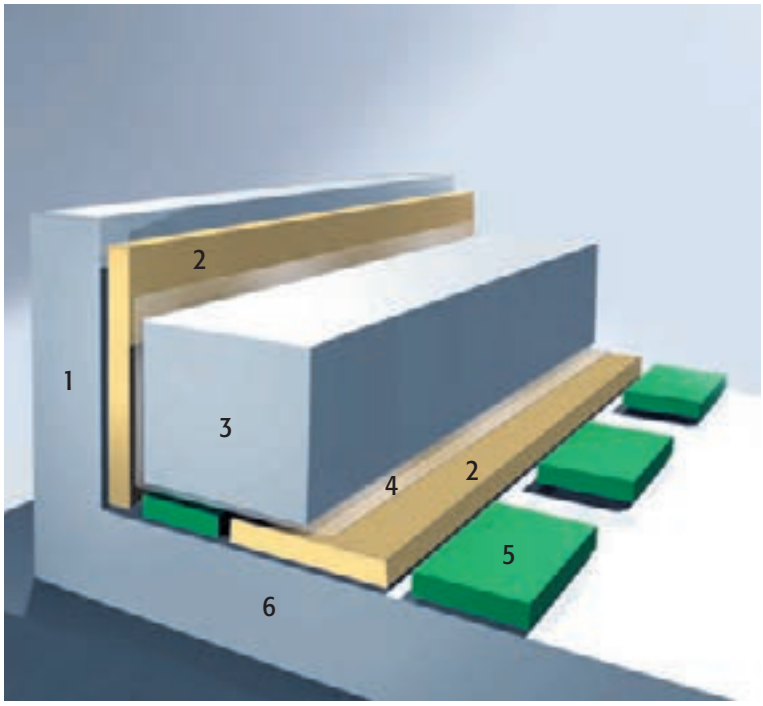
Vibration foundation with insulation pad sets

Application example:
Foundation insulation with insulation pads and lost formwork



Insulation pads are perfectly suitable for the vibration insulation of foundations

1 Foundation pit (side wall)
2 Mineral fibre and cover plate (lost framework)
3 Foundation block
4 PVC foil cover
5 Bilz insulation pads (set of pads)
6 Foundation pit (base)

APPLICATION

Installation of a vibration foundation in an automotive plant for receiver insulation of a milling machine located opposite the press shop. Total mass of the foundation block 1,200 t.

Image 1, 2, 3: Design with Bilz insulation pads (black) and intermediate spaces with mineral fibre insulation board.

Image 4: Covering of the entire surface with construction foil, then with hard fibre boards. Bonding the overlapping areas.

Image 5, 6: Installation of the reinforcement.

Image 7, 8: Pouring the concrete.

1

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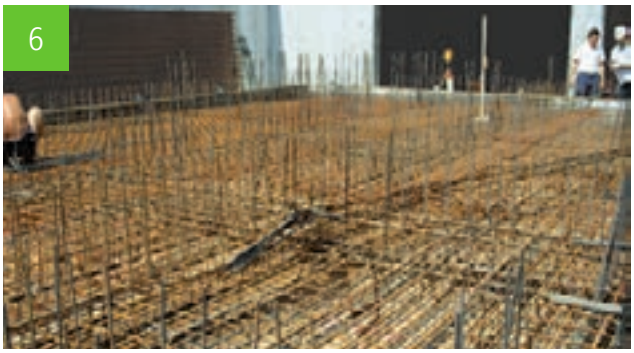

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8

Vibration foundation with FAEBI®

Application example:

Foundation insulation with FAEBI® rubber air springs and level control.
Implementation with pre-cast concrete slabs.

