GENERAL CATALOGUE
INDUSTRY

HUTCHINSON®

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HUTCHINSON®

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YOUR NEEDS

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Protect the equipments and employees

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Improve fiability and lifetime

OUR OFFER

European distribution network

Standard range of products

Specific products

Industry catalogue

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YOUR NEEDS

Optimise comfort and security

Protect the equipments

Respect the current standards

Meet the new technical requirements

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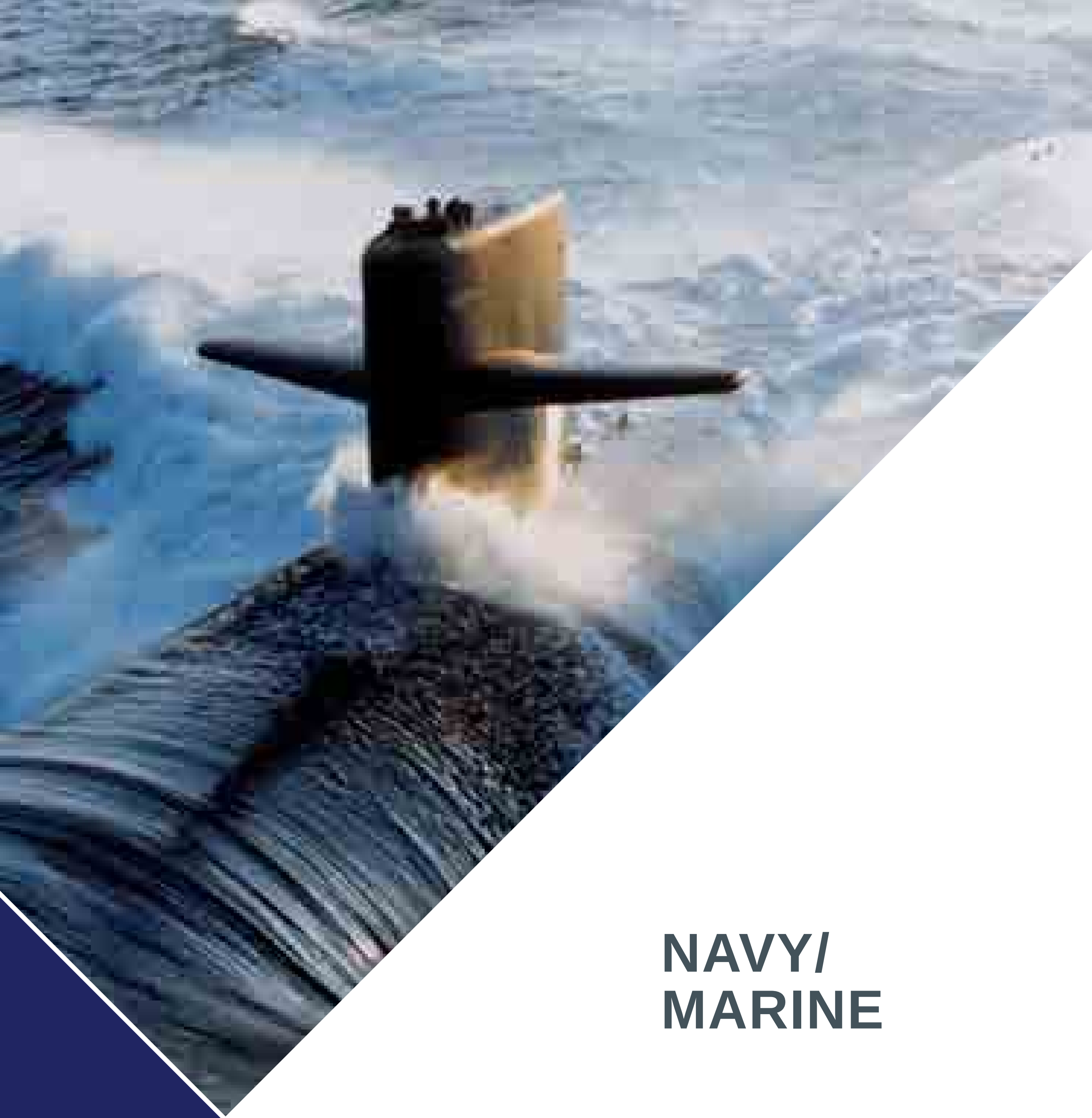
Wide range of suspensions

Wide choice of technologies



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Improve lifetime

Respect the applicable standards

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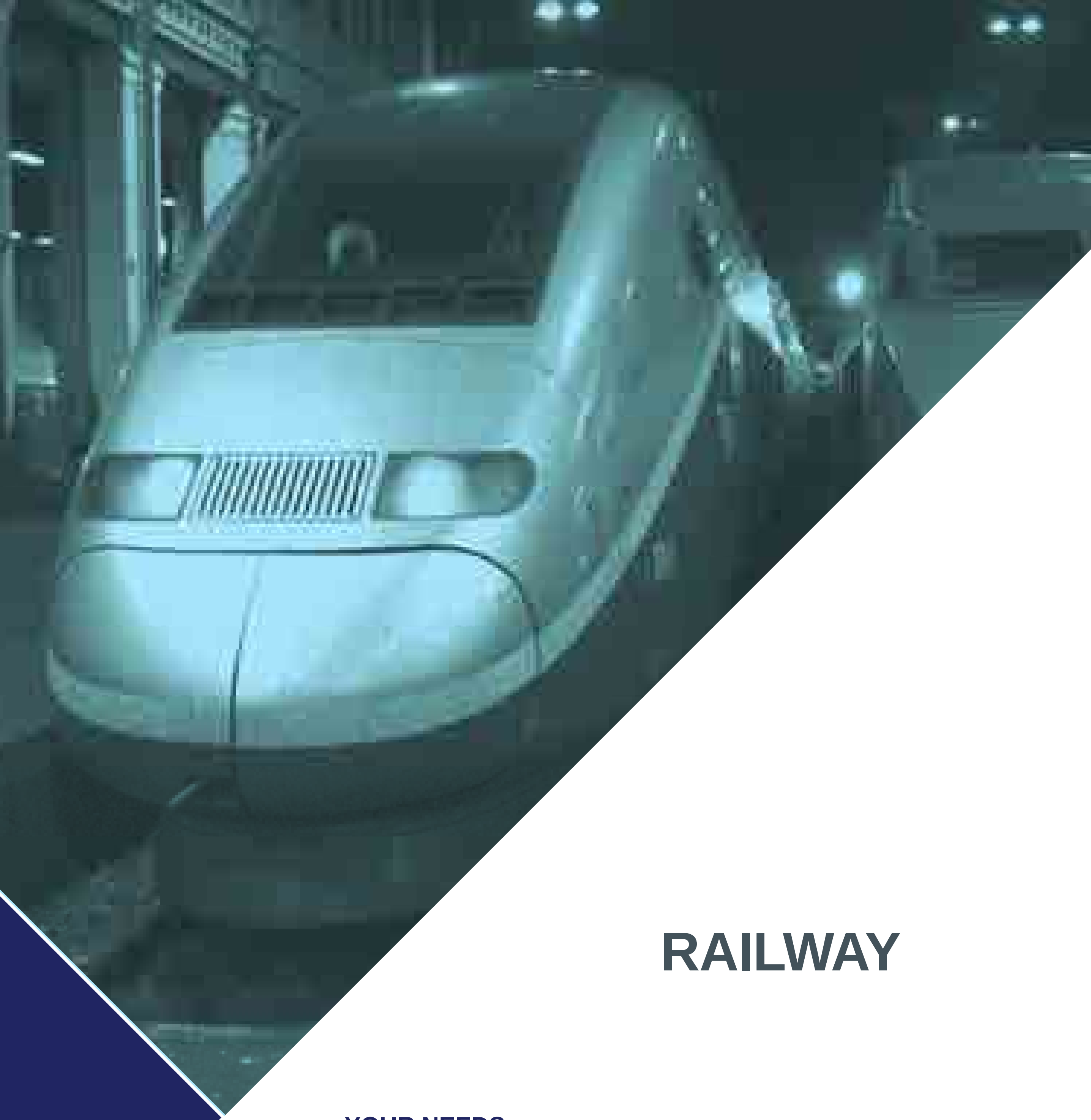

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Resist to large variations of temperature

OUR OFFER

Isolation and damping of structures solutions

Defrosting system

ELASTOMER MOUNTS

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A complete range bringing a technical solution to neutralize the noise transmission and vibrations, and ensure a protection against shocks.

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A range of steel mountings completing the elastomer range and allowing the hold over time of his characteristics even with critical environmental and temperature conditions.

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Power Transmission from 2,5 to 100 000 N.m allowing to absorb radial, axial and angular misalignment as well as couple irregularities.

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FLEXIBLE MOUNTS

HUTCHINSON®
PAULSTRA

FLEXIBLE MOUNTS

CONTENT

See current price list for availability of items.
We reserve the right to modify the design and manufacture of the products and materials described in this catalogue.
The pictures of the products are supplied for information only.

I - INTRODUCTION

The reduction of noise and vibration has become very important :

- the need to improve operating conditions makes it essential;
- the increasing mechanisation of industrial and domestic equipment and appliances make it necessary;
- the lightness and increasing complexity of equipment demand it.

The following pages are dedicated to protection against vibration and shock. They offer design engineers the means to resolve isolation problems using elastomer alone or elastomer bonded to metal supports.

The first few pages start, therefore, with a summary of definitions and an explanation of the terminology used as well as the principal formula on which suspension calculations are based. The design of a flexible mounting system is a major undertaking and is the subject of a special section which gives the principles used to select a mounting system according to its size, characteristics, type and applications.

Warning : solving flexible mounting system problems very often requires the services of a specialist and we advise, very strongly, that if a simple solution cannot be found, then our technical services should be consulted.

II - DEFINITIONS

II.1 - Flexible mounts

II.1.1 - PROPERTIES

Flexible mounts are components which exhibit both flexibility and damping, at the same time and to varying degrees.

- **Flexibility**

- Flexibility is the ability of the mount to deform and recover, with an amplitude approximately proportional to the load.

- **Damping**

Damping is a braking force the most important effect of which is the reduction of oscillations.
There are essentially two types of damping :
- constant friction (dry friction) which, for a given setting, provides a constant braking force independent of the movement. For there to be movement, it is, therefore, necessary to apply a force at least as great as the frictional force;
- viscous damping (such as that provided by hydraulic dampers) which provides a braking force proportional to the instantaneous velocity of the suspended part relative to the fixed part. Viscous damping is, therefore, essentially dynamic: it does not affect the position of static equilibrium.

II.1.2 - ENVIRONMENTAL CONDITIONS

Most of the standard mounts are made of natural rubber which has been chosen because of its good dynamic properties. Under normal operating conditions, these rubber compounds guarantee stability over long periods and, in particular, limited creep.
The following operating conditions are considered abnormal :
- temperatures greater than 70°C;
- prolonged contact with corrosive liquids;
- prolonged contact with acids or alkalis;
- aggresive environment (oils, fuels);
- corrosive gases (ozone, chlorine...).

Using a mount unintentionally under such conditions can lead to premature ageing, degradation or even destruction of the rubber. An abnormally agressive environment can, in particular, increase the deformation of the mounting (creep).

PAULSTRA flexible mounts may be made using various special compounds that are highly resistant and able to withstand the abnormal conditions described above.
Our technical services are at your disposal to reply to any queries about the properties of particular compounds.

II.1.3 - ELASTOMERIC FLEXIBLE MOUNTS

Mounts using natural or synthetic elastomers always provide a combination of pure elasticity and viscous damping. Although commonly used, the term “shock absorbers” is completely incorrect. The two characteristics, flexibility and damping, are, in fact, essentially different : a rubber mounting may be compared to a car suspension where the two functions are provided by different components working in parallel :
- true elastic suspension provided by springs;
- damping provided by hydraulic damping (shock absorbers).

A flexible mounting using rubber = a spring + a damper.

II.1.4 - CHARACTERISTICS OF ELASTOMERIC FLEXIBLE MOUNTS

- **Elastic properties**

These are the parameters which define the ability of the mounting to be deformed in various directions.

- **The linear stiffness** K_x, along the axis G_x is the ratio of the force to the corresponding displacement along this axis. The linear stiffness is expressed by daN/mm.
The linear stiffness (K_y, K_z) for the other axes (G_y, G_z)are defined in the same way.
- **The torsional stiffness** (C_x, C_y, C_z) about the three axes (G_x, G_y, G_z) is the ratio of the torque to the angular displacement about the axis.

The tortional stiffness is expressed in m.daN/rad.

These six parameters, which are not independent of each other for a given mount (the interdependence changes with the shape and structure of the mounting), are proportional to the Young's modulus of the elastomer used in the mounting.
Using these six values, it is possible to calculate the stiffness along or about any arbitrary axis.

- **Damping properties**

The most useful parameter is the "intrinsic damping factor" of the elastomer used. This will be defined for a suspension (§ II.2.2). The intrinsic damping factor of a mount is the same as that of the suspension.

II.2 - Flexible mounting systems

A machine is suspended elastically by placing flexible mounts between the machine and its seatings (floor, slab, chassis, etc.). The type of mount, its number, distribution, positioning and individual characteristics, depend on the overall characteristics required by the suspension to give the desired result.
The most common problems are those where vibration determines the essential characteristics of the suspension. It is necessary, therefore, to start with a presentation of the terminology and a review of the most important definitions and principles.

II.2.1 - VIBRATION THEORY CONCEPTS

A machine, suspended elastically, vibrates when it is subject to periodic alternate influences which produce oscillations of greater or lesser amplitude.
There are two main modes of vibration :

- natural or free vibration, which is the vibration of the machine that occurs when it is released after having been displaced from its position of equilibrium;
- forced vibration, which is imposed on the machine, either by its own operation, or by influences from its surrounding.

- **Degrees of freedom**

The number of degrees of freedom is the number of independent parameters which determine the position of the machine at any given time. Degrees of freedom of movement :

  - linear movement parallel to a given axis (the independent parameter is the displacement along the axis),
  - rotation about a given axis (the independent parameter is the angle of rotation about the axis).

- **Vibrations with only one degree of freedom**

The following discussion applies to vibrations with only one degree of freedom : a linear vibration parallel to a fixed axis.

- **Periodic vibration**

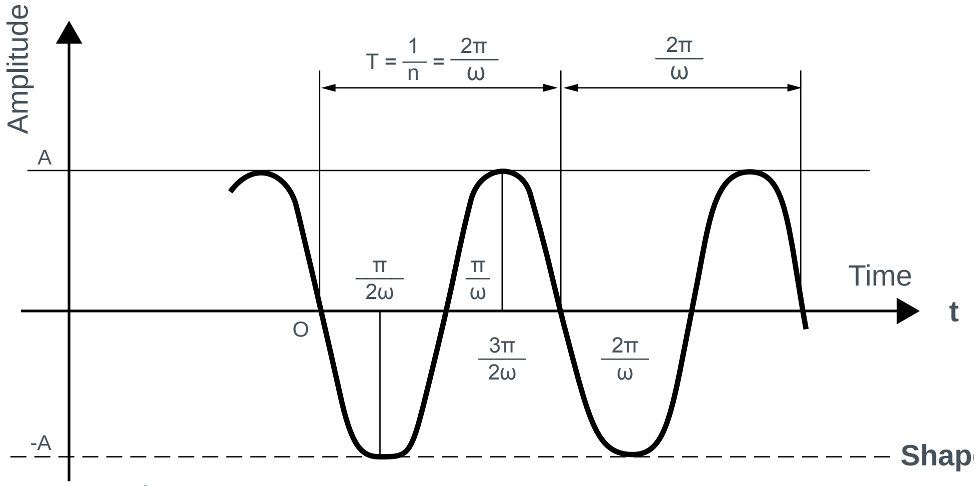
- Frequency : number of complete cycles in a unit of time.
N = number of cycles per minute.
n = number of cycles per second (Hertz).
- Period : duration of one cycle.

$$T = \frac{1}{n} \text{ in second.}$$

- Pulsation : $\omega = 2\pi\, n = \dfrac{2\pi}{T}$ in radians per second

- Maximum amplitude : The maximum offset from the equilibrium position for each cycle. For a forced vibration under constant conditions, the amplitude remains constant.

- Sinusoidal vibration $x = A \sin \omega t$ (shape 1)



Shape 1

- Frequency $n = \dfrac{1}{T} = \dfrac{\omega}{2\pi}$

- Amplitude A
- Maximum velocity $V = A\omega$
- Maximum acceleration $\Gamma = - A\omega^2$

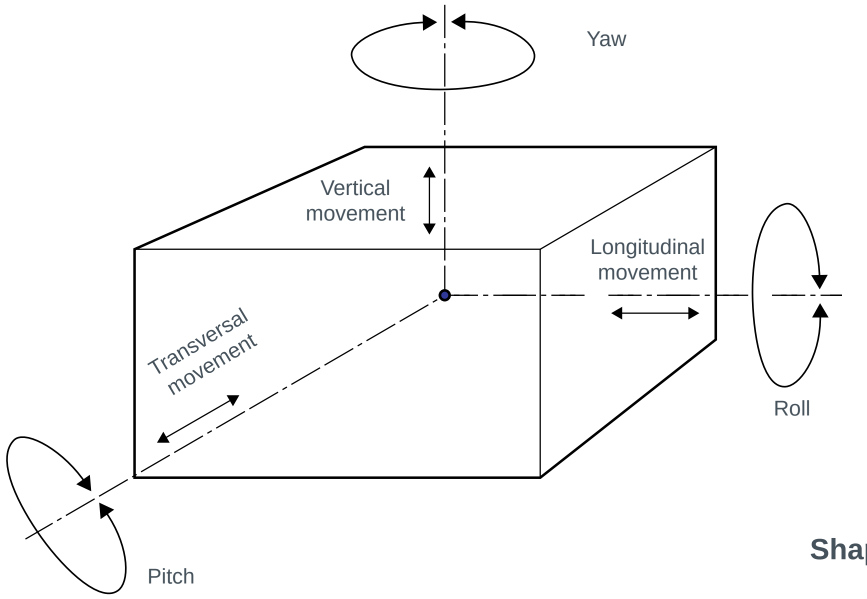
- Instantaneous amplitude $x = A \sin\omega t$
- Instantaneous velocity $v = A\omega \cos\omega t$
- Instantaneous acceleration $\Upsilon = - A\omega^2 \sin\omega t$

High frequency vibrations (high ω) may, therefore, produce very high accelerations even at low amplitudes.

II.2.2 - CHARACTERISTICS OF FLEXIBLE MOUNTING SYSTEMS

- **Elastic properties**

These are the parameters which define the freedom of a machine to move with respect to its seating. The movements are, usually, referred to an axis system (G_x, G_y, G_z).
In the example in shape 2 :
- the origin of the axis system is at the equilibrium position of the machine's centre of gravity;
- the axes are parallel to the axes of symetry of the machine.



Shape 2

As for mounts, the stiffness of a suspension is defined for displacements with only one degree of freedom relative to a fixed set of axes.

- Linear stiffness :
K_x along G_x = longitudinal movement.
K_y along G_y = transverse movement.
K_z along G_z = vertical movement.
For each axis, the linear stiffness is the sum of the linear stiffness of all the mounts.

$K_x = \Sigma K_x$ $\qquad$ $K_y = \Sigma K_y$ $\qquad$ $K_z = \Sigma K_z$

- Torsional stiffness :
C_x about G_x = roll.
C_y about G_y = pitch.
C_z about G_z = yaw.

The torsional stiffness of the suspension depends on :
- the individual stiffness of the mounts;
- the position and orientation of the mounts with respect to the centre of gravity G of the machine.

- **Damping properties**

Elastomers exhibit viscous damping, the braking force applied to an elastic suspension is R x V, where : R is the resistance, V is the relative velocity of the suspended machine at time t.

If, starting with an undamped suspension, the damping is progressively increased (with all other factors remaining constant) the amplitude of the free oscillations, starting from a given initial offset, die away more and more quickly.
The value of damping for which the return to the equilibrium position is asymptotic (without oscillation) is called the “critical damping” and is denoted by a resistance R_c.
The damping factor ε is defined for a resistance R :

$$\varepsilon = \frac{R}{Rc} \text{ (}\varepsilon = 1 \text{ for critical damping).}$$

When suspension is subjected to forced vibrations at a frequency ω, it has been shown that, for natural elastomers, the product εωremains reasonably constant. This is equally true at the resonant frequency (see below).

$\varepsilon\, \omega = \varepsilon_o\, \omega_o$ constant (ω_o is the resonant frequency).
ε_o being the damping factor at the resonance frequency.

It can be shown that ε_o is an intrinsic property of the elastomer used.

ε_o = intrinsic damping factor.
ε_o of a suspension = ε_o of each mounting (if all mountings use the same elastomer).

- **Electrical characteristics**

Elastomers have an electrical resistance which varies according to their composition, hardness.
As a guide, the following values have been measured for our standard elastomers.

Natural Rubber	hardness 45	10^{13}	Ohm x cm² /cm
	hardness 60	10^{6}	Ohm x cm²/cm
	hardness 75	10^{4}	Ohm x cm²/cm

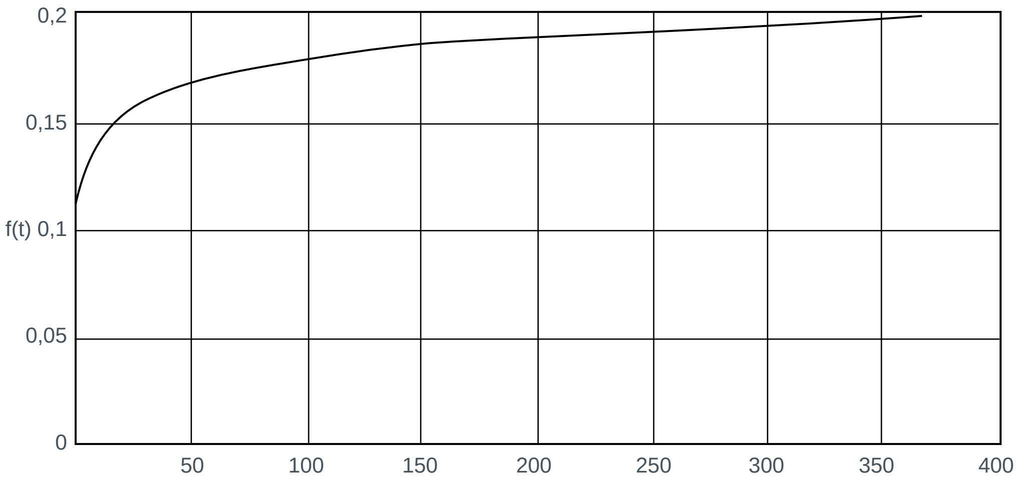
We have also developed special elastomers which can have a dielectric strength greater than 2,000 Volts for 1 minute.

• Creep characteristics

The following formula, which is derived from measurements on samples, gives an estimate of the creep for a load which compresses a Radiaflex mount by 10% of its height at a temperature of 30°C. The creep for an actual mounting also depends equally on its shape.

Static deflection at time t = initial static deflection x (1 + C_m x f(t))
where f(t) is the value of the creep from the graph below:

Creep f(t) in compression relative to the initial static deflection.



t (time in days)

and C_m is a correction coefficient taken from the table below according to the sample material :

Material	Hardness 45	Hardness 60	Hardness 75
Standard natural rubber	1.0	1,6	1,7
Polychloroprene	1,1	1,6	1,6

Note

These values are given as a guide only. Consult us for use under other conditions (temperature, complex profiles or other elastomers).

Mounting

For applications where alignment is important, to overcome the problems of initial creep of the elastomer mounts, adjustment to align the axes of shafts should be made at least two days after the machine has been mounted.

III - FUNCTION OF A FLEXIBLE MOUNTING SYSTEM

III.1 - Static function

An elastic suspension allows the static load to be more evenly distributed.
If a machine rests on more than three points using “rigid” mountings, it is impossible to predict the load on each mounting point and the machine could be unevenly stressed.

With elastic mounts having a known stiffness, it is possible to determine (by calculation, or direct measurement) the deflection in each mounting and thus deduce the loading and correct any imbalance.

An elastic suspension accomodates minor differences in the distance between mounts. However many mountings there are, in order to avoid excessive local stresses, a rigid assembly requires very close tolerances on the distance between mountings and of the mating surfaces of the machine and its seatings.

To avoid prohibitively close manufacturing tolerances, “play” is allowed in the mount which gives rise to the well known problems of wear and noise due to loose fixings.

Flexible mounts allow larger manufacturing tolerances without large variation in forces.

An elastic suspension can also absorb small movements due to, for example, the expansion or the deformation of chassis, bodyshells, girders, etc.

III.2 - Dynamic function

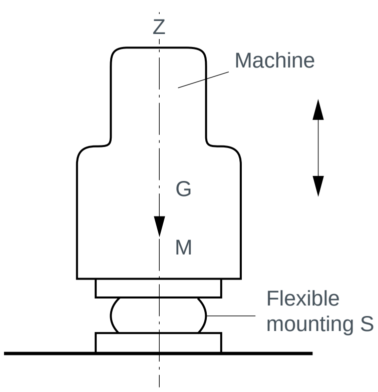
This is the primary function of elastic suspensions where there is vibration or shock. The calculations presented here assume that the linear stiffness of the mounts remains constant. This is true for elastomeric mountings in normal conditions of use (mechanical vibration, normal temperature).

III.2.1 - VIBRATIONS WITH ONLY ONE DEGREE OF FREEDOM

The action of a flexible mounting system is very complex. To present the principles, we will study a simple idealised case (shape 3).

Taking the case of a machine of mass M constrained so that it can only move in a direction parallel to the vertical axis Gz.

It is attached to its seatings by a flexible mount S with a stiffness K along the axis Gz.



Shape 3

- **Free oscillation (natural frequency)**

a) Undamped (entirely theorical)
The machine having been displaced from its position of equilibrium by a distance A oscillates sinusoidally.
The equation of motion is : $z = A \sin \omega_o t$

The natural pulsation is $\omega_o = \sqrt{\frac{K}{M}}$ Proper frequency $F_0 = \frac{\omega_o}{2\pi}$

The oscillation continues indefinitely with an amplitude A (as shown in shape 1 with ω replaced by ω_o).

b) Damped
In this case, the machine oscillates about its position of equilibrium with a damped sinusoidal motion (see shape 4). The equation of motion is :
$z = A.e^{-\varepsilon'_o \omega'_o t}.\sin \omega'_o t$

The natural pulsation is :

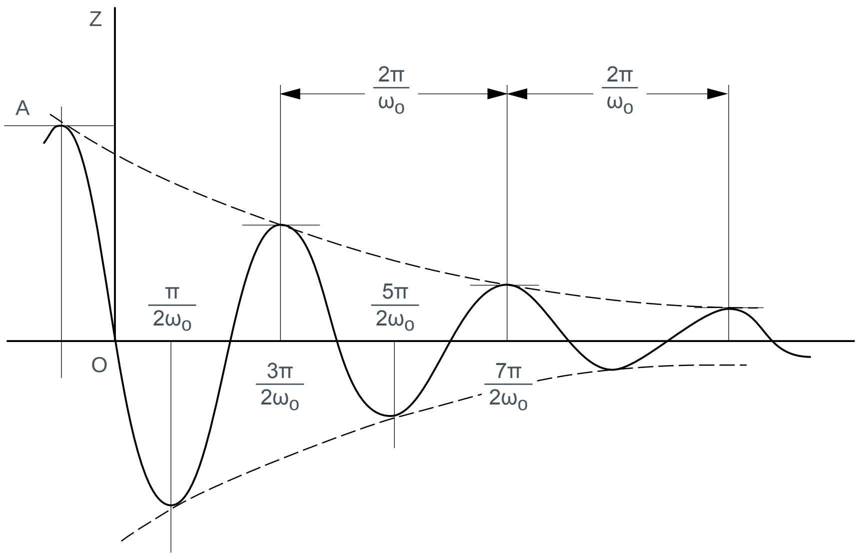
$$\omega_o = \sqrt{\frac{K}{M}(1 - \varepsilon'^2_o)} = \omega_o\sqrt{1 - \varepsilon'^2_o}$$

ε'_o is the damping factor at the frequency ω'_o.

As ε'_o is very close to ε_o, the natural frequency may, therefore, be written as :

$$\omega'_o \approx \omega_o\sqrt{1 - \varepsilon^2_o}$$

For natural rubber, ε_o is small by comparison with 1 (from 0.02 to 0.1).
ω'_o is, therefore, very close to ω_o.



Shape 4

- **Forced vibration**

If the machine is now subject to forced vertical vibration induced by a sinusoidal force of frequency ω.
The inducing force is F = FM sin ωt.

- For a rigid suspension : the inducing force is transmitted directly to the structure the machine is mounted on.

- For an elastic suspension with a natural frequency ωo or proper frequency $F_0 = \frac{\omega_o}{2\pi}$ and damping factor ε_o :

When the inducing force is applied, an oscillation is induced at the natural frequency ωo which dies away rapidly so that, after a short period, only the steady state forced vibration at frequency ω remains which transmits a sinusoidal force to the surrounding structure.
The force transmitted is: F' = F'M sin ωt.
A transmission coefficient λ is defined as the ratio between the amplitude of the force transmitted F'M to the amplitude of the inducing force FM (or, if preferred, the force that would be transmitted if the suspension was not elastic).
For a mounting system using elastomeric mounts, this coefficient is :

$$\lambda = \frac{F'M}{FM} = \sqrt{\frac{1 + 4\varepsilon_0^2}{\left(1 - \frac{\omega^2}{\omega_o^2}\right)^2 + 4\varepsilon_0^2}}$$

To summerize :

	Inducing force	Transmitted force	Transmission coefficient
Rigid system	F = FM sin ωt	F = FM sin ωt	λ = 1
Flexible system (ωo, εo)	F = FM sin ωt	F' = F'M sin ωt	$\lambda = \frac{F'M}{FM} = \sqrt{\frac{1 + 4\varepsilon_0^2}{\left(1 - \frac{\omega^2}{\omega_o^2}\right)^2 + 4\varepsilon_0^2}}$

The variations of the transmission, coefficient λ, as a function of $\frac{\omega}{\omega_o}$ for various values of ε_0 are shown in shape 5 (page 12).

Attenuation

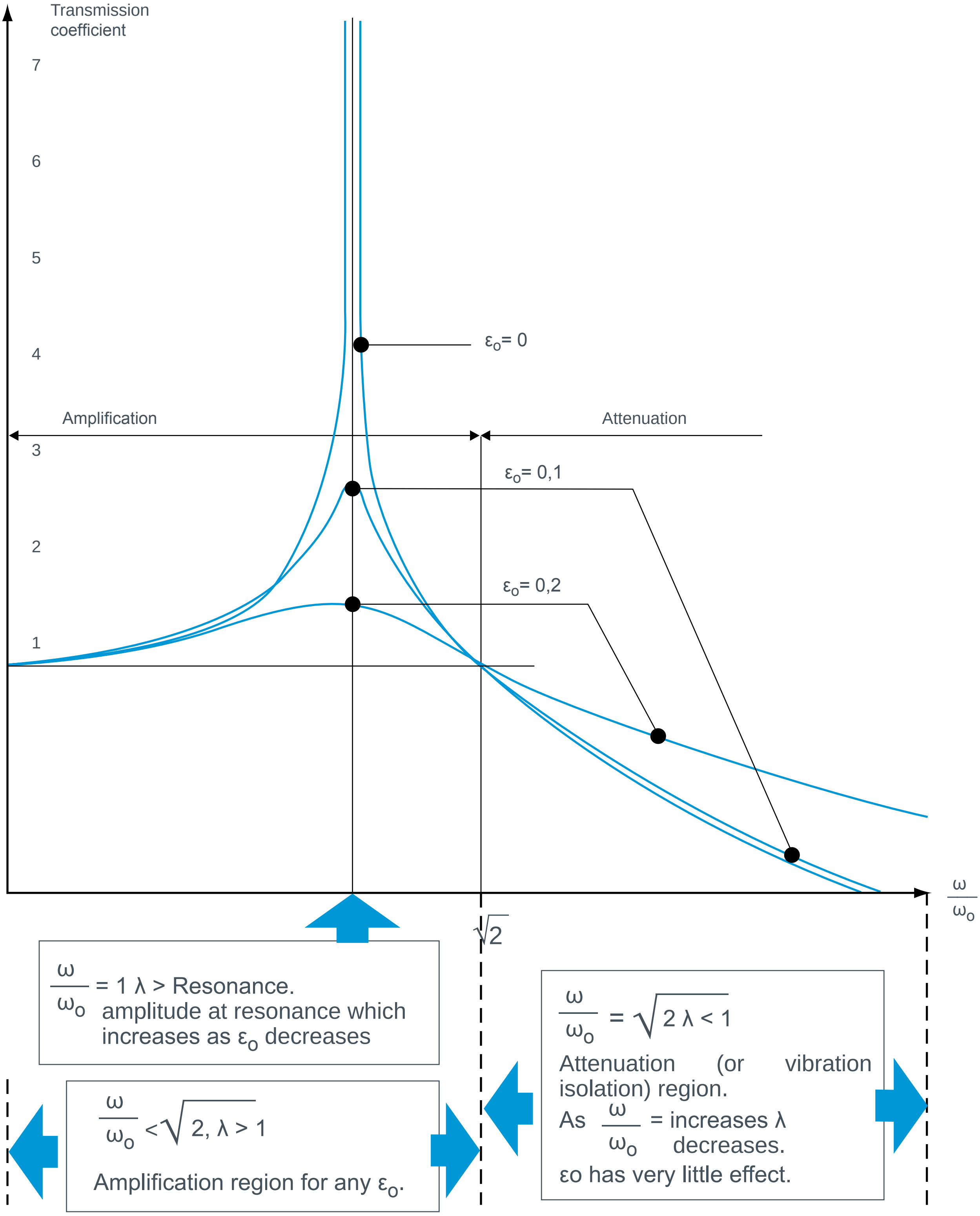
For rubber mountings, the term $4\,\varepsilon_0^2$ is much smaller than 1. The attenuation in % is 1 - λ :

$$E\,\% = 100\,\frac{\left(\frac{\omega}{\omega_o}\right)^2 - 2}{\left(\frac{\omega}{\omega_o}\right)^2 - 1} \quad \text{ou} \quad 100\left(1 - \frac{1}{\left(\frac{\omega}{\omega_o}\right)^2 - 1}\right)$$

For a given induced frequency ω the attenuation depends on the natural frequency of the suspension.

For a particular direction, the relationship between the natural frequency, the suspension's sub-tangent and the induced frequency are plotted on the chart shape 6.

For a particular induced frequency (for example 1500 rpm) it is possible to find the sub-tangent which will provide an acceptable attenuation. In general, an attenuation greater than 50% is required. For this example, the chart indicates that an attenuation of 80% will be achieved for a natural frequency of 10 Hz (see section IV.3.1).



Shape 5

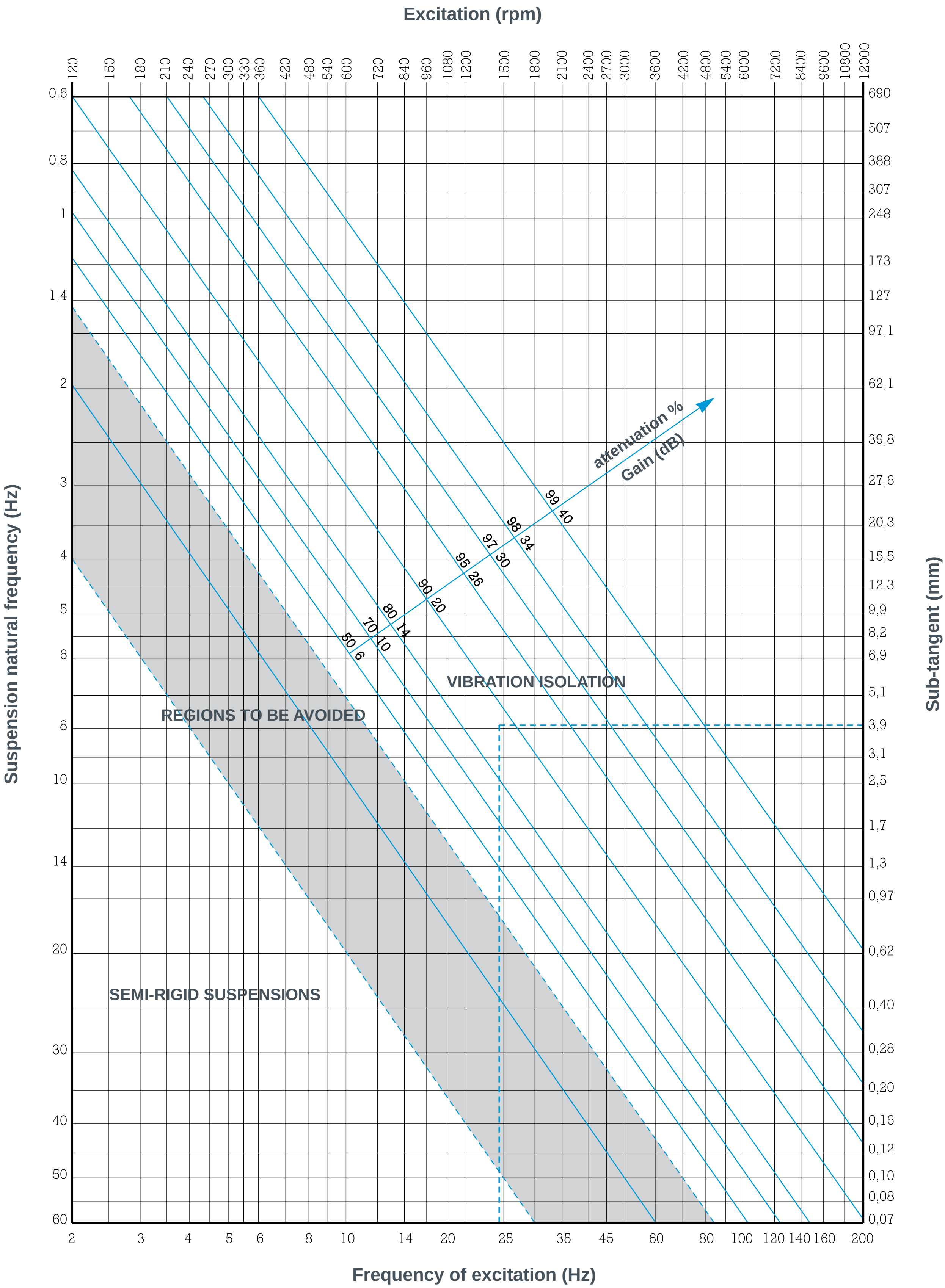
An efficient mounting system use :

a high value of $\frac{\omega}{\omega_o}$ ⟶ low values ωo ⟶ low values λ

a moderate εo ⟶ - limited amplification in the resonant region.
- minor effect in the attenuation region.

ABAQUE

Attenuation as a function of natural frequency and frequency of excitation. (A theorical graph for a mounting system without damping)



Shape 6

- **Practical considerations**

a - Variable speed machines

In practice, there may not be a single, well defined value for ω, as machines may have a variable speed (variable ω).
In these cases, the vibration isolation should be determined for the lowest speed.

b - Passing through resonance

All machines must start and stop.
Starting from rest to reach the speed ω (in the vibration isolation region), it is necessary to pass through the resonant region.
It is neccesary to ensure :
- that the passage through resonance is as quick as possible;
- that the suspension is sufficiently well damped so that the maximum force transmitted presents no risk for the machine, the suspension or the seating.

c - Elastomeric suspensions

For the elastomers currently used in flexible mounting systems, the intrinsic damping factor ε_0 lies between 0.02 and 0.1 (it can be as high as 0.2 with synthetics such as butyl rubber).
In the vibration isolation region, the formula for the transmission coefficient is simplified as, for the values of ε_0 for natural rubber, the term $4\varepsilon_0^2$ is negligible by comparison with 1.

$$\lambda = \frac{1}{\frac{\omega^2}{\omega_0^2} - 1}$$ For ε_0 between 0.02 and 0.1

At resonance $\lambda r = \frac{1}{2\,\varepsilon_0}$ $\qquad \lambda = \frac{1}{2\,\varepsilon}$

For natural rubber, therefore, the amplification at resonance is between :

$$\frac{1}{2 \times 0{,}1} = 5 \quad \text{and} \quad \frac{1}{2 \times 0{,}02} = 25$$

a) Noise and vibration

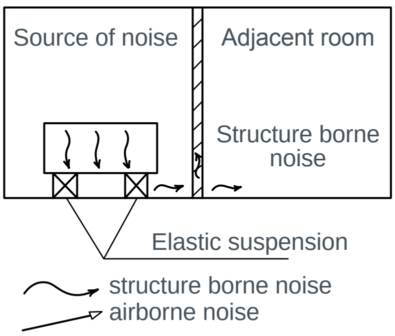
Noise is a random vibration. It is formed by the combination of a number of uncorrelated fundamental frequencies. Noise gives rise to **sound**.
Airbone noise is usually treated separately from structure borne noise.
Sound is associated with the disturbance of a medium (solid, liquid or gaseous). This disturbance is in the form of a vibration of the molecules of the medium about their position of equilibrium.

b) Improving acoustics

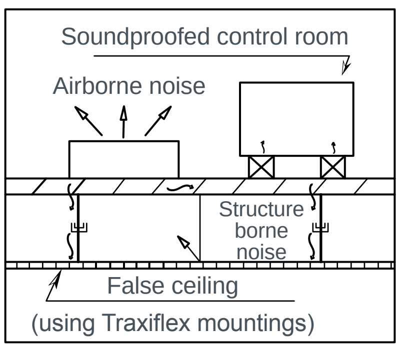
An elastic suspension affects only structure borne noise.

This is a vibration of the building structure and a flexible mounting system breaks the transmission close to the source. The resilience of the attachment reduces the forces transmitted to the base and its vibrational energy.

Transmission from one room to another



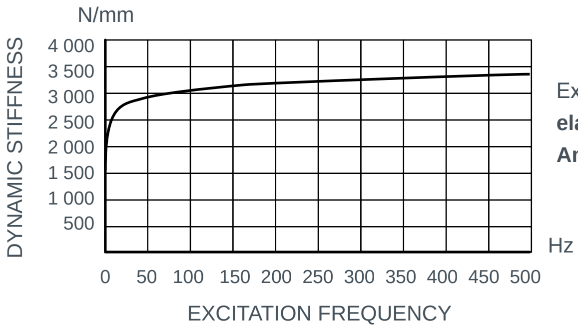
Example : Workshop with guillotine (shock and noise)



As the radiation efficiency is unchanged, the improvement in terms of radiated power (acoustic) is the same as the improvement in terms of the force transmitted. The curve giving the vibrational attenuation in % may be translated into decibels.

Attenuation in dB is : $20 \log \frac{100}{100 - E}$ where E is the attenuation in % (structure borne, not airborne noise).

The suspension of the machinery allows the **adjacent room** to be sound insulated and to be made more quiet. The rigidity of the base supporting the suspended mass must always be taken into account. As a rule, it is considered that unless the mountings are ten times more flexible than the base the choice of suspension must be re-considered.
PAULSTRA mountings may be caracterised at high frequencies.



Example of measurements made on a special Radiaflex mounting.
elastomer: polychloroprene hardness 47.
Amplitude ± 0.01 mm about the position under static load

III.2.3 - SHOCK

- **The nature of shock**

For a given period, the equipment is subjected to a brief, impulsory excitation. It is the most severe type of excitation that it may encounter during its lifetime.
During the period that the excitation is applied, the speed of the equipment will vary : it is subject to acceleration and, therefore, to a force.
A system that reacts slowly will not be subject to the same shock as a system that reacts quickly. It is necessary to compare the length of period that the stimulus is applied, against the natural frequency of the equipment.

- **Types of shock**

In practice, there are two types of problems.

- the equipment is subjected to shocks which are well defined by experiments, but are very complex and not reproducible under laboratory conditions. It is, therefore, necessary to define an equivalent shock;
- the equipment must resist shocks which are arbitrarily defined (e.g. meeting standards). A shock is defined by an excitation which varies with time: the acceleration, the speed or the displacement of the point where the excitation is applied. In some cases, it is better to define the shock as the energy transferred to the equipment (e.g. vehicle impact).

- **Protection against shock**

There are two principal cases to be considered :
a) Limitation of the force transmitted to the equipment :
This case often appears in the following form : the equipment, moving at a known speed meets an obstacle. The force that it can withstand without damage is limited to a known value.
A system of rubber parts, which could be the flexible mounting system of the equipment, is placed between the equipment and the obstacle.
These parts provide a constant stiffness Kz in the direction of the shock. If there is energy W to be absorbed in the absence of damping:

$W = \frac{1}{2} K_z Z^2$ The maximum force $F_M = K_z Z = \frac{2w}{Z}$ The maximum force is inversely proportional to the travel.

The travel $Z = \sqrt{\frac{2W}{K_z}}$. The travel is inversely proportional to the square root of the stiffness.

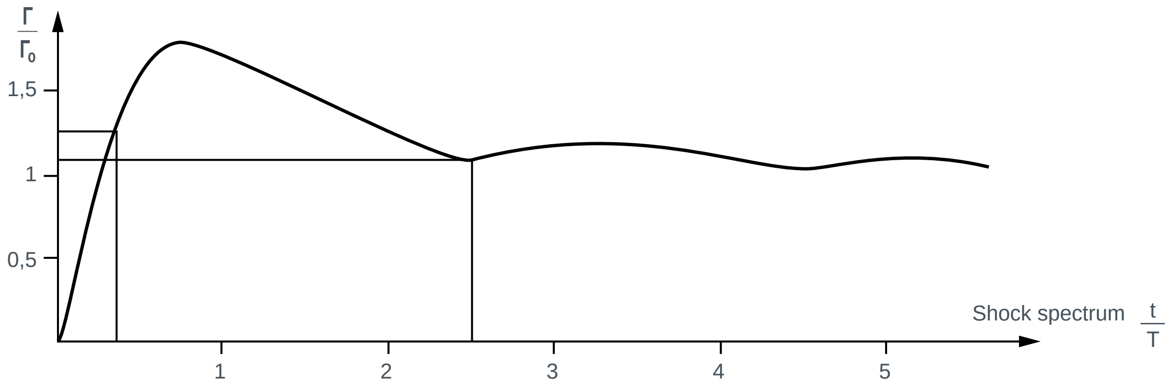
Remarque : some systems do not have a constant stiffness, but a stiffness which increases rapidly (e.g. compression systems). It is clear that if the energy W is not absorbed before the stiffness increases, the maximum force will be much higher than predicted by this formula.

b) Limiting the acceleration of particular parts of the equipment
In this case the shock must be described in terms of its potential to destroy. The efficiency of the protection system is measured by its ability to reduce this potential. A shock to the equipment can damage a component part if this part is induced to vibrate at an amplitude which is incompatible with its mechanical characteristics thus causing it to break.

A shock can be characterised by its action on a whole series of components.
For the same shock, each component has its own specific response, which differs from one component to the next.
The shock spectrum is the graphical representation of the ratio of amplitude of vibration (Γ) of the components to the amplitude of the shock (Γ_0) as function of the ratio of the duration of the shock τ to the natural frequency T of the elements.
This is not a representation of the amplitude as a function of time, neither of the excitation nor of the effect, but a convenient representation of the destructive power of a shock.
The representation is not reversible :

- it is not possible to recover the form of the shock from the spectrum;
- two different shocks may well produce the same spectrum.

Take, for example, the case of shock with a semi sinusoidal acceleration.



A piece of equipment must withstand a shock of Γ_0 = 400 m/s² for a period t = 8.75 x 10-3 s.

	Component A of the equipment	Component B of the equipment
Natural frequence mass	40 Hz 10 kg	286 Hz 1 kg
$\frac{\tau}{T}$ $\frac{\Gamma}{\Gamma_0}$ Load on mounting points	8,75 - 10^{-3} x 40 = 0,35 1,25 400 x 1,25 x 10 = 5000 N	8,75 - 10^{-3} x 286 = 2,5 1,1 400 x 1,1 x 1 = 440 N

Study of the spectrum shows that the performance of a mounting system is acceptable when it is possible to obtain a natural frequency T such as:

$\frac{\tau}{T}$ < in which case the ratio $\frac{\Gamma}{\Gamma_0}$ is less than 1 and the component is protected.

If it is not possible, it is better to set up the flexible mounting system to avoid the region of significant amplification for:

$\frac{\tau}{T}$ between 0.25 and 2.5

This simple case shows the role of a flexible mounting system and the importance of knowing the details (shock spectrum, amplitude as a function of time) and, above all, the duration of the shock.

- **The role of damping**

Damping can be useful in reducing rebounds and the amplitude of successive cycles of oscillation. It is, however, important not to use just any type of damping as some can give rise to unfortunate reactions. Elastomers provide a compromise which allow the provision a high level of protection.

- **Important note**
  Two points must always be borne in mind when designing equipment:
  Firstly, that a high level of protection requires great flexibility which requires considerable clearance between the equipment and its surrounding;
  Secondly, that the equipment will oscillate and room must be allowed for the rebound in case of shock. Travel limiters must be positioned so that they do not impede the operation of the flexible mounting system during the shocks allowed for in the design.

A flexible mounting system using rubber protects against shock by reducing the travel and maximum force. It is necessary to allow enough clearance for the rebound.

III.2.4 - GENERAL CASE

Theoretical study above is based on a very simple case:
movement with only one degree of freedom (vertical) with only one excitation (also vertical) aligned with both the centre of gravity of the suspended machine and the centre of elasticity of the mounting system.
In general, things are not so simple. The machine can move in any of the degrees of freedom (rotation or linear movement). In theory, there are as many **natural frequencies** as there are degrees of freedom.
These natural frequencies are not independent but are “coupled”. If one of these is excited in one degree of freedom, it can, as a result of the **coupling**, give rise to vibrations at the same frequency in other degrees of freedom.
To analyse the whole behaviour, the **stiffness** in all directions needs to be taken into account and not just the mass of the suspended body but also the **moments of inertia** so that rotational behaviour can be evaluated.
In addition there may be not one but several forced vibrations with variable frequencies applied to several different points, in various directions or about various axes.
Even general cases can be very complex however symmetrical structures and mounting arrangements allow the use of the single degree of freedom analysis shown above. In other cases only an in-depth study allows an effective solution to be found. Our Technical Services are there to help you to define it.

III.3 - Various types of flexible mounting systems

III.3.1 - ACTIVE ISOLATION SYSTEM

This is a flexible mounting system designed to prevent a machine from transmitting its vibrations to its seating or foundation.
This is the theorical problem (with one degree of freedom), which was treated by attenuating the vibration, in the preceding pages.
The vibration isolation does not stop the machine from vibrating, but it reduces the transmission of these vibrations.
By comparison with a rigid suspension (which transmits the vibrations), the amplitude of the machine’s vibrations may be greater. The machine is, to an extent, freed from its fixed seating. This is the case for the automobile “floating engine” which, mounted on a flexible mounting system, no longer transmits its vibrations to the bodywork and the passengers due to increased mobility under the bonnet (hood).
If excessive movement cannot be tolerated, the only way to reduce it, without reducing the efficiency of the flexible mounting system, is to increase the suspended mass (ballasting). For a given excitation, the amplitude is inversely proportional to the mass.
This is necessary for certain machines which produce particulary severe vibration: slow single cylinder compressors, centrifuges, power hammers etc.
These machines, are therefore, rigidly fixed to a chassis or heavy slabs and the whole assembly is suspended.
Increasing the suspended mass allows good vibration isolation with limited vibration of the suspended assembly.
It is worthwhile suspending complete assemblies rather than individual machines: generating sets, motor/compressor units, motor/pump units.

III.3.2 - PASSIVE ISOLATION SYSTEM

This is a flexible mounting system designed to protect a non-vibrating machine from the vibrations of its surroundings.

The design of a flexible mounting system for attenuating vibration, as defined above, is still valid. With the correct flexible mounting system, the acceleration transmitted to the machine is very small and as it is not subject to any other excitation it remains almost stationary.

The vibration of the supporting structure is almost entirely absorbed by the flexible mounts.

III.3.3 - SEMI-RIGID MOUNTING SYSTEM

This is a suspension where there is no vibration isolation for a given frequency ω

$$\left(\frac{\omega}{\omega_0} < \sqrt{2}\right)$$

As shown above, such a mounting system should be of no interest as it leads to an amplification of the vibration, not an attenuation. In practice, it can, however, give reasonable performance in the following two cases.

- Coupling

In practice, there is not just one movement. For a mounting system, several movements are possible. In fact, as we have seen (shape 2), a machine may have six degrees of freedom. A proper study of a mounts system will take into account the type of excitation acting on the machine and try to arrange that it does not vibrate in all directions. However, because of constraints on mounting points, the mounts may not always be put in ideal positions: if the machine is subject to an excitation in one direction, it may, therefore, move in several directions, e.g. two. These two movements are said to be “coupled”.

The natural frequencies in each direction are not identical. The coupling between the two movements has the effect of lowering the lower natural frequency and raising the higher. Instead of having one maximum (shape 5), the response curve has two. It is essential the excitation does not fall on one or the other. As it may demand an impossibly high flexibility, it is not always possible to make the coupled natural frequencies sufficiently low to put the frequency of the excitation in the vibration isolation region. On the other hand, if the two natural frequencies are placed on either side of the frequency of the excitation, a modest attenuation may be obtained.

- **Harmonics**

A vibration of frequency ω is rarely “pure”. Frequently it also includes “harmonics”; i.e. vibrations at related frequencies 2 ω, 3 ω ... Even if it is not possible to provide vibrational isolation of the fundamental ω, it may be possible to attenuate the harmonics. This may be more important as the low frequencies are often inaudible and, in addition, correspond to very small mechanical accelerations whereas the higher frequencies are a source of noise which can be eliminated by an appropriate vibration isolator.

III. 3.4 - EXTERNAL CONNECTIONS

So far, it has been assumed that the machine is only connected to its surrounding by its flexible mounting system.

In pratice, there will be other connections, such as :

- pipework (inlet, exhaust, cooling);
- electric cables, remote controls...

It is necessary to ensure, or arrange, that these external connections are sufficiently flexible with respect to the relative movements.

This precaution will avoid :

- damage to pipework.
- reduced vibration isolation by introducing additional rigidity.
- direct transmission, via these connections, of the vibrations which have been suppressed elsewhere.

As the flexible mounts attenuate the transmission of the vibrations the machine is free to move, be sure to leave enough clearance in all directions to allow freedom of movement.

IV - DESIGNING A FLEXIBLE MOUNTING SYSTEM

When designing a flexible mounting system, it is essential to know, precisely the basic characteristics of the machine to be suspended.

It is extremely useful to have a drawing (even if it is schematic) which shows the position of the centre of gravity and the mounting points provided.
The drawing may also allow the evaluation of certain parameters which may be necessary and which are often unknown to either the manufacturers or the users (e.g. moments of inertia).

For passive isolation, it is necessary to obtain the maximum of information about the external vibrations which may disturb the machine.
In any case, for complex problems (oscillations in many degrees of freedom, multiple excitation), it is advisable to consult our Technical Services.

For simple problems (one degree of freedom, or two degrees of freedom with the centre of gravity close to the mounting plane) it is possible to design the suspension, as shown below, with a minimum of information about the machine and the disturbance.

Information about...	...to determine the fundamental parameters of the flexible mounting system
...the **machine** and... Centre of gravity Weight Number and position of mounting points (supplied or possible)	Load on each mounting
the **disturbance**... Frequency of disturbance (or speed of rotation)	Deflection of the mount for the required attenuation
Principle direction of the disturbing force	Stiffness characteristics of the mount

IV.1 - Determining the centre of gravity

IV.1.1 - ASK THE MANUFACTURER

In most cases, the manufacturer of the machine should be able to supply the exact position of the centre of gravity as well as the weight.
Consult the manufacturer.

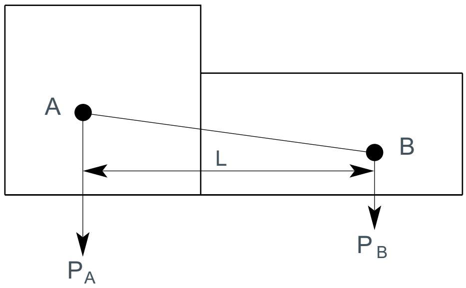
IV.1.2 - GRAPHICAL METHOD FOR FINDING THE CENTRE OF GRAVITY OF AN ASSEMBLY

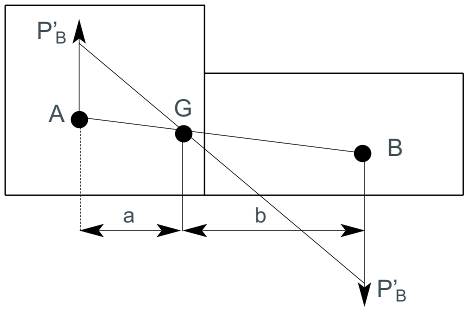
This is suitable for assemblies of units for which the individual weights and centres of gravity are known.

Important notes

- Using a graphical method, it is important to represent dimensions using a well determined scale and the weights by vertical lines whose lengths are proportional to their size (e.g. 1 cm for 10 daN).
- If the centres of gravity considered in this section are not in the same vertical plane, the procedures proposed here should be applied twice: for the front and for the side view with the outlines corresponding to each view.

- **An assembly of two units**





Shape 7

Two units of weights P_A and P_B respectively with centres of gravity A and B separated by L.

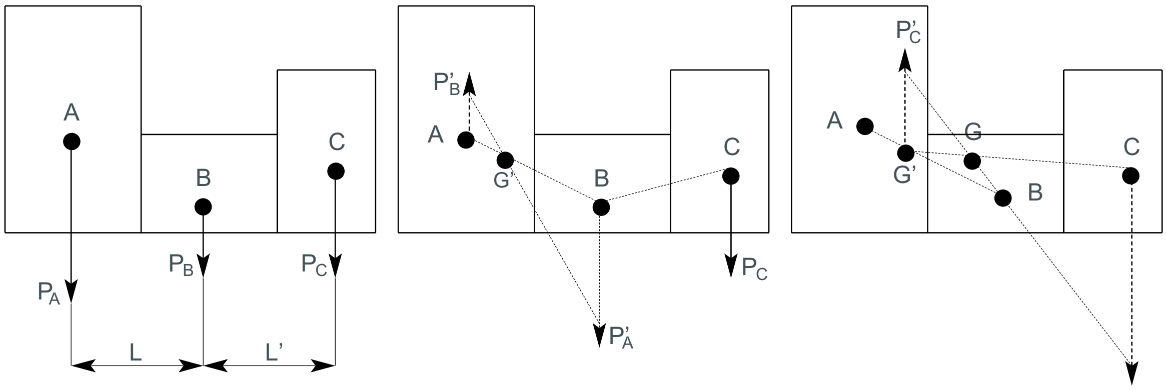
Shape 8

Draw : $AP'_B = BP_B$ ð in P'_A and P'_B
$BP'_A = AP_A$
The centre of gravity G lies at the intersection of the lines P'_A P'_B and AB. Measure a and b.

- **An assembly of three or more units**

Proceed, stage by stage, as described above using groups of two units or sub-assemblies with centres of gravity and weight known or calculated.

Shape 9



IV.1.3 - EXPERIMENTAL DETERMINATION OF THE CENTRE OF GRAVITY OF A UNIT

This method is used where the above two methods prove to be impossible or difficult (complex geometry).

- **Using a roller**

For a given orientation (length, width and height) the centre of gravity is in the vertical plane passing through the axis of the roller when the machine is balanced. The centre of gravity is at the intersection of the three planes thus determined.

- **By «hanging»**

Suspended from a cable, the centre of gravity is on the vertical dropped from the suspension point. To find the exact centre of gravity, repeat the operation twice, using a different suspension point each time.

IV.1.4 - ANALYTICAL DETERMINATION OF THE CENTRE OF GRAVITY OF AN ASSEMBLY OF SEVERAL MASSES

An assembly of several masses m_1, m_2, ... mn is fixed in space.
It is assumed that the coordinates, within an arbitrary Cartesian set, of each mass are known.

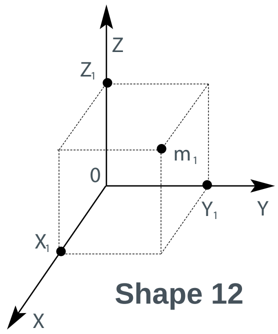
$$m_1 \begin{cases} X_1 \\ Y_1 \\ Z_1 \end{cases} \qquad m_2 \begin{cases} X_2 \\ Y_2 \\ Z_2 \end{cases} \qquad m_n \begin{cases} X_n \\ Y_n \\ Z_n \end{cases}$$

The mass of the assembly M = m_1 + m_2 + ... + mn acts at the coordinates of the centre of gravity of the whole : x, y, z

$$x= \frac{m_1 x_1 + m_2 x_2 +...+ m_n x_n}{M}$$

$$x= \frac{m_1 y_1 + m_2 y_2 +...+ m_n y_n}{M}$$

$$x= \frac{m_1 z_1 + m_2 z_2 +...+ m_n z_n}{M}$$



Shape 12

Important note : The coordinates of the centres of gravity may be negative and must be used with their sign.

IV.2 - Determining the load per mount

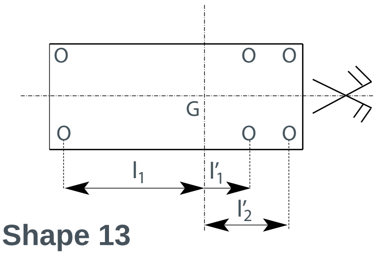
IV.2.1 - NUMBER AND POSITION OF THE MOUNTING POINTS ARE NOT PREDETERMINED

In this case, the number and position of the mountings are determined in such a way that the load on each mounting is the same for all mounting points.
Taking, for example, a symmetrical machine with :

G : the centre of gravity,
P : the weight of the machine.
Calculate the position of 6 mounting points such that the load on all the mounting points is P_1.

$$P_1 l'_1 + P_1 l'_2 = P_1 l_1$$

from which $l_1 = l'_1 + l'_2$ and the load per point = $\frac{\text{Weight}}{6}$



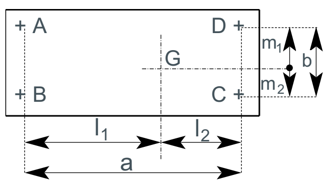
Shape 13

IV.2.2 - NUMBER AND POSITION OF THE MOUNTING POINTS ARE PREDETERMINED

In this case, it may not be possible to have the same load on each mount.

- **Four mounting points**

A, B, C and D are the mounting points.
G the centre of gravity
P the total weight suspended
P_A, P_B, P_C and P_D are the load on the mounting points A, B, C and D.



Shape 14

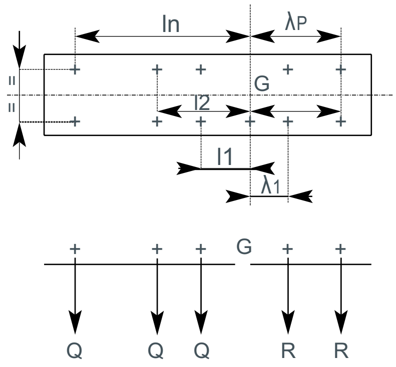
$$P_A = \frac{m_2}{b} \cdot \frac{l_2}{a} \cdot P \qquad P_B = \frac{m_1}{b} \cdot \frac{l_2}{a} \cdot P$$

$$P_C = \frac{m_1}{b} \cdot \frac{l_1}{a} \cdot P \qquad P_D = \frac{m_2}{b} \cdot \frac{l_1}{a} \cdot P$$

If P_A, P_B, P_C and P_D are significantly different, it is, theoretically, necessary to choose four different mounts which will give the same deflection under the various loads.

- **More than four mounting points (shape 15)**

In this case it is best if the assembly is symmetrical about a vertical plane. This is assumed to be true in the following.
To the left of G, there are 2n identical mounts.
To the right of G, there are 2p identical mounts which are, possibly, different from the 2n mounts to the left.
The problem is to set the difference between the left hand and right hand mounts so that the deflection under load of the 2n + 2p mounts are all the same.
Under these conditions, all the mounts to the left of G will be supporting the same load Q and all those to the right will be supporting the same load R.
This will give :



Shape 15

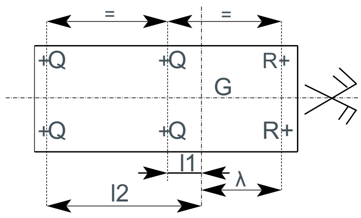
$$Q\,(l_1 + l_2 + ...+ l_n) = (\lambda_1 + \lambda_2 + ... + \lambda p)$$

$$2\,nQ + 2\,pR = P$$

From which the mounts load is:

$$Q = \frac{\lambda_1 + \lambda_2 + \lambda p}{2\,n\,(\lambda_1 + \lambda_2 + ...+ \lambda p) + 2\,p\,(l_1 + l_2 + ...+ l_n)}\,.P$$

$$R = \frac{l_1 + l_2 + \lambda p}{2\,n\,(\lambda_1 + \lambda_2 + ...+ \lambda p) + 2\,p\,(l_1 + l_2 + ...+ l_n)}\,.P$$



Shape 16

If Q and R are not too different, the same size mounts may be used but with different hardness elastomers.
Example (shape16)
Taking a symmetrical machine with an offset centre of gravity G and 6 mounting points n = 2 et p =1.
which gives :

$$Q = \frac{\lambda}{4\,\lambda + 2\,(l_1 + l_2)}\,.P$$

$$R = \frac{l_1 + l_2}{4\,\lambda + 2\,(l_1 + l_2)}\,.P$$

If the machine weighs 500 daN
and λ = 0.4 m; l_1 = 0.3 m; l_2 = 0.9 m, then Q = 50 daN and R = 150 daN.

IV.2.3 - IMPORTANT NOTES

If a single size of mount is used but different hardness elastomers are choosen, there is a high risk that the mount may be interchanged which may degrade the attenuation of the suspension. The machine must be mounted with great care.
There are, however, benefits from using identical mounts to build a suspension. If the predetermined mounting points of the chassis do not allow a centered suspension, the solution is to attach these to a false chassis, as rigid as possible, to which the desired number of identical flexible mounts are attached in the positions required. If this false chassis is a slab of concrete (or inertia block) the suspended mass is increased which improves the quality of the suspension.

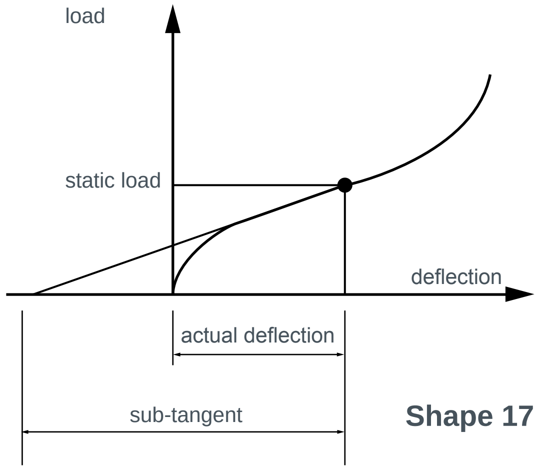
IV.3 - Determining the deflection

IV.3.1 - DEFLECTION AND SUB-TANGENT

Shape 17 is a graphical representation of the derivation of the deflection and sub-tangent from the load/deflection curve.
For a given static load, the deflection corresponds to the compression of the mount under that load, but the stiffness about the position under load is given by the sub-tangent (the projection of the tangent onto the axis). This is the elasticity which determines the natural frequency of the mounting.

$$\omega_0 = \sqrt{\frac{K}{M}} = C\sqrt{\frac{1}{\text{sub-tangent}}}$$

(C = constant)



Shape 17

For most PAULSTRA mounts, the load/deflection curve is linear in the region of static loads (shape 18) and, as a result, the sub-tangent and the deflection are identical.

The curve in shape 17 is typical of EVIDGOM mounts.
For these it is best to work at the point of inflection of the curve where the sub-tangent is the largest possible and so the natural frequency is as low as possible.
The deflection does not indicate the amplitude of the oscillations of the machine.

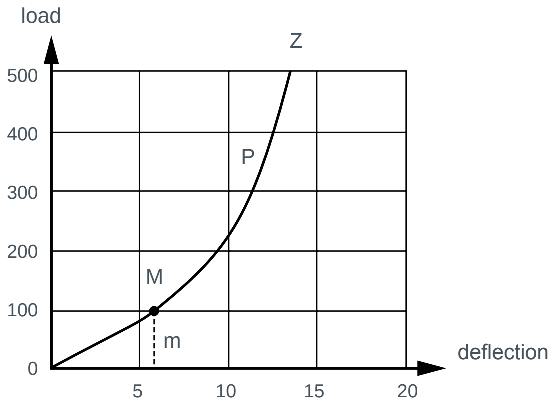
IV.3.2 - OPERATING REGIONS

The region OM is the static load region. The deflection is approximately proportional to the load.

In the data sheets, the coordinates of the point M are given as the NOMINAL STATIC LOAD.

The region MP is the dynamic load region corresponding to normal, repeated shocks provided that the rate and total deflection stay within normal limits.

In the region PZ, which corresponds to exceptional, accidental shocks, the curve rises rapidly.
The stiffness increases progressively which has the effect of reducing the amplitude of the movement. Note that, because of the natural damping properties of the rubber, this increase also depends on the speed of impact.



Shape 18

IV.3.3 - ATTENUATION - EXCITATION FREQUENCY

At a given excitation frequency ω, the attenuation depends on the natural frequency ωo and thus the sub-tangent. With most rotating machinery, the excitation frequency in cycles per minute can be taken to be the rotation speed in rpm.
As indicated on the chart (shape 6, in § III.2.1.2) for a natural frequency in a known direction, the aim is to obtain the highest possible attenuation within the constraints of the load / deflection characteristics of the mounts.
The deflection selected must not be so high as to be detrimental to the stability of the suspension. If the operating point is not within the vibration isolation zone, our technical services should be consulted.

IV.3.4 - STATIC STIFFNESS - DYNAMIC STIFFNESS - NATURAL FREQUENCY

Whereas deflection and sub-tangent are given by the static stiffness curve of the mounting, it's natural frequency is linked to the dynamic stiffness. In the case of elastomeric mountings, static and dynamic stiffness can be different.
The ratio between static and dynamic stiffness depends on the input amplitude, the frequency and the type of elastomer. Under nominal load, the natural frequency is given for indication only.
For a different load, the natural frequency could be found with the following formula:

$$f_0 \text{ (actual load)} = f_0 \text{ (nominal load)} \times \sqrt{\frac{\text{nominal load}}{\text{actual load}}}$$

This approximate is valid only if the actual load is in the linear part of the load/deflection curve (shape 17 & 18).

IV.4 - Design examples

PAULSTRA mounts are classified according to their stiffness characteristics
Therefore, after having determined the number and deflection of the mountings as described above, the choice of mounts depends on the direction of the excitation.

- equi-frequency mounts : the flexibility is approximately the same vertically as horizontaly;
- mounts with high axial flexibility : high axial flexibility while supporting radial loads;
- mounts with high radial flexibility : high radial flexibility while supporting axial loads;
- low frequency mountings : high sub-tangent to achieve a very low natural frequency (a few Hertz).

IV.4.1 - SUSPENSION FOR A FAN

- **Characteriscs of the equipment**

- Weight : 3000 daN.
- Speed of rotation : 1200 rpm.
- Fan mounted on a 2.5 x 3m chassis with no constraint on the position of the mounting fixing points.
- Known centre of gravity.

Number of mounts : after trials, using successive approximation to balance the moments of inertia, 12 mounting points were selected.
Load per mounting = 3000/12 = 250 daN.
Natural frequency of the mounts (see chart).
For an input frequency (or speed of rotation) of 1200 rpm, the maximum natural frequency is 14 Hz.
A natural frequency of 7 Hz will achieve a reasonable attenuation of about 85%.
Therefore, a mounting system.with a natural frequency of 7 Hz under 250 daN is required.
As it is a rotating machine with no special characteristics, isometric mountings are selected.
The selection guide gives a PAULSTRADYN mount with a 8 mm deflection under a 260 daN load.
According to the data sheet for PAULSTRADYN mounts, the PAULSTRADYN Ø 100 hardness 60 has a deflection of 7.4 mm under a load of 240 daN, which is just right.

- **Suspension characteristics:**

- 12 PAULSTRADYN 260. Mount part number 533712.

- Ratio = $\frac{\text{real load}}{\text{nominal load}} = \frac{250}{260} = 0.96$

- Attenuation ~ 85%*.

- Loaded height ~ 32.5 mm*.

*These values are given by the Paulstradyn data sheet.

IV.4.2 - SUSPENSION OF AN ENGINE/HYDRAULIC PUMP UNIT MOUNTED ON AN EXCAVATOR

- **Characteristics of the assembly**

- Weight: 1200 daN.
- Speed of rotation : 1500 rpm.
- Known centre of gravity.
- 6 mounting points.

Load per mounting : 1200/6 = 200 daN.
Deflection (see chart, shape 5).
For a frequency of 1500 rpm, a deflection of 3 mm will achieve an attenuation of approximately 85%.

The vibrations are predominantly vertical and the unit needs to be restrained laterally to cope with the movement of the excavator in operation. Mountings with dominant axial flexibility are selected.

The PAULSTRA mount selection guide shows a STABIFLEX mount with a deflection of 5 mm for a load of 210 daN. According to the STABIFLEX mounting data sheet, the mount required is a STABIFLEX 530622 hardness 45 with a square base.

- **Suspension characteristics (under 1 200 daN at 1 500 tr/mn)**

- 6 STABIFLEX mounts reference 530622 hardness 45.
- Deflection 4.7 mm.
- Theoretical attenuation 85% (16 dB).

IV.4.3 - SUSPENSION OF A SIEVE

- **Characteristics of the equipment**

- Weight: 400 daN.
- Vibration frequency (horizontal): 1200 cycles/mn or 20 Hz.
- Known centre of gravity.
- 6 mounting points.

Load per mounting: 400/6 = 66 daN.
Deflection (see chart, shape 5).
For a frequency of 20 Hz, a deflection of **6 mm** will achieve an attenuation of approximately 70%.

Mount characteristics required:

1) mounts which will withstand the vertical load;

2) mounts with a radial flexibility very much greater than the axial flexibility (mounting with dominant radial flexibility);

3) providing vibration isolation vertically (axially), which, taking account of requirement (2), will assure the horizontal vibration isolation.

The PAULSTRA mount selection guide gives a RADIAFLEX cylindrical stud giving a deflection of 8 mm for a load of 70 daN.
According to the RADIAFLEX mounting data sheet, the mount required is a stud Ø 30 height 30 mm with 2 mounting bolts (ref. 521312).
The radial flexibility (shear) is considerably higher than axial flexibility (compression).

- **Suspension characteristics :**

- 6 RADIAFLEX cylindrical mounts with 2 screws reference 521312 (theoretical vibration attenuation : 80% - 14 dB).

IV.4.4 - SUSPENSION OF A COMPRESSOR UNIT

- **Characteristics of the assembly**

- Weight: 6000 daN.
- Speed of rotation : 400 rpm.
- Known centre of gravity.
- 8 mounting points.
- Load per mount: 6000/8 = 750 daN.

- **Deflection of the mountings**

For a frequency of 400 rpm, the minimum deflection to be within the vibration isolation region is 12 mm. The PAULSTRA mounting selection guide gives a low frequency mounting which can provide sufficiently large deflections (26 mm).
According to the EVIDGOM mount series data sheet, the mounting required is an EVIDGOM mount Ø 125, height 140 mm, reference 810784 which gives a deflection of 26 mm under a load of 800 daN.

- **Suspension characteristics**

- 8 EVIDGOM mountings reference 810784, Ø 125 mm, height 140 mm.
- Deflection 26 mm.
- Attenuation 37% (4 dB).

Note : as the low frequency mounts are tall, for some applications (sideways forces) it may be necessary to provide lateral stops.

IV.4.5 - SUSPENSION FROM A CEILING (FALSE CEILING, VENTILATION UNITS, PIPEWORK)

- For light loads of 15 to 135 kg per item our TRAXIFLEX mount may be used directly.
Example of use :
False ceiling - load per mount 50 kg - frequency of excitation 25 Hz - mounting selected 535611 hardness 45 - deflection under load 4 mm - theoretical vibration attenuation 77% - 13 dB.

- For heavy loads, it is necessary to use a PAULSTRADYN, STABIFLEX or EVIDGOM mounting with a safety fixing.
Example of use :

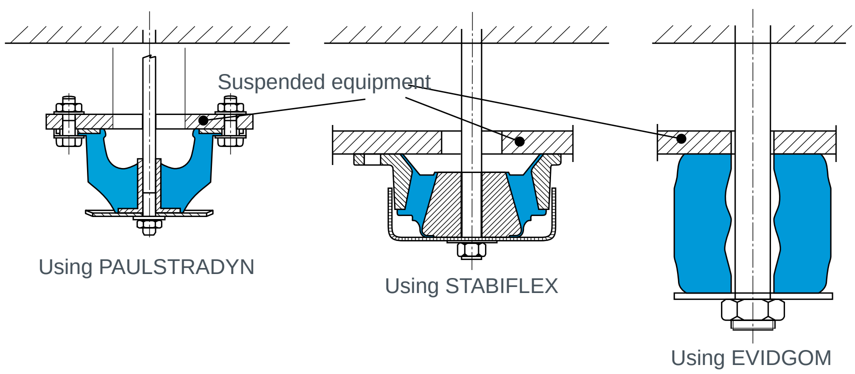
1. Suspending a ventilation unit - weight 1000 daN - frequency 25 Hz - 4 PAULSTRADYN mount Ø 100 reference 533712 - natural frequency. 7 Hz - theoretical vibration attenuation 90% - 20 dB.

2. Suspending a special 5 tonnes machine requiring accurate radial positioning - frequency 20 Hz - 4 STABIFLEX mount reference 530652 hardness 60 - deflection under load 8 mm - theoretical vibration attenuation 84% - 16 dB.

3. Suspending a 20 tonnes tank subject to longitudinal expansion - frequency 15 Hz - 4 EVIDGOM mount reference 810733 hardness 60 - deflection under load 50 mm - theoretical vibration attenuation 95% - 26 dB.

Mounting examples :

Fixing to ceiling

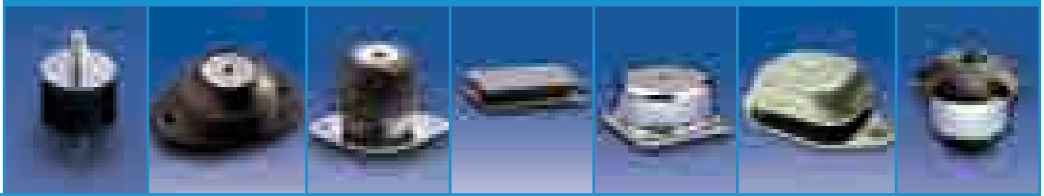


INDUSTRIAL RANGE OF ELASTOMERIC MOUNTING SYSTEM

HUTCHINSON®
PAULSTRA

MOUNTING

APPLICATIONS

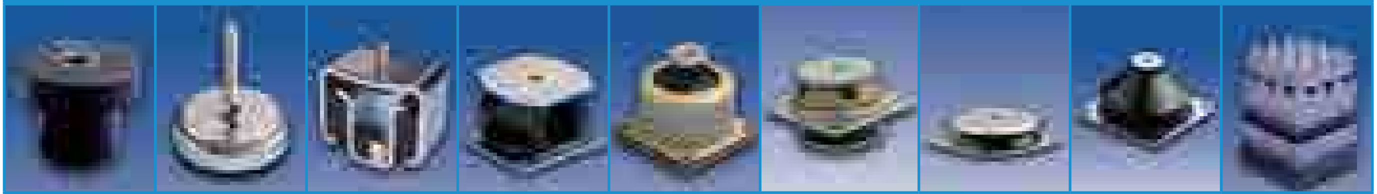


	HIGH RADIAL FLEXIBILITY	HIGH AXIAL FLEXIBILITY	LOW FREQUENCY	HIGH SHEAR FLEXIBILITY	PRIMARILY AXIAL LOADING		
	RADIAFLEX®	PAULSTRADYN®	EVIDGOM®	SANDWICH	STABIFLEX	PAULSTRAFLOAT®	S.C.
Pages	p. 60	p. 69	p. 73	p. 76	p. 79	p. 82	p. 87
FANS	□	■	■				
AIR CONDITIONING	□	■	■				
PUMPS	□	■				■	
COMPRESSORS	□	■	■		■	■	
GEARBOXES					■	■	■
GENERATING SETS	□	■	■	■	■	■	□
IC ENGINES					■	■	■
PLANT CABS					■	■	■
VIBRATING TABLES/SCREENS	■	■	■				
HOPPERS	■	■	■				
MACHINE TOOLS				■	■		
PRESSES GUILLOTINES				■	■		
GANTRIES				■			
CIVIL ENGINEERING				■			
CEILING, PIPEWORK							
LABORATORY EQUIPMENT	■	■					
ELECTRICAL ENCLOSURE MOBILE OF FIXED INSTALLATION	□	■				■	
TRANSFORMERS		■		■			
FRAGMENTERS		■	■	■			
SIEVES	■		■				
COMPUTERS							
SHIPBOARD ELECTRONICS						■	
PROTECTION AGAINST BUMP AND SHOCK							
COVERS OR ENCLOSURES							

In general :
For fixed installations: RADIAFLEX. PAULSTRADYN and BECA. For mobile installations : STABIFLEX, S.C.,S.T.C.
Avoid using the mount with the rubber to metal bond area in tension. These mounts should only be used in compression or shear.

APPLICATION GUIDE

PRIMARILY AXIAL LOADING			SAME AXIAL & RADIAL FREQUENCY					ACOUSTIC
S.T.C.	NIVOFIX®	TRAXIFLEX®	SPECIAL PACKAGING	ARDAMP®	SPECIAL ELECTRONICS	BECA	VIBMAR*	STRASONIC
p. 91	p. 104	p. 107	p. 131	p. 128	p. 114 to 127	p. 134	p. 172	p. 153 to 169



Recommended application

Admissible application

RADIAFLEX ®

DESCRIPTION

Metalwork : mild steel, plated.
Natural rubber, bonded, cylindrically shaped.
Welded fixings : 5 styles (single side threaded stud, single side threaded hole, double threaded stud, double threaded hole,combination fixing).

European thread standards are not always consistent with French thread standards so Paulstra has created the Radiaflex® Europe range based on those standards.
The end stop version is now available with a threaded hole in addition to the threaded stud.

CHARACTERISTICS

The design of the RADIAFLEX® mount gives the following basic characteristics:

- radial elasticity greater than axial elasticity.
- the rubber works in :
  - compression (axial),
  - shear (radial),
  - compression/shear according to the fixing method.

Advantages

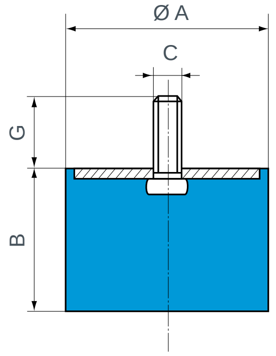
- Simple to fix.
- Simple and economical.
- Extensive range :
  - 13 stud diameters.
  - Several heights for each diameter.
  - 5 methods of fixing.

Recommendations

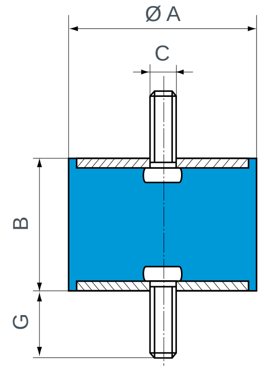
- Operation in shear is very useful for vibration isolation provided that the radial forces are not too great.

DIMENSIONS AND COMPRESSIVE LOADS

Single stud fixing



Double stud fixing



Threaded studs

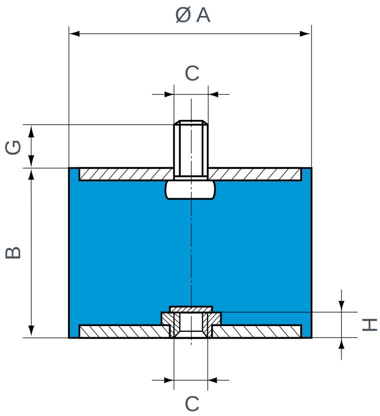
Ø A (mm)	B (mm)	C	G (mm)	Compression		Ref.
				Max. load (daN)	Deflection (mm)	
12,5	10 13,5 15 20	M5	10	12 11 10 8	2 2,5 3 3,5	**511110 511128 511115 511125**
16	10 15	M4	10	20	2 3	**511150 511151**
	10 15 20 25	M5	12	20 20 15 15	2 3 4 5	**511292 511294 511296 511298**
20	5 8,5	M6	10	77 40	0,6 1,5	**511206 511200/11**
	8,5 15 20 25 30	M6	16,5	40 35 30 30 25	1,5 4 5 5,5 7	**511200 511215 511220 511225 511230**
25,5	10 15 20 30	M6	18	80 60 50 50	2 3,5 5 8	**511158 511155 511159 511160**
	5 10 15	M8	20	82 80 60	0,6 2 3,5	**511265/50 511265 511270**
	15	M8	12	60	3,5	**511270/13**
	19 22 25 30 40	M8	20	55 50 50 50 50	4,5 5,5 6 8 10	**511251 511275 511280 511285 511290**
30	15 22 30 40	M8	25	90 80 70 60	3,5 6 8 9	**511308 511310 511312 511314**
40	30 40	M8	20	120 120	7 10	**511157 511161**
	20 25 35 40 45	M10	25	160 150 120 120 120	5 6 8 10 11	**511450 511401 511452 511454 511456**
50	25 35 45	M10	25	300 250 190	6 9 11	**511525 511535 511545**
60	22 25 36 45	M10	25	350 400 300 250	3 6 9 11	**513601 511625 511635 511645**
70	35 50 70	M10	25	450 350 300	9 12 14	**511735 511750 511770**
80	25 30 40 70 80	M14	45 35 35 35 35	1 100 950 600 500 450	6 8 10 17 19	**513801 511830 511840 511870 511880**

Threaded hole fixing on request (except Ø 12.5).
See current price list for availability of items.

Ø A (mm)	B (mm)	C	G (mm)	Compression		Shear*		Ref.
				Max. load (daN)	Deflection (mm)	Max. load (daN)	Deflection (mm)	
10	8	M3	6	10	1,6	1,25	0,9	**voir p. 115**
12	8	M3	6	12	1,2	1,5	0,75	**voir p. 115**
12,5	10 15 20	M5	10	12 10 8	2 3 3,5	1,5 2,5 2,5	1,5 2 4	**521293 521128 521295**
16	10 15	M4	10	20	1,5 3	2,5	1,5 2	**521650 521651**
	10 15 20 25	M5	12	20 20 15 15	1,5 3 4 5	2,5 2,5 2,5 2	1,5 2 4 5	**521292 521294 521296 521298**
20	8,5 15 20 25 30	M6	16,5	40 35 30 30 25	0,6 3 4,5 5,5 7	5 5 5 4,5 4,5	1 2,5 3,5 4,5 4,5	**521178 521249 521297 521299 521319**
25,5	10 15 20 30	M6	18	80 60 50 50	1,5 2,5 2 7,5	8 8 8 8	1,5 2,5 4 6	**521655 521656 521652 521653**
	10 15 22 25 30 40	M8	20	80 60 50 50 50 50	1,5 2,5 4 5,5 7,5 10	8 8 8 8 8 6,5	1,5 2,5 4 4,5 6 6	**521340 521341 521251 521342 521343 521344**
30	15 22 30 40	M8	25	90 80 70 60	3 5 8 9	11 11 11 11	2,5 4 6 7,5	**521308 521310 521312 521314**
40	30 40	M8	20	150 120	6 10	20 20	5,5 7,5	**521181 521657**
	20 28 35 40 45	M10	25	160 150 120 120 120	4 6 8 10 11	20 20 20 20 20	3 5,5 6,5 7,5 9	**521450 521401 521452 521454 521456**
50	25 35 45	M10	25	300 250 190	6 8 11	25 25 25	4,5 7 9	**521580 521581 521582**
	45	M10	15	190	11	25	9	**521582/15**
60	25 36 45	M10	25	400 300 250	5 8 11	30 30 30	4,5 7 9	**521601 521603 521641**
70	35 50 70	M10	25	450 350 300	8 11 14	35 35 35	6,5 11 15	**521705 521710 521711**
80	40	M12	28	600	9	40	7	**521658**
	30 30 40 70 80	M14	45 35 35 35 35	950 950 600 500 450	7 7 9 17 19	40 40 40 40 40	5 5 7 15 17	**521803 521840 521841 521842 521843**
100	40 55 80	M16	47	1 100 900 750	8 12 19	60 60 60	7 10 17	**521908 521909 521910**

* The shear characteristics are measured under axial load.

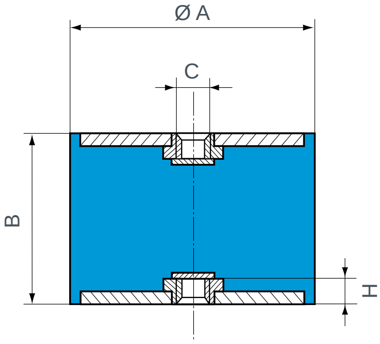
Combination fixing



Ø A (mm)	B (mm)	C	G (mm)	H (mm)	Compression		Shear*		Ref.
					Maxi. load (daN)	Deflection (mm)	Max. load (daN)	Deflection (mm)	
16	10 15	M4	10	2	20	1,5 3	2,5	1,5 2,5	**520053** **520054**
16	10 15 20 25	M5	12	3	20 20 15 15	1,5 3 4 5	2,5 2,5 2,5 2	1,5 2 4 5	**520010** **520011** **520012** **520013**
20	15 20 25 30	M6	16,5	4	35 30 30 25	2,5 4,5 5,5 7	5 5 4,5 4,5	2,5 5 4,5 4,5	**520015** **520016** **520017** **520018**
25,5	15 20 30	M6	18	4	60 50 50	2,5 3,5 7,5	8 8 8	8,5 4 6	**520052** **520055** **520057**
25,5	22 25 30 40	M8	20	6	50 50 50 50	3,5 5 7,5 10	8 8 8 6	4 4,5 6 6	**520021** **520022** **520023** **520024**
30	15 22 30 40	M8	25	6	90 80 70 60	3 4,5 7,5 9	11 11 11 11	2,5 4 6 7,5	**520025** **520026** **520027** **520028**
40	30 40	M8	20	6	150 120	4,5 10	20 20	5,5 7,5	**520056** **520058**
40	20 28 35 40 45	M10	25	8	160 150 120 120 120	4 5 7,5 10 11	20 20 20 20 20	3 5,5 6,5 7,5 9	**520029** **520030** **520031** **520032** **520033**
50	45	M10	15	8	190	11	25	9	**520036/15**
50	35 45	M10	25	8	250 190	8 11	25 25	7 9	**520035** **520036**
60	36 45	M10	25	8	300 250	8 10	30 30	7 9	**520038** **520039**
70	35 50 70	M10	25	9	450 350 300	7,5 10 14	35 35 35	6,5 11 15	**520040** **520041** **520042**
80	40	M12	28	10	600	8	40	7	**520059**
80	40 70 80	M14	35	12	600 500 450	8 17 19	40 40 40	7 15 17	**520044** **520045** **520046**
100	40 55 80 100	M16	47	14	1 100 900 750 600	8 12 19 23	60 60 60 60	7 10 17 20	**520100** **520101** **520102** **520103**

Ø 16 mounts with threaded holes are fitted with RAPID nuts.
Maximum torque 1.8 m.N.

