EN

General catalogue

Your expert for vibration insulation

and machine setting technology

On the same wavelength as our customers.

Bilz Vibration Technology AG is a company that was founded in 1985, which mainly deals with the insulation of vibration and structure-borne noise of machinery and equipment. We have taken a leading position in Europe in this very specialized field as a supplier of mechanical and plant engineering to e.g. both the automotive and semiconductor industry and its suppliers.

Our company history:
1985 Founded as Bilz Schwingungstechnik GmbH

2006 Transformation into a stock company and renamed Bilz Vibration Technology AG

Our product range covers a very wide range of applications. From the insulation of a single press with insulation pads up to the air cushioning of highly sensitive equipment in the semiconductor industry, there is virtually no technical vibration problem for which we cannot provide an efficient and cost-effective solution.

We are also always able to respond to different customer requirements quickly and flexibly due to the high level of in-house vertical integration.

To keep this catalogue as clear as possible, we have limited ourselves to the most common variants of our products.

If you can't find a solution suitable for you, please contact us, we're here to help!

The Bilz team is available to competently answer further questions at any time.

Quality
to us means that our products, services and solutions fully meet your expectations and specifications. And we do not orient ourselves to a relative scale. We accept only the very best quality measured against the most modern scientific and technological knowledge.

Technical competence
is achieved through the continuous training of our engineers and specialists who constantly embark upon new developments and who work at the cutting edge of technology.

Comprehensive service
offering on-site problem analysis, design and planning, manufacture, installation and commissioning as well as after-sales support all from a single source.

A close partnership
and long-term relationships with our customers and suppliers are very important to us.

Delivery times
must be kept as short as possible. Our comprehensive stock in Leonberg makes us a reliable partner when it comes to punctuality and short delivery times.

The prices
of our systems and components represent a fair equivalent value to our innovative strength and service professionalism. We place great value on retaining this balance and to ensure that this ratio is sustained.

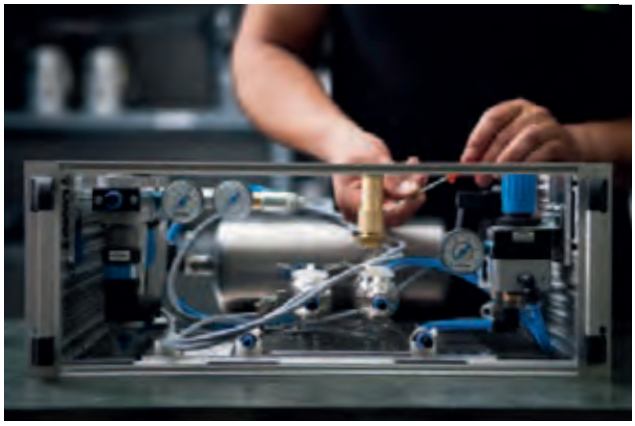
Bilz Vibration Technology AG

Quality made in Germany

The headquarters of Bilz Vibration Technology AG encompassing management, assembly, quality assurance and warehousing, are located in Leonberg near Stuttgart.

The family tradition has now been continued for three generations. Our entrepreneurial thinking is characterized by long-term concepts and vision and is not aimed at short-term profit maximization.

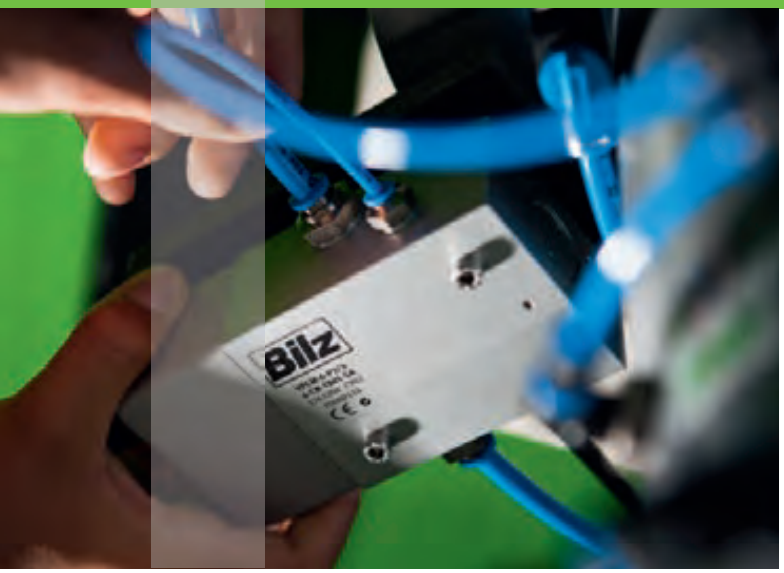
As a result, our revenues and number of employees has continued to grow steadily since the company was founded in 1985.



Worldwide distribution
We are present in almost all parts of the world through our global distribution network and offer our customers on the spot expert advice, services and of course our solutions for vibration insulation.

Made in Germany
The development, design, construction, manufacture and assembly of our products and solutions is centralized at our headquarters in Leonberg. This enables us to offer you the quality that you expect.

When solutions are required quality makes the difference.



We have set up a training and demonstration centre at our headquarters. Here we can show our customers all our products from Bilz insulation pads to our Active Isolation System AIS™ with six degrees of freedom in a constructive and pleasant atmosphere. We regularly hold seminars and trainings here for our employees and customers and for our global network of agencies.

As a customer, you always have the option of coming along to discuss and inspect the functionality, benefits and structure of various Bilz insulating systems before placing an order. The engineers and technicians at Bilz AG are provided with several modifiable vibration test benches to facilitate the continuous development and improvement of our products and solutions. These enable us to perform exhaustive testing aimed at improving quality and realisation of customer-specific designs. The tests can also be performed both in the natural frequency range of Bilz vibration insulators and the frequency range of relevant land and building structures.
The use of test beds in combination with the latest 3D simulation and calculation programs enables us to review your particular boundary conditions in advance, guaranteeing the design most suitable for the application.

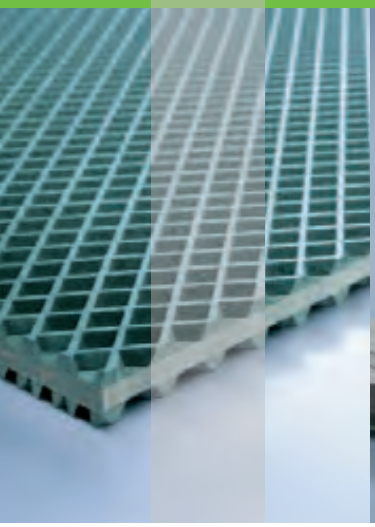
Content

Your benefits from Bilz technology and know-how

- Optimum vibration and structure-borne noise insulation
- Effective protection of persons, environment and buildings
- Quality improvements through reduced manufacturing tolerances and increased manufacturing precision
- Increased production throughput by shortening cycle times in production
- Cost reductions through simplified and flexible machine installation
- Quality and safety through compliance with the latest standards, directives and guidelines
  - DIN ISO 9001
  - EC Machinery Directive
  - EC Low Voltage Directive
  - EC EMC Directive

General information on vibration technology

Demands on the design and operation of modern machinery and equipment continue to escalate. The technical capabilities of today's machines in terms of machining speed, dynamic load changes and achievable precision, as well as the key features of the geometry and the properties of the materials used have grown steadily over recent years. However, this also increases the need to reduce the transmitted vibrations and structure-borne noise. This concerns both the emission of vibrations (source insulation), for example in metal-working machines, as well as machines being subject to vibrations (receiver insulation), e.g. in measuring machines. The importance of measures to protect people, buildings and the environment also continues to grow.




DEFINITION OF TERMS

Damping is the physical property of an insulator to remove energy of a vibrating system. This limits the vibrations to an acceptable level and converts mechanical energy into heat.

Insulation means the decoupling of disturbance forces and vibrations. This effect always works in both directions, that is from the machine to the environment as well as in the opposite direction.

Source insulation is the vibration-isolated mounting of a machine in order to reduce its pulse or sinusoidal vibration forces. This protects objects in the environment such as adjacent machines, the building and people from the disturbing forces.

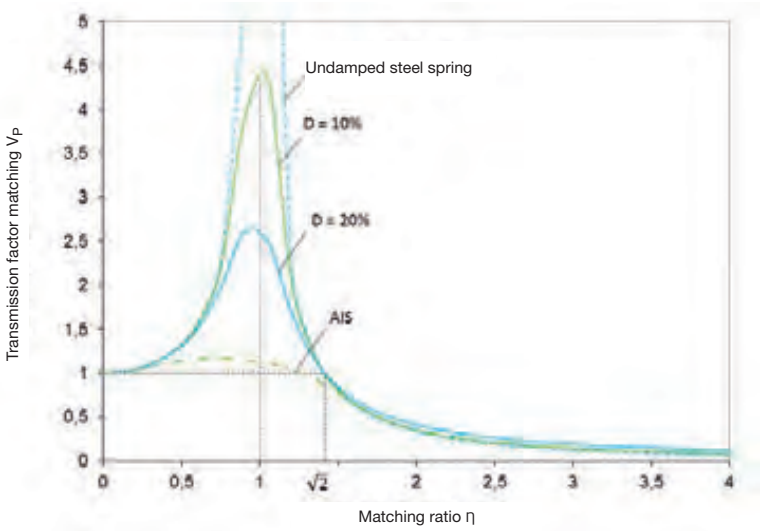
The special task here is to keep the movement of the now elastically mounted machine within its operational limits.

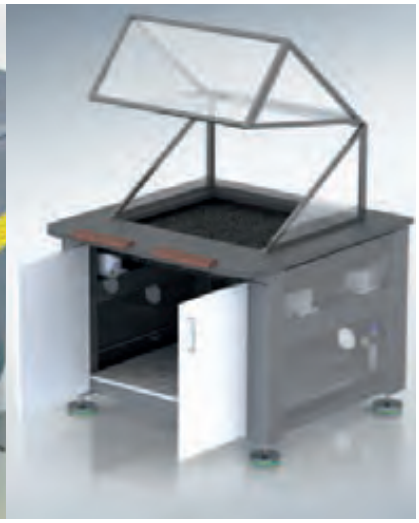
In the case of **receiver insulation** it is necessary to protect vibration-sensitive equipment (e.g. measuring machines) from interfering ground vibrations. The production or characterization of ever smaller components, down to structures consisting of a few atoms or molecules, make heavy demands on facilities and their vibration insulation.

Passive vibration isolators exhibit upon excitation an amplification of the vibration amplitude in the range of the natural frequency. This resonance amplification is dependent on the damping characteristics of the isolators.

Active vibration isolators generate a counter-force phase-shifted by 180° through a suitable control; the isolators act as actuators. The resonance amplification in the natural frequency range of the isolators is minimized.
An optimum isolating effect is achieved with frequencies above the resonance range.

Vibration control matching





Insulation of periodically excited vibrations
The effect of vibration insulation depends mainly on the ratio of the disturbance frequency or excitation frequency to the natural frequency of the insulator (matching ratio), and its damping. With source insulation the excitation frequency is the machine speed or stroke rates, with receiver insulation disturbing ground vibrations. Generally it can be said that the lower the natural frequency of the insulator the better the efficiency of the insulator, i.e., the larger the ratio of disturbing frequency is compared to the natural frequency. The resulting graph shows that an isolating effect only occurs when the value of the harmonizing ratio is greater than $\sqrt{2}$. At smaller values an amplification (resonance magnification) of the disturbing force may also occur.

Transmission factor V_S of the vibration insulation without damping:

$$V_s = 1 - \frac{\eta^2 - 2}{\eta^2 - 1}$$

The transmission factor V_P taking into account the damping ratio D is:

$$V_P = \sqrt{\frac{1 + 4D^2\eta^2}{(1-\eta^2)^2 + 4D^2\eta^2}}$$

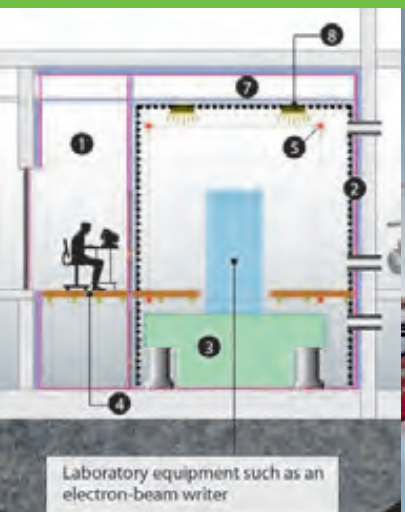
f_{dist} Disturbing or exciting frequency

f_0 Natural frequency of the insulator

$\eta = \frac{f_{dist}}{f_0}$ Matching ratio

Usually a matching ratio of between 3 and 4 is striven for, whereby 3 is considered the technical lower limit and 4 the economic upper limit. A matching ratio larger than 4 cannot normally be justified from the economic perspective because the material expense would increase above average compared to the degree of insulation.

INSULATION OF SHOCK



Essential characteristics of shock are its duration, its distribution and its intensity.

With **shock insulation**, the dynamic disturbing pulse, consisting of a high power peak over a short period of time, generated e.g. by presses, stamps or hammers, is changed to a longer lasting pulse with smaller forces.

Unlike periodically excited vibrations the isolated system oscillates at the excited natural frequency of the isolated system and not in accordance with the excitation, for example, the number of strokes. This can be compared with a tuning fork, which always produces a sound of a constant pitch.

Efficiency of shock insulation

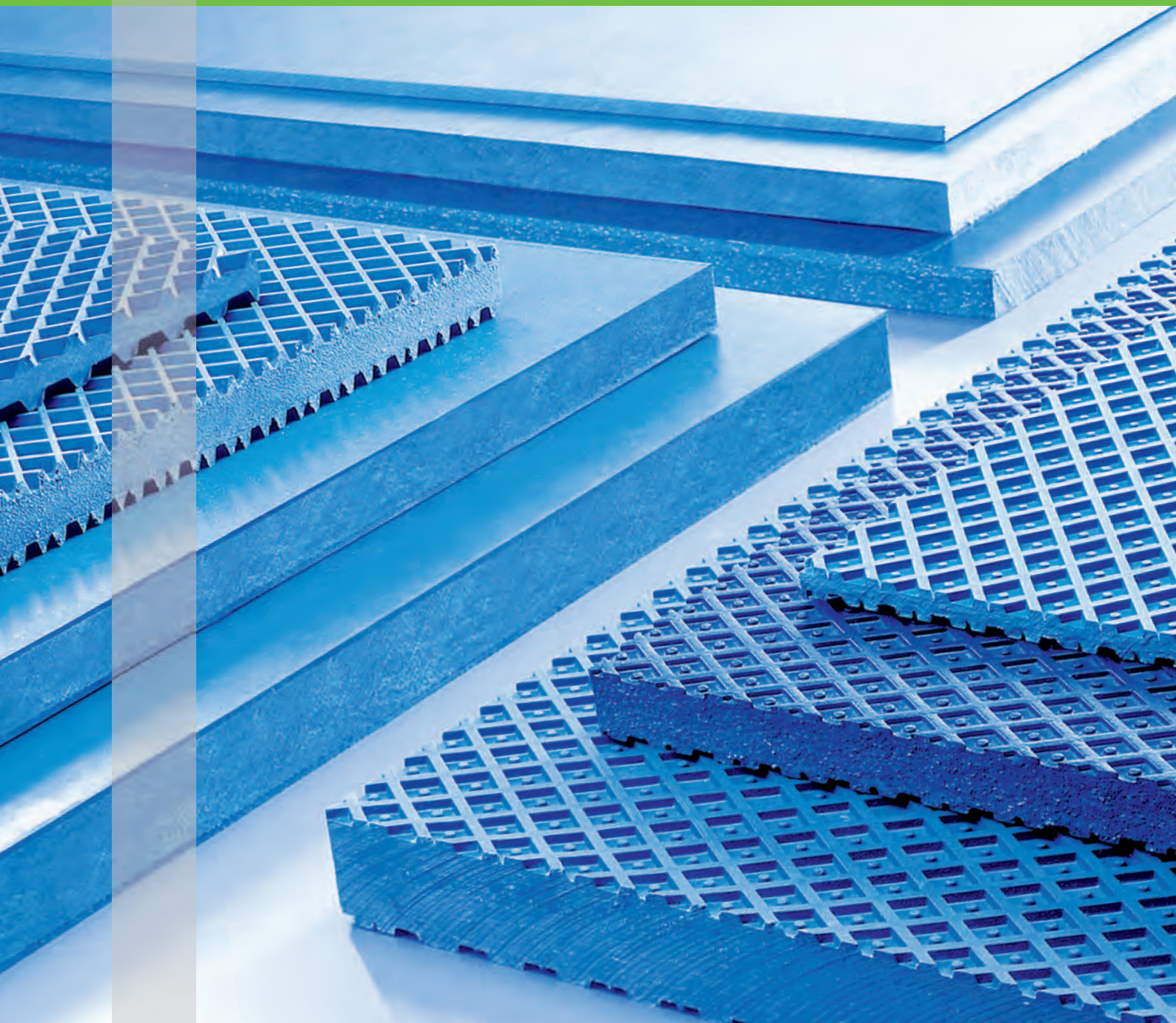
$$J_S = 1 - \frac{f_{iso}}{f_{fix}}$$

f_{fix} Natural frequency of the system on its rigid-base foundation.

f_{iso} Natural frequency of the isolated system

Insulation pads

Bilz insulation pads have been used successfully for many years in a variety of industries as an economical solution in the fight against problems caused by vibration and structure-borne noise.
Made from a precisely defined combination of nitrile rubber and cork particles embedded in a composite of cotton fibres, the physical and mechanical properties of this high-quality composite material meet all of the current requirements for various industrial applications depending on type of pad. Very good damping properties ensure optimum deflection and level consistency both under static and under dynamic loading.
The material composition used ensures secure anti-slip protection on conventional industrial floors. It has high resistance properties particularly to modern cooling lubricants.



Avoiding vibration and structure-borne noise problems has always been in our focus during the development of Bilz insulating pads. As, depending on the type of machine, the requirements can be very different because of the dynamic particularities, there are numerous different types of pads available for almost any vibration problem. Especially noteworthy are the excellent compression set values of our insulation pads. This property is particularly important in vibration-isolated mounting of modern machines because the geometric accuracy must remain unchanged and stable for years.

Structure-borne noise
Effective noise insulation

Ageing resistant
Virtually unlimited service life with adherence to load values. No permanent changes in shape.

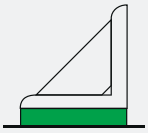
Chemical resistance
Exceptionally good resistance to oils, grease, acids and cooling emulsions used in industry.

Temperature resistance
-20 °C to +120 °C

Damping properties
Very high degree of damping of up to 30 %

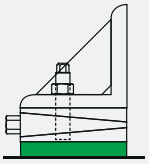
FOUR POSSIBLE OPTIONS FOR THE USE OF INSULATION PADS FOR MACHINE INSTALLATION

1



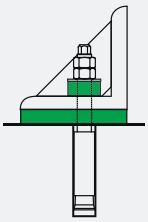
Free-standing machine foundations using Bilz insulation pads with low demands on alignment. The uneven floor is compensated for with pads, etc. The arrangement of the pads is usually a pattern of points, not over the full surface. Number and size of the required insulation pads is given by the weight of the machine and the existing support surface.

2



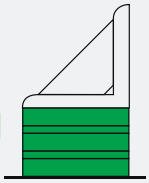
Stable connection to the machine bed using **bolt-on installation fittings** that remain in place when the machine is lifted. Specifically for machines with high dynamic forces (injection moulding machines, stamping equipment, etc.).

3



Bolt-through ground anchoring using insulation pads and insulation washers. The use of insulation washers prevents vibrations being transmitted through the bolt.

4



Highly effective shock and vibration insulation by Bilz **insulation pad sets**. Different Bilz pads are combined into pad sets offering significantly improved insulation.

Bilz insulation pads are resistant to the following substances:

Lubricants
Greases for plain and roller bearings, gear greases

Synthetic lubricants
Polyalkylene, carboxylic acid esters, antifreeze

Combustibles and fuels
Petrol, diesel fuel, heating oil, aviation fuel, special fuels

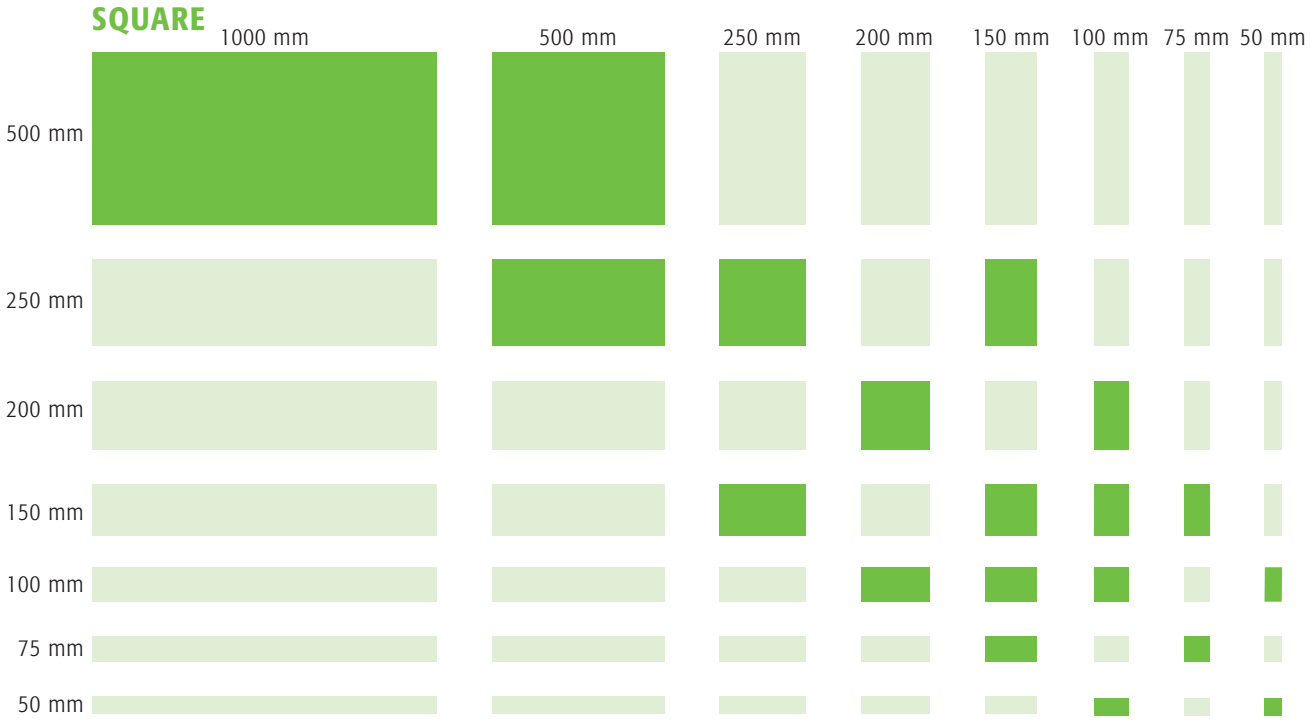
Fire resistant hydraulic fluids
Oil-in-water emulsions, water-in-oil emulsions, aqueous polymer solutions

Mineral oils
Common water-miscible cooling lubricants, ATF (Automatic Transmission Fluid), cooling lubricants, water-miscible anti corrosive oils, slideway oils, compressed air oils, lubricating oils, heat transfer oils, filter oils, rolling oils, automotive gear oils, brake fluids based on mineral oil

Cleaning agents
Hydro-chlorofluorocarbons, benzene, cold cleaner

Cleaning agent (aqueous solutions)
Washing and cleaning agents, wetting agents, dilute acids, dilute alkalis, salt solutions

ITEM NUMBERS AND STANDARD SIZES



- **Available standard formats square**
- Special and other formats are individually made on request

SQUARE	B4	B0	B6	B5	B50	B32	B32W	B30	B30W	B13W	BS1	BS	BN	BR7	B8
mm															
1000 x 500	01-0202	01-0005	01-0323	01-0260	01-0291	01-0139	01-0175	01-0057	01-0087	01-0038	01-0462	01-0441	01-0371	01-0391	01-0350
500 x 500	01-0223	01-0027	01-0342	01-0280	01-0310	01-0158	01-0194	01-0079	01-0106	01-0051	01-0473	01-0458	01-0384	01-0406	01-0365
500 x 250	01-0222	01-0026	01-0341	01-0279	01-0309	01-0157	01-0193	01-0078	01-0105	01-0050	01-0472	01-0457	01-0383	01-0405	01-0364
250 x 250	01-0217	01-0020	01-0337	01-0274	01-0305	01-0153	01-0189	01-0072	01-0101	01-0048	01-0470	01-0453	01-0380	01-0402	01-0361
250 x 150	01-0216	01-0019	01-0336	01-0273	01-0304	01-0152	01-0188	01-0071	01-0100	01-0047	01-0469	01-0452	01-0379	01-0401	01-0360
200 x 200	01-0214	01-0016	01-0334	01-0271	01-0302	01-0150	01-0186	01-0069	01-0098	01-0046	01-0468	01-0450	01-0378	01-0400	01-0359
200 x 100	01-0213	01-0015	01-0333	01-0270	01-0301	01-0149	01-0185	01-0068	01-0097	01-0045	01-0467	01-0449	01-0377	01-0399	01-0358
150 x 150	01-0210	01-0012	01-0330	01-0267	01-0298	01-0146	01-0182	01-0065	01-0094	01-0043	01-0465	01-0446	01-0375	01-0397	01-0356
150 x 100	01-0209	01-0011	01-0329	01-0266	01-0297	01-0145	01-0181	01-0064	01-0093	01-0042	01-0464	01-0445	01-0374	01-0396	01-0355
150 x 75	01-0211	01-0013	01-0331	01-0268	01-0299	01-0147	01-0183	01-0066	01-0095	01-0044	01-0466	01-0447	01-0376	01-0398	01-0357
100 x 100	01-0204	01-0006	01-0324	01-0261	01-0292	01-0140	01-0176	01-0058	01-0088	01-0039	01-0463	01-0442	01-0372	01-0392	01-0351
100 x 50	01-0205	01-0007	01-0325	01-0262	01-0293	01-0141	01-0177	01-0060	01-0089	01-0040	-	-	01-0373	01-0393	01-0352
75 x 75	01-0228	01-0034	01-0346	01-0284	01-0313	01-0162	01-0198	01-0083	01-0110	01-0053	-	-	01-0388	01-0409	01-0369
50 x 50	01-0224	01-0029	01-0343	01-0281	01-0311	01-0159	01-0195	01-0080	01-0107	01-0052	-	-	01-0385	01-0407	01-0366

Note

- Bilz insulation pads can be cut with any circular or band saw.
- We are happy to supply special sizes on request.
- The specified maximum load is composed of static and dynamic loading of the machine.
  The best insulation effect is achieved at approximately 80-90 % of the specified maximum load.
- Selected insulation pads can also be supplied with a profile on one side (designated for example B4-1).
- The stated coefficient of friction refers to conventional industrial screed.
- Cutting tolerance is according to DIN 7715/T5, class P3.
- **W:** Waffle structure designs for compensation of uneven floors (B32W, B30W, B13W)

Right to make technical changes is reserved.

ROUND

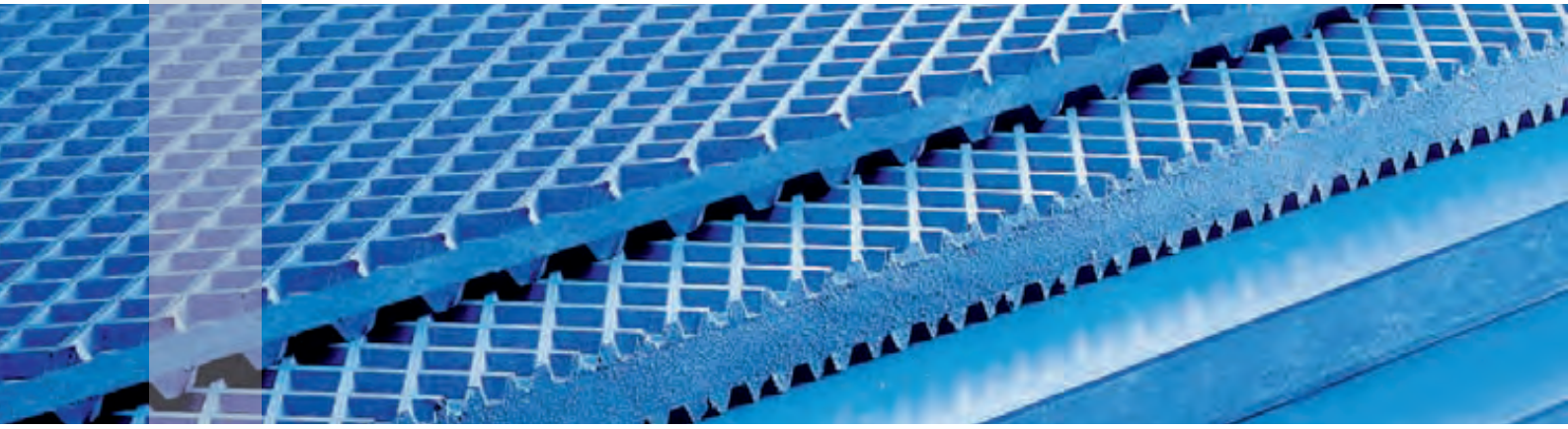
Ø 300 mm | Ø 238 mm | Ø 200 mm | Ø 150 mm | Ø 110 mm | Ø 75 mm | Ø 50 mm

● Available standard formats round

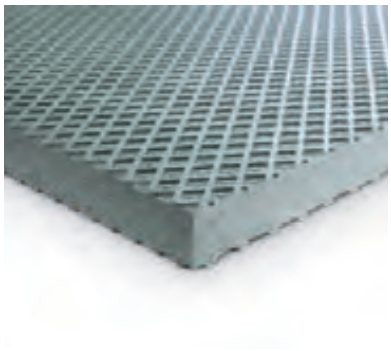
ROUND	B4	B0	B6	B5	B50	B32	B32W	B30	B30W	B13W	BS1	BS	BN	BR7	B8
Ø mm															
50	01-0220	01-0024	01-0339	01-0277	01-0307	01-0155	01-0191	01-0076	01-0103						
75	01-0227	01-0033	01-0345	01-0283	01-0312	01-0161	01-0197	01-0082	01-0109						
110	01-0206	01-0008	01-0326	01-0263	01-0294	01-0142	01-0178	01-0061	01-0090						
150	01-0208	01-0010	01-0328	01-0265	01-0296	01-0144	01-0180	01-0063	01-0092		These types of pads are available on request.				
200	01-0212	01-0014	01-0332	01-0269	01-0300	01-0148	01-0184	01-0067	01-0096						
238	01-0215	01-0018	01-0335	01-0272	01-0303	01-0151	01-0187	01-0070	01-0099						
300	01-0218	01-0021	01-0338	01-0275	01-0306	01-0154	01-0190	01-0073	01-0102						

SELECTION OF THE APPROPRIATE TYPE OF PAD

Application	B4	B0	B6	B5/B50	B32/B32W	B30/B30W	B13W
Metal processing							
Machining centre		■	■				
Drilling machine	■						
Boring mill			■				
Lathe		■					
Lathe, long bed			■				
Milling machine	■	■					
Press				■	■		
Saw	■						
Guillotine shear				■	■		
Grinding machine		■	■				
Punching/nibbling machine				■	■	■	
Transfer line			■				
Plastic processing							
Granulator	■	■					
Mills and boring mill				■	■		
Injection moulding machine	■			■		■	
Printing and paper industry							
Book binding-/printing machine, folder	■						
Shearing, packing systems	■				■		
Measuring and inspection							
Measuring machines, scales, microscope						■	
Plate sets							
Foundation							■



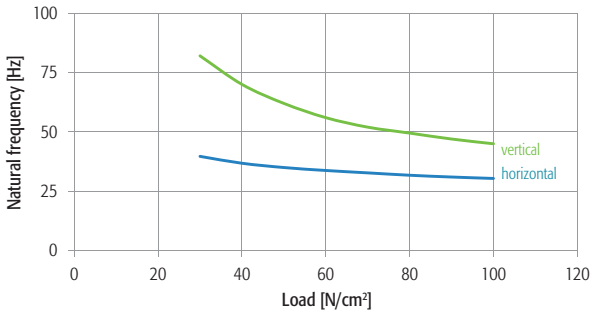
PAD TYPE **B4**[2]



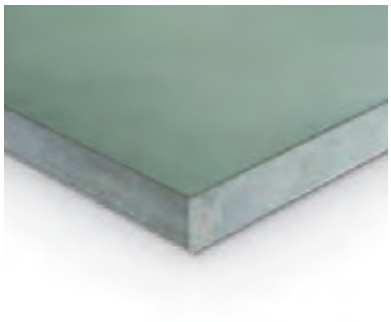
High universal variant. Can be used for machine tools, plastic machines and printing machines. Very well suited for machines with a tendency to "wander".

