Industrial Products Catalogue

METALASTIK® & NOVIBRA®

TRELLEBORG

Trelleborg's Novibra® division and Metalastik® have joined forces to become Trelleborg Industrial AVS. A world leader in the design and manufacture of rubber to metal bonded components for antivibration applications and suspension systems used in rail, marine, industrial and civil engineering applications. Our strength is that we can offer a wide range of isolators in combination with the specialised expertise that is needed to achieve a total solution. We use data-based surveillance software, conduct tests, and provide full technical support.

Trelleborg Industrial AVS employs approximately 500 people and its head office, research and development units are located in Leicester, UK while production is divided between Leicester and two Swedish factories at Trelleborg and Sjöbo. There are regional offices in Belgium, France, Germany, Italy, the Netherlands, Sweden and the United States.

The Trelleborg Group is a global group with 15 500 employees in 40 countries and an annual turnover of 1 650 MUSD.

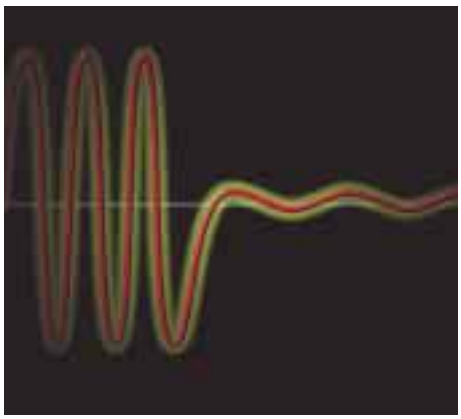
Trelleborg Industrial AVS operates a policy of continuous improvement and development.
We reserve the right to change design and specification of our products without prior notification or alteration of literature.

Solutions for

vibration & shock

– worldwide

All machinery vibrates and causes noise and structure-borne sound. At Trelleborg Industrial AVS we solve this type of problem all the time, and we know it pays off. The working environment can be improved, which among other things means fewer industrial injuries to the people who work with the machinery; and the economic benefits are considerable, less wear, lower maintenance costs and increased lifetime of the machinery.



It is always worth taking care of a vibration problem. Both people and machines perform better if vibrations are kept to a minimum.

Two vibration problems are never alike. We always analyse the problem carefully before we start to work on a solution. During the design and development phases we transform our ideas into reality and thus create effective vibration solutions.

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Trelleborg Industrial AVS – Product Description

RA and Fail Safe EF	*For effective isolation of vibration and noise on machines with rotating movements.*	**18**
RAEM	*For effective isolation of vibration and noise on machines with rotating movements.*	**20**
Cushyfloat™ Mountings	*The Cushyfloat mounting is a general purpose unit designed to provide effective isolation of vibration and noise arising from both static and mobile equipment. Also marine engine suspension.*	**22**
SIM™	*SIM is a mounting for marine and mobile applications. The strong metal parts and the soft vertical stiffness combined with high stiffness in axial direction makes it suitable for suspension of marine and industrial engines both with and without thrust bearing.*	**24**
Cushyfoot™	*Cushyfoot mountings are suitable for many different types of machinery, such as diesel engines, generator sets, fans, hydraulic units and lift machinery.*	**26**
Vee Mountings	*A high load capacity mounting with large rubber volume providing a high degree of vibration and noise isolation. Ideally suited for suspending engines installed in public service and goods vehicles.*	**28**
RAB	*For effective isolation of vibration and noise on machinery with rotating movements. Especially suitable for 1-, 2- and 3-cylinder engines.*	**30**
M	*Type M is ideal for applications involving isolation of low frequency vibrations in all planes. Also suitable for shock attenuation due to the designed ability to provide large deflection while providing passive vibration isolation on electronic instruments, measuring equipment and test cells.*	**32**
Equi-Frequency Mountings	*General purpose low profile mounting for use where space is restricted. Suitable for stationary applications. May also be used to protect delicate or sensitive units from external shock or disturbances.*	**34**
Fanflex™	*A simple low cost mounting designed predominantly for the suspension of heating, ventilating and air conditioning equipment.*	**36**
BA and Double U-Shear	*Novibra® type BA and Metalastik® type Double U-Shear are equally suitable for isolating vibrations from low speed machines and equipment while also protecting sensitive and lightweight units from external shocks and vibrations.*	**38**
Metacone™ and HK	*A range of mountings designed for high load capacity with relatively large static deflections. The high loading for a given size is achieved by utilising the rubber to best advantage in shear and compression. Suitable for both engine and cab suspension in mobile applications.*	**40**
Cab Mountings	*Specially profiled rubber section together with bump and rebound control washers provide optimum suspension characteristics for cabs on commercial vehicles, tractors and other off road vehicles, earthmoving equipment and construction plant.*	**44**
EH	*Type EH mountings are designed to achieve effective vibration isolation on engines, operator cabs and other ancillary units.*	**46**
UH	*Novibra® mounting type UH is particularly suitable for the suspension of both mobile and static cabs as well as platforms on agricultural vehicles.*	**48**

VP and UD Bushes	*For vehicle suspension, pivot arms and all types of mechanical linkage, permits oscillating movement through the deflection of rubber in shear. Suitable to replace roller bearings where small motions are required (up to 20 degrees). Reduces shock loads and noise transmission in structures.*	**50**
Spherilastik™ Bearings	*Typical uses include traction and braking reaction rods for rail, road and off road vehicles, hydraulic damper fixings and other applications where a high duty bearing of compact size is required.*	**51**
Metaxentric™ Bushes	*Similar to conventional Ultra Duty Bushes but with inner and outer sleeves offset radially. This feature provides a greater rubber thickness and hence increased flexibility in the normal direction of loading while maintaining control in other modes and still allowing torsional movement.*	**52**
U	*Type U provides for a stable machine installation and is particulary suitable for the vibration isolation of heavier machinery with relatively high interfering frequencies.*	**53**
SAW	*Novibra® elements type SAW are heavy-duty mountings for high vertical static and shock loads in compression. Provides high isolation in the horizontal shear direction.*	**54**
Rectangular SAW Mountings	*Widely used for suspending engines on road vehicles and may also be used as springs for vibratory equipment.*	**57**
Circular SAW Mountings	*Used in a variety of industrial applications including vibratory rollers and small screens or for the suspension of smaller type I.C. engines.*	**60**
SE	*Novibra® type SE is suitable for the isolation of high frequency disturbances and also provides reduction of structure-borne noise.*	**63**
GK	*Novibra® mounting type GK is specifically designed for isolation of heavy machinery with low interfering frequencies. It is widely used under concrete foundations supporting heavy machinery.*	**64**
Novibra® AV plate	*The Anti-Vibration Plate is intended, primarily, for applications with low demands on vibration isolation.*	**66**
TF	*Novibra® type TF with level adjuster is a modern machine mounting suitable for a wide range of free standing workshop machines.*	**68**
Flanged Instrumountings	*The Flanged Instrumounting protects sensitive equipment from external vibration and/or shock forces.*	**70**
ANB	*The shock buffer type ANB is used to effectively limit movement of equipment or machine components which need to be slowed down or stopped.*	**72**
Two Bolt Instrumountings	*Two Bolt Instrumountings provide a convenient and effective means of isolating vibration generated by lightweight machinery.*	**75**
Buffers	*Buffers are designed to protect structures and equipment from impact forces. They are usually fitted as non-metallic stops or incorporated in vehicle suspension systems to provide progressive stiffening under increasing load.*	**78**
VT	*Novibra® type VT protects wall-mounted instrument cabinets from vibrations and shocks generated by nearby engines, workshop machinery.*	**80**
Bobbins	*A supplementary range of cylindrical mountings for a wide range of applications. They can be loaded either in compression or shear taking into consideration individual demands for actual applications.*	**82**
Metacone™ & HK Washers	*Overload and rebound washers (top and bottom) are necessary to limit maximum movement in the event of shock loading.*	**87**
HA	*The HA height adjustment facilitates precise coupling alignment for engine installations and boat building tolerances.*	**88**
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Expansion Joints are available for the UK market. Please contact the Leicester office.

Trelleborg Industrial AVS – Provides a healthier environment

Trelleborg Industrial AVS's antivibration mountings primary task/function is to eliminate harmful vibration and to effectively reduce structure-borne sound.

Our mission

To be our customers' preferred choice for engineered solutions in Industrial, Rail and Marine markets.

Our polymer technologies enable the control of vibration and movement for the protection of people, equipment and the environment.

World-wide solutions to exceed our customers expectations

Trelleborg Industrial AVS is a well-recognized supplier of antivibration mountings. With decades of experience of vibration problems all over the world, Trelleborg Industrial AVS today covers a wide spectrum of applications. Our principal markets are Industrial, Rail and Marine.

In the industrial sector we have satisfied the requirements of manufacturers of fans, compressors, separators, generators, pumps, wind generators, off-road vehicles, material handling equipment, buildings and bridges.

Complete solution of the vibration problem

Trelleborg Industrial AVS offers more than just a complete solution. We perform computer-managed calculations to achieve the optimum technical solution, we educate and train in vibration techniques to increase the understanding and knowledge of vibration problems.

We make FFT measurements on site to analyse the vibration problems.

Delivery of Trelleborg Industrial AVS mountings for industry is effected directly from stock to customer in order to minimize lead-time.

Our principal markets are Industrial, Rail and Marine.

From R & D to finished product

Being a member of the Trelleborg Group enables Trelleborg Industrial AVS to be in a position of full control of the complete production process and all vital raw materials.

The Trelleborg Group has its own rubber mixing departments and laboratories with complete test equipment for measurements of raw materials and finished products. Our laboratories continuously measure and control specifications of the raw material and finished products. Trelleborg Industrial AVS has an R&D department, production facilities in the UK and Sweden, and follows the product all the way to the customer. Total control, in accordance with ISO 9001, of this process, results in the quality of the product required by the customer.

Environmental policy – ISO 14000

Trelleborg Industrial AVS is working in the same way as its customers with the development of environmental friendly solutions and production processes, implementing an environment management system according to ISO 14000.

This means, for example, elimination of solvents in the vulcanising process of composite material and solvent free adhesive to eliminate hazardous discharge.

At Trelleborg Industrial AVS we are convinced that a safe and healthy working and living environment provides good job satisfaction and higher productivity.

Trelleborg Industrial AVS – A safe choice

Technical solutions

Vibration problems are often complicated and Trelleborg Industrial AVS has a technical department with the ability to help customers analyse and evaluate in order to achieve the perfect solution to their vibration problem. Our advanced computer based programs are designed in cooperation with technical universities.

Our long in depth knowledge of vibration technology guarantees the optimum solution to our customers' vibration problems. We commit ourselves to all kinds of issues.

Training and test

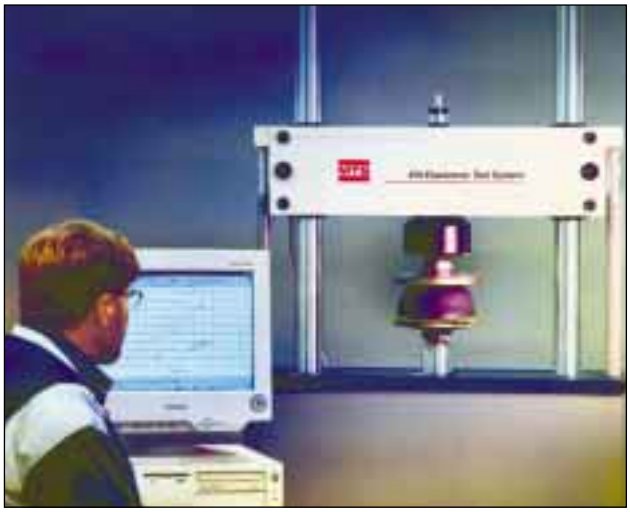
Trelleborg Industrial AVS has possibilities to perform analysis with FFT technology. In such cases we perform measurements, analyse the application and recommend the best solution.

To increase the knowledge of vibration issues and Trelleborg Industrial AVS solutions, we conduct training and education courses for our customers and distributors.

Our Technical Centre with advanced testing facilities provides to Trelleborg Industrial AVS excellent opportunities for product development.

Volvo articulated hauler

Dynamic stiffness test



Trelleborg Industrial AVS – Vibration technology

VIBRATION CAUSES STRUCTURE-BORNE NOISE

Vibration is generated by all kinds of machinery particularly those with rotating or reciprocating movements. Solidly mounted, these generated motions would be transmitted directly to the foundations giving rise to irritating noise to the immediate surroundings where the machine is installed.

Noise may also occur in areas some distance away, transmitted through the structure. This is normally referred to as "structure-borne noise" (structural noise). In addition to noise, the creation of vibration can cause serious problems to sensitive machinery.

The human body, too, can be affected negatively and this manifests itself in reduced working capacity, tiredness, and headaches caused by both high and low frequencies. Extremely low frequencies with considerable movement cause motion sickness and sea-sickness.

The harmful effects of noise can be eliminated by:

1. Reducing imbalance in the machine and the machine´s natural vibrations to a minimum by applying greater accuracy in manufacture, suitable design of cutting tools, etc.
2. Vibration-isolating the machine to prevent vibrations from being transmitted to surrounding areas.
3. Vibration-isolating the machine to prevent the effect of outside interference.
4. Sound-insulating the machine with suitable sound insulation and absorbing material to combat air-borne noise.

TRELLEBORG INDUSTRIAL AVS REDUCES THE TOTAL COST

The manufacturing costs related to extremely accurate balancing of machines are very high and may rise quickly with increasingly finer balancing. Since vibration isolation of the entire machine may still have to be considered, Trelleborg Industrial AVS antivibration mountings can be cost effective by reducing the need for intensive balancing requirements.

Fig 1. High pressure compressor mounted on Novibra© type RA.

THE PROPERTIES OF RUBBER MAKES IT PARTICULARLY SUITABLE AS A SPRING MATERIAL

Vibration isolation is based on installing machinery on springs or resilient material of known stiffness. The types of spring material which are used most often are rubber and steel. Another alternative is air springs.

Rubber has high load bearing capacity with an ability to accommodate overload conditions without the catastrophic failures associated with steel and other materials. It can carry complex loadings more easily and economically than other alternatives.

The bonding of rubber to a rigid material creates a product, which can accommodate movement without any sliding or rotating surfaces that require lubrication. This allows operation in many harsh environments without concern and with substantially reduced maintenance requirements.

Components can be designed to integrate with the space limitations of the application and provide control in all six modes of freedom.

Steel springs are normally used in the form of coil springs or leaf springs. The benefit of these is that they permit relatively high deflections, but their disadvantage is that they provide very little damping. Due to this, excessive movement occurs when passing through the resonance range. Often special devices are installed in order to limit deflections.

To allow their properties to be utilised in a satisfactory way, Trelleborg Industrial AVS rubber mountings are available in various hardness grades and polymer types.

Rubber has many unique properties, including acoustic damping characteristics, which assist the installation designer in keeping noise levels inside and outside passenger accommodations to a minimum.

Fig 2. Chemical ingredients

RUBBER AS AN ENGINEERING MATERIAL

Compared with other engineering materials, rubber is very ductile. In some cases, the elongation may be higher than 1000%, and by far the highest proportion of this strain is elastic. Metals, on the other hand, have very small strains below the elastic limit. Compared with metals, the tensile strength of rubber is low. The maximum level that can be achieved with rubber is 25-30 MPa. However, because of the high strain, rubber has a very large work absorption capacity compared with the best grade of steel.

If a material is subjected to a load below the elastic limit, the deformation will, according to Hooke´s law, be proportional to the load. This does not apply to rubber under tension or compression. This means that rubber does not have any constant tensile or compression modulus of elasticity. Metals will normally be softer towards the end of a tensile test, while the opposite is often the case with rubber. Rubber does not have a yield point, and the modulus is increased until there is abrupt failure.

THE MOST IMPORTANT PROPERTIES FOR RUBBER

High elastic ductility

High elastic ductility is, therefore, the most pronounced feature of rubber. Just how easy it is to deform rubber is shown by the fact that the modulus of elasticity of compression for rubber within the normal hardness range, 30-80° IRH, is between 2 and 12 MPa; while the modulus of elasticity of steel is 210 000 MPa, This means that rubber is about 100 000 times softer than steel.

Damping capacity

Damping capacity is an additional important feature of compounded rubber. This is of particular importance when operating a machine that is supported on springs through the resonance range. The resonance deflection with rubber springs is only 1/5 to 1/50 compared with the deflection when using steel springs with the same stiffness, see ***fig. 3.*** With a spring made of natural rubber working with compression or shear load, the direct loss of energy is between 6 and 30% depending on the hardness of the rubber. This energy loss is such that it is possible in many cases to use rubber springs as dampers. Care must be taken when it comes to damping in a rubber element. If the element works with high amplitudes, a substantial amount of energy is converted into heat, and the heat which is generated may cause the rubber element to be destroyed. See ***fig. 4.*** In the case of simple impact, the vibrations sequence will be as shown in ***fig. 5.*** The left-hand curve represents a steel spring, while the right-hand curve represents a rubber spring. These two curves clearly show how quickly the vibrations degenerate in the rubber, while in steel springs they diminish slowly.

Sound-insulating

As sound-insulating material, rubber is one of the very best. The effect of sound insulation increases with the thickness of the rubber. Rubber is an excellent absorber of impact sound, which occurs in foundations, floors, buildings, etc.

Environmental Conditions

Trelleborg products are manufactured in a wide range of rubber compound types. A range of hardnesses is available in each compound type to allow the required stiffness to be achieved.

Each compound is carefully formulated to obtain the best performance for specific properties. The compound chosen depends upon the most important properties for the application's requirement. Strength and fatigue requirements, operating temperature, environmental conditions and potential contaminates must be considered. Most Trelleborg rubber compounds are based on polyisoprenes, offering high strength and excellent performance characteristics. A range of synthetic rubber compounds is also available for special applications where resistance to continuous high temperatures (>75°C) or other harsh environmental conditions is required. Anti-oxidants and anti-ozonants are included in many formulations to provide resistance against ozone and ultra violet rays.

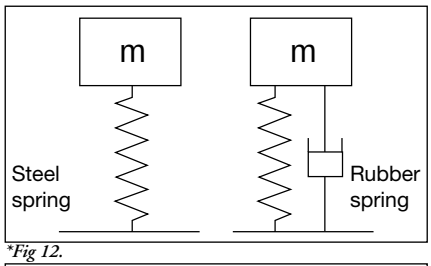


*Fig 12.

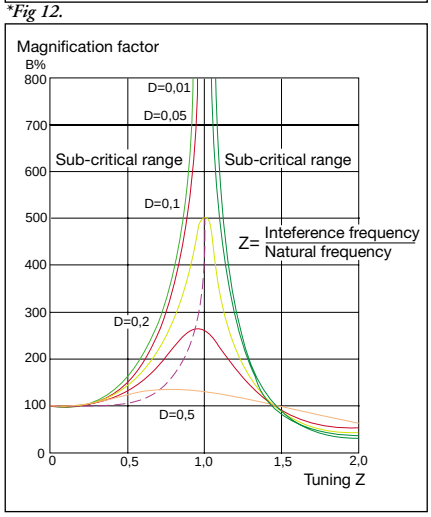


Fig 3.
Resonance curve for spring material with different internal damping.

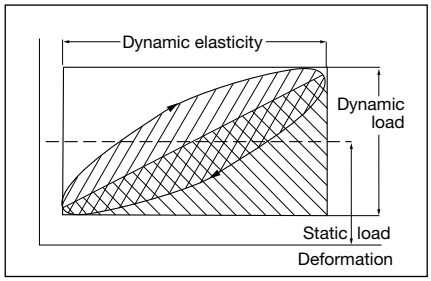


Fig 4.
Schematic representation of the internal damping properties of rubber. The elliptical area indicates the loss of energy.

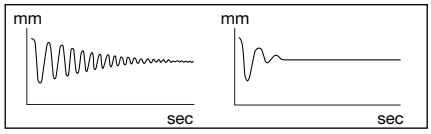


Fig 5.
Vibrations sequence with single impact for steel and rubber springs.

**Fig 12. Schematic difference between rubber spring and steel spring.*

Basic Polymer	Natural Rubber – polyisoprene	Poly-Chloroprene	Natural Rubber and Styrene Butadiene blend	Synthetic Polyisoprene	Natural Rubber	Natural Rubber	Ethylene Propylene
Compound Type	First Grade General Purpose	Oil Resisting	High Damping	Very Low Creep	Medium Creep	Low Creep	High Temperature
Physical Strength	Excellent	Good	Very Good	Very Good	Excellent	Excellent	Moderate
Compression Set	Good	Moderate	Moderate	Excellent	Very Good	Very Good	Good
Ozone Resistance	Good	Good	Moderate	Poor	Poor	Good	Excellent
High Temperature Performance	Moderate	Good	Moderate	Good	Moderate	Good	Very Good
Low Temperature Performance	Good	Poor	Moderate	Good	Good	Good	Moderate
Fatigue Performance	Excellent	Moderate	Moderate	Good	Very Good	Very Good	Moderate
Oil Resistance	Poor	Moderate	Poor	Poor	Poor	Poor	Poor
Creep Performance	Moderate	Poor	Poor	Excellent	Good	Very Good	Moderate
Hardness Range IRH	35 – 80	45 – 70	45 – 70	45 - 70	40 - 70	40 - 70	40 – 70
Nominal Critical Damping %	3 - 5	6 - 8	7 – 10	2 – 4	2 - 4	2 - 4	7 - 10

Table 1. Typical properties for rubber compounds used in antivibration mountings.

SPRING COEFFICIENTS

A rubber spring has different charactistics for static and dynamic conditions. A constant load causes a deflection, and the inclination/deflection gives the static spring coefficient. When the spring from equilibrium is loaded with a dynamic force, the response is a higher spring coefficient.

Static Stiffness

The stiffness of a spring is a measure of applied force (P) against a resulting Deflection (X). Measurements taken at a continuous feed rate (usually in the order of 1mm/sec velocity) provide static (or pseudo static) characteristic. The curves in fig. 6 show alternative methods of determining stiffness.

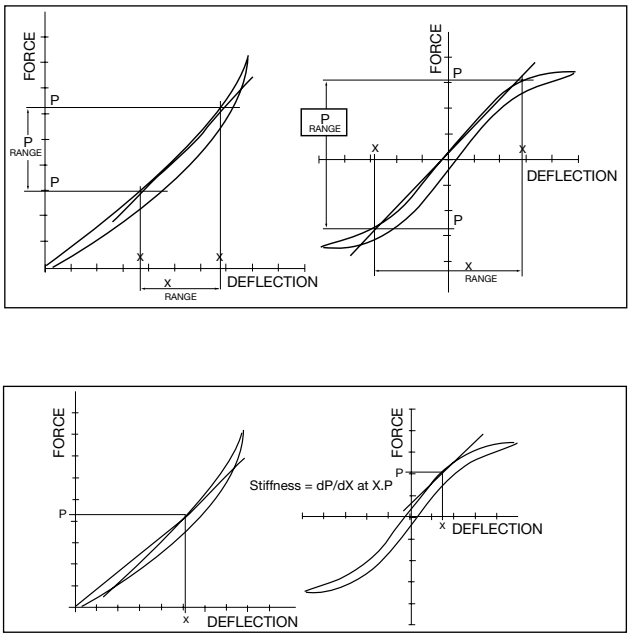


Fig. 6
dP/dX at XP average gradient over P (or X) range (usually derived by least squares method of curve fitting).

Dynamic Stiffness

The stiffness of a rubber spring changes when a dynamic force is applied. This is known as the dynamic (or complex) stiffness. The dynamic stiffness is usually higher than the pseudo-static stiffness, (the difference being referred to as the dynamic to static ratio) and is affected by several factors including changes in frequency, temperature and amplitude. See fig. 7.

The dynamic stiffness is considered to be unchanged between 5Hz and 80Hz under constant conditions. Above this frequency range, the dynamic stiffness of the spring will deviate from the ideal 'massless' spring stiffness. This is due to the mass effects of standing waves. "Wave effect" changes of dynamic stiffness are generated when the rubber section dimensions become comparable with multiples of the half wavelength of the propagated wave passing through the spring. Calculations of the deviation from ideal "massless" spring dynamic stiffness due to wave effect are complex and are normally obtained from test measurement. A typical stiffness curve for a large section rubber to metal bonded spring is shown below.

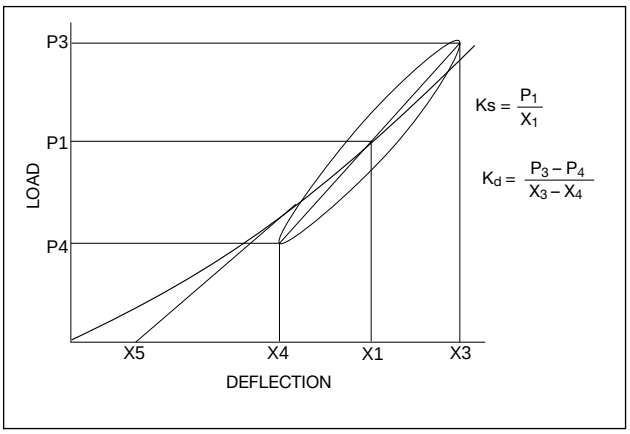


Fig. 7

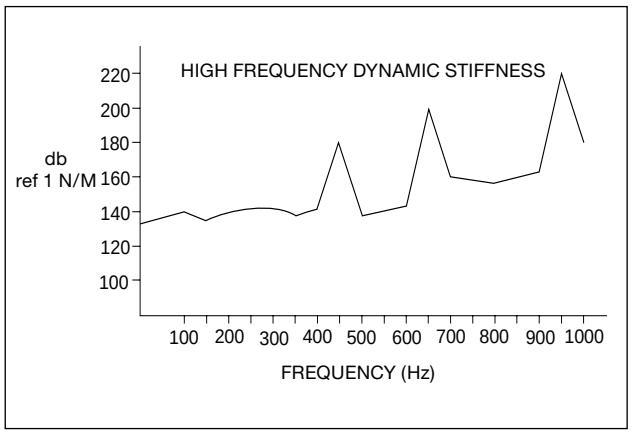


Fig. 8

Creep Performance

When a rubber spring is subjected to a constant load, the resultant deflection continues to increase with time. An example of creep that occurs in a pair of inclined springs is shown on the graph in fig. 9.

A typical creep characteristic for rubber used in antivibration mountings is 3-5% per time decade.

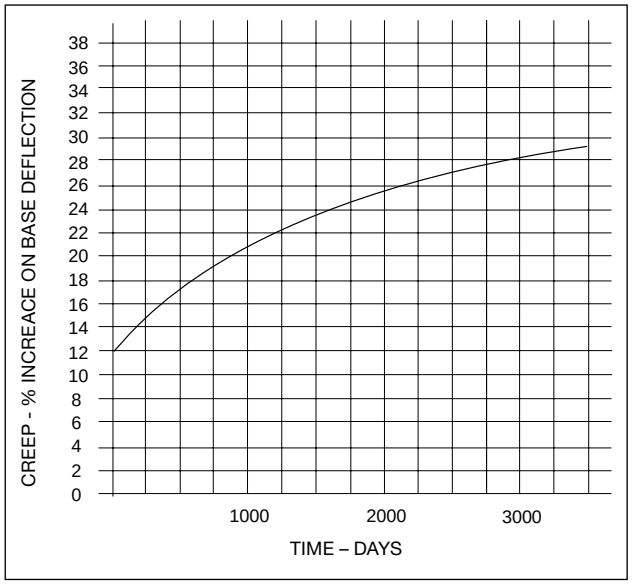


Fig. 9

Joule effect

Changes in temperature cause small changes in the deflection of loaded rubber springs. This change in temperature, which is reversible with temperature, is known as the Joule effect. For pairs of springs shown a 10°C rise in temperature will cause an increase in clearance by approximately 4.5% of the nominal static deflection. See fig. 10 and 11.

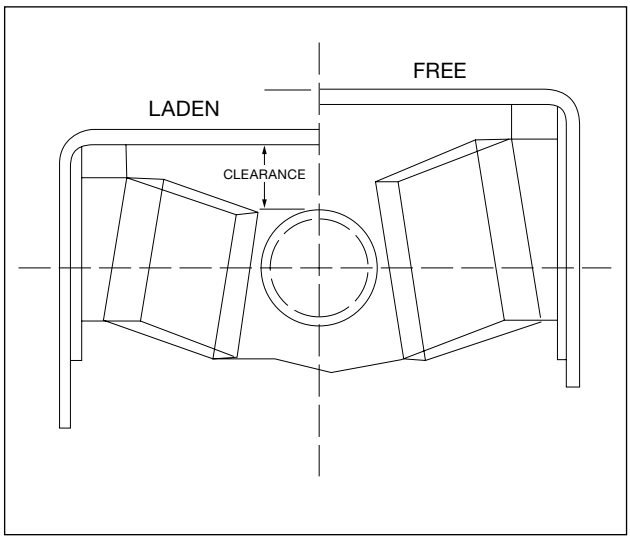


Fig 10.

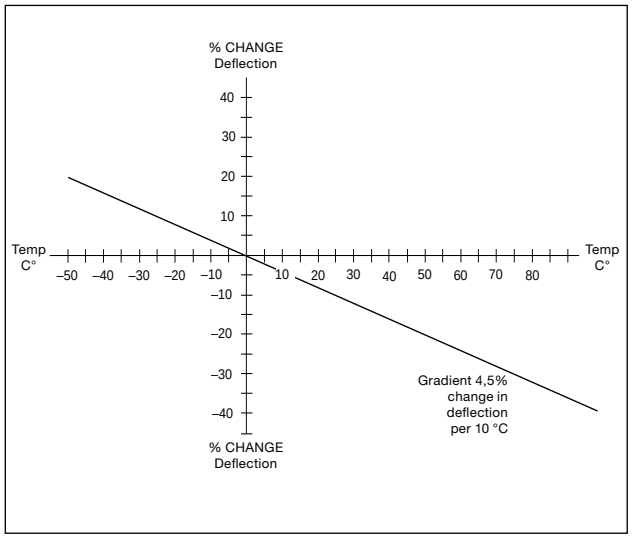


Fig 11.

STIFFNESS OF A RUBBER SPRING

When calculating compression characteristics of rubber, it should be noted that the deflection is not directly proportional to the load, as the modulus of elasticity in compression increases with the degree of stress. The modulus of shear, however, remains constant for normal stresses.

The factor with the most effect on stiffness is the ratio between loaded and free surface area of rubber. This is the so-called shape factor (often designated S). With thin rubber sections, a very high modulus of elasticity can be achieved. In other respect, the stiffness of a rubber spring is determined by the dimensions and the hardness of the rubber.

Fig. 13 illustrates the relationship between rubber hardness and shear modulus, and **fig. 14** the dependence of the bulk modulus on the shape factor. The latter curve applies at 10% deformation.

The curves show that rubber at a shape factor of 0.25 for shear is about 6-8 times softer than compression for the same rubber hardness. Since only 3-4 times the stress value in compression can be considered, it may be said that rubber is best used in shear to achieve large deflections and good isolation properties, particularly at low interference frequencies.

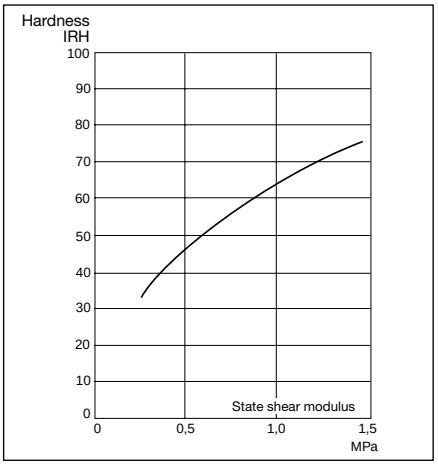


Fig 13.
Relationsip between rubber hardness and shear modulus.

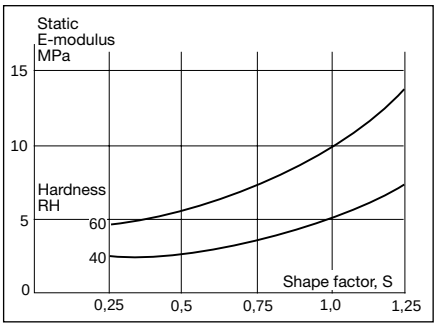


Fig 14.
The dependence of the compression modulus upon the shape factor.

SELECTION OF ANTIVIBRATION MOUNTINGS

The principle relating to vibration isolation with springs is that they are placed between the machine and the base or plinth. To ensure effective isolation, the springs must be selected carefully, otherwise the result could be impaired performance. In favourable cases, the transmitted force can be reduced to only 2 or 3% of that of a rigidly mounted machine. In such cases, the vibrations are practically eliminated.

SOME VIBRATION DEFINITIONS

Amplitude	A	(m)	The magnitude of the displacement of a vibration deflection from the mean position. The total vibration is thus twice the amplitude.
Interference frequency	f	(Hz)	Is essentially the same as the frequency of the rotational speed of the machine or a harmonic.
Frequency	f_o	(Hz)	The number of vibrations in a freely-oscillating system per unit of time.
Mass	m	(Kg)	The mass of the oscillating system.
Spring force	F	(N)	The force emanating from a spring on the machine or the reverse.
Deflection	d	(m)	The deformation of the spring from the neutral position.
Static spring stiffness	Kstat	(N/m)	The force required in Newtons to compress the mounting 1 m.
Dynamic spring stiffness	Kdyn	(N/m)	Spring stiffness when an alternating force is applied.
Tuning ratio	Z	(-)	The ratio between interference frequency f and natural frequency f_o.
Interference force	F_s	(N)	The force transmitted to the base of an isolated machine.
Impulse force	F_i	(N)	The force transmitted to the base of a rigidly mounted machine.
Magnification factor	B	(-)	The part of the impulse force which is transmitted as a vibration force. Indicates the relation between the interference force F_s and impulse force F_i.
Level of isolation	I	(-)	The part of the impulse force which is eliminated by the vibration isolation, (1-B) or, if B is expressed as a percentage, (100-B).
Damping coefficient	c	(Ns/m)	The linear viscous damping coefficient.
Critical damping	c_{kr}	(Ns/m)	The linear viscous damping coefficient at critical damping. A system is said to be critically damped if it returns to its initial static position without any over-oscillation after a displacement.
Damping factor	D	(-)	The ratio between c and c_{kr}.
Reduction	R	(dB)	Isolation expressed in decibels.
Deflection	δstat	(mm)	The static deflection for a spring.

Calculation of deflection

When calculating deflection the following formula shall be used.

$$\delta_{stat} = \frac{F}{K_{stat}}$$

Calculation of isolation degree

The following formulas are used for calculating the isolation degree for a given spring.

The natural frequency:

$$f_o = \frac{1}{2\pi}\sqrt{\frac{K_{dyn}}{m}}$$

Tuning: $Z = f/f_o$

Magnification factor:

$$B = \frac{F_s}{F_i} = \sqrt{\frac{1+4D^2Z^2}{(1-Z^2)^2+4D^2Z^2}}$$

The factor D depends on the internal damping of the spring material. In rubber D has the value 0.04-0.1 depending on hardness of the rubber. The term $4D^2 \cdot Z^2$ can generally be neglected completely except in the resonance range, that is, when Z=1. If Z=1, that is, the machine speed (rpm) = the natural vibrations of the system, it is said that there is resonance, and the vibrations will be infinitely large if there is no damping. Here, then, a rubber spring has a district advantage over a steel spring, which has minor internal damping and in which the amplitude, in theory, grows to a very high value in the resonance point. Refer to fig. 3 on page 10.

Isolation degree I=(1-B) or as percentage, I=(1-B)x100

Reduction in dB R=20log(1/B)

The relative magnitude of the transmission of force depends entirely on the tuning ratio Z. If Z is high, the force transmission percentage will be small.

As can be seen in fig. 15, B at $Z=\sqrt{2}$ has dropped to 100% and when Z is further increased, B drops rapidly. Vibration isolation is therefore of significance first when the operating frequency considerably exceeds the natural frequency. For practical applications, Z should be between 3 and 5, which means that 88 and 96 % of interference forces are eliminated.

Generally, the operating speed of a machine (interference frequency) is given. If the system´s natural vibration coefficient can be modified, and influence Z, it is possible to change the force transmitted. This is exactly what happens when vibration isolation is achieved. The low elasticity and shear moduli of rubber are used to achieve a low natural frequency.

To summarize, transmission of vibration forces can be effected in three ways:

1. Rigidly mounted machines transmit vibration forces in unchanged form to the base, which is therefore forced to be a part of the movement of the machine. The magnification factor can be regarded as being 100%.

2. In the case of an unsuitable spring system, the magnification factor will increase considerably and may amount to several hundred percent.

3. The force transmission percentage is reduced substantially by correct calculation and suitable mountings being installed between the machine and base. Typical reductions can be from 100 down to 10%, but in favourable circumstances can be as low as 2%.

All machines have more than one resonance point as, through many interacting movements, they can vibrate in different modes. The resonance points can be determined, but the methods of calculation are often difficult. Experience has shown that all resonance velocities that may arise do not need to be clarified. It is usually sufficient to calculate the more significant ones which can be determined easily. The desired level of isolation and the interference frequency determine where the resonance frequency shall be.

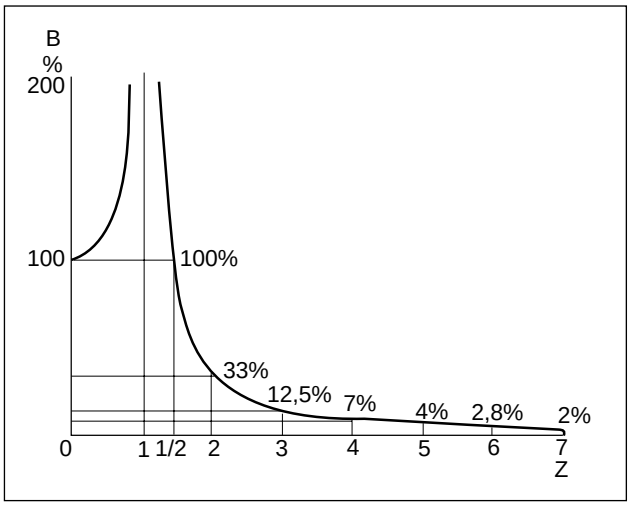


Fig. 15 Resonance curve.

SHOCK ISOLATION

Shock is usually described as a transient phenomenon as opposed to a vibration, which is a continuous process.

A shock pulse can normally by described by parameters such as maximum amplitude (acceleration, for example), duration (in milliseconds, for example), and the shape of the pulse. The pulse may be a half sine wave, rectangular, saw tooth or other shape of wave.

The basic principle for achieving good shock isolation is to mount the machine on mountings that are soft enough to give a low natural frequency, and which can offer relatively large mounting deflections.

If the duration of a shock pulse is τ seconds, and the natural frequency of the set up is f_o Hz, then the product must be τf_o <approx. 0.25 if the isolation is to provide protection against the shock.

The value 0.25 is not an absolute value but depends on the shape of the shock pulse.

STORAGE

There may be changes in appearance and physical properties of rubber products during storage, particularly if adverse condition apply. BS3574 provides an ideal guide to the most suitable storage conditions, including:

– Moderate temperature (ideally 20°-30°).
– Low humidity.
– Protection from intense light, radiation and high ozone concentrations.
– It is recommended that the storage period does not exceed five years.

Unit conversion

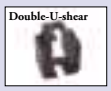
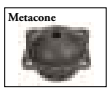
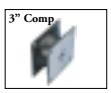
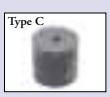
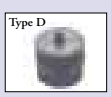
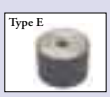
Multiply	**by**	**to obtain**
feet	0.30480	meters
inches	0.02540	meters
pounds	0.453	kilograms
pound/force	4.45	Newtons
feet second	0.3048	meters/second
inches/second	0.0254	meters/second
feet/second^2	0.3048	meters/second^2
inches/second^2	0.0254	meters/second^2

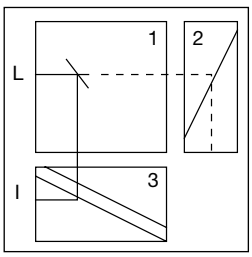
GENERAL SET UP

1. The various parts of the machine are combined on a common base.
2. The entire machine is isolated by means of suitable Trelleborg Industrial AVS anti-vibration mountings.
3. Flexible connections to the machine are required in order to achieve effective isolation. The application of Trelleborg expansion joints can be recommended.
4. If required, there should be grounding for removing static electricity.

Fig 16. General set up.

Assistance when choosing antivibration mountings

Type of machine	Type of mounting	How to choose
Rotating Equipment		
Stationary installations Combustion engines Compressors, Generators	RA/RAEM M RAB Fail-safe Vee Mounting Cushyfoot	**Important information** • Weight • Number of mounts • Rotational speed • Environment **See corresponding product data sheet:** To select correct mounting, the following data are needed: **1.** Load per mounting (kg) **2.** Interfering frequency (Hz) (Hz = rpm/60) Select correct load line in diagram 1 and correct interference line in diagram 3. The load line intersects with required type of mounting. Connect this intersection point vertically down to the interference line in diagram 3. Here, on the sloping curve, the isolation degree is indicated. For static deflection, see diagram 2.
Mobile installations Vehicle engines, Compressors, Generators, Marine engines	HK SIM Cushyfloat Metacone Vee Mounting	
Sensitive Equipment Electronics, Cameras, Fans, Small Pumps	M SE MC Fanflex Equi-Frequency Two Bolt Instru-mounting Flanged Instrumo-untings	
Transit Protection Computers, Test Equipment	VT M BA  Double-U-shear	
Vehicles Engines, Cabs, ROPS cage	HK  Metacone Cab Mounts EH UH	
Instrument mountings Electronic Racks, Radio TX/RX, Mobile Computer Systems	M Two Bolt Instru-mounting Flanged Instrumo-untings	
Heavy Duty Isolators Off Highway Vehicles, Vibratory Screens, Large Engines, Public Service Vehicles	SAW Rectangular SAW Cirkular SAW  3" Comp	
Building and Construction Inertia Blocks, Heavy Plant, Ductwork, Suspended Ceilings	GK VT AV-Plate	
Machine Tools Lathes, Punch Presses, Grinders, Woodworking Equipment	TF AV-plate	
Motion Control Rebound, Motion Limitation	SE Buffers ANB	
Vehicle Suspension Pivot Arms, Trunnion Mounts, Gearbox Mountings	VP UD SP-Bearings Metaxentric bushes	
General purpose mounts Exhaust systems, Small fans, Instrument panels	Type A Type B  Type C  Type D Type KD  Type E	



RA & Fail Safe EF

Novibra® type RA and Metalastik® type Fail Safe EF

For effective isolation of vibration and noise on machines with rotating movements, e.g.

