

Trelleborg IAVS product catalogue

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Trelleborg industrial anti-vibration solutions

With over 100 years of experience as Metalastik and Novibra, today Trelleborg Industrial AVS make improvements people can physically feel. From smoother travel to quieter, more efficient machines, we make life feel better. With quality, testing and compliance built in, we're in it for the long haul, ensuring your solution works over an extended and often arduous life-cycle.

With three state-of-the-art manufacturing plants across the globe, our experience in rubber-to-metal bonding enhances a wide range of industries, including off-highway vehicles, rail and mass transit, marine and energy and industrial applications.

Alongside our large network of trusted distributors, we offer an end-to-end service, to take you from concept through design, manufacturing and testing to delivery. This reduces the complexity of supply, helping you cut costs, mitigate risk and receive on time, on budget delivery, wherever you are.



MAKING THE WORLD FEEL BETTER

Trelleborg Industrial AVS is part of Trelleborg Group, which employs 15,000 people in over 40 countries. Whatever your challenge, whatever your role and wherever you are, Trelleborg is nearby to offer expert knowledge and quality solutions. Work with Trelleborg Industrial AVS and enjoy improvements you can feel.



The Trelleborg difference

PERFORMANCE THAT'S NEVER FELT BETTER

We know that you're looking for more than just products. You're looking for business solutions. That's why our innovation is built around the outcomes you want to achieve. Whether it's providing a safer environment for machine operators, reducing noise pollution, reducing downtime or saving costs and increasing revenue, we can work with you to help you attain your goals.

Building on our long history and track record, we're always evolving our solutions to pre-empt and meet the needs of our customers.

Our expert polymer technologies create maximum business value through improved longevity, productivity and cost effectiveness, optimizing comfort, health and safety, to ensure operators and machines have never felt better.

QUALITY, RELIABILITY, SAFETY

Focused on advanced technology and design, Trelleborg provides the know-how, skill and technical expertise to develop solutions that ensure your organization has never felt better. We believe in intelligent innovation. Our solutions are based on the unique needs of your project and developed in the most cost effective way. So you can feel confident our products give you an advantage that goes beyond the quality of our products.

Because we keep performance up and maintenance down, you can just keep running. All our solutions undergo stringent in-house testing before they are released to market, so you can be confident they'll perform to your high expectations, protecting your productivity and your people.



PARTNERSHIP ETHOS

We believe that working in partnership will achieve the best results for our customers. Our specialist teams will assist you from specification and design to post-installation. We also deliver training for customers on getting the best out of our anti-vibration systems.

LOCAL PRESENCE, GLOBAL REACH

Trelleborg Industrial Anti Vibration Solutions is part of Trelleborg Group, which employs 15,000 people in over 40 countries. Whatever your challenge, whatever your role and wherever you are, we are nearby to offer expert knowledge and quality solutions.

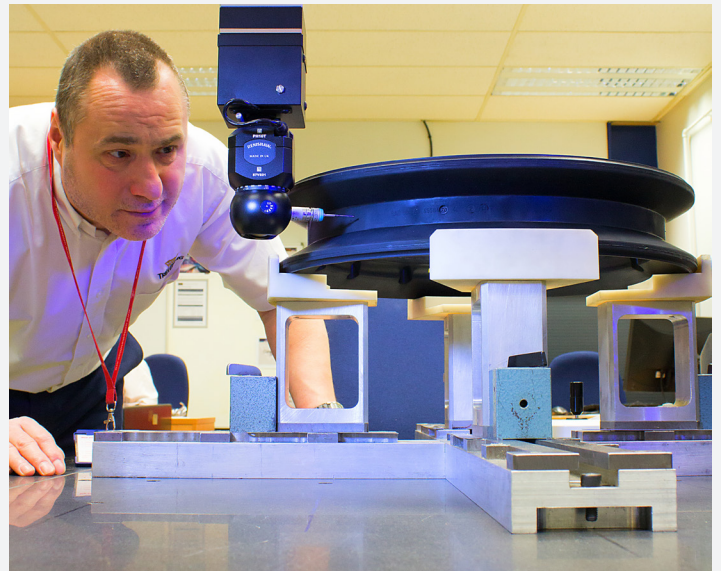
TECHNICAL EXPERTISE

Trelleborg Industrial AVS is a world leader in the design and manufacture of rubber to metal bonded components for noise and vibration isolation in engine mounting and suspension systems. Our skilled R&D team is constantly working to evolve our solutions, working closely with customers to pre-empt and meet changing markets and requirements. As part of our continuous improvement, we proactively work to improve the durability, service life and design of our products.

Customized solutions

Across all application areas our specialist teams will assist you with specification and design. As well as our range of standard products, we offer bespoke solutions that are completely tailored to the needs of your application and project.

Our wide ranging experience allows us to measure and test your environment and model the perfect anti-vibration and suspension system characteristics to meet your needs.



HIGH LEVELS OF SERVICE

Our wide portfolio allows you to reduce the number of suppliers you have to manage, and the complexities of associated administration. You'll even have access to your own dedicated customer service team, to add an extra layer of support.

We'll take your project from concept to delivery, through design, manufacturing and testing, reducing complexity in the supply chain, helping to mitigate risk and facilitating easy administration. Once you're with us, our low maintenance solutions, reliable stock levels and open, transparent communications mean you can manage cost effectively over the long term.

Our global knowledge of regulations and extensive product certification will ensure your solution is totally compliant. What's more, because we realize minimum order values and quantities can be restrictive, we always deliver the amount you require, when you need it. Our strong, global supply chain will both support and enhance your logistics.

This flexibility in logistics also extends to our paperwork and packaging, and our entire offering is supported by convenient communication, tailored to the way you talk. Our high quality products are subjected to stringent testing, by the most rigorous in-house material and product procedures.

A photograph of a male scientist with grey hair and a beard, wearing glasses and a white lab coat over a blue shirt. He is seated at a laboratory bench, focused on a task with his hands. The background is a blurred laboratory setting with various equipment. The text 'Quality and innovation' is overlaid in large white letters.

Quality and innovation

Our product range has been built on application expertise spanning over 100 years, through innovation that solves business issues and supports business growth. Our broad portfolio of high quality, cost efficient industrial products reduce noise and vibration in the most demanding environments, helping to ensure our customers' machinery has never felt better, even after years of hassle-free service.



Working in industry never felt better

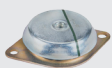
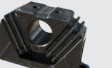
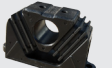
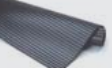
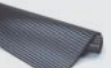
INDUSTRIAL APPLICATIONS

We provide performance you can rely on to fit and forget.

Our anti-vibration solutions give you a firm foundation to build sustainable productivity plans upon, across all manufacturing and processing equipment installations. Our strong supply chain means we can reduce costs and deliver on time and on budget.

Our intelligent innovation is focused on the outcomes you want to achieve: providing a safe environment for machine operators, reducing noise pollution, reducing downtime to save costs and increase revenue. We partner with you to provide so much more than products.

Solutions for your market - Industrial

APPLICATION	TYPE OF MOUNT					
Stationary Installations Combustion Engines Compressors, Generators	RA/RAEM 	M 	RA/RAB 	FAIL-SAFE 	VEE MOUNTING 	CUSHYFOOT 
Mobile Installations Vehicle Engines, Compressors, Generators, Marine Engines	CUSHYFLOAT 	METACONE 	VEE MOUNT 			
Sensitive Equipment Electronics, Cameras, Fans, Small Pumps	M 	SE 	EQUI-FREQUENCY 	2 BOLT INSTRUMENTS 	FLANGED INSTRUMENT MOUNTING 	LOW FREQUENCY 
Transit Protection Computers, Test Equipment	VT 	M 	BA 	DOUBLE U-SHEAR 		
Vehicles Engines, Cabs, ROPS Cage	METACONE 	CAB MOUNTS 	EH 	UH 		
Instrument Mounts Electronic Racks, Radio TX/RX, Mobile Computer Systems	M 	2 BOLT INSTRUMENTS 	FLANGED INSTRUMENTS 	LOW FREQUENCY 		
Heavy Duty Isolators Off Highway Vehicles, Vibratory Screens, Large Engines, Public Service Vehicles	SAW 	RECTANGULAR SAW 	CIRCULAR SAW 	COMP SHEAR 		
Building & 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 Re-Bound, 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 E 	



MARINE AND ENERGY

In the marine and energy sectors, downtime is at an absolute premium, so you need solutions and services that just work. Our bespoke anti-vibration and noise suspension solutions for marine applications and energy production are guaranteed to meet specification, regulations and certification requirements, with on time and on budget delivery, to help you navigate complicated logistics and avoid unnecessary downtime.

Harsh and variable conditions demand high quality, low maintenance products and stringent testing. Our solutions encompass these factors and more, enabling you to keep costs low over the whole product and project lifecycle.



Solutions for your market - Marine

APPLICATION	TYPE OF MOUNT						
Naval Noise & Vibration Control Propulsion Engines, Gensets, Machinery Rafts, Electric Converters, Pumps	D-SERIES	DX MOUNT	EQUI-FREQUENCY LARGE	EQUI-FREQUENCY SMALL	SUPER D	SANDWICH MOUNT	
Naval Shock Protection Propulsion Engines, Gensets, Machinery Rafts, Electric Converters, Pumps, Cabinets, Instruments.	DX MOUNT	EQUI-FREQUENCY LARGE	SUPER D	BA AND DOUBLE U-SHEAR	METACONE SHOCK MOUNT		
Motion Control Naval and Commercial Applications	BUFFER	BA AND DOUBLE U-SHEAR					
Commercial Noise & Vibration Control Propulsion Engines, Gensets, Machinery Rafts, Electric Converters, Pumps	CUSHYFLOAT	CUSHYFLOAT HT	CUSHYFLOAT HD	MINI CUSHYFLOAT HD	CUSHYMOUNT	D-SERIES	EQUI-FREQUENCY MOUNTS
Lightweight Shock Protection Sensitive Instruments, Radar & Communications, Electrical Cabinets	BA AND DOUBLE U-SHEAR	M-MOUNT					
High Noise Attenuation Marine Engines, Gensets	SANDWICH MOUNT	SUPER D					
Leisure Boat Noise & Vibration Control Propulsion Engines, Gensets, Pumps	CUSHYFLOAT	CUSHYFLOAT HT	CUSHYFLOAT HD	MINI CUSHYFLOAT HD	RA MOUNT	RAEM	METACONE
Miscellaneous Applications Including Entertainment	M-MOUNT	RA MOUNT	CYLINDRICAL MOUNT				



A day's heavy lifting never felt better

OFF-HIGHWAY VEHICLES

Engines are becoming lower weight, cabs have stricter noise, vibration and harshness levels to adhere to, maintenance access is becoming more difficult, loads are increasing and trucks are becoming heavier: vehicle suspension needs to evolve too.

The demands on off-highway vehicles are more diverse and challenging than ever. That's why our solutions are built to improve safety and comfort, prolong life and optimize performance, allowing you to maximize productivity, reduce downtime and meet environmental objectives.

Solutions for your market - Off-Highway Vehicles

APPLICATION	TYPE OF MOUNT					
Loaders Medium Loaders, Skid Steer Loaders, Compact Track Loader, Backhoe Loader	FLUID MOUNT	METACONES	EH	CUSHYFLOAT	METAXENTRIC BUSHINGS	
Excavators Hydraulic Excavator (HEX), Wheeled Excavator (WHEX), Mini Excavator (MHEX)	METACONE	CUSHYFLOAT	FLUID MOUNT	MDS	RA MOUNT	EH
Vibratory Compactors Single Drum Compactor (SD) Asphalt and Soil, Dual Drum Compactor (DD) Asphalt, Vibratory Drum	METACONE	CUSHYFLOAT	MDS	FLUID MOUNT	EH	SHEAR MOUNT
Articulated Dump Trucks 25 - 50 Ton ADT	METACONE	AXLE TOWER SPRING	FLUID MOUNT	SPHERILASTIK BEARING	CONICAL BEARING	CONTROL LINKS
Track Type Tractors Large Track Type Tractor, Track Type Tractor, Small Track Type Tractor	MDS	METACONE	EH	FLUID MOUNT	METAXENTRIC BUSHING	SPHERILASTIK BEARING
Mobile Cranes Wheeled Cranes, Tracked Cranes	MDS	METACONE	FLUID MOUNT	SPHERILASTIK BEARING	EH MOUNT	CONICAL BEARING
Lift Trucks/ Fork Lifts Container Lifts, LPG or Diesel Forklifts, Electric Forklifts	MDS	EH	METACONE	CUSHYFLOAT	FLUID MOUNT	TCM
Container Transport Spotter Truck, Automated Guided Vehicles (AGV)	MDS	EH	METACONE	CUSHYFLOAT		
Agricultural Vehicles Wheeled Tractors, Tracked Tractors, Combine Harvesters, Sprayers, Hay and Forge Harvester	MDS	EH	METACONE	FLUID MOUNT	CONTROL LINK	
Forestry Equipment Skidder, Forwarder, Wheeled and Tracked Harvesters	MDS	EH	METACONE	FLUID MOUNT	TCM	METAXENTRIC BUSHING



Being on track
never felt better

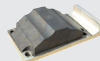
RAIL AND MASS TRANSIT

Our materials and technologies are developed to facilitate faster, smoother, quieter and safer rail travel. With safety and reliability so high on the agenda, your market is a rightly conservative one. That's why our solutions come with the reassurance of extensive and reliable testing, and finite element analysis carried out in our IRIS approved factory.

