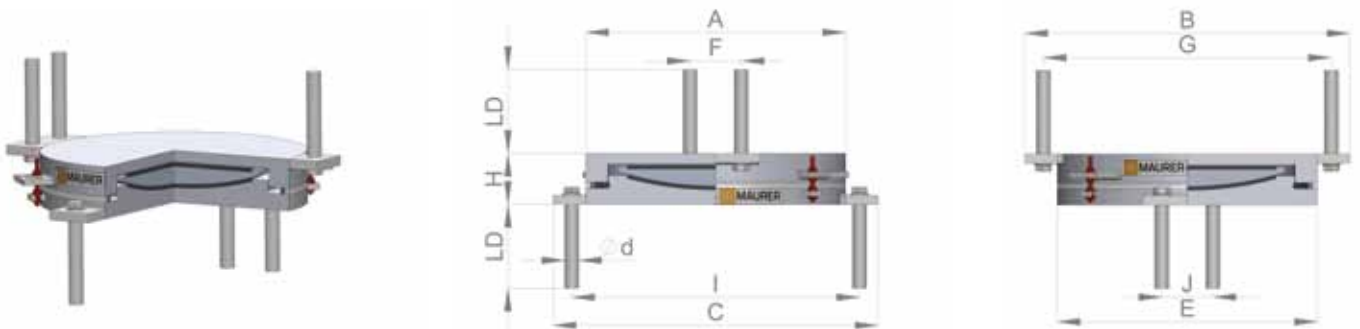
MAURER MSM®-MSA® Spherical Bearings without anchor plates

>> KGEQ without anchor plates



Type	max. N_{zd} kN	min. N_{zd} kN	max. $V_{x,Ed}$ kN	max. $u_{y,d}$ mm	A mm	B mm	C mm	E mm	F mm	G mm	H mm	I mm	J mm	LD mm
KGEQ 1	1000	400	100	10	300	450	480	190	1 x 110	370	140	400	1 x 110	180
KGEQ 2	2000	800	200	10	350	500	530	230	1 x 110	420	145	450	1 x 110	180
KGEQ 3	3000	1200	300	10	390	540	580	280	1 x 110	460	145	500	1 x 110	180
KGEQ 4	4000	1600	400	10	420	570	600	320	1 x 110	490	145	520	1 x 110	180
KGEQ 5	5000	2000	500	10	440	580	620	360	1 x 110	500	155	540	1 x 110	180
KGEQ 6	6000	2400	600	10	480	620	670	390	1 x 110	540	155	590	1 x 110	180
KGEQ 7	7000	2800	700	10	500	650	680	420	1 x 110	570	155	600	1 x 110	180
KGEQ 8	8000	3200	800	10	520	670	710	450	1 x 110	590	165	630	1 x 110	180
KGEQ 9	9000	3600	900	10	540	700	740	480	1 x 110	620	165	660	1 x 110	180
KGEQ 10	10000	4000	1000	10	560	720	760	500	1 x 220	640	170	680	1 x 220	180
KGEQ 11	11000	4400	1100	10	580	750	770	530	1 x 220	670	180	690	1 x 220	180
KGEQ 12	12000	4800	1200	10	600	770	780	550	1 x 220	690	180	710	1 x 220	180
KGEQ 13	13000	5200	1300	10	620	790	810	570	1 x 220	710	185	730	1 x 220	180
KGEQ 14	14000	5600	1400	10	630	810	830	590	1 x 220	730	195	750	1 x 220	180
KGEQ 15	15000	6000	1500	10	660	830	870	610	1 x 220	750	195	790	1 x 220	180
KGEQ 16	16000	6400	1600	10	680	860	880	640	1 x 220	780	200	800	1 x 220	180
KGEQ 17	17000	6800	1700	10	690	880	900	660	1 x 220	800	205	820	1 x 220	180
KGEQ 18	18000	7200	1800	10	700	890	910	670	1 x 220	810	205	830	1 x 220	180
KGEQ 19	19000	7600	1900	10	720	910	930	690	1 x 220	830	210	850	1 x 220	180
KGEQ 20	20000	8000	2000	10	730	930	930	710	1 x 220	850	220	850	1 x 220	180