- Compressors
- Combustion engines
- Generators
- Converters
- Pumps
- Industrial and marine gen-sets
- Fans

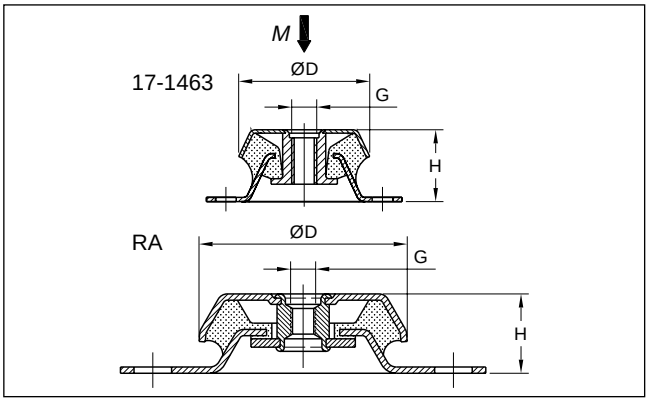
Also suitable for use with presses, punches and other workshop machines.

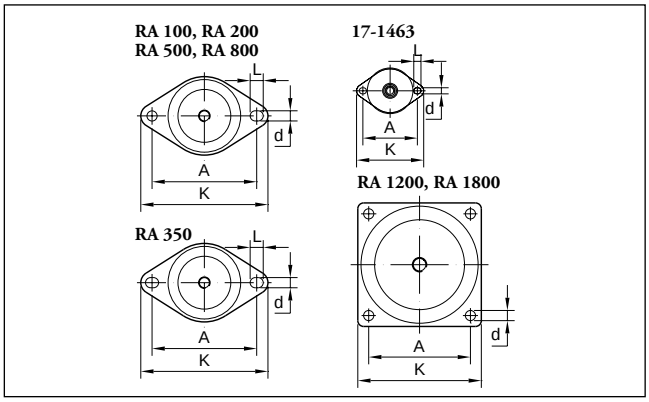
Features

RA and EF uses the rubber profile in shear and compression, obtaining good vertical flexibility with the advantage of horizontal stability. For normal speeds of approx. 1500 rpm, the RA and EF type provides a degree of isolation of 75-85%. For better isolation, the alternative RAEM or M can be chosen.

Its unique construction and the latest production methods make Novibra® type RA and EF a high performance mounting having a number of advantages:

- Rubber features are utilised effectively combining compression and shear.
- Wide load rating options, 40-2100 kg.
- Corrosion protected to cope with arduous environments on land or marine applications (Fe/Zn8C as per ISO 2081).
- Fitted as standard with an integral fail-safe design device with resilient stop, making RA and EF ideal for use in mobile or marine applications. The RA/EF-mounts can accomodate occasional shock loads to 5 g reference to the weight in hardness 60° IRH. The mount will withstand shock loads up to 2 g without plastic deformation.
- Clear and durable product marking so that mountings can be identified even after several years in operation.
- Domed shape cover to protect against oil contamination.



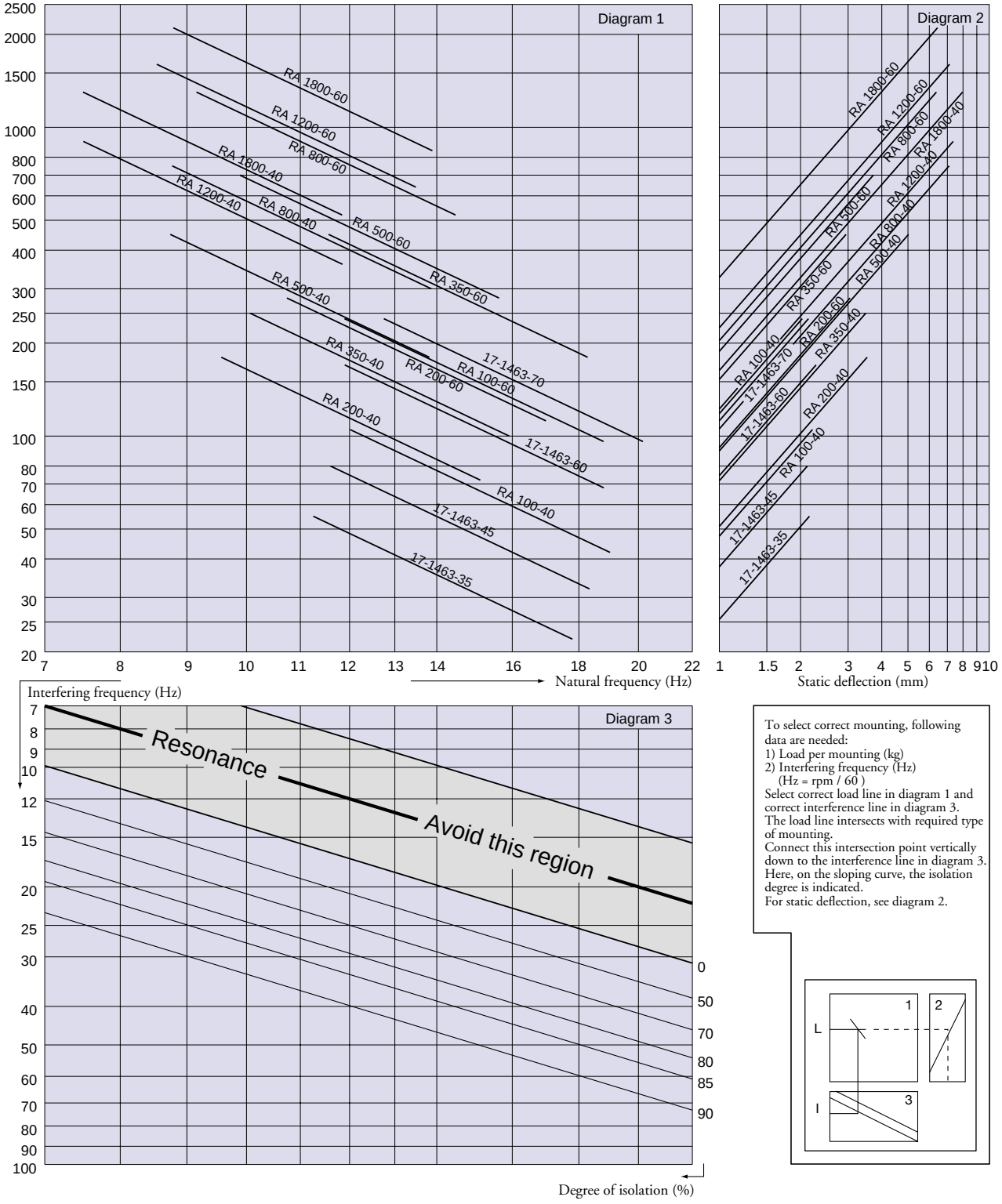


Type	Art.No. 40° IRH	Art.No. 60° IRH	D	A	H	K	d	L	G	Weight (kg)	*M*-Max (kg) 40° IRH	*M*-Max (kg) 60° IRH
				Dimensions in mm								
RA 100/M10	1861700	1861710	79	110	30	130	9	12	M10	0.33	105	240
RA 100/M12	2256120	2256130	79	110	30	130	9	12	M12	0.33	105	240
RA 200/M10	1861740	1861750	94	124	35	150	10	15	M10	0.47	180	280
RA 200/M12	2255720	1860350	94	124	35	150	10	15	M12	0.47	180	280
RA 350/M12	2256370	2256380	101	140-148	38	175	14	18	M12	0.74	250	450
RA 350/M16	1861760	1861770	101	140-148	38	175	14	18	M16	0.74	250	450
RA 500	1861800	1861810	123	158	42	192	14	18	M16	1.02	450	700
RA 800	1861820	1861830	144	182	48	216	14	18	M16	1.59	750	1300
RA 1200	2255360	2255370	161	140	58	170	14		M20	2.19	900	1600
RA 1800	2255380	2255390	181	160	66.5	190	14		M20	2.33	1300	2100
Fail Safe EF	17-1463-35 (35° IRH)									0.22	55	
	17-1463-45 (45° IRH)		65	76.2	35	94	8.5	10	M12	0.22	80	
	17-1463-60 (60° IRH)									0.22	170	
	17-1463-70 (70° IRH)									0.22	240	

Trelleborg Industrial AVS operates a policy of continuous improvement and development. We reserve the right to change design and specification of our products without prior notification or alteration of literature

Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)



To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.

RAEM

Novibra® type RAEM

For effective isolation of vibration and noise on machines with rotating movements, e.g.

- Compressors
- AC units
- Industrial fans
- Generators
- Combustion engines
- Emergency power sets
- Large milling machinery
- Industrial and marine gen sets
- Refiners
- Defibrators

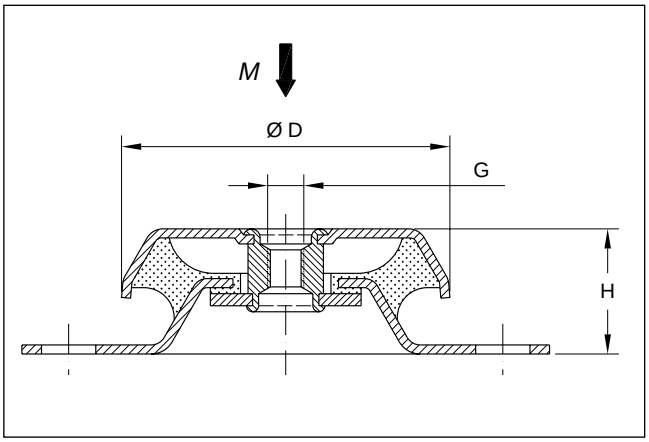
Features

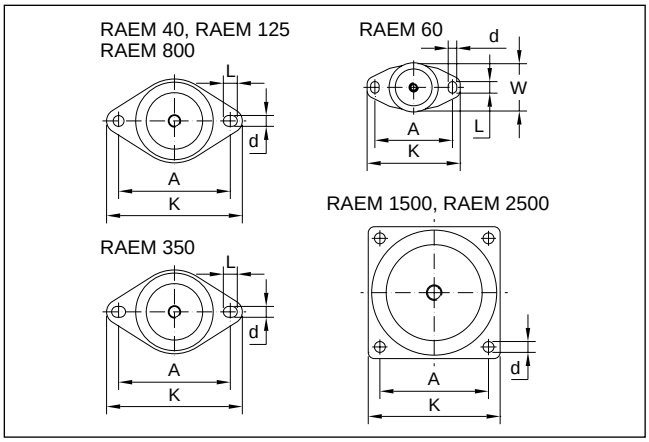
RAEM is a universal mounting for applications demanding maximum isolation. It is a further development of RA, where EM stands for "extra soft". Suitable for both light and heavy machines.

For normal speeds of approx. 1500 rpm the RAEM type provides a degree of isolation of 85-95%, and gives good isolation with low frequency machines.

Its unique construction and the latest production methods make Novibra type RAEM a high performance mounting having a number of advantages:

- Rubber features are utilised effectively combining compression and shear.
- Wide load rating options, 10-3400 kg.
- Corrosion protected to cope with arduous environments on land or marine applications (Fe/Zn8C as per ISO 2081).
- Fitted as standard with an integral fail-safe design with resilient stop, making RAEM ideal for use on mobile or marine applications. The RAEM mounts can accomodate occasional shock loads to 5 g reference to the weight in hardness 60° IRH. The mount will withstand shock loads up to 2 g without plastic deformation.
- Clear and durable product marking so that mountings can be identified even after several years in operation.
- Domed shape cover to protect against oil contamination.





Type	Art.No. 40° IRH	Art.No. 60° IRH	Dimensions in mm D	A	W	H	K	d	L	G	Weight (kg)	*M*-Max(kg) 40° IRH	60° IRH
RAEM 40	1861860	1861870	64	88		35.5	110	9	12	M10	0.26	30	60
RAEM 60	2256760	2256770	63	100	61	35.5	120	11	15	M12	0.30	60	120
RAEM 125 M10	1861720	1861730	84	110		35.5	135	11	15	M10	0.37	80	180
RAEM 125 M12	2256140	2256150	84	110		35.5	135	11	15	M12	0.37	80	180
RAEM 350 M12	2256440	2256450	110	140-148		42	175	14	18	M12	0.80	200	400
RAEM 350 M16	1861780	1861790	110	140-148		42	175	14	18	M16	0.80	200	400
RAEM 800	1861840	1861850	155	182		54	216	14	18	M16	1.8	450	800
RAEM 1500	2255400	2255410	182	146		85	180	14		M20	3.0	900	1700
RAEM 2500	2255420	2255430	224	180		105.5	220	17.5		M24	4.6	1700	3400

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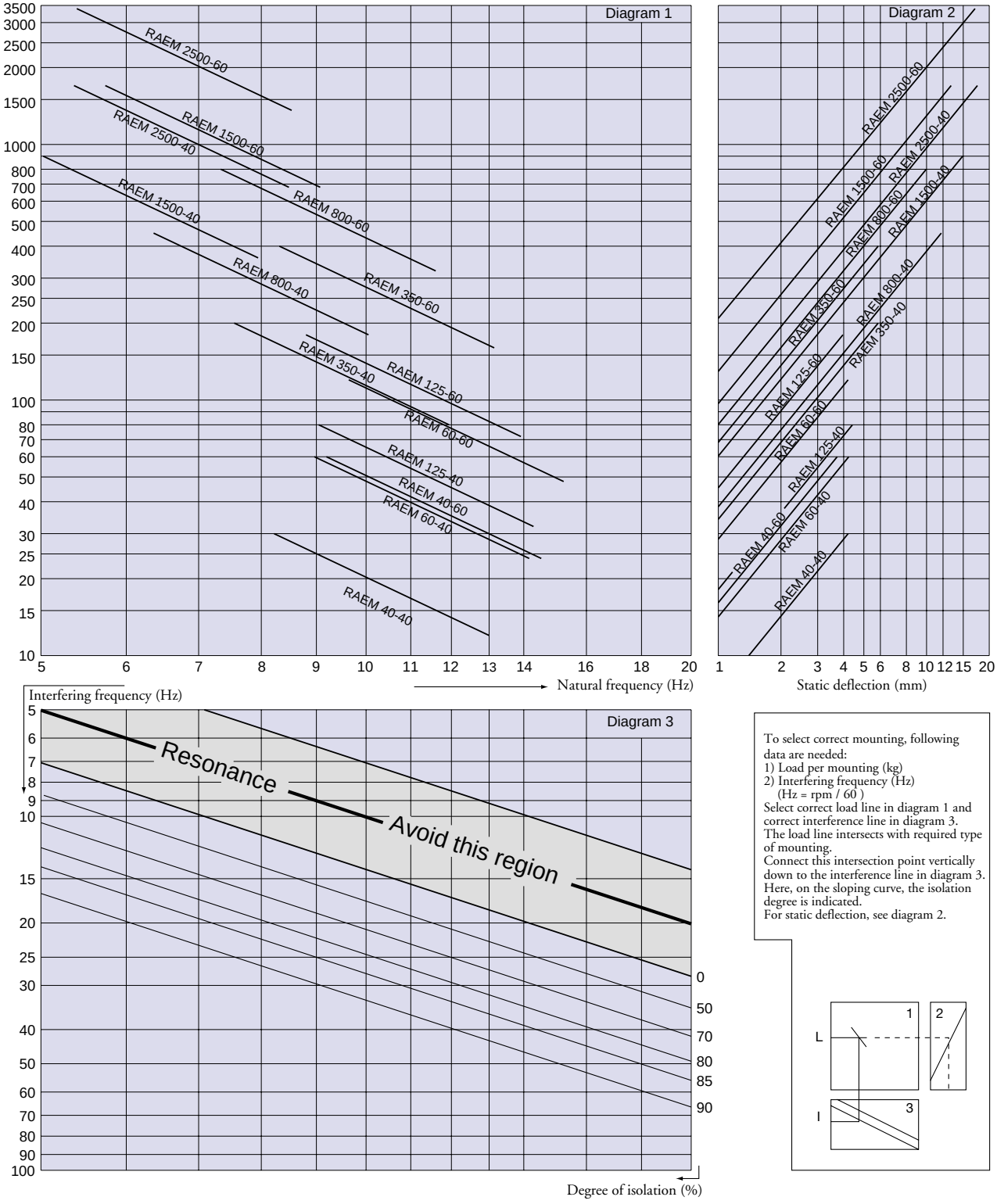
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

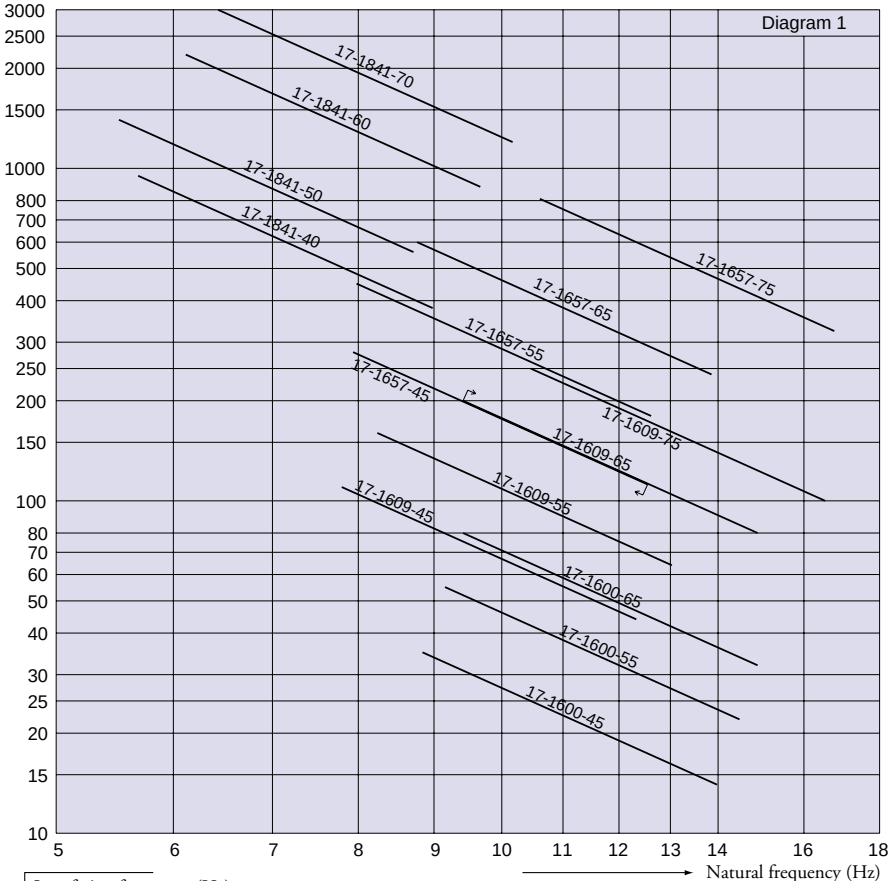
Load
per mounting (kg)

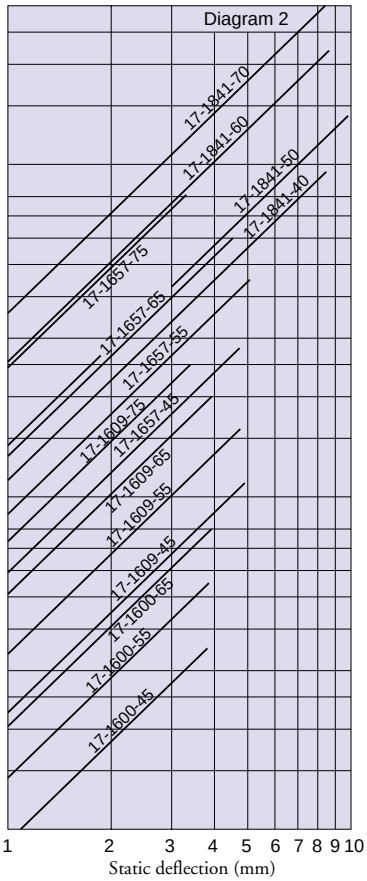


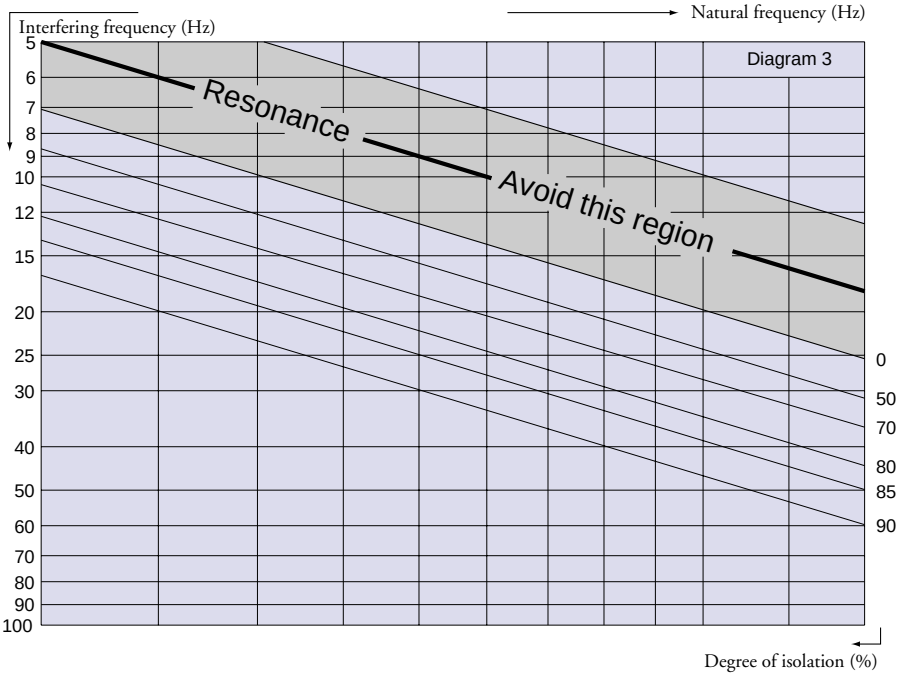
To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.

Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)







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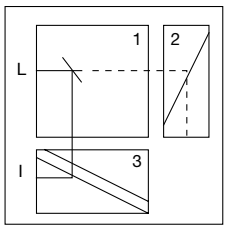
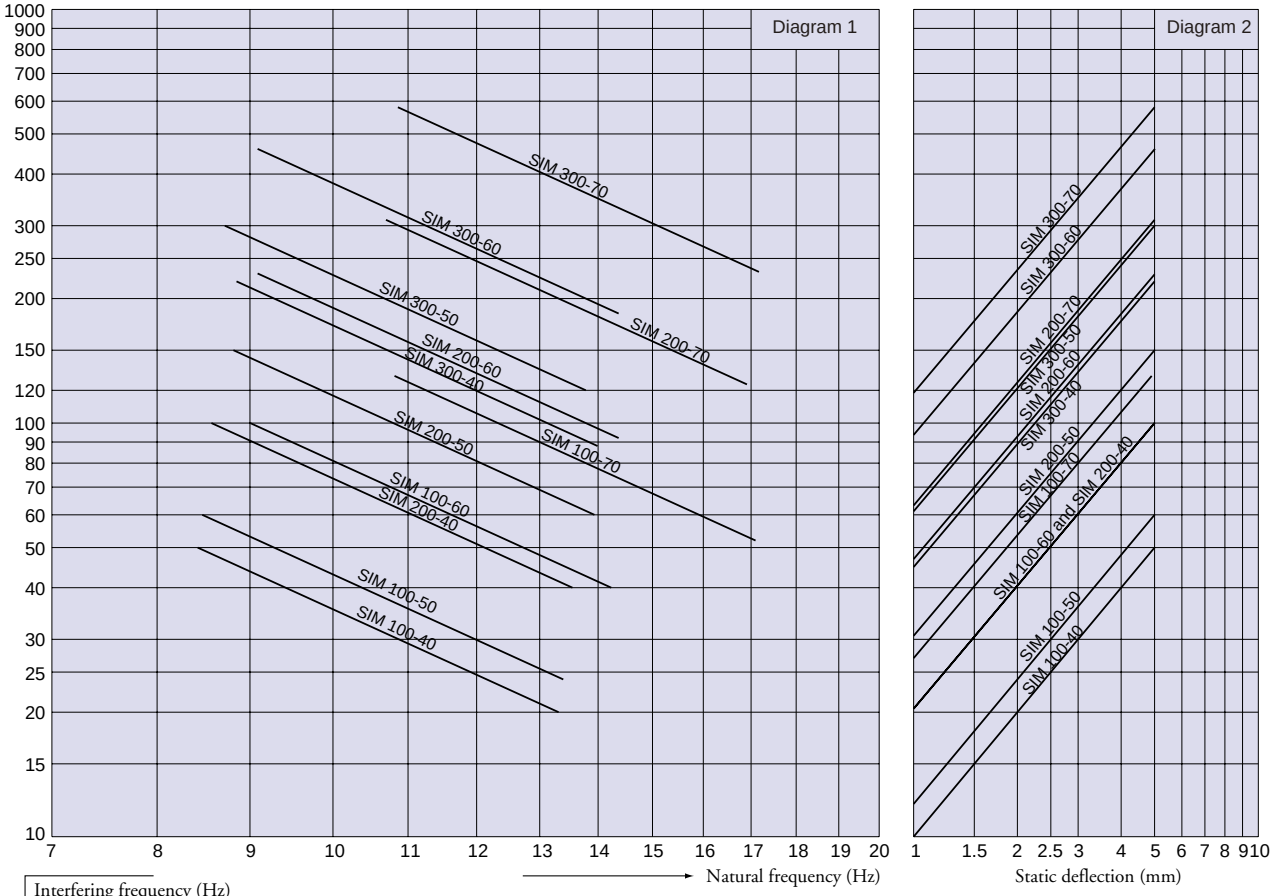
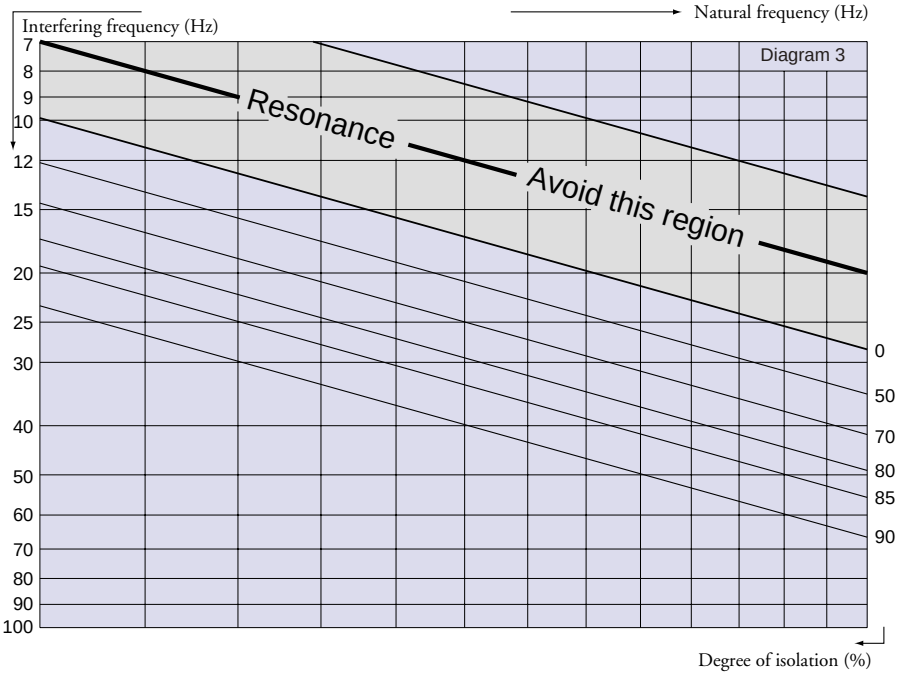


Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
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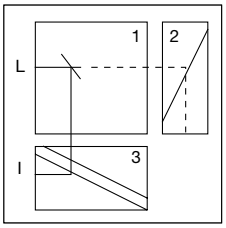
For static deflection, see diagram 2.



Cushyfoot™

Metalastik® type Cushyfoot™

Cushyfoot™ mountings are suitable for many different types of machinery, e.g. diesel engines, generator sets, compressors, fans, hydraulic units and lift machinery.

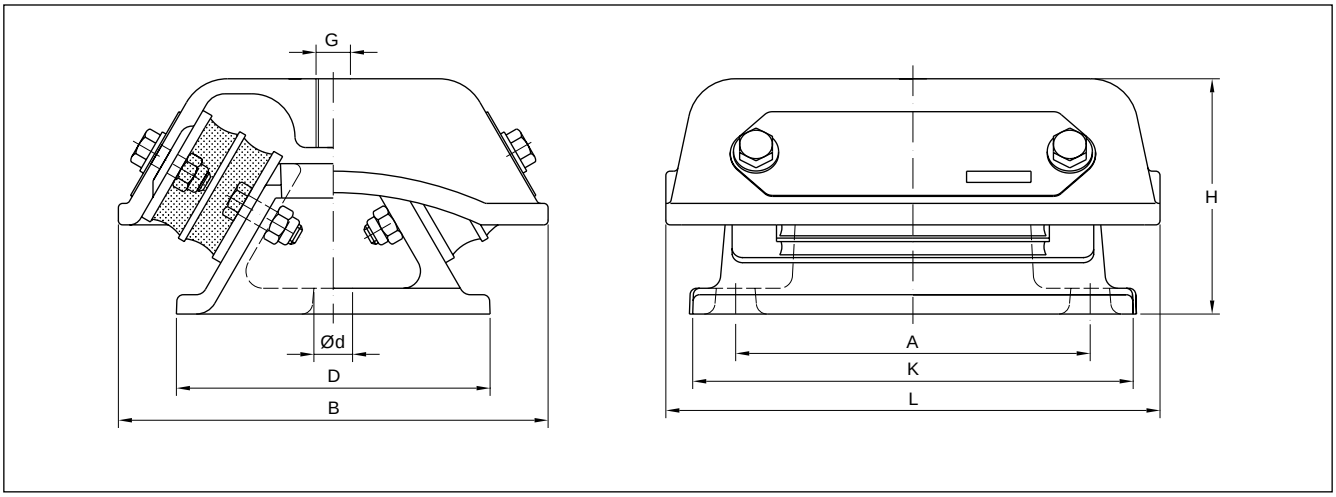
Features

Cushyfoot™ mountings have two rubber elements, used in shear and compression, to provide excellent stiffness characteristics for the isolation of a wide range of vibration frequencies.

There are three sizes, 17-0290 for loads up to 230 kg per mounting, 17-0213 for loads up to 1250 kg and 17-0346, which will carry up to 1280 kg per mounting, but will provide up to 16 mm static deflection.

The Cushyfoot™ mounting has the following features:

- A wide load range from 50 to 1280 kg.
- Stamped identification plates for product identification.
- Strong castings for safety and reliability.
- Dissimilar horizontal stiffnesses give optimum vibration isolation and motion control.



Type	Art.No		Dimensions in mm L	B	A	K	H	D	d	G	Max vertical load (kg)	Weight (kg)
Cushyfoot™ mountings	17-0290-45	(45° IRH)	122	132	90	114	72	82	13	M16	120	2.3
	17-0290-60	(60° IRH)	122	132	90	114	72	82	13	M16	230	2.3
	17-0213-45	(45° IRH)	230	204	165	205	110	148	18	M16	590	10
	17-0213-60	(60° IRH)	230	204	165	205	110	148	18	M16	1250	10
	17-0346-45	(45° IRH)	230	204	165	205	123	148	18	M16	630	9.5
	17-0346-60	(60° IRH)	230	204	165	205	123	148	18	M16	1280	9.5

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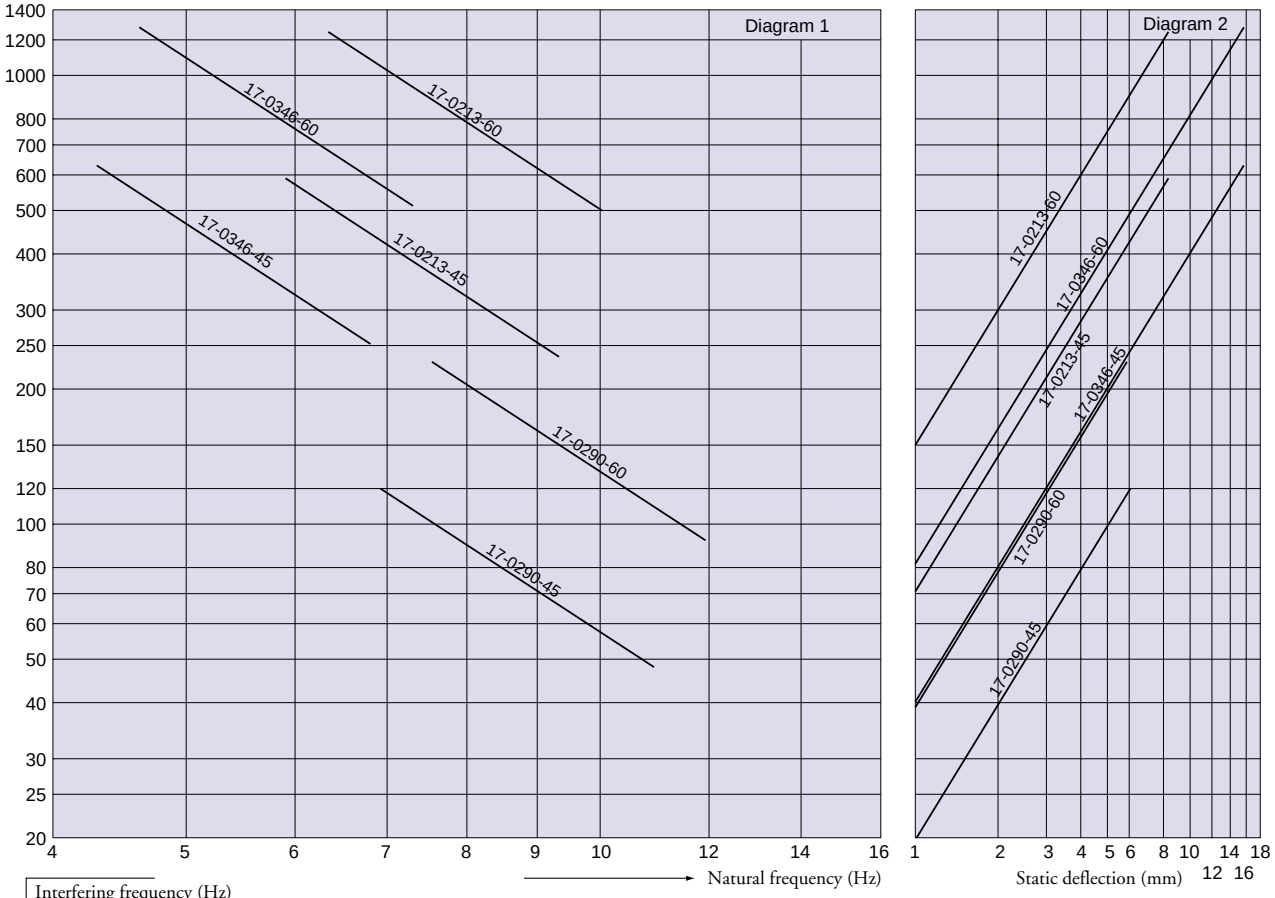
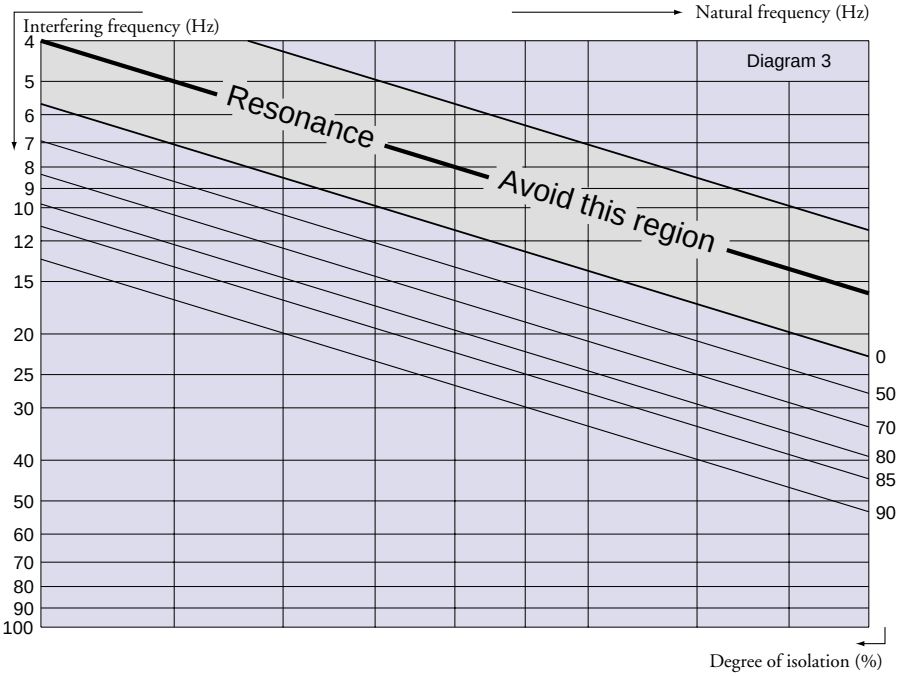
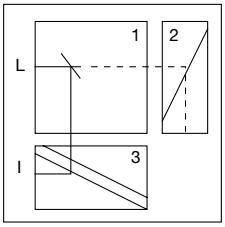
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



Vee Mountings

Metalastik® type Vee Mountings

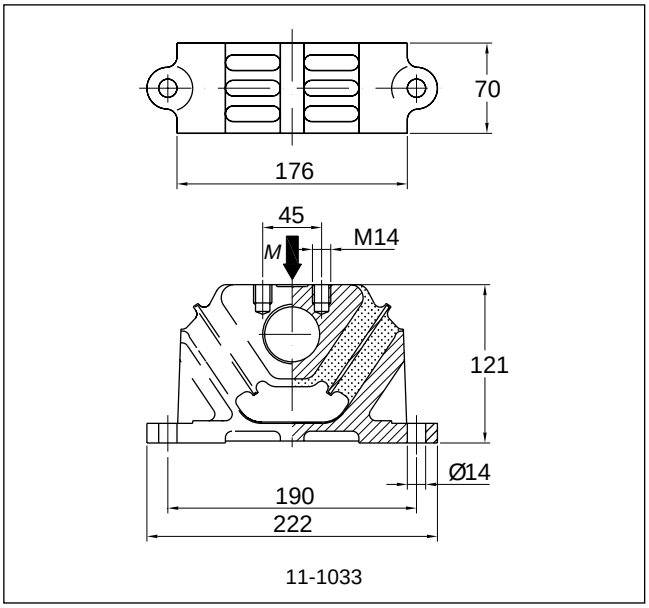
A high load capacity mounting with relatively large rubber volume providing a high degree of vibration and noise isolation and makes it ideally suited for suspending engines installed in public service and goods vehicles.

Features

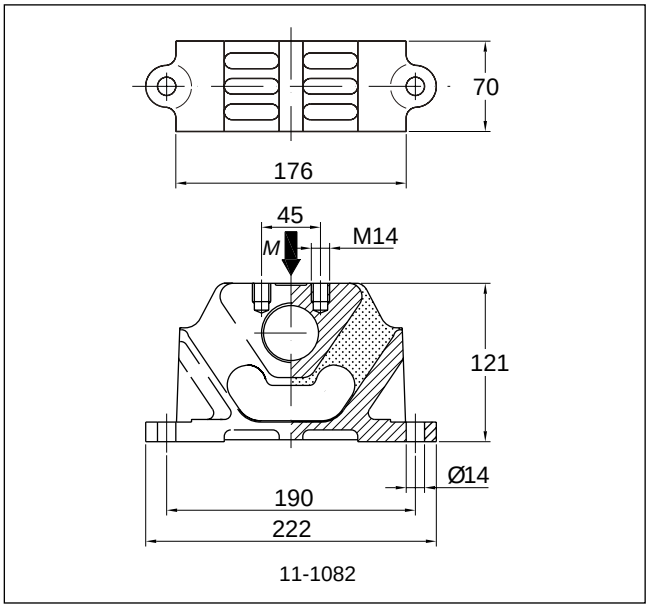
Vee mountings have ideal stiffness characteristics for rail vehicle engine suspensions. The vertical stiffness rate ensures that when the mounting is properly loaded, the vertical natural frequency doesn't coincide with the body bending frequency. The high longitudinal stiffness controls shunting shock motion. The mounting is usually connected to the sole bars via the base casting, and a buffer is attached to the Vee section casting to limit tensile loades.

The Vee mounting has the following features:

- Three dissimilar translational stiffnesses for the best vibration isolation and motion control.
- Strong castings for safety and reliability.



