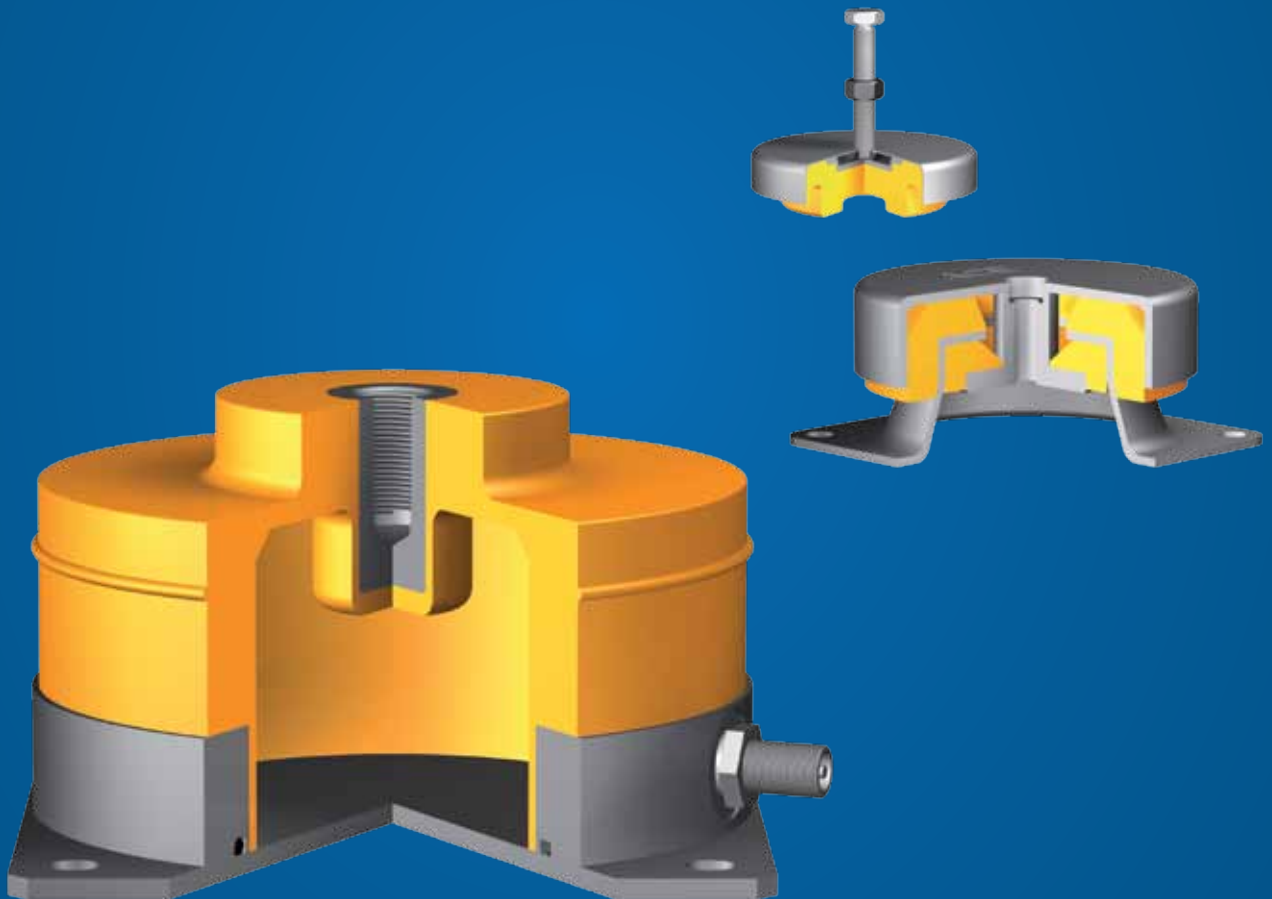


**NEW**

# ACEolator

Isolates undesired  
Vibrations.



Vibration Technology

# For support please contact the international help desk

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## Automation Control Equipment



### Industrial Automation Control

Industrial Shock Absorbers, TUBUS Profile Damper, TUBUS Pressing Tools, SLAB SL-030 to SL-300



### Industrial Motion Control

Gas Springs Push Type, Gas Springs Pull Type, Hydraulic Dampers, Hydraulic Feed Controls, Rotary Dampers, TUBUS Spring



### Vibration Control

Rubber-Metal Isolators, Vibration-Isolating Plates, Low-Frequency Air Spring Elements



### Safety Products

LOCKED Clamping Elements, Safety Shock Absorbers, TUBUS Single Hit Damper

## We are your specialists for industrial damping technology

**ACE is the internationally recognised expert in the field of industrial damping technology – with representative offices in 45 countries on all continents. ACE has also been active in Germany since 1978. A team of 25 engineers work in this country alone on further developing the product range every day.**

ACE customers profit from well-conceived solutions, valuable innovations and model service for all damping technology issues. Thanks to its close cooperation with leading mechanical engineering companies, the German ACE branch office has recently established itself as a pioneer of technical progress in damping technology.

This catalogue is a decisive step – a much expressed desire of our customers: the realisation of offering everything from one source for damping technology and vibration isolation.

ACE develops, produces and distributes a broad spectrum of damping products. These include industrial and safety shock

absorbers, profile dampers, rotary dampers, industrial gas springs, brake cylinders, vibration isolators, air springs and oil brakes.

The products are particularly successful with forward-looking companies, because there are no better solutions available for braking moving masses rapidly, gently and precisely or for isolating harmful vibrations.

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# 01

## Rubber-Metal Isolators



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# 02

## Vibration-Isolating Plates



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# 03

## Low-Frequency Air Spring Elements



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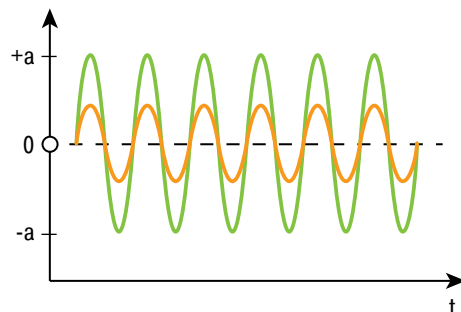
# Vibration Isolation

**Noise reduction and vibration isolation are becoming more and more important in our daily lives. This applies in particular to the workplace and the environments around production companies.**

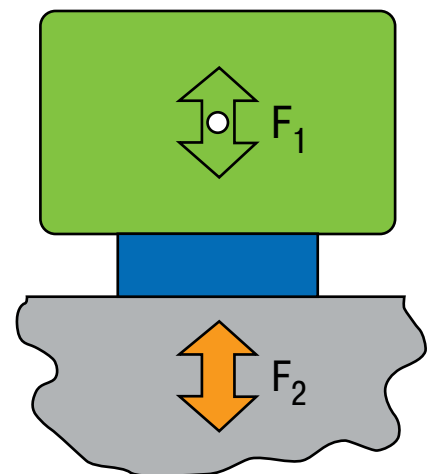
Preventing noise emissions or harmful vibrations is therefore not only a necessity entailed by noise protection and occupational health and safety legislation; their sources must also be localised by means of targeted analyses in order to develop suitable improvement measures for achieving, for example, increased production quality. A second by-product of vibrations are their effects on the surrounding production environment and any measuring and testing facilities that may be in use.

## Preventive vibration isolation leads to

- improved working conditions for people and the environment
- more accurate production tolerances and thereby increased product quality
- competitive and cost advantages thanks to lower reject rate in production
- increased production speed thanks to increased maximum machine dynamics
- longer tool and machine life thanks to lower stress
- faster and more accurate measuring results



Measurement of degree of isolation



## Types and mode of action of vibration isolation

Vibration isolation is generally subdivided into source isolation and receiver isolation. In source isolation (emission protection), for example, a press or a machine is isolated from its foundation so that the vibrations are damped to a desired extent.

In the case of receiver isolation (immission protection), however, the object to be protected, e.g. a measuring table, is isolated from the foundation. If the machinery or equipment is rigidly connected with the foundation, one can assume an almost 100% transmission of vibrations or shocks.

The task of vibration isolation for machinery and equipment is to reduce the transmission of mechanical vibrations and reciprocal forces by installing elastic, damping components.

However, it is not always possible in practice to provide a desirably elastic (soft) support for all machines, foundations, measurement facilities and building parts. Users are forced therefore to aim for a viable state between system stability and degree of isolation.

**Our technicians and engineers are happy to assist you in selecting products and solutions.**



A measuring machine as an example of receiver isolation



A machine connection as an example for source isolation

### Effectiveness and vibration calibration

In order to assess the effectiveness of isolation elements for harmonic vibrations, one relates the excitation frequency  $f_e$  (machine speed in 1/s) of the isolator to the natural frequency  $f_0$ . It may generally be assumed that the effectiveness of an isolation increases with the decreasing natural frequency of the system. If the ratio  $\eta$  of the excitation frequency to the natural frequency of the system is larger than  $\sqrt{2}$ , one may refer to an isolation effect. Furthermore, the degree of effectiveness (isolation) increases in proportion to the ratio ( $\eta = f_e / f_0$ ).

If the ratio is lower than  $\sqrt{2}$ , the vibrations become amplified. This is particularly the case in the resonance range if the disturbance frequency is equal to the natural frequency of the isolator ( $\eta = f_e / f_0 = 1$ ).

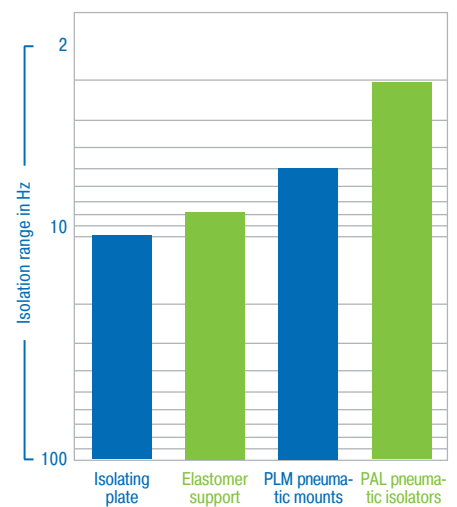
Damping (D) plays an additional, not unimportant role in vibration isolation. When ramping up machines to their operating speed or when ramping down, the natural frequencies of the vibration isolation are generally passed through. In order not to exceed the amplitudes or limit values when passing through the resonances, sufficient damping must be in place.

### Quick selection

Different materials can be used to isolate machinery and equipment. These differ in material, form and mode of action. The following quick selection will allow an initial rough estimation by showing you the effectiveness of the different damping products.

Unlike uniform vibrations, shocks induced by machinery, equipment or production processes differ in their time profile and intensity. Our application engineers are happy to assist you in selecting the right shock absorber. In addition, selection ranges which suit your needs are available on our homepage.

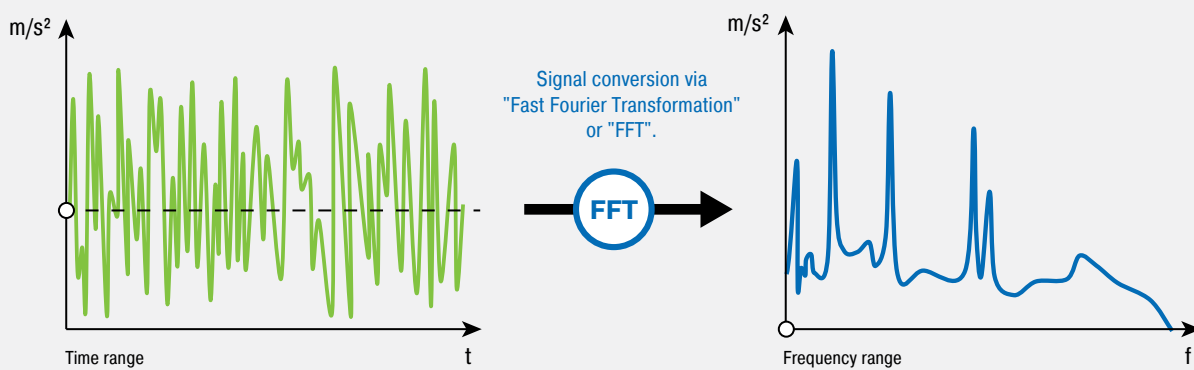
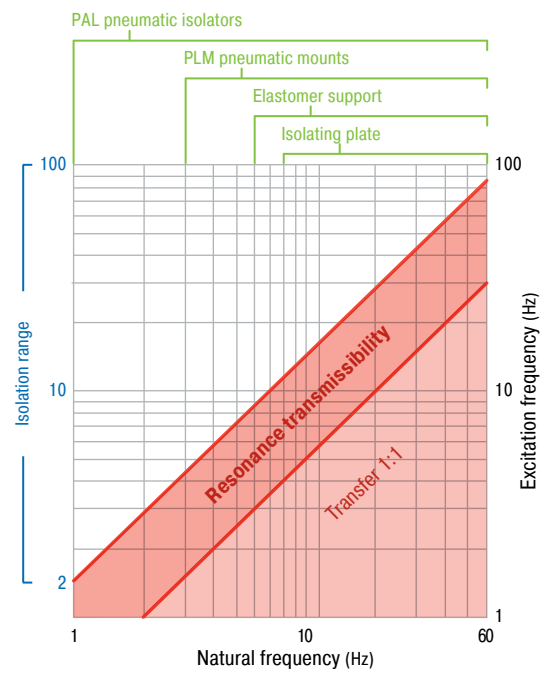
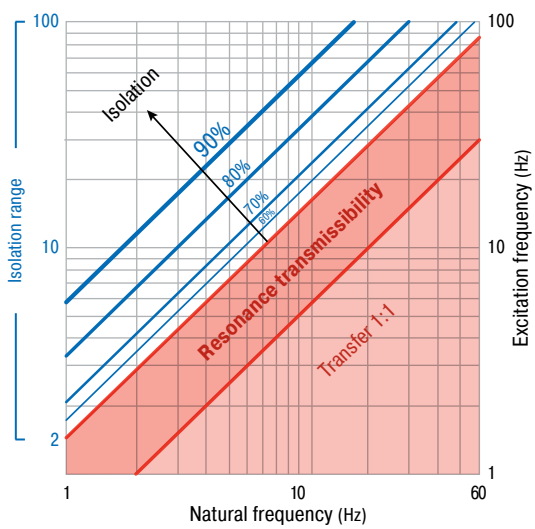
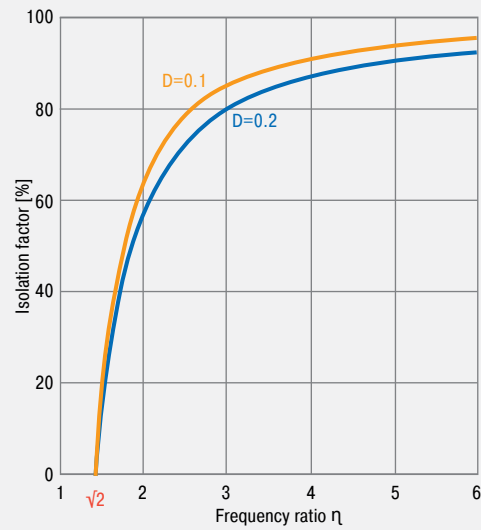
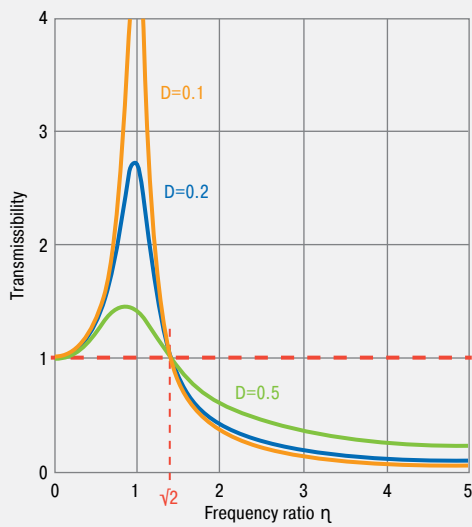
Application ranges of isolators



### More complex vibration states

In case of more complex vibration states, a prior vibration analysis is recommended. In this process, the measured time signal is transformed into the frequency range. This allows for an evaluation of the frequencies for which an isolation is required. The selection of isolation material is then made for the lowest excitation frequency to be isolated.





# ACEolators

## 01

### Rubber-Metal Isolators

LEV, CM, COM, AAM, SFM, BM, UMO, FL

## 02

### Vibration-Isolating Plates

SLAB, CEL, PAD

## 03

### Low-Frequency Air Spring Elements

PLM, PAL

## Application overview

Type	Machines	Transfer systems	Construction Transport	Blower Fan	Foundations	Control units Electrical systems
<b>Rubber-Metal Isolators</b>						
LEV	■	■		■		
CM	■			■		
COM	■	■		■		■
AAM		■				■
SFM						
BM				■		■
UMO	■	■				■
FL	■		■			■
<b>Vibration-Isolating Plates</b>						
SLAB	■	■	■	■	■	
CEL	■	■	■	■	■	
PAD	■		■		■	
<b>Air Spring Elements</b>						
PLM	■					
PAL					■	

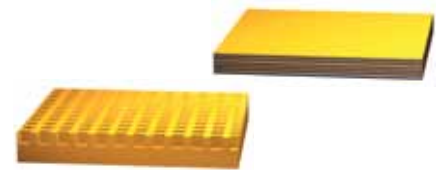
### Ready-to-install isolators for your quick selection

Rubber-metal isolators and machine feet are delivered ready-to-install and can be implemented in a large number of vibration isolation applications. Frequent applications include motors, compressors, transfer systems, machines, fans and blowers.



### Damping technology made to measure through cutting to size and combination

A number of applications, such as machine foundations, bearing surfaces, decoupling elements, pipelines and machinery improvements require a custom-fit solution. With its product series of vibration-isolating plates, ACE offers extensive isolation possibilities. The products are manufactured and delivered according to the requests of customers either as standard plates or as drawn parts.



### Highly effective isolation – it doesn't get much lower!

The low-frequency air spring elements PLM and PAL are a good choice whenever there is a demand for the perfect isolation of measuring tables, test facilities and high-efficiency machines. On request, we will perform an exact system analysis at the site of our customers and develop the right solution.



Issue 06.2013

Off-road	Engines Generators	Compres- sors	Oil and gas industry	Aerospace engineering	Presses	Medicine	Measuring tables	Test benches	Type
<b>Rubber-Metal Isolators</b>									
					■				LEV
■	■	■							CM
	■	■			■				COM
■	■			■		■			AAM
■	■								SFM
■	■			■		■			BM
■	■	■	■	■					UMO
	■	■							FL
<b>Vibration-Isolating Plates</b>									
			■		■	■	■		SLAB
			■		■	■	■	■	CEL
■			■		■				PAD
<b>Air Spring Elements</b>									
					■	■	■	■	PLM
				■			■	■	PAL

## Quick selection of suitable isolation products made easy!

The majority of isolation solutions can be found with the relatively easy use of diagrams. They allow a simple relation to be made between natural frequency, the predominant excitation frequency and the degree of isolation to be expected.

As marked in the diagrams, we recommend the use of products with a theoretical degree of isolation of 50% or higher. Another rough guide value for an efficient and cost-effective vibration isolation is a ratio of roughly 3 between the excitation frequency of the isolator and the predominant natural frequency.

The quick selection guide is based on the physics of a single degree of freedom system. With more complex and non-rigid systems and superstructures, it is always recommended to contact a technical consultant or application engineer.

The selection tables were prepared according to our best knowledge; their use excludes entitlement to legal and warranty claims. On request, ACE offers consultation and measurement services separately to this approximate preselection.

- 1 **Natural frequencies of products** in relation to the load in kg per element (rubber-metal isolators) or N/mm<sup>2</sup> as surface pressure (damping plates).
- 2 **Spring characteristic** according to load or surface pressure.
- 3 **Relationship diagram** with relation between excitation frequency and the required natural frequency of an isolator in relation to the desired isolation result.

### Using the diagram

#### Example

A user has a 1,000 kg machine with 1,800 1/min, which corresponds to an excitation frequency of  $1,800 / 60 = 30$  Hz. Furthermore, the user would like to achieve a good isolation from the floor by using 4 CM cup mounts (250 kg per isolator).

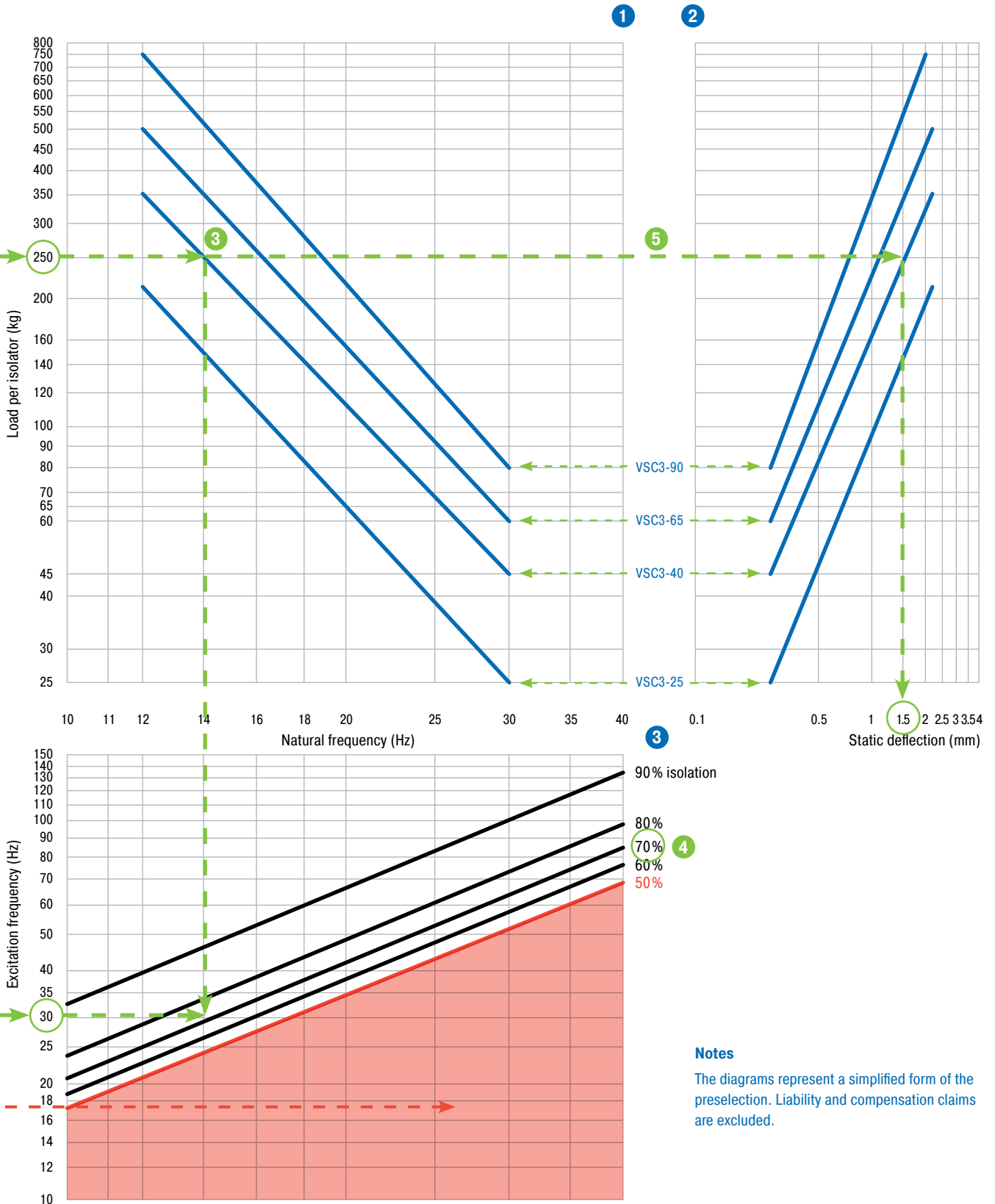
The selection is as follows:

- 1 Draw horizontal line in diagram 1 at 250 kg Load per isolator. The line intersects 3 products as solutions, with the most cost-effective being the CM-VSC3-40 in this case.
- 2 Draw horizontal line in diagram 3 at 30 Hz excitation frequency.
- 3 Draw a vertical line from the intersection point in diagram 1 downwards until the horizontal line previously drawn in diagram 3 is met.
- 4 Now you can simply read the isolation to be anticipated: in this case it is 70%, which represents a good isolation value.
- 5 Continue to draw the horizontal line from diagram 1 until it intersects the product line CM-VSC3-40 in diagram 2. Here the value for the static deflection can be read on the x-axis below. In this example, the reference value is 1.5 mm.

