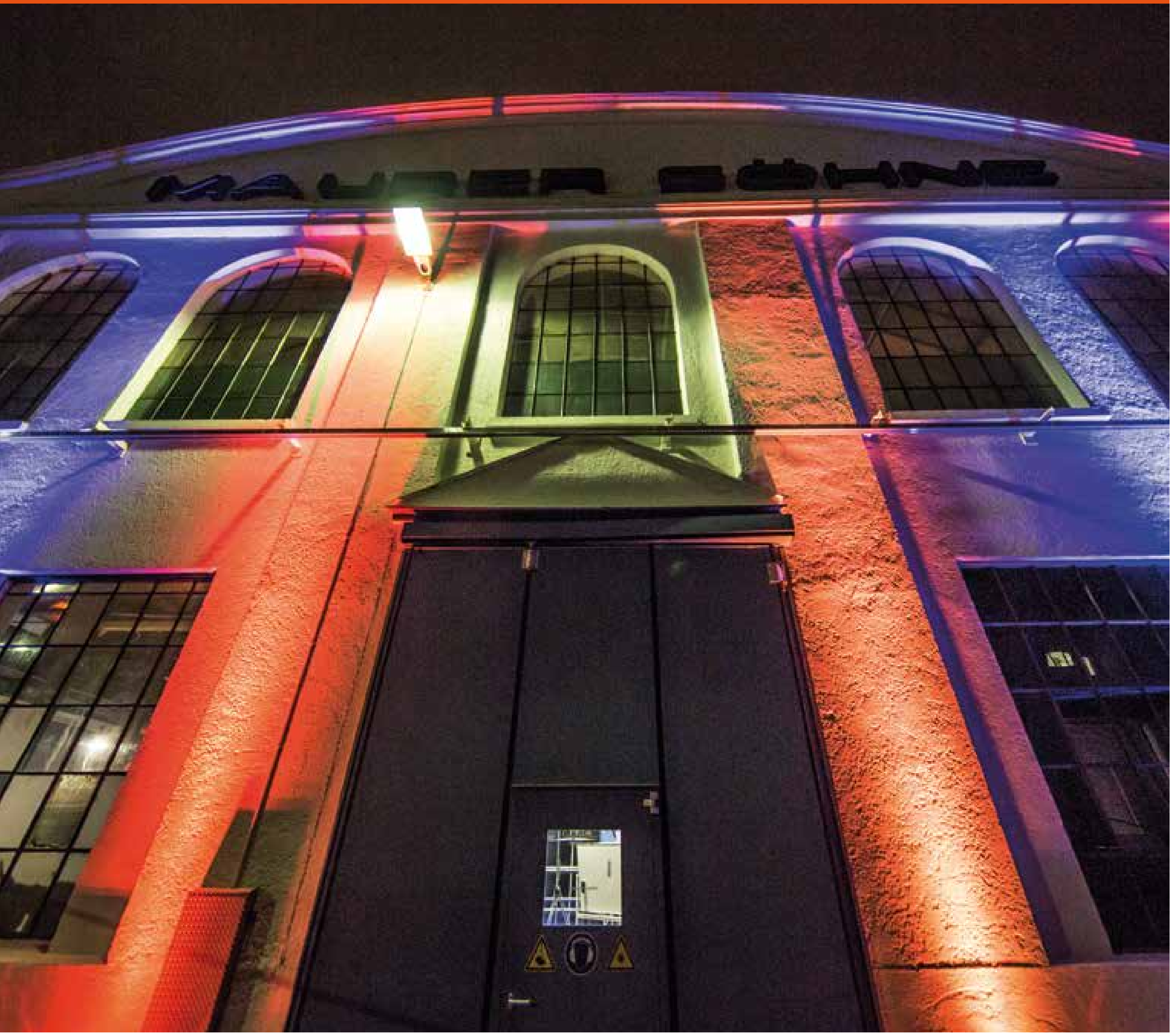
MAURER

MAURER SE

Innovative since 1876



forces in motion

Abandoibarra Bridge, Bilbao / Spain

Innovative since 1876

Our history could easily be characterized as a succession of small and great successes and progress, both in the past and at present. However, like with all things that grow and get bigger: what strengthened MAURER and made it a recognized firmly established company in our global markets were the phases of reorientation and reinvention.

From Friedrich Maurer's metalware workshop for ornaments in the Glockenbach quarter in Munich, the lightning arrester factory Friedrich Maurer's Söhne emerged, which, after several relocations in the municipal area of Munich, established today's headquarters shortly after the first economic crisis in the early 1920s.

Competition, new technologies, industrialization, expansion of the infrastructure, crises and war forced us into entrepreneurial repositioning time and again – well into the period of reconstruction. Among our products were: tools and roofing material, lattice masts, punched parts for railroad cars, gasometers, boilers, traction drives and hangar gates, but also coal shovels, frying pans and tin boxes.

What makes us renowned worldwide today – structural and civil engineering – has been a constant for a good 90 years. And the recipe for our strength proper is this: our willingness to use our know-how and expertise for the benefit of a population that is growing together worldwide.

Dr. Christian Braun

Max Meincke

« Since 1876, our best solutions have been made from a very special material – the ideas provided by our staff. »

Dr. Christian Braun, Max Meincke
Managing Directors

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 in1876. It is 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.