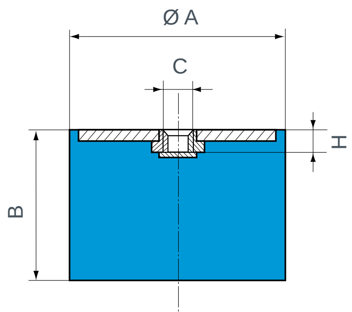
Threaded hole fixing



Ø A (mm)	B (mm)	C	H (mm)	Compression		Shear*		Ref.
				Max. load (daN)	Deflection (mm)	Max. load (daN)	Deflection (mm)	
16	10 15	M4	2,5	20 20	1,5 3	2,5 2,5	1,5 2	**520550** **520551**
16	10 15 20 25	M5	3	20 20 15 15	1,5 3 4 5	2,5 2,5 2,5 2	1,5 2 4 5	**520500** **520501** **520502** **520503**
20	15 20 25 30	M6	4	35 30 30 25	2,5 4,5 5,5 7	5 5 4,5 4,5	2,5 3,5 4,5 4,5	**520505** **520506** **520507** **520508**
25,5	20 30	M6	4	50 50	3 7,5	8 8	4 6	**520554** **520555**
25,5	22 25 30 40	M8	6	50 50 50 50	3 4,5 7,5 10	8 8 8 6	4 4,5 6 6	**520511** **520512** **520513** **520514**
30	22 30 40	M8	6	80 70 60	4 7,5 9	11 11 11	4 6 7,5	**520516** **520517** **520518**
40	30 40	M8	6	150 120	4,5 10	20 20	5,5 7,5	**520552** **520553**
40	28 35 40 45	M10	8	150 120 120 120	4,5 7 10 11	20 20 20 20	5,5 6,5 7,5 9	**520520** **520521** **520522** **520523**
50	35 45	M10	8	250 190	7 10	25 25	7 9	**520525** **520526**
60	36 45	M10	8	300 250	7 9	30 30	7 9	**520528** **520529**
70	35 50 70	M10	9	450 350 300	7 9 14	35 35 35	6,5 11 15	**520530** **520531** **520532**
80	40	M12	10	600	7	40	7,5	**520556**
80	40 70 80	M14	12	600 500 450	7 17 19	40 40 40	7 15 17	**520534** **520535** **520536**
100	40 55 60 75 80 100	M16	14	1 110 900 1 100 600 750 600	8 12 8 10 19 23	60 60 180 140 60 60	7 10 10 12 17 20	**520541** **520542** **520545** **520546** **520543** **520547**

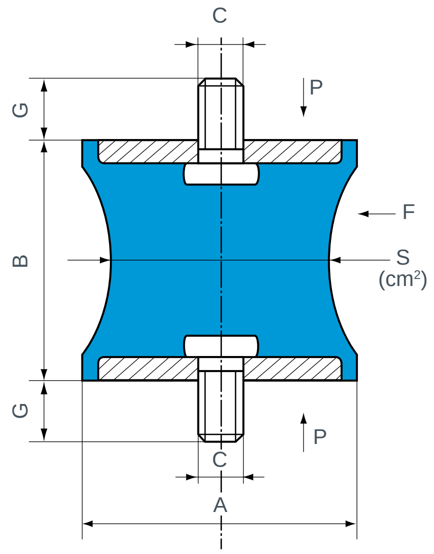
See current price list for availability of items.
*** Shear characteristics are measured under axial load.**

One threaded hole



Ø A (mm)	B (mm)	C	H (mm)	Compression		Ref.
				Maxi. load (daN)	Deflection (mm)	
16	10 15	M4	2,5	20 20	2 3	511152 511153
20	15	M6	4	35	4	511154
25,5	15 20 30	M6	4	60 55 50	3,5 5,5 8	511164 511162 511163
30	22	M8	6	80	6	511156
50	20	M10	10	343	3,4	511168

Diabolo mounts



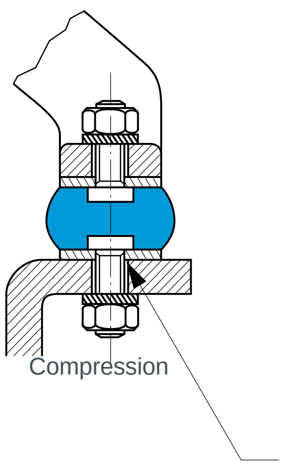
Ø A (mm)	B (mm)	C	G (mm)	S (cm^2)	Compression (P)		Shear* (F)		Ref.
					Max. load (daN)	Deflection (mm)	Max. load (daN)	Deflection (mm)	
12,5	14	M5	10	0,3	3	1,4	0,5	1,2	**521300**
20	19	M6	16,5	1,6	12	2,5	3	5	**521201**
40	28	M10	25	3,1	30	5	2,5	4,5	**521403**
57	44	M8	20	5	40	5	7	5	**521571**
57	44	M8	20	9,5	75	5	12	6	**521572**
60	60	M10	25	19,5	150	8	30	10	**521602**
80	70	M14	35	38,5	300	9,5	55	9,5	**521801**
95	76	M16	45	50	400	9,5	70	8	**521951**

See current price list for availability of items.

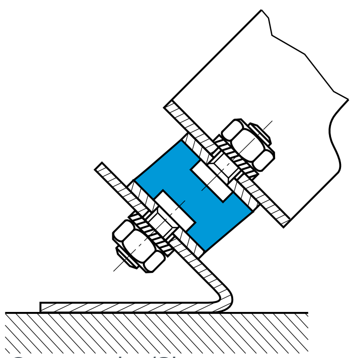
Ø A (mm)	B (mm)	C	G (mm)	S (cm^2)	Compression (P)		Shear* (F)		Ref.
					Max. load (daN)	Deflection (mm)	Max. load (daN)	Deflection (mm)	
80	60	M14	15,5	38,5	250	5	70	8	**521802**

* Shear characteristics' are measured under axial load.

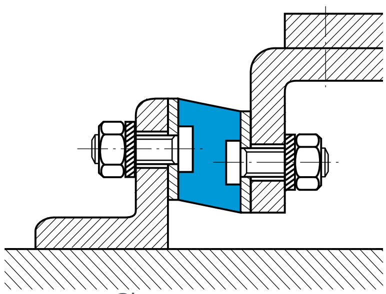
ASSEMBLY



Compression



Compression/Shear



Shear

The fixing holes for the Radiaflex mounts should have a chamfer with a depth equal to the pitch of the thread.
Ex. **521401** : M10 x 150 chamfer = 1,5 mm
521951 : M16 x 200 chamfer = 2 mm

Cylindrical stop | Conical progressive stop | LEVAFLEX progressive stop | EVIDGOM stop

STOPS

See :
Supports and
Bump stops

DESCRIPTION

There are several types of stops :

- cylindrical or DIABOLO stops;
- conical progressive stops;
- LEVAFLEX progressive stops with central cavity;
- EVIDGOM stops.

OPERATION

The design of the PAULSTRA elastic stops gives the following basic characteristics :

- highly deformable allowing high energies to be absorbed;
- progressive absorption of energy due to the carefully designed shape.

Advantages

- By comparison with rigid stops, PAULSTRA elastic stops are quiet and avoid hammering and deterioration of equipment.

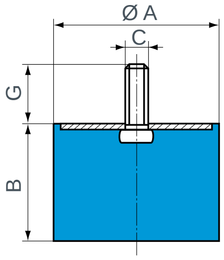
Recommendations

- The stops must be fitted so that, on impact, the axis of the stop is perpendicular to the contact surface.
- On impact, the external diameter of the stop increases: this must be allowed for when fixing.

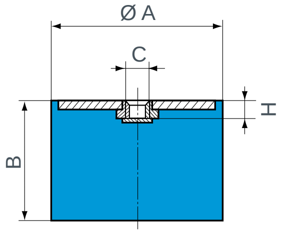
DIMENSIONS AND OPERATING CHARACTERISTICS

CYLINDRICAL STOPS

Shape 1



Shape2

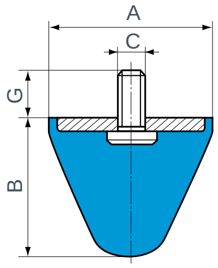


Ø A (mm)	B (mm)	C	G (mm)	Shape	H (mm)	Max. load (daN)	Deflect. (mm)	Energy (joules)	Reference
12,5	10 13,5 15 20	M5	10	1	-	12 11 10 8	2 2,5 3 3,5	0,12 0,13 0,16 0,14	**511110 511128 511115 511125**
16	10 15 10 15	M4	10 10 - -	1 1 2 2	- - 2,5 2,5	20	2 3 2 3	0,20 0,30 0,20 0,30	**511150 511151 511152 511153**
	10 15 20 25	M5	12	1	-	20 20 15 15	2 3 4 5	0,20 0,30 0,30 0,30	**511292 511294 511296 511298**
20	15	M6	-	2	4	35	4	0,70	**511154**
	8,5 15 20 25 30	M6	16,5	1	-	40 35 30 30 25	1,5 4 5 5,5 7	0,30 0,70 0,70 0,80 0,80	**511200 511215 511220 511225 511230**
25,5	10 15 20 30 15 20 30	M6	18 18 18 18 - - -	1 1 1 1 2 2 2	- - - - 4 4 4	80 60 50 50 60 55 50	2 3,5 5 8 3,5 5,5 8	0,80 1,00 1,20 2,00 1,00 1,20 2,00	**511158 511155 511159 511160 511164 511162 511163**

Ø A (mm)	B (mm)	C	G (mm)	Shape	H (mm)	Max. load (daN)	Deflect. (mm)	Energy (joules)	Reference
25,5	10 15 19 22 25 30 40	M8	20	1	-	80 60 55 50 50 50 50	2 3,5 4,5 5,5 6 8 10	0,80 1,00 1,20 1,30 1,50 2,00 2,50	**511265 511270 511251 511275 511280 511285 511290**
30	22	M8	-	2	6	80	6	2,40	**511156**
	15 22 30 40	M8	25	1	-	90 80 70 60	3,5 6 8 9	1,50 2,40 2,80 2,70	**511308 511310 511312 511314**
40	30 40	M8	20	1	-	120 120	7 10	4,60 6,00	**511157 511161**
	20 25 35 40 45	M10	25	1	-	160 150 120 120 120	5 6 8 10 11	4,00 4,50 4,80 6,00 6,60	**511450 511401 511452 511454 511456**
50	25 35 45	M10	25	1	-	300 250 190	6 9 11	9,00 11,20 10,00	**511625 511635 511645**
60	25 36 45	M10	25	1	-	400 300 250	6 9 11	12,00 13,50 13,70	**511625 511635 511645**
70	35 50 70	M10	25	1	-	450 350 300	9 12 14	20,00 21,00 21,00	**511735 511750 511770**
80	25 30 40 70 80	M14	45 35 35 35 35	1	-	1100 950 600 500 450	6 8 10 17 19	33,00 38,00 30,00 42,50 43,00	**513801 511830 511840 511870 511880**

See current price list for availability of items.

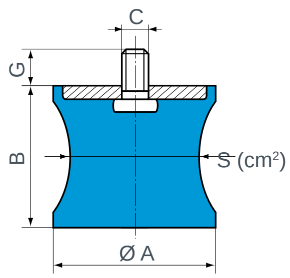
CONICAL PROGRESSIVE STOPS



Reference	Ø A (mm)	Ø B (mm)	C	G (mm)	Repetitive shocks			Exceptionnal shock energy (joules)	Weight (g)
					Energy (joules)	Deflect. (mm)	Reaction (daN)		
512251	25,5	19	M8	20	3	8	100	9	20
512307	30	30	M8	25	6	15	140	18	37
512301	30	30	M6	13,5	6	15	140	18	30
511962	40	39	M8	16	15	16	250	45	62
512515	50	50	M10	25	30	25	340	90	85
512501	50	50	M8	20	30	25	340	90	75
512516	50	64	M10	25	40	32	370	120	150
512502	50	64	M8	35	40	32	370	120	150
512517	50	58	M10	25	37	32	400	110	130
512503	50	58	M8	15	37	28	400	110	120
512608	50	40	M10	25	27	28	550	70	140
512601	60	40	M14	62	27	18	550	70	200
512700	72	58	M10	25	50	26	550	150	290
512721	72	58	M12	30	50	26	550	150	300
512951	95	80	M16	45	120	37	1 100	350	750
512951/13	95	80	M16	65	120	37	1 100	350	750

See current price list for availability of items.

DIABOLO STOPS

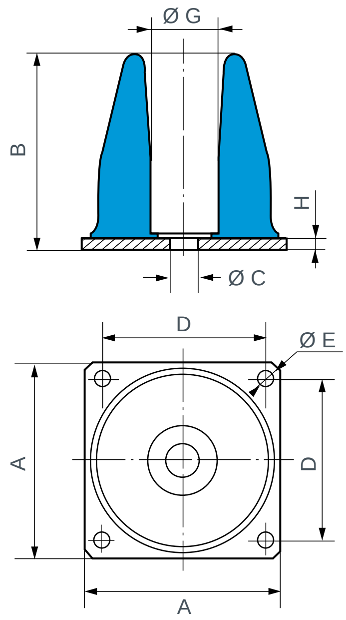


References	S (cm²)	Ø A (mm)	B (mm)	C	G (mm)	Max. instant. load (daN)	Deflect. (mm)	Max. static load (daN)	Deflect. (mm)	Energy (joules)	Weight (g)
511571	5	57	42	M8	20	100	10	10	4	1	60
511572	9,5	57	42	M8	20	200	12	75	5,5	2	80
511601	19,5	60	57	M10	25	350	15	150	8	6	190
511801	38,5	80	65	M14	30	800	16	300	9,5	15	500
511951	50	95	70	M16	47	1 000	18	400	9,5	20	790

LEVAFLEX PROGRESSIVE STOPS

Reference	A (mm)	B (mm)	Ø C (mm)	D (mm)	Ø E (mm)	Ø G (mm)	H (mm)	Weight (g)
514085	85	85	8,5	69	8,5	20	5	600
514110	110	110	12,5	90	8,5	30	6	1 200
514130	130	130	19	106	11	40	6	2 000
514160	160	160	23	132	11	45	8	3 000
514200	200	200	28	168	13	60	10	7 000

See current price list for availability of items.



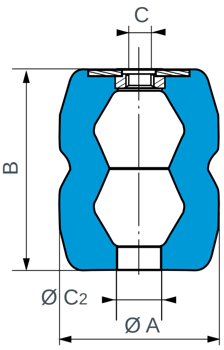
Repetitive shocks			Exceptional shock energy (joules)	Reference hardness
Energy (joules)	Corresponding deflection (mm)	Reaction (daN)		
170	40	1 200	500	**514085/60**
280	40	1 700	850	**514085/75**
330	50	1 800	1 000	**514110/60**
550	50	3 400	1 500	**514110/75**
600	65	2 800	1 800	**514130/60**
650	60	3 000	1 900	**514130/75**
1 050	75	4 500	3 000	**514160/60**
1 200	90	4 000	3 600	**514200/60**
1 300	70	6 000	3 900	**514160/75**
2 200	85	7 800	6 600	**514200/75**

See current price list for availability of items.

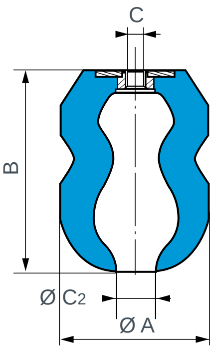
EVIDGOM STOPS

Repetitive shocks			Exceptional shock energy (joules)	Reference hardness
Energy (joules)	Corresponding deflection (mm)	Reaction (daN)		
31	30	190	95	**810644**
100	50	580	300	**810645**
110	45	600	330	**810666**
180	67	750	540	**810642**
350	75	1 250	1 050	**810653**
360	65	1 400	1 100	**810655**
400	85	1 500	1 200	**810669**
300	70	900	-	**810784**
600	75	1 625	-	**810775**
1 050	90	2 375	-	**810776**
2 500	90	5 500	-	**810733/60**
7 100	150	11 000	-	**810732/60**
9 500	200	9 500	-	**810731/60**
13 000	130	18 000	-	**810732/75**
17 500	175	19 000	-	**810731/75**
21 000	200	25 000	-	**810735/60**
29 000	250	35 000	-	**810734/60**
41 000	200	70 000	-	**810735/75**
50 000	250	55 000	-	**810734/75**

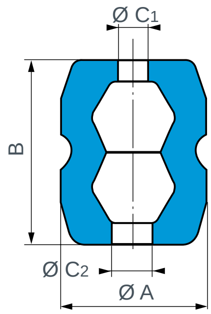
See current price list for availability of items.



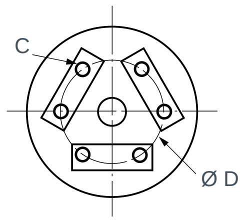
Shape 1



Shape 2



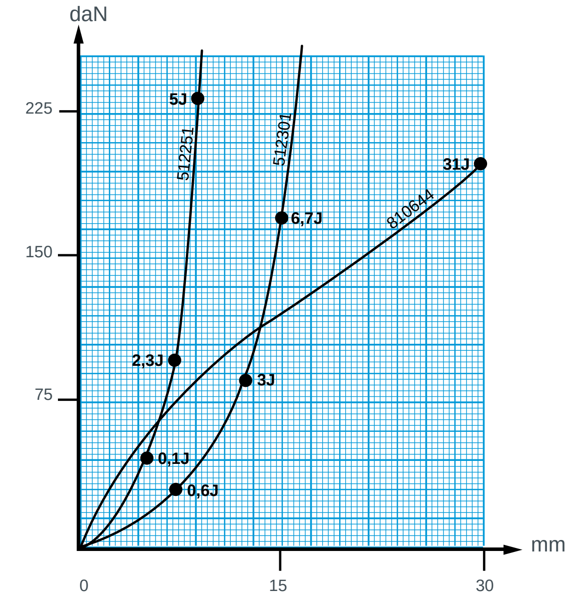
Shape 3

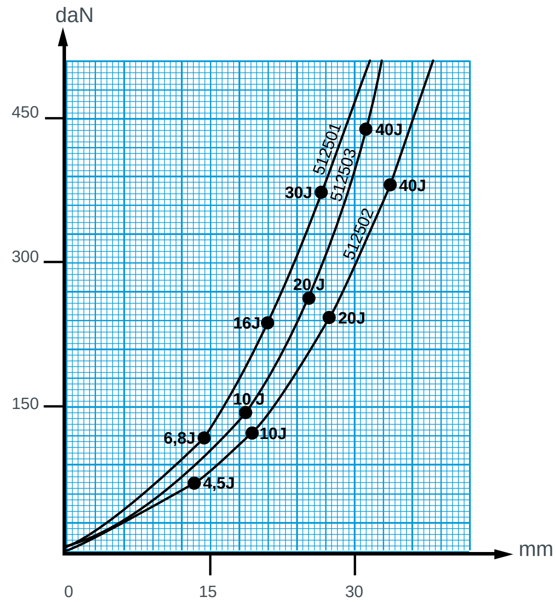


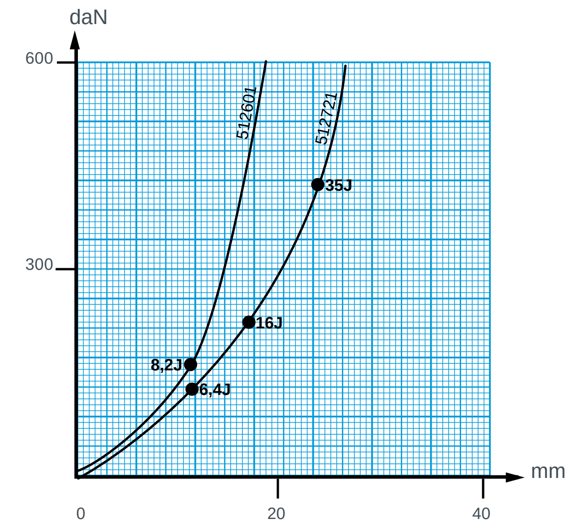
Stop reference	Shape	All rubber Evidgom reference	Ø A (mm)	B (mm)	C	Ø C1 (mm)	Ø C2 (mm)	Ø D (mm)	Ø A under load (mm)
810642	1	**810022**	85	120	M16	20	30	-	114
810644	1	**810004**	55	55	M10	14	14	-	72
810645	2	**810035**	66	93	M16	20	14	-	100
810653	1	**810023**	100	130	M16	20	30	-	140
810655	1	**810025**	110	132	M16	20	30	-	142
810666	2	**810046**	76	90	M16	20	14	-	98
810669	2	**810029**	110	150	M16	20	30	-	155
810731	3	-	250	400	2 x 6 x M24	70	70	150	360
810732	3	-	250	315	2 x 6 x M24	70	70	150	380
810733	3	-	250	230	2 x 6 x M24	70	70	150	370
810734	3	-	350	500	2 x 6 x M24	85	85	196	445
810735	3	-	350	395	2 x 6 x M24	85	85	196	500
810775	1	**810015**	155	150	M16	25	30	-	202
810776	1	**810016**	188	180	M24	40	40	-	256
810784	1	**810014**	125	140	M16	30	25	-	168

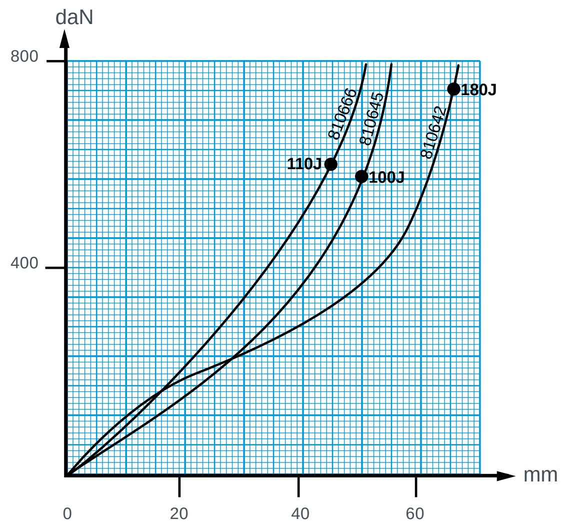
NOTA : The values are given for test conditions with an impact speed of 1 m/s. Consult us for speeds that are much higher.

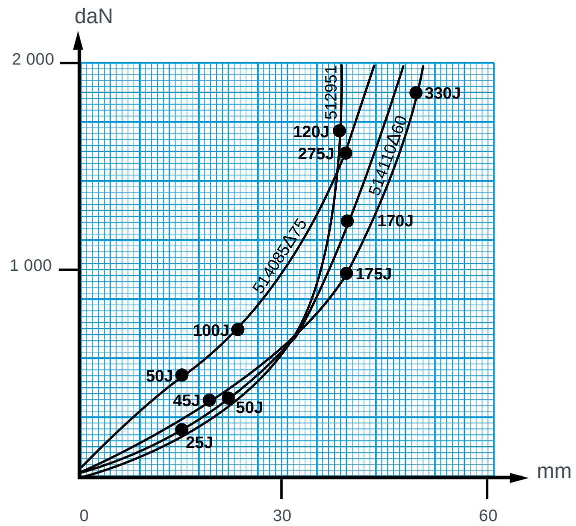
DEFLECTION CURVES AND ENERGY VALUES FOR PROGRESSIVE, LEVAFLEX AND EVIDGOM STOPS

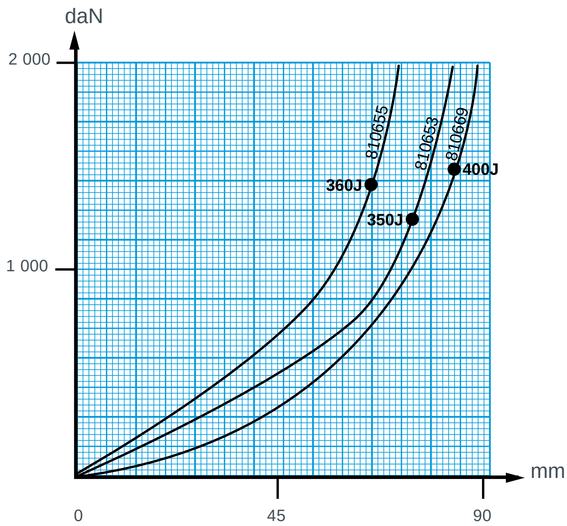


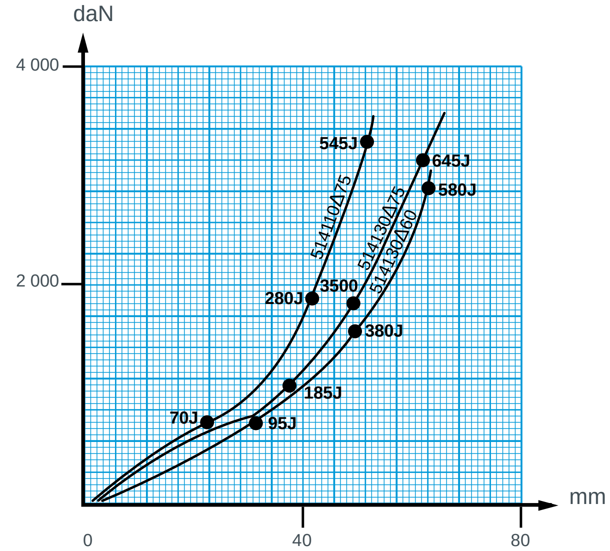


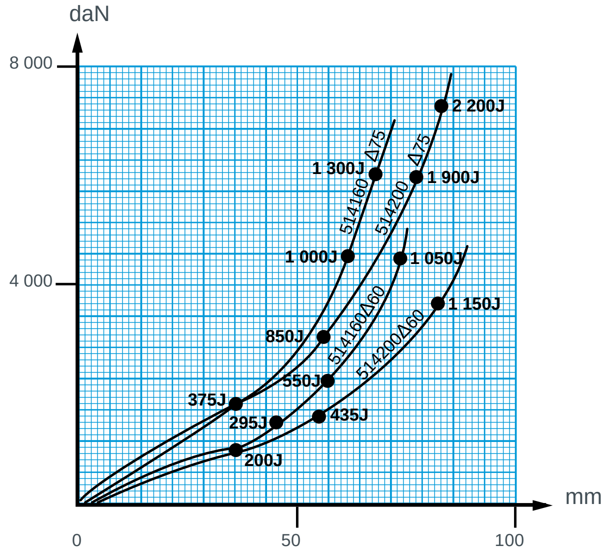


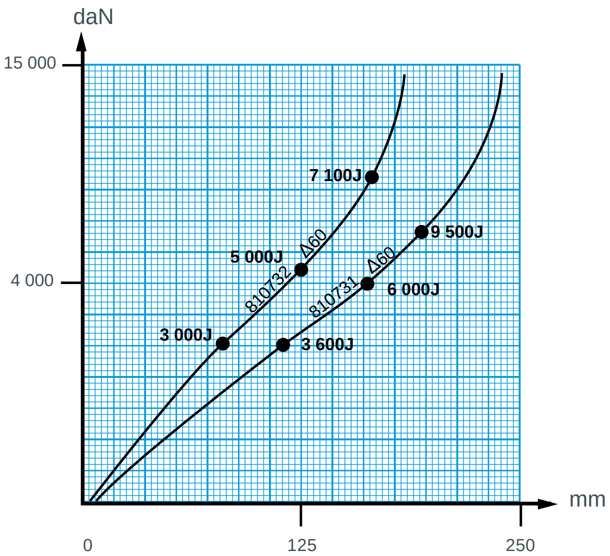


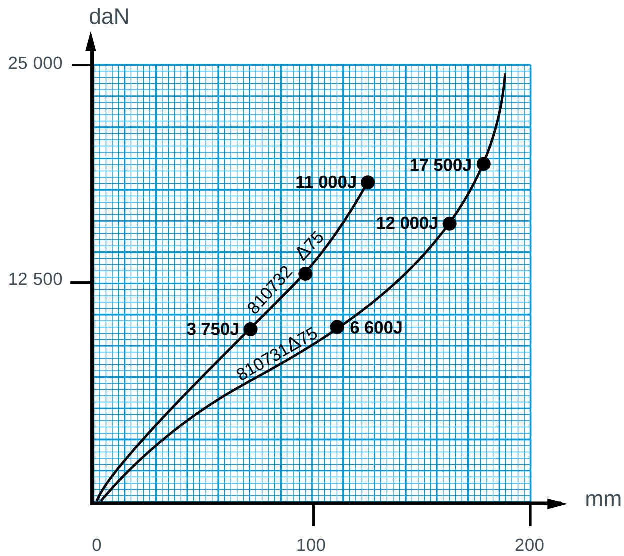


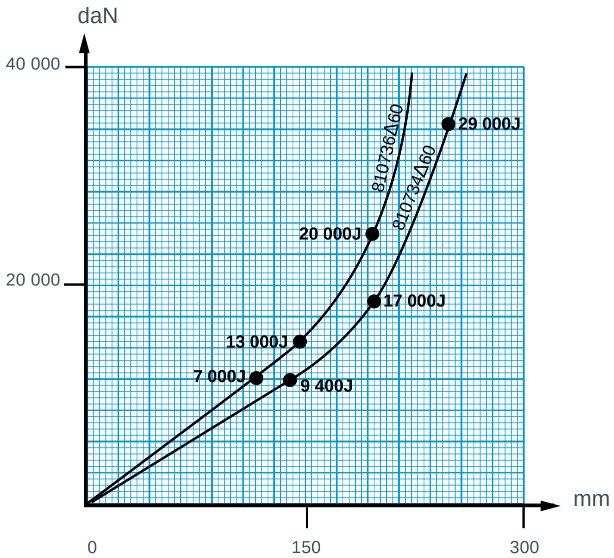


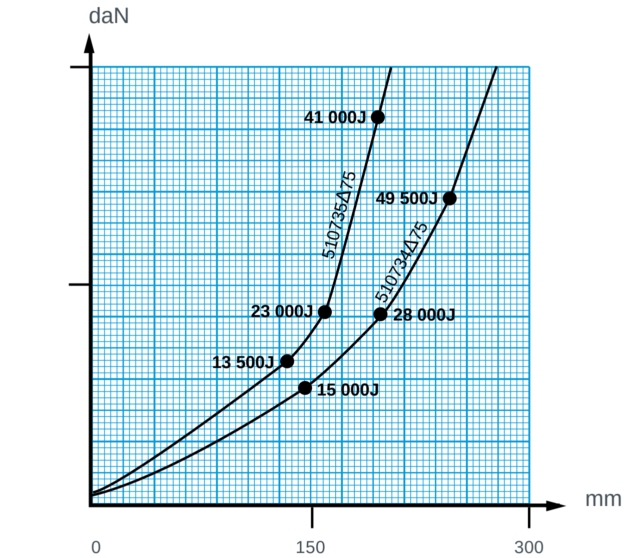

daN
4 000
2 000
545J
514110Δ75
645J
580J
514130Δ75
514130Δ60
280J
3500
380J
185J
70J
95J
mm
0
40
80


daN
8 000
4 000
2 200J
1 300J
514160 Δ75
514200 Δ75
1 900J
1 000J
1 050J
1 150J
850J
514160Δ60
514200Δ60
550J
375J
295J
435J
200J
mm
0
50
100


daN
15 000
4 000
7 100J
9 500J
5 000J
810732 Δ60
810731 Δ60
6 000J
3 000J
3 600J
mm
0
125
250


daN
25 000
12 500
17 500J
11 000J
12 000J
810732 Δ75
3 750J
6 600J
810731Δ75
mm
0
100
200


daN
40 000
20 000
29 000J
810736Δ60
810734Δ60
20 000J
17 000J
13 000J
7 000J
9 400J
mm
0
150
300


daN
41 000J
510735Δ75
49 500J
510734Δ75
23 000J
28 000J
13 500J
15 000J
mm
0
150
300

PAULSTRADYN ®

Natural frequency : (1)
- axial : 7Hz
- radial : 3 to 5,5 Hz

AVANTAGES

- Better than 90% isolation at 1.500 rpm (25 Hz).
- Constant height over wide load range.
- Stabilised characteristics during Service Life.
- Simple to fit.
- 500 hours protection against salt spray*.
- Design.

*When mounted according to the recommendations given in the catalogue.

Resilient Element = SILTECH
- Low increase of stiffness with frequency
- Low creep

Finite element modeling (FEM) was used when designing the Paulstradyn® series resulting in the lowest possible elastomer stresses and most efficient performance for a high deflection mount of this type.

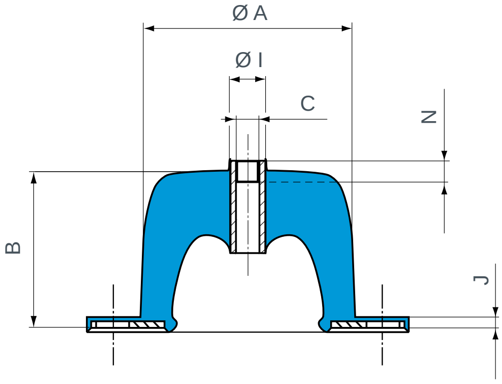
APPLICATIONS

Antivibration isolation for static equipment :
- rotating machinery such as fans, air-conditioning, pumps, compressors, generator sets;
- pipeworks, ceilings, transformers, electrical enclosures.

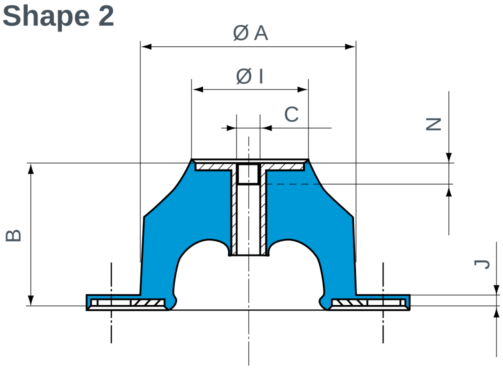
1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

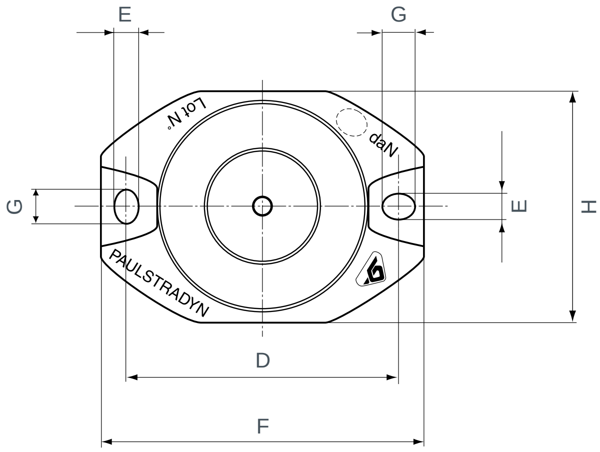
DIMENSIONS CHARACTERISTICS

Shape 1



Shape 2





Designation	Ref.	Nominal Load NL (daN)	Shape	Dimensions (mm)										
				Ø A	B*	C	D	E	F	G	H	Ø I	J	N
Paulstradyn® 4 7 12	**533701** **533702** **533703**	4 7 12	1	40	40	M6	52	6,2	64	6,2	44	12	2,5	6
Paulstradyn® 20 30 50	**533704** **533705** **533706**	20 30 50	2	60	40	M6	76	6,2	90	8,2	64	31	2,5	6
Paulstradyn® 70 100 130	**533707** **533708** **533709**	70 100 130	2	80	40	M8	100	8,2	122	12,2	84	48	2,5	12
Paulstradyn® 160 200 260	**533710** **533711** **533712**	160 200 260	2	100	40	M10	124	10,2	152	16,2	104	68	3	10
Paulstradyn® 325 400 500	**533713** **533714** **533715**	325 400 500	2	150	40	M12	182	12,2	214	20,2	154	116	4,5	10
Paulstradyn® 640 820 1050 1350	**533716** **533717** **533718** **533719**	640 820 1050 1350	2	200	40	M16	240	14,2	280	24,2	204	159	5,5	20

* Height, unloaded 40 mm, under load 32 mm (see Technical Characteristics).
NL : Nominal static load with mounting under axial compression.

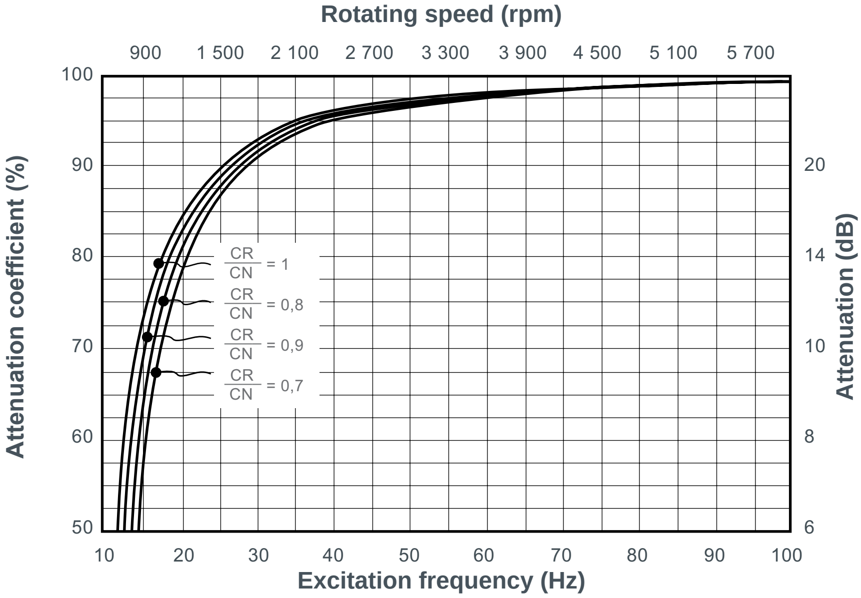
TECHNICAL CHARACTERISTICS

The vibration attenuation and height characteristics under nominal loads are **stabilised after one month under a load at 20°C.**

Common characteristics

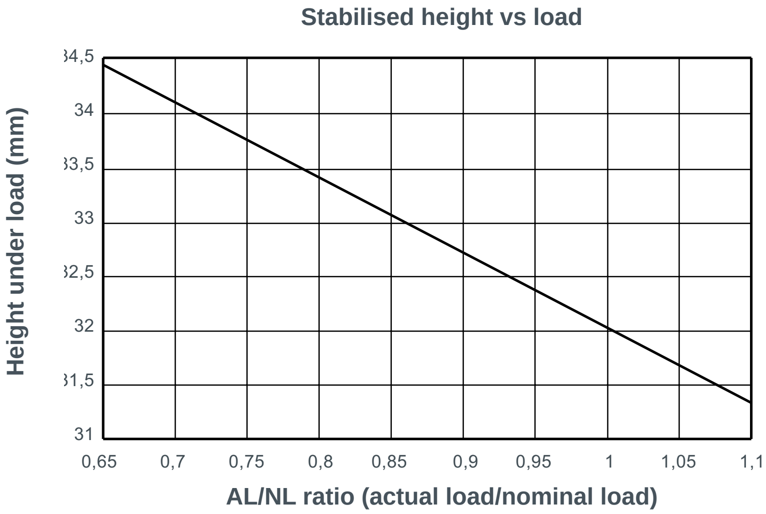
- Natural axial frequency : 7 Hz with nominal load.
- Natural radial frequency : 3 to 5.5 Hz
- Maximum displacement :
  - axial : 12 mm
  - radial : ± 10 mm.

Vibration attenuation



$\frac{AL}{NL}$ = Ratio $\frac{\text{actual load}}{\text{nominal load}}$

Height under load



Temperature	Operating temperature : - 20 °C to + 70 °C.
Other characteristics*	Good dynamic performance at high frequency Withstand fatigue and shock. Reduced creep.

* Detailed Technical Characteristics can be sent on request. Ask us for details.

MOUNTING

Standard Mounting

❶machine base or foot
dimensions > Ø M*

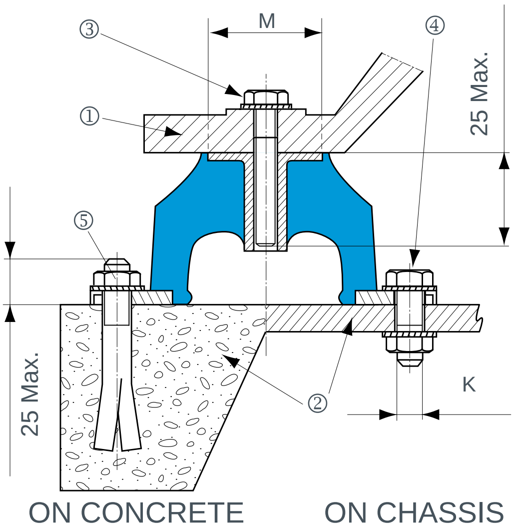
❷supporting structure (floor)
dimensions > base of mounting F*

❸screw Ø C**

❹screw HM Ø K, a washer is required between the screw head and the PAULSTRADYN®**

❺screw Ø K, a washer is required between the screw head and the PAULSTRADYN®**

* to ditribute the load and resist corrosion.
** nuts and screws grade 4.6 minimum.



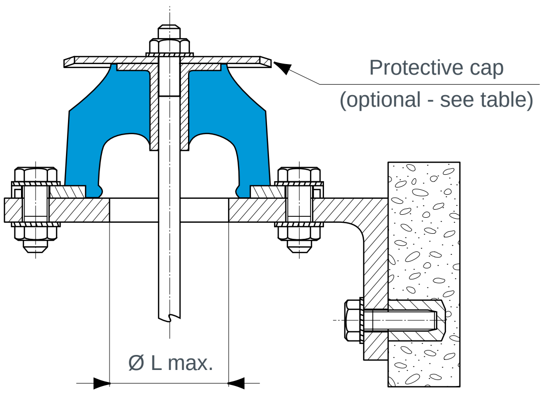
Shape 1

Recommanded torque

Diameter K (mm)	M6	M8	M10	M12
Torque N.m	2	5	12	20

Note : Do not paint the mountings after fitting.

Alternative mounting



Shape 2

Mounting and cap references

Paulstradyn® references	Dimensions (mm)			Protective cap reference (optional)
	K Shape 1	L max. shape 2	M min. shape 1	
533701, 533702, 533703, 533704, 533705, 533706	M5	27	14	**342919**
533707, 533708, 533709	M5	40	34	**342356**
533710, 533711, 533712	M6	46	50	**342733**
533713, 533714, 533715	M8	47	70	**342734**
533716, 533717, 533718	M10	99	118	**342353**
533719	M12	127	162	**342354**

EVIDGOM ®

Natural frequency : (1)
2,5 to 7 Hz

DESCRIPTION

The EVIDGOM® mount is formed from two thick conical membranes joined at their bases to create a highly elastic mounting.
There are three variations :

- all rubber EVIDGOM®;
- EVIDGOM® with bonded fixing;
- EVIDGOM® with a diamond or square mounting plate (fixing plate supplied as a separate kit).

OPERATION

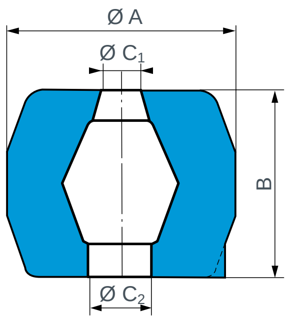
The design of the EVIDGOM® mount gives the following basic characteristics:
- a very high axial elasticity;
- very low natural frequency (a few Hertz);
- progressive buffer against shocks or accidental overload.

Advantages
- As the load/deflection curve has a point of inflection, a suspension may be designed to have a sub-tangent greater than the static deflection.
- The elastomer used provides intrinsic damping with a corresponding ability to absorb energy which gives appreciable advantages over metallic springs.

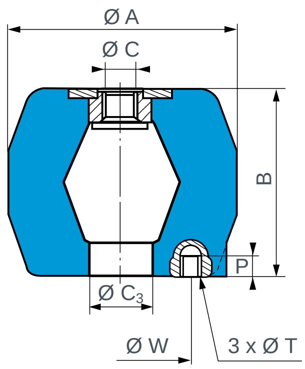
Recommendations
- The selection of a low natural frequency (large deflection) must not be allowed to endanger the stability of the suspension (tall equipment).
- In certain cases (use under maximum load) the use of side stops is recommended.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

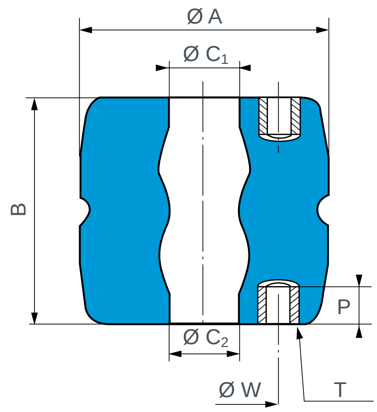
DIMENSIONS CHARACTERISTICS



Shape 1



Shape 2

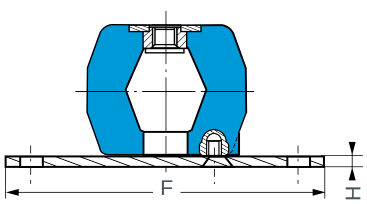


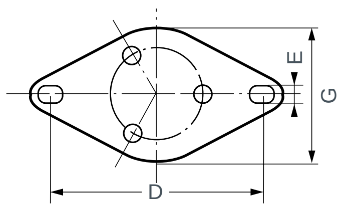
Shape 3

Ø A (mm)	B (mm)	EVIDGOM® reference				C	Ø C1 (mm)	Ø C2 (mm)	Ø C3 (mm)	Ø W (mm)	T	P (mm)
		All rubber	Shape	With fixings	Shape							
34	25	**810002**	1	-	-	-	8	8	-	-	-	-
40	55	**810003**	1	-	-	-	14	14	-	-	-	-
50	70	**810005**	1	-	-	-	14	14	-	-	-	-
60	40	-	-	**810780**	2	M10	-	25	25	40	M6	6
85	70	**810006**	1	**810766**	2	M16	20	30	30	60	M8	8
95	90	**810008**	1	**810768**	2	M16	20	30	30	60	M8	8
108	90	**810009**	1	**810769**	2	M16	20	30	34	70	M10	10
120	110	**810012**	1	-	-	-	20	30	-	-	-	-
140	120	**810013**	1	**810773**	2	M16	25	40	35	70	M10	10
125	140	**810014**	1	**810774**	2	M16	25	30	25	70	4xM12	12
125	140	**810014**	1	**810784**	2	M16	25	30	25	70	M10	10
140	90	**810019**	1	**810779**	2	M16	28	12	28	70	M10	10
140	56	**810020**	1	**810770**	2	M16	30	30	30	70	M10	10
155	150	**810015**	1	**810775**	2	M16	25	30	30	90	M14	14
188	180	**810016**	1	**810776**	2	M24	40	40	40	90	M14	14
250	230	-	-	**810733**	3	-	70	70	-	150	6 X M24	40
350	290	-	-	**810736**	3	-	85	85	-	196	6 X M24	40

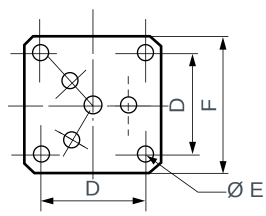
See current price list for availability of items

Lower fixing plate





Shape a



Shape b

Evidgom® reference	Fixing pack reference	Shape	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)
810780	**337566**	a	98/102	8,2	117	65	5
810766	**337567**	a	124/128	10,2	158	110	5
810768	**337567**	a	124/128	10,2	158	110	5
810769	**337568**	a	178/182	10,2	214	150	6
810773	**337568**	a	178/182	10,2	214	150	6
810784	**337568**	a	178/182	10,2	214	150	6
810779	**337568**	a	178/182	10,2	214	150	6
810770	**337568**	a	178/182	10,2	214	150	6
810775	**337569**	b	170	10,5	200	-	8
810776	**337569**	b	170	10,5	200	-	8

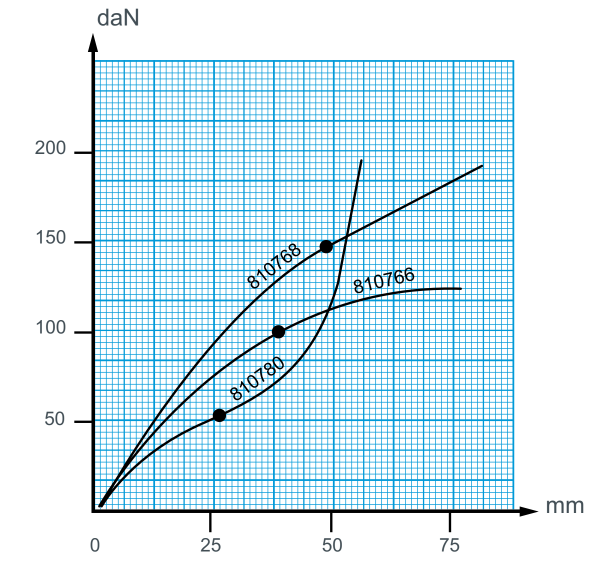
OPERATING CHARACTERISTICS

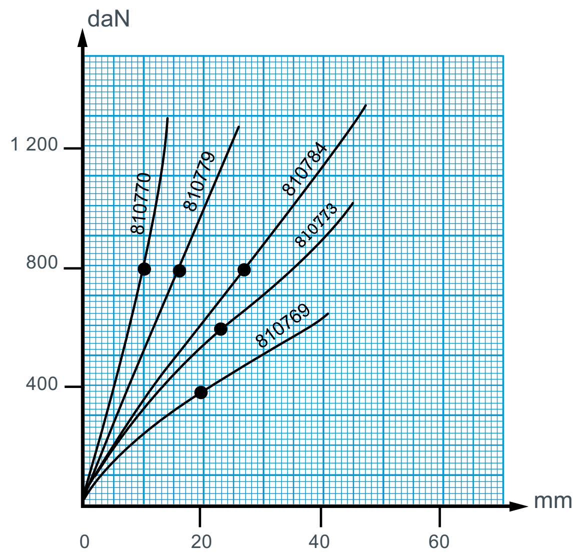
Nominal static load (daN)	Deflecty ±15% (mm)	Ø A mm under nominal charge	Height B (mm)	Reference
5-15	5	40	25	**810002**
10-40	11	50	55	**810003**
20-80	14	63	70	**810005**
15-60	10	80	40	**810780**
25-100	15	105	70	**810766**
35-150	18	124	90	**810768**
100-400	20	136	90	**810769**
100-390	23	134	110	**810012**
150-600	24	175	120	**810773**

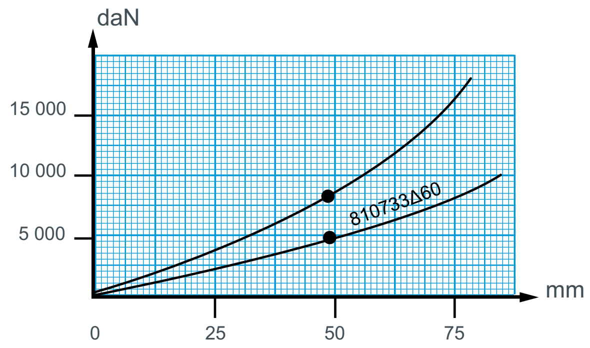
Nominal static load (daN)	Deflecty ±15% (mm)	Ø A mm under nominal charge	Height B (mm)	Reference
00-800	26	170	140	**810784**
200-800	16	175	90	**810779**
200-800	10	166	56	**810770**
325-1300	30	175	150	**810775**
500-2000	35	240	180	**810776**
1250-5000	50	345	230	**810733Δ60**
2000-8000	50	345	230	**810733Δ75**
2250-9000	60	500	290	**810736Δ60**
3500-14000	60	500	290	**810736Δ75**

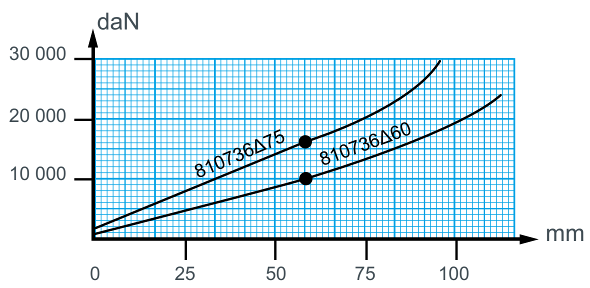
See current price list for availability of items.

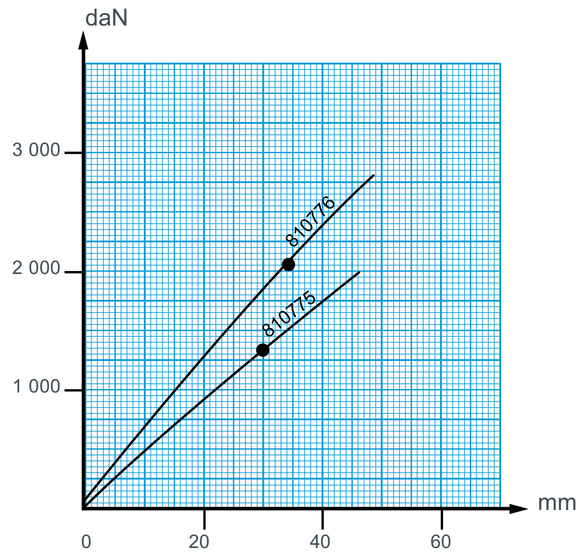
LOAD/DEFLECTION CURVES IN AXIAL COMPRESSION











“SANDWICH” MOUNTS

Natural frequency : (1)
5 to 13 Hz

DESCRIPTION

The SANDWICH mount comprises one or more layers of elastomer bonded to flat, parallel metallic plates. These mountings may be cylindrical or rectangular. They are designed to withstand very high compressive loads. The range of mechanical characteristics is gover-ned by the hardness of the rubber and the number of intermediate metallic plates.

These mountings can support compression from 20 to 100 bars.

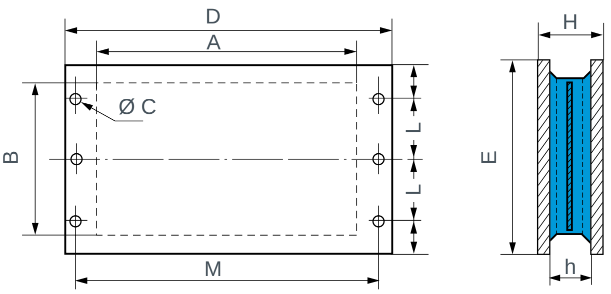
The elastomer is polychloroprene which provides a high resistance to atmospheric exposure.

OPERATION

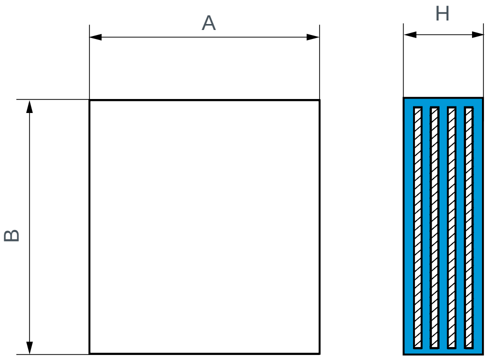
The design of the SANDWICH mount gives the following basic characteristics :

- very slim;
- large surface area;
- stackable mountings;
- the suspended equipment is free to move in all directions;
- high ratio of axial stiffness to radial stiffness;
- very high axial loads.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.



Shape A



Shape B

BRACKET WITH FIXING (Shape A)

Ref. without intermediate plate	Ref. with intermediate plate	A (mm)	B (mm)	D (mm)	E (mm)	H (mm)	h (mm)	Nr holes x Ø C (mm)	L (mm)	M (mm)	Weight (kg)
539608	**539607**	182	142	255	170	49	40	6 x 9	58	235	5
539612	539933	372	252	460	300	61	50	6 x 13	100	430	18
539613	-	702	252	805	300	61	50	6 x 17	95	765	35
-	539267	160	110	230	110	58	44	4 x 15	35	202	5
539821	-	283	140	380	140	76	60	6 x 18	50	340	9,5

See current price list for availability of items.

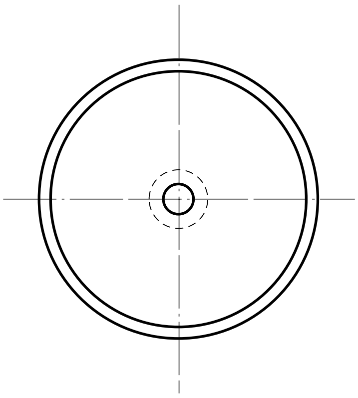
Nominal static load (daN)	Deflection (mm)	Reference	Hardness
1000-4000	8	539821	50
1250-5000	4	**539608**	60
2500-10000	6	**539607**	45
6250-25000	3,5	539267	70
3750-15000	5	**539607**	60

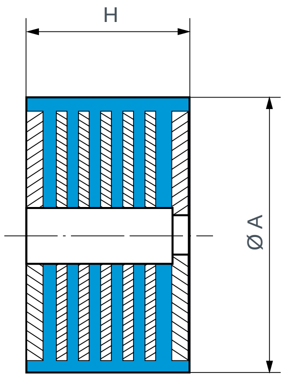
Nominal static load (daN)	Deflection (mm)	Reference	Hardness
5000-20000	6	**539612**	45
7500-30000	7	**539612**	60
11250-45000	5	**539613**	60
15000-60000	4	539933	60

BRACKET WITHOUT FIXING (Shape B)

Reference	A (=D) (mm)	B (=E) (mm)	H (mm)	Maximum static load (daN)
539832	200	165	38	95 000
539823	220	220	270	150 000
539833	240	200	38	145 000
539992	250	250	140	200 000
539820	400	300	78	380 000
539835	405	255	61	310 000
539537	500	500	66,5	870 000
539890	510	410	82	700 000
539939	600	500	125	1 000 000
539520	650	650	152	1 500 000
539924	702	252	50	450 000
539903	800	250	190	480 000
539701	750	750	300	2 000 000
519821	200	190	60	115 000
519822	260	230	60	185 000
519823	280	180	60	143 000

CYLINDRICAL MOUNTINGS

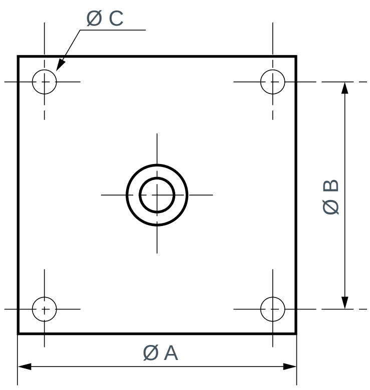


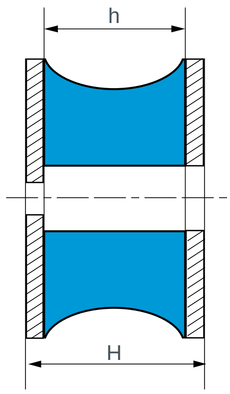


Dimensions can change. Please contact us.

Reference	Ø A (mm)	H (mm)	Nominal static load (daN)
539904	115	54	1 500
544051	150	110	12 000
539796	200	94,5	18 000
539983	200	90	5 000
539539	275	275	5 000
539938	320	19	100 000
539937	350	105	110 000
539900	400	117	150 000
544078	600	167	300 000
544079	600	285	433 000
544080	860	300	650 000

DOMINANTLY RADIAL MOUNTINGS





Dimensions can change. Please contact us.

Reference	A (mm)	h (mm)	B (mm)	H (mm)	Ø C (mm)	Shear		Compression (daN)
						(mm)	(daN)	
534646	150	62	120	70	12,5	20	200	1 500
534647	150	62	120	70	12,5	20	150	1 000
534455	232	74	190	86	16,5	25	500	2 000
534456	232	74	190	86	16,5	25	625	3 500
539898*	180	88	146	100	13	10	400	3 000
539917*	180	66	146	76	13	10	250	1 500
539940	300 x 480	318	430 x 219	350	18	70	4 500	13 000
539806	360 x 200	100	330 x 170	120	18	30	1 200	3 000
544051*	240 x 160	100	190 x 110	110	17	30	1 800	10 000

* Multilayer laminated part.

STABIFLEX

Natural frequency : (1)
6 to 11 Hz

DESCRIPTION

The STABIFLEX mount comprises a conical rubber section bonded between inner and outer metal parts.

- Centre axis with threaded hole.
- Square (4 holes) or diamond base (2 holes) with clearance hole.
- Bonded natural rubber, anti-slip bead.
- Cup to protect the rubber and distribute the load.

OPERATION

The design of the STABIFLEX mount gives the following basic characteristics :

- axial elasticity two or three times higher than radial elasticity;
- the rubber works in shear/compression;
- progressive buffer against shocks or accidental overload;
- anti-slip (may be placed directly on the ground).

Advantages

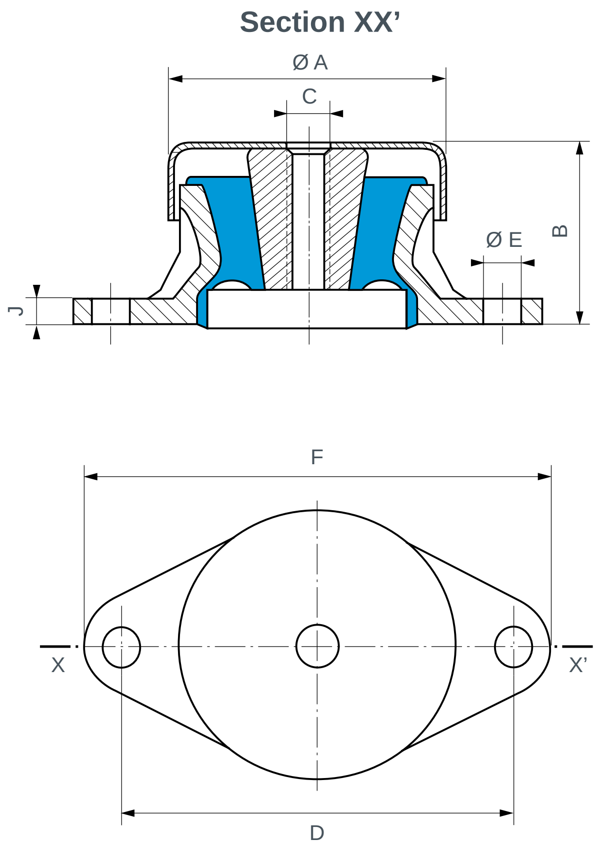
- The machine may be placed with its mounts directly on the ground.
- Speed of fixing.
- Easy movement of suspended machinery.
- Rubber protected against harmful liquids.
- Extensive range : 3 hardnesses of rubber for 5 existing types, allowing the mount to be optimised as a function of the load and forcing frequency.
- May be used with an anti-rebound washer.

Recommendations

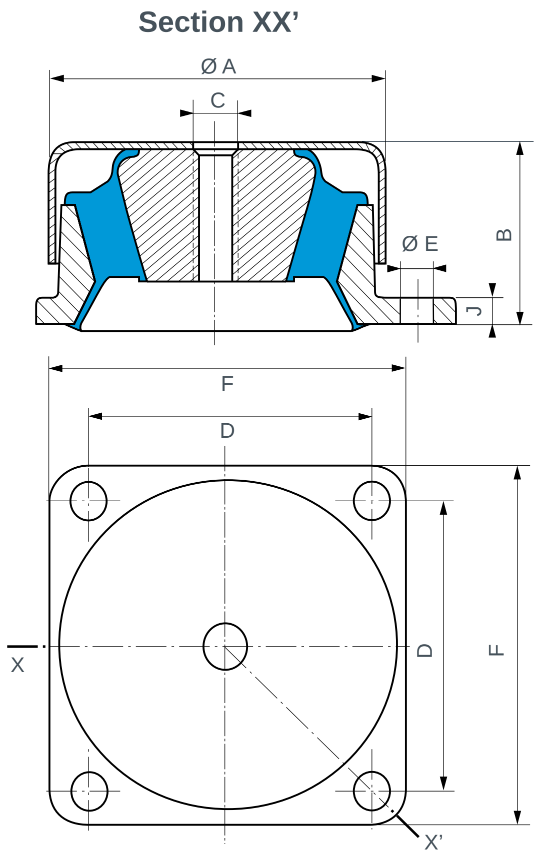
- In order not to affect the performances of the mounting system, all external connections must be flexible.
- STABIFLEX mounts must be fitted so that the vibration input is in the axial direction.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



STABIFLEX - diamond base



STABIFLEX - square base

Type	Reference	Hardness	Ø A (mm)	B (mm)	C	D (mm)	E (mm)	F (mm)	J (mm)	Weight (gr)
Diamond base	**530603** **530613**	45.60.75 45.60.75	69 84	41 51	M12 M12	98 115	9 11	114 137	6 7	250 450
Square base	**530622** **530642** **530652***	45.60.75 45.60 45.60.75	100 133 133	52 69 69	M12 M16 M16	90 114 114	11 13 13	114 144 144	7 9 9	1000 2300 2700

* Part identified by the letter "R" (reinforced)

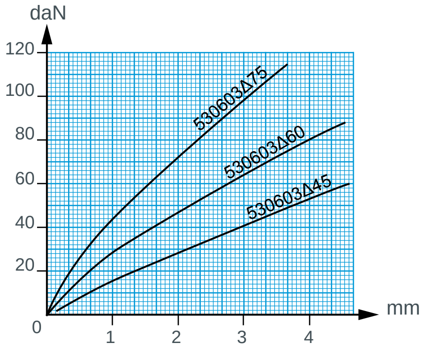
See current price list for availability of items.

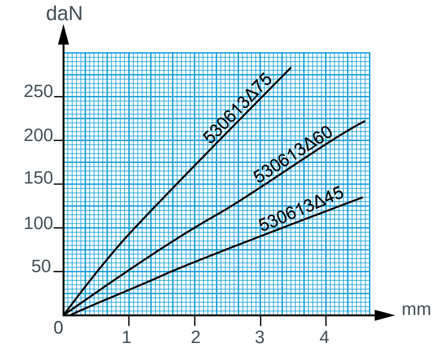
OPERATING CHARACTERISTICS

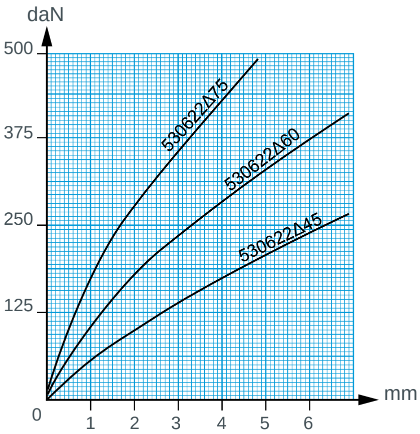
Nominal static load (daN)	Deflection (mm)	Reference	Hardness
10 - 42	3,5	**530603**	45
15 - 60	3	**530603**	60
20 - 93	3,5	**530613**	45
30 - 125	4	**530603**	75
40 - 165	3,5	**530613**	60
50 - 210	5	**530622**	45
65 - 260	3	**530613**	75

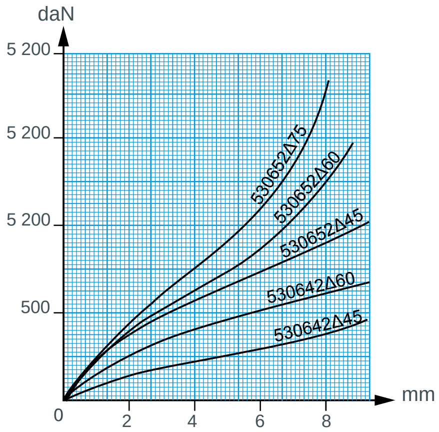
Nominal static load (daN)	Deflection (mm)	Reference	Hardness
65 - 275	4,5	**530622**	60
95 - 380	3,5	**530622**	75
110 - 450	8	**530642**	45
175 - 700	8	**530642**	60
250 - 1000	8	**530652**	45
325 - 1300	8	**530652**	60
450 - 1800	8	**530652**	75

LOAD/DEFLECTION CURVES IN AXIAL COMPRESISON



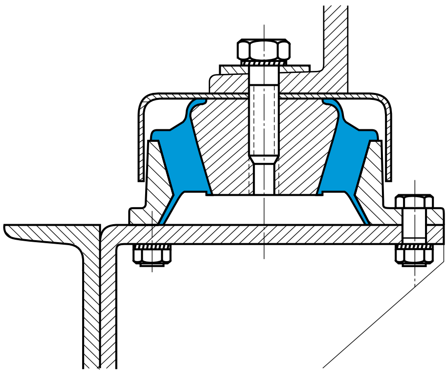


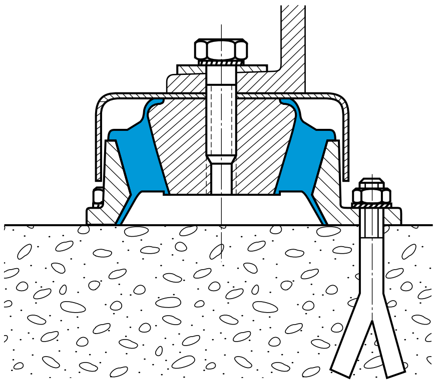




ASSEMBLY

Standard fixing methods

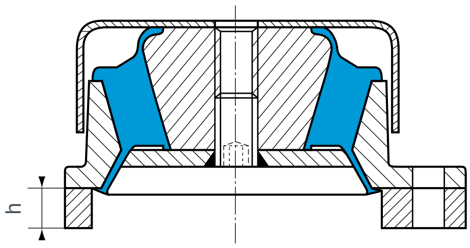




Fixing with anti-rebound washer

- The anti-rebound washer (not supplied) is fixed to the lower side of the centre axis.
- In this case, do not forget to fit a spacer.

  Spacer thickness required :
  530603 h: 2 mm
  530613 h: 4 mm
  530622 h: 7 mm
  530642 h: 14 mm
  530652 h: 14 mm



All our mounts are identified by conventional markings, either a paint spot or figures indicating the hardness : grey = hardness 45, green = hardness 60, blue = hardness 75.

PAULSTRAFLOAT

Natural frequency : (1)
- axial 8 Hz

DESCRIPTION

Paulstrafloat® mount of rectangular design is composed of :
- diamond base (2 holes) with clearance hole;
- cup to protect the rubber and distribute the load;
- progressive stiffness and rebound for protection against shocks.

OPERATION

The design of the Paulstrafloat® mount gives the following basic characteristics :
- differents stiffness in 3 axis : vertical - longitudinal (length) - width;
- the rubber works in shear/compression;
- set position control with the slots;
- higher axial stiffness;
- this mount is suitable for mobile equipment.

Advantages
- The machine may be placed with its mounts directly on the ground.
- Quick installation.
- Rubber protected against harmful liquids.
- Extensive range : 3 hardnesses of rubber for 3 existing types, allowing the mount to be optimized as a function of the load and forcing frequency.
- Anti-rebound and fail-safe.

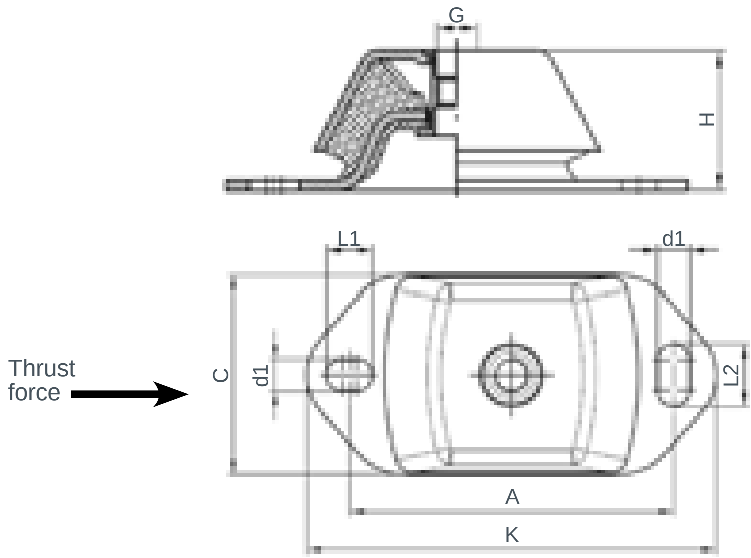
Recommandations
- Paulstrafloat® mounts must be installed on the longitudinal axis to handle thrust force.

APPLICATIONS

Paulstrafloat® mount is perfectly suitable for shipboard equipment, motor suspension, transports and boarding equipment. Used for static applications : generator, pump, fan …

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



OPERATING CHARACTERISTICS

References	Hardness	C	A	K	H	d1	L1	L2	G
544397	45/55/65	60	100	120	38	11	14	14	M12
544396	45/55/65	75	140	183	50	13	20	30	M16
544395	45/55/65	112	182	230	70	18	26	39	M20

References	Hardness	Max. load (daN)	Max. deflection under load (mm)	Max. load with thrust force (daN)
544397	45	60	5.5	40
	55	70		60
	65	110		90
	75	380		290
544396	45	160		100
	55	220		145
	65	310		220
	75	620		410
544395	45	350		250
	55	550		390
	65	810		565
	75	1380		975

CUPMOUNT

Natural frequency : (1)
25 to 35 Hz

DESCRIPTION

The CUPMOUNT is made of rubber rings that are each compression fit between two profiled metal structural components and the core.

- Internal structural element or core has an integral tapped hole.
- External structural element or base has four equally spaced mounting holes conforming to industry standard geometry and dimensions for cup style mounts.

OPERATION

The design of the CUPMOUNT gives the following basic characteristics : the ratio of radial and axial rigidity of the elements is 1/1, which allows excellent stability.

Advantages :

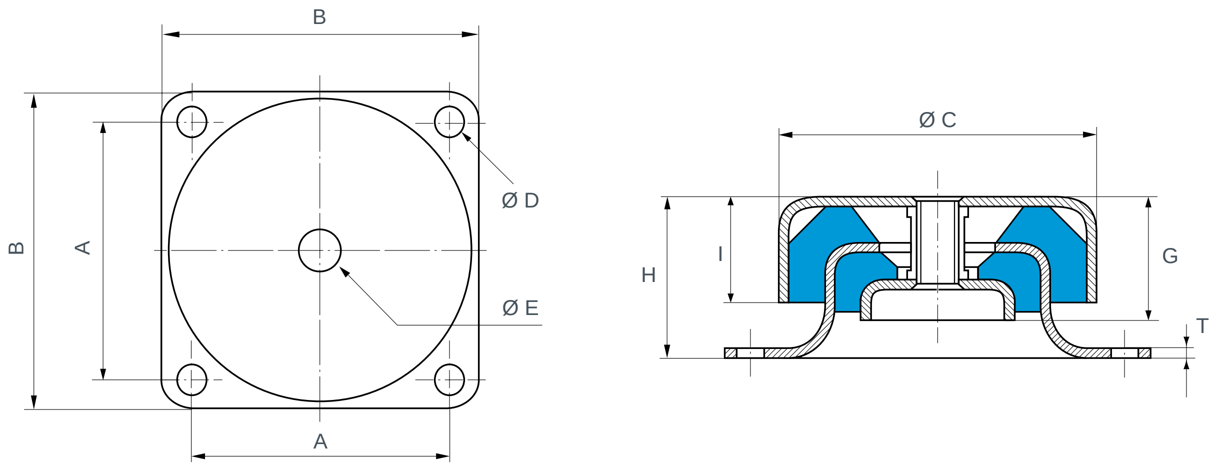
- Four models, load capacity of 1 to 1000 daN.
- Support iso-stiffness into axial and radial.
- Can be assembled multidirectional. Effective in compression, traction and shear.
- Chloroprene resistant to oils.
- Easy and fast to install.

APPLICATIONS

Engines, pumps, air conditioning, ventilators, transformers...
The CUPMOUNT can also be used for suspended ceilings and for mobile applications

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS CHARACTERISTICS



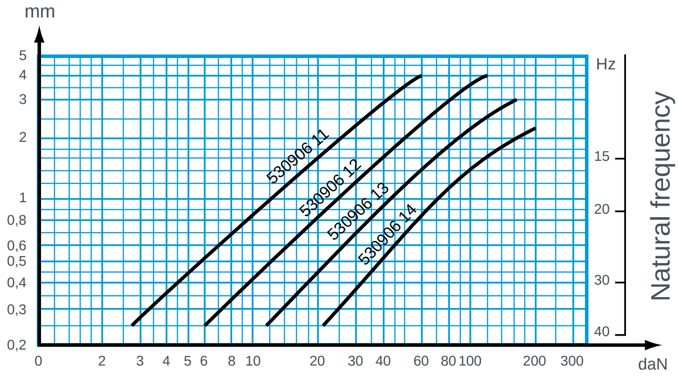
Paulstra reference	Barry Controls* reference	A (mm)	B (mm)	Ø C (mm)	Ø D (mm)	Ø E	G (mm)	H (mm)	I (mm)	T (mm)	Weight (kg)
530906 11/14	C1000	49,5	60	58	5,2	M6	20	28	18	1,6	0,2
530906 21/26	C2000	63,5	75	76	6,4	M10	30	38	25	2,3	0,4
530906 31/34	C3000	143	175	168	13,5	M16	65	90	59	4,7	4,5
530906 41/44	C4000	108	133	124	11,9	M16	19	63	38	4	1,8

OPERATING CHARACTERISTICS

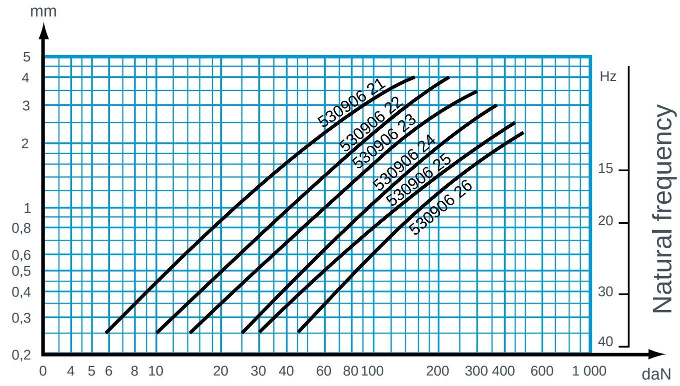
Paulstra reference	Barry Controls* reference	Maximum load (daN)	
		Mobile application	Static application
530906 11 530906 12 530906 13 530906 14	C1010 C1015 C1035 C1050	6,5 14 26 45	13 28 52 90
530906 21 530906 22 530906 23 530906 24 530906 25 530906 26	C2020 C2040 C2060 C2075 C2090 C2125	13 24 34 60 72 92	26 48 68 120 144 184
530906 41 530906 42 530906 43 530906 44	C4100 C4135 C4200 C4300	70 118 160 250	140 236 320 500
530906 31 530906 32 530906 33 530906 34	C3125 C3175 C3300 C3500	90 125 165 330	180 250 330 660

* Barry Controls part numbers are given as a reference only.

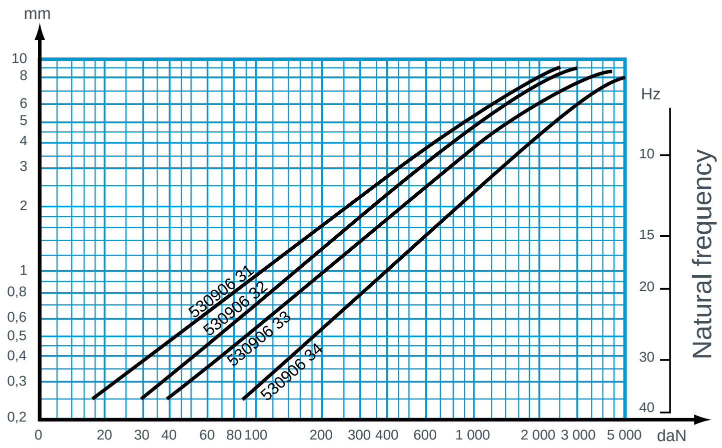
LOAD/DEFLECTION CURVES IN AXIAL COMPRESSION



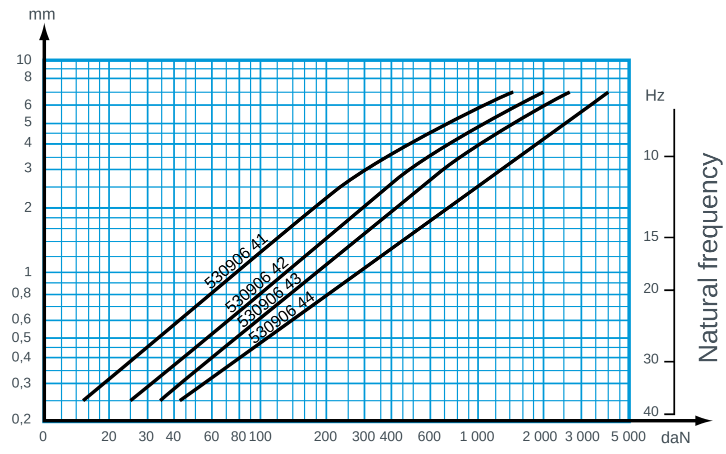
References 530906 11 to 14



References 530906 21 to 26



References 530906 31 to 34



References 530906 41 to 44

S.C. MOUNTS

Natural frequency : (1)
6 to 30 Hz

DESCRIPTION

The S.C. mount comprises an annular section bonded between the inner tube and outer housing. The outer housing has a mounting flange (4 different types).

OPERATION

The design of the S.C. mount gives the following basic characte-ristics :

- axial elasticity four times higher than radial elasticity;
- the rubber works in shear;
- progressive buffer against shocks or accidental overload, provided that a large metal washer is used to bear against the rubber dome;
- can be used as a fail safe assembly when fitted as in shape 1.

Advantages

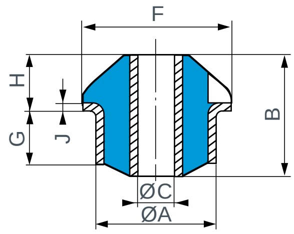
- Extensive range: 3 hardnesses of rubber for 20 existing types, allowing the mounting to be opti mised as a function of the load and exciting frequency.

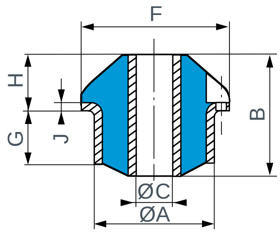
Recommendations

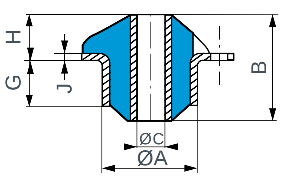
- In order not to affect the performance of the mounting system, all external connections must be flexible.
- S.C. mounts must be fitted so that the vibration input is in the axial direction.

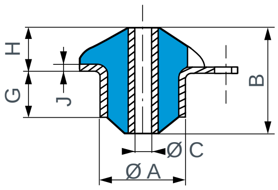
1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

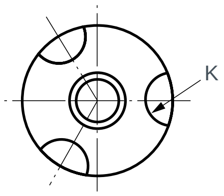
DIMENSIONS



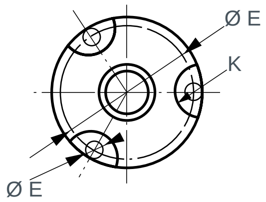




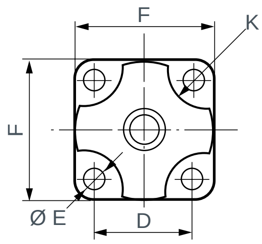




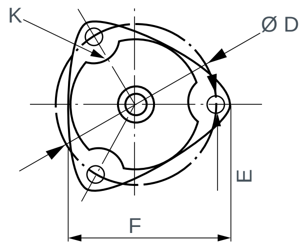
Shape a



Shape b



Shape c



Shape d

Type	Reference				Ø A (mm)	B (mm)	Ø C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	Weight (g)
	With fixing holes		Without fixing holes												
S.C. 000	**531201**	Shape c	-	-	20	11	6,2	19	3,2	25	3	7	1	4	8
S.C. 00	**531301**	Shape c	-	-	26	28	8	26	5,2	36	12,5	11,5	1,5	12	40
S.C. 01	-	-	**531401**	Shape a	37,5	40	12,1	-	-	48	18	18	2	8	110
S.C. 02	-	-	**531402**	Shape a	37,5	51	12,1	-	-	48	24	18	2	8	130
S.C. 10	**531216**	Shape d	-	-	49,1	47	12,2	69	8,2	72	20	18	2	12	190
S.C. 11	**531611**	Shape d	-	-	49,1	60	12,2	69	8,2	72	31	18	2	12	290
S.C. 20	-	-	**531701**	Shape a	55,7	55	18,2	-	-	70	27	19	3	10	370
S.C. 21	-	-	**531702**	Shape a	55,7	70	18,2	-	-	70	39	19	3	18	480
S.C. 21	**531240**	Shape d	-	-	57,2	70	18,2	86	10,5	90	39	19	3	18	500
S.C. 30	**531259**	Shape b	-	-	65	75	20,2	78	8,5	90	29	28	3	18	560
S.C. 31	**531261**	Shape d	-	-	66,5	93	20,2	95	8,5	107	47	28	3	18	780
S.C. 40	**531714**	Shape d	-	-	76	90	22,2	100	8,5	112	42	28	3	18	880
S.C. 41	**531327**	Shape d	-	-	76	110	22,2	100	8,5	112	49	28,5	3	18	960
S.C. 41	-	-	**531902**	Shape a	74	110	22,2	-	-	100	49	28	3	18	960
S.C. 50	**531939**	Shape d	-	-	87,5	100	40,2	114	8,5	127	47	33	3	20	1300
S.C. 51	**531947**	Shape b	-	-	86	120	40,2	104	10,5	120	63	33	4	22	1500
S.C. 70 Red.	**531933**	Shape b	-	-	118	98	60,2	145	10,5	164	36	46	4	22	2200
S.C. 70	**531932**	Shape b	-	-	118	140	60,2	145	10,5	164	66	46	4	22	3000
S.C. 71	**531931**	Shape b	-	-	118	170	60,2	145	10,5	164	96	46	5	30	3800
S.C. 80	**531940**	Shape b	-	-	170	167	80	204	12,2	230	95	53	5	30	7100
S.C. 81	**531941**	Shape b	-	-	170	185	80	204	12,2	230	113	53	5	30	7700

See current price list for availability of items.