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B4	30-100	15	0.8

DYNAMIC NATURAL FREQUENCY



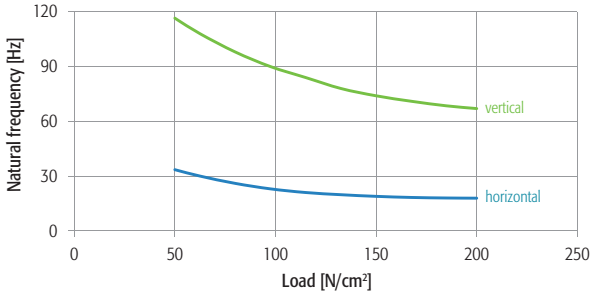
PAD TYPE **B0**



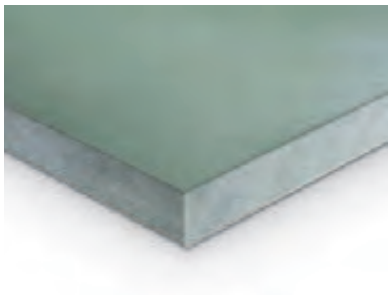
Variant without profiles. Very good level consistency. Specifically for machines with low intrinsic rigidity such as machining centres, lathes and grinding machines, etc.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B0	50-200	15	0.6

DYNAMIC NATURAL FREQUENCY



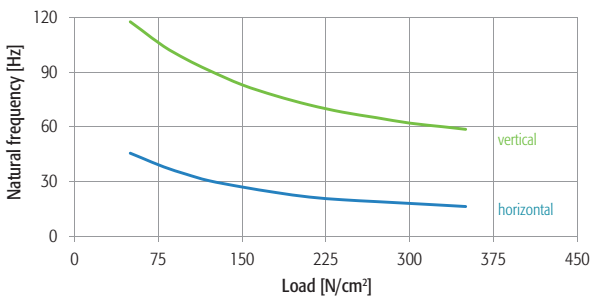
PAD TYPE **B6**



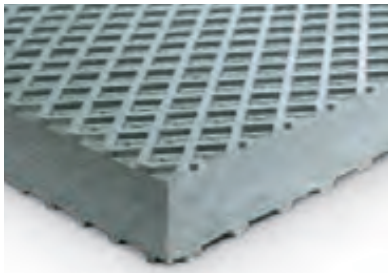
Variant without profiles. Extremely high load capacity with the highest level consistency. For very heavy and long-bed machines.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B6	50-350	15	0,6

DYNAMIC NATURAL FREQUENCY



PAD TYPE **B5**

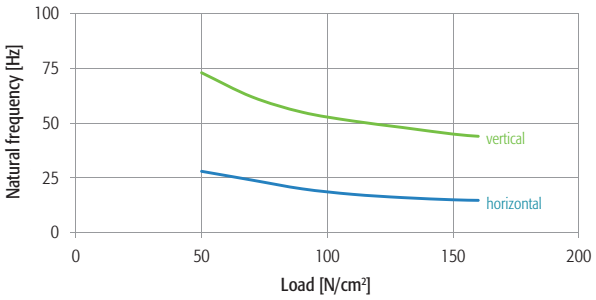


For machines subject to very highly dynamic disturbing force, such as presses, punches, shears, etc.

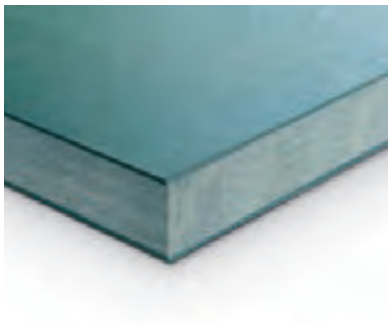
With a profile for compensating uneven floors.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B5	50-160	25	0.8

DYNAMIC NATURAL FREQUENCY



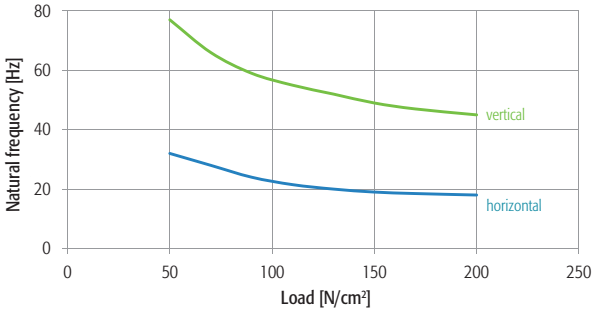
PAD TYPE **B50**



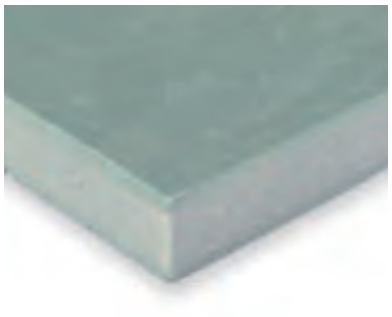
For machines subject to very highly dynamic disturbing force, such as presses, punches, shears, etc.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B50	50-200	25	0.8

DYNAMIC NATURAL FREQUENCY



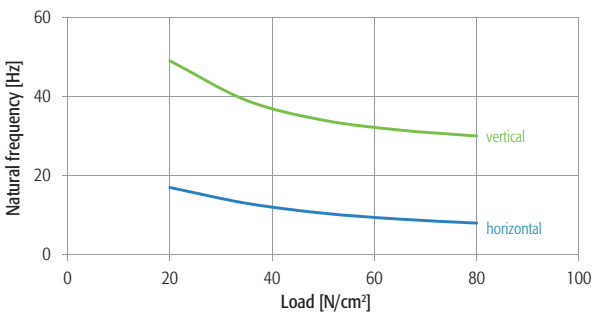
PAD TYPE **B32**



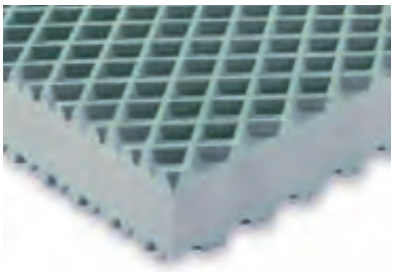
Soft variant without a profile.
Excellent insulation effect for mid-sized presses, punches, etc.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B32	20-80	25	0.8

DYNAMIC NATURAL FREQUENCY



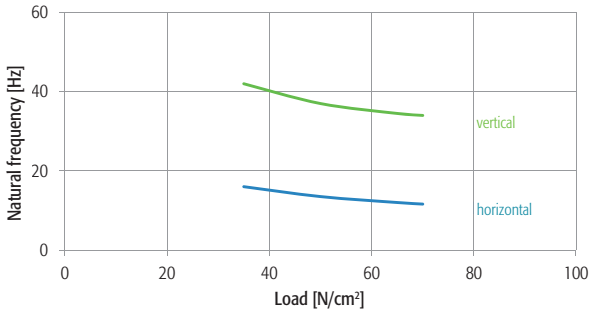
PAD TYPE **B32W**[2]



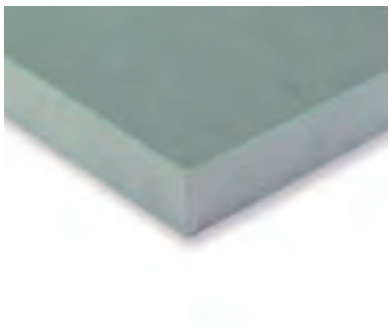
Very soft variant, comparable with B30, but with improved insulation effect.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B32W	35-70	25	0.8

DYNAMIC NATURAL FREQUENCY



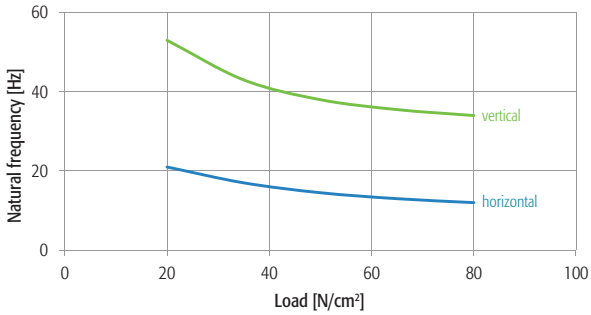
PAD TYPE **B30**



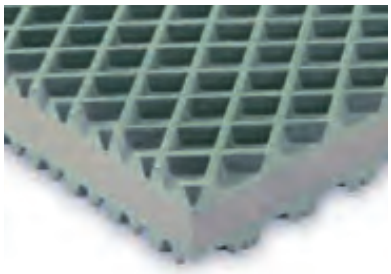
Soft variant without a profile. Particularly suitable for effective insulation when installing on upper floors.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B30	20-80	18	0.8

DYNAMIC NATURAL FREQUENCY



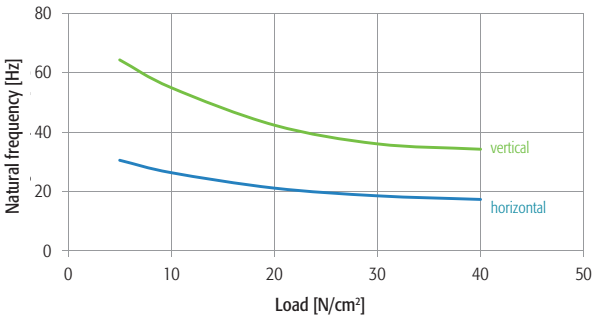
PAD TYPE **B30W**[2]



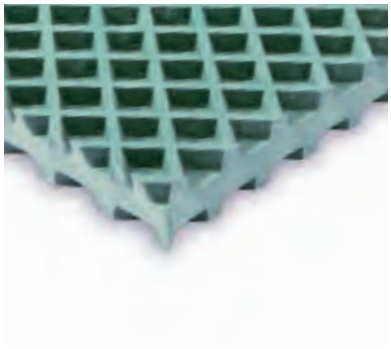
Very soft variant for optimum insulation through low-frequency matching, such as for measuring machines and inspection machines, scales and microscopes.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B30W	5-40	18	0.8

DYNAMIC NATURAL FREQUENCY



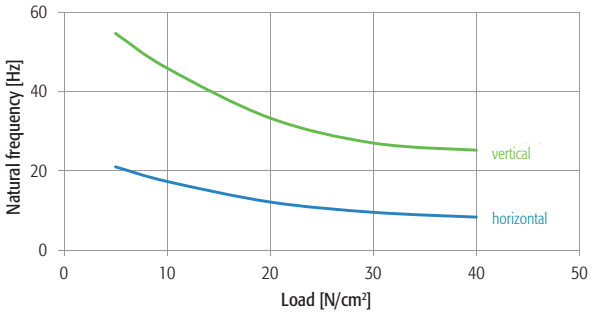
PAD TYPE **B13W**



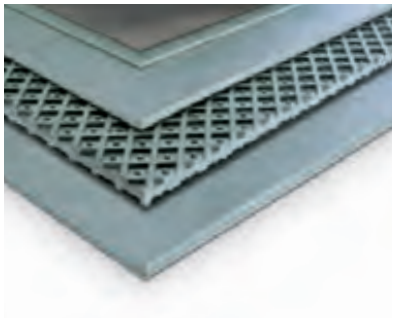
Special variant for the highest insulation values. Can be stacked up to 5 times. Matching up to approximately 8 Hz. Perfectly suited as a pad set for foundation insulation.

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
B13W	5-40	13	0.8

DYNAMIC NATURAL FREQUENCY



PAD TYPE **BS1**, **BS**, **BN**, **BR7**[2], **B8**



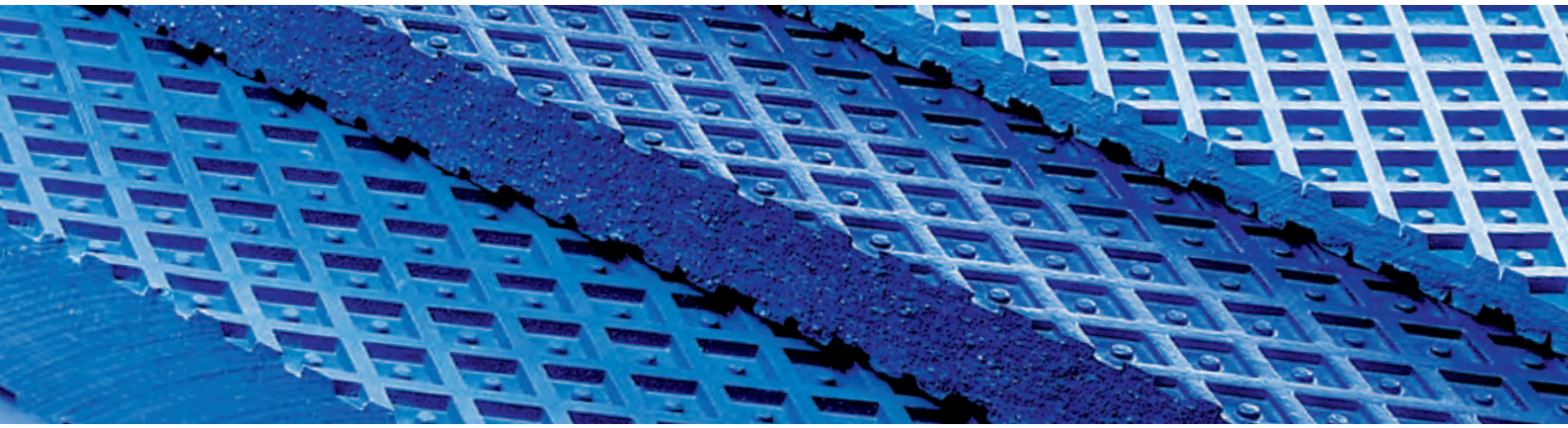
Bilz anti-slip and distance pads.
No vibration insulation!

Type	Load[1] N/cm²	Height mm	Coefficient of friction[3]
BS1	10-400	1	0.9
BS	10-400	2	0.9
BN	10-300	5	0.6
BR7	10-160	7	0.8
B 8	5-40	8	0.8

ANTI-SLIP PADS

Note

- Bilz insulation pads can be cut with any circular or band saw.
- We are happy to supply special sizes on request.
- (1) The specified maximum load is composed of static and dynamic loading of the machine. The best insulation effect is achieved at approximately 80-90 % of the specified maximum load.
- (2) Can also be supplied with a profile on one side (designated for example B4-1).
- (3) The stated coefficient of friction refers to conventional industrial screed.
- Cutting tolerance is according to DIN 7715/T5, class P3.

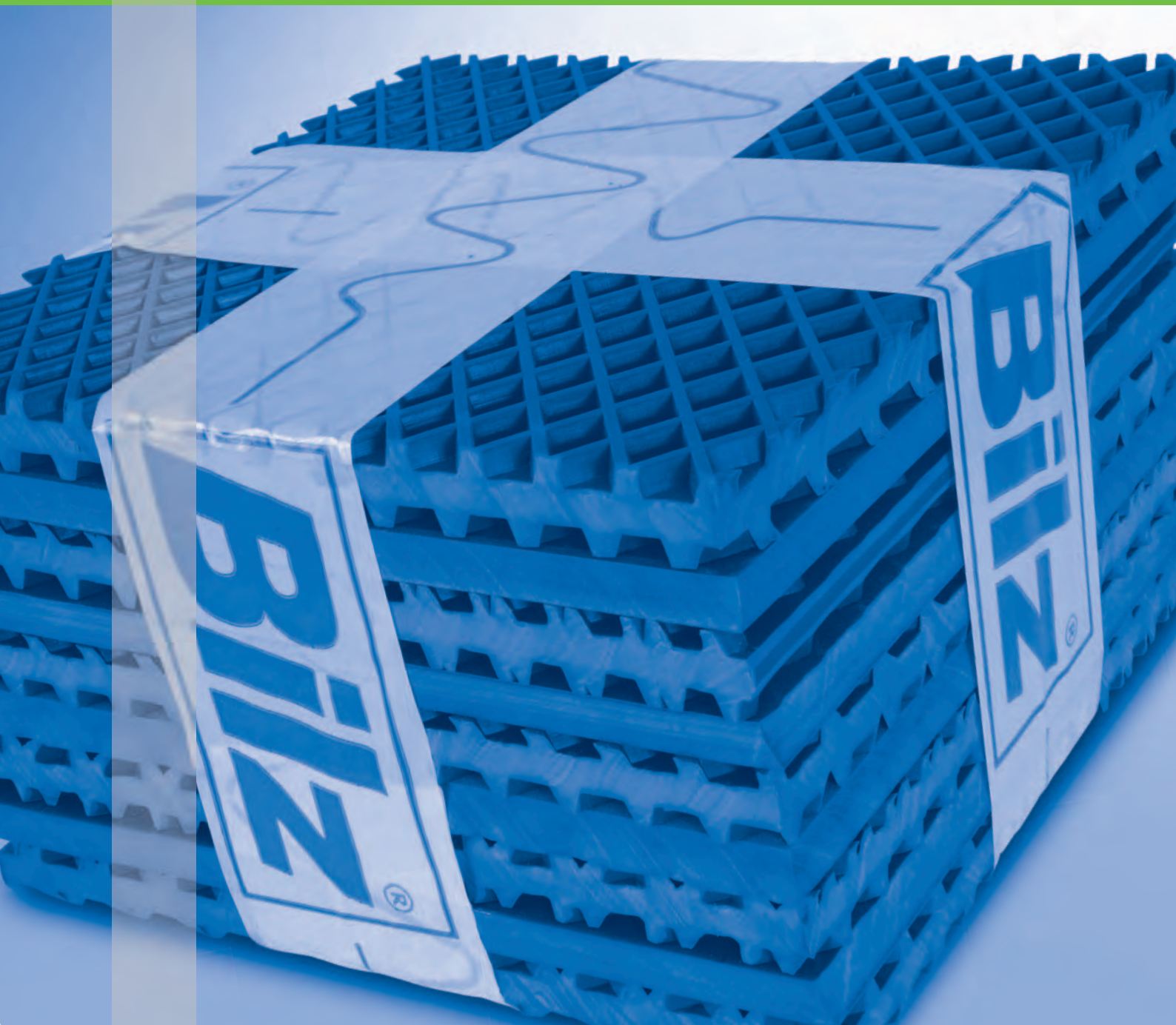


Insulation pad sets

Multiple layering of Bilz insulation pads can achieve significantly reduced natural frequencies and therefore considerably increase the insulation effect compared with a single layer of insulation pads.

These pad sets are particularly suitable for large machines and sprung foundations. The vibration insulation and damping properties of these insulation pads remain unchanged even after years of dynamic loading.

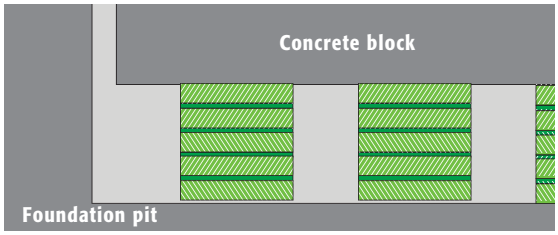
Bilz insulation pads are resistant against the most common greases, oils, coolants, cleaning agents as well as acids and alkalis.



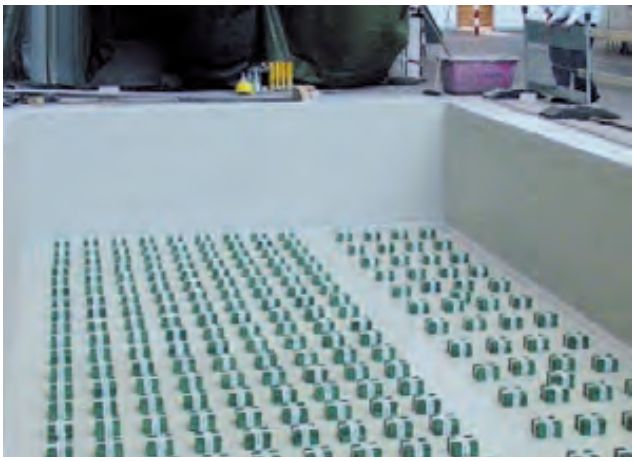
Insulation pad sets

Application

- Effective insulation pads for highly dynamic machines and foundations.
- The permissible load capacity of a pad lies between 5 and 40 N/cm² depending on the application. The number and size of the insulating layers and the required distribution of the pad sets is determined specifically for the application by Bilz.

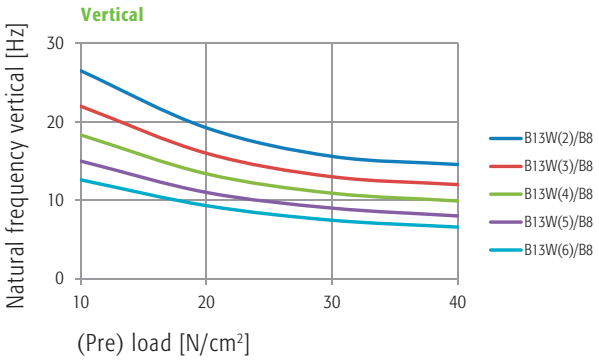


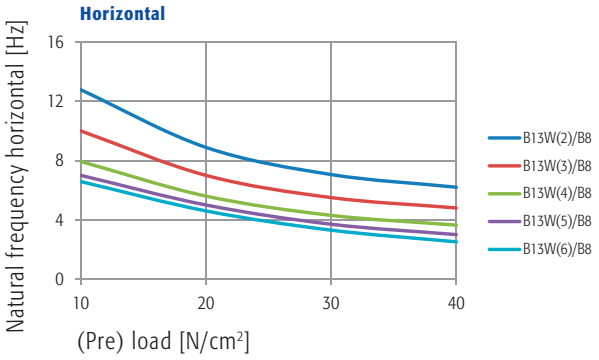
For further information contact us to arrange a personal consultation.



Foundation pit with Bilz insulation pads laid out

NATURAL FREQUENCY





STANDARD SIZES

Standard	**Item no. 01-0476**	When ordering please state the desired size.
Special sizes	**Item no. 01-0475**	

SQUARE

Width mm \ Length mm	500	250	200	166	150
500	■	■			
250		■	■	■	
200			■	■	
166				■	
150					■

Type	Thickness unloaded mm	Natural frequency vertical Hz	Natural frequency horizontal Hz
B13W/B8, 2-layer	34	14.5 - 26.5	5.5 - 12.5
B13W/B8, 3-layer	55	12.0 - 22.0	4.5 - 10.0
B13W/B8, 4-layer	76	10.0 - 18.5	3.5 - 8.0
B13W/B8, 5-layer	97	8.0 - 15.0	3.0 - 7.0
B13W/B8, 6-layer	118	6.5 - 12.5	2.5 - 6.5

Levelling elements

Bilz levelling elements are used for vibration and structure-borne noise insulated machine installation. The maintenance-free machine feet guarantee the simple and precise levelling of machines and are available in many versatile designs.
The sizes and insulation pads are selected according to the application and load. The range of levelling can be adapted depending on the selected bolt length and the individual requirements.

General information

- The type of insulation pads used can be found in the type description, e.g. BNSH 80/50 is equipped with B50, BNVS 50/30W with B30W etc.
- The specified maximum load is composed of static and dynamic loading of the machine. The best insulation effect is achieved at approximately 80–90 % of the specified maximum load.
- Details on the properties of the insulation pads used can be found on pages 14–17.
- Permissible temperature range: -20 °C to +120 °C
- A table for selecting the available bolts can be found on pages 26–27. They are supplied complete with nuts and washers.
- Please contact us if the size, colour, insulation pad mounting, or bolts that you are looking for are not listed. In addition to our standard solutions and colours we also carry numerous special solutions. We are always happy to offer our advice.

Series **BNSH / BNSHA**

Round, without/with bolt-on floor attachment.

Application: Specifically developed for the mounting of injection moulding machines, presses, punches etc. Optimum load distribution due to our proven pressure plate design. Very high horizontal stability over the entire levelling range. The BNSHA elements with bolt-on floor plate are particularly suitable for all machines that tend to wander. The floor anchor is **not** used as a safeguard against tipping.

Insulation pad properties:

B50: Good insulating effect when the machine is installed on natural ground. Very well suited for machines with highly dynamic forces.

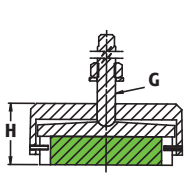
B32: Very good insulation effect. Specifically developed for mounting on upper floors or insufficiently stable supporting surfaces.

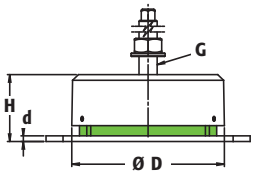
Bolts: For the suitable levelling bolts see Table 2, p. 27.

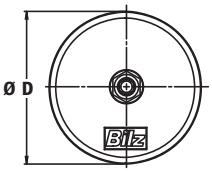
Colour: RAL 7037, dusty grey

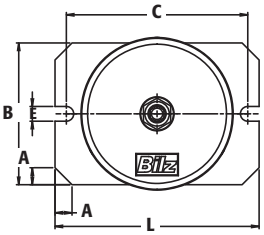
BNSH / BNSHA

Type BNSH / BNSHA	Item no. BNSH	Item no. BNSHA	max. load N/pc.	H BNSH mm	H BNSHA mm	Ø D mm	Adjustment range mm	Thread G	Pitch
70/0*	12-0042	12-0016	5,000	31	36	80	+6	M10	1.25
80/50	12-0047	12-0020	9,500	43	48	96	+18	M12	1.5
120/50	12-0024	12-0003	20,000	51	56	133	+18	M16	1.5
160/50	12-0028	12-0006	40,000	52	57	175	+17	M20	1.5
175/50	12-0032	12-0009	45,000	56	64	193	+17	M20	1.5
200/50	12-0036	12-0012	65,000	63	71	229	+16	M24	2.0
250/50	12-0040	12-0015	90,000	67	75	270	+15	M30	2.0
70/30*	12-0043	12-0017	1,800	34	39	80	+6	M10	1.25
80/32	12-0045	12-0018	4,800	43	48	96	+18	M12	1.5
120/32	12-0022	12-0001	9,600	51	56	133	+18	M16	1.5
160/32	12-0026	12-0004	17,000	52	57	175	+17	M20	1.5
175/32	12-0030	12-0007	20,800	56	64	193	+17	M20	1.5
200/32	12-0034	12-0010	29,000	63	71	229	+16	M24	2.0
250/32	12-0038	12-0013	41,000	67	75	270	+15	M30	2.0









BNSH BNSHA

* Special mounting

BNSHA DIMENSION BASE PLATE

Type	L mm	A mm	B mm	C mm	E mm	d mm
BNSHA 70	125	15	75	105	8	5
BNSHA 80	140	15	90	120	8	5
BNSHA 120	180	15	125	160	13	5
BNSHA 160	220	15	170	200	16	5
BNSHA 175	260	20	185	230	20	8
BNSHA 200	300	20	225	270	20	8
BNSHA 250	330	20	265	300	20	8

Series **BNV / BNVS**

Square, without/with flexible levelling bolt

Application: Proven and very effective plate element, preferably for light to medium heavy machines with matching locating holes in the machine feet. The BNV/BNVS elements are used where a rigid joint is required between the machine and the fitting. Any unevenness or angular differences in the floor up to ± 3° can be compensated for using the movable levelling bolt.

Insulation pad properties:

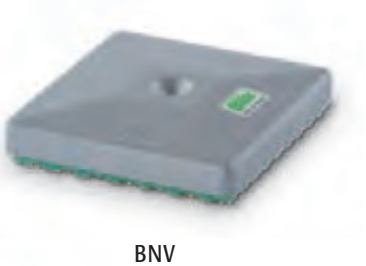
B4: Medium hard pad with good vibration and structure-born noise insulation. Universal application.

B0: Non profile insulation pad with very high levelling consistency, e.g. for lathes, machining centres etc.

B30W: Soft matching for a very good insulation effect, e.g. for grinding machines, test equipment, measuring machines, etc.