### Critical performance area

In the area shown here in red, there is either no improvement or only a very minor improvement in the starting vibration situation. This critical performance area also corresponds to the area of resonance.

### Example Diagram



**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.

# 01

## Rubber-Metal Isolators


**LEV**
**Levelling Mounts (height-adjustable machine feet)**

Secure, adjustable stabilisation for all types of machines, transfer systems, assembly stations, etc.


**CM**
**Cup Mounts**

For isolating machinery and equipment. Fail-safe isolators for all axes in any installation position. Application examples: compressors, off-road vehicles, engines, fans, etc.


**COM**
**Compression Mounts (pre-tensioned high-performance bearing surface)**

Vertically acting isolators for machinery and equipment. Applications include: blowers, compressors, motors, generators, presses, etc.


**AAM**
**All Attitude Mounts (vibration-isolating fasteners)**

Maintenance free isolators for decoupling parts and components in electronics, aerospace, the military, medicine transfer systems, etc.


**SFM**
**Stable Flex Mounts (stable machine feet)**

Extremely rugged and maintenance-free isolators, e.g. for marine applications, for diesel generators, in power generation or in off-road vehicles.


**BM**
**Bubble Mounts (low-frequency vibration isolators)**

For protecting small devices and electronic components, e.g. in medical technology, aerospace, electronic systems or computers.


**UMO**
**Universal Mounts (universal connection isolators)**

Maintenance-free connection isolators which can be implemented both radially and axially. Application examples: conveying systems, machinery and equipment, off-road, oil and gas industry, control systems, etc.


**FL**
**Flex Locs (quick fastening elements)**

Simple, efficient components with versatile applications as isolating fasteners for decoupling structure-borne sound in enclosures, housings, equipment and machinery. For application in mechanical engineering, in buildings, vehicles, or navigation.



# LEV

## Levelling Mounts

### Height-adjustable machine feet

**Height-adjustable machine feet from the LEV product group are maintenance-free and ready-for-installation.**

**The precise, adjustable LEV machine feet are used whenever machines require an adjustable, stable positioning.**

Their function ensures the secure positioning of machinery and equipment, protecting them against damaging shocks and vibrations. LEV machine feet can be supplied in different sizes, from M10 to M24 threads, and can secure and bear loads in these sizes from 45 to 5,900 kg.

The selection of suitable machine feet is simply made via the given mass of the machine or plant distributed among the desired support points. A weight distribution within the system must be considered in such a way that the feet are also measured with the associated load component. If additional dynamic loads are exerted by the machine or plant, the next largest type must be chosen in a borderline static load case.

The mounts meet OSHA requirements for anchoring machines.

#### Properties

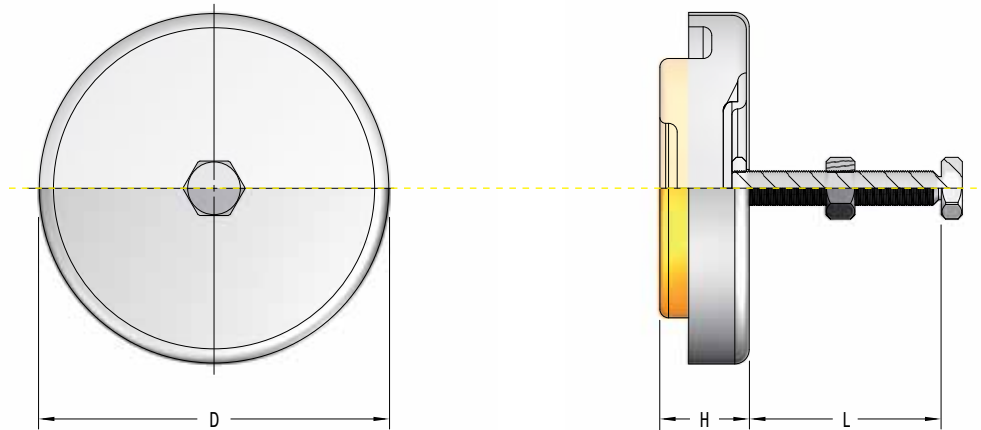
- Easy to level
- Vibration-reducing
- Noise-reducing
- Improved product quality
- Maintenance-free
- Compensates for floor unevenness
- Special models available on request
- Special vibration-isolating feet according to design and custom-made product

#### Areas of application

- Injection moulding machines
- Conveyors
- Production and processing centres
- Assembly stations
- Small presses, etc.



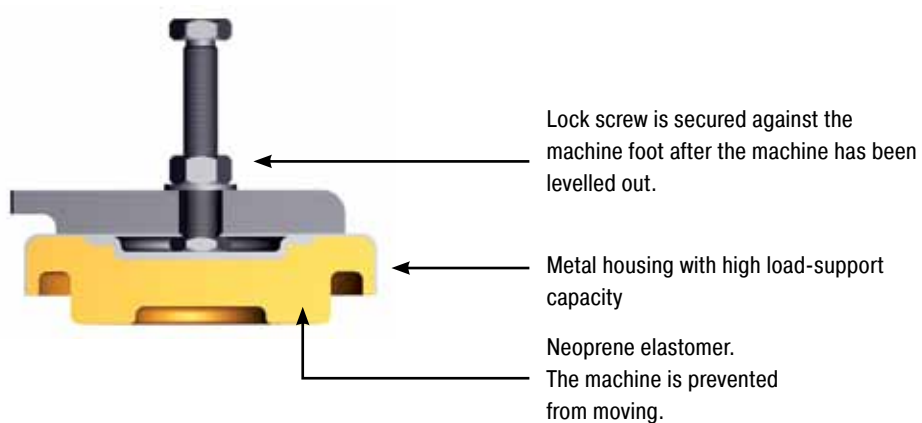
## LEV M10 to M24



Type	Min. load kg	Max. load kg	Thread M	L mm	D mm	H mm
<a href="#">LEV-52221-M10</a>	45	230	M10 x 1.5	80	80	38
<a href="#">LEV-52224-M12</a>	135	450	M12 x 1.75	130	120	38
<a href="#">LEV-52226-M20</a>	230	2040	M20 x 2.5	130	160	41
<a href="#">LEV-52229-M24</a>	1815	5900	M24 x 3.0	180	230	57

Standard delivery with hexagon nut

### Installation sketch





# CM

## Cup Mounts

**The CM cup mounts protect machinery, vehicles and equipment against damaging vibrations and shocks. They are maintenance-free machine elements.**

The correct function of the mounts is guaranteed even in an arduous environment due to the pretensioned, fail-safe design of the machine elements. The low-profile CMs are able to isolate machine parts from each other in an effective way. The CMs can be installed in the applications freely in space (X, Y and Z) and at any inclination. Standard CMs are manufactured and delivered with neoprene as damping material.

For applications in the areas of heavy shocks (off-road) and extreme temperatures, we recommend the use of the CMs with high-damping silicone as damping material. Under normal loading conditions, the CMs have a natural frequency of approx. 25 Hz (please refer to the selection diagram for more exact values).

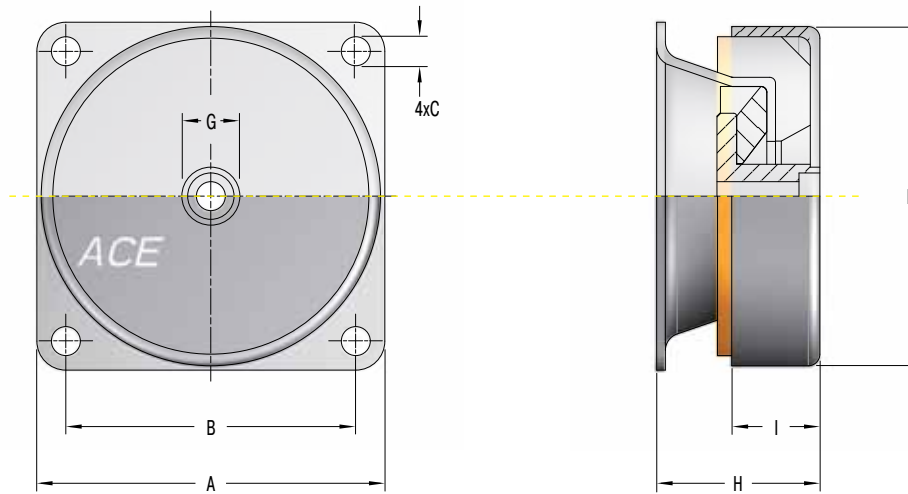
### Properties

- Fail-safe
- Can be installed in all spatial axes
- Can be used for shear, compressive and tensile loads
- Available with centric thread or through-hole
- All metal parts galvanised, aluminium or stainless steel optionally available
- Temperature range -30 °C to +80 °C for neoprene
- Temperature range -60 °C to +150 °C for high-damping silicone

### Areas of application

- Compressors and other vibrating machines
- Electronic control units and systems
- Crusher plants
- Fans and blowers in construction machinery and in buildings
- Off-road vehicles
- Shipbuilding
- Aircraft construction

## CM-VSC1 / CM-VSC2 / CM-VSC3



Type	Thread G	Screw-in depth mm	A mm	B mm	D mm	C mm	H mm	I mm	Weight kg
<b>CM-VSC1-2</b>	M6 or M8	20	60	49.5	58	5.5	28	18	0.2
<b>CM-VSC1-4</b>	M6 or M8	20	60	49.5	58	5.5	28	18	0.2
<b>CM-VSC1-7</b>	M6 or M8	20	60	49.5	58	5.5	28	18	0.2
<b>CM-VSC1-10</b>	M6 or M8	20	60	49.5	58	5.5	28	18	0.2
<b>CM-VSC2-5</b>	M10 or M12	30	76	63.5	76	6.4	38	25	0.45
<b>CM-VSC2-10</b>	M10 or M12	30	76	63.5	76	6.4	38	25	0.45
<b>CM-VSC2-15</b>	M10 or M12	30	76	63.5	76	6.4	38	25	0.45
<b>CM-VSC2-25</b>	M10 or M12	30	76	63.5	76	6.4	38	25	0.45
<b>CM-VSC2-40</b>	M10 or M12	30	76	63.5	76	6.4	38	25	0.45
<b>CM-VSC3-25</b>	M16	19	133	108	124	11.9	63	38	1.8
<b>CM-VSC3-40</b>	M16	19	133	108	124	11.9	63	38	1.8
<b>CM-VSC3-65</b>	M16	19	133	108	124	11.9	63	38	1.8
<b>CM-VSC3-90</b>	M16	19	133	108	124	11.9	63	38	1.8

### Difference between stationary and mobile application in the selection diagrams

Stationary applications are those in which the cup mounts isolate stationary machines, plants, etc.

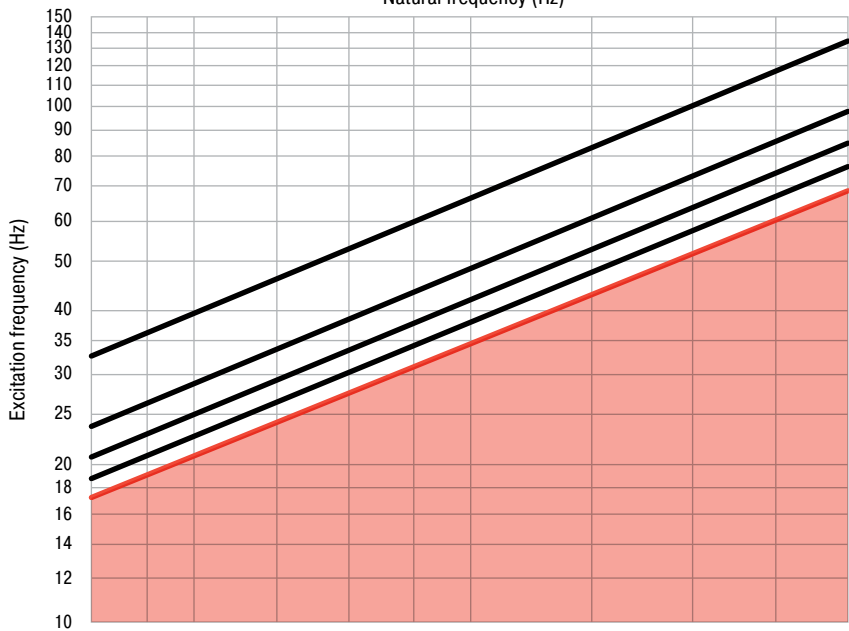
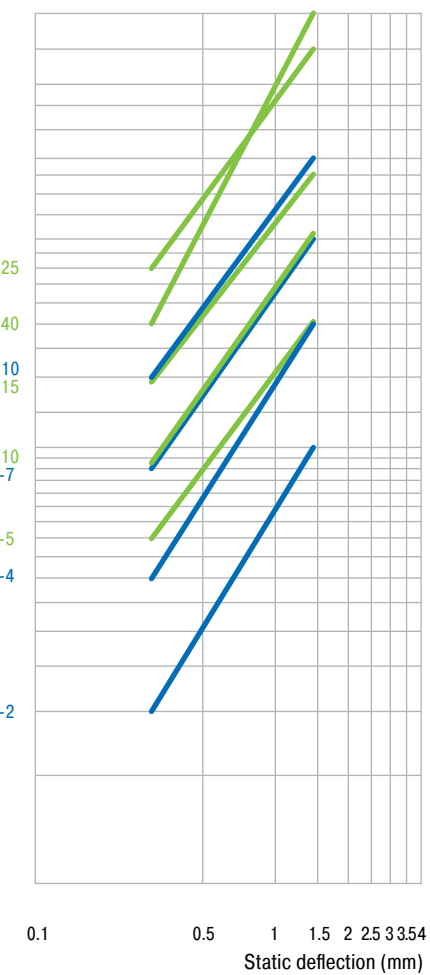
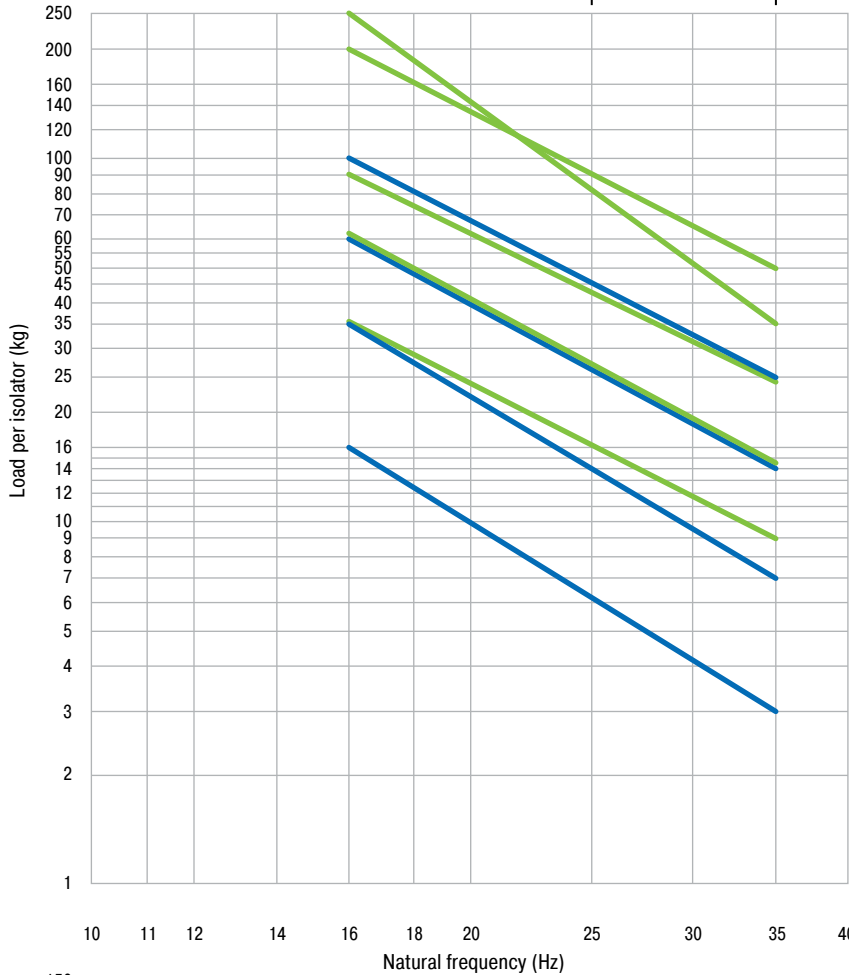
Mobile applications, however, refer to applications in which the cup mounts isolate engines, rotors or other parts on moving vehicles. Their range of application is reduced because, in addition to static load, there are additional dynamic loads exerted by the movement which must be considered.

CM – Cup Mounts



# CM-VSC1 / CM-VSC2

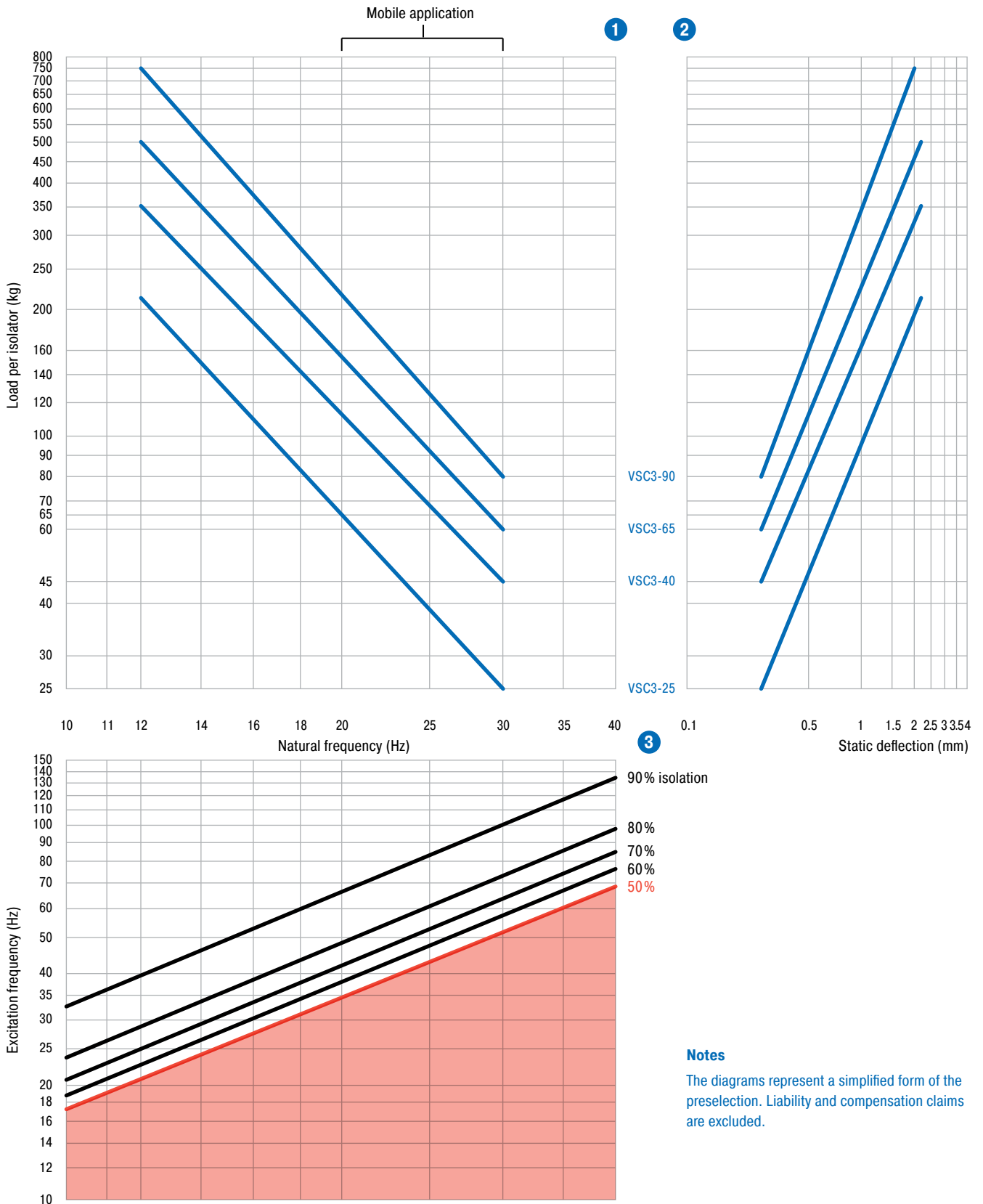
Mobile application 1 2



**Notes**  
The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



### CM-VSC3





# COM

## Compression Mounts

### Pre-tensioned high-performance bearing surfaces

**The COM compression mounts are pre-tensioned high-performance bearing surface elements for vertically isolating machines and plants. These extremely rugged elastomer bearing surfaces are primarily used in heavy-duty applications, such as in pumps and compressors.**

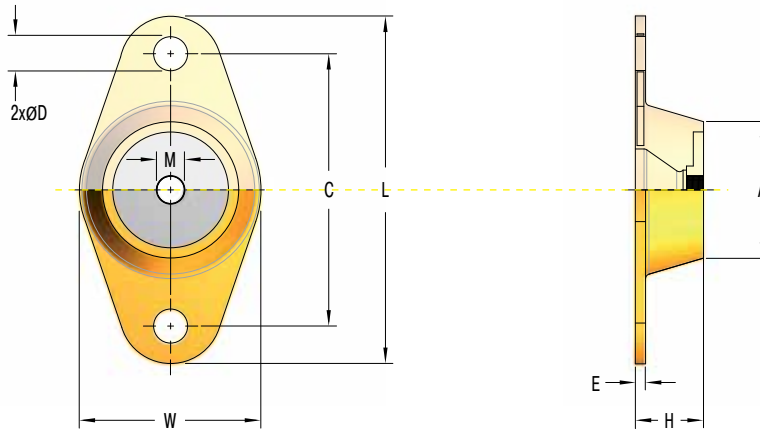
In their operating range, the COMs exhibit a low natural frequency of approx. 8 to 15 Hz and can when necessary be coupled for certain applications, whereby the natural system frequency can be further reduced to approx. 6 to 10 Hz (please refer to the selection diagram for more exact data). They are often used in situations in which unbalanced machine parts cause shocks and vibrations which can have a negative impact on the surrounding area. Disturbance frequencies from 900 min<sup>-1</sup> (15 Hz) are effectively isolated. With excitation frequencies of 25 Hz, the degree of isolation of the COMs is 90%. Through the use of the pre-tensioned high-performance bearing surfaces, structure-borne noise paths become interrupted, preventing the generation of resonant sound.