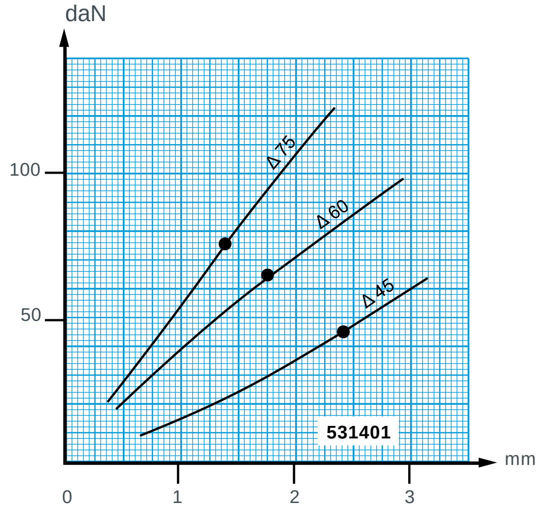
TECHNICAL CHARACTERISTICS

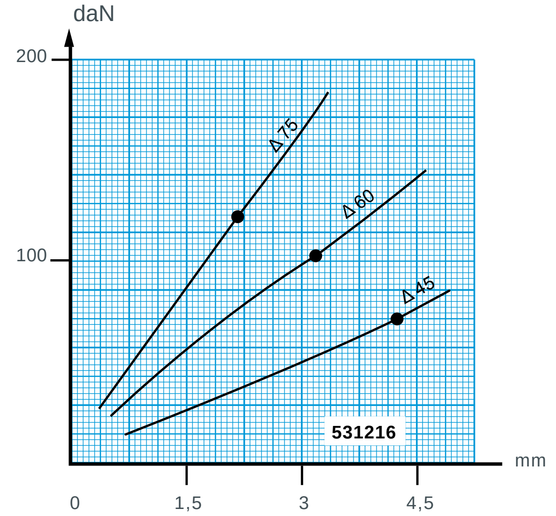
Nominal static load (daN)	Deflect. (mm)	Reference	Hard. Shore A
1-6	1	**531201**	45
2-8	0,8	**531201**	60
2-10	0,5	**531201**	75
5-20	1,5	**531301**	45
7-30	1,2	**531301**	60
10-40	0,8	**531301**	75
10-50	2,5	**531401**	45
15-65	1,8	**531401**	60
15-65	2,5	**531402**	45
15-70	4	**531216**	45
20-80	1,5	**531401**	75
20-85	1,8	**531402**	60
20-85	4	**531611**	45
20-85	3	**531216**	60
25-100	3,5	**531701**	45
25-100	1,5	**531402**	75
25-110	2	**531216**	75
30-120	3	**531611**	60
30-135	3,5	**531240**	45
30-135	3,5	**531702**	45
35-150	1,5	**531611**	75

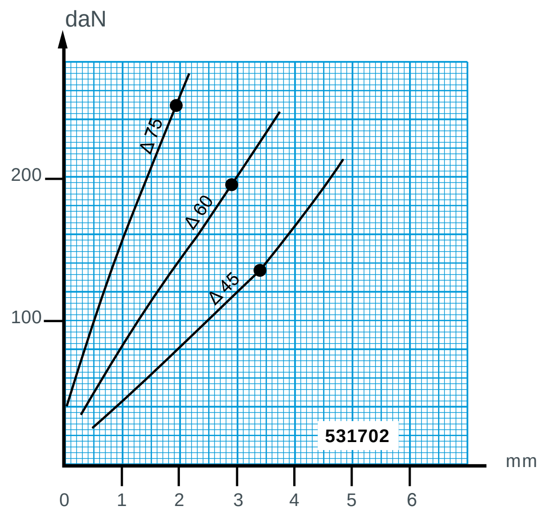
Nominal static load (daN)	Deflect. (mm)	Reference	Hard. Shore A
35-150	3	**531701**	60
40-175	5	**531259**	45
45-180	2	**531701**	75
45-190	3	**531240**	60
45-190	3	**531702**	60
55-225	5	**531714**	45
60-240	3,5	**531259**	60
60-250	2	**531240**	75
60-250	2	**531702**	75
60-250	5	**531261**	45
60-250	5	**531327**	45
60-250	5	**531902**	45
75-300	2	**531259**	75
80-320	4,5	**531714**	60
80-325	4,5	**531939**	45
85-350	3,5	**531261**	60
90-360	4,5	**531327**	60
90-360	4,5	**531902**	60
95-380	3	**531714**	75
100-400	4,5	**531947**	45
105-420	2	**531261**	75

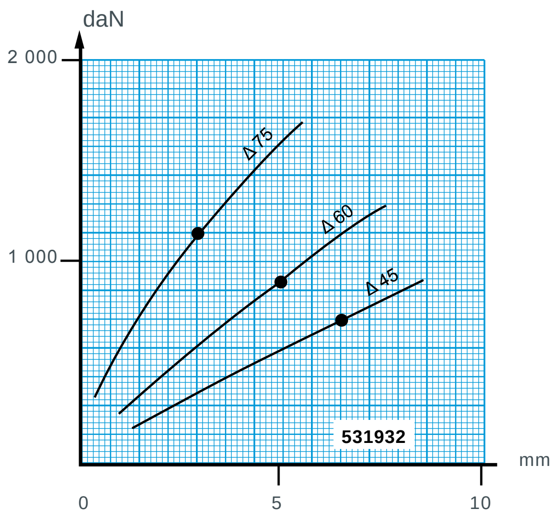
Nominal static load (daN)	Deflect. (mm)	Reference	Hard. Shore A
110-450	3,5	**531939**	60
110-450	3	**531327**	75
110-450	3	**531902**	75
110-450	6,5	**531933**	45
135-550	2,5	**531939**	75
135-550	3,5	**531947**	60
150-600	5	**531933**	60
165-670	2,5	**531947**	75
175-700	6,5	**531932**	45
210-850	6,5	**531931**	45
225-900	5	**531932**	60
275-1100	3	**531932**	75
275-1100	5	**531931**	60
310-1250	11	**531940**	45
350-1400	3	**531931**	75
400-1600	11	**531941**	45
450-1800	8,5	**531940**	60
525-2100	8,5	**531941**	60
575-2300	5	**531940**	75
650-2600	5	**531941**	75

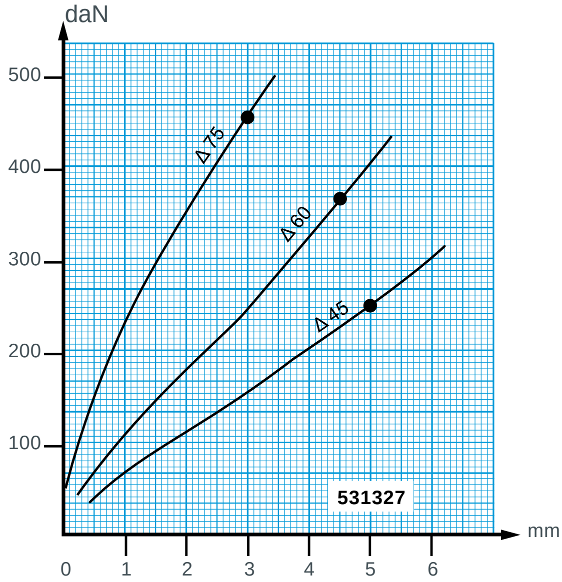
LOAD/DEFLECTION CURVES IN AXIAL COMPRESSION

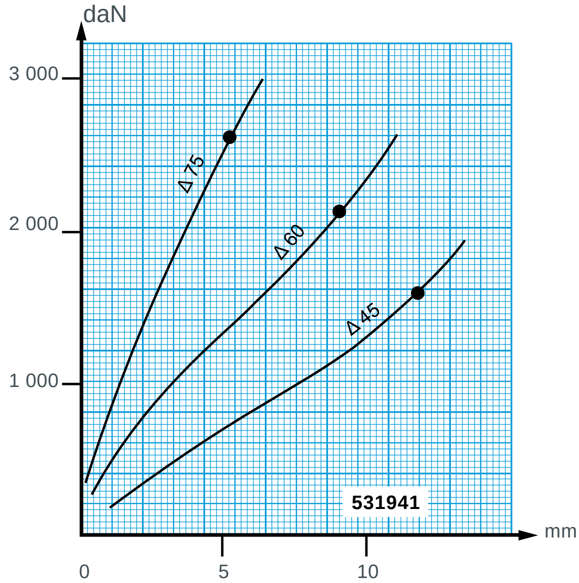






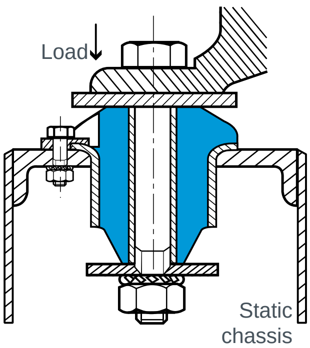




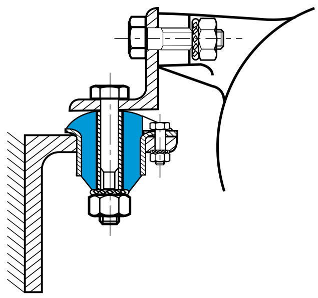


ASSEMBLY

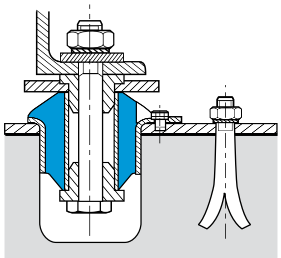
Standard Installations



Shape 1 - Fixing between the equipment and a metallic chassis (failsafe in mobile applications).

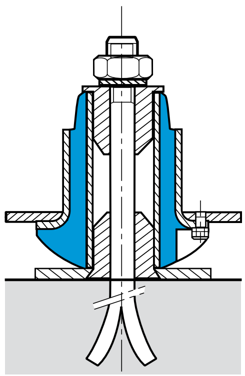


Shape 2 - Fixing between two brackets onto a vertical surface (non failsafe).

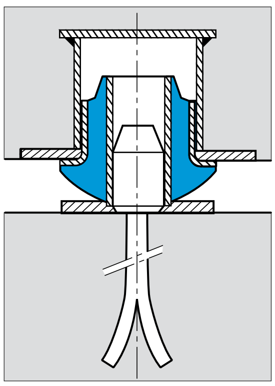


Shape 3 - Fixing between the equipment and concrete (using locating rings).

Reversed Installations

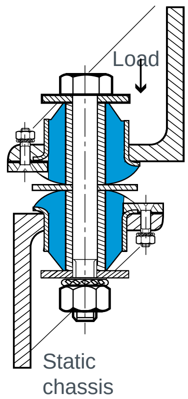


Shape 4



Shape 5 - Fixing between inertia base and foundation. The inertia base increases the suspended mass and thus reduces the amplitudes of the vibrations as well as lowering the natural frequency.

Tandem Mounting



Shape 6 - Two mounts fixed face to face. Provides twice the deflection under the same load.

S.T. C

Natural frequency : (1)
10 to 25 Hz

DESCRIPTION

The S.T.C. mount comprises a rubber ring bonded to a central tube.

- Inner tube : mild steel.
- Bonded rubber in the form of a ring at the top with a collar below which is used for fixing.

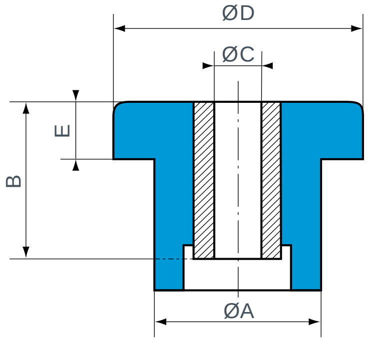
OPERATION

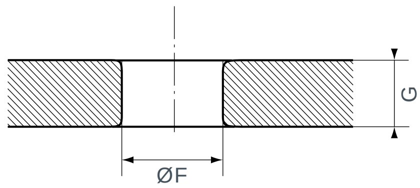
The design of the S.T.C. mount gives the following basic characteristics :
- the rubber works in compression;
- anti-rebound;
- can be used as safety mounting.

Advantages
- Simple to fix.
- Simple and economical.
- Extensive range of loads.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS





Reference	Ø A (mm)	B (mm)	Ø C (mm)	Ø D (mm)	E (mm)	Ø F (mm)	G (mm)
539887	20,6	17,5	10	27,7	5,6	20,6	8
539190	31,5	25,4	13	44,5	10,4	31,5	10
539886	34,3	35	13	50,8	13,5	34,3	16
539191	41,1	44,5	16	63,5	15,7	41,1	19
***539920**	38	23	16	64	16	38,5	19
539951	56,6	50,8	20	95	25,4	56	20

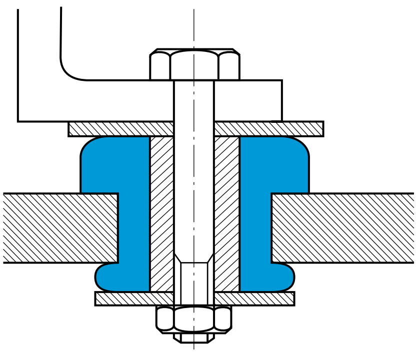
* This S.T.C. is mounted in pairs : see shape 2.
See current price list for availability of items.

OPERATING CHARACTERISTICS

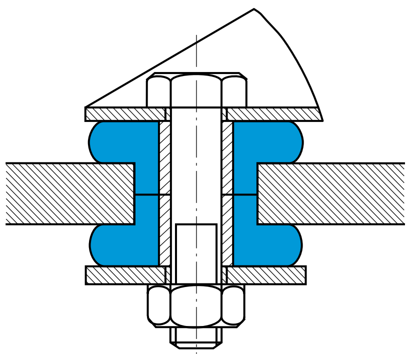
Reference	Hard. Shore A	Nominal static load (daN)	Deflection (mm)
539887	45 60	8-35 10-50	0,7 0,7
539190	45 60	15-75 25-100	1,2 1,2
539886	60 75	35-150 80-330	1,2 1,2

Reference	Hard. Shore A	Nominal static load (daN)	Deflection (mm)
539191	60 75	60-250 125-500	2 2
539920	45 75	100-400 250-1 000	2 1
539951	45 65	175-700 250-1 000	3 3

ASSEMBLY



Shape 1



Shape 2 (For **539920**)

MOUNT 22000

Natural frequency : (1)
10 to 25 Hz

DESCRIPTION

The S.T.C. mount comprises a rubber ring bonded to a central tube.
- Inner tube : mild steel.
- Bonded rubber in the form of a ring at the top with a collar below which is used for fixing.

OPERATION

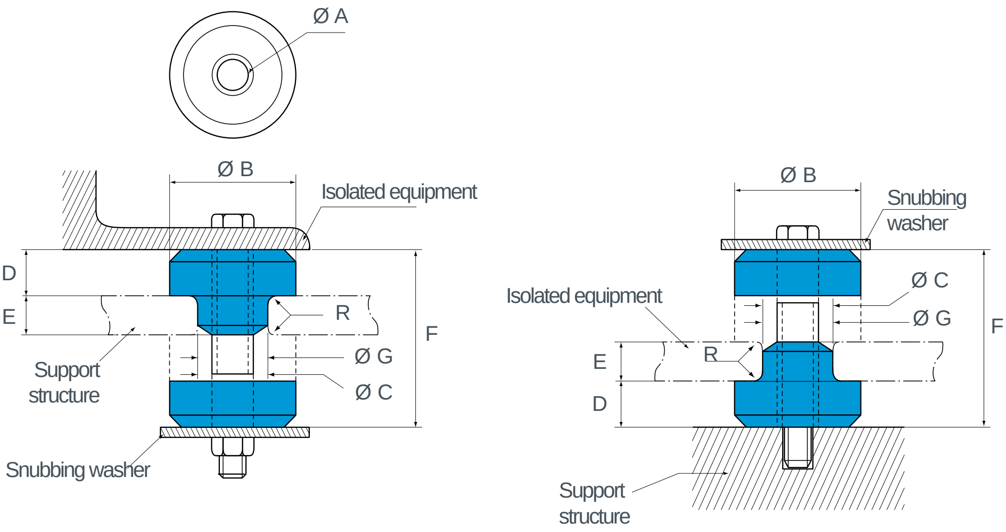
The design of the S.T.C. mount gives the following basic characteristics :
- the rubber works in compression;
- anti-rebound;
- can be used as safety mounting.

Advantages
- Simple to fix.
- Simple and economical.
- Extensive range of loads.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS CHARACTERISTICS

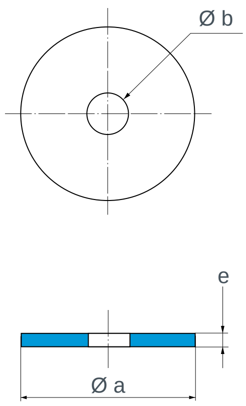
G : Ø mounting hole
C : Ø elastomer
F : Free height
R : Radius required



E : support structure thickness can be E_1 or E_2 depending on the required load and natural frequency (see technical chart next page).

Paulstra reference	Barry Controls* reference	Ø A (mm)	Ø B (mm)	Ø C (mm)	D (mm)	F (mm)	Mounting hole Ø G (mm)	Mounting hole R (mm)	Weight (g)
530903 11 to 15	**22001-11 to 15**	10,4	33,2	20,1	12,3	31,7	19	1	43
530903 21 to 25	**22002-11 to 15**	13,5	47,7	33	19,8	49,2	31,7	1,5	142
530903 31 to 35	**22003-11 to 15**	16,7	64,8	40,1	22,8	61,7	38,1	2,3	313
530903 41 to 45	**22004-11 to 15**	23,8	88,9	58,4	25,4	73,1	57,1	3	670
530903 51 to 55	22005-11 to 15	27	123,9	64,8	31,7	85,8	63,5	3	1 306

* Barry Controls part numbers are shown as a reference only.



Zinc plated steel washers are recommended for the assembly of the mount.
They make it possible to carry out debouncing.

PAULSTRA reference*	Washer* Ø a (mm)	Washer* Ø b (mm)	Washer* e (mm)	Washer* Weight (g)
530903 11 to 15	39,6	10,3	2,2	24
530903 21 to 25	54,1	13,5	3,4	54
530903 31 to 35	71,3	16,7	4,7	140
530903 41 to 45	98,5	23,8	6,3	368
530903 51 to 55	133,3	27,0	9,5	991

* Not supplied

OPERATING CHARACTERISTICS

The maximum loadings depend on the compression of the assembly by comparing the thicknesses E_1 and E_2.

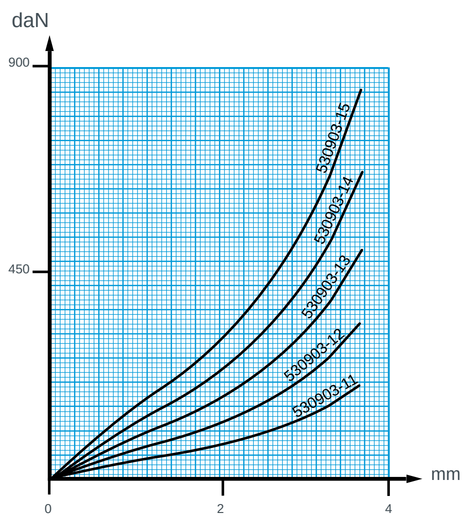
Paulstra reference	Barry Controls* reference	Support structure thickness E_1 Load per mount				Support structure thickness E_2 Load per mount				Colour marking
		Axial (daN)	Radial (daN)	Fo (Hz)	E_1 (mm)	Axial (daN)	Radial (daN)	Fo (Hz)	E_2 (mm)	
530903 11	**22001-11**	18	9			18	9			Red & White
530903 12	**22001-12**	40	13			40	13			Yellow & White
530903 13	**22001-13**	63	18	15	9,5	63	18	15	9,5	Green & White
530903 14	**22001-14**	113	22			113	22			Blue & White
530903 15	**22001-15**	136	27			136	27			Purple & White
530903 21	**22002-11**	59	22			27	18			Red & White
530903 22	**22002-12**	79	29			54	36			Yellow & White
530903 23	**22002-13**	109	40	12	14	72	56	15	12,5	Green & White
530903 24	**22002-14**	172	75			118	81			Blue & White
530903 25	**22002-15**	286	127			172	127			Purple & White
530903 31	**22003-11**	95	40			40	31			Red & White
530903 32	**22003-12**	159	63			68	47			Yellow & White
530903 33	**22003-13**	222	102	11	22	102	72	15	19	Green & White
530903 34	**22003-14**	390	175			147	111			Blue & White
530903 35	**22003-15**	604	313			227	163			Purple & White
530903 41	**22004-11**	122	61			68	50			Red & White
530903 42	**22004-12**	231	104			136	100			Yellow & White
530903 43	**22004-13**	350	156	10	28,5	181	136	15	25,5	Green & White
530903 44	**22004-14**	531	268			227	181			Blue & White
530903 45	**22004-15**	954	443			272	263			Purple & White
530903 51	22005-11	518	109			136	68			Red & White
530903 52	22005-12	877	154			227	100			Yellow & White
530903 53	22005-13	1 172	277	10	32	318	136	15	25,5	Green & White
530903 54	22005-14	1 609	404			409	213			Blue & White
530903 55	22005-15	2 072	640			545	300			Purple & White

See current price list for availability of items.

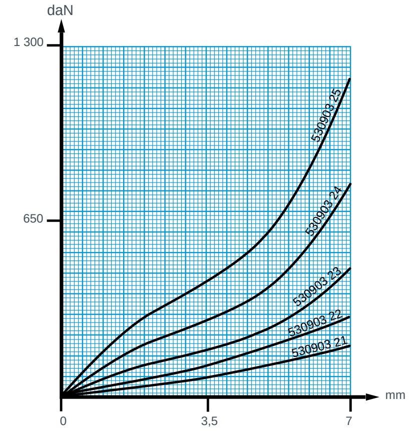
* Barry Controls part numbers are shown as a reference only.

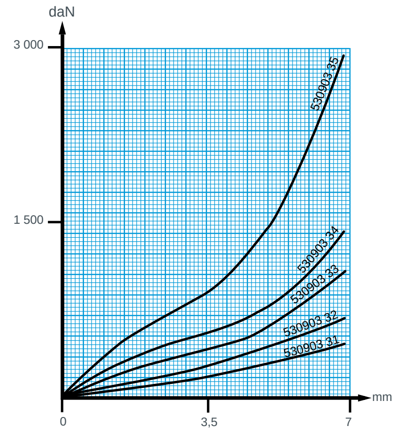
LOAD/DEFLECTION CURVES IN AXIAL COMPRESSION

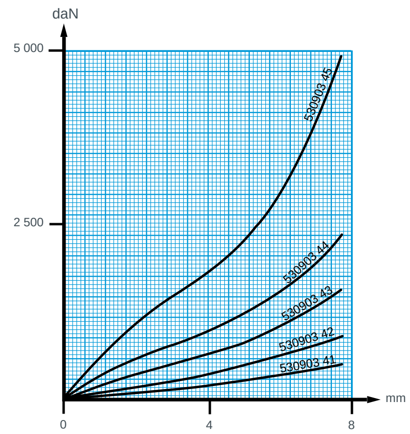
Support structure thickness E_1 and E_2

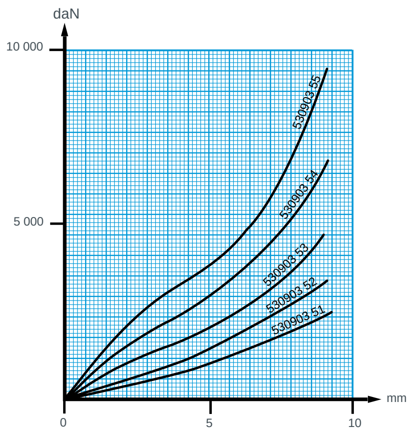


Support structure thickness E_1

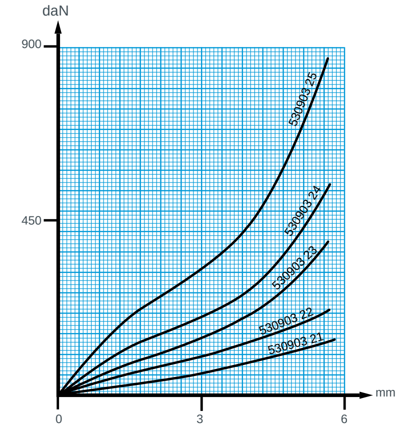


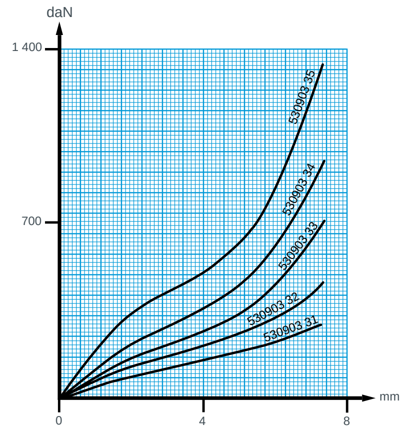


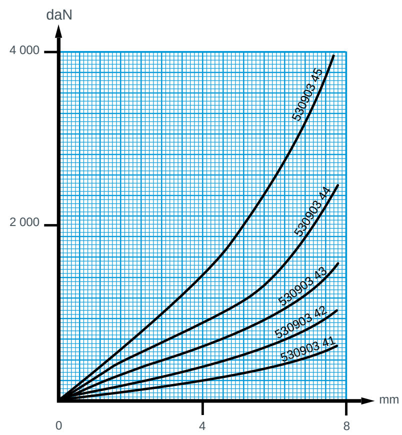


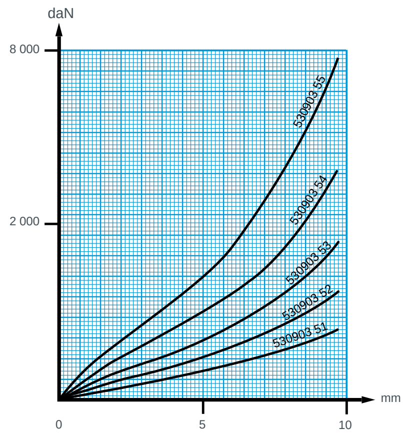


Support structure thickness E_2









TRIAXDYN

DESCRIPTION

This anti-vibration mount comprises two elastomers which are assembled into a casting and pre-loaded.

The mounting is designed to offer :
- a large deflection (in axial);
- different stiffness in three axis;
- built-in stops to limit movement in all directions.

Note : the mount body can be modified to offer alternative interface dimensions providing the internal interface with the elastomer is maintained.

APPLICATIONS

This mount has been designed to isolate engines or cabs in fixed or mobile applications with a high level of isolation and shock protection. Its compact design enables fail safe suspension of loads from 150 to 280 kg.

It is suitable for :
- engine mounting;
- cab mounting;
- equipment mounting.

DIMENSIONS CHARACTERISTICS

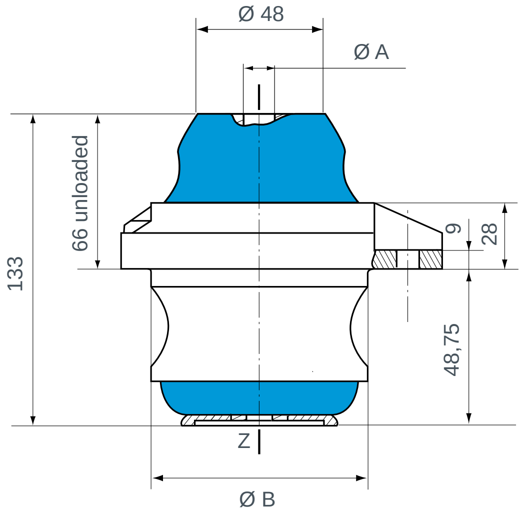
- Nominal load : 150 to 280 kg.
  Possibility to extend, on request, the load range up to 350 kg.

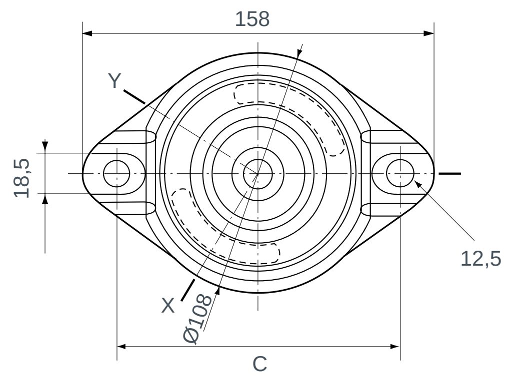
- Different stiffness in three axis (for a hardness 50) :
  - axial on Z : 500 N/mm;
  - radial on X (in direction of voids) : 350 N/mm;
  - radial on Y (at 90 deg. to voids) : 500 N/mm.
  The geometry of the part provides low dynamic stiffness in the vertical dimension.

- Maximum deflection :
  - axial : ± 10 mm, ± 4 g;
  - radial : ± 6 mm, ± 2.5 g.

- Operating temperature :
  - 40 up to + 80°C.

- Salt spray protection 400 h. for external aluminium metalwork





Mounting

Reference	Ø A (mm)	Ø B (mm)	C (mm)
905233	12,4	94	128

ENGINE MOUNTING SYSTEMS

Natural frequency : (1)
6 Hz

DESCRIPTION

This engine mount is made of one conical elastomeric element enclosed in a cast iron assembly. A built-in adjustable stop limits the vertical and lateral displacement during shock. It can be supplied with or without levelling system and with a threaded hole or a threaded stud.

OPERATION

This mount has been designed to suspend fixed or mobile generators which require a high level of vibration isolation and shock protection. The load per mount varies from 600 kg to 2300 kg. This load range is covered by 5 different variants (12 to 16) clearly identified by a coloured marking (see table).

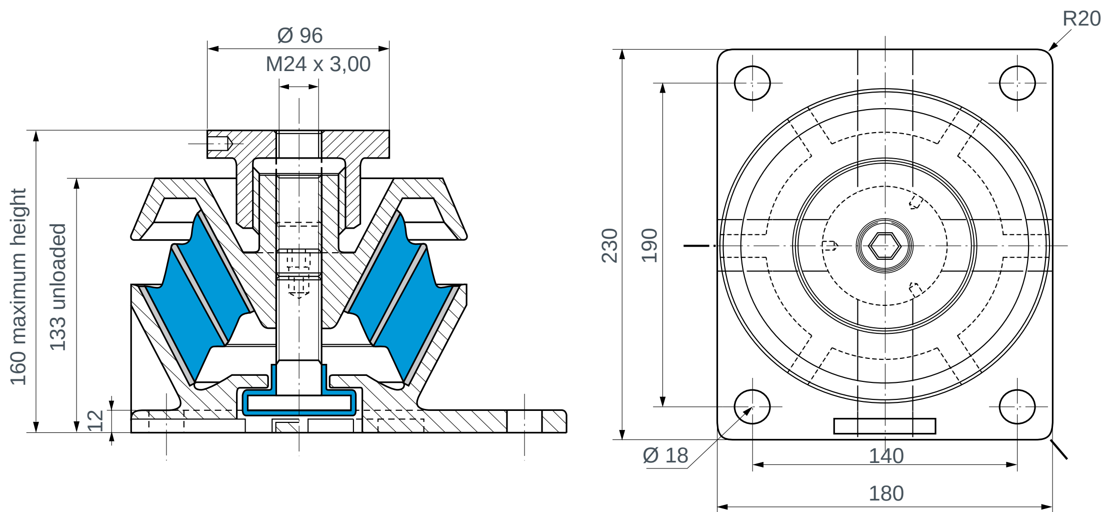
This mount is available in two different alternatives depending on the type of upper fixing needed :
- 905201 : No levelling system - M24 x 3.00 threaded hole.
- 905202 : Built-in levelling system - M24 x 3.00 threaded hole.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

OPERATING CHARACTERISTICS AND DIMENSIONS

- Load range : please refer to the chart below for the different variants and their colour marking.
- Deflection under static load :
  4,5 to 7,5 mm (Natural frequency : 5 to 6,5 Hz.)
- Maximum displacement :
  vertical (Axial) : ± 6 mm;
  lateral (Radial) : ± 4 mm.
- Structural resistance :
  vertical (Axial) : ± 4 g;
  lateral (Radial) : ± 2 g.
- Operating temperatures : - 10°C up to + 70°C.
- Unit weight : 11.5 to 12.8 kg (depending on the variant).

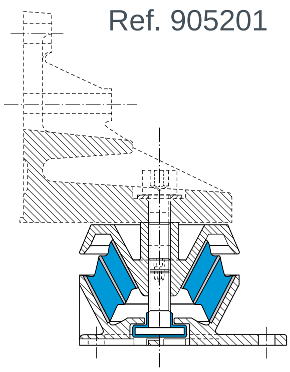
Load range (daN)	Variant	Colour
600 - 850	12	White
850 - 1 150	13	Yellow
1 100 - 1 450	14	Green
1 400 - 1 900	15	Blue
1 700 - 2 300	16	Purple

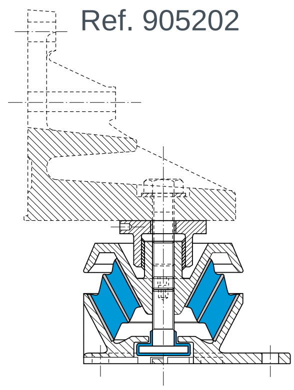


Reference 905202

ASSEMBLY

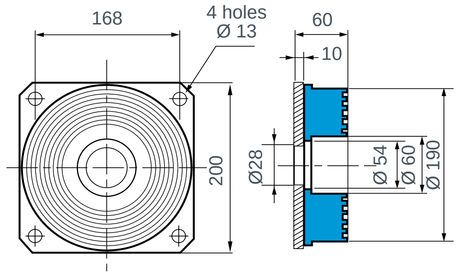
The installation of these mounts and the adjustments of their limit stops once loaded are detailed in an assembly procedure supplied with the mounts.



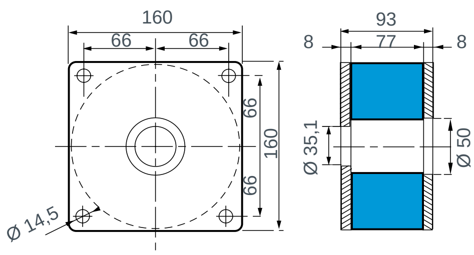


SUPPORTS AND BUMP STOPS

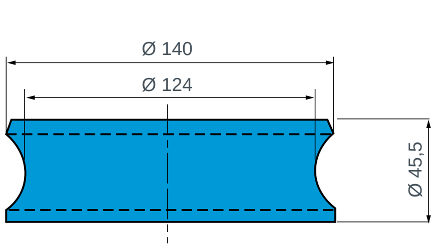
Reference : **514202** - Hardness : 75
Compressive load : 5000 daN - Deflection : 8mm



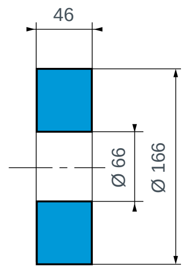
Reference : **534501** - Hardness : 60
Load : Compression : 2500 daN - Deflection : 15 mm
Shear load : 300 daN - Deflection : 10 mm



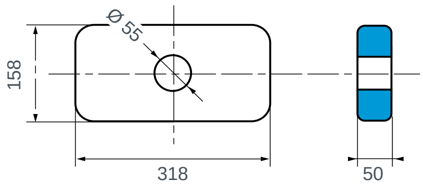
Reference : 813501 - Hardness: 60 -
Compressive load : 1000 daN - Deflection : 4mm



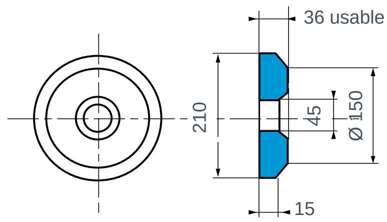
Reference : 817505 - Hardness 60 -
Compressive load : 1500 daN - Deflection : 5 mm



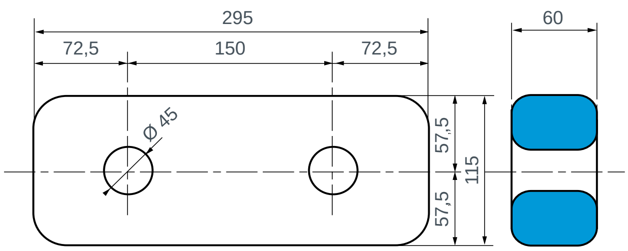
Reference : 813506 - Hardness 60 -
Compressive load : 4000 daN - Deflection : 2.4mm



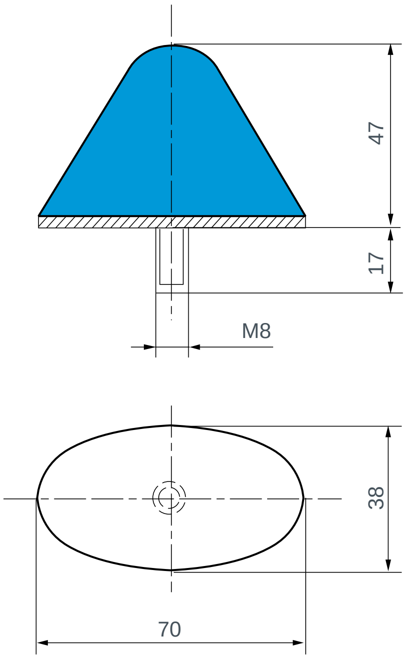
Reference : 817605 - Hardness 60 -
Compressive load : 2000 daN - Deflection : 1.4mm



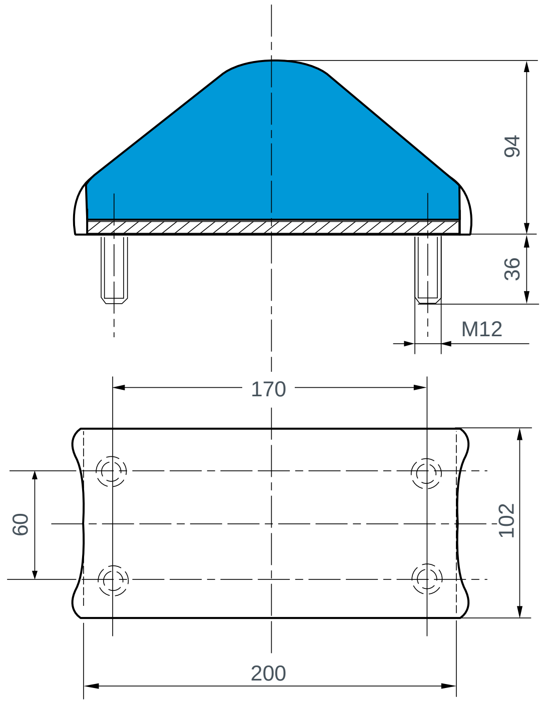
Reference : 813504 - Hardness 60
Compressive load : 3000 daN - Deflection : 9 mm



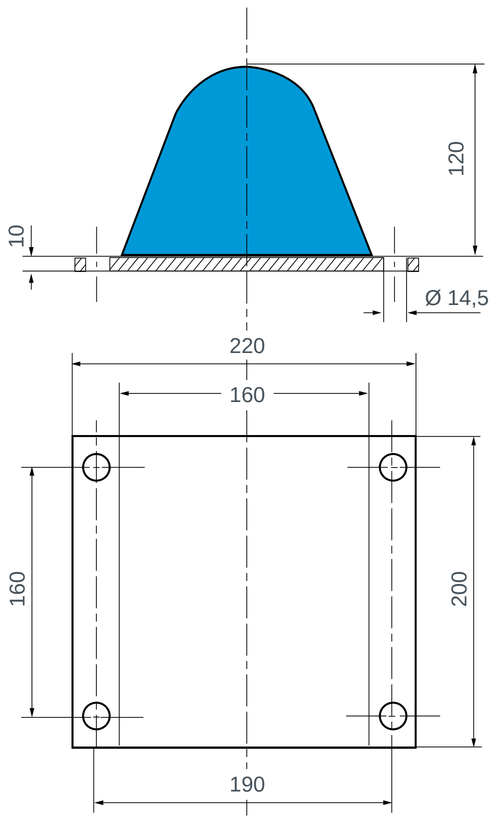
See current price list for availability of items.



defection : 14 mm
maximal charge : 150 daN
reference **512389**

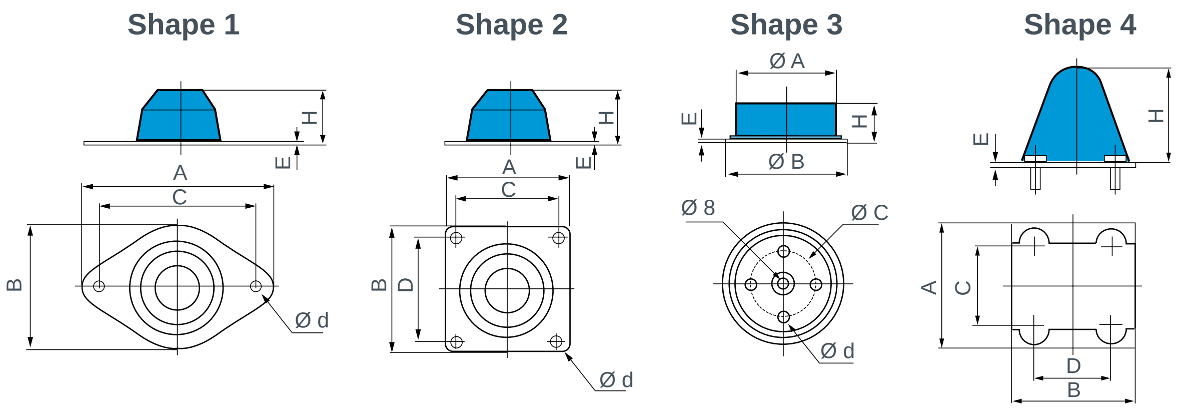


defection : 35 mm
maximal charge : 3 000 daN
reference **519186**



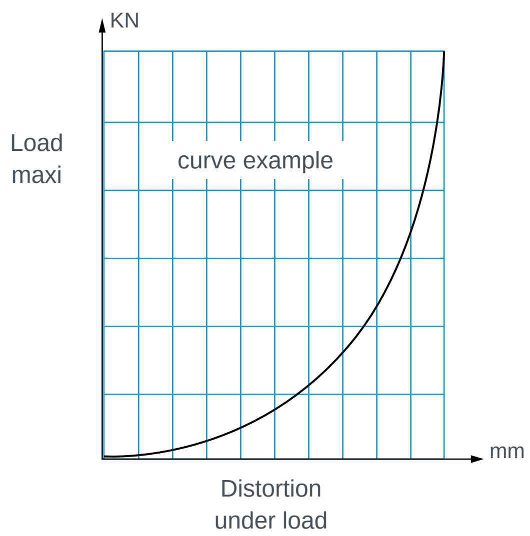
defection : 45 mm
maximal charge : 4 800 daN
reference **512991**

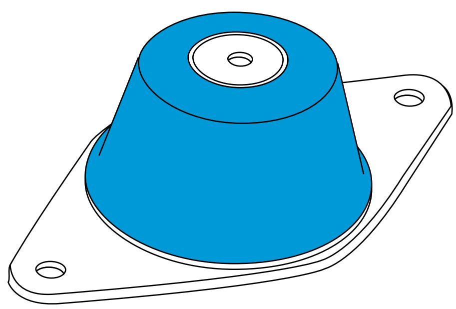
See current price list for availability of items.



See also stops range (page 64)

Reference	Shape	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	H (mm)	Deflection under load (mm)	Load maxi (KN)	Ø d (mm)
E1V-3245-04	4	135	125	106	85	5	110	-	50	M10
E1V-3568-01	3	126	-	80	-	3	36	10	59	5/16 or M8
E1V-3892-01	2	196	140	174	118	5	85	40	25	13
E1V-3914-01	1	170	110	140	-	3	40	25	20	15
E1V-3921-01	1	170	110	140	-	3	50	31	28	15
E1V-3922-01	2	180	180	148	148	6	56	32	60	15
E1V-3927-01	1	170	110	140	-	3	40	25	28,5	15
E1V-3931-01	2	110	110	92	92	3	90	-	26	9
E1V-3932-0	1	170	110	140	-	3	30	15,5	50	15
E1V-3940-01	1	170	88	140	-	3	20	10	30	15
E1V-4031-01	1	170	110	140	-	3	65	41	25	15
E1V-4059-11	1	234	125	200	-	5	70	40	51,2	14
519805	1	170	110	140	-	3	50	31	28	15
519830	2	100	110	80	90	3	62	25	12,5	11





Avantages
- Sliding plate.
- Integrated stop.
- Progressive stifness.

NIVOFIX®

See Vibrachoc metallic range
V43 - V44
V45 - V46

DESCRIPTION

The NIVOFIX® mount is an adjustable equipment foot comprising a circular disc bonded to a protected elastomer base. An adjustement screw permits the levelling.

The elastomer base has anti-slip ridges.

OPERATION

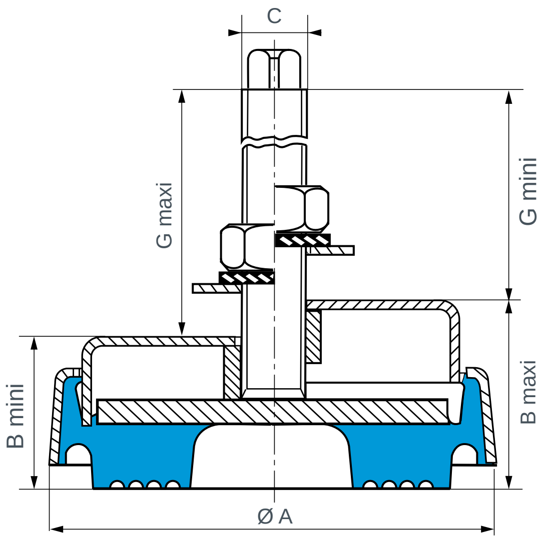
The design of the NIVOFIX® mount gives the following basic characteristics :

- accurate adjustment of the mount to correct the equipment’s seating (adjustment screw, correction of altitude);
- absorbs high frequency vibrations;
- corrosion resistant (nitrile elastomer, protective shroud, galvanised metallic parts);
- anti-slip sole (no need to fix).

Advantages

- Speed of fixing.
- Simple removal of the equipment.
- No shimming.

DIMENSIONS



Reference Stainless steel	Reference Steel	Ø A (mm)	B (mm)			C	G (mm)		Weight (g)	Stud lenght (mm)
			B max. = B min. + adjustment				min.	max.		
530815	**530810**	65	31,5	26,5	5	M12	105	110	280	128
530825	**530820**	88	46	33	13	M16	114	127	690	150
530835	**530830**	133	58	46	12	M20	130	142	1 820	173
-	**530840**	200	70	58	12	M24	145	157	5 250	195
-	**530850**	260	83	65	18	M24	158	176	10 000	215

See the current price list for availability of items.

OPERATING CHARACTERISTICS

Reference	Nominal static load min. - max. (daN)	Deflection (mm)
530810	100 - 600	1 - 3,5
530815	100 - 600	1 - 3,5
530820	325 - 1 300	2 - 4
530825	325 - 1 300	2 - 4

Reference	Nominal static load min. - max. (daN)	Deflection (mm)
530830	650 - 2 600	2 - 4
530835	650 - 2 600	2 - 4
530840	1 500 - 6 000	1,5 - 3
530850	3 000 - 12 000	2 - 4

APPLICATIONS

NIVOFIX® mounts are used for all equipment requiring height adjustment.

Equipment already using NIVOFIX® mounts :

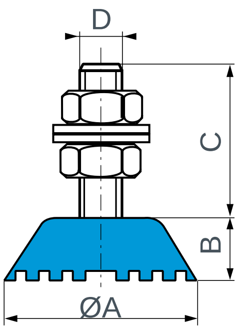
- Vertical mill
- Mortiser
- Multichuck drill
- Sheet metal bender
- Polisher
- Press
- Plane
- Horizontal mill
- Lathe
- Gear cutter
- Textile machinery
- Packaging machine
- Test equipment
- Printing press

MINIFIX®

DESCRIPTION

The MINIFIX® mount comprises an elastomer pad with an anti-slip ridged surface and a threaded stud allowing accurate height adjustment of equipment.
Made in two hardnesses (50 and 80 Sh) the MINIFIX® mount is perfectly suited to a variety of applications and is delivered complete with fixing nuts and washers. MINIFIX® mounting nuts and screws are made of steel or stainless steel.

CHARACTERISTICS



Reference Stainl. steel	Reference Steel	Hardness	Colour	Ø A (mm)	B (mm)	C (mm)	D	Load range (daN)
-	**530801**	50 SBR 80 Nitrile	grey black	32	15	38	M8 stud	5-30 15-70
-	**530802***	50 SBR 80 Nitrile	grey black	46	15	-	M10 nut	10-40 25-100
530806	**530805**	50 SBR 80 Nitrile	grey black	46	15	38	M10 stud	10-40 25-100
-	**530807**	50 SBR 80 Nitrile	grey black	70	25,5	55,5	M12 stud	50-120 100-350

See current price list availability of items.
* Threaded centre hole.

APPLICATIONS

Simple and economic, MINIFIX® mountings are particularly suitable for the installation of equipment such as :

- electrical or electronic enclosures.
- packaging equipment.
- test and measuring equipment.
- equipment for the food industry.
- laboratory equipment.
- household appliances.

TRAXIFLEX®

Natural frequency : (1)
8 à 10 Hz

See Vibrachoc metallic range :
VE101 - VE111
VE112 - VE113

DESCRIPTION

The TRAXIFLEX® hanger comprises two metallic U armatures joined by two bonded rubber blocks.
It is available in two versions : male/female and female/female.

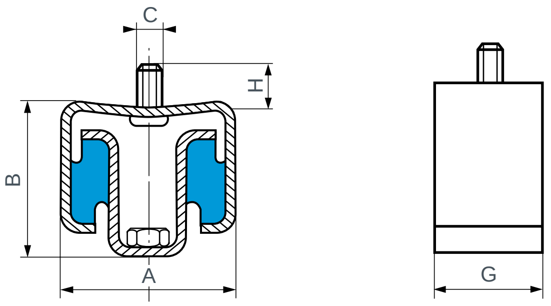
OPERATION

The design of the TRAXIFLEX® hanger gives the following basic characteristics :
- rubber works in compression-shear;
- the same deflection under nominal load for all types;
- safety system in case of elastomer failure.

Advantages
- Economic solution for suppressing structure borne noise.
- Several fixing methods.
- High resistance to atmospheric exposure :
  - galvanised armatures;
  - chloroprene elastomer.
- Upper metallic part is shaped to simplify orientation while fixing.
- Two hardnesses of elastomer to extend the choice of mounting as a function of load.
- Filtration of vibration and the attenuation of the consequent noise.
- Allows movement due to thermal expansion.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



Type	Reference		Hardness Shore A	A (mm)	B (mm)	C	G (mm)	H (mm)
	1 screw - 1 nut	2 nuts						
TR 12-30	535600	-	45-60	47	38	M7 x 1,50	16	7
TR 12-30	**535603/61***	-	60	47	38	M6 x 1,00	16	17
TR 12-30	**535603**	-	45	47	38	M6 x 1,00	16	17
TR 12-30	-	**535623/61**	60	47	38	M8 x 1,25	16	17
TR 40-80	**535611**	**535621**	45-60	55	47	M8 x 1,25	30	13
TR 100-250	**535612**	**535622**	45-60	74	50	M12 x 1,75	40	17

See current price list for availability of items.
*** Elastomer resistant to fire M1.**

OPERATING CHARACTERISTICS

Recommended load (daN)	Deflection (mm)	Reference		Hardness Shore A
		1 screw - 1 nut	2 nuts	
4-18	4	535600	-	45
4-18	4	**565603**	-	45
7-30	4	565600	-	60
7-30	4	**535603/61***	-	60
7-30	4	-	**535623/61**	60
10-52	4	**535611**	**535621**	45
20-80	4	**535611**	**535621**	60
20-80	4	**535611***	**535621**	60
20-92	4	**535612**	**535622**	45
30-136	4	**535612**	**535622**	60

TRAXIFLEX® mounts have been subjected to acoustic trials at the Centre Expérimental de Recherches et d'Études du Bâtiment et des Travaux Publics which has given the P.V nr. 554.6.078.
*** Elastomer resistant to fire M1.**

ASSEMBLY

When fixing, ensure that all the TRAXIFLEX® hanger are supporting the same load. It is necessary to ensure that they are all the same distance from the fixing surface (ceiling, girder, plank...).
TRAXIFLEX® mounts can be used to suspend pipework : the whole assembly being fixed to the ceiling.

- suspending hot air ducts;
- suspending a fan unit and distribution ducts;
- suspending a hot air generator with continuous airflow;
- suspending an integral cased air conditioner.

FLEX-LOC

DESCRIPTION

A flexible fixing resistant to oils, the majority of solvents and ageing.

OPERATION

The design of the FLEX-LOC mount gives the following basic characteristics :

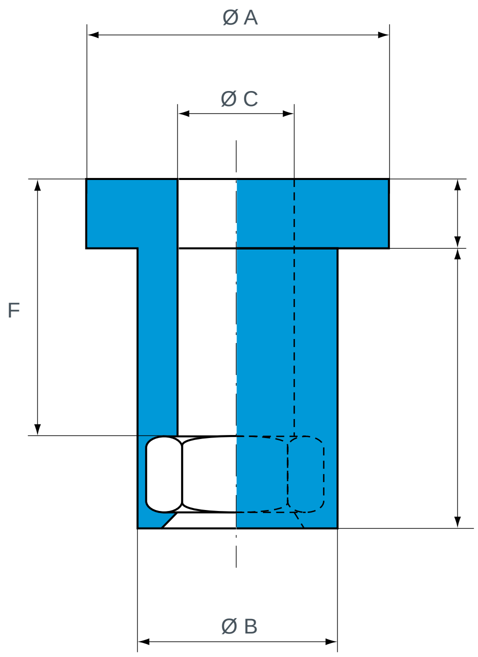
- the rubber works in :
  - compression (axial);
  - shear (radial);
  - compression/shear according to the fixing method.

Advantages
- 80% reduction of vibrational energy transmitted from normal structural frequencies.
- Simple and economical.
- Simple to fix.
- Light weight.

APPLICATIONS

FLEX-LOC are suitable for the fixing of sheets, frameworks, engines, ventilators, electronic equipment, computers, etc.
They have, moreover, a function of insulation against the structure borne noises, unlike other fasteners.

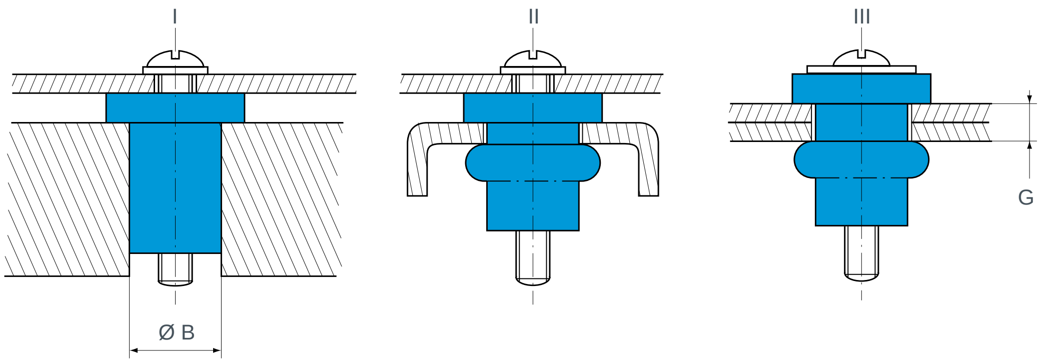
DIMENSIONS



Paulstra reference	Barry Controls* reference	Nut	Ø A (mm)	Ø B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
530909 03	Q3	M3	9	7,2	3,4	9	2,5	8
530909 04	Q4	M4	12	9,3	4,4	11,5	3	10,5
530909 05	Q5	M5	15	10,2	5,4	14,5	3,5	13
530909 06	Q6	M6	18	12,7	6,4	17	4	15
530909 07	Q8	M8	24	16,5	8,4	22	5	19,5

* Barry Controls part numbers are given for reference only.

OPERATING CHARACTERISTICS



Paulstra reference	Barry Controls* reference	Clearance hole Ø B (mm)	Plate thickness G (mm)	Torque range		Static load (daN)		
				I (Nm)	II or III (Nm)	I	II or III	
						Compression / shear	Compression	Shear
530909 03	Q3	7,2 - 7,5	0,6 - 2,5	0,5	0,4	1	5	2,5
530909 04	Q4	9,3 - 9,6	0,8 - 3,3	0,6	0,5	1	7	3,5
530909 05	Q5	10,2 - 10,5	0,8 - 4,3	1,0	0,6	1,5	10	5
530909 06	Q6	12,7 - 13,0	1,5 - 5,0	3,5	0,9	3	14	7
530909 07	Q8	16,5 - 16,8	1,5 - 6,5	4,0	1,8	5	28	14

* Barry Controls part numbers are given for reference only.

RINGS AND BUSHINGS

Natural frequency : (1)
6 to 28 Hz

DESCRIPTION

These all elastomer parts are compatible with the majority of the industrial environments and have an operating temperature range of - 40°C to + 83°C.

OPERATION

A ring assembled with the associated bushing constitutes a flexible interface and a simple solution to decrease noise and vibrations.

- These supports can be installed in parallel for a greater load capacity and may also be stacked in series when greater deflection capacity is required.
- Bushings can be used in pairs, bushing end to bushing end, without rings for a more robust installation or where the structure thickness does not allow for a standard ring and bushing assembly.

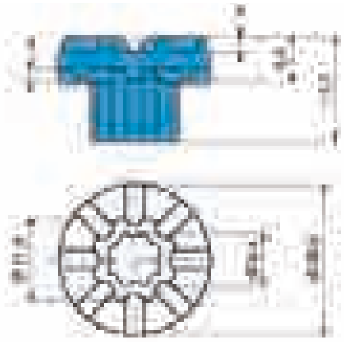
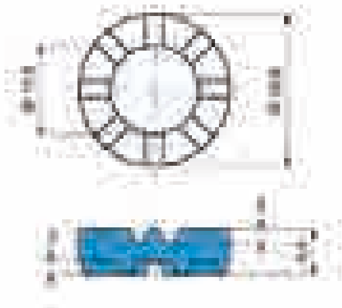
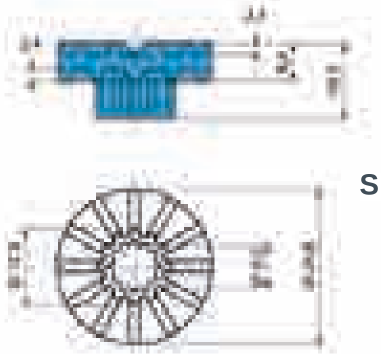
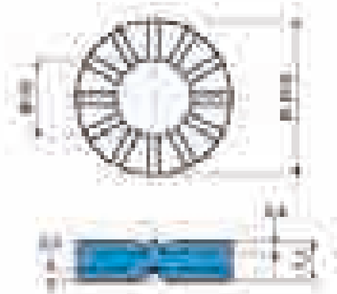
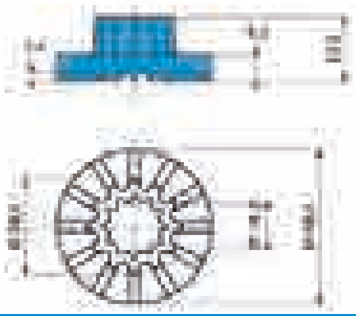
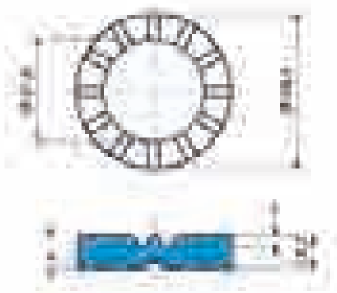
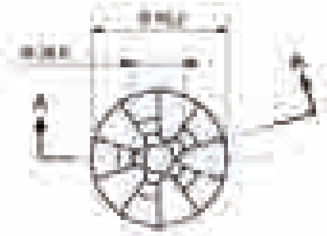
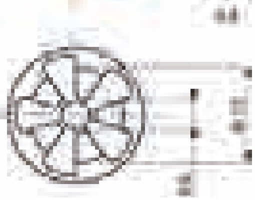
Advantages
- Highly efficient noise reduction,
- Absorb schock and vibrations,
- Simple and economic,
- Four models in four stifnesses for load capacities going from 0.5 to 160 kg per isolator.

APPLICATIONS

- Office machines, motors, fans, HVAC equipment, electronics equipment, telecommunication equipment; etc.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS CHARACTERISTICS

Rings		Bushings
	Shape 1	
	Shape 2	
	Shape 3	
 Section A - A  	Shape 4	 Section A - A 

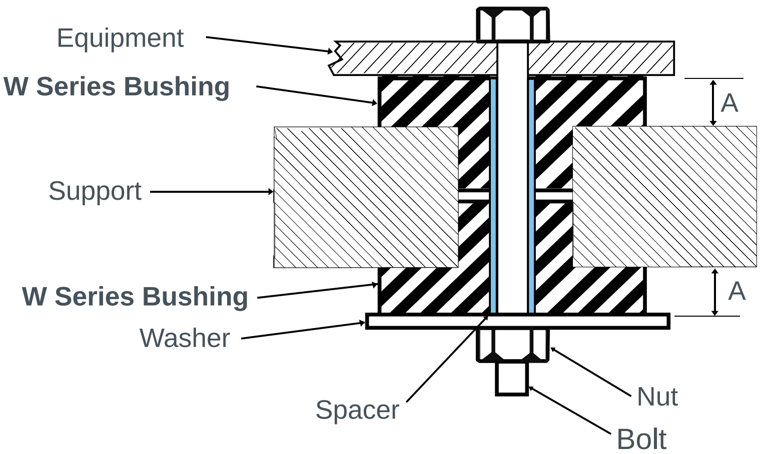
OPERATING CHARACTERISTICS

Group Paulstra reference Barry Controls* reference	Colour	Shape	Load range	
			Min. (daN)	Max. (daN)
530907 13 / 530908 13 WB1-030 / WR1-030	blue	1	0,4	1,8
530907 14 / 530908 14 WB1-040 / WR1-040	brown	1	0,9	2,7
530907 15 / 530908 15 WB1-050 / WR1-050	black	1	1,4	3,6
530907 16 / 530908 16 WB1-060 / WR1-060	grey	1	2,3	5,4
530907 43 / 530908 43 WB4-030 / WR4-030	blue	3	4,5	16
530907 44 / 530908 44 WB4-040 / WR4-040	brown	3	9	23
530907 45 / 530908 45 WB4-050 / WR4-050	black	3	13,6	27
530907 46 / 530908 46 WB4-060 / WR4-060	grey	3	18	74

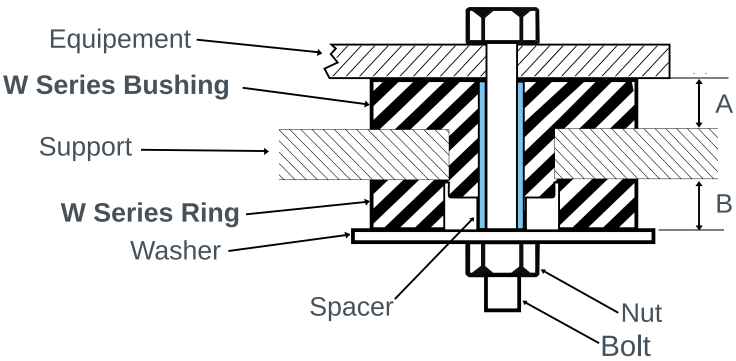
* Barry Controls part numbers are given as a reference only

Group Paulstra reference Barry Controls* reference	Colour	Shape	Load range	
			Min. (daN)	Max. (daN)
530907 33 / 530908 33 WB3-030 / WR3-030	blue	2	2,7	9
530907 34 / 530908 34 WB3-040 / WR3-040	brown	2	3,2	10,7
530907 35 / 530908 35 WB3-050 / WR3-050	black	2	4,5	11,4
530907 36 / 530908 36 WB3-060 / WR3-060	grey	2	6,8	16
530907 63 / 530908 63 WB6-030 / WR6-030	blue	4	27	55
530907 64 / 530908 64 WB6-040 / WR6-040	brown	4	50	73
530907 65 / 530908 65 WB6-050 / WR6-050	black	4	61	114
530907 66 / 530908 66 WB6-060 / WR6-060	grey	4	73	159

ASSEMBLY



Dimensions (mm)		
	A	B
530907 1x	5,8	-
530908 1x	-	5,8
530907 3x	7,6	-
530908 3x	-	7,6
530907 4x	8,4	-
530908 4x	-	11,4
530907 6x	31,75	-
530908 6*	-	19,1



ELASTOMER MOULDED PARTS

SILICONE RUBBER / SPECIAL ELECTRONICS

CHARACTERISTICS

These parts are usually supplied in VHDS (very high density silicone) rubber and the full reference should include:

- the letter S,
- the appropriate grade which corresponds :
  - to the youngs modulus of the rubber under static compression in accordance with ASTM D945 (ref. 33 to 77),
  - or to the stiffness measured on a part (ref. 16 to 25).

These standard VIBRACHOC grades are shown in the following table:EPDM, butyle, nitrile.

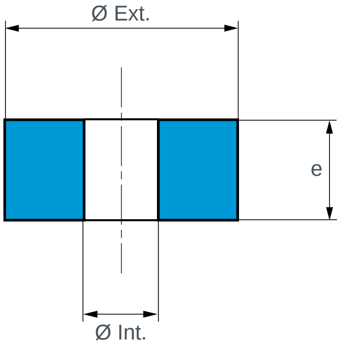
Hardness	Color	Characteristics		
		G : Shear modul. (MPa)	E : Elast. modul. (MPa)	Stiffness (1)(2) (N/mm) Tolerance : ± 10%
		Tolérance : ± 15 %		
16	yellow			19
20	dark blue			20
25	black			25
33	light blue	0,4	1,2	36
38	grey	0,47	1,4	40
42	brown	0,53	1,6	45
48	dark green	0,6	1,8	50
55	brick red	0,67	2,0	55
63	orange	0,8	2,4	65
72	light green	1	3,0	75
77	ultramarine blue	1,1	3,3	100

(1) measured on standardised Ø 19 - h 12.7 mm high part.
(2) linear region between 1 to 3 mm compression.

Example : E3RP0754S55 flat washer internal diameter 7, external diameter 30, height 6, in VHDS silicone, young modulus 2 MPa; washer colour: brick red.
Other elastomers may be used: natural rubber, neoprene, EPDM, butyl rubber, nitrile rubber.

DIMENSIONS

FLAT WASHERS

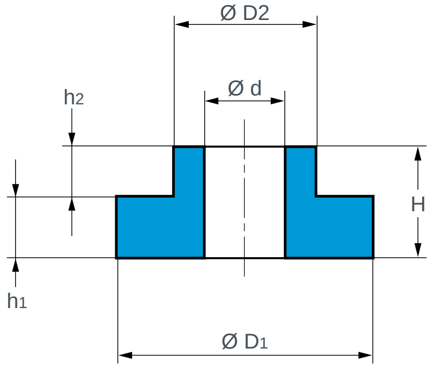


Reference	Ø Int. (mm)	Ø Ext. (mm)	e (mm)
E3RP2439	2	6	10
E3RP3419	2	7	1
E3RP2062	4	8	5
E3RP3291	4	9	3,4
E3RP2061	4	12	4
E3RP2667	5	12	5
E3RP2025	5	15	4
E3RP2024	5	22	4
E3RP2401	6	18	6
E3RP2282	6,1	12	6
E3RP2281	6,1	20	4
E3RP2959	6,4	12	3
E3RP2453	6,5	11,8	2,5
E3RP2403	6,5	13,5	10
E3RP3534	6,5	15	4,5
E3RP2402	6,5	18	14,5
E3RP3162	6,5	25	2
E3RP2882	7	12	4
E3RP0590	7	12	6
E3RP2883	7	16	6
E3RP0591	7	16	8
E3RP2404	7	30	3
E3RP0754	7	30	6
E3RP2148	7,4	11,5	7,5
E3RP2149	7,6	17,6	6
E3RP2454	7,7	11,8	7,7
E3RP2406	8	13	4
E3RP2405	8	16	4
E3RP0607	8	18	6
E3RP0608	8	18	8
E3RP0588	8	22	4
E3RP0777	8	24	4
E3RP2436	8	26	6
E3RP0609	8	26	10
E3RP2045	8,5	26	4

Reference	Ø Int. (mm)	Ø Ext. (mm)	e (mm)
E3RP2604	9	13	4
E3RP2605	9	19	4
E3RP2330	9	36	6
E3RP2181	9,5	20	6
E3RP2570	9,5	24	4
E3RP2446	9,5	26	4
E3RP3500	10	18	4
E3RP0613	10	20	6
E3RP2346	10	21	6
E3RP2437	10	22	4
E3RP0584	10	22	6
E3RP2345	10	24	6
E3RP2645	10	25	4
E3RP0614	10	26	6
E3RP0615	10	26	12
E3RP2435	10	30	6
E3RP0644	10	30	12
E3RP0585	10	34	6
E3RP0643	10	34	8
E3RP0586	10	34	12
E3RP2329	11	36	4
E3RP2328	11	36	6
E3RP0694	12	17	4
E3RP0695	12	18	4
E3RP0738	12	50	12
E3RP2407	14	22	6,5
E3RP3222	14	30	3
E3RP2408	16	29	7
E3RP2409	20	32	10,5
E3RP3532	20	38	3
E3RP0782	21	29	5
E3RP2434	22	38	17
E3RP0744	31	36	3
E3RP0745	36	44	3
E3RP2341	44,5	83	3,2

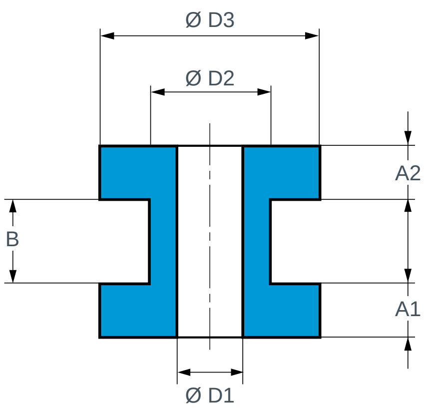
DIMENSIONS

FLANGED WASHERS



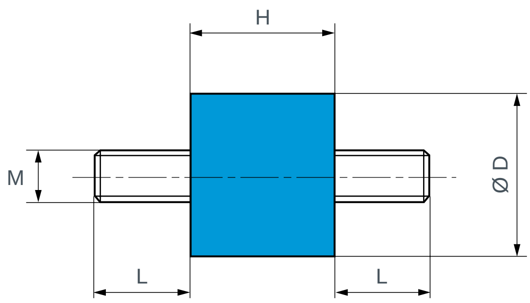
Reference	Ø d (mm)	Ø D1 (mm)	Ø D2 (mm)	H (mm)	h1 (mm)	h2 (mm)
E3RP0712	3,5	10	7,5	4,7	3,2	1,5
E3RP2292	3,5	13	6	7	3,3	3,7
E3RP3290	4	9	6	5,4	3,4	2
E3RP0647	4,2	8	5,8	3,3	1,7	1,6
E3RP0997	5	18	10	24	14	10
E3RP2192	6	12	8,5	7	4	3
E3RP2410	6	18	10	10	6	4
E3RP3533	6,5	15	11	8	4,5	3,5
E3RP0755	7	30	17	14	6	8
E3RP2374	8	18	12	6	3	3
E3RP2379	8	18	13	3,5	2	1,5
E3RP0563	8	19,8	13,8	7	2	5
E3RP2173	8	21	13	6	4	2
E3RP0778	8	24	14	8	4	4
E3RP2042	8,5	26	17	8	4	4
E3RP3491	9,5	24	18	8	4	4
E3RP3490	10	18	14	8	4	4
E3RP0553	11	24	17	9	4	5
E3RP0575	12	50	28	22	12	10
E3RP2315	16	50	28	22	12	10

GROMMETS

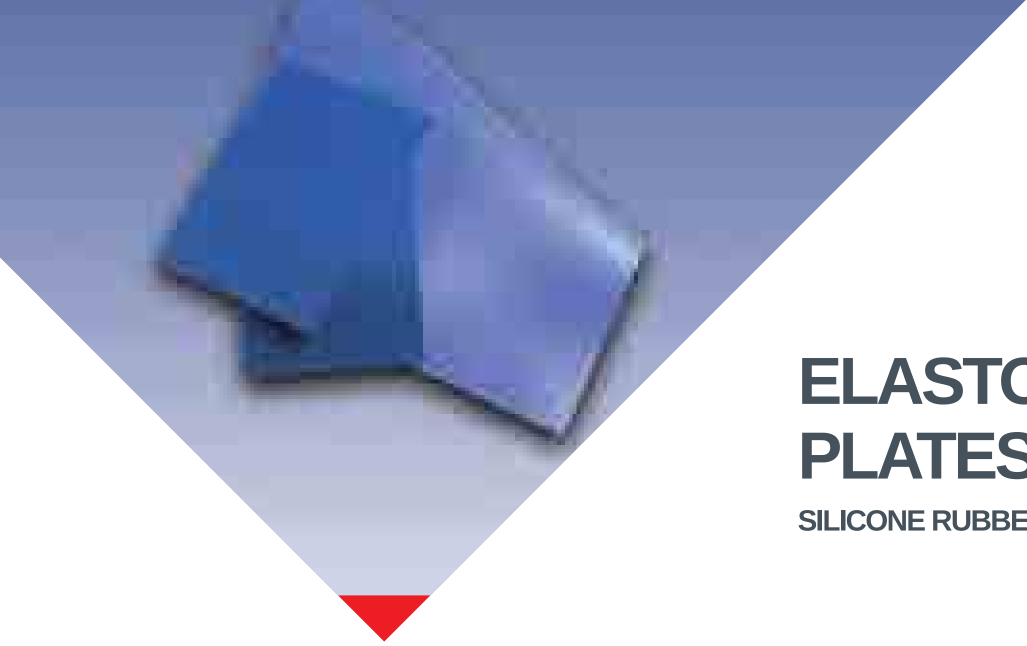


Reference	Ø D1 (mm)	Ø D2 (mm)	Ø D3 (mm)	A1 (mm)	A2 (mm)	B (mm)
E3RP2364	4	6	8	2,2	2,2	1,6
E3RP0648	4,2	5,8	8	1,7	1,7	1,6
E3RP0576	5	8	12	2	2	4
E3RP3295	8	12	18	5,5	5,5	3
E3RP3258	8	12	18	5,5	5,5	6

THREADED STUDS



Reference	Ø D (mm)	H (mm)	L (mm)	M (mm)
E4432F01	10	8	6	M3
E3RP0956	12	8	6	M3
E3RP2118	16	16	8 / 9,5	M5
E3RP0757	20	23	12	M5
E3RP0954	33	26	13,2	M6
E3RP0708	33	39	13,2	M6
E3RP0686	33,2	53,5	12	M6



ELASTOMER PLATES E3PEPL

SILICONE RUBBER / SPECIAL ELECTRONICS

DESCRIPTION

VHDS elastomer sheet.

APPLICATIONS

These sheets may be used for making grommets, washers or anti-vibration mountings for equipment.
There is a wide range of VIBRACHOC moulded parts, but in certain cases, such as prototypes, undefined specification, etc, it is often advantageous to determine the suspension using elastomer compo-nents cut from sheet and bonded.

CHARACTERISTICS

- Overall tolerances :
  - on the lengths : ± 5%;
  - on the thickness : ± 3%.

Shape	Dimensions (mm)	Thickness (mm)
SQUARE	300 x 300	2, 3, 4, 5, 6, 8, 10

VIBRACHOC plates should be ordered using the following reference :

E3PEPL $\underbrace{\square\square}_{1}S\underbrace{\square\square}_{2}C\underbrace{\square\square\square}_{3}$

1 : dimension in cm - 2 : hardness (see p 114) - 3 : thickness in 1/10 mm.

For example : E3PEPL30S55C060 =
- square plate 300 X 300 mm;
- 6 mm thick;
- VHDS rubber compound, grade 55.

For other shapes, sizes or materials, ask us for details.

DISC DRIVE SUSPENSION E4330F**

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : 20 to 30 Hz (1)

DESCRIPTION

A silicone (VHDS) elastomer with a bonded metal insert. The legs have tangs which enable each leg to be pulled through mounting holes in the equipment. The suspended component can then be attached with an M3 screw through the insert. The tangs can be cut off after insertion.

APPLICATIONS

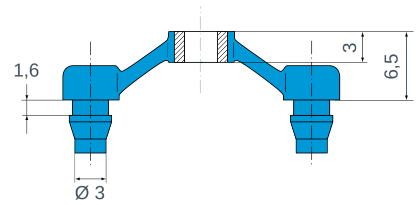
- Suspension of disc drives.
- Protection of electronic components and printed circuit boards with very low mass in mobile or static environments.

CHARACTERISTICS

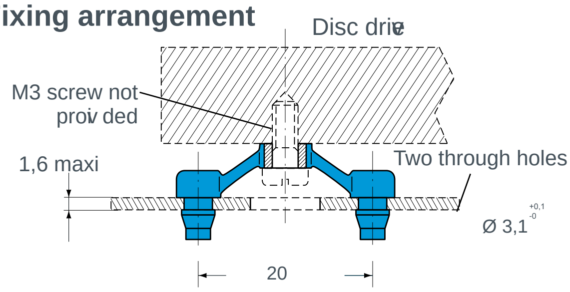
Natural Frequency :
- axial : 15 to 30 Hz;
- radial : 15 to 30 Hz.

Amplification factor at resonance < 5.
Operating temperature range : -50°C to +150°C.

Reference	Nominal load (daN)
E4330F01	0,03
E4330F11	0,035
E4330F21	0,036
E4330F31	0,042
E4330F71	0,1



Fixing arrangement



Possible installation configurations :

Mounting in compression

Mounting in shear

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

S.L.F.® MOUNTS

SILICONE RUBBER / SPECIAL ELECTRONICS
SMALL LOADS - HIGH DEFLECTION

Natural frequency : 10 to 25 Hz (1)

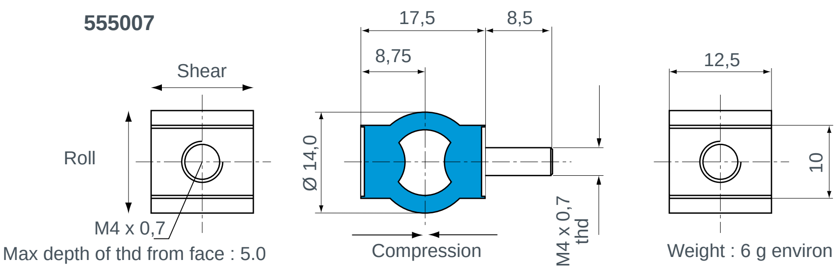
DESCRIPTION

Low frequency high deflection antivibration mount available in a choice of elastomers including high damped silicone. The zinc plated mild steel metalwork is fully bonded for improved fatigue strength.

APPLICATIONS

These mounts have been designed to protect low mass components and instruments from vibration and shock and to isolate small rotating machines e.g. pumps and electric motors.

DIMENSIONS



OPERATING CHARACTERISTICS

Maximum sinusoidal input at resonance : ± 0.5 mm.
Resonance frequencies at maximum input : 10 to 25 Hz dependent on axis and load.
Axial to radial stiffness : 3 : 1.
Amplification at resonance : silicone : 4 natural rubber : 10.
Maximum displacement during shock : axial : 5 mm.
radial : 7 mm.
Mechanical strength corresponding to a continuous acceleration of 10 g at maximum load.

Reference	Mix	Static load in compression (daN)	Static load in shear (daN)	Static load in roll en roulis (daN)	Temperature for continuous operation
55500x-42 **55500x-72**	Silicone 42 Sh Silicone 70 Sh	0,10 - 0,50 0,60 - 0,80	0,10 - 0,25 0,25 - 0,50	0,10 - 0,15 0,15 - 0,30	-54 to + 150 °C
55500x-01 **55500x-02**	NR 50 Sh NR 70 Sh	0,10 - 1,50 1,50 - 3,00	0,10 - 0,50 0,50 - 1,00	0,10 - 0,40 0,40 - 0,80	- 40 to + 70 °C

NB : The * define the type of fixing : combination fixing : 555007, male/male fixing : 555005, female/female fixing : 555006.

ASSEMBLY

Improved stability can be achieved if the mounts are inclined at 45° towards the centre of gravity.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

E1E931S
E1E4045

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : (1)
15 to 25 Hz

DESCRIPTION

- High damped silicon elastomer (VHDS).
- Stainless Steel flange and centre axis.

APPLICATIONS

- Protection of electronic equipment, navigation equipment, control consoles, measuring instruments, onboard aircraft, trains and trucks.

CHARACTERISTICS

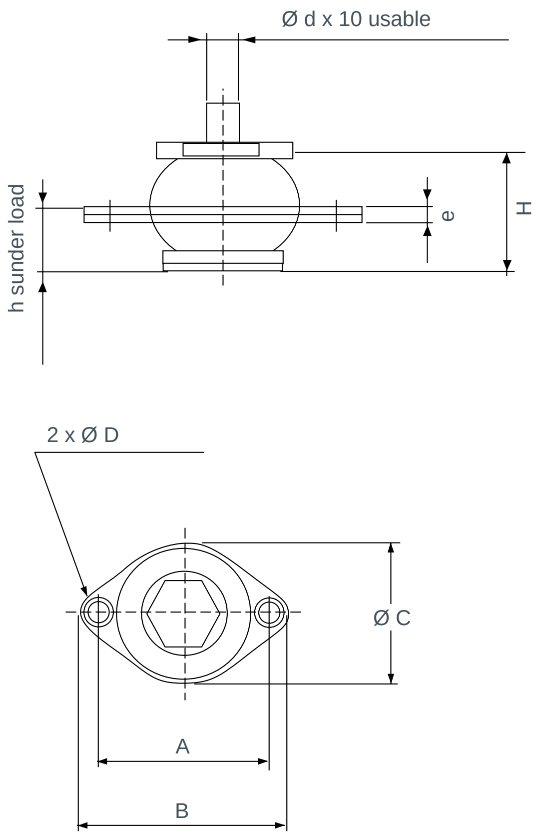
Natural frequency :
- axial : 15 to 25 Hz;
- radial : 10 to 20 Hz.

Maximum sinusoidal input amplitude at resonance frequency : ± 0,4 mm.
Amplification factor at resonance < 4.
Operating temperature range : - 54 °C to + 150 °C.
Mechanical strength corresponding to a continuous acceleration of 10 g at maximum load.
Maximum axial displacement during shock : 3 mm
Weight : E1E931S : 31 g.

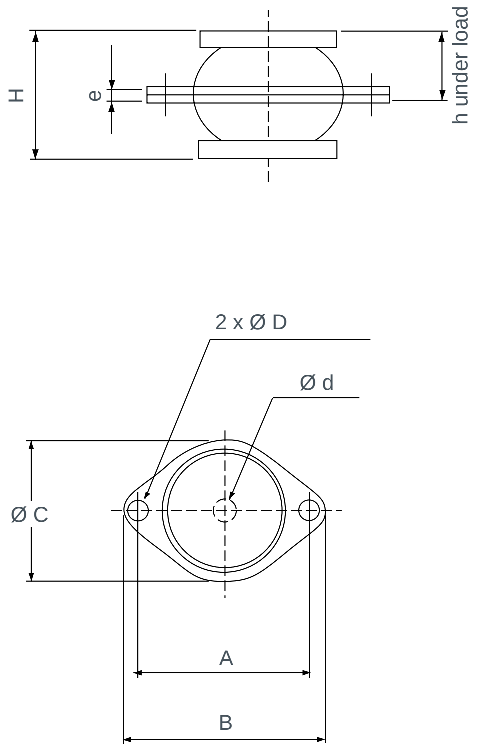
Part number	Axial static load (daN)
E1E931S38 E1E4045-38	0,8 - 2
E1E931S55 E1E4045-55	1 - 2,5
E1E931S72 E1E4045-72	1,5 - 4

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS CHARACTERISTICS



E1E931S



E1E4045

Reference	A (mm)	B (mm)	Ø C (mm)	Ø D (mm)	H (mm)	Ø d (mm)	e (mm)	h (mm)
E1E931S ❑❑	34,9	44	30	4,2	24,5	M5	2,5	12,5
E1E4045-❑❑	35,9	44	30	4,2	20	5,1	2	11

E1E11S**E*
E1E12S**E*
E1E13S**E*

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : 20 to 25 Hz (1)

DESCRIPTION

- VHDS elastomer able to carry loads under compression and traction.
- Pedestal, washer and shaft in 18/8 stainless steel.

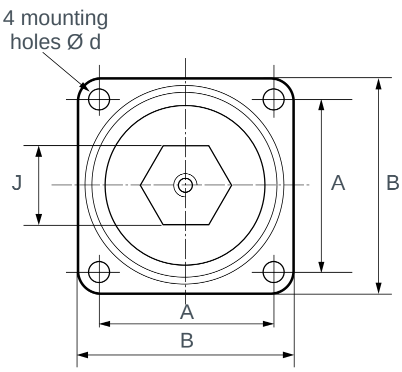
APPLICATIONS

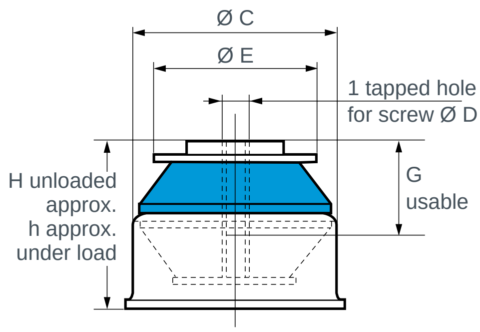
- Protecting electronic equipment, navigation equipment, instrument panels, measuring instruments, control panels on aircraft, road vehicles and railway trains.

CHARACTERISTICS

Natural frequency :
- axial : 20 to 25 Hz;
- radial : 20 to 25 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 0.5 mm.
Amplification factor at resonance < 5.
Operating temperature : - 54°C to + 150°C.
Structural strength corresponds to a continuous acceleration of 10 g at maximum load.
Maximum axial travel available for shock :
E1E11 : + 4mm / E1E12 : + 5 mm / E1E13 : + 7 mm.
Weight : E1E1 : 60 g / E1E12 : 120 g / E1E13 : 225 g.
These mounts meet the standard AIR7304 curve ZF





Reference	Axial static loads (daN)
E1E11S38EC	1,60 - 2,80
E1E11S42EC	1,80 - 3,20
E1E11S48EC	2,10 - 3,80
E1E11S55EC	2,50 - 4,50
E1E11S63EC	3,00 - 5,30
E1E11S72EC	3,50 - 6,20
E1E12S38ED	3,70 - 5,70
E1E12S42ED	4,00 - 6,30
E1E12S48ED	4,60 - 7,10
E1E12S55ED	5,20 - 8,10
E1E12S63ED	6,00 - 9,30
E1E12S72ED	6,60 - 10,30
E1E13S38EE	5,50 - 8,50
E1E13S42EE	6,00 - 9,50
E1E13S48EE	6,50 - 10,50
E1E13S55EE	7,50 - 12,00
E1E13S63EE	8,50 - 14,00
E1E13S72EE	10,00 - 16,00

Reference	A (mm)	B (mm)	Ø C (mm)	D	Ø E (mm)	H (mm)	J (mm)	Ø d (mm)	h (mm)	G (mm)
E1E11S❑❑EC	25,4	34	28,5	M5	23	29	14	4,3	28	10
E1E12S❑❑ED	34,9	44,4	40	M6	34,6	35,6	19	4,3	34,5	12
E1E13S❑❑EE	49,2	60,5	57	M8	45	47	23	5,3	45,5	16

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

E1E11S**AL
E1E12S**AL
E1E13S**AL

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : 20 to 25 Hz (1)

DESCRIPTION

VHDS elastomer able to carry loads under compression and traction.
Flange, washer and shaft in 18/8 stainless steel.

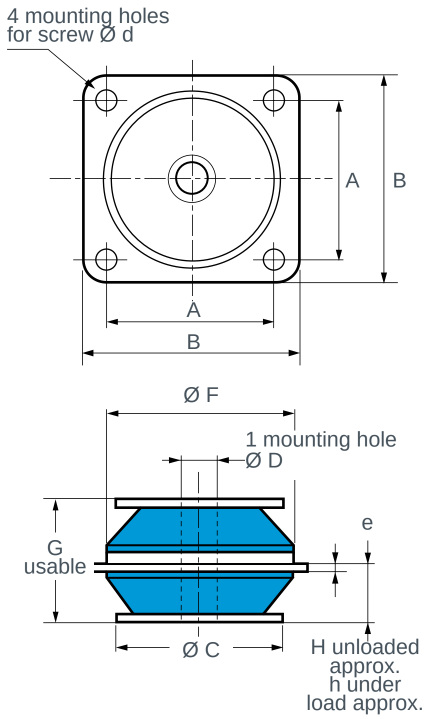
APPLICATIONS

Protecting electronic equipment, navigation equipment, instrument panels, measuring instruments, control panels on aircraft, road vehicles and railway trains.

CHARACTERISTICS

Natural frequency :
- axial : 20 to 25 Hz;
- radial : 20 to 25 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 0.5 mm.
Amplification factor at resonance < 5.
Operating temperature : - 54°C to + 150°C.
Structural strength corresponds to a continuous acceleration of 10 g at maximum load.
Maximum axial travel available for shocks :
E1E11 : + 4mm / E1E12 : + 5 mm / E1E13 : + 7 mm.
Weight : E1E11 : 25 g / E1E12 : 75 g / E1E13 : 225 g.
These mounts meet the standard AIR7304 curve ZF.



Reference	Charges statiques axiales (daN)
E1E11S38AL	1,60 - 2,80
E1E11S42AL	1,80 - 3,20
E1E11S48AL	2,10 - 3,80
E1E11S55AL	2,50 - 4,50
E1E11S63AL	3,00 - 5,30
E1E11S72AL	3,50 - 6,20
E1E12S38AL	3,70 - 5,70
E1E12S42AL	4,00 - 6,30
E1E12S48AL	4,60 - 7,10
E1E12S55AL	5,20 - 8,10
E1E12S63AL	6,00 - 9,30
E1E12S72AL	6,60 - 10,30
E1E13S38AL	5,50 - 8,50
E1E13S42AL	6,00 - 9,50
E1E13S48AL	6,50 - 10,50
E1E13S55AL	7,50 - 12,00
E1E13S63AL	8,50 - 14,00
E1E13S72AL	10,00 - 16,00

Reference	A (mm)	B (mm)	Ø C (mm)	Ø F (mm)	G (mm)	Ø d (mm)	e (mm)	H (mm)	h (mm)	Ø D (mm)
E1E11S❑❑AL	25,4	32	23	25,6	19	3,6	1,5	10	9	5,2
E1E12S❑❑AL	34,9	44,4	34,6	38,7	25,4	4,2	1,8	11,5	10,5	6,7
E1E13S❑❑AL	49,2	60,5	45	53	38	5,3	2,5	17,75	18,5	8,5

E1E21
E1E22
E1E23

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : 20 to 25 Hz (1)

DESCRIPTION

- VHDS elastomer.
- Flange and shaft in 18/8 stainless steel.

Two Ø C fail safe rings must be provided.

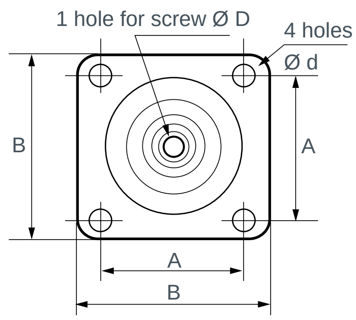
APPLICATIONS

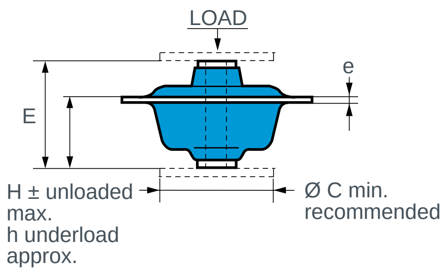
- Protecting electronic equipment, navigation equipment, instrument panels, measuring instruments, control panels on aircraft, road vehicles and railway trains.

CHARACTERISTICS

Natural frequency :
- axial : 15 to 25 Hz;
- radial : 20 to 35 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 0.5 mm.
Amplification factor at resonance < 4.
Operating temperature : - 54°C to + 150°C.
Structural strength corresponds to a continuous acceleration of 10 g at maximum load.
Maximum axial travel available for shock :
E1E21 : ± 4 mm for f min / E1E22 : ± 4.5 mm for f min
± 6 mm for f max ± 6 mm for f max.
Weight : E1E21 : 9 g / E1E22 : 25 g / E1E23 : 63 g.
These mounts meet the standard AIR7304 curve ZF





Reference *	A (mm)	B (mm)	Ø C (mm)	D	E (mm)	Ø d (mm)	e (mm)	H (mm)	h (mm)
E1E21S❑❑AL	25,4	32	24	M4	19	3	0,8	12,5	11
E1E22S❑❑AL	34,9	44,5	28	M5	25,4	4	1,5	16,5	15
E1E23S❑❑AL	49,2	60,5	42	M6	36	5	2	22	20

* Exist with a diamond flange (BL)

Reference	Axial static load (daN)	Frequency (Hz)	Radial static load (daN)	Frequency (Hz)
E1E21S38AL E1E21S63AL E1E21S77AL	0,10 -0,40 0,20 - 0,90 0,26 - 1,20	15 - 25	0,10 - 0,15 0,20 - 0,30 0,26 - 0,40	20 - 25
E1E22S38AL E1E22S63AL E1E22S77AL	0,20 - 1,00 0,40 - 1,70 0,50 - 2,20	12 - 25	0,20 - 0,40 0,40 - 0,70 0,50 - 0,90	12 - 25
E1E23S42AL E1E23S77AL	0,40 - 1,20 1,00 - 2,90	10 - 15		

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

E1E31
E1E32

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : 15 to 25 Hz (1)

DESCRIPTION

- VHDS elastomer.
- Flange and shaft in 18/8 stainless steel.

Two Ø K fail safe rings must be provided.

APPLICATIONS

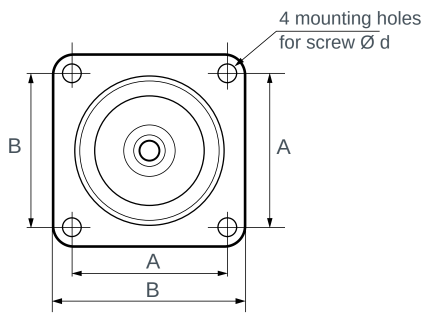
- Protecting electronic equipment, navigation equipment, instrument panels, measuring instruments, control panels on aircraft, road vehicles and railway trains.