MAURER headquarters, Munich / Germany

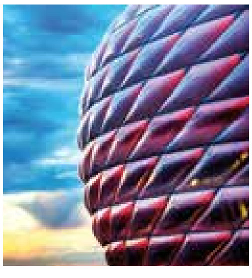
Five areas of application for a customized Structural Protection System

Traffic, wind and seismic-induced movements of buildings, bridges and complex structures can be controlled through selective use of structural bearings, expansion joints, tuned mass dampers, seismic devices and vibration isolation systems 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


STRUCTURAL BEARINGS


EXPANSION JOINTS


TUNED MASS DAMPERS


SEISMIC DEVICES


VIBRATION ISOLATION

Looking back to the future –

>> 1876

Early on, Munich exerted a strong pull on people, also on the metal craftsman **Friedrich Maurer** from Benediktbeuern who settles down in the Bavarian royal capital in summer 1876.

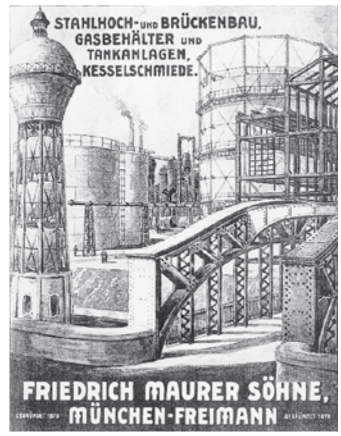
At that time, **Munich** gets its **first streetcar** and it may well be that the open-mindedness towards the world and the technical progress prompts Maurer to seek his professional fortune there.

On September 19, 1876, he opens a **small workshop as a metal spinner** in the rear building of Fraunhoferstraße 18.

This craftsman's trade mainly deals with **metal forming and other processing of metal sheets of all kinds**. First and foremost, Maurer manufactures lighting fixtures, bowls and tableware made of precious and non-precious metals. In the course of 20 years, a **metalware factory** evolves from this workshop.

>> 1899

After the death of the founder in 1899, his sons Friedrich and Georg continue business under a new name: **FRIEDRICH MAURER'S SÖHNE**.



>> 1911

Official registration of the company in the **commercial register**.

>> 1924

Manufacturing of lattice masts as well as pressed and punched parts for **equipment of railroad cars of the German State Railroad**.

1876 1925 1935 19

>> 1925

In 1925, the company **moves** to its today's location **in the north of Munich**. From there, also **"iron structures"** are offered. These are **hall and roof constructions, crane tracks and bridges**.

>> 1928

The first large object in this regard is the **new construction** of the **Oberottl commercial building located in Sendlinger Straße** in Munich in 1928. The beginning **electrification of the German State Railroad** brings about orders for the company on all kinds of **lattice masts** and **accessories for railroad car equipment**.

>> 1929

The employees gain **first experience in mechanical engineering**: drilling stands for the German State Railroad.

>> 1931

A **large-scale order on scrapping of railroad engines** leads to a business encounter between **Georg Maurer and Johannes Beutler**. Despite the economic crisis, Beutler **acquires** the **"iron factory" FRIEDRICH MAURER'S SÖHNE and continues business under the same name**. Georg Maurer remains associated with the company for 20 years as technical manager; however, from then on, Johannes Beutler controls the entrepreneurial fate.

>> 1932

Brake cylinder supports are manufactured in large quantities **under a Kunze-Knorr license**.

>> 1934

Johannes Beutler purchases the adjacent piece of land of the former Bergmann works thus enabling a **considerable expansion of the factory**. In the following years, the company starts with **structural engineering on a large scale**.

>> 1935

Further development of **welding technique** enables the **construction of gasometers** and other receptacles of all sizes.

>> 1936

The first **gas separators** for oil drilling are produced and partly exported as far afield as **the USA**.

a MAURER history of perspectives

>> 1937

The expansion of the **air transportation sector** causes a considerable **boost**. Everywhere, hangars spring up like mushrooms. In particular, the **hangar gates** following a patent issued by the operations manager Mr. Dittmann make **MAURER SÖHNE** public all over Germany.

>> 1938

Further mechanical engineering products: **traction drives for mixers.**

>> 1945

The years from 1945 to 1954 are characterized by **dismantling, improvisation and reconstruction**.

>> 1947

First postwar product: **agricultural vehicle trailers**.

>> 1948

Delivery of **lattice girders** and other parts for the **ropeway Spitzingsee**.

>> 1953

Construction of large concreting cranes for the **Danube power plant Jochenstein**.

>> 1954

Numerous **pylons, pillars and anchoring portals** are delivered for the **expansion of the power supply** (Bayernwerk).

>> 1957

First steam boiler, Maurer-de Poray system, is completed.

>> 1958

Ernst Beutler is succeeded by **notary Paul Bauer and Rudolf Gumberger**.

From 1958 to 1963, the company is involved in several **prominent steel structures** in the **Munich area**, e.g. the **reconstruction of the main station, the Palace of Justice** and **the National Theater**.

In addition, **steel bridges, steel stacks** and other products from **receptacle and sheet manufacturing** are produced.

>> 1939

Due to **governmental stipulations**, several **munitions** are included in the production program.

The **Second World War** brings about a temporary **highlight in the company's history** with over 1,000 employees and large orders, particularly for large halls, scaffoldings and platforms for the aluminum industry.

>> 1951

After **Johannes Beutler's death** in 1951, his **widow Margarete Beutler** continues the business as a limited partnership.