#### Properties

- Pre-tensioned to enhance efficiency
- Isolates structure-borne noise
- Low-frequency application range from about 15 Hz
- Rugged
- Maintenance-free

#### Areas of application

- Centrifuges
- Blowers
- Vibrators and crusher plants
- Compressors and ventilation systems
- Injection moulding systems
- Switch cabinets
- Military and off-road



## COM-5250x / COM-5252x / COM-5254x



Type	Colour code*	Max. load kg	Thread M	L mm	W mm	H mm	A mm	C mm	D mm	E mm
COM-52501	blue	15.9	M8 X 1.25	79.4	44.5	25.4	31.8	60.3	8.7	4.8
COM-52502	black	20.4	M8 X 1.25	79.4	44.5	25.4	31.8	60.3	8.7	4.8
COM-52503	red	31.8	M8 X 1.25	79.4	44.5	25.4	31.8	60.3	8.7	4.8
COM-52504	green	54.4	M8 X 1.25	79.4	44.5	25.4	31.8	60.3	8.7	4.8
COM-52521	blue	61.2	M10 X 1.5	98.4	60.3	31.8	44.5	76.2	8.7	5.6
COM-52522	black	77.1	M10 X 1.5	98.4	60.3	31.8	44.5	76.2	8.7	5.6
COM-52523	red	108.9	M10 X 1.5	98.4	60.3	31.8	44.5	76.2	8.7	5.6
COM-52524	green	172.4	M10 X 1.5	98.4	60.3	31.8	44.5	76.2	8.7	5.6
COM-52525	grey	249.5	M10 X 1.5	98.4	60.3	31.8	44.5	76.2	8.7	5.6
COM-52541	black	113.4	M12 X 1.75	139.7	85.7	44.5	63.5	104.8	14.3	6.4
COM-52542	red	238.1	M12 X 1.75	139.7	85.7	44.5	63.5	104.8	14.3	6.4
COM-52543	green	340.2	M12 X 1.75	139.7	85.7	44.5	63.5	104.8	14.3	6.4
COM-52544	grey	499.0	M12 X 1.75	139.7	85.7	44.5	63.5	104.8	14.3	6.4

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

## COM-5251x / COM-5253x / COM-5255x



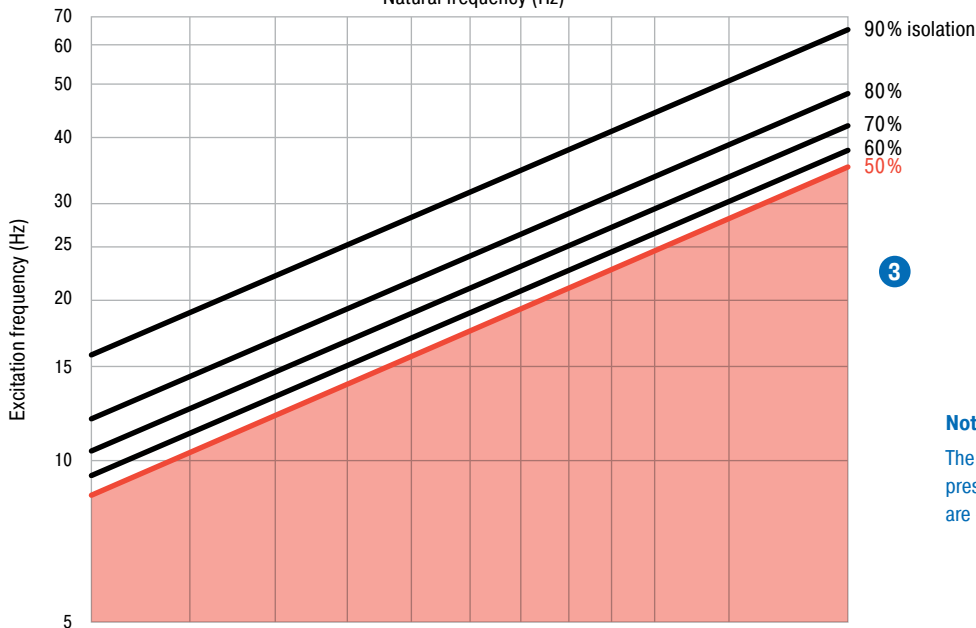
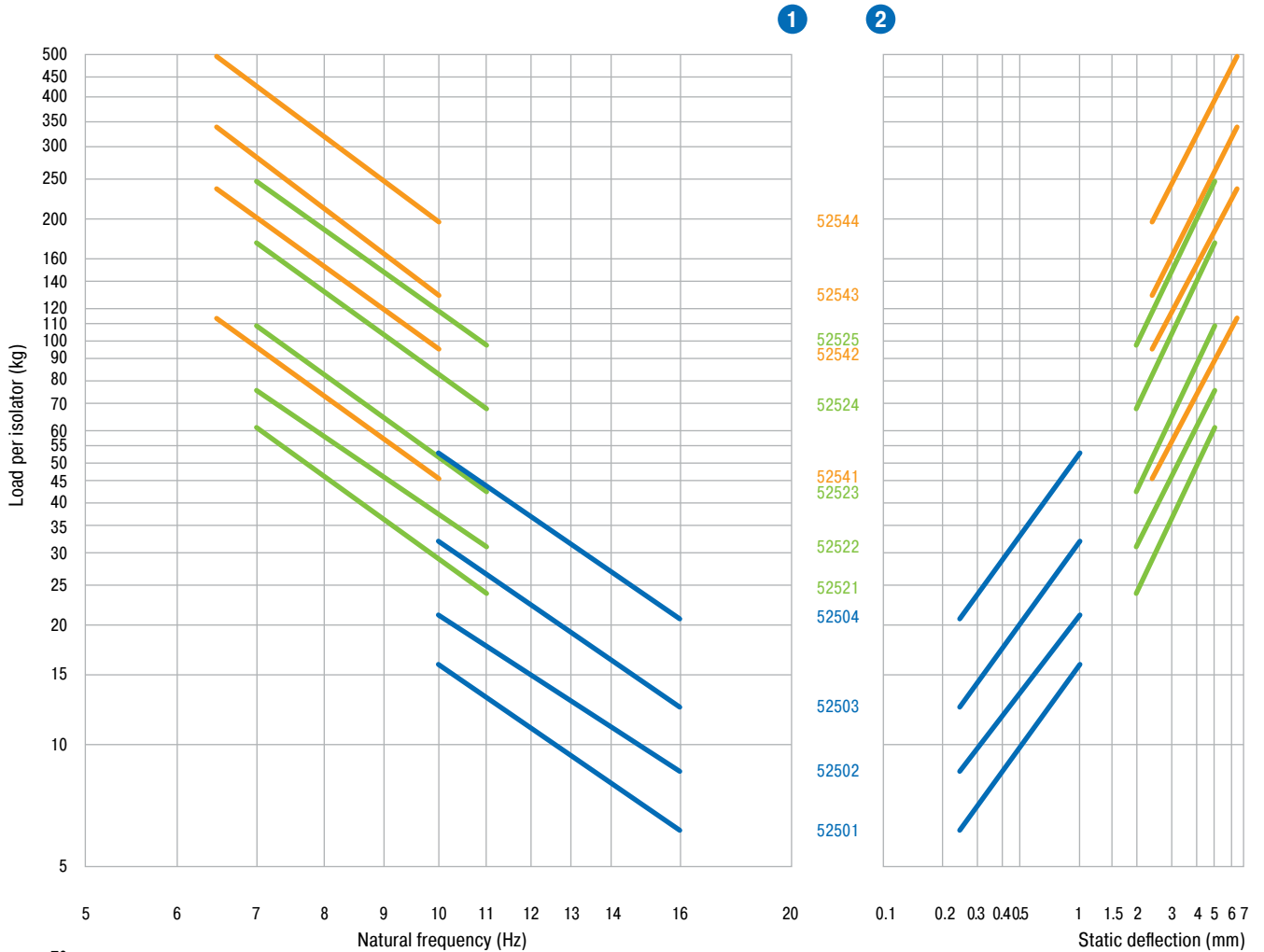
Type	Colour code*	Max. load kg	Thread M	L mm	W mm	H mm	A mm	C mm	D mm	E mm
COM-52511	blue	15.9	M8 X 1.25	79.4	44.5	31.8	31.8	60.3	8.7	4.8
COM-52512	black	20.4	M8 X 1.25	79.4	44.5	31.8	31.8	60.3	8.7	4.8
COM-52513	red	31.8	M8 X 1.25	79.4	44.5	31.8	31.8	60.3	8.7	4.8
COM-52514	green	54.4	M8 X 1.25	79.4	44.5	31.8	31.8	60.3	8.7	4.8
COM-52531	blue	61.2	M10 X 1.5	98.4	60.3	44.5	44.5	76.2	8.7	5.6
COM-52532	black	77.1	M10 X 1.5	98.4	60.3	44.5	44.5	76.2	8.7	5.6
COM-52533	red	108.9	M10 X 1.5	98.4	60.3	44.5	44.5	76.2	8.7	5.6
COM-52534	green	172.4	M10 X 1.5	98.4	60.3	44.5	44.5	76.2	8.7	5.6
COM-52535	grey	249.5	M10 X 1.5	98.4	60.3	44.5	44.5	76.2	8.7	5.6
COM-52551	black	113.4	M12 X 1.75	139.7	85.7	73	63.5	104.8	14.3	6.4
COM-52552	red	238.1	M12 X 1.75	139.7	85.7	73	63.5	104.8	14.3	6.4
COM-52553	green	340.2	M12 X 1.75	139.7	85.7	73	63.5	104.8	14.3	6.4
COM-52554	grey	499.0	M12 X 1.75	139.7	85.7	73	63.5	104.8	14.3	6.4

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

COM – Compression Mounts



# COM-5250x / COM-5252x / COM-5254x



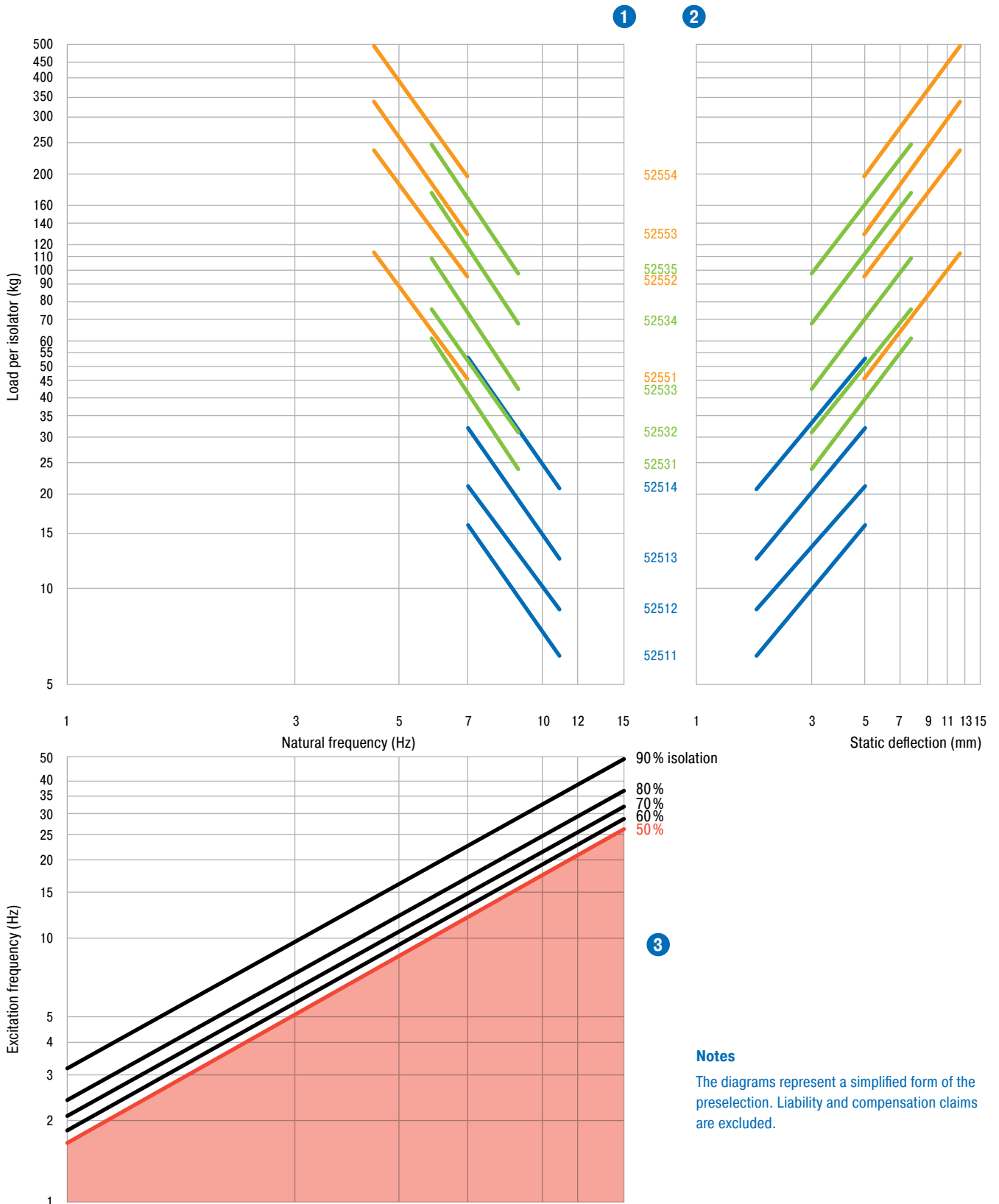
**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.





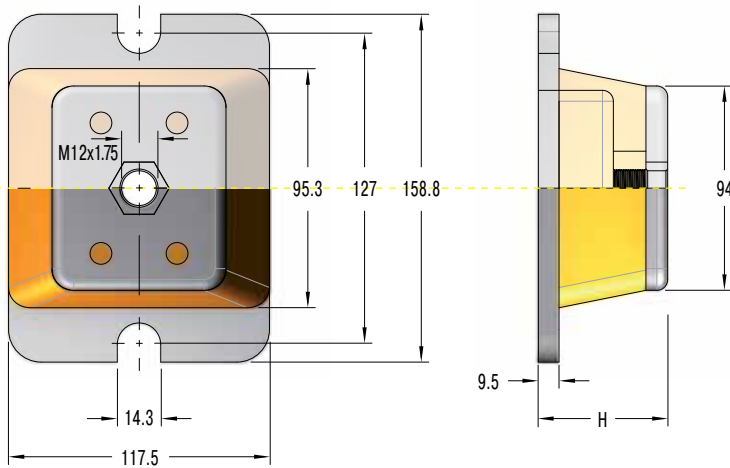
### COM-5251x / COM-5253x / COM-5255x



**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.

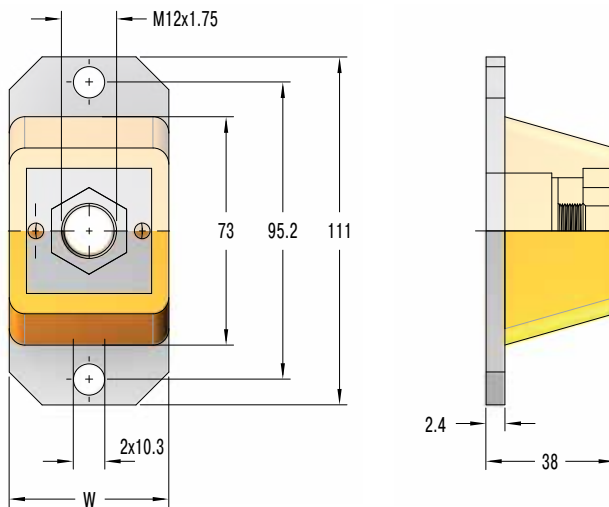
## COM-5256x / COM-5257x



Type	Colour code*	Max. load kg	H mm
COM-52561	black	680.4	41.3
COM-52562	red	1020.6	41.3
COM-52563	green	1360.8	41.3
COM-52564	grey	1814.4	41.3
COM-52571	black	680.4	69.9
COM-52572	red	1020.6	69.9
COM-52573	green	1360.8	69.9
COM-52574	grey	1814.4	69.9

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

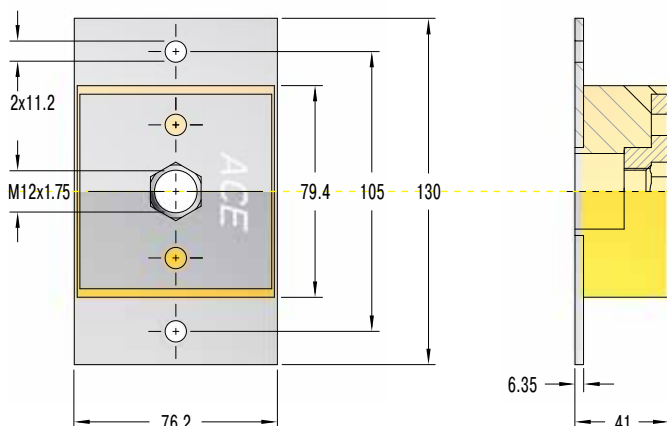
## COM-5216x



Type	Colour code*	Max. load kg	W mm
COM-52160	yellow	27.2	50.8
COM-52161	red	45.4	50.8
COM-52162	green	68.0	50.8
COM-52163	blue	90.7	50.8
COM-52164	red	90.7	101.6
COM-52165	green	127.0	101.6
COM-52166	blue	226.8	101.6
COM-52167	white	317.5	101.6

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

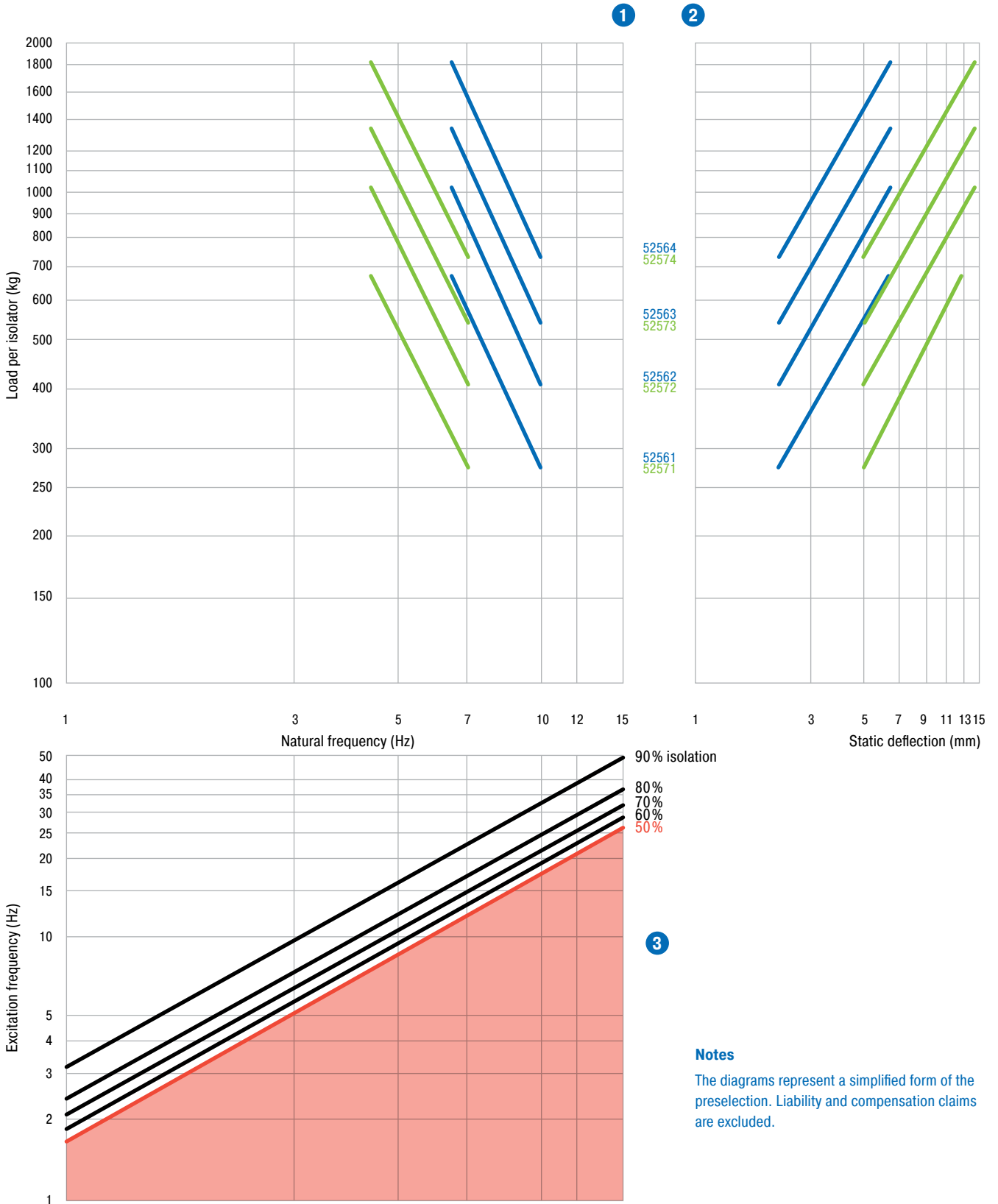
## COM-5217x



Type	Colour code*	Max. load kg
COM-52171	red	317.5
COM-52172	green	453.6
COM-52173	blue	680.4
COM-52174	white	1134.0