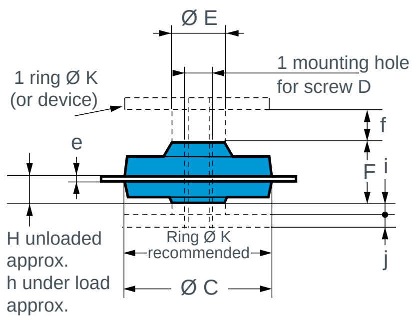
CHARACTERISTICS

Natural frequency :

- axial : 15 to 25 Hz;
- radial : 20 to 35 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 0.5 mm.
Amplification factor at resonance < 4.
Operating temperature : - 54°C to + 150°C.
Structural strength corresponds to a continuous acceleration of 10 g with maximum load.
Maximum axial travel available for shocks :
E1E 31: ± 4 mm for f min;
± 6 mm for f max.
E1E 32 : ± 4.5 mm for f min;
± 6 mm for f max.
Weight : E1E31 : 9 g / E1E32 : 25 g.
These mounts meet the standard AIR7304 curve ZF





Reference	Axial static loads (daN)	Frequency (Hz)
E1E31S38AL E1E31S55AL E1E31S77AL	0,20 - 0,70 0,30 - 1,00 0,40 - 1,70	15 - 25
E1E32S38AL E1E32S55AL E1E32S77AL	0,30 - 1,10 0,60 - 1,80 0,80 - 2,60	

Reference	A (mm)	B (mm)	Ø C (mm)	D	Ø E (mm)	F (mm)	J (mm)	Ø K (mm)	Ø d (mm)	e (mm)	f (mm)		H (mm)	j (mm)		h (mm)
											Min.	Max.		Min.	Max.	
E1E31S❑❑AL	25,4	32	25	M4	8,5	10,5	2	25	3,6	1	3,2	5	4,5	0	1,75	3,5
E1E32S❑❑AL	34,9	44,5	35	M5	13	14,5	3	35	4,3	1,5	4,5	7	6,2	0	2,5	5

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

E1E41
E1E42
E1E43

SILICONE RUBBER / SPECIAL ELECTRONICS

Natural frequency : (1)
10 to 25 Hz

DESCRIPTION

- VHDS elastomer able to carry loads under compression.
- Base and centre axis in 18/8 stainless steel.

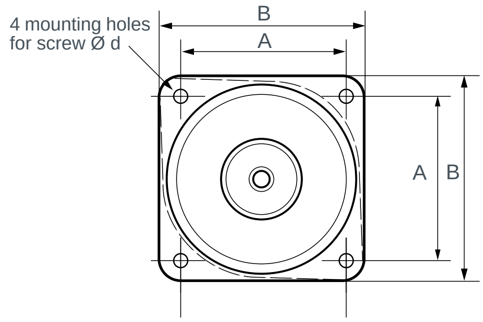
APPLICATIONS

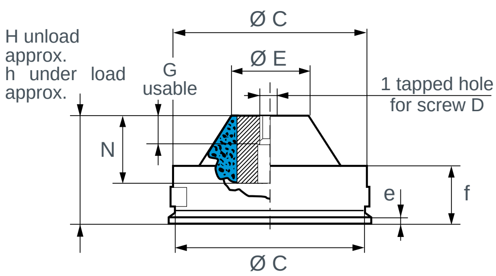
- Protecting electronic equipment, navigation equipment, instrument panels, measuring instruments, control panels on aircraft, road vehicles and railway trains.

CHARACTERISTICS

Natural frequency :
- axial and radial : 10 to 25 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 0.5 mm.
Amplification factor at resonance < 4.
Operating temperature : - 54°C to + 150°C.
Structural strength corresponds to a continuous acceleration of 10 g at maximum load.
Maximum axial travel available for shocks :
E1E41: 8.8 mm / E1E42, E1E43 : 12 mm.
Weight : E1E41 : 22 g / E1E42 : 60 g / E1E43 : 96 g.
These mounts meet the standard AIR7304 curve ZF.





Reference	Axial static loads (daN)
E1E41S38EB	1,20 - 2,10
❶ E1E41S63EB	2,20 - 3,80
E1E41S77EB	3,00 - 5,20
E1E42S38EC	1,75 - 3,30
E1E42S63EC	3,20 - 5,90
E1E42S77EC	4,40 - 8,30
E1E43S38ED	3,10 - 5,50
E1E43S63ED	6,00 - 10,80
E1E43S77ED	7,50 - 13,60

❶ These isolators exist with an oval flange (FB).

Reference	A (mm)	B (mm)	Ø C (mm)	D	Ø E (mm)	G (mm)	H (mm)	N (mm)	Ø d (mm)	e (mm)	f (mm)	h (mm)
E1E41S❑❑EB	25,4	34	30,5	M4	10	6	23	14,2	4,3	0,8	14	21
E1E42S❑❑EC	34,9	43	41,5	M5	12	8	33	20	4,3	1,5	18	31
E1E43S❑❑ED	49,2	60,5	57	M6	21,5	8	33	20	5,3	2	16	31

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

E1E941S

Natural frequency : (1)
15 to 30 Hz

DESCRIPTION

- High damped silicon elastomer (VHDS).
- Stainless Steel flange and centre axis.

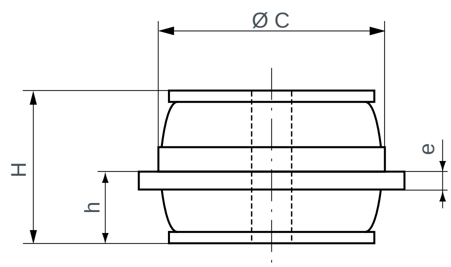
APPLICATIONS

- Protection of electronic equipment, navigation equipment, control consoles, mesuring instruments, onboard aircraft, trains and trucks.

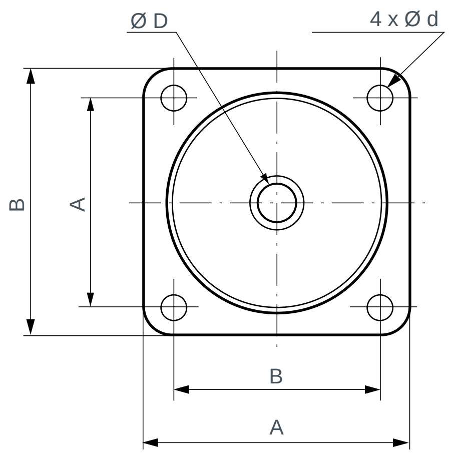
CHARACTERISTICS

Natural frequency :
- axial and radial : 12 to 30 Hz.

Maximum sinusoidal input amplitude at resonance frequency : ± 0,5 mm.
Amplification factor at resonance < 5.
Operating temperature range : - 54 °C to + 150 °C.
Mechanical strength corresponding to a continuous acceleration of 10 g at maximum load.
Maximum axial displacement during shock:
E1E941S : 4 mm.
Weight : E1E941S : 80 g.
These mounts meet the standard AIR7304 curve ZF.



Reference	Axial static loads (daN)
E1E941S38	5 - 14
E1E941S55	7 - 20
E1E941S72	12 - 30



Reference	A (mm)	B (mm)	Ø C (mm)	Ø D (mm)	H (mm)	Ø d (mm)	e (mm)	h (mm)
E1E941S□□EB	34,9	44,5	38	6,7	26,2	4,3	3	12

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

ARDAMP®

Natural frequency : (1)
10 to 25 Hz

DESCRIPTION

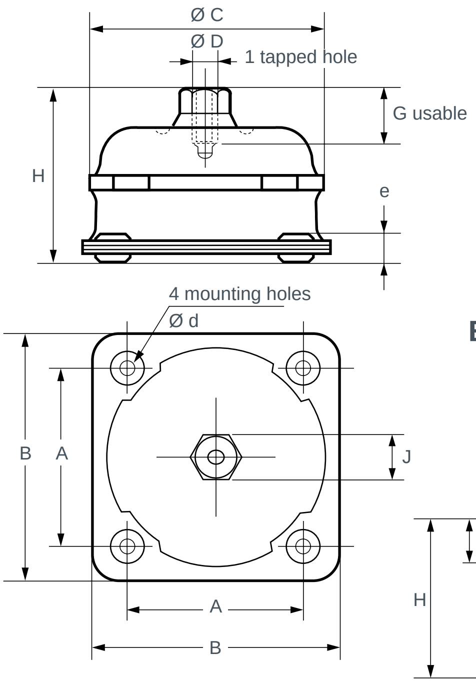
The ARDAMP® series dampers have a spring and piston embedded in high viscosity silicone rubber gel which itself is embedded in an elastomer membrane bonded to the case.

APPLICATIONS

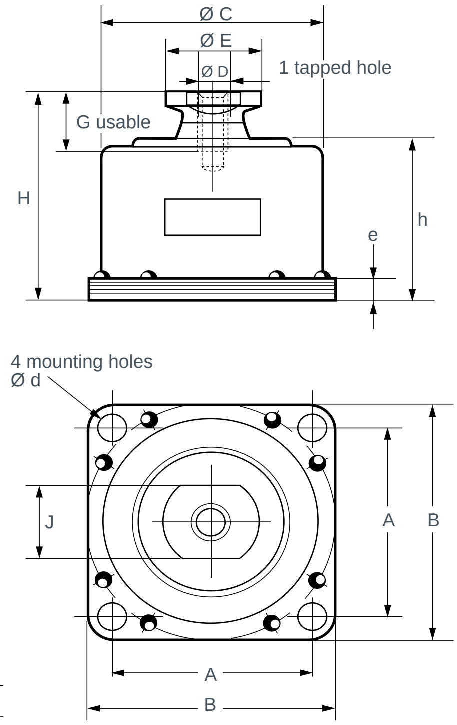
Due to their high performances and high shock damping capacity ARDAMP® dampers are designed to protect fragile electronic equipment, control panels and measuring instruments on ground vehicles, aircrafts, helicopters, civil and military submersible crafts.

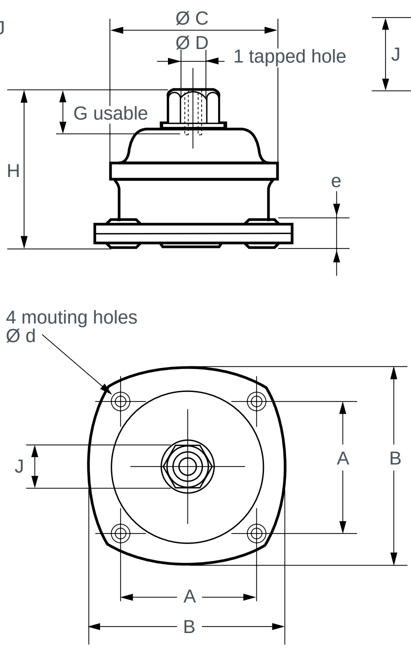
1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



E1FH 781 **S01** **C01**





E1FH 866C01
E1FH 2507-01

E1FH 76
E1FH 77
E1FH 78

Reference	H Unload. (mm)	H approx. under load (mm)	A (mm)	B (mm)	Ø C (mm)	D	Ø E (mm)	G max. (mm)	J (mm)	Ø d (mm)	e (mm)	h (mm)	Weight approx.
E1FH781S01 **E1FH781C01**	42 43	39 41	35	54	43	M5		10	12	4,5	5,5		120 g
E1FH866C01 **E1FH2507-01**	47	46	49,2	65,3	61,5	M6		15	12	5,2	5		230 g 215 g
E1FH76-01 **E1FH76-02**	70 67	66 65	63,5	77	70	M10	30	19	24	8,4	7,2	49	390 g
E1FH77-01	86	82	88	110,5	96	M12	40	24	34	8,4	8,5	62	930 g
E1FH78-01 **E1FH78-02**	102 98	99 95	107,9	132	117	M16	54	25	44	11	9,5	77,5	1,5 kg

OPERATING CHARACTERISTICS

Natural frequency :
- axial : 10 to 25 Hz;
- radial : 10 to 20 Hz.

Damping : 20% c/cc (E1FH781, 866, 2507-01);
17% c/cc (E1FH76, 77, 78).
Amplification factor at resonance : 2.5 to 3 max.
These dampers comply with SEFT 001A, AIR 7304, MIL STD 810 C.

Reference	SEFT 001 A			AIR 7304			MIL STD 810 C		Non standard applications		Shocks and bumps OZ axis	
	Load kg per damper	Axial Fn (Hz)	Radial Fn (Hz)	Load kg per damper	Axial Fn (Hz)	Radial Fn (Hz)	Load kg per damper	Axial Fn (Hz)	Load kg per damper	Radial Fn (Hz)	6 ms 1/2 sine shocks max. input (g)	11 ms 1/2 sinus shocks max. input (g)
E1FH781S01 **E1FH781C01**	-	-	-	0,2 - 2 2 - 5	20 - 25	15 - 20	4	16	1,5 - 3,5 3,5 - 8	10 - 20	70 g	38 g
E1FH866C01	8 - 15	10 - 20	12 - 20	6 - 8	20 - 25	15 - 20	8	20	8 - 15	10 - 20	50 g	27 g
E1FH2507-01	-	-	-	-	-	-	-	-	5 - 8	6 - 10	-	-
E1FH76-01 **E1FH76-02**	14 - 20 18 - 30	10 - 20	12 - 20 11 - 16	7 - 12 9 - 20	20 - 25	15 - 20	14 18	18 17	14 - 20 18 - 30	10 - 20	40 g 55 g	22 g 30 g
E1FH77-01	20 - 50	10 - 20	10 - 17	-	-	-	30	15	20 - 50	10 - 20	50 g	25 g
E1FH78-01 **E1FH78-02**	50 - 100 90 - 130	10 - 20	10 - 16 10 - 15	-	-	-	75 100	10 11	50 - 100 90 - 130	10 - 20	40 g	22g

E1C2321
E1T2105

SPECIAL PACKAGING

Natural frequency :
10 to 25 Hz (1)

DESCRIPTION

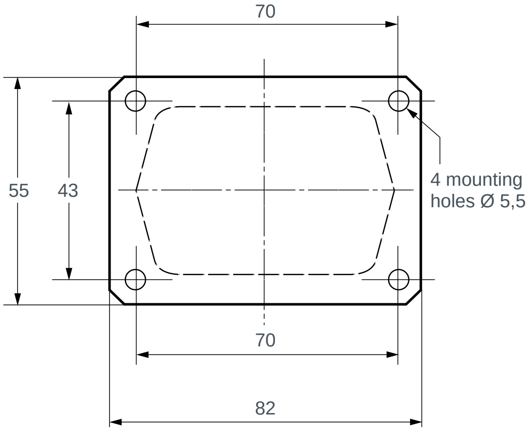
The special packing dampers have a flexible elastomer element designed for various applications, bonded to two steel mounting plates.

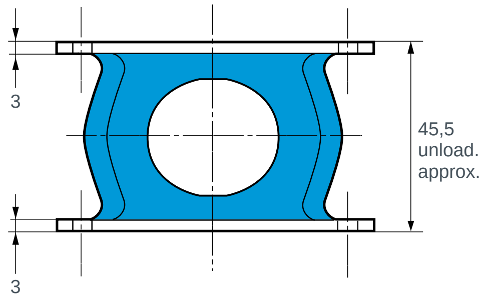
APPLICATIONS

These multi-directional dampers allow considerable deflection to protect equipment transported in containers against drops and transport shocks (missiles, aeronautical equipment).
These dampers are also suitable for suspending equipment to be protected against shocks and vibrations caused by explosions or earthquakes.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS





OPERATING CHARACTERISTICS

Natural frequency :
- axial : 10 to 25 Hz;
- radial : 10 to 25 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 1.6 mm.
Maximum travel available for shocks : - axial : 15 mm;
- radial : 40 mm.

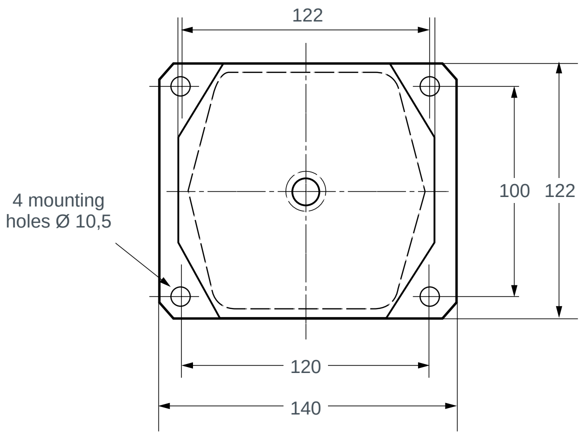
Operating temperature : see table.
Weight : 0.3 kg.

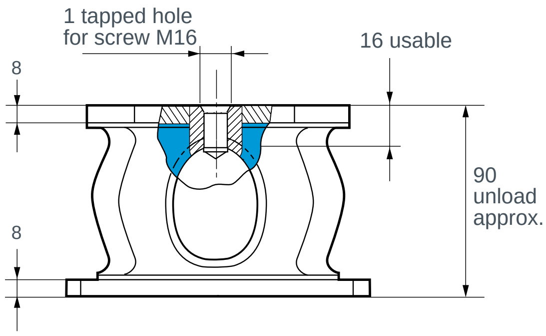
Reference	Axial static load (daN)	Damping	Resistance to oils and hydrocarbons	Resistance to fatigue	Operating temperature	Material (1)
E1C2321S01	1-10	***	*	*	- 54 to + 150 °C	SIL 33 Sh
E1C2321S02	2-20					SIL 55 Sh
E1C2321-01	2-20	*	**	***	- 30 to + 100 °C	CR 60 Sh
E1C2321-02	5-50					CR 70 Sh
E1C2321-03	10-100					CR 75 Sh
E1C2321-21	2-20	***	*	***	- 40 to + 90 °C	BR 60 Sh
E1C2321-22	5-50					BR 70 Sh
E1C2321-23	10-100					BR 80 Sh

(1) SIL : Silicone; CR : Chloroprene-Rubber; BR : Butadiene-Rubber.

E1C2105

DIMENSIONS





OPERATING CHARACTERISTICS

Natural frequency :
- axial : 10 to 25 Hz;
- radial : 10 to 25 Hz.

Maximum permitted excitation at natural frequency of suspension : ± 1.6 mm.
Maximum travel available for shocks : - axial 40 mm;
- radial 75 mm.

Operating temperature : see table.
Weight : 2.6 kg.

Reference	Axial static load (daN)	Damping	Resistance to oils and hydrocarbons	Resistance to fatigue	Operating temperature
E1T2105S01 **E1T2105S02**	2-20 4-40	***	*	*	- 54 to + 150 °C
E1T2105-41 **E1T2105-42** **E1T2105-43**	10-100 20-200 40-400	*	***	**	- 25 to + 90 °C
E1T2105-21 **E1T2105-22** **E1T2105-23**	10-100 20-200 50-400	***	*	***	- 40 to + 90 °C

BECA

Natural frequency : (1)
8 to 14 Hz

DESCRIPTION

The BECA mount comprises one piece elastomer bonded to a top and bottom plate.
- Top plate : smooth or threaded (welded nut) hole.
- Bottom plate : fixing lugs or direct bearing on the ground.
- Bonded rubber.
- Domed rubber ring.
- Anti-slip bead or grooved anti-slip sole.
- Removable protective top cover : protects the rubber and distributes the load.

OPERATION

The design of the BECA mount gives the following basic characteristics :
- transverse elasticity approximately the same as the axial elasticity (equifrequency);
- rubber works in compression;
- progressive buffer against shocks or accidental overload;
- anti-slip (may be placed directly on the ground).

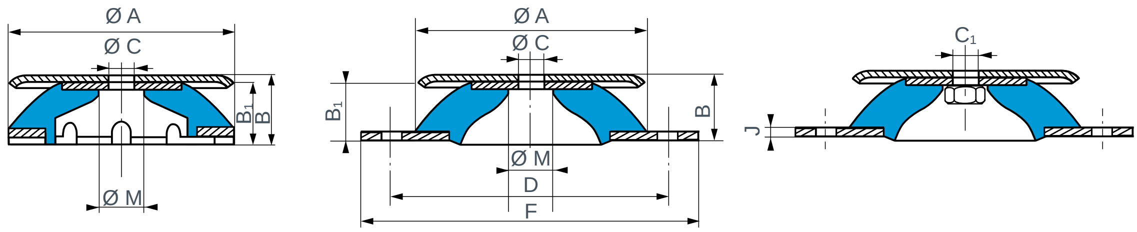
Advantages
- The machine may be placed (with its mounts) directly on the ground.
- Very slim.
- Speed of fixing.
- Simple removal of the assembly.
- Extensive range : 3 hardnesses of rubber for 6 existing sizes, allowing the mounting to be optimised as a function of the load and stimulation frequency.
- A choice of 3 fixing styles.

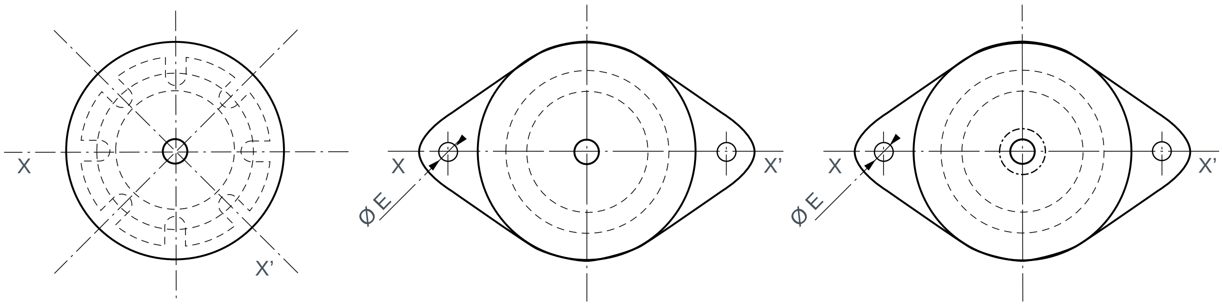
Recommendations
- In order not to affect the suspension of the machine, all external connections must be flexible.
- BECA mount can be used for fixed, well-balanced rotating machinery, otherwise a ballasting slab should be used.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS

Section XX' | Section XX' | Section XX'





Shape a
BECA with anti-slip base

Shape b
BECA with lugs, smooth hole

Shape c
BECA with lugs, threated hole

Type	Hardness	Reference			Ø A (mm)	B (mm)	B1 (mm)	Ø C (mm)	C1	D (mm)	Ø E (mm)	F (mm)	J (mm)	Ø M (mm)	Weight (g)
		anti-slip base	Diamond base												
		Smooth hole Shape a	Smooth hole Shape b	Threaded hole Shape c											
Ø 40	45.60	-	-	**533641***	40	20	18	-	M6	52	6,2	64	2	19	50
Ø 60	45.60.75	-	-	**533661**	60	24	22,5	-	M6	76	6,2	90	2	18	140
Ø 80	45.60.75	-	**533581**	**533681**	80	27	25	8,1	M8	100	8,2	120	2	22	250
Ø 100	45.60.75	**533108**	-	-	100	30	28	10,2	-	-	-	-	-	22	420
Ø 100	45.60.75	-	**533109**	**533609**	100	27,5	25,5	10,2	M10	124	10,2	148	2,5	22	460
Ø 150	45.60.75	**533151**	-	-	150	41	38	14,2	-	-	-	-	-	34	1220
Ø 150	45.60.75	-	**533152**	**533652**	150	39	36	14,2	M14	182	12,2	214	4	34	1340
Ø 200	45.60.75	**533202**	-	-	200	46	42	18	-	-	-	-	-	44	2750
Ø 200	45.60.75	-	**533203**	**533623**	200	44	40	18	M18	240	14,5	280	5	44	3030

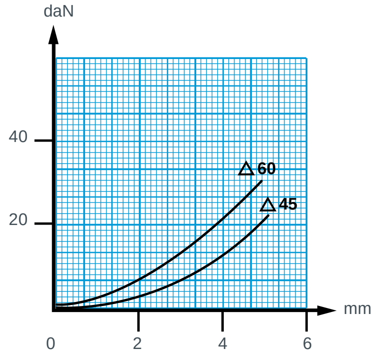
See current price list for availability of items.
* Ø M40, M6 - RAPID nut - max. torque : 3 N.m.

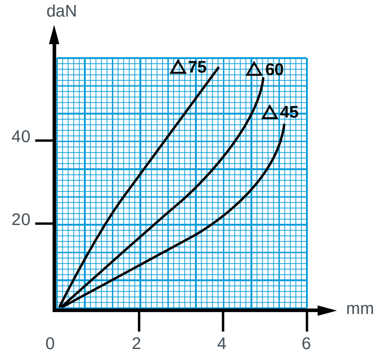
OPERATING CHARACTERISTICS

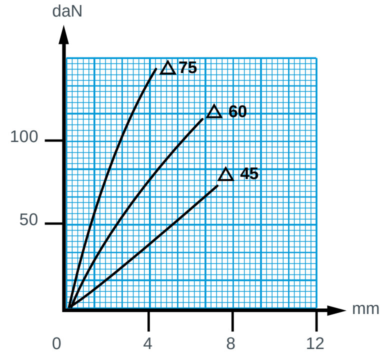
Nominal static load (daN)	Deflection (mm)	Type	Hardness
1 - 4	2	Ø 40	45
2 - 10	2,5	Ø 40	60
3 - 15	3	Ø 60	45
6 - 25	3	Ø 60	60
11 - 45	3	Ø 60	75
11 - 45	4,5	Ø 80	45
20 - 80	4,5	Ø 80	60
22 - 90	4	Ø100	45
30 - 120	4	Ø 80	75

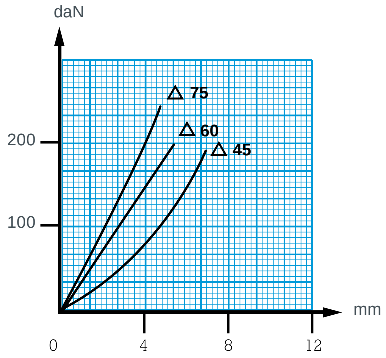
Nominal static load (daN)	Deflection (mm)	Type	Hardness
30 - 130	7	Ø 150	45
40 - 160	4	Ø 100	60
50 - 220	4	Ø 100	75
60 - 250	7	Ø 150	60
85 - 350	6	Ø 150	75
125 - 500	7	Ø 200	45
200 - 825	7	Ø 200	60
310 - 1250	6	Ø 200	75

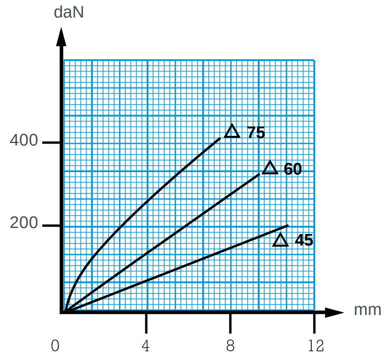
LOAD/DEFLECTION CURVES IN AXIAL COMPRESSION

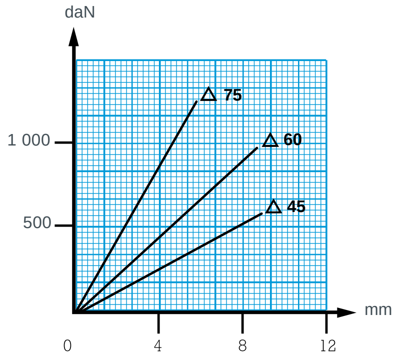




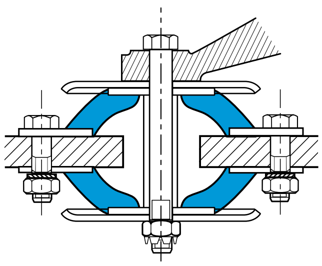




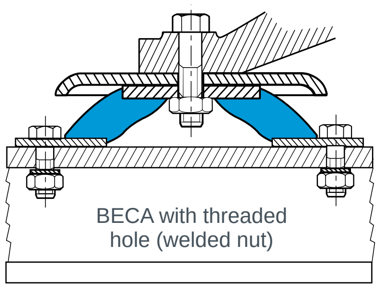


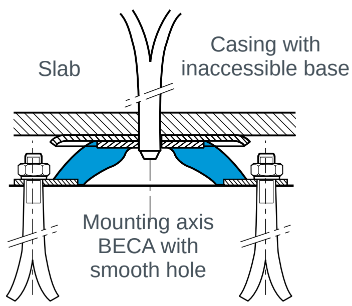


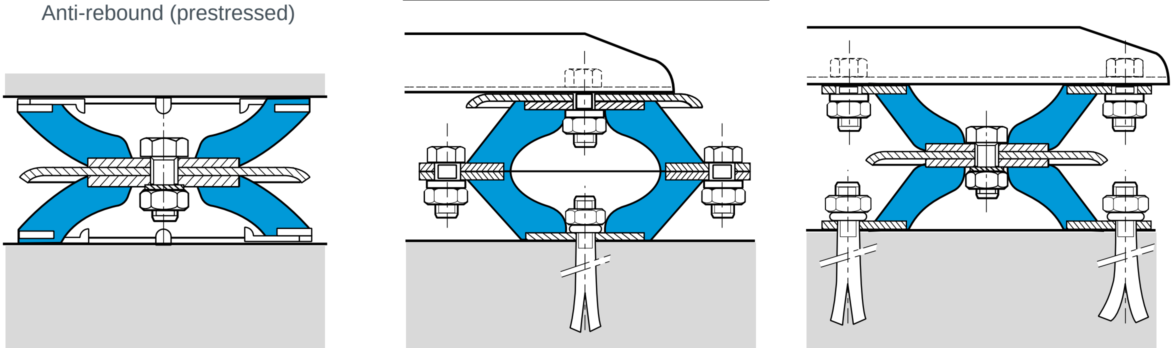
ASSEMBLY



Anti-rebound (prestressed)





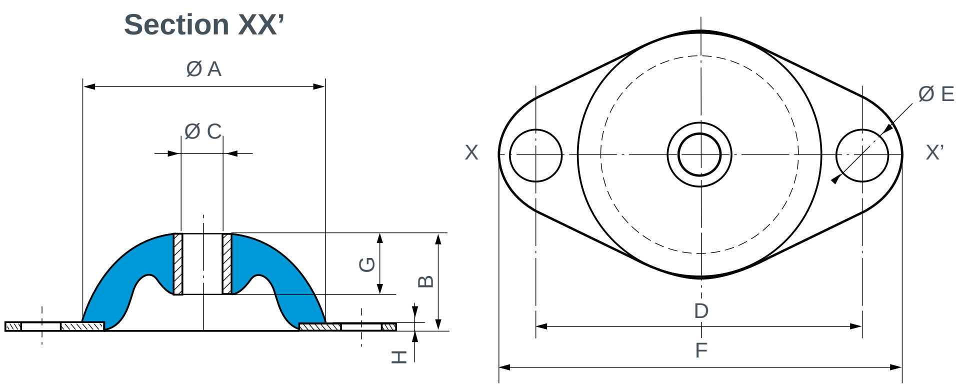


BECA mounts in tandem (to double the deflection)

All of our mounts are identified by conventional markings, either a paint spot or figures indicating the hardness: grey = hardness 45, green = hardness 60, blue = hardness 75.

POLYFLEX

Natural frequency : (1)
9 to 20 Hz



DIMENSIONS

Reference	Ø A (mm)	B (mm)	Ø C (mm)	D (mm)	Ø E (mm)	F (mm)	G (mm)	H (mm)
532300	30	16	6	40	6,1	50	8	1,5
532500	50	20	8	66	8,2	82	13	2
532563	55	23	10,1	90	8,2	106	15	3
532561	60	25	12,2	76	8,5	95	20	4
532750	75	30	12,2	95	11,0	118	25	6

See current price list for availability of items.

OPERATING CHARACTERISTICS

Nominal static load (daN)	Deflection (mm)	Reference	Hardness
1-5	3	**532300**	45
1-7	2	**532300**	60
2-8	1	**532300**	75
2-10	4	**532500**	45
3-15	3	**532500**	60
4-18	5	532563	45
5-20	2,5	**532500**	75
7-30	3	**532561**	45

Nominal static load (daN)	Deflection (mm)	Reference	Hardness
7-30	5	532563	60
10-40	2	**532561**	60
10-50	1,5	**532561**	75
10-50	4	**532750**	45
15-60	5,5	532563	75
15-65	3	**532750**	60
20-80	1,5	**532750**	75

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

ISOFLEX ®

Natural frequency : (1)
11 to 15 Hz

DESCRIPTION

The ISOFLEX® mount comprises two concentric metallic parts joined by a bonded, perforated rubber ring.

OPERATION

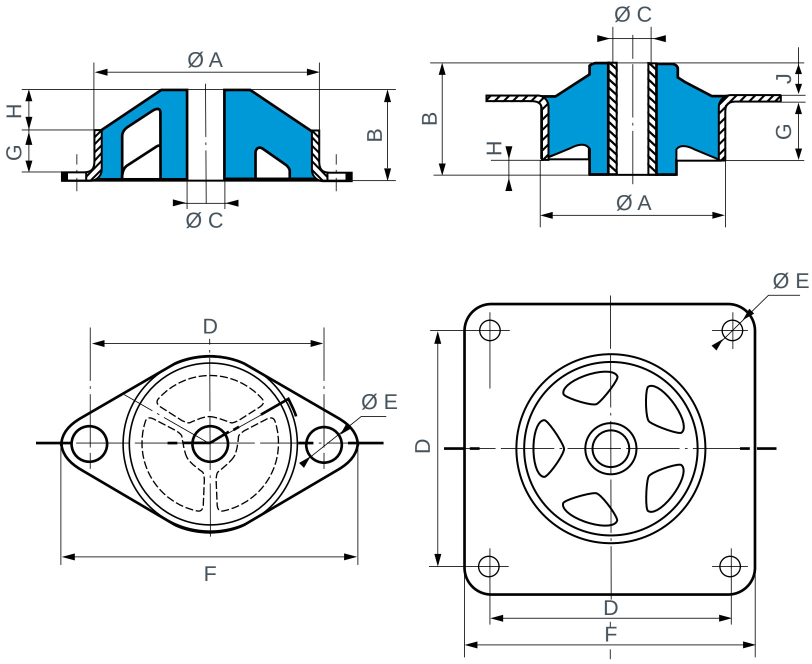
The design of the ISOFLEX® mount gives the following basic characteristics : elasticity approximately the same in all directions (equi-frequent mounting).

APPLICATIONS

ISOFLEX® mounts may be used for suspending any small measuring or recording equipment, mobile equipment, machine tool controls.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



Shape a **Shape b**

Type	Shape	Reference	Hardness	Ø A (mm)	B (mm)	Ø C (mm)	D (mm)	Ø E (mm)	F (mm)	G (mm)	H (mm)	J (mm)	Weight (g)
R	a	**552428**	50	28	8	4,2	36	3,2	44	4	3	-	9
I.20	b	**552231**	45 - 60	25,4	10,3	4,2	25,4	3,6	31,8	4,2	1	4,3	10
I.30	b	**552241**	45 - 60	38,1	15,9	6,2	34,9	4,2	44,5	7,3	-	7,3	30

See current price list for availability of items.

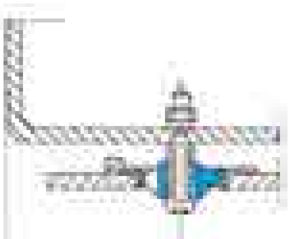
TECHNICAL CHARACTERISTICS

Nominal static load (daN)	Deflection (mm)	Type	Reference	Dureté
0,25 - 1 0,50 - 2 0,75 - 3	3 3 2,5	R I.20 I.20	**552428** **552231** **552231**	50 45 60

Nominal static load (daN)	Deflection (mm)	Type	Reference	Dureté
1 - 4 1,5 - 6	3 2	I.30 I.30	**552241** **552241**	45 60

All of our mounts are identified by conventional markings, either a paint spot or figures indicating the hardness : grey = hardness 45, green = hardness 60, blue = hardness 75.

ASSEMBLY



Fixing method

To avoid toppling or canting, the suspension should be designed so that the centre of gravity of the suspended equipment is close to the geometrical centre of the suspension.

ISODYNE ®

DESCRIPTION

The ISODYNE® mount comprises two half mountings joined together.

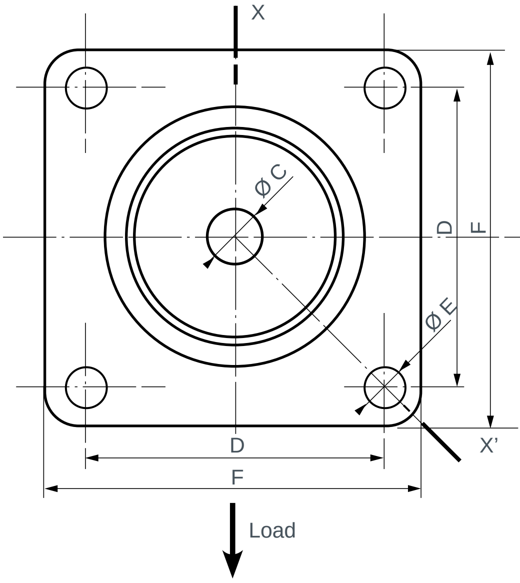
OPERATION

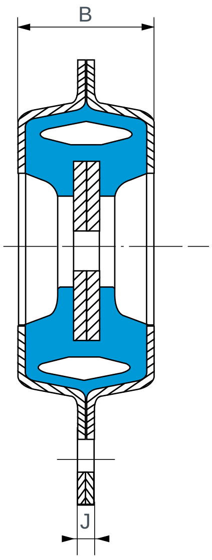
The design of the ISODYNE® mount gives the following basic characteristics :
- a very high axial to radial stiffness ratio;
- vertical fixing avoiding excessive inclination of the equipment;
- fixing at any angle;
- safe (551571), anti-rebound.

APPLICATIONS

ISODYNE® can be used to suspend lightweight equipment in a vertical plane.

DIMENSIONS





Section XX'

Reference	Hardness	B (mm)	Ø C (mm)	D (mm)	Ø E (mm)	F (mm)	J (mm)	Weight (g)
551321 **551441** **551571**	50 45 45.60	16 18 20	4,2 6,5 8,2	25,4 35 45,5	3,5 4,2 6,2	32 44,5 57,5	1,6 2 2	10 24 50

See current price list for availability of items.

OPERATING CHARACTERISTICS

Nominal static load (daN)	Deflect. (mm)	Reference	Hardness
2,5	1	**551321**	50
10	3	**551441**	45

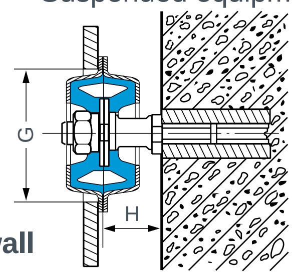
Nominal static load (daN)	Deflect. (mm)	Reference	Hardness
25	2,5	**551571**	45
35	2,5	**551571**	60

ASSEMBLY

Fixing clearances (approximate).

Reference	G (mm)	H (mm)
551321 **551441** **551571**	28 40 47	18 20 22

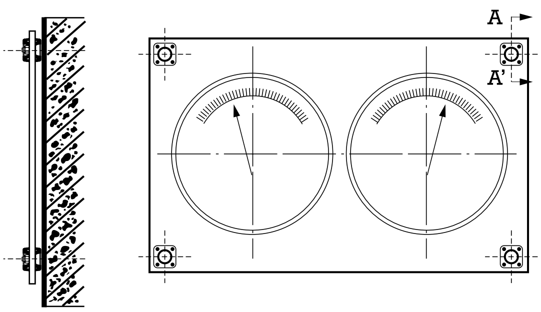
Suspended equipment



Fixing to wall

Vertical wall

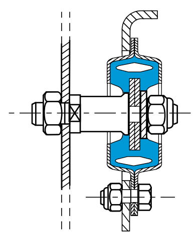
Fixing a control panel against a wall or vertical frame.



Suspended equipment

frame

mount



Fixing to frame

SUSPENSION OF EQUIPMENT IN MOBILE APPLICATIONS

Natural frequency : 16 to 22 Hz (1)

DESCRIPTION

This mount has rubber moulded around a metal centre axis.
The elastomer is shaped so that the mount can be pressed into the mounting structure.

OPERATION

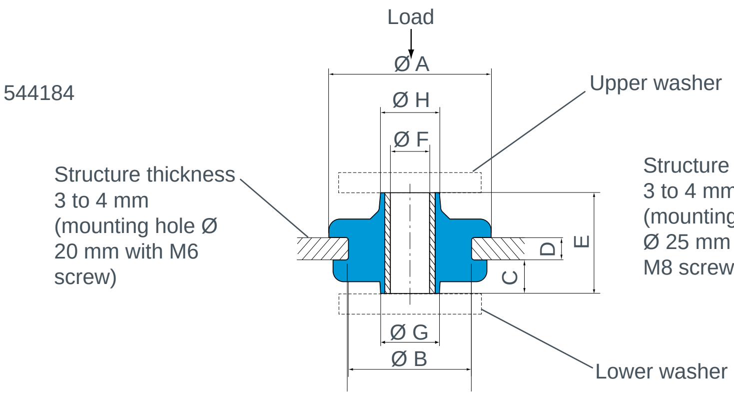
The mount combines the advantages of low natural frequency and easy installation.
The simple design means the part can be assembled usring a single bott or screw fixing.

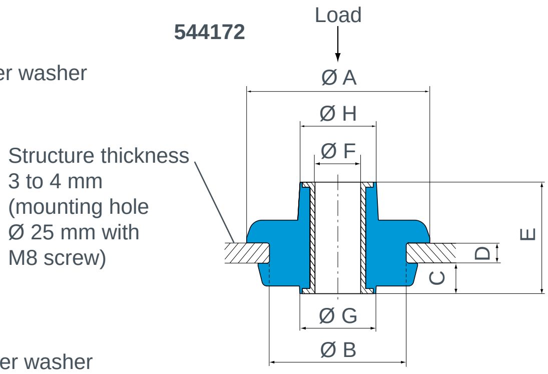
APPLICATIONS

- Anti-vibration mounts suitable for mobile equipment mounted in light and heavy vehicles, construction equipment (hydraulic pumps, acoustic panels, control boxes, air conditioning sets, compressors,…).
- Isolation of light weight equipment in static environments.

CHARACTERISTICS

Natural frequency :
Axial and radial : 16 to 22 Hz.
Fail safe assembly possible with washers fitted above and below the mount.
(dim Ø 6,2 x Ø 30, thickness 1,5)





Reference	Ø A (mm)	Ø B (mm)	C (mm)	D (mm)	E (mm)	Ø F (mm)	Ø G (mm)	Ø H (mm)
544184	29	22	6	4	18	6,2	10,5	10,5
544172	36	27	6	4	22	9	15	15

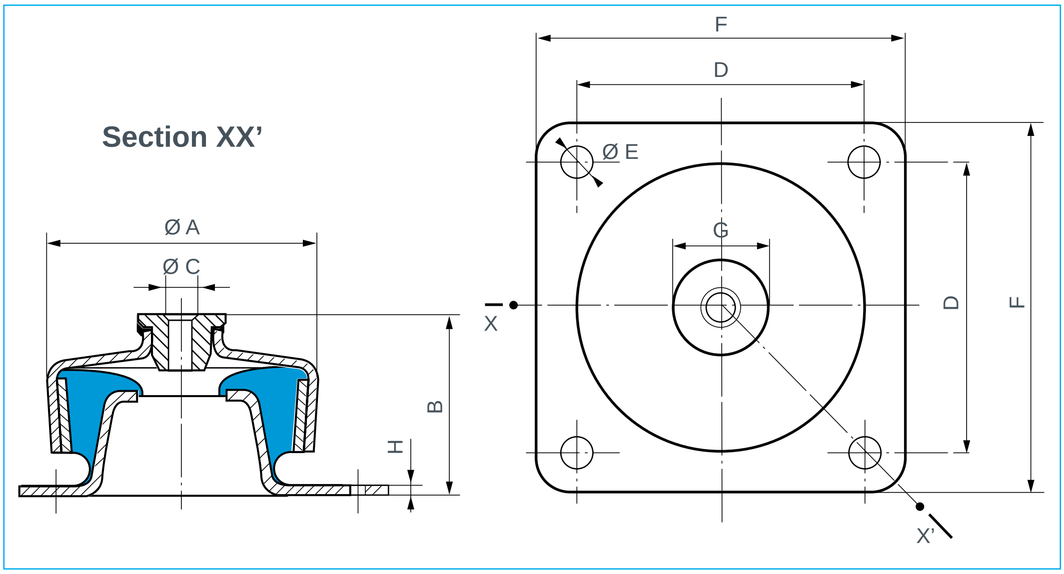
See current price list for availability of items.

Reference	Load range (daN)	Temperature range
544184 - 11	2 - 3	-30 to +80°C
544184 - 16	2,5 - 3,5	-30 to +60°C
544172 - 11	2 - 3	-30 to +60°C

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

S.C.P. MOUNTING

Natural frequency : (1)
9 to 15 Hz



DIMENSIONS

Reference	Ø A (mm)	B (mm)	Ø C (mm)	D (mm)	Ø E (mm)	F (mm)	G (mm)	H (mm)
530220	74	53	M10	72	9	90	32	3
530420	92	63	M12	90	11	114	36	3
530420	124	94	M16	114	13	144	60	4

OPERATING CHARACTERISTICS

Reference	Hardness 45		Hardness 60		Hardness 75		Weight (g)
	Load (daN)	Deflect. (mm)	Load (daN)	Deflect. (mm)	Load (daN)	Deflect. (mm)	
530120	70	3	120	2,5	175	2	580
530220	140	4	200	3	300	2,5	1 000
530420	300	5	500	5	800	4	2 550

See current price list for availability of items.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

BATRA® RING

Natural frequency : (1)
7 to 22 Hz

DESCRIPTION

The BATRA® ring comprises a rubber ring bonded to two metallic washers one with a circular groove, the other with a mating circular ridge which allows BATRA® rings to be mounted one on top of another.

OPERATION

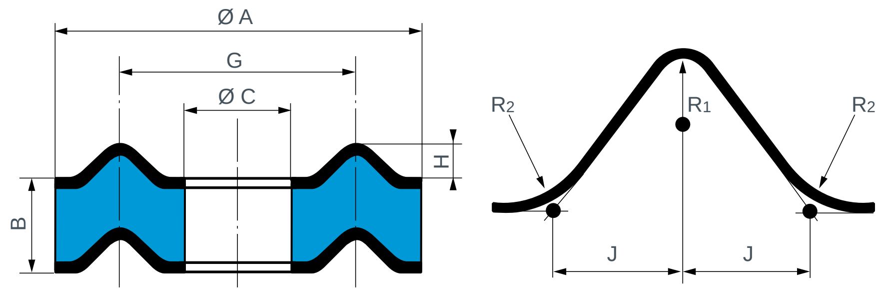
The design of the BATRA® ring gives the following basic characteristics :
- behaviour identical to that of a metallic spring plus damper;
- robustness :
  - well behaved under shock;
  - removal of the risks of suspension collapse;
- flexibility easily tailored by stacking BATRA® rings;
- transverse creep limited by the two bonded armatures.

APPLICATIONS

BATRA® rings may be used :
- for making suspensions that are very flexible vertically and also damped by the natural properties of the rubber (road and rail vehicles);
- for making very effective anti-shock buffers (wagons, cars, gantries).
  For special applications, where the quantities would justify custom manufacture, it is possible to supply Special BATRA® rings either with only one bonded lower armature or “all rubber”.
  For special cases of shock, there are Special BATRA® rings with overlapping, non-bonded, armatures.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



Reference	Ø A (mm)	B (mm)	Ø C (mm)	G (mm)	H (mm)	J (mm)	R1 (mm)	R2 (mm)	Weight (g)
541050	50	11	14	32	4	5	2,5	1,5	45
541083	80	27	41,5	61	4	6	3	3	220
541082	86	27,5	32	65	5	7	4	2	300
541100	100	28,5	32	65	5	7	4	2	415
541112	115	30	50	85	10	10	5	3	540
541145	140	35	55	100,5	10	10	5	3	890
541146	146	20	55	100,5	10	10	5	3	750
541144	146	35	55	100,5	10	10	5	3	980
541175	170	35	60	115	10	10	5	3	1 360
541174	170	50	60	115	10	10	5	3	1 680
541185	185	40	95	140	10	10	5	3	1 510
541249	250	50	70	160	10	10	5	3	2 600
541250	250	59	70	160	10	10	5	3	4 400

See current price list for availability of items.

OPERATING CHARACTERISTICS

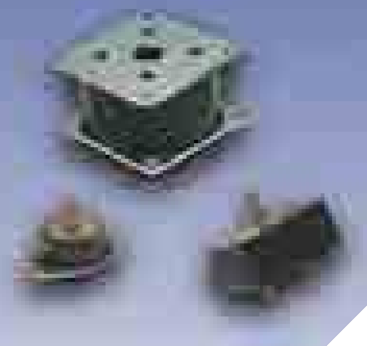
Static compression		Dynamic compression			Reference
Nominal load (daN)	Deflect. (mm)	Load (daN)	Deflect. (mm) (1)	Ø A max.	
50 - 200	0,8	600	3,5	57	**541050**
90 - 360	3	1 100	7	90	**541083**
125 - 500	3	1 500	7	100	**541082**
175 - 700	3	2 100	7	115	**541100**
210 - 850	3	2 500	7	130	**541112**
325 - 1 300	3,5	4 000	9,5	150	**541145**
375 - 1 500	3	4 500	7	158	**541144**

Static compression		Dynamic compression			Reference
Nominal load (daN)	Deflect. (mm)	Load (daN)	Deflect. (mm) (1)	Ø A max.	
475 - 1 900	1,1	5 700	2,5	158	**541146**
500 - 2 000	3	6 000	9,5	190	**541175**
500 - 2 000	5,3	6 000	14	190	**541174**
500 - 2 000	4,5	6 000	12	205	**541185**
1 125 - 4 500	4,5	13 500	12	282	**541249**
1 125 - 4 500	5,5	13 500	13	282	**541250**

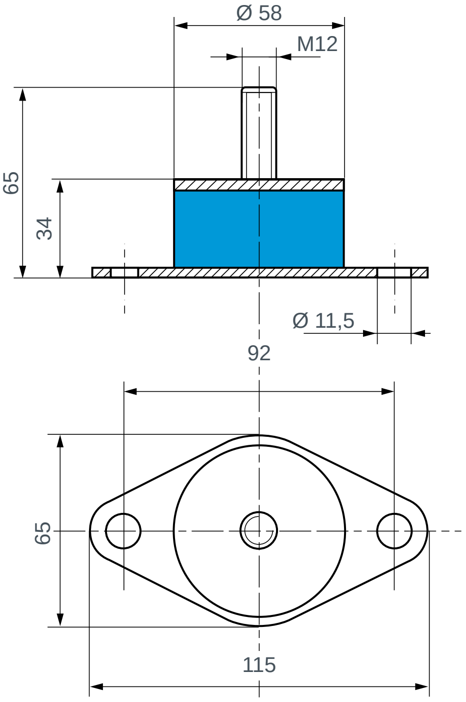
(1) The instantaneous deflection indicated in this table is approximate as it depends on the impact speed.
It is possible to use a metallic cushion for this application.

ASSEMBLY

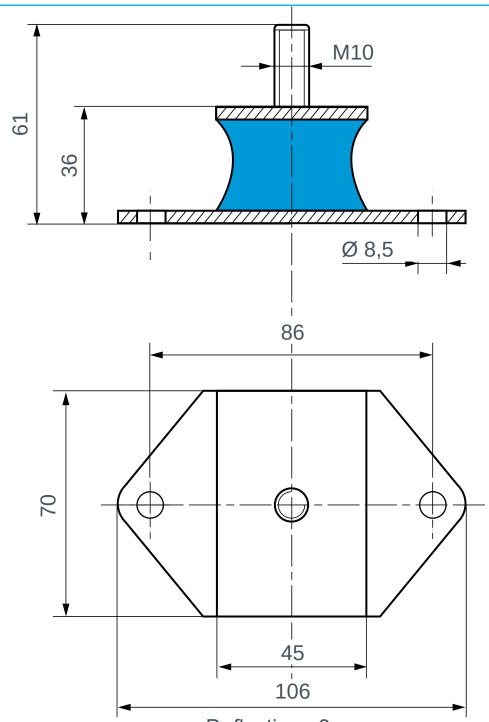
The rings are centred using the grooves and ridges. To avoid play under no-load conditions, the stack should be pre-compressed by 3 to 10% of its height. It is also necessary to leave sufficient room around the stack for the sideways expansion under load.



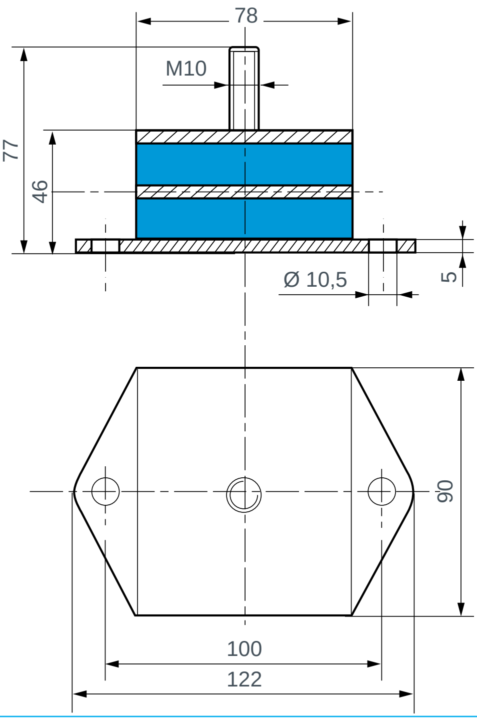
OTHER
MOUNTING SYSTEMS



Deflection : 5 mm
Maximum load : 250 daN
Reference **539243-55**



Deflection : 3 mm
Maximum load : 150 daN
Reference **534135**



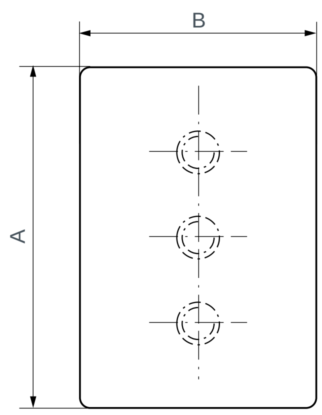
Compression :

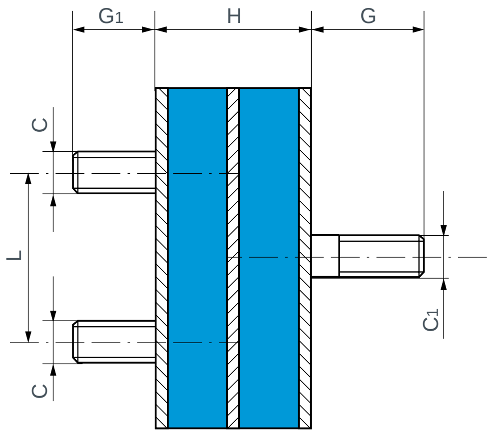
Deflection : 4.5 mm
Maximum load : 800 daN

Shear :

Deflection : 6.5 mm
Maximum load : 80 daN

Reference **534079**





DIMENSIONS

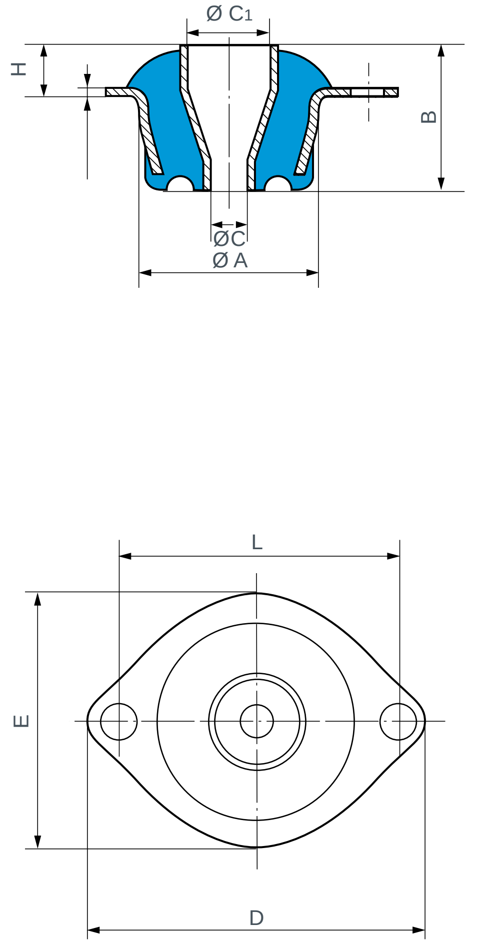
Reference	A (mm)	B (mm)	H (mm)	C	C1	G (mm)	G1 (mm)	L (mm)	Number intermed plates
538076	100	70	46	M10	M12	34	23	50	-
539214	100	70	46	M10	M12	31	23	50	2
539377*	100	70	46	M10	M12	33	23	50	1

* This reference has 4 screws.

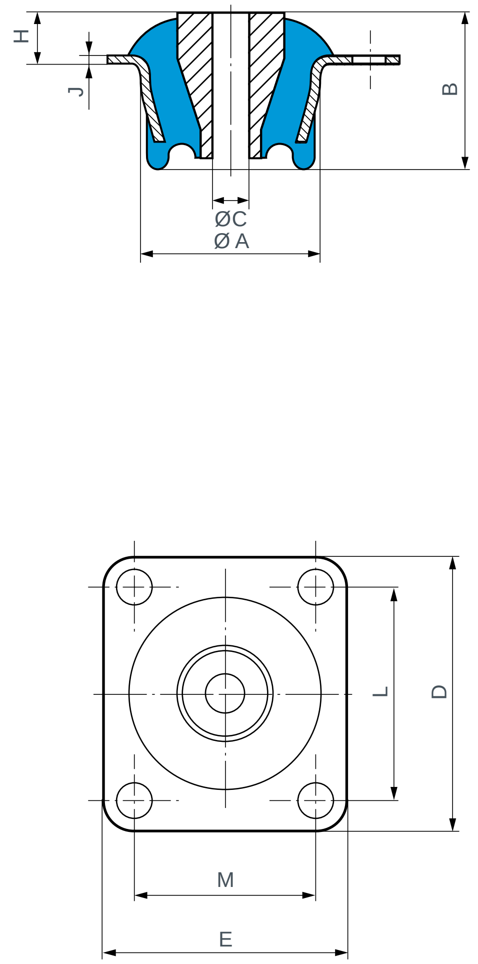
OPERATING CHARACTERISTICS

Reference	Hardness	Static load (daN)	Deflection (mm)
538076	45	300	5
539214	40	300	1
539377*	60	300	0,7

* This reference has 4 screws.



Reference 539004



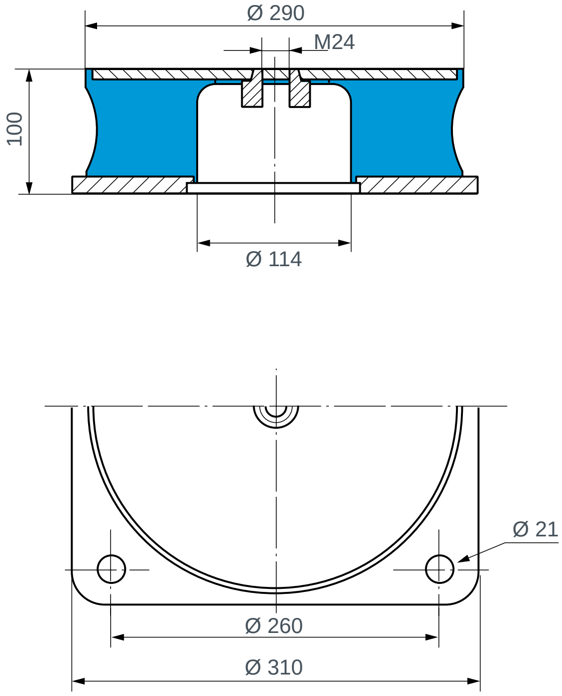
Reference 539743

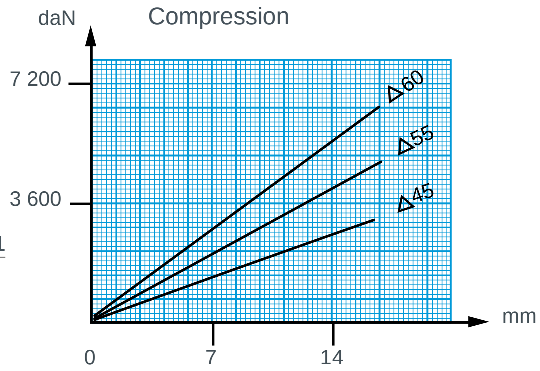
DIMENSIONS

Reference	Ø A (mm)	B (mm)	Ø C (mm)	Ø C_1 (mm)	D (mm)	E (mm)	H (mm)	J (mm)	L (mm)	M (mm)
539004	54	52	15,8	25,4	102	76	13,5	3	82,5	-
539743	74,6	71	16,25	-	105	92	33,5	3	82,5	69,5

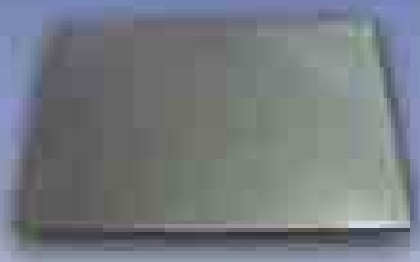
OPERATING CHARACTERISTICS

Reference	Hardness	Axial stiffness	
		Load (daN)	Deflection (mm)
539004	50	150	2
	60	230	2
539743	45	200	4,5





Reference 539972
Also exists with anti-rebound stop - reference 539971



STRUCTURAL DAMPING SYSTEMS

DESCRIPTION

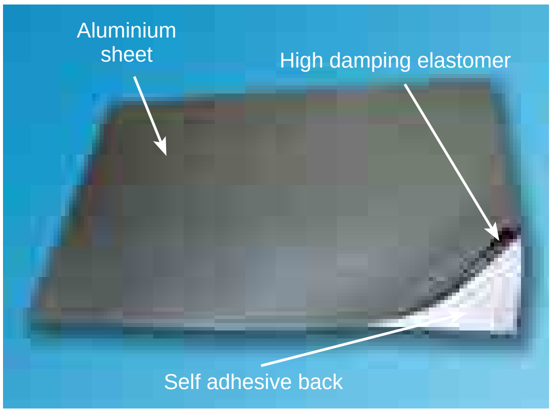
This damper is made of an high damping material bonded on an aluminium plate. A self adhesive layer on the elastomer to ease the installation. This product will reduce vibrations and noise. The damping is due to the shearing of the high damping layer.

APPLICATIONS

This damper is designed to face structure borne noise (engine compartments, cabs, bodyshells,….).
Its limited thickness ease it’s installation in confined areas.

CHARACTERISTICS

- Part numbers : **820248 (300 x 200 mm).**
- Total thickness : 1.5 mm.
- Weight : 0.7 kg (820248) by sheet.
- Temperature range : - 30°C to + 80°C with maximal damping at ambient.



INSTALLATION

The surfaces must be clean and dry. An acetone type solvant or equivalent can be used for cleaning. Cut the sheet to the appropriate size. Remove the adhesive protection and lay the sheet on the surface avoiding any air bubble.
In case of an installation on a curved surface, or with an edge, we recommend you to give the right shape to the sheet with the adhesive protection in place.
The constrained layer damping system will be fully operationnal 72 hours after installation.

ACOUSTIC AND THERMIC SILICONE FOAM PAULSTRANE®

DESCRIPTION

PAULSTRANE® is a mass heavy silicone foam which can be used in all sectors : industry, railway, marine and offshore for phonic protection, thermal and fire in a wide range of temperatures of use.

This solution both well resisting to natural ageing and common main chemical agents. It can be integrated into the side dish of walls, partitions, ceilings, floors and seat (in boats, trains, planes, cars, bus, industrial vehicles / trucks, but also theaters and every noisy places).

BENEFITS

- Soundproofing.
- Fire protection FAR 25 853 (a) 1) ii) ; FAR 25 856 (a).
- Density and opacity of very low smokes.
- Good resistance in natural ageing (UV, ozone).
- Good resistance in the environment (corrosion, molds, usual chemical agents).
- Range of use : of - 60 in + 200 °C.
- Exist in self-adhesive version (PAULSTRANE SA).

DIMENSION

Type	Reference	Dimensions (mm)	Thickness (mm)	Weight/Surface (kg/m2)
PAULSTRANE / 1,2	820340 00 10	1400 x 975	2,5	1,2
PAULSTRANE SA / 1,3	820349 00 10			1,3
PAULSTRANE / 1,6	820316 00 10		3,2	1,6
PAULSTRANE SA / 1,7	820295 00 10			1,7
PAULSTRANE / 2,7	820319 00 10		5,5	2,7
PAULSTRANE SA / 2,8	820318 00 10			2,8
PAULSTRANE / 3,5	820353 00 10	1400 x 600	7	3,5
PAULSTRANE SA / 3,6	820369 00 10			3,6
PAULSTRANE / 5	820341 00 10		10	5
PAULSTRANE SA / 5,1	820350 00 10			5,1

TECHNICAL CHARACTERISTICS (according to testing method A.S.T.M.)

PROPERTIES

- Density
  500 kg/m3

- Weight
  from 1,25 to 5 kg/m2

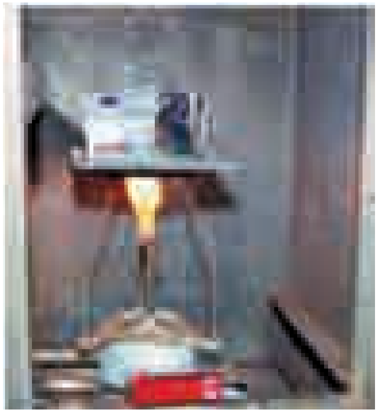
- Temperatures of use
  of -60 °C in +200 °C

- Thermal conductivity
  at 50°C : < 0,15 W/m.K
  at 100°C : < 0,15 W/m.K
  at 200°C : < 0,15 W/m.K

- Fire resistance
  Vertical burn : FAR 25 853(a)(1)(ii)
  Radiant Panel : FAR 25 856(a) appendix F leave VI

- Environment resistance
  to oil and solvents : excellente
  to the corrosion : excellente
  to the mold : excellente

- Storage conditions
  max 30°C, 50% RH (for PAULSTRANE SA)



Test at 890 °C

STRASONIC ®
ACOUSTIC FOAM

DESCRIPTION

STRASONIC® is a range of complex materials designed to provide the best acoustic isolation. Their structure is based on polyurethane foams or cellular rubber.

Their main function is to reduce airborne noise (Isolation, Absorption and Damping) in partial or complete enclosures of machinery.

APPLICATIONS

The STRASONIC® material can be used in a range of applications such as : air conditioning, pumps, presses, compressors, electric motors, diesel engines, generator sets, gearboxes, turbines, agricultural or construction equipment and other machinery.

Due to their design, they are light, easy to handle and a self adhesive side simplifies the installation (depending on the type of foam).

POLYURETHANE FOAM

CORRUGATED, WITH SELF ADHESIVE LAYER

DESCRIPTION

50 mm of corrugated PU Ether absorption foam. **Self adhesive layer on one side**.
Temperature range : from - 25°C to + 110°C.
Fire resistance : M4.

APPLICATIONS

- Air conditioning
- Fans
- Ventilation shaft
- Pumps
- Presses
- Air compressors

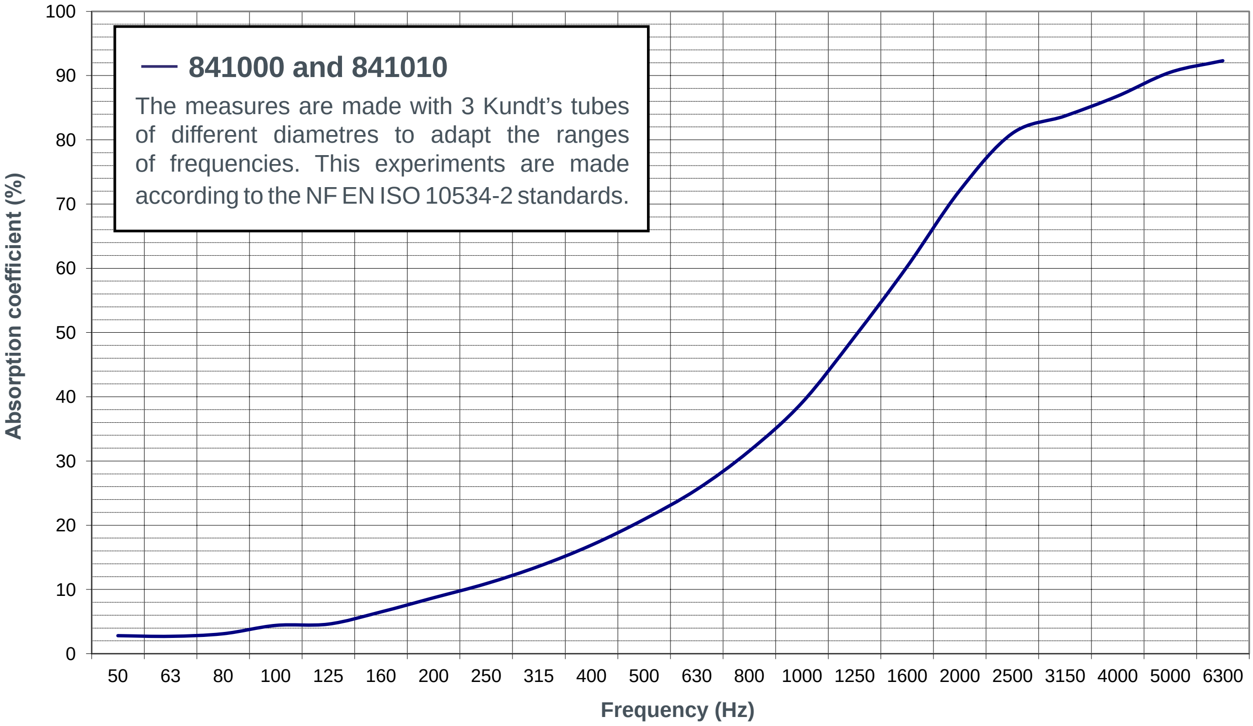
DIMENSIONS

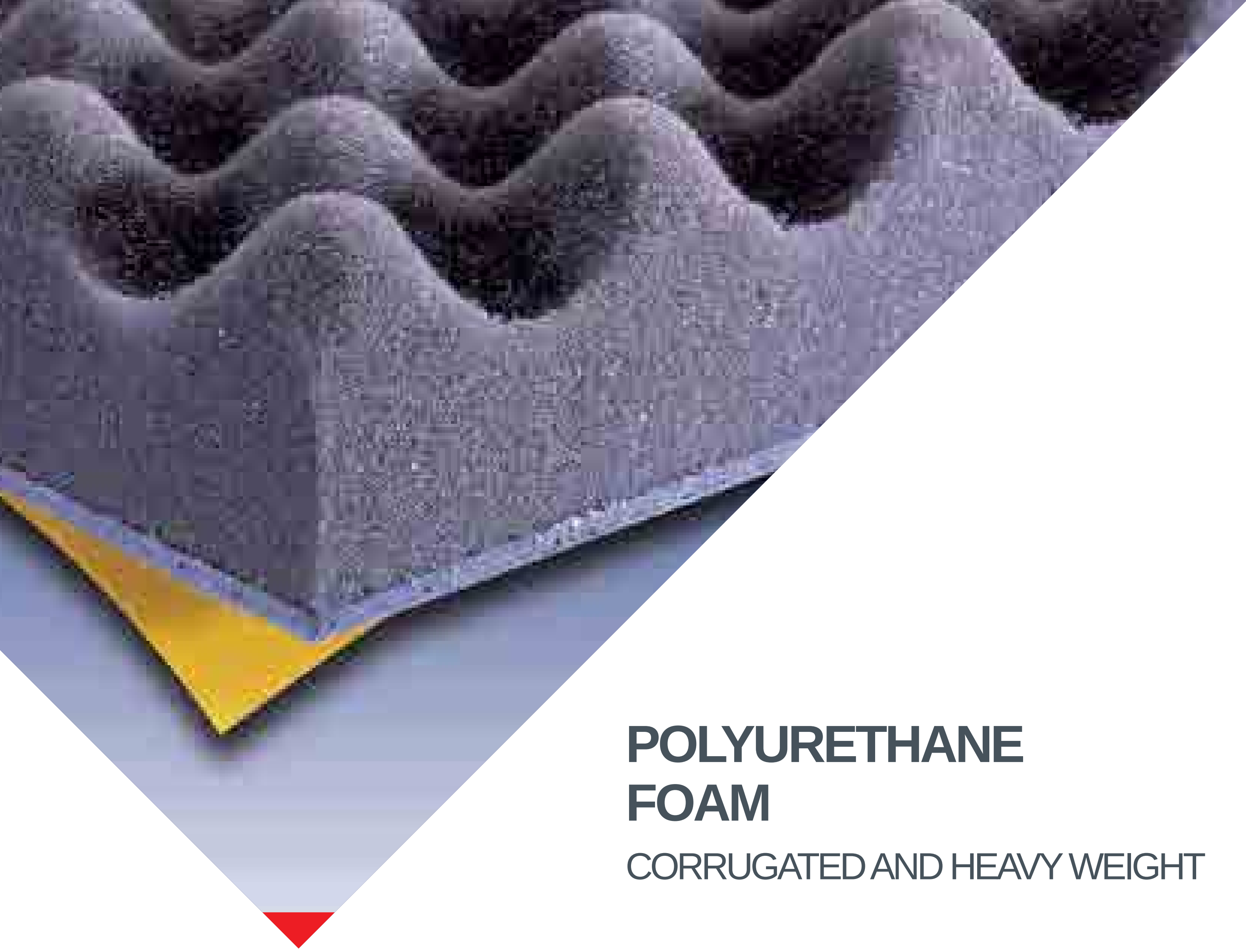
Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841000	700	500	50	0,43
841010	2000	1400	50	3,44

Tolerance : ± 6 mm

ACOUSTIC PERFORMANCES

Average absorption factor K 65%.
Approximate gain on a 2 mm steel sheet : - 10 dB (A).
The corrugations increase the absor ption surface by 40%.





POLYURETHANE FOAM

CORRUGATED AND HEAVY WEIGHT

DESCRIPTION

50 mm of heavy weight 5 kg/m2, corrugated PU Ether absorption foam bonded to **3 mm** of spring foam.
Temperature range : from - 25°C to + 110°C.
Fire resistance : M4.

APPLICATIONS

- Air compressors
- Gearboxes
- Presses
- Compressors
- Electric motors

DIMENSIONS

Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841001	700	500	50	2,13
841001-50*	700	500	50	2,05

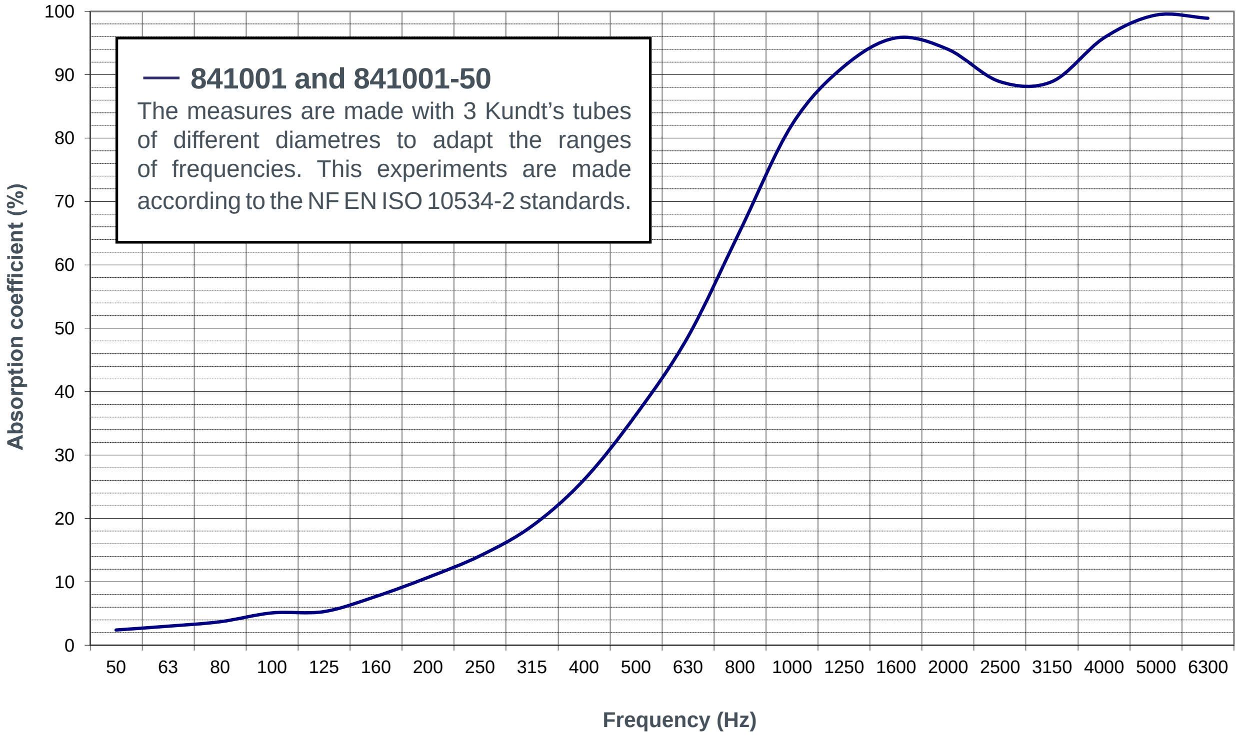
*Self adhesive layer on one side.

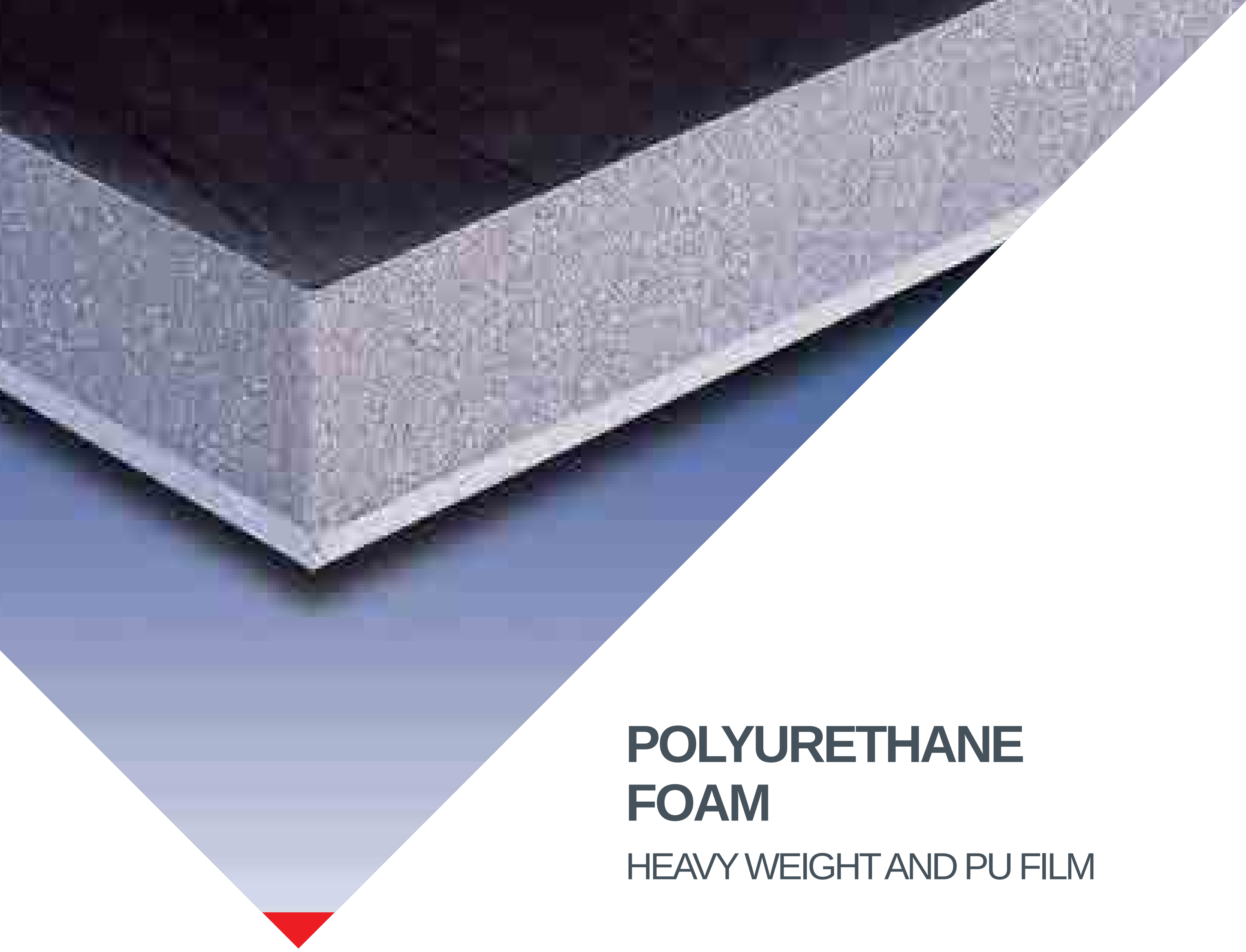
Tolerance : ± 6 mm

Note : In order to glue foam **841001**, we advise you to use a neoprene based adhesive.

ACOUSTIC PERFORMANCES

Average absorption factor K 68%.
Approximate gain on a 2 mm steel sheet : - 25 dB (A).
Very good performance from 500 Hz to 5000 Hz.





POLYURETHANE FOAM

HEAVY WEIGHT AND PU FILM

DESCRIPTION

100% waterproof black PU film bonded to 25 mm of heavy weight 5 kg/m2 corrugated PU Ether absorption foam bonded to **3 mm** of spring foam.
Temperature range : from - 25°C to + 110°C.
Fire resistance : M4.

APPLICATIONS

- Generator sets
- Agricultural and Construction, equipment machines
- Electric and Diesel engines
- Compressors, Pumps
- Turbines
- Test benches

DIMENSIONS

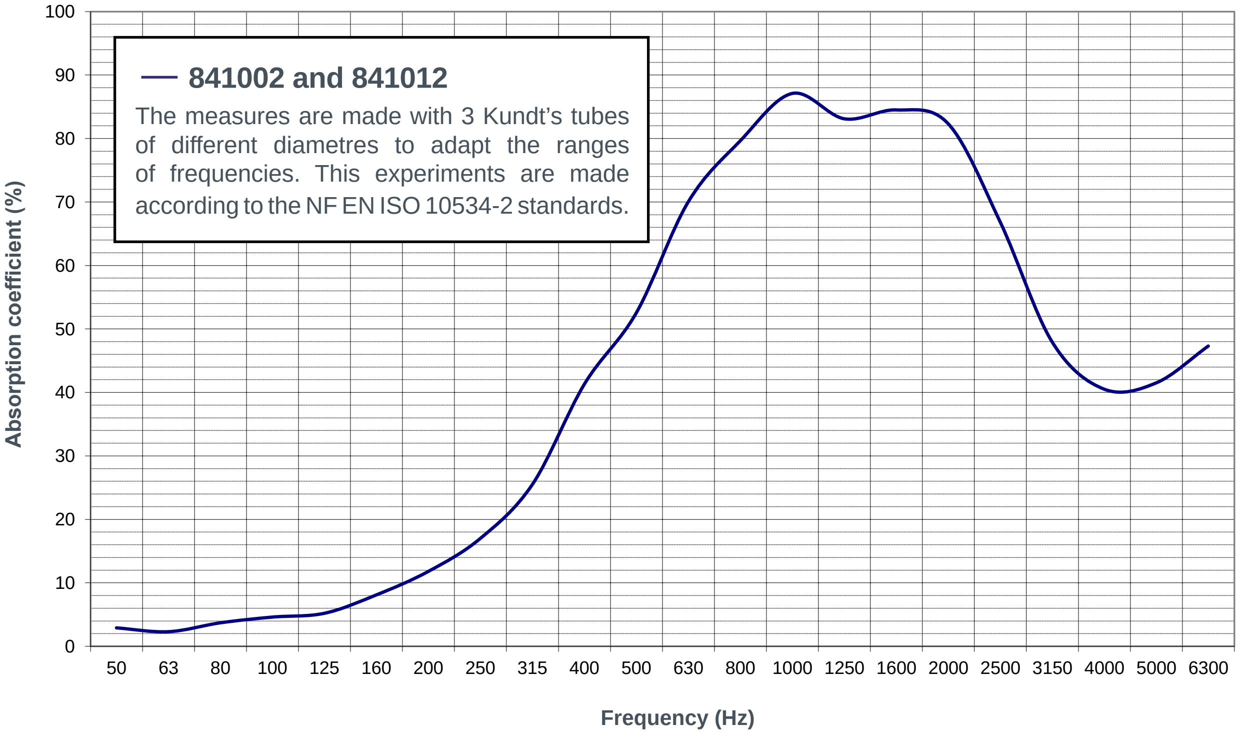
Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841002	700	500	25	1,99
841012	2000	1400	25	3,4

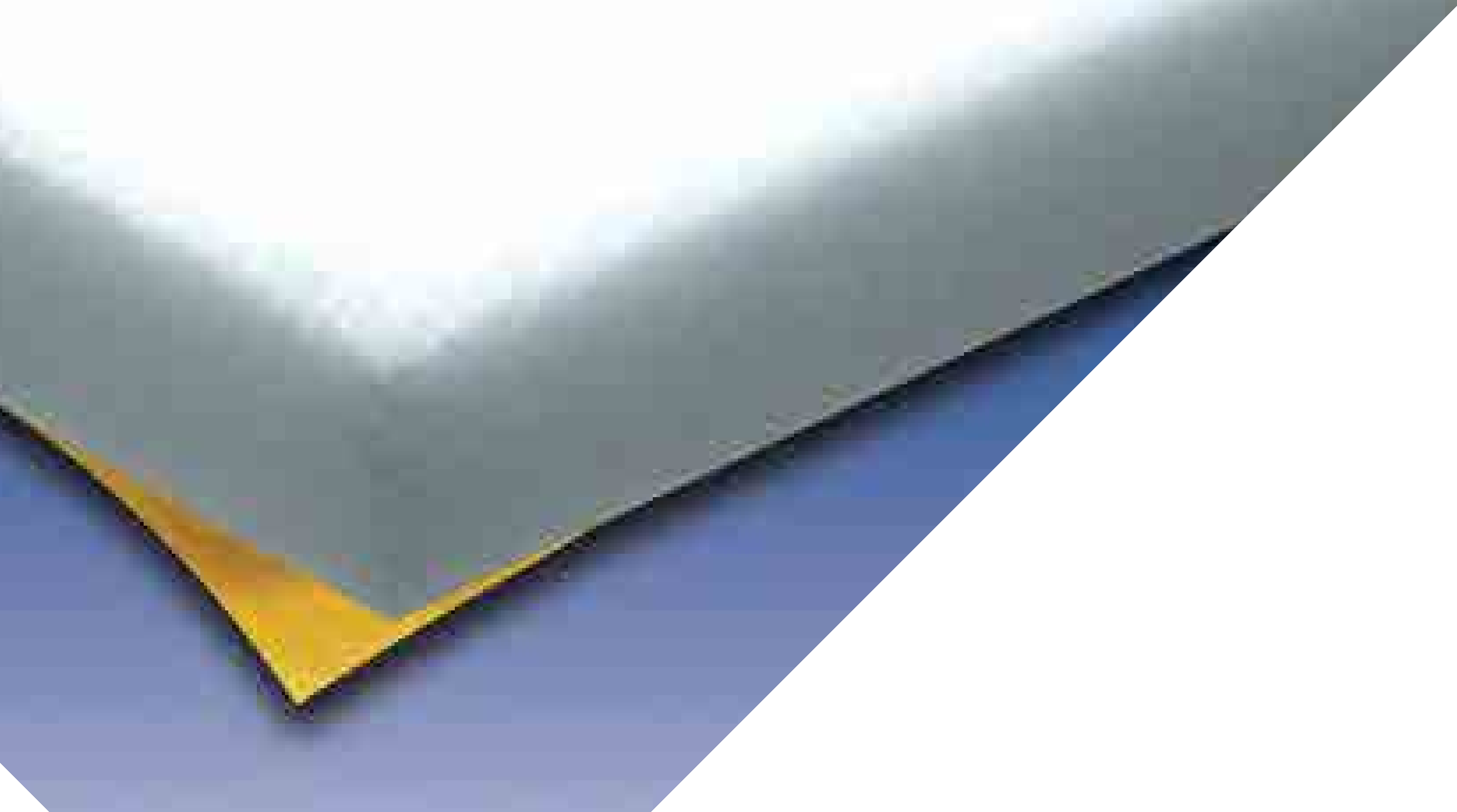
Tolerance : ± 6 mm

Nota : In order to glue foam **841002** and **841012**, we advise you to use a neoprene based adhesive.

ACOUSTIC PERFORMANCES

Approximate gain on a 2 mm steel sheet : - 20 dB (A).
Very good performance from 125 Hz to 4000 Hz.





FOAM

MEETING WITH FIRE STANDARD M1

DESCRIPTION

Melamine Resin based soundproofiing foam, thickness 30 mm, self adhesive layer on one side.
Temperature range : up to +150°C.
Fire resistance : M1/UL94 - B1/DIN 4102.
Classiefied 0/BS476 6/7.

APPLICATIONS

- Acoustic and thermal isolation,

Building applications :
- Air conditioning;
- Fans;
- Ventilation shaft;
- Recording studios.

Industrial applications :
- Air compressors, Air exhausts;
- Vacuum pump;
- Injection presses;
- Gearboxes.