>> KF without anchor plates



Type	max. N_{zd}	min. N_{zd}	max. $V_{x,Ed}$	max. $V_{y,Ed}$	A	B	C	E	F	G	H	I	J	LD
	kN	kN	kN	kN	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
KF 1	1000	400	100	100	260	400	400	260	1 x 110	320	85	320	1 x 110	180
KF 2	2000	800	200	200	350	490	490	350	1 x 110	410	90	410	1 x 110	180
KF 3	3000	1200	300	300	390	530	530	390	1 x 110	450	90	450	1 x 110	180
KF 4	4000	1600	400	400	460	600	600	460	1 x 110	520	95	520	1 x 110	180
KF 5	5000	2000	500	500	510	650	650	510	1 x 110	570	105	570	1 x 110	180
KF 6	6000	2400	600	600	530	670	670	530	1 x 110	590	105	590	1 x 110	180
KF 7	7000	2800	700	700	590	730	730	590	1 x 110	650	110	650	1 x 110	180
KF 8	8000	3200	800	800	620	760	760	620	1 x 110	680	110	680	1 x 110	180
KF 9	9000	3600	900	900	650	790	790	650	1 x 110	710	120	710	1 x 110	180
KF 10	10000	4000	1000	1000	690	830	830	690	1 x 220	750	125	750	1 x 220	180
KF 11	11000	4400	1100	1100	720	860	860	720	1 x 220	780	125	780	1 x 220	180
KF 12	12000	4800	1200	1200	740	880	880	740	1 x 220	800	130	800	1 x 220	180
KF 13	13000	5200	1300	1300	770	910	910	770	1 x 220	830	130	830	1 x 220	180
KF 14	14000	5600	1400	1400	810	950	950	810	1 x 220	870	145	870	1 x 220	180
KF 15	15000	6000	1500	1500	830	970	970	830	1 x 220	890	145	890	1 x 220	180
KF 16	16000	6400	1600	1600	860	1000	1000	860	1 x 220	920	145	920	1 x 220	180
KF 17	17000	6800	1700	1700	890	1030	1030	890	1 x 220	950	155	950	1 x 220	180
KF 18	18000	7200	1800	1800	920	1060	1060	920	1 x 220	980	155	980	1 x 220	180
KF 19	19000	7600	1900	1900	950	1090	1090	950	1 x 220	1010	155	1010	1 x 220	180
KF 20	20000	8000	2000	2000	960	1100	1100	960	1 x 220	1020	160	1020	1 x 220	180

The horizontal loads in each direction have been considered to be 10% of the vertical force. The resulting horizontal force is 14% of the maximum vertical load.

MAURER References

>> Botlekbrug, Rotterdam / Netherlands

Task:

Opening and closing a bridge of this size represents uncharted territory. It requires special bearings and expansion joints which MAURER has developed specifically for this purpose.

Scope of project:

16 MAURER Spherical Bearings across the slip plane which can be opened. In contrast to the expansion joints, the plain bearings remain on the abutments and only the second plane moves upwards. The spherical bearings measure around 1,200 x 1,100 mm and weigh more than 4 t. The load amounts to 21,000 or 29,000 kN.

Rotterdam has the largest port in Europe, so its port entrance for overseas container ships is both vast and congested. This is the entrance to what is currently the largest lift bridge in Europe: the Botlekbrug. The Botlekbrug is part of a 37-km motorway section of the A15 that passes through Rotterdam port and is being widened by order of the Rijkswaterstaat.



>> Allianz Arena, Munich / Germany

Task:

Support of the roof construction

Scope of project:

96 MAURER MSM® Spherical Bearings

The Allianz Arena is a landmark in the north of Munich. Finished in 2005, the stadium offers space for 75,000 spectators of the German football league.

Since the beginning of the 2005/06 season, the two Munich football clubs FC Bayern München and TSV 1860 München have held their home games in this arena. It was also a venue for the 2006 FIFA World Cup and a venue for the final of the UEFA Champions League 2012.