Bilz scope of supply and services

8 x Bilz FAEBI® 580 HD with mechanical-pneumatic level control MPN-LCV

Planning services

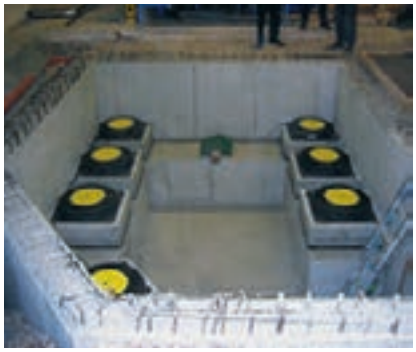
- Creation of the foundation
- Static calculations
- Formwork and reinforcement plans
- Steel and steel bending schedule

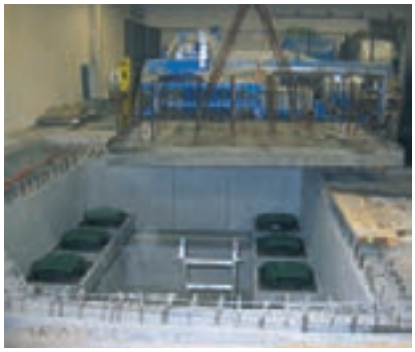
Requirements

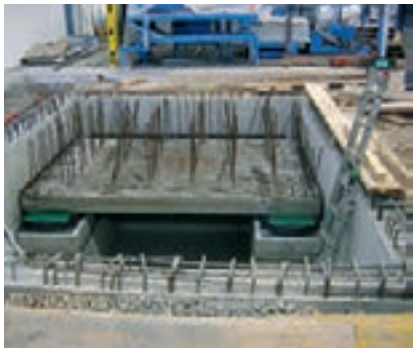
- A maximum of 3 weeks loss of production.
- Special shape 5 corner
- Tight space conditions and entry to the inspection channel through the foundation block
- Extremely small permissible horizontal movements of the machine
- Reliable source insulation for suppressing the disturbing vibrations in the adjacent building, 2. floor, from 10 Hz.

APPLICATION

Punching machine, machine weight including the tool and accessories approximately 23 t, dynamic forces vertical approx. 60 kN, horizontal approx. 30 kN, foundation block approx. 5.1 x 3.5 x 1.0 m, weight approx. 40 t.



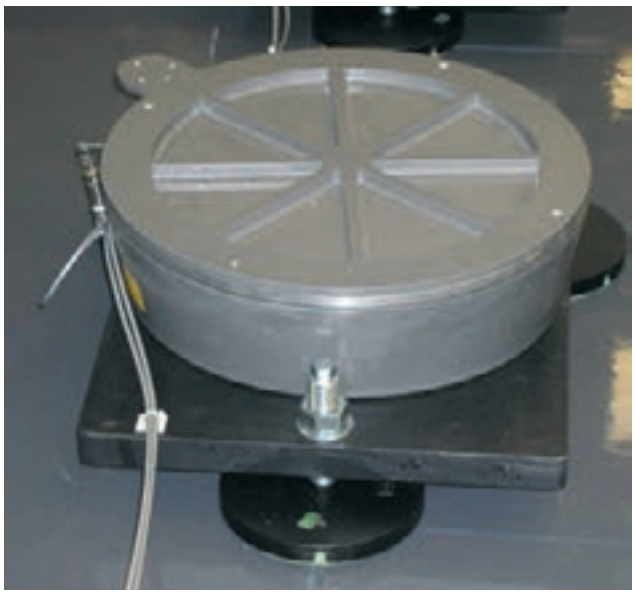




Vibration foundation with BiAir®

Application example:

Foundation insulation with BiAir® membrane air springs and level control.
Implementation with pre-cast concrete slab.



The foundation insulation using low-frequency BiAir® membrane air springs enables an optimum insulation effect.
Unlike with the use of pad sets or steel springs the adjustable level of the foundation block automatically resets itself in response to load changes through the level control.