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

### COM-5256x / 5257x



**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.

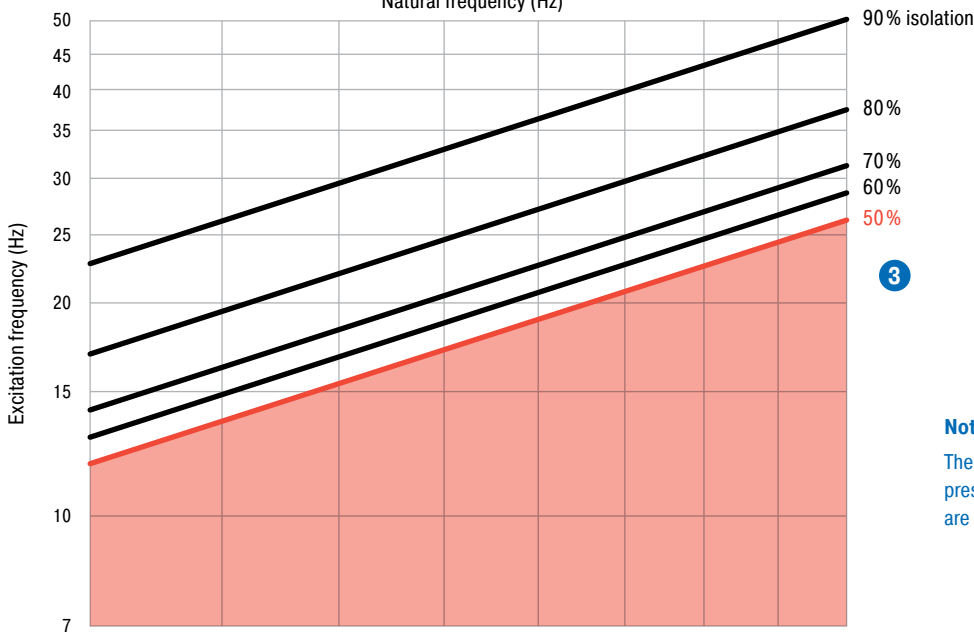
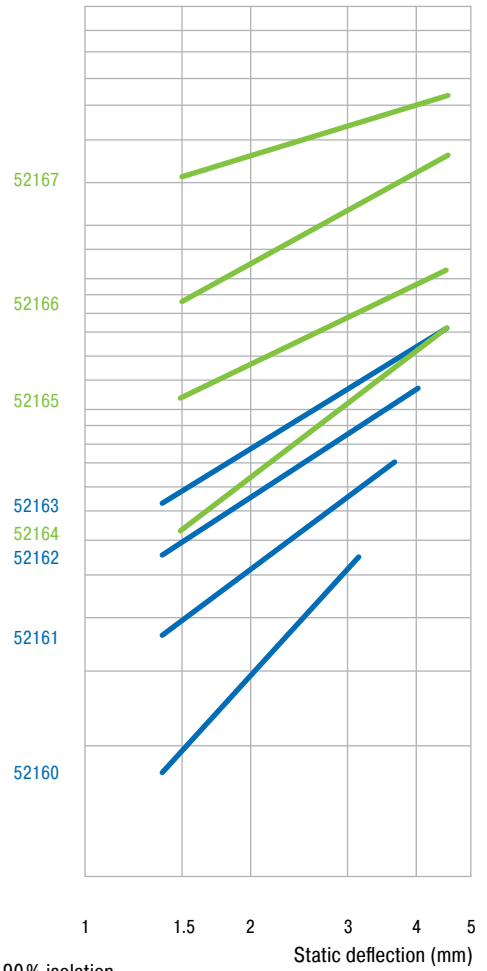
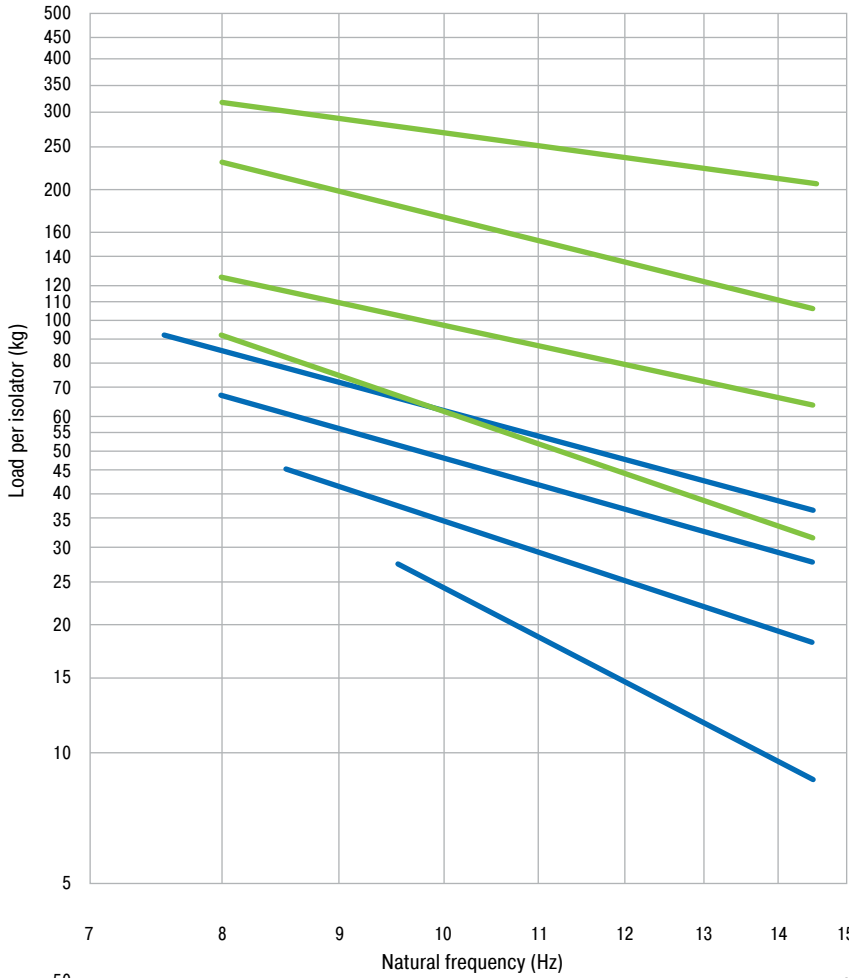
COM – Compression Mounts



# COM-5216x

1

2



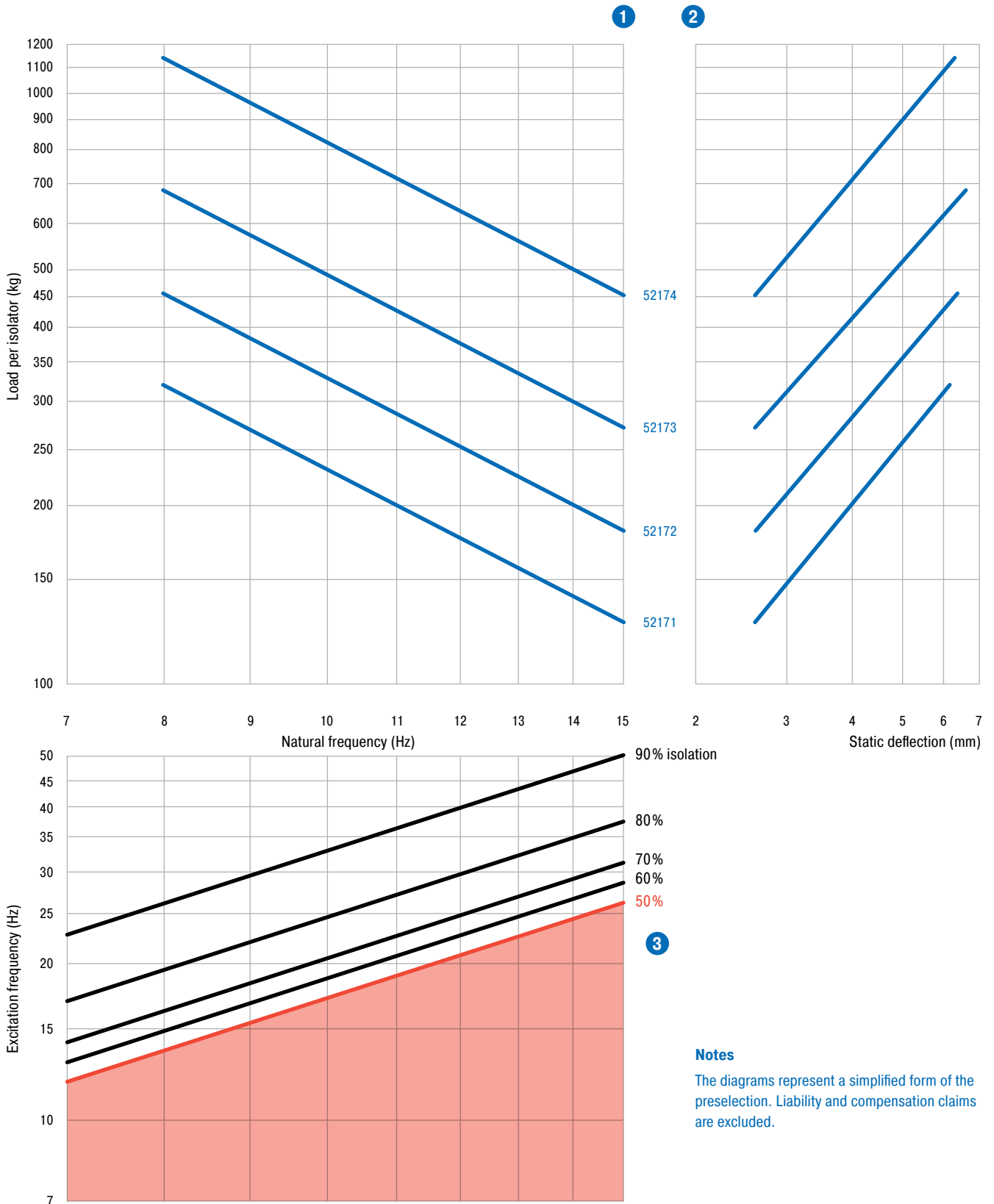
3

**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.

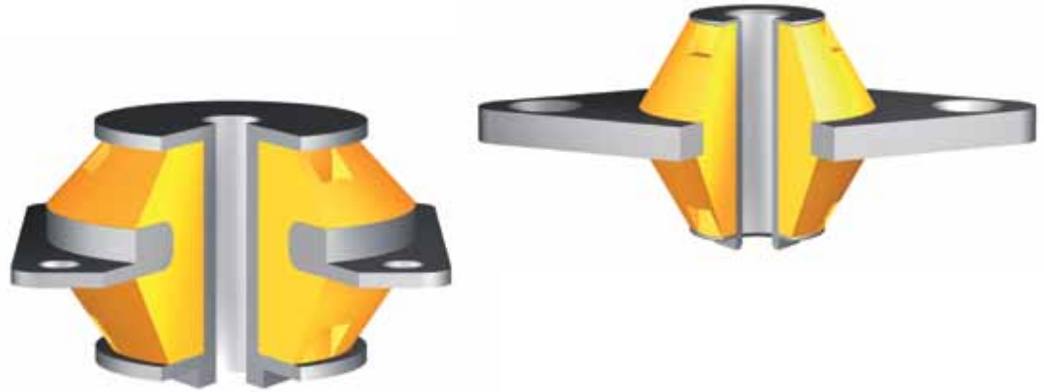


## COM-5217x



#### Notes

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



# AAM

## All Attitude Mounts

### Vibration-isolating fasteners

**The vibration-isolating fasteners (all-attitude mounts) of the AAM product group are maintenance-free and ready-to-install isolators that can reduce vibrations and shocks in all directions. The isolation effect is achieved by a special neoprene- or silicone-elastomer.**

For applications in which shock absorption is particularly important, the AAMs can also be manufactured with high-damping silicone. The elements can be installed in all spatial axes. The AAM range is used mainly for isolating lighter electronic equipment and components.

#### Properties

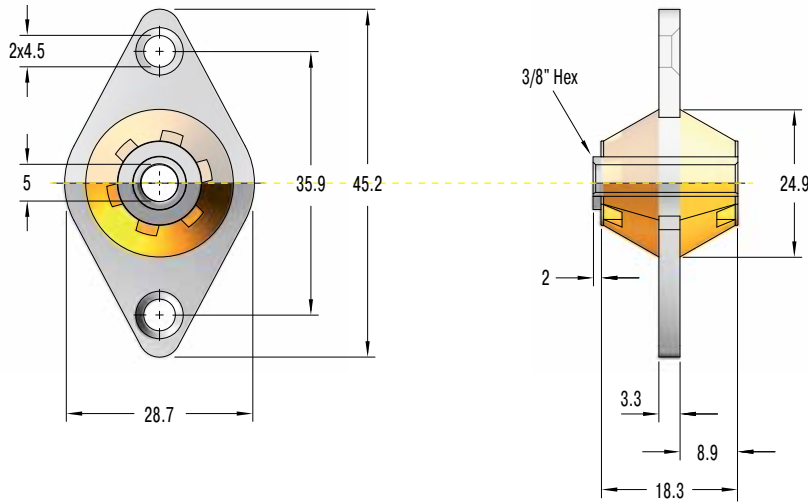
- Can be used in all spatial axes and inclinations
- Standard with neoprene
- Special applications with high-damping silicone possible
- Shock absorption possible

#### Areas of application

- Electronic equipment and control units
- Off-road
- Military



### AAM-5642x

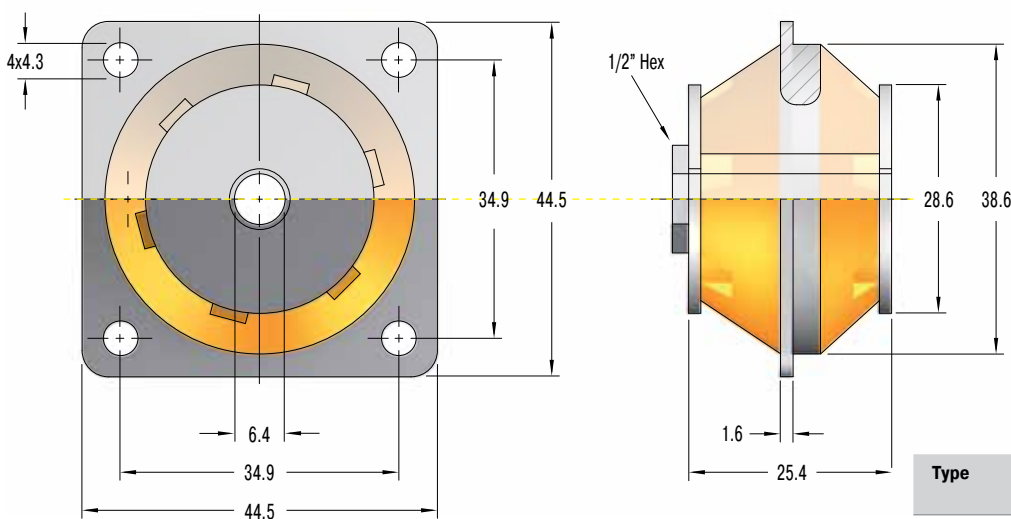


Type	Colour code*	Max. load kg
AAM-56423	grey	1.4
AAM-56424	red	2.0
AAM-56425	yellow	3.2
AAM-56426	green	4.5

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

Damping Material: Silicone

### AAM-5220x



Type	Colour code*	Max. load kg
AAM-52205	red	6.8
AAM-52206	green	11.3
AAM-52207	yellow	15.9
AAM-52208	blue	22.7

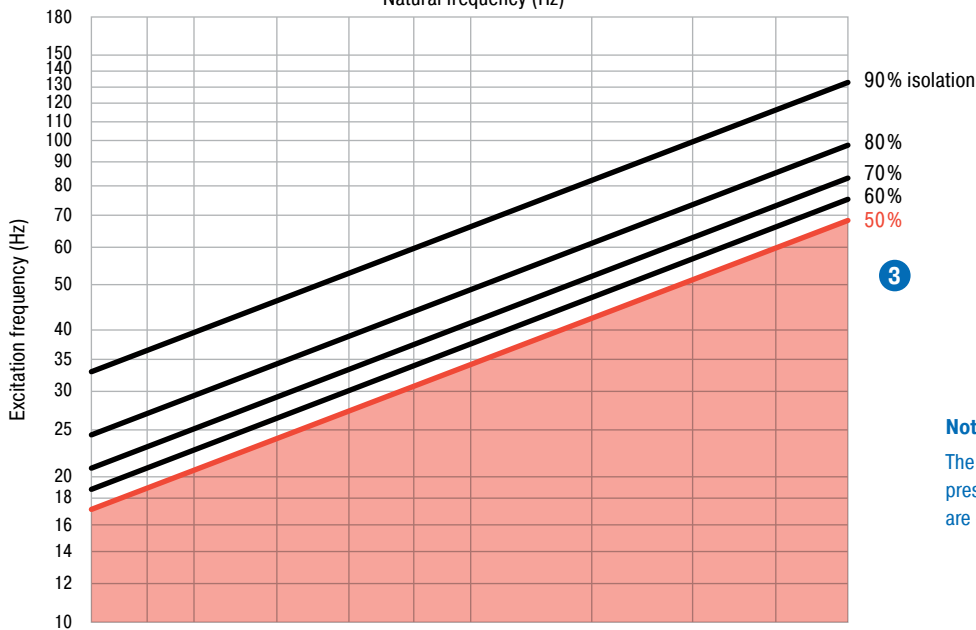
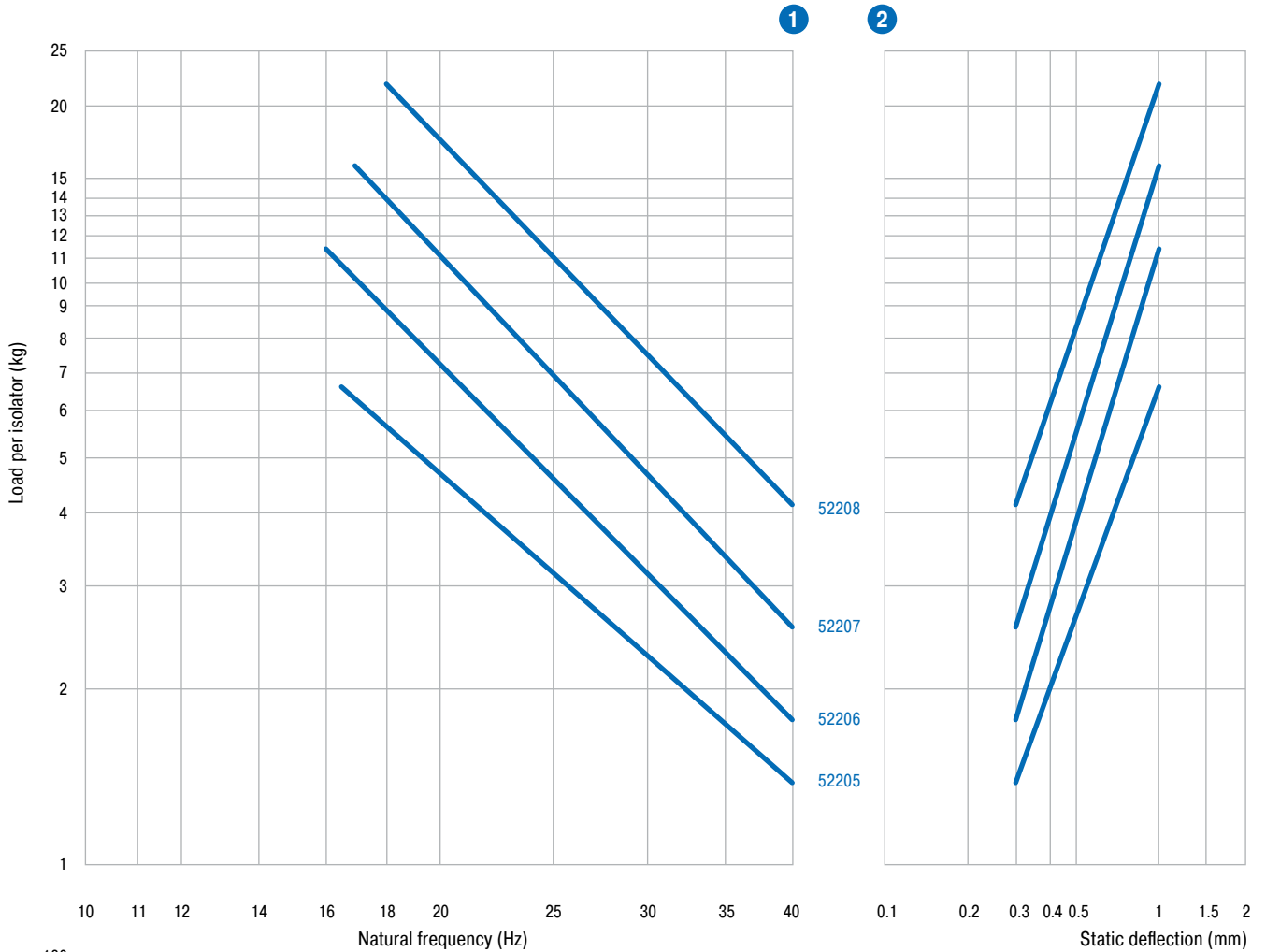
\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.