11-1033



11-1082

Type	Art.No.	*M*-Max (kg)	Weight (kg)
Vee mountings	11-1082-55 (55° IRH)	210	4.2
	11-1082-65 (65° IRH)	315	4.2
	11-1033-50 (50° IRH)	470	4.5
	11-1033-60 (60° IRH)	710	4.5

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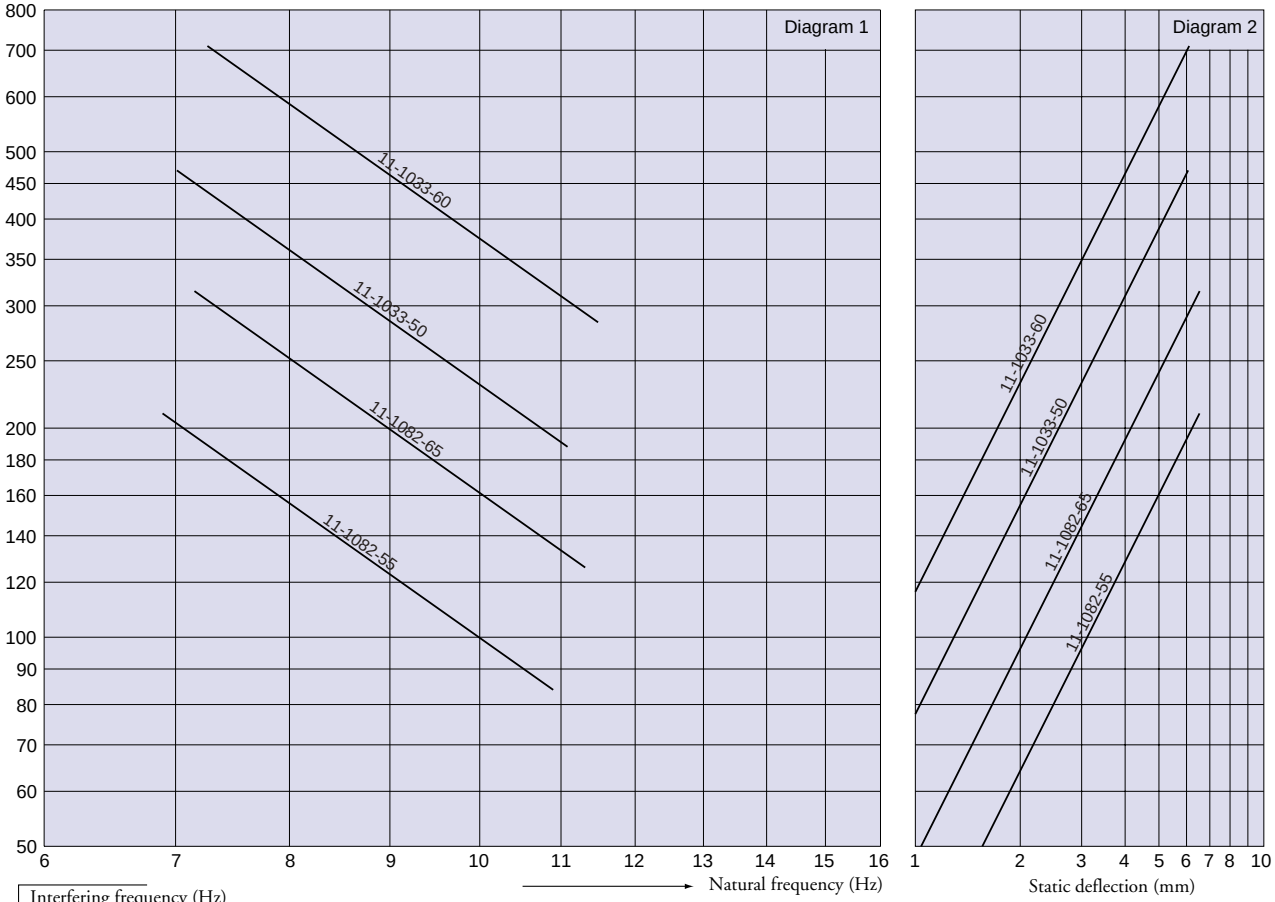
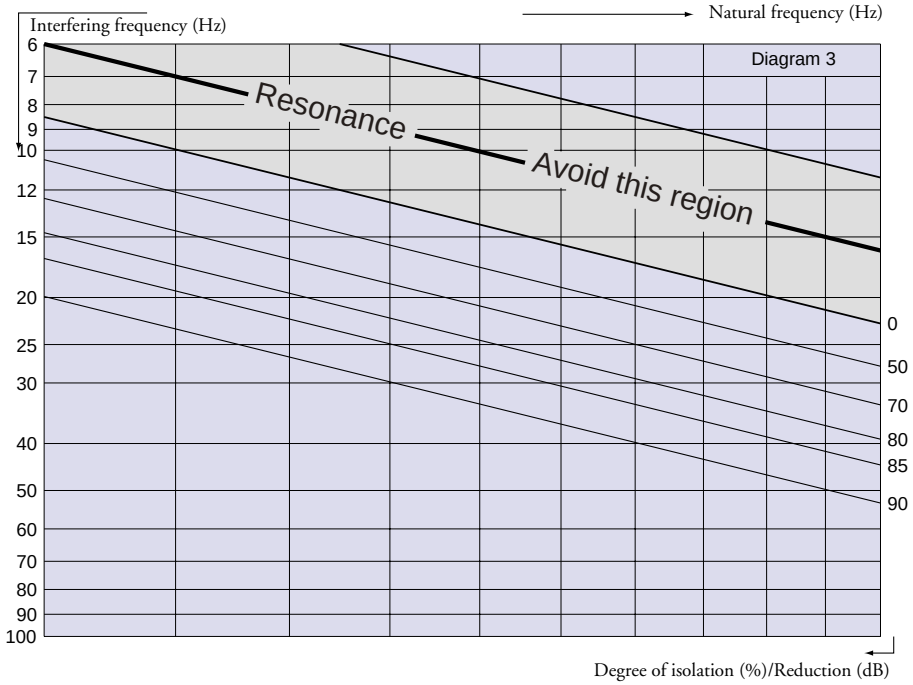
Load
per mounting (kg)





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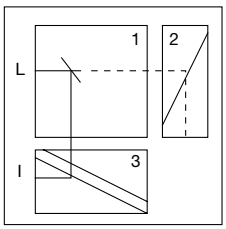


RAB

Novibra® type RAB

Effective isolation of vibration and noise on different machinery with rotating movements, e.g.

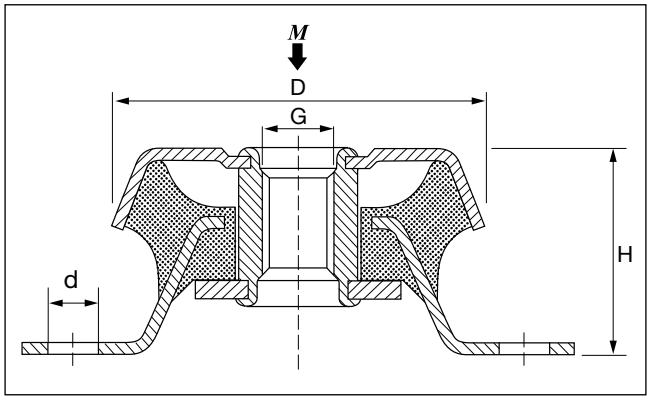
- Diesel engines
- Combustion engines
- Emergency power packs
- Pumps
- Industrial gensets
- Marine gensets

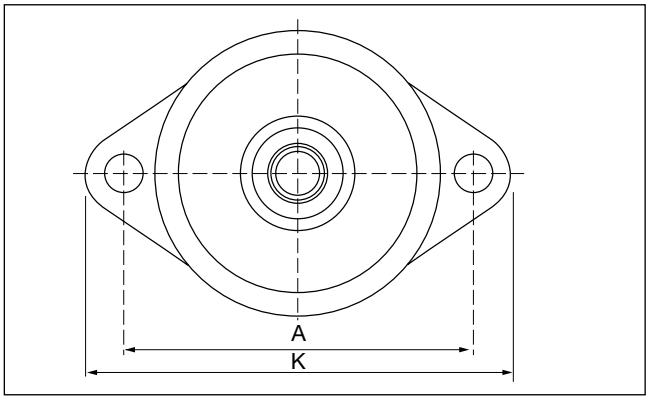
Features

Similar in design to the RA/RAEM range, type RAB uses rubber in shear and compression for optimum stiffness characteristics and horizontal stability. Especially effective on small 1, 2 and 3 cylinder diesel engines where the special compound employed provides effective isolation of vibration while eliminating much of the excessive movement normally associated with 1–3 cylinder engines.

Its unique construction and the latest production methods make Novibra® type RAB a high performance mounting having a number of advantages:

- Rubber features are utilised effectively combining compression and shear.
- Tight tolerances on dynamic stiffness rate for accurate vibration calculations.
- Load rating options, 10-130 kg.
- Corrosion protected to cope with arduous environments on land or marine applications (Fe/Zn8C as per ISO 2081).
- Fitted as standard with a shock-proof device with resilient stop, ideal for mobile or marine use. The RAB-mounts can accomodate occasional shock loads to 5 g reference to the weight. The mount will withstand shock loads up to 2 g without plastic deformation.
- Clear and durable product marking so that mountings can be identified even after several years in operation.
- Domed shape cover to protect against oil contamination.





Type	Art.No. 55° IRH	Dimensions mm D	A	H	K	d	G	Weight kg	*M*-Max (kg)
RAB- 0	2256600	63	76	35	93.5	8.5	M12	0.22	130
RAB -2	2256610	63	76	35	93.5	8.5	M12	0.22	105
RAB -3	2256620	63	76	35	93.5	8.5	M12	0.22	70

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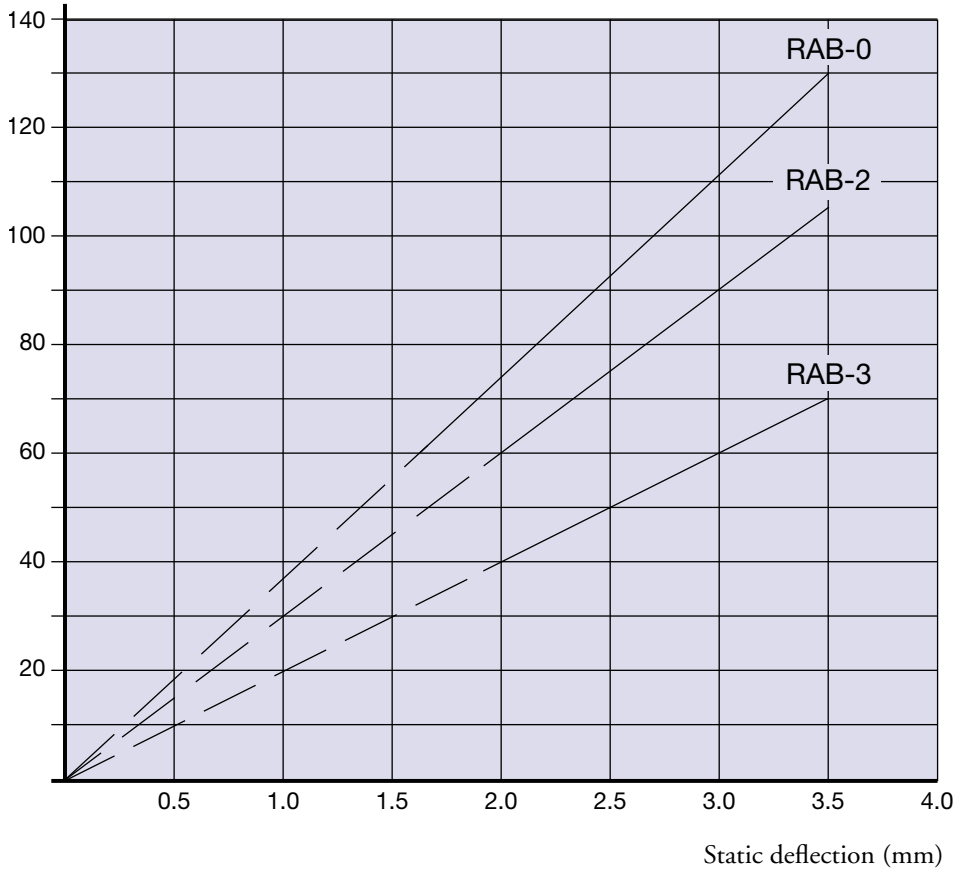
Load per mounting (kg)



Fully approved by NATO and Europe's leading manufacturers of 1- 2- and 3-cylinder versions of compact diesel engines.

Example of RAB-installation on a 3-cylinder diesel engine power pack.

Novibra® type M

Type M is ideal for applications involving isolation of low frequency vibrations in all planes. Also suitable for shock attenuation due to the designed ability to offer large deflection. Provides passive vibration isolation on electronic instruments, measuring equipment and test cells.

Specific fields of application are:

- Compressors
- Refrigerators
- AC-units
- Ventilators
- Fans
- Powder handling machinery
- Vibratory screens
- Packaging applications
- Electric motors
- Weighing scales
- Test cell equipment
- Noise control units
- Pumps
- Food processing equipment

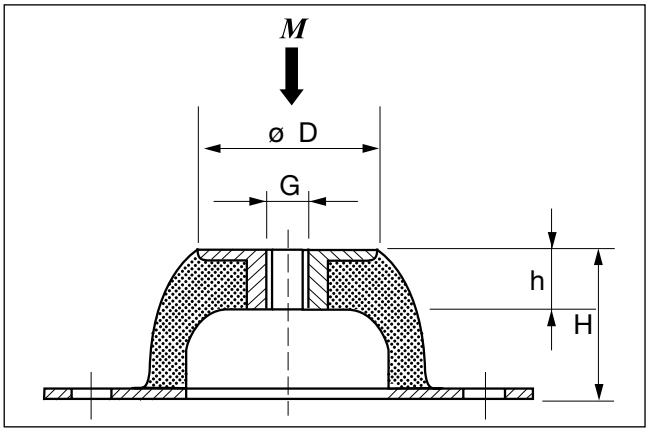
Features

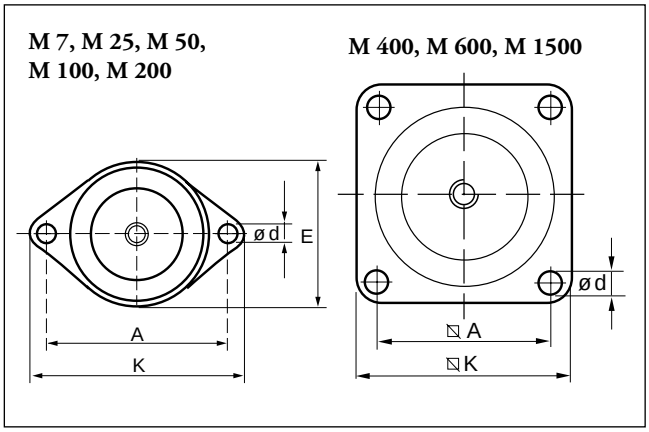
Novibra® type M is specifically designed to give large deflection at low loads. Although the mount design allows high deflection, the mountings are compact in weight and easy to install.

Its unique construction and the latest production methods make Novibra® type M a high performance antivibration mounting having a number of advantages:

- Tight tolerances on dynamic stiffness rate for accurate vibration calculations.
- Wide load rating options, 3.5–2500 kg.
- Corrosion protected to cope with arduous environments on land or marine applications (Fe/Zn8C2 as per ISO 2081).
- Clear and durable product marking so that mountings can be identified even after several years in operation.

When using M mount together with the height adjuster HA, it is necessary to use a washer. The diameter of the washer must be 20% larger than the diameter of the upper plate (D).





Type	Art.No. 40° IRH	Art.No. 60° IRH	Dimensions in mm D	E	A	K	H	h	d	G	Weight (kg)	*M*-Max(kg) 40° IRH	60° IRH
M 7	2255110	2255120	18	43	50	64	20	7	7.0	M 6	0.02	3.5	9
M 25	1861220	1861230	33	56	66	85	25	11	8.0	M 8	0.07	20	50
M 50	1861240	1861250	45	76	92	114	35	14	10.0	M 10	0.16	40	80
M 100	1861620	1861610	53	96	110	136	40	15	11.5	M 10	0.26	70	150
M 200	1861660	1861670	58	101	124	151	45	13	11.5	M 10	0.42	130	220
M 400	1861680	1861690	78		120	150	63	18	14.5	M 12	1.06	280	500
M 600	1533710	1533720	100		160	200	85	25	14.5	M 16	2.35	380	750
M 1500	1533730	1533740	186		250	310	160	43	18.0	M 24	9.43	1400	2500

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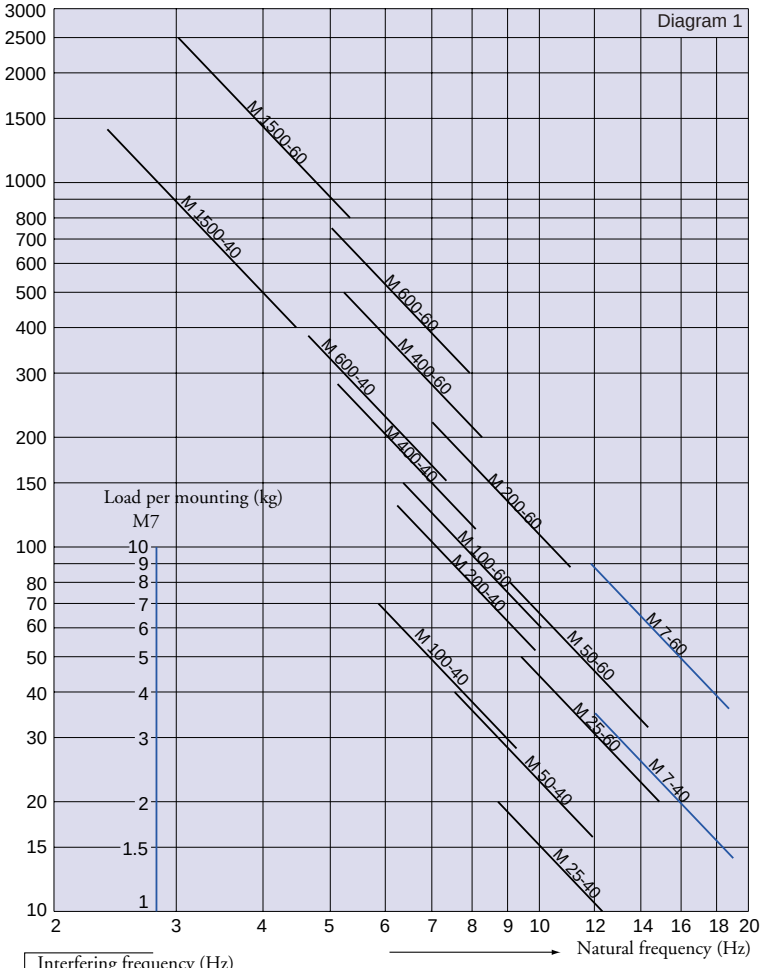
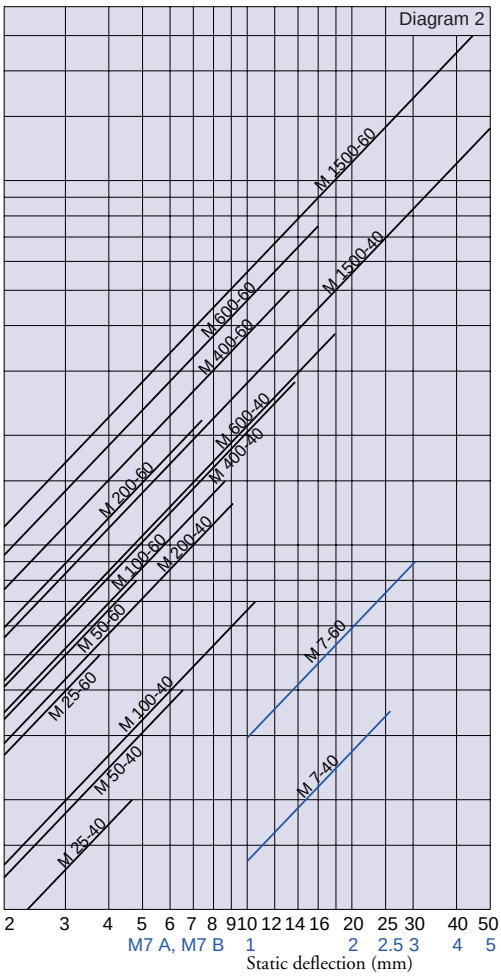
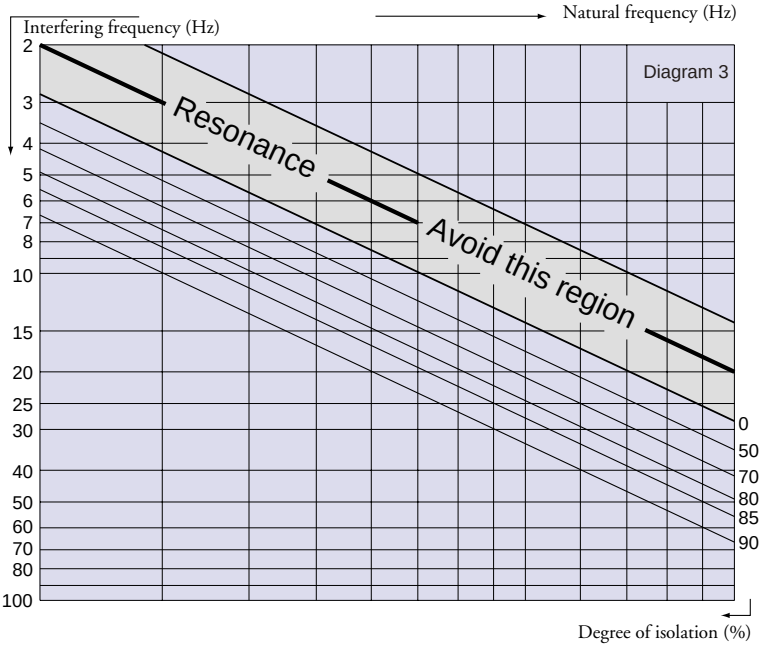
Load per mounting (kg)
M25 – M1500







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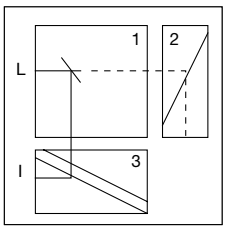
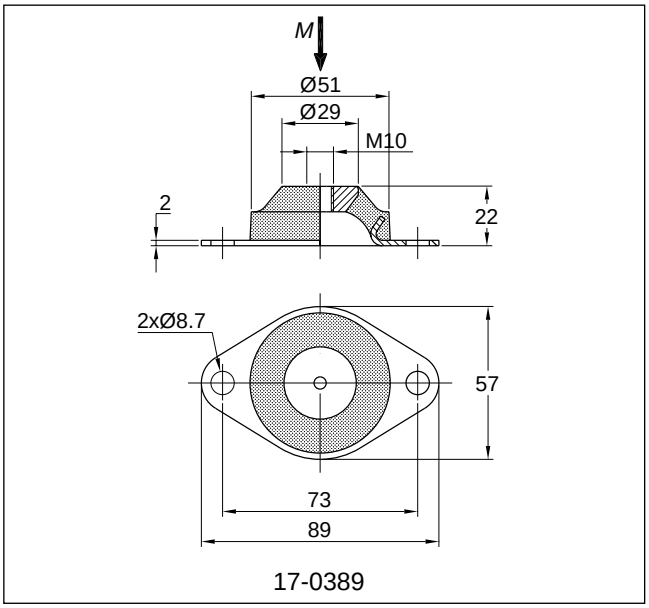


Equi-frequency Mountings

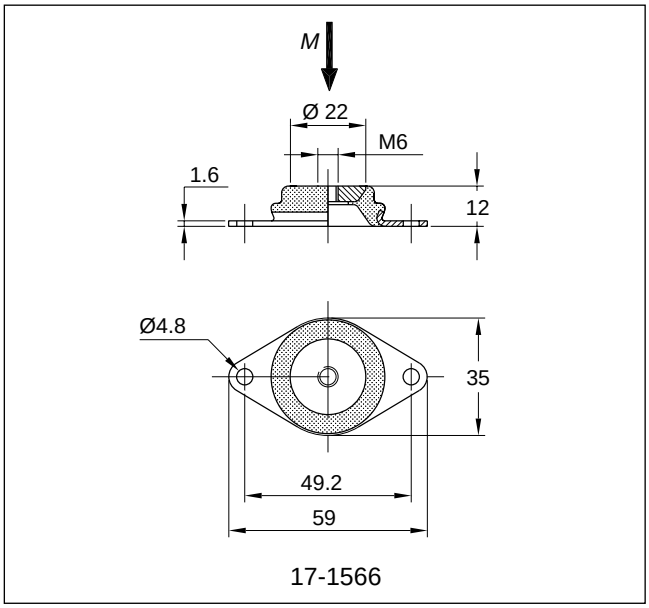
Features
Each design has substantially the same stiffness in vertical and horizontal directions. Load range 11 kg to 54 kg. Can be used as small anti-shock mounting when static loadings are derated.

Metalastik® type Equi-frequency Mounting
General purpose low profile mounting for use where space is restricted. Suitable for stationary applications. May also be used to protect delicate or sensitive equipment from external shock or disturbances.

Typical applications include:
- Instrument panels
- Small fan sets
- Small vacuum pumps



17-0389



17-1566

Type	Art.No.	*M*-Max (kg)	Weight (kg)
Equi-frequency mountings	17-1566-45 (45° IRH)	11	0.024
	17-1566-60 (60° IRH)	22	0.024
	17-0389-45 (45° IRH)	27	0.10
	17-0389-60 (60° IRH)	54	0.10

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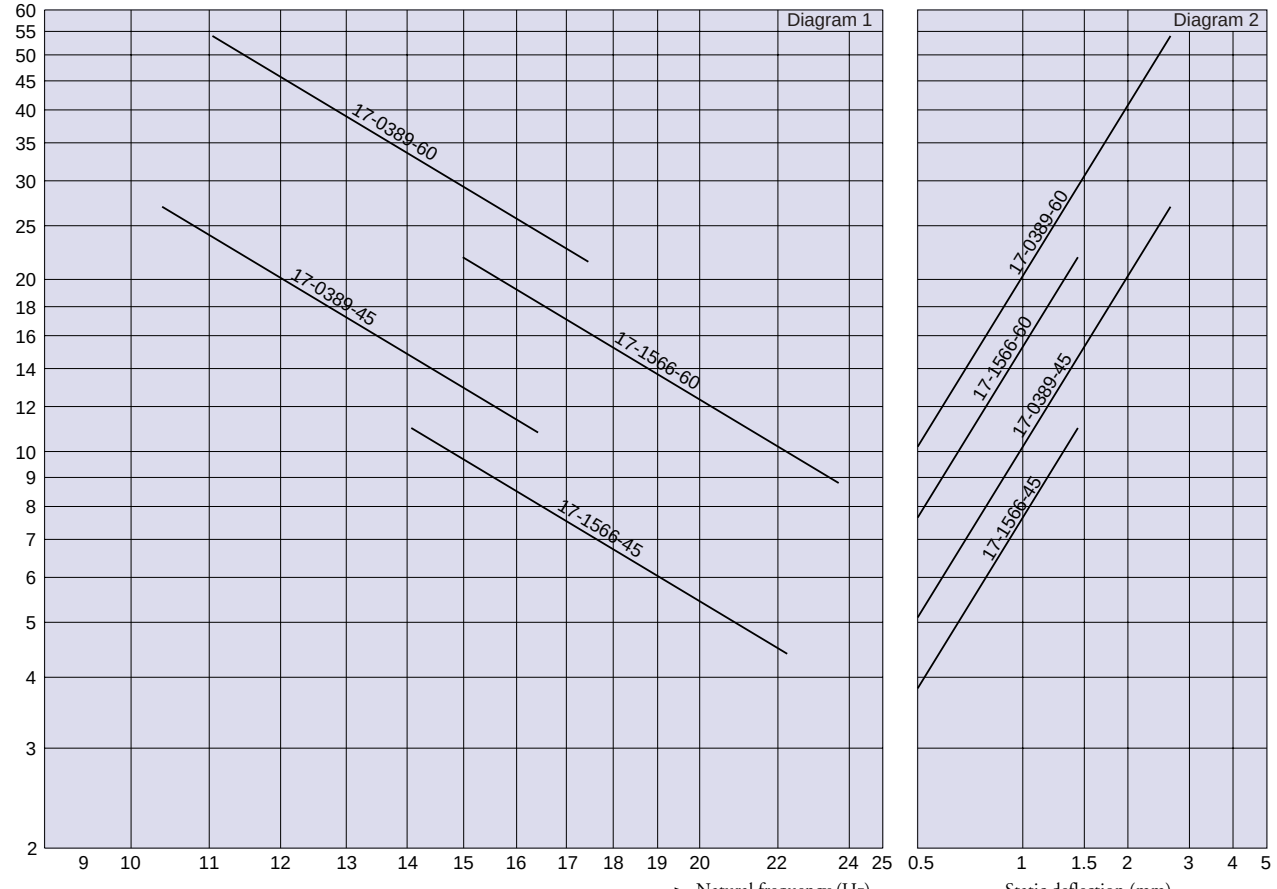
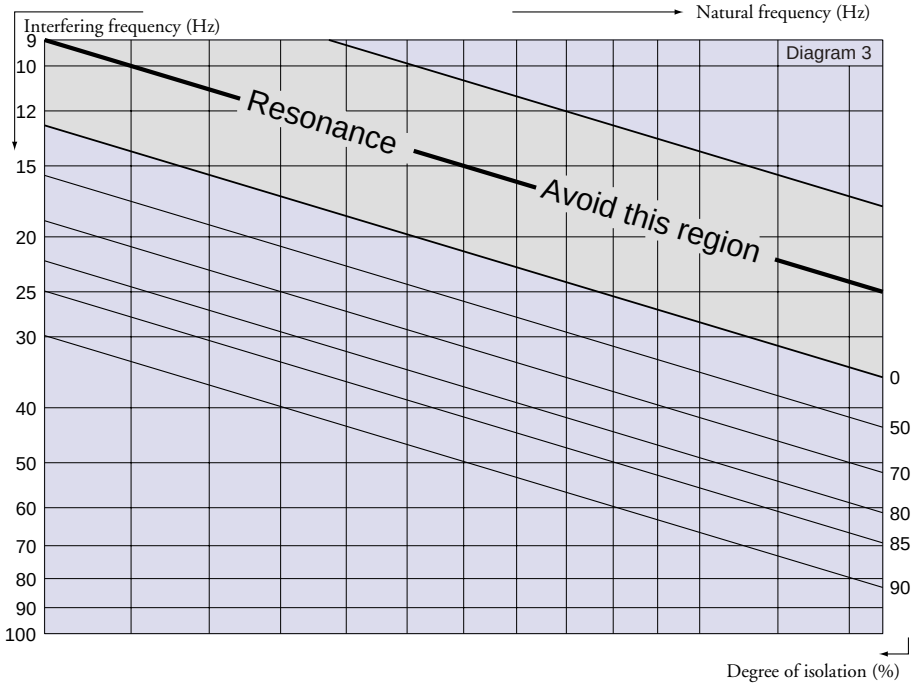
Load
per mounting (kg)





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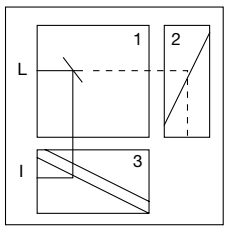


Fanflex™

Features

Simple design with metal parts encapsulated in high grade oil-resisting rubber compound giving good environmental resistance.

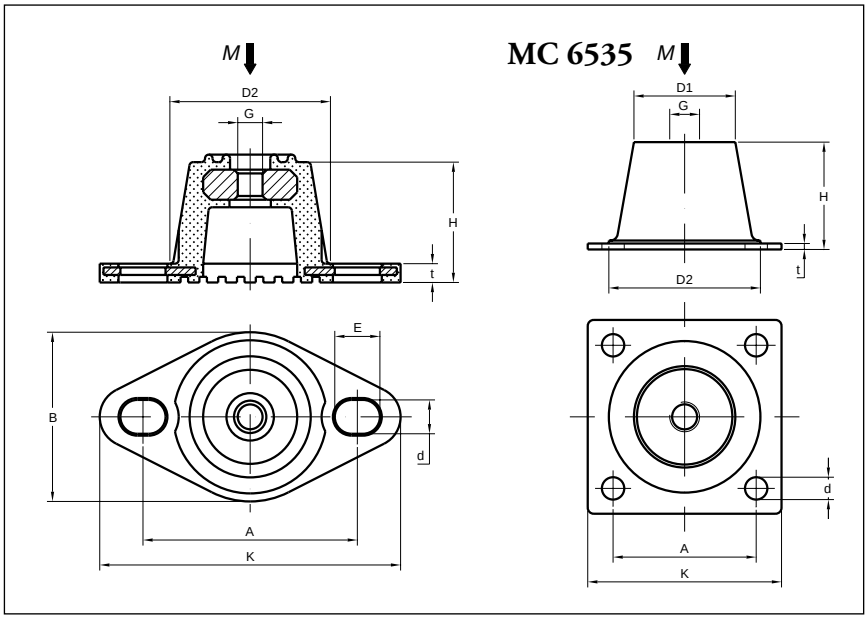
Provides relatively large static deflections and hence a high degree of vibration attenuation - 90% isolation for disturbing frequencies of 15 Hz (900 c.p.m).

Range gives capacity for point loads of 35 kg to 350 kg.

Metalastik® type Fanflex™

A simple mounting designed predominantly for the suspension of heating, ventilating and air conditioning equipment.

May be used for:
Pumps, fans, compressors and control cabinets.



Type	Art.No	Dimensions in mm A	K	H	B	D1	D2	E	G	d	t	Weight (kg)	*M*-Max (kg)	Colour code
Fanflex 100-45 (45° IRH)	319900	57	80	32	45		41	12	M8	9	5	0.09	35	yellow
Fanflex 100-55 (55° IRH)	319910	57	80	32	45		41	12	M8	9	5	0.09	65	blue
Fanflex 100-65 (65° IRH)	319920	57	80	32	45		41	12	M8	9	5	0.09	100	red
Fanflex 200-45 (45° IRH)	319930	71	95	45	60		56	14	M10	9	5	0.22	130	yellow
Fanflex 200-55 (55° IRH)	319940	71	95	45	60		56	14	M10	9	5	0.22	225	blue
Fanflex 200-65 (65° IRH)	319950	71	95	45	60		56	14	M10	9	5	0.22	350	red
MC 6535-45 (45° IRH)	2231000	48	65	36		34	51	8	M10	7.5	2	0.12	45	white
MC 6535-55 (55° IRH)	2231010	48	65	36		34	51	8	M10	7.5	2	0.12	75	red
MC 6535-65 (65° IRH)	2231020	48	65	36		34	51	8	M10	7.5	2	0.12	115	black

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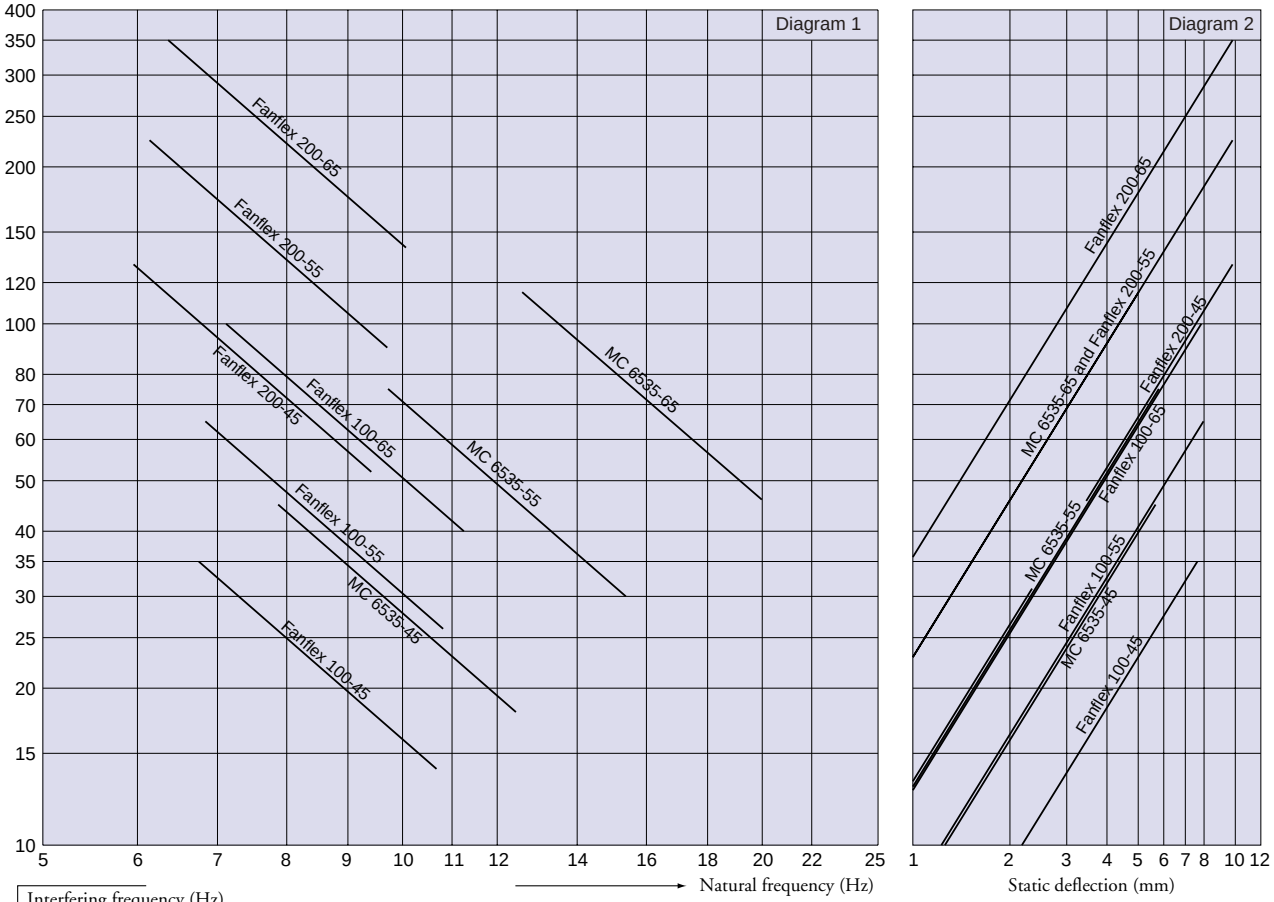
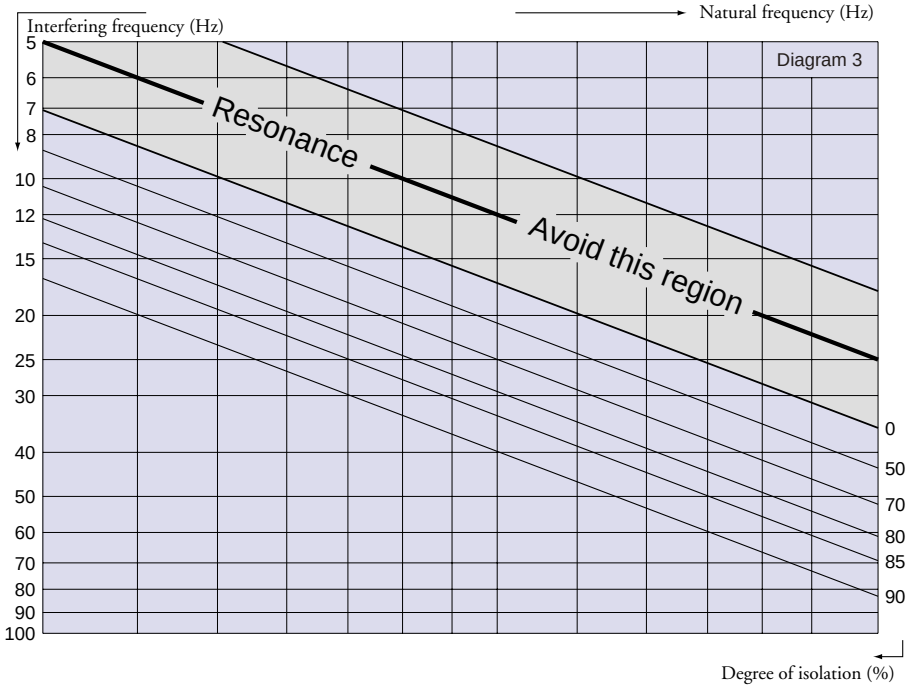
Load
per mounting (kg)





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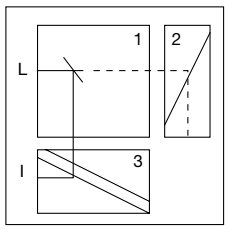
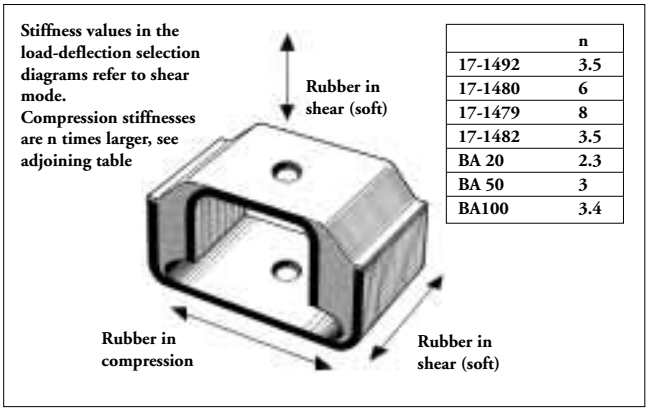


BA & Double U-Shear



	n
17-1492	3.5
17-1480	6
17-1479	8
17-1482	3.5
BA 20	2.3
BA 50	3
BA100	3.4

Novibra® type BA and Metalastik® type Double U-Shear

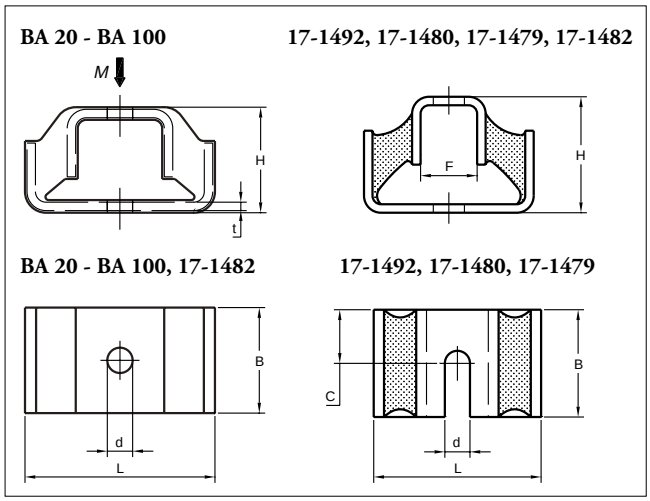
Novibra® type BA and Metalastik® type Double U-Shear are equally suitable for isolating vibrations from low speed machines and equipment. Protects sensitive and light-weight units from external shocks and vibrations.

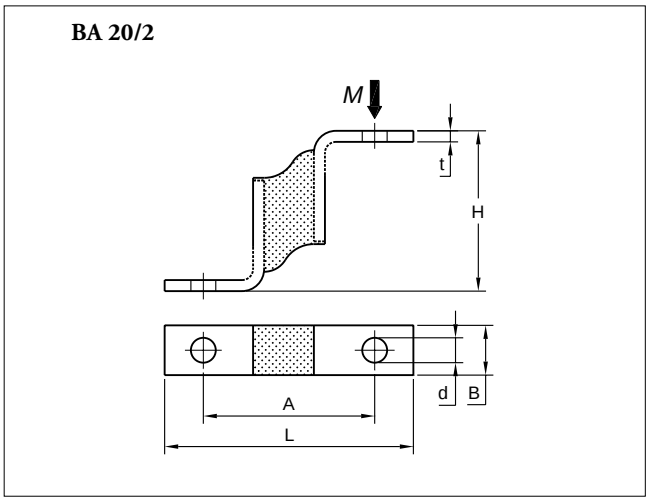
Type BA and Double U-Shear are easy to install and ideal for applications e.g.

- Light fans and compressors
- Portable gensets and pumps
- Computers and electronic units
- Transit cases
- Measuring and test instruments
- Gauging equipment

Features

Novibra® type BA and Metalastik® type Double U-Shear mountings utilise bonded rubber in shear to permit relatively high deflections. Provides excellent isolation of low frequencies. (Type BA 20/2 is a half section suitable for very light loads). On rotating equipment applications the soft axis should be at right angles to the shaft. On mobile applications the stiff axis should be aligned in the direction of travel. For transit case applications the mountings need to be arranged so that the horizontal stiffness is the same in all directions.