His **brother Ernst Beutler** manages the company until 1958.

>> 1944

Toward the **end of the war**, most of the **commercial buildings** are **destroyed** in air strikes.

>> 1962

Particularly in the **off-conventional-steel-construction areas**, remarkable services are provided.

For instance, from 1962 to 1976 the company delivers a whole range of **cantilever scaffoldings** (centerings) for concrete bridge construction, thus making **a substantial development contribution** to this particular line of production.

>> 1964

In 1964, **Dipl.-Ing. Hans Beutler**, a **son of Johannes Beutler**, joins the company and takes over the **management** in 1971.

New products are added: **malting plants, steel stacks and special receptacles** such as **drying towers and skips**.

>> 1965

A new specialty is tackled: **watertight roadway joint constructions**.

From 1965 to 1976, the company establishes its reputation through **patent acquisitions and inhouse further developments of roadway joint constructions** ("MAURER joint") and **becomes the leading manufacturer**. 40 patents, domestic and abroad, meanwhile (= 1976) protect this development.

>> 1966

From 1966 to 1973, **three new factory buildings** and **one administrative building** are built.

>> 1970

In 1970, a **subsidiary in Dortmund-Hörde** is founded, thereafter several representations **abroad in Europe**.

>> 2001

Terminal 2 Munich Airport, steel structure.

>> 2003

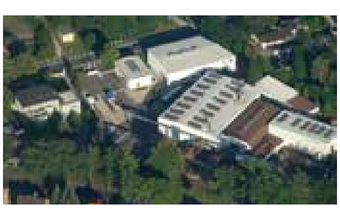
Development of MSM® (MAURER Sliding Material).

Pedestrian bridge **Neuland Bridge**, Leverkusen / Germany, **steel structure for the bridge construction**.

1966 1975 1996

>> 1973

In 1973, the **manufacturing of bridge bearings** commences. By acquiring **Fritz Kreutz KG**, from whose long-standing experience in bridge bearing manufacturing MAURER SÖHNE now benefits, a **complete, fully developed product range for bridge equipment** can be presented.



>> 1975

More than 60,000 m of watertight **MAURER expansion joints** are installed **in over 3,500 bridges worldwide**.

>> 1976

340 employees

>> 1984

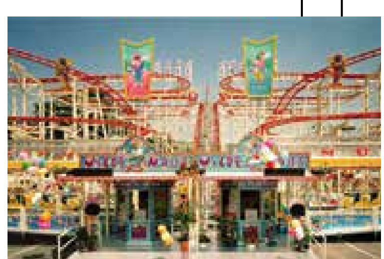
Introduction of the **swivel joist**.

>> 1991

Foundation of the Bernsdorf **works**.

>> 1993

Rollercoaster Wild Mouse, Munich



>> 1996

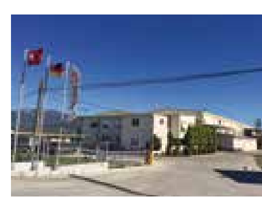
Beginning of production of **seismic devices**.

>> 1999

Subsidiaries in **Turkey and China**.

>> 2005

Introduction of **semi-active cable vibration absorbers** (e.g. Sutong Bridge).



>> 2004

Development of low-noise expansion joints (with rhomboid or sinus-shaped plates).

Subsidiaries in **Russia and France**.

Development of the **Sliding Isolation Pendulum Bearing** (isolation of buildings from earthquakes, e.g. New Acropolis Museum in Athens).

From 2004 to 2006 **steel construction and roofing at BMW World Munich**.

>> 2010

Introduction of **MSA®** (MAURER Sliding Alloy) for **highest corrosion protection** and **approval in Germany**.

Subsidiary **MAURER India / Sanfield Ltd.**

Development of **MAURER Wave Expansion Joint XW1**.

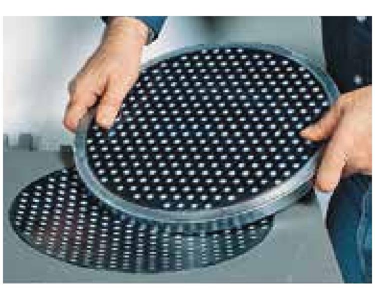
>> 2014

Change of company's name from Maurer Söhne GmbH & Co. KG to **MAURER AG**.

2004 2010 2014 2018

>> 2006

Europe-wide approval of MSM® (ETA – European Technical Approval).



>> 2012

Foundation of the **subsidiary in Brazil**.

>> 2011

Development of **MAURER Modular Bridging System** for construction sites.

>> 2016

Change of company's name from MAURER AG to **MAURER SE.**

Today, the company is owned by the **third generation** of the **Beutler family**.

MAURER Structural Bearings

Berlin Main Station / Germany

MAURER MSM® Spherical Bearing for 220.000 kN vertical load

Vibrations, rotations and powerful forces – bridges and superstructures may undergo a turbulent life. MAURER Structural Bearings ensure at any place that these impacts remain without consequences as long as possible. 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, Guided-Sliding and Free-Sliding.