Bilz scope of supply and services

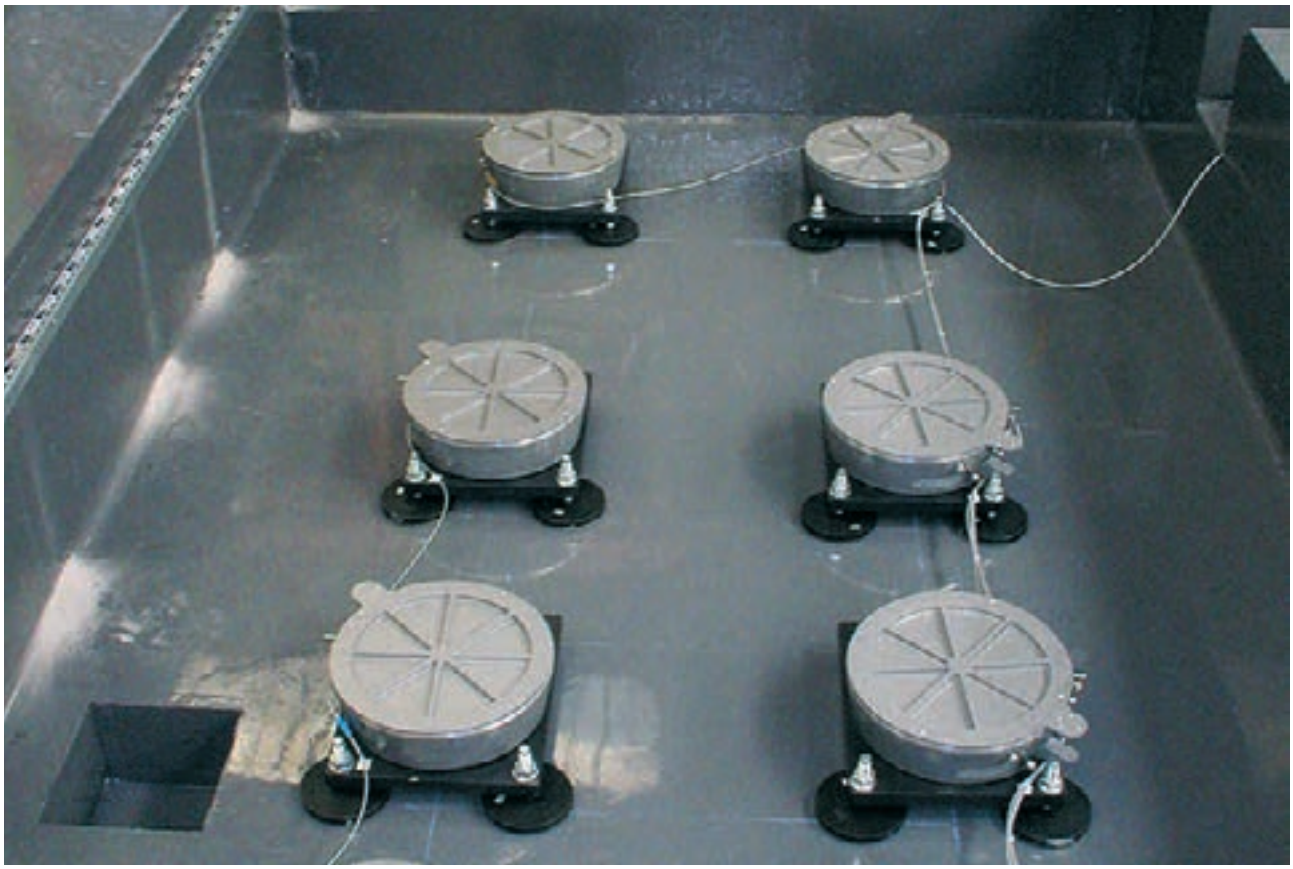
8 x Bilz membrane air springs BiAir® 4-ED with mechanical-pneumatic level control MPN-LCV.

Particular general conditions

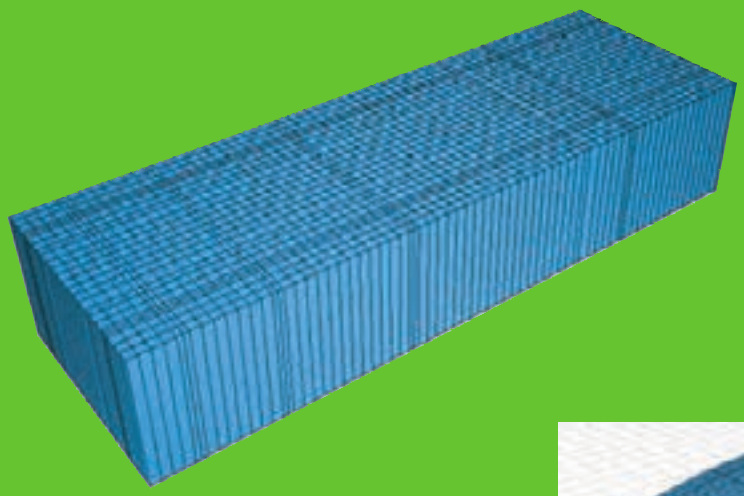
The processing accuracy required of the roller grinding machine cannot be met due to disturbing influences from adjacent machines and an overhead crane rail. Large travel distances and tools weighing up to 10t cause large load changes that necessitate the use of a fast, mechanical-pneumatic level control with a level accuracy of ± 0.1 mm.

