Effective solutions for vibration isolation and impact sound insulation
Protection of our society and valuables

Problem

• Changed perception
People’s sensitivity to vibrations and sounds in buildings and structures has changed over the course of recent years. Negative impacts on quality of life and work are no longer simply accepted. Vibrations and noises which were previously acknowledged as unavoidable might today often lead to protracted court cases.

• New challenges

Construction materials: Thanks to a greater use of technologically, advancing construction materials, building designs are becoming ever more streamlined, the spans of beams, joists and ceilings are becoming ever larger and are often more susceptible to vibrations as a result.

Technical installations: The increasing installation of technical equipment such as heating pumps, lifts and air conditioning units also contribute to the cause of vibrations in the building structure.

Traffic: In addition, there is from year to year a significant additional burden as a result of increasing traffic in the air, on the rails and on the streets.

Effects and solutions

Noise affects people’s quality of life. It has an impact on the physical and mental health. In addition to the long-term health consequences of noise often employees are affected from a reduced learning and performance. In many cases, these effects have led to significant reductions in rental rates or the termination of long-term rental contracts.

mageba’s product portfolio of vibration isolation and impact sound insulation offers effective solutions for every application:

• Elastic mounting of buildings
• Machine supports
• Crane track mountings
• Mounting of load distribution plates and floor constructions

As one of the leading global manufacturers of bridge bearings for road and rail infrastructure, mageba is measured against the highest standards in the field of safety and maintenance on a daily basis. For us, this provides motivation to constantly continue improving the high quality of our products and their implementation.

Certification and approval

In 1991, mageba was the first company in bearing production to achieve certification of its quality management system in accordance with ISO 9001. Reinforced elastomer bearings are regulated in EN 1337-3. However, this standard is not applicable for bearings for vibration insulation in buildings. However, the capacity of the reinforced mageba VIBRAX®BLOCK bearing is assessed following EN 1337-3.

The products in the VIBRAX® range have been tested by the following institutions, among other, in order to determine the static and dynamic properties:

• EMPA Dübendorf | CH
• Technical University of Munich | DE
• Stuttgart material testing institute | DE
• Karlsruhe material testing institute | DE

In addition, the products in the field of sound insulation have European technical approval (ETA, CE marking).

All-round services

• Elaboration of special solutions for the mounting of your supporting structure
• Advice and calculation of bearings
• Training of engineers
• Supervision and training of the building contractor during installation
• Fitting by experienced experts
• Inspection of installed bearings
• Tendering and costing
• Implementation of building-specific laboratory tests
Vibration damping

Moving parts in machines generate undesirable vibrations and structure-borne noise during operation as a result of rotation and lifting/lowering movements. This can be felt and heard as noticeable tremors or as audible airborne noise in surrounding office or residential areas.

Isolation with the help of our VIBRAX® products also provides relief here. Our solutions eliminate disturbances completely and permanently or reduce them to an acceptable level.

Vibrations in buildings can be a source of significant disruption. Vertical movements of the building structure can cause noticeable shaking, and noise can result from the excitation of individual structural elements.

mageba has developed sustainable solutions for these cases on the basis of the well proven VIBRAX® products. Our professional and sustainably effective solutions are based not only on these outstanding products, but also on a deep understanding of structural behaviour and on experience from a multitude of projects.

Area of application: vibration isolation

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Area of application: impact sound insulation

Underlay and load distribution plates in production halls or supermarkets, for example must be able to support high loads. At the same time, the acoustic insulation requirements for such structures have increased in order to shield people in the neighbouring residential and work areas from impact noises and vibration emissions (i.e. forklift traffic, among other things).

Our certified materials in the VIBRAX® range fulfil the enhanced requirements of the SIA 181 for impact sound insulation and are suitable for loads of up to 200 kN/m².

Our services at a glance

Elastic mounting of buildings

Machine supports

Crane track mountings

During operation, crane tracks generate noticeable vibrations and structure-borne noise as a result of braking and acceleration processes as well as unevenness in the castors and rails.