>> **Western High-Speed Diameter Project,
St. Petersburg / Russia**

Task:

The Western High-Speed Diameter (WHSD) is a unique high-speed urban motorway being created in St. Petersburg with a length of 46.6 km, 14 motorway intersections, many tunnels, canal bridges and viaducts. WHSD is a motorway tackling St. Petersburg transport issues, allowing to reduce traffic intensity in the city centre and solve congestion problems. MAURER has supplied an important part of the structural bridge and viaduct accessories.

Scope of project:

Delivery of approximately 2,500 pcs of MAURER bridge bearings (spherical + elastomeric) up to 60,000 kN load and approximately 4,000 metres of modular expansion joints with movements up to 880 mm.

The construction of WHSD is the largest PPP (Public Private Partnership) project in the field of road construction in the world.



>> **Waal Bridge, Ewijk / Netherlands**

Task:

The Waal Bridge near Ewijk needed in form of a twin bridge due to increasing traffic. This bridge has been a reference project for MAURER since 1997. The largest modular and watertight expansion joints in the Netherlands were installed there. In 1999, all the bridge bearings were replaced. This "old" bridge is still fully functioning; however, it cannot cope with the increasing traffic any longer.

Scope of project:

22 MAURER MSM® Spherical Bearings with a diameter of 2,660 mm, 4 pylon bearings with a vertical load of up to 220,000 kN, weighing each around 21 tons.





>> **Gazprom Arena, St. Petersburg / Russia**

Task:

Support of the roof construction

Scope of project:

96 MAURER Spherical Bearings, 60 of which uplift-/load bearings.

Max. load capacity: 17,500 kN

Min. load capacity: 3,500 kN

(tensile load)

The Gazprom Arena is a football stadium under construction in St. Petersburg/ Russia. It will provide space for 62,167 spectators. The inauguration is planned to take place in 2017, in time for the 2017 FIFA Confederations Cup and the FIFA World Cup 2018.

>> **Russki Bridge, Vladivostok / Russia**

Task:

MAURER was in charge of the complete structural protection of the bridge: expansion joints which are designed to accommodate seismic movements, bridge bearings, as well as damper systems which protect the bridge deck and the stay cables which are up to 580 m long.

Scope of project:

24 MAURER Guided Sliding Bridge Bearings: two each at the two pylons, at the two abutments and at the four piers between pylon and abutment. The load ranges from 12,000 kN to 34,000 kN.

The horizontal force bearings at the pylons feature a weight of 40 tons, being 5 m long, 3 m wide and 80 cm high. These bearings are guided and allow for longitudinal movements of ± 1.2 m caused by temperature, wind, and earthquake. The bearings transfer 25,000 kN in longitudinal direction and 20,000 kN in lateral direction.

The Russki Bridge is world's longest cable-stayed bridge from Vladivostok over the Eastern Bosphorus to the Russki Island.



>> **Raymond Barre Bridge, Lyon / France**

Task:

The steel arc bridge which caters for pedestrians, bicycles and a tram, had to be safeguarded against uplift forces with uplift bearings.

Scope of project:

8 MAURER MSM® Spherical Bearings and two calotte-in-calotte-system MAURER Uplift Bearings to facilitate the transfer of both tension (i.e. uplift) and compression forces in any state of rotation and displacement.



>> **New Orbital Highway Package / Qatar**

Task:

The New Orbital Highway Contract 1 is to be built with the intention to bypass Doha City by connecting New Doha Port to the Orbital Highway, thus relieving the existing traffic congestion expected to increase in the coming years. MAURER is supporting this project with the installation of 600 MAURER Bridge Bearings including hundreds of spherical bearings and horizontal shear keys (horizontal load bearings).

Scope of project:

Delivery of MAURER MSM® Spherical Bearings up to 15,000 kN vertical load and Horizontal Load Bearings up to 10,000 kN horizontal load.

With regard to the upcoming FIFA World Cup 2022 and the high number of expected visitors, Doha is preparing and expanding its infrastructure development.

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