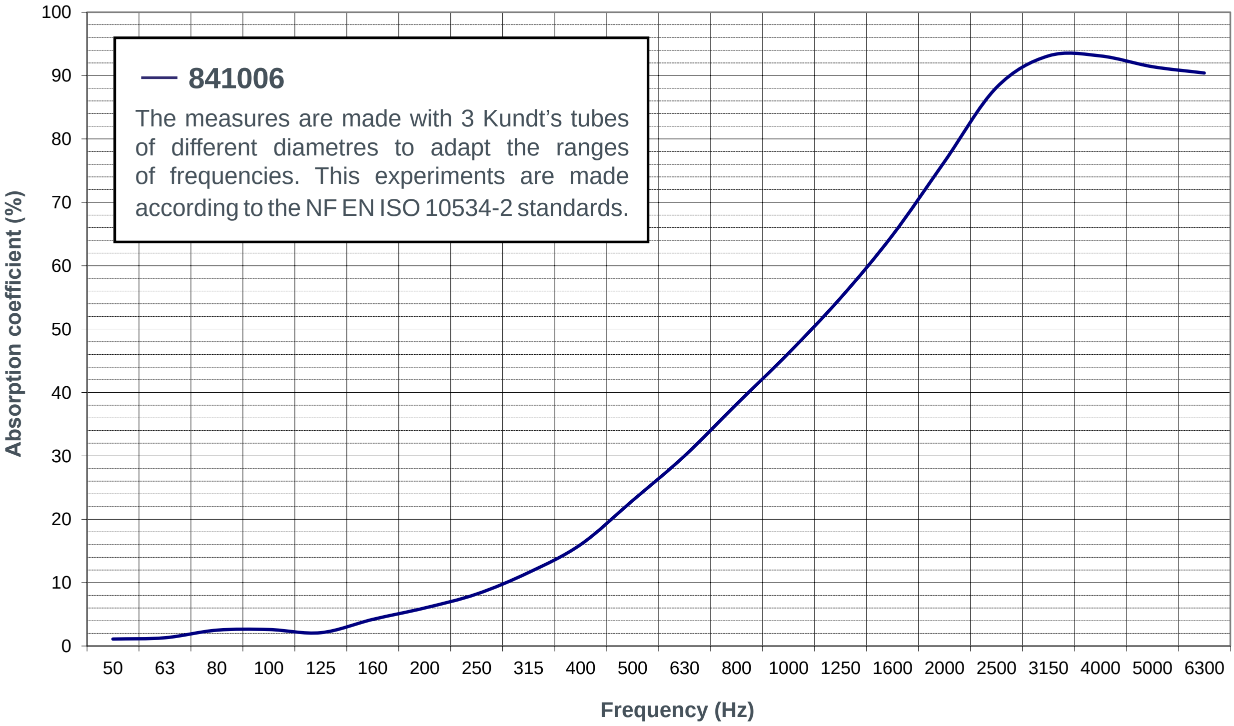
DIMENSIONS

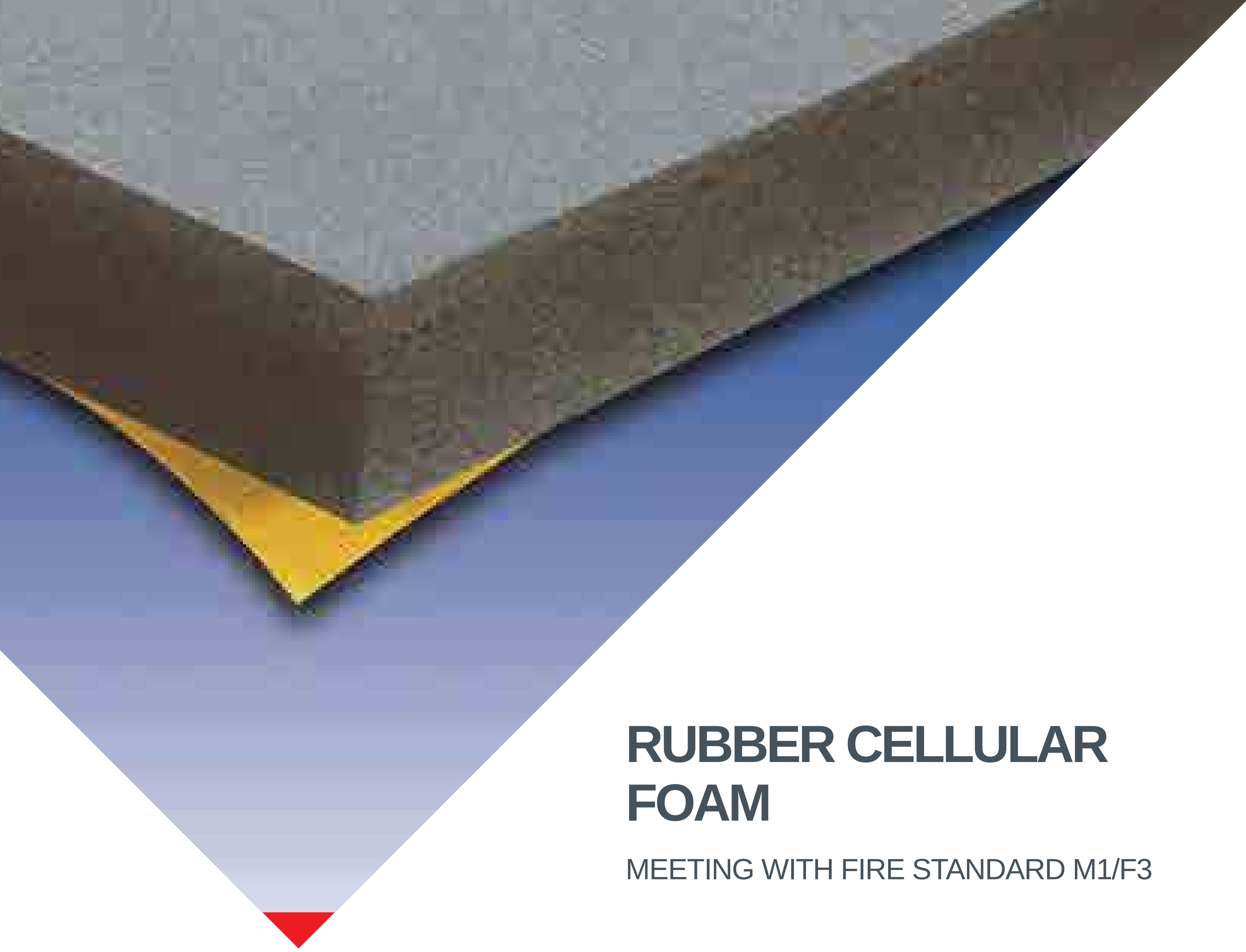
Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841006	500	500	30	0,14

Tolerance : + 5 to -20 mm

ACOUSTIC PERFORMANCES

Average absorption factor K : 85% at 2000 Hz.
Very good acoustic performance in high frequencies above 1250 Hz.





RUBBER CELLULAR FOAM

MEETING WITH FIRE STANDARD M1/F3

DESCRIPTION

NBR-PVC **based waterproof cellular rubber thickness 30 mm (± 3 mm) self adhesive layer on one side.**
Temperature range : **-** 40 °Cup to + 90 °C continuous.
Very good resistance to oil. Good fire properties with very few smock released.
Self extinguishible
Rated : **M1/F3** (NFP 92507).

APPLICATIONS

- Acoustic and thermal isolation,

Building applications :
- Air conditioning,
- Fans,
- Ventilation shaft,
- Recording studios, ...

Industrial applications :
- Air compressors, Air exhausts,
- Vacuum pump,
- Injection presses,
- Gearboxes,...

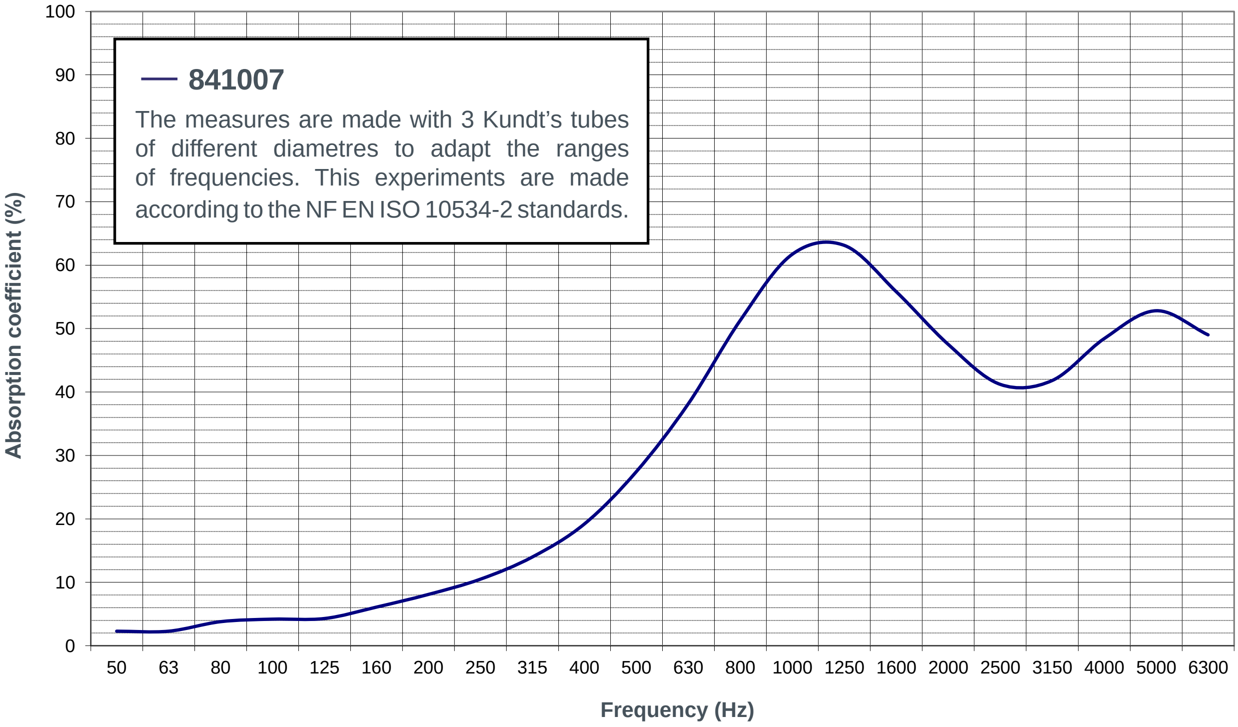
DIMENSIONS

Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841007	500	500	30	0,46

Tolerance : + 5 to -20 mm

ACOUSTIC PERFOMANCES

Average absorption factor K : ≥ 20 % from 600 Hz (increase with frequency).
Very good acoustic performance in high frequencies above 2000 Hz.
Approx. gain on a 2 mm steel sheet : - 10 dB (A) at 2500 Hz / - 20 dB (A) at 5000 Hz.



CELLULAR RUBBER

NBR BASED

DESCRIPTION

NBR based waterproof cellular rubber, thickness **33 mm**. **Self adhesive layer on one side.**
Temperature range static from - 40°C to +105°C continuous.
Very good resistance to oil, ozone, air and UV.
Fire resistance : M4/FMVSS 302.

APPLICATIONS

- Sand blasting systems, Saws
- High speed drills
- Vacuum pumps
- Injection presses
- Gearboxes

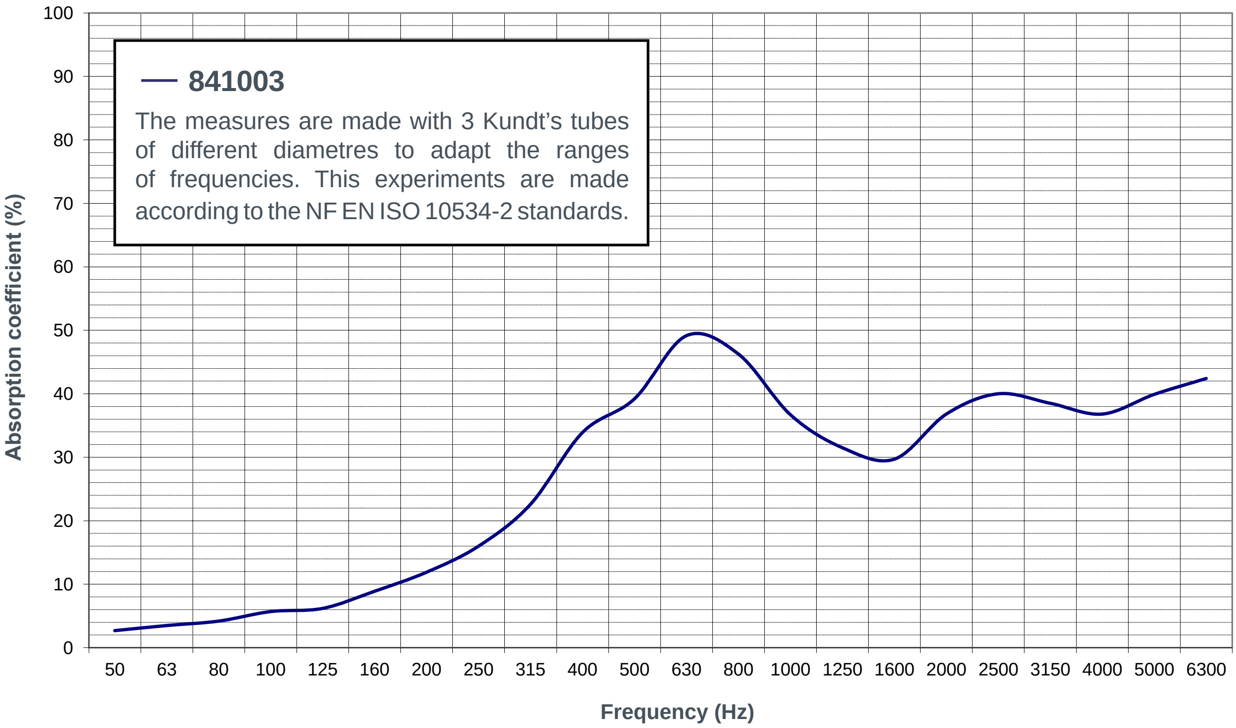
DIMENSIONS

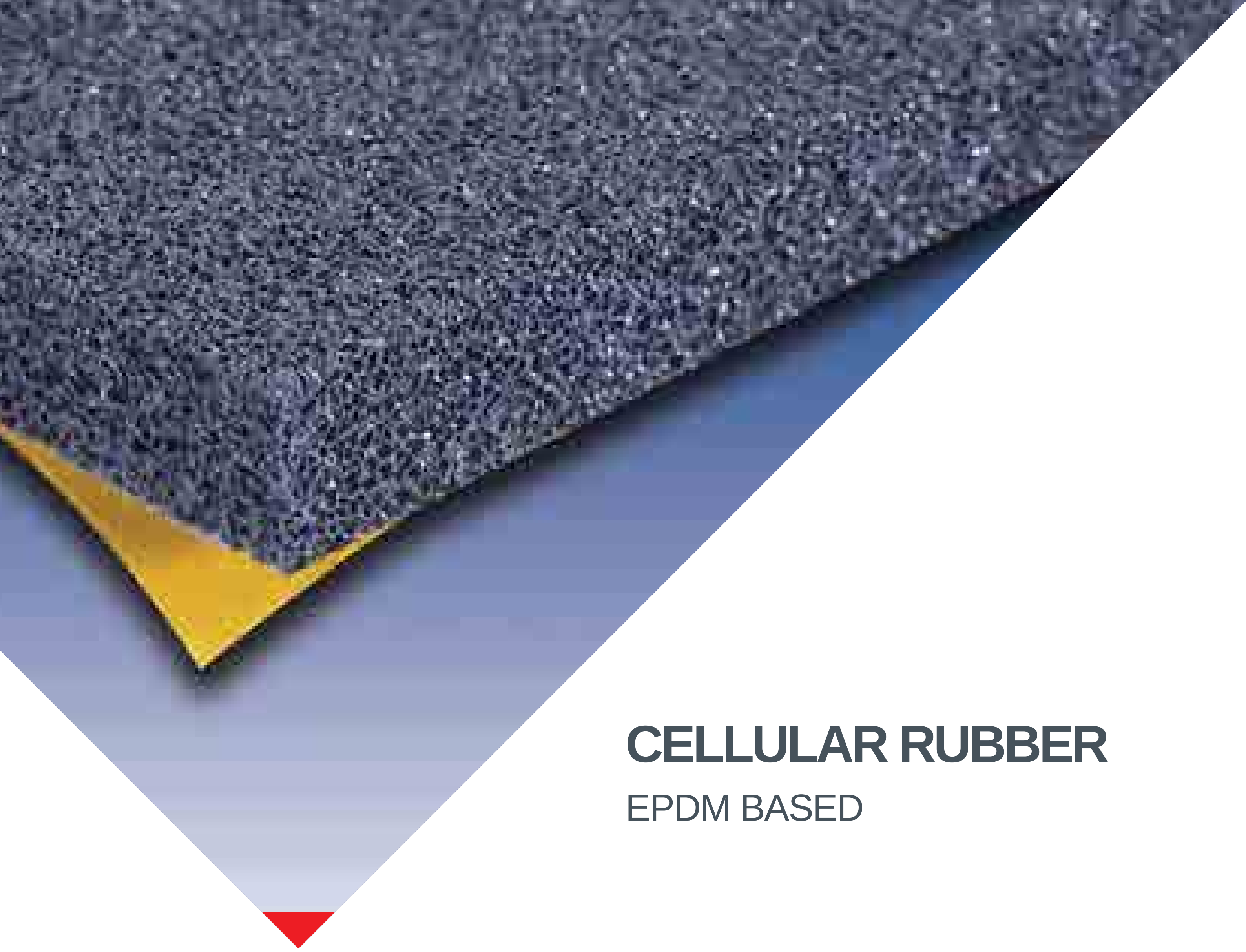
Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841003	500	500	33	0,53

Tolerance : + 0 to -30 mm

ACOUSTIC PERFORMANCES

Average absorption factor K ≥ 30% from 500 Hz.
Very good acoustic performance in high frequencies above 2500 Hz.
Approximate gain on a 2 mm steel sheet :
- 10 dB (A) at 2500 Hz;
- 20 dB (A) at 5000 Hz.





CELLULAR RUBBER

EPDM BASED

DESCRIPTION

EPDM based cellular rubber with half closed cells.
Thickness **15 mm.**
Self adhesive layer on one side.
Temperature range continuous from - 40°C to + 130°C.
Very good resistance to air, ozone and UV.
Very flexible. Good ageing resistance.
Waterproof if slightly compressed.
Fire resistance : FMVSS 302.

APPLICATIONS

- Air jet positioning
- Sound blasting systems, Saws
- High speed drills
- Vacuum pumps
- Injection presses
- Gearboxes

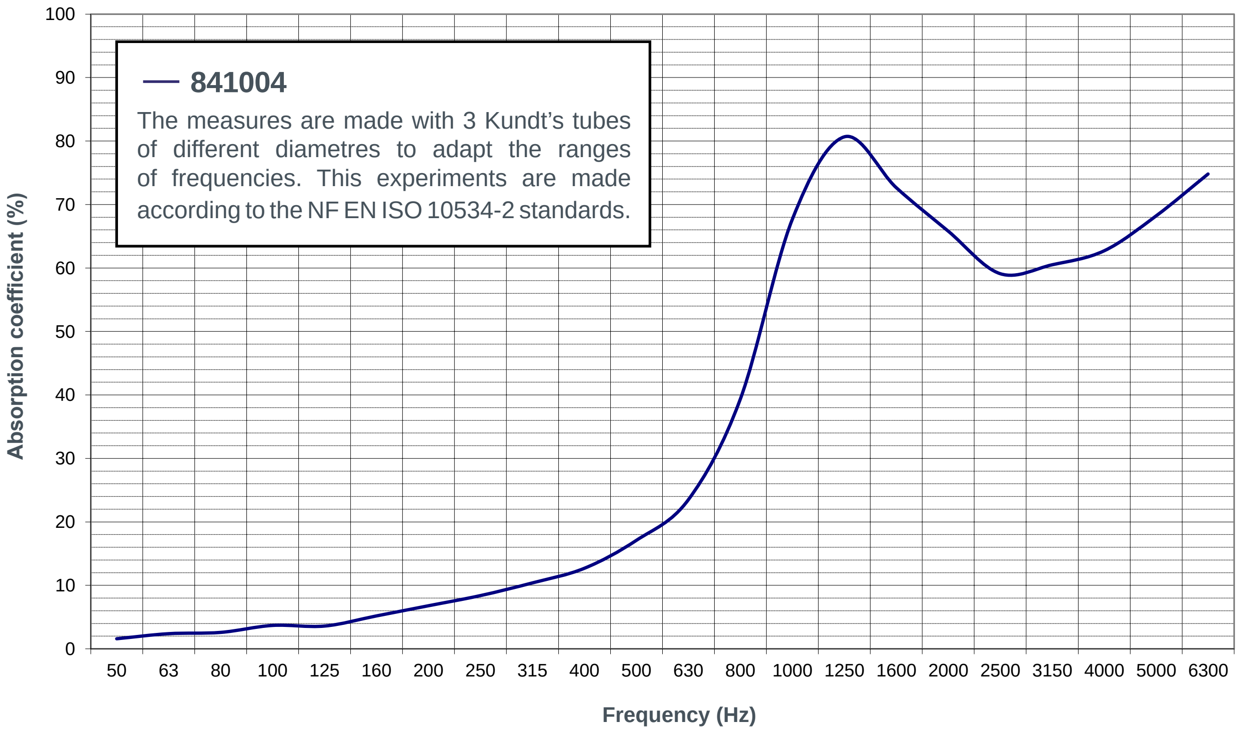
DIMENSIONS

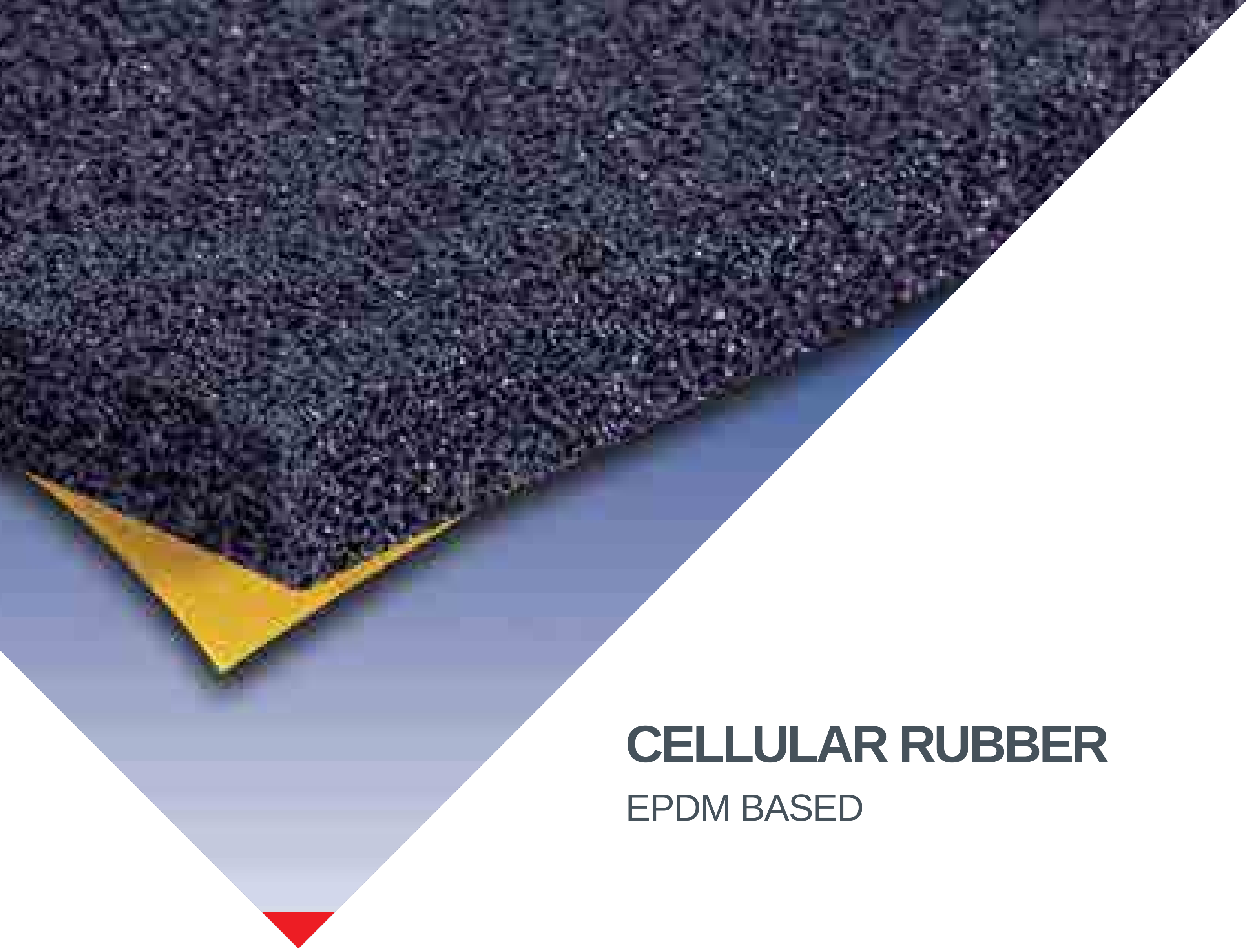
Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841004	500	500	15	0,51

Tolerance : + 0 to -30 mm

ACOUSTIC PERFORMANCES

Average absorption factor K ≥ 30% from 600 Hz.
Very good acoustic performance in high frequencies above 2000 Hz.
Approximate gain on a 2 mm steel sheet:
- 8 dB (A) at 2500 Hz;
- 20 dB (A) at 5000 Hz.





CELLULAR RUBBER

EPDM BASED

DESCRIPTION

EPDM based cellular rubber half closed cells.
Thickness **22.5 mm. Self adhesive layer on one side.**
Temperature range continuous from - 40°C to + 130°C.
Very good resistance to air, ozone and UV.
Very flexible. Good ageing resis-tance.
Waterproof if slightly compressed.
Fire resistance : FMVSS 302.

APPLICATIONS

- Air jet positioning
- Sound blasting systems, Saws
- High speed drills
- Vacuum pumps
- Injection presses
- Gearboxes

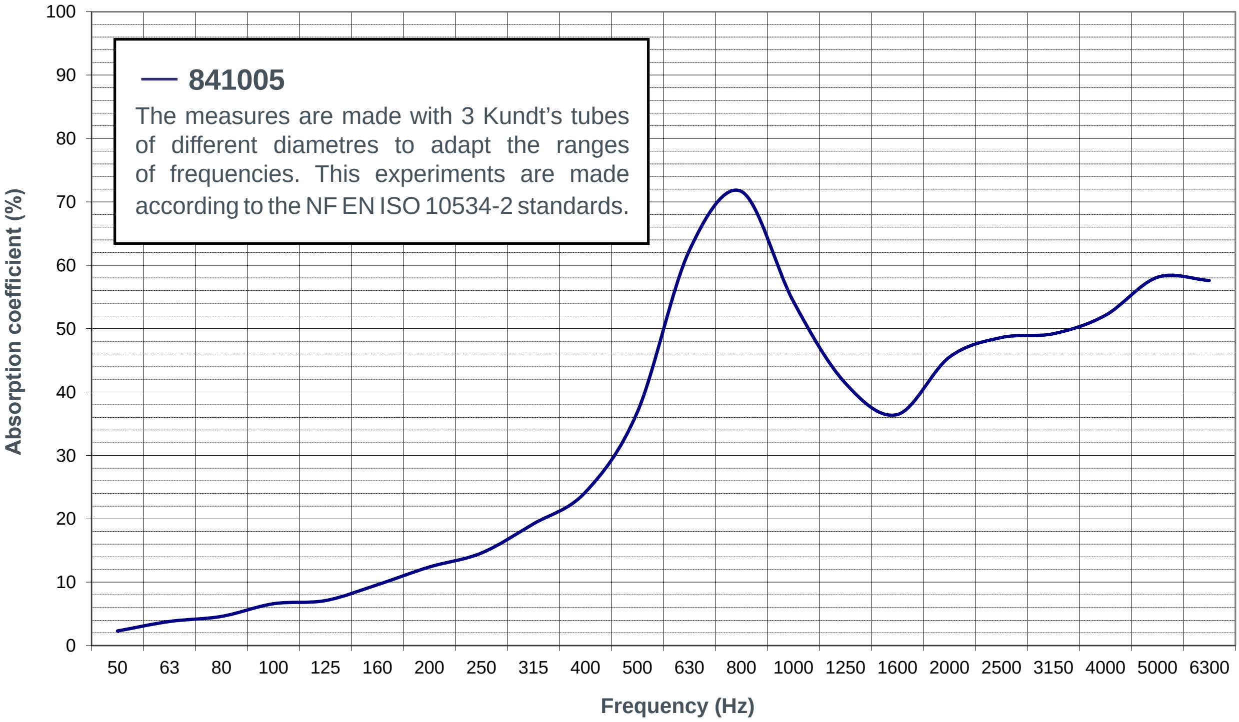
DIMENSIONS

Reference	Lenght (mm)	Width (mm)	Thickness (mm)	Weight (kg)
841005	500	500	22,5	0,94

Tolerance : + 0 to -30 mm

ACOUSTIC PERFORMANCES

Average absorption factor K ≥ 30% from 500 Hz.
Very good acoustic performance in high frequencies above 2000 Hz.
Approximate gain on a 2 mm steel sheet :
- 10 dB (A) at 2500 Hz;
- 27 dB (A) at 5000 Hz.



NAVY SHOCK MOUNTING SYSTEMS

HUTCHINSON®
PAULSTRA

NAVY SHOCK MOUNTING SYSTEMS

INTRODUCTION

A shock mounting system must fulfil the following functions :
- supporting the suspended mass when there is no shock while providing isolation from vibration and structure bourne noise;
- in case of shock: limit the force and/or movement to acceptable values;
- after shock : return the suspended mass to its initial position.

Schematically, there are two types of shock :
- an energy shock resulting from a falling mass for which the parameters taken into consideration are the incident kinetic energy and that restituted, the impact speed and the maximum forces and deflections.
- a shock resulting from a movement of the suspended mass. The parameters taken into consideration are the speed or acceleration of the assembly in time and also the forces relating to the maximum deflection.

STANDARDS APPLICABLE TO THE MARINE MOUNTS

Reference*	Applications
BR 3021	Shock for onboard equipment
BR 8470	
BV 043	Shock for surface ships and submarines
DIN 95365	Marine mounts geometry and characteristics
GAM-EG-13C	Vibration and shock onboard ship
MIL-S-901D	Shock for onboard equipment
MIL-STD-167	Marine equipment vibrations
STANAG 4142	Shock resistance analysis of equipment for surface ships
STANAG 4549	Testing of surface ship equipment on shock testing machines
STI-MM-305	Vibration and shock testing for onboard equipment

* For compliance with these standards according to the applications, ask our Technical Department.

ADVANTAGES

- The mountings described below are intrinsically stable under shock, that is to say, they enable the mass to return to its initial position; the system retains no plastic deformation nor residual buckling when the shock stresses are removed.
- The suspended mass may therefore undergo successive shocks with impunity. Nevertheless, the stability of the assembly in relation to the relative positions of the mountings and the centre of gravity of the suspended mass should be checked.
- PAULSTRA shock mounting systems are also exceptionally effective against vibration.

VIB LD 03
DECOUPLING WASHERS

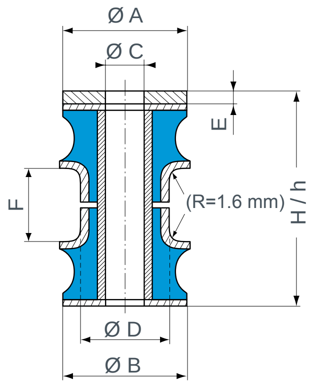
DESCRIPTION

Elastomer rings for linking and positioning of equipment while maintaining acoustic discretion and protection from shocks.
A decoupling washer is composed of :

- 2 bonded elastomer washers;
- 1 stainless steel anti-shock washer;
- 1 stainless steel preload spacer.

CHARACTERISTICS

- Natural frequencies (vertical and axial) 15 to 20 Hz depending on load.
- Maximum deflection under shock:
  - axial : 8 mm;
  - radial : 5 mm.
- Mechanical strength corresponding to 30 times the nominal load.



Nominal load (daN)	Reference	Ø A (mm)	Ø B (mm)	Ø C (mm)	Ø D (mm)	E (mm)	F (mm)	H unloaded (mm)	h under load (mm)
14	E1RP-3804-51	Square 28x28	28	8,2	20	2,5	10	42,5	35,5 approx
18	E1RP-3804-52	Square 28x28	28	8,2	20	2,5	10	42,5	35,5 approx
27	E1RP-3805-51	Square 28x28	28	8,2	20	2,5	10	42,5	35,5 approx
40	E1RP-3806-51	42,5	42,5	14,2	29	5	15	50	44 approx
60	E1RP-3806-52	42,5	42,5	14,2	29	5	15	50	44 approx
85	E1RP-3806-53	42,5	42,5	14,2	29	5	15	50	44 approx
125	E1RP-3807-51	56	56	18,2	35	8	15	53	47 approx
140	E1RP-3807-52	56	56	18,2	35	8	15	53	47 approx
185	E1RP-3807-53	56	56	18,2	35	8	15	53	47 approx
260	E1RP-3808-51	78	80	24,5	50	12	25	67	60,5 approx
320	E1RP-3808-52	78	80	24,5	50	12	25	67	60,5 approx
380	E1RP-3808-53	78	80	24,5	50	12	25	67	60,5 approx
520	E1RP-3809-51	8	90	27,5	53	16	25	71	64,5 approx
1000	E1RP-3809-53	88	90	27,5	53	16	25	71	64,5 approx
2000	E4353F-51	220	220	60	125	35	48,9	120,9	112,9 approx
3500	E4353F-52	200	200	60	125	35	48,9	121,9	113,9 approx

LOW DEFLECTION MOUNTS

LOW LOADS

DESCRIPTION

The main role of these mounts is to isolate vibration. A snubber system limits the movement of the suspended mass (10 mm), however the loads developed in this case, are high.
A wide load range from 0,5 to 32 daN depending upon the application.
In case of shock protection, the structural resistance of the mount can accept acceleration of up to 150 g. These mounts are mainly suited for vibration, hence the loads generated in case of shock are very high.
Fixation on the inside or on the outside.

CHARACTERISTICS

- Natural frequencies (vertical and lateral) under a nominal load of 5 to 8 Hz.
- B = unloaded.
- B - 6 mm height under nominal load (deformation under load . 6 mm).
- Maximum deflection from loaded position ± 10 mm in all directions (vertical and lateral).
- Stop at 10 mm deflection, maximum acceptable loads = 150 x nominal static load.

Nominal static load (daN)	Reference	Ø A (mm)	B (mm)	C (mm)	Ø D (mm)	E (mm)	Ø F (mm)	G	H (mm)	I (mm)	J max. (mm)	K	L max. (mm)
0,5	552320 50 14	66	30	25,5	48	2,5	56	M6	12	8 10	15	3	20
1	552320 50 04	66	30	25,5	48	2,5	56	M6	12	8 10	15	3	20
2	552321 50 04	66	30	25,5	48	2,5	56	M6	12	8 10	15	3	20
4	539966 50 04	82	31,5	34,5	63	5	71	M8	13,5	6,5 11	20	3	20
8	539967 50 04	82	31,5	35,5	63	6	71	M8	13,5	6,5 11	20	3	20
16	539985 50 24	82	51	32	63	8	71	M12	33	10 15	20	4	40
24	539985 50 04	82	51	32	63	8	71	M12	33	10 15	20	4	40
32	539985 50 14	82	51	32	63	8	71	M12	33	10 15	20	4	40

VIBMAR

Natural frequency : (1)
5 to 12 Hz

DESCRIPTION

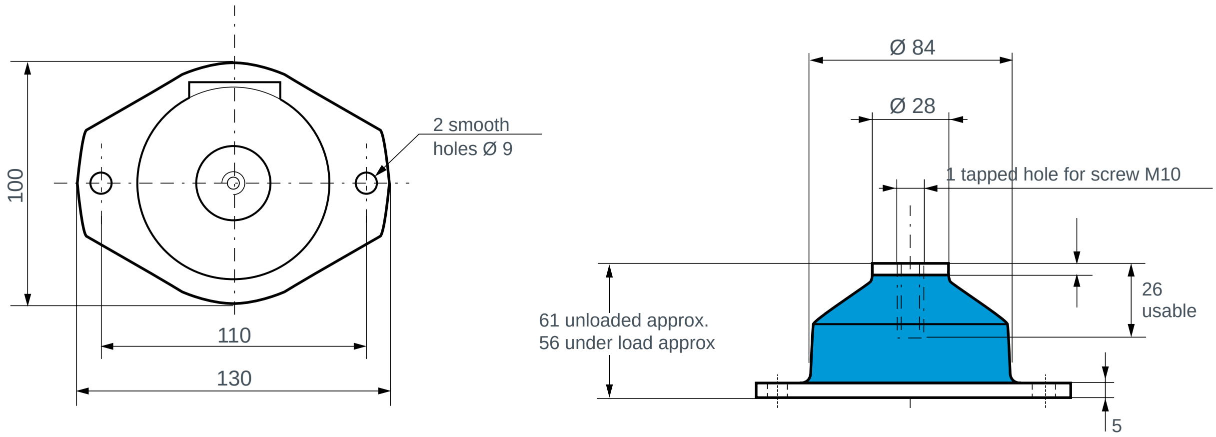
The VIBMAR series has a base plate with two or four mounting holes and a tapped steel core.
The elastomer is bonded to the steel.
E1N104 and E1N106 versions have a conical spring embedded in the rubber.
Environmental protection is provided by painting the metal parts and by coating the elastomer with an ozone resistant compound.

APPLICATIONS

These multi-axis low frequency dampers have been specially designed to protect electrical or electronic racks and marine or road transport generator sets (on board or not). They are cone-shaped to absorb considerable displacement and shocks.

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

DIMENSIONS



OPERATING CHARACTERISTICS

Natural frequency :
- axial : 8 to 12 Hz;
- radial : 6 to 10 Hz.

Maximum permitted excitation at the natural frequency of suspension : ± 1.25 mm.
Maximum axial travel available for shocks : 30 mm.
Amplification factor at resonance : < 6 and < 4 for silicone rubber versions.
Structural strength corresponding to a continuous accelaration of 3 g with maximum load.
When suspending an enclosure, the same type of damper should be used as a stabiliser.

Operating temperature : - 30°C to + 100°C;
- 54°C to + 150°C for silicone rubber versions.

Weight : 0.6 kg.

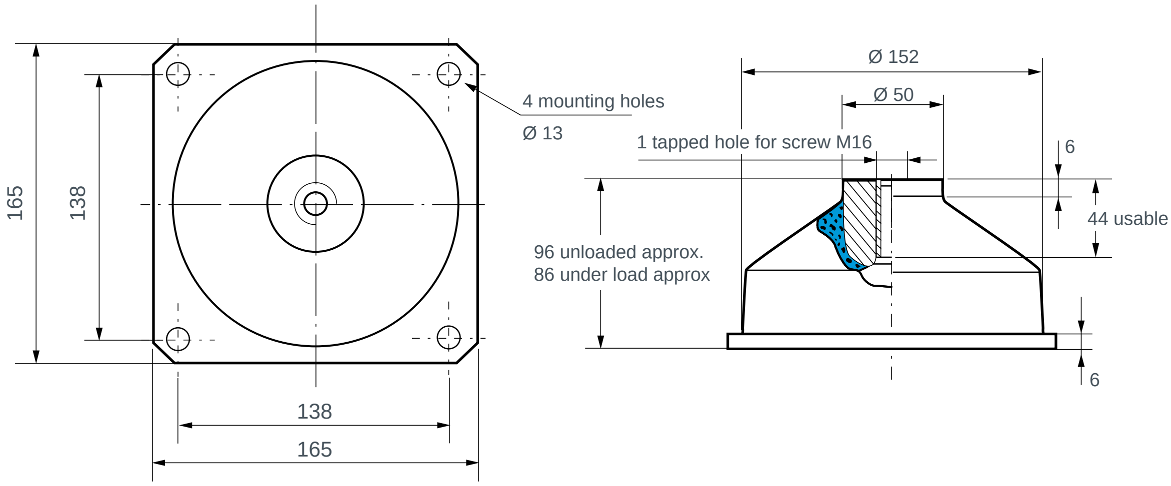
Reference	Static load (daN)
E1N2296-01	17-30
E1N2296-02	35-55
E1N2296-03	55-70

SILICONE RUBBER

Reference	Static load (daN)
E1N2296 S01	10-18
E1N2296 S02	17-25
E1N2296 S03	20-30

Note : Product available with stainless steel plates and/or alternative elastomers.
Please consult us

DIMENSIONS



OPERATING CHARACTERISTICS

Natural frequency :

- axial : 5 to 6 Hz;
- radial : 4 to 6 Hz.

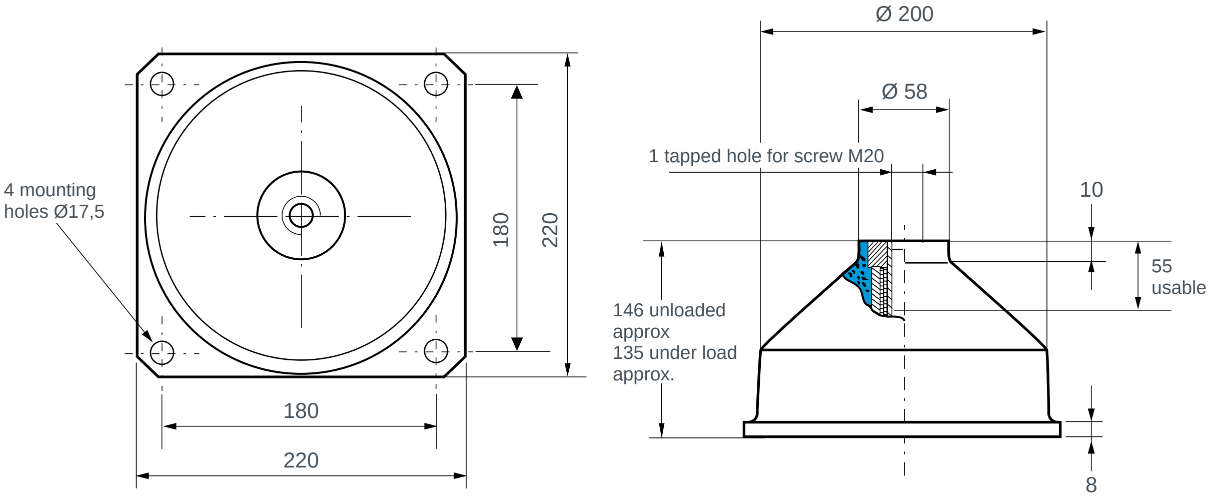
Maximum permitted excitation at natural frequency of suspension : ± 1.5 mm.
Maximum travel available under shocks : 30 mm in all directions

Weight : 2 kg.

Reference	Axial static load (daN)
E1N101-01	50 - 85
E1N101-02	85 - 120
E1N101-04	130 - 210
E1N101-05	210 - 310
E1N101-06	310 - 530

Note : Product available with stainless steel plates and/or alternative elastomers on special request.
Please consult us.

DIMENSIONS



OPERATING CHARACTERISTICS

Natural frequency :
- axial : 5 to 7 Hz;
- radial : 6 to 8 Hz.

Maximum permitted excitation at the natural frequency of suspension : ±1.5 mm.
Amplification factor at resonance : 4 < Q < 10.
Maximum axial travel available under shocks :
- axial ± 45 mm;
- radial ± 25 mm.

Structural strength corresponding to a continuous accelaration of 10 g with maximum load.

Weight : 2 kg.

Reference	Axial static load (daN)
E1N104C45AS	200 - 360
E1N104C60AS	360 - 600
E1N104C75AS	500 - 800
E1N106C60AS	700 - 1000
E1N106C75AS	900 - 1300

VIB HD 50

MEDIUM DEFLECTION MOUNTS

LOW LOADS

DESCRIPTION

The permitted deflection (40 to 50 mm) of the suspended mass in relation to the mounting base limits reaction under shock. No efficient vibration protection is offerred during shock.

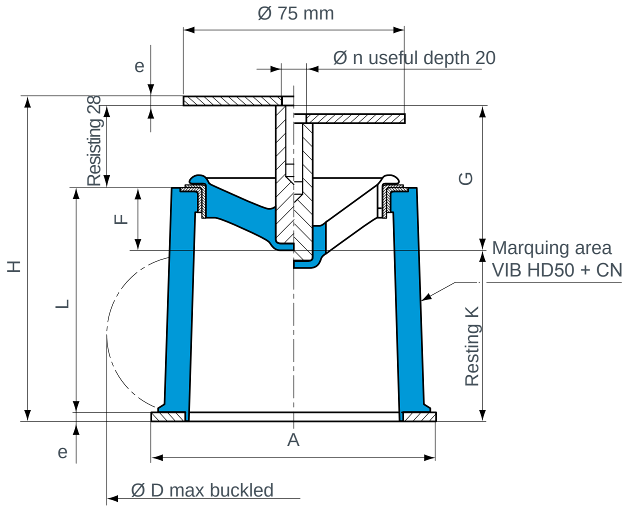
CHARACTERISTICS

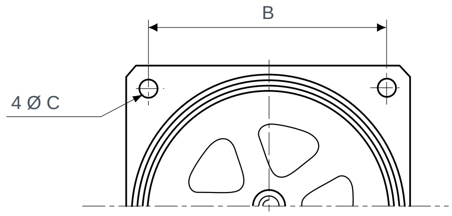
- Natural frequency (vertical and lateral) under load of 5 to 8 Hz.

- Maximum deflection under load :
  - vertical : ± 50 mm*;
  - lateral : ± 45 mm*.

- H in rest position.
- H - 6 mm under nominal load (deflection under load = 6 mm).

* maximum forces corresponding to 10 times the load.





Nominal static load (daN)	Reference	❑A (mm)	H (mm)	❑B (mm)	e (mm)	Ø C (mm)	Ø n (mm)	F (mm)	G (mm)	Ø D (mm)	L (mm)	K (mm)
1	552301 50	90	109	75	2	5,5	8	19	47	105	77	60
2	552302 50	90	109	75	2	5,5	8	19	47	110	77	60
4	552303 50	95	110	80	3	5,5	8	21	49	120	76	58
8	552304 50	95	110	80	3	5,5	8	21	49	120	76	58
16	552305 50	105	129,5	90	5	6,5	12	39,5	67,5	125	91,5	57
24	552306 50	105	129,5	90	5	6,5	12	39,5	67,5	130	91,5	57
32	552307 50	105	129,5	90	5	6,5	12	39,5	67,5	135	91,5	57

VIB HD 45
HIGH DEFLECTION SHOCK MOUNTS

DESCRIPTION

Range of omnidirectional high deflection shock mounts made with a square base plate and a threaded core on the upper side.
The elastomer, in natural rubber, is developed especially for navy applications (other materials on demand).

ADVANTAGES

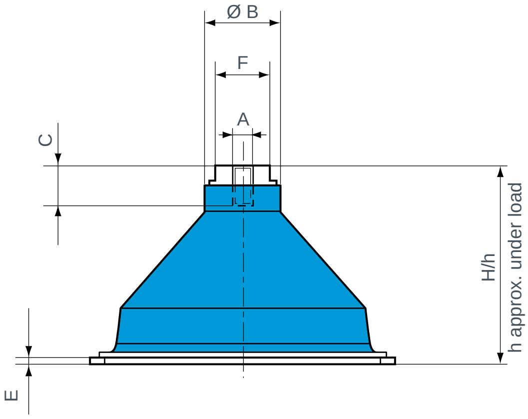
These mounts provide both high level of vibration isolation and shock protection. Its high structural strength corresponds to a continuous acceleration of 10 g under maximum load.

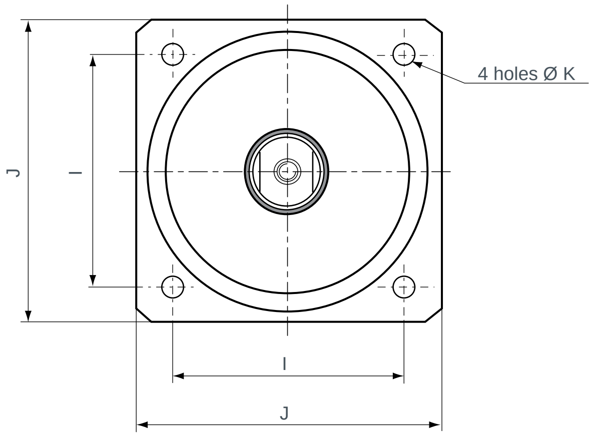
The range includes 17 different mounts covering a wide load range from 15 kg up to 1670 kg per mount.

This mount meets the latest US and European shock standards in use in the naval forces across the globe.

The metalworks are protected against corrosion (ie. : salt spray).

DIMENSIONS





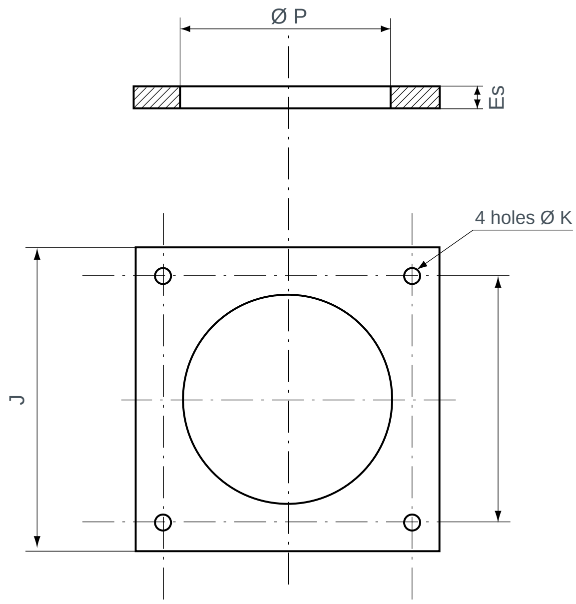
OPERATING CHARACTERISTICS

Nominal load (daN)	Load range (daN)	Part number	A	Ø B (mm)	C useful lenght (mm)	H unloaded (mm)	h /s under load (mm)	E (mm)	F (mm)	I (mm)	J (mm)	Ø K screw hole (mm)
30	15 to 35	E1N-3628-52	M10	37	20	100	89	5	27	114	150	9
45	23 to 52	E1N-3628-51	M10	37	20	100	89	5	27	114	150	9
60	30 to 69	E1N-3454-54	M10	37	20	100	89	5	27	114	150	9
85	43 to 98	E1N-3454-53	M10	37	20	100	89	5	27	114	150	9
110	55 to 126	E1N-3454-52	M10	37	20	100	89	5	27	114	150	9
130	65 to 150	E1N-3454-51	M10	37	20	100	89	5	27	114	150	9
165	83 to 190	E1N-3454-56	M10	37	20	100	89	5	27	114	150	9
170	85 to 196	E1N-3455-54	M20	54	40	126	115	10	41	140	165	13
230	115 to 265	E1N-3455-53	M20	54	40	126	115	10	41	140	165	13
320	160 to 370	E1N-3455-52	M20	54	40	126	115	10	41	140	165	13
425	213 to 490	E1N-3455-51	M20	54	40	126	115	10	41	140	165	13
560	280 to 645	E1N-3455-56	M20	54	40	126	115	10	41	140	165	13
500	250 to 575	E1N-3456-54	M24	116	48	154	141	15	41	210	250	18
625	313 to 720	E1N-3456-53	M24	116	48	154	141	15	41	210	250	18
800	400 to 920	E1N-3456-52	M24	116	48	154	141	15	41	210	250	18
1080	540 to 1212	E1N-3456-51	M24	116	48	154	141	15	41	210	250	18
1450	725 to 1670	E1N-3456-55	M24	116	48	154	141	15	41	210	250	18

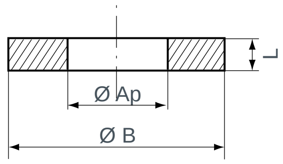
- Vertical nominal static load : from 15 kg to 1670 daN per mount.
- Axial and radial natural frequencies : 4 to 8 Hz, depending on the load (see chart).
- Maximum axial shock displacement : 45 mm (can be increased up to 63 mm with the addition of washers).
- Maximum radial shock displacement : 45 mm.
- Structural strength : 12 g under maximum load.
- Operating temperature : - 30°C to + 80°C.

ADDITIONAL SPACERS

Washer for the mounting plate *



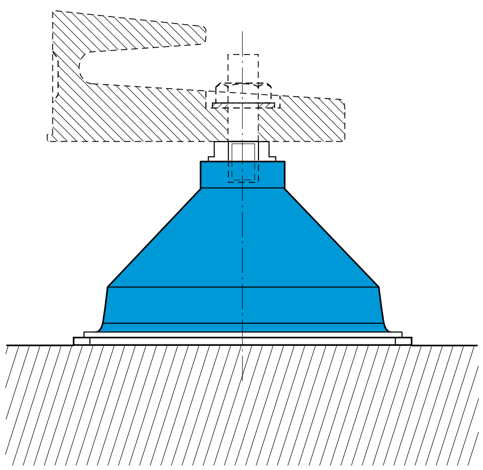
Washer for the threaded core *



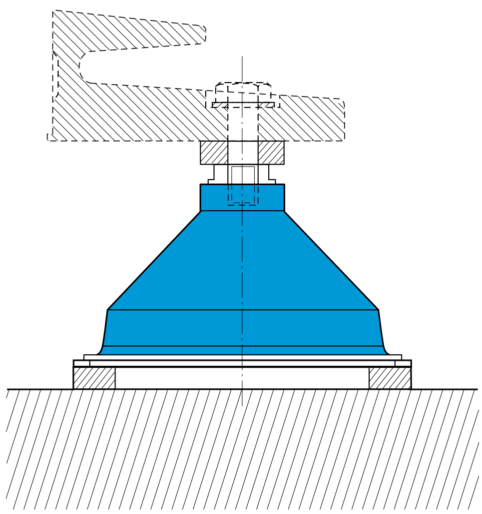
* Not supplied

For the part number	Max. axial displacem. (mm)	Washer for the mounting plate					Washer for the threaded core		
		Thickness Es(mm)	Ø P (mm)	J (mm)	I (mm)	Ø K (mm)	Ø B (mm)	Ø Ap (mm)	Height L (mm)
E1N-3628-XX	63	8	88	150	114	9	37	11	10
E1N-3454-XX	63	8	88	150	114	9	37	11	10
E1N-3455-XX	67	5	105	165	140	13	54	22	10
E1N-3456-XX	69	5	130	250	210	18	116	26	10

Installation without washer



Installation with washers



ASSEMBLY

These parts are designed to be loaded in compression. they have to be installed on a flat surface covering the entire surface of the base plate. The supported structure is then secured to the central core using a high tensile screw M20 for shape 1.

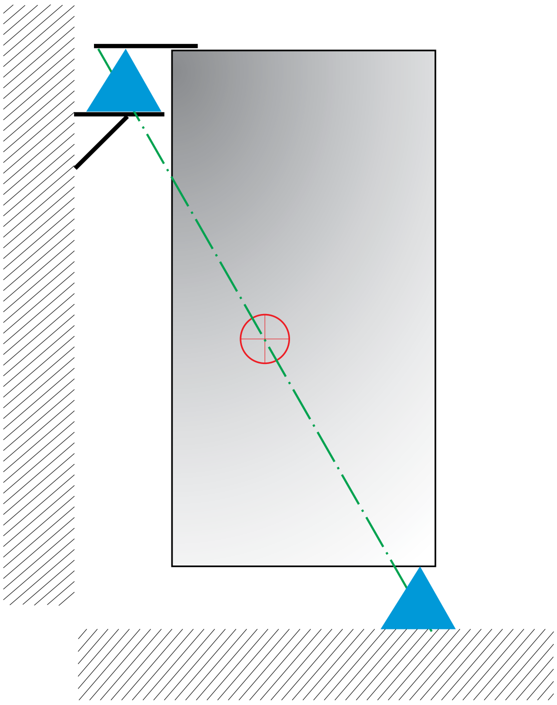
For a better result, the load per mount should be evenly distributed. In the case of a tall suspended equipment, these mounts can be used as stabilizing devices. They will be secured to the equipment only after stabilization of the base mount.

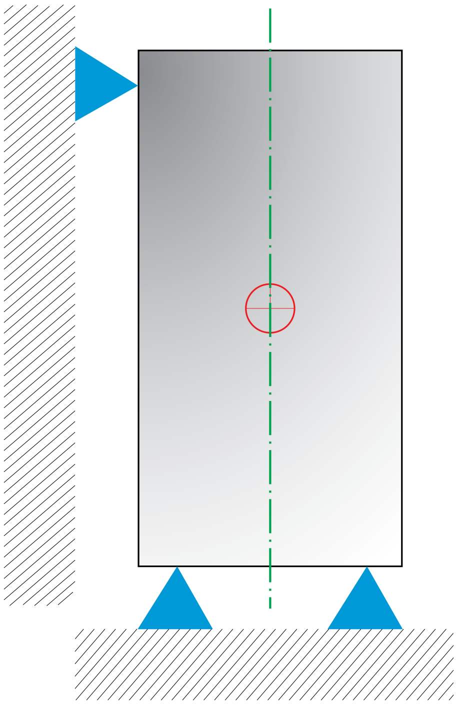
These mounts are not designed to carry a permanent load in shear or in tension.

All connections with the suspended equipment must be flexible and capable to accept high displacement allowing the suspensions to work properly.

We strongly recommend to have your installation approved by our technical department before ordering the mounts.

Assembly drawings





VIB HD 56

MEDIUM DEFLECTION MOUNTS

HIGH LOADS

DESCRIPTION

A complete range of high deflection omnidirectional mounts. They are made of two cast iron inserts, a threaded steel plate holding the fixing interfaces is added to one end.
The elastomer is a specially developed natural rubber to meet the NAVY requirements (Other materials can be delivered on request).

ADVANTAGES

These mounts will provide both a very high level of vibration attenuation and a high shock capacity to reduce the transmitted acceleration. It's structural resistance correspond to a continuous acceleration of 10 g at the maximum load.

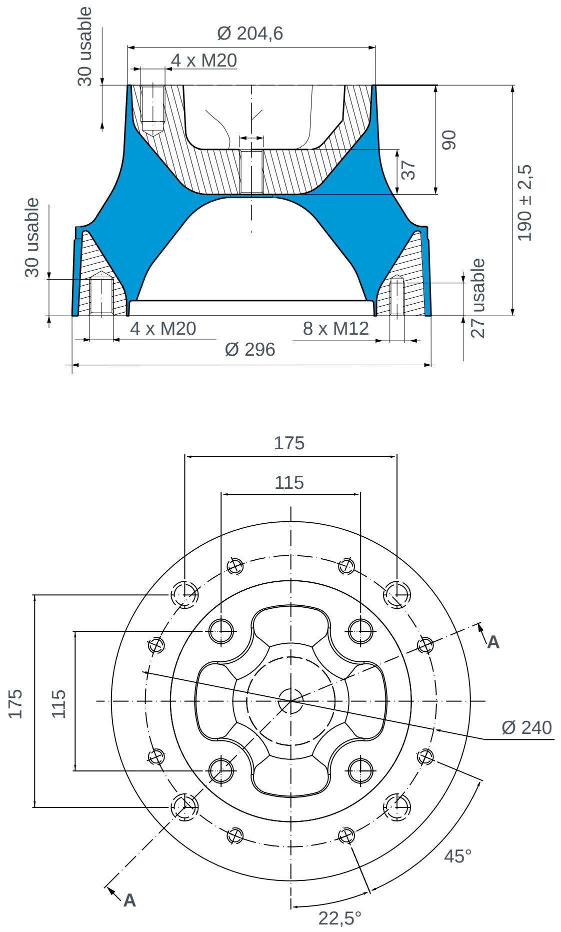
The range is made of several references with a load range ranging from 1125 daN up to 7000 daN per mount.

These mounts meet both the European and North American shock standards.

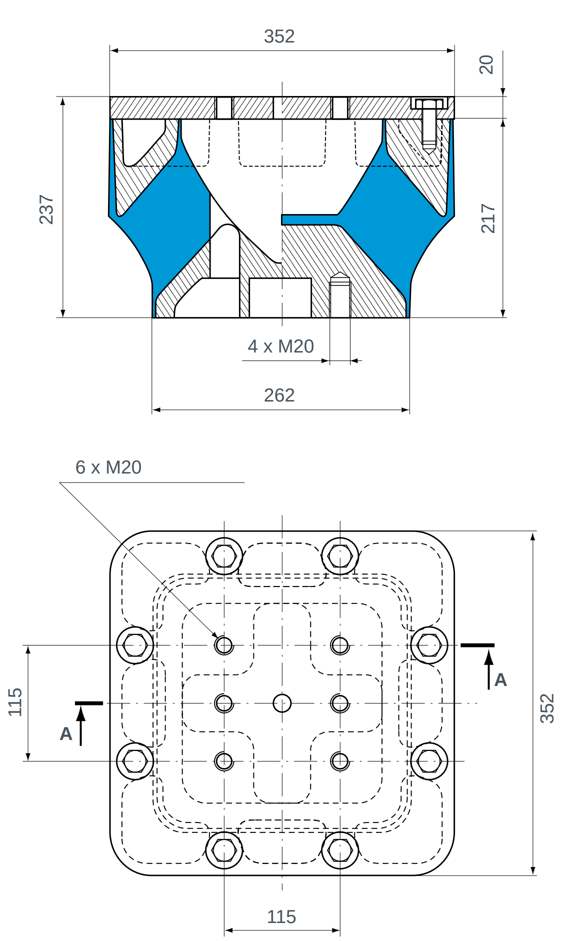
The metalwork are treated against corrosion.

DIMENSIONS IN mm
(for Shapes 1 & 2)

Shape 1*



Shape 2



OPERATING CHARACTERISTICS
(for Shapes 1 & 2)

Load range (daN)	Reference	Shape	Height under max. load (mm)
850 to 1955 1050 to 2415 1250 to 2875 1600 to 3680	E1N-4001-54 E1N-4001-52 E1N-4001-53 E1N-4001-51	1	177 ± 2
3000 to 5000 4200 to 7000	E1N-4066-52 E1N-4066-51	2	220 ± 2

- Static nominal load : 1125 to 7000 daN per mount.
- Axial and radial natural frequency : 4 to 7 Hz depending on load.
- Displacement under shock : 56 to 60 mm depending on the axis.
  For the E1N-4001mount, it can be increased to 63 mm using spacers.

- Structural strength : 10 g at maximum load.
- Temperature range : - 30°C up to + 80°C.

* Geometry evolution. Please consult us.

ASSEMBLY

These mounts are designed to carry load in compression and should be installed on a smooth surface. The equipment in Men second using 4 M20 bolts (shapes 1 and 2).

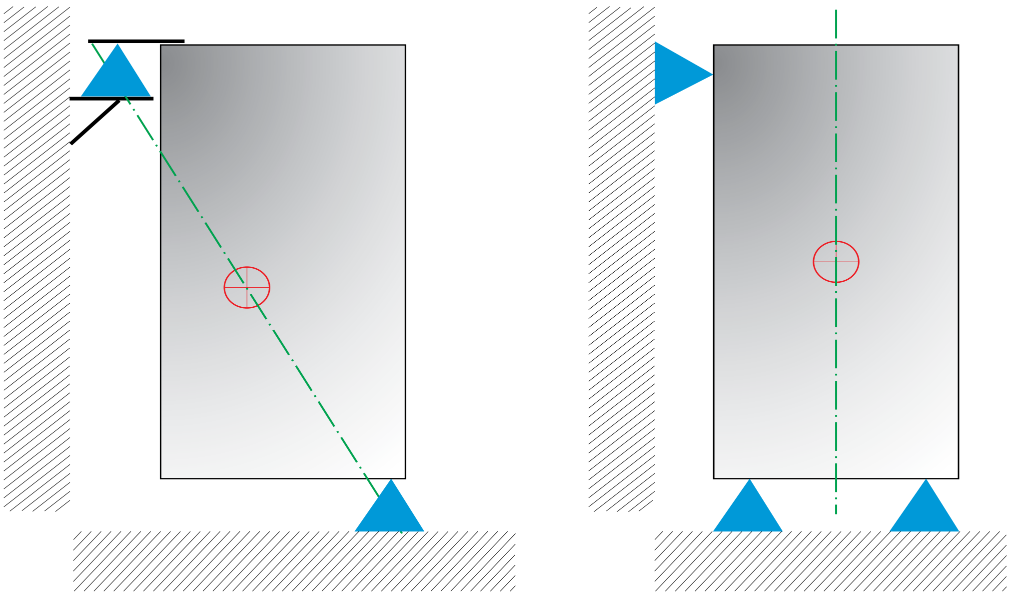
For a better result, the load per mount should be evenly distributed. In the case of a tall suspended equipment, these mounts can be used as stabilizing devices. They will be secured to the equipment only after stabilization of the base mount.

These mounts are not designed to carry a permanent load in shear or in tension.

All connections with the suspended equipment must be flexible and capable to accept high displacement allowing the suspensions to work properly.

We strongly recommend to have your installation approved by our technical department before ordering the mounts.

Assembly drawings



GB 530 MOUNTS

Natural frequency : (1)
5 Hz

DESCRIPTION

The GB530 comprises of one part in elastomer bonded to a base plate and a tapped steel core (a non magnetic version is also available).

Advantages

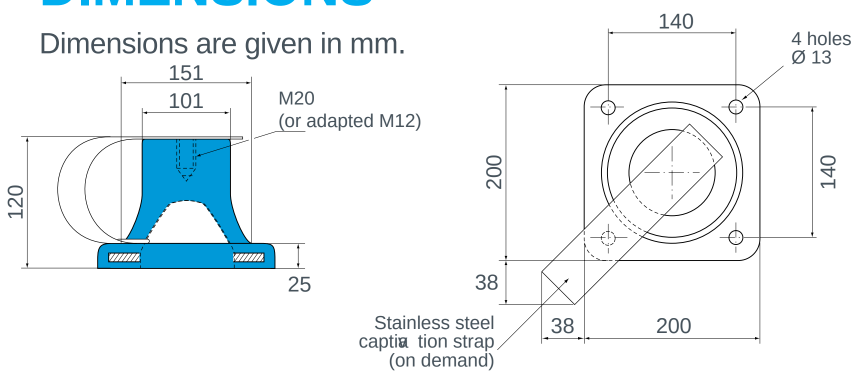
- Can provide high deflection under shocks.
- Long life.
- Low natural frequency (5 Hz in axial).
- Low amplification at resonance.(8 at 10)

APPLICATIONS

These are specific mounts created for the naval industry : on board electronics, radars, special weapons equipment.

DIMENSIONS

Dimensions are given in mm.



OPERATING CHARACTERISTICS

Paulstra reference	Barry Controls * reference	Load range (daN)
530901 21 00	GB530-NR1	7,5 - 75
530901 21 10	GB530-NR2	15 - 150
530901 21 20	GB530-NR3	25 - 250
530901 21 30	GB530-NR4	40 - 400
530901 21 40	GB530-NR5	60 - 600

* Barry Controls part numbers are give n as a reference.

Temperature range :
-30° C to + 70°C
Weight : 3 - 4 kg

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

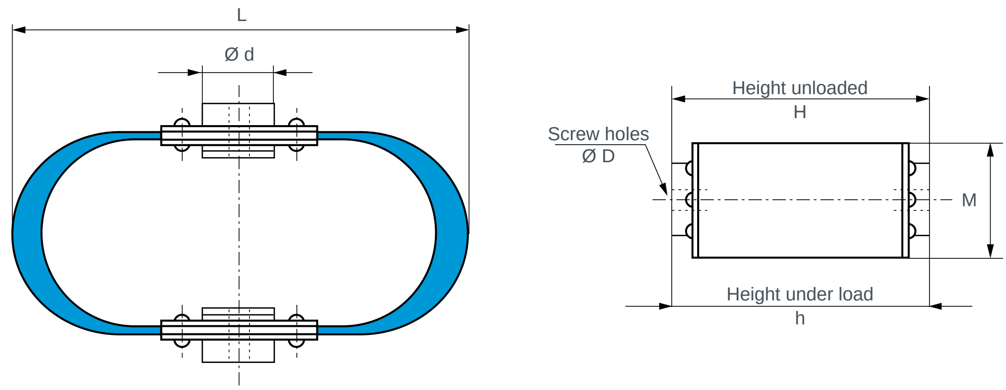
"X" TYPE FLEXIBLE MOUNTS

Natural frequency : 4 to 10 Hz (1)

DESCRIPTION

Steel mounting with excellent shock absorption capacity, highly resistant to fatigue.
It is made of a stainless steel and epoxy resin sandwich which limits the amplification.

DIMENSIONS



Reference	Nominal load (daN)	H (mm)	h (mm)	L (mm)	M (mm)	Ø d (mm)	Ø D (mm)
E1M-3950-01	10	114,3	106,9	203,2	50,8	31,8	8
E1M-3951-01	20	114,3	106,9	203,2	50,8	31,8	8
E1M-3952-01	45	133,3	123,2	215,9	50,8	31,8	12
E1M-3953-01	70	133,3	123,6	215,9	50,8	31,8	12
E1M-3954-01	110	133,3	124,2	215,9	50,8	31,8	12
E1M-3955-01	180	190,5	185,4	297,2	101,6	63,5	20
E1M-3956-01	320	190,5	183,4	297,2	101,6	63,5	20
E1M-3957-01	450	190,5	184,4	297,2	101,6	63,5	20
E1M-3958-01	450	209,6	199,3	365,0	50,8	34,9	20

1) the indicated natural frequency, are valid for the maxi loads of the ranges of use quoted in the paragraph : TECHNICAL CHARACTERISTICS.

VIB VHD 75

VERY HIGH DEFLECTION

LOW LOADS

DESCRIPTION

A range of multi directional mounts with very large deflection manufacture with elastomer and metal parts.

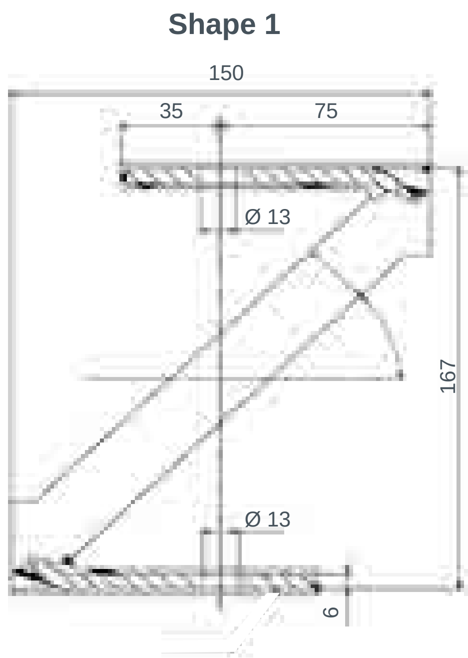
The elastomer is based on natural rubber which has been specially developed for marine applications.

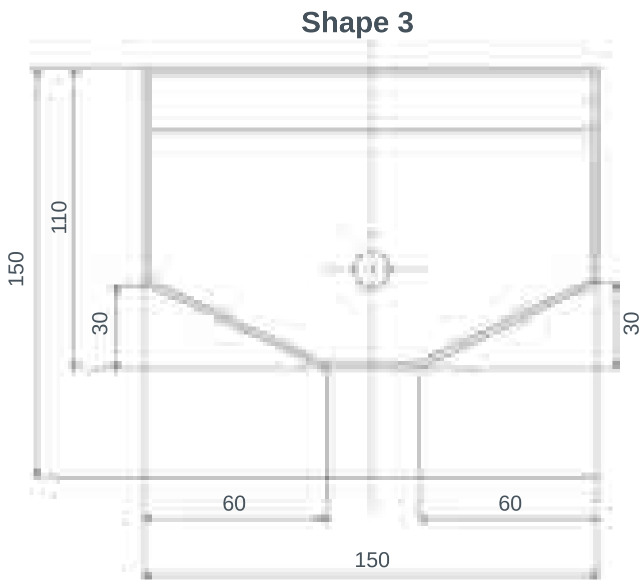
ADVANTAGES

The mounts provide a high level of vibration isolation and shock attenuation. Their strenght is equal to a continuous acceleration of 10g at the maximum load. The range includes 5 references with load ranging from 11 to 94 daN.

The mounts meet the shock requirements for European and North American specifications.
The metalwork is covered with elastomer to protect it against corrosion (ex. : salt fog).

DIMENSIONS



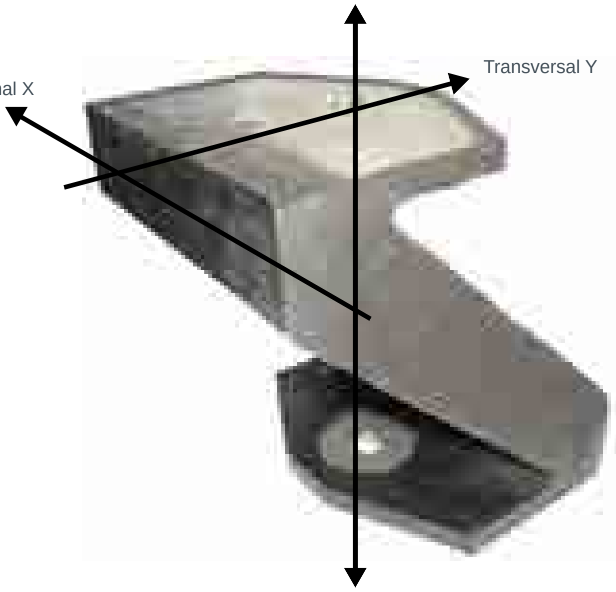


Static loads

Part numbers	Axial Z compression (daN)			Axial Z traction (daN)		Transversal Y (daN)	
	nominal	mini	maxi	nominal	maxi	nominal	maxi
552450	15	11,3	18,8	7,5	9,4	7,5	9,4
552451	25	18,8	31,3	12,5	15,6	12,5	15,6
552452	35	26,3	43,8	17,5	21,9	17,5	21,9
552453	50	37,5	62,5	25	31,3	25	31,3
552454	75	56,3	93,8	37,5	46,9	37,5	46,9

Longitudinal X : No permanent loads should be applied in this direction.

TECHNICAL CHARACTERISTICS



- Resonance Frequency axial and radial : 5 to 7 Hz depending on load.
- Deflection during shock : 75 mm in all directions.
- Mechanical strenght : 10 g with maximum load.
- Operating temperature : - 30 °C to + 80 °C.
- Metallic parts are covered with elastomer provide good corrosion resistance when used in a sea water environment.

ASSEMBLY

In the case of a large cabinet, the mounts can also be used as stabilisers.
They should be fixed after the load has been supported by main mountings.

To ensure the mounting system operates correctly all connections should be capable of large displacements. We recommend that installation design should be approved by our technical department.

VIB VHD 75

HIGH DEFLECTION MOUNTINGS

HIGH LOADS

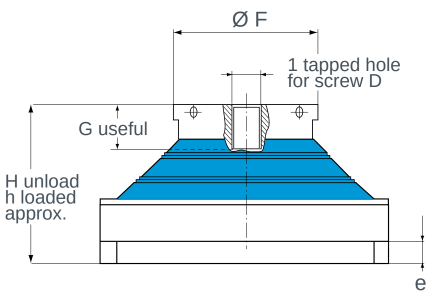
DESCRIPTION

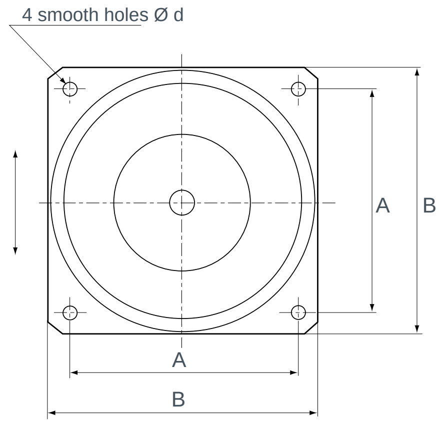
Elastomer isolators designed for acoustic isolation and shock protection.

CHARACTERISTICS

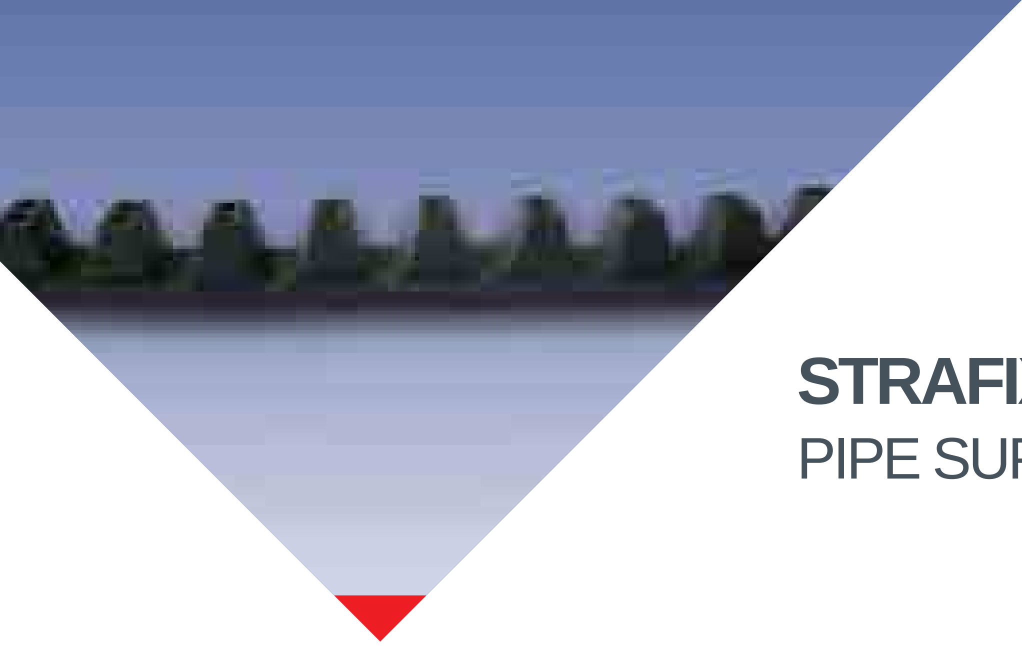
- Natural frequency (vertical and lateral) under nominal load : 4 to 5.5 Hz
- Maximum displacement under shock 75 mm* all in directions.

* maximum forces corresponding to 15 times the load.





Nominal load (daN)	Reference	D	Ø F (mm)	G lenght useful (mm)	e (mm)	H unloaded (mm)	h under load (mm)	A (mm)	B (mm)	Ø d screw hole (mm)
120	E1N-3392-50	M30	92	45	15	211	197 approx.	200	236	18
200	E1N-3392-59	M30	92	45	15	211	197 approx.	200	236	18
250	E1N-3392-58	M30	108	45	15	211	197 approx.	234	270	18
380	E1N-3392-57	M30	112	45	15	211	197 approx.	234	270	18
630	E1N-3392-56	M56	199	84	40	255	238 approx.	360	446,5	30
900	E1N-3392-55	M56	199	84	40	255	238 approx.	360	446,5	30
1200	E1N-3392-54	M56	240	84	40	255	238 approx.	360	446,5	30
2000	E1N-3392-53	M56	240	84	40	255	238 approx.	360	446,5	30
3000	E1N-3392-52	M56	240	84	40	255	238 approx.	360	446,5	30
4000	E1N-3392-51	M56	280	84	40	305	289 approx.	460	546,5	30



STRAFIX

PIPE SUPPORTS

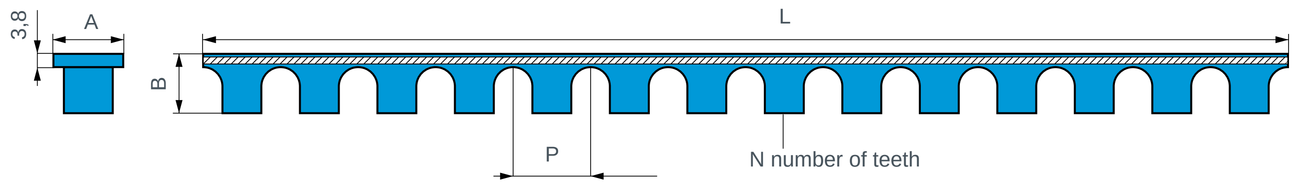
DESCRIPTION

The part has a toothed profile to support the pipe, moulded onto a steel strap. There are 3 different profiles depending on the diameter of the pipe to be supported. The elastomer is available in either chloroprene or non flamable silicone.

Advantages :
With only 3 different parts it is possible to provide vibration isolation to pipes with Ø 6 up to 206,5 mm. Cutting and shaping the STRAFIX to suit the pipes is easy.

CHARACTERISTICS

PROFILE BEFORE MOUNTING

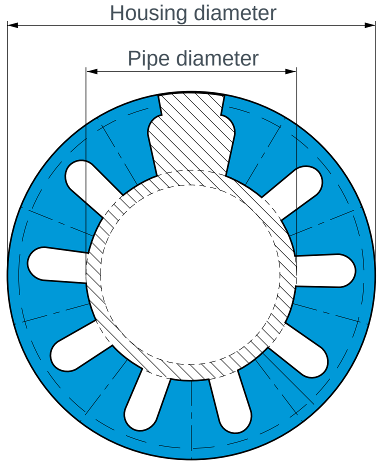


Designations & references	Strafix G1	Strafix G2	Strafix G3
Ref. non flamable silicon	E 4286 F01	E 4287 F01	E 4288 F01
Ref. Chloroprene	E 4286 F02	E 4287 F02	E 4288 F02

Strafix	Dimensions (mm) PROFILE BEFORE MOUNTING		
	G1	G2	G3
Width A	15	20	35
Height B	12	17	17
Pas P (1 pitch)	16,71	22,2	38,28
Lenght L	501,3	666	842,16
Number of teeth	30	9	22

Strafix	Dimensions (mm) PROFILE AFTER MOUNTING		
	G1	G2	G3
Ø Pipe minimum	6	16	51
Ø Pipe minimum	42 approx.	94,9 approx.	206,5 approx.
Housing diameter	approx. DE+20	approx. DE+30	approx. DE+30

STRAFIX AFTER MOUNTING



STRAFIX AFTER MOUNTING

MECHANICAL CHARACTERISTICS

- Maximum dynamic amplitude in all directions : ± 0,5 mm
- CR : Max static radial load.
- CA : Max static axial load : 20% of CR
- Max strength under shock :
  - axial = 4 x CA;
  - radial = 10x CR.

STRAFIX G1

Pipe diameter DE (mm)	Number of teeth	Radial load (daN)	Radial Kdyn (N/mm)	Axial Kdyn (N/mm)
6 - 10,1	4	0,67	10	1,6
10,2 - 15,5	5	0,83	12,5	2
15,6 - 20,8	6	1	15	2,4
20,9 - 26,1	7	1,17	17,5	2,8
26,2 - 31,4	8	1,34	20	3,2
31,5 - 36,7	9	1,5	22,5	3,6
36,8 - 42,1	10	1,67	25	4

STRAFIX G2

Pipe diameter DE (mm)	Number of teeth	Radial load (daN)	Radial Kdyn (N/mm)	Axial Kdyn (N/mm)
16 - 17,1	5	6,6	90	14,4
17,2 - 24,2	6	7,9	108	17,3
24,3 - 31,3	7	9,2	126	20,16
31,4 - 38,3	8	10,6	144	23,04
38,4 - 45,4	9	11,9	162	25,92
45,5 - 52,5	10	13,2	180	28,8
52,6 - 59,5	11	14,5	198	31,68
59,6 - 66,6	12	15,8	216	34,56
66,7 - 73,7	13	17,2	234	37,44
73,8 - 80,7	14	18,5	252	40,32
80,8 - 87,8	15	19,8	270	43,2
87,9 - 94,9	16	21,1	288	46,08

STRAFIX G3

Pipe diameter DE (mm)	Number of teeth	Radial load (daN)	Radial Kdyn (N/mm)	Axial Kdyn (N/mm)
51 - 60,2	6	61	915	146
60,3 - 72,4	7	71,2	1068	171
72,5 - 84,6	8	81,3	1220	195
84,7 - 96,8	9	91,5	1372	220
96,9 - 109	10	101,7	1525	244
109,1 - 121,2	11	112	1678	268
121,3 - 133,4	12	122	1830	293
133,5 - 145,5	13	132	1983	317
145,6 - 157,7	14	142	2135	342
157,8 - 169,9	15	152	2288	366
170 - 182,1	16	163	2440	390
182,2 - 194,3	17	173	2593	415
194,4 - 206,5	18	183	2745	439

Active control systems of noise and vibrations

INTRODUCTION

Active isolators cancel the incoming vibration by generating a dynamic force of same magnitude in opposite phase through the use of electrodynamic actuators, thus improving the low frequency performance of the suspension.

The objective is to improve the insulation of vibration in the range 10 to 1000 Hz even more – according to the needs of the application.

The applications of STRACTIVE are endless : reactive silencer, electric motor, transformers, internal combustion engines, structures, pumps,...

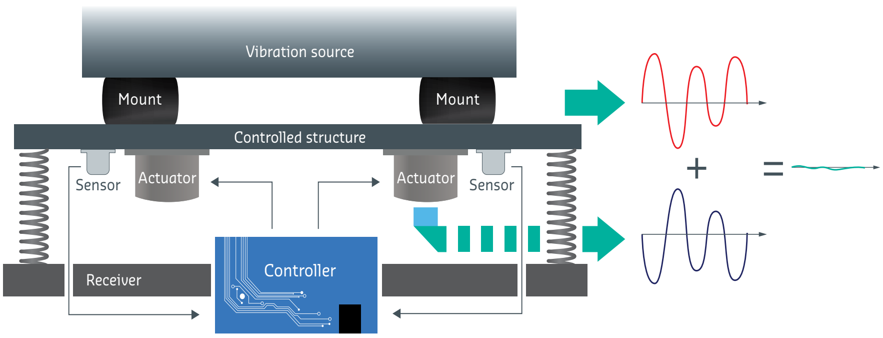
EXAMPLES OF APPLICATIONS

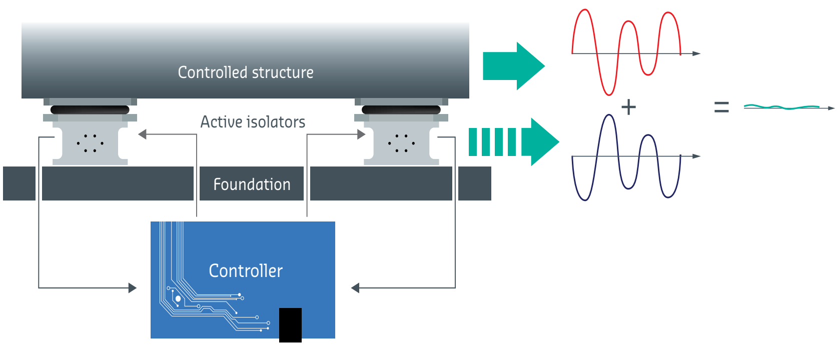
- Improves the threshold of oceanographic research vessel sonar detection.
- Extends crew shift.
- Reduce submarines noises.
- Diesel engines / ventilation systems : reduction of air noises by active silencers.
- Machine tools : improvement of precision and life cycle of manufacturing tools.

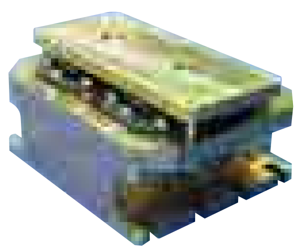
ADVANTAGES

- To improve dynamic isolation offered by passive suspensions of the same stiffness.
- To improve uncoupling between structures.
- To simplify the installation of the equipment by reducing or eliminating inertia blocks.
- To reduce structural stress and increase life.
- To reduce noise.
- To reduce movement of connections to equipment
- Excellent vibration reduction : 12 to 36 dB of additional filtering compared to the passive solution only.
- Total suppression of the most annoying harmonic.
- Performance upgrade of existing machines with minimum impact (Add-on kit).
- Space & weight saving.
- Improve the professional environment in term of noises and vibrations exhibition.
- Reduce submarines noises.

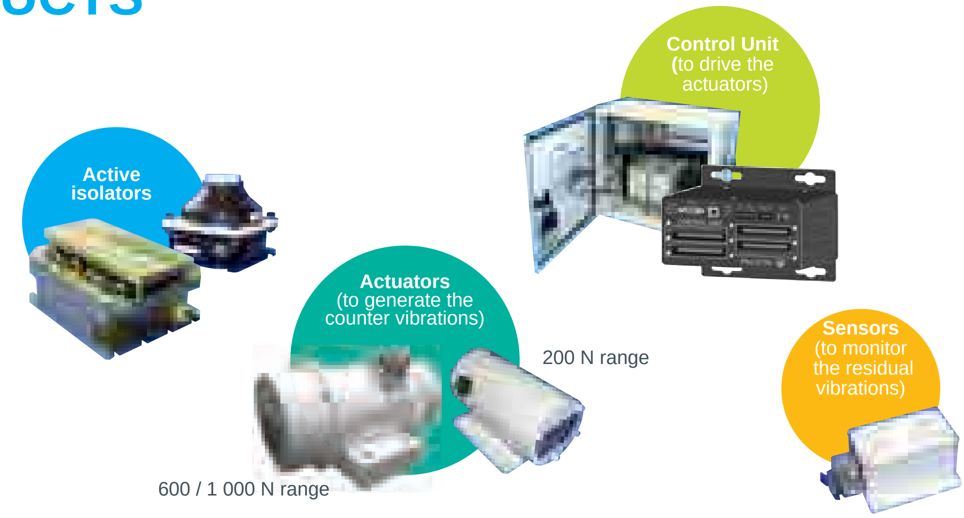
PRINCIPLE





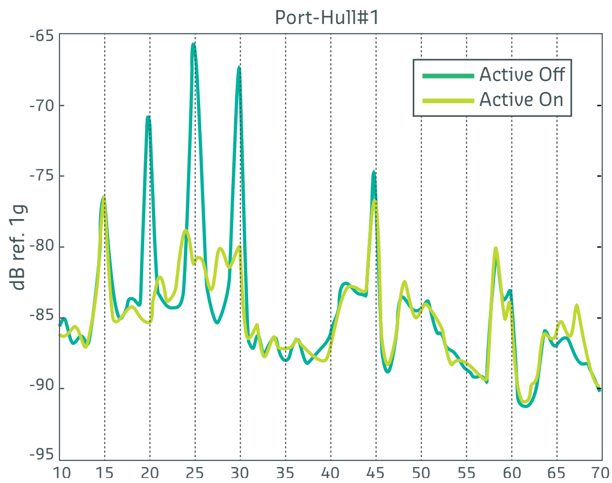


PRODUCTS

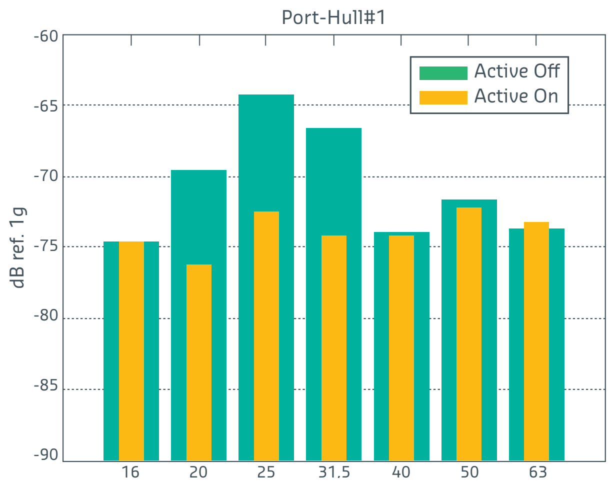


EXAMPLES OF RESULTS

Active Vibration Control Test Results



Fréquency (Hz)



1/3 Octave band (Hz)

METAL MOUNTINGS

METAL MOUNTINGS

HUTCHINSON®

SUSPENSIONS MÉTALLIQUES

SOMMAIRE

See current price list for availability of items.
We reserve the right to modify the design and manufacture of the products and materials described in this catalogue.
The pictures of the products are supplied for information only.