The industry is globalizing rapidly, but political and economic factors still demand localization. With over 100 years' experience supplying anti-vibration solutions to the global rail industry, we have a deep knowledge of national and international regulations and can help you to ensure compliance through high quality, total reliability solutions.



Solutions for your market - Rail

APPLICATION	TYPE OF MOUNT					
Primary Suspension	CHEVRON SPRING 	METACONE PRIMARY SPRING 	RADIAL ARM BEARING* 	TRACTION LINK* 		
Secondary Suspension	AIRSPRING* 	BEARER SPRING 	HOURGLASS SPRING 			
Anti-Roll Bar Systems	SPHERILASTIK BEARINGS 	HALF SHELL BEARING* 				
Control and Traction Centers	UD BUSH 	BEARER SPRING 	BUFFER* 	LOW FRICTION BUFFER* 		
Power Train System	METACONE 	VEE MOUNT 	SPHERILASTIK BEARING 	UD BUSH 	MDS 	CUSHYMOUNT 
Ancillary Equipment Control See industrial product range.						

* Contact Trelleborg IAVS or your local distribution partner for further information on these products

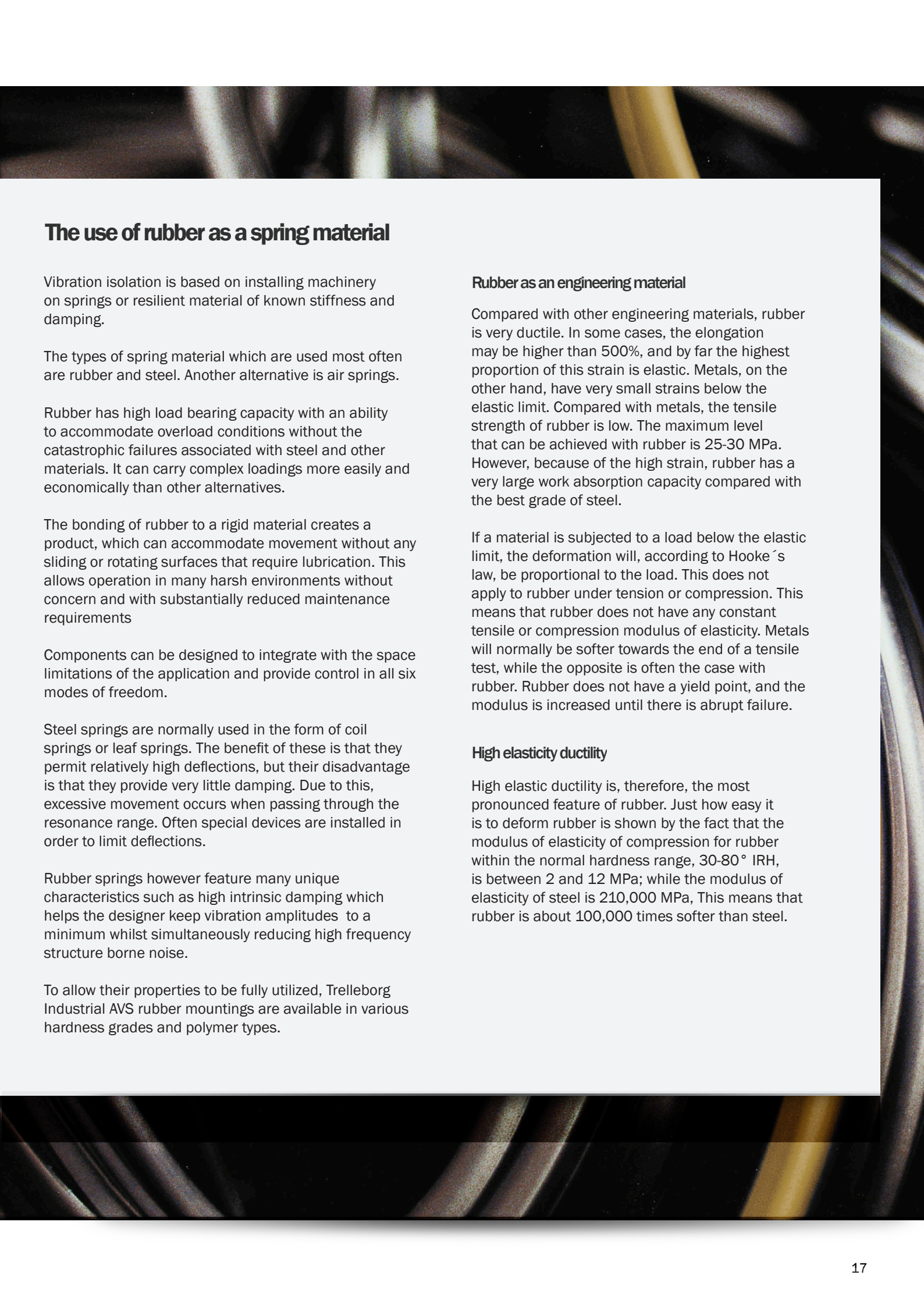
Mount Finder Pro

Find your perfect anti-vibration mount with the new MountFinder Pro mobile application.

MountFinder Pro directly measures your machines RPM to help determine the very best anti-vibration solution for your application.

Available for download now from iTunes and the Google Play store.





The use of rubber as a spring material

Vibration isolation is based on installing machinery on springs or resilient material of known stiffness and damping.

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.

Rubber springs however feature many unique characteristics such as high intrinsic damping which helps the designer keep vibration amplitudes to a minimum whilst simultaneously reducing high frequency structure borne noise.

To allow their properties to be fully utilized, Trelleborg Industrial AVS rubber mountings are available in various hardness grades and polymer types.

Rubber as an engineering material

Compared with other engineering materials, rubber is very ductile. In some cases, the elongation may be higher than 500%, 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.

High elasticity 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 compound rubber. This is of particular importance when operating a machine that is supported on springs through the resonance range. In Fig.1 you can see the principle difference between an almost ideal spring and a rubber spring. 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.2. 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. The 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.3. In the case of simple impact, the vibration sequence will be as shown in Fig.4. 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 the steel springs they diminish slowly.

Sound insulation

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.

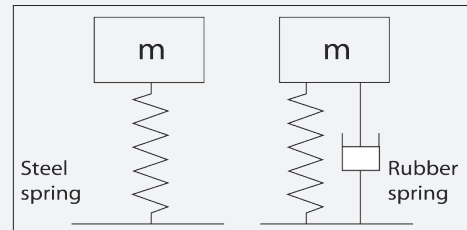


Fig. 1. Schematic difference between rubber spring and steel spring.

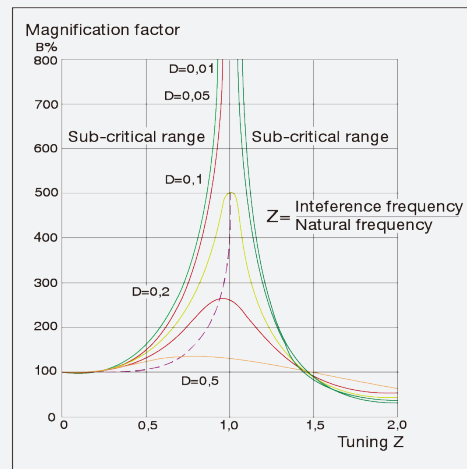


Fig. 2. Resonance curve for spring material with different internal damping.

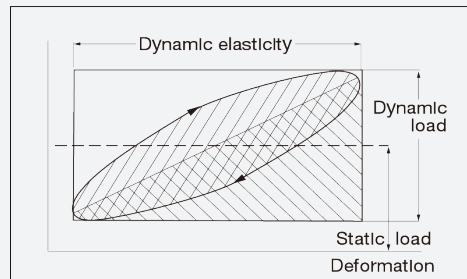


Fig. 3. Schematic representation of the internal damping properties of rubber. The elliptical area indicates the loss of energy.

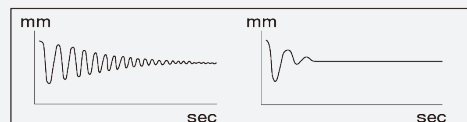


Fig. 4. Vibrations sequence with single impact for steel and rubber springs.

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 contamination 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.

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. 5 show alternative methods of determining stiffness.

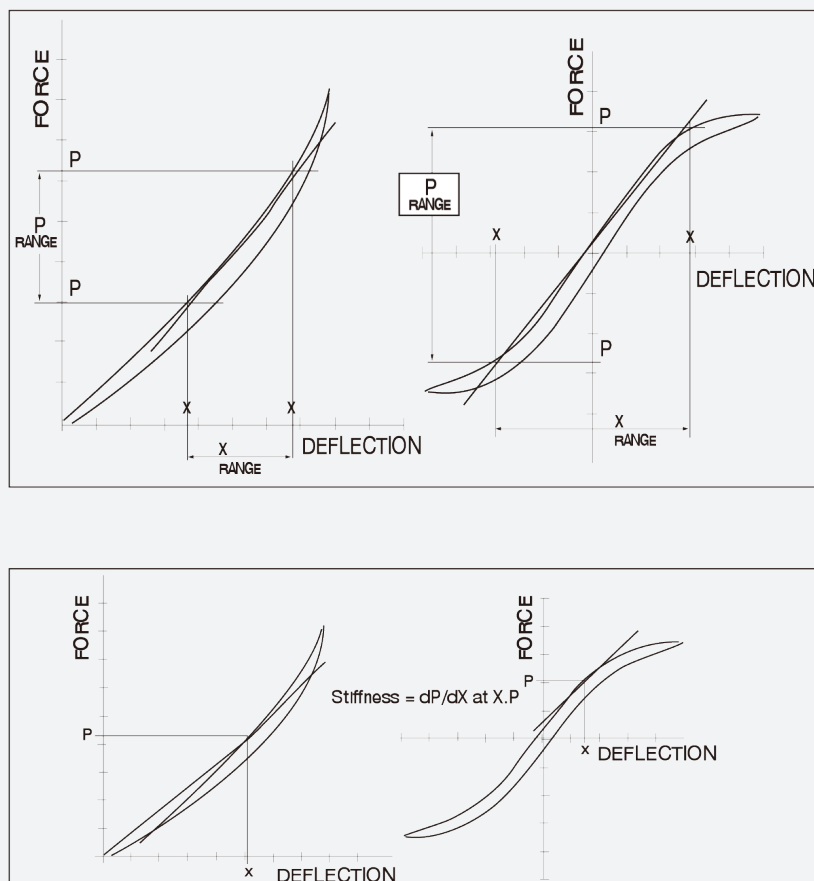


Fig. 5. dP/dX at XP average gradient over P (or X) range (usually derived by least squares method of curve fitting).

Typical Compound Properties

COMMERCIAL NAME INTERNATIONAL DESIGNATION	BUTYL RUBBER IIR	ACRYLONITRILE BUTADIENE RUBBER NBR	NATURAL RUBBER NR
Hardness range IRH	45 - 70	40 - 70	35 - 80
Temperature range	-40 to + 120°C	-40 to + 130°C	-40 to + 70°C
Properties			
Creep performance	Moderate	Moderate	Good
Fatigue performance	Good	Moderate	Very Good
High temperature performance	Good	Good	Moderate
Low temperature performance	Good	Good	Good
Physical strength	Good	Good	Excellent
Resistant to			
Acids	Very Good	Conditional	Conditional
Oil and greases	Not Suitable	Excellent	Not Suitable
Ozone	Very Good	Moderate	Moderate
Petrol	Not Suitable	Excellent	Not Suitable
Solvents, Aliphatic	Not Suitable	Very Good	Not Suitable
Solvents, Aromatic	Not Suitable	Conditional	Not Suitable
Solvents, Halogen	Not Suitable	Bad	Not Suitable
Water	Good	Good	Good
Durability	Good	Very Good	Very Good

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. 6.