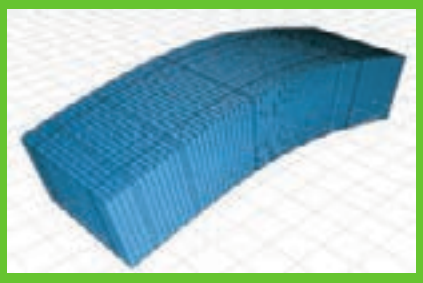
APPLICATION

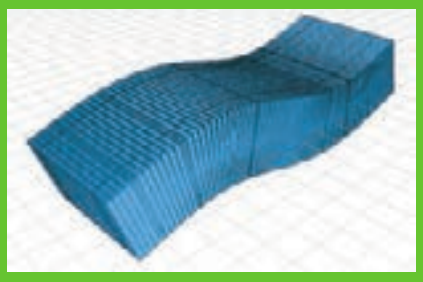
Gear grinding machine GLEASON PFAUTER P 1200 G,
machine weight incl. tool up to 25 t,
foundation block approx. 5.2 x 1.9 x 0.7 m, approx. 20 t

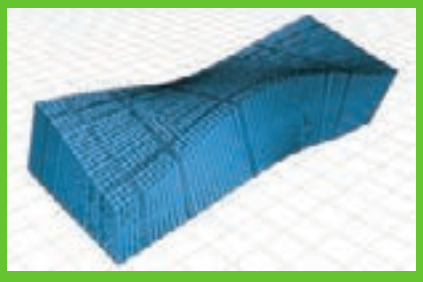


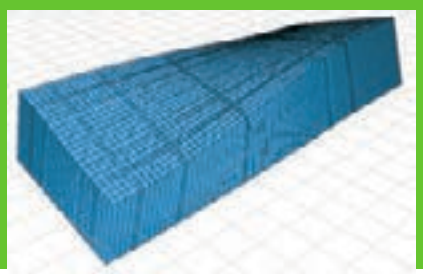
Static and dynamic calculations / reinforcement plans / FEM analysis