Type	Art.No. 40° IRH	Art.No. 60° IRH	Dimensions in mm B	L	H	A	F		d	t	Weight (kg)	*M*-Max (kg) 40° IRH	60° IRH
BA 20/2	67868	67876	20	90	58	62			8	4	0.09	12	27
BA 20	2255230	2255240	20	90	50				10	4	0.16	20	35
BA 50	2255250	2255260	50	90	50				12	4	0.42	60	110
BA 100	2255270	2255280	100	90	50				15	4	0.83	130	250
Double U-shear	40° IRH	50° IRH						C				40° IRH	50° IRH
	17-1492-40	17-1492-50	19	60	43		19	10.3	6.7		0.09	14	20
	17-1480-40	17-1480-50	51	80	78		32	25	13		0.6	70	100
	17-1479-40	17-1479-50	64	86	108		38	32	16.7		1.1	150	220
	17-1482-40	17-1482-50	51	60	41		20		11		0.2	37	56

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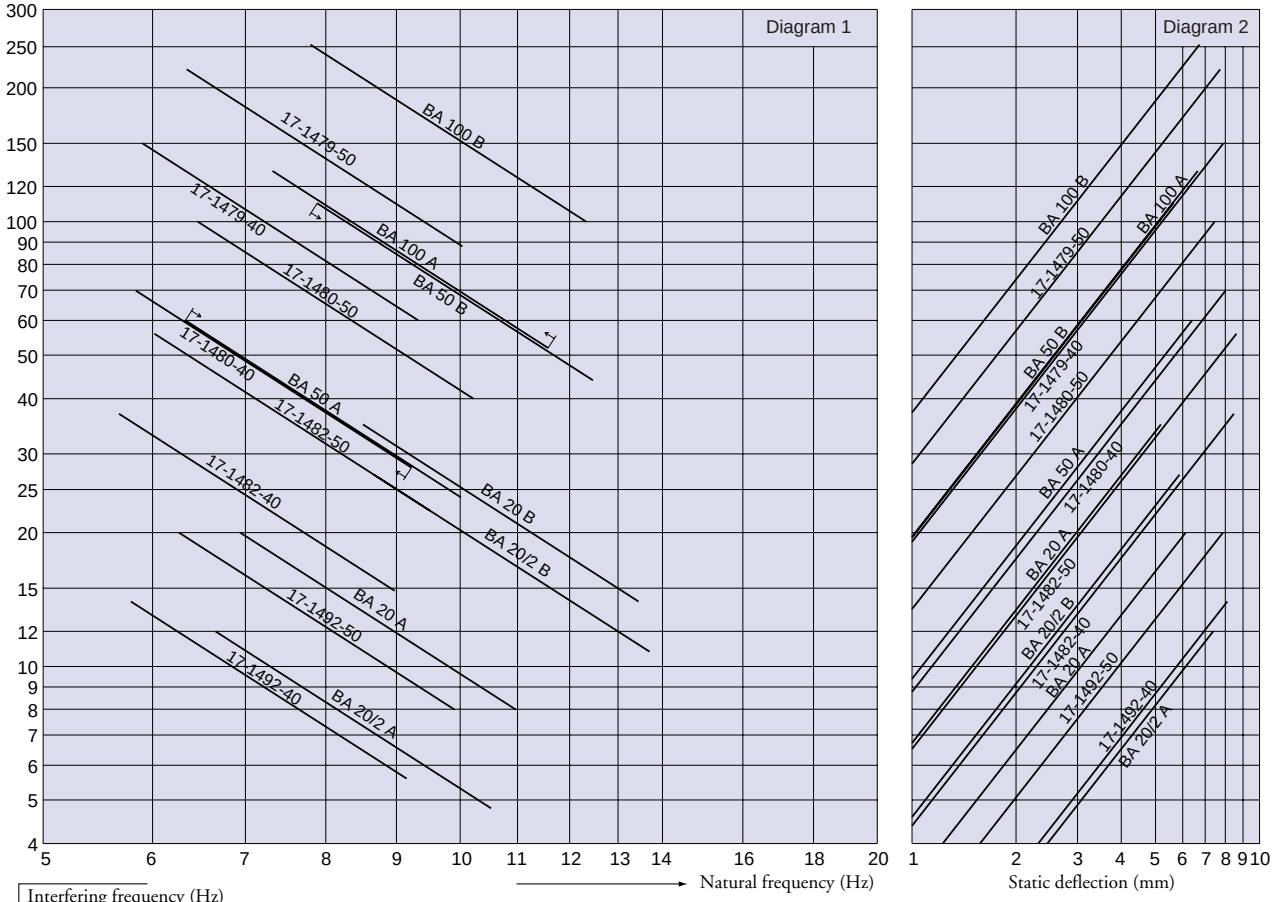
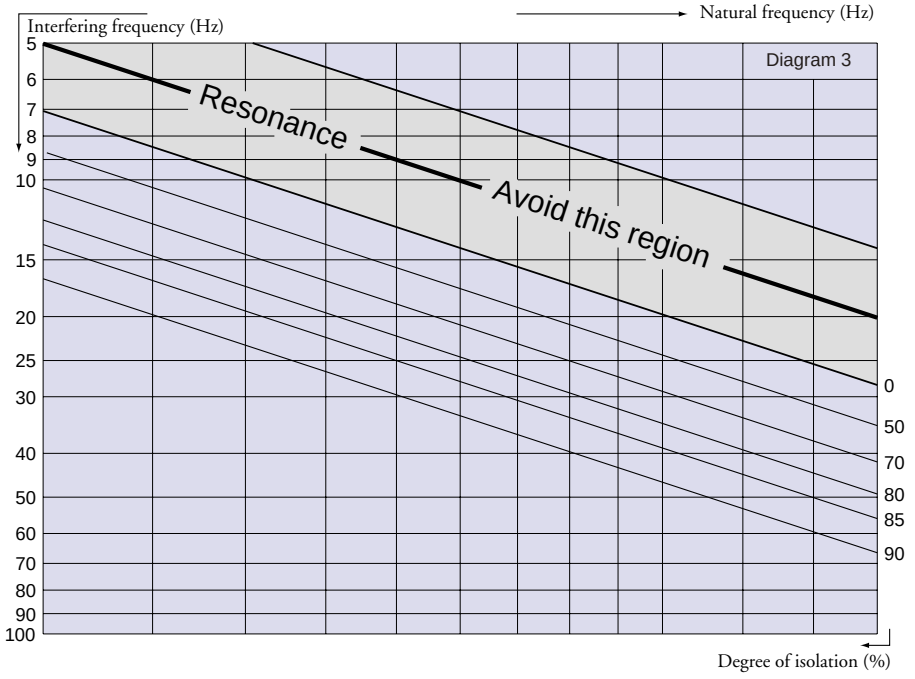
Load
per mounting (kg)





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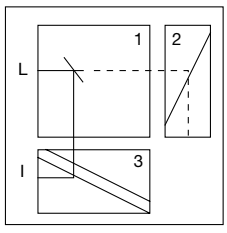
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



Metacone™ & HK

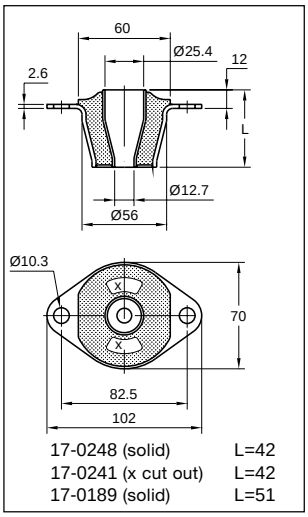
Metalastik® type Metacone™ and Novibra® type HK

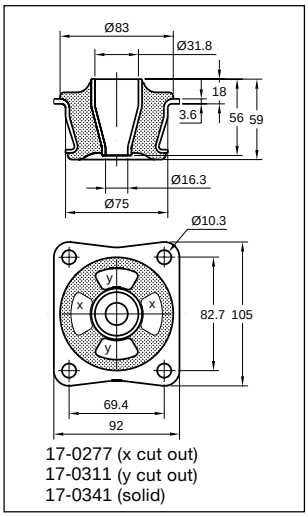
A range of mountings designed for high load capacity with relatively large static deflections. The high loading for a given size is achieved by utilising the rubber to best advantage in shear and compression. Normally, mountings are assembled with overload and rebound washers to control and limit movement of the suspended equipment under shock loads. Centre fixing bolts should be torque tightened to the recommended values.

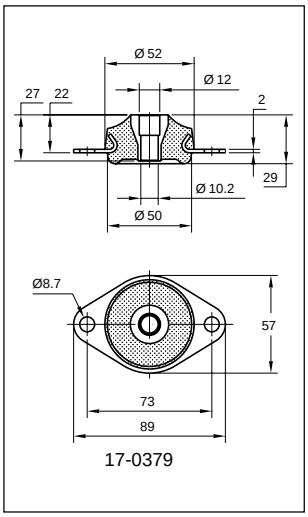
Applications include suspensions for:
- Off-road and road vehicle engines
- Vehicle Cabs
- Oil Tanks/Tankers
- Mobile applications

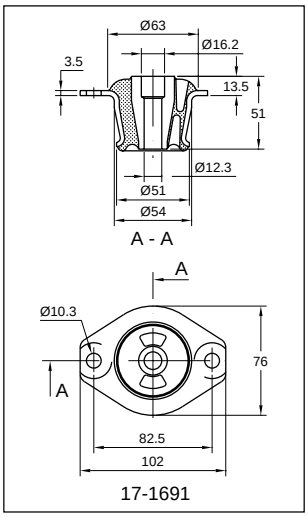
Features

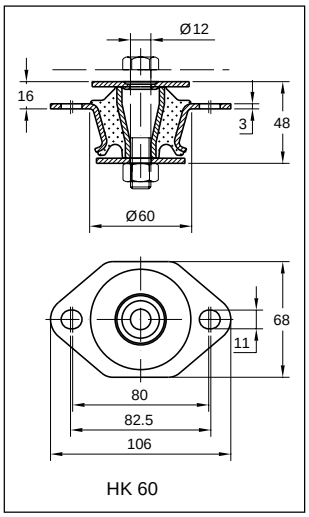
A compact fail safe design, available for a wide range of loadings with in some cases alternative fixings.
Cutouts in rubber section on various sizes provide different vertical/horizontal stiffness ratios.
Most sizes can be supplied complete with overload and rebound washers.











Type	Art.No.		Max vert. load (kg)	Weight (kg)
Metacone™	17-0189-45	(45° IRH)	145	0.28
	17-0189-70	(70° IRH)	290	0.28
	17-0241-45	(45° IRH)	62	0.18
	17-0241-60	(60° IRH)	122	0.18
	17-0248-45	(45° IRH)	95	0.19
	17-0248-60	(60° IRH)	190	0.19
	17-0277-45	(45° IRH)	125	0.56
	17-0277-60	(60° IRH)	230	0.56
	17-0379-45	(45° IRH)	35	0.12
	17-0379-60	(60° IRH)	70	0.12
	17-0341-45	(45° IRH)	160	0.54
	17-0341-60	(60° IRH)	300	0.54
	17-0341-70	(70° IRH)	430	0.54
	17-0311-45	(45° IRH)	125	0.58
	17-0311-60	(60° IRH)	220	0.58
	17-1691-45	(45° IRH)	72	0.44
	17-1691-60	(60° IRH)	144	0.44
HK 60-40	2256900	(40° IRH)	90	0.24
HK 60-50	318390	(50° IRH)	115	0.24
HK 60-60	2256910	(60° IRH)	180	0.24
HK 60-70	318380	(70° IRH)	250	0.24

Type	Cone mount	Top washer Art.No.	Bottom washer Art.No.
Metacone™	17-0189	336050	336000
	17-0241	336050	336000
	17-0248	336050	336000
	17-0277	336060	336080
	17-0379	336070	336070
	17-0341	336060	336080
	17-0311	336060	336080
	17-1691	336110	336120
HK	HK 60	318490	318500

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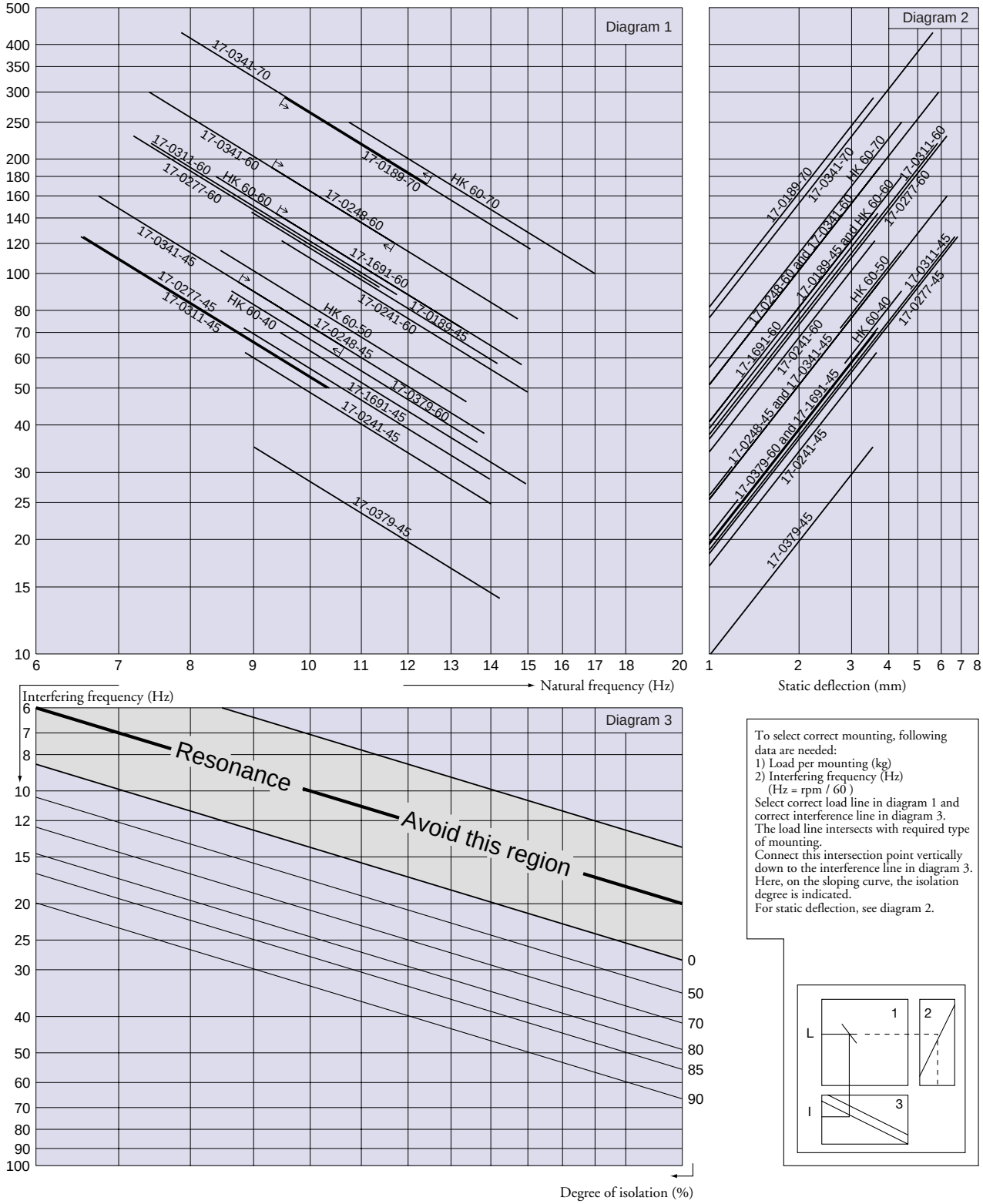
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

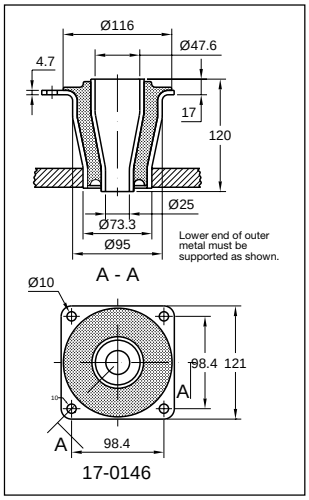
Load
per mounting (kg)

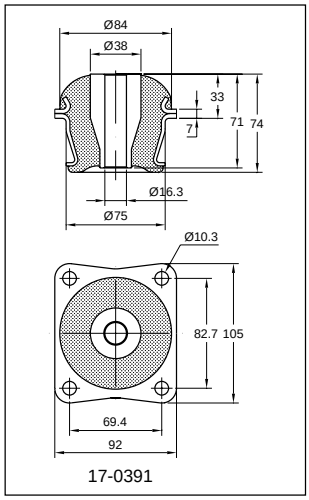


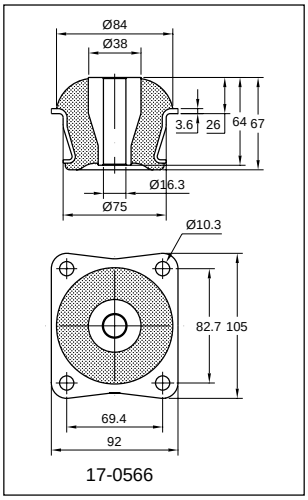
To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.

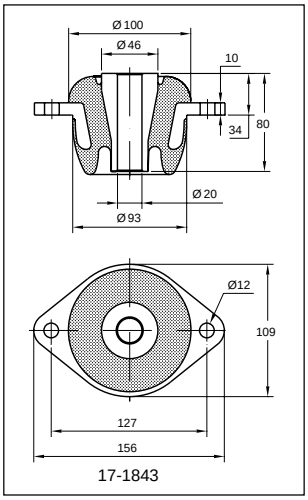
Metacone™ & HK

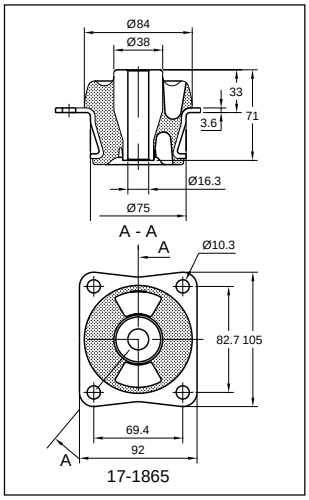
Metalastik® type Metacone™ and Novibra® type HK

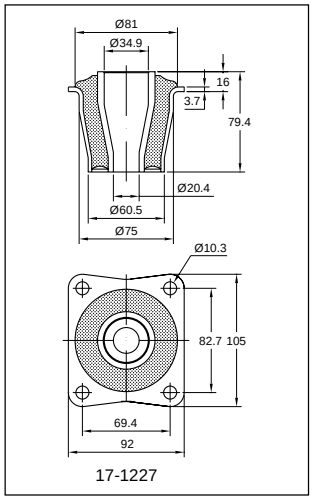


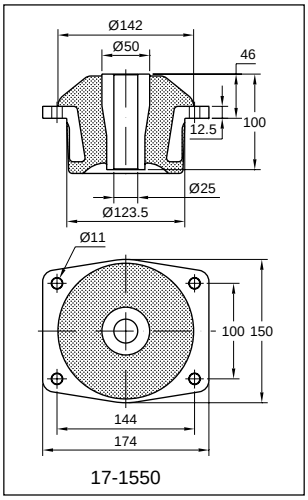




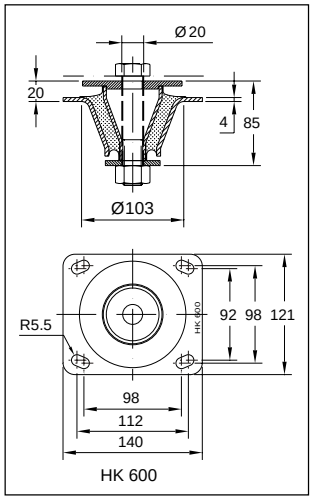


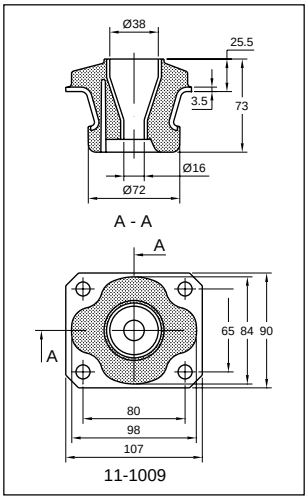






Type	Art.No.		Max vert. load (kg)	Weight (kg)
Metacone™	11-1009-45	(45° IRH)	140	0.59
	11-1009-55	(55° IRH)	200	0.59
	17-0391-45	(45° IRH)	290	1.1
	17-0391-60	(60° IRH)	500	1.1
	17-0391-70	(70° IRH)	610	1.1
	17-0566-45	(45° IRH)	200	0.82
	17-0566-60	(60° IRH)	380	0.82
	17-0566-70	(70° IRH)	525	0.82
	17-1227-45	(45° IRH)	560	1.1
	17-1227-60	(60° IRH)	1000	1.1
	17-1550-45	(45° IRH)	720	4.4
	17-1550-60	(60° IRH)	1250	4.4
	17-1843-45	(45° IRH)	320	1.7
	17-1843-60	(60° IRH)	600	1.7
	17-1865-55	(55° IRH)	180	0.86
	17-0146-45	(45° IRH)	950	2
	17-0146-60	(60° IRH)	1700	2
HK 600-40	2256940	(40° IRH)	940	1.0
HK 600-60	2256950	(60° IRH)	1700	1.0





Type	Cone mount	Top washer Art.No.	Bottom washer Art.No.
Metacone™	11-1009	336080	336080
	17-0391	336080	336080
	17-0566	336080	336080
	17-1227	336040	336020
	17-1550	336100	336100
	17-1843	336090	336090
	17-1865	336080	336080
	17-0146	336030	336010
HK	HK 600	2230570	2230560

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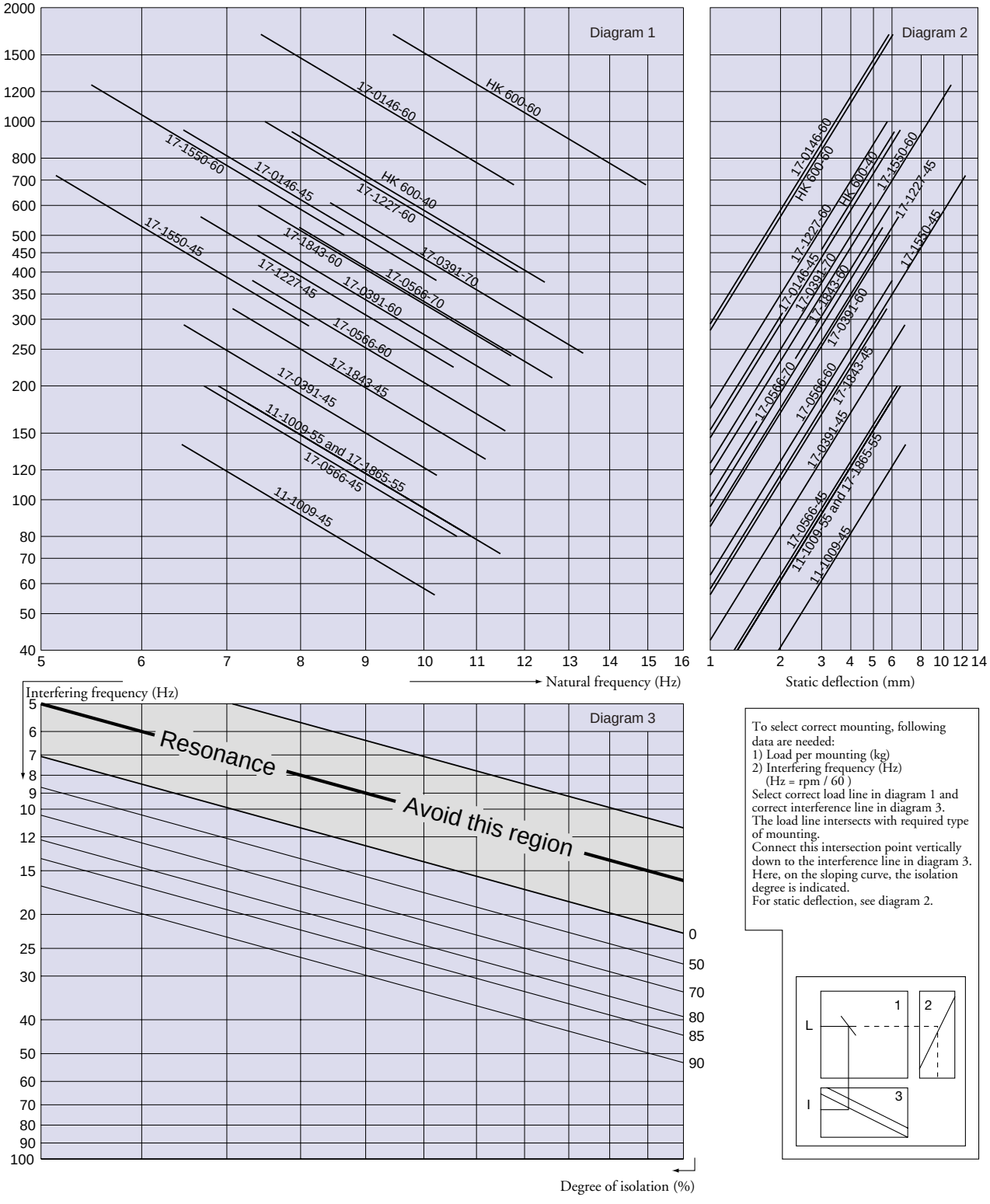
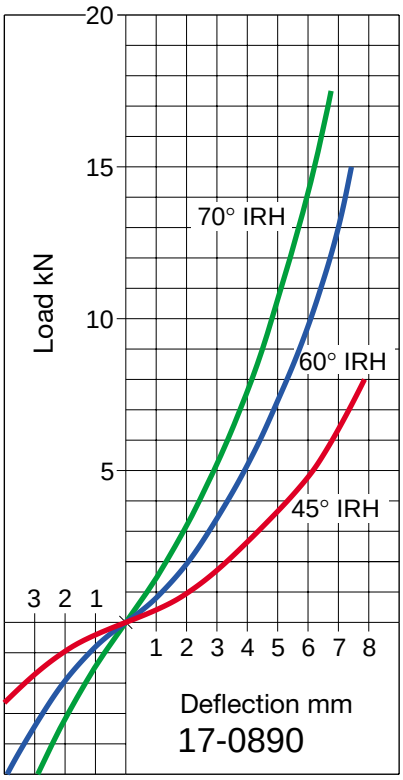
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)



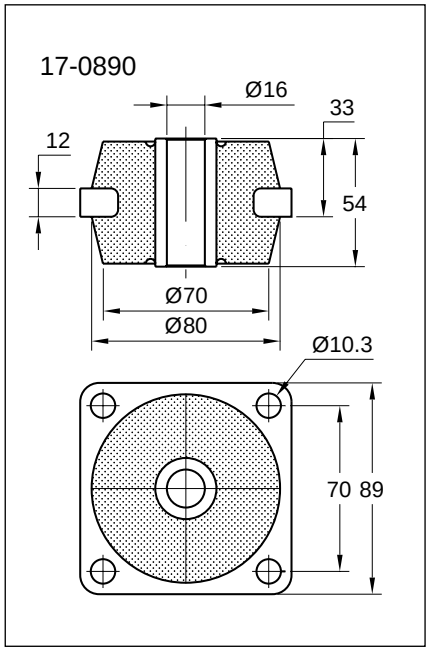
To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.

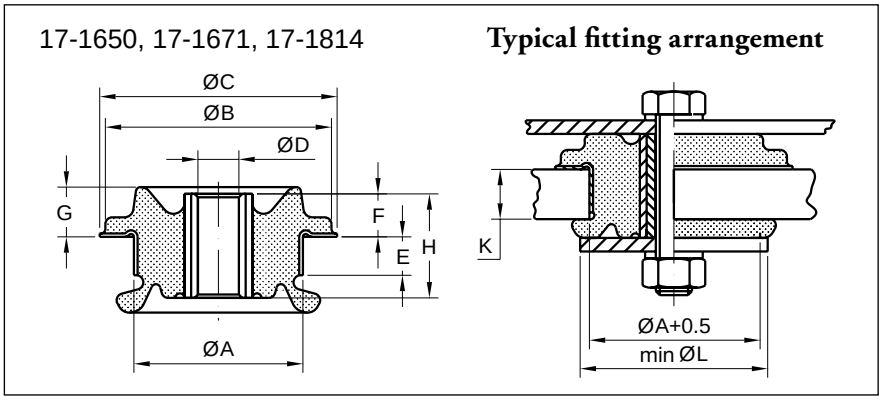
Cab Mountings

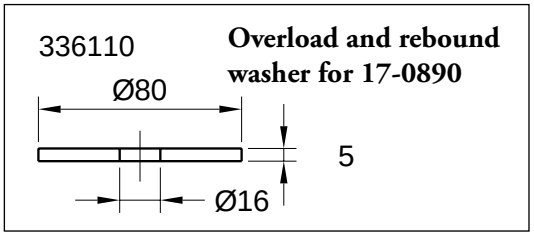


Metalastik® type Cab Mountings

Specially profiled rubber section together with bump and rebound washers provide optimum suspension characteristics for cabs on commercial vehicles, tractors and other off-road vehicles, earthmoving equipment and construction plant.







Type	Art.No		Dimensions in mm A	B	C	D	H	F	E	G	K	L	Max load (kg)	Radial stiffness (N/mm)	Weight (kg)
Cab	17-1671-45	(45° IRH)	75	100	105	16.5	46	19	17	22	20	105	160	500	0.45
mountings	17-1671-60	(60° IRH)	75	100	105	16.5	46	19	17	22	20	105	300	1220	0.45
	17-1650-45	(45° IRH)	75	100	105	16.5	46	19	17	22	20	105	300	650	0.46
	17-1650-60	(60° IRH)	75	100	105	16.5	46	19	17	22	20	105	500	1300	0.46
	17-1814-45	(45° IRH)	89	115	120	25	47	13	23	21	25	120	410	700	0.63
	17-1814-60	(60° IRH)	89	115	120	25	47	13	23	21	25	120	760	1400	0.63
	17-0890-45	(45° IRH)											Max static		0.83
	17-0890-60	(60° IRH)					See drawing						deflection		0.83
	17-0890-70	(70° IRH)											5 mm		0.83
Washer	336110														

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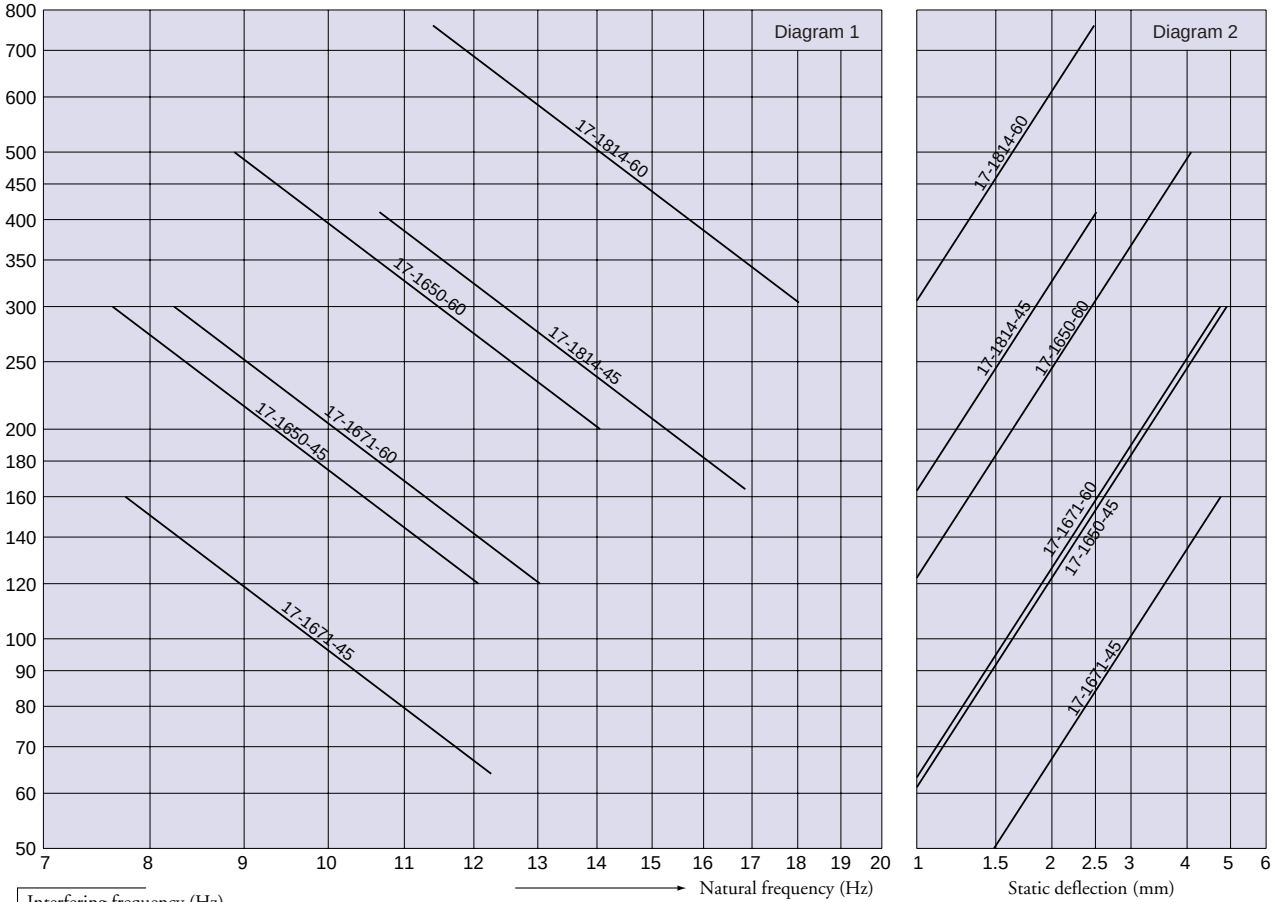
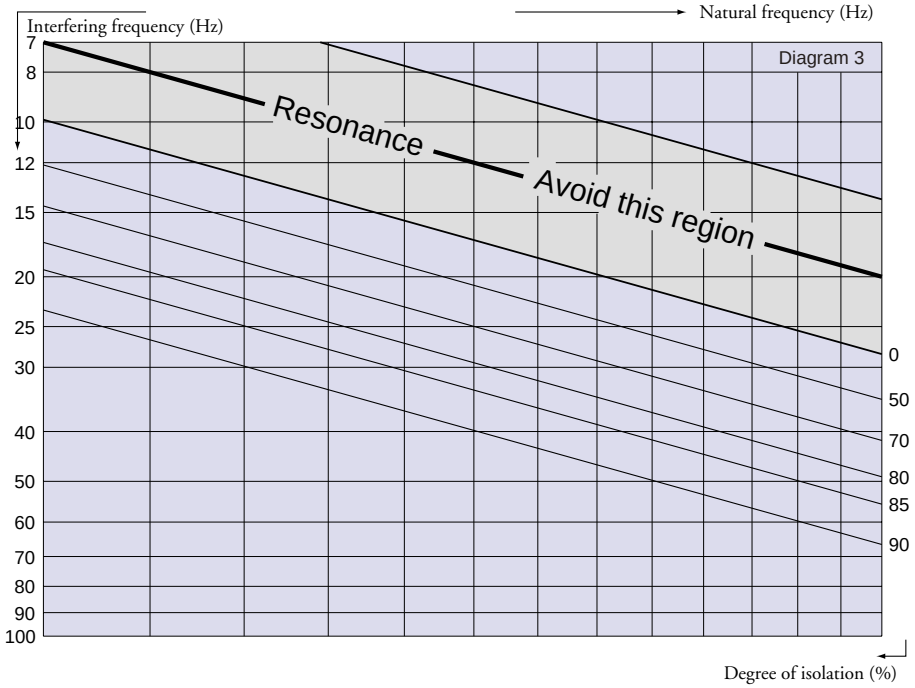
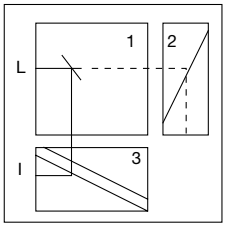
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



EH

Novibra® type EH

Type EH mountings are designed to achieve effective vibration isolation on engines, operator cabins and other ancillary units.

Typical applications can be found in the following areas:

- Off-road equipment
- Military vehicles
- Transport machinery
- Construction equipment
- Agricultural vehicles
- Industrial mobile machinery

Max tightening torque

- EH 4850: 40 Nm
- EH 6463: 80 Nm
- EH 9075: 200 Nm

Features

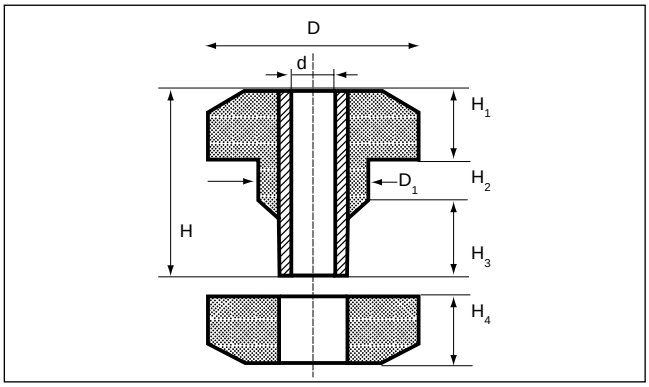
Type EH is designed primarily for mobile applications where high dynamic and shock forces are encountered.

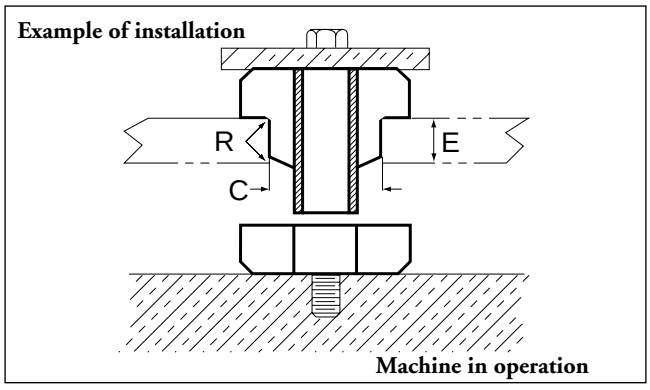
Dynamic vertical movements in both the directions are restricted and excellent horizontal stability is provided.

Stress on brackets are optimized while at the same time obtaining vibration isolation and shock absorption.

The function of EH includes features as:

- Dynamic efficiency in all directions
- Attenuation of structure-borne noise
- Accommodation of misalignment and distortion
- Simple design – easy to install
- Fail-safe installation
- Wide load range, 80 to 450 kg





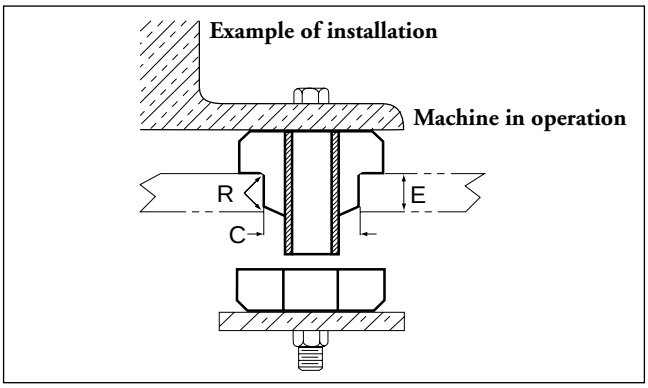


Table of dimensions for installation

Type	Dimensions in mm C	E	R
EH 4850	31.0	15.0	1.5
EH 6463	39.0	22.0	2.3
EH 9075	56.5	28.0	3.0

Type	Art.No. 40° IRH	Art.No. 60° IRH	Dimensions in mm d	D	D1	H	H1	H2	H3	H4	Max load (kg) 40° IRH	60° IRH
EH 4850	1860570	1860560	13.0	50	32	50	20	10	20	20	80	130
EH 6463	1860550	1860540	17.0	64	40	62	23	14	25	23	120	260
EH 9075	1860530	1860520	23.0	89	58	73	25	19	29	25	260	450

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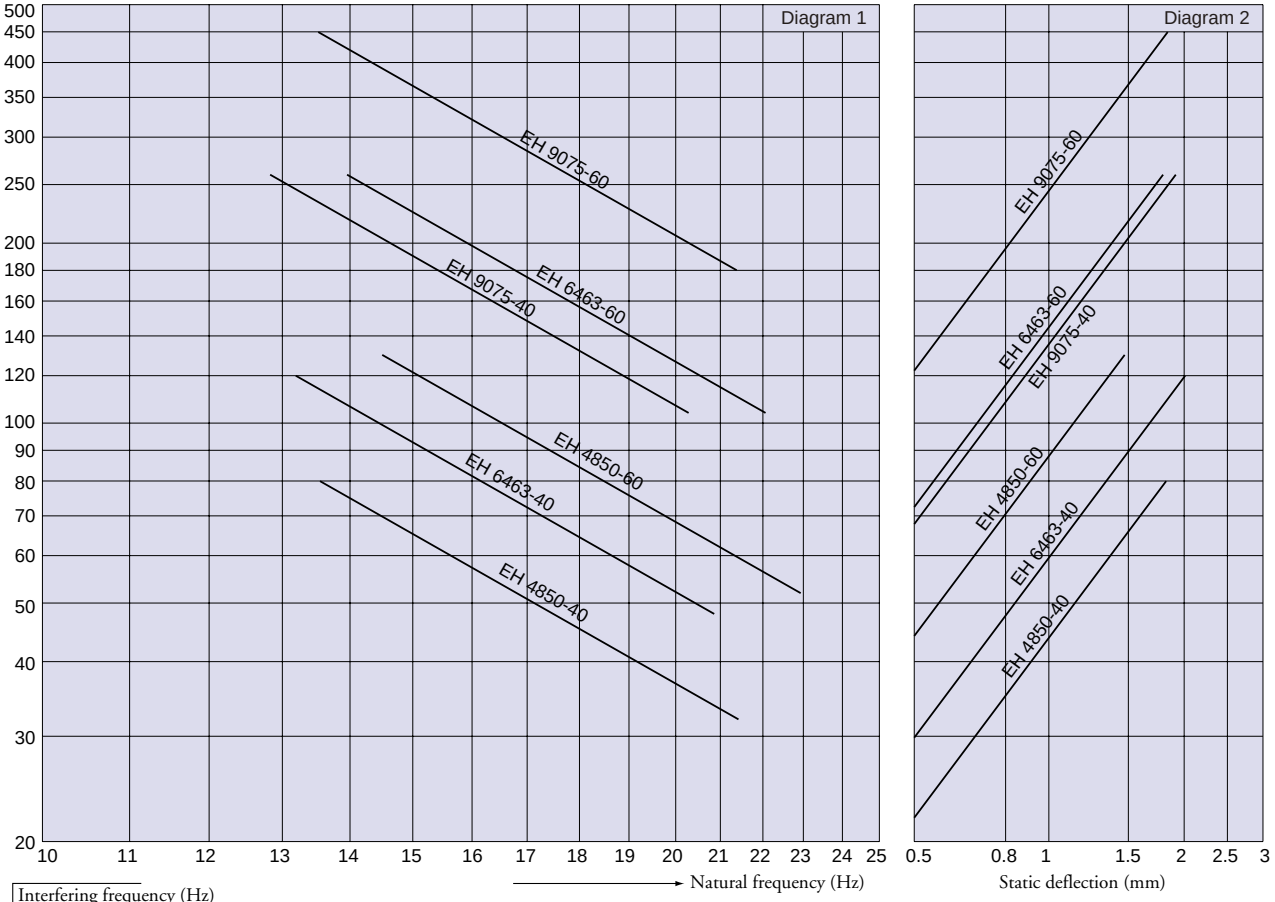
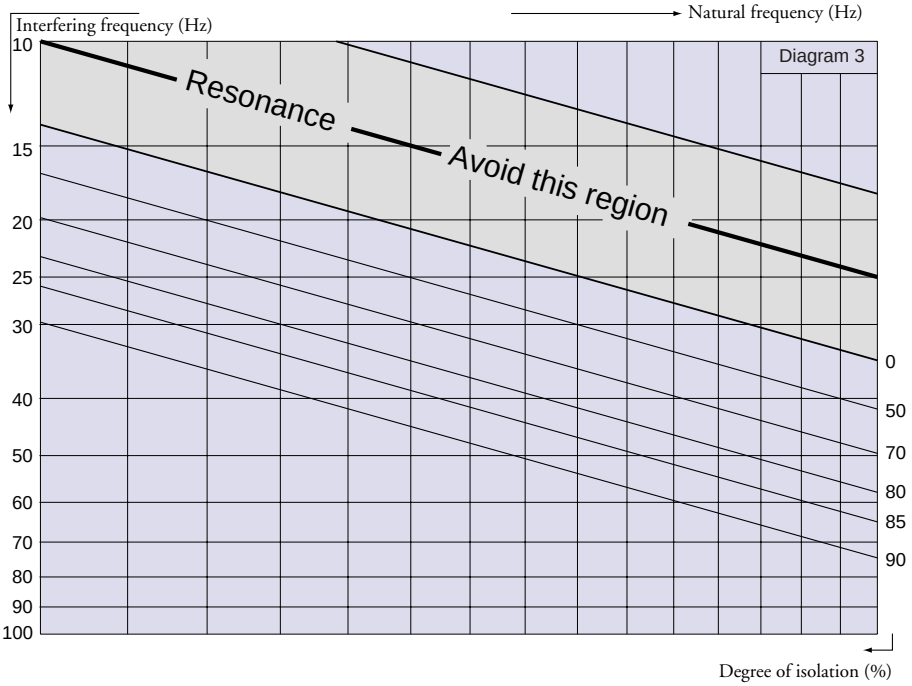
Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
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(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
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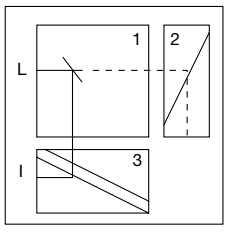


UH

Novibra® type UH

Mounting type UH is particularly suitable for the suspension of both mobile and static cabs as well as platforms on agricultural vehicles.