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 across In Fig. 7.

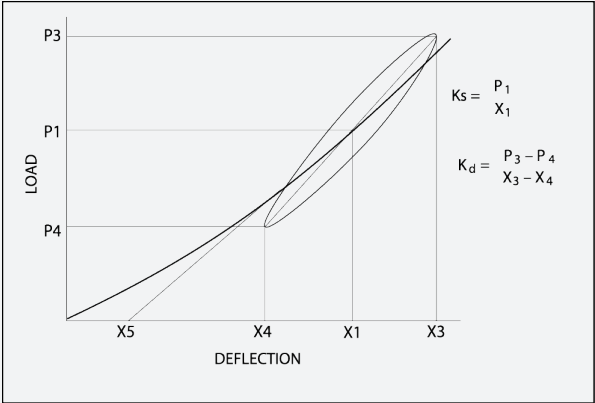


Fig. 6.

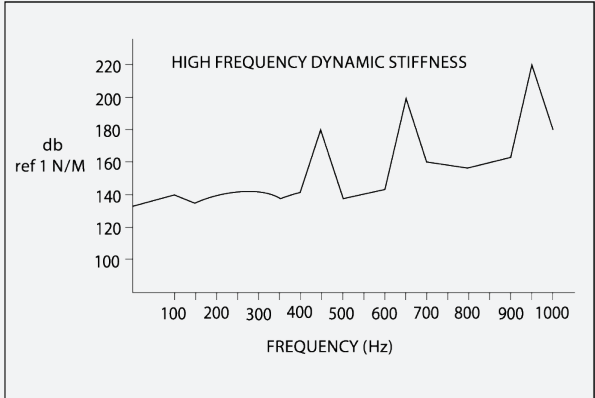


Fig. 7.

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

Gough-Joule Effect

Changes in temperature cause small changes in the deflection of loaded rubber springs. This change in deflection, which is reversible with temperature, is known as the Gough-Joule effect. For pairs of springs (Fig.9.) 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.

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 another respect, the stiffness of a rubber spring is determined by the dimensions and the hardness of the rubber.

Fig. 11 illustrates the relationship between rubber hardness and shear modulus, and fig. 12 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.

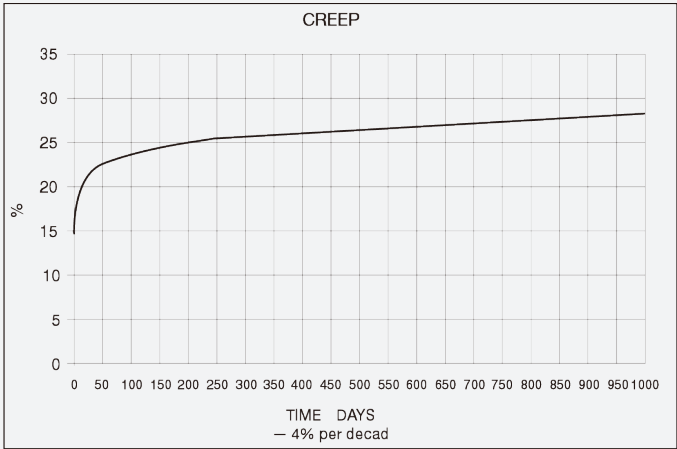


Fig. 8.

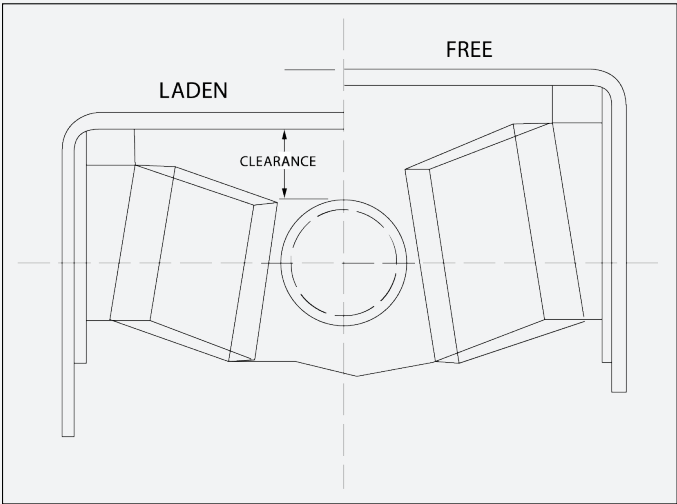


Fig. 9.

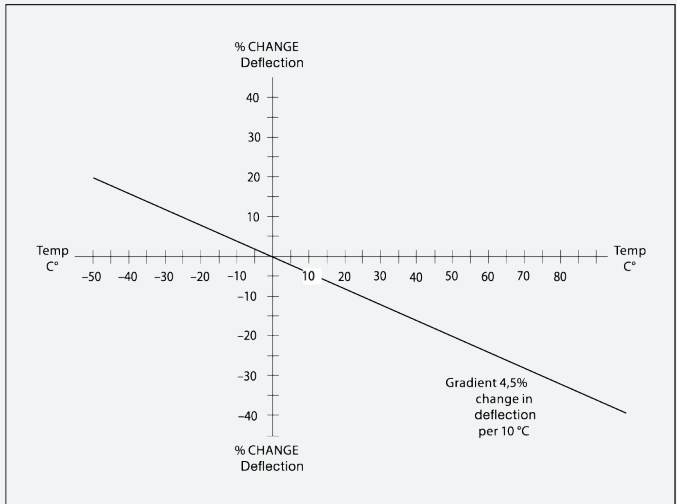


Fig. 10.

Selecting an anti-vibration mount

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.

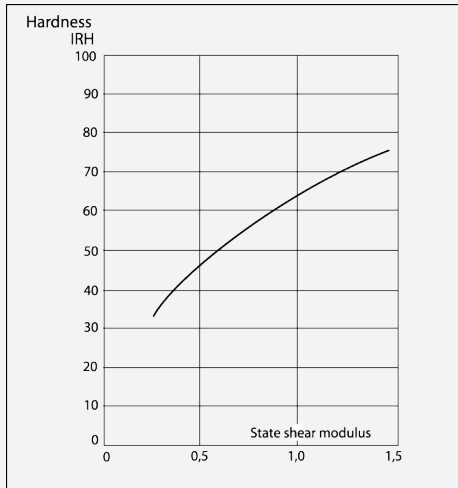


Fig. 11. Relationship between rubber hardness and shear modulus.

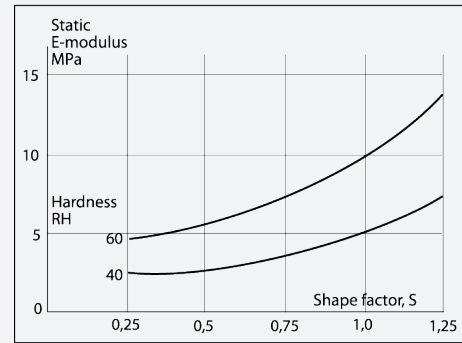


Fig. 12. The dependence of the compression modulus upon the shape factor.

	SYMBOL	MEASUREMENT	DESCRIPTION
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	K _{stat}	(N/m)	The force required in Newtons to compress the mounting 1 m.
Dynamic Spring Stiffness	K _{dyn}	(N/m)	Spring stiffness when an alternating force is applied.
Tuning Ratio	Z	(-)	The ratio between interference frequency f and natural frequency fo.
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	δ _{stat}	(mm)	The static deflection for a spring.

Calculations

Calculation of deflection

When calculating deflection the following formula shall be used.

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

Calculation of isolation degree

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

The natural frequency: $f_o = \frac{1}{2\pi} \sqrt{\frac{K_{\text{dyn}}}{m}}$

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 $4D^2Z^2$ 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 direct 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. 2 on page 12.

Isolation degree $I=(1-B)$ or as percentage, $I=(1-B) \times 100$

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

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. 13, 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 - 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 factors 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.

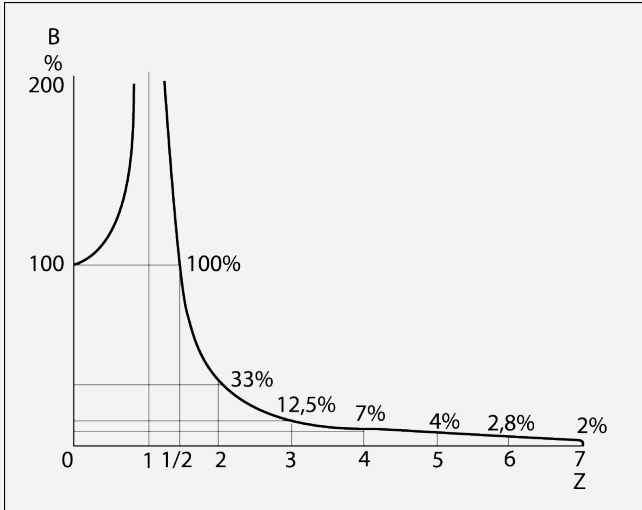


Fig. 13 Resonance curve.

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 be defined 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_0 Hz, then the product must be $\tau f_0 < \text{approx. } 0.25$ 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. ISO 2230 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

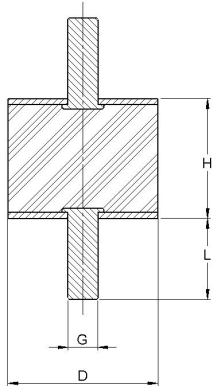
MULTIPLY	BY	TO OBTAIN
Feet	0.30480	Meters
Inches	0.02540	Meters
Pounds	0.453	Kilograms
Pound/Force	4.45	Newtons
Feet/Second	0.3048	Meters/Second
Inches/Second	0.0254	Meters/Second
Feet/Second ²	0.3048	Meters/Second ²
Inches/Second ²	0.0254	Meters/Second ²

Important Considerations

- Flexible connections to the machine are required in order to achieve effective isolation. The application of Trelleborg expansion joints can be recommended.
- If required, there should be grounding for removing static electricity.

Bobbin - Type A

Technical Drawing



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.

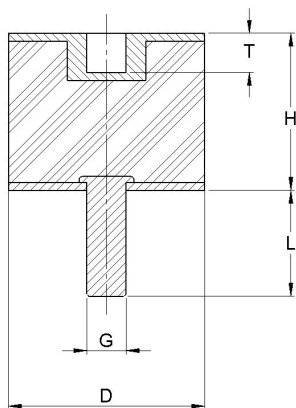
Figures stated are for natural rubber hardness 60° IRH.

Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)				COMPRESSION		SHEAR		MAX BOLT TORQUE (Nm)	WEIGHT (kg)
			D	H	G	L	MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX LOAD (kg)	MAX DEFLECTION (mm)		
19-0272	20-01435	A10/10	10	10	M4	10	4	0.9	2	2	1.6	0.004
19-0400	20-01066	A10/15	10	15	M4	10	4	1.2	2	3.1	1.6	0.006
19-0294	20-01067	A15/10	15	10	M4	10	12	0.9	4	2.8	1.6	0.006
19-0769	20-01068	A15/15	15	15	M4	10	10	1.5	4	3.2	1.6	0.006
19-0296	20-00418	A20/10	20	10	M6	15/18	17	0.5	7	1.4	8.3	0.013
19-0383	20-01226	A20/15	20	15	M6	18	16	1.2	7	2.6	8.3	0.016
19-0384	20-00541	A20/20	20	20	M6	15/18	16	1.7	7	4.5	8.3	0.016
19-0387	20-01228	A20/25	20	25	M6	15/18	15	2.1	6	6.2	8.3	0.023
19-0297	20-00557	A25/10	25	10	M6	18	31	0.8	12	1.5	8.3	0.028
19-0415	20-00558	A25/15	25	15	M6	18	30	1.5	11	2.5	8.3	0.030
19-0416	20-00559	A25/20	25	20	M6	18	29	2.6	11	3.8	8.3	0.024
19-0419	20-01437	A25/25	25	25	M6	18	27	2.7	11	5.4	8.3	0.031
19-0421	20-01629	A25/30	25	30	M6	18	25	3.4	9	6.7	8.3	0.035
19-0267	20-01536	A30/15	30	15	M8	20	51	0.9	17	2.6	20	0.045
19-0388	20-01438	A30/20	30	20	M8	20	45	1.7	17	3.9	20	0.050
19-0389	20-01440	A30/25	30	25	M8	20	41	2.1	16	5.3	20	0.035
19-0392	20-01441	A30/30	30	30	M8	20	39	2.9	15	6.6	20	0.057
19-0393	20-00438	A30/40	30	40	M8	20	31	4	10	10	20	0.065
19-0268	20-01423	A40/20	40	20	M8	23	92	1.5	31	3.8	20	0.078
19-0395	20-01443	A40/30	40	30	M8	23	71	2.4	31	6.6	20	0.090
19-0397	20-00563	A40/40	40	40	M8	23	66	3.5	27	9	20	0.110
19-0270	20-01444	A50/20	50	20	M10	28	204	2.1	51	3.6	40	0.139
19-0401	20-00564	A50/25	50	25	M10	28	143	2.5	51	4.6	40	0.149
19-0402	20-01445	A50/30	50	30	M10	28	143	3.2	51	6.4	40	0.160
19-0533	20-01714	A50/35	50	35	M10	25	133	3.5	51	8	40	0.168
19-0404	20-01446	A50/40	50	40	M10	28	112	3.8	46	8.5	40	0.180
19-0405	20-00882	A50/45	50	45	M10	28	107	4.1	46	10.1	40	0.191
19-0407	20-00549	A50/50	50	50	M10	28	107	4.8	43	11.7	40	0.205
19-0305	20-01447	A70/35	70	35	M10	25	245	4.5	92	9	40	0.210
19-0512	20-01253	A70/45	70	45	M10	28	235	4.2	92	9.9	40	0.346
19-0306	20-00547	A75/40	75	40	M12	37	296	3.6	102	4.9	70	0.437
19-0513	20-01027	A75/50	75	50	M12	37	286	5.2	102	11.2	70	0.480
19-0514	20-00548	A75/55	75	55	M12	37	255	5.2	102	12.5	70	0.526
19-0273	20-01259	A100/40	100	40	M16	41	673	3.9	204	8.2	170	0.884
19-0412	20-00568	A100/55	100	55	M16	41	520	6.1	204	12.4	170	1.020

Bobbin - Type B

Technical Drawing



Figures stated are for natural rubber hardness 60° IRH.

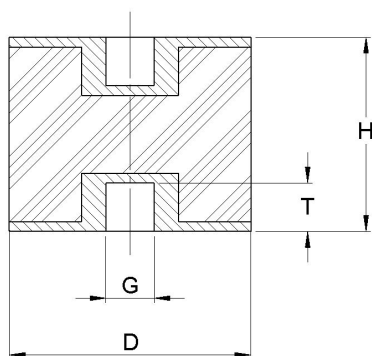
The technical values are to be used for info only. If you have any questions, please contact TIAVS.

Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)					COMPRESSION		SHEAR		MAX BOLT TORQUE (Nm)	WEIGHT (kg)
			D	H	G	L	T	MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX LOAD (kg)	MAX DEFLECTION (mm)		
19-0307	20-01449	B10/10	10	10	M4	10	4	6	0.9	1	2.3	1.6	0.003
19-0515	20-00794	B10/15	10	15	M4	10	4	5	1.5	2	3.8	1.6	0.003
19-0529	20-01698	B15/15	15	15	M4	10	5	12	1.4	5	3.8	1.6	0.007
19-0310	20-01264	B20/15	20	15	M6	18	6	16	0.9	11	3.8	8.3	0.017
19-0524	20-01265	B20/20	20	20	M6	18	6	16	1.2	9	5	8.3	0.019
19-0526	20-01266	B20/25	20	25	M6	18	6	15	2.5	9	6.3	8.3	0.020
19-0311	20-01267	B25/15	25	15	M6	18	6	30	1.3	16	3.8	8.3	0.024
19-0539	20-01268	B25/20	25	20	M6	18	6	29	2.1	15	5	8.3	0.026
19-0540	20-00573	B25/25	25	25	M6	18	6	27	2.9	14	6.3	8.3	0.029
19-0541	20-01016	B25/30	25	30	M6	18	6	25	3.2	14	7.5	8.3	0.031
19-0542	20-01269	B30/15	30	15	M8	20	8	69	1.4	21	3.4	20	0.041
19-0543	20-00898	B30/20	30	20	M8	20	8	39	1.6	21	5	20	0.047
19-0546	20-00464	B30/25	30	25	M8	20	8	38	2.3	20	6.3	20	0.051
19-0547	20-00575	B30/30	30	30	M8	20	8	36	2.8	19	7.5	20	0.050
19-0549	20-01539	B30/40	30	40	M8	20	10	31	3.2	10	8	20	0.050
19-0554	20-00466	B40/30	40	30	M8	20	8	61	2.4	35	7.5	20	0.090
19-0555	20-00821	B40/40	40	40	M8	23	8	61	3.8	34	10	20	0.107
19-0556	20-01273	B50/20	50	20	M10	28	10	133	1	46	4	40	0.121
19-0559	20-00577	B50/30	50	45	M10	28	10	122	2.6	51	7	40	0.145
19-0558	20-00578	B50/40	50	40	M10	28	10	112	3.6	32	10	40	0.167
19-0561	20-01276	B50/50	50	50	M10	28	10	107	5.1	51	12.5	40	0.190
19-0848	20-00822	B60/40	60	40	M10	28	10	178	4.6	71	6.3	40	0.200
19-0536	20-01283	B75/50	75	50	M12	37	12	265	4.3	121	12.5	70	0.470
19-0537	20-00824	B75/55	75	55	M12	37	12	245	4.7	119	13.8	70	0.501
19-0322	20-00581	B100/40	100	40	M16	41	16	663	3.2	236	10	170	0.853
19-0535	20-01285	B100/55	100	55	M16	41	16	520	5	222	13.8	170	0.970
19-0849	20-01286	B100/60	100	60	M16	41	16	510	5.6	217	15	170	1.041

Bobbin - Type C

Technical Drawing



Figures stated are for natural rubber hardness 60° IRH.

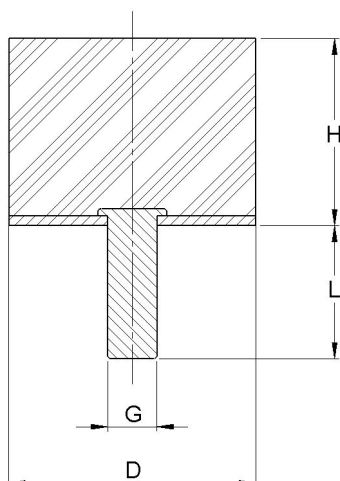
The technical values are to be used for info only. If you have any questions, please contact TIAVS.

Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)				COMPRESSION		SHEAR		MAX BOLT TORQUE (Nm)	WEIGHT (kg)
			D	H	G	T	MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX LOAD (kg)	MAX DEFLECTION (mm)		
19-0324	20-00095	C10/10	10	10	M4	4	10	1.6	1	1.2	1.6	0.003
19-0325	20-00583	C15/15	15	15	M4	4	12	1.5	4	2	1.6	0.006
19-0551	20-01289	C20/20	20	20	M6	4/6	17	1.6	5	2.5	8.3	0.015
19-0552	20-00584	C20/25	20	25	M6	6	15	2.2	4	2.7	8.3	0.015
19-0553	20-00363	C20/30	20	30	M6	6	12	2.5	4	3	8.3	0.017
19-0327	20-01291	C25/20	25	20	M6	6	29	1.7	9	3	8.3	0.024
19-0424	20-01292	C25/25	25	25	M6	6	27	2.2	8	3.5	8.3	0.021
19-0328	20-00475	C30/25	30	25	M8	8	38	2.2	12	3.6	20	0.037
19-0427	20-01455	C30/30	30	30	M8	10	36	2.6	11	4.1	20	0.047
19-0430	20-01075	C30/35	30	35	M8	8	44	3.1	21	9.4	20	0.050
19-0812	20-00476	C30/40	30	40	M8	8	44	3.6	21	10.9	20	0.052
19-0329	20-00551	C40/30	40	30	M8	8	71	2.7	25	5.2	20	0.092
19-0423	20-00587	C40/40	40	40	M8	8	66	3.9	25	7.4	20	0.105
19-0330	20-01456	C50/30	50	30	M10	10	122	2.4	41	5.2	40	0.140
19-0434	20-00116	C50/35	50	35	M10	10	117	2.9	41	6.4	40	0.140
19-0436	20-01457	C50/40	50	40	M10	10	112	3.3	41	7.4	40	0.170
19-0438	20-01025	C50/45	50	45	M10	10	107	4.1	41	8.6	40	0.169
19-0440	20-01313	C50/50	50	50	M10	10	107	4.9	41	9.7	40	0.182
19-0447	20-01318	C75/40	75	40	M12	12	296	3.2	92	7	70	0.396
19-0448	20-01541	C75/45	75	45	M12	12	280	3.5	92	8	70	0.423
19-0450	20-01320	C75/50	75	50	M12	12	265	4.1	92	9	70	0.445
19-0451	20-00125	C75/55	75	55	M12	12	245	4.6	92	10.1	70	0.478
19-0332	20-01324	C100/40	100	40	M16	16	663	2.9	153	5.6	170	0.794
19-0446	20-01325	C100/55	100	55	M16	16	520	4.9	153	9.1	170	0.933

Bobbin - Type D

Technical Drawing



Figures stated are for natural rubber hardness 60° IRH.

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Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)				COMPRESSION		MAX BOLT TORQUE (Nm)	WEIGHT (kg)
			D	H	G	L	MAX LOAD (kg)	MAX DEFLECTION (mm)		
19-0324	20-00095	C10/10	10	10	M4	4	10	1.6	1.6	0.003
19-0325	20-00583	C15/15	15	15	M4	4	12	1.5	1.6	0.006
19-0551	20-01289	C20/20	20	20	M6	4/6	17	1.6	8.3	0.015
19-0552	20-00584	C20/25	20	25	M6	6	15	2.2	8.3	0.015
19-0553	20-00363	C20/30	20	30	M6	6	12	2.5	8.3	0.017
19-0327	20-01291	C25/20	25	20	M6	6	29	1.7	8.3	0.024
19-0424	20-01292	C25/25	25	25	M6	6	27	2.2	8.3	0.021
19-0328	20-00475	C30/25	30	25	M8	8	38	2.2	20	0.037
19-0427	20-01455	C30/30	30	30	M8	10	36	2.6	20	0.047
19-0430	20-01075	C30/35	30	35	M8	8	44	3.1	20	0.050
19-0812	20-00476	C30/40	30	40	M8	8	44	3.6	20	0.052
19-0329	20-00551	C40/30	40	30	M8	8	71	2.7	20	0.092
19-0423	20-00587	C40/40	40	40	M8	8	66	3.9	20	0.105
19-0330	20-01456	C50/30	50	30	M10	10	122	2.4	40	0.140
19-0434	20-00116	C50/35	50	35	M10	10	117	2.9	40	0.140
19-0436	20-01457	C50/40	50	40	M10	10	112	3.3	40	0.170
19-0438	20-01025	C50/45	50	45	M10	10	107	4.1	40	0.169
19-0440	20-01313	C50/50	50	50	M10	10	107	4.9	40	0.182
19-0447	20-01318	C75/40	75	40	M12	12	296	3.2	70	0.396
19-0448	20-01541	C75/45	75	45	M12	12	280	3.5	70	0.423
19-0450	20-01320	C75/50	75	50	M12	12	265	4.1	70	0.445
19-0451	20-00125	C75/55	75	55	M12	12	245	4.6	70	0.478
19-0332	20-01324	C100/40	100	40	M16	16	663	2.9	170	0.794
19-0446	20-01325	C100/55	100	55	M16	16	520	4.9	170	0.933

Bobbin - Type E

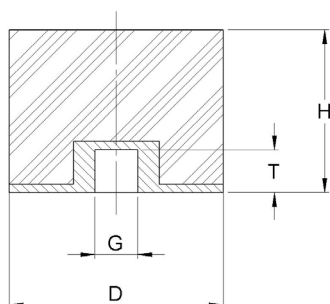
Figures stated are for natural rubber hardness 60° IRH.