Bolts: For the suitable levelling bolts see Table 1, p. 26

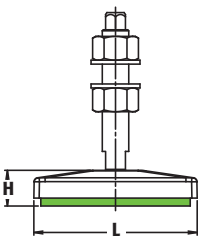
Colour: RAL 7037, dusty grey

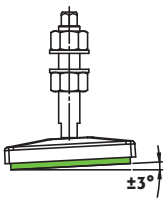


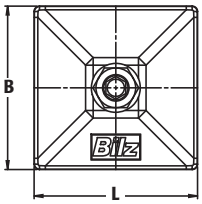
BNV

BNVS

BNV / BNVS (SQUARE)







BNVS

Type BNV / BNVS	Item no. BNV	Item no. BNVS	max. load N/pc.	L mm	W mm	H mm
50/4	08-0030	10-0013	2,000	60	60	22
80/4	08-0034	10-0023	4,700	85	85	24
110/4	08-0004	10-0004	12,000	123	123	28
115/4	08-0008	10-0026	11,400	163	88	29
150/4	08-0016	10-0009	18,000	147	147	32
200/4	08-0020	10-0025	37,000	264	165	35
50/0	08-0028	10-0011	4,000	60	60	22
80/0	08-0032	10-0021	9,500	85	85	24
110/0	08-0002	10-0002	24,000	123	123	28
115/0	08-0006	10-0027	22,800	163	88	29
150/0	08-0014	10-0007	36,000	147	147	32
200/0	08-0018	10-0028	74,000	264	165	35
50/30W	08-0029	10-0012	950	60	60	25
80/30W	08-0033	10-0022	2,300	85	85	27
110/30W	08-0003	10-0003	5,000	123	123	31
115/30W	08-0007	10-0029	4,500	163	88	32
150/30W	08-0015	10-0008	7,300	147	147	35
200/30W	08-0019	10-0030	15,000	264	165	38

Series **BNR/BNRS**

Round, without/with flexible levelling bolt

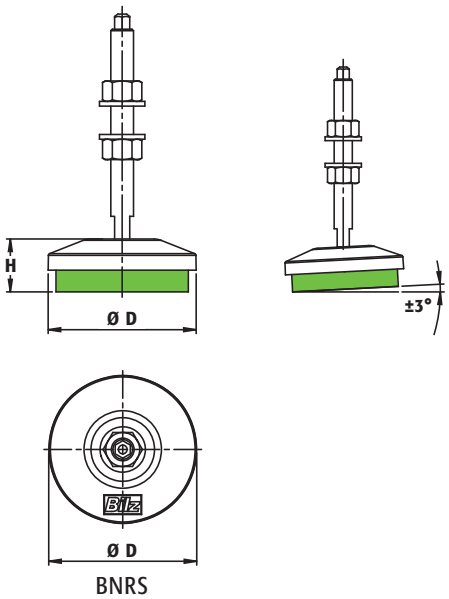
Application, Properties and bolts:
See type BNV/BNVS

BNR

BNRS

BNR / BNRS (ROUND)

Type BNR / BNRS	Item no. BNR	Item no. BNRS	max. load N/pc.	Ø D mm	H mm
50/4	09-0035	11-0014	1,700	60	21
70/4	09-0048	11-0019	3,600	79	29
80/4	09-0045	11-0023	4,200	85	23
110/4	09-0006	11-0004	9,100	120	33
150/4	09-0016	11-0009	17,000	162	29
200/4	09-0025	11-0026	31,000	213	32
50/0	09-0033	11-0012	3,400	60	21
70/0	09-0049	11-0017	7,200	79	29
80/0	09-0042	11-0024	8,400	85	23
110/0	09-0002	11-0002	18,200	120	33
150/0	09-0012	11-0007	34,000	162	29
200/0	09-0021	11-0027	62,000	213	32
50/30W	09-0034	11-0013	700	60	24
70/30W	09-0050	11-0018	1,400	79	32
80/30W	09-0043	11-0025	1,600	85	26
110/30W	09-0003	11-0003	3,500	120	36
150/30W	09-0013	11-0008	6,900	162	32
200/30W	09-0022	11-0028	12,000	213	35



BNRS

Series **BNRV / BNRSV** stainless-steel design

Round, stainless-steel design, without/with flexible levelling bolt

Application: Food, luxury food, packaging, chemical and pharmaceutical industries as well as clean room applications.

Insulation pad properties:

B4: Medium hard pad with good vibration and structure-born noise insulation. Universal application.

B30W: Soft matching for a very good insulation effect, e.g. for grinding machines, test equipment, measuring machines, etc.

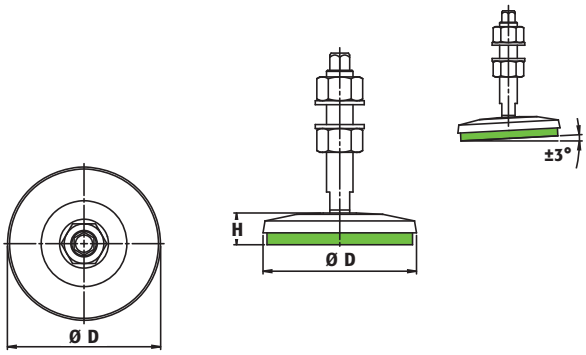
BR7: Anti-slip plate without vibration insulation.

Bolts: For suitable levelling bolts with standard thread see Table 1, p. 26.

BNRV

BNRSV

BNRV / BNRSV



BNRSV

Type BNR / BNRSV	Item no. BNRV	Item n0. BNRSV	max. load N/pc.	Ø D mm	H mm
50/4	30-0031	30-0014	1,700	54	24
70/4	30-0035	30-0018	3,600	76	25
110/4	30-0023	30-0007	9,100	116	27.5
150/4	30-0027	30-0011	17,000	156	29.5
50/30W	30-0030	30-0013	700	54	27
70/30W	30-0034	30-0017	1,400	76	28
110/30W	30-0022	30-0006	3,500	116	30.5
150/30W	30-0026	30-0010	6,900	156	32.5
50/BR7	30-0032	30-0016	2,800	54	16
70/BR7	30-0036	30-0020	5,800	76	17
110/BR7	30-0024	30-0009	14,500	116	19.5
150/BR7	30-0028	30-0012	27,500	156	21.5

Series **BFE** stainless-steel design

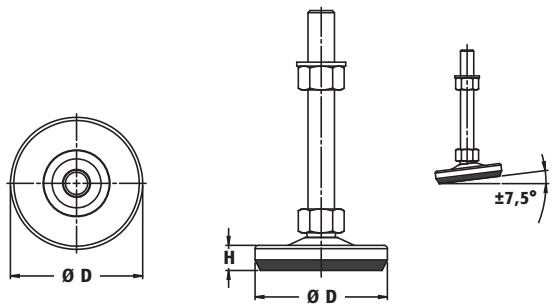
Round, stainless-steel design, with flexible levelling bolt

Application: Cost-effective stainless steel design with adequate vibration insulation for the food, luxury food, packaging, chemical and pharmaceutical industries.

Bolts: For suitable levelling bolts with standard thread see Table 3, p. 27.

Note: These elements are also available in an electrically conducting design on request.

BFE



Type BFE	Item no. BFE	max. load N/pc.	Ø D mm	H mm
50	30-0003	3,000	50	14
80	30-0004	8,500	80	17
100	30-0001	20,000	100	19
125	30-0002	30,000	125	19

Series **GMA** and **BNL**

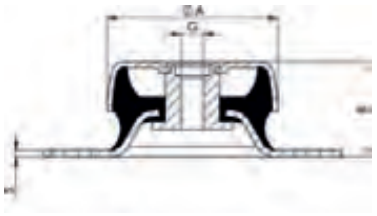
GMA (bolt-on rubber-metal element)

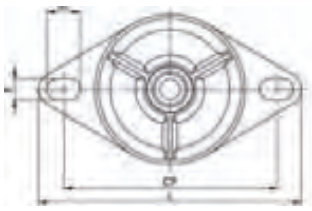
The bolt-on Bilz rubber-metal element offers an effective and robust vibration and structure-borne noise insulation for machines and systems, specifically for use in outside areas. The universally usable elements are made from high-quality EPDM and galvanised steel.
They offer a very stable machine mount with constant elastic properties from both forces acting in the horizontal plane and pressure or tensile forces acting in the vertical plane.

Natural frequency: approx. 25 Hz

Application: Stationary and movable use of machines, devices and aggregates, such as motors, machine tools, timber processing machines, sieves, rolling mills, pumps, compressors, air conditioning and ventilation systems.

Bolts: These elements are supplied without bolts.





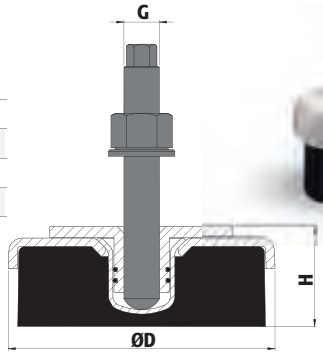
Type GMA	Item no.	Ø A mm	B mm	F mm	M mm	CF mm	L mm	S mm	max. pressure load. N/pc.	max. deflection mm	Thread G
63	13-0003	63	30	9	14	89	110	2.5	2,400	2.0	M8
78	13-0004	78	30	9	12	110	135	3.0	2,670	2.3	M10
92	13-0005	92	35	10	15	123.5	150	3.0	3,150	3.5	M10
106	13-0006	106	38	13	19	143	175	4.0	4,500	3.0	M12
125	13-0007	125	43	14.5	20	156	192	4.0	7,400	4.0	M16
150	13-0008	150	50	14	18	182	218	4.0	13,200	6.0	M16

BNL (round, steel with levelling bolt)

Application: Cost-effective levelling element for machines with high vertical and horizontal dynamic forces, adequate vibration and structure-borne noise insulation, pressure plate that can be precisely levelled for optimum weight distribution.

The rubber element is resistant to commercial acids, alkalis and lubricating oils.

Bolts: Appropriate levelling bolt each with a nut and washer included.



Type BNL	Item no. BNL	max. load N/pc.	Ø D mm	H mm	Adjustment range	G	Length mm
80	14-0001	5,000	80	39	+11	M12 x 1.5	120
120	14-0002	11,000	120	47	+12	M16 x 1.5	120
160	14-0003	26,000	160	54	+12	M20 x 1.5	170
200	14-0004	40,000	200	58	+12	M20 x 1.5	170

Levelling and fixing bolts

A large range of different bolts are available for each type of levelling element. The appropriate bolt in each case can be found in the following tables.

TABLE 1 BOLTS FOR LEVELLING ELEMENT TYPE **BNRS, BNVS** AND **BNRSV**

Thread	Material		Length in mm 70	100	125	150	200	250	300
M10	galvanised	2 x nut/washer	19-0025	19-0020					
	stainless steel	2 x nut/washer	18-0012	18-0006					
M12	galvanised	2 x nut/washer		19-0042	19-0045	19-0048			
	stainless steel	2 x nut/washer		18-0017	18-0068	18-0020			
M16	galvanised	2 x nut/washer		19-0086	19-0092	19-0095	19-0099	19-0102	
	stainless steel	2 x nut/washer		18-0031	18-0061	18-0034	18-0037	18-0056	
M18	galvanised	2 x nut/washer		19-0131	19-0134	19-0137	19-0140	19-0143	
M20	galvanised	2 x nut/washer		19-0179	19-0183	19-0186	19-0189	19-0192	
	stainless steel	2 x nut/washer		18-0042	18-0063	18-0045	18-0048		
M24	galvanised	2 x nut/washer				19-0215	19-0224	19-0227	19-0230
	stainless steel	2 x nut/washer				18-0053	18-0064	18-0065	

Thread assignment for levelling element sizes

BNRS	50	70	80	110		150	200
M10	■						
M12	■	■	■				
M16		■	■	■		■	
M18			■	■		■	■
M20				■		■	■
M24						■	■
BNVS	**50**		**80**	**110**	**115**	**150**	**200**
M10	■						
M12	■		■	■			
M16			■	■	■	■	
M18				■	■	■	■
M20					■	■	■
M24						■	■
BNRSV	**50**	**70**		**110**		**150**	
M10	■						
M12	■	■		■			
M16		■		■		■	
M18				■		■	
M20						■	
M24						■	

All bolts are supplied with standard threads.
The selection of the type of bolt is made depending on the static and dynamic loading in the particular application.
We would be happy to help you in the selection.

TABLE 2 BOLTS FOR LEVELLING ELEMENT TYPE **BNSH** AND **BNSHA**

Thread	Material	Pitch	Length in mm 80	100	125	150	200
M10	galvanised	1.25		19-0283	19-0284		
M12	galvanised	1.5	19-0039	19-0032	19-0034	19-0036	
M16	galvanised	1.5		19-0079		19-0081	19-0083
M20	galvanised	1.5		19-0156	19-0162	19-0167	19-0172
M24	galvanised	2.0				19-0219	19-0221
M30	galvanised	2.0				19-0242	19-0245

These galvanised bolts are included and are each supplied with 1 nut and washer.
Please state the desired length.

TABLE 3 BOLTS FOR LEVELLING ELEMENT TYPE **BFE**

Thread	Material	Length in mm 50	80	100	120	150	180	200	250	300
M8	stainless steel	■	■	■	■	■	■	■		
M10	stainless steel	■	■	■	■	■	■	■		
M12	stainless steel	■	■	■	■	■	■	■		
M16	stainless steel	■	■	■	■	■	■	■	■	■
M20	stainless steel	■	■	■	■	■	■	■	■	■
M24	stainless steel	■	■	■	■	■	■	■	■	■
M30	stainless steel	■	■	■	■	■	■	■	■	■

All bolts are supplied in stainless steel each with 2 nuts and washers.
They come with a standard thread and are suitable for all sizes of element.

Note: Do you need a type of bolt that is not listed in the table?
Then please contact us. We are happy to offer a wide selection of special bolts in terms of size, thread, material, quality, etc.

Precision levelling wedges

Due to their large contact area Bilz precision levelling wedges (PK) for vibration and structure-borne noise insulation offer optimum support and stiffening of the machine bed. They are available in a wide range of sizes and dimensions as free-standing, bolt-on to the machine or bolt-through to the foundation design.

The proven design principle enables the machine to be quickly levelled to a degree of levelling in the 1/100 mm range even at loads of 100 tons per wedge.
The powerful self-locking effect of the levelling bolt prevents self-adjustment under the effects of vibration. Depending on the application, their use in conjunction with Bilz insulation pads creates the perfect strength coherence and very effective vibration insulation.

General information

- On request we supply special solutions in terms of coating, insulation pad mounting and dimension..
- Permissible temperature range: -20 °C to +120 °C
- To simplify handling the upper or lower wedge can be secured with a tension spring.
- The general tolerances in accordance with ISO 2768 vL apply to the specified lengths and widths. The specified height at the centre position is subject to a tolerance of ± 1mm.

THE WIDTH ACROSS FLATS FOR BILZ PRECISION LEVELLING WEDGES

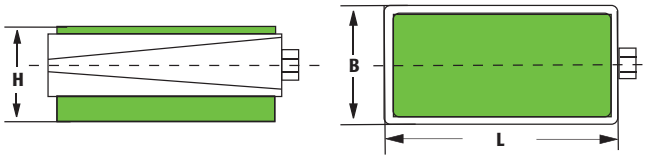
Type	Inner	Outer
PK 1	SW 6	SW 13
PK 2	SW 10	SW 19
PK 2.5	SW 10	SW 19
PK 3	SW 12	SW 22
PK 3.2	SW 12	SW 22
PK 3.5	SW 12	SW 22
PK 3.8	SW 12	SW 22
PK 4	SW 14	SW 27
PK 4.5	SW 14	SW 27
PK 5	SW 14	SW 27
PK 5.5	SW 14	SW 27
PK 6	SW 14	SW 27
PK 7	SW 17	SW 32
PK 8	SW 19	SW 41
PK 9	SW 22	SW 50

Type	Inner	Outer
PKA/PKD 1	SW 10	SW 19
PKA/PKD 2	SW 12	SW 22
PKA 3.5	SW 17	SW 32
PKA/PKD 3	SW 14	SW 27
PKA/PKD 4	SW 14	SW 27
PKA/PKD 5	SW 14	SW 27
PKA/PKD 6	SW 17	SW 32
PKA/PKD 7	SW 19	SW 41
PKA/PKD 8	SW 22	SW 50

Precision levelling wedge **PK** Free-standing

Specifically for machines without mounting holes in the machine bed

Colour: RAL 7037, dusty grey



Note

- The specified maximum load is composed of static and dynamic loading of the machine. The best insulation effect is achieved at approximately 80-90 % of the specified maximum load.
- Details on the properties of the insulation pads used can be found on pages 14-17.
- Please contact us if the size or insulation pad mounting that you are looking for is not listed.
  In addition to our standard solutions and colours we also carry numerous special solutions. We are always happy to give advice.

A-MOUNTING

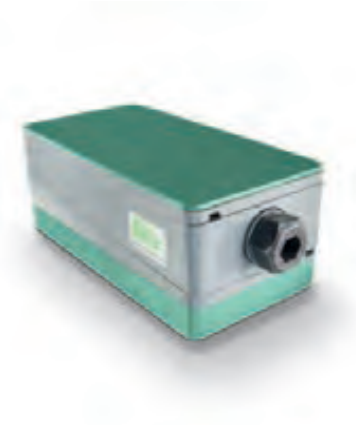
Universal application for machine tools and injection moulding machines. Very good insulation effect. Specifically for machines subject to high horizontal forces. Very high anti-slip effect!

TOP FACE:
Anti-slip plate BR7-1

BOTTOM FACE:
Insulation pad B4-1

Type	Item no. PK	max. load	L	B	H	Adjustment range Centre position
		N/pc.	mm	mm	mm	mm
PK 1-A	02-0004	5,400	105	55	59	+4/-5
PK 2-A	02-0011	10,000	150	75	63	+5/-6
PK 2.5-A	02-0104	12,000	115	115	67	+4/-5
PK 3-A	02-0025	18,000	200	95	67	+5/-5
PK 3/72-A	02-0019	18,000	200	95	94	+5/-4
PK 3.2-A	02-0110	20,000	150	150	68	+5/-6
PK 3.5-A	02-0116	26,000	115	250	92	+4/-8
PK 3.8-A	02-0122	26,000	170	170	76	+6/-8
PK 4-A	02-0042	38,000	200	200	70	+5/-7
PK 4/72-A	02-0033	38,000	200	200	94	+5/-7
PK 4.5-A	02-0128	39,000	180	230	84	+9/-9
PK 5-A	02-0050	48,000	200	250	94	+10/-7
PK 5.5-A	02-0134	73,000	300	250	106	+10/-8
PK 6-A	02-0057	80,000	250	330	94	+7/-10
PK 7-A	02-0064	117,500	300	400	95	+8/-12
PK 8-A	02-0071	195,500	400	500	95	+8/-14
PK 9-A	02-0078	294,500	500	600	137	+12/-15

B-MOUNTING



Special design for CNC lathes, grinding machines, drilling and cutting mills, cutting centres, transfer lines.

TOP FACE:
Anti-slip plate BS

BOTTOM FACE:
Insulation pad B0

Type	Item no. PK	max. load	L	B	H	Adjustment range Centre position
		N/pc.	mm	mm	mm	mm
PK 1-B	02-0005	10,000	105	55	54	+4/-5
PK 2-B	02-0012	21,000	150	75	58	+5/-6
PK 2.5-B	02-0105	25,000	115	115	62	+4/-5
PK 3-B	02-0026	36,000	200	95	62	+5/-5
PK 3/72-B	02-0020	36,000	200	95	89	+5/-4
PK 3.2-B	02-0111	43,000	150	150	63	+5/-6
PK 3.5-B	02-0117	55,000	115	250	87	+4/-8
PK 3.8-B	02-0123	55,000	170	170	71	+6/-8
PK 4-B	02-0043	77,000	200	200	65	+5/-7
PK 4/72-B	02-0034	77,000	200	200	89	+5/-7
PK4.5-B	02-0129	79,500	180	230	79	+9/-9
PK 5-B	02-0051	97,000	200	250	89	+10/-7
PK 5.5-B	02-0135	144,000	300	250	101	+10/-8
PK 6-B	02-0058	161,000	250	330	89	+7/-10
PK 7-B	02-0065	236,000	300	400	90	+8/-12
PK 8-B	02-0072	393,000	400	500	90	+8/-14
PK 9-B	02-0079	591,000	500	600	132	+12/-15

C-MOUNTING

Type	Item no. PK	max. load	L	B	H	Adjustment range
			Centre position			
		N/pc.	mm	mm	mm	mm
PK 1-C	02-0006	4,600	105	55	64	+4/-5
PK 2-C	02-0013	8,700	150	75	68	+5/-6
PK 2.5-C	02-0106	10,000	115	115	72	+4/-5
PK 3-C	02-0027	14,600	200	95	72	+5/-5
PK 3/72-C	02-0021	14,600	200	99	99	+5/-4
PK 3.2-C	02-0112	17,000	150	150	73	+5/-6
PK 3.5-C	02-0118	22,000	115	250	97	+4/-8
PK 3.8-C	02-0124	22,000	170	170	81	+6/-8
PK 4-C	02-0044	31,000	200	200	75	+5/-7
PK 4/72-C	02-0035	31,000	200	200	99	+5/-7
PK 4.5-C	02-0133	32,000	180	230	89	+9/-9
PK 5-C	02-0052	38,900	200	250	99	+10/-7
PK 5.5-C	02-0136	58,000	300	250	111	+10/-8
PK 6-C	02-0059	64,500	250	330	99	+7/-10
PK 7-C	02-0066	94,500	300	400	100	+8/-12
PK 8-C	02-0073	157,000	400	500	100	+8/-14
PK 9-C	02-0080	236,000	500	600	142	+12/-15

Highly effective vibration insulation. Especially for installation on upper floors.
Please contact us in cases of sensitive applications.

TOP FACE:
Anti-slip plate BS

BOTTOM FACE:
Insulation pad B32

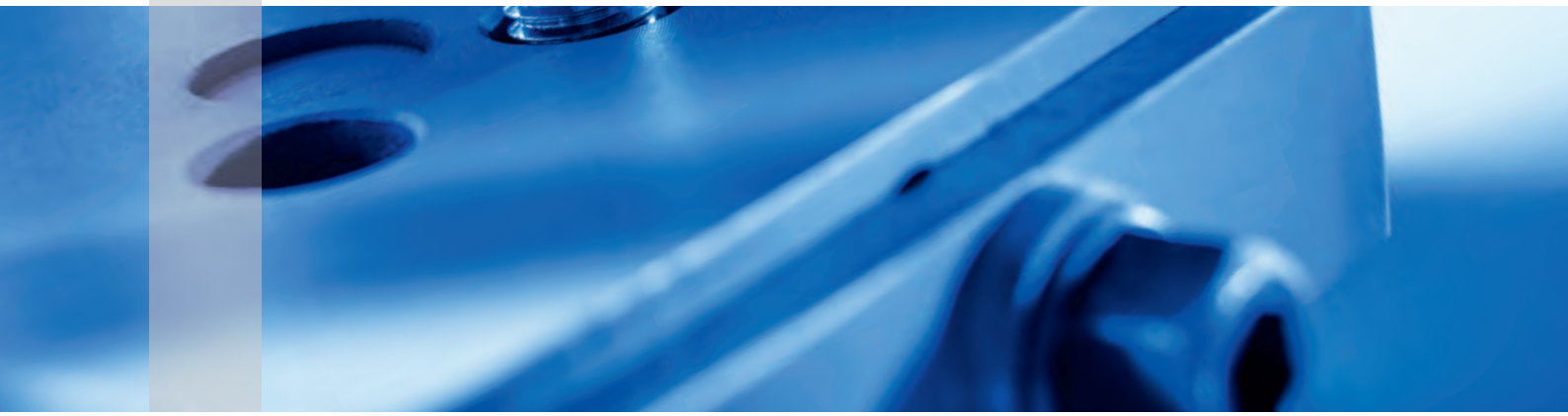
D-MOUNTING

Type	Item no. PK	max. load	L	B	H	Adjustment range
			Centre position			
		N/pc.	mm	mm	mm	mm
PK 1-D	02-0007	8,700	105	55	69	+4/-5
PK 2-D	02-0014	17,000	150	75	73	+5/-6
PK 2.5-D	02-0107	20,000	115	115	77	+4/-5
PK 3-D	02-0028	29,000	200	95	77	+5/-5
PK 3/72-D	02-0022	29,000	200	95	104	+5/-4
PK 3.2-D	02-0113	34,500	150	150	78	+5/-6
PK 3.5-D	02-0119	44,500	115	250	102	+4/-8
PK 3.8-D	02-0125	44,500	170	170	86	+6/-8
PK 4-D	02-0045	62,000	200	200	80	+5/-7
PK 4/72-D	02-0036	62,000	200	200	104	+5/-7
PK 4.5-D	02-0130	64,000	180	230	94	+9/-9
PK 5-D	02-0053	77,000	200	250	104	+10/-7
PK 5.5-D	02-0137	116,000	300	250	116	+10/-8
PK 6-D	02-0060	129,000	250	330	104	+7/-10
PK 7-D	02-0067	189,000	300	400	105	+8/-12
PK 8-D	02-0074	314,000	400	500	105	+8/-14
PK 9-D	02-0081	470,000	500	600	147	+12/-15

For machines with high dynamic forces such as presses, punches, shears.

TOP FACE:
Anti-slip plate BR7-1

BOTTOM FACE:
Insulation pad B5



E-MOUNTING

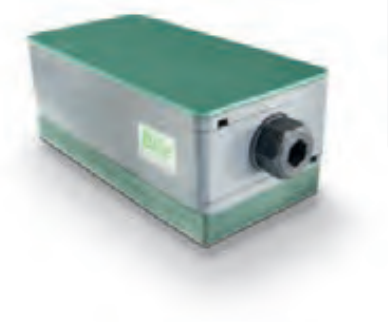
Machines and systems that require no vibration insulation. Good frictional engagement due to equipping with anti-slip plates. Very low overall height.

TOP FACE:
Anti-slip plate BS

BOTTOM FACE:
Anti-slip plate BS

Type	Item no. PK	max. load	L	B	H	Adjustment range
			Centre position			
		N/pc.	mm	mm	mm	mm
PK 1-E	02-0008	16,000	105	55	41	+4/-5
PK 2-E	02-0015	32,500	150	75	45	+5/-6
PK 2.5-E	02-0108	38,000	115	115	49	+4/-5
PK 3-E	02-0029	54,900	200	95	49	+5/-5
PK 3/72-E	02-0023	54,900	200	95	76	+5/-4
PK3.2-E	02-0114	65,000	150	150	50	+5/-6
PK3.5-E	02-0120	83,500	115	250	74	+4/-8
PK3.8-E	02-0126	83,500	170	170	58	+6/-8
PK 4-E	02-0046	116,400	200	200	52	+5/-7
PK 4/72-E	02-0037	116,400	200	200	76	+5/-7
PK 4.5-E	02-0131	120,000	180	230	66	+9/-9
PK 5-E	02-0054	145,500	200	250	76	+10/-7
PK5.5-E	02-0138	218,000	300	250	88	+10/-8
PK 6-E	02-0061	242,000	250	330	76	+7/-10
PK 7-E	02-0068	355,000	300	400	77	+8/-12
PK 8-E	02-0075	589,500	400	500	77	+8/-14
PK 9-E	02-0082	887,000	500	600	119	+12/-15

F-MOUNTING



For extremely high loads. Very good level consistency.

TOP FACE:
Anti-slip plate BS

BOTTOM FACE:
Insulation pad B6

Type	Item no. PK	max. load	L	B	H	Adjustment range
			Centre position			
		N/pc.	mm	mm	mm	mm
PK 1-F	02-0009	19,000	105	55	54	+4/-5
PK 2-F	02-0016	38,000	150	75	58	+5/-6
PK 2.5-F	02-0109	44,500	115	115	62	+4/-5
PK 3-F	02-0030	64,000	200	95	62	+5/-5
PK 3/72-F	02-0024	64,000	200	95	89	+5/-4
PK3.2-F	02-0115	75,800	150	150	63	+5/-6
PK3.5-F	02-0121	97,000	115	250	87	+4/-8
PK3.8-F	02-0127	97,000	170	170	71	+6/-8
PK 4-F	02-0047	135,000	200	200	65	+5/-7
PK 4.5-F	02-0132	139,500	180	230	79	+9/-9
PK 4/72-F	02-0039	135,000	200	200	89	+5/-7
PK 5-F	02-0055	170,000	200	250	89	+10/-7
PK5.5-F	02-0139	253,000	300	250	101	+10/-8
PK 6-F	02-0062	282,000	250	330	89	+7/-10
PK 7-F	02-0069	414,000	300	400	90	+8/-12
PK 8-F	02-0076	680,000	400	500	90	+8/-14
PK 9-F	02-0083	1,035,000	500	600	132	+12/-1

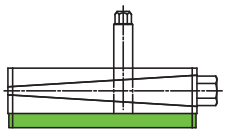
Precision levelling wedge series **PKA**

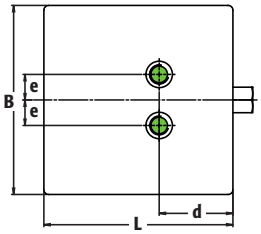
Bolt-on Bilz precision levelling wedges PKA are used on machines subject to high thrust that require a permanent connection to the machine bed, such as injection moulding machines, slotting machines, extrusion machines etc.

The bolt-on levelling wedges remain in position even when the machine is lifted, significantly easing the installation of the machine.

Bolts: Suitable bolts and nuts with standard thread can be supplied on request, see table 1, p. 37.

Colour: RAL 7037, dusty grey





Note

- The type of Insulation pads used can be found in the type designation, for example PKA 3-0 is equipped with pad B0, PKA 3-4 with B4.
- The specified maximum load is composed of static and dynamic loading of the machine. The best insulation effect is achieved at approximately 80-90 % of the specified maximum load.
- Details on the properties of the insulation pads used can be found on pages 14-17.
- Please contact us if the size, insulation pad mounting or bolt size that you are looking for is not listed. In addition to our standard solutions and colours we also carry numerous special solutions. We are always happy to give advice.

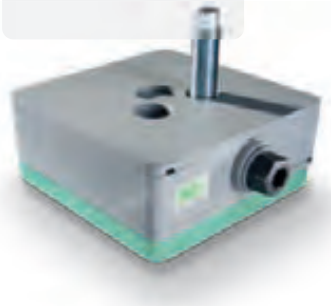
PKA 1-0 to PKA 8-0

Type	Item no. PKA	max. load	L	B	H Centre position	d	e	Internal thread	Adjustment range
		N/pc.	mm	mm	mm	mm	mm		mm
PKA 1-0	03-0007	25,000	115	115	60	50	24	M16	+3/-3
PKA 2-0	03-0010	43,000	150	150	61	58	23	M18	+4/-4
PKA 3-0	03-0024	77,000	200	200	63	76	27	M20	+4/-6
PKA 3/72-0	03-0020	77,000	200	200	87	76	27	M20	+4/-7
PKA 4-0	03-0028	97,000	200	250	87	95	27	M20	+10/-7
PKA 5-0	03-0033	161,000	250	330	87	125	105	M24	+6/-10
PKA 6-0	03-0037	236,000	300	400	88	150	95	M24	+8/-12
PKA 7-0	03-0040	393,000	400	500	88	200	130	M24	+8/-14
PKA 8-0	03-0043	591,000	500	600	130	255	150	M30x2	+12/-15

Lathes, boring mills, grinding machines and machining centres.

TOP FACE:
Plain surface

BOTTOM FACE:
Insulation pad BO



PKA 1-4 TO PKA 8-4

Type	Item no. PKA	max. load	L	B	H Centre position	d	e	Internal thread	Adjustment range
		N/pc.	mm	mm	mm	mm	mm		mm
PKA 1-4	03-0008	12,000	115	115	60	50	24	M16	+3/-3
PKA 2-4	03-0011	20,000	150	150	61	58	23	M18	+4/-4
PKA 3-4	03-0025	38,000	200	200	63	76	27	M20	+4/-6
PKA 3/72-4	03-0022	38,000	200	200	87	76	27	M20	+4/-7
PKA 4-4	03-0030	48,000	200	250	87	95	27	M20	+10/-7
PKA 5-4	03-0034	80,000	250	330	87	125	105	M24	+6/-10
PKA 6-4	03-0038	117,500	300	400	88	150	95	M24	+8/-12
PKA 7-4	03-0041	195,500	400	500	88	200	130	M24	+8/-14
PKA 8-4	03-0044	294,500	500	600	130	255	150	M30x2	+12/-15

Plastic injection moulding machines, die casting machines, plaining and slotting machines, cold extrusion machines, etc. Extreme slip resistance.