Through the use of our VIBRAX® CRANE bearings, developed specially for crane tracks, such disturbances can be largely eliminated without great effort.
## Products – vibration isolation

### VIBRAX®BLOCK
Reinforced elastomer bearing made from natural rubber
- Load range: 3–10 N/mm²
- Natural frequency: ≥ 6 Hz
- Installation thickness: 40–250 mm

### VIBRAX®DAMP C
Elastomer bearing made from natural rubber
- Load range: 1–4 N/mm²
- Natural frequency: ≥ 19 Hz
- Installation thickness: 12 mm

### VIBRAX®DAMP B
Elastomer bearing made from EPDM
- Load range: 0.3–0.7 N/mm²
- Natural frequency: ≥ 18 Hz
- Installation thickness: 10, 20 mm

### VIBRAX®PUR
Elastomer bearing made from polyurethane
- Load range: 0.01–2.8 N/mm²
- Natural frequency: ≥ 8 Hz
- Installation thickness: 12–50 mm

### VIBRAX®DYN
Elastomer bearing made from polyurethane
- Load range: 0.075–2.0 N/mm²
- Natural frequency: ≥ 6 Hz
- Installation thickness: 12–50 mm

### VIBRAX®DAMP
Elastomer bearing made from rubber granulate
- Soft | Medium | Hard | Ultra | Supreme
- Load range: 0.05–2.0 N/mm²
- Natural frequency: ≥ 15 Hz
- Installation thickness: 10–30 mm

### VIBRAX®DAMP 17/8
Elastomer made from rubber fibres
- Load range: 0.02–0.10 N/mm²
- Natural frequency: ≥ 15 Hz
- Installation thickness: 17 mm

### Special designs
Bearings and tension-pressure anchors with project specific properties are available on request.

### Key
- NR - natural rubber
- PUR - polyurethane
- EPDM - Ethylene propylene diene monomer

1) During installation, care should be taken to ensure that the profiled side of the elastomer mats should lie on the existing concrete subsurface.

2) Elastomer mats can be laid in multiple layers in order to reduce the natural frequency and increase the insulating effect.
## Products – impact sound insulation

### VIBRAX®MULTI

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### VIBRAX®MULTI 8/4

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*) Specifications in accordance with ISO 10140-3 apply for single layer laying and subsurface thicknesses of up to 80 mm (179 kg/m²).

For thicker underlays and/or multi-layer laying, the impact sound improvement is higher.

The impact sound insulation is dependent on the material thickness, underlay thickness and floor covering used.
Elastic mounting of buildings

Concept
Vibration bearings form the link between a dynamically inducing system and a system to be protected. The bearing elements reduce noise and vibrations and therefore also increase the value of a property. Depending on the foundation situation and shape of the building structure, various arrangements of the insulation layers are possible:

- **Figure 1:**
The entire building with basement is elastically mounted on an appropriate foundation so that the horizontal reinforcement of the building can be realised through lateral securing of the basement walls against the soil. Noise and vibration transmission from external sources such as rail traffic, for example, is minimised.

- **Figures 2 and 3:**
With the arrangement of the decoupling layer between the basement and the ground floor, penetration of water into the insulation layer is prevented through bearing reinforcement. The floors above the ground floor are therefore decoupled from external vibrations as well as from internal sources in the basement (mixed construction). In high-rise buildings, it can be more practical to simply mount wide-span ceilings elastically and thus reduce their natural frequency to an uncritical level.

Products
A low natural frequency in the system supported is generally crucial for successful decoupling. With the products in the VIBRAX® range, proven over many years, mageba has the option of implementing low frequency elastic mounting of buildings which can be sized by the engineers.

We help you find the right solution
For functional and effective vibration insulation or tremor protection, the following aspects are relevant and should be taken into account:

- Thrust transmission as a result of low horizontal stiffness of the bearing products
- Avoidance of constrictions resulting from temperature fluctuations and shrinkage
- Connection to bracing building sections such as staircases, lift shafts and the like
- The effect of enclosed airspaces
- Possible penetration of water into the insulation layer
- Mutual coordination of mixed systems

Our experienced experts are happy to answer your questions.