VIBRACHOC RANGE

I - METAL MOUNTING SYSTEMS

VIBRACHOC have a range of all steel mountings whose essential element is the **“steel cushion”** made from compressed woven or knitted stainless steel wire mesh.

Metal mounts have considerable mechanical strength as well as high damping characteristics in the order of 10 to 20%, depending on the application.

ADVANTAGES

Stability. Steel mounts provide stable characteristics and the height under load remains constant with time.

Unaffected by corrosion. Steel dampers are unaffected by oil, grease, solvents, adverse weather and corrosive products.

Unaffected by temperature. Steel dampers withstand temperatures from - 70°C to + 300°C without changing characteristics.

Low natural frequency. Steel mounts with springs can have natural frequencies as low as 3 Hz, which can provide up to 98% attenuation for low speed rotating machinery.

II - GENERAL INFORMATION ON VIBRATION AND SHOCK

PURPOSE OF AN ELASTIC SUSPENSION

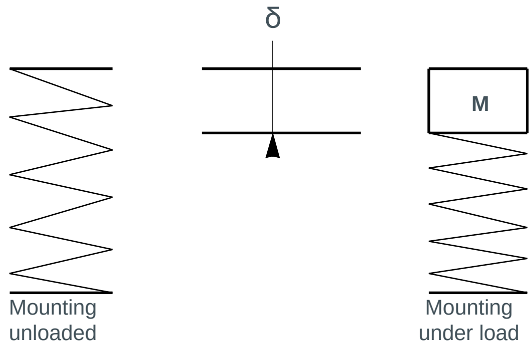
An appropriate elastic mount placed between the support and the equipment usually fulfils two functions :

- it has an important static role: it provides better load distribution by absorbing certain manufacturing tolerances, thus allowing more reliable, cheaper installation;
- it has a dynamic role : it provides protection against vibration and shock, considerably reducing the surrounding vibration and increasing the life time of the equipment isolated.

THEORY

Natural frequency

An elastic mount characterised by its load-deflection curve. The load produced by a mass M causes a static deflection δ (difference between the unloaded height and the height under load) and a subtangent Δ.



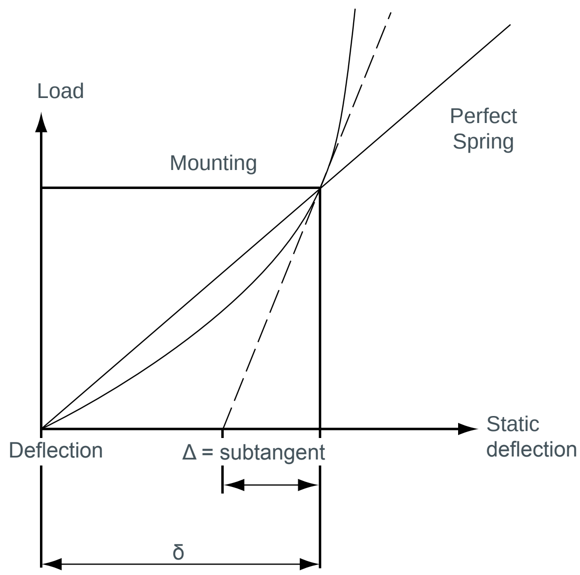
The Natural frequency of the suspended mass is given by the formulae

f in Hz $f = \frac{1}{2\pi}\sqrt{\frac{K}{M}}$

K = stifness of the mounting in N/m

M in kg $f = \frac{15{,}8}{\sqrt{\delta}}$

Δ = dynamic deflection in mm



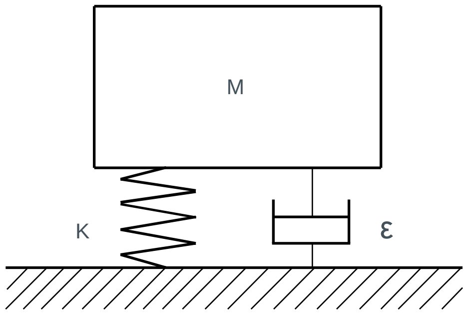
The load-deflection curve is linear for a theoretical spring but is not necessarily linear for a mounting. The form of the curve is highly variable and depends on the design and materials of the mountings.

Natural frequency

The purpose of a mount is to reduce the transmission of excitation forces between the suspended mass and the foundation. The degree of attenuation obtained depends firstly on the natural frequency of the mount or, more exactly, on the ratio of fe (excitation frequency) to f_0 (natural frequency).

In the simplest case, that of a single degree of freedom (vertical translation), the natural frequency of the mass + isolator without damping and is written

$$f_0 = \frac{1}{2\pi}\sqrt{\frac{K}{M}}$$



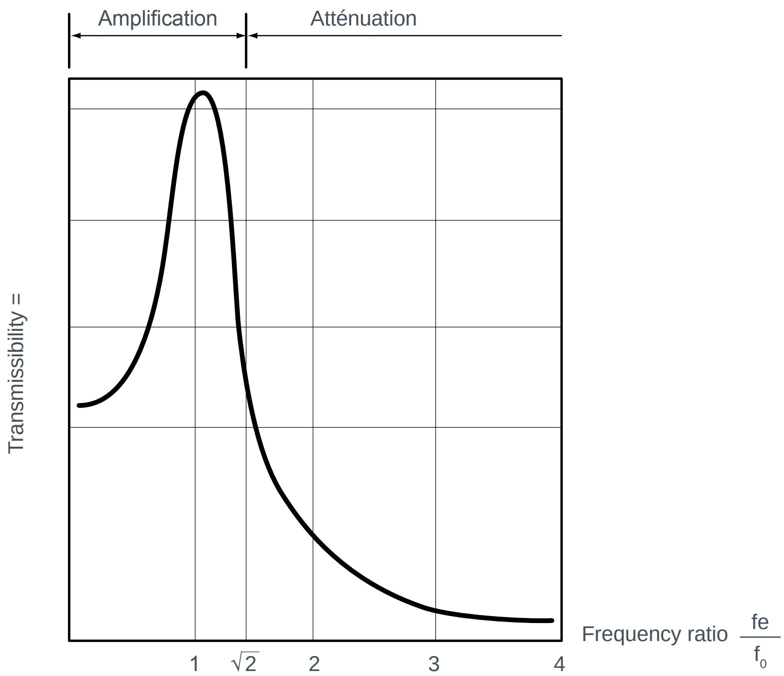
f_0 = Hz
K = Stiffness of isolator in N.m
M = Kg
Model of an elastic mount
K = stiffness
e = damping

Transmissibility is the ratio of the transmitted force fp to the excitation force fe. Examination of the curve opposite shows that :

- for $fe/f_0 < \sqrt{2}$ and in particular when the natural frequency of the mount is greater than the excitation frequency, there is amplification of vibration rather than attenuation.

This illustrates the fact that the selection of unsuitable resilient mount makes the problem worse rather than solving it.

- for $fe/f_0 > \sqrt{2}$, the excitation is attenuated. This shows the advantages of using a mount with a natural frequency (f_0) as low as possible in relation to the excitation frequency (fe). The greater the difference, the higher the degree of attenuation.



Damping

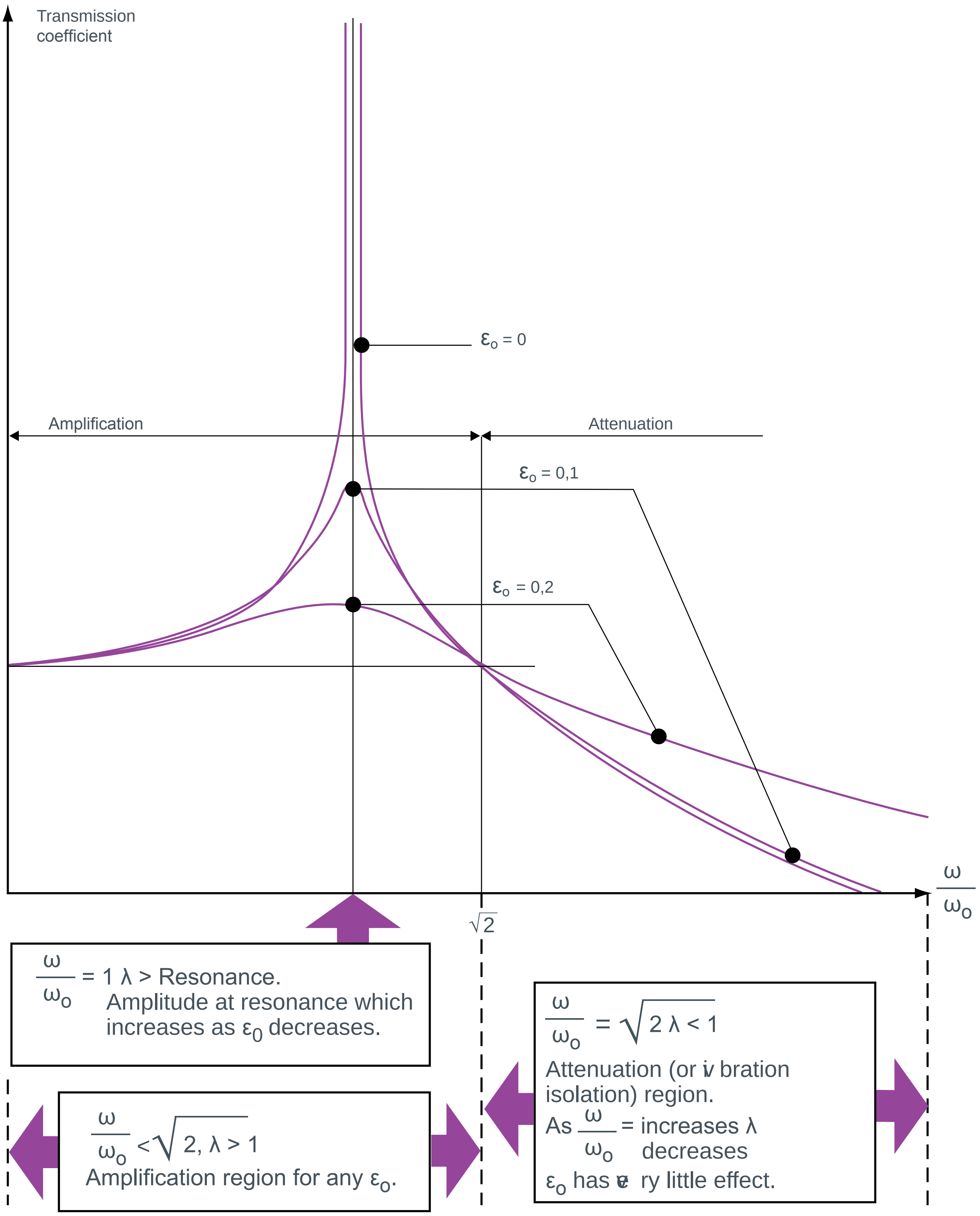
Damping dissipates vibrational energy by dry or viscous friction and acts as a brake, preventing displacement of the suspended assembly.

It can be seen that :

- for $fe/f_0 < \sqrt{2}$, the amplification decreases with higher damping, particulary when close to resonance;

- for $fe/f_0 > \sqrt{2}$, attenuation improves with lower damping.

To limit amplification at resonance while achieving good attenuation, it is necessary to find a good compromise when choosing a damper.



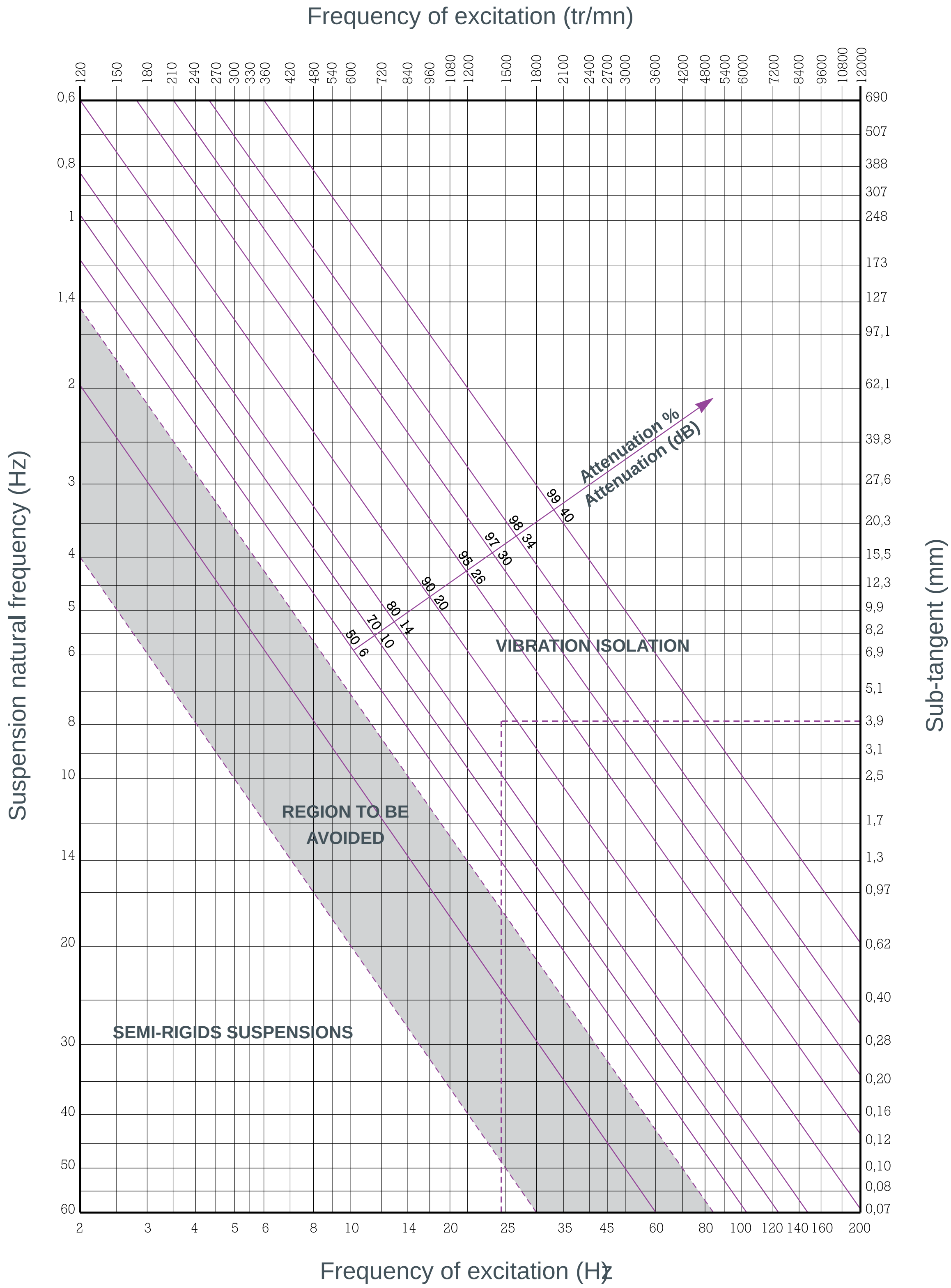
For an efficient mounting system use :

a high value of $\frac{\omega}{\omega_o}$ ⟶ low value of ω_0 ⟶ low value of λ

a high value of ε_0 ⟶ - limited amplification in the resonant region;
- minor effect in the attenuation region.

ABAQUE

Attenuation as a function of natural frequency and frequency of excitation
(A theoretical graph for a mounting system without damping)



- Select the running speed (rpm) or frequency of excitation (Hz) of the equipment to be mounted, on the horizontal axis.
- Project a vertical line to intersect with a horizontal line which passes through the natural frequency of the mounting system selected.
- Where the two lines intersect, follow a diagonal line to find the level of isolation for the mounting system chosen.

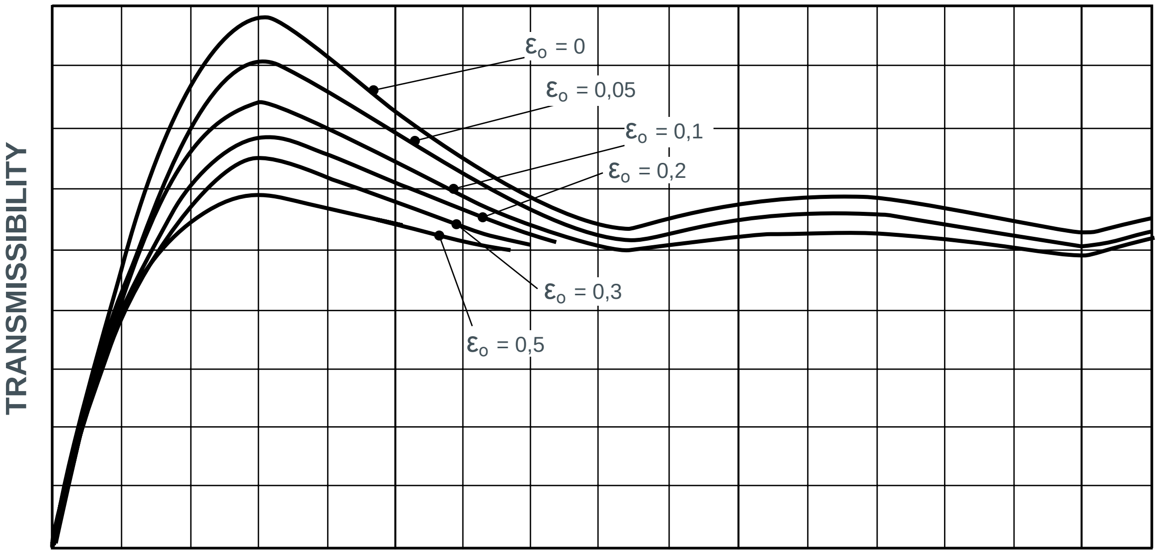
Shock

For impact machines like presses, forging hammers, etc, excitation is generated in the form of individual very short-time based shocks. In the same way as for vibration, where the importance of the relationship of fe to fn is paramount in determining the attenuation provided, here it is the fn/fs relationship (f_0 : natural frequency of the mounting - fs : shock frequency) which as to be considered.

We can deduce from these curves that :

- to obtain attenuation of a ½ sine shock (T < 1) the fn/fs ratio must be approximately less than 0.30. Beyond this limit the excitation force is amplified. Thus for a shock lasting 0.02 second, the resonant frequency of the isolators chosen must be as low as possible and in any case must be lower than 7.5 Hz;
- the presence of damping between 0 and 0.5 of critical contributes to the attenuation of a shock, but this improvement is slight for f_0/fs < 0.3.

The influence of the damping effect will be all the greater in the case of multi-frequency excitation where it is not always possible to select a natural frequency well away from the excitation frequencies. This is also true when searching for a compromise between shock attenuation (force transmission) and the limitation of displacement.



NATURAL FREQUENCY, fn X DURATION OF SHOCK T (secs) - FOR ½SINE SHOCK

III - VIBRACHOC RANGE APPLICATIONS

INDUSTRY

- Isolation of rotating machinery.
- Isolation of machine tools.
- Protection of works of art.

DEFENCE

- Protection of vehicle mounted electronics (tanks,shelters, off-road vehicles).
- Protection of inertial platforms, guidance systems, fire control and command and control electronics.
- Protection of missiles, their associated equipment and components.

MARINE AND NAVAL

- Suspension of motors, engines, sructures, and exhaust systems.
- Protection of electronic cabinets.
- Discrete acoustics.

AEROSPACE

- Protection of electronics.
- Helicopter lead lag dampers and laminated bearings.
- Mounting for onboard avionics.
- Engine and APU Mounting Systems.

RAIL

- Protection of train mounted electronics.
- Suspension of train mounted equipment (forms, air conditioners, transformers).
- Improved acoustics (suspension of bay front panel, floors ...).

CIVIL ENGINEERING

- Suspension of fans and air conditioning systems.
- Suspension of floors.
- Suspension of pipes and ducting.

IV - INDUSTRIAL APPLICATIONS OF THE VIBRACHOC RANGE

IV.1 MACHINE TOOLS AND IMPACT MACHINERY

- Lathes, horizontal and vertical mills, tapping machines, drills, etc.
- Hydraulic and mechanical presses, shears, etc.
- High speed presses, power hammers, etc.
- Printing machinery, textile machinery, etc.

Suspension of machine tools
For example, lathes, drills, mills, planes, mortise cutters, saws, grinders, nibblers, gear cutter, borers, tapping machines, etc. The machinery is isolated actively (attenuation of the vibration generated by the machine) and passively (the machine is protected from floor vibrations).

- Vertical natural frequency between 20 and 25 Hz, provides excellent attenuation of the vibration spectrum, very effective for this type of machinery.
- Various assembly possibilities : integral levelling, non-slip base, fitting under machinery that does not have any mounting holes, etc.

Suspension of machinery for forming materials
For example : shears, folding machines, presses for punching, stamping, pressing and embos-sing, machinery for making nuts, hydraulic and mechanical presses, etc.
This type of machinery operates mainly by delivering blows and the shocks generated, which are sometimes significant, have to be absorbed by dampers with both a considerable capacity and high mechanical strength. The noise propagated to the structure is also noticeably reduced.

Suspension of high speed presses
The suspension has to avoid transmitting shock to the floor while maintening the stability of the machine, particulary for automatic feed.

The dampers must be selected to avoid resonance with the machine speed :

- the machine speed may vary from 0 to 600 cycles/min;
- if the speed is greater than 250 cycles/min, highly efficient isolation is obtained by using very low frequency mountings. An integrated damping system is usually necessary (metal pad, fluid dampers, etc.).

IV.2 ROTATING AND VIBRATING MACHINERY

- Engines, generators sets, compressors, fans, crushers, centrifuges, dryers, pumps, etc.
- Sieves, riddles, engine test benches, pipework, etc.

Suspension of well balanced rotating machines
This category includes most rotating machines, which develop free forces during operation which are quite low in comparison with their mass, such as : generator sets, air conditioning plants, most engines, fans (in clean air), compressors, pumps, etc.

The choice of mounting depends mainly on the speed of rotation of the machine and the degree of attenuation required. The natural frequency of the mounting must be low for slow rotational speed and high attenuation.

The antivibration mounting protect the machine without using an inertia mass. However, the engine should be mounted on the same chassis as the driven equipment if they are not already mounted in this way, to avoid excessive stress on the couplings.

Suspension of rotating machines with high dynamic forces
Grinders, centrifuges, dryers, certain types of reciprocating compressors, pumps, engines (with 2 or 3 cylinders), etc. may generate very high forces (such as eccentric loads, unbalanced forces or torque, start-up and short-circuit torque, etc.) during operation which may affect their stability and the various connectors and hoses. It is essential to limit the displacement of the suspended equipment by ensuring that the anti-vibration system is properly designed:

- the mountings should include dampers such as metal pads, damping fluids, etc.;
- an inertial mass may be incorporated, but only if the damping obtained is insufficient to stabilise the equipment.

The design of the mounting system must cover all aspects and be carried out from the start of the equipment installation design to define the supporting structures accurately at a sufficiently early stage.

Consult us for particular solutions.

Passive suspension of rotating machines
Certain types of compressors are perfectly balanced and do not generate any significant vibration. However, their operation and setting are so sensitive to vibration or shock (nearby workshops, handling, etc.) that they need passive protection.

The machine should be mounted on an inertial mass suspended on mountings with springs and metal pads.

Suspension of on-board rotating machines
On board lorries, trailers, trains, road and rail vehicles, boats, etc.

In addition to active protection, the machine needs to be protected against shocks and vibrations generated by the vehicle.

“Captive” mountings are usually used. They have travel limiting stops in all directions to ensure absolute safety while the vehicle is moving.

Suspension of vibrating machinery
Suspending sieves, vibrating riddles, etc... is more complex because these machines already have elastic couplings (e.g. springs) which assist operation.

If the machine is suspended on vibration mountings, it becomes a two-stage vibration system. When designing these systems the natural frequency of the elastic couplings within the machines as well as any flexibility in the chassis have to be taken into account.

Suspending engine test benches
This type of equipment poses a special vibration problem:
- the forces generated may be very high and sudden;
- the equipment must be able to be used with engines that vary considerable in size, weight and power.

An effective solution is to use an inertia mass suspended on very low frequency mountings with adequate integral damping.

IV.3 VEHICLES

- Civil engineering plants
- Handling equipment
- Trucks
- Trailers
- Road vehicles
- Railway engines

Particular attention must be paid to elastic mountings for equipment on civil engineering plant and vehicles in general. **The relative elasticity of the structures must often be taken into account as they can generate low or very low frequency vibration as a result of shocks arising from the work or movement.**

To be effective, the elastic mounting, must, therefore, be carefully designed.

The following examples, in particular for cabs, seats and equipment, are given for illustration only. The right solution may vary considerably from one machine to another.

Suspension of propulsion systems
The problem here is to minimise the vibration and noise generated by the engine through the structure of the vehicle (structure borne).

The disturbing frequencies vary from 10 to 100 Hz (and harmonics) for engines and 120 to 400 Hz for gear boxes.

The damping system should usually have :
- a low (isometric) resonant frequency (if possible 6-8 Hz);
- a limited displacement under extreme forces (system with very progressive siffness);
- considerable low frequency damping and as low as possible above 100 Hz.

IV.4 MARINE - OFFSHORE

The vibration and noise on board ships is generated by :
- the system of propulsion: the alternating hydro-dynamic forces generated by the propellors pass through the hull, usually creating low frequency vibration;
- the main engines and auxiliary engines which transmit vibrations to the hull via the structure : the spectrum is usually in the 15-50 Hz region;
- the exhausts : spectrum 16-8000 Hz;
- the effects of the sea : swell, heavy seas, wind;
- accidental shocks against the quays.

Regulations have been drawn up to protect the crews, passengers and equipment from discomfort caused by shocks and noise.

The VIBRACHOC range provides a comprehensive selection of means for complying with the standards and regulations for vibration and noise on ships (ask us for details).

Suspension of main engines and auxiliary engines
The main engines and auxiliary engines transmit vibrations to the structure of the ship. They also emit noise :
- directly into the air;
- indirectly, as the structures linked rigidly to the engine themselves become sources of transmitted noise.

Mountings (dampers) at strategic places between the engine and the structure significantly reduce the structure borne vibration and noise.
Many parameters are required for calculating the suspension required for marine engines : the rotation speed of the engine, the number of cylinders, the number of blades on the propeller, the natural frequency of the hull, the elastic coupling characteristics, the roll, the pitch and the maximum permitted forces. The technical service of Paulstra has several computer calculation programmes to define the most suitable suspension.

An extensive range of all metal or elastomer based dampers is available for mounting all kinds of engines :
- **diesel engines** of all sizes for merchant ships, war ships or pleasure boats;
- **auxiliary engines**, generators, pumps, compressors, windlasses, etc.

Suspending exhaust pipes
The turbulent gases circulating in exhaust pipes are a source of vibration and noise.
Using elastic mountings to anchor exhaust pipes from diesel engines has the advantages of :
- reducing the vibrations transmitted to the structure of the ship;
- attenuating the global noise in areas near the funnels, by between 5 and 20 dB (A);
- eliminating expansion compensators, as the mounting allows free expansion of the ducts;
- eliminating the deformation of the pipes caused by rigid mountings. The suspension of an exhaust pipe usually requires supports and stabilisers.

Suspension of on board equipment
Elastic suspension of sensitive on-board equipment (radio, navigation, electric or electronic enclosures, control panels, etc) provides protection against vibration coming from the structure. On board warships, high deflection mountings also provide protection against shocks from mines, etc. Stabilisers have to be added to supporting dampers for tall enclosures or racks.

IV.5 BUILDINGS

The problem of preventing vibration caused by air conditioning, ventilation, compressor or pumping systems, etc, in housing (flats, hotels, etc) offices or factories is now becoming more common for two reasons :
1) there is a general tendency to reduce the vibration and noise levels to comply with new noise regulations;
2) there is also a general tendency to build lighter constructions with greater spans, implying greater floor flexibility.

Active damping of machinery by preventing vibration being transmitted through the structure of buildings is often a way of complying with these regulations. The mechanical vibration filtered by VIBRACHOC mountings is transmitted at a level that is too low to excite structures that could create noise.

Suspension of foundations of lifts, hoists, etc.
The vibration generated by the winch while operating a lift has to be damped but it is especially important to absorb the shock generated when the machine starts or brakes. This often requires the use of elastic systems with good damping.

Suspension of fans, air conditioning, compressors, pumps, etc.
An elastic suspension provides good protection against vibration, **while, in most cases, avoiding the need for concrete masses, a costly solution** which prevents the equipment being moved easily.

The vibration and noise generated by a machine are more of a nuisance to the environment if they are positioned at a structurally weak point (roofs, terraces, floors, etc) and near offices or flats.

The rigidity of the floor is a factor that has to be taken into consideration when deciding which type of suspension to use.

Suspension of floating slabs
An economical solution is not to mount each machine separately but to group all the equipment likely to cause vibration on one slab, said to be floating because it is linked to the structure of the building by very low frequency mountings.

This system considerably increases the inertia of the suspended part and thus significantly reduces the displacement of the slab.

Suspension of pipework and conduits
Pipes and conduits generate two types of vibration :
- low frequency vibration due to turbulent flow (8-15 Hz);
- high frequency vibration due to the vibration of the pipes themselves (above 25 Hz).

The suspension usually also has to withstand quite high temperatures and allow the pipes to expand freely, which means that elastic all metal and/or telescopic systems have to be used.

SELECTION & APPLICATIONS GUIDES

HUTCHINSON®

SELECTION GUIDE OF

<table>
<tr><td></td><td>AXIAL FLEXIBILITY</td><td colspan="4">AXIAL & RADIAL FLEXIBILITY
+ ANTI-REBOUND</td><td>AXIAL FLEXIBILITY</td></tr>
<tr><td>Product range →</td><td>V4* (p229)
VIBSOL (p222)
PDM-1000 (p233)
PDM-2000 (p233)
SP55*W (p234)
SP56*W (p234)
V120 & V125 (p239)</td><td>V118-DG (p237)
V118-MG (p237)
V318 (p237)
V318-D (p237)
V1H5023 (p247)
V1H5025 (p247)
V402-MG (p243)</td><td>V164 (p241)
V168 (p241)</td><td>V1H751 (p245)
V1H752 (p245)</td><td>V1H-6000 (p249)
V1H-6100 (p249)</td><td>SP539-*** (p235)</td></tr>
<tr><td>Nominal static load in daN</td><td colspan="6"></td></tr>
<tr><td>5</td><td rowspan="20">Natural frequency = 10 to 25 Hz</td><td></td><td rowspan="7">Natural frequency = 8 to 22 Hz</td><td></td><td></td><td></td></tr>
<tr><td>10</td><td></td><td></td><td></td><td></td></tr>
<tr><td>20</td><td></td><td></td><td rowspan="9">Natural frequency = 12 to 18 Hz</td><td></td></tr>
<tr><td>30</td><td rowspan="19">Natural frequency = 11 to 25 Hz</td><td></td><td></td></tr>
<tr><td>50</td><td></td><td></td></tr>
<tr><td>70</td><td rowspan="11">Natural frequency = 15 to 25 Hz</td><td></td></tr>
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<tr><td>4 000</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5 000</td><td></td><td></td><td></td><td rowspan="7">Natural frequency = 10 to 16 Hz</td></tr>
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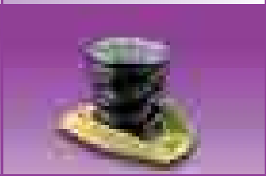
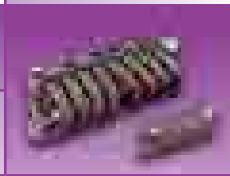
<tr><td>7 000</td><td></td><td></td><td></td><td></td></tr>
<tr><td>8 000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>15 000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>140 000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>280 000</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Warning :
At least two parameters are necessary to select a mounting system: the load to be supported and the excitation frequency or running speed of the equipment to be isolated. This frequency or speed needs to have the correct relatiionship with the natural frequency of the mounting system
(see graph on page 205).
If this relationship is ignored there is a risk that the vibration will be amplified.
* = replaces a figure which can be of different values.

MOUNTING SYSTEMS

<table>
<tr><th colspan="2">AXIAL & RADIAL FLEXIBILITY</th><th colspan="2">AXIAL & RADIAL FLEXIBILITY + ANTI-REBOUND</th><th>AXIAL FLEXIBILITY</th><th>MULTIAXIAL FLEXIBILITY</th><th></th></tr>
<tr><td>VIBRAFLOT (p268)</td><td>V1B1114-15-16 (p251)
V1B1134-35-36 (p251)
MV801-MV803 (p263)
V1209-V1210 (p265-266)</td><td>MV70 (p256)
MV71 (p256)
MV72 (p256)
MV73 (p256)</td><td>7002 (p254)</td><td>VE101 (p258)
VE111 (p258)
VE112 (p258)
VE113 (p258)
V1N30* (p264)</td><td>VIBCABLE (p260)</td><td>Product range ←</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Nominal static load in daN</td></tr>
<tr><td></td><td rowspan="24">Natural frequency = 1,5 to 9 Hz</td><td rowspan="4">Natural frequency = 15 to 25 Hz</td><td rowspan="6">Fréquence propre = 5 à 10 Hz</td><td rowspan="16">Fréquence propre = 3,5 à 6 Hz</td><td rowspan="16">Natural frequency = 7 to 25 Hz</td><td>5</td></tr>
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<tr><td rowspan="9">Natural frequency = 3 to 6 Hz</td><td></td><td></td><td>300</td></tr>
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<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>280 000</td></tr>
</table>

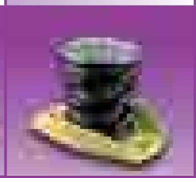
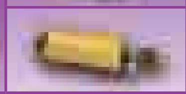
Note : Natural frequencies are given in axial.

APPLICATIONS GUIDE TO

	AXIAL FLEXIBILITY		AXIAL & RADIAL FLEXIBILITY + ANTI-REBOUND			
Product range →	Metal cushions (p218) & V1B5984 (p267)	V4* (p229) VIBSOL (p222) PDM-1000 (p233) PDM-2000 (p233) SP55*W (p234) SP56*W (p234) V120 & V125 (p239)	V118-DG (p237) V118-MG (p237) V318 (p237) V318-D (p237) V402MG (p243)	V164 (p241) V168 (p241)	V1H-6000 (p249) V1H-6100 (p249)	V1H751 (p245) V1H752 (p245)
APPLICATIONS						
ELECTRICAL ENCLOSURES	■				■	■
LIFTS AND ELEVATORS						
CRUSHERS			■		■	
VEHICLE CABS					■	
AIR CONDITIONING				■	■	
SIEVES						
GENERATOR SETS					■	■
MACHINE TOOLS	■	■	■	■		
SHIPBORNE EQUIPMENT			■		■	■
LABORATORY EQUIPMENT					■	
IC ENGINES					■	■
COMPRESSORS					■	■
PUMPS				■	■	■
GEARBOXES						
MATCH FONTS for all applications				■	■	
CIVIL ENGINEERING	■					
CEILINGS, PIPEWORK	■					
GANTRIES	■					
GUILLOTINES		■	■			
SCREENS						
TRANSFORMERS	■	■	■		■	
HOPPERS						
PIPEWORK	■		■		■	■
FLOATING FLOORS						
ELECTRONIC EQUIPMENT						

For mobile installation : V118, V318, V402, V1H751 or 752, V1H-6000 or 6100, 7002, VIBCABLE.
* = replaces a figure which can be of different values.

VIBRACHOC METAL RANGE

AXIAL FLEXIBILITY	AXIAL & RADIAL FLEXIBILITY		AXIAL & RADIAL FLEXIBILITY+ ANTI-REBOUND	AXIAL FLEXIBILITY	MULTIAXIAL FLEXIBILITY	
SP539-*** (p235)	VIBRAFLOT (p268)	V1B1114 (p251) V1B1115 (p251) V1B1116 (p251) V1B1134 (p251) V1B1135 (p251) V1B1136 (p251) V1209 (p265) V1210 (p266) MV801 (p263) MV803 (p263)	7002 (p254) MV70 (p256) MV71 (p256) MV72 (p256) MV73 (p256)	VE101 (p258) VE111 (p258) VE112 (p258) VE113 (p258) V1N30* (p264)	VIBCABLE (p260)	Product range ←
				 		APPLICATIONS
		■			■	ELECTRICAL ENCLOSURES
		■				LIFTS AND ELEVATORS
		■				CRUSHERS
						VEHICLE CABS
		■	■			AIR CONDITIONING
		■				SIEVES
		■				GENERATOR SETS
						MACHINE TOOLS
			■		■	SHIPBORNE EQUIPMENT
		■	■			LABORATORY EQUIPMENT
		■				IC ENGINES
		■				COMPRESSORS
		■				PUMPS
		■				GEARBOXES
		■				MATCH FONTS for all applications
■		■				CIVIL ENGINEERING
				■		CEILINGS, PIPEWORK
						GANTRIES
■		■				GUILLOTINES
		■				SCREENS
■						TRANSFORMERS
		■				HOPPERS
				■		PIPEWORK
	■	■				FLOATING FLOORS
			■			ELECTRONIC EQUIPMENT

METALLIC CUSHIONS

Natural frequency : (1)
12 to 25 Hz

DESCRIPTION

Metallic cushions are made from drawn, woven stainless steel wire that is compressed into a geometric shape.

The Vibrachoc range has more than 1000 standard metallic cushions of various sizes and characteristics.

As metallic cushions are easy to create, custom shapes and characte-ristics can be developed and produced on request.

APPLICATIONS

Standard or custom metallic cushions can be used for many industrial applications because they are naturally resistant to grease, oil, water, etc and withstand temperatures from - 70°C to + 300°C.

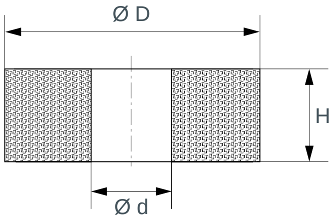
The static stiffness of the metallic cushion ensures progressive stiffening and maintains a constant natural frequency for a very wide range of loads within a small space.

Their natural frequency of between 12 and 25 Hz and damping of 15 to 20% make them suitable for mounting rotating machines with a rotation speed over 2000 rpm.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS

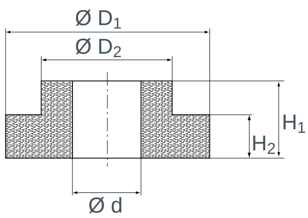
SIMPLE CYLINDRICAL SHAPE



For cushions with alternative dimensions and load ranges, please consult us.

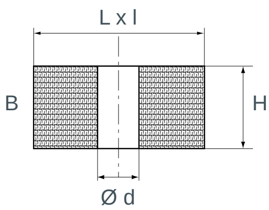
Reference	Ø Ext. D (mm)	Ø Int. d (mm)	Height H (mm)	Load range (daN)	Dynam. force (daN)	Natural frequency (Hz)
VI168-B	53	16,5	14	20 to 250	1 250	15 to 22
V3CNVJ653-A02	33	14	19	75 to 300	900	15 to 22
CH440-A02	72	50	21	50 to 350	1 000	15 to 20
VI771-A02	40	15	20	150 to 550	1 700	15 to 20
MC345-A02	72	34	21	300 to 1 300	5 000	15 to 20
CH281-A02	119	34	21,5	700 to 2 700	12 500	15 to 20
CH283-A02	159	70	21,5	250 to 7 000	22 500	15 to 20
VI996-A02	203	121	21	250 to 7 000	22 500	15 to 20
CH438-A02	72	51	10	50 to 350	1 000	15 to 25
CH265-A02	70	34	10,5	300 to 1 300	5 000	15 to 25
CH264-A02	116	36	11	700 to 2 700	8 000	15 to 25
VI771-B02	40	15	11,5	750 to 3 000	9 000	15 to 25
CH472-A02	156	72	10,5	2 000 to 7 000	21 000	15 to 25

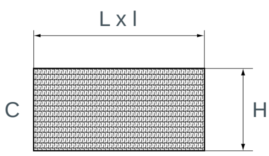
CYLINDRICAL SHOULDERED SHAPE



Reference	Ø D1 (mm)	Ø D2 (mm)	Ø int. d (mm)	H_1 (mm)	H_2 (mm)	Load range (daN)	Dynam. force (daN)	Natural frequency (Hz)
VJ148-A05	72	48	33	25	21	50 to 350	1 050	15 to 20
V3CNCH682-A05	69,5	52	34	30	23,5	50 to 300	900	15 to 20
V3CNVJ044-A05	52,6	26,5	16	21,5	14	25 to 200	600	15 to 22
V3CNVJ102-A05	49	27,5	18	30	24,5	20 to 100	300	15 to 20
VJ164-A05	34,5	20,5	12,5	14	10	15 à 100	300	20 to 25

RECTANGULAR SHAPE

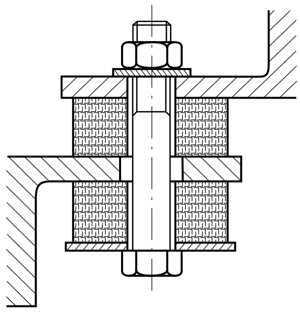




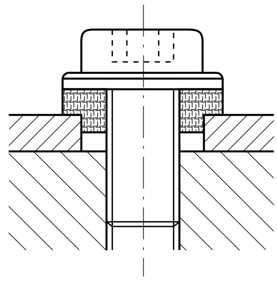
Reference	Shape	Dim. L x l (mm)	Ø int. d (mm)	H (mm)	Load range (daN)	Dynam. force (daN)	Natural frequency (Hz)
VI786-A06*	B	53 x 49	8	25	30 to 200	800	12 to 18
VI830-B06	C	28 x 28	-	15	50 to 300	1 000	17 to 22
VI700-A06*	C	50 x 47	-	25	75 to 400	1 200	12 to 18
VI700-B06*	C	50 x 47	-	16	75 to 400	1 600	17 to 22
CH422-A06	C	45 x 36	-	16	400 to 1 500	5 000	20 to 25
V3CNVJ034-A06	B	100 x 100	20	34	2 000 to 7 000	20 000	12 to 18
VJ149-A06	B	28 x 28	10,5	10	25 to 150	450	20 to 25
V3CNVJ006-A06	B	157 x 157	30	25	500 to 5 000	15 000	13 to 18

* : References detailed in the following pages

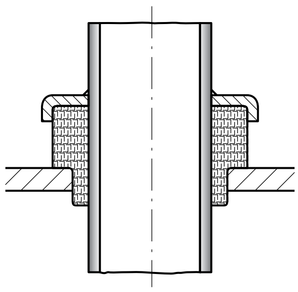
ASSEMBLY EXAMPLES



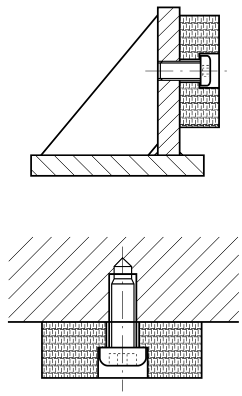
Suspension of gearboxes, motors, fans, pumps, axial load only.
A gap is necessary around the fixing screw.



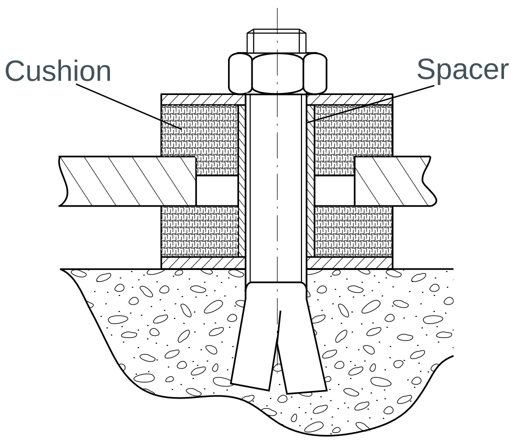
Absorbs expansion and isolates screws under dynamic load.



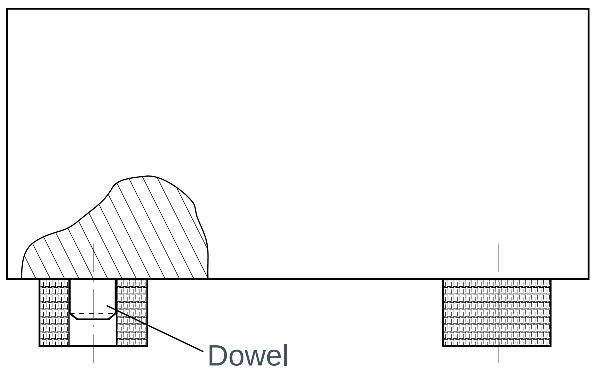
Pipe isolation.



Suspension of motors, fans, etc.



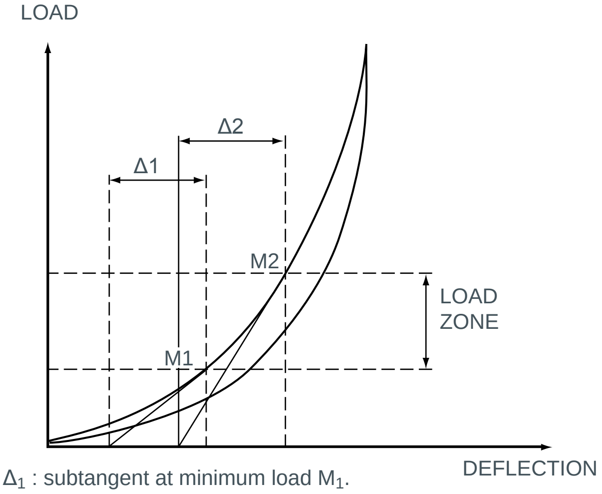
Scheme showing a cushion mounting with uplift snubber.



Machine mounted on cushions located on dowels.

OPERATING CHARACTERISTICS

TYPICAL STIFFNESS CURVE
FOR A METALLIC CUSHION



Δ_1 : subtangent at minimum load M_1.
Δ_2 : subtangent at maximum load M_2.
$\Delta_1 = \Delta_2$

Natural frequency of the mounting remains constant in the load zone.
The elastic limit of the metallic cushion under compression is 3 to 5 times greater than the maximum static load shown in the data sheets.

1 - Excellent resistance to oil, grease, solvents, water, dust, chemical agents.

2 - Whistands temperatures from - 70°C to + 300°C and in certain applications - 150°C to + 400°C.

3 - Highly resistant to ageing : characteristics are stable.

4 - High damping from 15 to 20%, i.e. tan. δ from 0.3 to 0.4 corresponding to an amplification factor at resonance < 4.

5 - Loading up to 150 kg/cm² under compression and 500 kg/cm2 for isolating shocks.

6 - Natural frequency between 15 and 25 Hz.

VIBSOL ®

Natural frequency : (1)
15 to 30 Hz

DESCRIPTION

The VIBSOL mount is made of a round metal cushion covered with an anti-slip elastomer pad on both side.

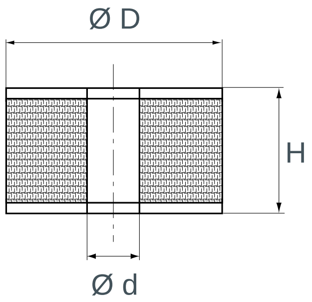
- It is available in two versions :
  - a standard version with a natural frequency of 22 to 30 Hz (machine tools);
  - a thick version (W) with lower stiffness and a natural frequency of 15 to 22 Hz (metal forming machines).

APPLICATIONS

- The VIBSOL mount is a simple and quick solution for machine tools offering a good shock absorption, and easy to install by sliding it under the base of the machine.
- Unaffected by oils, cutting fluids, detergents, high and low temperatures with good resistance to fatigue.
- It offers good stability for the suspended machine.
- A constant natural frequency over a wide load range makes mount selection easy.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

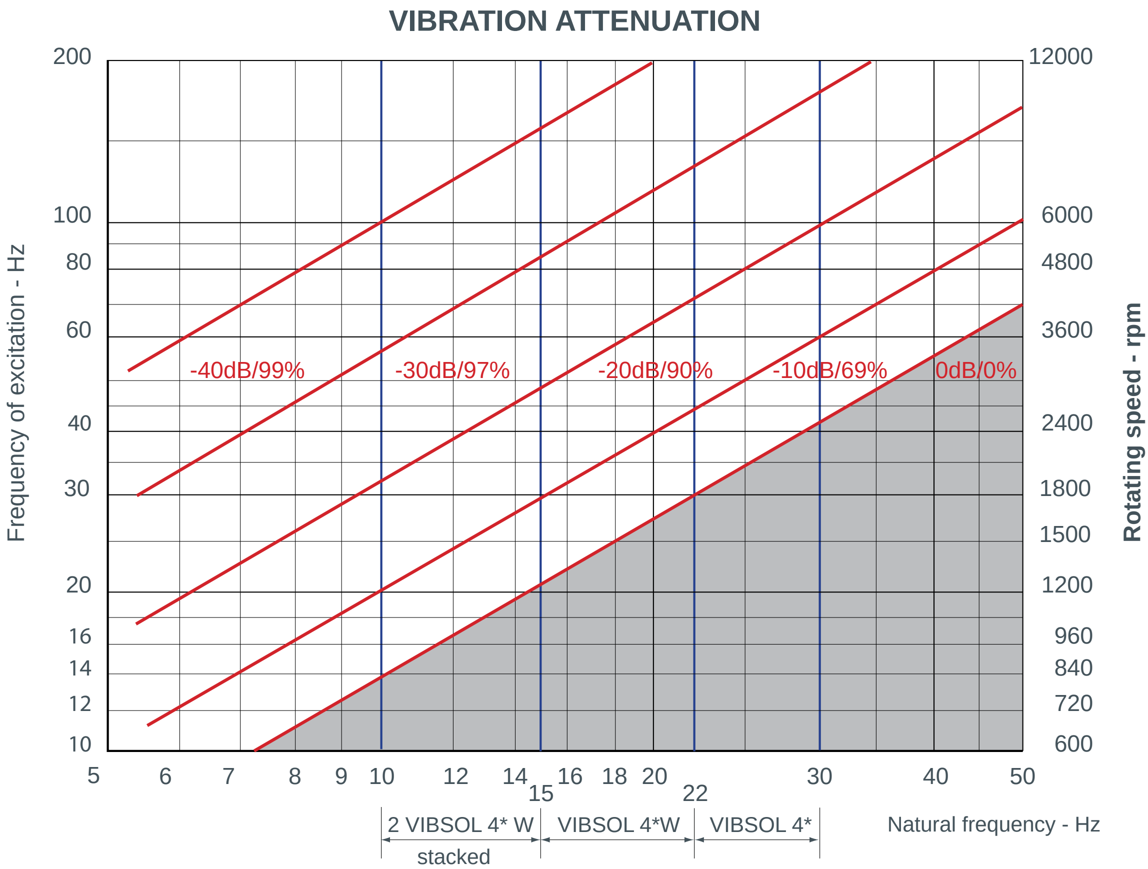
DIMENSIONS



Type	Part number	Ø D (mm)	Ø d (mm)	Height H (mm)	Load range (daN)	Natural frequency (Hz)
VIBSOL 43	V6080 F43	72	51	12	50 to 350	22 to 30
VIBSOL 43W	V6080 F43W	72	50	23	50 to 350	15 to 22
VIBSOL 44	V6080 F44	70	34	13	300 to 1 300	22 to 30
VIBSOL 44W	V6080 F44W	70	34	23	300 to 1 300	15 to 22
VIBSOL 45	V6080 F45	116	36	13	700 to 2 700	22 to 30
VIBSOL 45W	V6080 F45W	116	34	24	700 to 2 700	15 to 22
VIBSOL 46	V6080 F46	156	72	14	2 000 to 5 000	22 to 30
VIBSOL 46W	V6080 F46W	156	70	24	2 000 to 5 000	15 to 22

The part numbers referenced are kept in stock, see current price list for availability of items.

OPERATING CHARACTERISTICS



VIBSOL® mountings

VI786 - A06
VI700 - A06
VI700 - B06

Natural frequency : (1)
15 to 20 Hz

DESCRIPTION

This suspension system consists of rectangular cushions made of woven compressed stainless steel wire. The VI786 have a Ø 9 bored screw hole, so that they can be mounted in collars with the diameters required by the user.

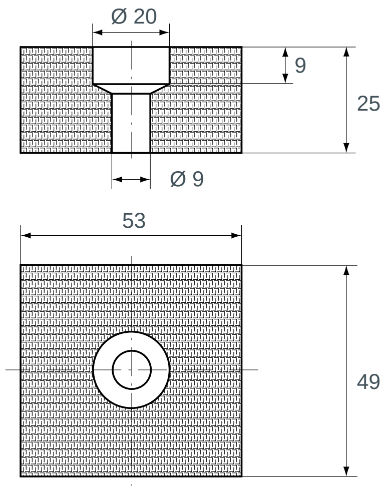
APPLICATIONS

This suspension system is particularly suitable for mounting exhaust pipes from generator sets on board ship or permanently mounted in buildings. They are unaffected by aggressive chemicals, oil, grease and corrosion and withstand extreme temperatures from - 70°C to + 300°C.

The natural frequency of between 15 and 20 Hz enables the pipes to be mounted independently of the support and thus reduces noise levels and allows the pipes to expand freely.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS

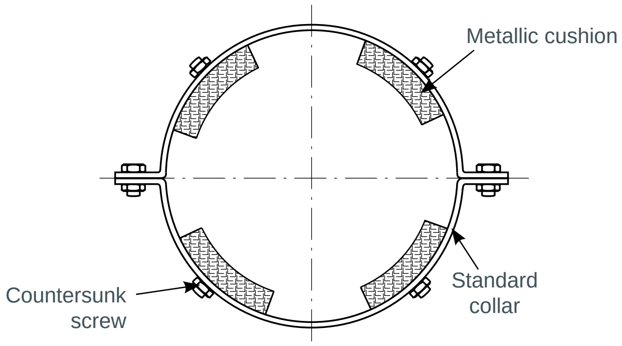


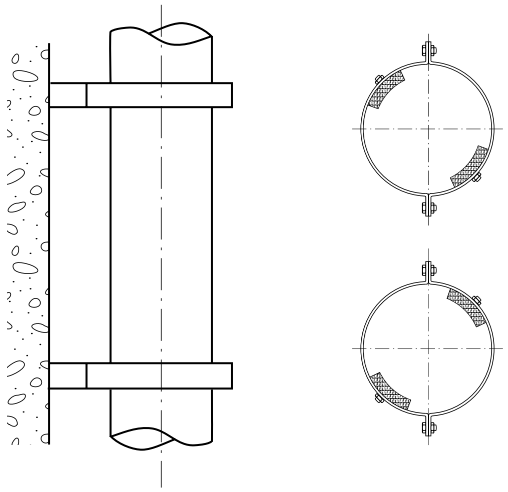
Assembly :
Countersunk screws can be used to mount the cushions inside the collar.

The number of cushions used should be a multiple of 4, depending on the diameter of the pipework see table below.

However, for small diameter pipes, 2 collars can be used edge to edge, each having 2 pads at opposite diagonals.

OPERATING CHARACTERISTICS



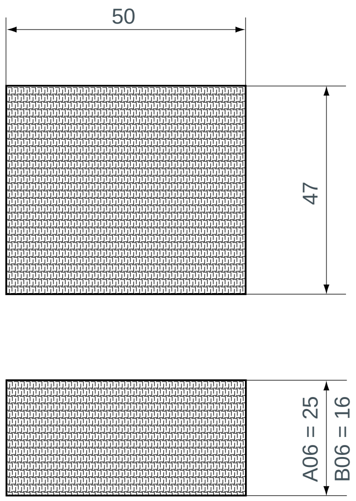


Ø of the pipe (mm)	Number of cushions
75 - 175	4
175 - 425	8
425 - 550	12
550 - 700	16
700 - 850	20
850 - 1 000	24
1 000 - 1 150	32
1 150 - 1 300	36
1 300 - 1 450	40
1 450 - 1 600	44
1 600 - 1 750	48

Max. dynamic force in compression : 800 daN.
Static load range from 30 to 200 daN.

Collars and screws not supplied.

DIMENSIONS



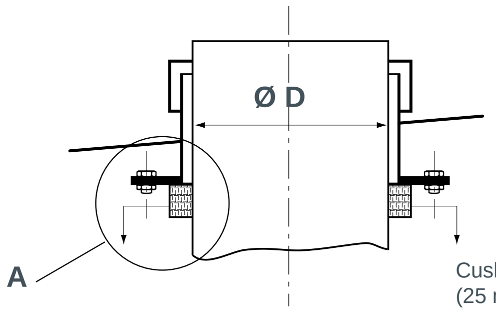
Assembly :
Our wide range of mounts can meet many requirements. These mounts should be used as shown in the following diagram (two half collars, in which the cushions are placed side by side, are connected to the structure).

Note : the cushions may be mounted in two orientations : the height H is shown on the table. Refer to the drawing to ensure that the height H is correct when mounted.

Choice :
The cushions are 16 mm or 26 mm thick. We advise using VI700-B06 pads (16 mm thick) for Ø D pipes < 270 and VI700-A06 (25 mm thick) for Ø D pipes > 270.

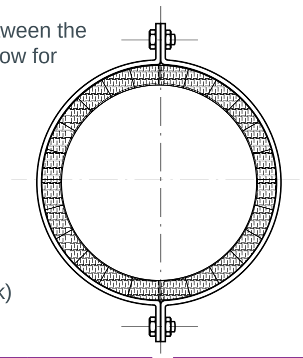
For example :
- for Ø D ext 140 pipe : use 9 VI700-b06 cushions;
- for Ø D ext 1000 pipe : use 61 VI700-A06 cushions.

OPERATING CHARACTERISTICS



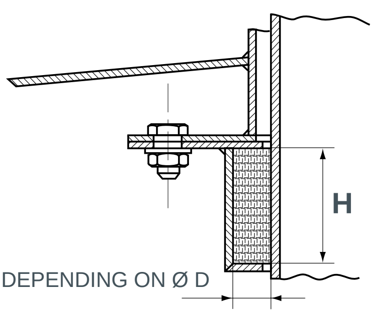
Use spacers between the half collars to allow for future tightening

Cushions VI700-A06 (25 mm thick) or VI700-B06 (16 mm thick)



Necklace and screw not supplied.

DETAIL A



Pipe Ø D (mm)	H (mm)	Number of cushions	Pipe Ø D (mm)	H (mm)	Number of cushions
75 to 85	50	5	335 to 380	47	21
80 to 90	47	5	360 to 410	50	24
90 to 100	50	6	400 to 450	50	27
95 to 105	47	6	445 to 500	47	28
105 to 120	50	7	500 to 560	47	31
120 to 135	50	8	560 to 630	47	35
135 to 150	50	9	620 to 700	47	39
150 to 170	50	10	700 to 790	47	44
165 to 185	50	11	780 to 880	47	49
180 to 200	50	12	875 to 985	47	55
195 to 220	50	13	975 to 1 100	47	61
210 to 240	50	14	1 100 to 1 240	47	69
240 to 270	47	15	1 230 to 1 385	47	77
270 to 305	47	17	1 370 to 1550	47	86
300 to 340	50	20	1 530 to 1 725	47	96

Maximum dynamic force in compression : VI700-A06 = 1 200 daN
VI700-B06 = 1 600 daN

Static load range from 75 to 400 daN

METALLIC CUSHIONS FOR PIPEWORK

Natural frequency : depending on load (1)

DESCRIPTION

The metal cushions for pipework are made from stainless steel wire that is work hardened, knitted, crimped and compressed to a given shape in a press.
The cushion can be supplied on its own or in a mounting kit which comprises two cushions, two spacers, a retaining zinc plated steel clamp.

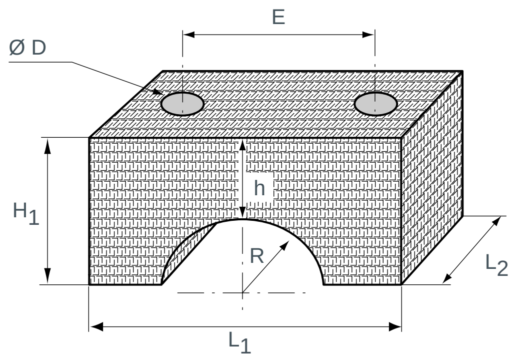
APPLICATIONS

The cushions are resistant to temperatures from - 70°C to + 300°C and are used to clamp and isolate pipes against vibration.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS

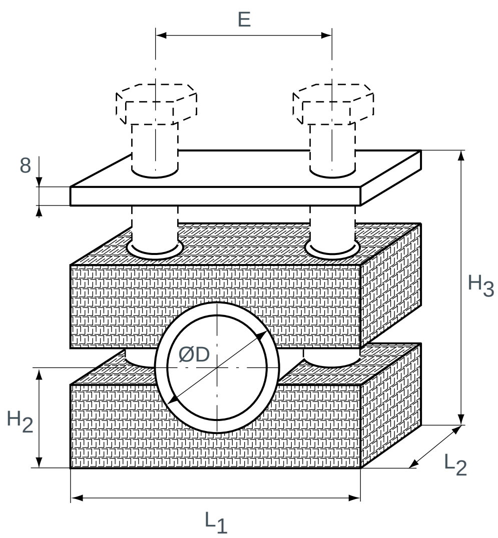
CUSHION ONLY



Reference for cushion only	R (mm)	L_1 (mm)	L_2 (mm)	H_1 (mm)	h (mm)	Ø D (mm)	E (mm)
000 51 430	5,10	60	30	15	12	7	40
000 51 431	6,75	60	30	15	12	7	40
000 51 432	8,60	70	30	20	16	7	50
000 51 433	10,65	70	30	20	14	7	50
000 51 423	16,50	87	31	30	20	9	65
000 51 422	24,00	88	32	30	15	9	65
V3CNVJ123-A06	20,00	115	35	35	15	13,5	85
V3CNVJ122-A06	25,00	115	35	35	15	13,5	85
V3CNVJ121-A06	30,00	115	35	35	15	13,5	85

Dimensions are for unloaded cushions.

CUSHION KIT (Screws not supplied)



Kit reference	Ø D (mm)	L1 (mm)	L2 (mm)	H2 (mm)	H3 (mm)	E (mm)
V6056K01	40	115	35	32,5	73	85
V6057K01	50	115	35	37,5	83	85
V6058K01	60	115	35	42,5	93	85

Dimensions are for loaded cushions.

V43 V44
V45 V46

Natural frequencies : (1)
V4* = 22 to 30 Hz
V4*W = 15 to 22 Hz

See also PAULSTRA elastomer range : Nivofix - Minifix

DESCRIPTION

Standard V43, V44, V45 and V46 mounts have a cast steel base and a resilient element made from a stainless steel wire cushion.
The version H includes a cup and a levelling stud. It can also be equiped with grip pads.
Version W differs from the standard version as it has a thicker cushion for greater flexibility

APPLICATIONS

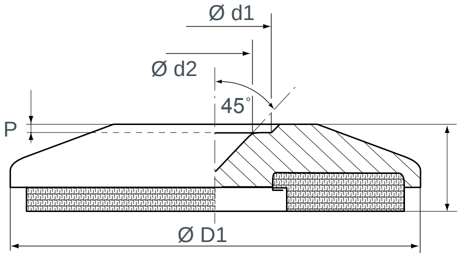
This range with a natural frequency of 15 to 30 Hz can be used for mounting machine tools in harsh industrial environments.

They are unaffected by oil, temperature and fatigue and their life time is often the same as that of the machine.

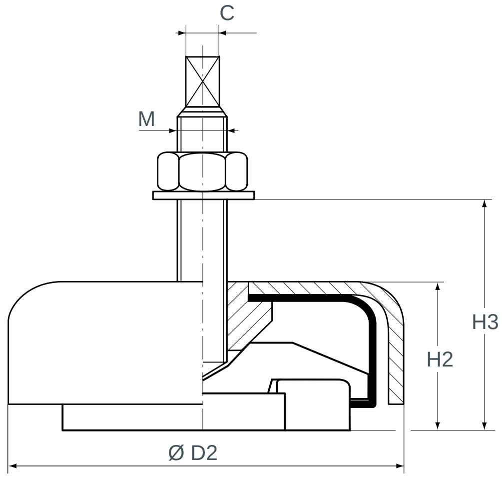
The thicker metallic cushion of the version W, can be used for mounting forming tools (presses, shears, folding machines) and improves the vibration isolation level.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



V4*(-W)



V4*H(-W)

* Complete part number; see table below.
W = Low frequency cushion.

OPERATING CHARACTERISTICS

Reference	Static load (daN)	Max. dynamic force in compression (daN)	Natural frequency (Hz)	Ø D1 (mm)	H1 (mm)	Ø D2 (mm)	H2 (mm)	M	C (mm)	H3 maxi (mm)	Ø d1 (mm)	Ø d2 (mm)	P (mm)
V43	50 to 350	750	22 to 30	81	20	-	-	-	-	-	17	12	3
V43-H				-	-	96	35	M12	8	115	-	-	-
V43-W			15 to 22	81	31	-	-	-	-	-	17	12	3
V43-WH				-	-	96	46	M12	8	125	-	-	-
V44	200 to 1 300	4 000	22 to 30	81	20	-	-	-	-	-	17	12	3
V44-H				-	-	96	35	M16	10	135	-	-	-
V44-W			15 to 22	81	31	-	-	-	-	-	17	12	3
V44-WH				-	-	96	46	M16	10	147	-	-	-
V45	700 to 2 700	8 000	22 to 30	128	26	-	-	-	-	-	33	18	3
V45-H				-	-	152	45	M20	13	155	-	-	-
V45-W			15 to 22	128	36,5	-	-	-	-	-	33	18	3
V45-WH				-	-	152	56	M20	13	163	-	-	-
V46	2 000 to 5 000	15 000	22 to 30	170	34,5	-	-	-	-	-	44	28	4
V46-H				-	-	190	60	M24	16	160	-	-	-
V46-W			15 to 22	170	43,5	-	-	-	-	-	44	28	4
V46-WH				-	-	190	71	M24	16	170	-	-	-

Maximum excitation at resonant frequency: ± 0.2 mm (± 0.4 mm with low frequency cushion, suffix W).

V47 V47D
V47T V47Q

Natural frequency : (1)
8 to 20 Hz

DESCRIPTION

- Anti-vibration mount available with a constant natural frequency over a wide load range.
- Cast iron base and levelling device.
- Conical wire mesh cushion, capable of narrying lateral loads.
- V47D version has a stack of two cushions with a cast iron separating cup.
- V47T and V47Q have three and four metal cushions respectively.

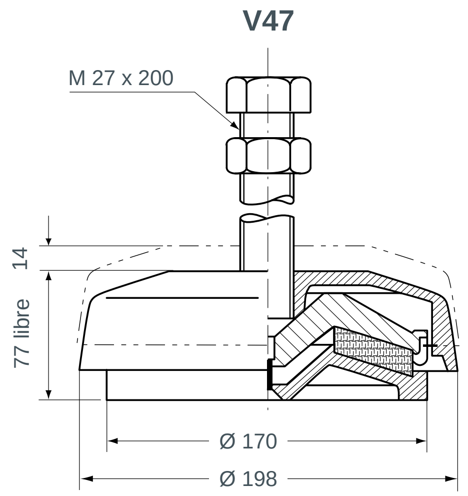
APPLICATIONS

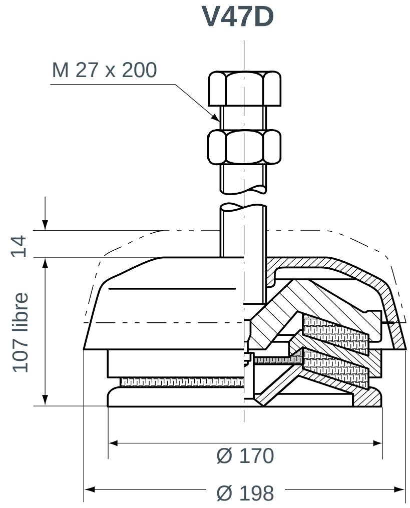
This machinery mount, with adjustable height, is used for machine tools and other rotating machine.

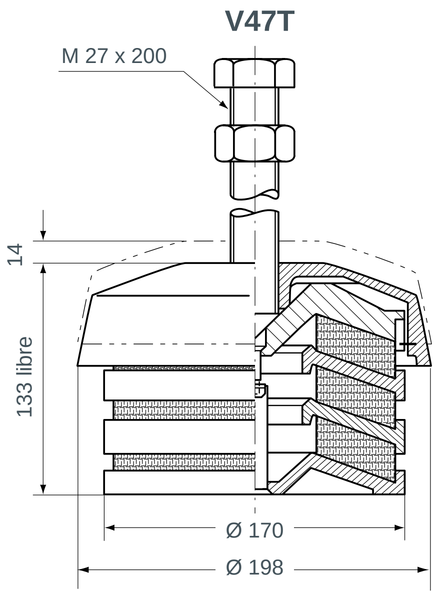
The V47 and V47D are designed for presses and printing machines.

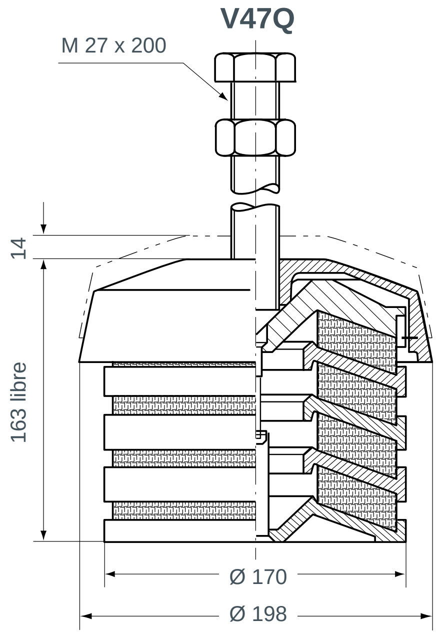
(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS









OPERATING CHARACTERISTICS

Reference	Load range (daN)	Max. dynamic force (daN)	Natural frequency (Hz)	Weight of mounting (kg)
V47	250 to 7 000	21 000	15 to 20	9,1
V47D	250 to 7 000	21 000	12 to 16	12,2
V47T	250 to 7 000	21 000	10 to 13	13,1
V47Q	250 to 7 000	21 000	8 to 11	15,1

PDM-1000-01
PDM-2000-01

Natural frequency : (1)
15 to 18 Hz

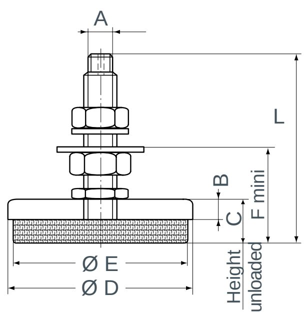
DESCRIPTION

Low profile mounts with high static and dynamic load range.
- 100% 316 stainless steel.
- Natural frequency from 15 to 18 Hz.
- Dynamic load in compression : 3 g.
- Maximum sinusoidal input at resonance: ± 0.4 mm.

APPLICATIONS

- Anti-vibration mounts for presses and machine tools without the need to fix or grout in position.
- For chemical, food industry,...

OPERATING CHARACTERISTICS



Reference	Static load (daN)	A	B (mm)	C (mm)	Ø D (mm)	Ø E (mm)	F (mm)	L (mm)
PDM-1000-01	200 to 1 000	M12 M16	18	27	80	73	52	156
PDM-2000-01	800 to 2 000	M16 M20	15	30	128	120	62	197

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

SP55*W
SP56*W

Fréquence propre : (1)
15 à 20 Hz

DESCRIPTION

Machine mount available with a stud (SP55*W) or threaded hole (SP56*W).
- Top cup and stud are mild steel zinc plated.
- Stainless steel wire mesh cushion.
- Natural frequency between 15 to 20 Hz.

APPLICATIONS

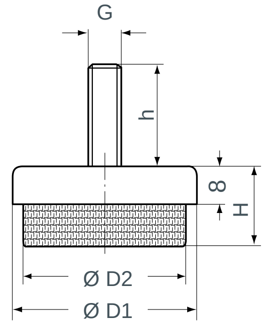
- Mount for low loads.
- Suitable for rotating machines (> 2500 rpm) and laboratory equipment ...

OPERATING CHARACTERISTICS

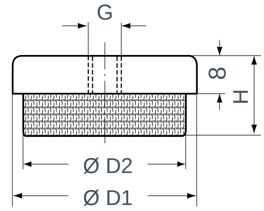
Reference with thread. stud	Reference with tapped hole	Ø D1 (mm)	Ø D2 (mm)	H (mm)	h* (mm)	G	Static load (daN)	Deflection under load (mm)
SP550W	SP560W	28	23,6	17,5	20	M6	60	4,2
SP551W	SP561W	40	34,5	17	20	M6	100	4,8
SP552W	SP562W	45	40	22	25	M8	150	5,6
SP553W	SP563W	58	53,6	22	25	M8	225	6,3

* SP55*W only

SP55*W



SP56*W



(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

SP539-882 SP539-883 SP539-887 SP539-888

Natural frequency : (1)
10 to 16 Hz

DESCRIPTION

All metal mount comprising a stack of between two and three woven steel cushions giving a variation in natural frequency depending upon the number of cushions. This make higher levels of isolation possible.

The stainless steel cushions in conical shape are capable of carrying radial loads.

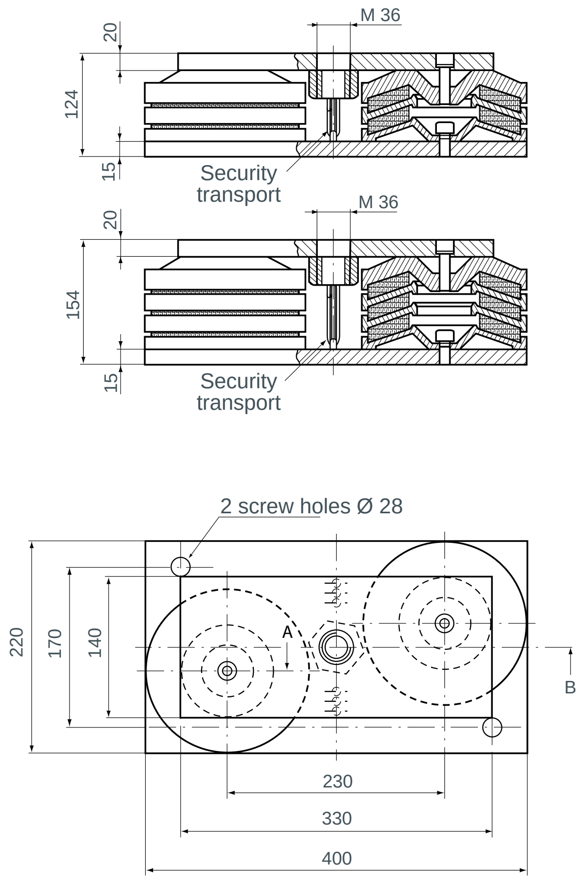
This mount ensures good stability of the suspended equipment.

APPLICATIONS

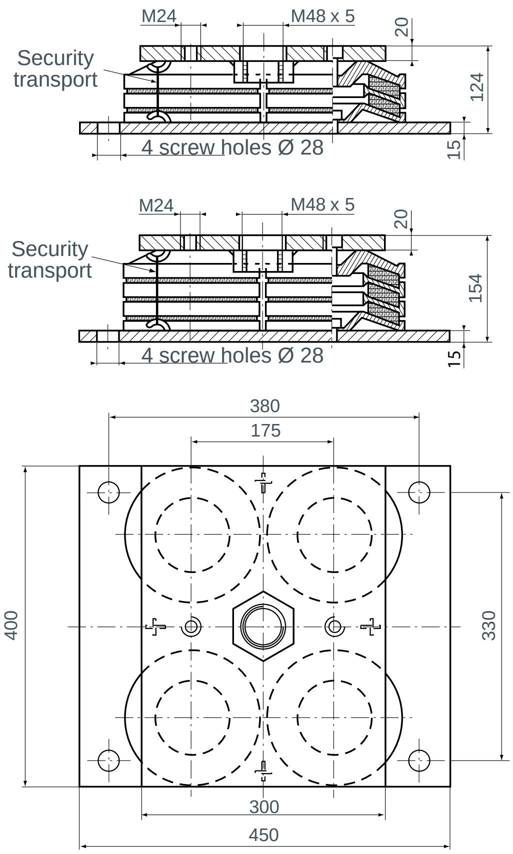
- Metal cutting or metal forming machines (presses, punches, ...).
- Heavy rotating machines.n Machines tournantes fortes charges.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



SP539-882
SP539-883



SP539-887
SP539-888

OPERATING CHARACTERISTICS

Reference	Height (mm)	Load range (daN)	Natural frequency (Hz)	Weight of mounting (kg)
SP539-882 SP539-883	124 154	500 to 14 000	12 to 16 10 to 13	37 41
SP539-887 SP539-888	124 154	1 000 to 28 000	12 to 16 10 to 13	70 82

V118-MG V118-DG
V318 V318-D

Natural frequency : 11 to 22 Hz (1)

DESCRIPTION

V118-MG and V318 mounts have cast iron cover and base with 4 mountings holes in the base and a central tapped hole in the cover.

The resilient elements are dtainless steel wire mesh cushions :

- V118-MG and V318 have two cushions;
- V118-DG and V318-D have three cushions.

APPLICATIONS

This series of mounts have a natural frequency between 18 and 25 Hz and can be used for mounting :

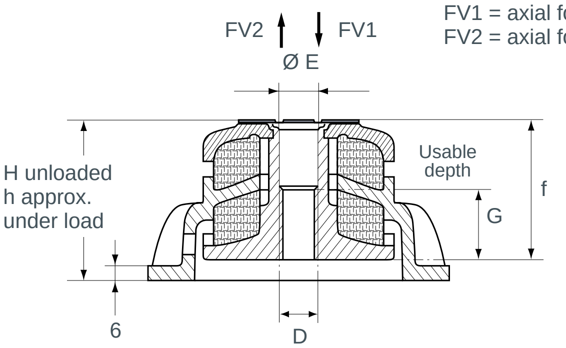
- heavy machinery (grinders, crushers, inclined presses, eccentric presses, printing presses, textile machines);
- rotating machines (motors, generator sets, pumps, etc), which rotate at more than 2000 rpm for V118-DG and V318-D and up to 2500 rpm for V118-MG and V318;
- gantry cranes (structure, cabs, equipment).

The isometric stiffness characteristics and anti-rebound metal cushions of these suspensions makes them suitable for suspending engines on ships, vehicles, etc.
As they can withstand temperatures between - 70°C and + 300°C, they can also be used for mounting exhaust pipes.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

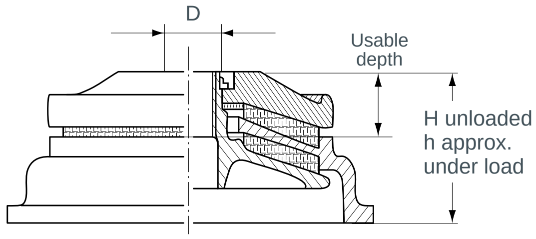
DIMENSIONS

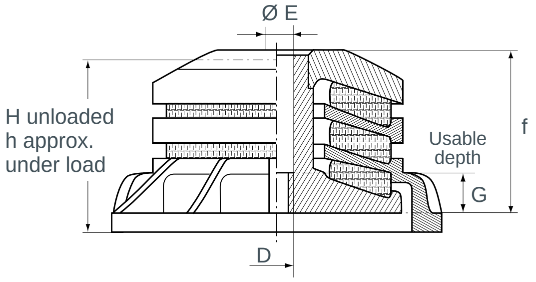
V118-MG

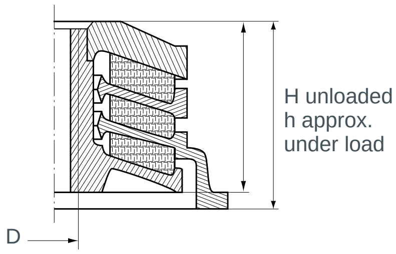


FV1 = axial force in compression
FV2 = axial force in traction

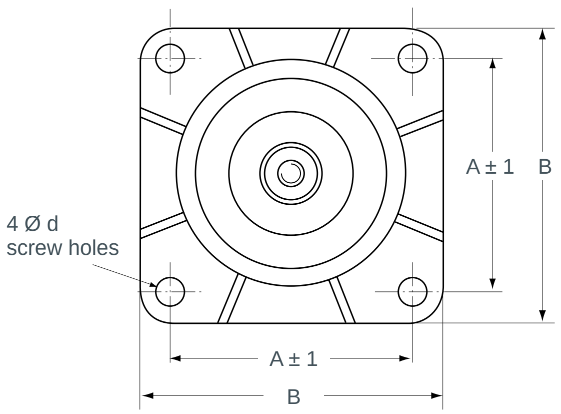
V318



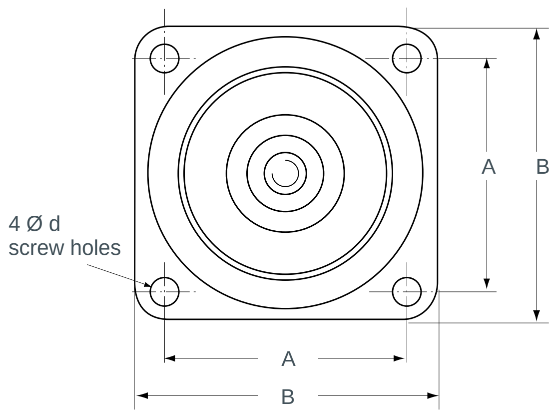




V118-DG



V318-D



Reference	A (mm)	B (mm)	D	Ø E (mm)	G (mm)	H (mm)	Ø d (mm)	f (mm)	h under FV1 app. (mm)	h under FV2 app. (mm)
V118-MG	100	130	M16	16,5	30	73	12	63	68	77
V118-DG	100	130	M16	16,5	30	98	12,5	84	-	-
V318	170	220	M27	-	59	97	17	-	93	100
V318-D	170	220	M27	-	-	125	17	112	-	-

Operating characteristics

- Maximum permitted excitation at natural frequency of suspension : ± 0.3 mm.
- Amplification factor at resonance : < 4.

Reference	Load range (daN)	Maximum dynamic forces (daN)			Natural frequency (Hz)	Weight of mounting (kg)
		Axial compression	Axial traction	Radial		
V118-MG V118-DG	50 à 900	4 500	1 500	1 500	16 to 22 11 to 17	2 2,4
V318 V318-D	250 à 7 000	21 000	9 000	7 500	16 to 22 11 to 17	10 13

V120 V120-D
V125 V125-D

Fréquence propre : (1)
13 à 20 Hz

DESCRIPTION

Series of all metal low profile mounts with one or two cushions, working in compression only, permitting high dynamic overloads (using a load distribution plate). Mounts can be fixed to floor.

Made of cups welded on a steel base with one or two stainless steel cushions (inox 18/8).

The steel parts are painted to protect against corrosion.

APPLICATIONS

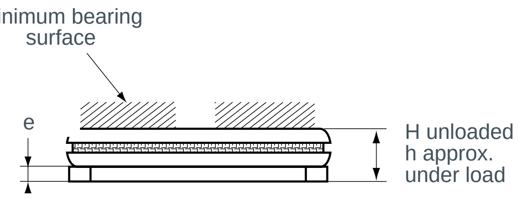
These mounts are designed for :

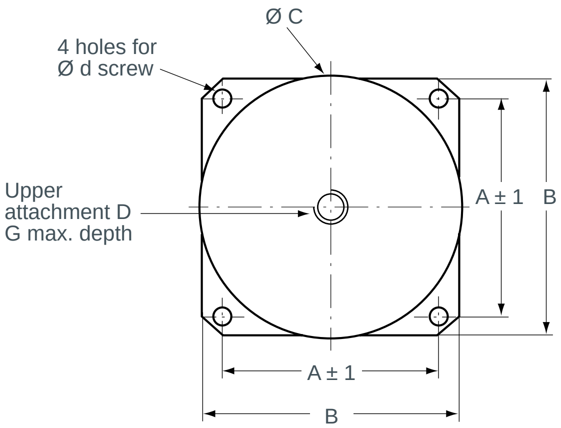
- suspension of presses;
- suspension of machine-tools which do not need levelling;
- suspension of transformers, diesel engines;
- suspension of rotating machines operating :
  - > 2500 rpm : V120 and V125;
  - > 2000 rpm : V120-D and V125-D.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

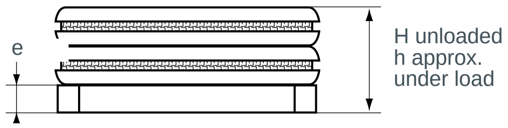
DIMENSIONS

V120
V125





V120-D
V125-D



Reference	A (mm)	B (mm)	Ø C (mm)	D	G (mm)	H (mm)	b (mm)	Ø d (mm)	e (mm)	h (mm)
V120 V125	114 138	150 165	126 165	M16 M20	28	36	140 160	12	8	32
V120-D V125-D	114 138	150 165	126 165	M16 M20	50	70 70.5	140 160	12	16	66

OPERATING CHARACTERISTICS

- Maximum permitted excitation at natural frequency of suspension :
  V120 and V125 : ± 0.3 mm;
  V120-D and V125-D : ± 0.4 mm.

- Natural frequencies for this amplitude :

  - Axial { V120 and V125 : 15 to 20 Hz;
    V120-D and V125-D : 13 to 18 Hz.

- Amplification factor at resonance : < 5.
- Operating temperature : - 70°C to + 300°C.

Reference	Static axial load (daN)	Maximum dynamic force in compression (daN)	Weight of mounting (Kg)
V120 V125	120 - 2 500 250 - 7 000	12 500 22 500	2,3 3,5
V120-D 125-D	120 - 2 500 250 - 7 000	12 500 22 500	4,5 7

V164
V168

Natural frequency : (1)
8 to 22 Hz

DESCRIPTION

The V164 and V168 dampers have a cover, an AG3 mounting plate and an AU4G shaft. The assembly is chromatised.

The upper and lower stainless steel cushions are the resilient elements of the mount. It has four Ø 8 mounting holes on the mounting plate and one M10 tapped hole on upper cover.

APPLICATIONS

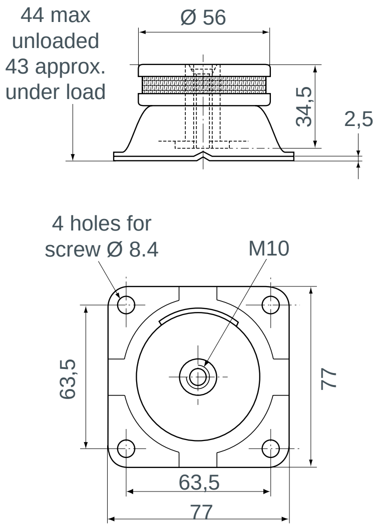
The load range of between 5 and 170 kg makes it suitable for isolating light machine tools from motors with rotational speeds of over 2500 rpm.

The V164 has an isometric natural frequency of 15 to 22 Hz and 8 to 12 Hz. Their lower cushion can withstand accidental traction forces (for example, shock rebound).

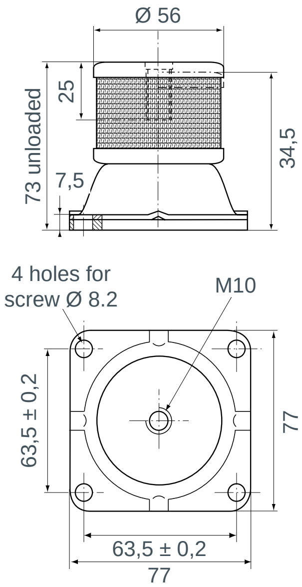
These dampers are not affected by aggressive chemicals and can be used, for example, for mounting petro-chemical pumps.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

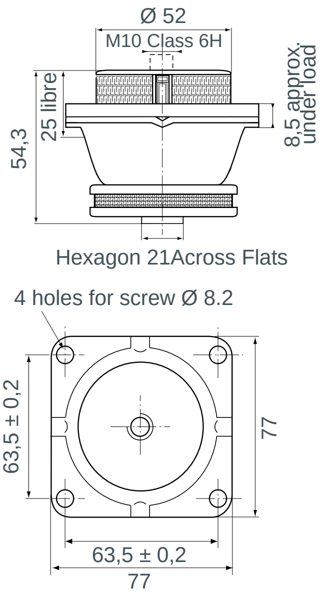
DIMENSIONS



V164



V168 - 1U
V168 - 2U



V168

OPERATING CHARACTERISTICS

- Maximum permitted excitation at natural frequency of suspension : ± 0.3 mm.
- Amplification factor at resonance : < 4.
- Operating temperature : - 70°C to + 300°C.

Reference	Natural frequency axial and radial	Static axial load axiale (daN)	Maximum dynamic forces (daN)		Weight of mounting (kg)
			Compression	Tension	
V1646-F V164-G	15 to 22 Hz	5 to 30 20 to 250	150 1 250	150 600	0,18
V168-1U V168-2U	8 to 12 Hz	25 to 60 50 to 170	150 510	75 150	0,35
V168-1 V168-2	10 à 13 Hz	25 à 60 50 à 170	75 150	180 510	0,35

V402 - MG

Natural frequency : (1)
15 to 22 Hz

DESCRIPTION

The V402-MG damper has a cast iron upper cover and mounting plate and a high strength aluminium alloy shaft.

The resilient element is a wonen stainless steel cushion.