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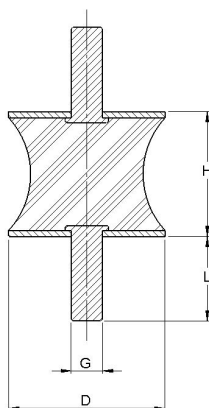


Technical Drawing

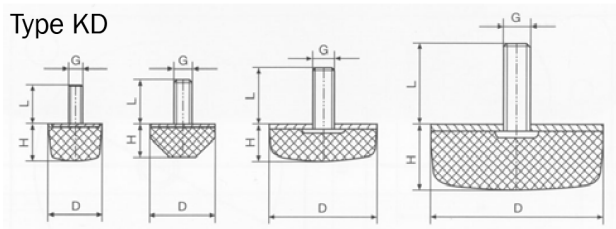
Type E



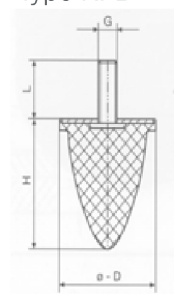
Type TA



Type KD



Type KPD



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)					COMPRESSION		SHEAR		MAX BOLT TORQUE (Nm)	WEIGHT (kg)
			D	H	G	L	T	MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX LOAD (kg)	MAX DEFLECTION (mm)		
19-0345	20-01564	E 15/15	15	15	M4	-	5	6	1	-	-	1.6	0.006
19-0347	20-00594	E 30/17	30	17	M8	-	8	45	1.7	-	-	20	0.010
19-0835	20-00668	E 40/30	40	30	M8	-	8	67	3.3	-	-	20	0.015
19-0349	20-01464	E 40/40	40	40	M8	-	10	61	4.6	-	-	20	0.020
19-0350	20-00501	E 50/20	50	20	M10	-	10	153	2	-	-	40	0.069
19-0456	20-00607	E 50/36	50	36	M10	-	10	120	3.5	-	-	40	0.097
19-0834	20-01406	E 50/40	50	40	M10	-	10	112	4.3	-	-	40	0.194
19-0457	20-01407	E 50/45	50	45	M10	-	11	107	5.1	-	-	40	0.138
19-0581	20-01610	TA 25/20	25	20	M6	12/18	-	31	1	12	2	8.3	0.050
19-0699	20-01647	TA 40/30	41	30	M8	20	-	45	1.7	17	3.9	20	0.083
15-4069	10-00087	KD 25/12	25	12	M6	16	-	31	0.8	-	-	8.3	0.016
15-3452	20-00013	KD 25/13	25	13	M6	16	-	30	0.8	-	-	8.3	0.010
19-0582	20-01611	KD 25/17	25	17	M6	18	-	29	2	-	-	8.3	0.017
19-0506	20-00595	KD 50/17	50	17	M10	28	-	155	2	-	-	40	0.070
19-0851	20-01469	KD 50/50	50	50	M8	23	-	107	5.1	-	-	20	0.102
19-0604	20-00686	KPD 30/30	30	30	M8	20	-	35	6	-	-	20	0.027
19-0507	20-00929	KPD 30/36	30	36	M8	20	-	35	7	-	-	20	0.034

Other dimensions on special demand with minimum quantity and/or order value.

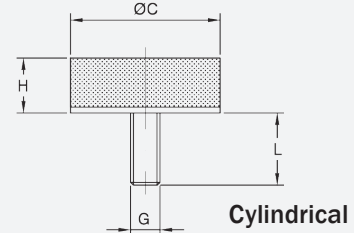
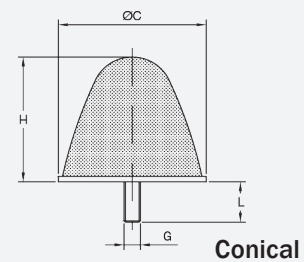
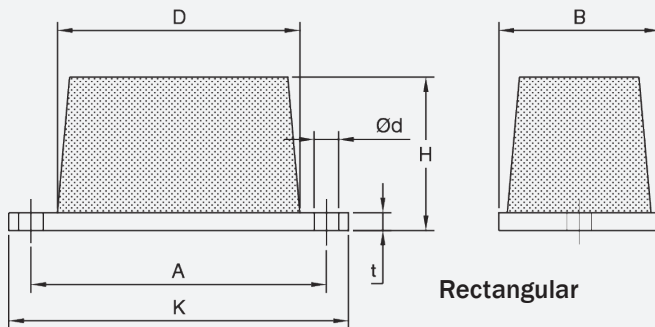
Buffers

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.

Circular and rectangular types are easily fitted.



Technical Drawing



Product Data

PART No.	TYPE	DIMENSIONS (mm)				MAX LOAD (kg)	MAX DEFLECTION (mm)	MAX BOLT TORQUE (mm)	WEIGHT (kg)
		C	H	G	L				
10-00341	CYLINDRICAL	21	19	M6	15	100	8	8.3	0.015
10-00342	CYLINDRICAL	32	20.6	M8	20	200	8	20	0.04
10-00337	CYLINDRICAL	50.8	19	M10	25	640	7	40	0.094
10-00340	CONICAL	28.6	37	M6	15	100	18	8.3	0.03
10-00339	CONICAL	38	38	M8	20	250	18	20	0.05
10-00334	CONICAL	48	51	M10	25	270	18	40	0.11
10-00338	CONICAL	70.3	46	M12	30	500	15	70	0.27
10-00336	CONICAL	108	93	M12	30	250	53	70	0.76
10-00335	CONICAL	108	119	M12	30	200	60	70	0.99

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)							MAX LOAD (kg)	MAX DEFLECTION (mm)	WEIGHT (kg)
			K	A	B	H	D	d	t			
15-0437	10-00322	RECTANGULAR	55	120.5	47.5	6	8.7	104.8	86	1750	24	0.48
15-0238	10-00315	RECTANGULAR	55	120.5	57	6	8.7	104.8	86	4600	23	0.55
15-0260	10-00317	RECTANGULAR	36.5	155.5	63.5	6	13.5	127	89	1000	10	0.54
19-0564	20-00417	RECTANGULAR	22	84	32	3	6.7	68.5	51	815	7	0.85

Cushyfloat® Mounting

The Cushyfloat® mounting is a general purpose unit designed to provide effective isolation of vibration and noise arising from both static and mobile equipment.

Originally designed for use with marine engines, the Metalastik Cushyfloat® is a simple to install, compact, low profile mounting. It combines 3 way control of the suspended equipment with relatively large static deflections where the rubber is loaded in shear and compression.

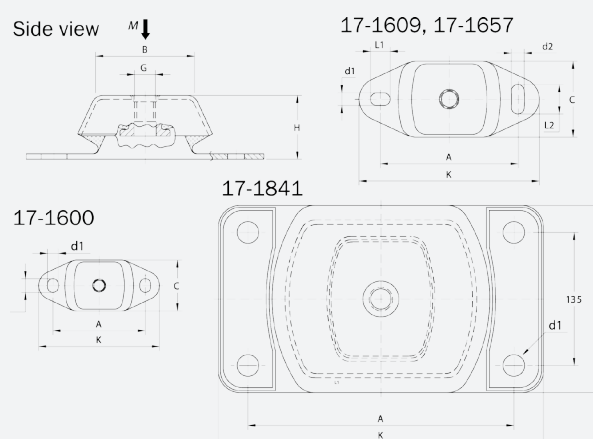
The design incorporates bump and rebound control features which limit excessive movements under shock loading. Top metal cover gives protection against oil contamination and protective finish resists corrosion attack. Propeller thrust on marine applications is accommodated. There are four sizes in the standard range with varying degrees of rubber hardness catering for point loads from 32kg to 3000kg. Natural frequencies as low as 8Hz are possible.

Typical Applications Include:

- Marine/industrial vehicle engines
- Portable gensets and pumps
- Generator sets
- Pumps and compressors



Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)										MAX LOAD (kg)		MAX THRUST LOAD (N)	WEIGHT (kg)
			B	C	A	K	H	d1	L1	d2	L2	G	VERTICAL	VERTICAL WITH THRUST		
17-1600	10-00535	45 IRH	62	60	100	120	38-40.5	11	14	11	14	M12	50	35	370	0.36
	10-00536	55 IRH	62	60	100	120	38-40.5	11	14	11	14	M12	65	55	560	0.36
	10-00537	65 IRH	62	60	100	120	38-40.5	11	14	11	14	M12	100	80	830	0.36
17-1609	10-00545	45 IRH	76	75	140	183	49	13	20	13	30	M16	150	95	1000	0.86
	10-00546	55 IRH	76	75	140	183	49	13	20	13	30	M16	210	140	1500	0.86
	10-00547	65 IRH	76	75	140	183	49	13	20	13	30	M16	300	210	2300	0.86
	10-00548	75 IRH	76	75	140	183	49	13	20	13	30	M16	450	315	3300	0.86
17-1657	10-00557	45 IRH	72	112.5	182	228	70	18	26	18	34	M20	300	250	2800	2.25
	10-00558	55 IRH	72	112.5	182	228	70	18	26	18	34	M20	520	370	4200	2.25
	10-00559	65 IRH	72	112.5	182	228	70	18	26	18	34	M20	800	560	6400	2.25
	10-00560	75 IRH	72	112.5	182	228	70	18	26	18	34	M20	1000	700	11800	2.25
17-1841	10-00605	40 IRH	120	190	270	330	112	22	-	-	-	M24	950	630	5300	9.6
	10-00606	50 IRH	120	190	270	330	112	22	-	-	-	M24	1400	945	7100	9.6
	10-00607	60 IRH	120	190	270	330	112	22	-	-	-	M24	2200	1575	12500	9.6
	10-00608	70 IRH	120	190	270	330	112	22	-	-	-	M24	3000	2100	18000	9.6

EH Mount

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.

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, 40 to 1200 kg

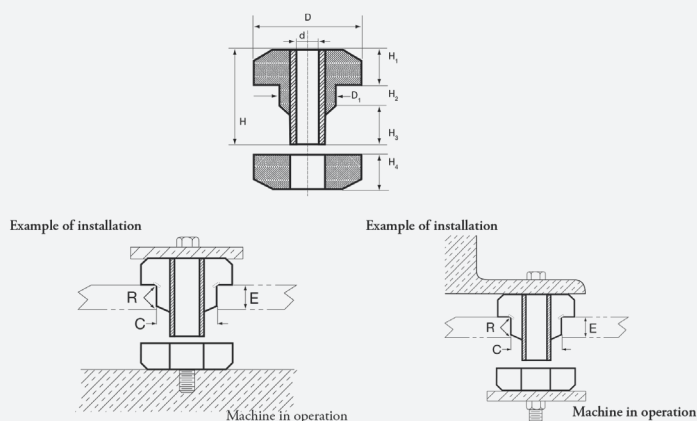
Type EH mountings are designed to achieve effective vibration isolation on engines, operator cabins and other ancillary units.

Typical applications include:

- Off-highway vehicles
- Military vehicles
- Construction equipment
- Material handling vehicles
- Agriculture vehicle



Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)												MAX LOAD (kg)	BOLT SIZE	MAX BOLT TORQUE (Nm)	WASHER PART No.	WEIGHT (kg)
			d	D	D	H	H1	H2	H3	H4	C	E	R						
55-1070-1	20-02900	EH 40	10	33	20	32	12	6.5	13	12	19	10	1	40	M10	25	20-02816	0.033	
55-1070-1	20-02901	EH 60	10	33	20	32	12	6.5	13	12	19	10	1	90	M10	25		0.033	
19-0213-1	20-00621	EH 4850-40	13	50	32	50	20	10	20	20	31	15	1.5	60	M12	40	20-00416	0.12	
19-0213-1	20-00620	EH 4850-60	13	50	32	50	20	10	20	20	31	15	1.5	100	M12	40		0.12	
19-0214-1	20-00619	EH 6463-40	17	64	40	62	23	14	25	23	39	22	2.3	90	M16	80	20-01495	0.23	
19-0214-1	20-00618	EH 6463-60	17	64	40	62	23	14	25	23	39	22	2.3	200	M16	80		0.23	
19-0727-1	20-00617	EH 9075-40	23	89	58	73	25	19	29	25	56.5	28	3	200	M22	200	20-00533	0.53	
19-0727-1	20-00616	EH 9075-60	23	89	58	73	25	19	29	25	56.5	28	3	350	M22	200		0.53	
13-4109-1	20-02558	EH 1127-40	37.8	124	64.8	85.9	31.8	22.3	31.8	31.8	63	32	4	550	M24	300	CONTACT FOR DETAILS	1.11	
13-4109-1	20-02899	EH 1127-60	37.8	124	64.8	85.9	31.8	22.3	31.8	31.8	63	32	4	1200	M24	300		1.11	

Level Mount

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

The rubber element of the level mount is oil and chemical resistant. All metal parts are zinc-plated and chromated for protection against corrosion.