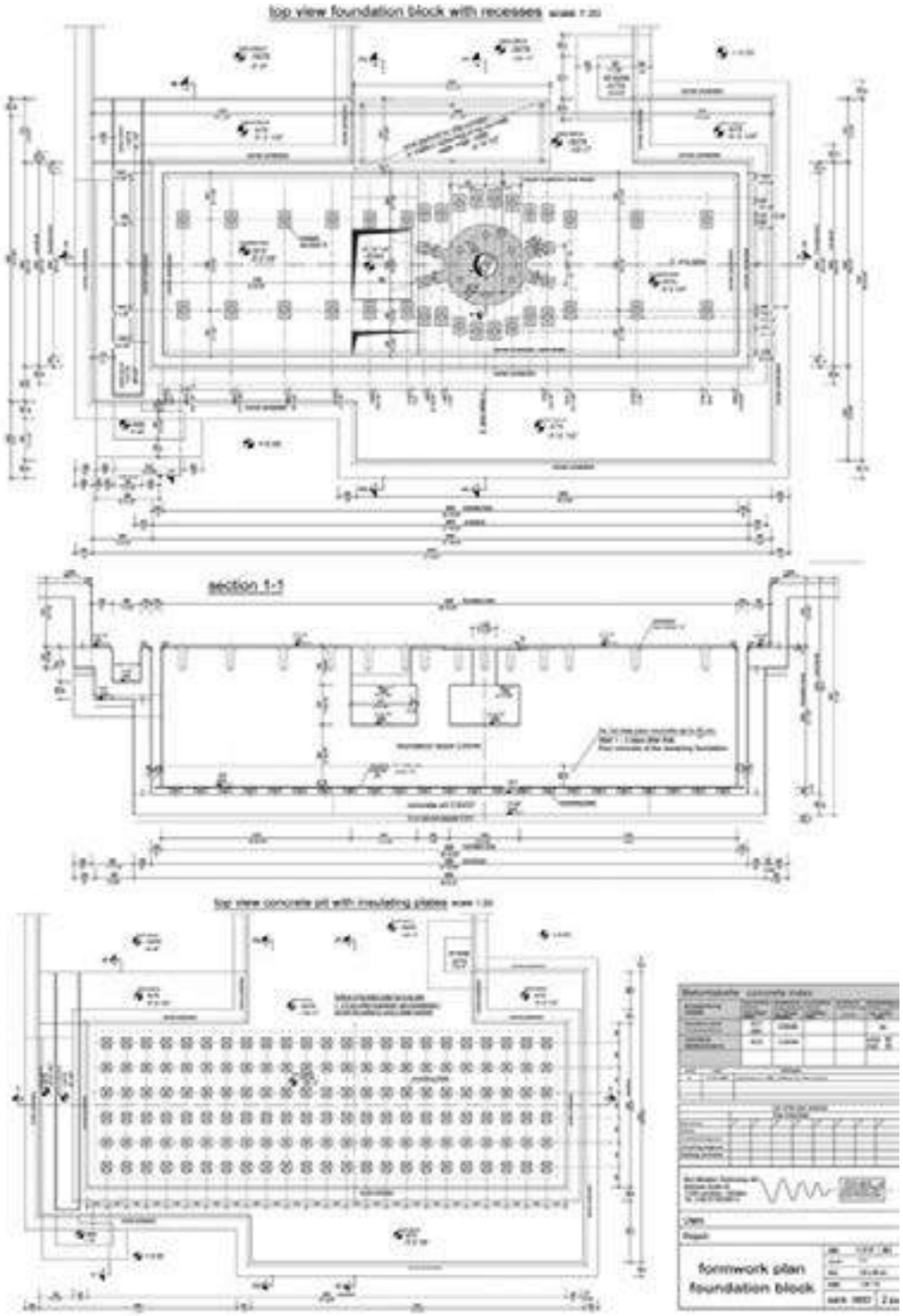


Foundation block natural modes

FEM image (example), shown greatly exaggerated

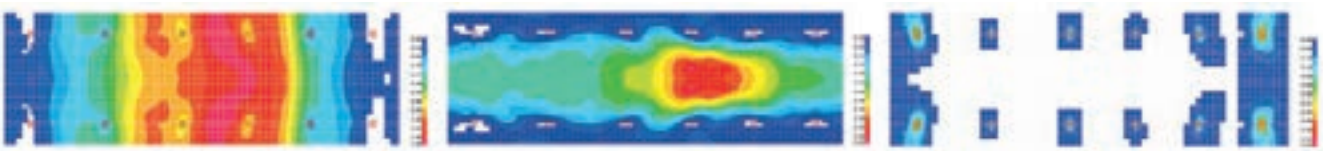
Foundation insulation with insulation pads

Design plan (example)



Block bending under the influence of alternating loads

FEM image (example)



Vibration insulation platforms

Many applications require indirect insulation due to the requirements for effective insulation and level control or due to insufficient intrinsic rigidity. If foundation insulation is not possible as e.g.

- installation is on the elevated floors of a building,
- the site of installation is of restricted space,
- the site of installation should be flexible (mobility),

then mounting the machine to a vibration insulated platform is a proven solution.

Usually either welded steel constructions or cast plates are used. Depending on the design of the platform the base of the machine is additionally extended and the centre of gravity is lowered by adding mass or the position of the insulators, which significantly enhances the stability of the overall system. In this way machines with a high centre of gravity and/or small base area can also be mounted to very low frequency and therefore soft insulators.