>> Key characteristics of MAURER Structural Bearings

- ✓ Ensure longevity of structure
- ✓ Lifespan identical to that of the structure
- ✓ Maintenance-free
- ✓ Function-proof through real-time monitoring
- ✓ Certified external quality management
- ✓ Load capacity 1–300.000 kN
- ✓ Extensive inhouse research & development
- ✓ CE marking available

MAURER Expansion Joints

Yavuz Sultan Selim Bridge, Istanbul / Turkey

Installation of MAURER Modular Expansion Joint for Izmit Bay Bridge

Roadway expansion joints on bridges reliably absorb continuous traffic loads in structures, including movements caused by shrinkage/creeping or temperature variations. These movements are enabled in any direction and structural gaps are covered at any load. Compared to road bridges, railroad bridges face different challenges, because the trains that pass bridges cause higher traffic loads. MAURER Seismic Joints are expansion joints with reserves for extreme situations. MAURER Architectural Joints optically adapt to the esthetics of the building.

>> Key characteristics of MAURER Expansion Joints

- ✓ Maintenance-free, watertight and fatigue-resistant
- ✓ Certified external quality management
- ✓ Certified life span 20 to 50 years
- ✓ Suitable for any movements from 5 to 5.000 mm >
- ✓ Expansion joints are approved by Deutsche Bahn and the Federal Ministry of Transport and Digital Infrastructure
- ✓ CE marking available for various types

MAURER Tuned Mass Dampers

Danube City Tower, Vienna / Austria

The MAURER factory team illustrates the dimension of the steel frame for the double pendulum of SOCAR Tower in Baku / Azer-baidjan

Civil engineering structures may be prone to large-amplitude vibrations due to wind and earthquake loading mechanisms because of their slenderness and low inherent damping ratio of approx. 1%. MAURER offers different types of Tuned Mass Dampers (TMD) to considerably enhance both comfort and structural stability.

>> TYPES OF VIBRATION

- Wind loading mechanisms which may evoke large resonance and therefore large-amplitude oscillations in high-rise buildings impair the comfort and lead to malaise (seasickness).
- Free vibrations of tall buildings after earthquake excitation may cause low-cycle fatigue.
- Bending, torsional galloping and flatter vibrations in bridges lead to large-amplitude and therefore dangerous resonant vibrations that may even destroy the deck structure.
- Human-induced vibrations in stadiums, floors and foot-bridges may yield vibration amplitudes that are beyond the acceptable maximum values for comfort and safety.

>> Key characteristics of MAURER Tuned Mass Dampers

- ✓ Single-source solution: model-based optimal design of TMD within structure, minimizing TMD size
- ✓ External testing
- ✓ Installation and adjustment
- ✓ Increased efficiency by up to 20% compared to customary mass dampers leads to cost reduction and increase of reliability

MAURER Seismic Devices

Djamaâ El Djazïr Mosque, Algiers / Algeria
© KSP Jürgen Engel Architekten, Krebs + Kiefer International

SIP Sliding Isolation Pendulum Bearing and two horizontally adaptive hydraulic dampers underneath the Mosque in Algiers. © KREBS + KIEFER Ingenieure GmbH

"Earthquakes are natural disasters whose feature is that most of the human and economic losses are not due to the earthquake mechanisms, but to failures in man-made facilities, like buildings, bridges, etc., which supposedly were designed and constructed for the comfort of the human beings." (Fabrizio Bertero)
In the middle of the 1990s, MAURER decided to invest in the establishment of the area of Seismic Devices, which has led to its present position of worldwide leadership.

MAURER Seismic Devices can consist of various combinations of isolators, dampers, fuse box systems and expansion joints.

>> Key characteristics of MAURER Seismic Devices

- ✓ Solution-based engineering for the structure: individual combination of devices, reduction of forces, increase of reliability and cost reduction
- ✓ Lifetime of MAURER System identical to structural lifetime
- ✓ CE marking is available for all devices

MAURER Vibration Isolation

ELI-NP, Bucharest, Romania; information property of IFIN-HH/ELI-NP

MAURER Isolators for power plants

Vibration isolation by MAURER prevents structures from unwanted vibrations caused by traffic loads and other disturbances as well as structure-induced noise. Likewise, it minimizes machine-induced structural vibrations.

In both cases, the structure and the machine, respectively, are elastically supported. The elastic elements are commonly designed based on the modeling of the single-degree-of freedom system.

We offer spring boxes and elastomeric isolators and a combination of both devices with dampers.

>> Key characteristics of MAURER Vibration Isolation

- ✓ Individual expert consulting
- ✓ Determination of the optimal system for micro-vibration (1–30 µ)
- ✓ Products with best price-performance ratio
- ✓ In the event of seismic load cases, horizontal displacements up to ± 500 mm

MAURER German Wheels

R80XL, MAURER site in Munich

Ferris wheels have always been most fascinating buildings. They are landmarks and rotating viewing platforms at the same time, providing visitors with new perspectives and prospects. Ferris wheels are a widely visible sign of great festivals and have long been part of the skylines of the modern metropolis. They create emotions and are gladly used as market place and meeting point.

In total, approximately 30 pieces of complete giant wheels have been manufactured by MAURER since 2002. Initially, the R40, R50 and R60 Ferris Wheel types were manufactured as stationary and mobile versions. The number signifies the diameter of the wheel (e.g. R40 Ø 40 m). Since 2013, MAURER has been selling the new R80XL Ferris Wheel as stationary and mobile version with 54 pieces of Ethos gondolas for 8 passengers or 27 of the more elegant and larger Zeppelin gondolas each for up to 16 passengers per gondola. A wheel of this type located in Puebla / Mexico with a total height of approx. 78 m is currently listed as the largest transportable Ferris wheel in the world in the Guinness Book of Records.