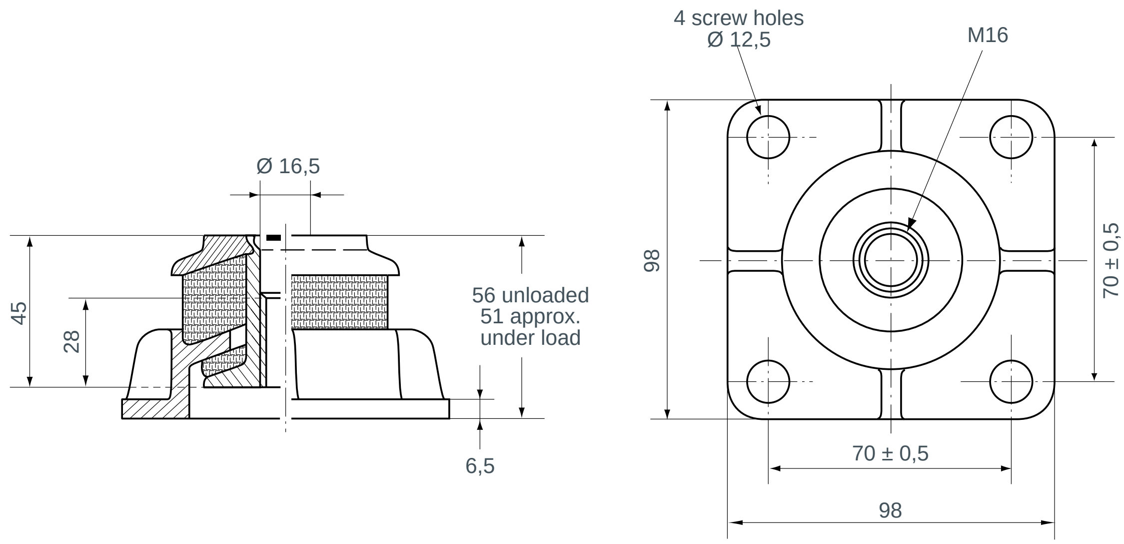
The cast iron parts are painted.

APPLICATIONS

This all metal damper has a natural frequency between 15 and 22 Hz and is isometric within the defined load ranges. It is designed for compression loads but its retaining cushion makes it able to withstand high tensile forces.
The conical cushions provide resilience in all directions. It can be used to suspend fixed or on board machine tools and rotating machines (pumps, engines, generator sets rotating at speeds over 2500 rpm).

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



OPERATING CHARACTERISTICS

- Natural frequency :
  - axial } 15 to 22 Hz.
  - radial
- Maximum permitted excitation at natural frequency of suspension : ± 0.3 mm.
- Amplification factor at resonance : < 4.
- Operating temperature : - 70°C to + 300°C.
- Weight 0.75 Kg approximative.

Reference	Static load (daN)	Maximum dynamic force (daN) (compression or tension)
V402-MG	30 to 700	3 500

V1H751
V1H752

Natural frequency : (1)
15 to 25 Hz

DESCRIPTION

The V1H751 and 752 range has a pressed steel casing and mounting plate and light alloy shaft. The resilient element is a stainless steel wire pad.

The steel parts are painted.

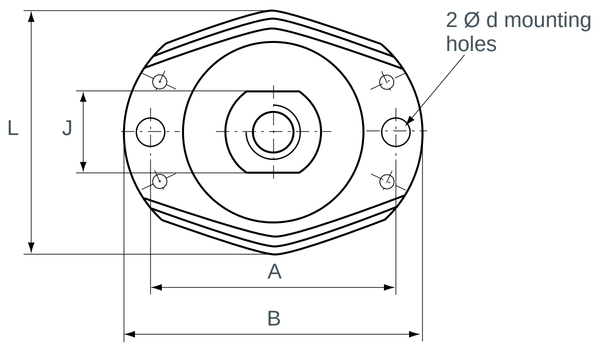
APPLICATIONS

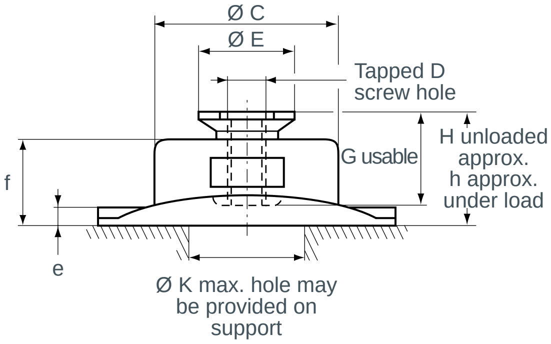
The V1H 751 and 752 have a natural frequency between 15 and 25 Hz for static loads under compression.

The -11 and -12 versions are reinforced by radial cushions and can absorb considerable horizontal dynamic forces, which makes it possible to use them for mounting on board equipment in ships, rail, road transport, civil engeneering plant (engines, pumps, generator sets, pipework) or fixed machines that have to be floor mounted.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS





Reference	A (mm)	B (mm)	Ø C (mm)	D	Ø E (mm)	G (mm)	H (mm)	J (mm)	Ø K (mm)	L (mm)	Ø d (mm)	e (mm)	f (mm)	h (mm)
V1H751	92*	110	69	M12	32	47	54	27	40	90	11*	5,5	40,5	50
V1H752	126	152	96	M20	41	51	60	36	60	124	15	7	45	56

* Oblong holes with 2 mm aperture.

OPERATING CHARACTERISTICS

- Natural frequency :
  - axial
  - radial

  } 15 to 25 Hz depending on load.

- Maximum permitted excitation at natural frequency of suspension : ± 0.4 mm.
- Amplification factor at resonance : < 4.
- Structural strength corresponding to continuous acceleration under compression of 5 g for the 751 and 10 g for the 752 with maximum load.
- Operating temperature : - 70°C to + 300°C.
- Weight : - V1H751 : 0.75 kg;
  - V1H752 : 1.6 kg.

Reference	Static axial load (daN)	Maximum dynamic forces (daN)			Upper mounting screws		
		Compression	Tension	Radial	Take up length (mm)		Torque (m.N)
					mini	maxi	
V1H751-01 V1H751-11 V1H751-02 V1H751-12	70 - 250 70 - 250 150 - 500 150 - 500	900 900 2 000 2 000	900 900 1 800 1 800	300 800 650 1 600	25	45	18 40 18 40
V1H752-01 V1H752-11	300 - 1 000 300 - 1 000	4 000 4 000	3 000 3 000	1 000 3 000	35	50	50 140

V1H5023
V1H5025

Natural frequency : (1)
15 to 25 Hz

DESCRIPTION

The V1H5023 and V1H5025 mounts have cast iron upper housing and base. The base has four fixing holes.
The resilient elements are stainless steel wire mesh cushions. The cast iron parts are painted.

APPLICATIONS

Isolation of machine-tools : grinding machines, crushing machines, fly-presses, printing machines, textile machinery, etc.

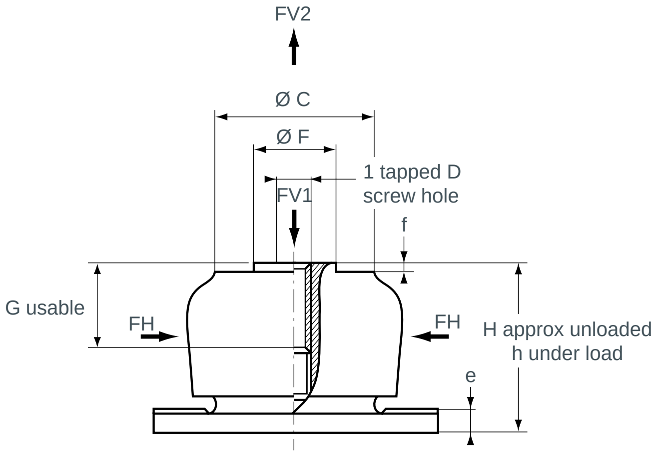
Isolation of rotating machines : engines, sets, pumps, etc. rotating over 2500 rpm.

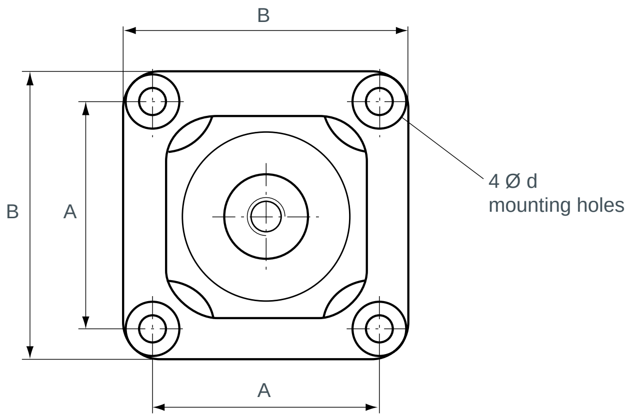
Marine : isolation of exhaust pipes, manifold, boilers, motors, sets, pumps, etc.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS

FV1 = axial force in compression
FV2 = axial force in traction
FH = radial force





Reference	A (mm)	B (mm)	Ø C (mm)	D	Ø E (mm)	G (mm)	H (mm)	Ø d (mm)	e (mm)	f (mm)	h under FV1 (mm)	h under FV2 (mm)
V1H5025*	138	172	100	M20	50	50	100	15	12	5	96	104
V1H5023*	215	260	140	M33	70	60	136	23	18	7	132	140

* Load indice, see below.

OPERATING CHARACTERISTICS

Maximum permitted excitation at natural frequency of suspension : ± 0.3 mm.

- Natural frequencies for this amplitude :
  - axial
  - radial } 15 to 25 Hz depending on load.
- Amplification factor at resonance : < 4.
- Structural strength : see table.
- Operating temperature : - 70°C to + 300°C.

Reference	Static axial load (daN)	Maximum dynamic forces (daN)			Weight (kg)
		Axial compression	Axial tension	Radial	
V1H5025-01 V1H5025-02	350 - 900 800 - 3 000	4 500 15 000	4 500 4 500	4 500 4 500	6,7
V1H5023-01 V1H5023-02	1 000 - 2 500 2 000 - 7 000	12 500 35 000	12 500 12 500	12 500 12 500	24,4

V1H-6000
V1H-6100

Natural frequency : 12 to 18 Hz (1)

DESCRIPTION

The V1H-6000 and V1H-6100 steel mounts have a mounting plate, a cover and a swaged steel shaft.

They are available with stainless steel or mild steel zinc plated metalwork.

The resilient parts are stainless steel wire cushions.

The steel parts are zinc plated.

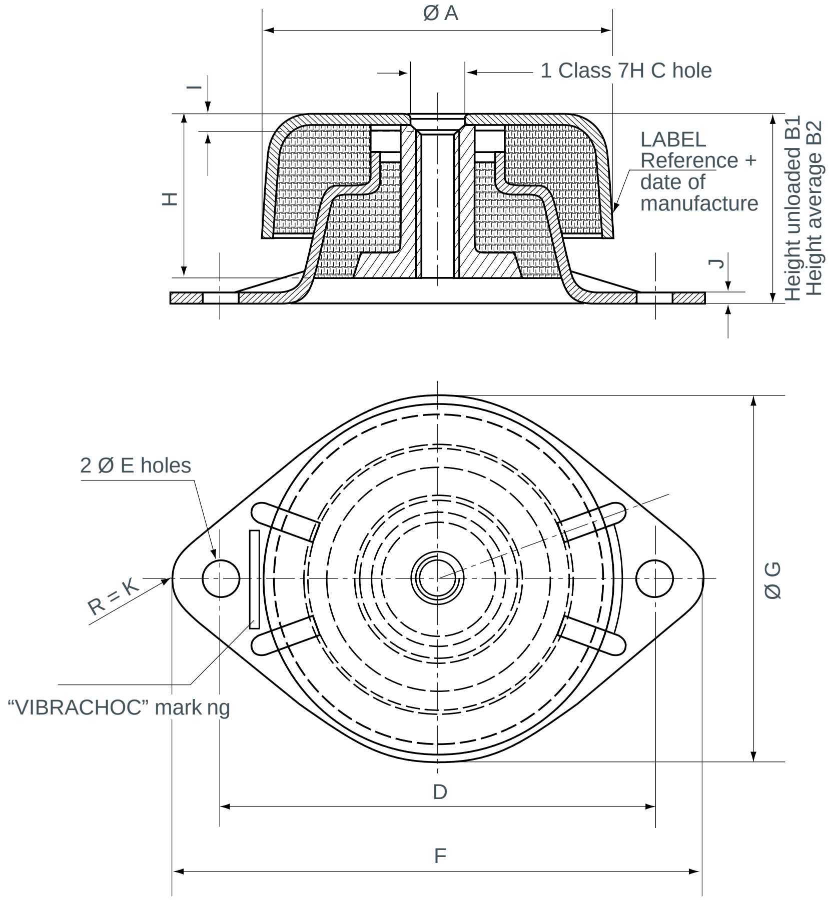
APPLICATIONS

The V1H-6000 and V1H-6100 mounts have a natural frequency of between 12 and 18 Hz and are designed for suspending rotating machines, electronic cabinets, pipes, air conditioning systems, etc. Its all metal construction means that its characteristics do not deteriorate with time and it maintains its height under load, even in the most severe ambient conditions and temperatures.

The shape of the armature and upper cushion provide high radial performance and a structural strength of 3 g, making it suitable for mounting on board equipment on military ground vehicles and ships.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



Reference	Ø A (mm)	B1 (mm)	B2 (mm)	C	D (mm)	Ø E (mm)	F (mm)	Ø G (mm)	H (mm)	I (mm)	J (mm)	K (mm)
V1H-6000*	105	62	57	M12	130	11	160	110	50	5	3	15
V1H-6100*	82	56	51	M10	98	9	120	85	46	3	2	11

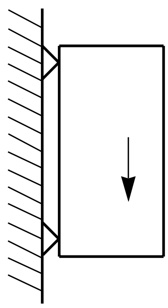
* load indice, see below.

OPERATING CHARACTERISTICS

- Natural frequency :
  - axial
  - radial

  } 12 to 18 Hz depending on the load.
- Structural strength : 3 g.
- Complies with GAMT13-MIL.STD. 167-1.
- Operating temperature : - 70°C to + 300°C.
- Amplification factor at resonance : < 4.

Steel reference	Inox reference	Load range (daN)	Weight (kg)
V1H-6100-21 V1H-6100-01 V1H-6100-02 V1H-6100-03	V1H-6100-21NX V1H-6100-01NX V1H-6100-02NX V1H-6100-03NX	15 to 40 25 to 75 50 to 150 100 to 250	0,65
V1H-6000-21 V1H-6000-01 V1H-6000-02 V1H-6000-03	V1H-6000-21NX V1H-6000-01NX V1H-6000-02NX V1H-6000-03NX	30 to 75 50 to 150 100 to 300 200 to 500	1,6



Mountings with radial load
(Consult us)

V1B1114 V1B1134
V1B1115 V1B1135
V1B1116 V1B1136

Natural frequency : (1)
3 to 9 Hz

DESCRIPTION

This range of mounts has one or two steel mounting plates depending on the model, one or several high strength steel springs, 2 light alloy rings and a stainless steel wire cushion in each spring.
All steel parts are painted.

APPLICATIONS

These very low frequency isolators (down to 3 Hz) can be used to mount machine rotating at speeds over 450 rpm, vibrators and impact machines, achieving an attenuation of about 95%.

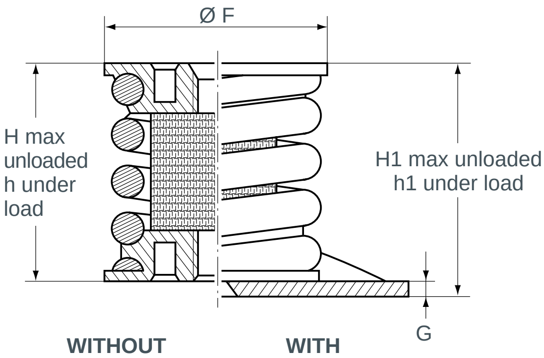
They are all metal and can be used outdoors or in the harshest conditions.

As they do not creep, their life time may be the same as that of the machine they are used to mount.

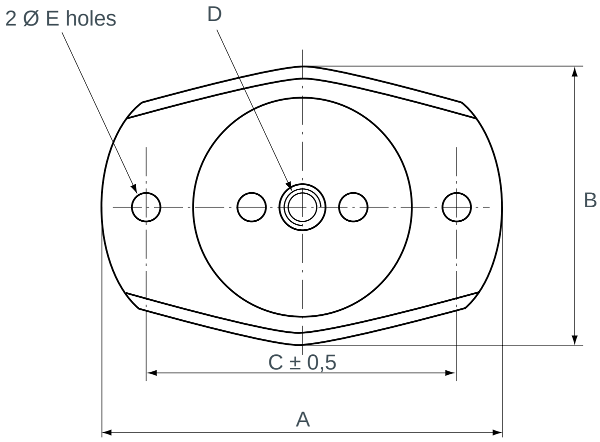
A metal cushion inside each spring increases the damping factor and limits the amplification at the natural frequency.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



WITHOUT MOUNTING PLATE **WITH MOUNTING PLATE**



MODEL WITH MOUNTING PLATE (VERSION A)

Reference	A (mm)	B (mm)	C (mm)	D	Ø E (mm)	Ø F (mm)	G (mm)	H (mm)	h (mm)	H1 (mm)	h1 (mm)	Tolerance / load (mm)
V1B1114	90	60	69,6	M8	7	47	2,5	59	47,5	61,5	50	±2
V1B1115	90	60	69,6	M8	7	47	2,5	59	47,5	61,5	50	±3
V1B1116	90	60	69,6	M8	7	47	2,5	88	68	90,5	70,5	±5
V1B1134	140	100	110	M12	11	78	4	88	78	92	82	±2
V1B1135	140	100	110	M12	11	78	4	88	78	92	82	±3
V1B1136	140	100	110	M12	11	78	4	142	120	146	124	±5

OPERATING CHARACTERISTICS

• Vibrational and mechanical characteristics

- Isolation of rotating machines with a minimum speed of :

Tr/mn	Series	Axial natural frequency = fz	Radial natural frequency = fr	Axial max. force	Radial max. force	Amplification factor at resonance
1 000	V1B1114 & V1B1134	7 to 9 Hz	fr = fz	4 g	1,2 g	≤ 5
650	V1B1115 & V1B1135	5 to 6 Hz	fr = fz	2 g	1,2 g	≤ 10
450	V1B1116 & V1B1136	3 to 4 Hz	fr = 0,7 fz	2 g	0,5 g	≤ 10

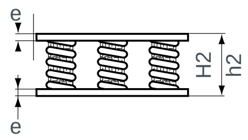
Maximum permitted excitation at natural frequency of suspension : ± 1 mm.

• Load ranges

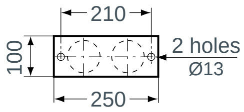
Part number		Static load (daN)
without mounting plate	with mounting plate	
V1B1114-01	V1B1114-01A	6 to 10,5
V1B1114-02	V1B1114-02A	7,5 to 13,5
V1B1114-03	V1B1114-03A	12 to 20
V1B1114-04	V1B1114-04A	18 to 30
V1B1114-05	V1B1114-05A	24 to 46
V1B1114-06	V1B1114-06A	40 to 75
V1B1115-01	V1B1115-01A	5 to 7
V1B1115-02	V1B1115-02A	6 to 9
V1B1115-03	V1B1115-03A	9 to 14
V1B1115-04	V1B1115-04A	14 to 20
V1B1115-05	V1B1115-05A	20 to 30
V1B1115-06	V1B1115-06A	30 to 50
V1B1116-01	V1B1116-01A	5 to 7
V1B1116-02	V1B1116-02A	6 to 9
V1B1116-03	V1B1116-03A	9 to 14
V1B1116-04	V1B1116-04A	14 to 20
V1B1116-05	V1B1116-05A	20 to 30
V1B1116-06	V1B1116-06A	30 to 50

Reference		Static load (daN)
without mounting plate	with mounting plate	
V1B1134-01	V1B1114-01A	40 to 85
V1B1134-02	V1B1114-02A	65 to 125
V1B1134-03	V1B1114-03A	110 to 190
V1B1134-04	V1B1114-04A	175 to 270
V1B1134-05	V1B1114-05A	250 to 400
V1B1134-06	V1B1114-06A	360 to 560
V1B1134-07	V1B1114-07A	540 to 730
V1B1135-01	V1B1115-01A	30 to 48
V1B1135-02	V1B1115-02A	48 to 80
V1B1135-03	V1B1115-03A	80 to 130
V1B1135-04	V1B1115-04A	130 to 200
V1B1135-05	V1B1115-05A	200 to 310
V1B1135-06	V1B1115-06A	310 to 400
V1B1135-07	V1B1115-07A	420 to 560
V1B1136-01	V1B1116-01A	75 to 105
V1B1136-02	V1B1116-02A	95 to 130
V1B1136-03	V1B1116-03A	115 to 160
V1B1136-04	V1B1116-04A	160 to 230
V1B1136-05	V1B1116-05A	220 to 310
V1B1136-06	V1B1116-06A	300 to 415
V1B1136-07	V1B1116-07A	410 to 550

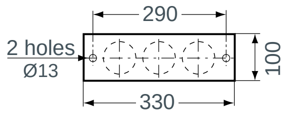
DIMENSIONS



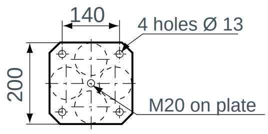
H2 max under load - h2 under load



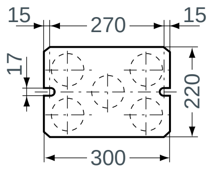
V1B1134-25, -26 or -27
V1B1135-25, -26 or -27
V1B1136-25, -26 or -27



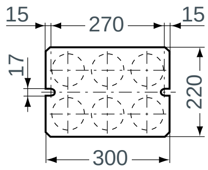
V1B1134-25, -26 or -27
V1B1135-25, -26 or -27
V1B1136-25, -26 or -27



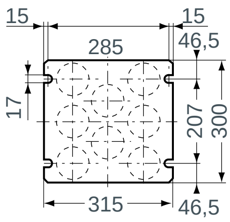
V1B1134-45 or 46
V1B1135-45 or 46
V1B1136-45 or 46



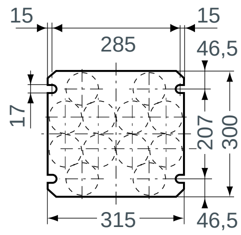
V1B1134-56 or V1B1135-56
V1B1136-56



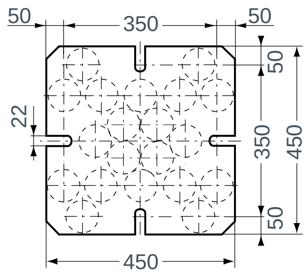
V1B1134-66 or V1B1135-66
V1B1136-66



V1B1134-86
V1B1135-86
V1B1136-86



V1B1134-125 or -126
V1B1135-125 or -126
V1B1136-125 or -126



V1B1134-205 or -206
V1B1135-205 or -206
V1B1136-205 or -206

OPERATING CHARACTERISTICS

- **Vibrational and mechanical characteristics** (see single elements)
- **Load ranges**

Part number	Static load (daN)	H2 unload. (mm)	h2/s under load (mm)	e (mm)
V1B1134-25	500 to 800	96	86 ±3	4
V1B1134-26	720 to 1 120	96	86 ±3	4
V1B1134-27	1 080 to 1 460	106	94 ±3	8
V1B1134-36	1 080 to 1 680	106	94 ±3	8
V1B1134-37	1 620 to 2 190	106	94 ±3	8
V1B1134-45	1 000 to 1 600	104	94 ±3	8
V1B1134-46	1 440 to 2 240	104	94 ±3	8
V1B1134-47	2 160 to 2 920	106	94 ±3	8
V1B1134-56	1 800 to 2 800	108	98 ±3	10
V1B1134-57	2 700 to 3 650	110	98 ±3	10
V1B1134-66	2 160 to 3 360	108	98 ±3	10
V1B1134-67	3 240 to 4 380	110	98 ±3	10
V1B1134-86	2 880 to 4 480	108	98 ±3	10
V1B1134-87	4 320 to 5840	110	98 ±3	10
V1B1134-125	3 000 to 4 800	108	98 ±3	10
V1B1134-126	4 300 to 6 720	108	98 ±3	10
V1B1134-127	6 480 to 8 760	110	98 ±3	10
V1B1134-205	5 000 to 8 000	108	98 ±3	10
V1B1134-206	7 200 to 11 200	108	98 ±3	10
V1B1134-207	10 800 to 14 600	110	98 ±3	10
V1B1135-25	390 to 620	96	86 ±3	4
V1B1135-26	620 to 840	96	86 ±3	4
V1B1135-27	840 to 1 120	106	94 ±3	8
V1B1135-36	930 to 1 260	106	94 ±3	8
V1B1135-37	1 260 to 1 680	106	94 ±3	8
V1B1135-45	780 to 1 240	104	94 ±3	8
V1B1135-46	1 240 to 1680	104	94 ±3	8
V1B1135-47	1 680 to 2 240	106	94 ±3	8
V1B1135-56	1 550 to 2 100	108	98 ±3	10
V1B1135-57	2 100 to 2 800	110	98 ±3	10

Part number	Static load (daN)	H2 unload. (mm)	h2/s under load (mm)	e (mm)
V1B1135-66	1 860 to 2 520	108	98 ±3	10
V1B1135-67	2 520 to 3 360	110	98 ±3	10
V1B1135-86	2 480 to 3 360	108	98 ±3	10
V1B1135-87	3 360 to 4 480	110	98 ±3	10
V1B1135-125	2 340 to 3 720	108	98 ±3	10
V1B1135-126	3 720 to 5 040	108	98 ±3	10
V1B1135-127	5 040 to 6 720	110	98 ±3	10
V1B1135-205	3 900 to 6 200	108	98 ±3	10
V1B1135-206	6 200 to 8 400	108	98 ±3	10
V1B1135-207	8 400 to 11 200	110	98 ±3	10
V1B1136-25	440 to 620	148	128 ±5	4
V1B1136-26	600 to 830	148	128 ±5	4
V1B1136-27	820 to 1 100	158	136 ±5	8
V1B1136-36	900 to 1 260	158	136 ±5	8
V1B1136-37	1 230 to 1 650	158	136 ±5	8
V1B1136-45	880 to 1 280	156	136 ±5	8
V1B1136-46	1 200 to 1 660	156	136 ±5	8
V1B1136-47	1 640 to 2 200	158	136 ±5	8
V1B1136-56	1 500 to 2 075	160	140 ±5	10
V1B1136-57	2 050 to 2 750	162	140 ±5	10
V1B1136-66	1 800 to 2 490	160	140 ±5	10
V1B1136-67	2 460 to 3 300	162	140 ±5	10
V1B1136-86	2 400 to 3 320	160	140 ±5	10
V1B1136-87	3 280 to 4 400	162	140 ±5	10
V1B1136-125	2 640 to 3 720	160	140 ±5	10
V1B1136-126	3 600 to 4 980	160	140 ±5	10
V1B1136-127	4 920 to 6 600	162	140 ±5	10
V1B1136-205	4 400 to 6 200	160	140 ±5	10
V1B1136-206	6 000 to 8 300	160	140 ±5	10
V1B1136-207	8 200 to 11 000	162	140 ±5	10

7002

Natural frequency : (1)
• En axial 7 to 10 Hz
• En radial 4,5 to 6 Hz

DESCRIPTION

The 7002 damper has a satin finish treated AG3 casing and mounting plate, a stainless steel centre axis. A spring and stainless steel cushion provide the resilient elements. It has four Ø 5.2 mounting holes in the base and a tapped hole in the centre axis.

APPLICATIONS

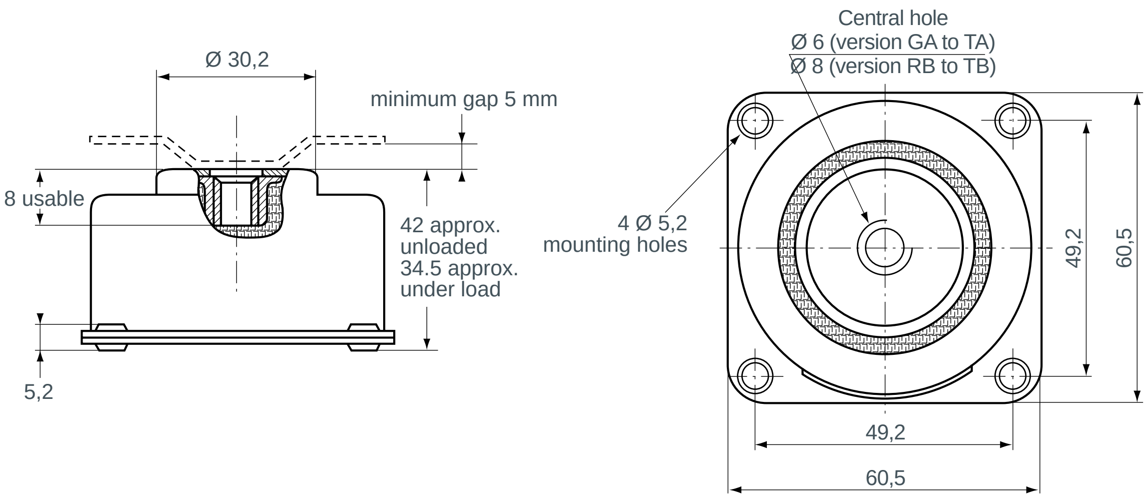
Its axial natural frequency of between 7 and 10 Hz and its integral travel limiter enable 7002 dampers to be used for mounting electronic or computer equipment, navigation equipment and on board measu-rement instruments.

They can also be used for static equipment for suspending control panels, etc.

Their all metal construction enable them to operate in the harshest of conditions.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



OPERATING CHARACTERISTICS

- Natural frequency :
  - axial : 7 to 10 Hz depending on load;
  - radial : 4.5 to 6 Hz depending on load.
- Maximum permitted excitation at natural frequency of suspension : ± 0.75 mm.
- Amplificator factor at resonance : < 4.
- Operating temperature : - 70°C to + 300°C.
- Structural strength corresponds to continuous acceleration of 10 g with maximum load.
- Travel available under shock :
  - axial : ± 6 mm;
  - radial : ± 5 mm.
- Weight : 100 to 200 (depending on version).

Reference	Axial static load (daN)	Central hole
7002 GA 7002 HA 7002 JA 7002 KA 7002 LA 7002 UA 7002 MA 7002 PA	0,70 - 1,25 1,15 - 2,30 2,00 - 4,50 2,80 - 5,60 4,50 - 9,00 7,00 - 14,00 8,00 - 18,00 16,00 - 22,00	M6
7002 RB 7002 SB 7002 TB	20,00 - 33,00 28,00 - 45,00 40,00 - 60,00	M8

MV70 MV71
MV72 MV73

Natural frequency :
axial and radial 15 to 25 Hz (1)

DESCRIPTION

All metal mount design to carry load in compression or tension and which includes an internal limit stop.

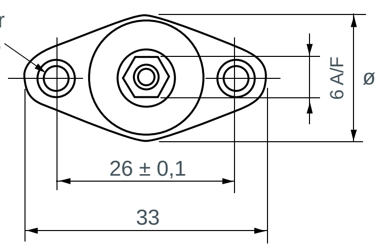
APPLICATIONS

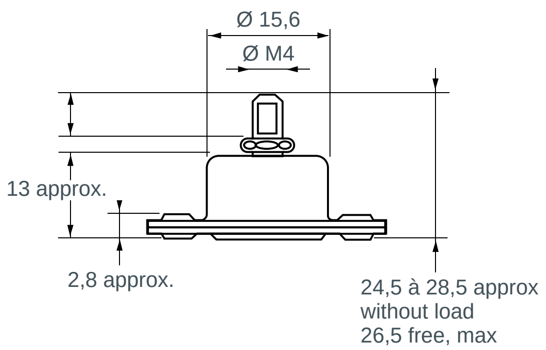
Protection of components, assemblies and electronic equipment mounted in aircraft, road vehicles and trains including navigation equipment, control consoles, measuring instruments.

TECHNICAL CHARACTERISTICS

- Max permitted excitation at natural frequency :
  MV70 : ± 0,3 mm.
  MV71 : ± 0,4 mm.
  MV72 : ± 0,45 mm.
  MV73 : ± 0,45 mm.
- Amplification factor at resonance : < 4.
- Operating temperature : - 70 °C to + 300 °C.
- Structural strengh corresponds to continuous acceleration of 10g with maximum load
- Internal snubber design for equivalent performance during continuous acceleration at maximum load.

MV70

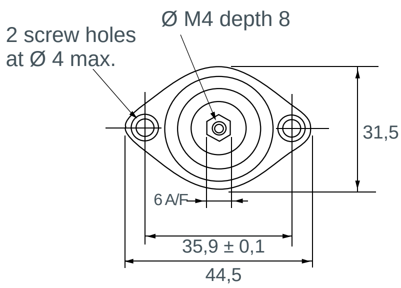


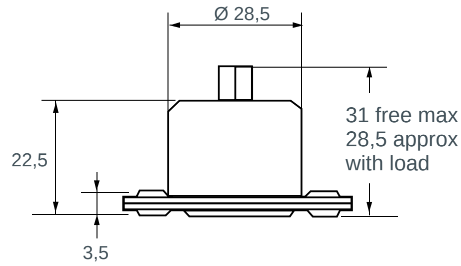


Reference	Static axial load (daN)	Natural frequency
MV70-01 MV70-02 MV70-03 MV70-04 MV70-05	0,05 - 0,20 0,15 - 0,35 0,30 - 0,65 0,50 - 0,85 0,75 - 1,00	20 to 25 Hz

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

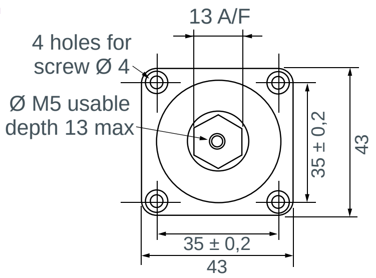
MV71

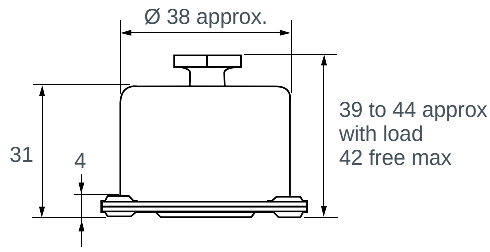




Reference	Static axial load (daN)	Natural frequency
MV71-01	0,18 - 0,50	
MV71-02	0,30 - 0,70	
MV71-03	0,45 - 0,90	
MV71-04	0,65 - 1,30	15 to 20 Hz
MV71-05	0,90 - 1,80	
MV71-06	1,35 - 2,40	
MV71-07	1,80 - 3,00	

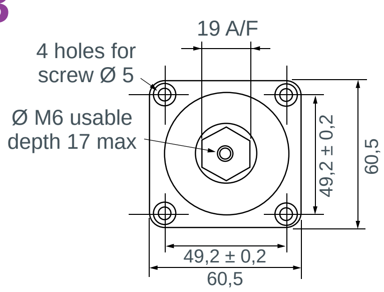
MV72

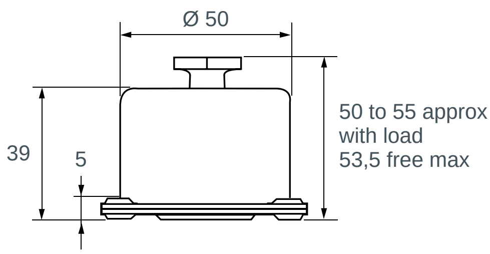




Reference	Static axial load (daN)	Natural frequency
MV72-P03	0,30 - 0,55	
MV72-P04	0,50 - 0,90	
MV72-P05	0,75 - 1,40	
MV72-P06	1,20 - 2,10	15 to 20 Hz
MV72-P07	1,90 - 3,40	
MV72-P08	3,00 - 5,90	
MV72-P09	4,20 - 8,20	
MV72-P10	5,90 - 11,50	

MV73





Reference	Static axial load (daN)	Natural frequency
MV73-P02	2,50 - 5,20	
MV73-P03	3,50 - 8,00	
MV73-P04	4,50 - 10,00	
MV73-P05	5,50 - 12,00	
MV73-P06	7,00 - 14,00	15 to 20 Hz
MV73-P07	9,00 - 16,00	
MV73-P08	10,50 - 19,00	
MV73-P09	12,00 - 22,00	
MV73-P10	15,00 - 27,00	

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

VE101 VE111
VE112 VE113

Natural frequency : 3,5 to 6 Hz (1)

See also PAULSTRA elastomer range : Traxiflex

DESCRIPTION

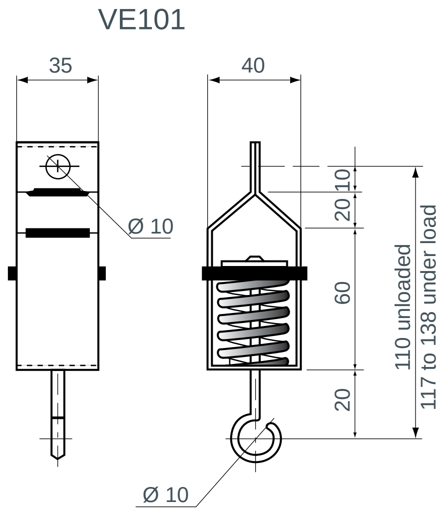
VE isolators have a cylindrical stainless steel spring, a galvanised body, an elastomer noise reduction guide and steel rings or studs depending on the model.
The VE112 series has a steel cushion inside the spring.

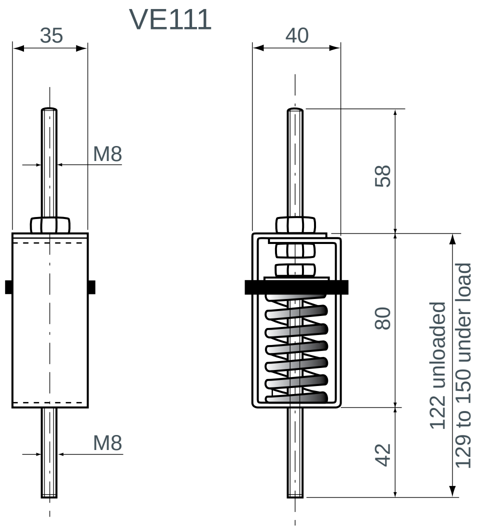
APPLICATIONS

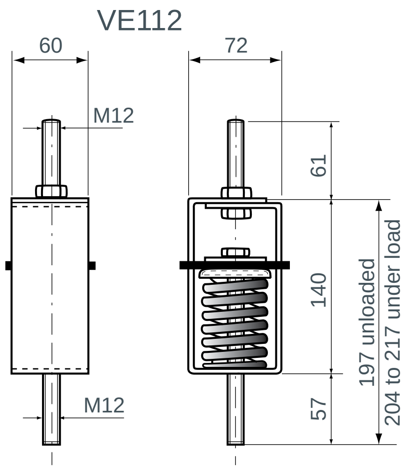
These isolators with a natural frequency of between 3.5 and 6 Hz are specially designed for suspending false ceilings, air conditioning equipment and pipework and significantly reduces noise in buildings.

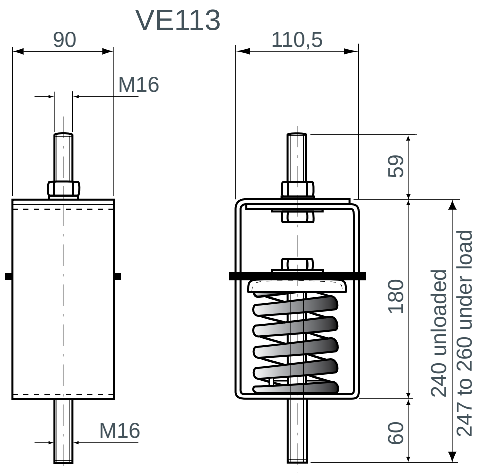
(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS









OPERATING CHARACTERISTICS

Reference	Static load (daN)
VE101 - 01	1 à 5
VE101 - 02	4 à 13
VE101 - 03	7 à 20
VE101 - 04	12 à 33
VE101 - 05	19 à 43

Reference	Static load (daN)
VE111 - 01	1 à 5
VE111 - 02	4 à 13
VE111 - 03	7 à 20
VE111 - 04	12 à 33
VE111 - 05	19 à 43

Reference	Static load (daN)
VE112- 01	25 à 70
VE112 - 02	45 à 130
VE112 - 03	85 à 230

Reference	Static load (daN)
VE113	150 à 420

Vibration characteristics

- Natural frequency: 3.5 to 6 Hz.

VIBCABLE

Natural frequency : (1)
5 to 25 Hz

DESCRIPTION

This range of mounts has a stainless steel cable wound between light alloy bars. The 8010 to 8060 versions are assembled using stainless steel clips and the 8080 to 8140 models have galvanised steel screws.

There are two or four mounting holes, per bar, smooth, counter sunk or tapped.

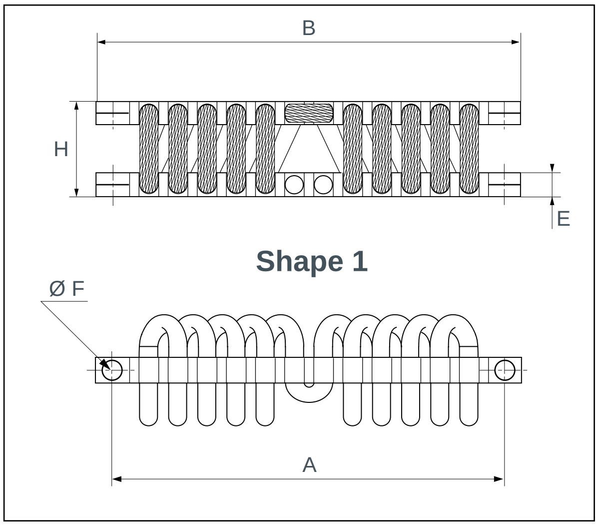
APPLICATIONS

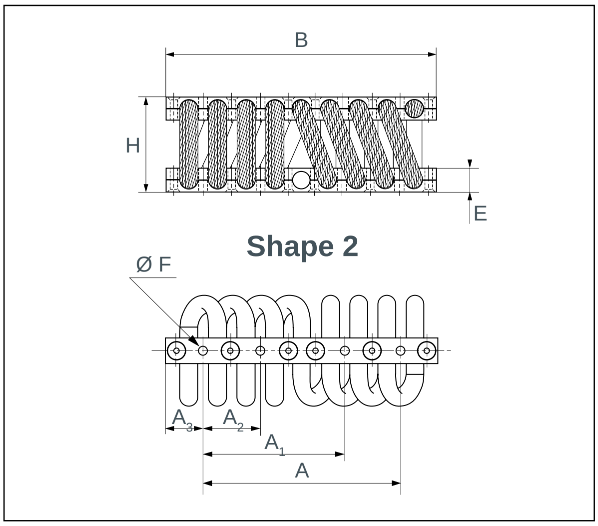
With a natural frequency between 5 and 25 Hz, damping up to 40% and high deflection in all directions, these dampers can absorb acce-lerations to equipment subjected to shock or drop.

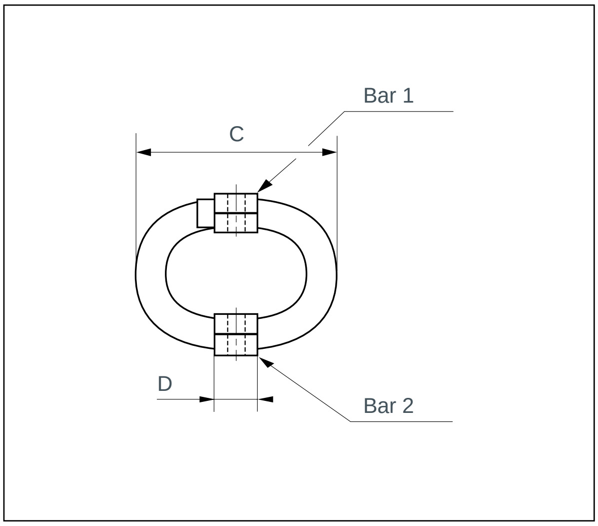
Protection of equipment in containers, protection of racks and any fragile on board equipment.

(1) Natural frequencies with max/min loads, see : OPERATING CHARACTERISTICS.

DIMENSIONS



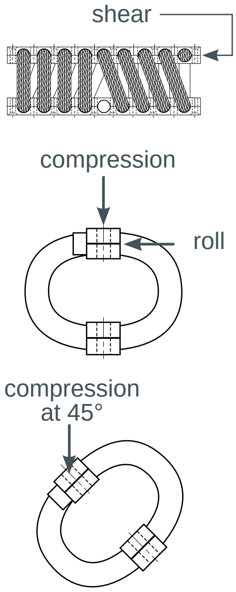




Reference	Shape	A (mm)	B (mm)	C (mm) depending on version		D (mm)	E (mm)	F (mm) (2 fixing holes)		H (mm) depending on version					
				min.	max.			tapped	threaded	01	02	03	04	05	06
V3CA8010-01 à -06	1	68	82	25	38	10	5	4,8	M4	18	26	20	28	30	33
V3CA8020-01 à -06	1	100	112	29	43	12,5	6	5,8	M5	21	31	35	25	28	38
V3CA8030-01 à -06	1	114	127	37	49	14	8	6,5	M6	28	30	33	36	38	41
V3CA8040-01 à -06	1	114	127	37	44	14	8	6,5	M6	28	33	38	-	-	-
V3CA8060-01 à -06	1	114	127	37	95	14	10	6,5	M6	38	43	87	43	31	34
V3CA8080-01 à -06	2	131	146	57	102	16	13	6,5	M6	48	54	60	64	80	90

Reference	Shape	A (mm)	A1 (mm)	A2 (mm)	A3 (mm)	B (mm)	C (mm) depending on version		D (mm)	E (mm)	F (mm) (4 fixing holes)		H (mm) depending on version					
							min.	max.			tapped	threaded	01	02	03	04	05	06
V3CA8090-01 à -06	1	155,75	111,25	44,5	30	215,75	80	135	25	16	9	M8	70	74	89	110	68	77
V3CA8100-01 à -06	1	155,75	111,25	44,5	30	215,75	92	150	25	20	9	M8	75	89	95	110	83	108
V3CA8110-01 à -06	1	191	136,5	54,5	38,1	267	102	170	25	25	11	M10	90	95	100	100	110	150
V3CA8120-01 à -04	1	266,5	190,5	76	50,5	370	145	195	40	40	13	M12	135	105	160	160	-	-
V3CA8140-01 à -02	1	378	270	108	70,8	520	224	248	50	50	20	M18	180	218	-	-	-	-

OPERATING CHARACTERISTICS



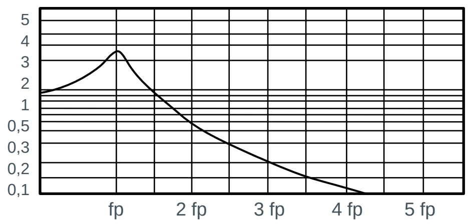
Reference	Static load range (daN)																	
	Compression						Compression at 45°						Roll/Shear					
Version	01	02	03	04	05	06	01	02	03	04	05	06	01	02	03	04	05	06
V3CA8010	7	3	5	5	4	4	6	3	4	4	3	3	4	2	3	2	2	2
V3CA8020	11	20	19	15	17	26	8	14	14	11	13	19	6	10	10	7	9	13
V3CA8030	17	18	17	13	11	10	13	13	13	10	8	8	9	9	9	7	6	5
V3CA8040	86	62	40	-	-	-	66	48	31	-	-	-	42	31	20	-	-	-
V3CA8060	63	58	19	53	82	100	46	44	15	40	62	75	32	29	10	27	41	50
V3CA8080	88	62	51	47	25	26	66	47	39	36	19	19	44	31	26	24	13	13
V3CA8090	194	162	120	82	188	134	147	122	91	62	142	101	97	81	60	41	94	67
V3CA8100	439	414	481	215	442	290	330	312	363	162	332	218	220	207	240	108	221	145
V3CA8110	848	682	712	529	486	315	639	532	556	406	366	246	424	342	357	265	243	157
V3CA8120	1 658	1 396	878	651	-	-	1 272	1 055	664	492	-	-	331	698	441	320	-	-
V3CA8140	2 229	2 031	-	-	-	-	1 687	1 527	-	-	-	-	-	-	-	-	-	-

- **Operating temperature :**
  - 180 °C to + 300 °C.

- **Electrical resistance :**
  with conducting coating < 210° Ω.

- **Environment :**
  The material used are unaffected by harsh environments.

- **Vibration transmission coefficient curves :**
  For perfectly free system.



The bars can be supplied with smooth, threaded or countersunk holes. Several combinations are possible :

		Bar 1		
		Smooth holes : L	Threaded holes : N	Countersunk holes : F
Bar 2	Smooth holes : L	LL	NL	FL
	Threaded holes: N	LN	NN	FN
	Countersunk holes : F	LF	NF	FF

- **Codification example : V3CA8010-01 LL**

OTHER METAL SUSPENSIONS
MV801 MV803

DESCRIPTION

MV801 and MV803 has a stainless steel wire mesh cushion and spring attached to alumi-nium alloy upper and lower cup with threaded centre holes.

APPLICATIONS

Isolation of low speed stationary rotating machines (fans, electric motors, pumps ...) sensitive equipments (measuring instruments, laboratory equipment ...).

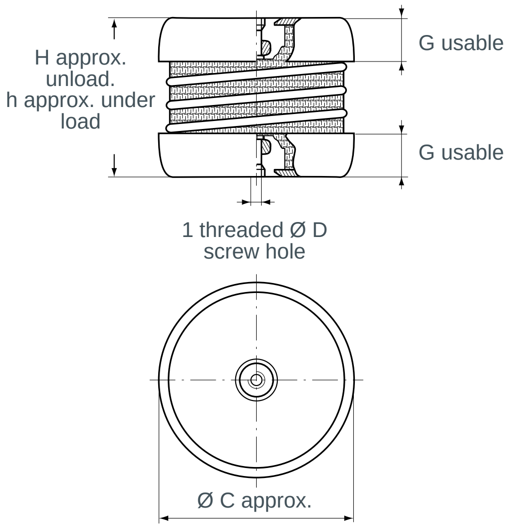
OPERATING CHARACTERISTICS

Reference	Axial static load (daN)
MV801-1CC	0,15 - 0,20
MV801-2CC	0,20 - 0,25
MV801-3CC	0,25 - 0,30
MV801-4CC	0,30 - 0,40
MV801-5CC	0,40 - 0,50
MV801-6CC	0,50 - 0,65
MV801-7CC	0,60 - 0,80
MV801-8CC	0,75 - 1,00
MV801-9CC	0,95 - 1,20
MV801-10CC	1,20 - 1,65
MV801-11CC	1,50 - 2,00
MV801-12CC	1,80 - 2,50
MV801-13CC	2,40 - 3,20
MV803-1CC	1,20 - 1, 65
MV803-2CC	1,50 - 2,00
MV803-3CC	1,80 - 2,50
MV803-4CC	2,40 - 3,20
MV803-5CC	3,00 - 4,00
MV803-6CC	3,70 - 5,00
MV803-7CC	4,80 - 6,50
MV803-8CC	6,00 - 8,00
MV803-9CC	7,50 - 10,00
MV803-10CC	9,50 - 13,00
MV803-11CC	12,00 - 16,50
MV803-12CC	15,00 - 20,00
MV803-13CC	18,00 - 25,00

Reference	H (mm)	Ø C (mm)	D	G (mm)	h (mm)
MV801	42	26	M4	6	25
MV803	55	40,2	M5	8	34

- Natural frequencies :
  - axial
  - radial

  } 5 to 10 Hz. depending on load.
- Amplification factor at resonance <5.
- Structural strength corresponds to continuous acceleration of 2 g with maximum load.
- Operating temperature : - 70°C to + 300°C.
- Maximum permitted excitation at natural frequency of suspension :
  MV801 : ± 0.7 mm.
  MV803 : ± 1 mm.



V1N303 V1N304 V1N305 V1N306 V1N308

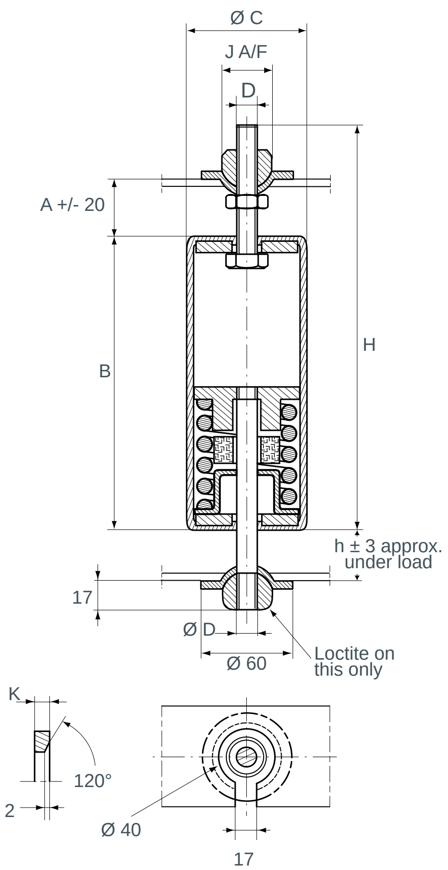
DESCRIPTION

A single acting telescopic anti-vibration manufac-tured with a helicoil spring and stainless steel woven cushion.
Protection, paint.

APPLICATIONS

Isolation of exhaust stucking and pipework.

OPERATING CHARACTERISTICS



- Maximum permitted excitation at natural frequency of suspension : ± 1 mm.
- Natural frequency for this amplitude :
  - axial : 3.5 to 5 Hz depending on load.
- Structural strength corresponds to continuous acceleration of 3 g with maximum load.
- Operating temperature : - 70°C to + 150°C.
- Displacement in all directions : ± 40 mm.
- Adjustment between attachment points : ± 20 mm.

Reference	Static load in traction (daN)	Ø of pipes 3 m long (for information only)
V1N303	45 - 85	150 - 300
V1N304	75 - 140	300 - 500
V1N305	120 - 230	500 - 800
V1N306	200 - 380	800 - 1 000
V1N308	270 - 500	1 000 - 1 200

Reference	A (mm)	B (mm)	Ø C (mm)	D	H (mm)	J (mm)	K (mm)	h (mm)
V1N303	40	135	63	M12	210	30	6	35
V1N304	40	155	63	M12	230	30	6	35
V1N305	45	175	82	M16	257	30	8	40
V1N306	45	200	82	M16	282	30	8	40
V1N308	45	220	82	M16	302	30	8	40

V1209

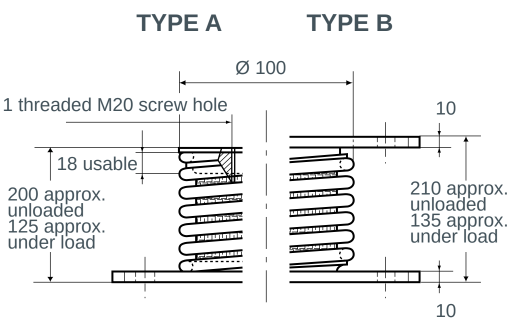
DESCRIPTION

Part of a series of very low frequency isolators working in compression only, giving very efficient isolation for rotating machines running at 250 rpm and above.

APPLICATIONS

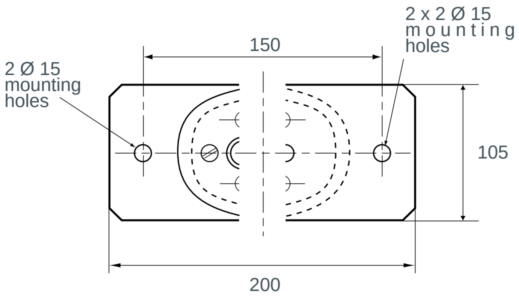
Rotating machinery, hoppers and sensitive equipment with or without the use of inertia blocks.

OPERATING CHARACTERISTICS



- Maximum permitted excitation at natural frequency of suspension : ± 3 mm.
- Natural frequencies for this amplitude :
  - axial
  - radial

  } 1,5 to 3,5 Hz depending on load.
- Amplification factor at resonance : < 5.
- Structural strength corresponds to continuous acceleration of 2 g with maximum load.
- Operating temperature : - 70°C to + 300° C.



With lower mounting plate	With lower and upper mounting plate	Static axial load (daN)
V1209-01A	V1209-01B	60 - 95
V1209-03A	V1209-03B	95 - 150
V1209-05A	V1209-05B	150 - 230
V1209-07A	V1209-07B	210 - 330
V1209-09A	V1209-09B	300 - 460

V1210

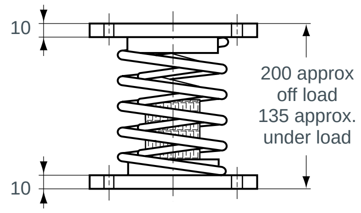
DESCRIPTION

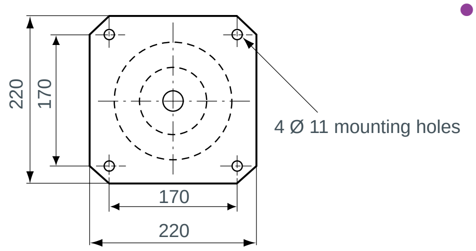
Part of a series of very low frequency isolators working in compression only, giving very efficient isolation for rotating machines running at 250 rpm and above.

APPLICATIONS

Rotating machinery, hoppers and sensitive equipment with or without the use of inertia blocks.

OPERATING CHARACTERISTICS





- Maximum permitted excitation at natural frequency of suspension : ± 3 mm.
- Natural frequency for this amplitude :
  - axial } 1,5 to 3,5 Hz depending on load.
  - radial
- Amplification factor at resonance : < 5.
- Structural strength corresponds to continuous acceleration of 2 g with maximum load.
- Operating temperature : - 70°C to + 300°C.

Reference	Static axial load (daN)
V1210-51	460 - 740
V1210-52	550 - 870
V1210-53	700 - 1 100
V1210-54	1 000 - 1 600
V1210-55	1 300 - 1 960

V1B-5984-01
V1B-5984-11

DESCRIPTION

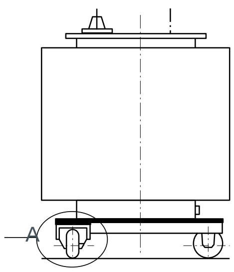
The assembly comprises :

- two metal cushions.
- a nut.
- two Bellevi lle washers.
- a threaded centre axis.
- two flat washers.

APPLICATIONS

Mountings for transformers with a lock ng system for use in transit.

OPERATING CHARACTERISTICS

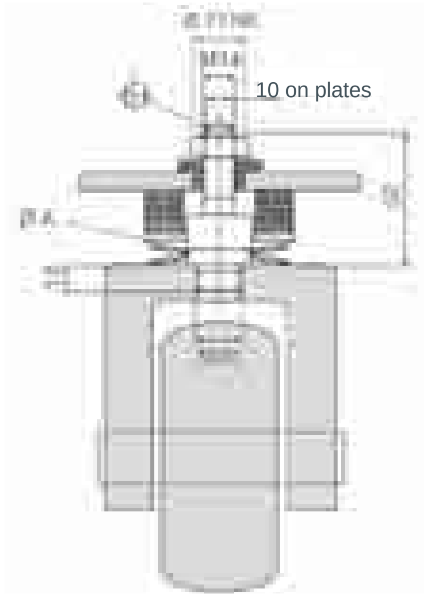


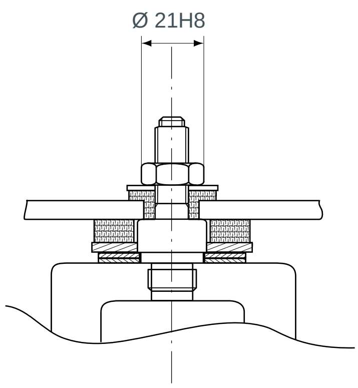
- Natural frequency :
  - axial
  - radial } 10 to 15 Hz depending on load.
- Attenuation 100 Hz > 90%.
- Good resistance to oil.
- Electrically conductive.

Reference	Static load (daN)	Lock ng torque (N.m) (for use when transformer in transit)	Ø A (mm)
V1B-5984-01 V1B-5984-11	930 1 500	90 100	65 75

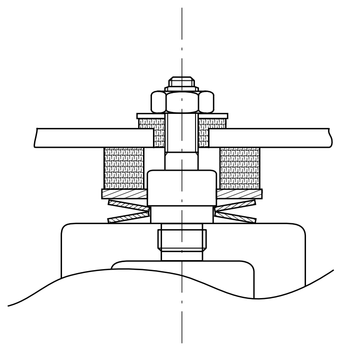
Torque when transformer in use for both types = 0 N.m.

ENLARGEMENT POINT A





Locked position during transit



Unlock position transformer in use

Not supplied

VIBRAFLOT® 357-961

DESCRIPTION

VIBRAFLOT® is an antivibration system consisting of the following elements :
- metallic box containing a low frequency spring;
- elastomer sheet to isolate high frequencies;
- system to fift the floating floor and set its height.

APPLICATIONS

Typical applications for floating floor in buildings :

- Theatres
- Ground floor shops
- Concert theatres
- Hospital
- Laboratories
- Sports & dance halls
- Cinemas
- Thalasso, Spas
- Discotechs
- Technical areas
- Hotels
- Auditoriums, Conference halls
- Recording studios
- Railway lines
- Luxury appartments
- Alleys

ADVANTAGES

Low natural frequency.
- High level of vibration attenuation.
- Improved stability of the suspension and reduced vibration amplitude.
- Improved operational life for suspended machinery.
- Integated system controlling the height of the floor.
- Mounts are accessible if modifications are required.

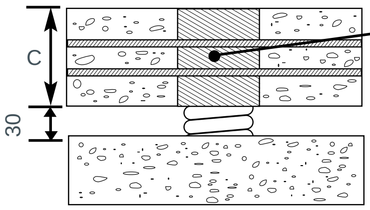
FUNCTION

Low natural frequency.
- High level of vibration attenuation.
- Improved stability of the suspension and reduced vibration amplitude.
- Improved operational life for suspended machinery.
- Integated system controlling the height of the floor.
- Mounts are accessible if modifications are required.

TECHNICAL CHARACTERISTICS

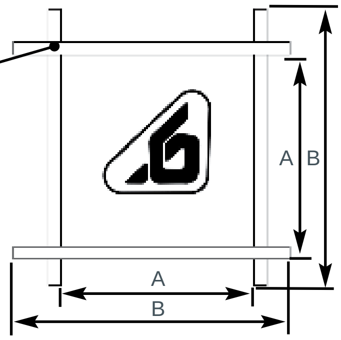
Static load	From 300 daN to 2.000 daN by box
Natural frequency	3 to 6 Hz
Elastic limit	2 - 4 g in vertical 1,2 g in horizontal
Concrete thickness	From 120 to 300 mm

DIMENSIONS

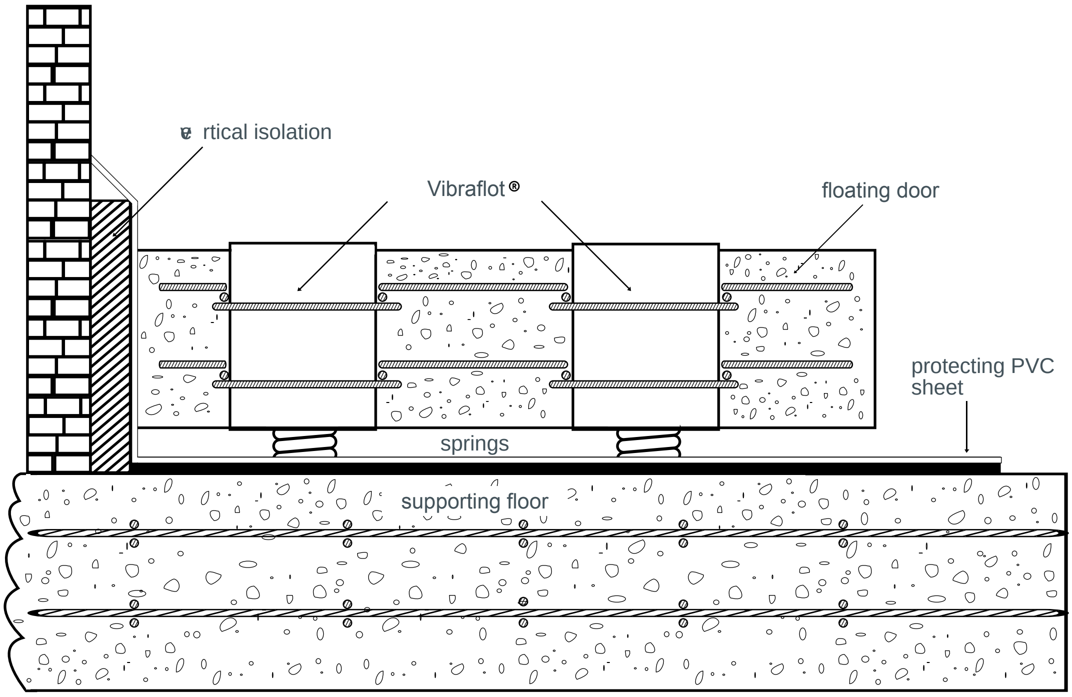


Vibraflot reinforcement

	Ref. - 357	Ref. - 961
A	140	200
B	200	260
C	120 - 170	170 - 300



TYPICAL MOUNTING ARRANGEMENT



FLEXIBLE BUSHES

FLEXIBLE BUSHES

HUTCHINSON®

FLEXIBLE BUSHES

CONTENTS

Please see current price list for availability of items.
We reserve the right to modify the design and manufacture of the products and materials described in this catalogue.
The pictures of the products are supplied for information only.

I - GENERAL

I.1 - THE OPERATION OF A FLEXIBLE BUSH

A flexible bush has an elastomeric element enclosed between an outer sleeve and a centre axis intended to replace a greased bush.
The improvements achieved in industry due to the use of elastic bushes have been justly compared to the progress achieved in the past by the use of ball joints. In fact, the improvements achieved by the latter by reducing friction and play considerably and reducing wear an noise, have been taken even further by elastomeric rubber bushes which eliminate play completely and isolate high frequency vibrations.

I.2 - STATIC CHARACTERISTICS

I.2.1 - RADIAL CHARACTERISTICS

The application of a radial force FR causes an elastic eccentricity X by compression of the elastomer on one side and stretching of the other side.
The bush is characterised by the permissible radial static force and by the corresponding eccentricity.
In practice, the permissible radial static forces are estimated by taking the stress rate on the surface area S of the rectangle which represents the projection of part of the elastomer which is in contact with the internal tube.

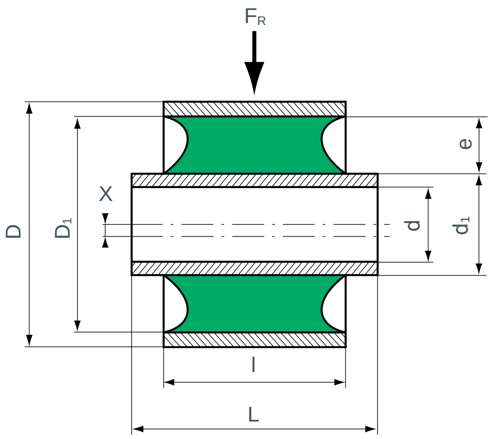
Stress rate = $t = \dfrac{FR}{S} = \dfrac{FR}{d_1 \times l}$

F_R in N
d_1 and *l* in m
t in N/m^2

The permissible stress is a function $\dfrac{l}{D}$ of the bush and of the specific properties of the elastomer.

It is clear that the permissible deformation for a given radial force will be linked in practice to the thickness of the elastomer.

$$e = \frac{D_1 - d_1}{2}$$

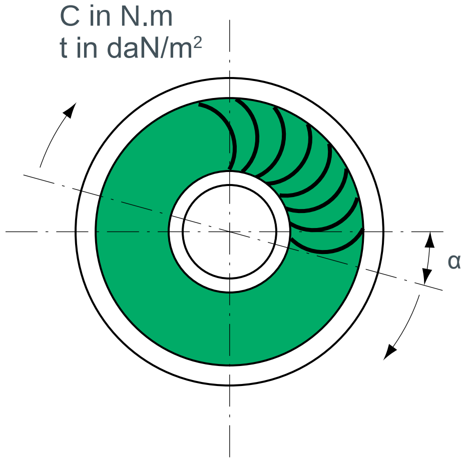


I.2.2 - TORSIONAL CHARACTERISTICS

The application of a torque to the centre axis of revolution of a bush causes an angular displacement. This displacement produces a torsional reaction expressed in N.m.
The bush is characterised by its maximum torsion angle a and by the corresponding compensating torque.
In practice, the permissible torsion angles are of the order of 20° to 30°. The maximum permissible static torque can be calculated on the basis of the stress rate at the point of contact between the internal tube and the elastomer.

$$C = t \times \pi \frac{d_1^2\ l}{2}$$

d_1 and *l* in m
C in N.m
t in daN/m^2

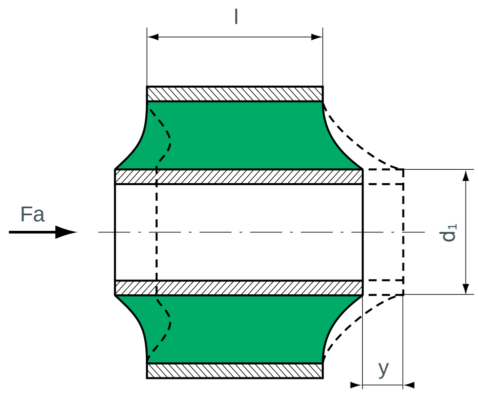


I.2.3 - AXIAL CHARACTERISTICS

When the external tube is fixed, the application of an axial force Fa on the internal tube will cause an elastic displacement “y” parallel to the axis of the bush, by shearing of the elastomer.
The bush is characterised by the permissible axial load and by the corresponding elastic displacement.
In practice, the permissible static axial loads are estimated by taking the stress rate at the internal tube.
$Fa = \pi \times d_1 \times l \times t$ where d_1 and l are in cm and Fa in daN and t is in daN/cm²
The permissible static deflection is a function of the radial thickness of the elastomer.

$$y = k \cdot \frac{D_1 - d_1}{2}$$

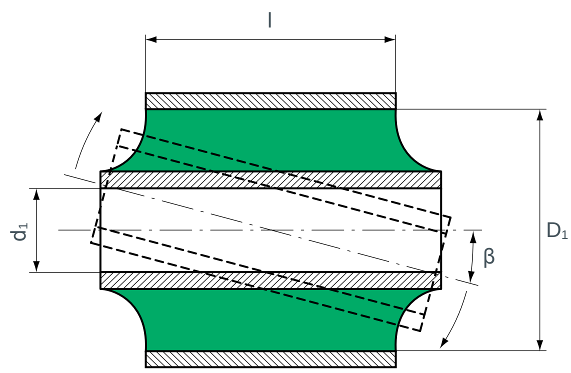
The axial breaking load of a bonded part is of the order of 10 times the permissible static load.



Note :
A Prestressed bush which is not fully bonded must not be subjected to a static axial load.

I.2.4 - CONICAL CHARACTERISTICS

The application of a torque whose axis is perpendicular to the axis of rotation of the bush will cause an angular deformation β.
This deformation will in turn produce a compensating elastic torque expressed in N.m.
The bush is characterised by the permissible conical angle and by the corresponding compensating torque.
In practice, the permissible conical angles are of the order of a few degrees. They vary greatly with the slenderness ratio $\frac{l}{D}$ of the part. $\frac{l}{D}$

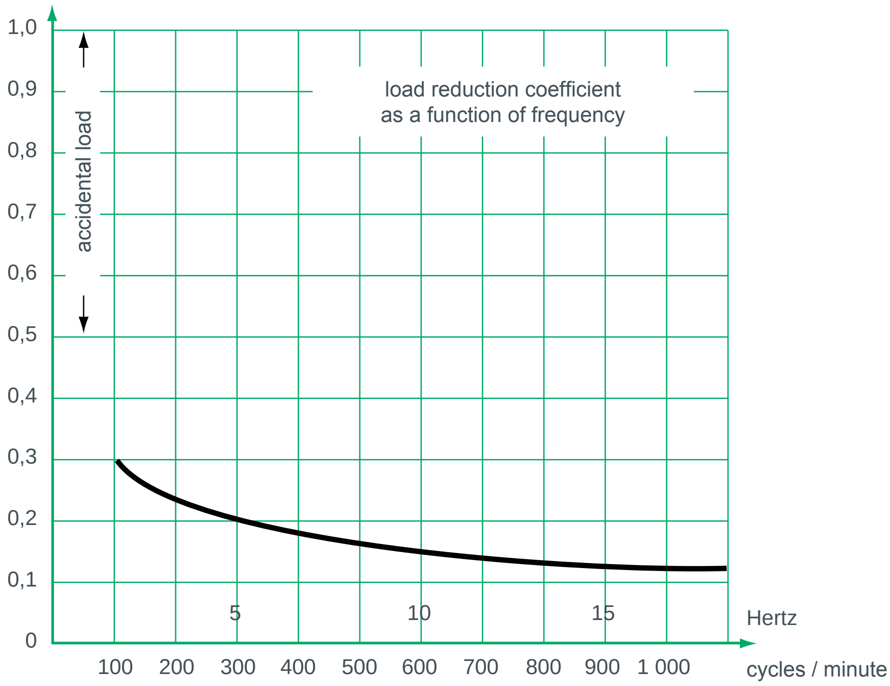


I.3 - DYNAMIC CHARACTERISTICS

I.3.1 - DYNAMIC LOADS

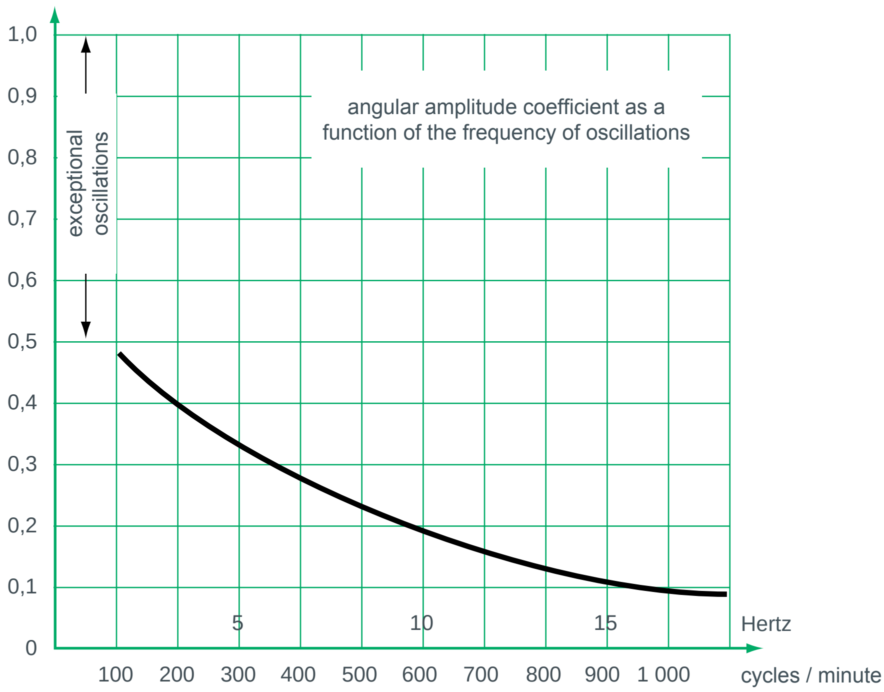
For dynamic loads, the following corrections must be added to the static loads provided in the catalogue :

- for infrequent forces of very short duration (shocks), the loads can be doubled;
- in the case of continuing periodic forces, the loads must be multiplied by a reduction coefficient λ which is a function of the frequency of the forces.



I.3.2 - TORSIONAL AMPLITUDES

The torsion amplitudes provided in the catalogue must be multiplied by a reduction coefficient μ which is a function of the frequency of the oscillations.



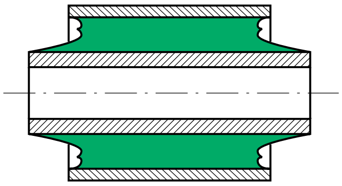
II - PRINCIPAL TYPES OF FLEXIBLE BUSHES

II.1 - SIMPLE BUSHES

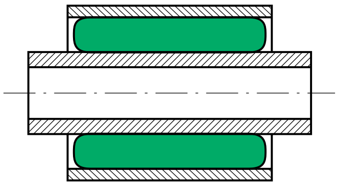
FLEXIBLOC (fig. 1) - FULLY BONDED
This is a bush made up of 2 concentric tubes between which of elastomer is bonded. Under the effect of external forces or torques, the relative movement of the tubes will cause an elastic deformation of the elastomer. By consulting the service conditions, a bush should be chosen which will remain within its elastic operational limits.

SILENTBLOC (fig. 2) - PRESTRESSED
This is a bush made up of 2 concentric tubes between which a ring of “adhérite®” elastomer is inserted by force. Under the effect of external forces or torques, the relative movement of the tubes will cause an elastic deformation of the elastomer. Above a certain value the adherite will slide in the tubes.

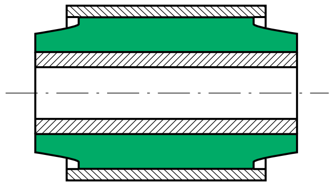
These simple bushes are considered to have lateral stops (shape. 3) when the elastomer protrudes from the external tube in the form of a support surface with various profiles.



Shape 1



Shape 2

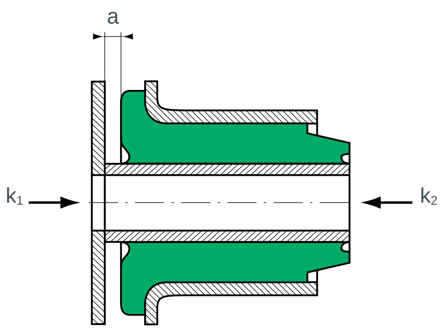


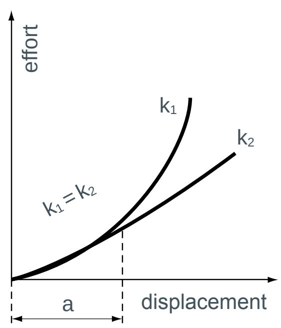
Shape 3

The lateral stop only comes into operation when the bush is forced off centre by a radial load. This causes the stop to protrude, thus ensuring an “anti-noise” role at the limit of axial movement.

II.2 - FLANGED BUSHES

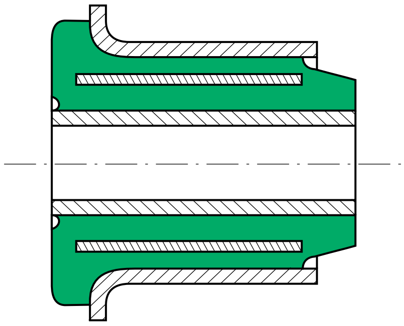
In this type of bush, one of the tubes is flanged.





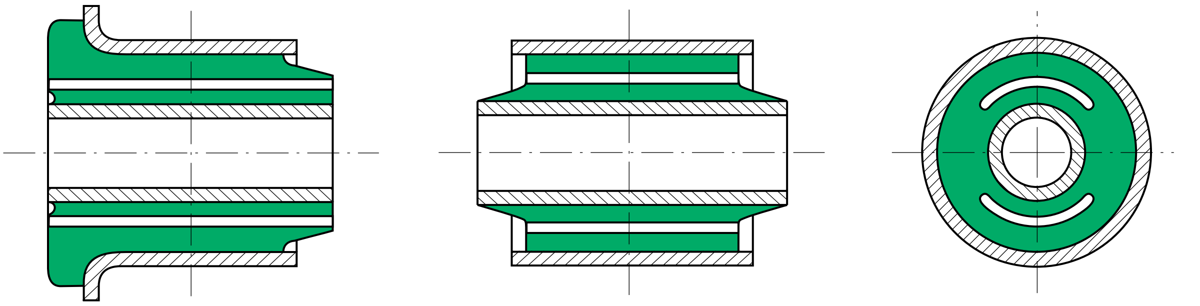
The rigidity k_1 is equal to k_2 if the travel is less than “a”, and it becomes greater than k_2 when the travel is greater than “a”.

II.3 - LAMINATED BUSHES



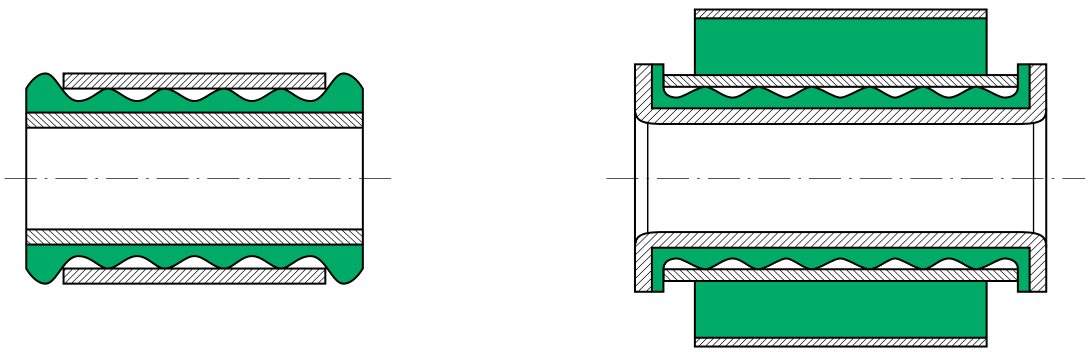
This type of bush has a thin metallic tube between the internal tube and the external tube. The object is to have a higher stiffness radially while keeping practically the same stiffness in torsion. The lamination of a bush also helps to decrease the work rate of the elastomer under high radial loads.

II.4 - VOID BUSHES



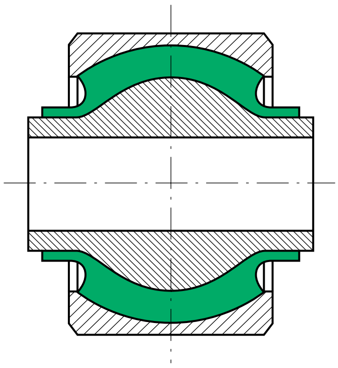
A void bush is designed to have radial stiffness which are very different at 90° to each other. The difference in rigidity is governed by the size of the voids, which may or may not run the whole length of the bush.

II.5 - PIVOT BUSHES



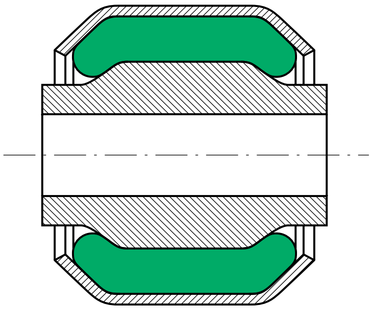
FLUIDBLOC :
This type of bush is intended to offer minimum resistance to torsion. The elastomer is bonded to only one of the armatures, and a suitable permanent lubricant ensures the lubrication between the elastomer and the second armature ensures a very low torsional resistance. Seals are provided at each end to prevent the lubricant from coming out and stop impurities from getting in. Resistance to axial force is provided by a flange in the elastomer which bears against the side of the outer sleeve, the force being transmitted by a lateral washer.

II.6 - Spherical bushes

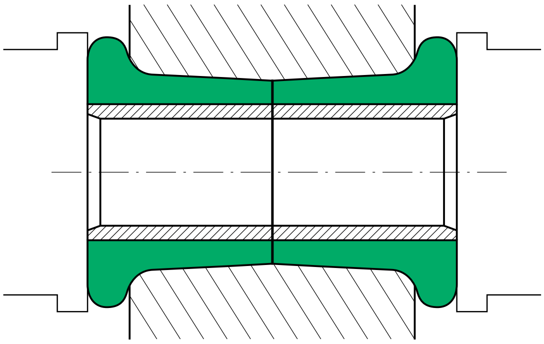


SPHERIFLEX :
In this bush, the outer sleeve and centre axis are spherical, which enables the bush to resist relatively high radial and axial loads and to obtain a circular rigidity which is independent of the axis of rotation.

II.7 - OTHER BUSHES



"PRESTRESSED BUSHES" with turned down sides :
For the same dimensions, this type of bush provides a radial load capacity which is superior to that of the classic "prestressed". In addition, versions of relatively short length permit conical movement more easily (reduced torque and increased angle).



CONICAL BUSH :
This takes the form of a rubber sleeve whose external surface is a truncated, and which surrounds a cylindrical internal part to which it adheres strongly by high radial expansion.
Assembly in pair, in a housing made up of two truncated cones placed small end to small end.
By axial pressure, a high compression is created which ensures the external adherence of the rubber and causes lateral cushions to form at each end of the housing. These cushions ensure resistance to axial forces.

III - OUTER SLEEVE AND CENTRE AXIS

III.1 - MATERIALS USED

In general, the outer sleeve and centre axis of flexible bushes are made of :

- Mild steel or polyamide for the external outer sleeve.
- Medium carbon steel for the centre axis.

The reason for the difference has to do with the method of fixation onto the internal armature, which is usually done by forcing from one end. The armature must therefore be both strong and not too thin, to avoid buckling.

III.2 - PROTECTION DURING STORAGE

To avoid corrosion of the steel parts, the parts are protected by a layer of phosphate which gives them a grey appearance, the whole being protected by a layer of oil.

To ease removal of fixing botts, the internal tubes are also protected on the interior by a layer of phosphate. This protection is good for storage, but it does not constitute a “tropicalised” protection, nor is it intended to resist saline mist.

III.3 - LENGTH TOLERANCES

- Length L (internal tube) : ± 0.1mm
- Length l (external tube) : JS 15, according to NF E02 100-1 and NF E02 100-2

- Longitudinal overhang : $\frac{L - l}{2} \pm 0{,}4$ mm

III.4 - DIAMETER TOLERANCES

On the internal diameter d : H10

d (mm)	3 to 6	6 to 10	10 to 18	18 to 30	30 to 50
H10	+ 0,048 + 0	+ 0,058 + 0	+ 0,070 + 0	+ 0,084 + 0	+ 0,1 + 0

On the external diameter D :

D ≤ 25 (mm)	25 < D ≤ 40 (mm)	D > 40 (mm)
+ 0,05 + 0	+ 0,1 + 0	+ 0,15 + 0

Recommended tolerance for fitting into a bored hole : boring D : N9 :

D (mm)	10 to 18	18 to 30	30 to 50	50 to 80	80 to 120
N9	- 0 - 0,043	- 0 - 0,052	- 0 - 0,062	- 0 - 0,074	- 0 - 0,087

IV - THE SELECTION OF A FLEXIBLE BUSH

In order to specify a bush correctly for a given application, the following criteria must be determined :

Basic data
For each of the 4 characteristics of the part (axial, radial, torsion or conical), the following values must be taken into account :
- the maximum static values (of force and/or of deflection) to which the part is subjected;
- the maximum dynamic values and their frequencies.

Fundamental parameters
Depending on the application, determine from the basic data the major fundamental parameter(s) which govern the choice of the bush to be used.

Dimensions
The fundamental parameters enable you to consult the catalogue for the range of dimensions of various bushes.

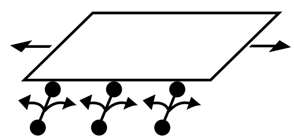
Stiffness
The final selection of the bush will depend on the required stiffness for the application. In particular, length, diameter and the thickness of the elastomer required for the desired bush will be determined.

Environmental conditions
Most of our standard bushes are in natural rubber. This has been chosen because of its good dynamic qualities.
In normal conditions of use, the types of rubber used guarantee a good life and limit creep in particular.
The following conditions of use are considered abnormal :
- temperatures above 70° C;
- prolonged contact with aggressive fluids;
- aggressive environments, such as oil or petrol;
- prolonged contact with acids or alkalis;
- aggressive atmospheres (e.g. ozone, chlorine).

Use in this conditions can accelerated ageing of the bushes, and cause the degradation or even the destruction of the rubber. An abnormally aggressive environment can, in particular, increase the deformation of the bush (by creep).
Flexible bushes can be made with special elastomers which are capable of surviving the abnormal conditions mentioned above and enabling the bushes to perform well.

Our technical services are at your disposal to reply to your questions about the properties of our various elastomers.

V - AN EXAMPLE OF A SELECTION



For the bushes of a vibrating carpet.
Weight : 120 daN. Number of fixing points : 6
Angle of movement : ± 2°. Frequency: 600 cycles/mn = 10 Hz
Radial load per bush : ± 20 daN (evenly loaded).
Amplitude reduction coefficient at 10 Hz : m = 0.18. Torsion angle : $\frac{2°}{0.18} = 11°$

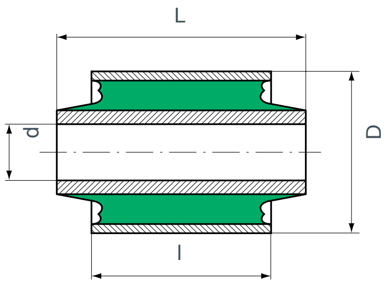
In this case, the axial and conical parameters are not of major importance in the selection of the bushes. Since the fixing diameter of the connecting rods is 10 mm, we would select reference 561 205 from the bush catalogue.

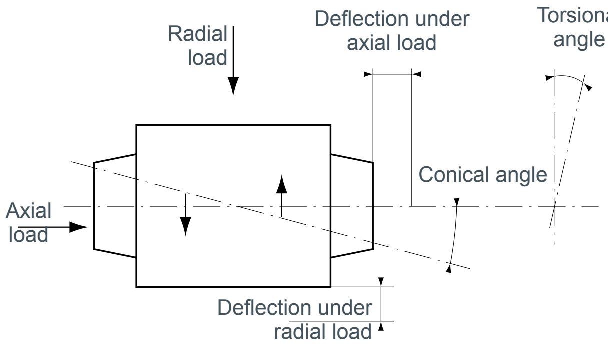
d = 10 mm D = 22 mm L = 17 mm l = 15 mm Radial load = 40 daN
Maximum torsion angle = 25°

Therefore, for the given application we would use : 12 Flexibloc 561205 bushes.

SIMPLE BUSHES

FLEXIBLOC® AND SILENTBLOC®





FLEXIBLOC - Fully Bonded : The elastomer is bonded to the 2 concentric tubes, Parts Number 560..., 561...

SILENTBLOC - Prestressed Elastomer : The ring of "adherite" is inserted by force between the 2 concentric tubes, Parts Number 861..., 862..., 864...