Damping material: Neoprene, silicone alternatively available

AAM – All Attitude Mounts



# AAM-5220x



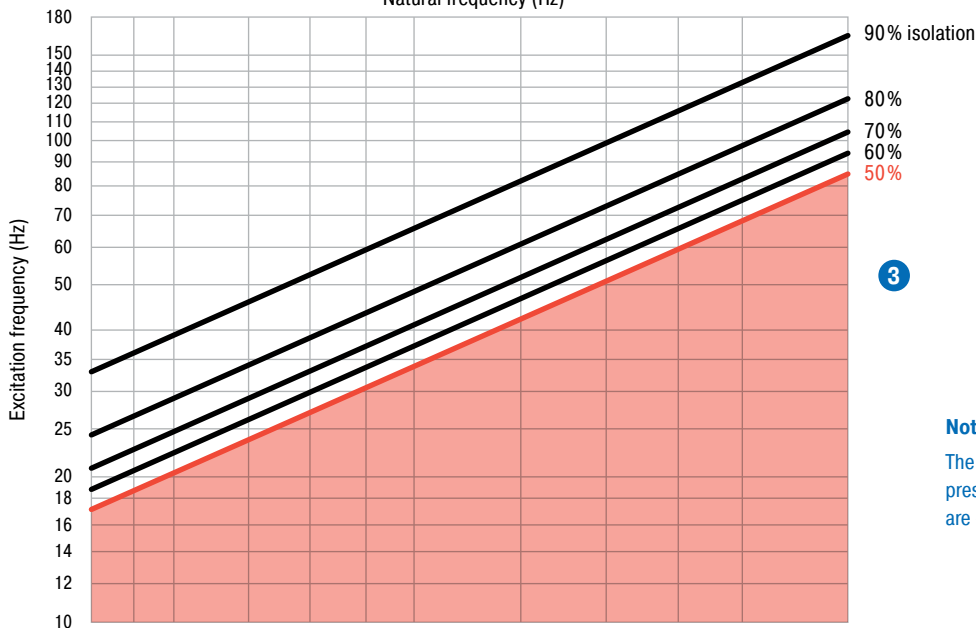
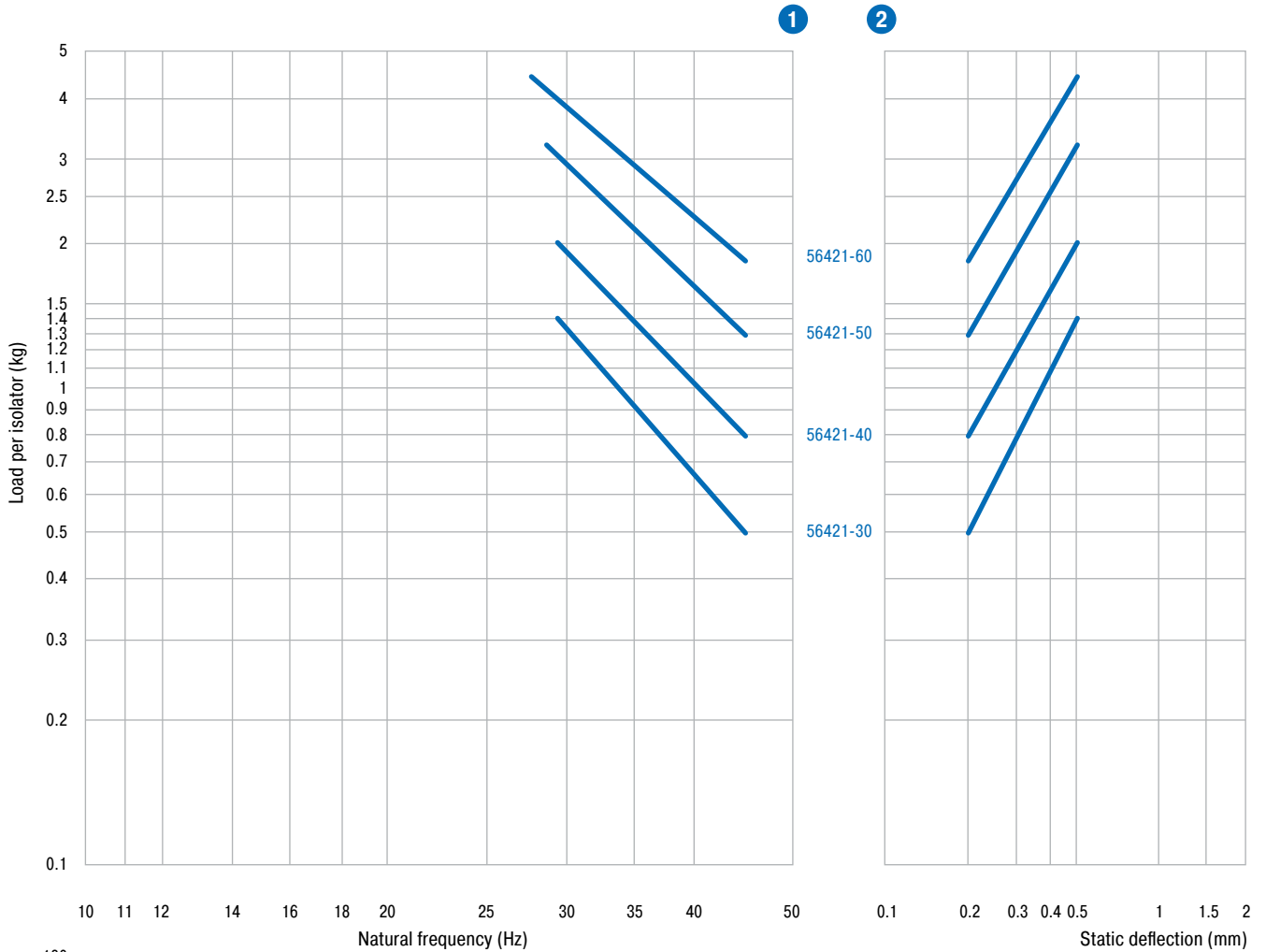
**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.





### AAM-5642x



**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



# SFM

## Stable Flex Mounts

### Stable machine feet

**These rugged, fail-safe isolators of the SFM product group are maintenance-free, ready-to-install machine elements. Neoprene is used as the standard damping material for these extremely effective fasteners.**

The isolators are used in marine applications and for diesel generators. The SFMs are available in three sizes for applications from 50 kg to 1,000 kg. Their longitudinal rigidity exceeds their transverse rigidity by a factor of 2.5. Under a working load, the SFMs have a natural frequency of only 8 Hz.

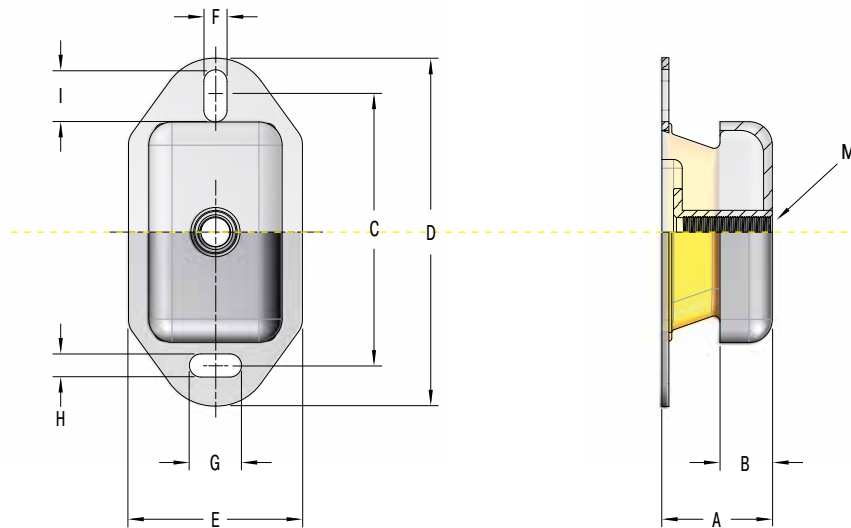
#### Properties

- Fail-safe
- Low natural frequency
- Rugged
- Versatile
- Maintenance-free

#### Areas of application

- Power generation
- Off-road
- Diesel and marine applications

## SFM-52010-xx / SFM-52011-xx / SFM-52012-xx



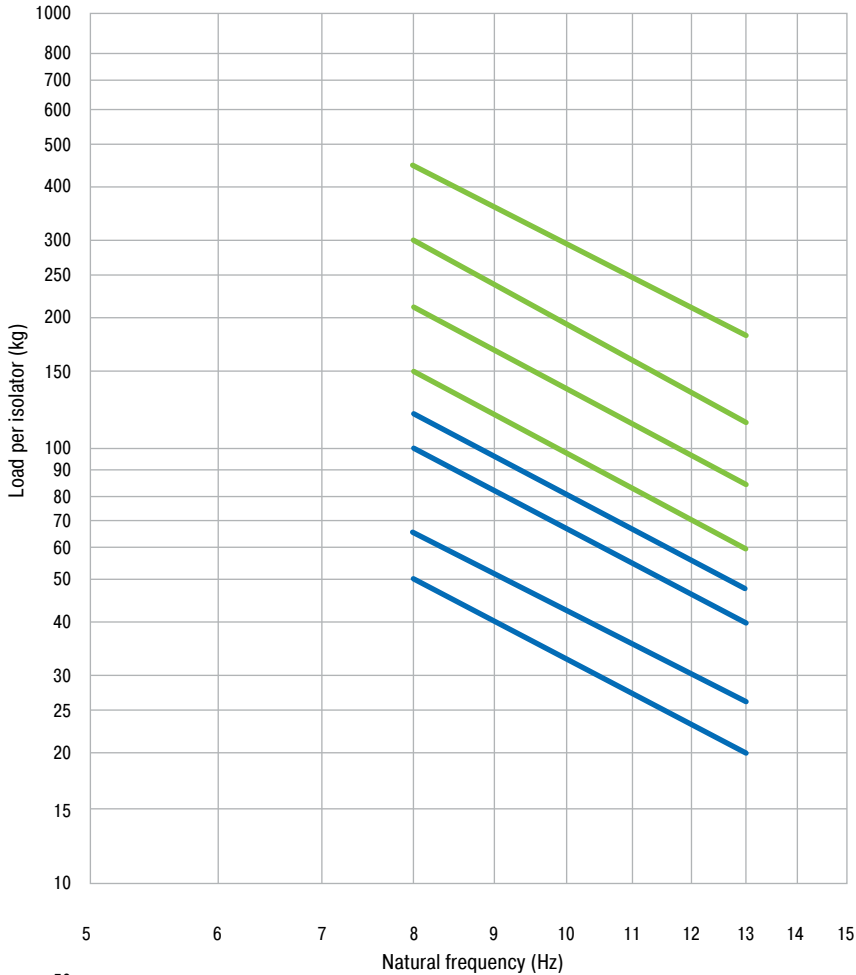
Type	Max. load kg	Thread M	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm
<b>SFM-52010-45</b>	49.9	M12	38.6	20.1	100.1	119.9	59.9	14.2	14.0	10.9	14.0
<b>SFM-52010-55</b>	65.8	M12	38.6	20.1	100.1	119.9	59.9	14.2	14.0	10.9	14.0
<b>SFM-52010-65</b>	99.8	M12	38.6	20.1	100.1	119.9	59.9	14.2	14.0	10.9	14.0
<b>SFM-52010-75</b>	120.2	M12	38.6	20.1	100.1	119.9	59.9	14.2	14.0	10.9	14.0
<b>SFM-52011-45</b>	149.7	M16	50.0	27.9	140.0	182.9	74.9	13.0	30.0	13.0	20.3
<b>SFM-52011-55</b>	210.9	M16	50.0	27.9	140.0	182.9	74.9	13.0	30.0	13.0	20.3
<b>SFM-52011-65</b>	299.4	M16	50.0	27.9	140.0	182.9	74.9	13.0	30.0	13.0	20.3
<b>SFM-52011-75</b>	449.1	M16	50.0	27.9	140.0	182.9	74.9	13.0	30.0	13.0	20.3
<b>SFM-52012-45</b>	349.3	M20	72.6	41.9	182.1	228.1	112.0	18.0	34.0	18.0	26.7
<b>SFM-52012-55</b>	519.4	M20	72.6	41.9	182.1	228.1	112.0	18.0	34.0	18.0	26.7
<b>SFM-52012-65</b>	703.1	M20	72.6	41.9	182.1	228.1	112.0	18.0	34.0	18.0	26.7
<b>SFM-52012-75</b>	997.9	M20	72.6	41.9	182.1	228.1	112.0	18.0	34.0	18.0	26.7



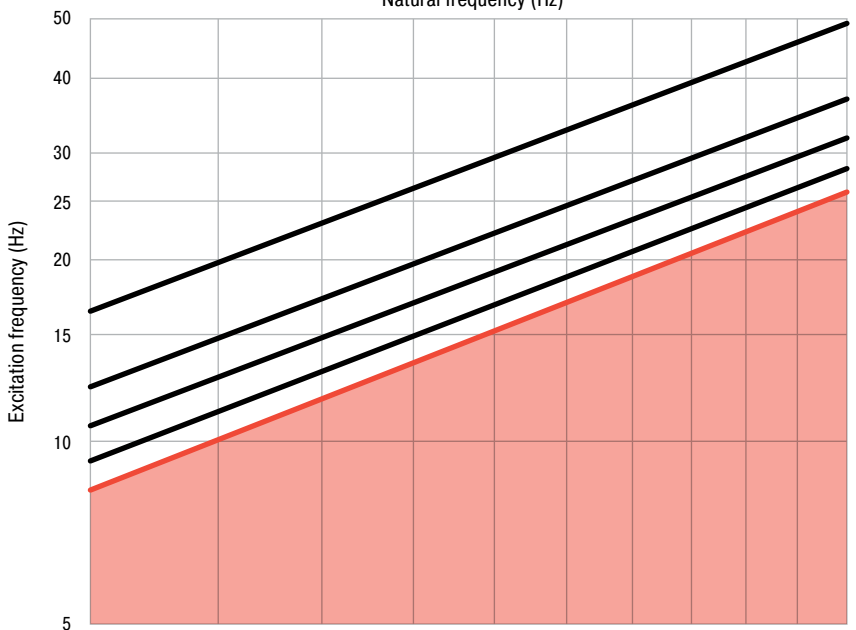
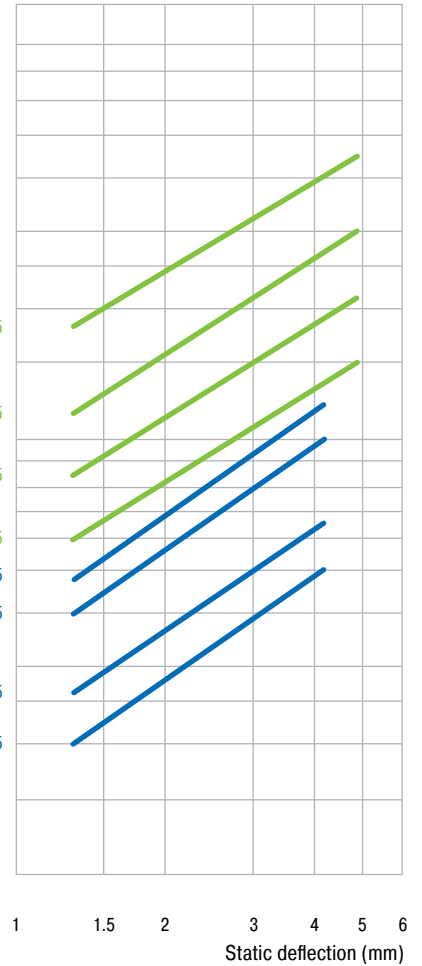
# SFM-52010 / SFM-52011

1

2



52011-75  
52011-65  
52011-55  
52011-45  
52010-75  
52010-65  
52010-55  
52010-45



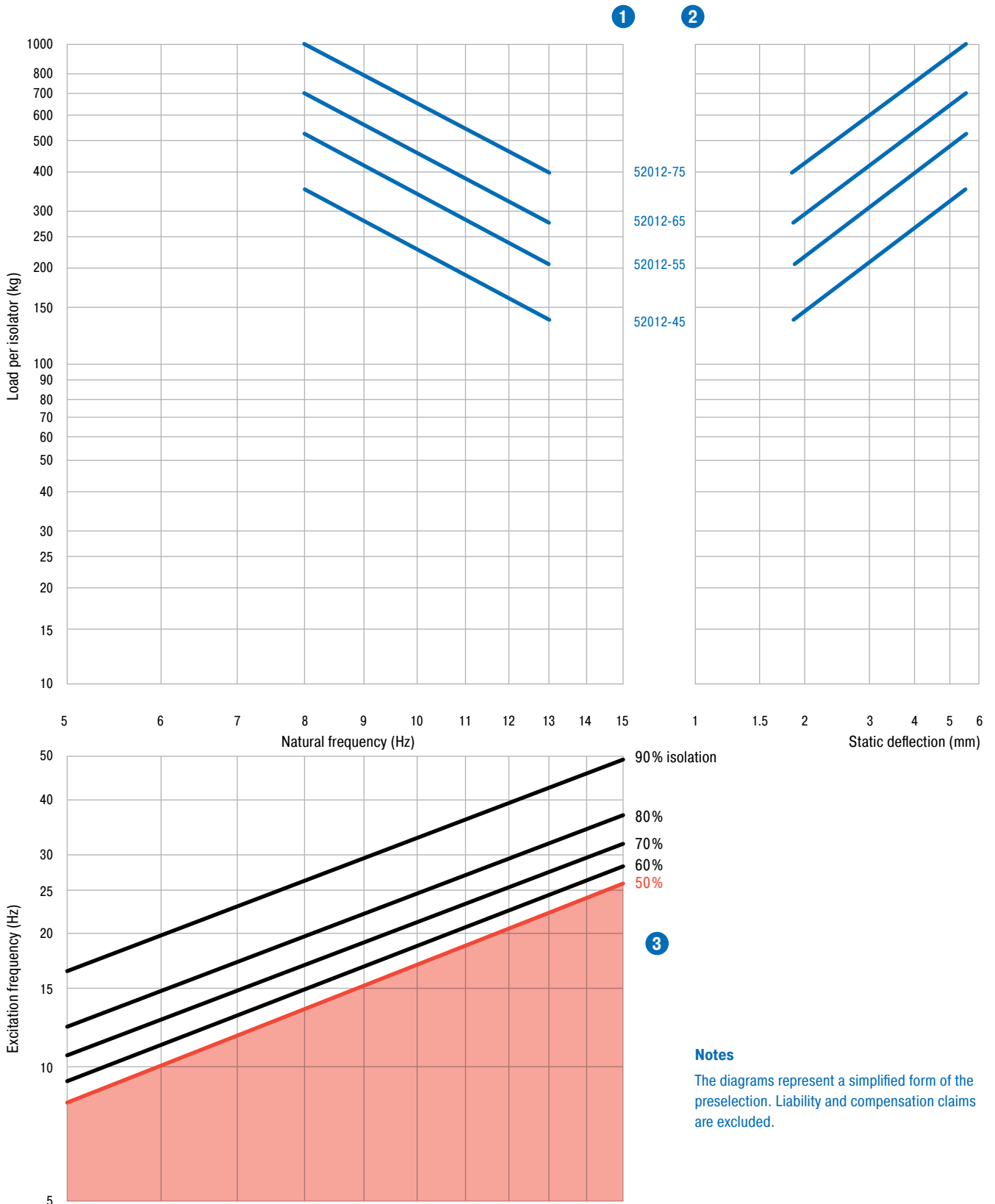
3

**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



## SFM-52012



#### Notes

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



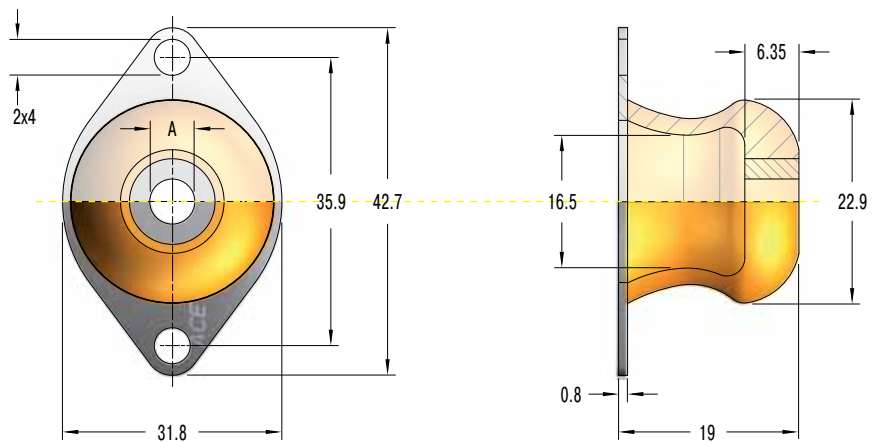
# BM

## Bubble Mounts

### Low-frequency vibration isolators

The **BM low-frequency vibration dampers** are used to isolate small devices, electronic components and control units.

BMs are mainly used in vertical compressive stresses under load. They efficiently protect electronic or medical equipment against damaging vibrations and shocks.