R80XL close up

R80XL Ferris Wheel

MAURER Rides

X-Car-Launch Coaster, Shock, Rainbow MagicLand / Italy

In 2003, MAURER founded the subsidiary MAURER Rides GmbH, which today acts as a specialized and independent unit of the MAURER Group. The production mainly takes place at the Munich site of MAURER SE.

MAURER Rides specializes in rail-mounted transportation systems. In addition to roller coaster trains and related amusement rides, this includes passenger transportation systems and people movers as well as conveyor systems for the transportation of goods.

The introduction of the revolutionary Spike® drive technology represents a milestone in several sectors in the development of rail-bound transportation systems. Numerous awards and patents underline the status of MAURER as a technology and innovation leader.

Spike Coaster from MAURER Rides

MAURER Certificates

>> MAURER Expansion Joints, Bearings and Dampers withstand the world's toughest certification processes.

European Technical Approval ETA-06/0131

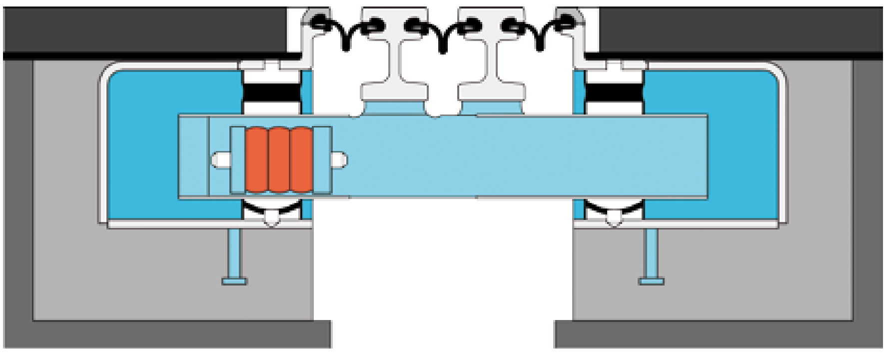
English translation prepared by DIBt - Original version in German language

Handelsbezeichnung / Trade name	MAURER MSM® Kalotten- und Zylinderlager / MAURER MSM® Spherical and Cylindrical Bearing
Zulassungsinhaber / Holder of approval	Maurer Söhne GmbH & Co. KG, Frankfurter Ring 193, 80807 München
Zulassungsgegenstand und Verwendungszweck / Generic type and use of construction product	Kalotten- und Zylinderlager mit besonderem Gleitwerkstoff / Spherical and cylindrical bearing with special sliding material
Geltungsdauer / Validity: vom / from	19 September 2011
bis / to	20 June 2016
Herstellwerk / Manufacturing plant	Maurer Söhne GmbH & Co. KG, Frankfurter Ring 193, 80807 München
Diese Zulassung umfasst / This Approval contains	26 Seiten einschließlich 5 Anhänge / 26 pages including 5 annexes
Diese Zulassung ersetzt / This Approval replaces	ETA-06/0131 mit Geltungsdauer vom 20.06.2011 bis 20.06.2016 / ETA-06/0131 with validity from 20.06.2011 to 20.06.2016

EOTA

Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

The CE marking ensures certified quality and compliance with the European standards. This is warranted through the respective external control, e. g. by the Materials Testing Institute (MPA) of Stuttgart University or other acknowledged, independent institutions.



Girder Grid Joints (noise reduction included / not included) Technical Approval according to TL/TP FÜ

>> Excerpt from certificates and European Technical Approvals for

MAURER MSM® Spherical and Cylindrical Bearings	European Technical Approval ETA-06 / 0131 DIBT
MAURER MSM® Spherical and Cylindrical Bearings	EC Certificate of Conformity MPA Stuttgart 0682-CPD-005.2
MAURER Elastomeric Bearings	EC Certificate of Conformity MPA Stuttgart 0672-CPD-005.5
MAURER Lead Rubber Bearings (MLRB)	Certificate of Constancy of Performance 0672-CPR-0362

MAURER Quality


Production test of the hydraulic dampers in Pavia / Italy

>> QUALITY POLICY

Quality and reliability of our products are, among other outstanding product features, the basis of our successful business. Together with economic considerations, quality and reliability are important criteria in the purchase decisions of our customers.

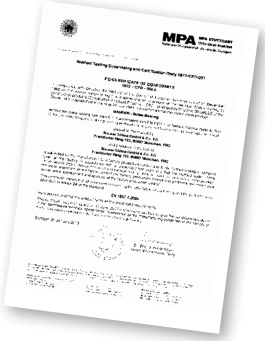
- Quality control by implementation of a quality management system
- Permanent assessment and measuring of quality
- Training of our employees regarding quality methods and tools

>> STANDARD SPECIFICATIONS & CERTIFICATES

MAURER product components are measured and tested according to EN 1337, EN 15129, AASHTO or other preference standards on an individual project-related basis.

>> EXTERNAL QUALITY CONTROL

External quality control is realized, for example, by the Materials Testing Institute (MPA) of Stuttgart University /Germany or by other certified and independent institutes.