Effectively isolating vibration and noise, the UH-mounting also protects tanks and ancillary equipment against metal fatigue caused by chassis distortion.

Specific applications can be found on:

- Tractors
- Combine harvester
- Wheel-mounted loaders
- Street sweepers
- Compactors
- Lifting cranes
- Construction vehicles
- Forestry vehicles
- Off-road equipment
- Fork-lift trucks
- Excavators

Features

UH is an anti-vibration mounting designed to accommodate axial static and shock loads in both directions. The dynamic natural frequency is constant irrespective of the static load.

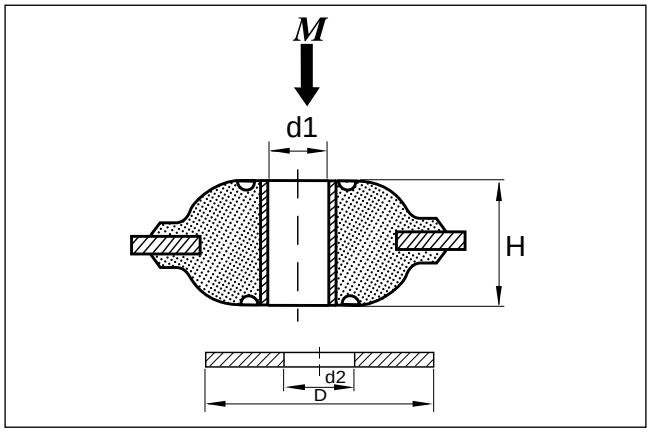
When fitted with overload/rebound washers, a high strength fail-safe installation is provided. Moreover, it is possible to alter the characteristics of the mounting by providing a dome-shaped washer at the upper rubber section. This will provide impact resistance to deflection beyond the permissable limit.

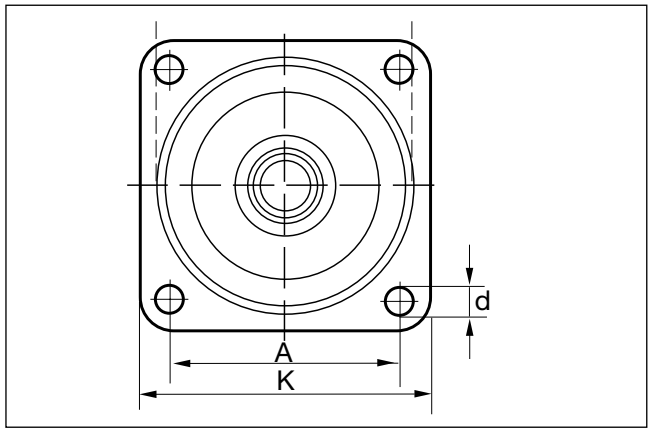
Installation reduces build tolerances.

UH is available in 2 standard versions allowing different maximum loads i.e. type UH 50 to a load of 250 kg and type UH 70 to 400 kg per mounting.

Note: Maximum tightening torque of bolts:

- UH 50 80 Nm
- UH 70 120 Nm





Type	Art.No.	K	A	Dimensions in mm H	C	d	d_1	Weight (kg)	*M*-Max (kg)
UH 50 (50° IRH)	1534120	100.5	80.4	37	91	10.5	15	0.41	250
UH 70 (70° IRH)	1660850	100.5	80.4	37	91	10.5	17	0.41	400
		d_2	D	t					
UH Washer	1660420	17	75	6					

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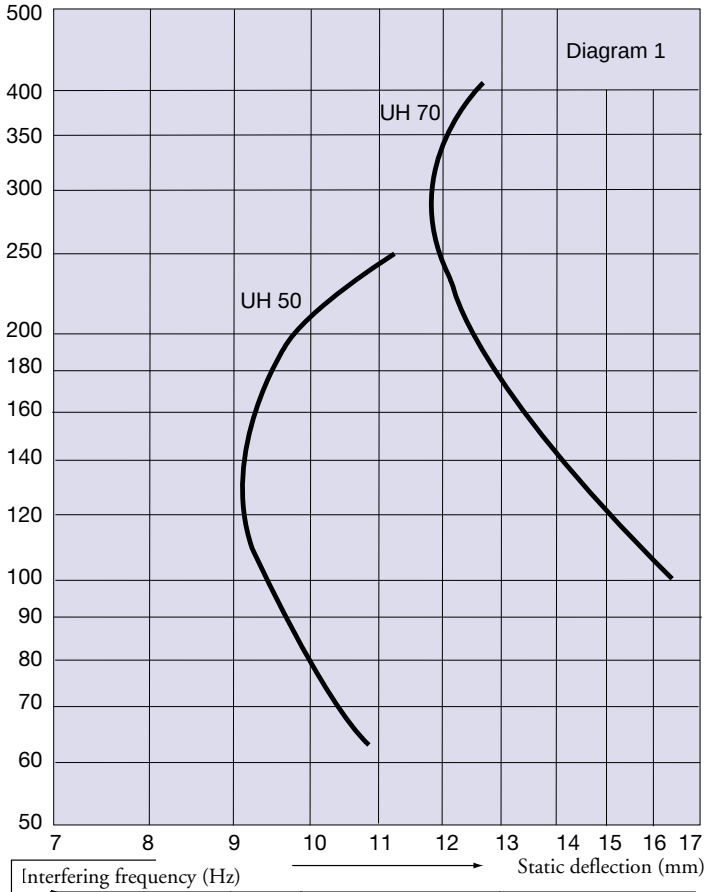
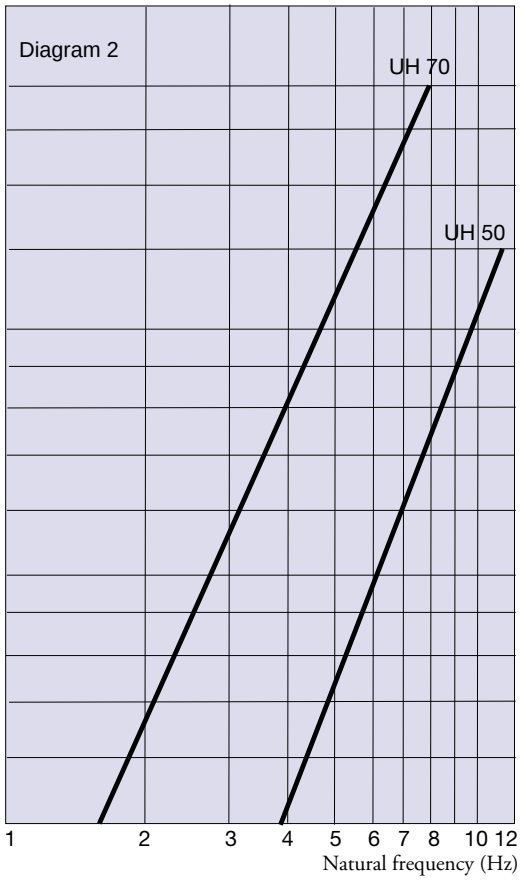
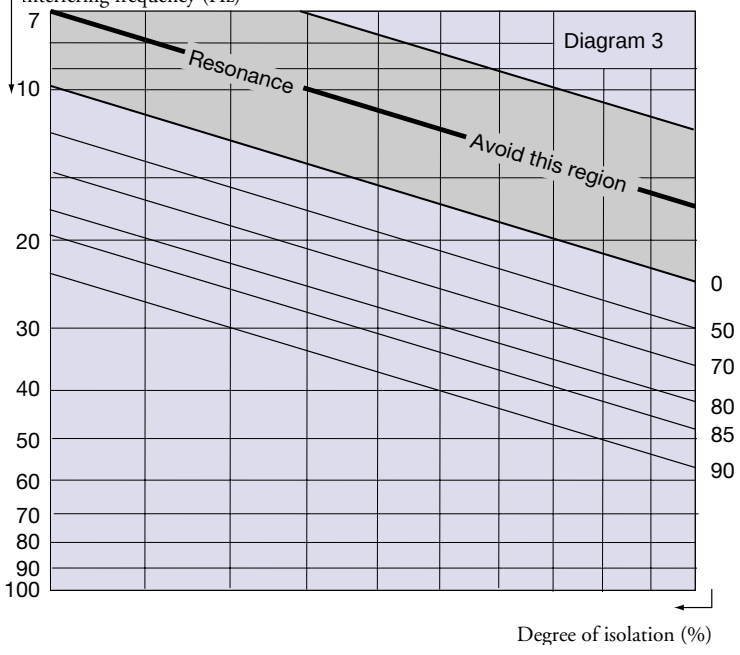
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

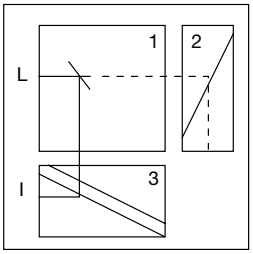
Load
per mounting (kg)







To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



VP & UD Bushes

Features

Novibra® type VP and Metalastik® type UD consist of two concentric sleeves with rubber securely bonded between them. Designed to accomodate torsional movements and axial and radial loads. The rubber is prestressed to give maximum dynamic strength and durability.

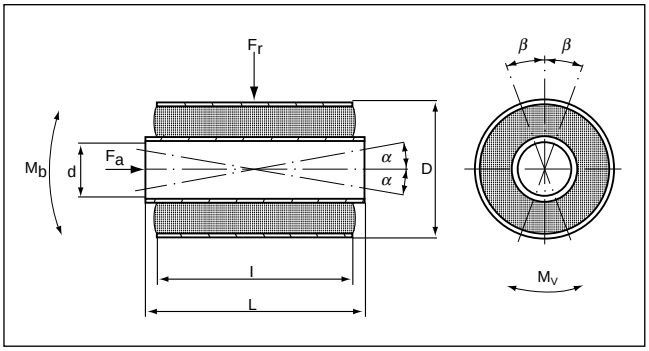
The bonded rubber takes up the full movement. Lubrication or other bearing maintenance is not required. The bush has excellent sound and vibration isolation characteristics, enabling structures fitted with Novibra® type VP and Metalastik® type UD sleeves to be silent and vibration free.

Novibra® type VP and Metalastik® type UD Bushes

For vehicle suspension, pivot arms and all types of mechanical linkage, permits oscillating movement through the deflection of rubber in shear. Suitable to replace roller bearings where small motions are required (up to 20 degrees). Reduces shock loads and noise transmission in structures.

Applications

- Vehicle suspension arms
- Vibratory feeders
- Conveyer tracks
- Mechanical linkages
- Pivot bearings



Designation Type	Art.No 60° IRH	Dimensions in mm d	D	L	l	Torsion Max Mv Nm/degr.	Max β degr.	Stiffness Nm/degr.	Max Mb Nm	Conical Max α degr.	Stiffness Nm/degr.	Axial load Max Fa N	Stiffness N/mm	Radial load Max Fr N	Stiffness N/mm	Weight (kg)
VP 10/2525	70169	10	25	25	20	5.0	15	0.3	6.0	8	0.7	750	170	2300	2000	0.04
VP 10/2540	70177	10	25	40	35	6.0	15	0.4	38.0	8	4.8	1500	380	3800	2350	0.06
VP 15/3530	70185	15	35	30	25	9.0	15	0.6	12.0	8	1.5	1500	220	3500	3000	0.08
VP 15/3550	70193	15	35	50	45	15.0	15	1.0	120.0	8	15.0	2500	520	6000	6500	0.12
VP 20/4540	70201	20	45	40	35	24.0	15	1.6	45.0	8	5.6	2600	330	6800	4000	0.16
VP 20/4575	70219	20	45	75	70	48.0	15	3.2	365.0	8	46.0	5500	820	13500	8000	0.32
VP 25/5045	70227	25	50	45	40	46.0	14	3.3	96.0	8	12.0	3800	450	9000	4500	0.21
VP 25/5085	70235	25	50	85	80	69.0	14	4.9	730.0	8	92.0	7500	960	18000	10500	0.42
VP 30/6055	70243	30	60	55	45	78.0	14	5.6	135.0	8	17.0	5100	530	12000	5000	0.34
VP 35/6560	70268	35	65	60	50	93.0	12	7.7	180.0	6	23.0	6600	720	16000	8500	0.43
VP 40/7065	70284	40	70	65	55	138.0	12	11.5	290.0	7	41.0	8300	870	20500	17000	0.56
VP 45/7570	70300	45	75	70	60	240.0	12	20.0	320.0	7	45.0	10000	1100	24000	20000	0.67
VP 50/8075	70326	50	80	75	65	275.0	11	25.0	700.0	7	100.0	12000	1350	28500	30000	0.77

Type	Art.No	Dimensions in mm d	D	l	L	Torsion Stiffness Nm/rad	±ß degrees	Axial Stiffness N/mm	Max defl. mm	Radial Stiffness N/mm	Max load kN	Weight (kg)
UD bushes	13-1232-60 (60° IRH)	8	20	15	17	10	13	205	1.3	2000	0.7	0.02
	13-1230-55 (55° IRH)	10	24	15	18	14	13	180	1.7	1300	0.5	0.02
	13-1782-60 (60° IRH)	12.7	38.2	25.4	31.8	30	22	220	3.3	1200	1.1	0.08
	13-1657-60 (60° IRH)	127	38.2	44.5	50.8	42	22	330	3.3	2100	2.2	0.14
	13-0785-60 (60° IRH)	14.3	30.2	44.5	50.8	86	13	640	1.9	11000	6	0.11
	13-0797-60 (60° IRH)	15.9	33.4	60.3	65	140	13	960	2.1	18800	9.5	0.16
	13-1004-60 (60° IRH)	15.9	47.7	44.5	50.8	74	20	330	4.2	2500	2.5	0.20
	13-1698-60 (60° IRH)	35	71.2	41.1	45	395	14	550	5.1	3800	4.5	0.39

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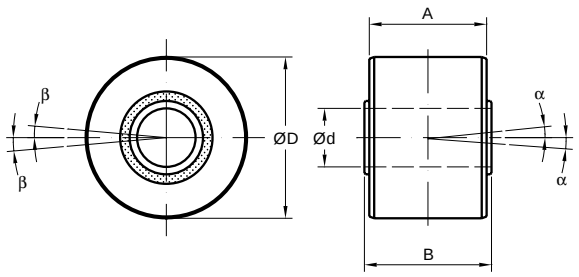
Features

A heavy duty flexible bearing which combines high load capacity with the ability to accommodate torsional and angular movements in all planes without lubrication and metal to metal wear. It is available with centre bore or solid member depending on fixing requirements.

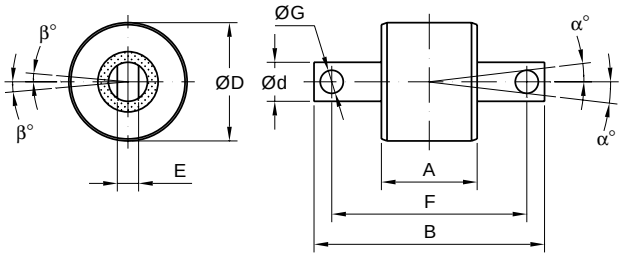
Metalastik® type Spherilastik™ Bearings

Typical uses include traction and braking reaction rods for rail, road and off-road vehicles, hydraulic damper fixings and other applications where a high duty bearing of compact size is required.

Spherilastik™ bearings, centre bore type



Spherilastik™ bearings, trunnion type



Type	Art.No		Dimensions in mm d	D	A	B	E	F	G	Radial Stiffness kN/mm	Radial Max load kN	Torsion Stiffness kNm/rad	Torsion ±ß degrees	Bending Stiffness kNm/rad	Bending ±α degrees	Weight (kg)
Spherilastik™	13-1316-60	(60° IHR)	25.4	66.7	47.6	54				70	34	0.9	8	0.9	6	0.84
bearings	13-1006-60	(60° IHR)	28.6	90.5	70	76.2				93	58	2.8	8	2.8	6	2.5
Centre bore	13-2106-60	(60° IHR)	28.6	90.5	70	76.2				100	58	2.8	8	2.8	6	1.8
type	13-1285-60	(60° IHR)	38.1	104.8	76.2	82.6				90	78	4.5	8	3.8	7	3.4
Trunnion	13-2202-65	(65° IHR)	35	66.7	47.6	120	20	90	13	70	34	0.7	8	0.9	6	1.2
type	13-2033-60	(60° IHR)	40	84	65	155	20	120	16.5	150	75	2.8	6	2.8	6	2.8

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Metaxentric™ Bushes

Metalastik® type Metaxentric™ Bushes

Similar to conventional Ultra Duty Bushes but with inner and outer sleeves offset radially. This feature provides a greater rubber thickness and hence increased flexibility in the normal direction of loading while maintaining control in other modes and still allowing torsional movement.

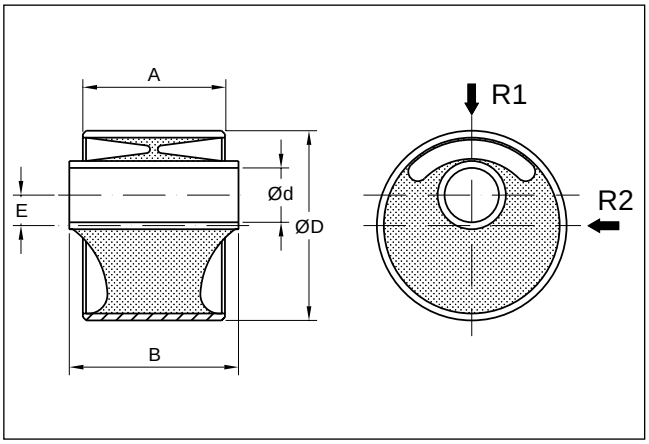
The rubber section is relieved to eliminate harmful tensile stresses.

Applications
- Vehicle spring eye mounting
- Tilt Cab pivot bush
- Engine mounting

Features

Metaxentric™ bushes have a large rubber section with the central pin offset towards one radial plane. These bushes can provide a relatively large radial deflection, but have excellent motion control characteristics.

The Metaxentric™ bush has the following features:
- Three dissimilar translational stiffnesses for the best vibration isolation and motion control.
- Load range from 130 to 400 kg.
- 'Rising rate' stiffness characteristics for overload conditions help to limit motion and transmitted acceleration.
- Robust and fail-safe, suitable for ROPS and FOPS cab structures.
- Simple to fit, the housing lends itself to robust structures.



			Dimensions in mm					Radial properties Direction R1		Direction R2	Weight
Type	Art.No		d	D	A	B	E	Stiffn N/mm	Max defl. mm	Stiffn N/mm	(kg)
Metaxentric™	13-1270-50	(50° IRH)	16	47.6	50.8	63.5	7.1	750	2	1600	0.18
	13-2174-60	(60° IRH)	24	75.3	50.8	70	10.5	1100	3.5	1200	0.59
	13-1165-50	(50° IRH)	25.4	88.9	66.7	79.4	14.3	585	3.8	640	0.86
	13-1165-65	(65° IRH)	25.4	88.9	66.7	79.4	14.3	900	3.8	990	0.86
	13-1355-60	(60° IRH)	43.7	101.6	63.5	72.4	9.5	1300	3.5	2200	1.1

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Features

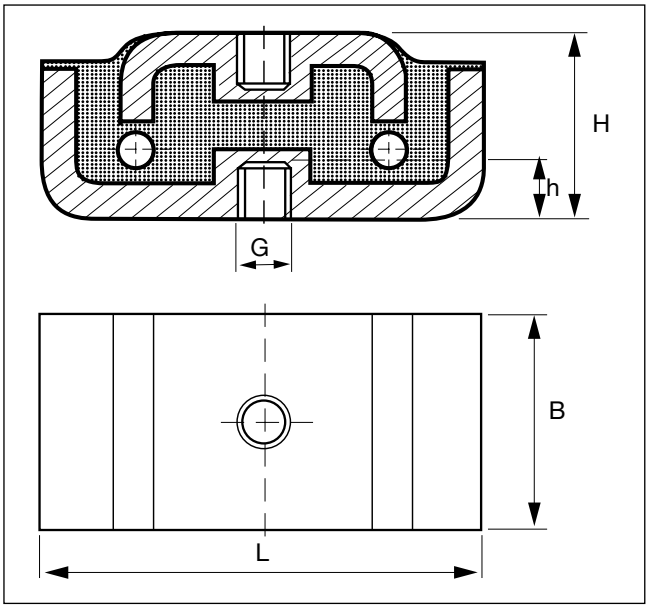
Type U is a robust element consisting of 2 solid U-shaped steel parts securely bonded to the rubber section. To achieve higher flexibility, two holes in the rubber are provided between the metals. The upper metal plate is fixed to the underside of the machine foot or baseplate by means of a bolt, while the bottom plate should be secured to the floor by an expansion bolt. For certain applications a dowel pin may be adequate.

Novibra® type U

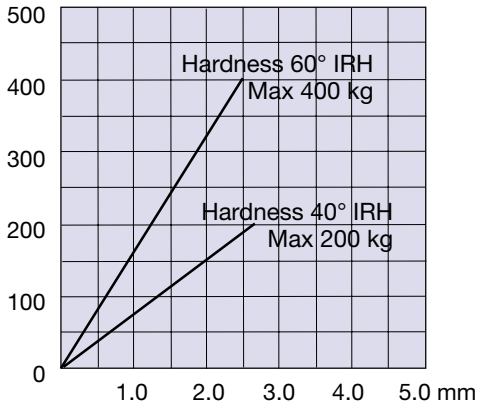
Type U provides for a stable machine installation and is particulary suitable for the vibration isolation of heavier machinery with relatively high interfering frequencies.

Typical applications can be found on:

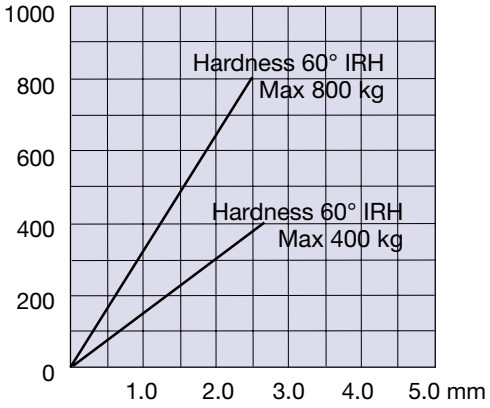
- Presses
- Punches
- Weaving machines
- Woodworking machines
- Church bells
- Transformers
- Printing machinery
- Other heavy, high-speed machines



U 100
Load per mounting (kg)



U 130
Load per mounting (kg)



Type	Art.No. 40° IRH	Art.No. 60° IRH	Dimensions in mm B	L	H	h	G	Weight (kg)	*M*-Max(kg) 40° IRH	60° IRH
U 100	67363	67371	50	100	42	12	M12	0.650	200	400
U 130	67421	67439	70	130	54	12	M12	1.318	400	800

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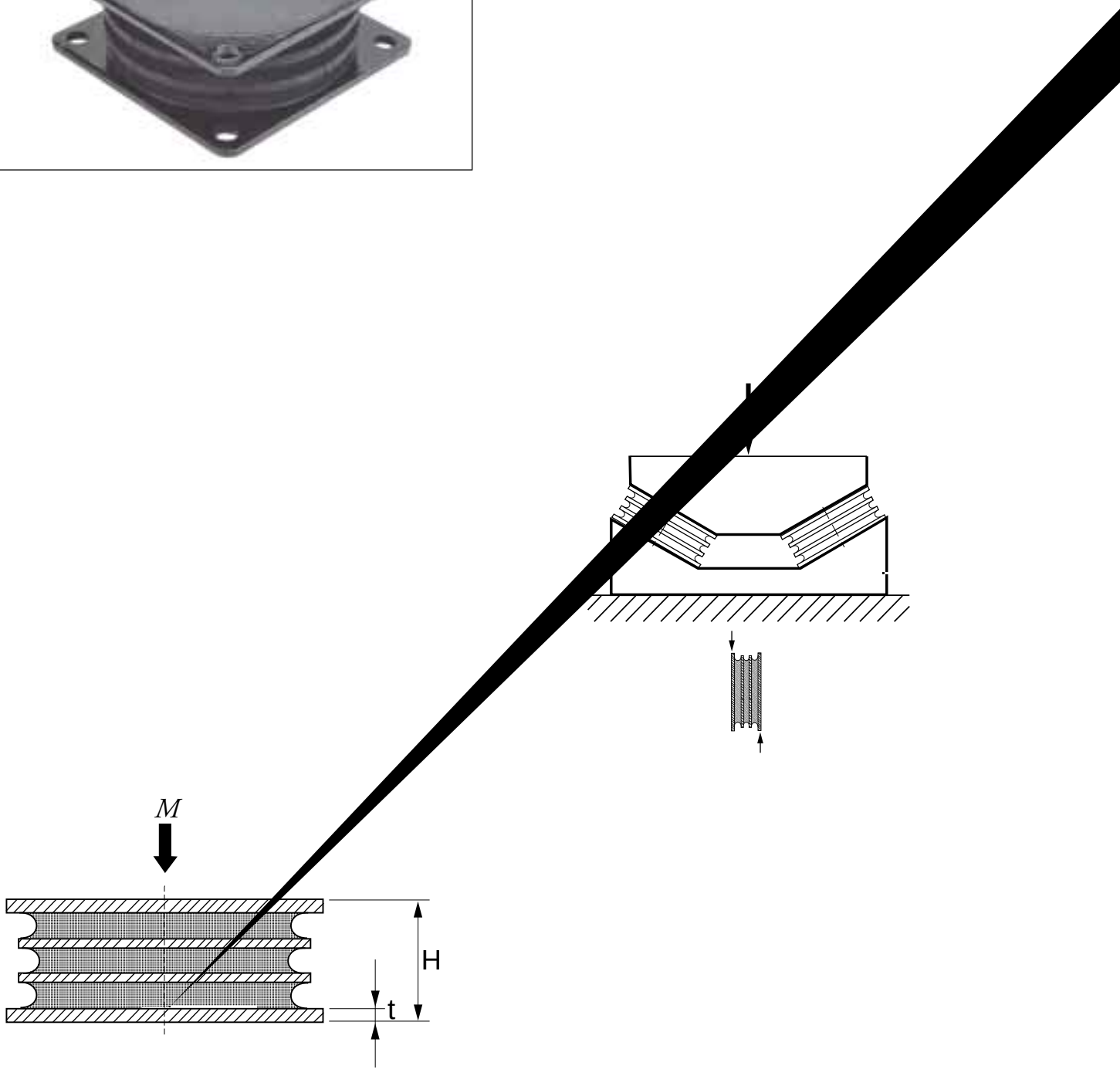
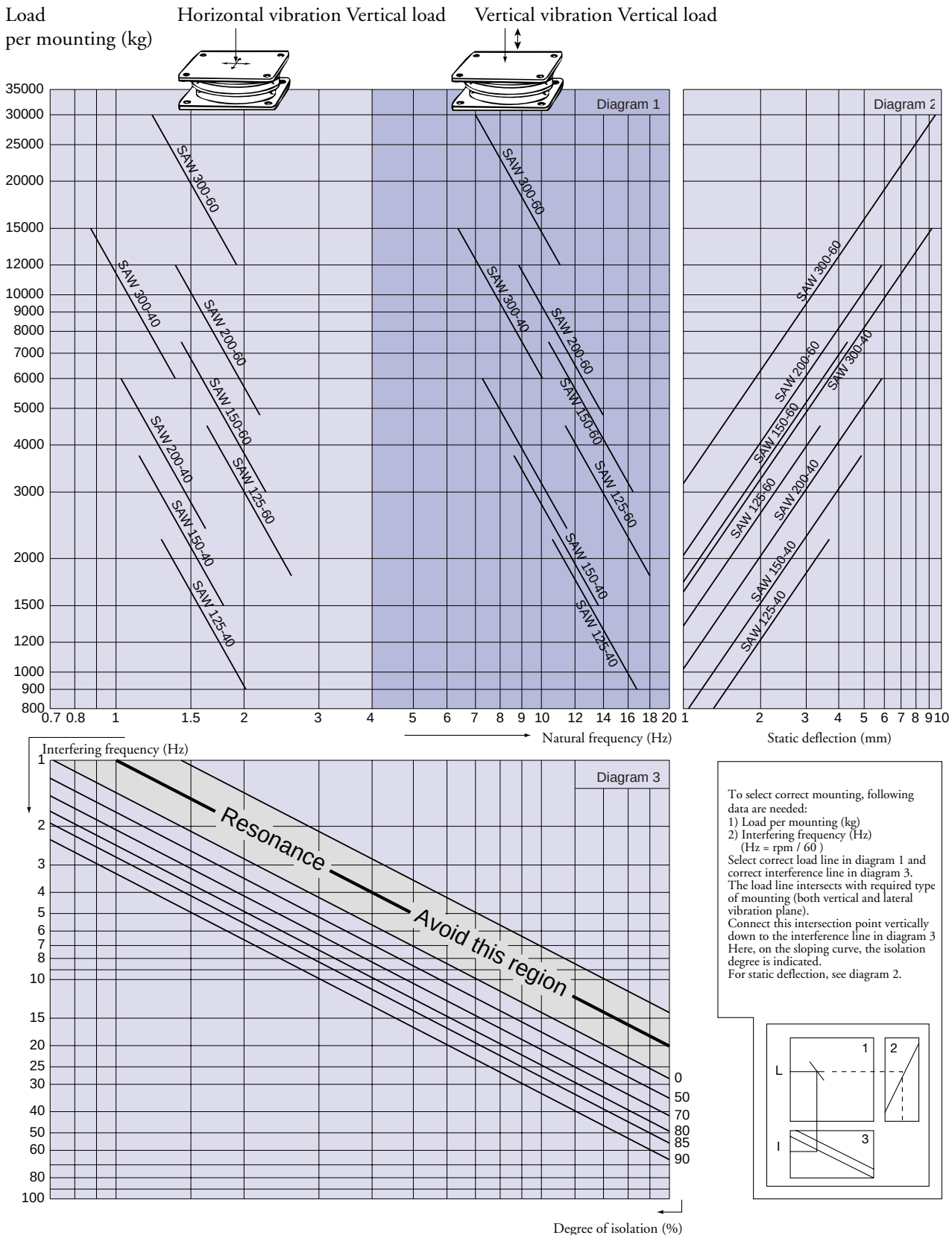

M
H
t

Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

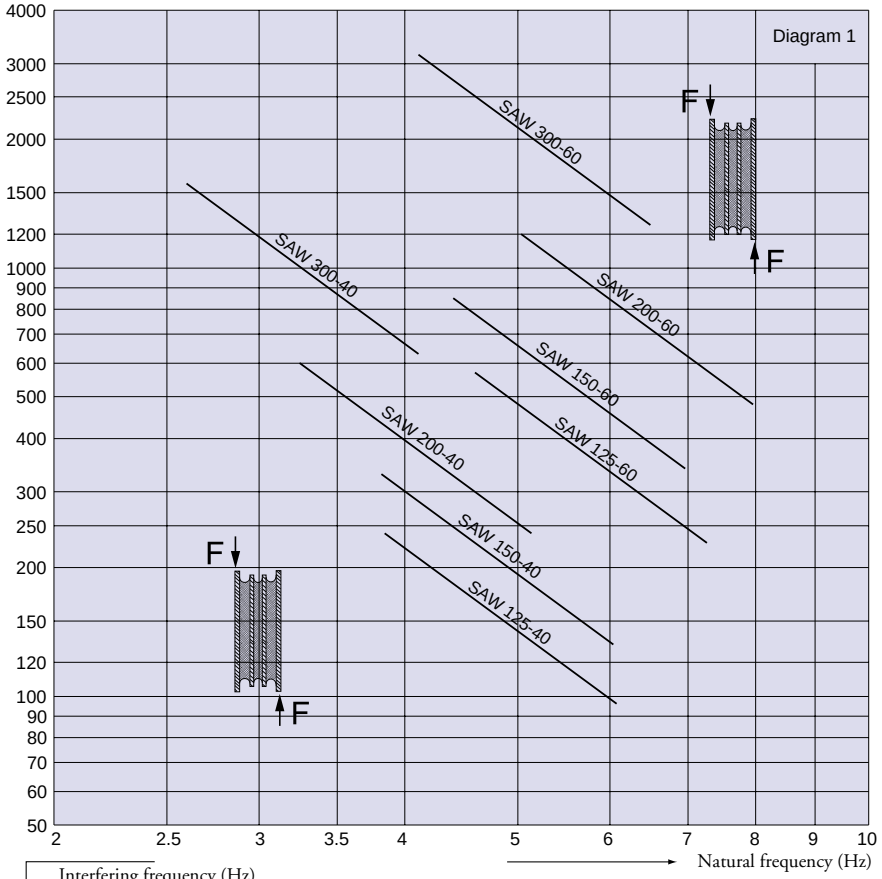


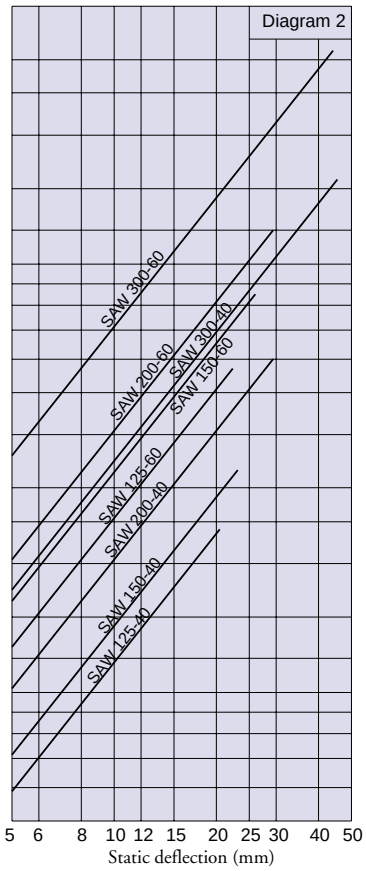
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

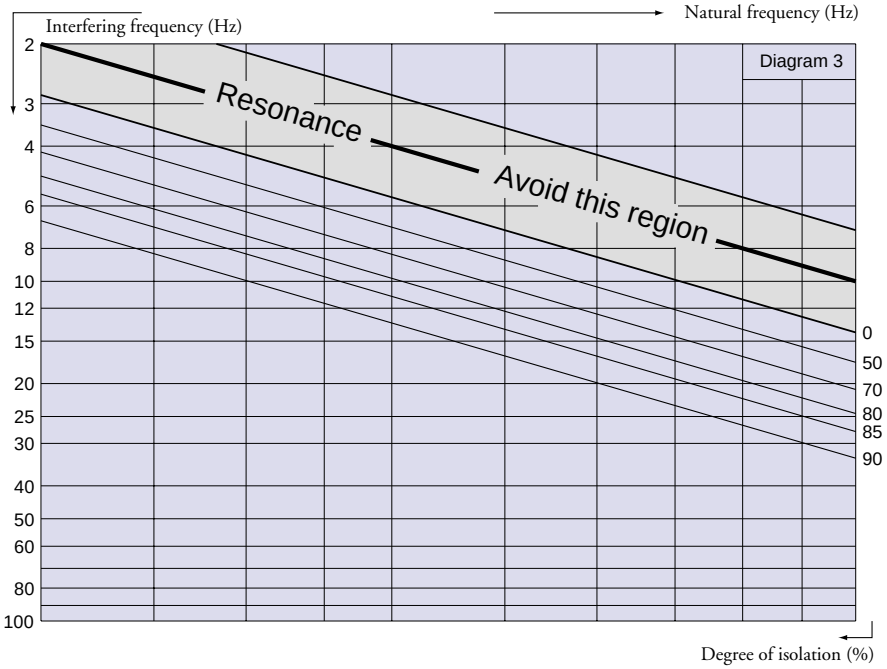
F max (kg)	50° IRH	50° IRH
SAW 125	240	570
SAW 150	330	850
SAW 200	600	1200
SAW 300	1575	3150

This page refers to shear load characteristics only!

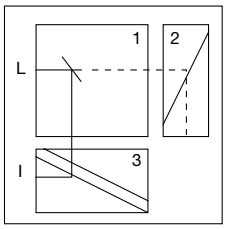
Load per mounting (kg)







To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting (both vertical and lateral vibration plane).
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



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Metalastik® type Rectangular SAW Mountings and Novibra® type 3” COMP

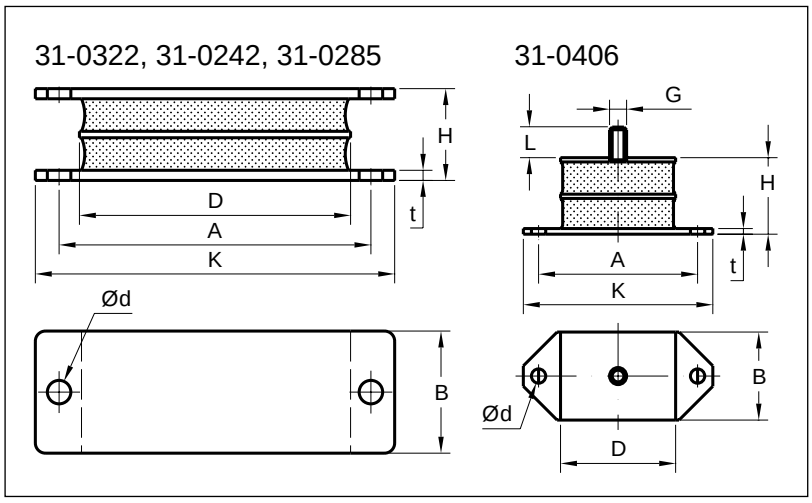
Widely used for suspending engines on road vehicles and may also be employed as springs for vibratory equipment.

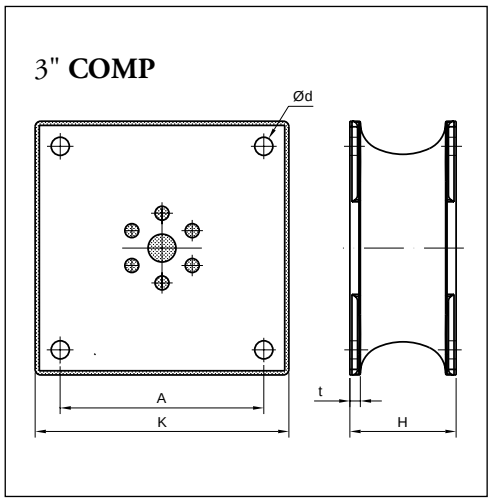
Features

Rectangular SAW mountings are also known as ’Sandwich’ mountings because they feature a rubber section sandwiched between plates of metal. This arrangement allows a large difference between the compression and shear stiffnesses, thus providing the potential to ’tune’ a mounting system by rotating the mountings. These mountings are commonly installed in a ’Vee’ formation to utilise this feature.

The Rectangular SAW Mountings has the following features:

- Available with plate or stud fixings.
- Can be loaded in compression or shear, or a combination of both, for example in a ’Vee’ arrangement.
- Can be manufactured with or without interleaves to change the ratio of shear to compression stiffness.





Type	Art.No		A	B	K	H	D	d	t	G	L	Max load in compression (kg)	Max load in shear (kg)	Weight (kg)
			Dimensions in mm											
Rectangular	31-0322-45	(45° IRH)	89	57	108	43	63.5	11	5			180	50	0.65
SAW	31-0322-60	(60° IRH)	89	57	108	43	63.5	11	5			360	75	0.65
Mountings	31-0242-45	(45° IRH)	146	57	168	43	127	11	5			450	120	1.1
	31-0242-60	(60° IRH)	146	57	168	43	127	11	5			900	150	1.1
	31-0242-70	(70° IRH)	146	57	168	43	127	11	5			1050	150	1.1
	31-0406-45	(45° IRH)	74.5	41	89	36	54	6.5	2.5	M8	14	90	40	0.23
	31-0406-60	(60° IRH)	74.5	41	89	36	54	6.5	2.5	M8	14	180	70	0.23
	31-0406-70	(70° IRH)	74.5	41	89	36	54	6.5	2.5	M8	14	250	90	0.23
	31-0285-45	(45° IRH)	146	57	168	43	127	11	5			275	150	0.9
	31-0285-60	(60° IRH)	146	57	168	43	127	11	5			546	150	0.9
3"COMP-55	7293805	(55° IRH)	146		182	76		13	7.5				220	3.4
3"COMP-60	7293806	(60° IRH)	146		182	76		13	7.5				280	3.4
3"COMP-65	7293804	(65° IRH)	146		182	76		13	7.5				340	3.4

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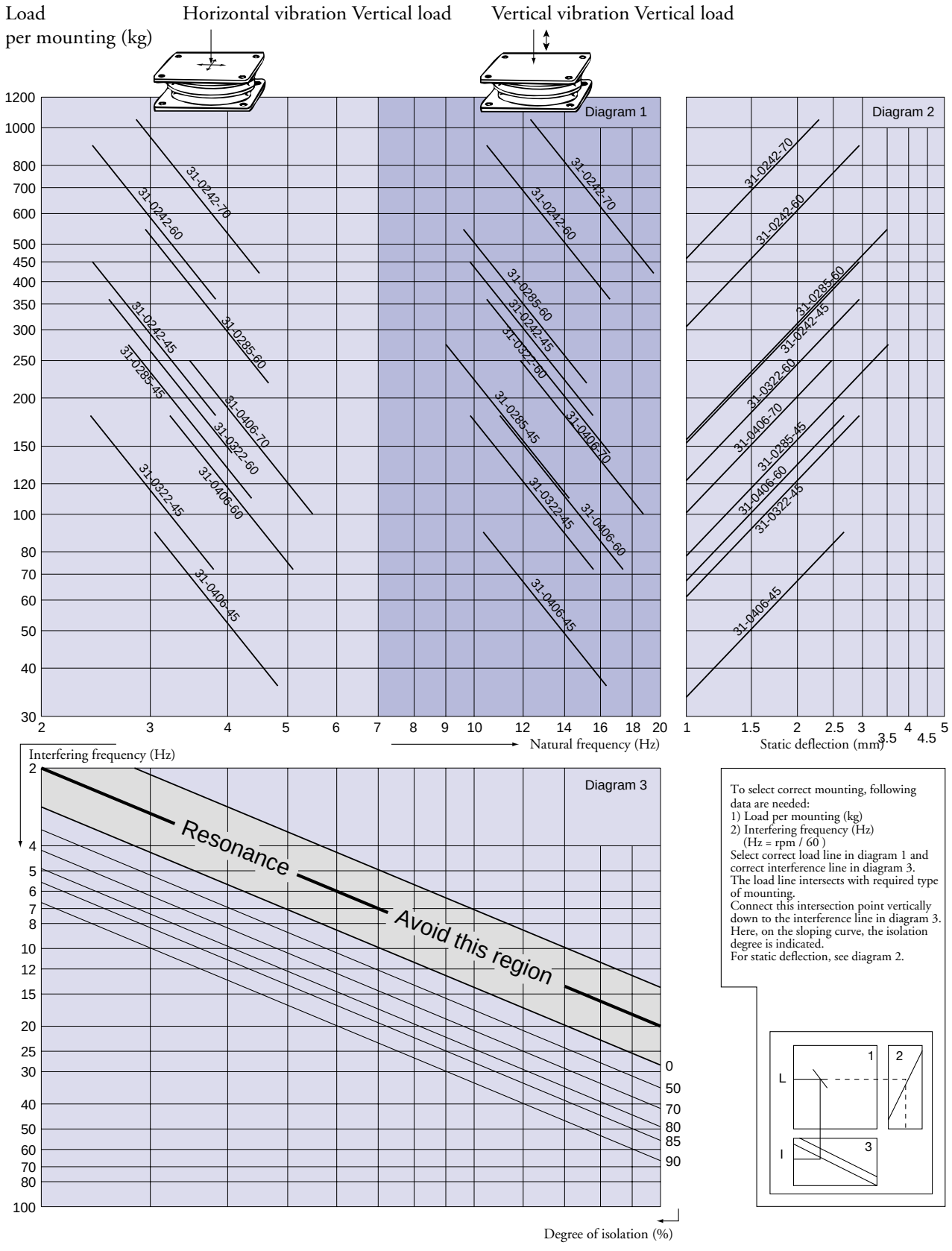
Rectangular SAW Mountings

Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.