1 Building support in the foundation area
2 Wall/column supports
3 Double ceiling construction
4 Seesicht Vitznau project installation details: steel-reinforced elastomer bearing on supports
Elastic building foundation over Rigibahn concourses on steel-reinforced VIBRAX® BLOCK bearings.
Craneway mountings

Concept

Craneway mountings in production buildings with adjoining office spaces or residential use above commercial spaces are also increasingly important. A critical point is that vibrations and structure-borne noise from crane operation begin even from interference frequencies of around 30 Hz. A low-frequency solution which achieves good, even acoustic insulation across the entire load range from unloaded to maximum load for the crane is therefore required for successful insulation.

In such cases, the Craneway mountings can be decoupled from the building using the VIBRAX®CRANE system solution. The vibration and structure-borne sound transmissions are thus effectively prevented.

Products

VIBRAX®CRANE is a solution based on the VIBRAX®BLOCK and VIBRAX®DAMP products made from solid elastomer for the elastic decoupling of craneway from the building structure.

Isolation values for vibration and structure-borne sound of 20 to 30 dB can therefore be achieved, depending on the frequency.

We help you find the right solution

- Solutions for standard cranes
  mageba offers the VIBRAX®CRANE complete solution for the common ranges from crane manufacturers. It achieves low natural frequencies across a wide load range and tolerates high permissible pressures.
  This makes the VIBRAX®CRANE complete solution the ideal acoustically insulating bearing for crane tracks.
- Solutions for special cranes
  For special cranes such as suspension cranes or heavy-duty cranes in port areas, for example, mageba has a product portfolio full of other suitable bearing systems. Let us advise you.

1 Diagram of a VIBRAX®CRANE solution for standard cranes
2 Meyer-Burger project installation details: Main connection for decoupling in a vertical direction
3 Meyer-Burger project installation details: Secondary connection for stabilising the craneway in a horizontal direction
Project: Meyer-Burger production building, Switzerland
Effective craneway mounting decouples the building and prevents the transmission of vibrations and structure-borne sound.
Vibration damping

Machine supports

Concepts
Generators, pumps, printing machines, rock grinders, crushing plants, milling machines and punching machines are typical examples of systems which cause disruptive vibrations.

The concepts, tested in practice, shown in the graphics 1–3 are feasible for the insulation of these vibrations.

Products
A low natural frequency in the system supported is crucial for successful decoupling. To this end, disturbances from operations and the vibration isolation requirements should be taken into account. In addition, the precise operating conditions when starting up and shutting down the system should be taken into account.

With the products in the VIBRAX® range, proven over many years, mageba has options for implementing simple and complicated systems which are still high performance. More information about the products can be found in the product overview.

Our specialists are happy to help with custom insulation systems for specific systems or system types.

We help you find the right solution
For a functional and effective vibration insulation of systems, the following should be taken into account:

• Owing to the low horizontal stiffness, the systems can move backwards and forwards on the bearing products. In extreme cases, this can lead to “creeping” of the machines.

• The transitions from decoupled to non-decoupled areas of flooring must be disengaged. mageba offers a range of joint products which are suitable for use with forklifts or other lifting machinery for this purpose.

• Systems which stand on insulated and non-insulated floor areas should also be decoupled using suitable measures.

• Since water is an incompressible material which has a negative influence on the insulating properties of the insulation materials, penetration of water into the insulating layer should be prevented.

• Too high deflection of the insulation layer and rotation of the system can have a negative influence on the operation or functioning.

Our experts have extensive experience in this matter and are happy to provide you with this know-how.

1 Point support directly under the system
2 Surface and/or point support under the superimposed system base
3 Surface mounting or combined surface and point support under the recessed system base
4 Biocentre project installation details: Vibration isolation for floor plate and machine base
Project: Biocentre of the University of Basel, Switzerland
Low frequency machine supports for systems which are sensitive to vibrations and systems which generate vibrations using VIBRAX®PUR.
Impact sound insulation

Concepts
The principle of impact sound insulation under underlays is presented in the graphics 1 and 2. In accordance with a simple mass oscillator model, a mass (underlay) is decoupled from the subsurface (concrete surface) using a spring (VIBRAX®).

Impact sound is a type of structure-borne sound and is generated, for example, when a ceiling or staircase is walked on. These vibrations can be perceived as disruptive in adjoining areas without high quality acoustic insulation.