>> SUITABILITY TESTS

Tests have been carried out at the following institutes:

- Universität der Bundeswehr München / Germany
- Ruhr-University in Bochum / Germany
- EUCENTRE at the University of Pavia / Italy
- University of Messina / Italy
- ISMES Institute in Bergamo / Italy
- Politecnico di Milano / Italy
- University of California San Diego / USA
- University of California Berkeley / USA

>> ECOLOGICAL POLICY

Our products, processes and environmental protection efforts are constantly improved by using up-to-date methods and measures. This concerns in particular the longevity and reliability of our products, which therefore make an important contribution to resource efficiency.

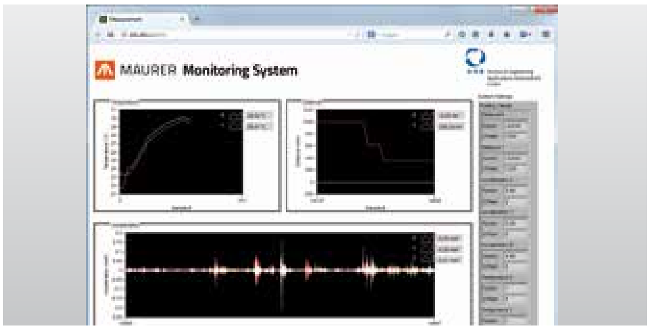

Test press 10 MN Universität der Bundeswehr München in Munich / Germany

MAURER Services

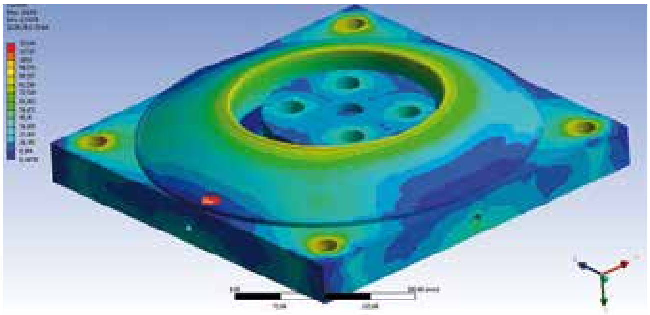
Installation Botlekbrug, Netherlands

>> 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 MMS monitoring system enables permanent monitoring of the load cases earthquake, traffic and wind. Forces, displacements, accelerations and temperatures, which have an impact on the structure and the structural protection system are recorded. This data provides the basis for documenting loads, carrying out inspections and further enhancing the protection system.



MAURER MMS Monitoring System



Finite element analysis

>> CONSULTING
The exceptional strength of our team is its comprehensive technical expertise and 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 AND MAINTENANCE
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 low cost.

Inspection of bridge bearings

MAURER Locations

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MAURER References

MAURER systems – designed as individually as the structures

>> Russky Bridge, Vladivostok / Russia

Task:
Structural protection against wind and earthquakes on currently the widest spanning cable-stayed bridge in the world with a pylon distance of 1,104 m.

Scope of project:
MAURER Swivel-Joist Expansion Joints for 2.4 m of movement and slip security (XLS 2400). MAURER MSM® Spherical Bearings (KGA, KGE) with 34 MN superimposed load and Horizontal Force Bearings plus 25 MN horizontal force, MAURER Hydraulic Wind / Earthquake Dampers (MHD) for 3 MN and 2.2 m of movement and passive / adaptive cable-stayed dampers for cables up to a length of 578 m.

>> New Acropolis Museum, Athens / Greece

Task:
Structural isolation to protect against earthquakes for the building with a weight of 33,000 t.

Scope of project:
MAURER MSM® Sliding Pendulum Bearings with an upper Sliding Plate (SIP) for up to 13.6 MN of superimposed load and ± 255 mm of movement.

>> **Las Piedras railroad viaduct in the north of Malaga / Spain**

Task:
The Spanish high-speed train AVE generates very high braking forces in the 1,200 m long viaduct, but these must not cause any significant structural movements. In addition, the up to 93 m tall and flexible pillars are subjected to considerable stress during earthquakes of 0.3 g.

Scope of project:
MAURER MSM® Spherical Sliding Bearings (KGA, KGE, KF) for up to 25 MN of superimposed load, 2 MN of horizontal force and ± 350 mm of movement. MAURER Hydraulic Dampers (MHD) for 2.5 MN, plus ± 350 mm of movement and shock transmitters and load limiter function (MSTL) for brake forces.

>> **Djamaâ El Djazïr Mosque, Algiers / Algeria**

Task:
The maximum seismic load on the 145 m long, 65 m tall main building is 0.65 g. The building is protected against this acceleration and will not sustain any damages.

Scope of project:
MAURER MSM® Sliding Pendulum Bearings with two Sliding Plates (SIP-DR) for up to 27 MN and ± 655 mm of movement; MAURER Hydraulic Dampers (MHD) for 2.5 MN, plus ± 655 mm of movement.

>> **Nissibi Bridge / Turkey**

Task:
The 610 m long bridge was placed on elastic / free-deforming bearings. The temperature fluctuations must be distributed evenly across the structure and the maximum movement amplitudes limited in the event of an earthquake.

Scope of project:
MAURER Lead Rubber Bearings (MLRB) for up to 31 MN of superimposed load and ± 380 mm of movement.

>> SOCAR Tower, Baku / Azerbaijan

Task:
The headquarters of the State Oil Company of Azerbaijan Republic (SOCAR) is 200 m tall and symbolizes the shape of a flame. As a result of its elastic, flexible construction, significant structural accelerations can occur on the upper storys under certain wind loads and in the event of earthquakes that cause discomfort for the building's inhabitants.