To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.

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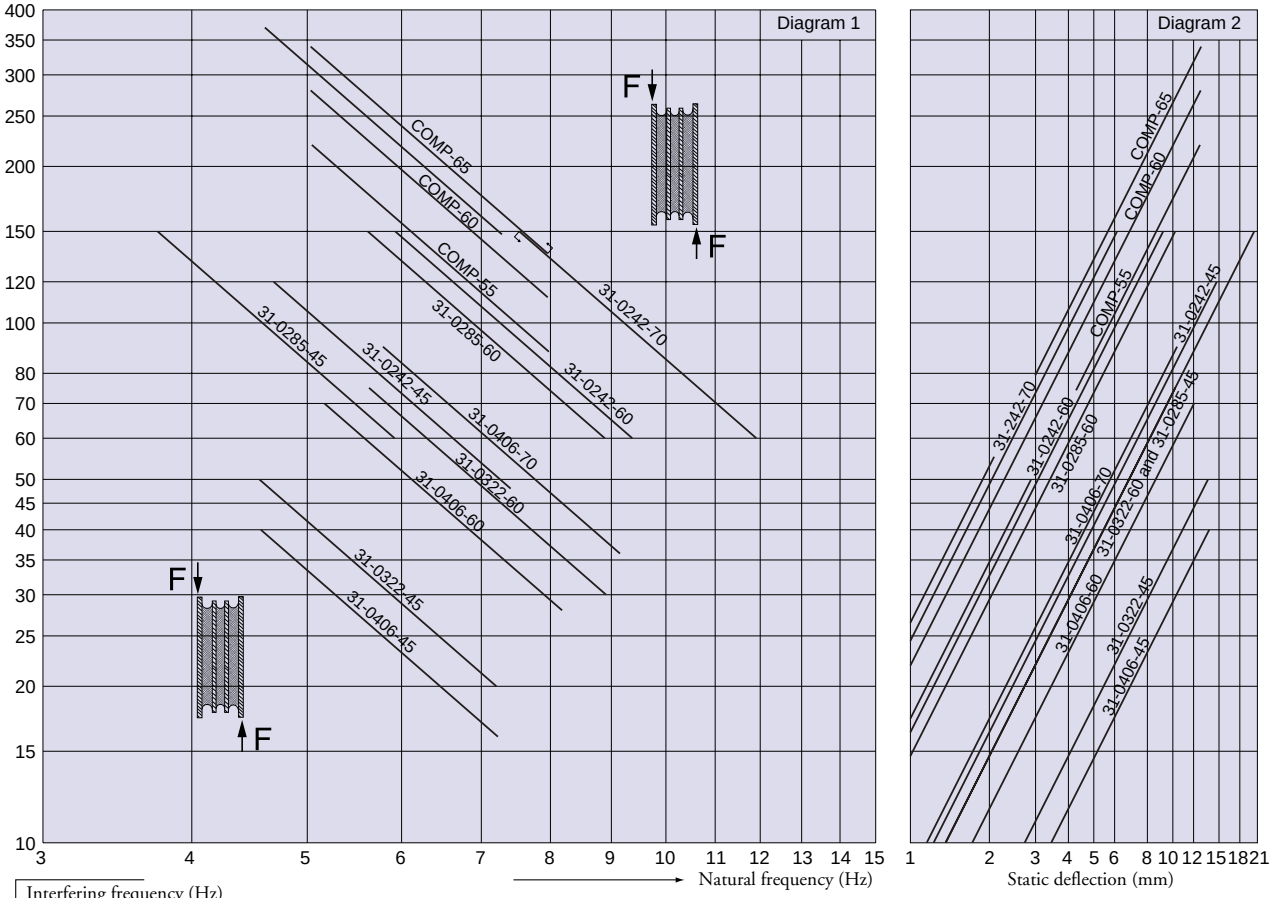
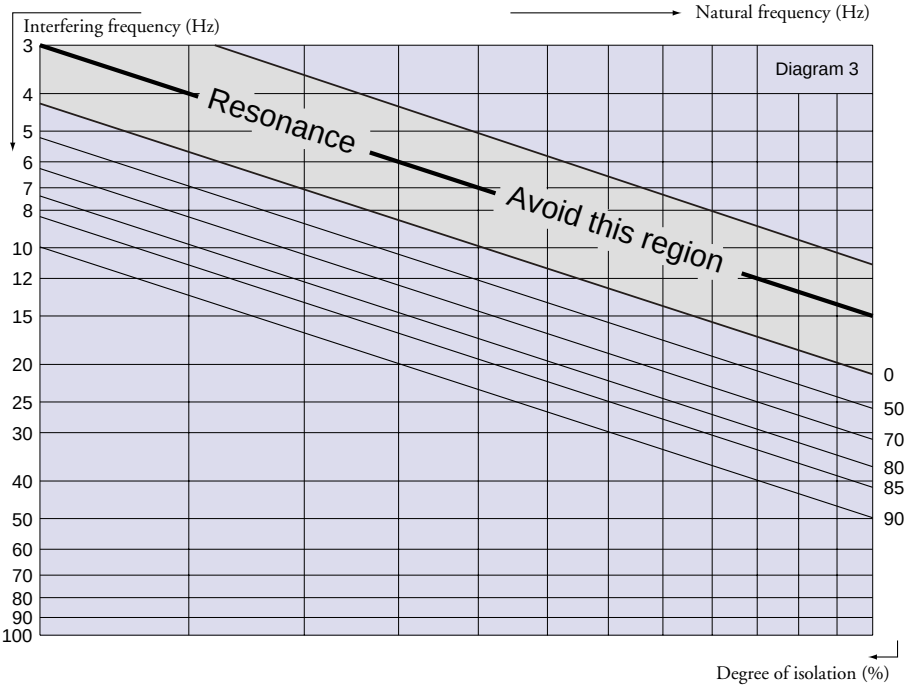
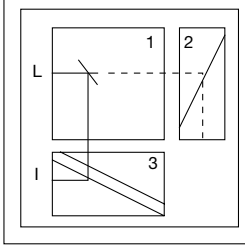
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



Circular SAW Mountings

Metalastik® type Circular SAW Mountings

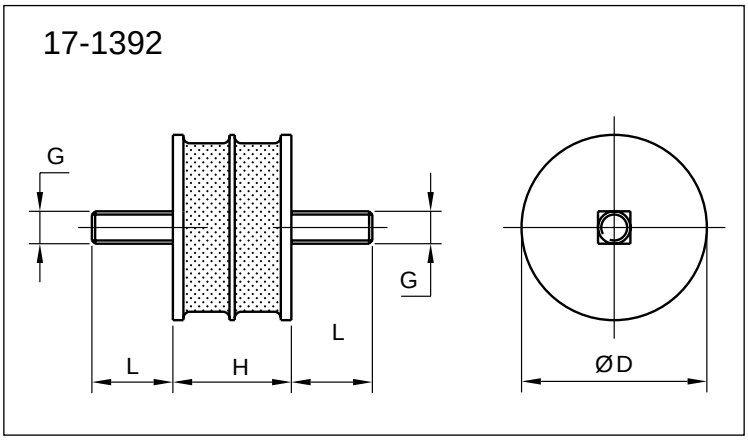
Used in a variety of industrial applications including vibratory rollers and small screens or for the suspension of smaller type I.C. engines.

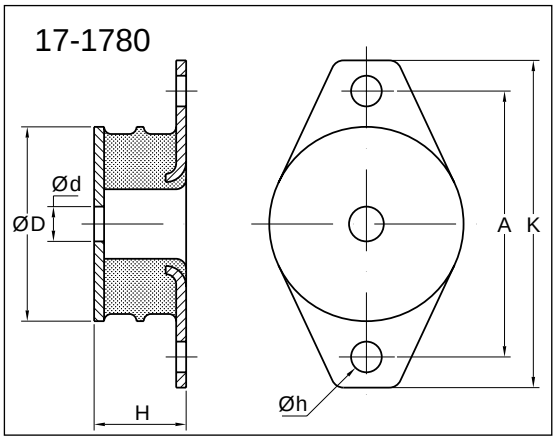
17-1780 can be fitted with a rebound washer for mobile applications.

Features

The metal interleaf incorporated (17-1392) in the design provides a higher compression to shear stiffness ratio, thereby increasing the load capacity in the compression or combined compression and shear modes.

The 17-1780 engine mounting features a void in the rubber section to allow the use of a central snubber device.





Type	Art.No.	Dimensions in mm D	H	L	G	A	K	d	h	Max load in compression (kg)	Max load in shear (kg)	Weight (kg)
Circular	17-1392-45 (45° IRH)	57	37	25	M10					120	90	0.28
SAW	17-1392-60 (60° IRH)	57	37	25	M10					250	90	0.28
Mountings	17-1392-70 (70° IRH)	57	37	25	M10					330	90	0.28
	17-1780-45 (45° IRH)	95	45			130	160	17	15	190	135	0.81
	17-1780-60 (60° IRH)	95	45			130	160	17	15	380	160	0.81

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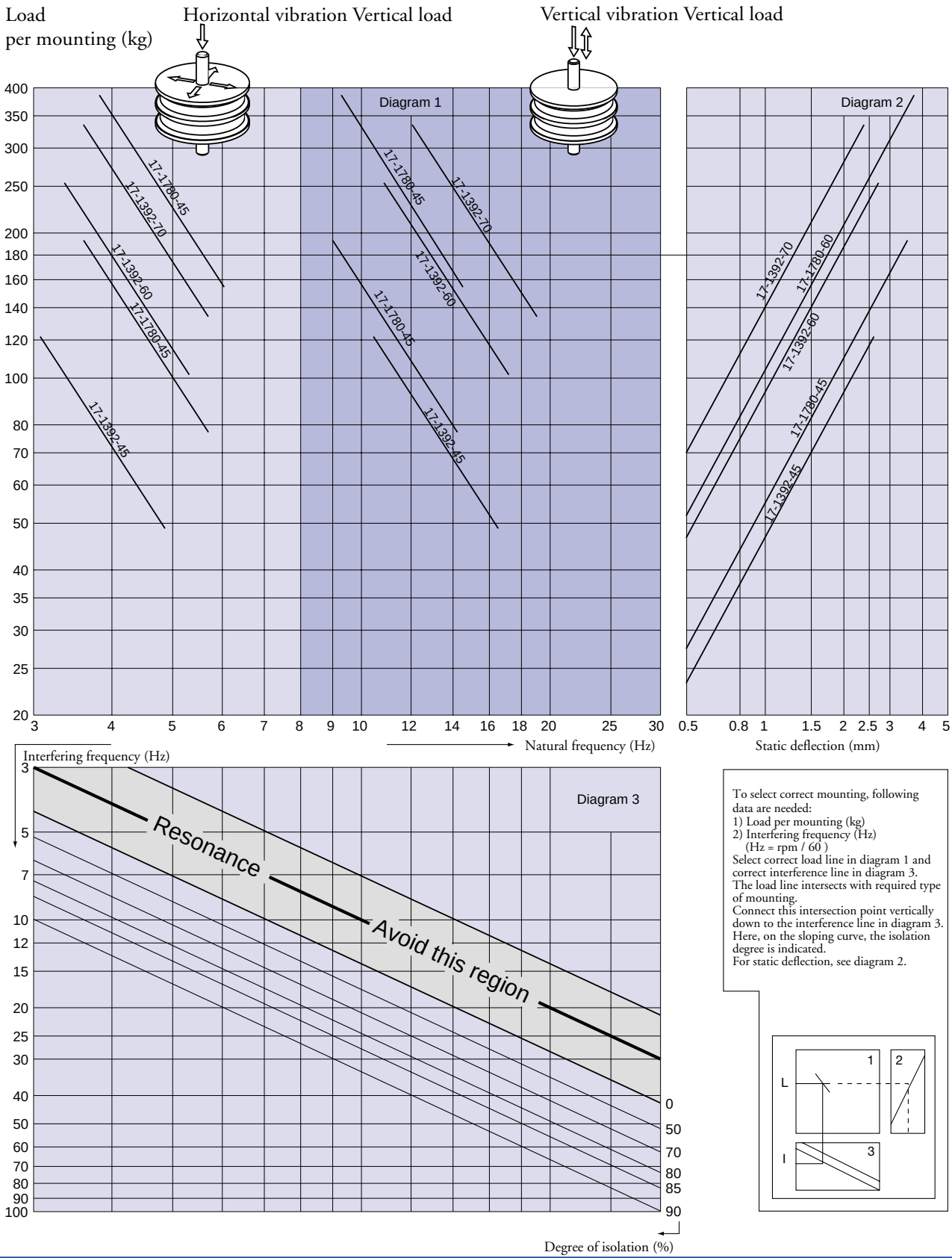
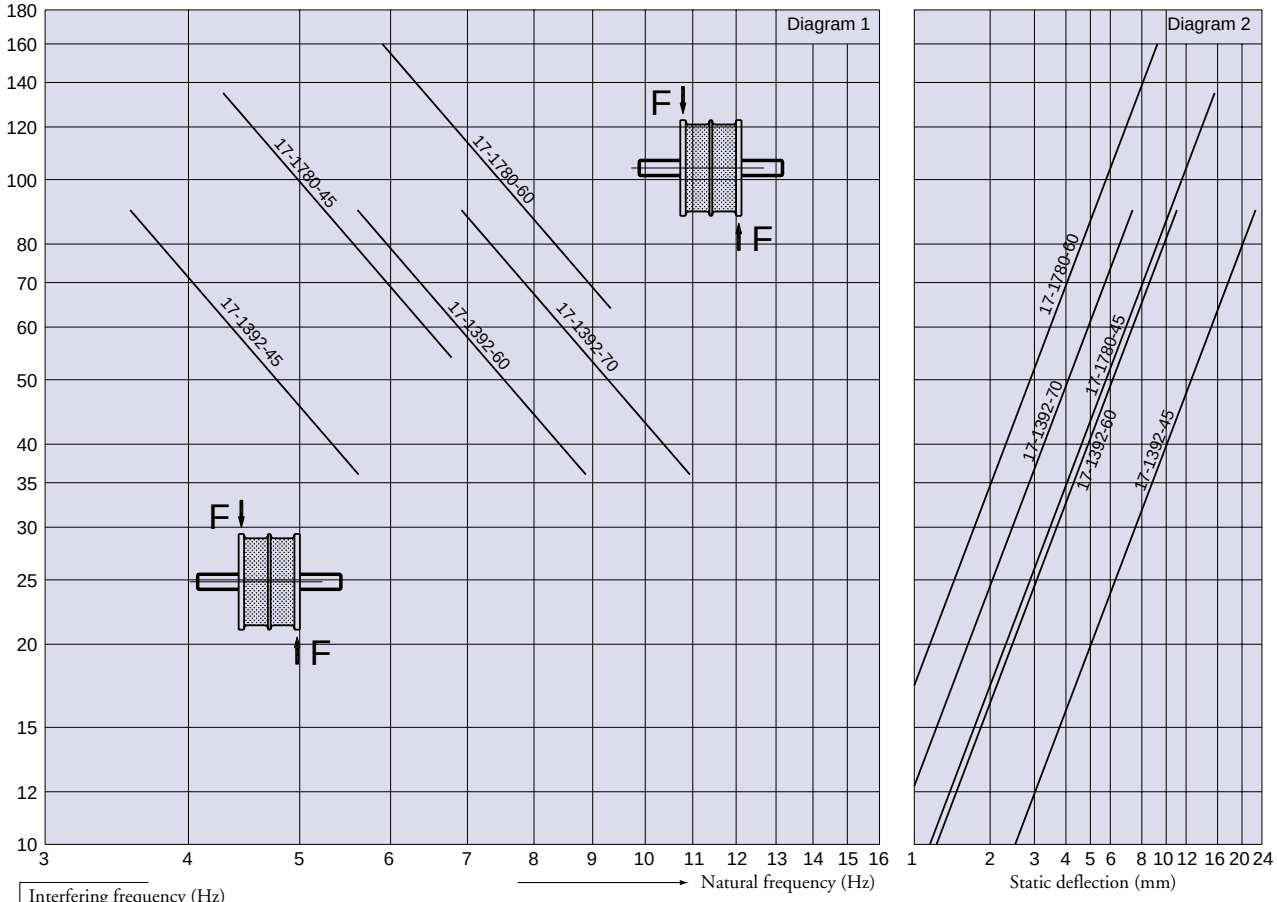
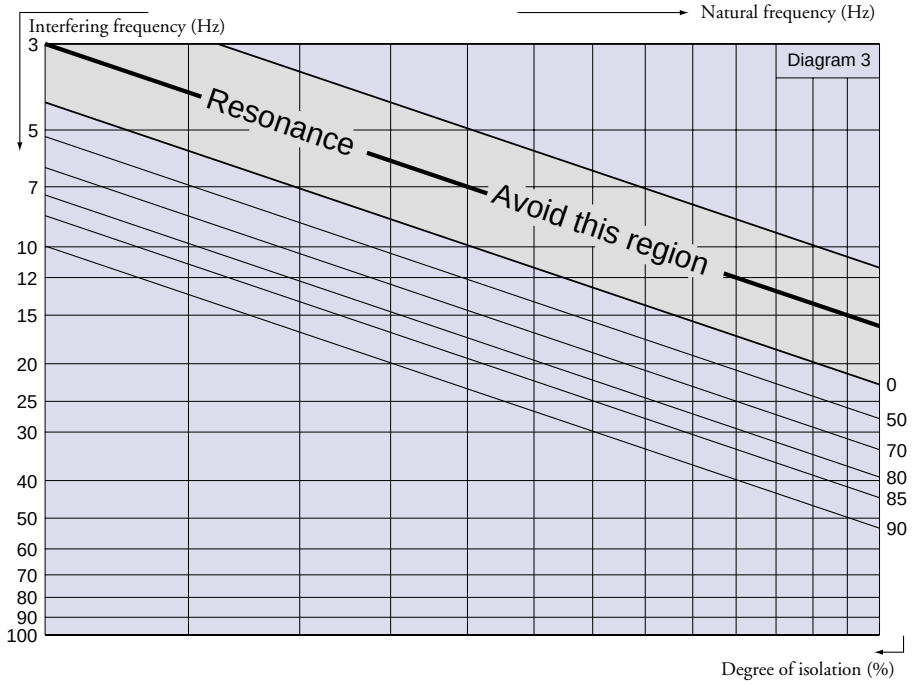
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.



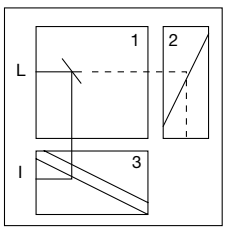
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



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Features

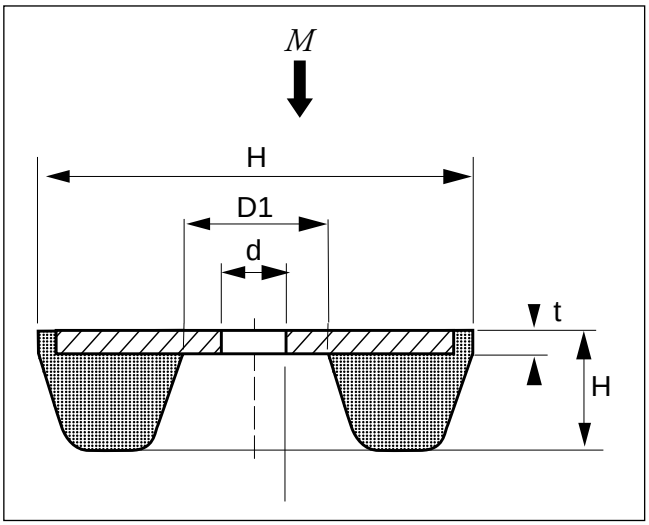
The SE-mounting consists of an annular rubber section, securely bonded to a single steel support plate. A clearance hole is provided which can either be left plain or tapped to suit the application.

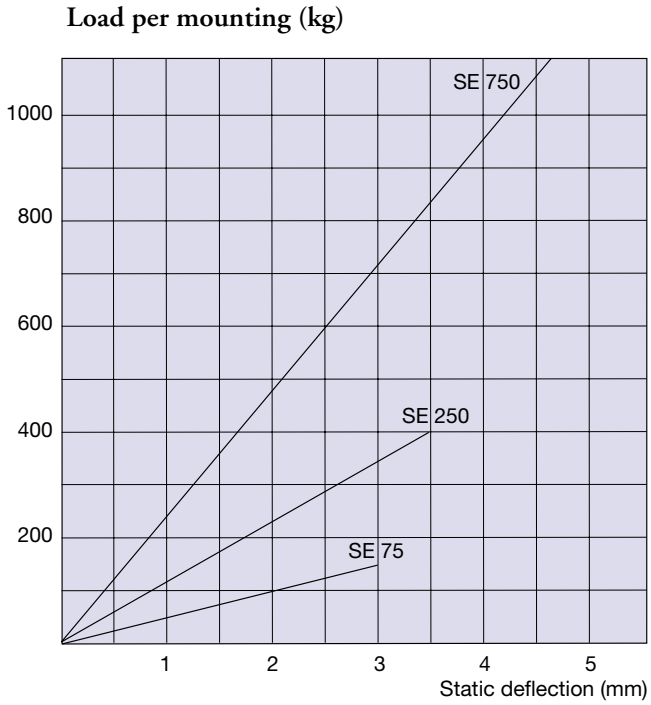
As the rubber element is in direct contact with the supporting surface, friction is normally sufficient to prevent the suspended equipment from "walking".

Novibra® type SE

Type SE is suitable for the isolation of high frequency disturbances and provides reduction of structure-borne noise.

Specific applications are:
- Office equipment
- Textile machinery
- Domestic appliances
- Electric motors
- Weighing equipment





Type	Art.No. 50° IRH	Dimensions in mm D	D1	d	H	t	Weight (kg)	*M*-Max (kg) 50° IRH
SE 75	1661010	55	18	8	15	3	0.069	150
SE 250	1861110	75	25	10	17	4	0.172	400
SE 750	1861120	115	40	14	24	4	0.456	1100

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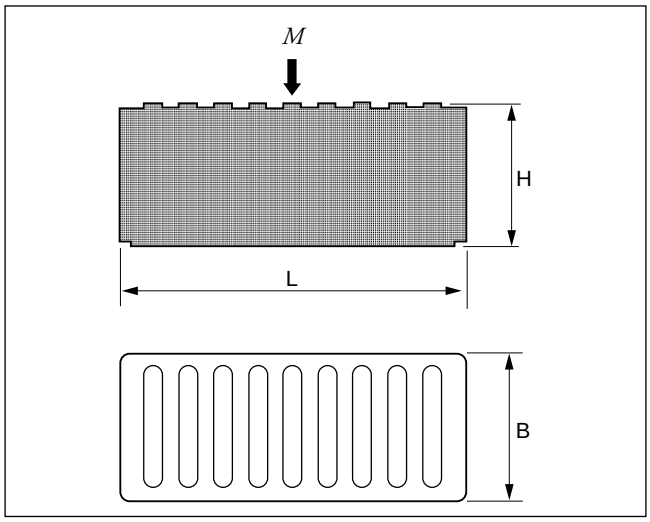
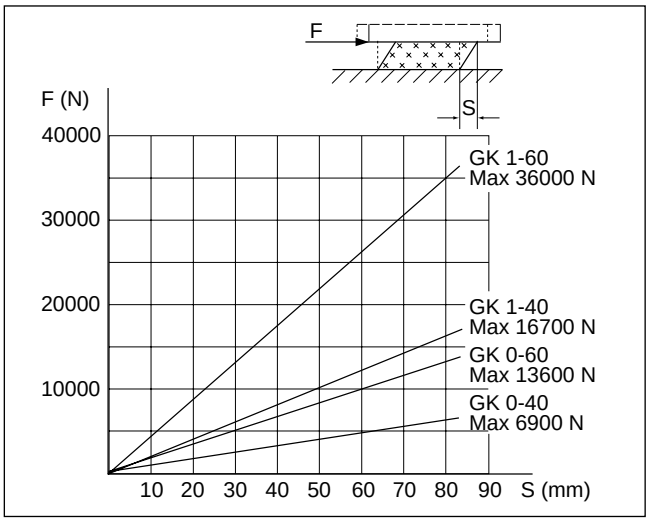
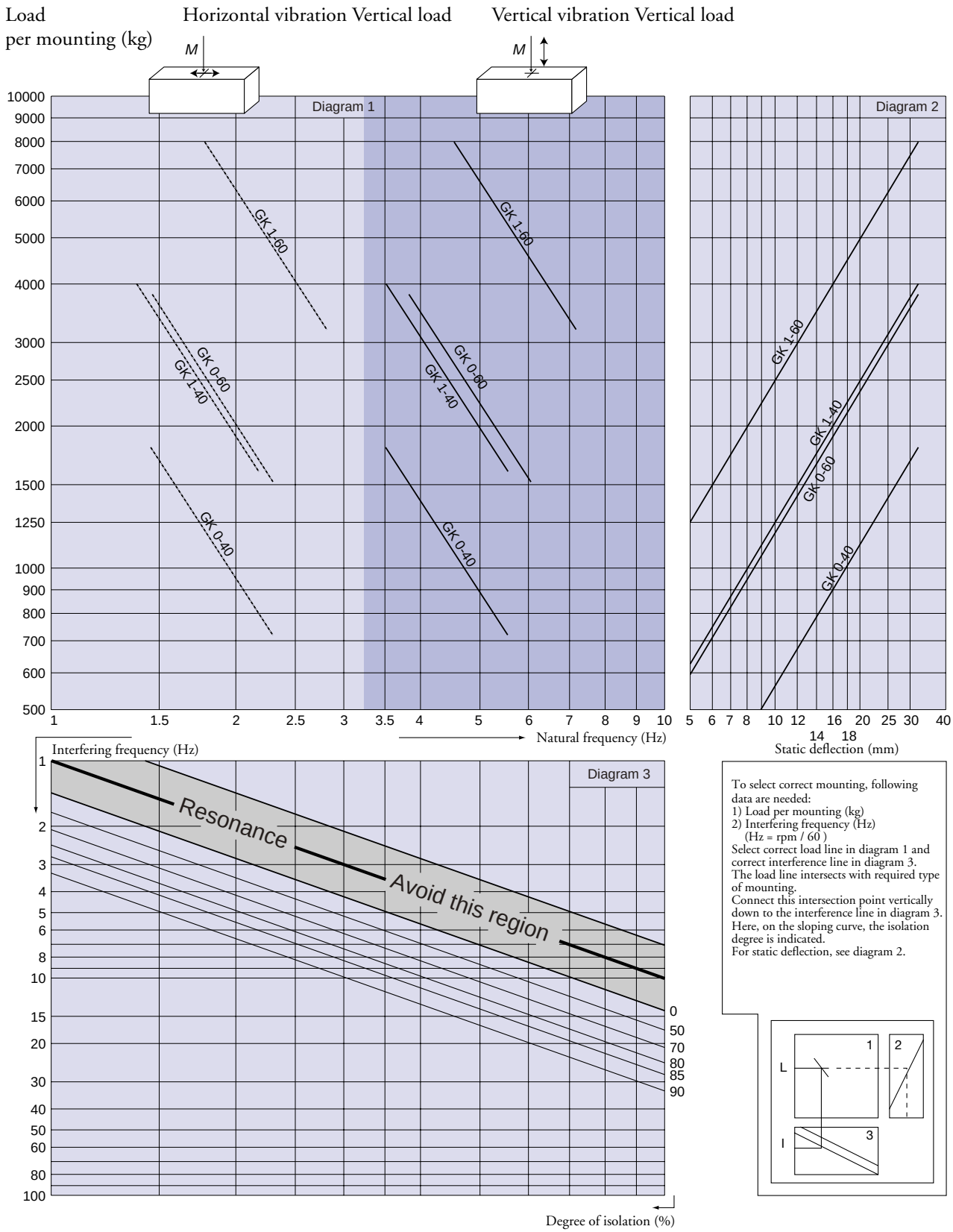

M
H
L
B


F
S
F (N)
40000
30000
20000
10000
GK 1-60
Max 36000 N
GK 1-40
Max 16700 N
GK 0-60
Max 13600 N
GK 0-40
Max 6900 N
10 20 30 40 50 60 70 80 90 S (mm)

Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.



Novibra® AV Plate

Features

The AV Plate, made of oil and grease resistant rubber material, is available either as a single (4.5 mm) or as a double (8 mm) version. The single version has ribs on one side only, while the double has ribs on both sides applied at a 90 degree angle to each other.

Good performance is obtained when using the Novibra® AV Plate in the building and construction industry as support pads between flooring and joists. This application provides for cushioning of loads and isolation of high frequency vibrations within the building.

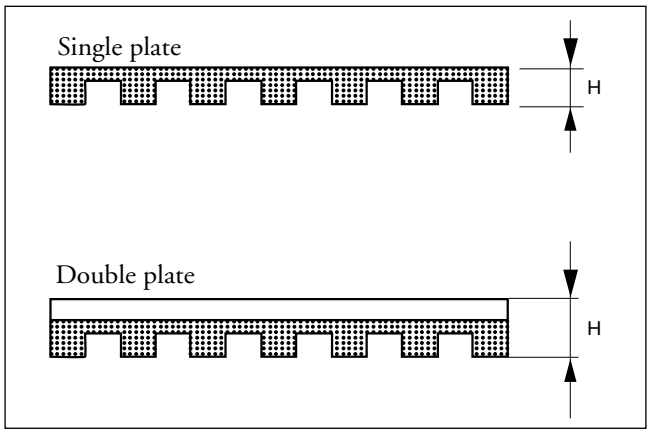
Novibra® type AV Plate

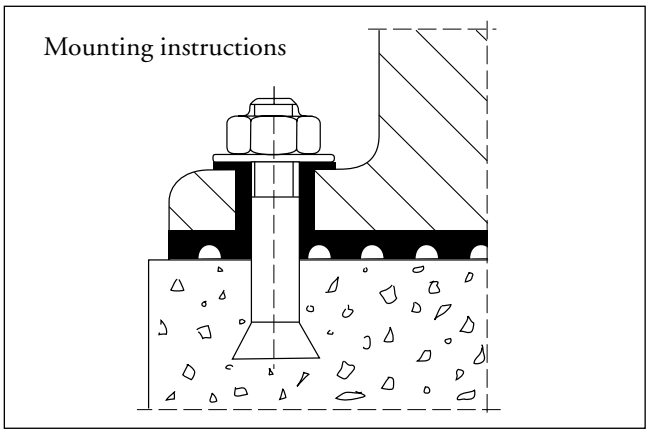
The Anti-Vibration Plate is intended, primarily, for applications with low requirement for vibration isolation. Typical installations are machinery generating vibrations in the high frequency range, and tall unstable installations, requiring secure attachments to the foundation.

If insufficient deflection is achieved with a single layer, multiple layers can be used by separating each layer with a weight distributing steel plate. In order to avoid direct contact between machine and foundation, a rubber bushing (e.g. rubber hose) should be installed in the mounting holes prior to installation of bolt and rubber washer. See "Mounting instructions" on this page.

Suitable applications are:

- Pillar drills
- Transformers
- Large pumps
- Printing presses
- Industrial fans
- Horizontal drill presses
- Textile machinery
- Large forging presses





Dimensions in mm				Weight	*M*-max load
Type	**Art.No.**	**LxB**	**H**	**(kg)**	**kg/cm²**
Single plate	70136	600x500	4.5	1.210	5
Double plate	70151	600x500	8.0	1.815	5

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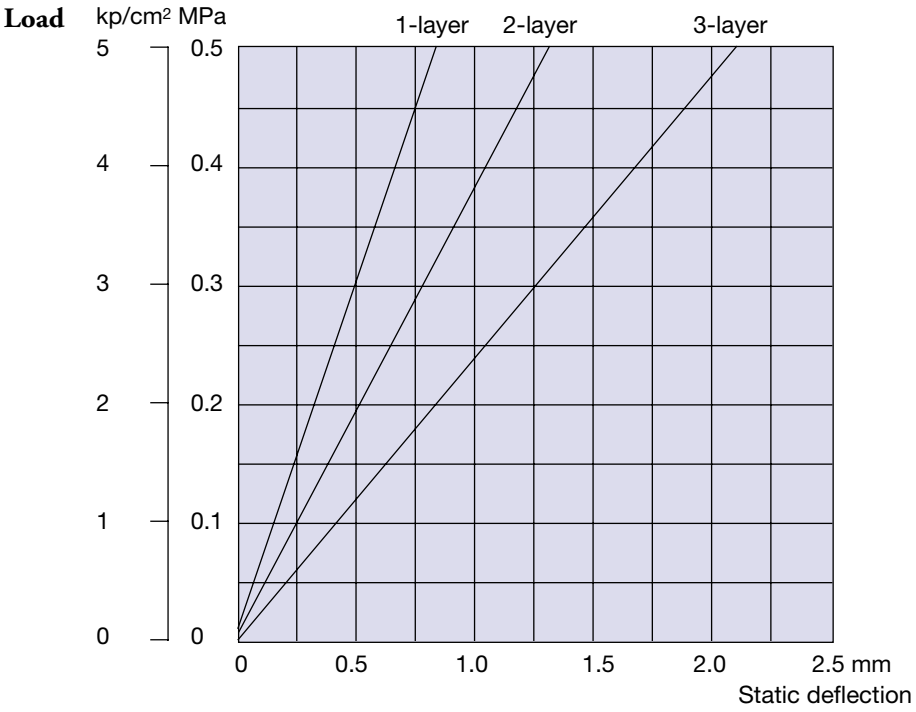
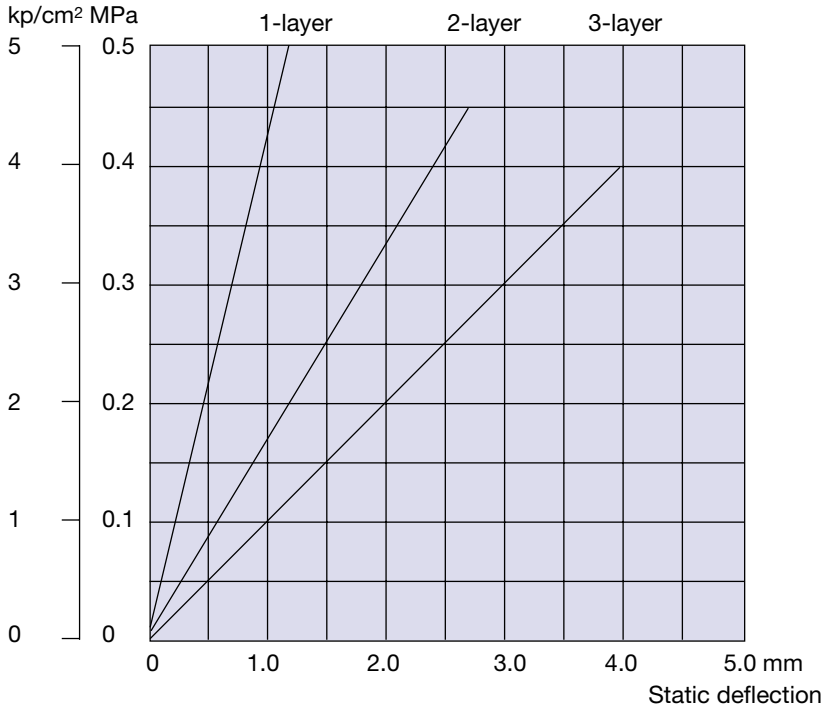
Single Novibra® AV Plate



Double Novibra® AV Plate



TF

Features

The TF mounting is installed in minutes by following the instructions provided. There is no need to fix the machines to the floor since the rubber base of the mounting keeps the machine in place. Whenever necessary, the machine can easily be re-positioned. The level is adjusted with load applied.

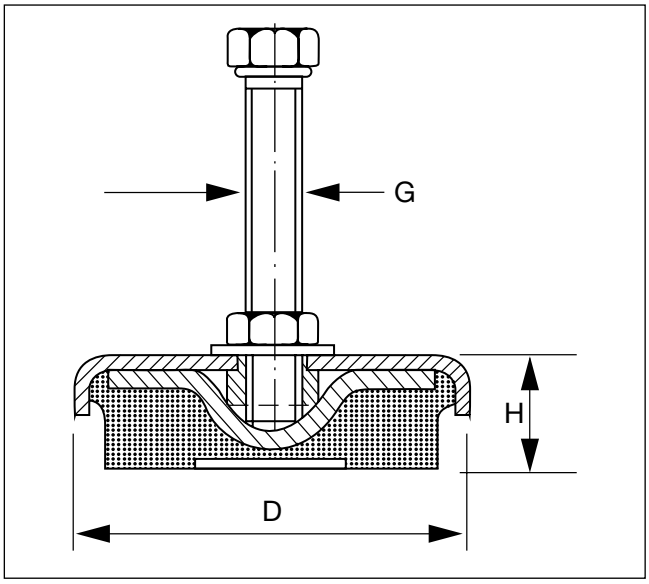
The rubber element of the TF mounting is oil and chemical resistant. All metal parts are zincplated and chromated for protection against corrosion.

Models TF 250, TF 600 and TF 1200, also available in S/S (ISO 2604/11, BS 3605:1).

Novibra® type TF

Novibra® type TF with level adjuster is suitable for a wide range of free standing workshop machines, e.g.

- Lathes
- Milling machines
- Grinding machines
- Multiple operation machinery
- Presses
- Plate shears
- Nibbling machines
- Punches and cutters
- Woodworking machines
- Plastic moulding machinery



Type	Art.No.	Dimensions in mm D	H min	H max	Overall bolt length	Thread G	Weight (kg)	Max load (kg)
TF 250	1860740	69	23	1)	100	M 12	0.40	250
TF 250 S/s	2256520	69	23	1)	100	M 12	0.40	250
TF 600	1860780	81	25	1)	100	M 12	0.49	600
TF 600 S/s	2256530	81	25	1)	100	M 12	0.49	600
TF 1200	1860790	108	29	1)	100	M 16	1.0	1200
TF 1200 S/s	2256540	108	29	1)	100	M 16	1.0	1200
TF 3000	1860800	151	35	1)	120	M 20	2.2	3000
TF 4000	1860810	170	39	1)	120	M 20	2.9	4000
TF 6000	1860820	205	44	1)	150	M 24	4.8	6000

1) Levelling of the bolt up to its total length.

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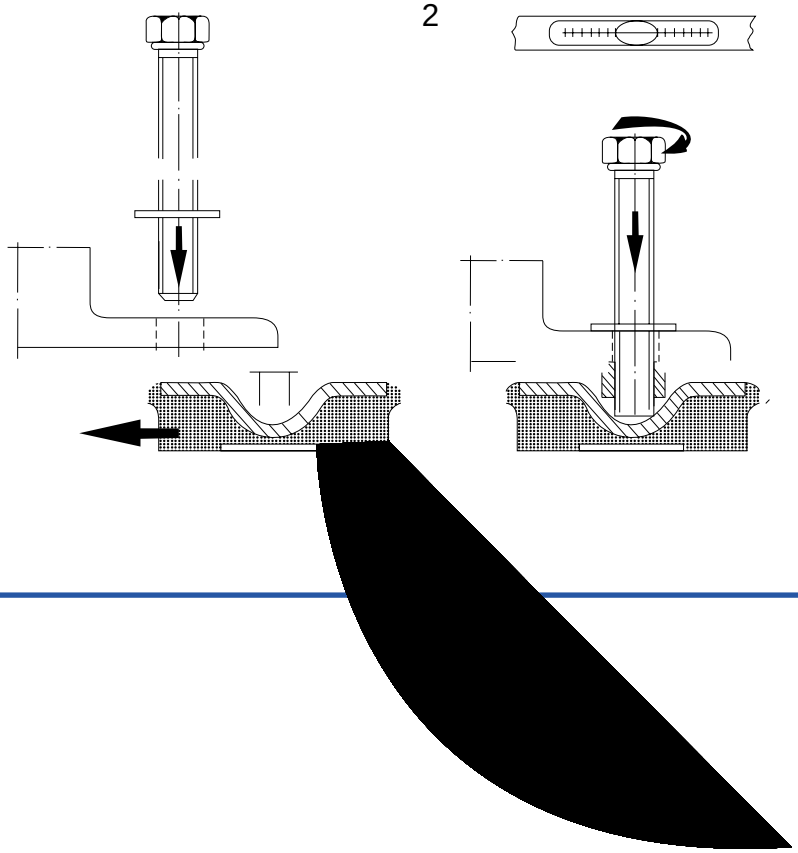
1



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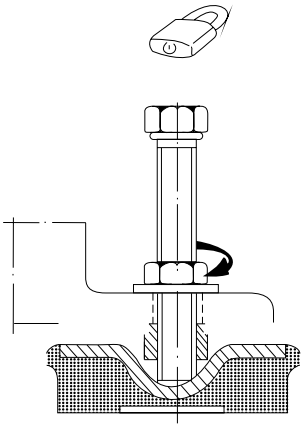
3



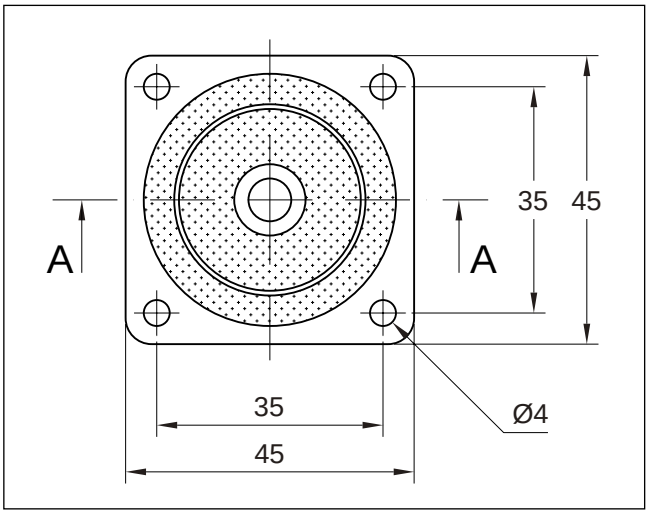
Flanged Instrumountings

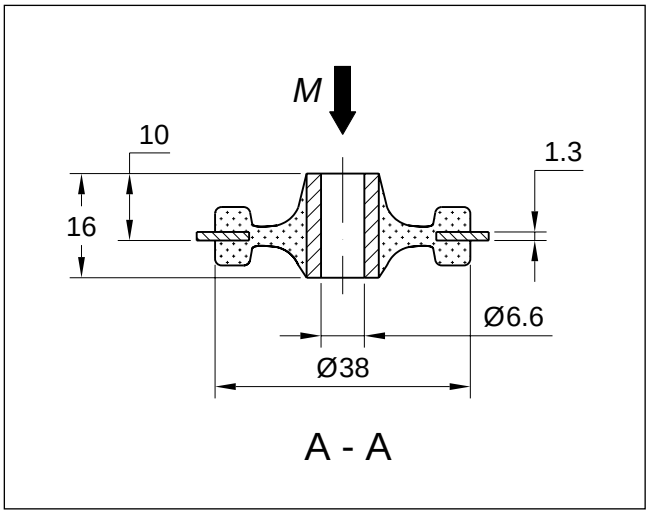
Features

- Fail-safe when fitted with overload and rebound washers of the same diameter as the rubber section.
- Load range from 2.7 to 5.4 kg.
- Static deflection up to 3 mm.
- Easy to fit as part of a cabinet enclosure.
- Can be used in both vertical directions.