TOP FACE:
Plain surface

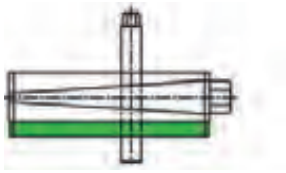
BOTTOM FACE:
Insulation pad B4

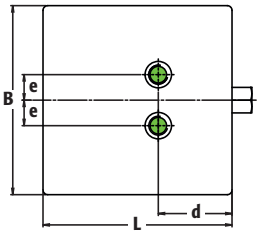
Precision levelling wedge series **PKD**

Bolt-through Bilz precision levelling wedge PKD are used on machines that necessarily need to be anchored due to unfavourable centre of gravity proportions. Also for machines that must be pushed or pulled when levelling – and for machines with low intrinsic rigidity.

Bolts: Suitable bolts and nuts with standard thread and anchor for floor anchoring can be supplied on request, see p. 37/38.

Colour: RAL 7037, dusty grey





Note

- The type of insulation pads used can be found in the type designation, for example PKD 3-0 is equipped with pad B0, PKD 3-4 with B4.
- The specified maximum load is composed of static and dynamic loading of the machine. The best insulation effect is achieved at approximately 80-90 % of the specified maximum load.
- Details on the properties of the insulation pads used can be found on pages 14-17.
- Please contact us if the size, insulation pad mounting or bolt size that you are looking for is not listed. In addition to our standard solutions and colours we also carry numerous special solutions. We are always happy to give advice.
- Supply is inclusive of an appropriate insulating washer to insulate the bolt head.

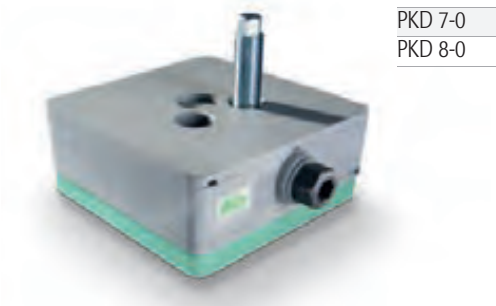
PKD 1-0 TO PKD 8-0

Boring and cutting mills, machining centres, special machines, long bed lathers, long bed plaining machines.

TOP FACE:
Plain surface

BOTTOM FACE:
Insulation pad B0

Type	Item no. PK	max. load	L	B	H	d	e	Drill hole	Adjustment range
					Centre position				
		N/pc.	mm	mm	mm	mm	mm		mm
PKD 1-0	04-0003	25,000	115	115	60	50	24	22	+4/-5
PKD 2-0	04-0005	43,000	150	150	61	58	23	23	+5/-6
PKD 3-0	04-0009	77,000	200	200	63	76	27	26	+3/-7
PKD 3/72-0	04-0007	77,000	200	200	87	76	27	26	+4/-7
PKD 4-0	04-0011	97,000	200	250	87	95	27	26	+10/-7
PKD 5-0	04-0013	161,000	250	330	87	125	105	30	+6/-10
PKD 6-0	04-0015	236,000	300	400	88	150	95	30	+8/-12
PKD 7-0	04-0017	393,000	400	500	88	200	130	35	+8/-14
PKD 8-0	04-0019	591,000	500	600	130	255	150	35	+12/-15

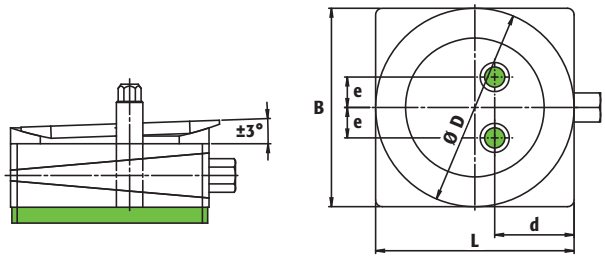


Precision levelling wedge with spherical seat
Series **PKAK / PKDK**

Bilz precision levelling wedge PKAK (**bolt-on**)/ PKDK **(bolt-through)** with spherical seat to compensate for angle differences between machines and foundations, e.g. non processed machine mounts or uneven floors. Specifically for machines with a long bed and higher demands on geometry.

Bolts: Suitable bolts and nuts with standard thread and anchor for floor anchoring (only PKDK) can be supplied on request, see p. 37/38.

Colour: RAL 7037, dusty grey



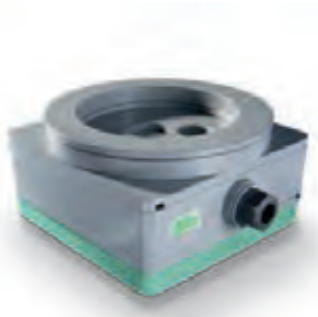
Note

- The type of insulation pads used can be found in the type designation, for example PKDK 3-0 is equipped with B0, PKDK 3-4 with B4.
- The specified maximum load is composed of static and dynamic loading of the machine. The best insulation effect is achieved at approximately 80-90 % of the specified maximum load.
- Details on the properties of the insulation pads used can be found on pages 14-17.
- Please contact us if the size, insulation pad mounting or bolt size that you are looking for is not listed. In addition to our standard solutions and colours we also carry numerous special solutions. We are always happy to give advice.
- For type PKDK supply is inclusive of an appropriate insulating washer to insulate the bolt head.

PKAK / PKDK 1-0 TO PKAK / PKDK 4-0 WITH SPHERICAL SEAT

Type	Item no. PK	max. load	L	B	H	Ø D	d	e	Internal thread	Adjustment range
					Centre position					
		N/pc.	mm	mm	mm	mm	mm	mm		mm
PKAK 1-0	05-0003	25,000	115	115	70	110	50	24	M16	+3/-3
PKAK 2-0	05-0008	43,000	150	150	77	150	58	23	M18	+4/-4
PKAK 3-0	05-0011	77,000	200	200	79	150	76	27	M20	+4/-6
PKAK 4-0	05-0015	97,000	200	250	103	150	95	27	M20	+10/-7
									Drill hole	
									mm	
PKDK 1-0	06-0003	25,000	115	115	70	110	50	24	22	+4/-5
PKDK 2-0	06-0006	43,000	150	150	77	150	58	23	23	+5/-6
PKDK 3-0	06-0008	77,000	200	200	79	150	76	26	26	+3/-7
PKDK 4-0	06-0010	97,000	200	250	103	150	95	27	26	+10/-7

TOP FACE SPHERICAL SEAT: Painted
BOTTOM FACE: Insulation pad B0



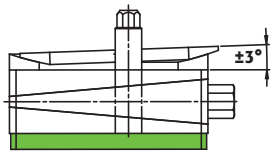
Precision levelling wedge **PKA(K)-AL / PKD(K)-AL**

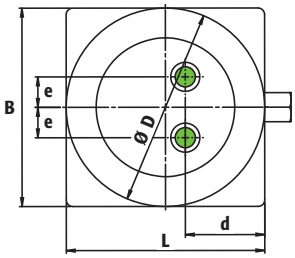
Aluminium designs of the series bolt-on and bolt-through

Bilz precision levelling wedges in aluminium design hard anodised (hard coating) are distinguished by their very high layer density, high degree of hardness – up to 600 HV and very good wear properties. The levelling wedge is easy to adjust and particularly suitable for EMV applications.

Bolts: Suitable bolts and nuts with standard thread and anchor for floor anchoring (only PKD-AL and PKDK-AL) can be supplied on request, see p. 37/38.

Colour: Natural colour dark grey



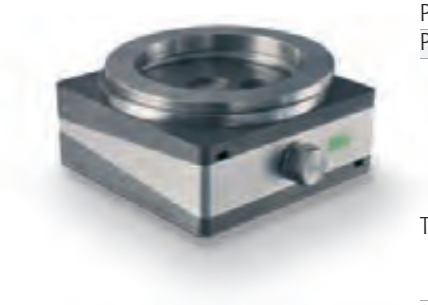


Note

- All sizes can be supplied with a stainless steel spherical seat.
- The specified maximum load is composed of static and dynamic loading of the machine.
- Mounting with Bilz insulation pads is also possible (also in EPDM or clean room applications).
- Please contact us if the size, insulation pad mounting or bolt size that you are looking for is not listed. In addition to our standard solutions and colours we also carry numerous special solutions. We are always happy to give advice.
- General tolerances in accordance with ISO 2768 mK.

PKA(K)-AL AND PKD(K)-AL

Machines for the food and luxury food industries, machines for the packaging, chemical and pharmaceutical industries. We also offer special solutions without lubricant and for higher loads for applications in clean rooms.



Type	Item no. PKA-AL	max. load	L	B	H Centre position	d	e	Internal thread	Adjustment range
		N/pc.	mm	mm	mm	mm	mm	mm	
PKA 1-AL	03-0060	19,000	115	115	44	50	24	M16	+3/-3
PKA 2-AL	03-0061	32,000	150	150	47	60	24	M18	+3/-5
PKA 3-AL	03-0062	57,000	200	200	53	80	27	M20	+4/-5
PKA 4-AL	03-0063	72,000	200	250	73	95	27	M20	+9/-5
	Item no. PKD-AL							Drill hole mm	
PKD 1-AL	04-0020	19,000	115	115	44	50	24	22	+3/-3
PKD 2-AL	04-0021	32,000	150	150	47	60	24	22	+3/-5
PKD 3-AL	04-0022	57,000	200	200	53	80	27	26	+4/-5
PKD 4-AL	04-0023	72,000	200	250	73	95	27	26	+9/-5

Type	Item no. PKAK-AL	max. load	L	B	H Centre position	Ø D	d	e	Internal thread	Adjustment range
		N/pc.	mm	mm	mm	mm	mm	mm		mm
PKAK 1-AL	05-0018	19,000	115	115	54	110	50	24	M16	+3/-3
PKAK 2-AL	05-0019	32,000	150	150	63	150	60	24	M18	+3/-5
PKAK 3-AL	05-0020	57,000	200	200	69	150	80	27	M20	+4/-5
PKAK 4-AL	05-0021	72,000	200	250	89	150	95	27	M20	+9/-5
	Item no. PKDK-AL								Drill hole mm	
PKDK 1-AL	06-0012	19,000	115	115	54	110	50	24	22	+3/-3
PKDK 2-AL	06-0013	32,000	150	150	63	150	60	24	22	+3/-5
PKDK 3-AL	06-0014	57,000	200	200	69	150	80	27	26	+4/-5
PKDK 4-AL	06-0015	72,000	200	250	89	150	95	27	26	+9/-5

Accessories

BOLTS FOR PRECISION LEVELLING WEDGE TYPE **PKA**

For PKA	Length in mm		
	100	125	150
M16	19-0085	19-0091	
M18	19-0130		
M20	19-0178		19-0185
M24			19-0214

Note

- **Galvanised** bolts; each supplied with 1x nut and 1x washer.
- Do you need a type of bolt that is not listed in the table? Please contact us.
  We are happy to offer a wide selection of special bolts in terms of size, thread, material, quality, etc.
- All bolts are delivered with standard thread.
- The selection of the type of bolt has to be made depending on the static and dynamic loading in the particular application.
  We would be happy to help you in the selection.

INSULATION WASHERS TO INSULATE THE BOLT HEAD

Our insulation washers for bolt heads offer adequate vibration and structure borne noise insulation in rigidly anchored machines and components.

They can be used at temperatures between -20 and +120 °C and are distinguished by their high resistance to oils, greases, acids and coolants used in industry.

Structure borne noise insulation in rigidly anchored machines and pipe suspensions.

for bolts Ø	Item no.	outer Ø mm	inner Ø mm	Installation height mm	max. preload force N	max. tightening torque Nm
to M12	20-0069	35	13	20	790	5
to M20	20-0071	50	21	22	1,500	16
to M30	20-0072	70	31	25	2,900	45

ANCHOR FOR FLOOR ANCHORING

Fischer heavy duty anchor SL

Fisher reaction anchor R and threaded rod RG

Fischer anchor bolt FAZ

Our supply range includes Fischer anchors.
Other types and manufacturers are available on request.

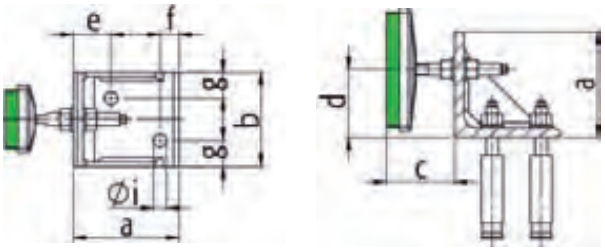
HORIZONTAL ELEMENTS

Size 1
Steel angle,
Levelling element
Type BNVS 115/5,
3 bolts
M16 x 150,
2 anchors M16

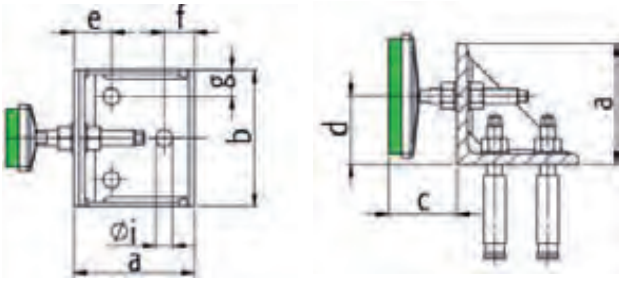
Size 2
Steel angle,
Levelling element
Type BNVS 115/5,
4 bolts
M20 x 150,
3 anchors M20

Type	Item no.	max. load N/pc.	a mm	b mm	c mm	d mm	e mm	f mm	g mm	i mm
Size 1	20-0066	16,500	140	125	45	60-115	50	25	35	17.5
Size 2	20-0067	16,500	160	180	55	60-140	48	43	37	22

Size 1



Size 2



EXTENSION FOR LEVELLING WEDGE BOLTS

Extension for levelling wedge bolts

We recommend the use of the levelling bolt extension for difficult to access levelling bolts This facilitates the quick and easy levelling of the machine even where space is limited.

These levelling aids are available if different lengths and width across flats depending on the levelling wedge being used. Please contact us for further details.

FAEBI®
Rubber air spring insulator

Highly effective insulation of vibrations, shocks and
structure borne noise for machines, apparatus and aggregates.

FAEBI® RUBBER AIR SPRING INSULATOR

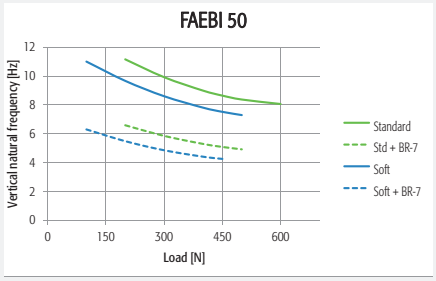
FAEBI® rubber air springs are used for the highly effective insulation of machines, apparatus and aggregates from shocks, vibrations and structure borne noise. The element comprises of a bell-shaped rubber form made from high-grade elastomer with a reinforced side wall. The constructive design does not only achieve excellent insulation properties, but also very high mechanical stability. Damage due to overload or a sudden pressure drop is virtually impossible. The air spring element has a very low degree of deflection in the horizontal direction. The inclusion of anti-slip pads on the spring element base plate means that additional floor anchoring is not usually required.

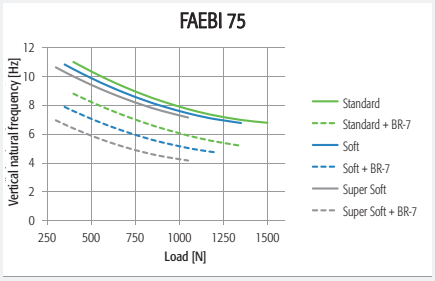
Note:

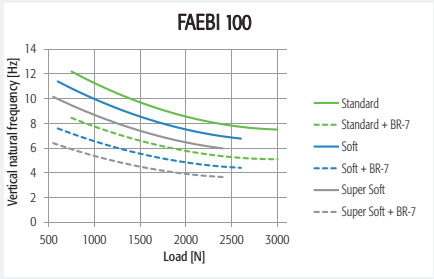
- FAEBI® elements can also be supplied in stainless steel designs and from EDPM elastomer for outdoor use (such as air conditioning).
- To reduce the movement amplitude in the vertical direction the FAEBI®-HD variant is supplied with additional damping.

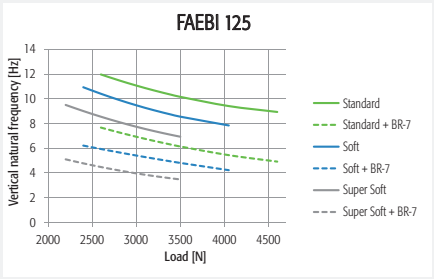
Applications

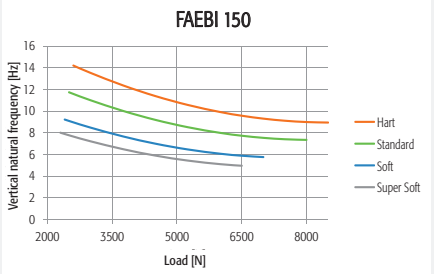
Perfectly suited for source insulation of fast running presses, forging hammers and other machines and aggregates with highly dynamic disturbance forces. Passive insulation of measuring and test equipment as well as highly accurate machine tools. Can also be combined with mechanical level control on request.

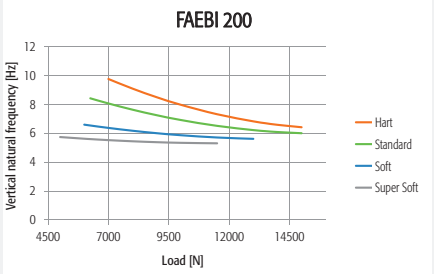


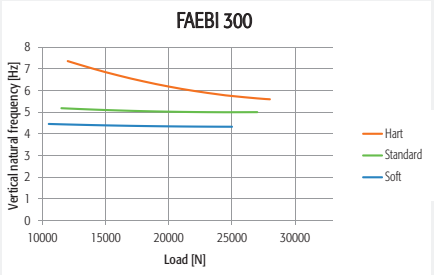


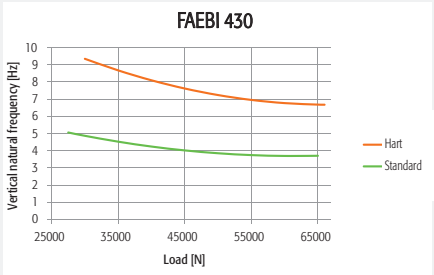


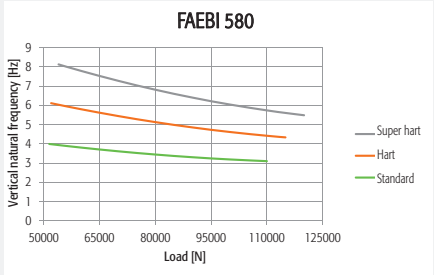












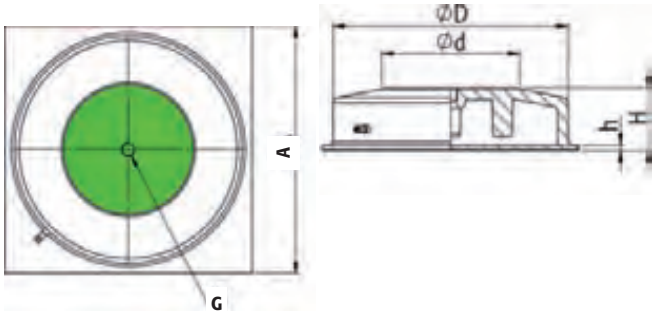
SHOCK AND VIBRATION INSULATION

The natural frequency of the rubber air spring in the vertical direction is between 3 and 14 Hz depending on the allowable static load and variant. The maximum spring deflection in response to a pulse load is up to 15 mm depending on the type and size of the air spring.

SERIES TYPE FAEBI®

Type	Variant	Item no. FAEBI®	Load N/pc.	max. Pressure bar	A mm	ØD mm	H approx. mm = Working height	H (deflated) mm	Ød mm	h mm	G mm
FAEBI® 50	Standard	40-0071	200–600	3	110	80	60	61	35	5	M10
	Standard + BR7-1	40-0134	200–500	2.5	110	80	62	68	35	5	M10
	Soft	40-0072	100–500	2.5	110	80	60	61	35	5	M10
	Soft + BR7-1	40-0135	100–450	2.3	110	80	62	68	35	5	M10
FAEBI® 75	Standard	40-0082	400–1,500	3	115	97	63	67	43	5	M12
	Standard + BR7-1	40-0136	400–1,350	2.7	115	97	65	74	43	5	M12
	Soft	40-0084	350–1,300	2.6	115	97	63	67	43	5	M12
	Soft + BR7-1	40-0137	350–1,.200	2.4	115	97	65	74	43	5	M12
	Super Soft	40-0083	300–1,050	2.1	115	97	63	67	43	5	M12
	Super Soft + BR7-1	40-0138	300–1,050	2.1	115	97	65	74	43	5	M12
FAEBI® 100	Standard	40-0024	750–3,000	5	135	118	62	65	60	5	M12
	Standard + BR7-1	40-0139	750–3,000	5	135	118	64	72	60	5	M12
	Soft	40-0026	600–2,600	4.4	135	118	62	65	60	5	M12
	Soft + BR7-1	40-0140	600–2,600	4.4	135	118	64	72	60	5	M12
	Super Soft	40-0025	550–2,400	4	135	118	62	65	60	5	M12
	Super Soft + BR7-1	40-0141	550–2,400	4	135	118	64	72	60	5	M12
FAEBI® 125	Standard	40-0033	2,600–4,600	5.5	165	140	93	98	66	5	M16
	Standard + BR7-1	40-0142	2,600–4,600	5.5	165	140	95	105	66	5	M16
	Soft	40-0035	2,400–4,050	4.9	165	140	93	98	66	5	M16
	Soft + BR7-1	40-0143	2,400–4,050	4.9	165	140	95	105	66	5	M16
	Super Soft	40-0034	2,200–3,500	4.2	165	140	93	98	66	5	M16
	Super Soft + BR7-1	40-0144	2,200–3,500	4.2	165	140	95	105	66	5	M16
FAEBI® 150	Hart	40-0043	2,600–8,500	6.4	200	170	91	96	80	8	M16
	Standard	40-0037	2,500–8,000	6	200	170	91	96	80	8	M16
	Soft	40-0040	2,400–7,000	5.3	200	170	91	96	80	8	M16
	Super Soft	40-0038	2,300–6,500	4.9	200	170	91	96	80	8	M16
FAEBI® 200	Hart	40-0051	7,000–15,000	6	260	236	91	95	130	8	M16
	Standard	40-0046	6,250–15,000	6	260	236	91	95	130	8	M16
	Soft	40-0048	6,000–13,000	5.2	260	236	91	95	130	8	M16
	Super Soft	40-0047	5,500–11,500	4.6	260	236	91	95	130	8	M16
FAEBI® 300	Hart	40-0058	12,000–28,000	6.5	370	340	89	93	200	8	M20
	Standard	40-0055	11,500–27,000	6	370	340	89	93	200	8	M20
	Soft	40-0056	10,500–25,000	5.6	370	340	89	93	200	8	M20
FAEBI® 430	Hart	40-0065	30,000–66,000	6.1	500	480	89	94	315	8	M20
	Standard	40-0064	27,500–65,000	6	500	480	89	94	315	8	M20
FAEBI® 580	Super Hart	40-0079	54,000–120,000	6.6	680	650	89	91	380	14	M24
	Hart	40-0078	52,000–115,000	6.3	680	650	89	91	380	14	M24
	Standard	40-0076	51,500–110,000	6	680	650	89	91	380	14	M24

Note

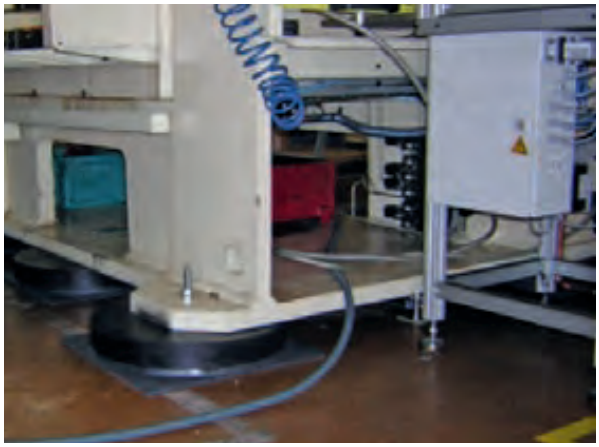


- Ensure that the element is selected so that the maximum load (static and dynamic load) is not exceeded!
  For applications with higher dynamics harder variants of the FAEBI® reduce the deflection of the element. However, the softer the element is, the better the achievable insulation effect is.
  Please contact us, we are happy to assist with selecting a suitable element.
- If the bottom edge of the machine does not completely cover Ø d, we recommend the use of our special **protective cover** (see Accessories p. 46).
- Permissible temperature range: -20 °C to +80 °C
- The elements are attached to the holes provided on the machine using the bolts supplied (see Accessories p. 46). Anchoring to the floor is usually not necessary.
- **Bolt in the bolt by hand only, do not use a wrench. Also only tighten the nut with low torque.**
- The machine is placed on the deflated element, which is then inflated in stages using the standard valve until dimension H (= working height) is reached. The maximum specified air pressure must also not be exceeded!
- **Inflation and deflation may only take place under load (observe the maximum permissible pressure).**
- Up to +/- 5 mm are available for levelling.

ADVANTAGES COMPARED TO STEEL SPRINGS

In comparison to steel springs the use of air spring offers many advantages when used for vibration insulation:

- Flexible insulation system design:
  Changes in the static or dynamic loads can be compensated for by adjusting the air pressure. This can be performed either manually or pneumatically (e.g. using Bilz level control)
- Integrated damping, therefore separate damping is not necessary.
- No transmission of structure borne noise



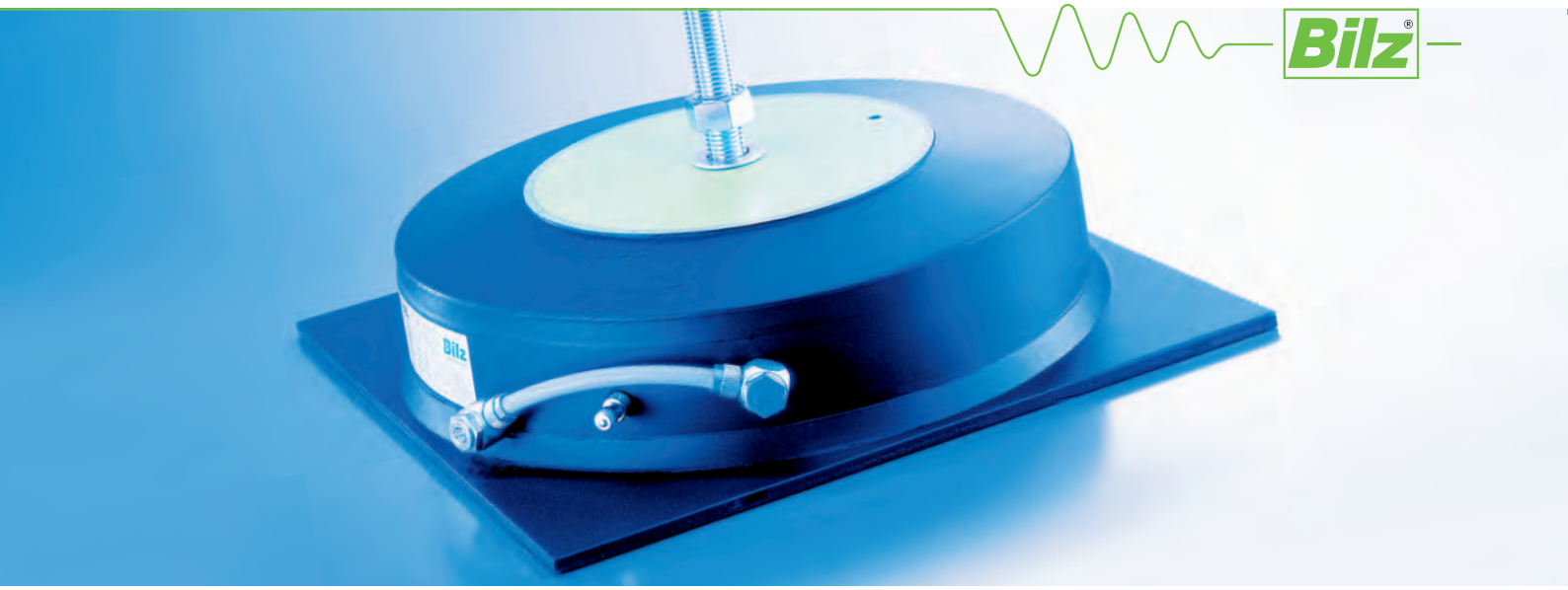
FAEBI® in stainless steel and **EPDM**-version

for outside applications

FAEBI® elements in VA and EPDM versions were specifically developed for outside applications.
Effortless vibration insulation of systems in the open air such as air conditioning units, compressors, heat exchangers, cold water chillers.

Note:

- Permissible temperature range: -25 °C to +125 °C
- Prices and delivery times on request.
- In addition to our standard solutions listed here we also carry numerous special solutions. Please contact us, we would be happy to advise you.
- The use of a stainless steel protective cover is recommended for outside applications.



Type series **FAEBI®-HD** with adjustable damping

The combined rubber-air spring insulator FAEBI®-HD with adjustable damping comprises of an elastomer metal bonding with reinforced side wall and a two-chamber system.
To achieve the greatest possible damping effect the interior of the air spring is divided into two air chambers connected by an air hose (load and damping volume). An adjustable throttle valve is used to set the flow cross section to the desired damping effect from the outside. The significantly higher damping effect compared to a single chamber system (FAEBI®) reduces the resonance amplification substantially and the machine movements fade noticeably faster. The increased energy substancially absorption also has a positive effect on the manufactured goods and on machine and tool wear.

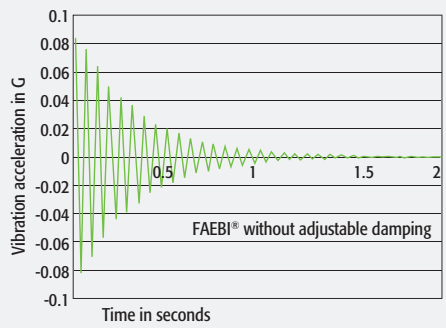
Benefits: In comparison to viscous damping air damping is absolutely free of wear and maintenance-free and the damping factor can be easily adjusted from outside.