DESIGN EXAMPLES

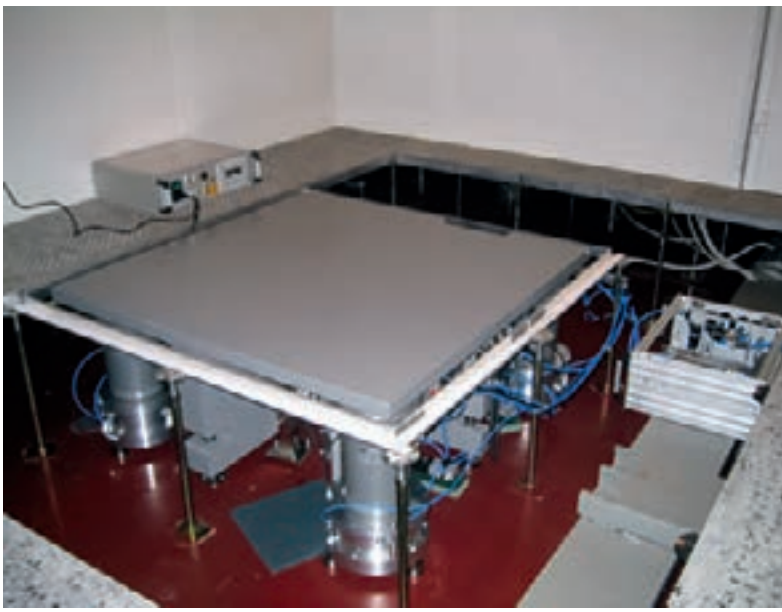
Basic platform

Platform for low installation height and for systems with a high centre of gravity

Platform for minimum installation height and for systems with a very high centre of gravity

SERVICES

- Frequency analysis and vibration measurement
- Simulations
- Design, manufacture, delivery, assembly and commissioning of total vibration insulation systems
- Manufacture, supply and installation of cast platforms
- Manufacture, delivery and installation of cast plates



Platform for integration in double/clean room floors with additional mass for the reduction of vibration peaks

Test beds

Low-frequency vibration insulation for demanding and highly dynamic applications

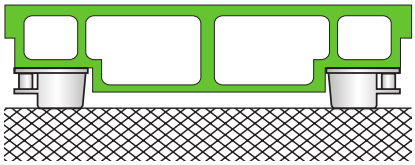
Vibration insulation of test beds

Parallel to the ever increasing demands on test beds and test systems for the automotive industry over recent years, the systems for vibration insulation have also been developing at the same pace.

Convenient and powerful air spring systems with level control have proven themselves ideal for very advantageous solution concepts. For the vibration insulation of test beds and aggregates with particularly high dynamic forces an additional seismic mass in the form of a concrete foundation is also needed, see p.76.

APPLICATION EXAMPLES

- Engine test beds
- Articulated test beds
- Formula-1-test beds (BMW, Mercedes, Ferrari, Toyota, Renault)
- Gearbox test beds
- Acoustic test beds
- Rolling road test beds
- Shaker
- Sliding table
- Cylinder test beds
- Special test beds
- Hydropulser
- Road simulation test beds