Metalastik® type Flanged Instrumountings

These mountings are suitable for both mobile and static applications, for the protection of sensitive equipment from external vibration or for vibration isolation of small fan sets, transformers and similar equipment. Flanged Instrumountings can be fail-safe if fitted with a washer to the top and bottom of the rubber section.





Art.No.	*M*-Max (kg)	Weight (kg)
17-1801-45 (45° IRH)	2.7	0.03
17-1801-60 (60° IRH)	5.4	0.03

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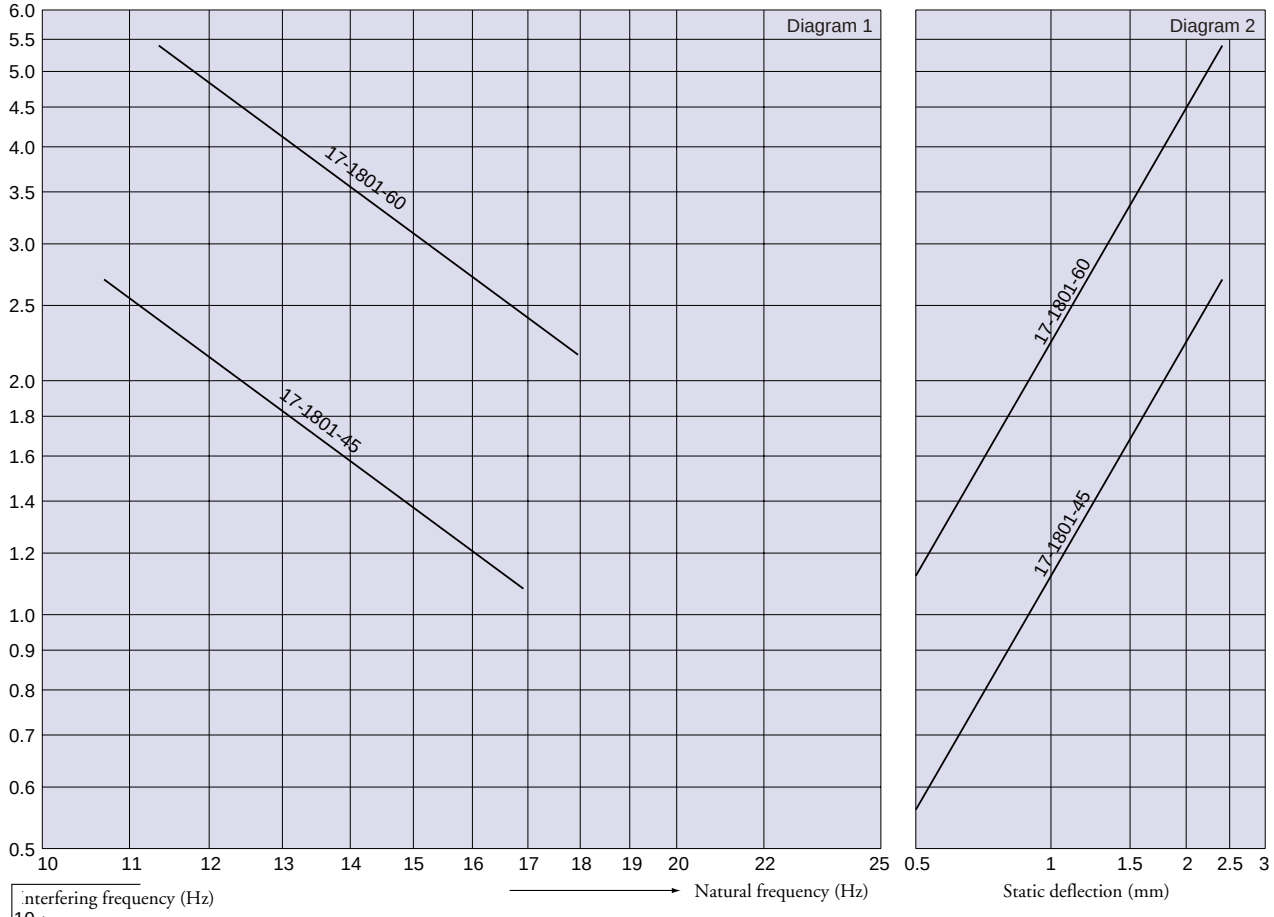
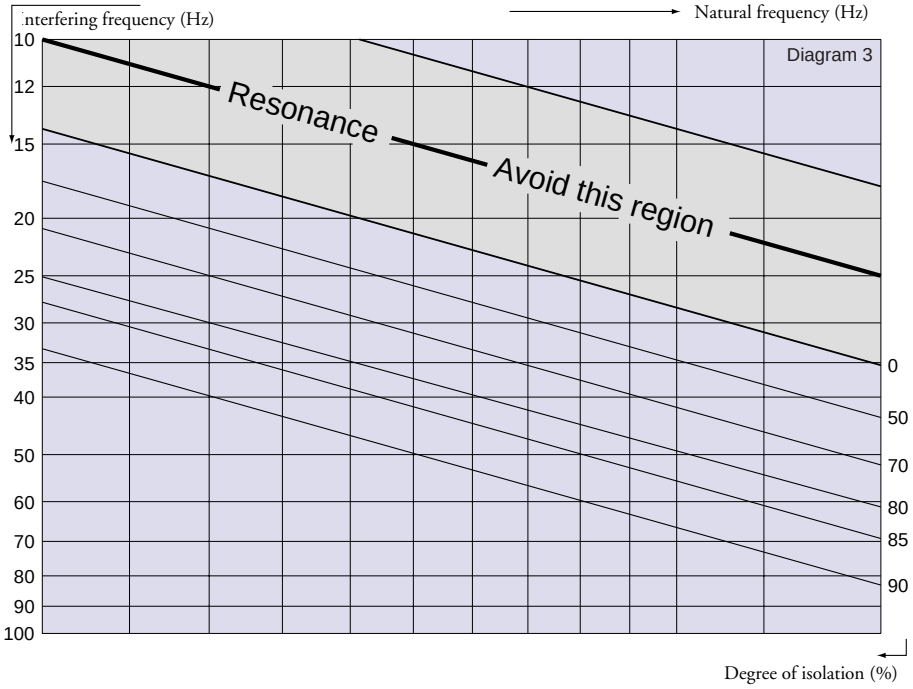
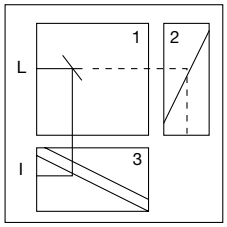
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



ANB

Novibra® type ANB

The shockbuffer type ANB is used to effectively limit movement of equipment or machine components.

Typical field applications would be:

- Wagons
- Traversing cranes
- Lifting cranes
- Working beams
- Falling goods
- Container handling equipment
- Cabinets
- Forestry vehicles
- Off-road material handling equipment

Through the low resilience of the rubber a high degree of energy absorption is achieved. The rubber is stiffer under dynamic conditions compared to static or pseudo static loading; hence more energy is absorbed for a given deformation. Diagram 4 shows the effect of the energy factor.

Features

Buffer type ANB consists of a cylindrical rubber body bonded to a square baseplate of steel. Each corner of the baseplate has a fixing hole.

Special high-hysteresis rubber compound is used to ensure as much energy absorption as possible. The volume of the rubber is used at optimum efficiency.

For new machine developments simpler designs and lighter calculated forces can be considered enabling a lower cost.

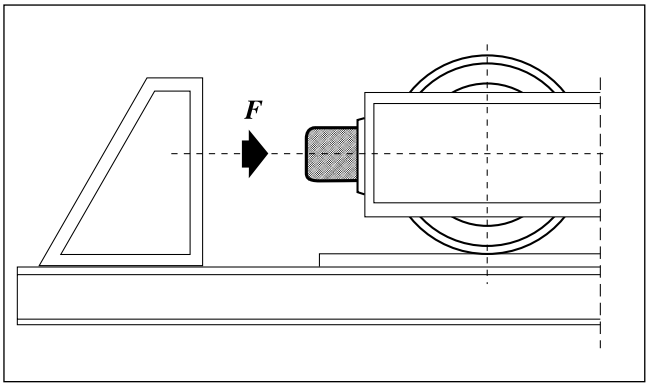


Fig. 1. Traverse crane with shock buffer ANB.

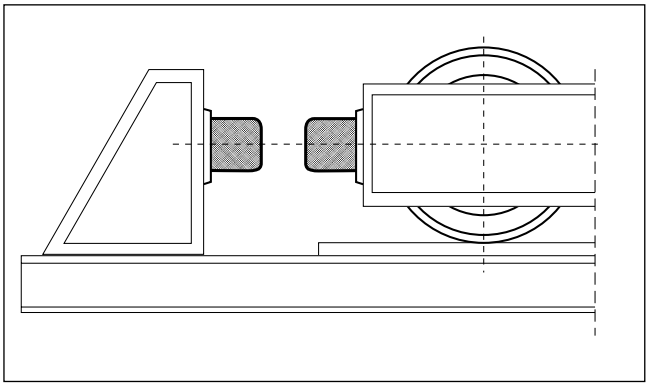


Fig. 2. Traverse crane with 2 ANB buffers connected in series.

		Dimensions in mm						Weight	*F*-Max
Type	**Art.No.**	**K**	**A**	**D**	**d**	**H**	**t**	**(kg)**	**(N)**
ANB 50	2255290	70	50	50	7	43	3	0.2	8000
ANB 75	2255300	100	75	75	9	63	3	0.5	20000
ANB 100	2255310	130	100	100	11	84	4	1.2	41000
ANB 150	68569	185	150	150	13.5	126	6	3.9	90000
ANB 200	68577	240	200	200	13.5	168	8	9.1	180000

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For calculation purposes the following equations can be used:

$E = \frac{m \cdot v^2}{2}$ (1)

$E = F \cdot s$ (2)

$F = m \cdot a$ (3)

$s = \frac{a \cdot t^2}{2}$ (4)

$v = \sqrt{a \cdot t}$ (5)

$v = \sqrt{2 \cdot a \cdot s}$ (6)

$v = \sqrt{2 \cdot g \cdot h}$ (7) applicable in free fall

Equation (4)- (7) valid for initial velocity = 0

E = energy in Nm
m = mass in kg
v = velocity in m/s
F = force in N
s = distance in m
a = acceleration in m/s²
t = time in s
g = acceleration due to gravity 9.81 m/s²
h = height in m
d = spring travel in m

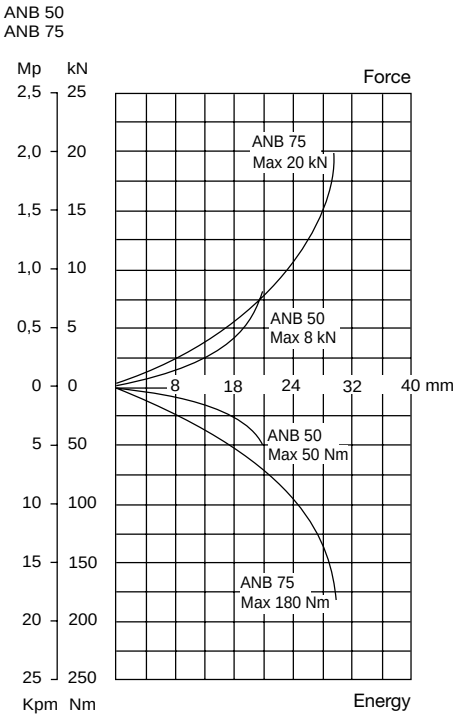


Diagram 1

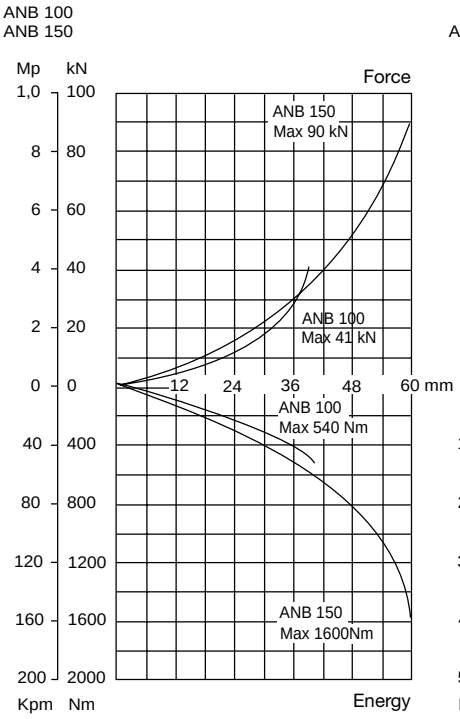


Diagram 2

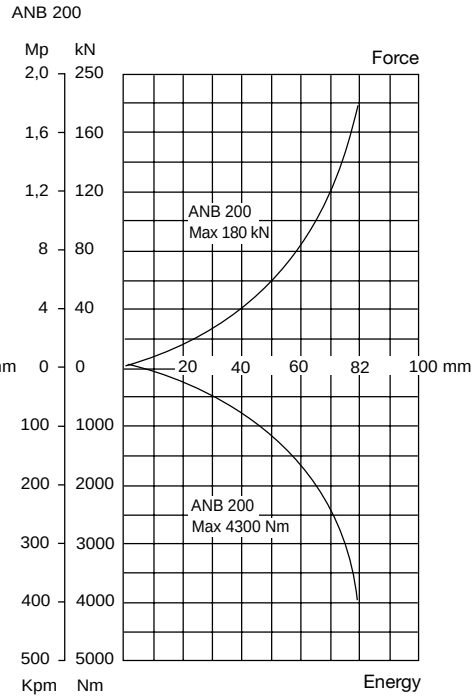
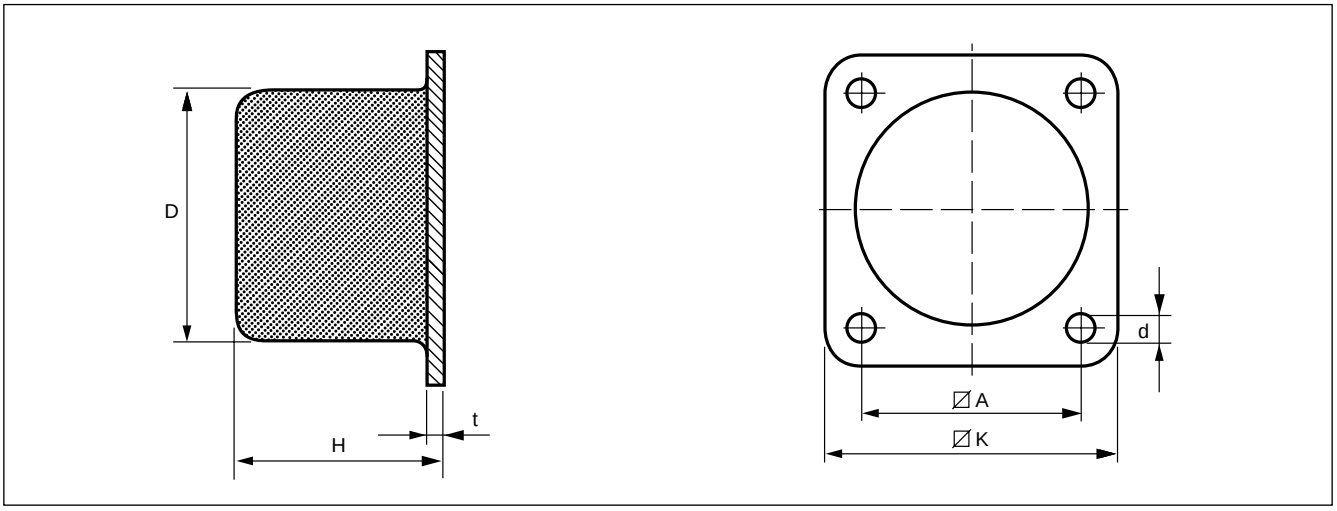


Diagram 3



CALCULATION EXAMPLES

The figures in parenthesis refer to the equations.

EXAMPLE 1: FREE FALL CALCULATION

1850 kg weight is to be dropped 1.83 metres onto 4 ANB buffers. What size ANB should be used? What force will be transmitted to the floor?

Energy E = F · s (2) = 1850 · 9.81 · 1.83 = 33212 Nm

Velocity at impact (shock velocity) V =
$\sqrt{2 \cdot g \cdot h}$ (7)=$\sqrt{2 \cdot 9.81 \cdot 1.83}$ = 6 m/s.

REFER TO ENERGY FACTOR GRAPH

If 50% deformation is allowed, the energy factor at 6 m/s is 0.4. Then dynamic energy 33212 Nm corresponds to 33212 · 0.4 = 13285 Nm static energy and for 4 buffers the static energy per buffer is 3320 Nm.

REFER TO FORCE-ENERGY DIAGRAM

Select ANB 200 which can each absorb up to 4300 Nm at 80 mm compression (which is 50% of static height) or will compress 76 mm at 3320 Nm.

Force at impact surface
= force at 76 mm deflection / 0.4
= 150 / 0.4 =375 kN per buffer
= 1500 kN for 4 buffers

Hence if 1850 kg is dropped 1.83 metres onto 4 x ANB 200 buffers they will each compress 76 mm and the total force on the floor will be 1500 kN.

EXAMPLE 2A: CRANE BUFFER CALCULATION

A crane weighs 2000 kg and travels at 1.6 m/s. What size ANB buffers should be used to stop it and what will the final force be?

The dynamic or kinetic energy E =
$\frac{m \cdot v^2}{2} = \frac{2000 \cdot 1.6^2}{2}$ = 2560 Nm (1)

REFER TO ENERGY FACTOR GRAPH

Assuming a 50% deformation, the energy factor = 0.75 at 1.6 m/s. Hence the equivalent static energy is 2560 · 0.75 = 1920 Nm. Then for 2 buffers the static energy is 960 Nm per buffer.

REFER TO FORCE-ENERGY DIAGRAM

ANB 150 buffers can be chosen with a deflection at 960 Nm of 49 mm, which is only 41% of a free height of 120 mm, whereas 50% had been assumed. With the energy factor reduced to 0.72 (for 41% deflection at 1.6 m/s) the static energy is:

2560/2 x 0.72 = 922 Nm

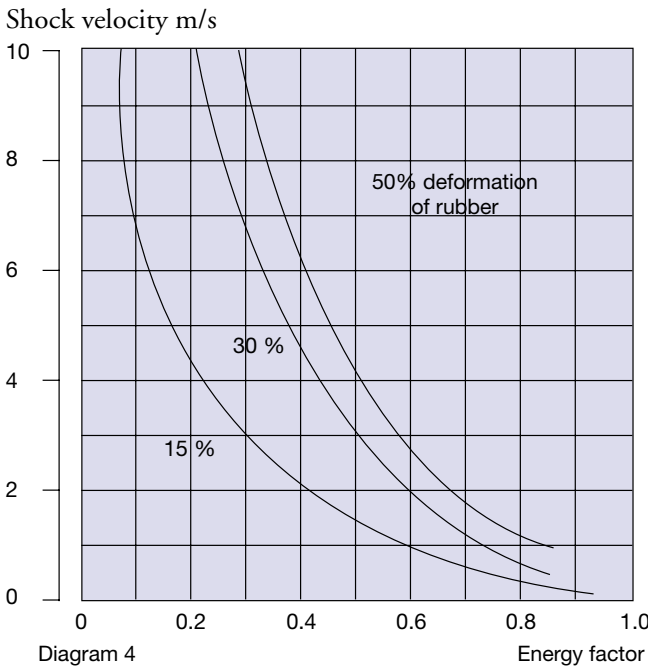


Diagram 4

REFER TO FORCE-ENERGY DIAGRAM FOR ANB 150

At 922 Nm static energy, the deflection is 48.5 mm (close to 49 mm). Then the static force at 48.5 mm deflection is about 51 kN. Therefore the dynamic load (Force at impact) = 51 / 0.72 = 71 kN. Hence 2 x ANB 150 buffers will deflect 48.5 mm and transmit a force of 71 kN or 7240 kg each, i.e. the structure must withstand 14.6 tons.

EXAMPLE 2B: CRANE BUFFER CALCULATION

How can the dynamic force calculated in example 2a be reduced, and by how much?

The force will be reduced and the deflection will be increased if ANB 150 buffers are connected in series (i.e. 4 buffers instead of 2) as illustrated by fig. 2.

Then, assuming 30% deformation the energy factor at 1.6 m/s = 0.68.

Hence the equivalent static energy is 2560 · 0.68 = 1740 Nm and for 4 buffers the static energy is 435 Nm per buffer.

The force-Energy diagram shows that at 435 Nm, buffer ANB 150 deforms 35 mm. This corresponds to 29.2% of a free height of 120 mm which is close to assumed value 30%.

Then the static force at 35 mm deformation is 26 kN and the dynamic load at impact will be:

26 / 0.68 = 38 kN

Hence 4 x ANB 150 buffers connected 2 + 2 will give a total deflection of 70 mm with a final force per double arrangement of 38 kN or 3870 kg, i.e. the structure must withstand 7.7 tons.

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Metalastik® type Two Bolt Instrumountings

Two Bolt Instrumountings provide a convenient and effective means of isolating vibration generated by lightweight machinery. Also used to protect instruments and light equipment from vibration and shock. They may be loaded in compression or shear depending on application requirements.

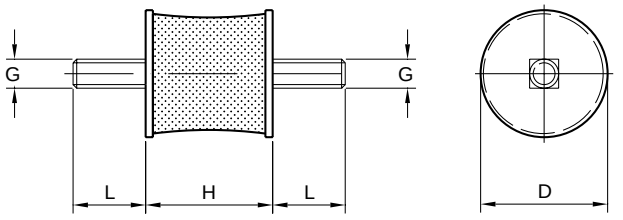
Typical applications:
- Instrument panels
- Lightweight laboratory machines
- Electronic equipment

Features

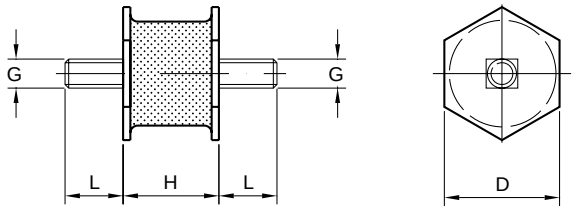
These mountings are high quality products capable of protecting light equipment from vibration and shock. Two Bolt Instrumountings are available in either 45° or 60° IRH natural rubber compound. Similar to Rectangular SAW Mountings and Circular SAW Mountings, Two Bolt Instrumountings can be assembled in a 'Vee' arrangement for good stability and improved vibration isolation.

- Circular or hexagonal end plates for simple fitting
- Can take up to 3 times rated load under shock conditions.
- Takes load in either shear or compression, or a combination.
- Fixing bolts threaded to within 2 pitches of the end plate.
- Up to 12 mm deflection in shear for a very soft suspension.
- Top quality bond strength for reliability and safety.

17-1061, 17-1379
17-1380



17-1382, 17-1383
17-1384, 17-1385



Type	Art.No	Dimensions in mm D	H	G	L	Max load in compression (kg)	Max load in shear (kg)	Weight (kg)
Two bolt instrumountings	17-1061-45 (45° IRH)	11	11	M4	10	2.4	2.3	0.005
	17-1061-60 (60° IRH)	11	11	M4	10	4.8	2.5	0.005
	17-1379-45 (45° IRH)	21	22	M6	15	7.0	5	0.02
	17-1379-60 (60° IRH)	21	22	M6	15	14	5	0.02
	17-1380-45 (45° IRH)	35	34	M8	20	16	15	0.07
	17-1380-60 (60° IRH)	35	34	M8	20	32	15	0.07
	17-1382-45 (45° IRH)	15	16	M6	15	3.8	3	0.013
	17-1382-60 (60° IRH)	15	16	M6	15	7.6	3	0.013
	17-1383-45 (45° IRH)	21	19	M8	20	8.0	6	0.03
	17-1383-60 (60° IRH)	21	19	M8	20	16	6	0.03
	17-1384-45 (45° IRH)	32	26	M8	16	15	10	0.06
	17-1384-60 (60° IRH)	32	26	M8	16	30	10	0.06
	17-1385-45 (45° IRH)	33	22	M10	25	30	14	0.11
	17-1385-60 (60° IRH)	33	22	M10	25	60	14	0.11

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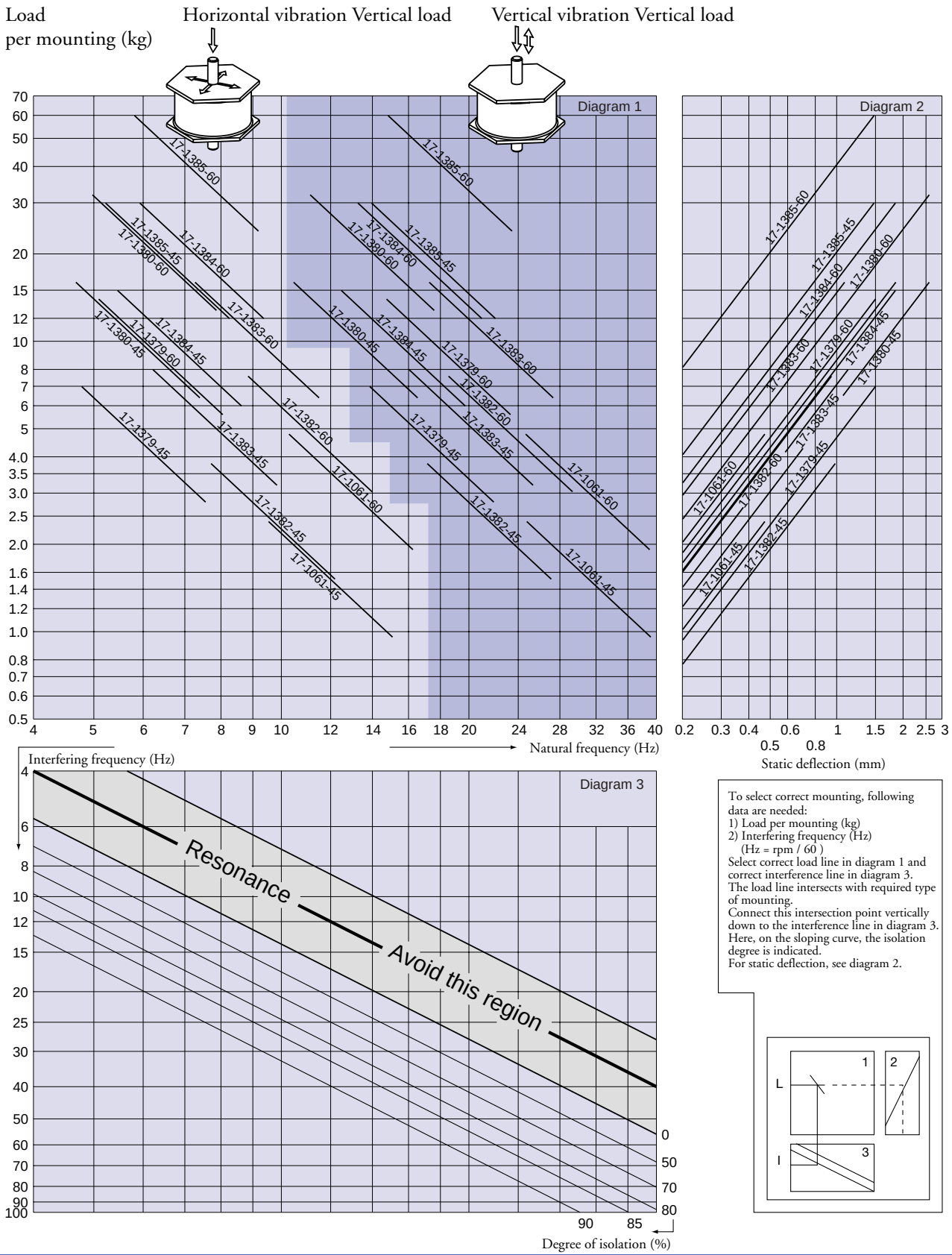
Two Bolt Instrumountings

Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.



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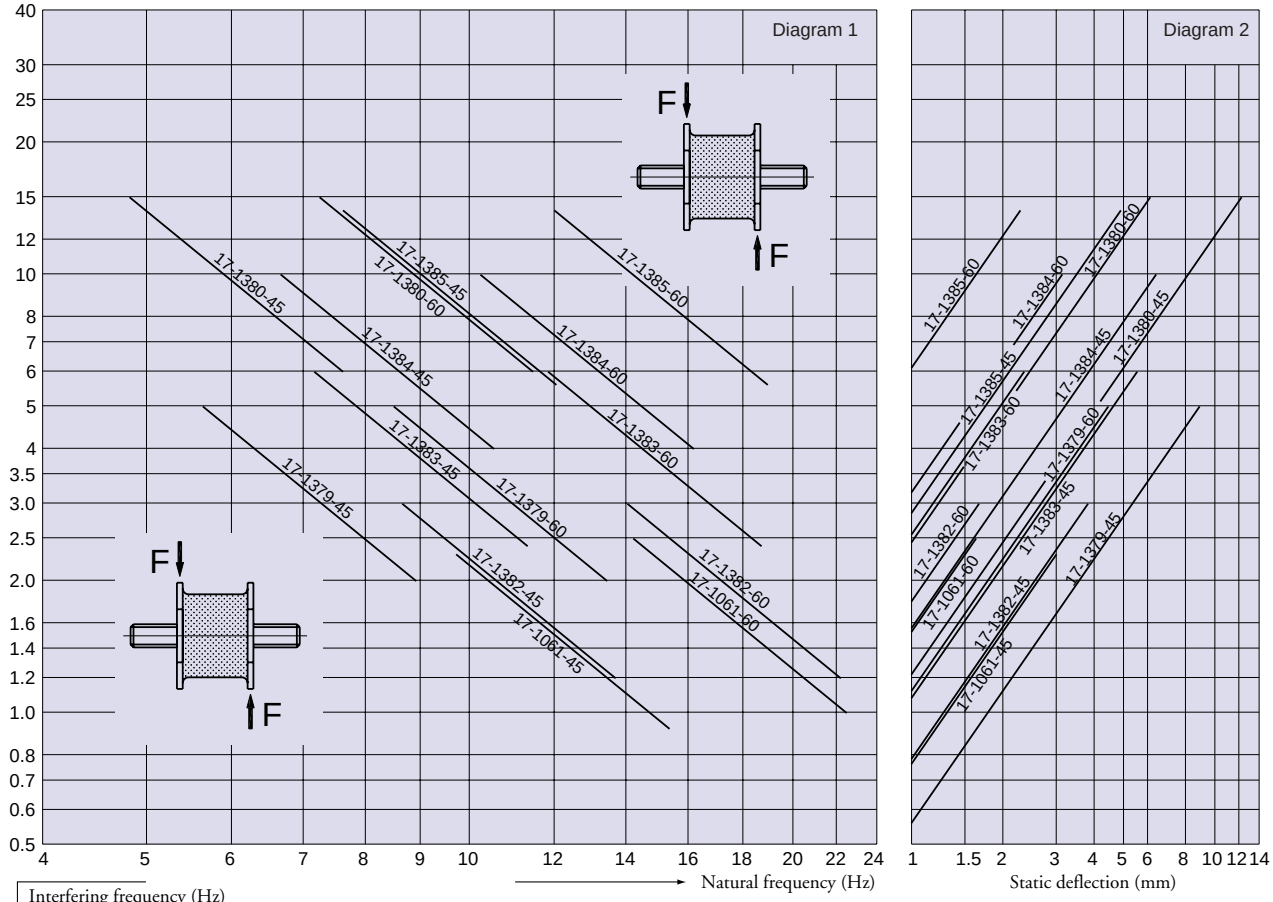
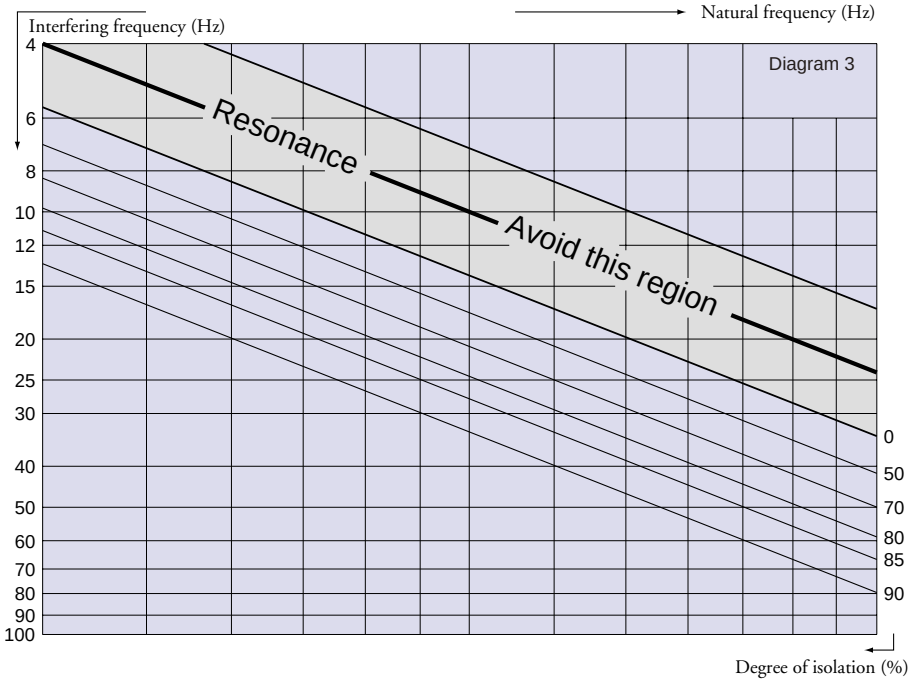
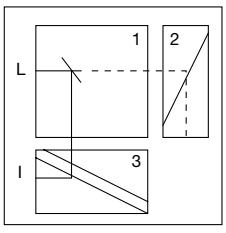
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



Buffers

Features

Circular and rectangular types are easily fitted. Reduction of transmitted shock loads enables equipment to be designed more economically.

The rising stiffness properties enable vehicle suspension characteristics to be optimised.

ANB - R is made in oil and chemical resistant Nitrile Rubber.

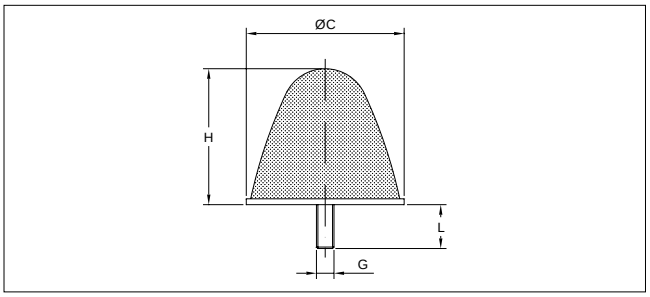
Metalastik® type Buffers

Buffers are designed to protect structures and equipment from impact forces. They are usually fitted as non-metallic stops or incorporated in vehicle suspension systems to provide progressive stiffening under increasing load.

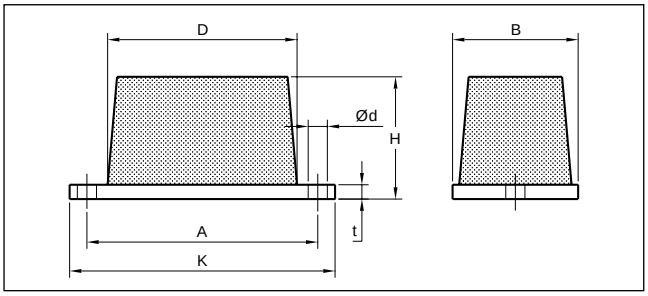
Typical applications:

- Dump trucks
- Off-road vehicles
- Cranes
- Handling equipment
- Vehicle suspensions

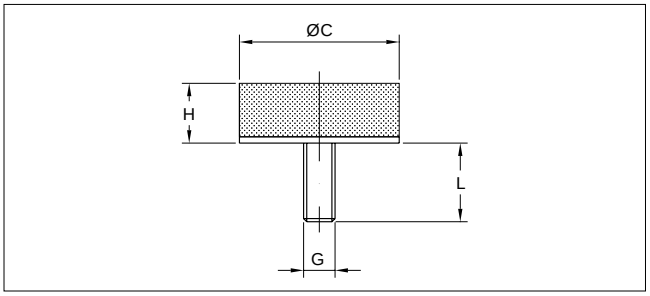
Conical



Rectangular



Cylindrical



Type	Art.No		Dimensions in mm C	H	G	L	Weight (kg)
Cylindrical buffers	15-3463-60	(60° IRH)	21	19	M6	15	0.02
	15-3464-60	(60° IRH)	32	21	M8	20	0.05
	15-3459-60	(60° IRH)	51	19	M10	25	0.1
Conical buffers	15-3462-60	(60° IRH)	28.5	37	M6	15	0.03
	15-3458-60	(60° IRH)	32	28.5	M8	20	0.04
	15-3461-60	(60° IRH)	38	38	M8	20	0.06
	15-3435-60	(60° IRH)	48	51	M10	25	0.12
	15-3460-60	(60° IRH)	70	46	M12	30	0.27
	15-3445-60	(60° IRH)	108	95	M12	30	0.79
	15-3443-60	(60° IRH)	108	121	M12	30	0.99

Type	Art.No		Dimensions in mm K	A	B	H	D	d	t	Weight (kg)
Rectangular buffers	15-0437-60	(60° IRH)	121	105	48	56	86	8.6	6.3	0.48
	15-0238-60	(60° IRH)	121	105	57	56	86	8.6	6.3	0.55
	15-0260-60	(60° IRH)	156	127	64	37	89	13.5	6.3	0.57
ANB R-50*	318510		84	68.5	32	22	51	6.7	3	0.06

** Manufactured in 50° IRH Nitrile Rubber*

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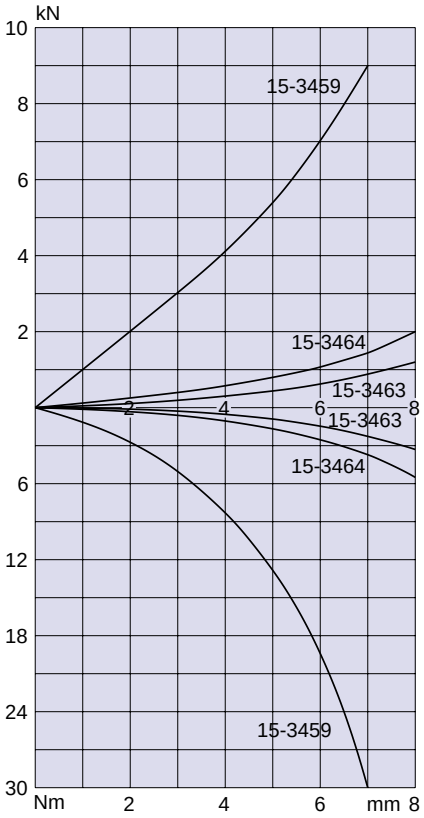
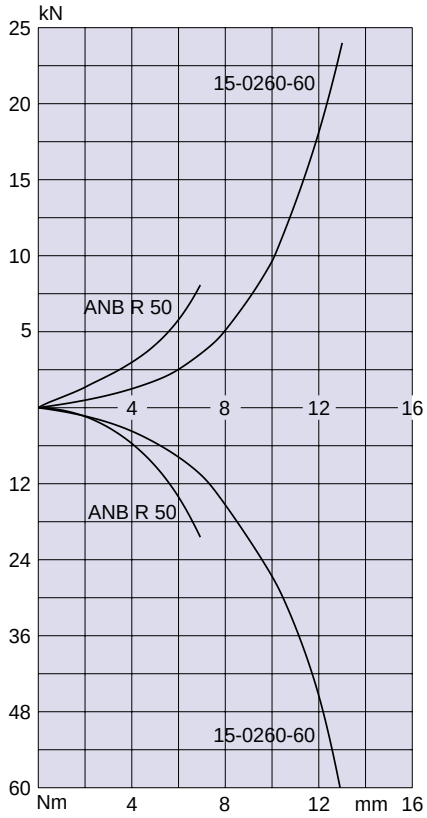
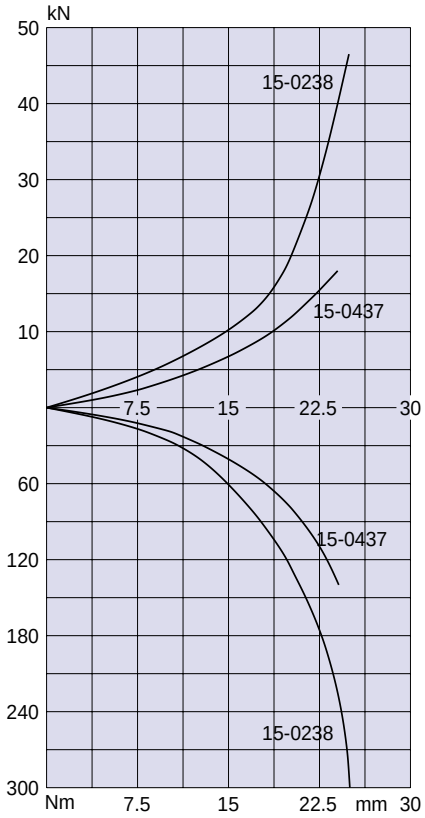
Cylindrical

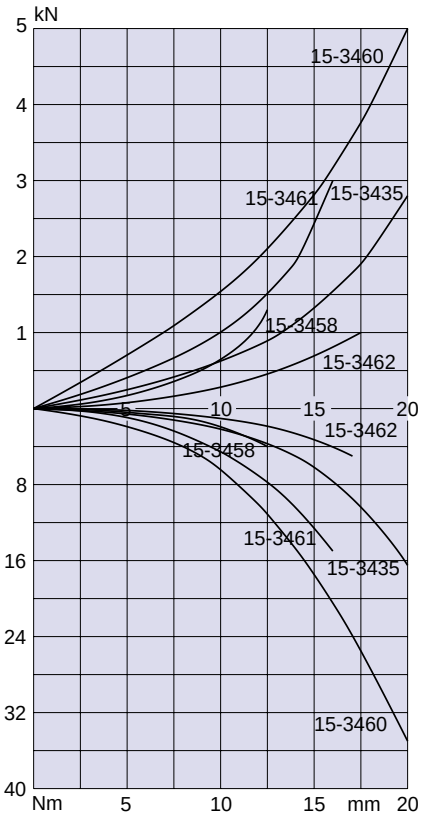


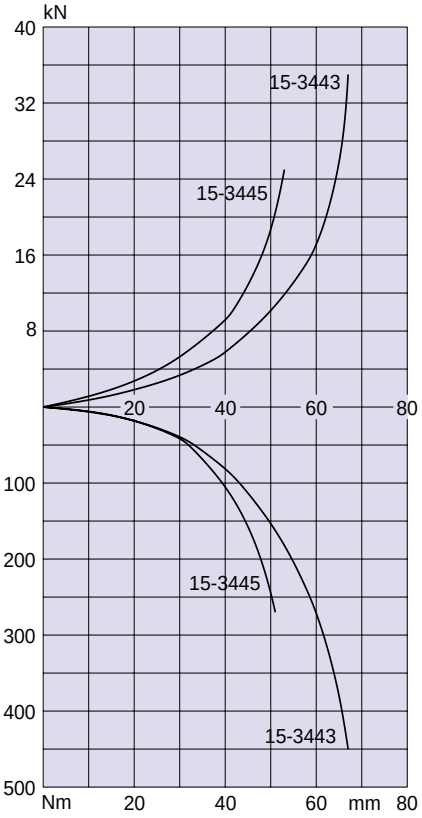
Rectangular

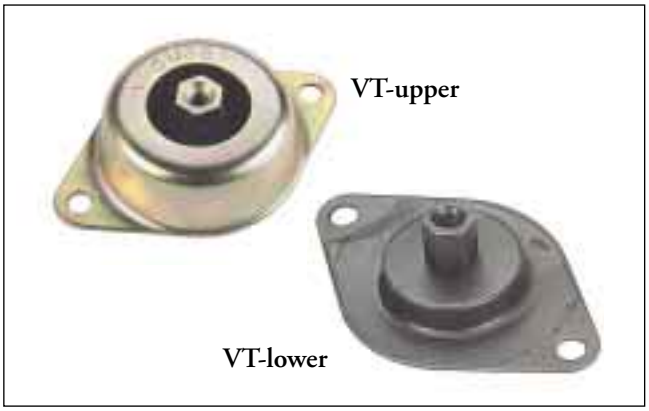




Conical







Novibra® type VT

Novibra® type VT protects wall-mounted instrument cabinets from vibrations and shocks generated by nearby engines, workshop machinery, etc. It is also suitable to isolate light wall-mounted machines, fans, refrigerating units, etc.