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

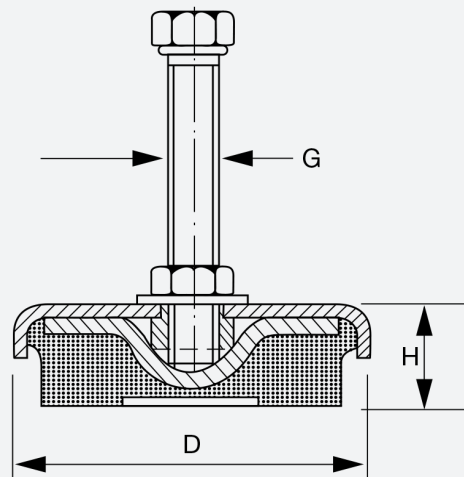
The mount, with level adjuster, is suitable for a wide range of free standing workshop machines.

Typical Applications Include:

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



Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)			OVERALL BOLT LENGTH (mm)	MAX LOAD (kg)	WEIGHT (kg)
			D	H	G			
19-0588	20-00623	TF 250	69	23	M 12	100	250	0.4
19-0589	20-00678	TF 250 S/S	69	23	M 12	100	250	0.4
19-0583	20-00624	TF 600	81	25	M 12	100	600	0.49
19-0585	20-00679	TF 600 S/S	81	25	M 12	100	600	0.49
19-0577	20-00625	TF 1200	108	29	M 16	100	1200	1
19-0578	20-00680	TF 1200 S/S	108	29	M 16	100	1200	1
19-0591	20-00626	TF 3000	151	35	M 20	120	3000	2.2
19-0596	20-00627	TF 4000	170	39	M 20	120	4000	2.9
19-0598	20-00628	TF 6000	205	44	M 20	150	6000	4.8

Low Frequency Mountings

These anti-vibration mountings are designed to give large deflection for small loads and are used to protect suspended equipment against vibration and impact. Low Frequency Mountings are available in three sizes and two grades of rubber hardness.

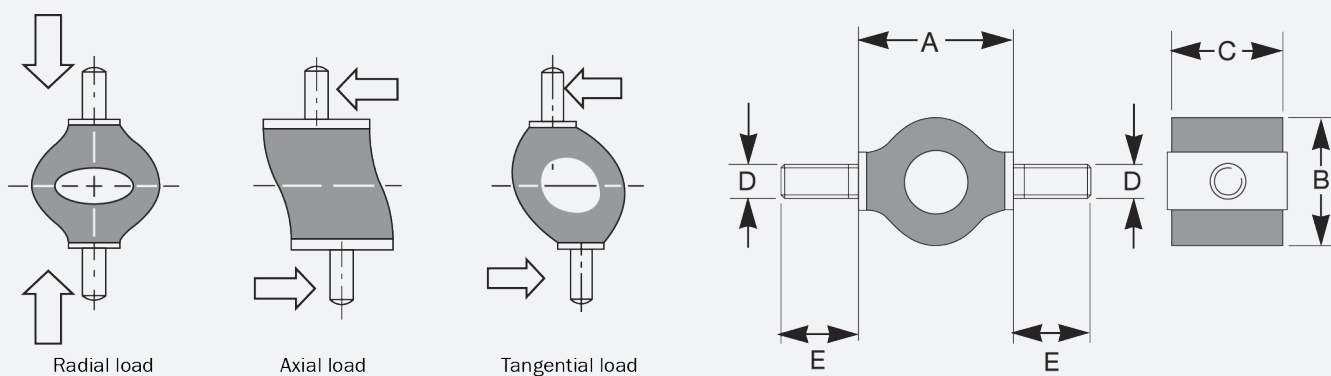
Novibra® type Low Frequency are designed for shear as well as compressive loads. Continual tensile load should be avoided.

Typical applications Include:

- Light instruments
- Light fans and compressors
- Computer and electronic units
- Shock mounting for light applications



Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)					MAX LOAD (kg)			MAX TORQUE (Nm)	WEIGHT (kg)
			A	B	C	D	E	COMPRESSION	SHEAR	ROLLING SHEAR		
17-1394	20-00017	45 IRH	17	14	13	M4	10	1.4	0.4	0.3	1.6	0.01
	20-00018	60 IRH						1.8	0.5	0.4		
17-1395	20-00020	45 IRH	30	25	19	M5	14	3.1	1.0	0.8	3.2	0.015
	20-00021	60 IRH						5.6	1.5	1.2		
17-1396	20-00022	45 IRH	38	35	25	M6	15	8.7	3.1	2.5	8.3	0.038
	20-00023	60 IRH						12.7	4.6	3.6		

M Mounting

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.

It's unique construction and the latest production methods make Novibra type M a high performance anti-vibration mounting with a number of advantages:

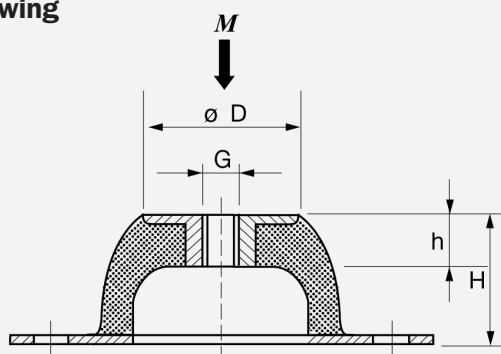
- Tight tolerance on dynamic stiffness rates for accurate vibration calculations.
- Wide load rating options, 3.5-2500 kg
- Corrosion protected to cope with arduous environments on land or marine applications (ISO 2081).
- Clear and durable product markings so that the mountings can be identified even after several years in operation.



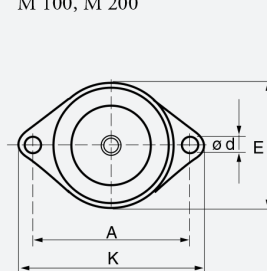
When using M mount together with the height adjuster HA, it is necessary to use a washer. The diameter of the washer must be 20% larger than the diameter of the upper plate (D).

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

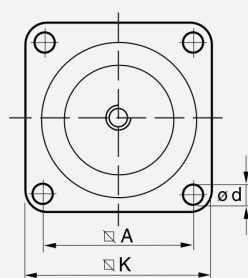
Technical Drawing



M 7, M 25, M 50,
M 100, M 200



M 400, M 600, M 1500



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)								MAX LOAD (kg)	WEIGHT (kg)
			D	E	A	K	H	h	d	G		
17-4056	10-00139	M 7 40 IRH	18	43	50	64	20	7	7	M6	3.5	0.02
17-4057	10-00140	M 7 60 IRH	18	43	50	64	20	7	7	M6	9	
17-4047	10-00094	M 25 40 IRH	33	56	66	85	25	11	8	M8	20	0.07
17-4048	10-00095	M 25 60 IRH	33	56	66	85	25	11	8	M8	50	
17-4052	10-00096	M 50 40 IRH	45	76	92	114	35	14	10	M10	40	0.16
17-4053	10-00097	M 50 60 IRH	45	76	92	114	35	14	10	M10	80	
17-4041	10-00100	M 100 40 IRH	53	96	110	136	40	15	11.5	M10	70	0.26
17-4042	10-00099	M 100 60 IRH	53	96	110	136	40	15	11.5	M10	150	
174044	10-00102	M 200 40 IRH	58	101	124	151	45	13	11.5	M10	130	0.42
17-4045	10-00103	M 200 60 IRH	58	101	124	151	45	13	11.5	M10	220	
17-4050	10-00104	M 400 40 IRH	78	-	120	150	63	18	14.5	M12	280	1.06
17-4051	10-00105	M 400 60 IRH	78	-	120	150	63	18	14.5	M12	500	
17-4054	10-00080	M 600 40 IRH	100	-	160	200	85	25	14.5	M16	380	2.35
17-4055	10-00081	M 600 60 IRH	100	-	160	200	85	25	14.5	M16	750	
17-4043	10-00082	M 1500 40 IRH	186	-	250	310	160	43	18	M24	1400	9.43
17-4049	10-00083	M 1500 60 IRH	186	-	250	310	160	43	18	M24	2500	

MCR Mount

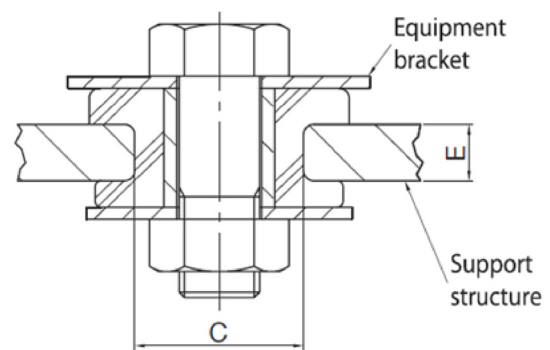
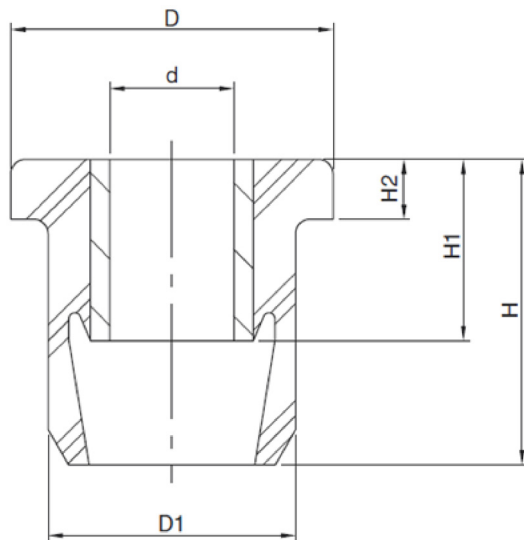
MCR mountings are designed for mobile applications where the disturbing frequencies are high and restricted movement is needed. The MCR mount is an easy to install single part mount that can be used to take up small bracket and chassis misalignments, it provides isolation of high frequency vibration and offers shock protection of vehicle mounted equipment.



Typical Applications Include:

- Exhaust system
- Radiator mounting
- Auxiliary pumps

Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS IN mm									MAX LOAD (kg)	BOLT SIZE	MAX BOLT TORQUE (Nm)	WASHER PART No.	WEIGHT (kg)
			d	D	D1	H	H1	H2	E	C	R					
19-0266	20-01129	MCR 27-1908-45	27.5	10	20	25.5	15.5	5	8	19	1.5	40	M10	30	20-00531	0.02
	20-00831	MCR 27-1908-60	27.5	10	20	25.5	15.5	5	8	19	1.5	55				
11-1196	20-00782	MCR 45-2810-45	45	13	31.5	32	25	10	10	28.5	1.5	80	M12	50	20-00416	0.06
	20-01137	MCR 45-2810-60	45	13	31.5	32	25	10	10	28.5	1.5	150				
13-4285	20-01133	MCR 51-3216-45	51.8	13.5	34	41	35	13.5	16	31.8	1.5	80	M12	50	20-00536	0.08
	20-01134	MCR 51-3216-60	51.8	13.5	34	41	35	13.5	16	31.8	1.5	180				
19-0277	20-00833	MCR 64-3820-45	64	16	41	50	43	16	20	38	3	190	M16	135	20-01495	0.17
	20-01130	MCR 64-3820-60	64	16	41	50	43	16	20	38	3	380				
19-0292	20-01135	MCR 75-4624-45	75	16	50	56	50	21	23.5	46	3	200	M16	135	20-00532	0.25
	20-01136	MCR 75-4624-60	75	16	50	56	50	21	23.5	46	3	400				
11-1018	20-01131	MCR 95-5119-45	95	21	57	63	51	25	19.1	50.8	3	320	M20	135	20-00533	0.39
	20-01132	MCR 95-5119-60	95	21	57	63	51	25	19.1	50.8	3	625				

Novibra® 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.

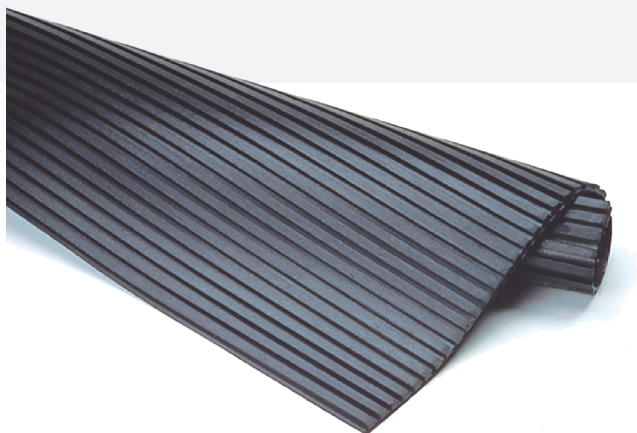
The AV Plate, made of oil and grease resistant rubber material, is available either as a single (4.5 mm) or as a double (8 mm) version.