Vibration insulation cast steel platform

Vibration insulation concrete block or steel platform

Vibration foundations for special test beds

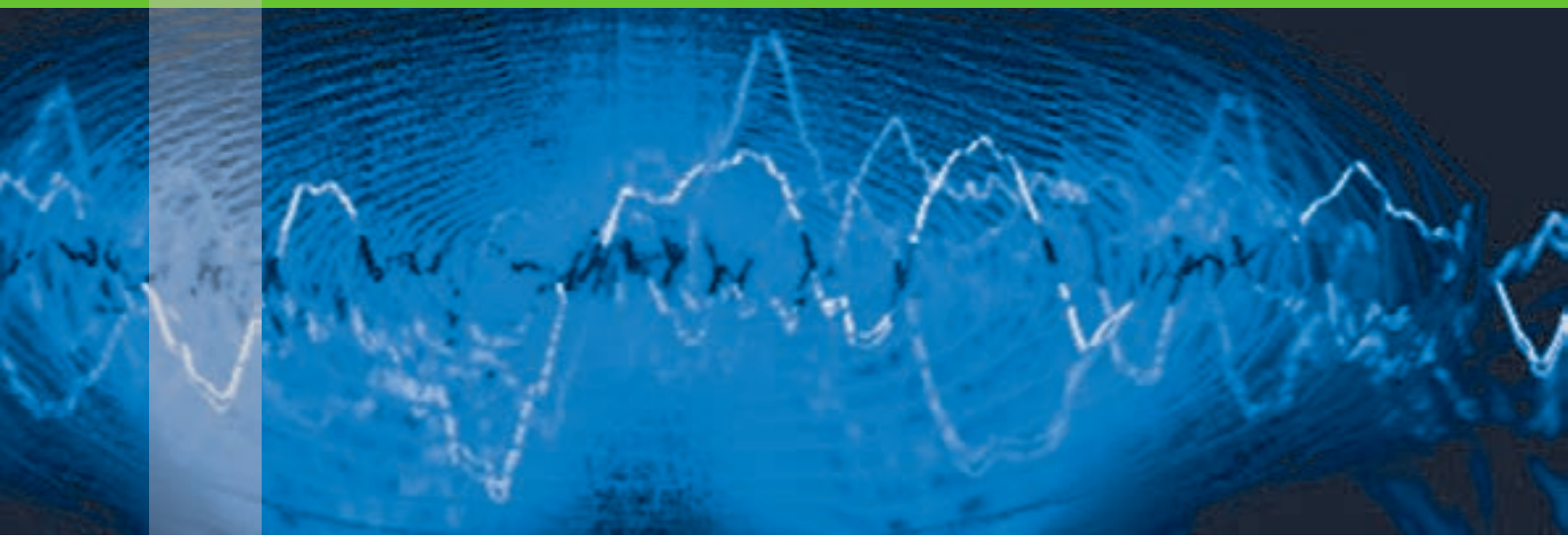
SERVICES

- Frequency analysis and vibration measurement
- Simulations
- Design, manufacture, delivery, assembly and commissioning of vibration insulation systems
- Design, supply and installation of cast iron plates
- Production of static and reinforcement plans for foundation pits and –blocks
- Preparation of tender documents, price comparison, cost estimation
- Construction supervision

For further information contact us to arrange a personal consultation.

Measurement and vibration analysis

Measurement of vibrations and shocks using state of the art instruments – FFT Analyser and analysis software



Assignment

Due to our decades of experience in the field of vibration technology and isolation, we guarantee you technically and economically reliable problem solutions. The on site measurement and analysis of vibration emissions and immissions is an essential part of our consulting services with regard to vibration and vibration insulation. Based on the measurement results, we develop vibration technical measures to comply with legally prescribed limits.

The assessment of periodic and non-periodic vibrations in the frequency range from 1 Hz to 80 Hz is e.g. based on the DIN 4150 "Vibrations in buildings; Effects on persons in buildings". Requirements and reference values are stated herein, in general the considerable disturbance of people in domestic properties and similar premises is to be avoided in order to comply with these regulations.

Procedure

In the first step the maximum value of the vibration levels for the three directional components x, y and z are determined. The largest of these three values KBF_{max} is compared with the reference values A_u and A_o according to Table 1

- If KBF_{max} is less than or equal to the (lower) reference value of A_u, then the requirements of this standard are met.
- If KBF_{max} is more than the (upper) reference value of A_u, then the requirements of this standard are not met.
- For short-term impacts and those that do not occur often, the requirement of the standard is met if KBF_{max} is less than or equal to A_o.

Another current example of the requirement for a vibration analysis is the storage of high-precision 3D-measurement machines, as well as other testing, measuring or grinding machines. Typically measurements must be carried out by such machines at the planned site, to ensure that existing ground vibrations do not exceed the permitted values (see Chart 1). To do this, the vibration acceleration is determined within a given frequency spectrum (1–100 Hz), as a simple sum value measurement would provide insufficient information about the exact environmental conditions. The analysis of the acceleration time signals is carried out using a fast-fourier-analyser, which indicates the corresponding measurement value (vibration acceleration in g) for each frequency of the spectrum. If the disturbances (vibration interference) are out of the permissible range, the appropriate insulation can be determined with the help of our PC calculation program.