Products
The crucial parameter for impact sound decoupling is the impact sound improvement factor \( \Delta L_w \). Measurement and assessment is done in accordance with the ISO 10140-3 and ISO 717-2 standards.

With the externally certified products in the VIBRAX® range, proven over many years, we have the right solution for your project.

Properties and benefits
• With European technical approval (CE marking)
• Outstanding acoustic insulation with a low installation height
• High load-bearing capacity thanks to very high compressive strength
• Permanently elastic
• Very low emissions
• Water-resistant and rot-proof
• Very environmentally friendly since recycled materials are used and are then recycled again

We help you find the right solution
The following should be taken into account for effective impact sound insulation under heavily used underlays:
• Certified products must be used in order to ensure lasting effectiveness and durability (static and dynamic) throughout the lifespan of the building.
• Structure-borne sound bridges can result from imperfect installation (e.g. Insulation of pipes), which can lead to exceedance of the specified noise level in the room. There are sources of error in the area of steps, pedestals, radiators, fittings, columns and, in particular, pipes.
• The transitions from decoupled to non-decoupled areas of flooring must be non-continuous. mageba offers a range of joint products which are suitable for use with forklifts or other lifting machinery for this purpose.
• If the stiffness of the insulation chosen is too low in favour of highest acoustic insulation values, this may result in cracks and damage to the load distribution plate.

Our experienced professionals are happy to advise you. With our early involvement in the planning phase, it is possible to recognise possible sources of error at the outset and avoid cost-intensive solutions at interfaces.

1 Mounting of a load distribution board
2 Structure of impact sound insulation
3 Multiplex project installation details: Acoustic insulation of an underlay

1 Underlay
2 PE film
3 VIBRAX® impact sound insulation
4 Concrete surface
Project: Business premises Multiplex 1 Frauenfeld, Switzerland
Structure-borne sound insulating mounting of the load distribution board and lifting platform
Worldwide reference projects

2800 Bloor St. West, Canada
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2017

Biozentrum Basel University, Switzerland
Solution:
Product: VIBRAX® PUR vibration isolation
Installation: 2016

Apartment building Zürich, Switzerland
Solution:
Product: VIBRAX® PUR vibration isolation
Installation: 2016

Multiplex 1 Frauenfeld, Switzerland
Solution:
Product: VIBRAX® GREI vibration isolation
Installation: 2015

Escher-Terrassen Zürich, Switzerland
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2014

Residence “Seesicht” Vitznau, Switzerland
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2014

ShopVille Zürich, Switzerland
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2013

Swiss Federal Laboratories for Materials Science and Technology (EMPA), Switzerland
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2010

COOP Jegenstorf, Switzerland
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2010

Quartier Mailänder Platz Stuttgart, Germany
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2010

MIGROS Fislisbach, Switzerland
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2008

Multiplex Cinemas Gaumont, France
Solution:
Product: VIBRAX® BLOCK B vibration isolation
Installation: 2005
mageba infrastructure products

**Structural bearings**
- Pot bearings
- Spherical bearings
- Elastomeric bearings
- Disc bearings
- ILM bearings
- Deformation bearings
- Special bearings

**Seismic devices / Structural protection**
- Hydraulic dampers
- Shock transmission units
- Preloaded spring dampers
- Friction pendulum
- Rubber isolators
- Fuse-Box for expansion joints

**Expansion joints**
- Single gap joints
- Modular expansion joints
- Sliding finger joints
- Cantilever finger joints
- Mat joints
- Railway joints
- Flexible plug joints

**Structural Monitoring & Services**
- Structural Health Monitoring
- Inspections
- Refurbishments
- Tests

Gateway Bridge, Australia
Longjiang Bridge, China
Köhlbrand Bridge, Germany
Johan Sverdrup Field, Norway
Sky Building, Ecuador
2nd Namhae Bridge, South Korea
Mumbai Metro, India
Macdonald & MacKay Bridges, Canada
Bridge over Sanda, Faroe Islands
Quai Bridge, Zurich
Fairmont Hotel, UAE
Tappan Zee Bridge, USA
Companies & agents worldwide

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- Costa Rica
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- Denmark
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- Romania
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- Slovakia
- South Africa
- South Korea
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
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- Vietnam

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