Note

- Ensure that the element is selected so that the maximum load (static and dynamic load) is not exceeded! For applications with higher dynamics harder variants of the FAEBI® reduce the deflection of the element. However, the softer the element is, the better the achievable insulation effect is. Please contact us, we are happy to assist with selecting a suitable element.
- If the bottom edge of the machine does not completely cover Ø d, we recommend the use of our special **protective cover** (see Accessories p. 46).
- Permissible temperature range: -20 °C to +80 °C
- The elements are attached to the holes provided on the machine using the bolts supplied (see p. 46). Anchoring to the floor is usually not necessary.
- **Bolt in the bolt by hand only, do not use an open-end wrench. Also only tighten the nut with low torque.**
- The machine is placed on the deflated element, which is then inflated in stages using the standard valve until dimension H (= working height) is reached. The maximum specified air pressure must also not be exceeded!
- **Inflation and deflation may only take place under load, observe the maximum permissible pressure.**
- Up to +/- 5 mm are available for levelling.

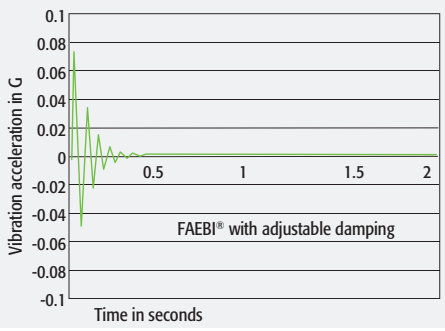
SETTLING BEHAVIOUR FAEBI®

Without adjustable damping (single chamber system)

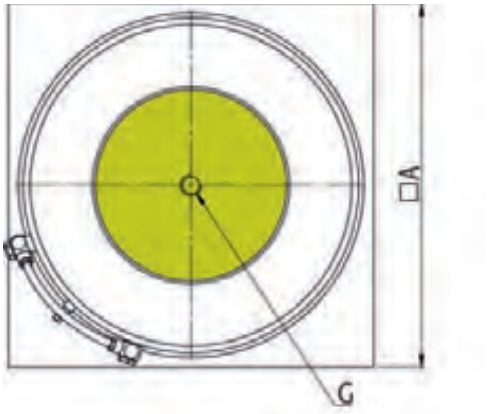


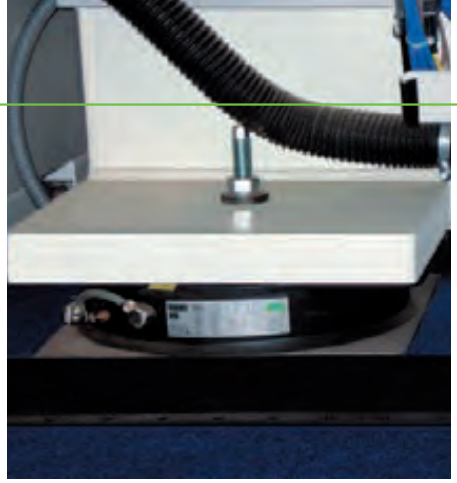
SETTLING BEHAVIOUR FAEBI®-HD

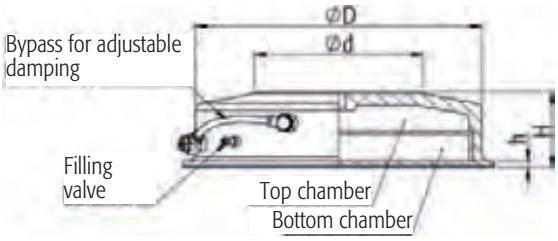
With adjustable damping (twin chamber system)



FAEBI®-HD



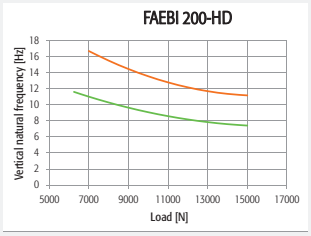




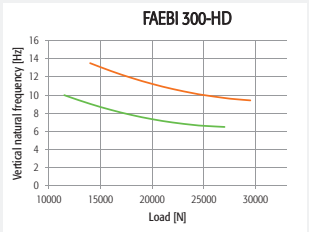
Type	Variant	Item no.	Load N/pc.	max.Pressure bar	A mm	Ø D mm	H approx. mm = Working height	H (deflated) mm	Ø d mm	h mm	G mm
FAEBI® 200-HD	Hart	40-0054	7,000 –15,000	6	260	236	89	90	130	8	M16
	Standard	40-0053	6,250 –15,000	6	260	236	89	90	130	8	M16
FAEBI® 300-HD	Hart	40-0063	14,000 – 29,500	6.5	370	340	89	94	200	8	M20
	Standard	40-0061	11,500 – 27,000	6	370	340	89	93	200	8	M20
FAEBI® 430-HD	Hart	40-0070	30,000 – 66,000	6.1	500	480	91	97	315	8	M20
	Standard	40-0067	27,500 – 65,000	6	500	480	91	96	315	8	M20
FAEBI® 580-HD	Super Hart	40-0081	60,000 – 115,000	6.9	680	650	126	135	380	14	M24
	Hart	40-0145	56,000 – 108,000	6.5	680	650	126	133	380	14	M24
	Standard	40-0080	47,000 – 100,000	6	680	650	126	130	380	14	M24

NATURAL FREQUENCIES FAEBI® 200-HD TO 580-HD

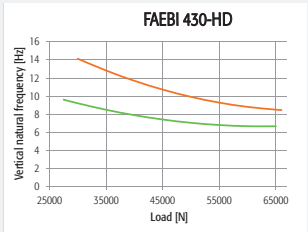
FAEBI® 200-HD



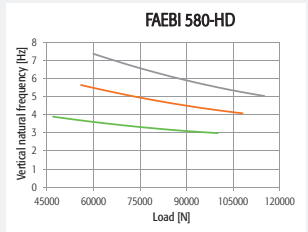
FAEBI® 300-HD



FAEBI® 430-HD



FAEBI® 580-HD



Super Hart Hart Standard

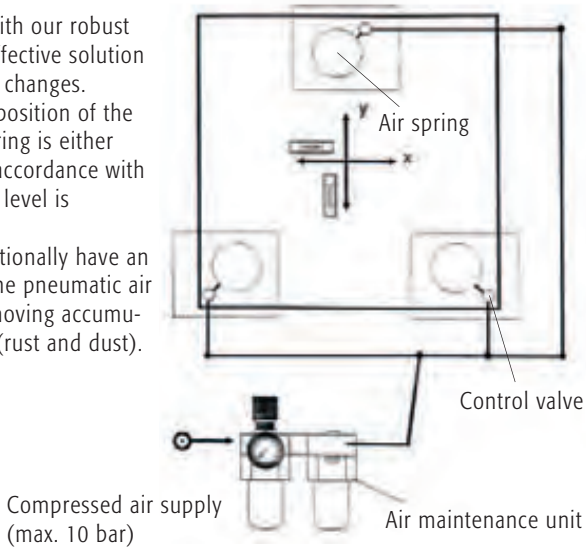
Right to make technical changes is reserved.

FAEBI® MPN-LCV

FAEBI® AND FAEBI®-HD with mechanical-pneumatic level control (MPN-LCV)

The mechanical-pneumatic level control (MPN) with our robust proportional valve LVC represents a simple but effective solution for preventing skew positions resulting from load changes.
A plunger continuously probes the level and the position of the plunger is transmitted to a slide valve. The air spring is either pressurized or the internal pressure is vented in accordance with the position of the plunger. The adjustable target level is maintained within an accuracy of ± 1/10 mm.
In principle three control valves are used, that optionally have an upstream air maintenance unit for conditioning the pneumatic air supply, limiting the system pressure to 6 bar, removing accumulated condensate and filtering out solid particles (rust and dust).

For further details see the catalogue page 51f.



PRESSURE CONTROL FOR FAEBI® AND FAEBI®-HD

The Bilz pressure control is the ideal addition to applications that do not need automatic level control.

Instead of filling the air springs manually, they are connected to a constant compressed air supply. The working height of the individual insulators can each be individually set with one pressure regulator.

Applications

- Applications with a constant centre of gravity during the production/testing process (no moving machine components, workpieces, etc., steady masses).
- Difficult to access systems, where the manual checking of air pressure in the air springs is impeded.

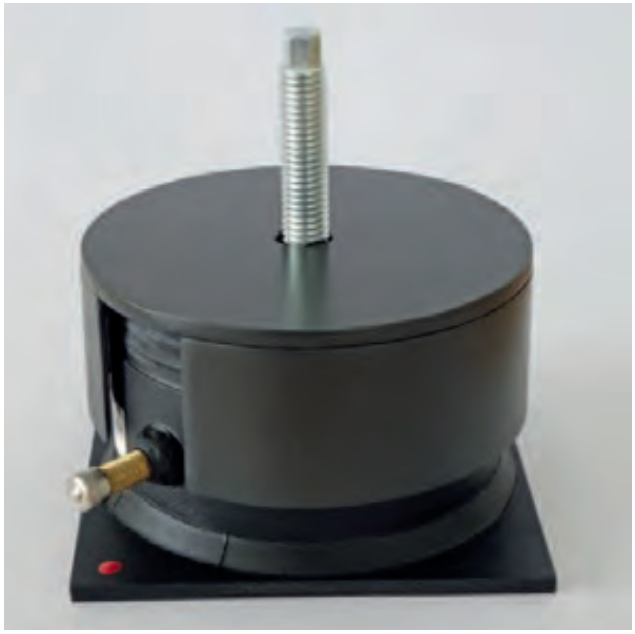
Advantages of FAEBI® pressure control

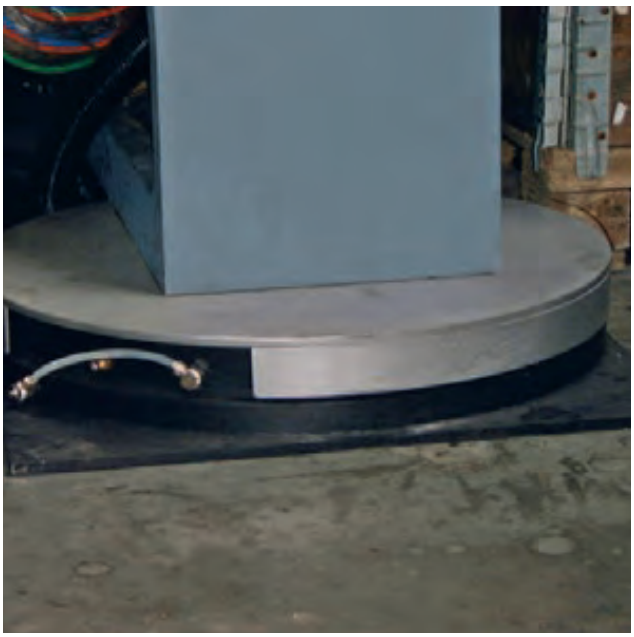
- Simple and precise setting of the required pressure for each air spring or control group.
- Maintenance free
- Manometer for continuous pressure indication
- Upstream particle filter and water trap
- Can be configured for any number of air springs or control groups

PROTECTIVE COVER FOR FAEBI® AND FAEBI®-HD ELEMENTS

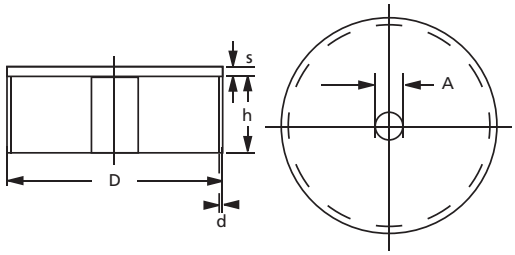
If the contact surface of the FAEBI® element (see Type series FAEBI® or FAEBI®-HD) is not completely covered by the bottom edge of the machine, then an appropriate hood is required to ensure the sufficient load distribution across the air spring.
A hood will also provide protection from external damage.

Material: Steel sheet (primed black)
The protective cover is also available in stainless steel on request.





Type	Item no.	A (mm)	D (mm)	s (mm)	h (mm)	d (mm)
AH- FAEBI® 50/75	40-0013	13	115	5	40	2
AH- FAEBI® 100	40-0001	14	140	5	45	2
AH- FAEBI® 125	40-0003	18	160	5	60	2
AH- FAEBI® 150	40-0006	18	190	5	60	2
AH- FAEBI® 200/-HD	40-0007	18	255	5	60	3
AH- FAEBI® 300/-HD	40-0009	22	360	5	60	3
AH- FAEBI® 430/-HD	40-0011	22	500	10	60	4
AH- FAEBI® 580/-HD	40-0014	27	680	10	60	4



FIXING BOLTS FOR FAEBI® AND FAEBI®-HD

A large range of different bolts are available for each type of FAEBI® element. The suitable bolt in each case can be found in the adjacent table.

All bolts are delivered with standard thread.
1 bolt, 1 nut and 1 washer are supplied with the FAEBI® elements.

Note

Do you need a type of bolt that is not listed in the table? Please contact us. We are happy to offer a wide selection of low-cost special bolts in terms of size, thread, material, quality, etc.

FAEBI®(-HD) TYPE	Thread	Material	Item No.	Length mm
FAEBI®50	M10	galvanised	19-0019	100
	M10	stainless steel	18-0005	100
FAEBI®75/100	M12	galvanised	19-0041	100
	M12	stainless steel	18-0016	100
FAEBI®125/150/	M16	galvanised	19-0091	125
200(-HD)	M16	stainless steel	18-0066	125
FAEBI®300(-HD)/	M20	galvanised	19-0185	150
430(-HD)	M20	stainless steel	18-0044	150
FAEBI®580(-HD)	M24	galvanised	19-0214	150
	M24	stainless steel	18-0052	150

BiAir®
Membrane air spring insulator

Low-frequency Bilz BiAir® membrane air spring with precisely adjustable damping for effective vibration insulation of sensitive measurement and testing equipment, precise finishing machines, laser equipment and optical and electronic instruments as well as vehicle, engine and gearbox test beds, etc.

BiAir® MEMBRANE AIR SPRING INSULATOR WITH ADJUSTABLE DAMPING

The BiAir® membrane air spring insulator is made of turned or cast aluminium. The air space is enclosed by thin-walled flexible and pressure-resistant rolling membrane. A piston sits on top of the membrane and is pressed into the air space.

This design allows a highly-effective insulation against vibration. In order to simultaneously achieve a high degree of damping, the air space within the insulator is divided into two chambers connected with an air tube (load/damping volume). An adjustable throttle valve is used to set the flow cross section to the desired damping effect from the outside. The friction in the air flow generated by the throttle valve can create a damping effect of up to 15 %.

Damage to the rolling membrane due to overpressure is virtually excluded through the use of additional safety valves or a mechanical piston stroke limit.

- Highly effective vibration insulation of
  - sensitive measurement and testing equipment,
  - precise finishing machines,
  - laser equipment as well as optical and electronic instruments.
- Vibration insulated bearings for vehicle, engine and gearbox test beds
- Foundation insulation

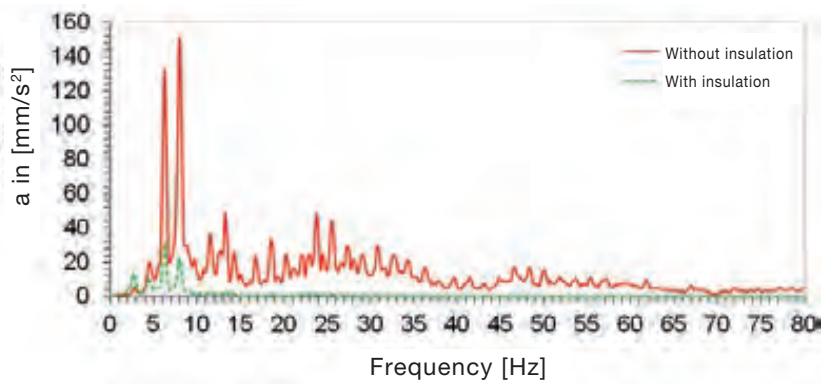
Advantages compared to conventional steel springs

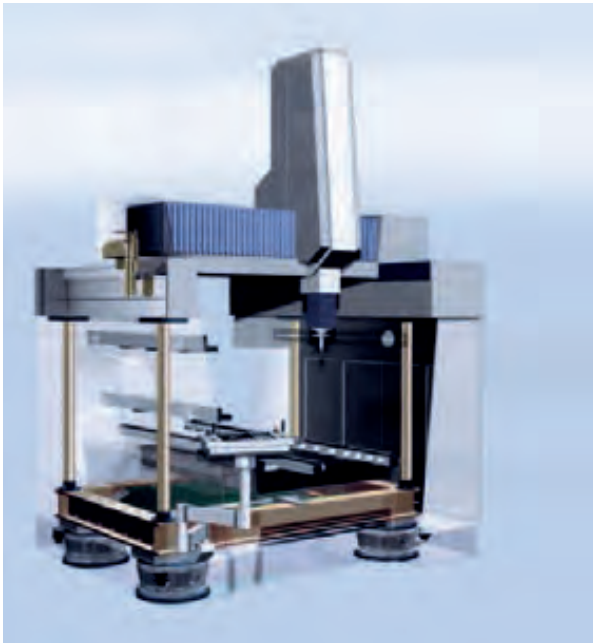
The use of Bilz BiAir® air spring insulators with active level control constantly maintains the correct level of machines or foundations. The level control and adjustment is completely automatic!

The pressure in the air springs is appropriately adjusted by in- or deflating in response to load changes. This keeps the insulating effect constant in every case.

Unlike steel springs air springs do not transmit structure-borne sound.

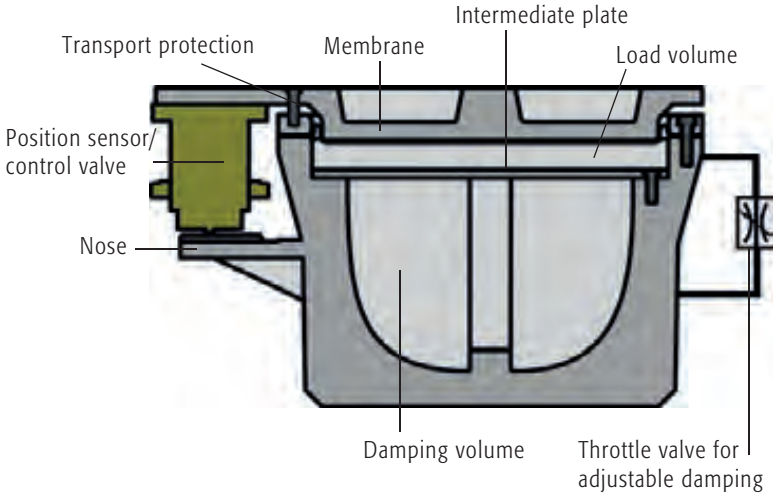
With/without insulation





Note:

- BiAir® membrane air springs are available in the following materials depending on size
  - BiAir®-ED: Cast aluminium, powder coated RAL similar to 7037 dusty grey
  - BiAir®-ED-AL: Aluminium (naturally anodized)
- with a nose for mounting valves (MPN) or displacement sensors are available with the hose connection on the left (NL) or on the right (NR).

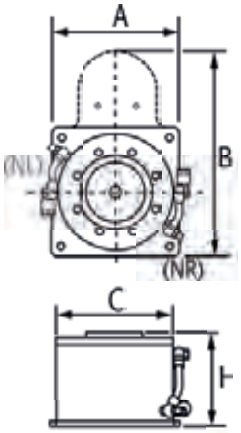


TYPE SERIES BiAir®-ED-AL IN ANODISED ALUMINIUM

Natural frequency vertical approximately 2.5 Hz, horizontal approximately 2.8 Hz.

	Aluminium BiAir®-ED-AL			A	B	C	Working height H	+/- travel	max. load N** at an air pressure of	
Type	without lug	NR	NL	mm	mm	mm	mm		4 bar	6 bar
0.125*	50-0002	-	-	75	-	74	77	+/-2.0	390	580
0.15*	50-0005	-	-	75	-	74	77	+/-2.0	670	1,000
0.25*	50-0129	50-0135	50-0136	120	182	110	87	+/-2.5	1,130	1,700
0.5	50-0130	50-0137	50-0138	130	198	129	100	+/-2.5	2,670	4,000
1	50-0131	50-0139	50-0140	200	275	200	100	+/-2.5	6,330	9,500
1.5	50-0146	50-0147	50-0148	230	305	230	100	+/-3.5	10,170	15,260
2	50-0133	50-0141	50-0144	260	350	260	100	+/-2.5	14,200	21,300
2.5	50-0134	50-0142	50-0143	300	390	300	100	+/-3.0	19,670	29,500

* Natural frequency vertical approximately 3.0 Hz, horizontal approximately 3.5 Hz
** When selecting the size of air spring please select an air pressure of 4 bar.



TYPE SERIES BiAir®-ED/-HE/-HE-MAX IN CAST ALUMINIUM

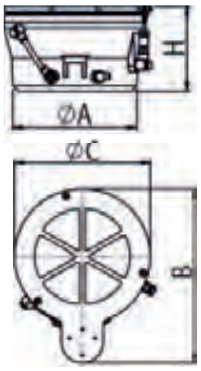
Natural frequencies vertical

BiAir®-ED	approx. 2.5 Hz
BiAir®-ED-HE	approx. 1.7 Hz
BiAir®-ED-HE-MAX	approx. 1.2 Hz

Natural frequencies horizontal

BiAir®-ED	approx. 2.8 Hz
BiAir®-ED-HE	approx. 2.8 Hz
BiAir®-ED-HE-MAX	approx. 2.8 Hz

	Item no.			ØA	B	ØC	Working height H in mm			+/- travel	max. load N** at an air pressure of	
Type	BiAir®-ED	BiAir®-ED/HE	BiAir®-ED/ HE-MAX	mm	mm	mm	BiAir®-ED	ED/HE	ED/ HE-MAX	mm	4 bar	6 bar
0.5	50-0012	50-0145	-	120	216	129	157	307	-	+/- 2.5	2,670	4,000
1	50-0026	50-0027	50-0035	172*	288	200	157	307	509	+/- 2.5	6,330	9,500
1.5	50-0020	50-0021	50-0025	212*	305	230	157	307	509	+/- 3.5	10,170	15,260
2	50-0045	50-0046	50-0054	226*	335	260	157	307	509	+/- 2.5	14,200	21,300
2.5	50-0036	50-0037	50-0044	271*	378	300	157	307	509	+/- 3.0	19,670	29,500
3	50-0055	50-0056	50-0062	348*	467	382	157	307	509	+/- 2.5	34,130	51,200
4	50-0064	50-0065	50-0066	490	605	530	157	307	509	+/- 2.75	65,730	98,600
5	50-0072	-	50-0073	747	875	798	157	-	509	+/- 3.5	155,730	233,600



* For the sizes 1 to 3 of series ED/HE-MAX the ØA is the same as ØC (piston diameter)
** When selecting the size of air spring please select an air pressure of 4 bar.

Note

- The maximum permissible movement amplitude in the horizontal plane is between approximately 1 to 2 mm depending on the size of the air spring.
- In addition to the standard solutions listed here we also offer numerous air springs with a larger stroke and lower natural frequency.
- Powder coated air springs are also available in other RAL colours on request.
- Permissible temperature range: -20 °C to +80 °C
- If you have any questions please contact us, we would be happy to advise you.

Right to make technical changes is reserved.

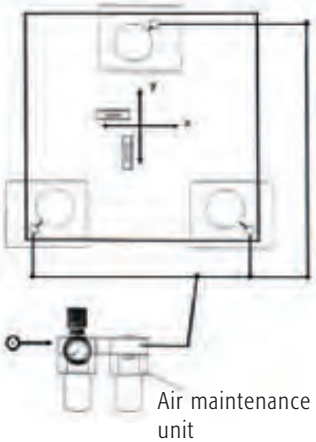
MPN
Mechanical pneumatic level control for Bilz air springs

Bilz mechanical pneumatic level control for air spring systems
with FAEBI® and FAEBI®-HD rubber or BiAir® membrane air springs.
Powerful vibration insulation at very high level consistency.

Mechanical pneumatic level control **MPN**

Bilz level control systems are significant components in the optimum function of vibration insulation using FAEBI® and FAEBI®-HD rubber or BiAir® membrane air springs. They prevent impermissible and undesired deflection of the insulators or an out-of-level condition of the machine that can be caused by load changes on an air spring mounted machine or system. Rapidly adding or venting air enables the air pressure within the air spring to be matched to the respective load, automatically controlling the height of the individual air springs. This enables the highest degree of stability and effective insulation even with changes in the centre of gravity.

Fig. 1



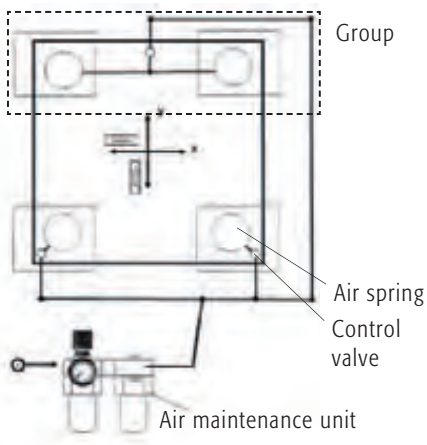
Valve functions

The level is continuously sensed using the plunger.
The position of the plunger is directly applied to the slide valve and the air spring is either pressurized or vented. The target level is adjusted by turning the knurled adjustment ring. The height and level of the machine is adjusted using three valves.

Design

At least three air springs are controlled (Fig. 1). If more insulators are required due to reasons of design or load, the system must still be worked in three controlled groups, as otherwise the system is statically overdetermined. This is achieved by using multiple insulators in parallel as a group (Fig.2).
An additional air maintenance unit is installed upstream of the control valves to prepare the compressed air.
See also Page 52.

Fig. 2



MPN-LCV

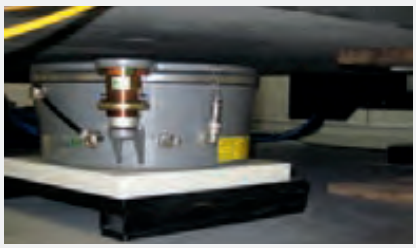
Item no. 61-0012

Very robust galvanised proportional valve. Level accuracy is approximately ± 1/10 mm. **Suitable for Bilz FAEBI®, FAEBI®-HD and BiAir® air spring insulators.**

Available in the following versions:
- MPN-LCV: Item no. 61-0012
  Standard version of the LCV with hard metal discs
- MPN-LCV-KURZ-Pad-A: Item no. 61-0054
  Shortened version of the LCV with plunger insulation pad

MPN-PVM

Item no. 61-0010



High-precision yellow chromed proportional valve.
Level accuracy is ± 1/100 mm. **Suitable for Bilz BiAir® air spring insulators.**

Available in the following versions:
- MPN-PVM: Item no. 61-0010
  Standard version of the PVM with carbide washers
- MPN-PVM-KURZ-Pad-A: Item no. 61-0058
  Shortened version of the PVM with stem insulation pad

Note

- Supplied as a complete set which includes the 3 control valves and all necessary hose lines and connectors. All components are also individually available as spare parts.
- In addition to the standard solutions listed here we also hold special versions with regard to material, flow, accuracy and restoring force.
- On the LCV variant the air flow can be reduced using the throttle valve should the control system tend to overshoot. The PVM variant can also be fitted with a throttle valve as an option.
- If you have any questions please contact us, we would be happy to advise you.

PLUNGER INSULATION PAD

To reduce the vibrations and disturbances transmitted through the valve plunger we offer a specially matched stem insulation pad.

The plunger insulation pad is an additional insulation disc that is inserted between the valve plunger and the machine that reduces disturbances that would otherwise be transmitted through the valve plunger. This facilitates improved insulation of sensitive machinery, particularly where the load is low.

The plunger insulation is normally ordered with the appropriate level control, see p. 51. The additional installation height must be taken into account. Shortened valves must be used when using with the BiAir® membrane air spring.

Item no. for individual ordering: 61-0026

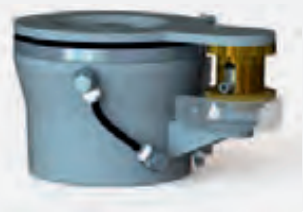
ANTI-TRAPPING PROTECTION

Anti-trapping protection reduces the risk of trapping in the vicinity of the valve or sensor plunger.

The anti-trapping protection can be plugged onto the hard metal disc and can therefore be retrofitted to existing systems. The anti-trapping protection can be removed without damage for maintenance work.

The anti-trapping protection is compatible with PVM and LCV valves, and also with the AIS™ and EPPC™ electronic systems.

Item no. for individual ordering: 50-0092



Air maintenance units with pressure regulators

The air maintenance units are used to set the optimum system pressure and prepare the compressed air for the air spring system. The integrated compressed air preparation system traps incidental condensate and cleans the compressed air of particles such as rust and dust.

WFD-M: Item no. 61-0045
Version with filter, matched for use with MPN-LCV

WFD-M-PVM: Item no. 61-0048
Version with fine filter, matched for use with MPN-PVM

WFD-M-PVM-ÖL-FILTER: Item no. 61-0049
Version with ultra fine filter, matched for use with MPN-PVM with contaminated/oily air*

WFD-M

WFD-M-PVM

WFD-M-PVM-ÖL-FILTER

* Must be checked against the air class.

Note

- For the operation of the pneumatic elements a compressed air quality in accordance with ISO 8573-1:2010 must be given:
  In combination with MPN-PVM: Air class 2.4.2;
  below 15 °C: Air class 2.3.3
  In combination with MPN-LCV: Air class 3.4.3
- If you have any questions please contact us, we would be happy to advise you.

EPPC™

Electronic Pneumatic Position Control

Real-time level control for efficient vibration insulation of vibration sensitive, highly dynamic machines and strict requirements on positional accuracy and setting time.

Please watch our EPPC™ video!

ELECTRONIC PNEUMATIC POSITION CONTROL EPPC™

EPPC™ System properties

- Real-time control of up to six degrees of freedom
- Optimum positional accuracy (+/-8 µm)
- Individually adjustable system parameters (such as damping)
- Short deflection and settling times in response to load changes
- One high-performance servo valve and one displacement sensor per degree of freedom
- Optimized connecting system using CAN bus technology
- Intelligent browser-based user interface for setting, diagnostics and monitoring, connection via Ethernet, remote maintenance possible
- Operator state display, (for example, ready, working position, motion complete, error)
- Digital I/O interface for external control and monitoring
- Optimized pneumatic design
- Noiseless control using high-resolution signal processing and servo valve technology
- Robust and proven air spring technology, can be combined with Bilz standard air springs
- No disturbing heat generation, magnetic field fluctuations or high power consumption as is the case with electro-magnetic actuators

Applications:

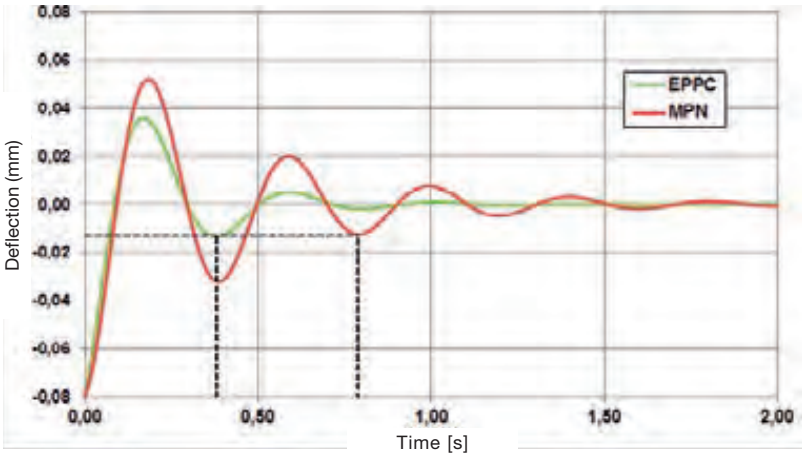
- High-precision machines
- Vibration-sensitive and highly dynamic measuring machines
- Microscopes
- Test and production machines in the semiconductor industry

EPPC™ real-time level control achieves an optimum production accuracy of +/- 8 µm and a significant reduction of the deflection and settling times in response to dynamic load changes

EPPC™ can be combined with three to six air spring control groups and control up to six degrees of freedom. Bilz offer a wide range of different size air springs for system design.