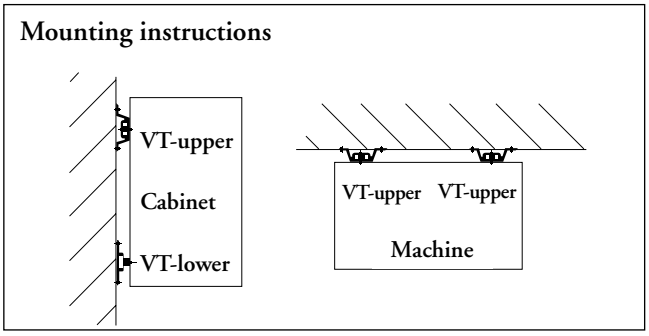
Mounting type VT-upper could be used for ceiling suspension e.g. fittings, fans, music speakers, etc.

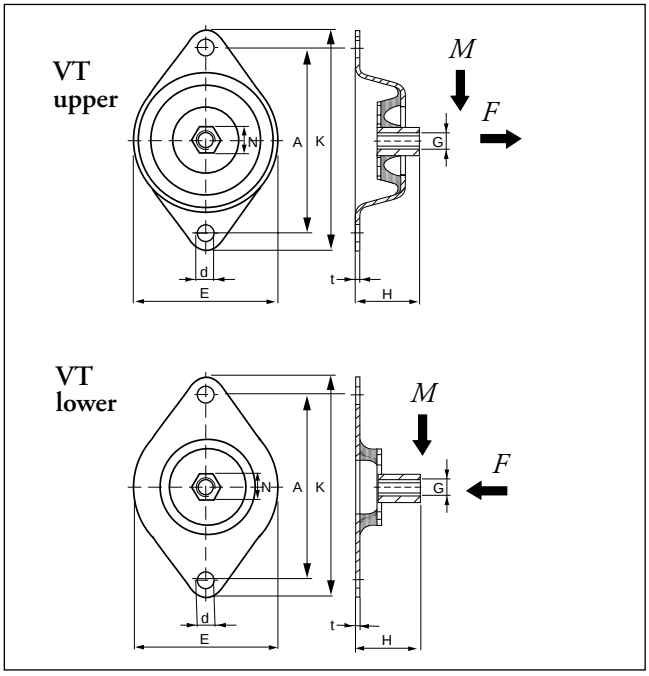
Features

Type VT has been designed so that upon installation the rubber section is subjected to shear loads, thus providing high deflection even at low loads.

Two different parts are available. The VT-upper provides for protection against tension preventing the isolated unit from falling down if overloading occurs.

VT-lower is designed to accept horizontal compression loads and allow shear deflection vertically.





Type	Art.No 40° IRH	Art.No. 60° IRH	E	K	A	H	d	N	t	G	Weight (kg)	*M*-Max(kg) 40°IRH	*M*-Max(kg) 60°IRH	*F*-Max(kg) 40°IRH	*F*-Max(kg) 60°IRH
			Dimensions in mm												
VT-upper	69526	69534	75	114	96	33	9	15	1.5	M8	0.149	14	25	30	70
VT-lower	69567	69575	75	114	96	33	9	15	1.5	M8	0.104	14	25	30	70

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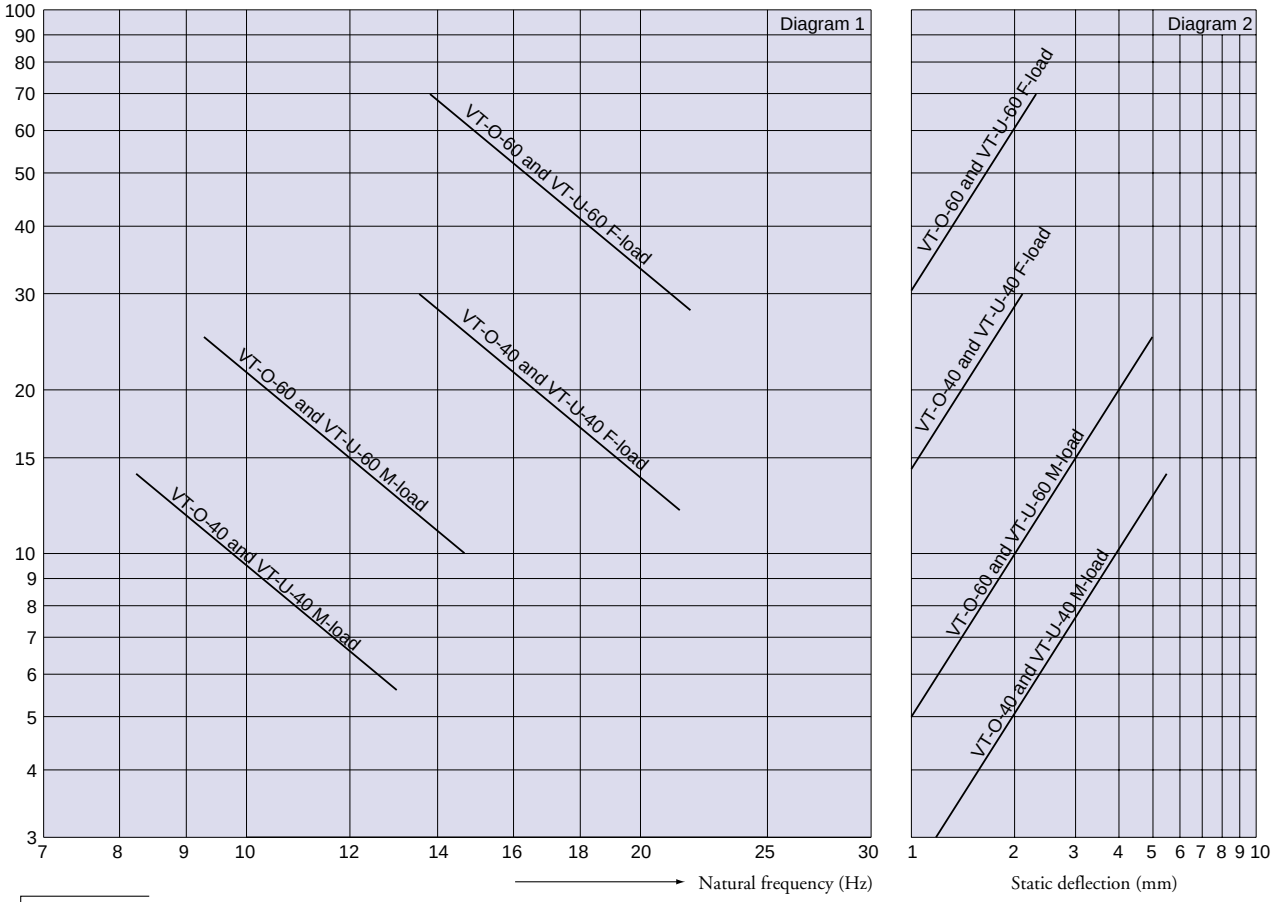
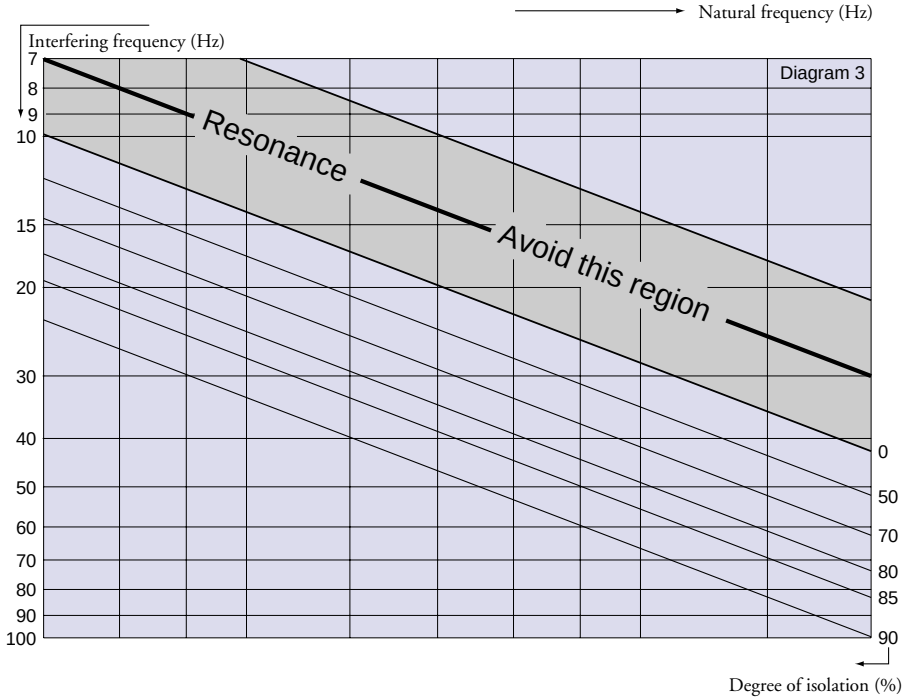
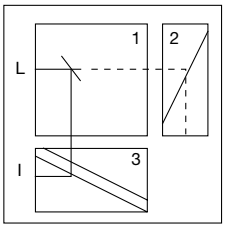
Note: The natural frequencies and degrees of isolation are based on dynamic characteristics of the mountings.

Load
per mounting (kg)





To select correct mounting, following data are needed:
1) Load per mounting (kg)
2) Interfering frequency (Hz)
(Hz = rpm / 60)
Select correct load line in diagram 1 and correct interference line in diagram 3.
The load line intersects with required type of mounting.
Connect this intersection point vertically down to the interference line in diagram 3.
Here, on the sloping curve, the isolation degree is indicated.
For static deflection, see diagram 2.



Trelleborg Industrial AVS - Bobbins

A supplementary range of cylindrical mountings for a wide range of applications. They can be loaded either in compression or shear taking into consideration individual demands for actual applications.

Manufactured in natural rubber hardness 40° IRH or 60° IRH.

Type A

Type B

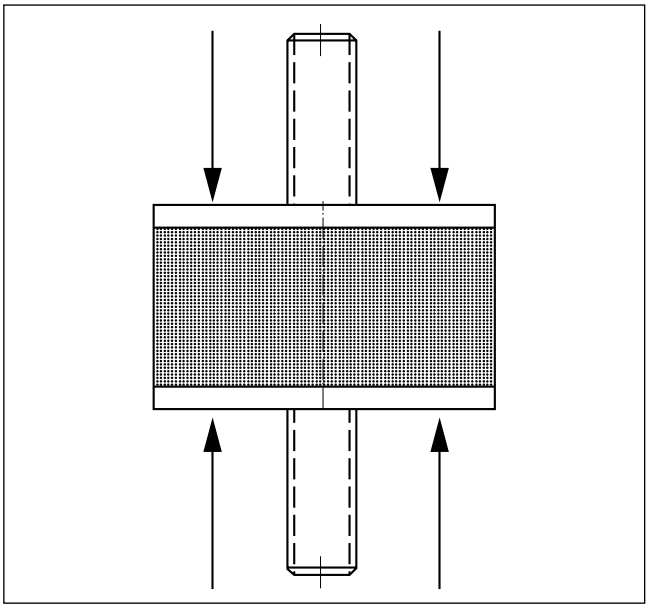
Type C

Type D

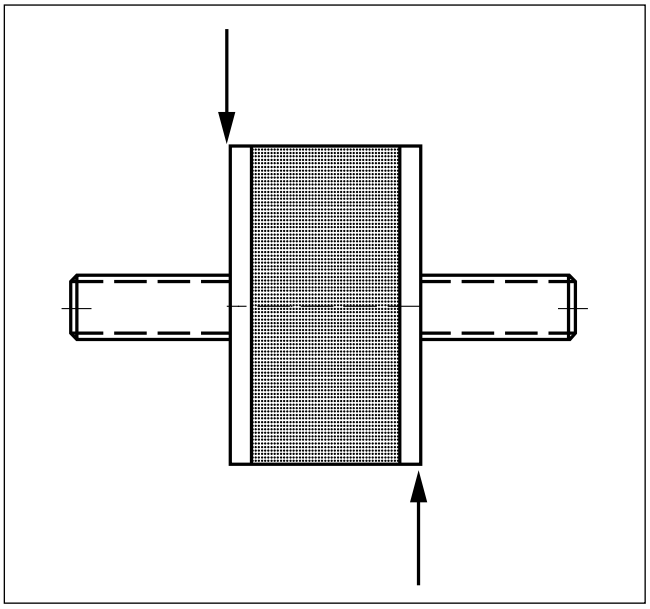
Type KD

Type E

Compression load



Shear load



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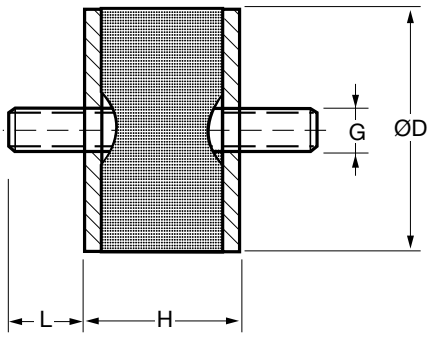

Cylindrical mountings type A

Type	D/H	GxL	Art.No. 40° IRH	Art.No. 60° IRH	40° IRH Compression load k_{comp} (N/mm)	40° IRH Compression load F_{max} (N)	40° IRH Shear load k_{shear} (N/mm)	40° IRH Shear load F_{max} (N)	60° IRH Compression load k_{comp} (N/mm)	60° IRH Compression load F_{max} (N)	60° IRH Shear load k_{shear} (N/mm)	60° IRH Shear load F_{max} (N)
A	10/10	M4x10		1255720					53	77	10	31
A	10/15	M4x10		318600					31	56	6	23
A	15/10	M4x10		318610					135	151	22	52
A	15/15	M4x10		318620					73	133	13	52
A	20/10	M6x15	318630	318640	162	170	19	42	309	324	41	92
A	20/15	M6x15	2255780	1255770	70	123	11	42	145	255	25	92
A	20/20	M6x15	2230950	1255300	45	110	8	42	96	235	18	92
A	20/25	M6x15	318650	1255780	33	105	6	42	72	227	14	92
A	20/30	M6x15	318660	318670	27	102	5	42	58	223	11	92
A	25/10	M6x15	318680	318690	314	330	29	66	574	603	64	144
A	25/15	M6x15	318700	318710	123	215	18	66	247	432	38	144
A	25/20	M6x15	318720	318730	75	184	13	66	157	385	27	144
A	25/25	M6x15	318740	318750	54	171	10	66	116	366	21	144
A	25/30	M6x15	318760	318770	43	164	8	66	93	356	17	144
A	30/15	M8x20	318780	1255830	237	378	28	95	453	723	61	208
A	30/20	M8x20	318790	1255320	129	295	19	95	261	600	42	208
A	30/25	M8x20	318800	318810	88	263	15	95	184	552	32	208
A	30/30	M8x20	1660730	1255840	67	248	12	95	143	529	26	208
A	30/35								117	516	22	208
A	30/40	M8x20	318820	318830	46	233	9	95	100	508	19	208
A	40/20	M8x20	318840	318850	275	632	34	170	534	1226	75	369
A	40/25								359	1076	58	369
A	40/30	M8x20	318860	318870	130	481	21	170	271	1002	47	369
A	40/40	M8x20	318880	318890	86	437	16	170	184	935	34	369
A	50/20	M10x25	318900	318910	564	1248	56	265	1042	2306	122	577
A	50/25	M10x25	318920	318930	335	976	42	265	652	1900	93	577
A	50/30	M10x25	1861540	1255870	234	846	34	265	472	1706	75	577
A	50/35	M10x25	318940	318950	180	774	29	265	371	1598	62	577
A	50/40	M10x25	318960	1255340	146	730	25	265	306	1533	54	577
A	50/45	M10x25	318970	1255880	123	701	22	265	261	1490	47	577
A	50/50	M10x25	318980	1255350	106	681	19	265	228	1460	42	577
A	75/40	M12x35	319000	319010	417	2032	57	596	827	4030	124	1299
A	75/50	M12x35	319020	319030	282	1766	44	596	579	3632	97	1299
A	75/55	M12x35	319040	319050	242	1689	40	596	504	3517	87	1299
A	100/40	M16x45	319060	319070	932	4541	102	1060	1755	8549	221	2309
A	100/55	M16x45	319080	319090	496	3455	71	1060	994	6929	155	2309

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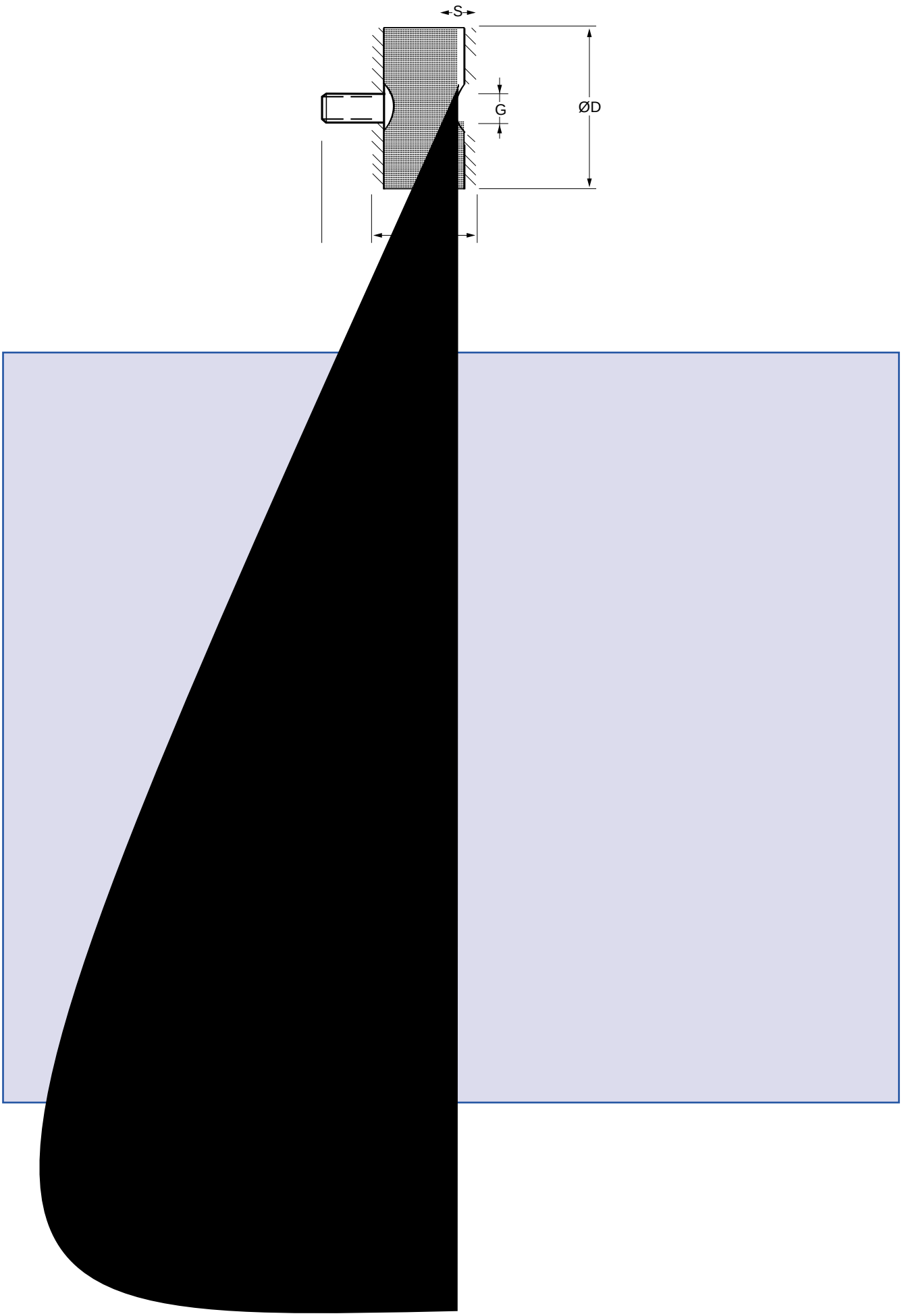
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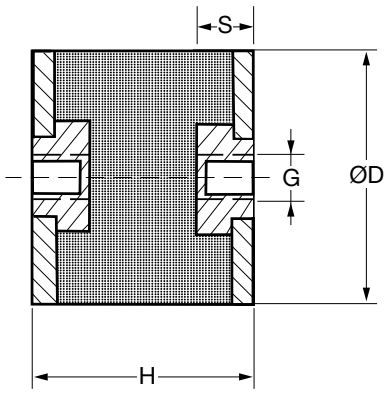

Cylindrical mountings type C

Type	D/H	G(S)	Art.No. 60° IRH	60° IRH Compression load		60° IRH Shear load	
				k_{comp} (N/mm)	F_{max} (N)	k_{shear} (N/mm)	F_{max} (N)
C	15/15	M4(4)	1256210	86	112	13	52
C	20/20	M6(4)	66522	114	199	18	92
C	20/25	M6(6)	1256220	85	192	14	92
C	20/30	M6(6)	66548	69	189	11	92
C	25/20	M6(6)	1256230	186	325	27	144
C	25/25	M6(6)	319280	137	309	21	144
C	30/25	M8(8)	319300	218	466	32	208
C	30/30	M8(8)	1255410	169	447	26	208
C	30/35	M8(8)	319310	139	436	22	208
C	30/40	M8(8)	319320	118	429	19	208
C	40/30	M 8(8)	1255420	320	846	47	369
C	40/40	M 8(8)	1256260	217	790	34	369
C	50/30	M10(10)	1256270	558	1440	75	577
C	50/35	M10(10)	2255730	438	1349	62	577
C	50/40	M10(10)	1256280	361	1294	54	577
C	50/45	M10(10)	1256290	308	1257	47	577
C	50/50	M10(10)	1256300	269	1232	42	577
C	75/36	M12(12)	66746	1180	3635	141	1299
C	75/40	M12(12)	319330	977	3402	124	1299
C	75/45	M12(12)	319340	805	3202	109	1299
C	75/50	M12(12)	2256670	684	3066	97	1299
C	75/55	M12(12)	1255430	596	2969	87	1299
C	100/40	M16(16)	319350	2074	7217	221	2309
C	100/45	M16(16)	319360	1655	6587	193	2309
C	100/50	M16(16)	319370	1374	6156	172	2309
C	100/55	M16(16)	319380	1174	5849	155	2309

S = internal thread length

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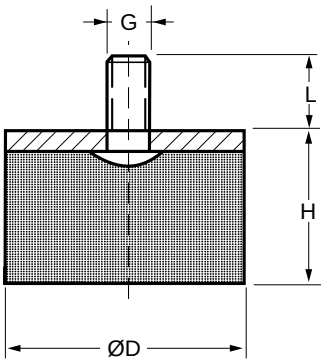
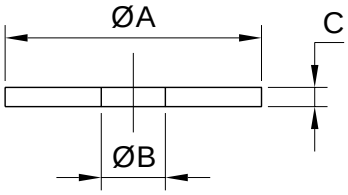

G
L
H
ØD

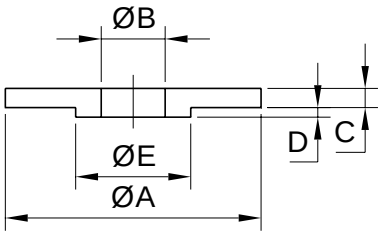
Top and bottom washers

Overload and rebound washers (top and bottom) are necessary to limit maximum movement in the event of shock loading.

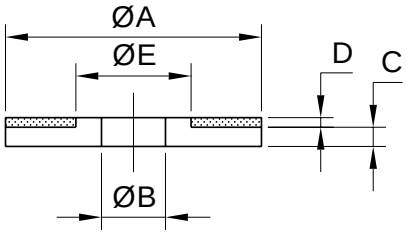
Type A
Steel Washer



Type B
Top Stepped Steel Washer



Type C
Rebound Washer with Rubber



Washer

Designation	Art.No.	Type	Dimensions in mm				
			A	B	C	D	E
Washer 50x12C	336000	C	50	12	3	3	28.5
Washer 95x24C	336010	C	95	24	8	6	38
Washer 67.5x20C	336020	C	67.5	20	5	5	30
Washer 116x24B	336030	B	116	24	8	4	47
Washer 80x20B	336040	B	80	20	6	3	34.5
Washer 55x12B	336050	B	55	12	5	2.5	25
Washer 80x16B	336060	B	80	16	6.5	3	31.5
Washer 50x10A	336070	A	50	10	4		
Washer 80x16A	336080	A	80	16	5		
Washer 100x20A	336090	A	100	20	6		
Washer 139x24A	336100	A	139	24	10		
Washer 55x16B	336110	B	55	16	5	2,7	25
Washer 51x16A	336120	A	51	16	4		
Washer 57x16B	318490	B	57	16	3	1.5	22
Washer 52x16A	318500	A	52	16	3		
Washer 110x20B	2230570	B	110	20	5	3	52.5
Washer 55x20A	2230560	A	55	20	5		

Recommended tightening torque for center fixing bolts	
Thread size	Torque (Nm)
M10	25
M12	40
M16	60
M20	120
M24	200

Metacone™ and HK on page 40

Type	Cone mount	Top washer Art.No.	Bottom washer Art.No.
Metacone™	17-0189	336050	336000
	17-0241	336050	336000
	17-0248	336050	336000
	17-0277	336060	336080
	17-0379	336070	336070
	17-0341	336060	336080
	17-0311	336060	336080
	17-1691	336110	336120
HK	HK 60	318490	318500

Metacone™ and HK on page 42

Type	Cone mount	Top washer Art.No.	Bottom washer Art.No.
Metacone™	11-1009	336080	336080
	17-0391	336080	336080
	17-0566	336080	336080
	17-1227	336040	336020
	17-1550	336100	336100
	17-1843	336090	336090
	17-1865	336080	336080
	17-0146	336030	336010
HK	HK 600	2230570	2230560

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Trelleborg Industrial AVS - Height Adjusters

Type HA is available in various sizes to suit the small and medium range of Trelleborg Industrial AVS-mountings, as listed in the table below. It allows mountings to be retrofitted to existing installations where original spares are unobtainable.

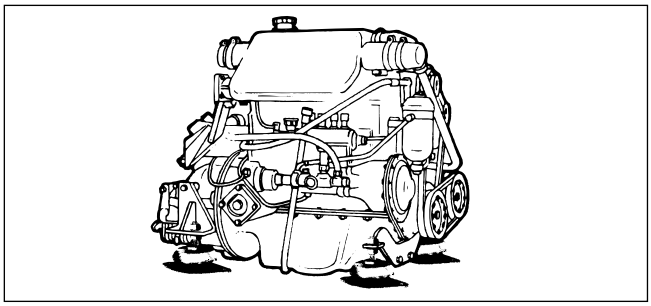
Notes:

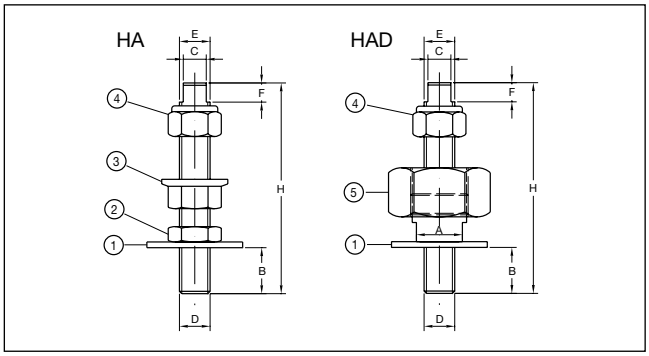
- For optimum solutions where close coupling tolerances are required, allow the mountings to settle for 48 hours before final alignment of the engine installation.
- For securing the bolt into the mounting, it is recommended to apply Loctite.
- The height adjuster HA can be used together with Novibra type M-mount. See description of M-mount.

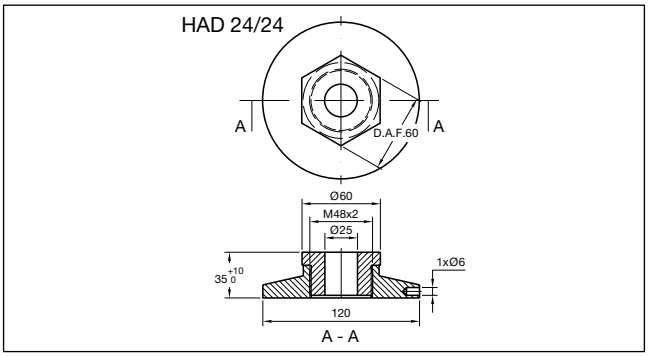
Height Adjusters	can be used togheter with
HA 12/12	RAB, RA 100 M 12, RA 200 M 12, RAEM 60,
HA 12/16	RAEM 125 M 12, RAEM 350 M 12, 17-1463,
HAD 12/16	Cushyfloat 17-1600, SIM 100
HA 16/16	RA 350 M 16, RA 500, RA 800,
HAD 16/16	RAEM M 16, RAEM 800,
HA 16/20	Cushyfloat 17-1609, SIM 200
HAD 16/20	Cushyfoot 17-0213, 17-0290, 17-0346
HA 20/20	Cushyfloat 17-1657, SIM 300
HAD 20/20	
HAD 24/24	Cushyfloat 17-1841

Features

Type HA is a height adjuster made in corrosion protected grade 8 steel. The steel is zinc plated and chromated according to DIN 50691/ISO 2081. The height adjuster is supplied complete with washer and nut for fastening to the mounting and two nuts and a lock washer for the engine foot fastening. The HA height adjustment facilitates precise coupling alignment for engine installations and boat building tolerances.







Type	Art.No.	Dimensions H	D	E	A	B	C	F	1 Washer	2 H low nut	3 e x flange nut	4 a g plastic insert	5 L adjusting unit
HA 12/12	319800	95	M12	M12		20	D.A.F. 8	8	37x12x3	M12	M12	M12	
HA 12/16	319810	105	M12	M16		20	D.A.F. 12	10	44x15x3	M16	M16	M16	
HA 16/16	319820	110	M16	M16		24	D.A.F. 12	10	50x15x3	M16	M16	M16	
HA 16/20	319830	130	M16	M20		24	D.A.F. 12	10	56x20x4	M20	M20	M20	
HA 20/20	319840	135	M20	M20		30	D.A.F. 12	10	60x21x4	M20	M20	M20	
HAD 12/16	319850	105	M12	M16	D.A.F. 24	20	D.A.F. 12	10					M30x1.5
HAD 16/16	319860	110	M16	M16	D.A.F. 24	24	D.A.F. 12	10					M30x1.5
HAD 16/20	319870	130	M16	M20	D.A.F. 27	24	D.A.F. 12	10					M36x2
HAD 20/20	319880	135	M20	M20	D.A.F. 27	30	D.A.F. 12	10					M36x2
HAD 24/24	319890				See drawing								

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Trelleborg Industrial AVS Questionnaire

Customer	Date
Contact	
Phone	Fax

TECHNICAL DATA FOR THE APPLICATION

- Type of equipment _____
- Environment for the application _____

❑ Industrial ❑ Residential

❍ Stationary (e.g. living area, hospital, hotel, office)

❍ Mobile

Shock loads ❑ Yes ❑ No

If yes, direction and magnitude _____

- Total supported weight: _____
- Number of mounting points: _____
- Position centre of gravity, along a horizontal axis: ❑ Centered
  ❑ Offset, please present outline drawing and indicate eventual fix mounting points.
- Position of centre of gravity, vertically: _____ Above mountings (mm): _____
- Disturbing frequency range (e.g. rpm, Hz, strokes/min): _____
- Direction of vibrations: ❑ Vertical ❑ Horizontal ❑ Rotating
- Is a combustion engine installed in the machinery? ❑ Yes ❑ No
  If yes, number of cylinders: _____ ❑ Four-stroke ❑ Two-stroke

Additional comments: _____

_____

Trelleborg Industrial AVS recommendation:

Date:	Sign:

Mounting type :	
Number of mountings :	
Degree of isolation :	%

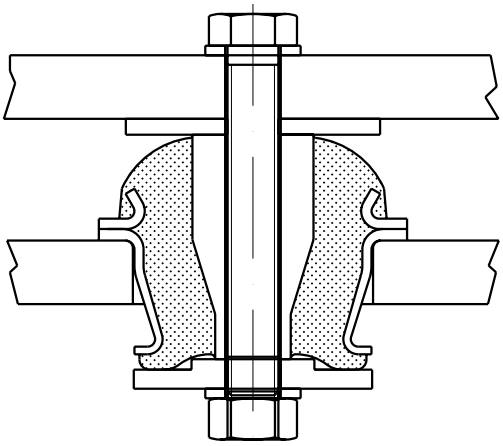
Please copy and fax questionnaire to nearest Trelleborg Industrial AVS office.

You can e-mail this page from "www.trelleborg.com/industrialavs" under the headlines, Products – Industrial

Installation guidelines

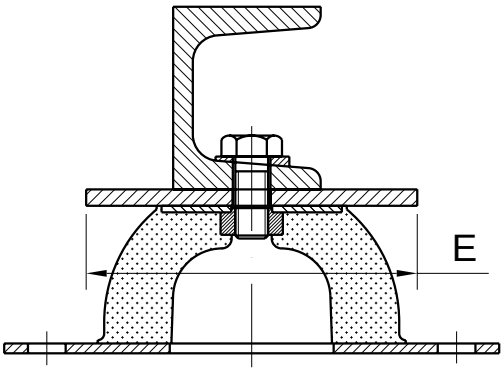
Metacone™ and HK

Always use appropriate washers when installing conical mountings! This recommendation refers also to mountings type Cab Mountings, UH and EH.



M Mountings

The underside surface of the suspended unit which rests on type M mountings should have an area of at least the diameter shown in the diagram and table. Otherwise a thick washer of diameter E should be fitted.



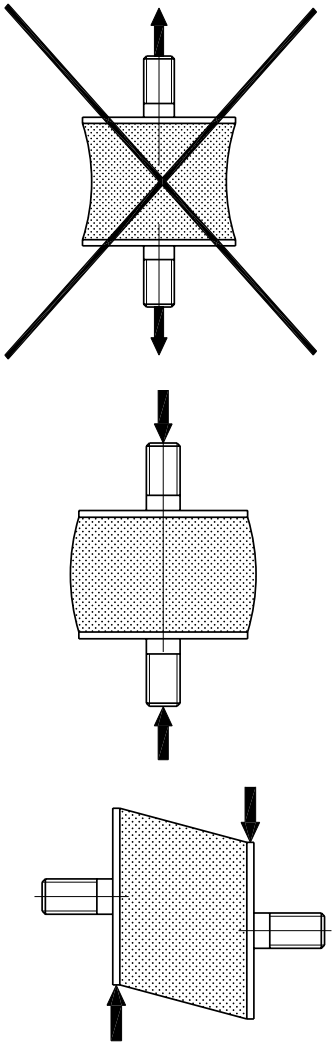
M mounting	E (mm)
M7	43
M25	56
M50	76
M100	96
M200	101
M400	125
M600	165
M1500	260

Loading directions

Do not install antivibration mountings in a way that causes the rubber to work in tension.

Compression and shear are the correct loading directions!

Take this into consideration for mounting types:
Bobbins, M, Two Bolt Instrumountings, Equi-Frequency, type SAW, Rectangular SAW and Circular SAW.



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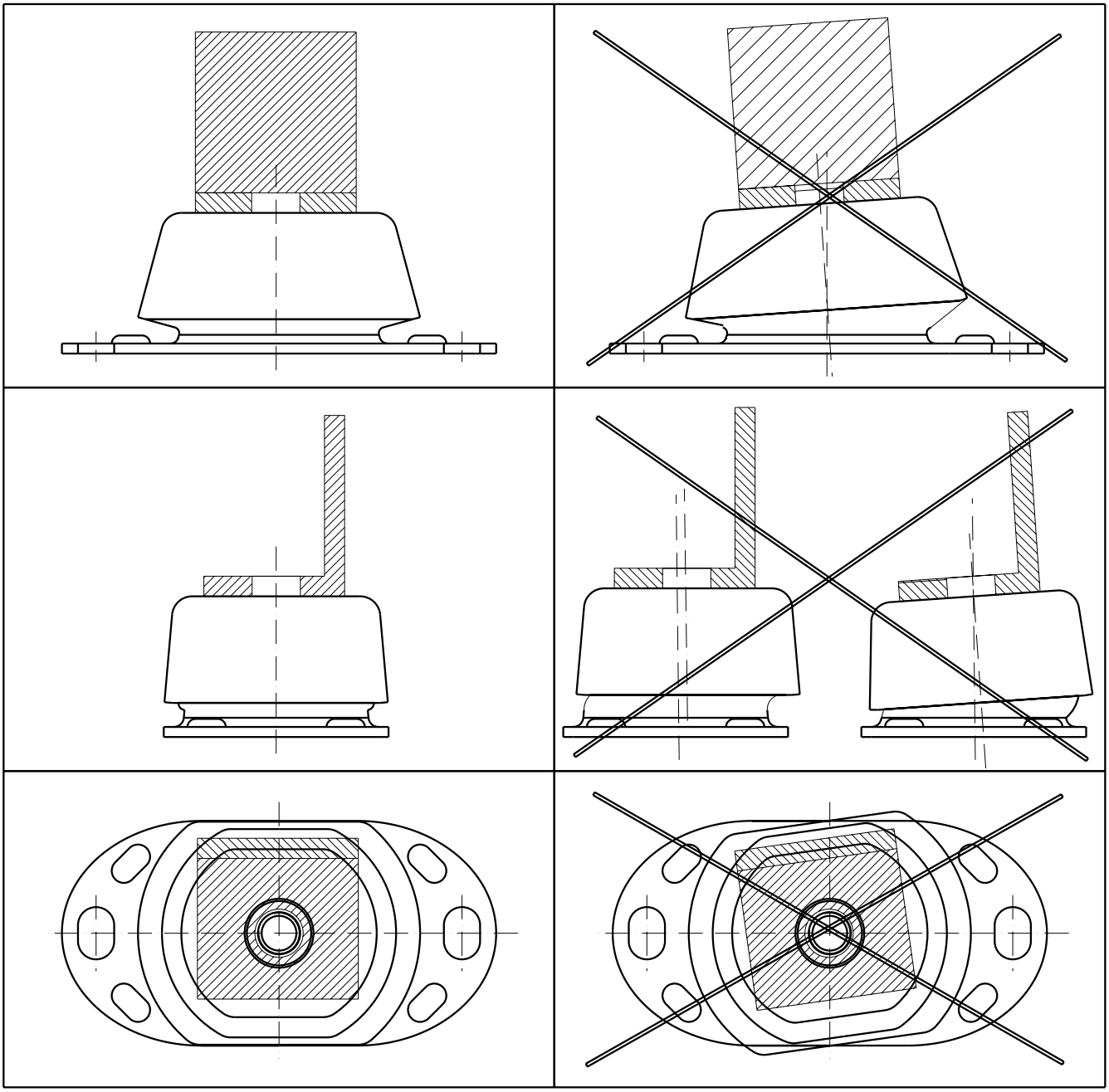
Alignment

In order to ensure maximum performance of all Metelastik® and Novibra® antivibration mountings fitted with top caps, all form of misalignment should be avoided.

Actual mounting types are: RA, RAEM, Cushyfloat™, SIM™, Cushyfoot™ and RAB.



Trelleborg Industrial AVS – A safe choice – All over the world

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