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.

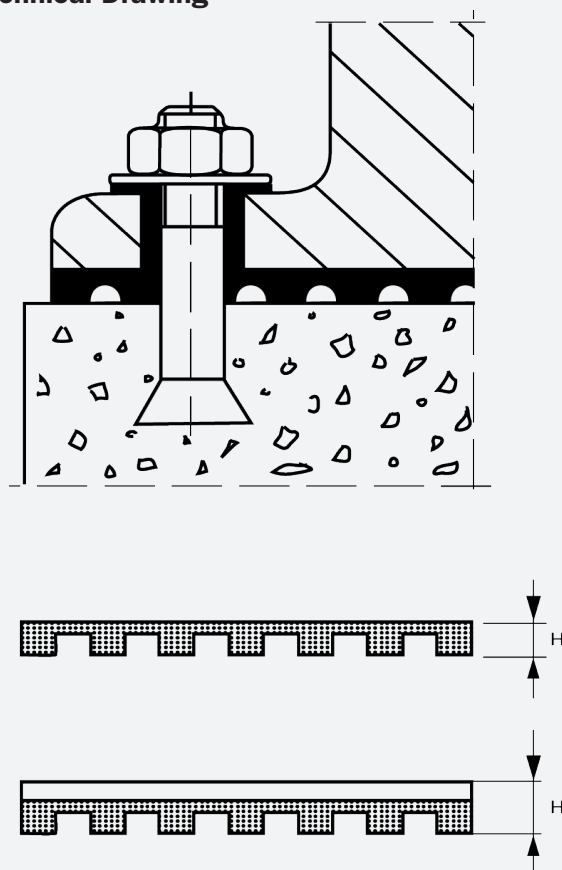
Good performance is obtained when using the Novibra AV Plate in the building and construction industry as support pads between flooring and joists. This application provides for cushioning of loads and isolation of high frequency vibrations within the building.

Typical Applications Include:

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



Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)		MAX LOAD (kg/cm ²)	WEIGHT (kg)
			L . B	H		
15-4039	10-00019	SINGLE PLATE	600-500	4.5	5	1.21
15-4038	10-00020	DOUBLE PLATE	600-500	8	5	1.82
15-4057	20-01798	AV DOUBLE PLATE	500-500	8	5	1.51
15-4080	20-01667	AV DOUBLE PLATE	500-500	10	5	1.89

RAEM Mounting

The RAEM is a universal mounting for applications demanding maximum vibration isolation. It is a further development of the RA mount, where EM stands for 'extra movement' and is suitable for both light and heavy machines.

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

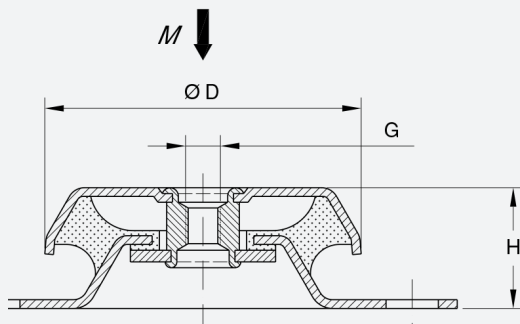
The Novibra RAEM is a high performance mount, with a number of advantages:

- RAEM offers nominally 70% extra deflection over standard RA mounts.
- Wide load rating options, 10-3400 kg.
- Corrosion protected to cope with arduous environments on land or marine applications.

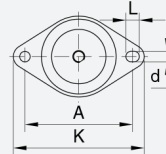


- Fitted as standard with a shock proof device with resilient stop, ideal for mobile marine use. The RAB mounts can accommodate occasional shock loads up to 5 g reference to the weight. The mount will withstand shock loads up to 2 g without plastic deformation
- Clear and durable product markings so the mount can be identified even after several years in operation
- Domed shape cover to protect against oil contamination

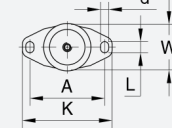
Technical Drawing



RAEM 40, RAEM 125
RAEM 800

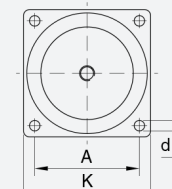
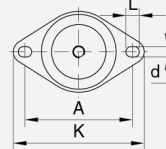


RAEM 60



RAEM 1500, RAEM 2500

RAEM 350



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)								MAX LOAD (kg)	WEIGHT (kg)
			D	A	H	K	d	L	G			
17-4023-1	10-00112	RAEM 40 40 IRH	64	88	35.5	110	9	12	M10	30	0.26	
17-4024-1	10-00123	RAEM 40 60 IRH	64	88	35.5	110	9	12	M10	60	0.26	
17-4025-1	10-00183	RAEM 60 40 IRH	63	100	35.5	120	11	15	M12	60	0.3	
17-4026-1	10-00184	RAEM 60 60 IRH	63	100	35.5	120	11	15	M12	120	0.3	
17-2336-1	10-00108	RAEM 125 40 IRH	84	110	35.5	135	11	15	M10	80	0.37	
17-2338-1	10-00109	RAEM 125 60 IRH	84	110	35.5	135	11	15	M10	180	0.37	
17-2336-2	10-00168	RAEM 125 40 IRH	84	110	35.5	135	11	15	M12	80	0.37	
17-2338-2	10-00169	RAEM 125 60 IRH	84	110	35.5	135	11	15	M12	180	0.37	
17-2341-1	10-00174	RAEM 350 40 IRH	110	140-148	42	175	14	18	M12	200	0.8	
17-2342-1	10-00175	RAEM 350 60 IRH	110	140-148	42	175	14	18	M12	400	0.8	
17-2341-2	10-00114	RAEM 350 40 IRH	110	148-148	42	175	14	18	M16	200	0.8	
17-2342-2	10-00115	RAEM 350 60 IRH	110	148-148	42	175	14	18	M16	400	0.8	
17-2347-2	10-00120	RAEM 800 40 IRH	155	182	54	216	14	18	M16	450	1.8	
17-2348-1	10-00121	RAEM 800 60 IRH	155	182	54	216	14	18	M16	800	1.8	
17-4020-1	10-00158	RAEM 1500 40 IRH	182	146	85	180	14	-	M20	900	3	
17-4018-1	10-00159	RAEM 1500 60 IRH	182	146	85	180	14	-	M20	1700	3	
17-4021-2	10-00160	RAEM 2500 40 IRH	224	80	105.5	220	17.5	-	M24	1700	4.6	
17-4022-1	10-00161	RAEM 2500 60 IRH	224	80	105.5	220	17.5	-	M24	3400	4.6	

SAW® Mounting

Novibra® elements type SAW are heavy duty mountings for static and shock loads in compression. The mounts provide high isolation in the horizontal shear direction.

Novibra® type SAW® mountings consist of a cylindrical shaped rubber section with integrally bonded interleaf metal plates, bonded between two square heavy duty outer metal fixing plates. Designed for large compressive forces with minimum deformation, while providing low shear stiffness rates.

The combination of a stable low installation height, high compressive strength and low shear stiffness makes Novibra® type SAW® a versatile high performance anti-vibration mounting. The 4 clearance holes in each fixing plate allow easy installation.

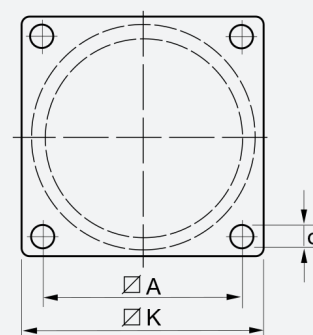
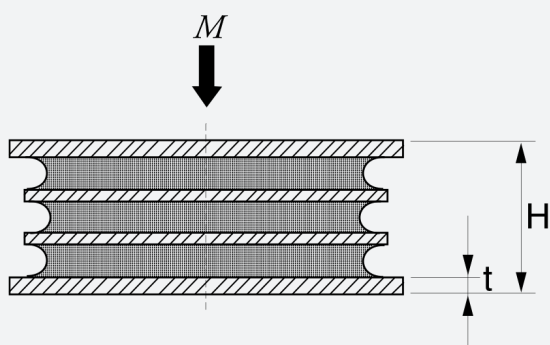
By connecting 2 SAW®- elements in a series, i.e. one on top of the other, an increased isolation efficiency is achieved in both shear and compression planes. Where larger deflections are required in the vertical plane, Novibra® type SAW® mountings are mounted at a calculated angle configuration to provide the optimum spring rate.



Typical Applications Include:

- Crushers
- Edge Runners
- Mills
- Hoppers and feeders
- Grinders
- Vibratory rollers
- Screens

Technical Drawing



Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)					MAX LOAD M (kg)	WEIGHT (kg)
			k	H	d	t			
17-4058	10-00141-01	SAW 125 40 IRH	118	148	52	13.5	5	2250	2.6
17-4058	10-00142-01	SAW 125 60 IRH	118	148	52	13.5	5	4500	2.6
17-4059	10-00143-01	SAW 150 40 IRH	136	166	63	13.5	6	3750	4.1
17-4059	10-00144-01	SAW 150 60 IRH	136	166	63	13.5	6	7500	4.1
17-4060	10-00075-01	SAW 200 40 IRH	184	220	82	17	8	6000	9.2
17-4060	10-00076-01	SAW 200 60 IRH	184	220	82	17	8	12000	9.2
17-4061	10-00077-01	SAW 300 40 IRH	270	310	120	22	10	15000	27
17-4061	10-00078-01	SAW 300 60 IRH	270	310	120	22	10	30000	27

UD Bush

Metalastik UD bush consists of two concentric sleeves with rubber securely bonded between them. Designed to accommodate torsional movements, axial and radial loads. The rubber is pre-stressed to give maximum dynamic strength and durability.

The bonded rubber takes up full movement. Therefore, lubrication or other bearing maintenance is not required. The bush has excellent sound and vibration isolation characteristics, enabling structures fitted with the sleeves to be silent and vibration free.

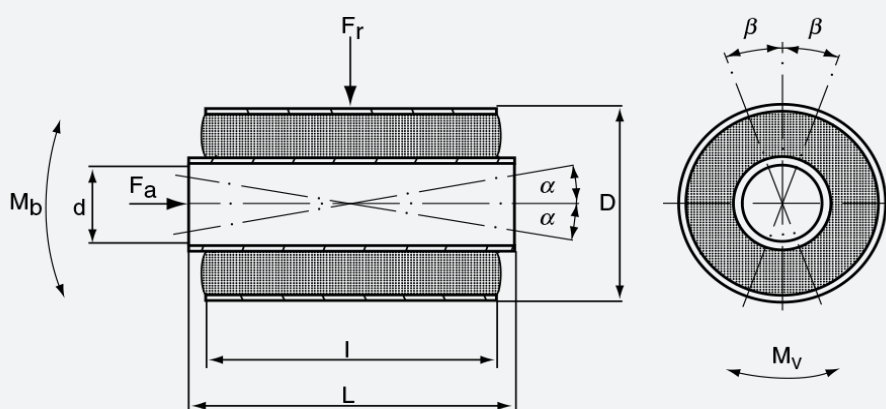
For vehicle suspension, pivot arms and all types of mechanical linkage, this mount permits oscillating movement through the deflection of rubber in shear. Suitable to replace roller bearings where small motions are required (up to 20 degrees). Reduces shock loads and noise transmission in structures.