The high-performance electronics (14 bit AD converter, 16-bit signal processor) and compressed air valves are mounted directly to the respective air springs, enabling virtually noise-free control without losses due to a pressure drop in the hose connections. The use of CAN Bus technology ensures the simplest electrical cabling and makes it possible to install the control unit up to 20 m away.

In comparison to conventional mechanical-pneumatic level control systems (for example Bilz MPN) the settling time can be significantly reduced using EPPC™.



Theoretical MPN vibration curve compared with EPPC™. At a deflection of -80 µm the MPN reaches a stable position within a tolerance of +/-15 µm after 0.75 seconds. With EPPC™ the deflection time is reduced by 45 % to 0.4 seconds.

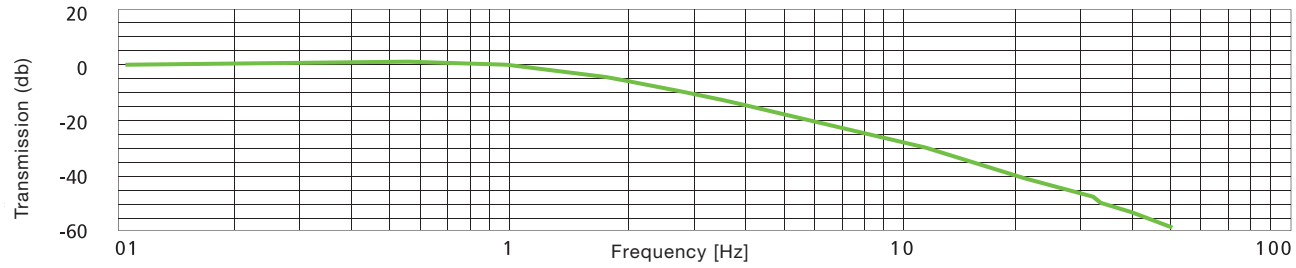
Active Isolation System AIS™

AIS™
Active Isolation System

Active electronic-pneumatic vibration insulation system with powerful real-time control for the highest demands on effective insulation, deflection and constant level.

- Active electronic-pneumatic vibration insulation with up to 6 controlled degrees of freedom.
- Air springs work as passive air springs and as actuators
- Highly efficient vibration insulation without resonance peaks
- Optimum positional accuracy in the vertical direction and horizontal plane
- Minimum deflection and settling time in response to machine load changes
- Very powerful real-time control
- PLC, CAN bus and one controller and one highly dynamic proportional valve per degree of freedom
- Each controller has a microprocessor and integrated high resolution sensors for position, pressure, and acceleration
- User-friendly, intelligent WinSNI/Web-Visu-Software for commissioning and diagnostics
- Simple digital switching capability between scanning mode (during sensitive machine operations) and loading mode (in response to machine load changes)
- No feed forward signal required
- No disturbing heat generation, magnetic field fluctuations or high power consumption as is the case with electromagnetic actuators

TRANSMISSION FUNCTION AIS™



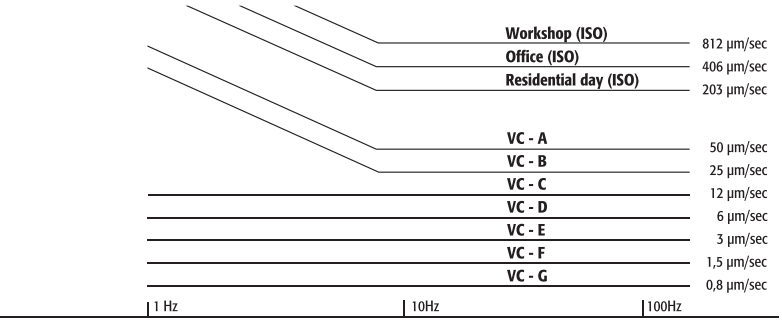
Membrane air spring BiAir®/-ED/HE-MAX

COMPASS PRO Wafer Inspection Machine

Electron microscope on a vibration insulating platform

AIS™ on Bilz measuring and test bed

VIBRATION CRITERIA VC



APPLICATION AREA

Optimum vibration insulation system for highly dynamic measuring and testing machines, laser high-resolution microscopes as well as inspection and production machines in the semiconductor industry.

AIS™ is used when the insulation effect and reaction times of conventional passive air spring insulators and a customary level control system are not sufficient.

TASKS

- Protection of vibration-sensitive machinery from floor vibrations.
- Minimization of structure borne vibration within a system. These are caused by load changes or movements of the machine.
- Settling time reduction.

AIS™ enables the highly efficient, vibration insulated installation of highly dynamic machines without loss of performance or cycle time.

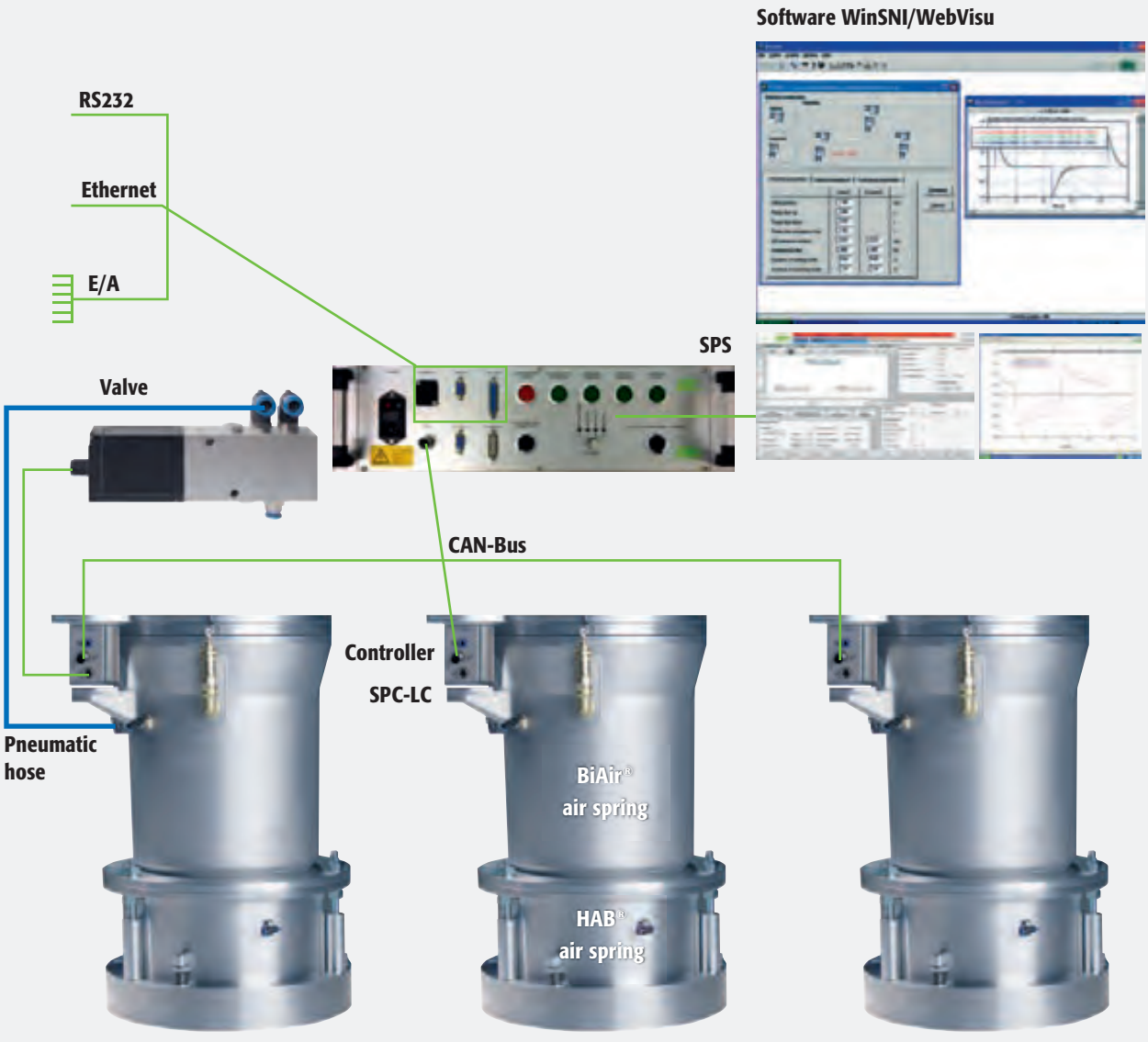
Active Isolation System AIS™

The Bilz AIS™ system is comprised of a PLC, CAN bus, 16-bit state controller, highly dynamic proportional valves, the BiAir® membrane air spring and the HAB™ horizontal air spring. A wide range of different sizes of valves and air springs for system design are available.

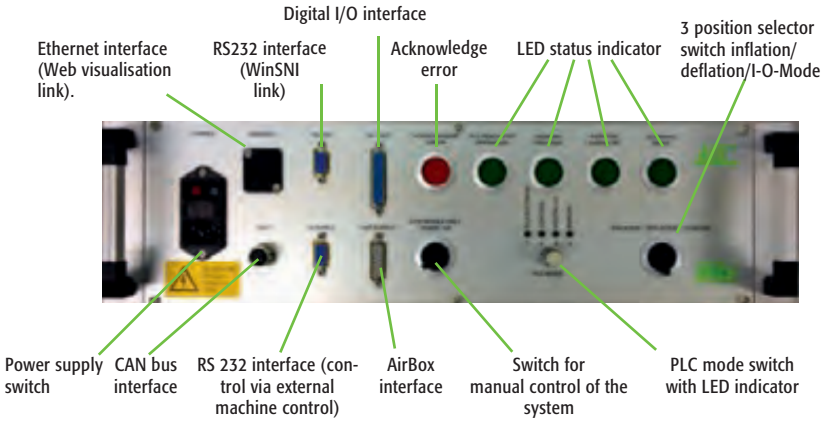
One controller and one valve are assigned to one air spring or one group of air springs. AIS™ works with at least three controlled groups of air springs and can be used with up to 6 degrees of freedom. The controllers are linked with the PLC via CAN bus.
A PC can be linked via a series RS-232 or Ethernet interface for commissioning and diagnostic purposes. The controller is mechanically coupled with the air spring insulator or to the machine in the direction of the force. Integrated on each controller is a microprocessor, a displacement measuring system for position feedback (resolution 0.2 µm), as well as an accelerometer (resolution 8 µg) and a pressure sensor (resolution 0.2 mbar). The signal sensor sampling rate is 4 kHz. As not only the higher-level control, but also each controller is equipped with a microprocessor and highly dynamic proportional valves are used, we can consider the system to be a powerful real-time control and an elaborate feed forward control from the machine manufacturer can be omitted.

The PLC also provides digital inputs and outputs, such as ready, pressure monitoring, position and tension, switching between scanning/loading mode, emergency stop. The user friendly switching capability between scanning and loading mode offers the advantage of parameterizing the insulation system for machine load changes so that it achieves the greatest rigidity, fastest response and accurate positioning and during machine operations so that it responds very gently and not aggressively.

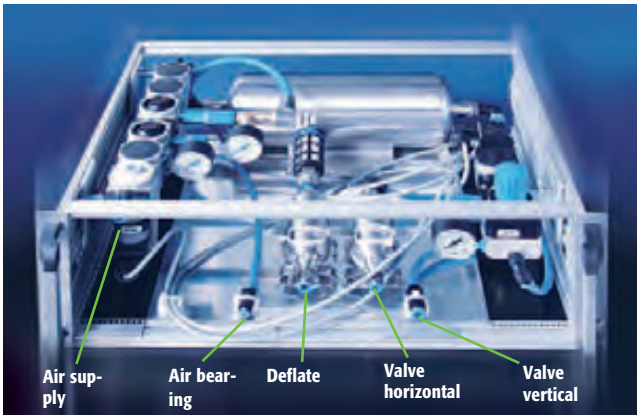
SYSTEM DESIGN



CONTROLLER 19" PLC AND AIR SUPPLY 19" AirBox



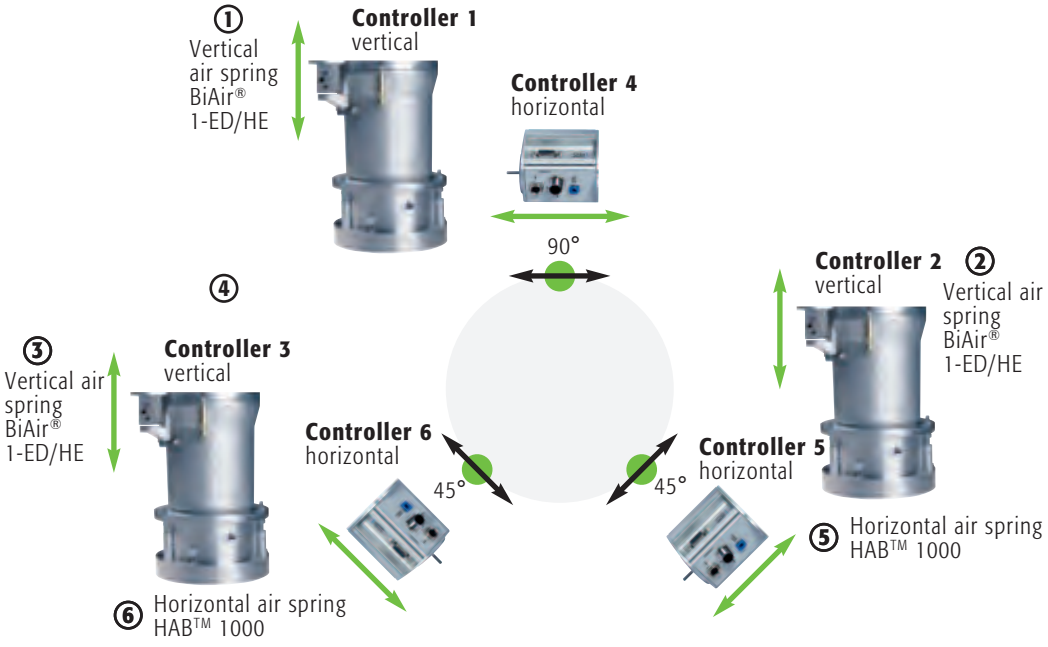
Dimensions: W / H / D / 483 x 133 x 270 mm



Dimensions: W / H / D / 483 x 177 x 384 mm

CONTROLLER **SPC-LC**

ARRANGEMENT OF THE AIS™ SYSTEM FOR AIR SPRINGS AND CONTROLLERS WITH 6 DEGREES OF FREEDOM



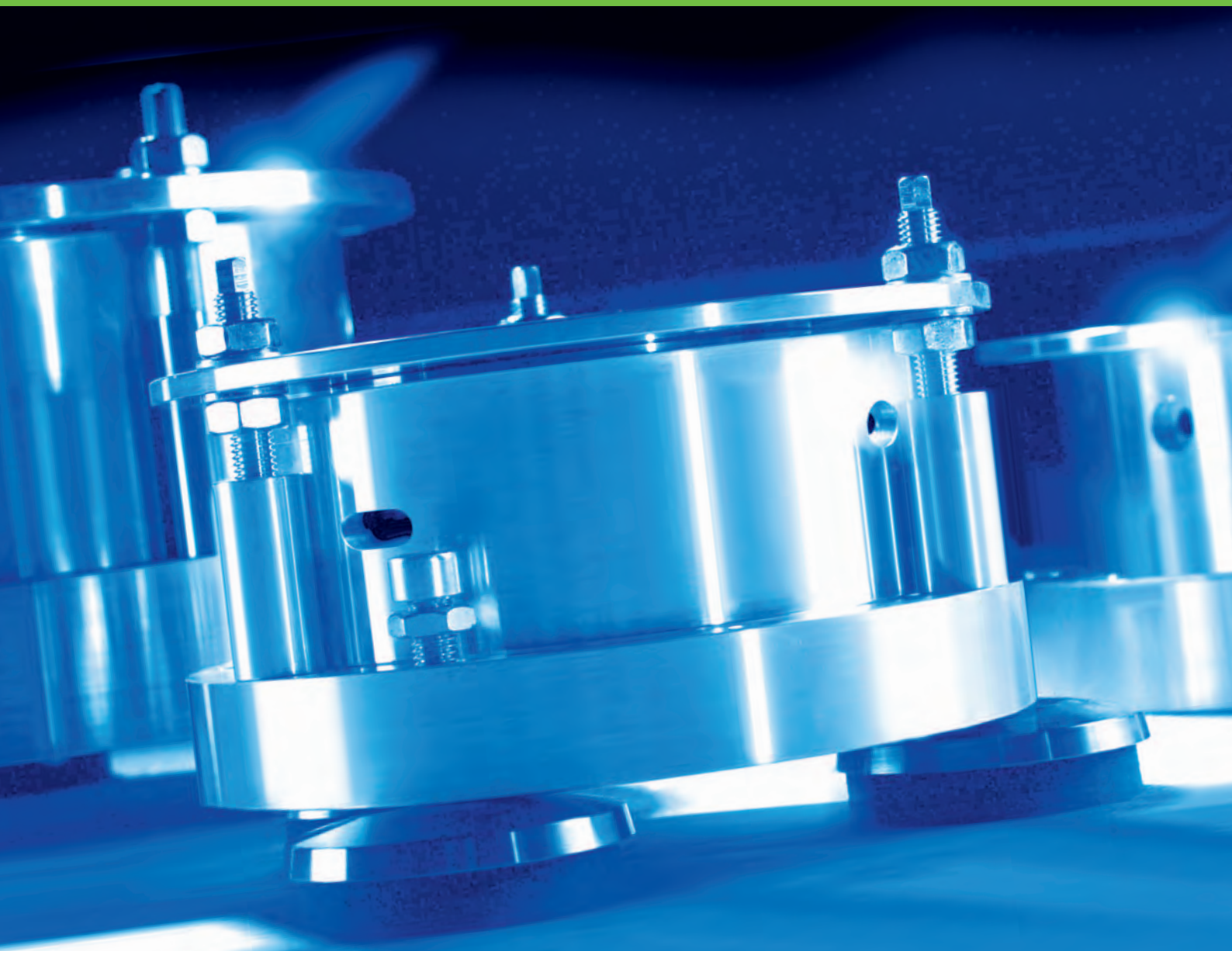
Application example:
Electron microscope on a vibration insulating platform

Right to make technical changes is reserved.

HAB™ Horizontal air springs

AIS™ Active Isolation System

Horizontal vibration insulation with
AIS ™ systems with 6 degrees of freedom.



Product description

Pneumatic horizontal vibration insulator each comprising of a cylindrical upper housing section and lower housing section. The two cylindrical side walls form an annular gap into which the air tubes are inserted and which act against the radially directed relative movements between the upper and lower sections. The necessary horizontal force depending on the machine type or the natural frequency of the air hoses can be adjusted using the variable air pressure.
A special air bearing is used to carry the vertical load resting on the upper section and to prevent frictional forces in the horizontal plane

The advantages compared to conventional air spring systems

- Application specific adjustable natural frequency
- Damping in the horizontal plane
- No uncontrolled frictional effects (such as slip-stick effects)
- In combination with AIS™:
  - No resonance peaks
  - Above average damping
  - Minimum settling time
  - High positional accuracy

Patents: German patent no. 102 49 647.1 – German patent no. 102 49 647

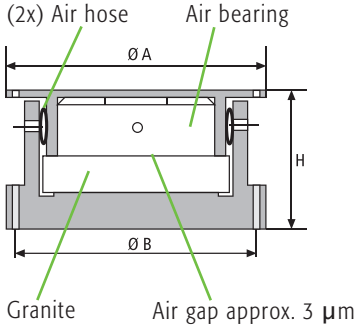
HAB™ HORIZONTAL AIR SPRING

Type	Item no.	Ø A mm	Ø B mm	H mm	Levelling bolt	max. vertical load capacity at 5.5 bar N	max. horizontal force absorption at 1 bar N	Adjustable horizontal natural frequency Hz
HAB™ 280	53-0055	200	180	101	M10 x 1.5	3,400	150	1.1 – 1.9
HAB™ 660	53-0084	250	230	118	M10 x 1.5	7,200	380	1.1 – 1.9
HAB™ 1000	53-0023	300	276	159	M12 x 1.5	11,000	490	1.1 – 1.9
HAB™ 1000-HL	53-0025	300	276	159	M12 x 1.5	14,000	490	1.1 – 1.9
HAB™ 24000	53-0039	350	326	172	M16 x 1.5	23,500	700	1.1 – 1.9
HAB™ 38000	53-0069	422	398	187	M16 x 1.5	38,000	1100	1.1 – 1.9

Larger sizes available on request!

Note

- In addition to our standard solutions listed here we also supply numerous special solutions. Please contact us, we would be happy to advise you.



Active Isolation System AIS™ High Performance

AIS™ Active Isolation System

Active vibration insulation in 6 degrees of freedom offering the best possible insulation effect

FUNCTION

With an elastic machine mount on vertical air springs (such as Bilz BiAir ®-ED) the insulated mass is carried on a volume of air enclosed by a membrane in the interior of the insulator. Because of the elastic properties of this air spring membrane the insulator has free movement in the vertical plane, and also a limited movement in the horizontal plane.

For extremely sensitive and high-precision applications, which must be mounted with 6 degrees of freedom, these slight horizontal elastic properties can have undesired influence on the work results.

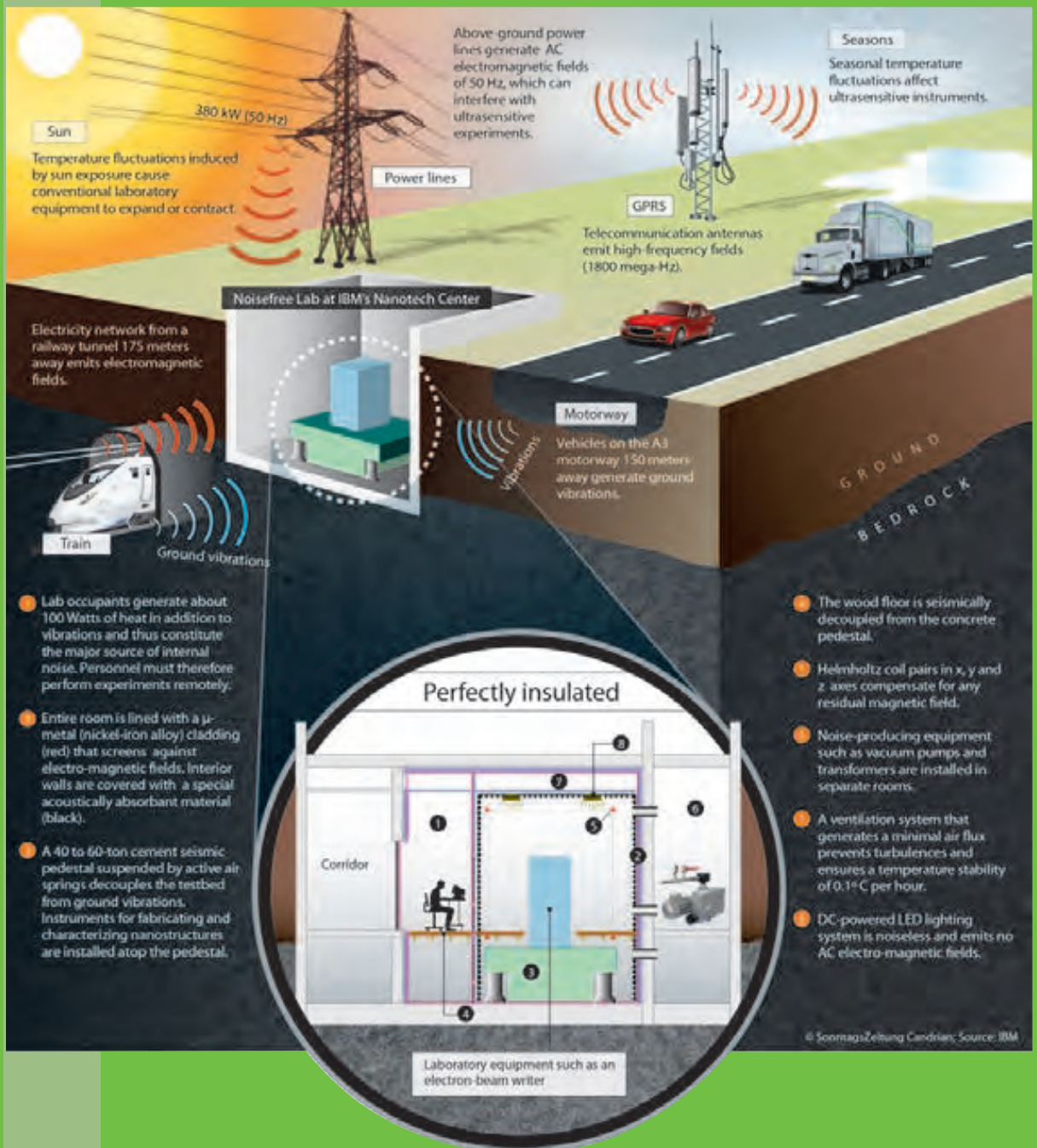
In this case the HAB horizontal air spring is used purely as an air bearing to reduce frictional effects; the required horizontal counter forces are generated by additional BiAir®elements. These additional BiAir® elements are fitted rotated 90° and replace the air hoses of the regular HAB™ air springs (see the Horizontal air springs section).

ADVANTAGES

- Best possible insulation properties specifically for applications with critical limit curves in the low frequency range.
- For applications with higher horizontal dynamics significantly higher counter forces can be realized by the additional BiAir® air springs than with standard AIS with 6 degrees of freedom.

AIS™
Active Isolation System

Noise and vibration insulation of research laboratories



The illustration shows some of the most important measures for reducing external disturbing influences in the "noise-free labs" of Binnig and Rohrer Nanotechnology Centers of IBM and ETH in Zurich.

The manufacture and characterising of ever smaller components, down to structures comprising of only a few molecules or atoms, make the highest demands on vibration insulation to protect the vibration-sensitive systems.

In order to precisely perform sensitive experiments and measurements in the nanometre range (1 nanometre = one millionth of a millimetre), the external disturbing influences such as temperature, humidity and air pressure fluctuations, noise, electromagnetic fields or floor vibrations must be kept to an absolute minimum level.

Globally respected as a competent partner, Bilz have specialized in solutions such as laboratory insulation (foundation block or platform insulators) or the direct insulation of highly sensitive machines (installation of insulation systems in machinery/plant.)

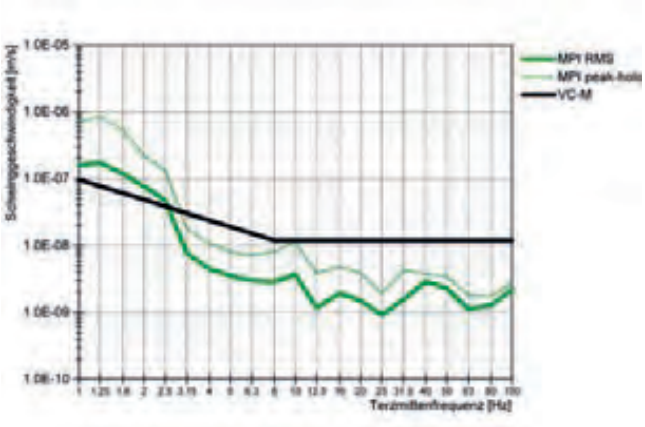
Passive membrane air springs, air springs or active vibration insulator systems are used for high-quality vibration insulation.

Depending on the customer's wishes Bilz also creates the complete foundation block or platform design, or provides support in the design and constructive integration of the insulation in the machine.

We are very proud to have equipped the most modern research laboratories in the world with noise and vibration insulation, these include the "Precision laboratories MPI Stuttgart" or the "Noise-free lab" of the Binnig and Rohrer Nanotechnology Centre (IBM/ETH Zurich).

In the field of semiconductors renowned companies such as Applied Materials, Visotec and Zeiss are among our most esteemed customers.

Active vibration insulation AIS™ High Performance by Bilz, which suspends the glass fibre reinforced plastic armoured foundation block weighing 75 tons on air cushions.