## BM-5064x

## BM-5068x

### Properties

- Good shock absorption
- Low natural frequency
- Small, light design

### Areas of application

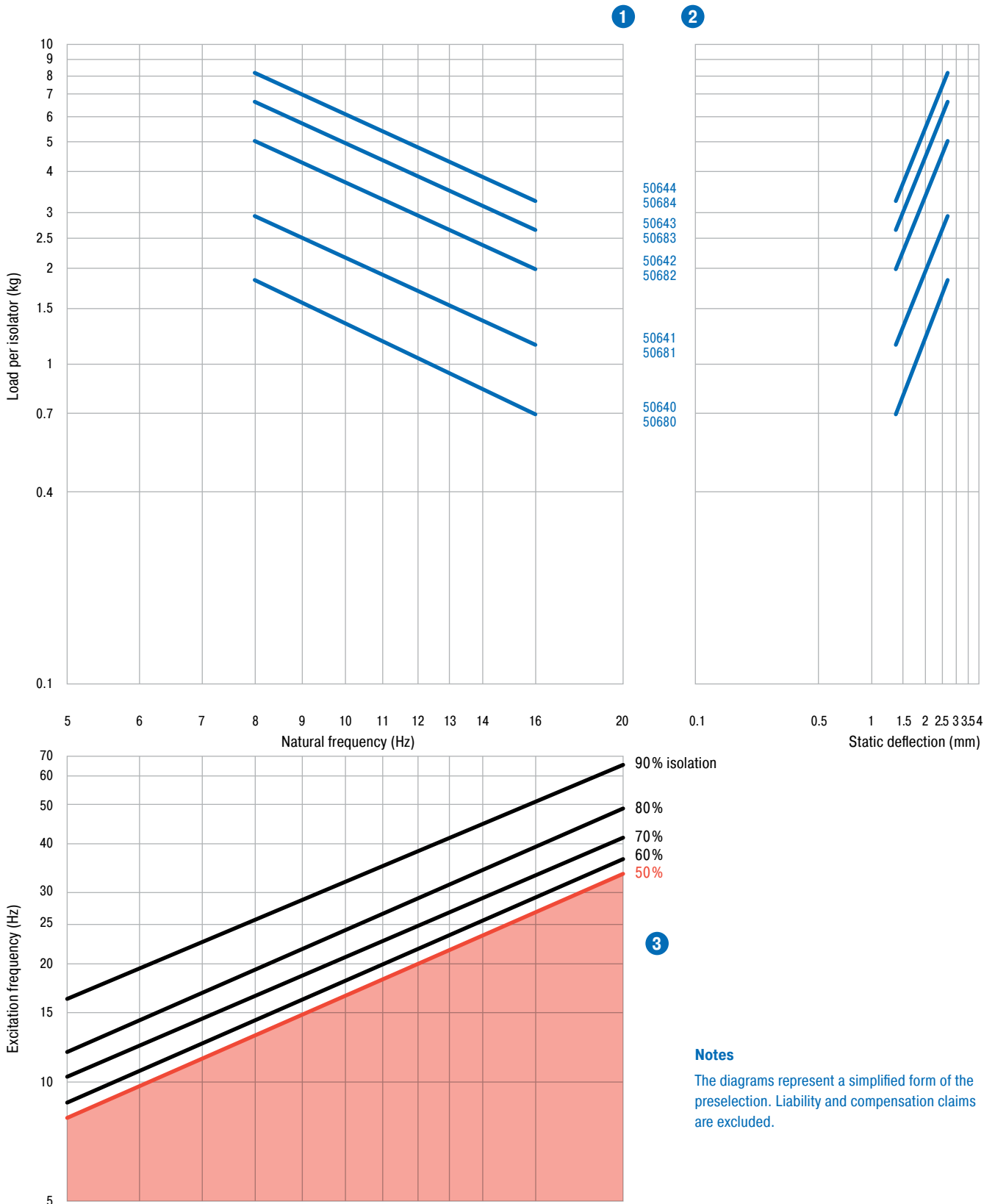
- Medical technology
- Computers
- Electronic equipment
- Aerospace

Type	Colour code*	Max. load kg	A mm
<b>BM-50640</b>	yellow	1.8	4.3
<b>BM-50641</b>	red	2.9	4.3
<b>BM-50642</b>	green	5.0	4.3
<b>BM-50643</b>	blue	6.8	4.3
<b>BM-50644</b>	white	8.2	4.3
<b>BM-50680</b>	yellow	1.8	6.5
<b>BM-50681</b>	red	2.9	6.5
<b>BM-50682</b>	green	5.0	6.5
<b>BM-50683</b>	blue	6.8	6.5
<b>BM-50684</b>	white	8.2	6.5

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.



### BM-5064x / BM-5068x



**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



# UMO

## Universal Mounts

### Universal connection isolators

**UMOs (universal mounts) are two-part isolators for connecting machines or plants with bordering components, such as cabins or housings.**

The UMOs can be installed in any spatial position and effectively decouple two components from each other. A galvanised metal limiting sleeve is vulcanised into the elastomer cylinders. The UMOs can be used within the wide temperature range of  $-30^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$ .

#### Properties

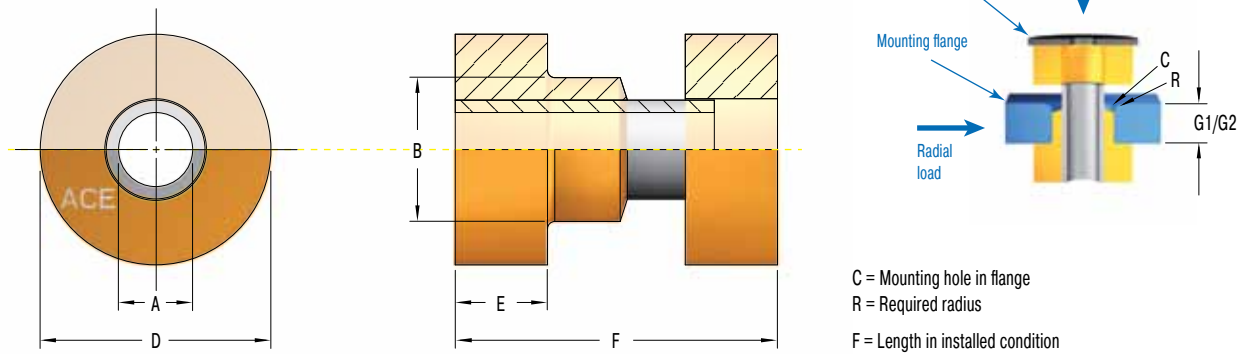
- Any installation position, all spatial axes and angles
- Simple design
- Fail-safe with the use of stop washers
- Oil, fuel and solvent-resistant neoprene
- Special design in high-damping silicone possible

#### Areas of application

- Machinery and equipment
- Conveying systems
- Compressors
- Generators
- Shipbuilding
- Construction machines
- Agricultural machines
- Off-road vehicles
- Transport industry



## UMO-600xx



Type	A mm	B mm	C mm	D mm	E mm	F mm	G1 mm	G2 mm	R mm
UMO-60011 - 60015	9.9	19.8	19.0	31.8	12.7	31.8	9.4		0.75
UMO-60021 - 60025	13.5	33.3	31.8	47.5	19.8	49.3	12.7	14.2	1.5
UMO-60031 - 60035	16.3	39.4	38.1	64.3	22.9	62.2	19.1	22.4	2.0
UMO-60041 - 60045	23.9	58.4	57.2	88.9	25.4	73.2	25.4	28.0	3.0
UMO-60051 - 60055	26.9	64.8	63.5	124.0	31.8	85.9	25.4	28.4	3.0

Type	Colour code*	Shore (+5)	Load with plate thickness G1				Load with plate thickness G2			
			axial kg	radial kg	fe Hz	T1 Nm	axial kg	radial kg	fe Hz	T2 Nm
UMO-60011	yellow	35	20	10	15	10				
UMO-60012	red	45	40	15	15	10				
UMO-60013	green	55	65	20	15	10				
UMO-60014	blue	65	115	25	15	10				
UMO-60015	white	75	140	30	15	10				
UMO-60021	yellow	35	30	20	15	13	60	25	12	14
UMO-60022	red	45	55	40	15	13	80	30	12	14
UMO-60023	green	55	75	60	15	13	110	40	12	14
UMO-60024	blue	65	120	80	15	13	175	75	12	14
UMO-60025	white	75	175	130	15	13	285	125	12	14
UMO-60031	yellow	35	40	30	15	19	95	40	11	22
UMO-60032	red	45	70	50	15	19	160	65	11	22
UMO-60033	green	55	105	75	15	19	220	100	11	22
UMO-60034	blue	65	150	110	15	19	390	175	11	22
UMO-60035	white	75	230	165	15	19	600	315	11	22
UMO-60041	yellow	35	70	50	15	25	125	60	10	28.6
UMO-60042	red	45	100	100	15	25	230	105	10	28.6
UMO-60043	green	55	140	140	15	25	350	155	10	28.6
UMO-60044	blue	65	180	180	15	25	530	265	10	28.6
UMO-60045	white	75	265	265	15	25	950	440	10	28.6
UMO-60051	yellow	35	70	70	15	25	515	110	10	32
UMO-60052	red	45	100	100	15	25	875	155	10	32
UMO-60053	green	55	140	140	15	25	1170	275	10	32
UMO-60054	blue	65	215	215	15	25	1600	400	10	32
UMO-60055	white	75	300	300	15	25	2065	640	10	32

\* The colour code is for identifying the loading capacity. The products are marked in colour accordingly.



# FL

## Flex Locs

### Quick fastening elements

**FLs are removable quick fastening elements for vibration isolation and shock absorption as well as the isolation of structure-borne noise. Their extremely simple design is so selected that only one element can be used to effectively decouple two components from each other by tightening a fastening screw.**

Standard metric screws (M3 to M8) can be used to tighten the connecting elements; no additional special tools are required. The FL elastic fasteners can be fixed via the screw connection into blind holes to connect panel elements to existing structures, for example. The inner threaded insert serves as an expansion element for fastening. The EPDM material used is resistant to ozone, oil and most acids. Standard FLs are available in 5 sizes from M3 to M8.

#### Properties

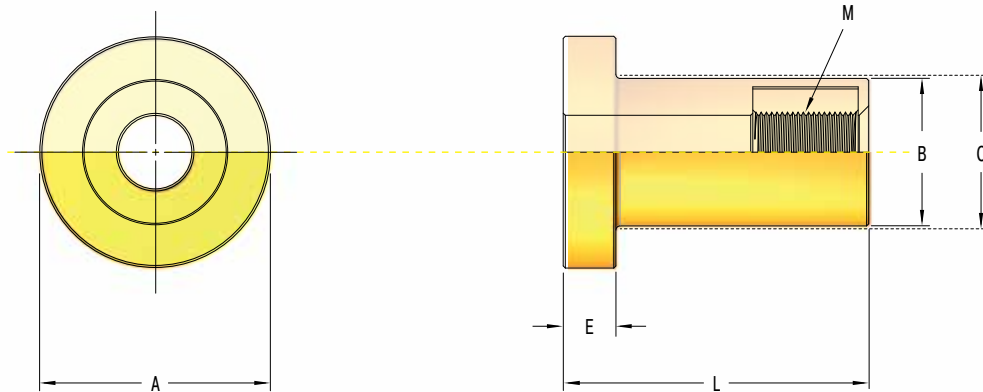
- Easy handling
- Efficient decoupling of housings
- No special tools necessary
- Isolates structure-borne noise
- Fail-safe
- Resistant to oil, most acids and ozone

#### Areas of application

- Machines and assemblies
- Tiling, sheets and flanges
- Attachments to buildings
- Vehicles and transport industry
- Construction machines



### FL-Q-x



Type	Sheet assembly		Blind hole assembly	Thread M	A mm	B mm	C <sup>1</sup> mm	E mm	L mm	P <sup>2</sup> mm	T I <sup>3</sup> Nm	T II <sup>4</sup> Nm
	Pressure kg	Shear kg										
FL-Q-3	5	2.5	1.0	M3	9	6.7	7.2 <sup>0</sup> <sub>-0.3</sub>	2.5 <sup>+0.4</sup> <sub>0</sub>	11.5 <sup>+1</sup> <sub>-0.5</sub>	0.6 - 2.5	0.4 - 0.5	0.3 - 0.4
FL-Q-4	7	3.5	1.0	M4	12	8.5	9.3 <sup>0</sup> <sub>-0.3</sub>	3.0 <sup>+0.4</sup> <sub>0</sub>	14.5 <sup>+1</sup> <sub>-0.5</sub>	0.8 - 3.3	0.4 - 0.6	0.4 - 0.5
FL-Q-5	10	5.0	1.5	M5	15	9.8	10.2 <sup>0</sup> <sub>-0.3</sub>	3.5 <sup>+0.4</sup> <sub>0</sub>	18.0 <sup>+1</sup> <sub>-0.5</sub>	0.8 - 4.3	0.6 - 1.0	0.5 - 0.6
FL-Q-6	14	7.0	3.0	M6	18	12.0	12.7 <sup>0</sup> <sub>-0.3</sub>	4.0 <sup>+0.4</sup> <sub>0</sub>	21.0 <sup>+/-1</sup>	1.5 - 5.0	2.3 - 3.5	0.7 - 0.9
FL-Q-8	28	14.0	5.0	M8	24	16.0	16.5 <sup>0</sup> <sub>-0.5</sub>	5.0 <sup>+0.4</sup> <sub>0</sub>	27.0 <sup>+/-1</sup>	1.5 - 6.5	3.0 - 4.0	1.6 - 1.8

- 1 Corresponds to mounting hole
- 2 Sheet thickness
- 3 Tightening torque T I (Drawing 01)
- 4 Tightening torque T II (Drawing 02)

#### Sheet assembly

Drawing 01



#### Blind hole assembly

Drawing 02



# 02

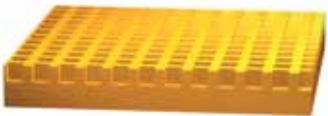
## Vibration-Isolating Plates



**SLAB**

**Universal Damping Plates**

For application on foundations for plants and machines, compressors, in pump stations, generators, for insulations, measuring tables, buildings, etc.



**CEL**

**Low-Frequency Damping Plates**

For use in foundations, buildings, transport routes, bridges, stairs, test benches, pump stations, generators, compressors, machines, etc.



**PAD**

**Rugged Fibre and Elastomer Plates**

For isolating and protecting foundations, e.g. of presses, plants, machines, as well as for use in pump stations, crane runways, bridges and heavy-duty applications

# Vibration-isolation made to measure

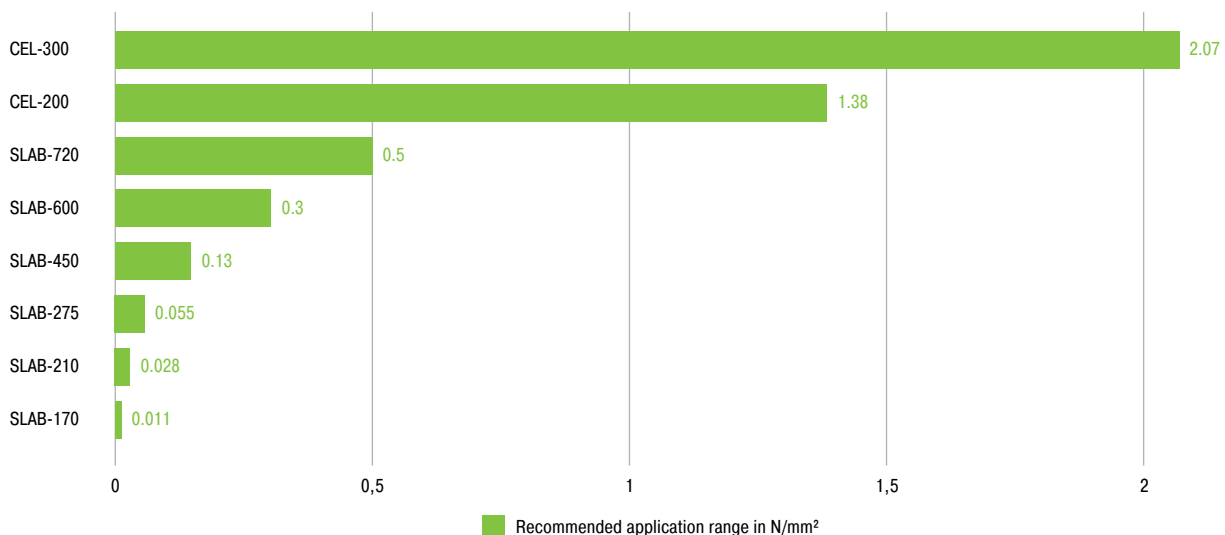
## Variable, flexible, custom-made

**Vibration-isolating ACE plates are used whenever an adjusted isolation of vibrations and structure-borne noise is required.**

The right damping solution for standard applications can be simply found by using the selection diagrams (following pages). The right material type can be identified independently of the load via the desired damping in relation to the excitation frequency. The ideal plate size can be quickly calculated on the basis of the load area.

A rough preselection of suitable plate materials can be made by consulting the permissible surface pressures of different plate materials.

### Application range according to surface pressure



The SLAB and CEL plates can either be ordered in their standard size or cut according to customer request. We require the desired specifications and quantities for calculating the required parts.

The custom-cutting of the plates allow the realisation of almost any shape and solution. In addition, various plates can be layered, glued and combined with reinforcing plates (steel) or sliding layers (PTFE).

The PAD product group is made from fibre-reinforced plate material used for very high loads of up to 13.8 N/mm².



# SLAB

## Universal Damping Plates

**SLAB damping plates of model series SL-170 to SL-720 are universally applicable elastic PUR materials which are manufactured according to a patented formula and can be used for a large number of applications.**

The plates with standard sizes of 170 kg/m<sup>3</sup> to 720 kg/m<sup>3</sup> serve as starting materials for the vibration isolation of different applications in industry and construction. The static and dynamic product properties are used as the basis for the selection of the most suitable damping solution.

The material determination (see selection diagram) is used to make the preselection of the correct damping material, after which, in a second, easy step, the suitable dimensions of the support are determined. SLABs are delivered as pre-fabricated standard plates or can be freely cut from the raw material (roll and plate material).

Standard SLABs are supplied in material thickness of 12.5 mm and 25 mm. On request, the sizes of delivered plates can be cut freely from the standard 800 x 1,500 mm stock. Sample plates with dimensions 220 x 150 mm and the respective thicknesses are available for test purposes and small applications, with maximum machinable dimensions up to 5,000 x 1,500.

### Properties

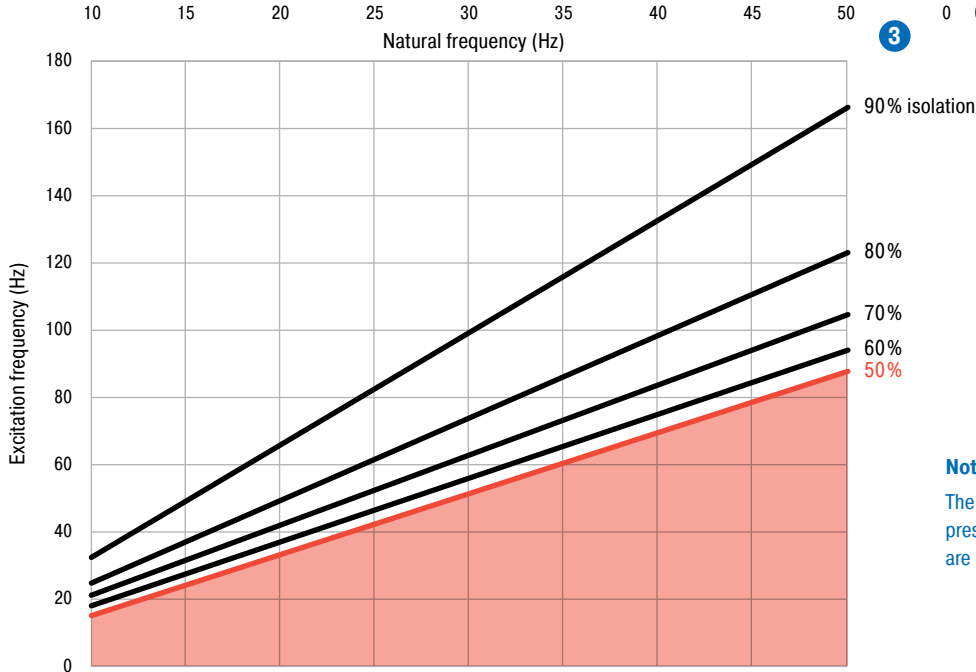
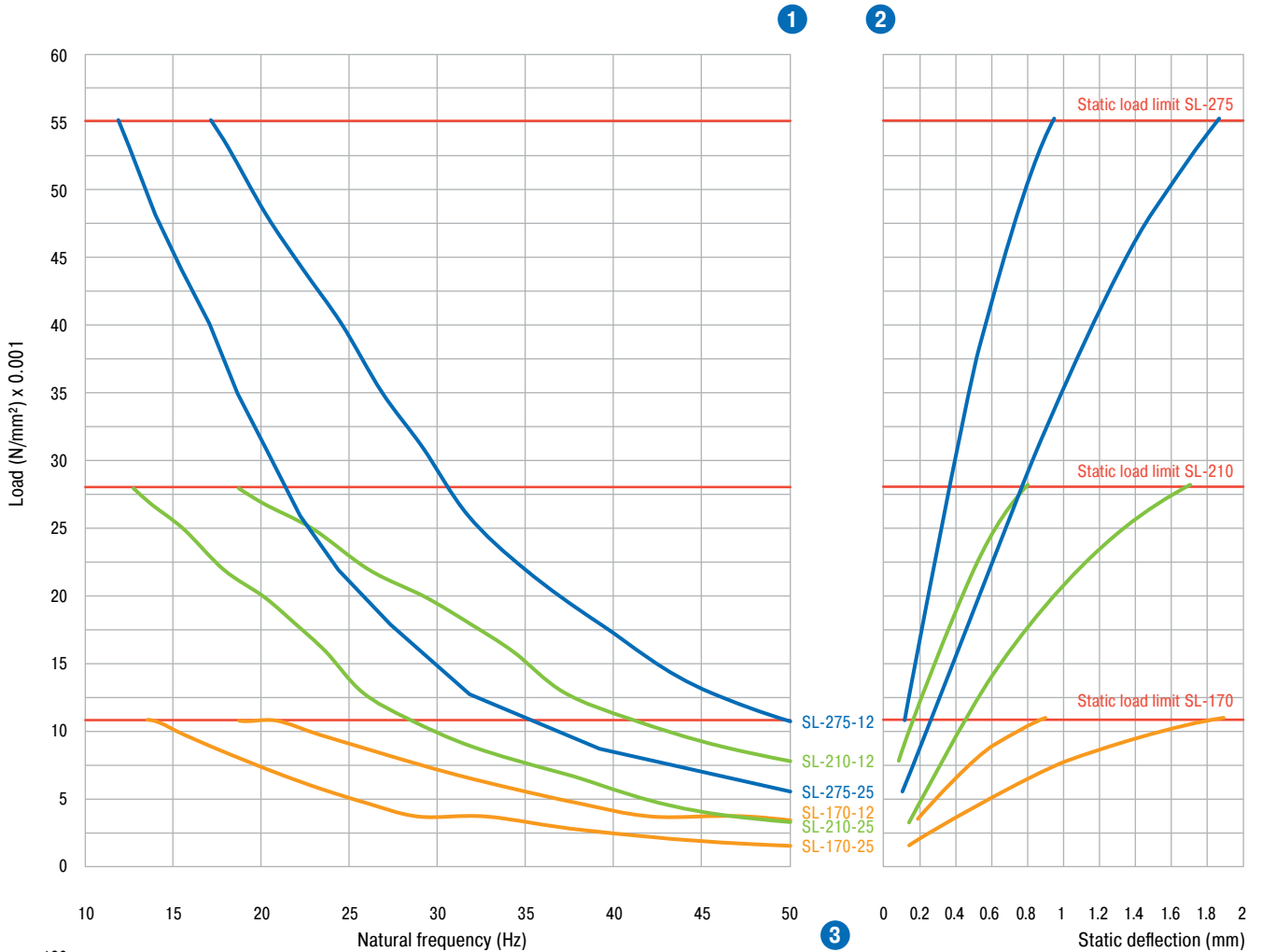
- Can be cut to many different shapes (water jet cutting)
- Can be combined to any desired isolation packages
- On-site vibration measurement and selection
- Special dimensioning software, no additional costs for designing
- Highly damping PUR