Scope of project:
MAURER Mass Pendulum Damper (MTMD - P) with a 450 t pendulum mass including MAURER Hydraulic Dampers (MHD) for the damping of 0.16–0.32 Hz in the x and y direction and ± 400 mm of movement in all horizontal directions. As end stops, four MAURER Lead Rubber Bearings (MLRB) were provided for the 450 t mass block; a monitoring system for movement and acceleration was included.

>> Franjo Tudjman Bridge, near Dubrovnik / Croatia

Task:
The 518 m long cable-stayed bridge is situated in an earthquake zone of moderate intensity. The flat sliding bearings needed to be designed for larger longitudinal movements to transfer tensile forces. The bridge deck movements are limited through hydraulic dampers to ± 150 mm in a seismic load situation. The abutments of the transition pier section are fitted with Swivel-Joist Expansion Joints and are accomodating the required horizontal and vertical movements.

Scope of project:
MAURER Uplift-Compression Pot Bearings (TGA-Z) with a load capacity of 9.750 kN; MAURER Hydraulic Dampers (MHD) with 2,000 kN and 500 mm of total movement; MAURER Swivel-Joist Expansion Joints DS 560F; 40–150 kN cable-stayed dampers.

>> Harilaos Trikoupis Bridge, near Patras / Greece

Task:
The 2,250 m long bridge deck needs to compensate enormous movement amplitudes from temperature fluctuations and earthquakes at the abutments. The approach ramps need to be supported with elastic floating bearings.

Scope of project:
MAURER Swivel-Joist Expansion Joints DS 2480 F; Elastomer Bearings with a 3,100 kN load capacity.

>> Danube City Tower, Vienna / Austria

Task:
The 220 m tall building sways in strong winds and earthquakes. The accelerations had to be reduced to provide adequate comfort. To do so, a 300 t mass is applied in a MAURER Mass Pendulum Damper.

Scope of project:
MAURER Semi-Active Hydraulic Dampers (MRD) for 30–80 kN and ± 700 mm of movement to dampen the 300 t pendulum mass; a monitoring system for movement, force and acceleration was installed.

>> Botlekbrug, Rotterdam / Netherlands

Task:
Opening and closing the largest lift bridge in Europe presented a technical challenge. Thus special bearings and roadway joints were required 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 approx. 1,200 x 1,100 mm and weigh more than 4 t. The loads are 21,000 to 29,000 kN.

The Botlekbrug is the entrance to the largest seaport in Europe and currently the largest lift bridge in Europe. It is part of a 37 km highway section of the A15 passing through Rotterdam.

>> 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 fans.

Since the beginning of the 2005 / 06 season, the Munich soccer club FC Bayern München has held its home matches in this arena. It was also a venue for the 2006 FIFA World Cup and 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 highway in St. Petersburg with a length of 46.6 km, 14 highway intersections, many tunnels, canal bridges and viaducts. WHSD is the solution to the traffic problems in St. Petersburg.

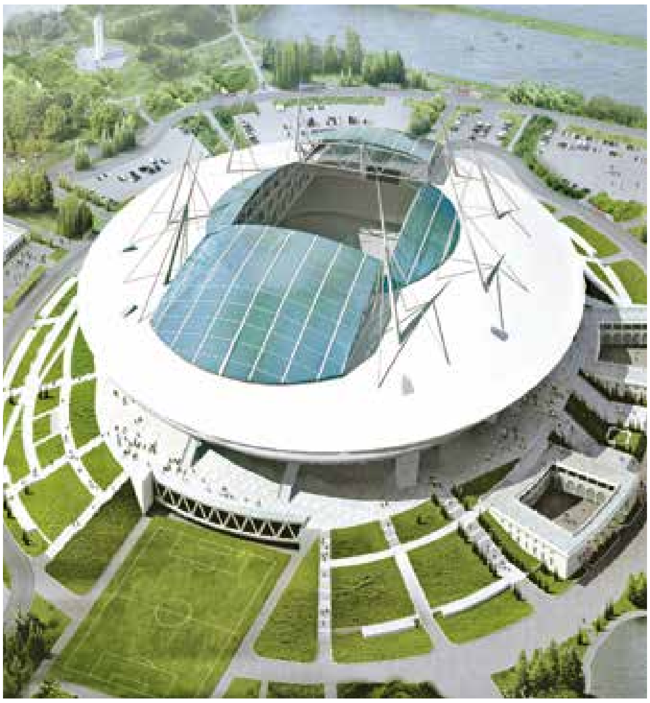
Scope of project:
Delivery of more than 2,500 MAURER Bridge Bearings (Spherical and Elastomeric Bearings) up to a load of 60,000 kN and approximately 4,000 m of modular expansion joints with movements up to 880 mm.

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:
Due to increased traffic load, a second bridge was built next to the old Waal Bridge. The old bridge with the largest modular and watertight expansion joints in the Netherlands has been a reference project for MAURER since 1997.

Scope of project:
22 MAURER MSM® Spherical Bearings and 4 pylon bearings with a load of up to 220,000 kN, weighing approximately 21 t each.



>> Gazprom Arena, St. Petersburg / Russia

Task:
Support of the roof construction

Scope of project:
96 MAURER Spherical Bearings, 60 of them are uplift / load bearings.
Max. load capacity: 17,500 kN
Min. load capacity: -3,500 kN (tensile load)

The Gazprom Arena is a soccer stadium under construction in St. Petersburg / Russia. It will provide space for 62,167 spectators. The inauguration is planned for the FIFA World Cup 2018.