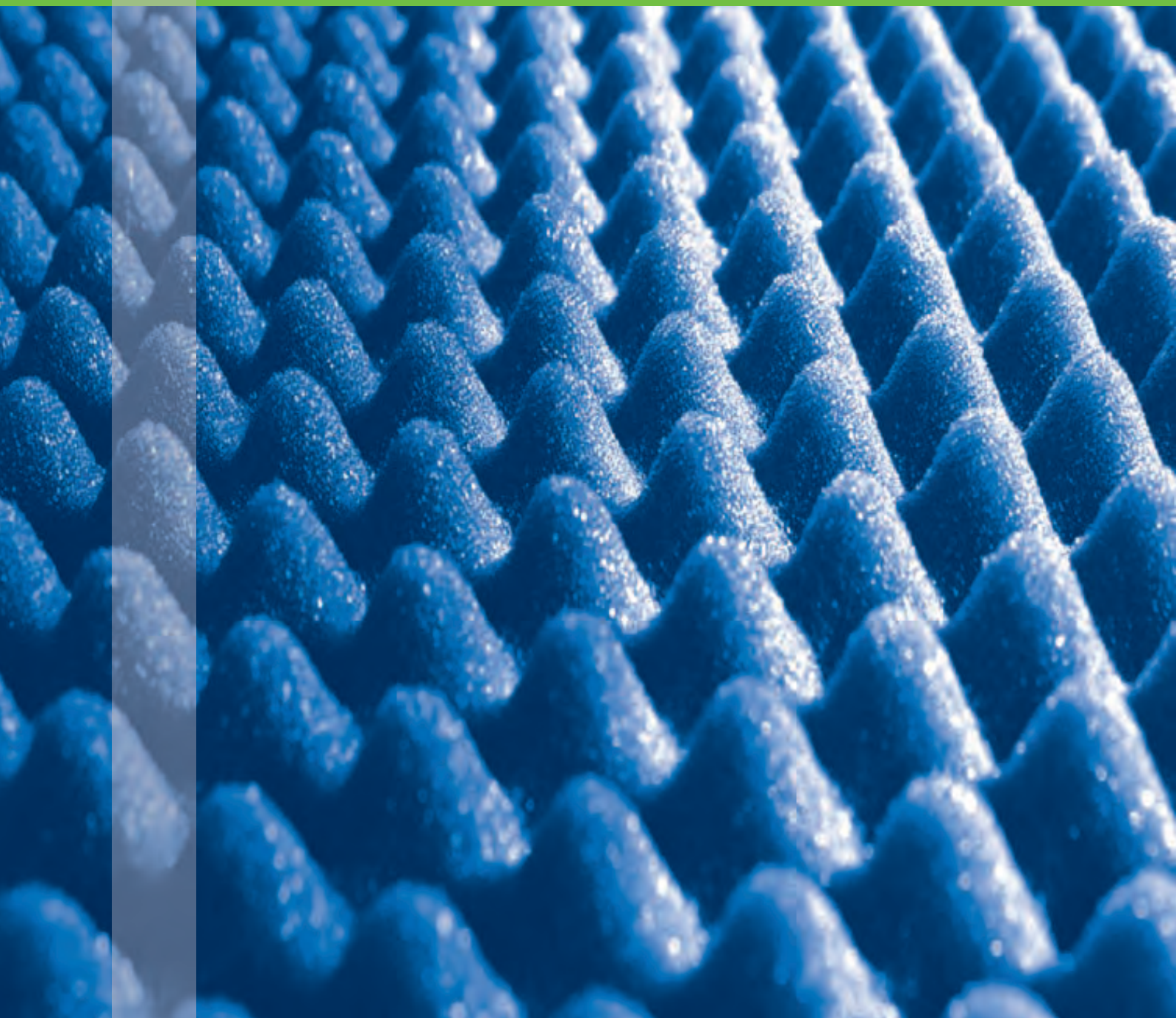
Result of vibration measurements on a foundation block insulated with Bilz membrane air springs.

Experimentation room with 4.2 m clear room height and acoustic insulation materials (supplied and installed by Bilz).
Source: Binnig and Rohrer Nanotechnology Center (IBM Research, Zurich).

Room acoustics and technical noise protection

Bilz acoustic elements enable optimized room acoustics and airborne noise insulation in office and industrial buildings, laboratories and test cells.

Our high-quality solutions for absorbing noise energy are distinguished by maximum noise insulation and minimisation of the associated sound pressure levels and the resulting resonance period.

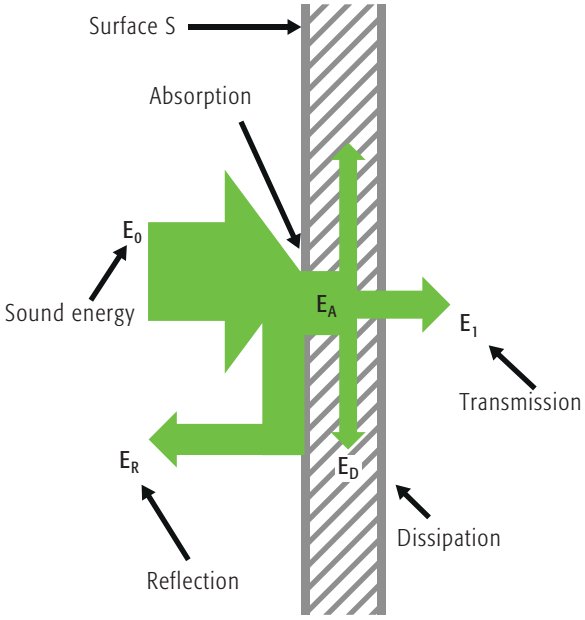


Variable and cost-effective acoustic solutions using Bilz surface elements. Very easily retrofitted.

When a sound wave strikes a body it is partially absorbed and partially reflected depending on the hardness and porosity of the material. The ratio between the occurring and absorbed sound energy is therefore the sound absorption coefficient, which usually lies between 0 (complete reflection) and 1 (complete absorption).

The **sound absorption** E_A therefore indicates the process of reducing sound energy E_0 in particular (but not necessarily) by conversion into heat.

The distinction from dissipation E_D is that this exclusively refers to the conversion into energy other than sound, in particular heat.



NOTE:

Bilz acoustic elements are available in various versions to match individual requirements such as wall elements, ceiling sails, enclosures, etc. Our delivery range also includes impact resistant, non-flammable (material class A2 according to DIN 4102) to suit the particular application.

The material can also be colour dyed or covered with printable fabric on request.

Source: Binnig and Rohrer Nanotechnology Center (IBM Research, Zurich).

Bilz absorber foam element. Excellent insulation properties due to its distinctive profiling

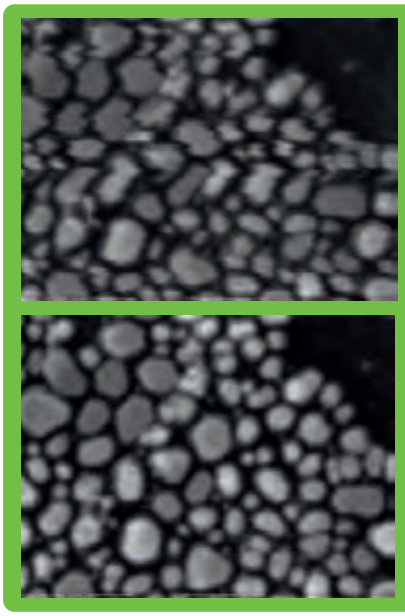
For further information about our products and installation services please call to arrange a personal consultation.

Magnetic field compensation

Effective and reliable shielding from low frequency magnetic fields for highly sensitive devices and applications such as electron microscopes, nanotechnology and biomagnetic examinations.

Disturbing influences are extensively neutralised with opposing fields with reversed polarity. Cable loops are laid around the work area to be protected and opposing fields are generated in real time using magnetic field compensation devices that continuously measure the actual electromagnetic value.
This method is an effective and cost-efficient alternative to expensive magnetic field shielding, for example with metal.

Besides natural magnetic fields that exist everywhere in the universe, the majority of problems encountered when operating sensitive devices arise from low-frequency magnetic fields that are caused by human activities, such as those emanating from electrical power cables, railways vehicles, elevators, etc. These fields occur as soon as electricity flows through a conductor. Without suitable shielding, they expand outwards in a circular form and are quite capable of passing through most materials unhindered.
Magnetic field compensation has established itself as the most cost-effective solution. With this method the magnetic field is continuously measured and a compensation device, which includes the necessary control electronics and power amplifier for the direct connection of compensation coils, generates an opposing field. The compensation coils can be made of coiled cables that are laid at the edges of the laboratory, or as a complete solution integrated in a self-supporting aluminium frame.



REM image without (above) and with (below) magnetic field compensation

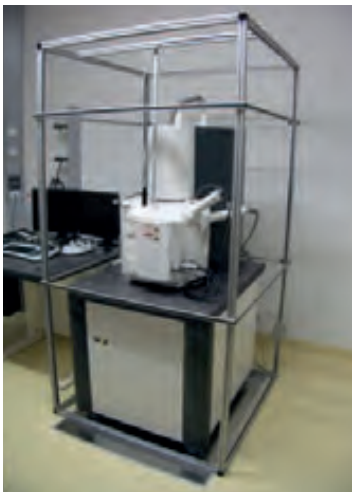
Applications

- Image enhancement in electron microscopy (REM and TEM)
- Biomagnetic applications
- Compensation of mains frequencies (50/60 Hz) and harmonic waves
- Suppression of slow and stepped magnetic fields caused by vehicles, moving magnetic objects, elevators, etc.
- A special version for MRI applications is available

Bilz magnetic field compensation system

- 3 axis automatic real-time compensation of low frequency magnetic field disturbance
- Frequency range DC to 1,000 Hz (1kHz)
- Fluxgate magnetic field sensor with sub Nano Tesla resolution
- Controller mode: AC, DC, AD+DC
- 40 db typical suppression of 50 Hz disturbance
- Compensation coil connection capability
- Measured value and alarm display

Bilz magnetic field compensation using room coils

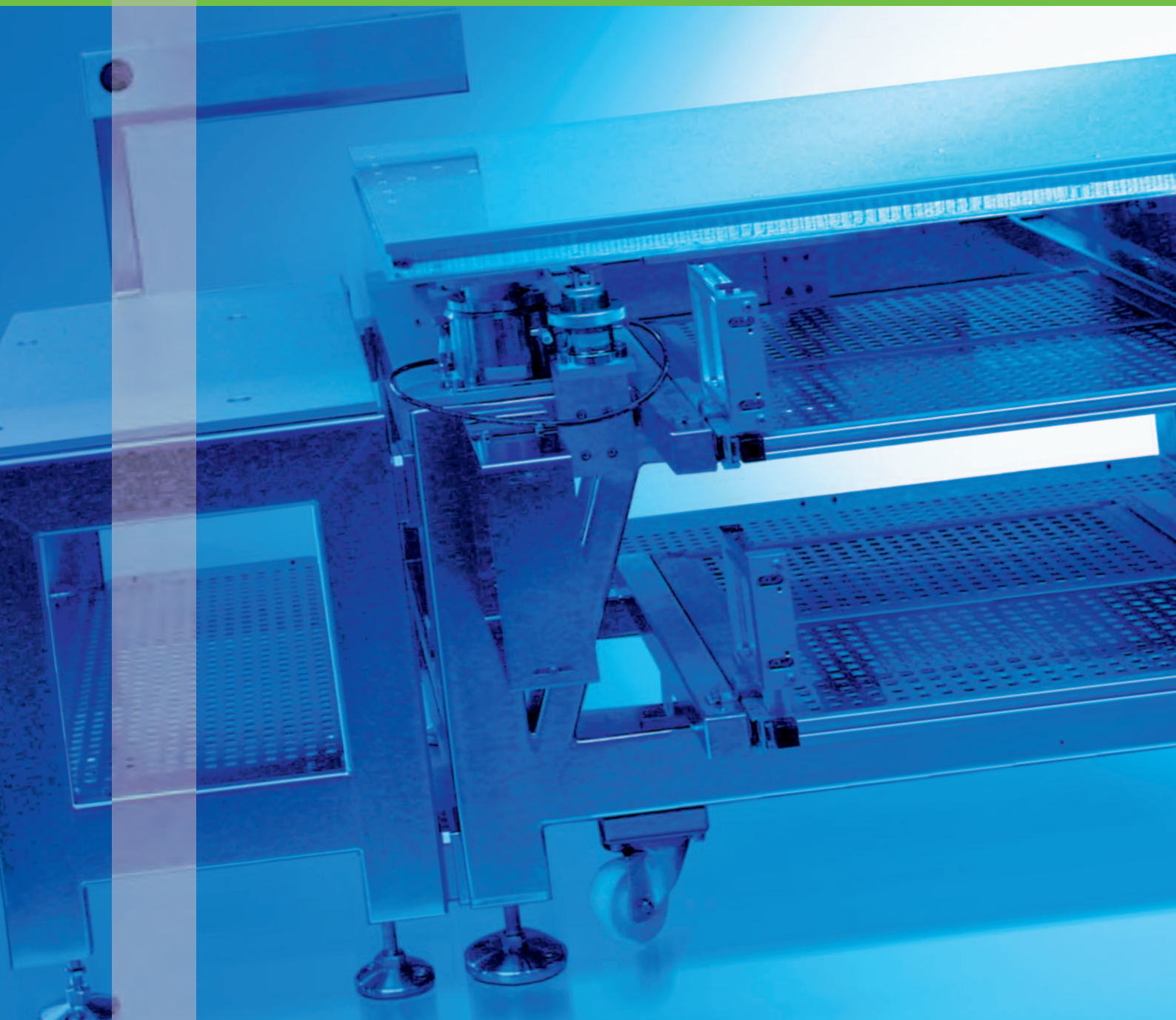


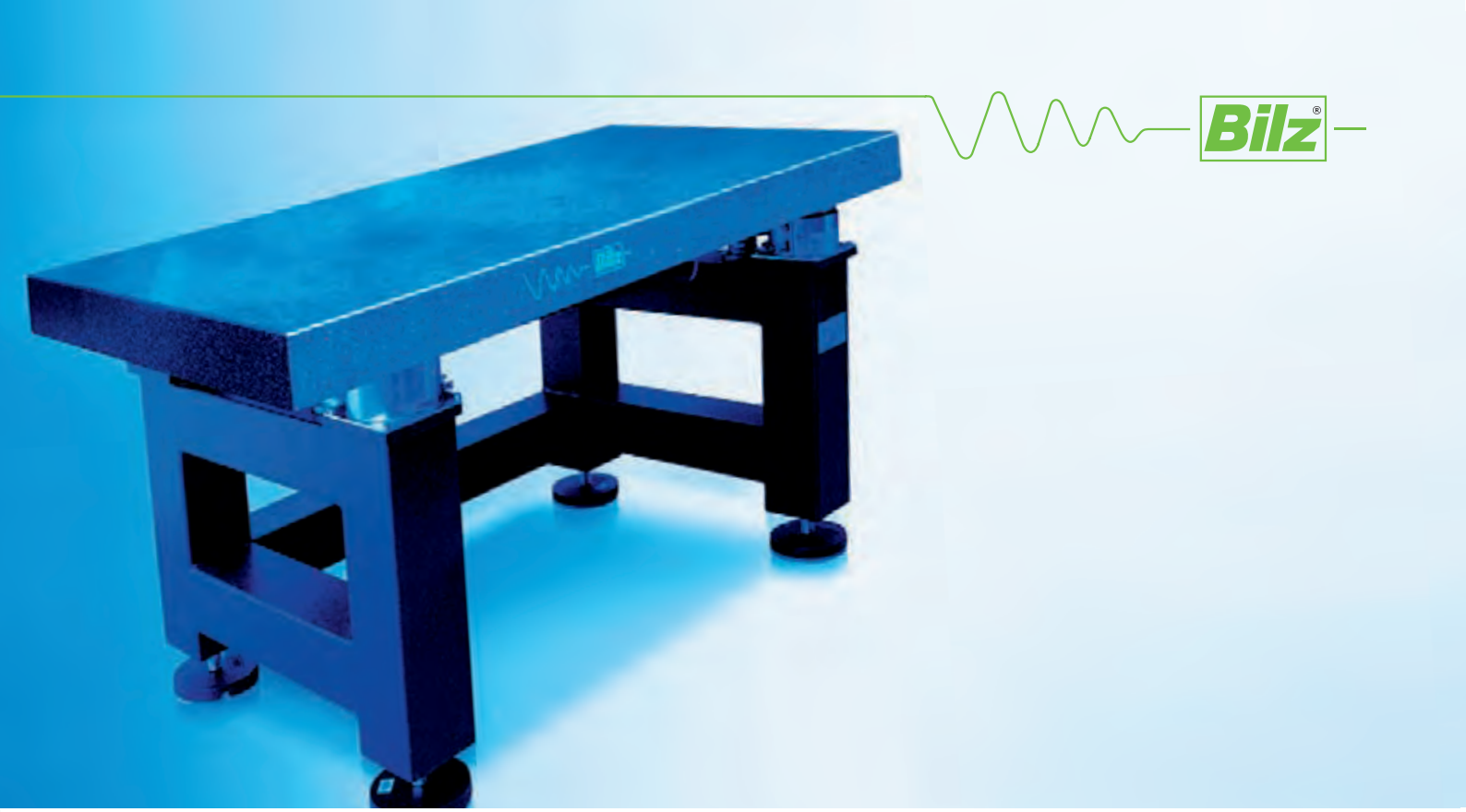
Integrated coil frame from Bilz for magnetic field compensation

For further information about our products and installation services please call to arrange a personal consultation.

Vibration insulated tables

Individually tailored to your requirements.





LTH laboratory table

Particularly robust and resistant

Product properties

- Adjustable table feet
- Rigid, welded steel subframe
- BiAir® membrane air spring (vertical natural frequency approximately 3 Hz) between the subframe and table top
- Magnetic-pneumatic level control (level accuracy ± 1/100 mm or ± 1/10 mm, depending on the valve used)
- Table top made from hard stone with a ground finish
- Painting as desired by the customer
- Standard colour: RAL 9005

Applications

- Vibration-sensitive measuring and testing equipment
- Laser equipment
- Optical and electronic instruments
- Scales
- Medical instruments

Technology

The Bilz laboratory table LTH is a vibration insulated work place and can be used for all applications where vibrations and/or changes in level cause sustained disturbances to the experiment or work.
Disturbing vibrations from the environment are isolated by means of highly effective membrane air spring insulators and the solid hard stone plate.
At the same time the mechanical-pneumatic level control automatically ensures that the level is retained to an accuracy of up to ±1/100 mm even with load changes.
The maintenance unit for compressed-air conditioning is included.

LTH LABORATORY TABLE STANDARD SIZES

Dimensions	LTH 60-50	LTH 80-60	LTH 100-63	LTH 90-75	LTH 100-80	LTH 100-100	LTH 120-80	LTH 150-100	LTH 200-100
Width [mm]	600	800	1,000	900	1,000	1,000	1,200	1,500	2,000
Depth [mm]	500	600	630	750	800	1,000	800	1,000	1,000
Thickness (hard stone) [mm]	100	120	100	100	140	160	160	190	220
Working height [mm]	760	760	760	760	760	760	760	760	760
max. Load [N]	2,500	2,500	3,000	3,600	7,000	7,000	7,000	18,000	28,000

Further dimensions are available on request

Right to make technical changes is reserved.

LTO optical table

Excellent quality and functionality

Product properties

- As LTH (see page 69)
- Optical table tops:
  – HD steel honeycomb core with high natural damping, cover plate without thread insert
  – HDT as HD, but with thread inserts
- Variants: Standard, clean room (base plate in stainless steel)
- Also available with BiAir® OC or BiAir® PAS as an option (see p. 72/73)

Description of the table tops:

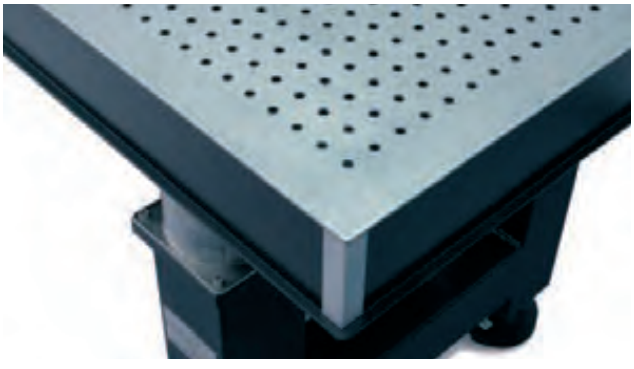
Cover plate:	Stainless steel 3 mm, magnetic or non-magnetic, anti-reflective.
Base plate:	Steel sheet 3 mm
Clamping hole grid:	25 mm (standard)
Core:	HD/HDT: Steel honeycomb made of galvanised 0.5 mm steel sheet, precision formed, bonded with specifically matched resin
Thread inserts (HDT):	Floating mounted threaded inserts M6, closed sleeves prevent any contact with the table core. Capability to displace the clamping bolts by 0.5 mm whilst simultaneously inclining by ±3°. Maximum depth of thread 30 mm.

Applications

- Construction of laser optical systems and interferometers
- Special microscopes

Technology

Work places from Bilz are distinguished by their excellent quality and functionality. Optical work places should offer optimum rigidity and damping with low density.
Bilz LTO honeycomb tops are optimised in regard to their damping response so that the usual high resonance amplitude in the higher frequency range are attenuated by the tables in the HD series by their natural damping.



LTO OPTICAL TABLE STANDARD SIZES

Dimensions	LTO 60-50	LTO 90-60	LTO 120-60	LTO 150-90	LTO 200-100	LTO 240-120	LTO 300-150
Width [mm]	600	900	1,200	1,500	2,000	2,400	3,000
Depth [mm]	500	600	600	900	1,000	1,200	1,500
Thickness [mm]	100	100	100	150	200	200	300
Working height [mm]	760	760	760	760	760	760	760
max. load [N]	1,500	2,000	3,000	5,000	5,000	7,500	7,500

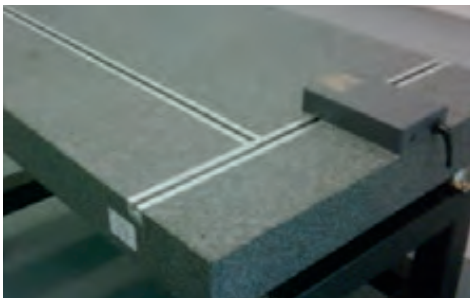
Further dimensions are available on request.

Right to make technical changes is reserved.

Individual design

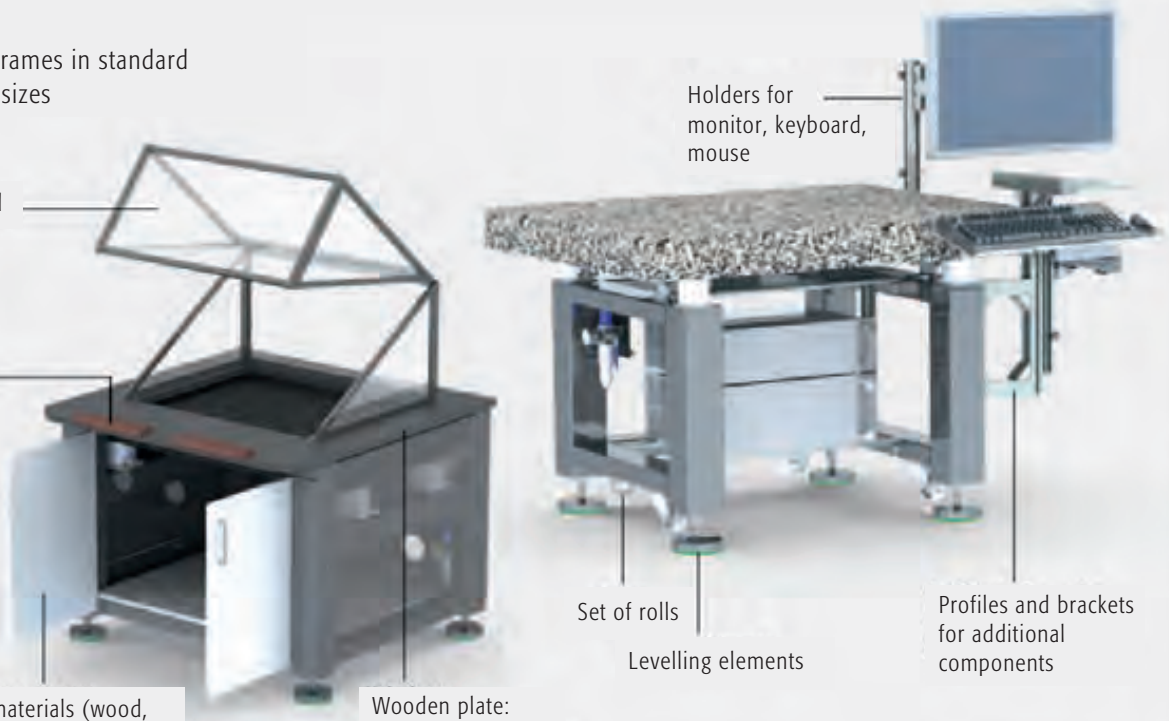
Compile the equipment features for the optimum laboratory table for your application:

- Additional holes/threads in the table top and the subframe
- Special sizes on request
- Can be equipped with metal guide rails on request



Options

Different frames in standard or special sizes



Differents materials (wood, metal) and colors for:
- Doors
- Base plates/inserted plates
- Housing

Wooden plate:
- Differents sizes
- Cutout
- Rounded corners

Powder coating in RAL colors

Insulators

- Level control (mechanical or electronic)
- Accessories (e.g. compressed-air control)
- Insulators perfectly integrated in the subframe

BiAir®

FAEBI®

Subframe

Levelling elements and rollers are available in various different designs and sizes.

LTH-Laboratory tables with BiAir® OC

Product properties

- As LTH (see page 69)
- Table top from hard stone with ground finish
- Design with membrane air spring insulators BiAir® OC between table top and subframe
- Also available with optical tops as an option (see page 70)

Technology

Due to their increased air volume the newly-developed BiAir® OC air springs achieve a reduced natural frequency of approximately 2 Hz in the vertical plane. The laboratory tables with BiAir®OC air springs are suitable for applications with lower dynamics that require an excellent insulation effect.

Applications

- Vibration-sensitive measuring and testing equipment e.g. atomic force microscopes (AFM), interferometer

LTH LABORATORY TABLES WITH BIAIR® OC STANDARD SIZES

Dimensions	LTH 60-50-OC	LTH 80-60-OC	LTH 100-63-OC	LTH 90-75-OC	LTH 100-80-OC	LTH 100-100-OC	LTH 120-80-OC
Width (mm)	600	800	1,000	900	1,000	1,000	1,200
Depth (mm)	500	600	630	750	800	1,000	800
Thickness Hard stone (mm)	100	120	100	100	140	160	160
Working height (mm)	760	760	760	760	760	760	760
max. load [N]	2,500	2,500	3,200	3,200	7,000	7,000	7,000

OC = one chamber

LTH-Laboratory tables with BiAir® PAS

Product properties

- As LTH (see page 69)
- Table top from hard stone with ground finish
- Design with pendulum suspended membrane air spring insulators BiAir® between table top and subframe
- Also available with optical tops as an option (see page 70)

Technology

Newly developed pendulum suspended BiAir® PAS air springs achieve a reduced vertical natural frequency due to their increased air volume and also have reduced natural frequency in the horizontal plane due to their pendulum suspension arrangement.
This enables the laboratory table with pendulum air springs to reach a natural frequency of approximately 2 Hz in the vertical plane and approximately 1.2 Hz in the horizontal plane. The laboratory table with pendulum air springs is suitable for applications with low dynamics and higher requirements for vibration insulation in both the vertical and horizontal planes.

Applications

- Vibration-sensitive measuring and testing equipment e.g. atomic force microscopes (AFM), interferometers

LTH LABORATORY TABLES WITH BIAIR® PAS STANDARD SIZES

Dimensions	LTH 60-50-PAS	LTH 80-60-PAS	LTH 100-63-PAS	LTH 90-75-PAS	LTH 100-80-PAS	LTH 100-100-PAS	LTH 120-80-PAS
Width (mm)	600	800	1,000	900	1,000	1,000	1,200
Depth (mm)	500	600	630	750	800	1.000	800
Thickness Hard stone (mm)	100	120	100	100	140	160	160
Working height (mm)	760	760	760	760	760	760	760
max. Load [N]	2,500	2,500	3,200	3,200	7,000	7,000	7,000

PAS = pendulum air spring

Subframe of a laboratory table with BiAir® PAS and LCV level control

BILZ-VITAP® Vibration insulating table platform

Product properties

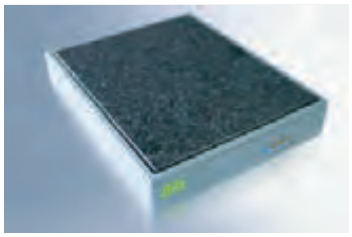
- Portable, robust, powder coated metal housing with integrated Bilz rubber air springs FAEBI® or optionally with Bilz membrane air springs BiAir®; colour: RAL 7037, dusty grey
- Equipped with very simple through to very convenient Bilz level control systems
- A ground-finished hard stone plate lies on the insulators as a support base and solid base mass
- Available with and without a connection to an external compressed air supply

Applications

- For very light and very small measuring or test equipment
- Weight range up to 200 kg
- Optical devices, optical microscopes, microscopes with a CCD camera, inspection microscopes, small surface roughness and roundness measuring equipment, hardness testers, analytical balances, applications in industrial production environments, laboratories and measuring rooms up to clean rooms. Also suitable for the portable use of these measuring devices.

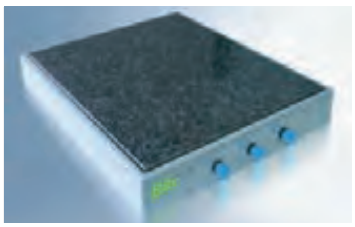
VITAP®-F

With long-term tried and tested Bilz FAEBI® rubber air springs with non-return valve. Integrated hand pump, no compressed air supply necessary.



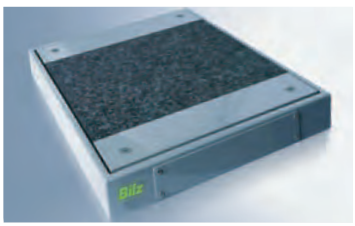
VITAP®-FP

With long-term tried and tested Bilz FAEBI® rubber air springs with precision pressure control for convenient height adjustment. Connection to an external compressed air supply.



VITAP®-BM

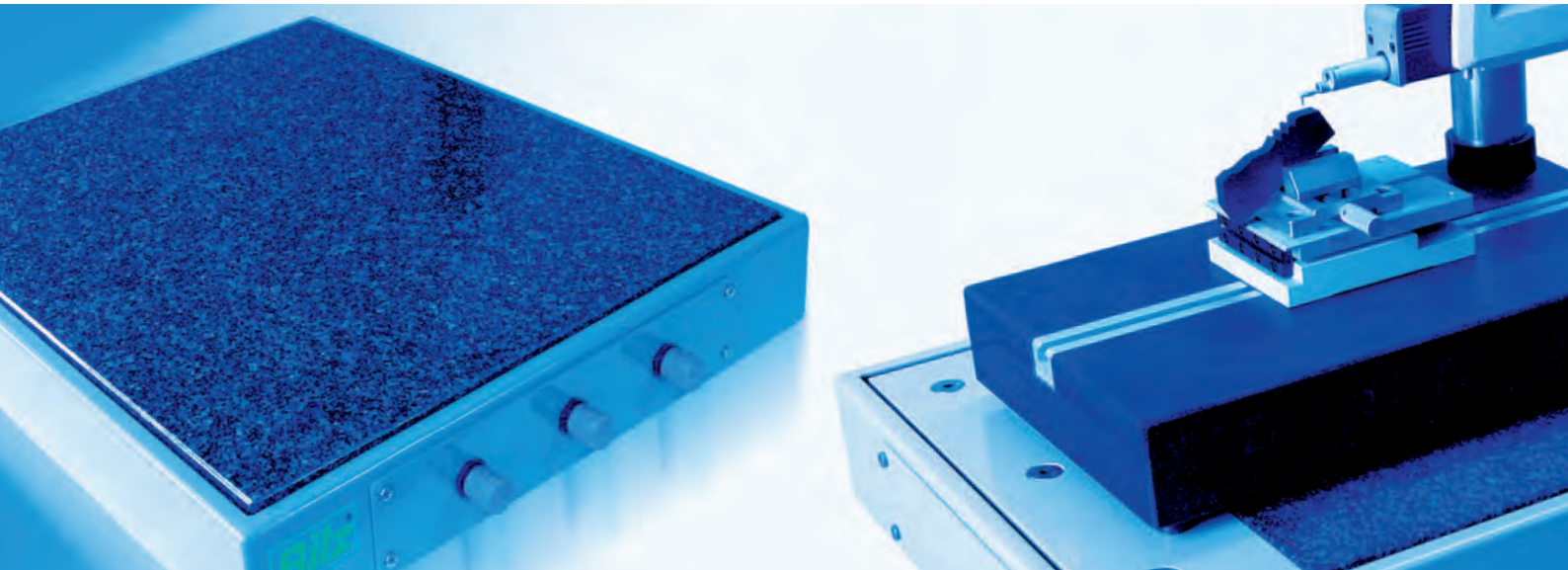
With highly efficient Bilz BiAir® membrane air springs and with mechanical-pneumatic level control (MPN) with automatic level compensation in response to load changes. Connection to an external compressed air supply.