### Areas of application

- Foundations of plants and machines
- Compressors
- Pump stations and generators
- Pipeline isolation
- Test benches, measuring tables and their foundations
- Buildings
- Staircase bearing surfaces



# SL-170 / SL-210 / SL-275



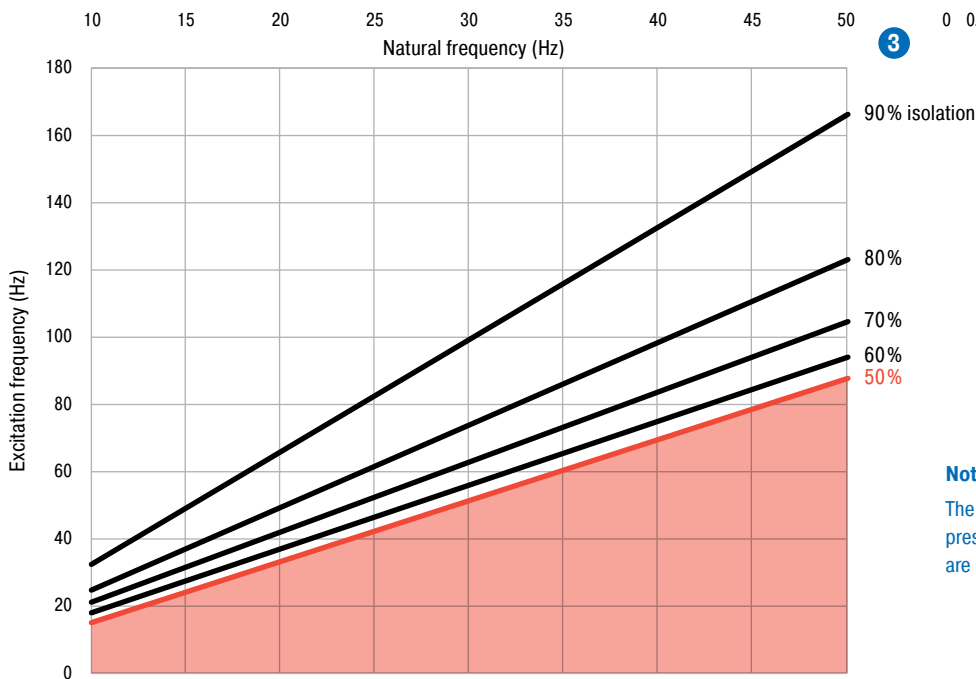
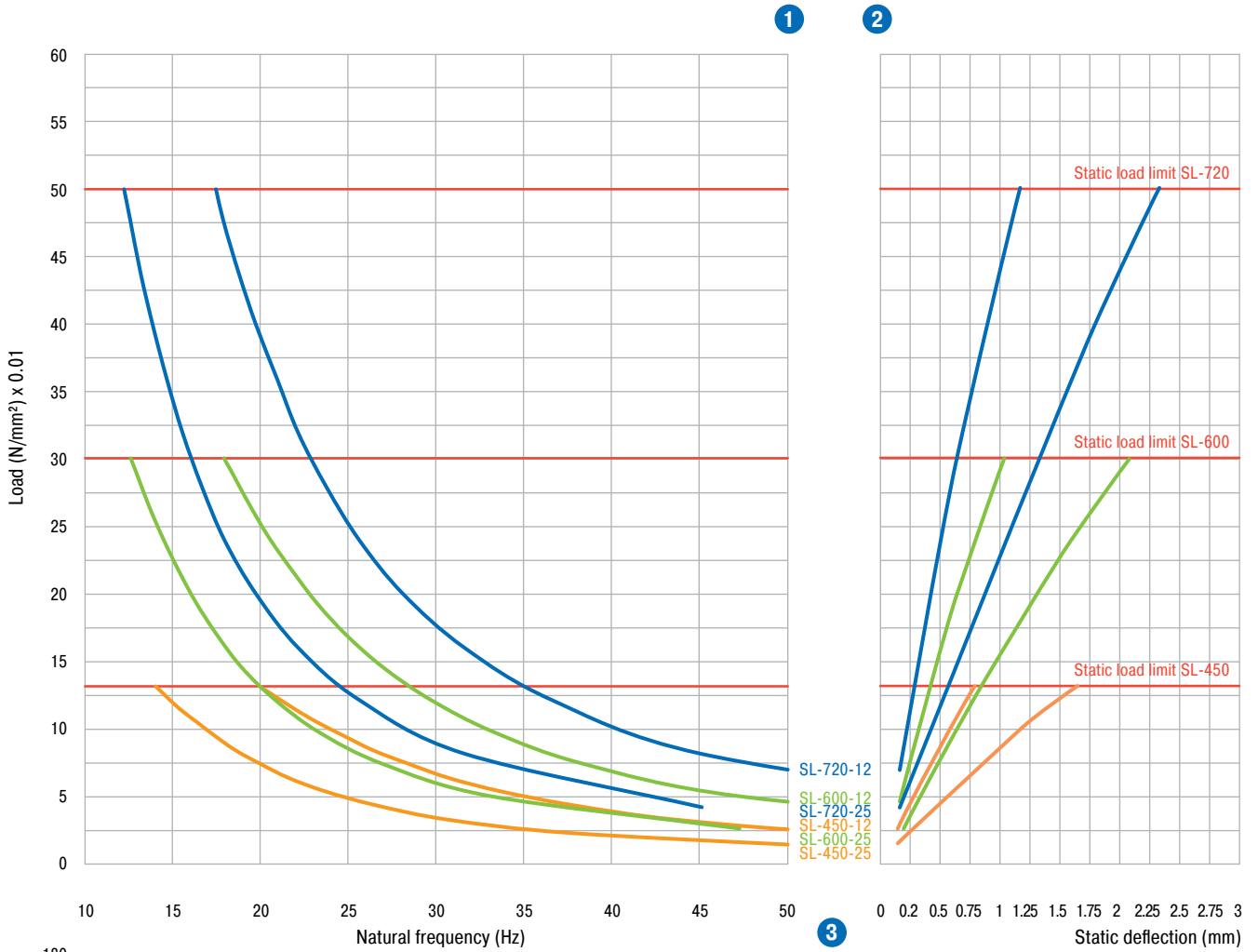
**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



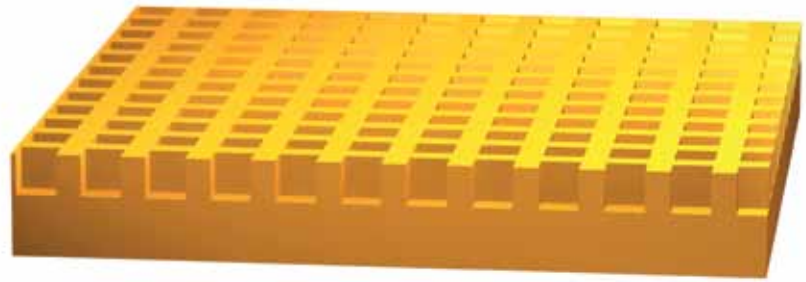


## SL-450 / SL-600 / SL-720



#### Notes

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



# CEL

## Low-Frequency Damping Plates

**CEL damping plates are produced from a special nitrile rubber which damps at low-frequencies.**

The damping plates can be custom-cut and glued together to form multiple layers depending on the application. The tried-and-tested CEL damping plates are used in the field of machine and plant engineering. Here the plates take charge of isolating the floor or foundation to the plant or machine. Damaging vibrations are prevented, increasing production or measuring quality.

### Properties

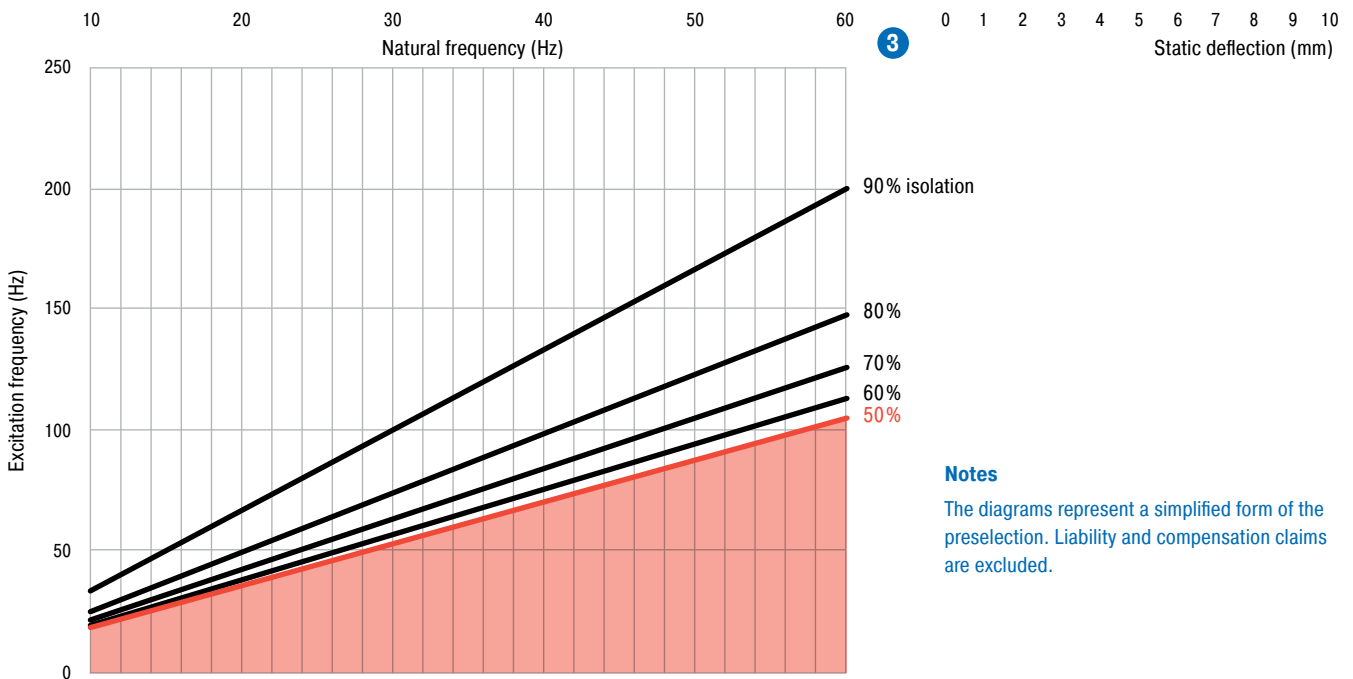
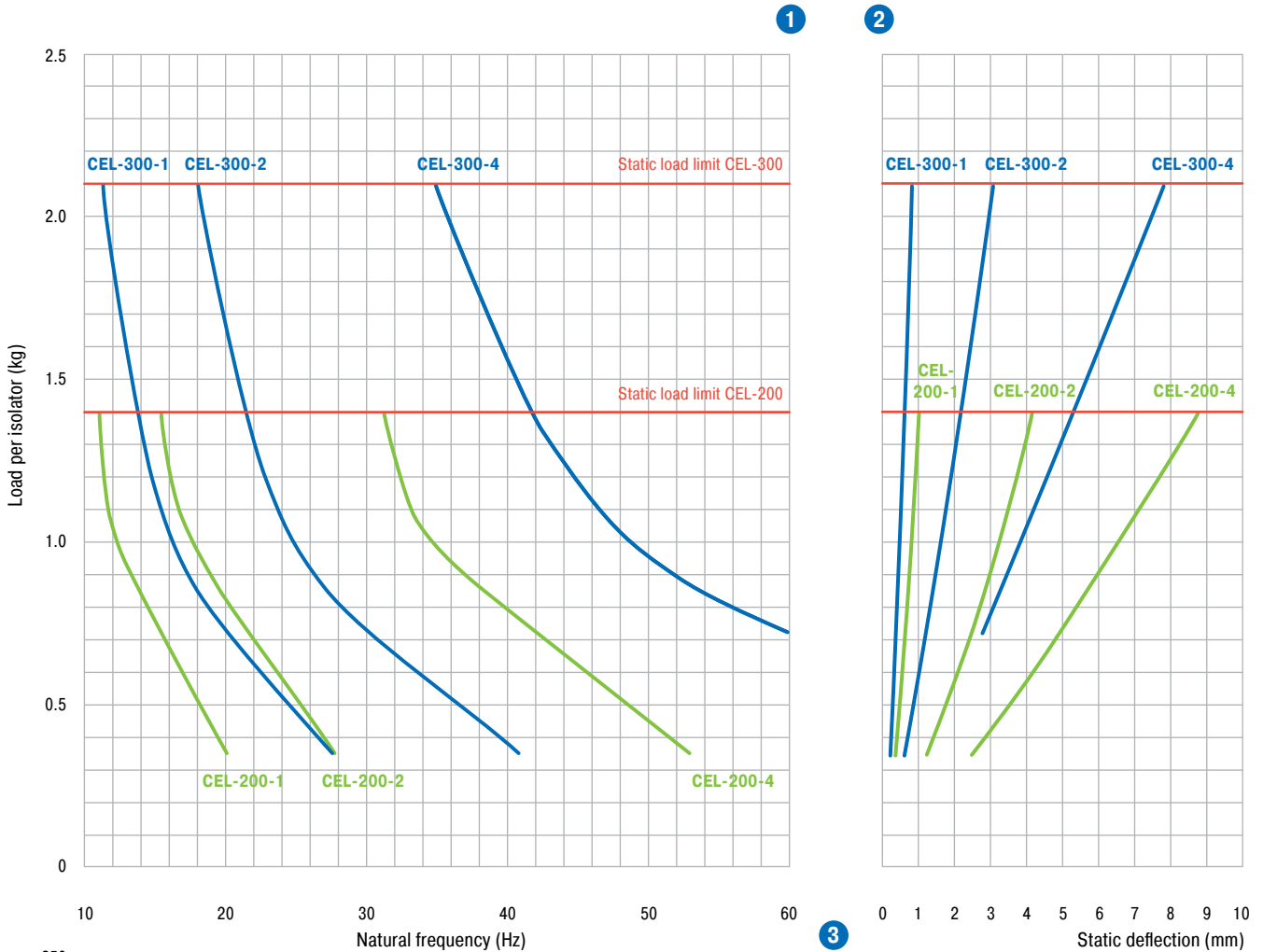
- Can be combined to form any desired isolation packages or glued together
- On-site vibration measurement and selection
- Special dimensioning software, no additional costs for designing

### Areas of application

- Foundations of plants and machines
- Compressors
- Pump stations and generators
- Pipeline isolation
- Test benches, measuring tables and their foundations
- Buildings
- Transport routes, bridges
- Staircase bearing surfaces



### CEL-200 / CEL-300



**Notes**

The diagrams represent a simplified form of the preselection. Liability and compensation claims are excluded.



# PAD

## Rugged Fibre and Elastomer Plates

**The PAD fibre and Elastomer Plates combine the positive properties of isolating elastomer bearing surfaces with the reinforcing effect of fibre inlays.**

The PADs are rugged damping plate for use in heavy-duty applications, e.g. under crane runways, in steel construction, pipeline construction and the coal, iron and steel industry. Due to their physical properties, the PAD plates provide outstanding damping against shocks and impacts and isolate vibrations and structure-borne noise.

Depending on the shape and selected dimensions, PADs can withstand compressive loads of up to 69 N/mm<sup>2</sup>. In general, the maximum surface pressure is 13.8 N/mm<sup>2</sup>.

### Properties

- Rugged
- Can be custom-cut
- Low creep tendency
- Thickness: 1,185 kg/m<sup>3</sup>

### Areas of application

- Foundations of presses, plants and machines
- Impact plates
- Pipelines
- Conveying systems
- Pump stations and generators
- Crane runways
- Bridges
- Heavy-duty applications



Due to the layered structure, the material exhibits excellent compressibility. This allows spring deflections to be reached without material flow (custom-fit installation complying with defined dimensions possible). The excellent material properties are also apparent in the very good creep behaviour under load. For example, under continuous static load, the material only exhibits a creep tendency of approx. 5%.

Depending on the application, the PADs can be custom-cut to meet customer specifications and be used as supports, discs and sleeves with an isolating/damping effect.

**Note**

PADs consist of organic material subject to batch-based fluctuations

PADs meet the following military specifications: MIL-C-882 and MIL-E-5272A.

The PADs are resistant to most oils, water vapour, water, mould and brine. Their operating temperature range is between -55 °C and +95 °C.

The hardness of PADs is 90 ±5 shore A.

The standard plates are available in different thicknesses, graduated between 1.6 and 25.4 mm. Other thicknesses are available by combining the standard thicknesses via gluing. A combination with steel plates or PTFE plates as equal layers is also available on request.

**Selection and calculation**

As with a conventional shock absorption application, the selection of a suitable material thickness and material dimensions is based on the consideration of the kinetic energy in the system in relation to the desired damping value. The hysteresis curve for the respective material is then taken as the basis for selecting the correct material dimensions, such as the length, width and height of the damper.

To measure the kinetic energy, we suggest you to try our shock absorption calculation software which we offer on our website free of charge. No need even to register, you can easily enter the required values here and obtain a suitable solution recommendation.

We will show the diagrams required for a graphic-based approach in the next issue.

**Our in-house and field application technicians are happy to assist you with this as with other issues.**

# 03

## Low-Frequency Air Spring Elements



**PLM**

**Pneumatic Air Spring Elements**

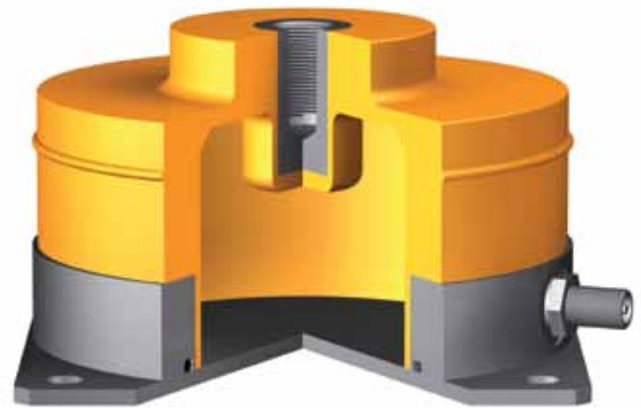
For an efficient isolation of measuring equipment, high-speed presses and machines.



**PAL**

**Air Spring Elements with Automatic Level Controls**

Isolation against disruptive vibrations and level-adjustment for test and measuring equipment. Isolating at extremely low-frequencies, these components are used in the automotive industry and in aerospace engineering.



# PLM

## Air spring elements

**PLM air spring elements offer low-frequency vibration and shock isolation for measuring stations, coordinate measuring machines, fans, air compressors, motor and generator units, high-speed presses and more.**

**The PLM air spring series comprises low-frequency vibration and shock isolators which reduce undesirable vibrations while simultaneously levelling the supported devices.**

When used as a vibration damper, the internal air chamber already guarantees a significant isolating effect from 5 Hz upwards. In an optimally loaded condition, the natural frequency is 3.0 Hz. PLM air spring elements also isolate in a pressure-free state.

The vertical natural frequency of the elastomer body is approximately 10 Hz, meaning that disturbances above 14 Hz are isolated.

The ratio of vertical to horizontal natural frequency is roughly 1:1 with high horizontal stability.

For applications with shock or impact loads, the elastomer wall design of the PLM air springs offer high dynamic spring deflection. If one wishes simultaneously to retain the low natural frequency of 3 Hz, the use of external arrestors is recommended in order to prevent the air springs from breaking through.

The PLM design features a vulcanised thread insert, by means of which the air springs can be inflated either with a standard tyre valve or a pneumatic fitting. Special connections are not necessary.

The isolators are delivered with a valve. They are inflated and levelled manually with the aid of hand pumps or adaptors connected to an air supply. If a compressed air fitting is mounted on the air springs, they can be connected to the controlled air supply system. This facilitates the pressurisation and the level control. In the event that no level control valve is used, a control unit can be provided to regulate the pressure and the height of the air springs linked to each other.

In addition, the PLM air spring elements can be supplied with automatic level control valves for height regulation. Each master isolator has a built-in level control valve which functions as a load detector and position sensor.

### Properties

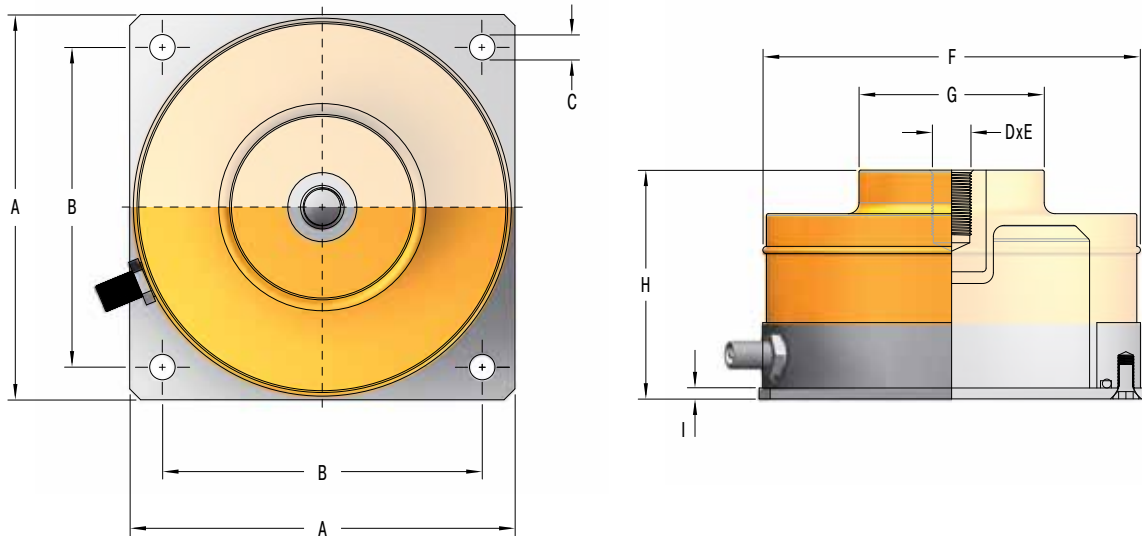
- Low natural frequency of 3 Hz
- Easy level control via integrated valve
- Height regulation control on request
- Ratio of horizontal to vertical natural frequency 1:1

### Areas of application

- Measuring tables
- Test benches
- High-speed presses
- Production plants



## PLM



Type	A mm	B mm	C mm	Thread D	E mm	F mm	G mm	H mm	I mm	Max. bearing load kg
PLM 1	76	60.5	6.9	M10	12.0	73	25	65	3.2	45
PLM 3	106	89	6.9	M12	13.5	105	56	65	3.2	135
PLM 6	130	108	7.4	M12	13.5	127	60	90	3.2	250
PLM 12	175	152	7.4	M12	13.5	171	100	90	3.2	550
PLM 24	254	216	14.2	M16	19.0	245	138	90	4.8	1100
PLM 48	343	305	14.2	M16	19.0	338	190	90	4.8	2200
PLM 96	470	406	20.6	M24	22.4	468	267	90	6.4	4400
PLM 192	610	508	20.6	M24	22.4	610	400	90	6.4	8800

Any number of parallel air springs can be added in order to increase the loading capacity of the overall system.