>> Hong Kong Zhuhai Macao Bridge, China

Task:
MAURER developed special joints with steel connections at both ends. The 700 m long Jianghai Bridge is part of the Hong Kong-Macao highway connection crossing the Pearl River delta.

Scope of project:
MAURER DS 1760 and DS 1200 Expansion Joints with a movement capacity of 1,760 and 1,200 mm, respectively.

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

Task:
The steel arc bridge which caters for pedestrians, bicycles and a tram, was protected against uplift forces through uplift bearings.

Scope of project:
8 MAURER MSM® Spherical Bearings and 2 MAURER Spherical Uplift / Load Bearings. They transmit both tension (i.e. uplift) and compression forces in any state of rotation and displacement.

>> **New Orbital Highway Contract / Qatar**

Task:
The first contract of the New Orbital Highway connects New Doha Port to the Orbital Highway. MAURER is supporting this project with the installation of 600 MAURER Bridge Bearings including Spherical Bearings and 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 force.

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

Research & Development

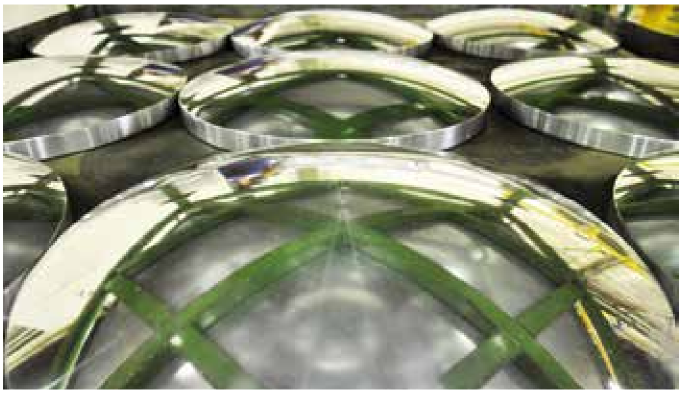
>> EXPERTISE

Material development
- Sliding materials
- Elastomers, polymers
- Fluids for dampers
- Steel alloys

Product development process
- Continuous improvement
- Customized solutions on demand
- New products

Structural understanding
- Site knowledge
- Qualified team of civil and mechanical engineers

Modern development tools, knowledge and permanent in-house education


Spherical lenses made of special alloy


MAURER Guided Cross Tie load test in test lab of Prof. Bucak, Augsburg / Germany


Universität der Bundeswehr

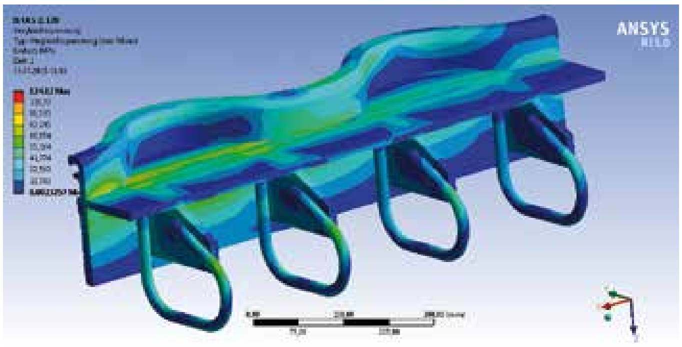

EUCENTRE in Pavia


SRMD at UCSD in San Diego, USA

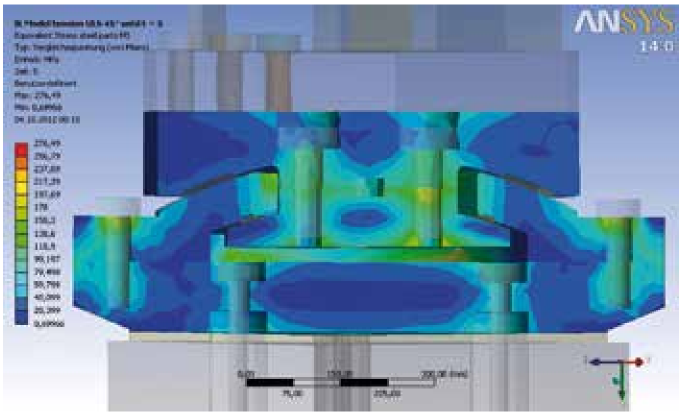

Test setup of intelligent expansion joint for load measurement

>> VERIFICATION / TESTING

- Full scale
- Independent laboratories
- Deep experience in testing
- Design and manufacturing of complex test arrangements
- Dynamic and static tests
- Standard: AASHTO, EN, BS, etc.
- Custom requirements
- Site tests and commissioning of frequency, damping, acceleration, amplitude and efficiency



Wave shaped XW1 Expansion Joint – FE model



Spherical Tension Compression Bearing – FE model

>> ENGINEERING

- FE analytics of devices
- Dynamic analysis of structure
  - seismic performance
  - vibration control of tall structures and footbridges
  - cable vibration
- Support of structural designers

>> RESEARCH

- Participant and leader in national and international founder research projects
- Crosslinked to renowned universities and institutes
- Launch of foundation "Maurer Söhne Stiftung" to promote scientists and scientific progress
- Participation in conferences
- Dissemination of scientific peer-reviewed papers

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