Very accurate vibration analysis in the lower frequency range are carried out with highly sensitive Geophones. Vibration speeds from below 0.01 µm/s in the range from 0.2 to 30 Hz can be recorded with the Geophones. Extremely precise measurements of vibration are necessary for an optimal and customer-specific design, particularly in the semiconductor and Nanotech industry as well as for high-precision 3D-measurement machines.

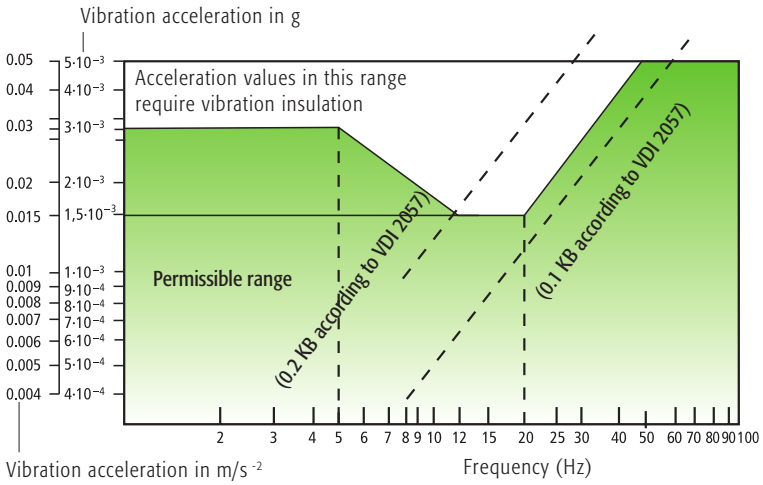


Chart 1: Example CMM limit curve

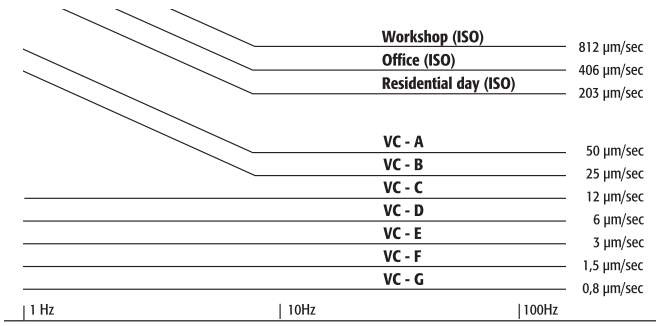


Chart 2: Vibration Criteria VC

FFT Analyser

Geophone

Table 1: Limit values DIN 4150

REFERENCE VALUES A FOR THE ASSESSMENT OF VIBRATION EMISSIONS

in domestic property and similar premises

Line	Impact site	daytime A_u	daytime A_o	daytime A_r	nightime A_u	nightime A_o	nightime A_r
1	Impact sites, in whose vicinity only commercial facilities and where appropriate are housed with the exception of where the owner and manager of operations, as well as supervisory and stand-by persons are housed (see Industrial estates § 9 BauNVO))	0.4	6	0.2	0.3	0.6	0.15
2	Impact sites, in whose vicinity mainly commercial facilities are housed (see Industrial estates § 8 BauNVO)	0.3	6	0.15	0.2	0.4	0.1
3	Impact sites, where neither predominantly commercial facilities nor predominantly domestic property are housed (see Core areas § 7 BauNVO, mixed areas § 6 BauNVO, village areas § 5 BauNVO)	0.2	5	0.1	0.1	0.2	0.15
4	Impact sites, in whose vicinity predominantly or exclusively domestic property is housed (see Pure residential areas § 3 BauNVO, General residential areas § 4 BauNVO, Small housing estates § 2 BauNVO)	0.15	3	0.07	0.1	0.2	0.3
5	Particularly vulnerable impact sites, for example in hospitals, sanatoriums, in so far as the are situated in those areas specially designated for them.	0.1	3	0.05	0.1	0.15	0.07

In brackets the areas of the Federal Land Utilisation Ordinance = BauNVO are specified, usually represented by the designations under line 1 to 4.
A schematic equation is not possible because the designations under line 1 to 4 are only made after the grounds have been established to protect against exposure to vibration, the zoning of the area in the BauNVO takes into account however also other planning requirements.

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