**Our technicians are happy to assist you in the selection process and provide any support you require.**

### Selection and calculation

The best isolation values can be achieved for the use of PLM air springs when the maximum load of the individual air spring elements is utilised to the fullest extent possible.

In standard applications, it is sufficient to select PLM air spring elements on the basis of the weight of the machine or plant to be isolated. If the maximum isolation effect is to be realised, additional weights (steel or e.g. granite plates) may have to be added so as to achieve the maximum permitted load range and thus the ideal isolation effect.

#### Note

When commissioning, please ensure that pressure is first applied on the PLM air spring elements before they are filled to the desired operating pressure (max. 5 bar for sizes 1 and 3; max. 6 bar for the remaining sizes) using the valve.

A separate usable control unit can be used to check the operating condition and adjust to the desired amount.

# PAL

## Air Spring Elements with Automatic Level Controls

**Air spring elements of the PAL series offer superior low-frequency vibration isolation for measuring devices, electron microscopes, MRT equipment, coordinate measuring machines and precision manufacturing machines.**

PAL air spring systems use level-controlled air springs. These isolators are ideal for conditions which require a constant level and vibration isolation at the same time. The PAL isolators meet all important requirements for measuring devices, electron microscopes, measuring stations and precision manufacturing machines.



Standard PAL isolators have a natural frequency of up to 1.7 Hz – depending on the height of the isolator. Even lower natural frequencies (up to 0.5 Hz) are possible for isolators manufactured according to customer specifications.



### Properties

- Height-adjustable
- Low-frequency isolation, natural frequencies of up to 0.5 Hz possible

### Areas of application

- Test and measuring equipment
- Aircraft and automotive test benches
- Foundation bearing surfaces

**Extremely low-frequency-calibrated precision isolators for use in high-resolution measuring and testing systems.**

A complete PAL system consists of at least three master isolators for a 3-point level control. Each isolator has a built-in level control valve which functions as a load detector and height control. Any number of slave isolators can be added in order to bear the overall weight of the equipment.

The scope of supply of a system contains a control unit, automatic level control valves, pneumatic lines and all the additional pneumatic accessories required for a complete system installation.

PAL air springs react quickly to changes in load or balance, with deviations from a preset position being automatically readjusted.

The performance of an air spring system is always a compromise between natural frequency (isolation), the resetting accuracy of the level control valve and the control setting time.

The control setting time is defined as the time required by the isolation system to reach a preset reference value again after a defined disturbance.



The disturbance can be caused by environmental factors or inherent machine forces, such as the movement of the measuring bridge of a measuring machine.

The control setting time is minimised with an optimal damping effect and an adequate flow through the valve. Long control setting times are not acceptable for air springs, as this can induce errors in repeat accuracy in the case of precision measuring devices and positioning machines as well as lower part throughput rates.

Depending on the application, ACE offers many different level control valves. The decisive variables for designing an acceptable solution are the valve flow-through and rigidity, as well as accuracy characteristics. Reset accuracies of +/- 0.15 mm or +/- 0.025 mm are available. The valve flow-through and rigidity are selected on the basis of the air spring design and the damping.



PAL-3 to PAL-9  
Small size



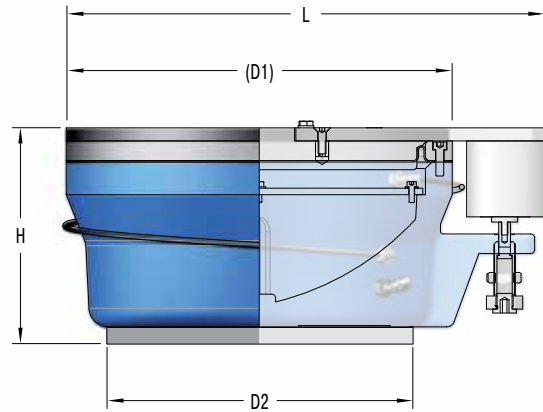
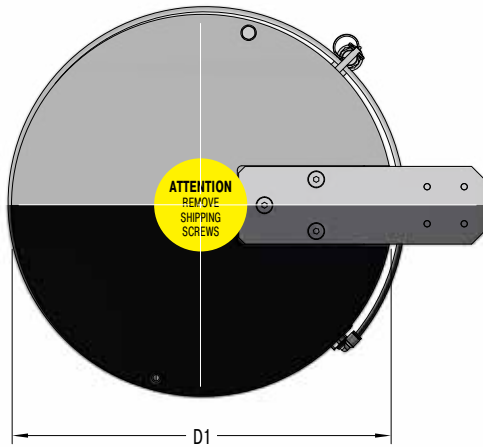
PAL-18 to PAL-1000  
Large size



PAL-5.5-2.5  
with level control valve PALV 5-5

The figures are not to the same scale.

# PAL



Type	D1 mm	D2 mm	H (pressureless) mm	H (max. Stroke) mm	L mm	Max. bearing load* kg	Special design only on request
PAL 18-6	165	152	153	160	234	800	■
PAL 21-6	200	150	153	163	270	950	
PAL 21-12	200	200	305	315	270	950	■
PAL 36-6	220	190	153	163	290	1630	
PAL 55-6	260	230	153	163	330	2500	
PAL 55-12	260	260	305	315	330	2500	■
PAL 75-6	300	265	153	163	370	3400	
PAL 133-6	380	350	153	163	450	6030	
PAL 133-12	380	380	305	315	450	6030	■
PAL 255-6	530	470	153	165	600	11 560	
PAL 255-12	530	460	305	317	600	11 560	
PAL 416-8	640	585	203	215	710	18 200	
PAL 1000-6	950	910	153	178	1 020	42 000	■
PAL 1000-18	914	914	450	475	990	42 000	■
PAL 3-2.5	80	80	64	70	157	126	
PAL 5.5-2.5	100	100	64	70	177	238	
PAL 9-4	130	130	94	98	207	385	
PAL 9-6	130	130	153	159	221	385	

\* At a maximum operating pressure of 7 bar

**Note**

The maximum permissible horizontal movement of the PAL air spring elements can be limited to 3 mm, if necessary.

## Isolation properties

Natural frequency	PAL xx-6 Hz	Pal xx-12 Hz	Damping	PAL xx-6 %	Pal xx-12 %
vertical	2.5 - 2.7	1.5 - 1.7	vertical (adjustable)	6 - 20	6 - 20
horizontal	2.0 - 4.5	2.0 - 4.5	horizontal	5 - 6	5 - 6

**Design service and analysis**

Low-frequency vibrations and strong shocks and force peaks influence the accuracy, production quality and productivity of high-performance and precision machinery.

The specifications for the maximum permissible accelerations and vibrations are often prescribed by the manufacturers of testing, measuring and production machines. Our expert team is happy to assist you with analysing the site conditions and selecting the right isolators for complying with the required system parameters.

On request, we execute highly precise measurements on site and document the respective target and actual conditions or develop suitable system solutions with our customers. Requirements and solution models may vary widely from case to case.

**Our technicians are happy to assist you in the selection process and provide any support you require.**

**Application examples**



Measuring tables, example: coordinate measuring machine

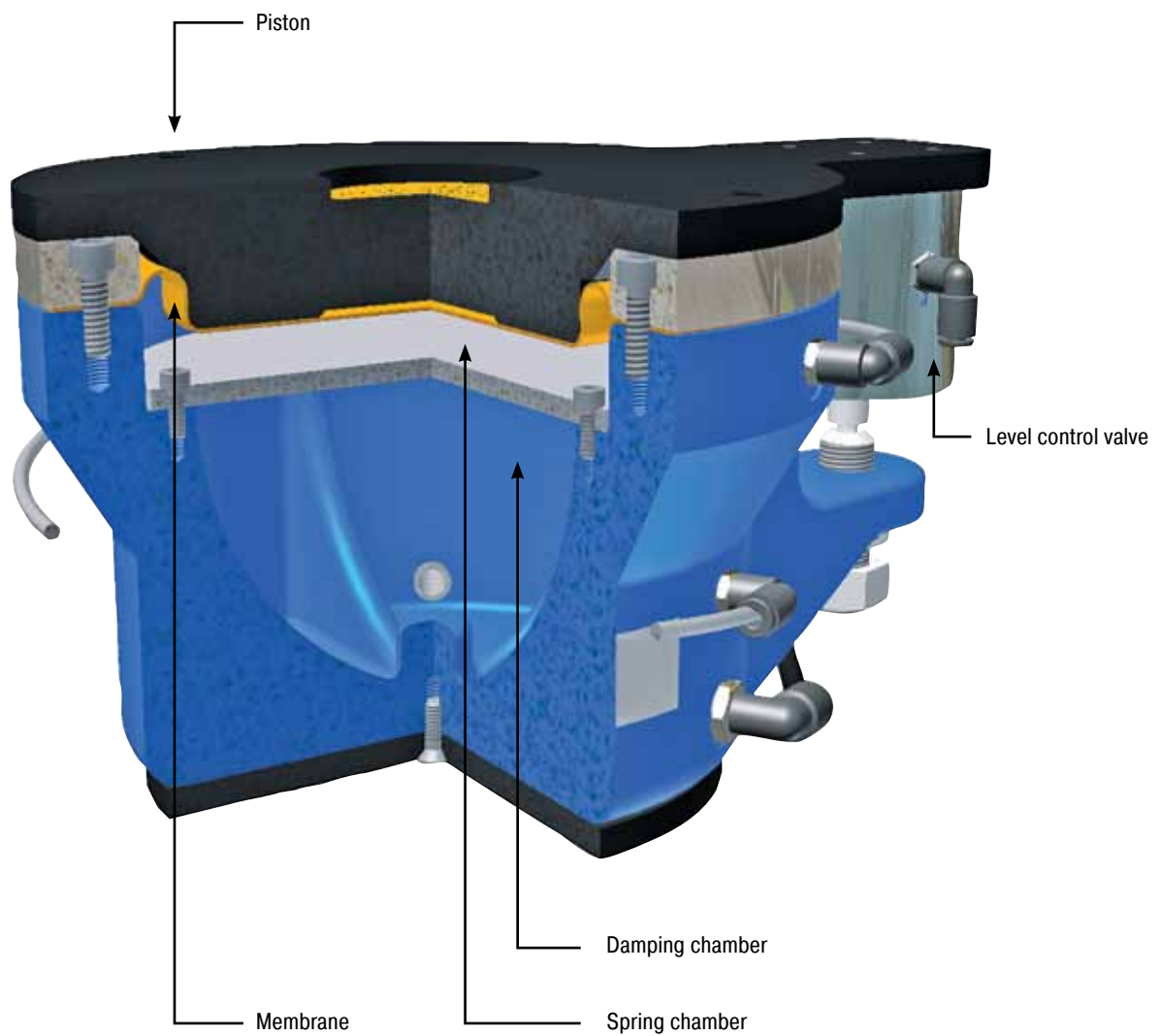


Test benches, example: street simulation test bench

# PAL

## Air Spring Elements with Automatic Level Control

### Structure



## in Countries without ACE Facility



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www.bibusmenos.pl  
(not distributor for gas springs and HB dampers)

Gas spring & HB damper specialists:

**F.H.U. ELMATIC S.C.**

ul. Lubicka 20, 87-100 Toruń, Poland  
Tel.: +48-56 659 15 49  
Tel./Fax: +48-56 659 16 81  
www.elmatic.com.pl


**PORTUGAL**

AIRCONTROL INDUSTRIAL S.L.  
Alameda Fernao Lopes 31A  
Torre 2 - Miraflores  
1495-136 Alges (Lisboa), Portugal  
Tel.: +351-21 410 12 57  
Fax: +351-21 410 56 08  
www.aircontrol.es

**BIBUS PORTUGAL LDA**

Rua 5 de Outubro, 5026  
4465-079 S. Mamede de Infesta, Porto, Portugal  
Tel.: +35-122 906 50 50  
Fax: +35-122 906 50 53  
www.bibus.pt  
(not distributor for gas springs and HB dampers)


**ROMANIA**

BIBUS SES S.R.L.  
Pestalozzi 22, 300155 Timisoara, Romania  
Tel.: +40-256 200 500  
Fax: +40-256 220 666  
www.bibus.ro  
(not distributor for gas springs and HB dampers)

Gas spring & HB damper specialists:

**D.C. COMPANY S.R.L.**

Dragos Voda nr. 43, 300351 Timisoara, Romania  
Tel.: +40-722 145 213  
Fax: +40-356 800 513  
www.ewarehouse.ro


**RUSSIA**

BIBUS O.O.O.  
Izmailovsky prospect 2, letter A  
190005 St. Petersburg, Russia  
Tel.: +7-812 251 62 71  
Fax: +7-812 251 90 14  
www.bibus.ru  
(not distributor for gas springs and HB dampers)

Gas spring & HB damper specialists:

**TEHINNOVATION**

Krasnodonskaya street 19, office 17  
109386 Moscow, Russia  
Tel.: +7-495 222 06 01  
Fax: +7-499 786 42 56  
www.tehinnovation.ru


**SLOVAKIA**

BIBUS SK S.R.O.  
Trnavska cesta, 94901 Nitra, Slovakia  
Tel.: +421-37 7777 950  
Fax: +421-37 7777 969  
www.bibus.sk  
(not distributor for gas springs and HB dampers)

Gas spring & HB damper specialists:

**PNEUTRADE S.R.O.**

Rybárska 8, 949 01 Nitra, Slovakia  
Tel.: +421-37/65 24 338  
Fax: +421-37/65 55 933  
www.pneutrade.sk


**SLOVENIA**

INOTEH D.O.O.  
K Železnici 7, 2345 Bistrica ob Dravi, Slovenia  
Tel.: +386-02 665 1131  
Fax: +386-02 665 2081  
www.inoteh.si  
(not distributor for gas springs and HB dampers)

For gas springs & HB dampers please contact:

**ACE STOSSDÄMPFER GMBH**

Albert-Einstein-Straße 15, 40764 Langenfeld  
Germany  
Tel.: +49-2173-9226-4100  
Fax: +49-2173-9226-89  
www.ace-ace.com


**SOUTH AFRICA**

PNEUMARK CONTROLS  
94A Crompton Street, Pinetown, 3610  
South Africa  
Tel.: +27-31 701 0421  
Fax: +27-86 551 2026  
www.pneumark.co.za


**SPAIN**

AIRCONTROL INDUSTRIAL S.L.  
Paseo Sarroeta 4  
20014 Donostia-San Sebastian, Spain  
Tel.: +34-943 44 50 80  
Fax: +34-943 44 51 53  
www.aircontrol.es

BIBUS SPAIN S.L.  
Avda Ricardo Mella, 117 D, 36330 Vigo, Spain  
Tel.: +34-986 24 72 86  
Fax: +34-986 20 92 47  
www.bibus.es  
(not distributor for gas springs and HB dampers)


**SWEDEN**

HYDNET AB  
Turebergsvagen 5, 191 47 Sollentuna, Sweden  
Tel.: +46-8 59 470 470  
Fax: +46-8 59 470 479  
www.hydnet.se


**SWITZERLAND**

BIBUS AG  
Allmendstrasse 26, 8320 Fehraltorf, Switzerland  
Tel.: +41-44-877 50 11  
Fax: +41-44-877 58 51  
www.bibus.ch  
(not distributor for gas springs and HB dampers)

For gas springs & HB dampers please contact:

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Tel.: +49-2173-9226-4100  
Fax: +49-2173-9226-89  
www.ace-ace.com


**TURKEY**

BIBUS OTOMASYON SAN. VE TIC. LTD. STI.  
Necatibey Cad. No:49 Kat:2  
34425 Karaköy/Istanbul, Turkey  
Tel.: +90-212 293 82 00  
Fax: +90-212 249 88 34  
www.bibus.com.tr  
(not distributor for gas springs and HB dampers)

Gas spring & HB damper specialists:

**POVVER PNÖMATİK A.S.**

Necatibey Cad. No:44 Kat:2  
34425 Karaköy/Istanbul, Turkey  
Tel.: +90-212 2938870  
Fax: +90-212 2936877  
www.powerpnomatik.com


**UKRAINE**

BIBUS UKRAINE TOV  
Mashinobudivnykiv Str., 5A  
Chabany, 08162 Kiev Region, Ukraine  
Tel.: +380-44 545 44 04  
Fax: +380-44 545 54 83  
www.bibus.com.ua  
(not distributor for gas springs and HB dampers)

For gas springs & HB dampers please contact:

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Germany  
Tel.: +49-2173-9226-4100  
Fax: +49-2173-9226-89  
www.ace-ace.com

Fax your inquiry form to +49 (0)2173 - 9226 - 89

### Calculation sheet for your applications

We would be happy to send you a design proposal for your application. In order to obtain a better picture of your application before establishing contact, we would like to ask you to send us the following basic information.

Please send us a sketch or drawing so that our application technicians understand the case. For the drawing, please use the designated field or send us a dimensioned sketch with a copy of the calculation sheet to [mail@aceolator.eu](mailto:mail@aceolator.eu). You can also simply use our calculation sheet at [www.aceolator.eu](http://www.aceolator.eu).

**Project designation** \_\_\_\_\_

**Description of the application** \_\_\_\_\_

### Please enter the technical data for the calculation here

**Excitation frequency / speed** Hz \_\_\_\_\_ or 1/s \_\_\_\_\_

**Weight of system in kg** \_\_\_\_\_

**Weight distribution**  centric (please indicate in sketch)  excentric (please indicate in sketch)

**Machine dimensions (mm)** length \_\_\_\_\_ width \_\_\_\_\_ height \_\_\_\_\_

**Number of support points (quantity)** \_\_\_\_\_

**Dimensions of the support points (mm)** length \_\_\_\_\_ width \_\_\_\_\_ diameter \_\_\_\_\_

**Desired degree of isolation**  50% (basic isolation)  60%  70%  80%  90% (very good isolation)  \_\_\_\_\_

**Environmental influences** media \_\_\_\_\_ temperature \_\_\_\_\_ misc \_\_\_\_\_

**Need / year (quantity)** \_\_\_\_\_

### Contact Details

Company \_\_\_\_\_

Name \_\_\_\_\_

Department \_\_\_\_\_

Street/PO Box \_\_\_\_\_

Postcode/City \_\_\_\_\_

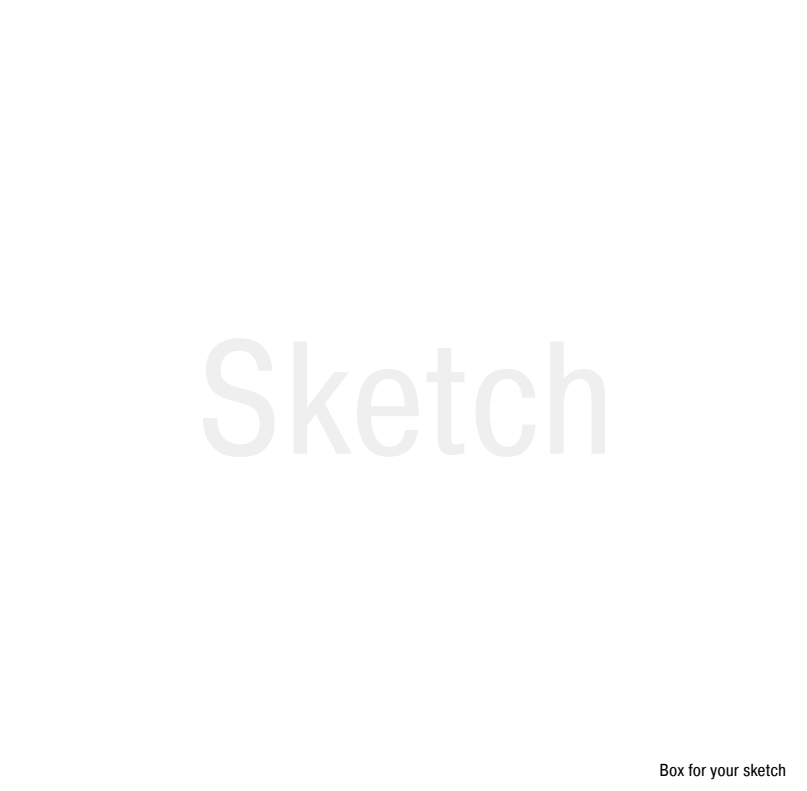
Country \_\_\_\_\_

Telephone \_\_\_\_\_

E-Mail \_\_\_\_\_

**Please copy, complete and fax to ACE  
+49 (0)2173 - 9226 - 89**

or use our Calculation Form on Website  
[www.aceolator.eu](http://www.aceolator.eu)



Box for your sketch

# ACEolator

Isolates undesired vibrations.



[www.aceolator.eu](http://www.aceolator.eu)



## Sales Locations



### GERMANY

ACE STOSSDÄMPFER GMBH

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### GREAT BRITAIN

ACE CONTROLS INTERNATIONAL

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T +44 (0)1942 - 727 440  
F +44 (0)1942 - 717 273  
[www.ace-controls.co.uk](http://www.ace-controls.co.uk)



### INDIA

ACE AUTOMATION CONTROL EQUIPMENT PVT. LTD.

Kaydon House, 2/396 A, Mookambigai Nagar  
Kattuppakkam, Iyyapanthangal, Chennai - 600 056, India  
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### JAPAN

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### CHINA

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