Typical Applications Include:

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

Technical Drawing



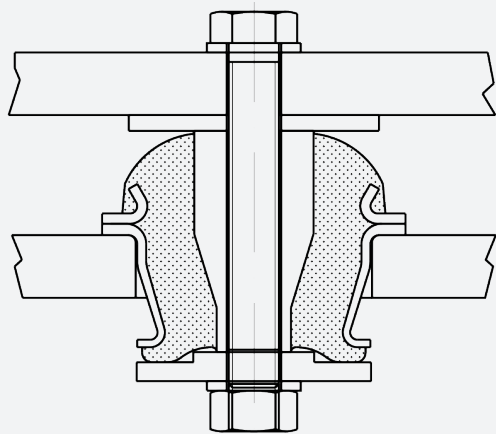
Product Data

DRAWING No.	PART No.	TYPE	DIMENSIONS (mm)				RADIAL		AXIAL		TORSION		WEIGHT (kg)
			d	D	l	L	STIFFNESS (N/mm)	MAX LOAD (N)	STIFFNESS (N/mm)	MAX DELF. (mm)	STIFFNESS (Nm/deg)	±β (degrees)	
13-1232	20-01612	60 IRH	8	20	15	17	2000	700	205	1.3	0.17	13	0.02
13-1230	10-00249	55 IRH	10	24	15	18	1360	500	170	1.7	0.24	13	0.02
13-1782	10-00277	60 IRH	12.7	38.2	25.4	31.8	788	1100	163	3.3	0.52	22	0.08
13-1657	10-00271	60 IRH	12.7	38.2	44.5	50.8	2100	2200	300	3.3	0.73	22	0.14
13-1004	10-00235	60 IRH	15.9	47.7	44.5	50.8	1981	2500	304	4.2	1.3	20	0.2
13-1698	10-00276	60 IRH	35	71.2	41.1	45	3800	4500	347	5.1	6.9	14	0.39
13-0785	10-00215	60 IRH	14.3	30.2	44.5	50.8	11000	6000	695	1.9	1.5	13	0.11
13-0797	10-00217	60 IRH	15.9	33.4	60.3	65	18800	9500	960	2.1	2.4	13	0.16

Installation Guidelines

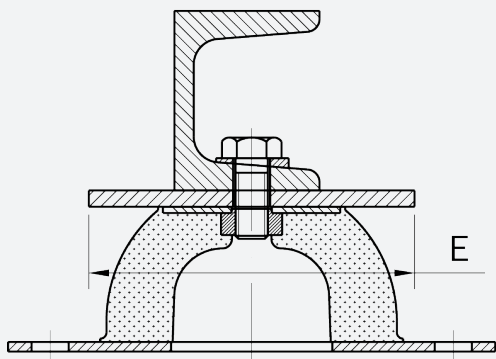
Metacone and HK

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



M Mounting

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.



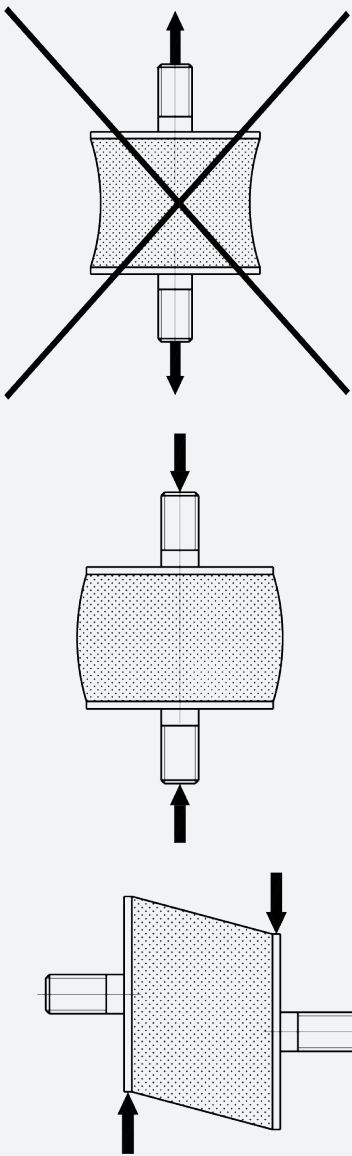
M MOUNTING	E (mm)
M7	43
M25	56
M50	76
M100	96
M200	101
M400	125
M600	165
M1500	260

Loading Directions

Do not install anti-vibration mountings in a way that causes the rubber to work in tension.

Compression and shear are the correct loading directions.

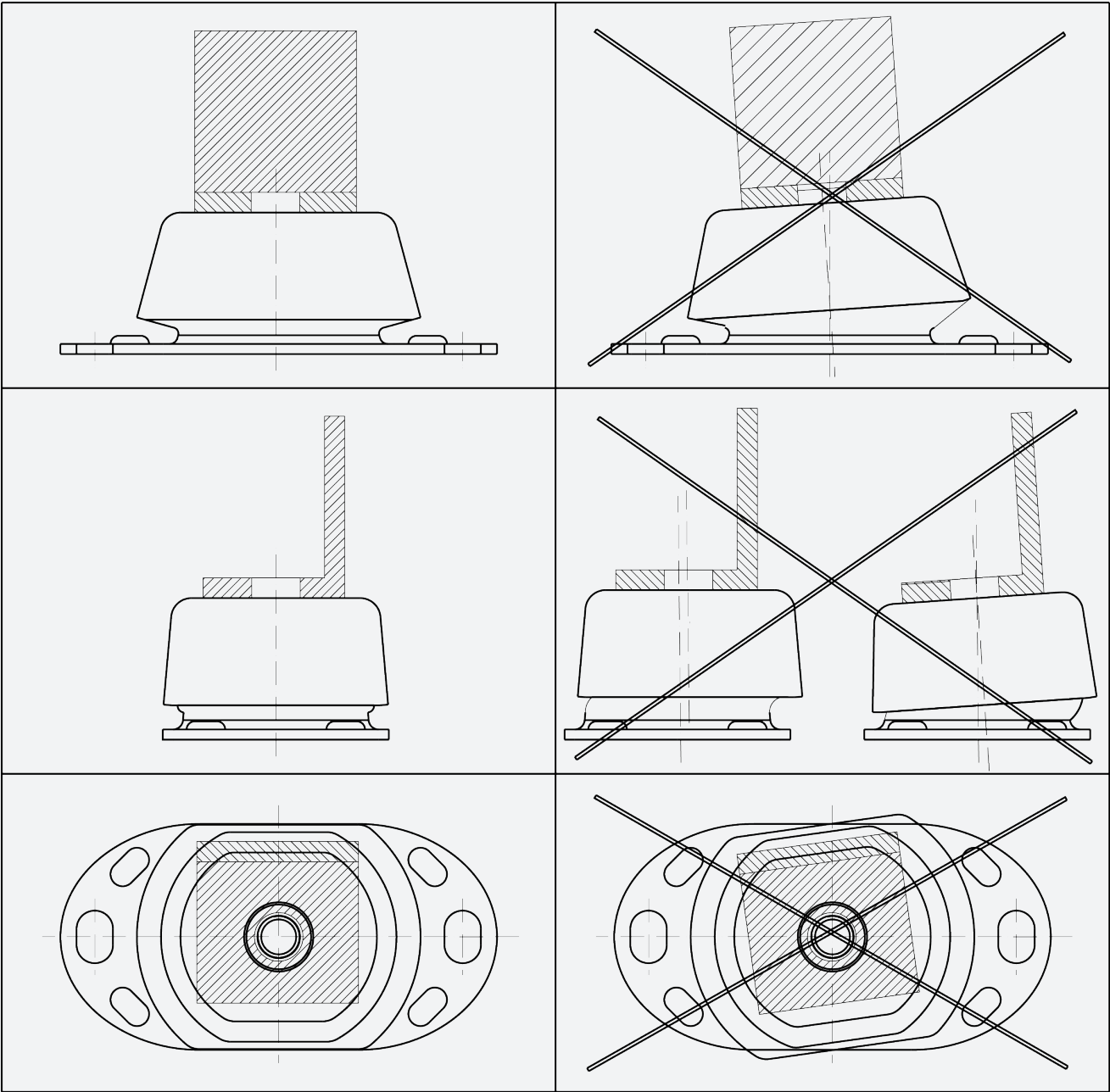
Take this into consideration for mounting types: Bobbins, M®, Two Bolt Instrumountings, Equi-Frequency, type SAW®, Rectangular SAW® and Circular SAW®.



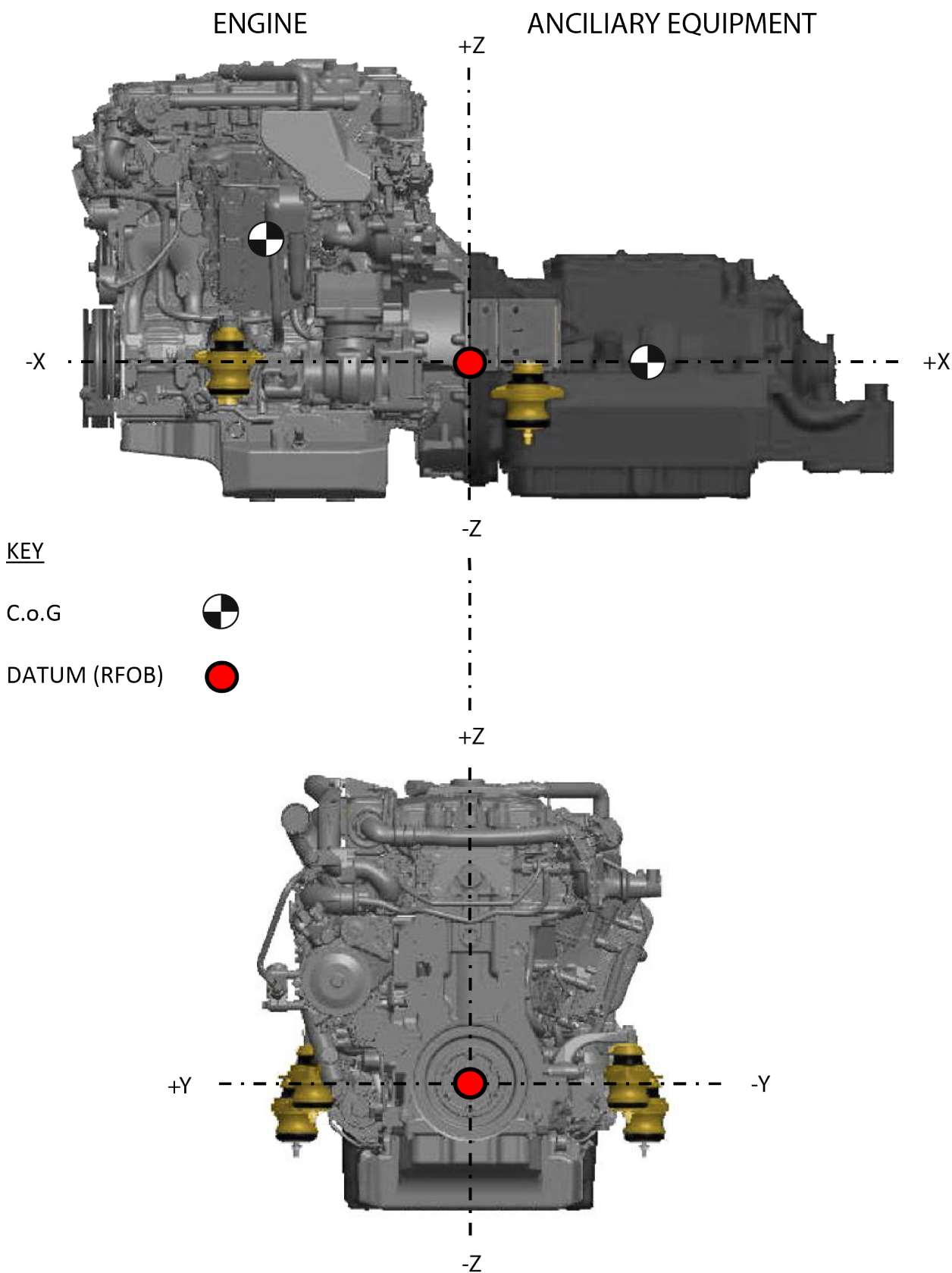
Alignment

Our mounts are designed to operate in compression and shear. Tensile loads should only be applied during shock / rebound conditions. Please ensure that (as illustrated below):

- During the initial installation the mounts are correctly loaded in accordance with the product rating, and that all interfaces above and below the mount are parallel within +/- 0.5mm to prevent incorrect loading. Shims may be required to achieve this standard.
- The upper and lower fixings remain correctly aligned after tightening fixing bolts.
- All fixing nuts and bolts have washers and are securely tightened.



Layout Example





Using advanced polymer technology, Trelleborg's industrial anti-vibration solutions (IAVS) operation specializes in the field of rubber-to-metal bonding for the removal of unwanted noise and vibration. Solutions include mountings, bearings and suspension. As part of the Trelleborg Industrial Solutions business area of Trelleborg Group, Trelleborg's Industrial AVS operation utilizes over 100 years of experience to provide solutions for numerous applications and environments, with a reputation of high quality, performance and service life. Markets include rail, marine, industrial and off-highway. The company focuses on isolation, attenuation and suspension solutions of unrivalled quality and reliability. The company's commitment and expert polymer technologies create maximum business value through improved longevity, productivity and cost effectiveness, while also optimizing comfort, health and safety. www.trelleborg.com/anti-vibration-solutions.

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