TECHNICAL DATA VITAP®-F, VITAP®-FP, VITAP®-BM

	Item no..	Dimensions mm Platform box	Dimensions mm Installation surface	Height mm	Load capacity N	Natural frequency Hz	Compressed air supply
VITAP®-F 50-40	56-0008	540 x 440	500 x 400	95	600	4.5 – 6	autonomous/air pump
VITAP®-F 60-50	56-0009	640 x 540	600 x 500	95	1,300	4.5 – 6	autonomous/air pump
VITAP®-FP 50-40	56-0010	540 x 440	500 x 400	95	600	4.5 – 6	4 bar/air pressure network
VITAP®-FP 60-50	56-0011	640 x 540	600 x 500	95	1,300	4.5 – 6	4 bar/air pressure network
VITAP®-BM 50-40a	56-0006	540 x 440	500 x 400	95	750	1.8 – 3	6 bar/air pressure network
VITAP®-BM 50-40b	56-0005	540 x 440	500 x 400	95	1,500	1.8 – 3	6 bar/air pressure network
VITAP®-BM 60-50a	56-0002	640 x 540	600 x 500	95	1,500	1.8 – 3	6 bar/air pressure network
VITAP®-BM 60-50b	56-0003	640 x 540	600 x 500	95	2,000	1.8 – 3	6 bar/air pressure network

Right to make technical changes is reserved.



Indirect insulation

Elastic mounting of machines with insufficient intrinsic rigidity.

Enhanced insulating effect and reduced vibration amplitudes through additional mass and lowering of the centre of gravity.

DIRECT INSULATION

Direct insulation means that vibration insulators are fitted directly under or in the machine, usually at the same locations as the available installation points.
Direct insulation requires that the machine bed or base frame has sufficient intrinsic rigidity and that it will not warp or twist due to elastic mounting. In addition the machine geometry must allow the suitable arrangement of the insulators.

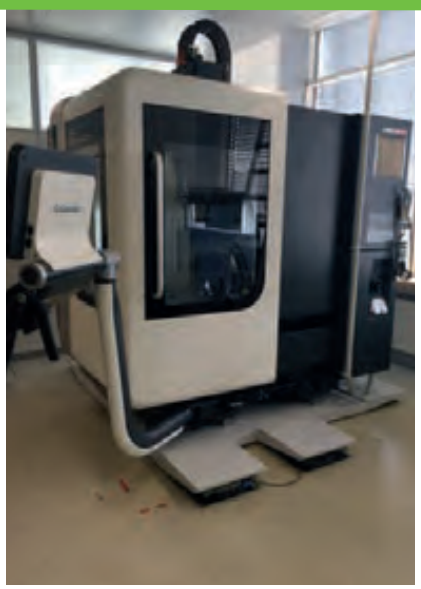
INDIRECT INSULATION

Machines whose intrinsic rigidity is not sufficient for direct insulation require a rigidly designed intermediate construction to be fitted between the insulators and the machine. This method also allows the positioning of the insulators to be optimised for the application.

Depending on

- Machine dimensions,
- Machine centre of gravity,
- Dynamic forces acting on the machine,
- Permissible machine movement,
- Requirements on the insulation,
- Mobility (flexible installation site),
- Attachment parts or feeds,
- Type of installation site (for example permissible floor loading, installation in above ground floors of a building),

this is achieved either by providing a block foundation made of concrete (see p. 77-82), a steel platform (p. 85) or a cast plate. In this case the insulation is referred to as indirect insulation.



FOUNDATION INSULATION

Indirect vibration insulation of a machine or system enhances the natural rigidity and leads to a significant improvement of the dynamic behaviour in response to large changes in load and travel distances. The exact design of the foundation according to the machine properties ensures an economic solution for the long-term and trouble-free operation of the system.

We have many years and a wide range of experience in the design and projecting of machine foundations. We therefore offer all of the necessary services from single source:

- Vibration analysis on site
- Simulation
- Vibration insulation design
- Design and calculation of the foundation block
- Creation of the complete documentation (such as tender documents, formwork and reinforcement plans)
- Construction supervision
- Installation and commissioning of the vibration insulators

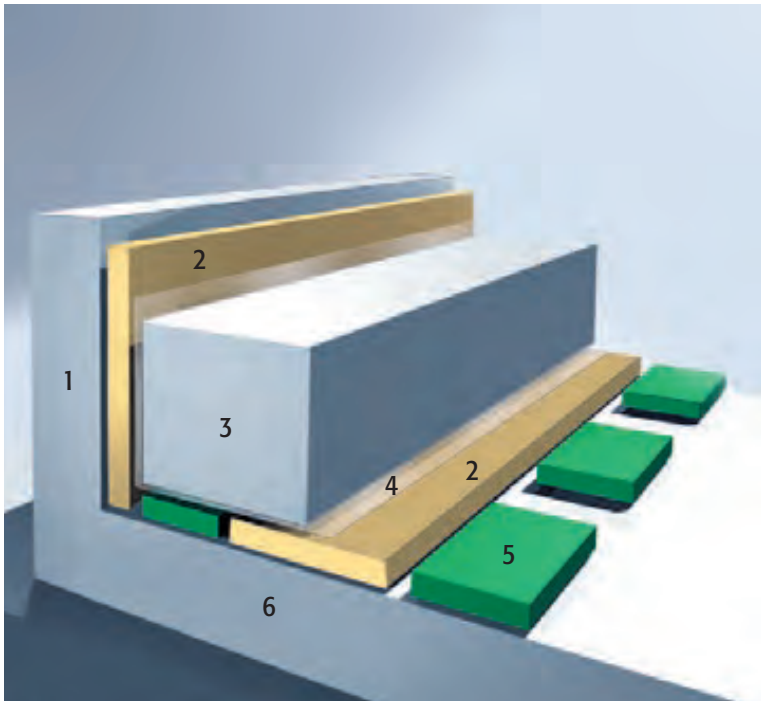
Your benefits from Bilz foundation insulations:

- The increased machine rigidity enables effective vibration insulation even with large machines and systems. This results in increased precision, receiver insulation (see explanation on page 8) and protects the machine surroundings.
- Reduction of the vibration amplitude by adding additional mass or moment of inertia and lowering of the centre of gravity. This results in electronic components, control, bearings, etc., enduring less stress and the quality of the results are significantly improved, in particular for applications where the level is critical.
- Smaller relative movements of individual machine components or attachments (such as robots, material feeds, etc.)
- Reduction of the size of the foundation compared to the foundation design without vibration insulation.
- All-round service from one single source; fewer interfaces and contacts.

Cast foundation block

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

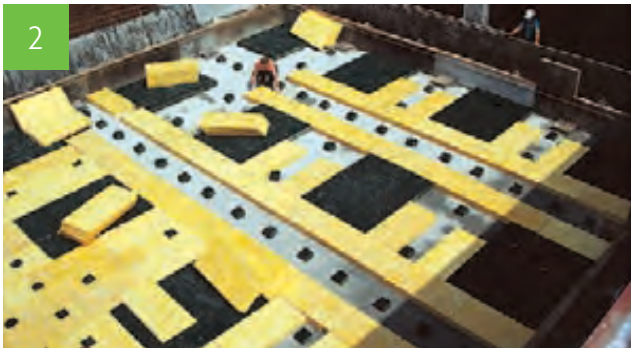
1 Foundation pit (side wall)
2 Mineral fibre and cover plate (lost framework)
3 Foundation block
4 PVC foil cover
5 Bilz insulation pads (set of pads)
6 Foundation pit (base)

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


2


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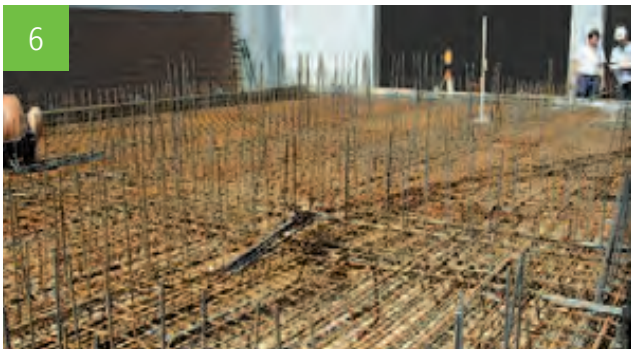

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8


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

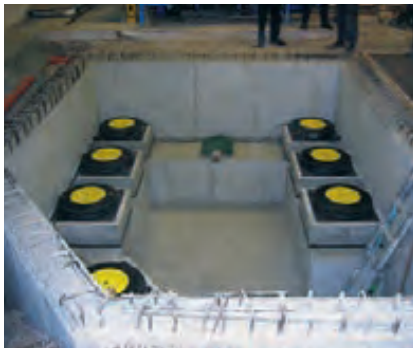
- Creation of the foundation
- Static calculations
- Formwork and reinforcement plans
- Steel and steel bending schedule

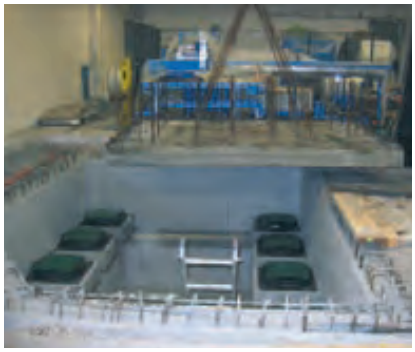
Requirements

- 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.

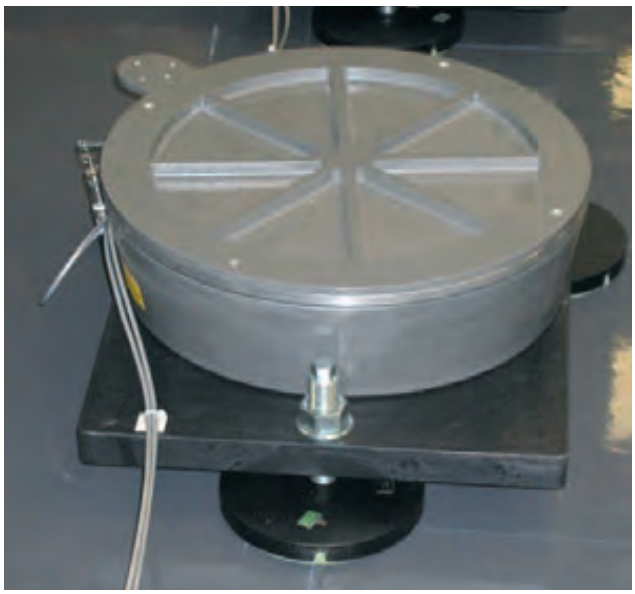




Vibration foundation with BiAir®

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

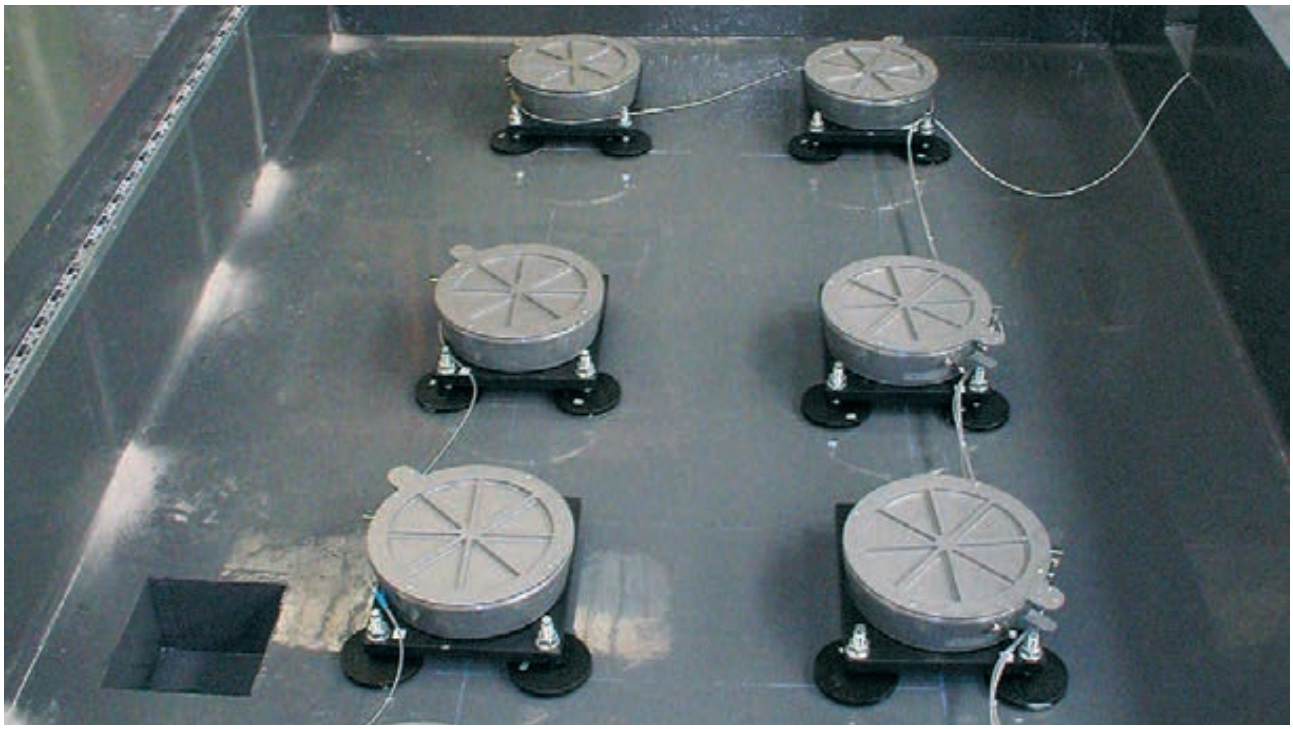
8 x Bilz membrane air springs BiAir® 4-ED with mechanical-pneumatic level control MPN-LCV.

Particular general conditions

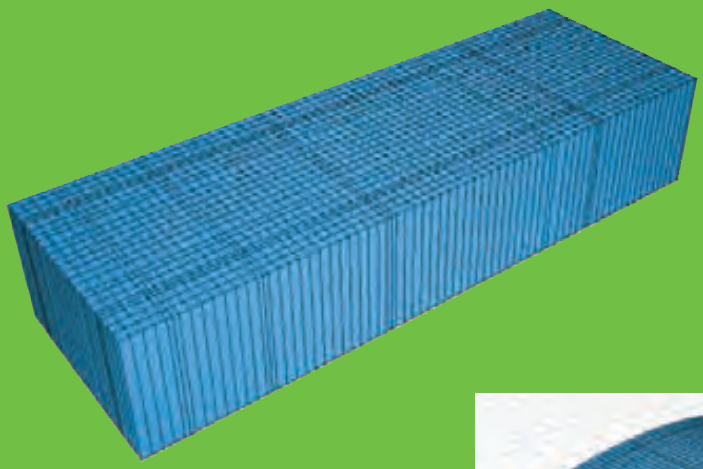
The processing accuracy required of the roller grinding machine cannot be met due to disturbing influences from adjacent machines and an overhead crane rail. Large travel distances and tools weighing up to 10t cause large load changes that necessitate the use of a fast, mechanical-pneumatic level control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

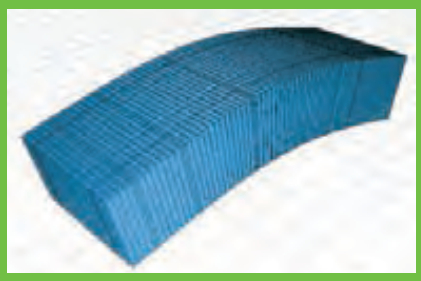
APPLICATION

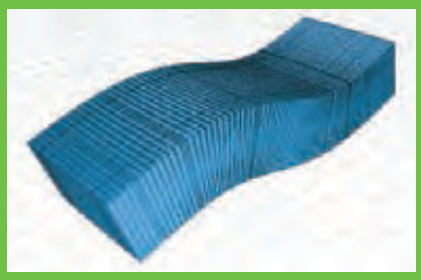
Gear grinding machine GLEASON PFAUTER P 1200 G,
machine weight incl. tool up to 25 t,
foundation block approx. 5.2 x 1.9 x 0.7 m, approx. 20 t

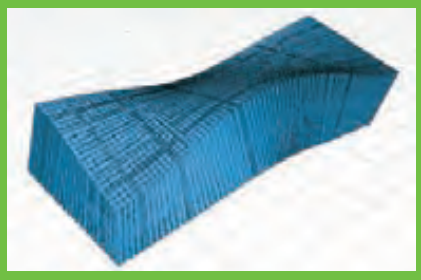


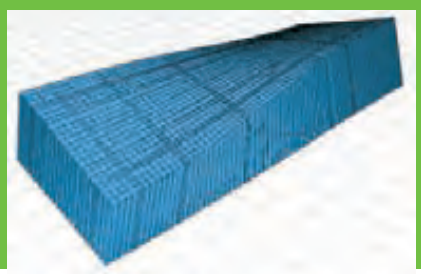
Static and dynamic calculations / reinforcement plans / FEM analysis









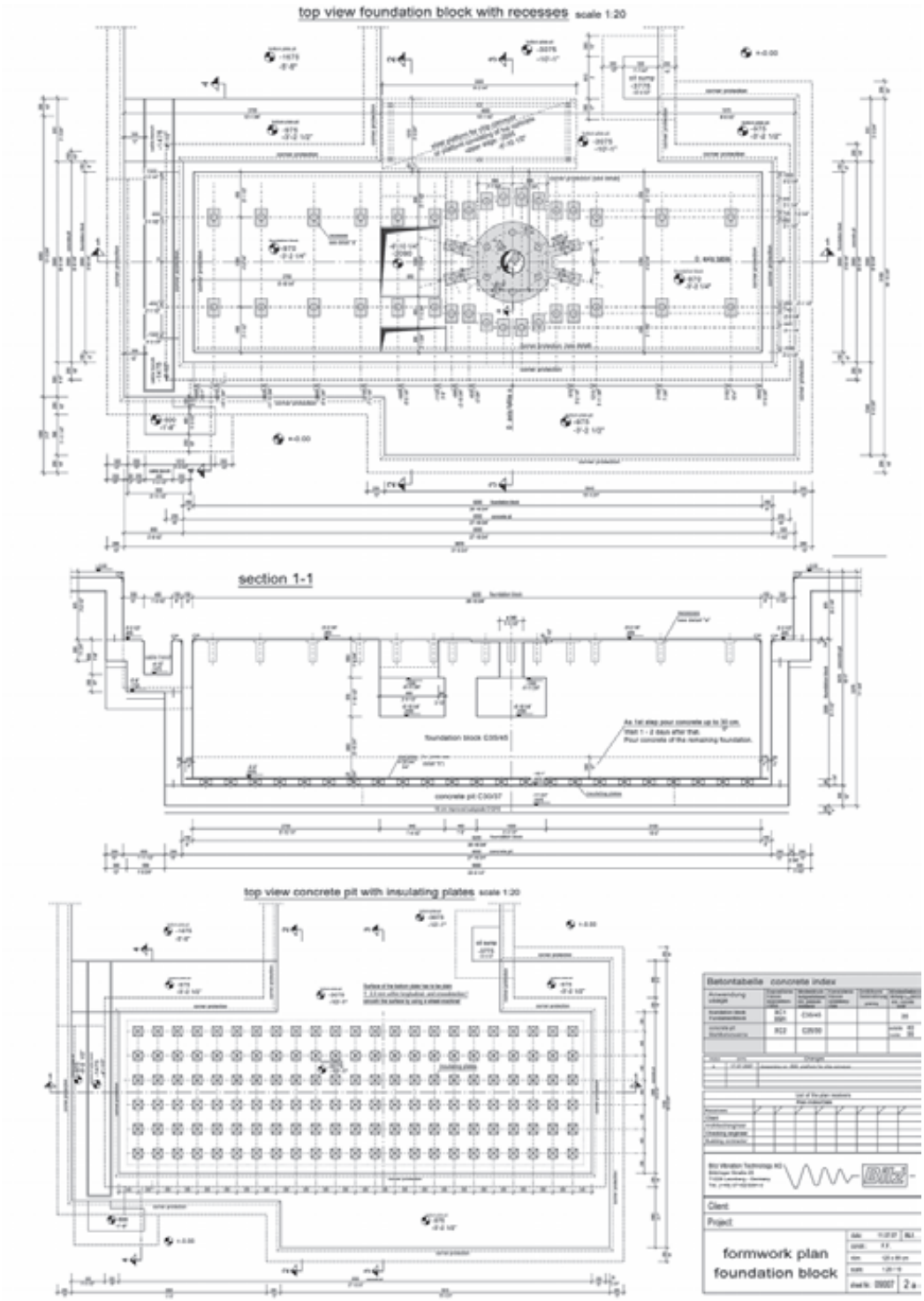


Foundation block natural modes

FEM image (example), shown greatly exaggerated

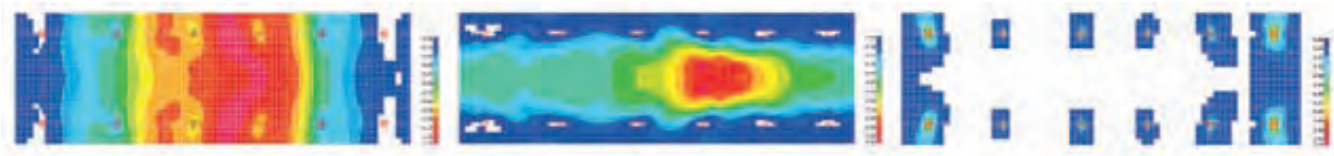
Foundation insulation with insulation pads

Design plan (example)



Block bending under the influence of alternating loads

FEM image (example)



Vibration insulation platforms

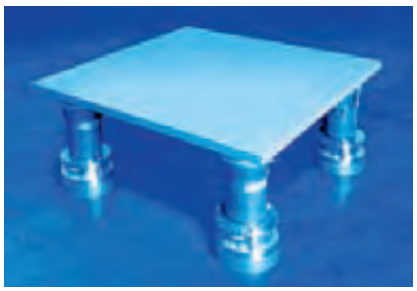
Many applications require indirect insulation due to the requirements for effective insulation and level control or due to insufficient intrinsic rigidity. If foundation insulation is not possible as e.g.

- 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



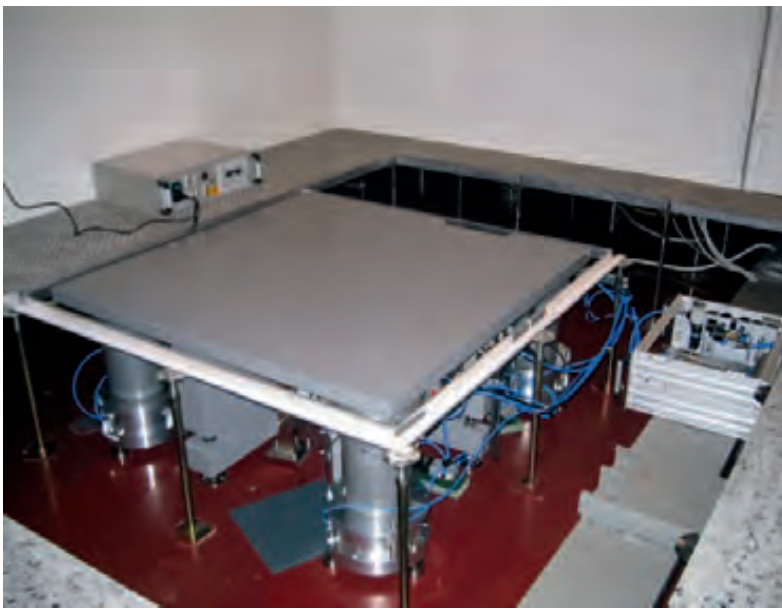
Basic platform

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

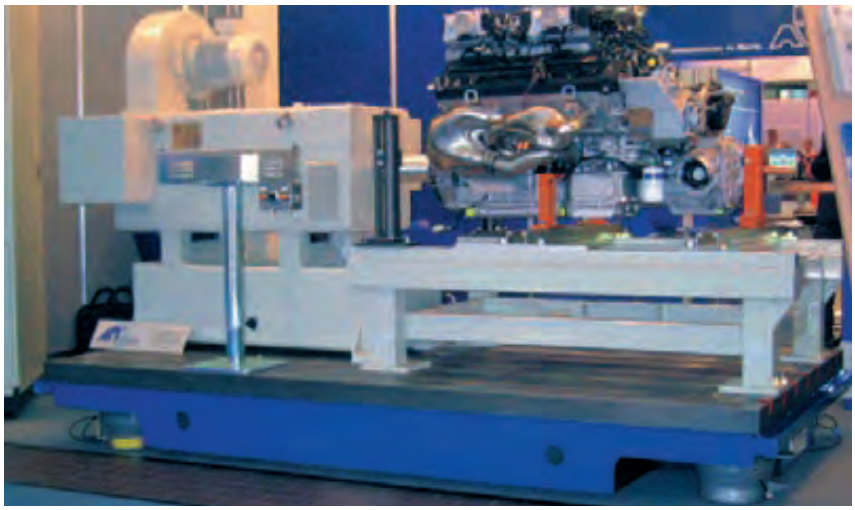
Vibration insulation of test beds

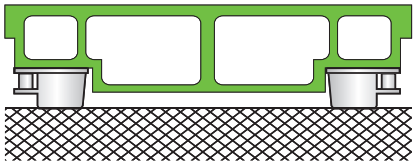
Parallel to the ever increasing demands on test beds and test systems for the automotive industry over recent years, the systems for vibration insulation have also been developing at the same pace.

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

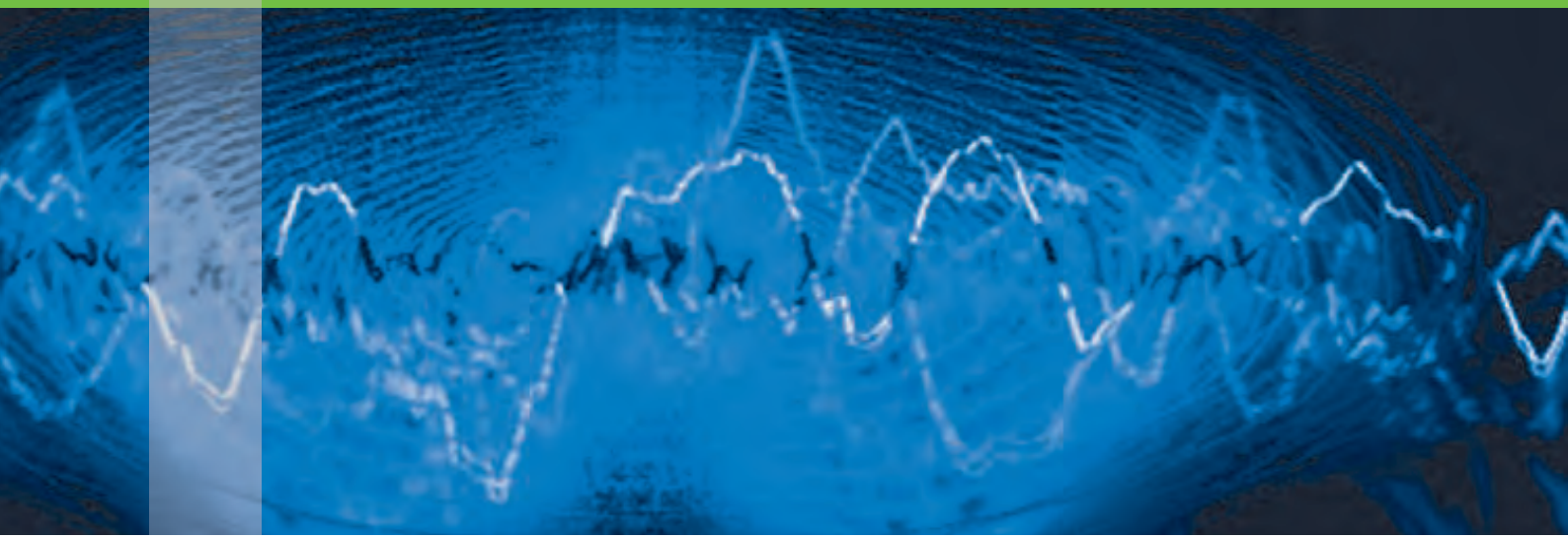
SERVICES

- 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.

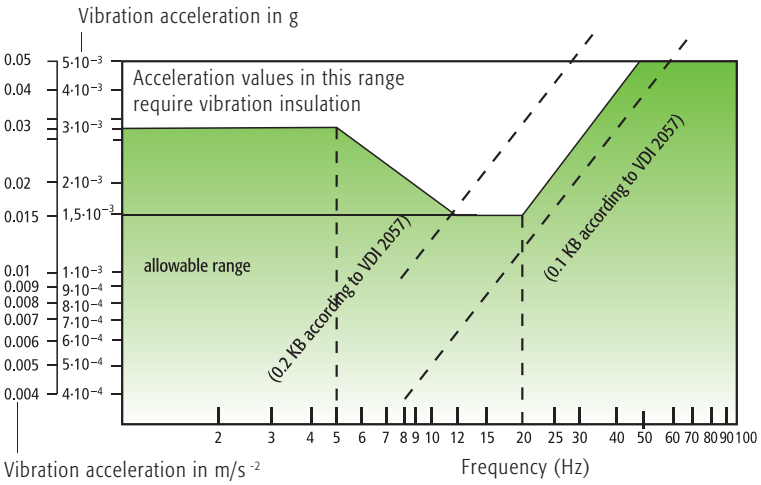


Chart 1: Example CMM limit curve

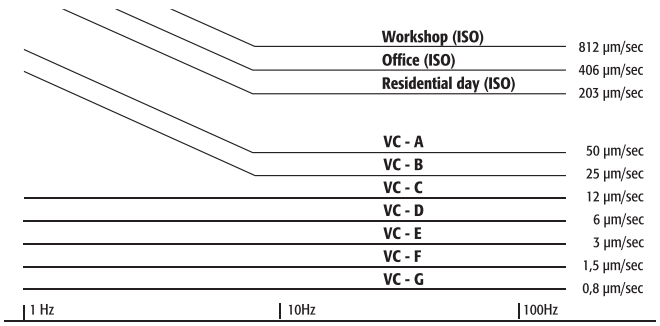


Chart 2: Vibration Criteria VC

FFT Analyser

Geophone

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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