BL : Bushes with a lateral stop.

d (mm)	D (mm)	L (mm)	l (mm)	Obs	RADIAL		TORSION	AXIAL		CONICAL	Reference
					Static Load (daN)	Deflection (mm)	Max angle (degrees)	Static Load (daN)	Deflection (mm)	Max angle (degrees)	
6	16	14	12		10	0,1	25°	10	0,6	5°	561101
	16	14	12		10	0,07	30°	5	0,3	7°	**861601**
	16	24	20		20	0,05	30°	15	0,4	3°	861602
	20	22	16		25	0,4	30°	20	2,2	6°	561239
8	16	17	15		30	0,1	15°	15	1,3	3°	**561102**
	16	24	20		50	0,1	10°	15	1	1°	561104
	16	25	22		55	0,03	20°	35	0,2	1°	861104
	16	28	25		65	0,03	20°	45	0,2	1°	**861103**
	20	17	15		15	0,1	30°	10	0,3	7°	**861603**
	20	19	15		20	0,1	30°	10	0,3	7°	**861783**
	32	23,2	18		30	0,5	35°	20	1,5	6°	**561418**
9	21	21	17	BL	40	0,2	30°	15	0,8	5°	561258
10	22	17	15		40	0,3	25°	15	0,8	6°	**561205**

The references kept in stock are written in bold. 1 kg ≈ 1 daN

d (mm)	D (mm)	L (mm)	l (mm)	Obs	RADIAL		TORSION	AXIAL		CONICAL	Reference
					Static Load (daN)	Deflection (mm)	Max angle (degrees)	Static Load (daN)	Deflection (mm)	Max angle (degrees)	
10	22	19	15		40	0,3	25°	15	0,8	6°	561206
	22	23	20		55	0,03	20°	35	0,4	1°	**861112**
	22	24	18		90	0,2	20°	15	0,4	2°	561112
	22	30	25		100	0,2	20°	40	1,5	3°	**561207**
	22	33	30		110	0,03	20°	70	0,6	1°	**861114**
	22	34	30		55	0,1	30°	35	0,3	3°	**861607**
	24	22	18		50	0,4	25°	25	0,2	5°	561209
	24	24	18	BL	70	1,3	30°	25	0,8	3°	561445
	27	22	17		65	0,5	30°	25	1,5	3°	**561613**
	28	26	20	BL	80	0,6	30°	25	1,5	3°	561150
	28	27	20	BL	80	0,5	20°	30	1	5°	**561424**
	28	32	26	BL	110	0,4	30°	40	0,8	2°	561518
11,3	19,85	30,2	25,4		45	0,05	10°	35	0,3	2°	561103
12	25	23	20		55	0,04	20°	25	0,2	3°	**861118**
	25	28	25		100	0,2	20°	40	1	4°	**561212**
	25	34	30		120	0,2	20°	50	0,8	3°	**561213**
	25	38	35	BL	145	0,04	20°	95	0,4	1°	**864105**
	25	44	35		145	0,04	20°	95	0,4	1°	**861197**
	25	54	50		550	0,3	15°	45	0,6	1°	**561250**
	26	24	20		35	0,06	30°	20	0,4	7°	**861611**
	26	34	32		80	0,07	30°	50	0,4	3°	**861613**
	28	28	25		50	0,07	30°	25	0,4	7°	861614
	28	38	32		120	0,25	20°	60	1,5	3°	**561446**
	28	49	45		130	0,2	30°	60	1,6	4°	561224
	30	30	24		110	0,5	35°	40	1,5	6°	**561302**
	30	30	24	BL	110	0,5	25°	40	1,5	3°	**561341**
	30	30	24	BL	70	0,1	5°	25	0,6	4°	864801
	30	42	36	BL	210	0,55	30°	35	1,1	2°	**561395**
	32	40	24		190	0,55	20°	30	1	2°	560034
	53	46,5	34		140	1,5	50°	50	2	6°	**561122**
12,04	41,27	76,03	52		100	1	40°	50	2	4°	561677
14	27	25	17		60	0,2	20°	30	1,1	3°	561120
	27	28	25		120	0,2	20°	50	1,8	4°	**561227**
	27	28	25		90	0,04	20°	45	0,4	3°	**861128**
	27	33	25		150	0,15	20°	40	1	3°	561747
	27	45	40	BL	120	0,2	25°	80	1,5	2°	**561269**
	27	49	45		250	0,04	20°	165	0,7	1°	**861132**
	27	54	50	BL	280	0,04	20°	185	0,5	1°	**864109**
	27	58	50		350	0,1	20°	80	1	1°	561748
	28	44	40		250	0,1	15°	80	0,7	1°	**561458**
	28	54	50	BL	250	0,1	15°	70	0,7	1°	**561617**
	29	44	32		120	0,2	20°	50	2,5	2°	561594
	30	28	25		120	0,7	30°	45	1,1	5°	561303
	30	28	25		50	0,08	30°	25	0,4	7°	**861618**
	30	30	25	BL	80	0,2	25°	50	1,2	5°	561377
	30	30	25		120	0,3	25°	55	1,2	5°	561304
	30	30	25		50	0,08	30°	25	0,4	7°	**861619**
	30	42	38		150	0,2	30°	70	1,9	3°	**561305**
	30	42	38		100	0,08	30°	65	0,4	3°	**861620**
	32	33	30		130	0,4	25°	60	2	4°	**561307**
	32	46	38	BL	170	0,3	25°	80	2	2°	561492
	32	48	40	BL	250	0,1	15°	100	0,5	2°	561340
	32	54	46	BL	190	0,08	25°	125	0,6	2°	**864403**
	32	70	65		300	0,2	30°	200	1,1	1°	**561309**
14,3	30,2	69,8	63,5		370	0,1	20°	190	0,9	1°	861251
16	28,1	34	25		30	0,05	20°	15	0,4	1°	861834
	30	30	25		200	0,2	5°	35	0,5	1°	561348
	32	26	20		70	0,05	20°	35	0,3	2°	**861136**
	32	28	22		120	0,2	20°	50	2	5°	561313
	32	28	25		140	0,2	20°	50	1,6	5°	**561312**

The references kept in stock are written in bold. 1 kg ≈ 1 daN

d (mm)	D (mm)	L (mm)	l (mm)	Obs	RADIAL		TORSION	AXIAL		CONICAL	Reference
					Static Load (daN)	Deflection (mm)	Max angle (degrees)	Static Load (daN)	Deflection (mm)	Max angle (degrees)	
16	32	32	28		130	0,05	20°	65	0,4	3°	**861141**
	32	54	50		330	0,05	20°	220	0,4	1°	**861143**
	32	54	50	BL	330	0,05	20°	220	0,4	1°	**864108**
	32	59	55		400	0,05	20°	260	0,4	1°	**861145**
	32	66	60		450	0,05	20°	300	0,4	1°	**861146**
	32	76	70		500	0,1	20°	180	1,5	1°	561358
	36	38	35		90	0,1	30°	45	0,5	7°	**861624**
	36	43	35		90	0,1	30°	45	0,5	7°	861756
	40	40	32		200	0,8	30°	45	1,5	2°	561401
	40	40	32		95	0,6	5°	-	-	4°	**861810**
	40	50	32		135	0,6	5°	-	-	4°	861931
	40	54	50		250	0,5	35°	120	3	3°	561402
	52	34	30		70	1	40°	30	3,5	7°	561511
	52	48	40		90	1	40°	50	4	7°	**561520**
18	34	33	30		120	0,1	20°	60	1,1	4°	561328
	34	33	30		150	0,05	20°	75	0,4	3°	**861151**
	34	36	32		160	0,05	20°	80	0,4	3°	**861152**
	34	54	50	BL	600	0,3	12°	100	1	1°	561455
	34	66	60		490	0,05	20°	320	1,5	1°	**861153**
	34	71	65		540	0,05	20°	360	1,5	1°	**861154**
	36	46	40		220	0,04	20°	145	0,4	1°	**861156**
	42	38	35		100	0,1	30°	50	0,5	7°	**861627**
	70	58	45	BL	225	2,5	50°	100	4	5°	561543
20	38	42	38		230	0,2	25°	75	1	3°	**561384**
	38	59	55		300	0,15	20°	50	1	2°	**561335**
	38	59	55		410	0,04	20°	270	1,5	1°	**861160**
	38	76	70		400	0,2	15°	200	1	1°	561337
	38	76	70		630	0,04	20°	420	1,5	1°	**861162**
	38	81	75		700	0,04	20°	465	1,5	1°	**861163**
	38	90	84	BL	600	0,1	15°	200	1	1°	561382
	40	45	38		70	0,15	25°	35	0,6	2°	861830
	42	42	38		300	0,3	25°	90	1,5	4°	**561404**
	42	42	38		165	0,08	20°	80	0,5	3°	861165
	44	45	38		210	0,5	25°	90	3	4°	561440
	45,15	42	38		300	0,8	25°	60	1,6	2°	561451
	48	46	33		65	0,2	5°	-	-	4°	861934
	50	50	40		155	0,5	5°	25	0,7	4°	**861817**
	52	66	60		300	1	25°	150	3	5°	561521
22	40	45	40		250	0,05	20°	130	0,4	3°	**861166**
	40	86	80		850	0,06	20°	560	1,5	1°	**861167**
24	42	50	45		340	0,06	20°	170	0,4	3°	**861169**
	42	55	50		400	0,05	20°	200	0,4	3°	**861170**
	42	96	90		1 100	0,02	20°	730	1	1°	**861171**
	44	58	48		125	0,08	20°	60	0,8	3°	861831
	48	44	40		160	0,3	20°	110	1,5	2°	**561411**
	48	58	50		350	0,3	20°	120	2	2°	**561400**
	48	93	85		560	0,15	30°	370	0,7	3°	861634
	58	58	48		215	1	5°	-	-	4°	**861818**
26	44	66	60	BL	500	0,2	15°	160	1	1°	561454
28	48	36	34		315	0,05	20°	160	0,5	3°	**861173**
	48	55	50		420	0,05	20°	210	0,5	3°	861174
	48	66	60		400	0,15	20°	190	1,1	2°	**561409**
	48	66	60		540	0,06	20°	270	0,5	3°	**861175**
	48	118	110		1 500	0,07	20°	900	2	1°	861177
	52	108	100		800	0,1	30°	500	0,7	3°	**861637**
	66	66	56		500	1,5	40°	140	3,5	7°	**561601**
	66	66	56		350	1	5°	100	3	4°	**861819**
	66	76	70		850	1	30°	320	3	6°	561660
30	50	128	120		1 900	0,07	20°	1 000	2,5	1°	**861178**
32	52	66	60		600	0,15	10°	260	2,2	1°	**561503**
	52	66	60		600	0,06	20°	300	0,3	3°	**861180**

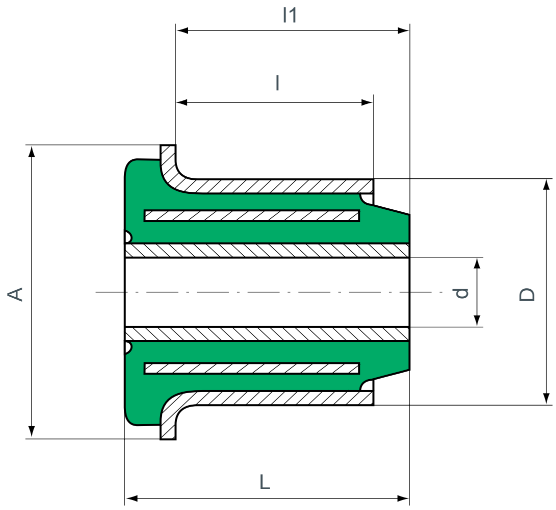
The references kept in stock are written in bold. 1 kg ≈ 1 daN

d (mm)	D (mm)	L (mm)	l (mm)	Obs	RADIAL		TORSION	AXIAL		CONICAL	Reference
					Static Load (daN)	Deflection (mm)	Max angle (degrees)	Static Load (daN)	Deflection (mm)	Max angle (degrees)	
32	56	55	50		310	0,08	30°	150	0,7	7°	**861638**
	56	116	108		1 000	0,1	30°	650	0,7	3°	**861639**
	70	76	70		1100	1,1	25°	190	2,3	2°	561703
34	50	45	39,5	SP	200	0,2	6°	100	2,5	1°	561141
36	58	130	120		1 900	0,08	20°	1 000	1	1°	**861182**
	60	60	55		400	0,15	30°	200	0,7	7°	861640
38	64	76	70		900	0,07	20°	450	0,5	3°	**861183**
	64	135	125		2 400	0,1	20°	1 300	1,5	1°	**861184**
	66	60	55		450	0,1	30°	220	0,7	7°	**861642**
42	78	66	60		680	0,07	30°	340	1	7°	**862601**
	78	86	80		1 000	0,5	10°	200	1,6	1°	**561701**
	78	86	80		1270	0,08	20°	630	0,8	3°	**862101**
	78	140	130		2 000	0,6	20°	400	2	1°	**561702**
	78	140	130		2 800	0,1	20°	1 500	2	1°	862102
	80	85	79		1 400	0,1	15°	-	-	3°	862111
44,45	76,2	63	60		700	0,1	30°	100	0,2	3°	862140
46	80	86	80		1 500	0,1	15°	-	-	3°	862137
	86	110	100		1 400	0,15	20°	700	1,5	1°	862422
50	80	83	79		1 500	0,2	15°	150	0,7	1°	862614
56	93	250	170		2 600	0,6	15°	1 400	2	0,3°	561901
58	93	132	117		2 000	0,2	15°	200	1,2	2°	862444
	95	90	83		1 600	0,3	15°	-	-	3°	862646
60	105	87	90		2 000	0,2	15°	200	1,2	2°	862435
	110	182	170		4 000	0,2	15°	400	0,8	1°	862510
	140	182	170		5 400	0,3	15°	360	2	1°	862512
62	105	120	110		2 500	0,2	15°	250	0,8	1°	862421
68	105	120	110		2 500	0,2	15°	250	0,8	1°	561657
70	120	120	115		3 000	0,3	15°	300	0,9	1°	862434
	120	182	170		4 500	0,2	15°	450	0,8	1°	862480
80	120	120	110		3 000	0,2	15°	300	0,8	1°	561658
	140	98	98		3 000	0,6	10°	1 800	2	2°	561009
	140	98	98		3 000	0,3	8°	-	-	2°	561043
	140	98	98		2 300	0,2	10°	-	-	1°	862481
	140	182	170		5 400	0,1	15°	540	0,8	1°	862414
90	145	170	145		5 500	0,25	15°	550	0,8	1°	862627
95	170	105	105		1 500	2,3	10°	-	-	5°	561956
110	175	205	190		7 500	0,15	12°	750	0,9	1°	862513
	160	190	170		6 000	0,1	12°	600	0,7	1°	561928
120	160	190	170		4 000	0,1	12°	400	0,6	1°	561938
125	160	185	184		4 300	0,1	12°	430	0,4	1°	561913
138	192	130	124		5 500	1	10°	-	-	3°	862810
150	185	210	209		5 500	0,1	10°	550	0,4	1°	561916
	185	240	239		6 500	0,1	10°	650	0,5	1°	561925
170	210	270	269		8 000	0,1	10°	800	0,4	1°	561184
190	230	270	258		8 500	0,1	10°	850	0,4	1°	561003
210	260	300	290		10 500	0,1	10°	1 000	0,4	1°	561989

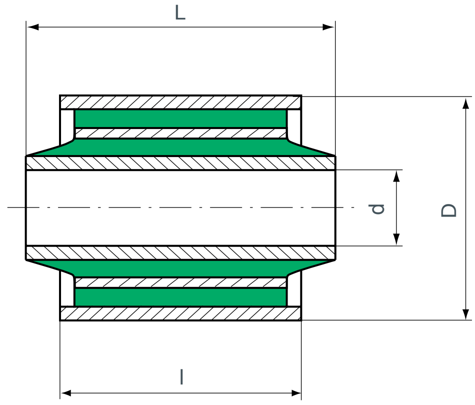
The references kept in stock are written in bold.

1 kg ≈ 1 daN

LAMINATED BUSHES



Shape 1



Shape 2

DIMENSIONS

d (mm)	D (mm)	A (mm)	L (mm)	l (mm)	l_1 (mm)	Shape	Reference
12	34	-	48	30	-	2	560033
14	35	-	58,3	43	-	2	561040
14	40	55	27,4	16,3	17	1	531427
16	40	-	46	32	-	2	560062
20	38	-	60	59	-	2	579071

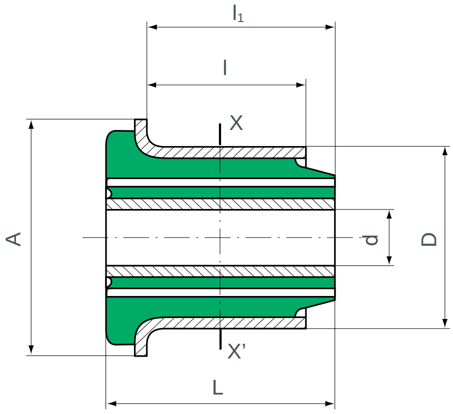
CARACTÉRISTIQUES TECHNIQUES

Reference	Maximum Radial Load		Axial static load (daN)	Torsion	
	Static (daN)	Dynamic (daN)		Max Angle	Approx. torque N.m.
531427*	400	-	130	20°	80
560062	900	-	40	15°	20
560033	750	-	40	20°	10
561040	850	-	50	20°	50
579071	10 500	15 000	-	6°	54

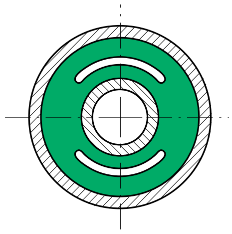
* The axial load is measured on the side of the lateral stop.

1 kg ≈ 1 daN

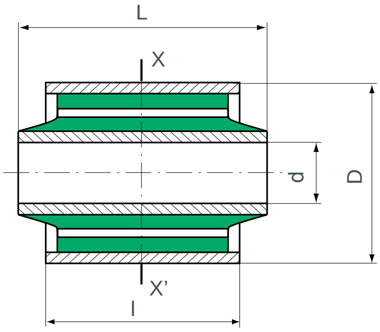
VOID BUSHES



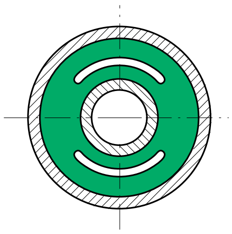
Section XX'



Shape 1



Section XX'

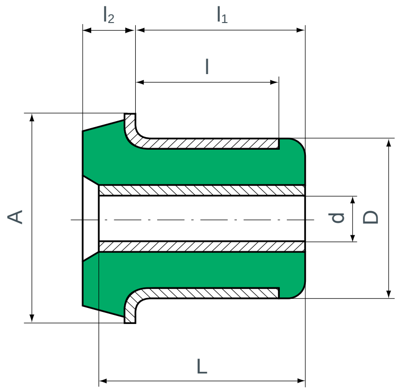


Shape 2

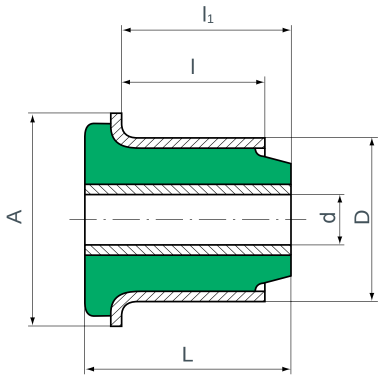
DIMENSIONS

d (mm)	D (mm)	A (mm)	L (mm)	l (mm)	l_1 (mm)	Shape	Reference
10,2	37	-	44,8	36	-	2	560218
10,2	37	-	54,3	36	-	2	560217
12	40	-	60	40	-	2	560065
12	43	60	41	26,5	32,5	1	531413
12,25	30	41	34,1	25,2	26,6	1	531363
12,25	30	41	34,1	25,2	26,6	1	531431

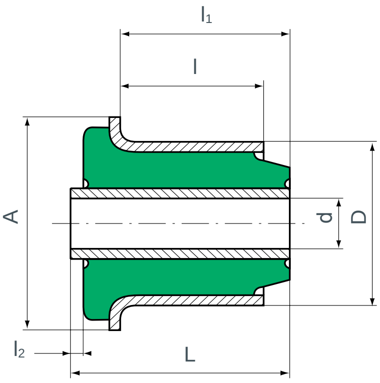
FLANGED BUSHES



Shape 1



Shape 2



Shape 3

FLANBLOC®

d (mm)	D (mm)	A (mm)	L (mm)	l (mm)	l_1 (mm)	l_2 (mm)	Maximum Radial Load		Dynamic axial load (daN)	Torsion		Shape	Ref.
							Static (daN)	Dynamic (daN)		Max angle	Approx. torque N.m.		
16	32	47	62	48	56,5	-	250		430	30°	45	2	866016
-	32	47	89	48	83,5	-	250	Overload coeffidient : 3	430	30°	45	2	866012
-	36	46	41	28,8	34,7	9,5	60		56	30°	90	1	867001

1 kg ≈ 1 daN

SPECIAL S.C.

d (mm)	D (mm)	A (mm)	L (mm)	l (mm)	l_1 (mm)	l_2 (mm)	Maximum Radial Load		Dynamic axial load (daN)	Torsion		Shape	Ref.
							Static (daN)	Dynamic (daN)		Max angle	Approx. torque N.m.		
12	32	43	50	34	40	3	50		160	35°	16	3	531300
16	40	50	50	32	40	-	150	Overload coefficient : 3	120	20°	-	2	531411
-	40	51	83	52	76	1	200		-	20°	-	3	531417

1 kg ≈ 1 daN

PIVOT BUSHES

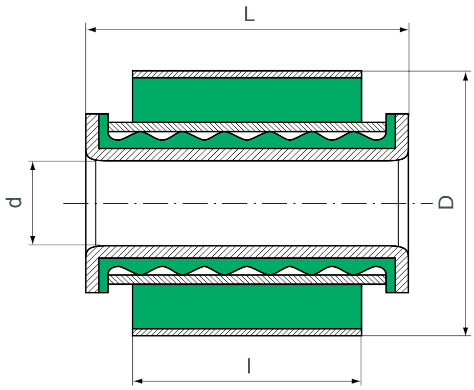


Fig. 1

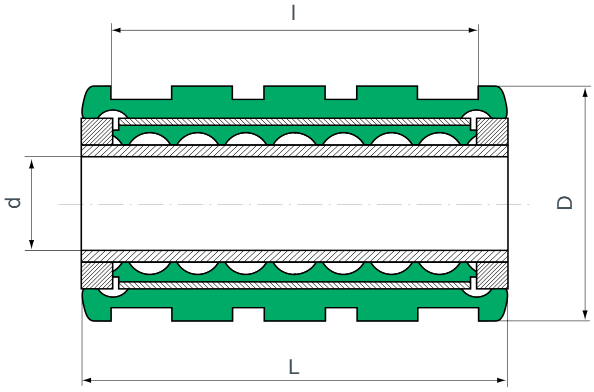


Fig. 2

FLUIDBLOC® AND TOURIFLEX®

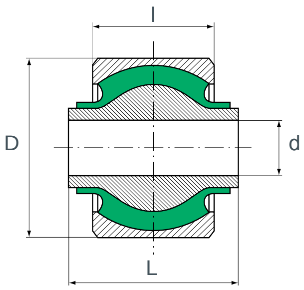
These are high precision bushes; they are made of injected polyurethane and can resist oil, water, ozone, etc.
These "pivoting" bushes are characterised by their very low torsional resistance (0.1 to 0.2 N.m).
They can ensure a complete rotation (360°), and have no requirements for maintenance because they have a permanent lubricant.
They don't need a high precision housing, and the load to remove the bushes is between 1500 and 1800 daN.
There are many applications, such as : leaf spring bushes for vehicles not exceeding 5 tons.

d (mm)	D (mm)	l (mm)	L (mm)	Maximum radial load static (daN)	Shape	Reference
16	36	60	70	900	2	566050
16	45	60	70	1 100	2	566051
AXE CARRÉ	140	214	304	7 000	-	568256
27	70	60	76	1 000	1	568247
36	88	70	86	1 000	1	568248

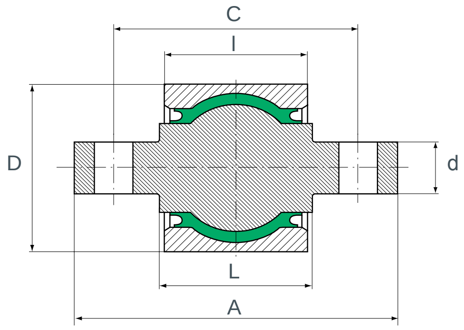
1 kg ≈ 1 daN

SPHERICAL BUSHES

SPHERIFLEX®



Shape 1



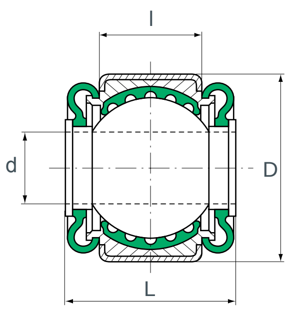
Shape 2

d (mm)	D (mm)	L (mm)	A (mm)	l (mm)	C (mm)	Radial Load		Torsion		Conical		Ref.
						Max (daN)	Stiffness daN/mm	Max (degrees)	Stiffness daN/mm	Max (degrees)	Stiffness daN/mm	
35	62	36	-	36	-	1 000	16 000	12	1 000	8	680	563075
24	64	58	-	30	-	800	22 000	12	220	10	220	563489
35	67	35(b)	-	36	-	1 000	16 000	12	1 000	8	680	563559
26	80	72(b)	-	56	-	3 800	55 000	10	2 200	8	1 900	563353
26	80	78(b)	-	56	-	3 800	55 000	10	2 200	8	1 900	563343
40(a)	80	49(b)	-	56	-	3 800	55 000	10	2 200	8	1 900	563354
36	85	80	-	66,5	-	3 800	30 000	12	2 150	6	1 650	563317
Axe	85	100	180	71	140	3 800	30 000	12	2 150	6	1 650	563425
Axe	88	75	144	66	-	3 800	30 000	12	2 150	6	1 650	563253
36	90	-	80	71	-	4 400	53 800	12	2 300	8	3 050	563316
Axe	90	90	170	68	130	4 000	50 000	12	2 150	10	2 800	563345
Axe	90	80	172	77	130	4 400	53 800	12	2 300	8	3 050	563300
Axe	90	90	170	77	130	4 400	53 800	12	2 300	8	3 050	563555
Axe	90	100	180	77	140	4 400	53 800	12	2 300	8	3 050	563426
44	100	114	-	87,5	-	7 000	60 000	12	1 500	8	2 000	563571
44	100,2	116	-	72,5	-	7 000	60 000	12	1 500	8	2 000	563605

(a) The internal diameter is shouldered (b) Length L not centered

1 kg ≈ 1 daN

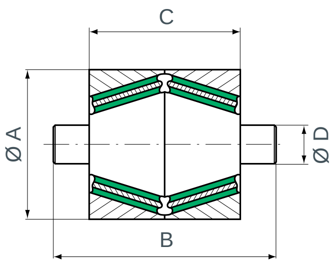
FLUIDBLOC®



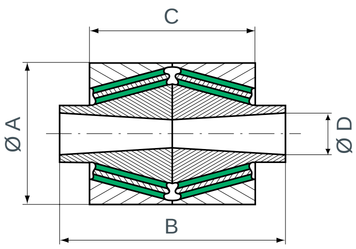
d (mm)	D (mm)	L (mm)	l (mm)	Radial static load (daN)	Axial static load (daN)	Sliding torque N.m.	Reference
24	64	58	36	850	100	1	568184

1 kg ≈ 1 daN

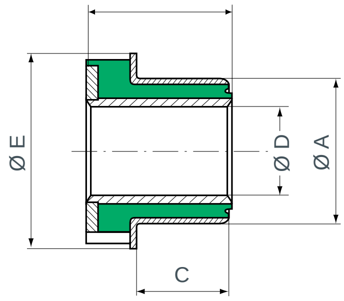
SPECIAL BUSHES



Shape 1



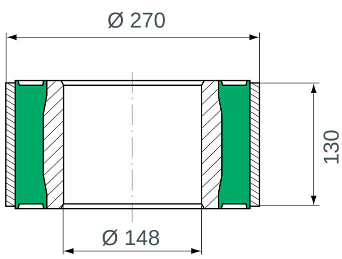
Shape 2



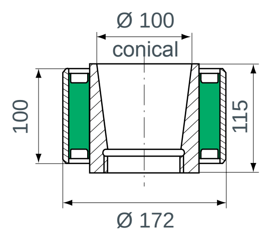
Shape 3

Reference	Shape	Ø A (mm)	B (mm)	C (mm)	Ø D (mm)	Ø E (mm)	Radial Stiffness KN/mm	Axial Stiffness KN/mm
563468	2	180	200	140	Ø 68	-	85	10
562908	1	140	254	160	50 x 56	-	85	17
562912	1	140	273	145	Ø 63	-	20	5
563533	2	185	190	150	Ø 70 cône	-	57,5	16,75
563550	2	185	190	150	Ø 68	-	57,5	16,75
563443	2	132	154	136	Ø 70	-	140	5
531293	3	110	55	42	Ø 50	86	17	8
531367	3	110	95	33	Ø 52	150	10	50
531330	3	122	72	54	Ø 70	162	40	30
563352	1	122	254	120	Ø 50	-	4	5

563264

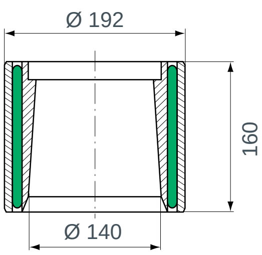


Max radial load : 100 kN

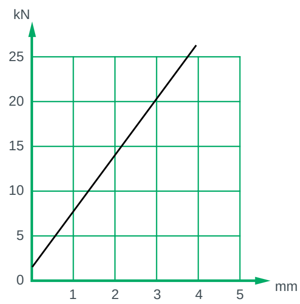


561958

862624



Max radial load : 70 kN



Radial load / Movement

FLEXIBLE COUPLINGS

FLEXIBLE COUPLINGS

HUTCHINSON®

FLEXIBLE COUPLINGS

CONTENTS

Please see current price list for availability of items.
We reserve the right to modify the design and manufacture of the products and materials described in this catalogue.
The pictures of the products are supplied for information only.

I - GENERAL

I.1 - FUNCTION OF A FLEXIBLE COUPLING

When transmitting torque from a drive shaft to a driven shaft, flexible couplings :

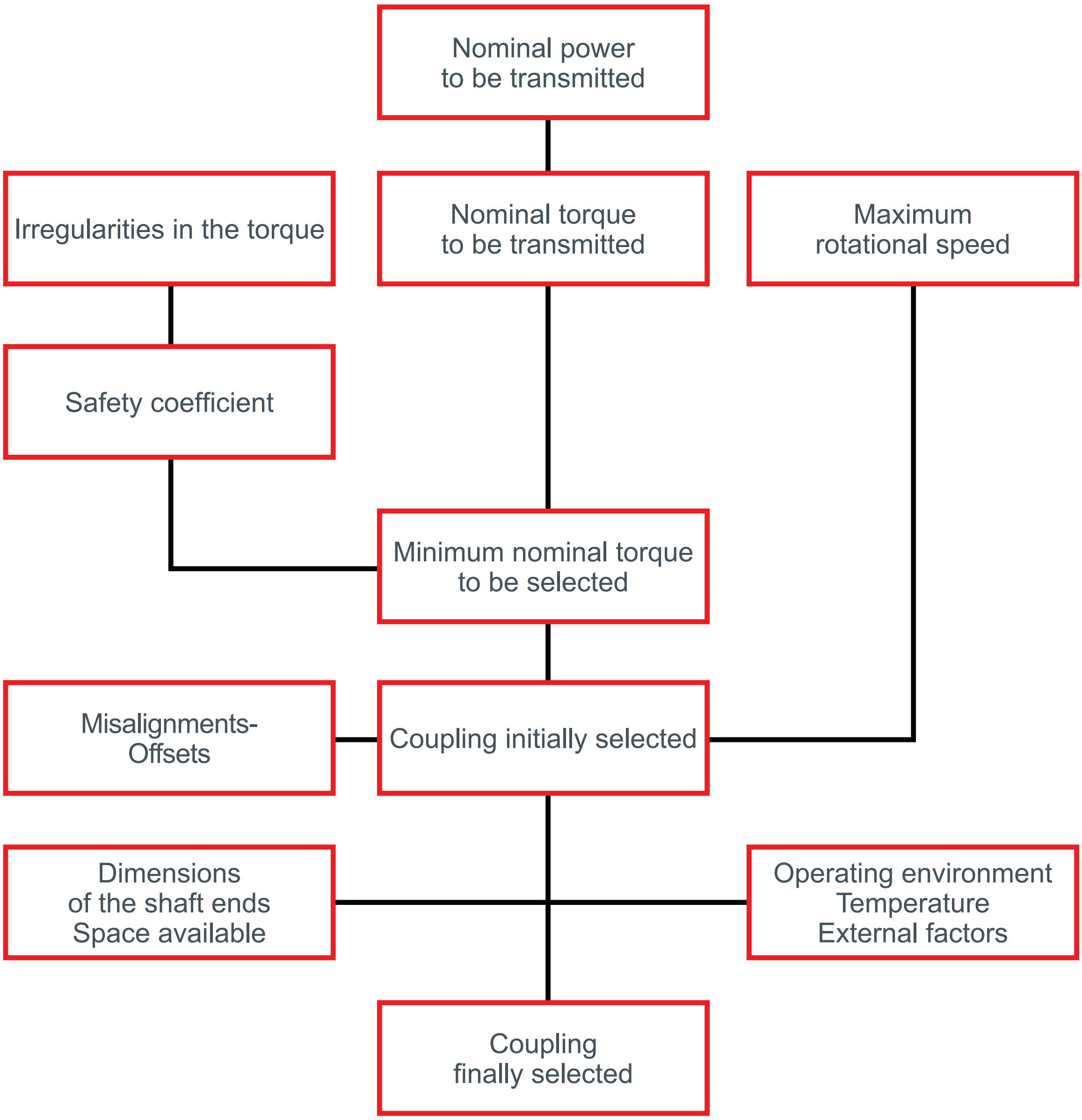
- absorb and dampen **irregularities** in the **torque**;
- distribute peak loads;
- allow misalignments and offsets between the shafts;
- permit some distortions in the mounting beds;
- avoid the unwelcome constraints that may occur if a rigid coupling were fitted in the same conditions;
- allow a lighter construction, with wider tolerances, and lower cost.

In particular, a flexible coupling is absolutely essential if the machines that are coupled are on **flexible mountings.**

Moreover, there is **no play** in a flexible coupling, and it therefore **runs silently, without friction and does not need to be greased**.

I.2 - SELECTION PARAMETERS

The procedure for selecting a coupling is set out below :



In order to select a flexible coupling, therefore, the following parameters should be known :

- **nominal torque to be transmitted;**
- **safety coefficient - Nominal torque of the coupling;**
- **stiffness - Misalignments - Offset;**
- **dimensions - Space available;**
- **operating environment - Temperature - External factors;**

I.2.1 - NOMINAL TORQUE TO BE TRANSMITTED

The nominal torque is the main factor which determines the dimensions of the coupling between the shafts of the machines that are connected directly to it.
The nominal torque to be transmitted is a function of the nominal power to be transmitted and the rotational speed.

$$T\ (\mathrm{N.m}) = \frac{7\,024 \times P\ (\mathrm{bhp})}{N\ (\mathrm{rpm})}$$

$$T\ (\mathrm{N.m}) = \frac{9\,550 \times P\ (\mathrm{Kw})}{N\ (\mathrm{rpm})}$$

The nominal power to be transmitted is that of the driving machine expressed in kilowatts (Kw) or brake horsepower (bhp). The couplings in PAULSTRA's standard range can transmit power from 1 Kw to more than 2,000 Kw.

The rotational speed expressed in revolutions per minute is that of the driving machine and must be less than the maximum speed accepted by the coupling.

The couplings in PAULSTRA's standard range allow high speeds (up to 10,000 rpm), which is greater than electric motor speeds. The maximum speeds indicated can be achieved only if great care is taken during assembly.

In addition to its elastic properties, the rubber has **viscous damping** characteristics which dampen the oscillations and in particular the oscillations which might become excessive during transient periods of peak load.
The dampening effect is produced by irreversibly absorbing the energy which is thus converted into heat. In order to prevent the rubber being damaged by the resultant increase in temperature, especially if running at high speed, it is important to ensure the best possible alignment.

Once the coupling has been chosen, if difficult **peak load conditions** become evident, it would be advisable to choose a flexible coupling with different characteristics.

I.2.2 - SAFETY COEFFICIENT

The following factors should be taken into consideration when selecting the nominal torque of the coupling :

- irregularities in the torque characteristic of the driving and the driven machines (K_1);
- frequency of start-ups (K_2);
- number of hours in operation per day (K_3).

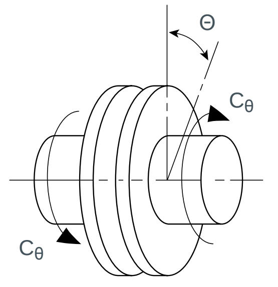
The product K of these three coefficients K_1, K_2, K_3, is called the safety coefficient or the load factor.

Nominal torque of the coupling = Nominal torque to be transmitted x safety coefficient.

An excessive safety coefficient should be avoided as this tends to lead to the selection of a coupling that is oversize and too stiff.

I.2.3 - STIFFNESS - MISALIGNMENTS - OFFSETS

A flexible coupling always allows, to varying degrees depending on type, structure and dimensions, displacements in four ways : axial, radial, conical and torsional. A stiffness defined for each of these cases. The stiffness affects the way in which the coupling reacts when subjected to each of the various possible displacements.

<table>
<tr><th>Torsional or polar stiffness</th><th>Radial stiffness</th><th>Axial stiffness</th><th>Conical stiffness</th></tr>
<tr>
<td>
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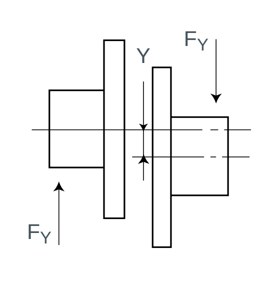
<td>
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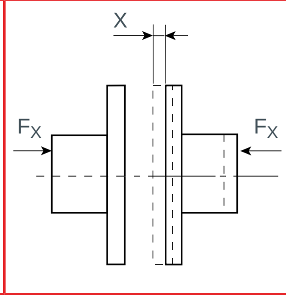
<td>
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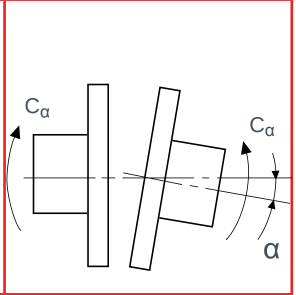
<td>
</td>
</tr>
<tr>
<td>$K_\theta = \frac{\text{Torque}}{\text{Angular}} = \frac{C_\theta}{\Theta}$
expressed in m.kN/radian</td>
<td>$K_y = \frac{\text{Radial force}}{\text{Corresponding radial displacement}} = \frac{F_y}{Y}$
expressed in m.kN/radian</td>
<td>$K_x = \frac{\text{Axial force}}{\text{Corresponding axial displacement}} = \frac{F_x}{X}$
expressed in daN/mm</td>
<td>$K_\alpha = \frac{\text{Misalignment torque}}{\text{Angular misalignment}} = \frac{C_\alpha}{\alpha}$
expressed in m.kN/radian</td>
</tr>
</table>

It can be seen that a coupling can absorb misalignment more easily if it is very flexible (ie it is less stiff). With flexible couplings «alignment» is not an arduous, high precision operation as is the case with rigid couplings.
The forces generated by flexible couplings, which are transmitted to the shafts and supports, are, of course, proportional to the magnitude of the misalignments.

I.2.4 - DIMENSIONS – SPACE OCCUPIED

When choosing the coupling, one should bear in mind :

- the dimensions (diameter and length) of the ends of the shafts to which the flanges of the coupling will be fitted;
- the space (diameter and length) available between the machines for the coupling.

I.2.5 - OPERATING CONDITIONS – TEMPERATURE – EXTERNAL FACTORS

The natural rubber which has been selected for most of our standard couplings on the basis of its good dynamic qualities :

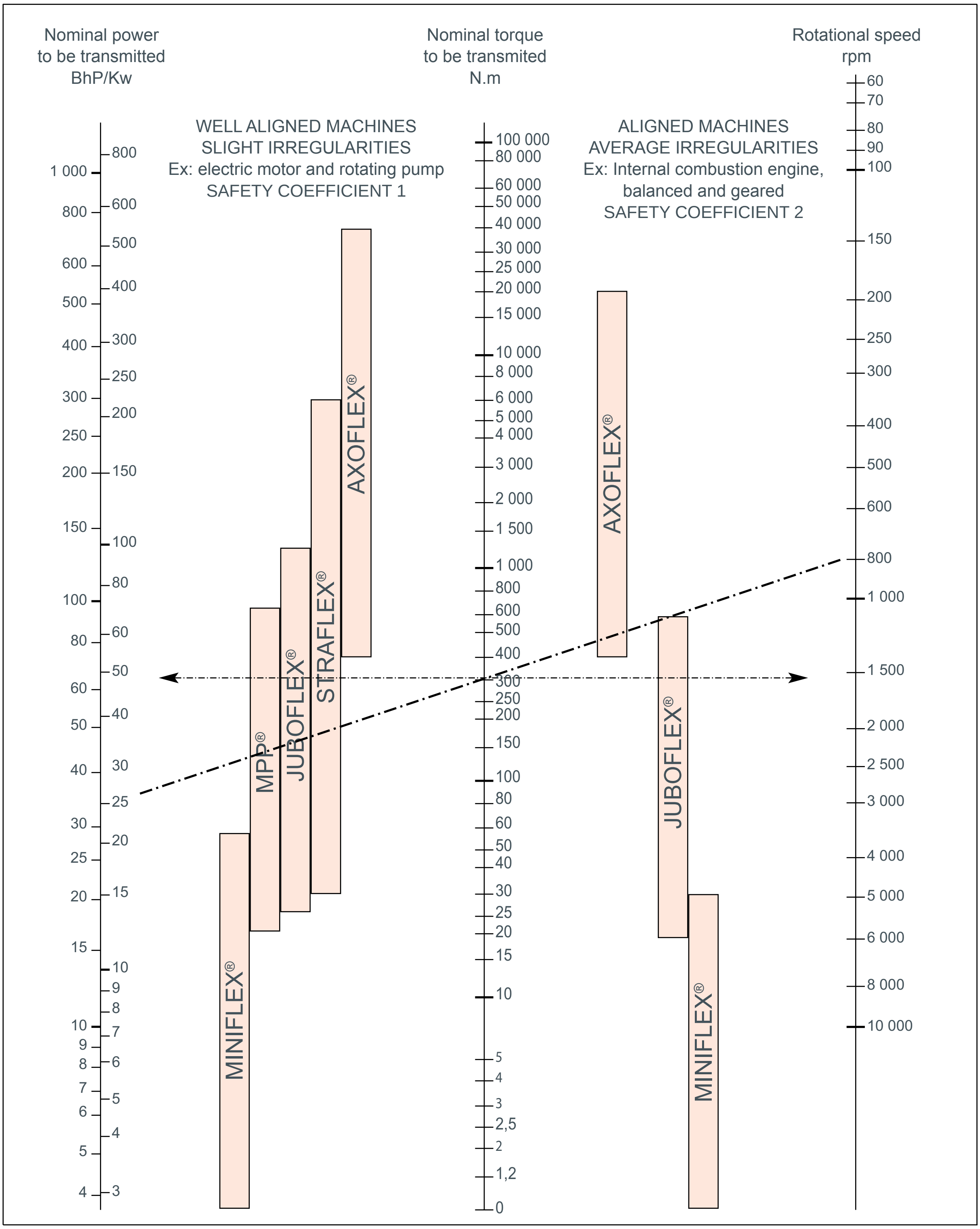
- is very good for the operating environment of most machines;
- is not affected by accidental contact with oil or petrol;
- easily withstands temperatures up to 70°C.

A temperature which is permanently higher will lead to progressive deterioration in the properties of the rubber and it would therefore be advisable to consider special compounds.
Most PAULSTRA flexible couplings can be made using various types of special compounds that can withstand above average temperatures and remain serviceable in unusual conditions: prolonged contact with hydrocarbons, acids, alkalis or with unusual gases (ozone, chlorine . .).

If operating conditions are different from those defined for our standard couplings, contact our Technical Department.

II - SELECTING A COUPLING

I.1 - CALCULATING THE NOMINAL TORQUE TO BE TRANSMITTED



Example : to calculate the torque, draw a straight line between the points representing the power to be transmitted and the rotational speed of the machine. The intersection at the central scale indicates the torque value.
Ex. : 25 Kw at 800 rpm 300 N.m. Draw an horizontal line through this point.
The type of coupling will then be selected, bearing in mind the safety coefficient to be applied and the flexibility required. Refer to the selection chart, page 300.

II.2 - SAFETY COEFFICIENT

II.2.1 - COEFFICIENT K_1 = DRIVING MACHINE/DRIVEN MACHINE

Driving Machine			Driven machine	Examples of driven machines
Electr. motor or turbine	Piston Engine			
	4 to 6 cylin.	1 to 3 cylin.		
1	1,2	1,4	❶ Smooth operation - Very low inertia	• Lay shaft • Lighting generator • Series of shafts • Centrifugal pump • Centrifugal fan...
1,2	1,4	1,7	❷ Irregular operation - Low inertia	• Fluid agitator • Conveyor belt • Lift • Rotating machine tools for wood and metal • Light textile machines • Folding machines • Geared pumps • Paddle pumps • Fans...
1,4	1,7	2	❸ Irregular operation - Average inertia	• Agitator for heavy liquid • Rotary compressor • Roller conveyor • Shredders • Rotary ovens • Wood machinery (planing machine, band-saw . . .) • Printing machines • Mixers • Hoists • Punch • Centrifugal pump for loaded liquid...
1,7	2	2,4	❹ Irregular operation - Average inertia - Average shocks	• Concrete mixer • Bar shredder • Shot blaster • Piston compressor with fly wheel • Chain conveyor • Crane • Light rolling mill • Flour mills • Power hammer • Loom • Piston pump with fly wheel • Horizontal mills • Winches • Mine fans...
2	2,4	2,8	❺ Irregular operation - High inertia - Hard shocks	• Hammer crushers • Calender (rubber, textiles...) • Piston compressor with low inertia fly wheel • Wood shredder • Excavator • Rolling mill • Piston pump with low inertia fly wheel • Forging press • Paper press • Vibrating sieve...
2,4	2,8	3,3	❻ Irregular operation - Very high inertia - Very hard shocks	• Piston compressor without fly wheel • Crusher • Welding generator • Heavy rolling mill • Brick press • Piston pump without fly-wheel...

II.2.2 - COEFFICIENT K_2 = NUMBER OF START-UPS

Depending on driving machine - driven machine See table K1	NUMBER OF START-UPS PER HOUR				
	1	10	30	60	120
❶	1	1,2	1,3	1,5	1,6
❷ ❸	1	1,1	1,2	1,3	1,4
❹ ❺ ❻	1	1,05	1,1	1,2	1,2

II.2.3 - COEFFICIENT K_3 = NOMBRE D'HEURES DE FONCTIONNEMENT QUOTIDIEN

Number of operating hours per day	0 - 2	2 - 8	8 - 16	16 - 24
Coefficient K3	0,9	1	1,1	1,2

II.2.4 - NOMINAL TORQUE OF THE COUPLING

Nominal torque of the coupling = Nominal torque to be transmitted x safety coefficient.
The safety coefficient, K, is the product of the three coefficients K_1, K_2 and K_3.

The above parameters should enable one or two types of coupling to be selected which are suitable for the application required.
The final choice will be made on the basis of the data sheets for the coupling selected, checking :

- the dimensions allowed for the shaft ends;
- the space available;
- the exact values of the misalignements, offset, stiffness;
- and any other parameter (eg : installation).

II.3 - EXAMPLES

II.3.1 - ELECTRIC MOTOR – PUMP

Driving machine Standard electric motor 160 M Power : 15 Kw Speed : 3000 rpm End of shaft Ø : 42 mm - length : 110 mm	Driven machine : Standard C2 water pump End of shaft Ø : 32 mm - length : 80 mm 30 start-ups/hour 8 hours operation per day

Nominal torque to be transmitted : chart indicates 5 N.m.
Safety coefficient : $K_1 = 1$ $K_2 = 1.3$ $K_3 = 1$ hence $K = K_1 \times K_2 \times K_3 = 1.3$.
Nominal torque of coupling : NT = 50 N.m x 1.3 = 65 N.m.

For machines which have a regular cyclic operation with correct alignment, it is not essential to have a highly flexible coupling and so the following couplings would be pre-selected :

CARDAFLEX	80 N.m
PAULSTRA MPP	80 N.m
STRAFLEX	100 N.m

All these couplings can be used at a speed of 3,000 rpm.

In this case, the PAULSTRA MPP 80 N.m coupling would be chosen as it is the only one which will fit the diameter (42 mm) of the end of the motor shaft.

II.3.2 - ELECTRIC MOTOR – COMPRESSOR

Driving machine : Standard 200 L electric motor Power : 30 kW Speed : 1,500 rpm End of shaft Ø : 55 mm - length : 110 mm	Driven machine : 2 cylinder compressor with fly wheel End of shaft Ø : 60 mm - length : 110 mm Less than one start-up/hour 8 hours operation per day

Nominal torque to be transmitted : chart indicates 190 N.m.
Safety coefficient : $K_1 = 1.7$ $K_2 = 1$ $K_3 = 1$ hence $K = 1.7$.
Nominal torque of coupling : NT = 190 x 1.7 = 320 N.m.

The characteristics of the driven machine mean that high torsional flexibility is essential to absorb the cyclic irregularities.

The JUBOFLEX 350 N.m will therefore be selected, having checked that it can accommodate the shaft ends of the machines.
These examples are simple cases. In many instances, this method is adequate for selecting couplings. In more complex cases (cyclic vibrations, for example), it is advisable to consult our technical Department.

COUPLING

In order to make it easier to select the coupling required, this selection chart indicates the behaviour of PAULSTRA couplings when under stress.

This rating takes account of the possibilities of misalignments, offset and the resultant forces on the shafts and supports. Each condition is shown :

	MINIFLEX® P303	MPP® P307	JUBOFLEX® P311	STRAFLEX® P319
TORSION	**	**	***	*
RADIAL	***	*	**	*
AXIAL	Push fit	Push fit	***	**
CONICAL	**	*	***	**

Nominal Torque (N.m): 100 000 / 50 000 / 40 000 / 30 000 / 20 000 / 10 000 / 5 000 / 4 000 / 3 000 / 2 000 / 1 000 / 500 / 400 / 300 / 200 / 100 / 50 / 40 / 30 / 20 / 10 / 2,5

MINIFLEX® P303

Coupling Ref.	Nominal Torque (N.m)	Speed Max (rpm)	Max shaft Ø (mm)
633047	60	4 000	55
633044	40	4 000	55
633038	20	7 000	42
633039	10	9 000	28
633041	2,5	10 000	14

MPP® P307

Coupling Ref.	Nominal Torque (N.m)	Speed Max (rpm)	Max shaft Ø (mm)
633055	650	3 000	75
633054	380	3 000	60
633051	200	4 000	55
633053	80	7 000	42
633052	30	9 000	28

JUBOFLEX® P311

Coupling Ref.	Nominal Torque (N.m)	Speed Max (rpm)	Max shaft Ø (mm)
632025	700	2 400	80
632043	500	2 800	75
632031	350	3 000	70
632017 *632217	250	3 500	60
632017 *632217	160	4 500	48
632023 *632210	90	5 000	40
632027 *632205	40	6 000	30

STRAFLEX® P319

Coupling Ref.	Nominal Torque (N.m)	Speed Max (rpm)	Max shaft Ø (mm)
635107	6 000	2 000	145
635106	3 200	2 400	110
635105	1 600	2 800	100
635304 *635308	800	3 500	700
635303 *635307	400	4 500	50
635302 *635306	200	5 000	42
635301 *635305	100	5 500	32
635100	50	6 000	30

*separate hubs

SELECTION CHART

Very flexible * * * Flexible * * Semi-flexible * Rigid

More precise information on the values for misalignment, offset and rigidity can be found in the individual data sheets.

	AXOFLEX® P333	CARDAFLEX® P325	RADIAFLEX® RTP* P329
TORSION	*	**	*
RADIAL	*	*	*
AXIAL	**	**	see Data Sheet
CONICAL	*	**	

AXOFLEX® P333

Coupling Ref.	Nominal Torque (N.m)	Speed Max (rpm)	Max shaft Ø (mm)
615418	40 000	1 200	200
615444 615414	24 000	1 400	200 170
615442 615412	17 500	1 500	170 150
615440 615410	12 000	1 500	150 120
615408	7 500	1 800	120
615212 615406	5 000	1 800 2 000	120 100
615210	3 600	2 500	100
615208	2 300	2 500	80
615206	1 300	3 000	80
615204	800	3 000	60
615203	800	3 000	60

CARDAFLEX® P325

Coupling Ref.	Nominal Torque (N.m)	Max shaft Ø (mm)
622406	520	4500
622405	160	5 500
622404	120	5 500
622403	80	6 000
622402	50	6 500
622401	30	7 000

RADIAFLEX® RTP* P329

Coupling Ref.	Nominal Torque (N.m)	Max shaft Ø (mm)
612616	104 000	
612613	72 000	
612612	60 000	
612608	34 000	
612606 612416	17 500	
612412	9 700	
612410	6 900	1 500
612408	4500	1 500
612212	4 100	2 000
612210	2 800	2 500
612406	2 500	1 500
612208	1 800	2 500
612206	1 100	3 000
612 204	630	3 000
612203	470	3 000

Nominal Torque (N.m)

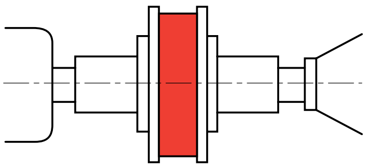
100 000, 50 000, 40 000, 30 000, 20 000, 10 000, 5 000, 4 000, 3 000, 2 000, 1 000, 500, 400, 300, 200, 100, 50, 40, 30, 20, 10, 2,5

* See current price list for items held in stock.

Braking force proportional to the speed of displacment.

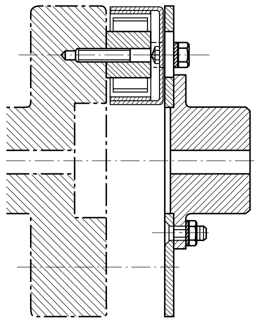
III - EXAMPLES OF INSTALLATION

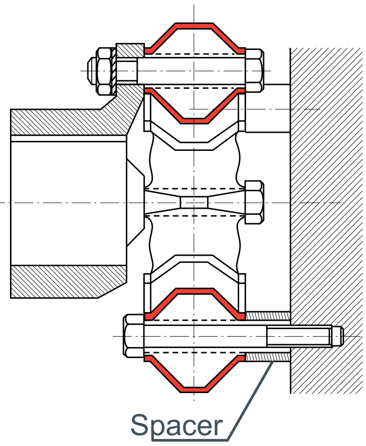
III.1 Flanged shaft mounting



The most common mounting

III.2 Flywheel mounting

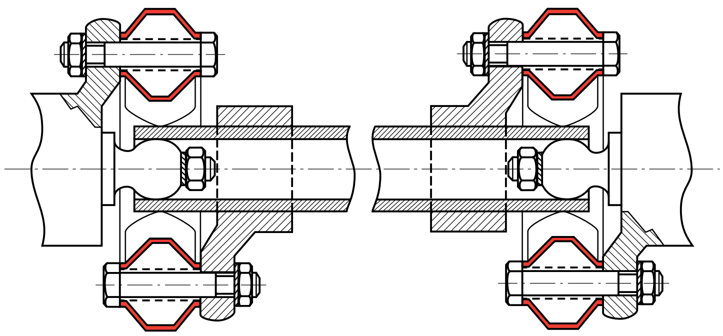




Mounted directly on flywheel
Ex. : AXOFLEX®

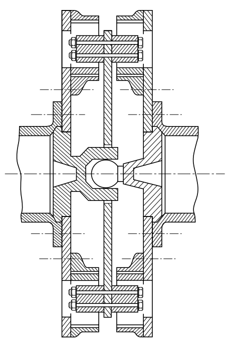
Mounting with spacer.
Ex. : JUBOFLEX®

III.3 Mounting on transmission shaft



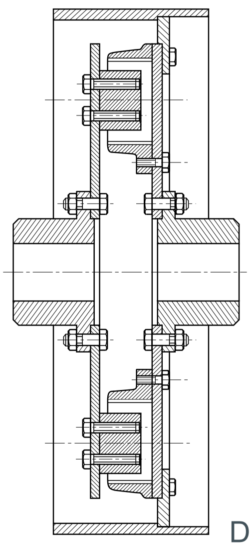
Assembly with centred transmission shaft. Ex. : JUBOFLEX®

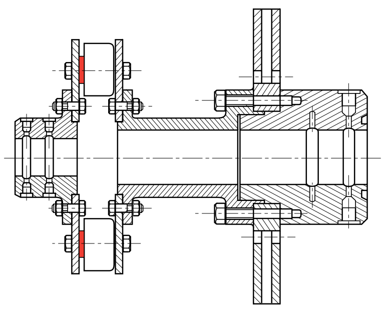
III.4 Mounting in series



Increases the flexibility while keeping the torque constant.
Ex.: AXOFLEX coupling with two sets of studs linked by an “anti-centrifuge” disk.

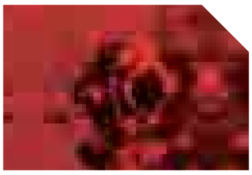
III.5 Drum brake and disk brake mounting





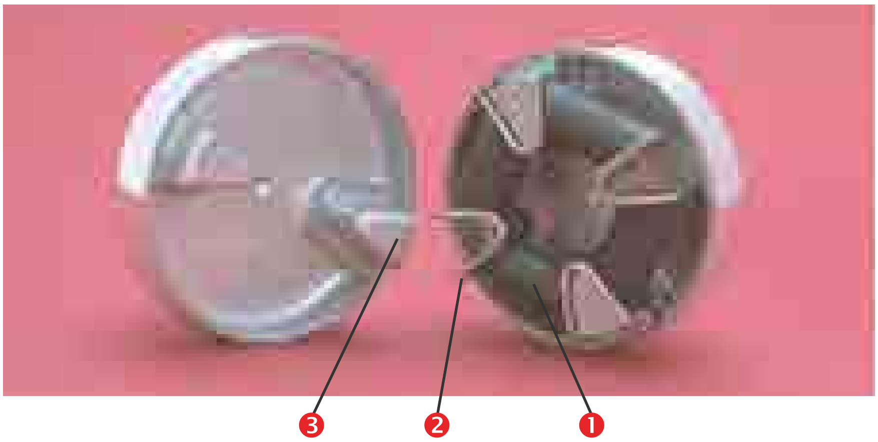
Disk brake mounting

Drum brake for mounting our couplings with rings : AXOFLEX®, R.T.P®.



MINIFLEX®

***	Torsional flexibility	***	Radial flexibility	Push fit	Axial flexibility	**	Conical flexibility



DESCRIPTION

- Flexible element
  ❶ Natural rubber block bonded to;
  ❷ V-shaped metal armatures.

- Flange : aluminium or cast-iron :
  ❸ DRIVE-SEGMENT

Operation

The MINIFLEX coupling is designed with the following features :

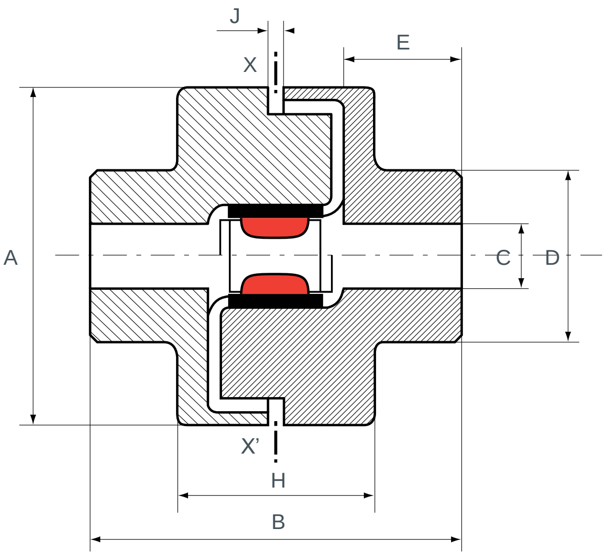
- push fit assembly;
- compact, smooth cylindrical shape without protrusions;
- the flexible element is precompressed during assembly, which extends the range of operating conditions where the rubber is not subject to tension.

Advantages
- Highly effective attenuation of cyclic irregularities and peaks in the torque.
- Exceptionally long-life ensured by precompressing the flexible element.
- Tolerance to large misalignment: avoids the need for precise alignment of the machines to be coupled.

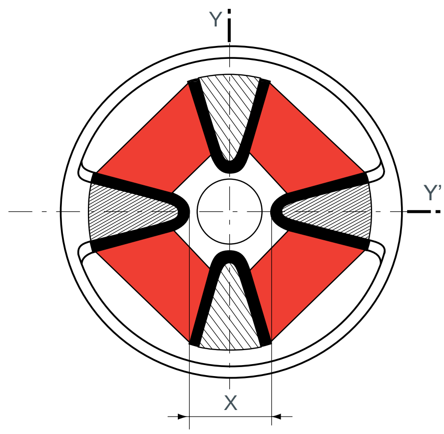
Recommendation
- It is recommended that the coupling should not be subjected to axial tension which might cause the flexible element to slip from the drive segment on the flange.

DIMENSIONS

Section YY'



Section XX'



Flanges supplied unbored

	Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Max hole C (mm)	A (mm)	B (mm)	D (mm)	E (mm)	Ref.	H (mm)	J (mm)	X (mm)	Weight (kg)
ALUMINIUM FLANGES	2,5	5	10 000	14	45	41	28	14	**633040**	21	2	14	0,10
	10	20	9 000	19	58	61	36	20	**633010**	31	2	16	0,26
	20	40	7 000	28	80	88	48	30	**633020**	40	4	28	0,68
CAST IRON FLANGES	2,5	5	10 000	14	45	41	28	14	**633041**	21	2	14	0,25
	10	20	9 000	28	58	61	42	20	**633039**	31	2	16	0,6
	20	40	7 000	42	84	88	63	30	**633038**	40	4	28	1,8
	40	80	4 000	55	118	116	82	40	**633044**	51	6	38	4,5
	60	120	4 000	55	118	120	82	40	**633047**	55	10	38	4,5

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

The maximum torque is considered to be infrequent, start-up torque and not periodic.

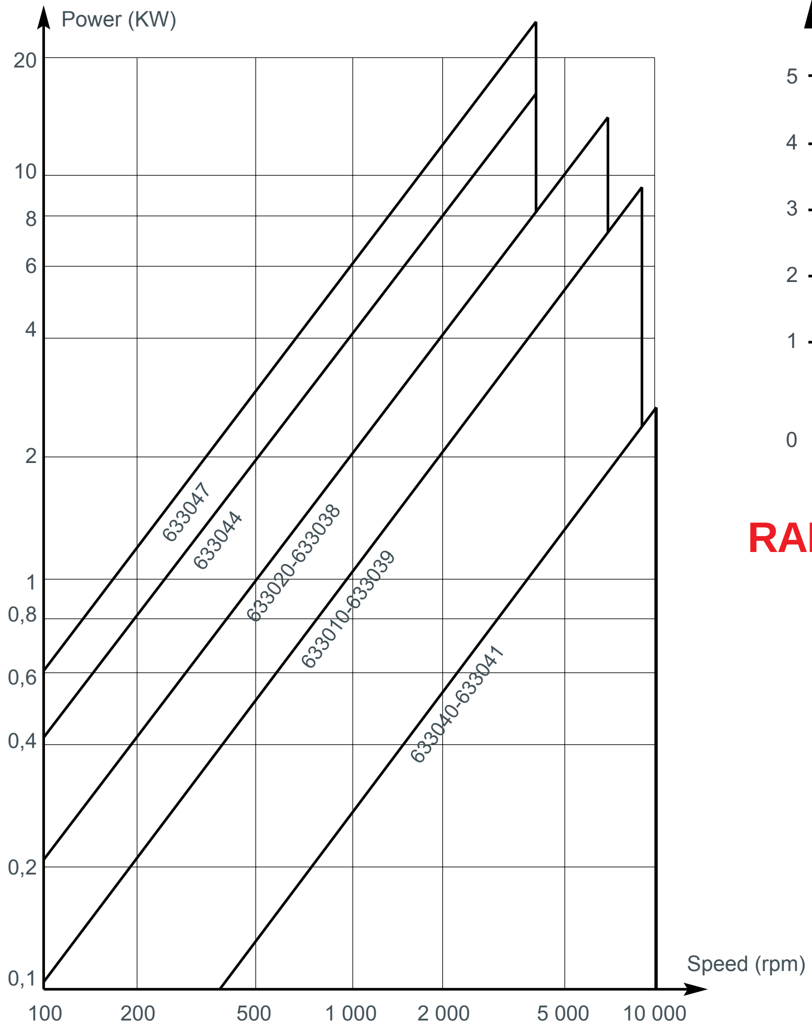
PARTS LIST

Coupling reference	Flexible element reference	Qty	Flange reference	Qty
633010	**633510**	1	321521	2
633020	**633520**	1	321531	2
633038	**633520**	1	321534	2
633039	**633510**	1	321535	2

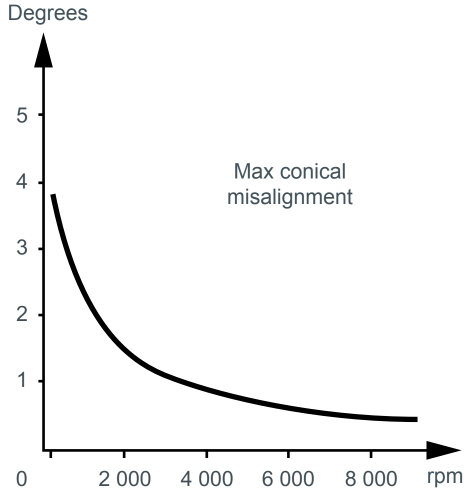
Coupling reference	Flexible element reference	Qty	Flange reference	Qty
633040	**633501**	1	321511	2
633041	**633501**	1	321501	2
633044	**633540**	1	321535	2
633047	**633640**	1	321535	2

OPERATING LIMITS

POWER RANGE



CONICAL MISALIGNMENT



RADIAL MISALIGNMENT

Nominal torque N.m	Radial misalignment at 1 500 tr/mn
2,5	0,15 mm
10	0,25 mm
20	0,50 mm
40	1,00 mm
60	1,00 mm

OPERATING CHARACTERISTICS

Nominal torque N.m	Vibrat. coupling (N.m)	Torsion under NT (degrees)	STIFFNESS			
			AXIA (daN/mm)	RADIAL (daN/mm)	TORSIONAL (daN/mm)	CONICAL (daN/mm)
2,5	1,2	28	0,30	2	0,004	0,005
10	5	28	1,50	5	0,020	0,090
20	10	24	1,25	7	0,045	0,090
40	20	18	2,0	8	0,126	0,022
60	30	16	4,5	12	0,214	0,034

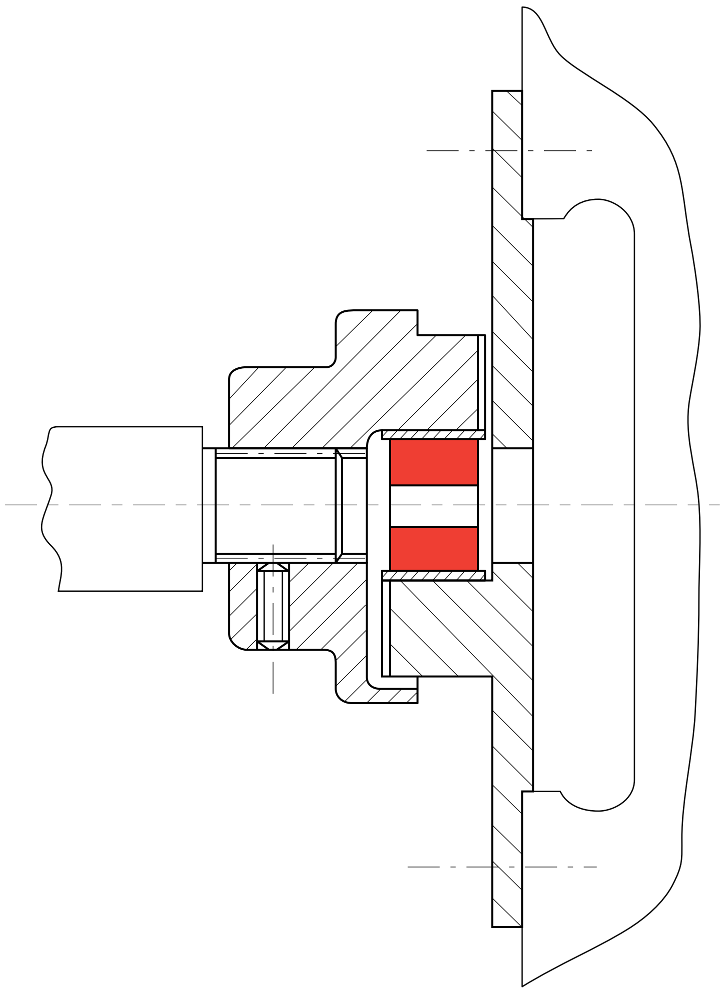
1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

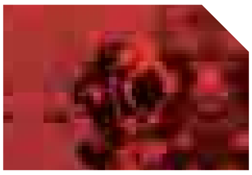
ASSEMBLY

The coupling is assembled and disassembled axially which entails moving one of the machines. This procedure is not difficult and can be done quickly, as at least one of the machines being coupled is not heavy.

Method :
- fit an opposing pair of armatures of the flexible element half-way onto the drive segments of one flange;
- position the second flange;
- push the two flanges together to engage the armatures of the flexible element;
- release.



Example : electric motor/pump coupling mounted on fly wheel and grooved shaft.



MPP®

**	Torsional flexibility	*	Radial flexibility	Push fit	Axial flexibility	*	Conical flexibility

DESCRIPTION

- Flexible element ❶ : polyurethane in the form of a Maltese cross.
- Flange ❷ : cast iron with drive segments ❸ supplied unbored (except 633054 and 633055).

OPERATING

The MPP coupling is designed with the following features :

- push fit assembly;
- smooth, compact cylindrical shape, without protrusions;
- the flexible element operates under compression;
- safe in use;
- temperature range -30°C to + 70°C in continuous operation.

Advantages

- Reduced size.
- Easy to use.

Recommendation

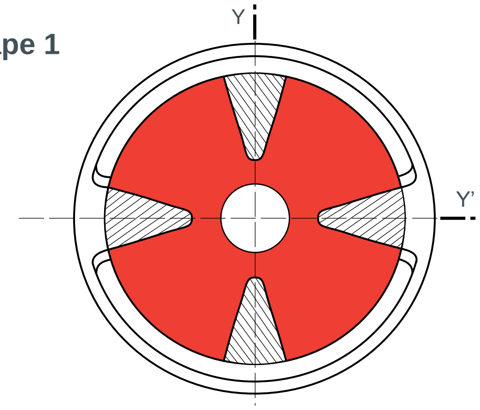
- It is recommended that the coupling should not be subjected to axial tension which might cause the flexible element to slip off the drive segments on the flanges.

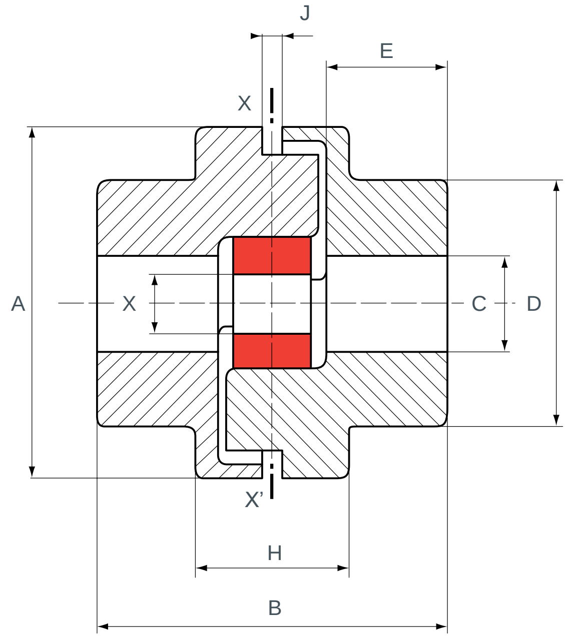
DIMENSIONS

Section XX'

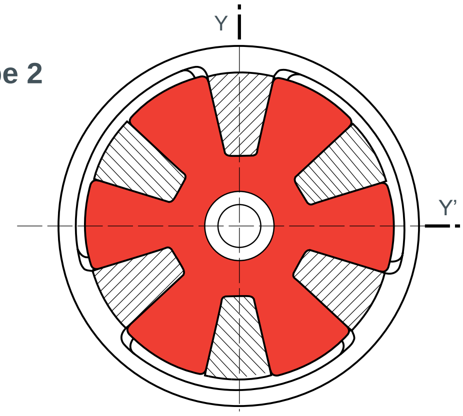
Section YY'

Shape 1





Shape 2



Flanges supplied unbored

Type	Fig.	Couple nominal TCN (N.m)	Couple maxi (N.m)	Vitesse maxi (tr/mn)	Alésage C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Réf.	H (mm)	J (mm)	X (mm)	Poids (kg)
					mini	maxi									
MPP® 3	1	30	90	9 000	-	28	58	62	42	20	**633052**	32	3	10	0,6
MPP® 8	1	80	240	7 000	-	42	84	89	63	30	**633053**	41	5	13	1,8
MPP® 20	1	200	600	4 000	-	55	118	116	82	40	**633051**	51	6	20	4,5
MPP® 38	2	380	1 150	3 000	20	60	145	160	90	60	**633054**	67	6	30	9,4
MPP® 65	2	650	2 000	3 000	20	75	170	208	112	80	**633055**	82	6	32	18

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

The maximum torque is considered to be an infrequent start-up torque and not periodic.

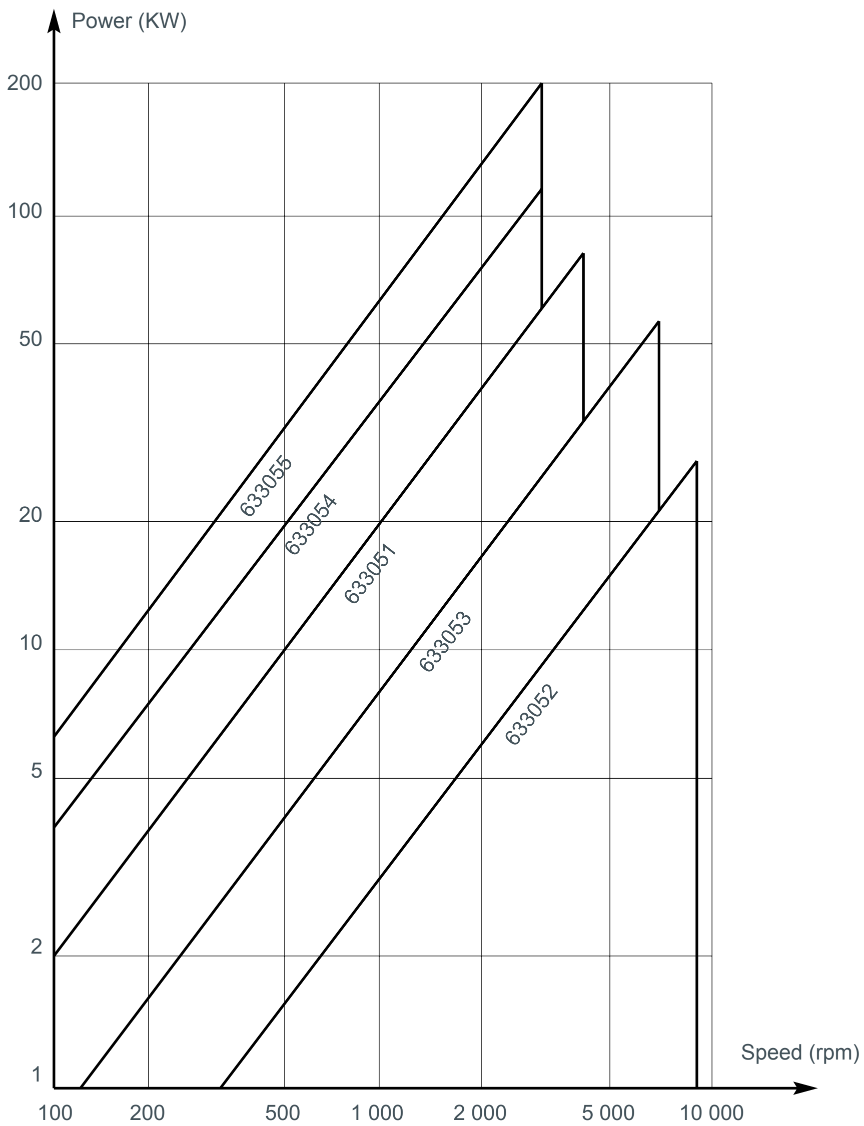
PARTS LIST

Coupling reference	Flexible element reference	Qty	Flange reference	Qty
633051	**633551**	1	321535	2
633052	**633552**	1	321503	2
633053	**633553**	1	321534	2

Coupling reference	Flexible element reference	Qty	Flange reference	Qty
633054	**633554**	1	321464	2
633055	**633555**	1	321465	2

OPERATING LIMITS

POWER RANGE

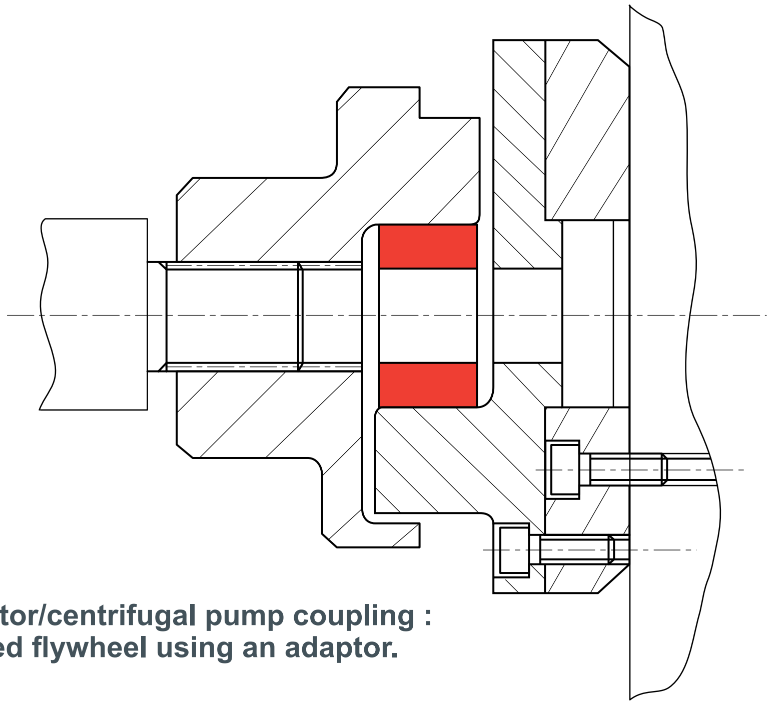


OPERATING CHARACTERISTICS

Nominal torque (N.m)	Vibratory torque (N.m)	Torsion under NT (degrees)	Radial misalignment* (mm)	Conical misalignment* (degrees)	Axial misalignment (mm)
30	15	10°	0,2	1°	1,5
80	40	10°	0,4	1°	2,5
200	100	10°	0,9	1°	3
380	380	10°	1	1°	3
650	650	10°	1	1°	4

* given for a speed of 3,000 rpm.

ASSEMBLY



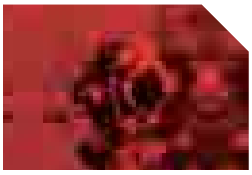
Example: electric motor/centrifugal pump coupling : mounted on motorised flywheel using an adaptor.

SELECTION GUIDE

PAULSTRA MPP® / STANDARD, 50 HZ ASYNCHRONOUS THREE PHASES MOTORS

This table uses a safety coeficient of 1.3 corresponding to normal operating conditions of commonly used driven machines.

Motor type	Power 2 poles n ≈ 3000 rpm		Type of coupling	Power 4 poles n ≈ 1500 rpm		Type of coupling	Power 6 poles n ≈ 1000 rpm		Type of coupling	Power 8 poles n ≈ 750 rpm		Type of coupling	Shaft dimensions D x E	
	Kw	CV		Kw	CV		Kw	CV		Kw	CV		≈ 3 000 rpm	≈ 1 500 rpm
56	0,09 0,12	0,12 0,16	MPP 3 MPP 3	0,06 0,09	0,08 0,12	MPP 3 MPP 3	0,06 0,09	0,08 0,12	MPP 3 MPP 3				9 x 20	
63	0,18 0,25	0,25 0,34	MPP 3 MPP 3	0,12 0,18	0,16 0,25	MPP 3 MPP 3	0,12 0,18	0,16 0,25	MPP 3 MPP 3				11 x 23	
71	0,37 0,55	0,5 0,75	MPP 3 MPP 3	0,25 0,37	0,34 0,5	MPP 3 MPP 3							14 x 30	
80	0,75 1,1	1 1,5	MPP 3 MPP 3	0,55 0,75	0,75 1	MPP 3 MPP 3	0,37 0,55	0,5 0,75	MPP 3 MPP 3				19 x 40	
90 S 90 L	1,5 2,2	2 3	MPP 3 MPP 3	1,1 1,5	1,5 2	MPP 3 MPP 3	0,75 1,1	1 1,5	MPP 3 MPP 3				24 x 50	
100 L	3	4	MPP 3	2,2 3	3 4	MPP 3 MPP 3	1,5	2	MPP 3	0,75 1,1	1 1,5	MPP 3 MPP 3	28 x 60	
112 M	4	5,5	MPP 3	4	5,5	MPP 3	2,2	3	MPP 3	1,5	2	MPP 3	28 x 60	
132 S	5,5 7,5	7,5 10	MPP 8	5,5	7,5	MPP 8	3	4	MPP 8	2,2	3	MPP 8	38 x 80	
132 M				7,5	10	MPP 8	4,0 5,5	5,5 7,5	MPP 8 MPP 8	3	4	MPP 8	38 x 80	
160 M 160 L	11,0 15,0 18,5	15 20 25	MPP 8 MPP 8 MPP 8	11 15	15 20	MPP 20 MPP 20	7,5 11	10 15	MPP 20 MPP 20	4 5,5 7,5	5,5 7,5 10	MPP 8 MPP 20 MPP 20	42 x 110	
180 M 180 L	22	30	MPP 20	18,5 22	25 30	MPP 20 MPP 20	15	20	MPP 20	11	15	MPP 20	48 x 110	
200 L	30 37	40 50	MPP 20 MPP 20	30	40	MPP 38	18,5 22	25 30	MPP 38 MPP 38	15	20	MPP 38	55 x 110	
225 S 225 M	45	61	MPP 38	37 45	50 61	MPP 38 MPP 38	30	40	MPP 38	18,5 22	25 30	MPP 38 MPP 38	55x110	60x140
250 M	55	75	MPP 38	55	75	MPP 65	37	50	MPP 65	30	40	MPP 65	60x140	65x140
280 S	75	100	MPP 38	75	100	MPP 65	45	61	MPP 65	37	50	MPP 65	65x140	75x140



JUBOFLEX ®

*** Torsional flexibility   ** Radial flexibility   *** Axial flexibility   *** Conical flexibility

DESCRIPTION

Flexible element

1. Precompressed natural rubber,
2. Bonded metal spacers,
3. Precompression band (to be removed after installation).

Flange

4. Die-cast steel (except 632320 which is cast-iron).

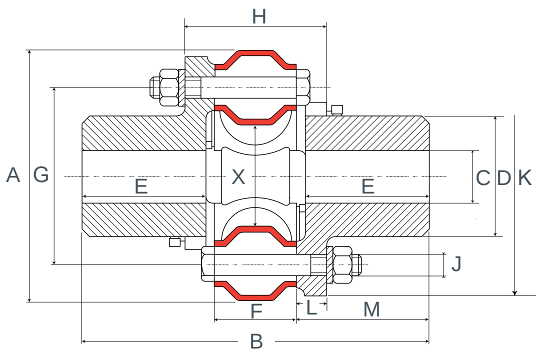
OPERATION

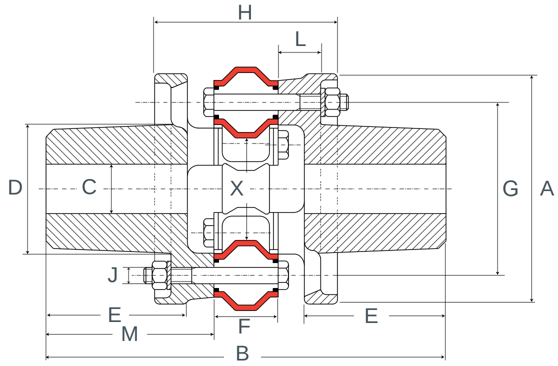
The JUBOFLEX coupling is designed with the following features :
- radial disassembly without moving the machines that are coupled;
- the flexible element is precompressed during assembly, which extends the range of operating conditions where the rubber is not subject to tension.

Advantages
- Highly effective attenuation of cyclic irregularities and peaks in the torque.
- Very safe in use and the precompression ensures very high resistance to oscillation.
- Tolerance to large misalignment: avoids the need for precise alignment of the machines to be coupled.

Recommendation
- In use, precompression is achieved by the fixing bolts, and the JUBOFLEX coupling operates wiThout the precompression band round the flexible element.

DIMENSIONS





Flanges supplied unbored

JUBOFLEX Steel flanges except 632320 — **JUBOFLEX Cast-iron flanges : ref. 632320**

Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Ref.	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	M (mm)	X* (mm)	Weight (kg)
			min	max														
40	120	6 000		30	91	128	42	47	**632027**	28	65	50	8	87	11	50	23	2
90	270	5 000		40	117	172	56	66	**632023**	32	85	60	10	113	14	70	35	3
160	480	4 500		48	142	196	68	70	**632017**	46	100	80	12	135	17	75	40	5
250	750	3 500		60	181	247	90	93	**632029**	51	132	93	14	172	21	98	63	12
350	1 050	3 000		70	202	284	105	109	**632031**	54	150	96	18	196	21	115	68	18
500	1 500	2 800		75	232	322	115	124	**632043**	62	170	108	20	225	23	130	75	25
700	2 100	2 400		80	263	346	122	133	**632025**	68	190	116	20	246	24	139	82	32
1 200	3 600	2 400	60	100	280	486	156	172	632320	78	210	222	20	-	52	204	110	57

* Diameter of passage in flexible element under the nominal torque.
1 N.m ≈ 0.1 mkg
Please see current price list for availability of items.

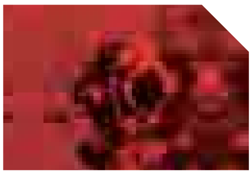
The maximum torque is considered to be an infrequent start-up torque and is not periodic.
For higher nominal torques see «JUBOFLEX ‘S».

PARTS LIST

The flexible elements are delivered precompressed using a precompression band which should be removed after installation.

Coupling without protector reference	Référence élément élastique	Qty	Flange reference	Qty
632017	**632505**	1	**321334**	2
632023	**632503**	1	**321324**	2
632025	**632511**	1	**321364**	2
632027	**632502**	1	**321314**	2
632029	**632507**	1	**321344**	2
632031	**632508**	1	**321354**	2
632043	**632500**	1	**321374**	2
632320	632520*	1	321390	2

* This element has 8 mounting holes.



JUBOFLEX ®
WITH SEPARATE HUB

*** Torsional flexibility   ** Radial flexibility   *** Axial flexibility   *** Conical flexibility

DESCRIPTION

Flexible element

1. Precompressed natural rubber.
2. Bonded metal spacers.
3. Precompression band (to be removed after installation).

- Flange

4. Die-cast steel specially bored to fit the separate hub.
5. Universal separate hub (not supplied by PAULSTRA).

OPERATION

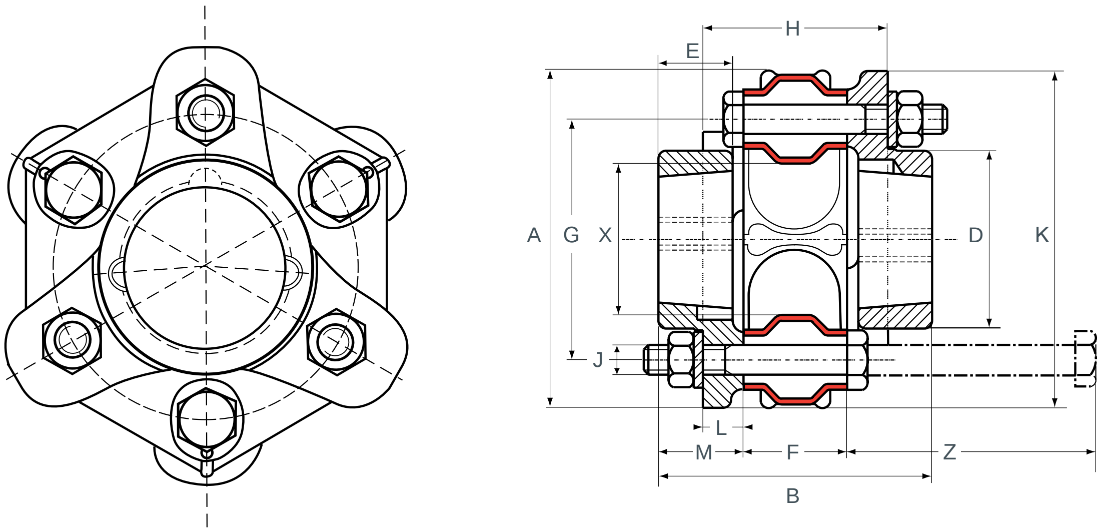
In addition to the characteristics described above, the separate hub used in conjunction with the JUBOFLEX coupling provides the advantage :

- Ready to assemble without machining the flanges.

Advantages
- Reduced size.
- Simplified axial positionning.
- Easy to assemble and disassemble.
- Reduction of costs by simplifiying the machining required for the shafts and flanges.

Recommendation
- In use, precompression is achieved by the fixing bolts and the JUBOFLEX coupling operates without the precompression band round the flexible element.

DIMENSIONS



Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Separate hub*	Ref.	A (mm)	B (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	M (mm)	X (mm)	Z (mm)	Weight (kg)
40	120	6 000	SEE PARTS LIST	**632205**	91	74	48	20	28	65	54	8	91	11	23	23	65	0,8
90	270	5 000		**632210**	117	90	60	25	32	85	65	10	121	14	29	35	75	1,6
160	480	4 500		**632217**	142	106	70	25	46	100	81	12	140	17	30	40	90	2,7
250	750	3 500		**632226**	181	121	95	30	51	132	91	14	177	21	35	63	100	5

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

*** For shaft diameters, please refer to the hub manufacturers' specifications.**

The maximum torque is considered to be an infrequent start-up torque and is not periodic.

For higher nominal torque see “Juboflex S”.

Parts list

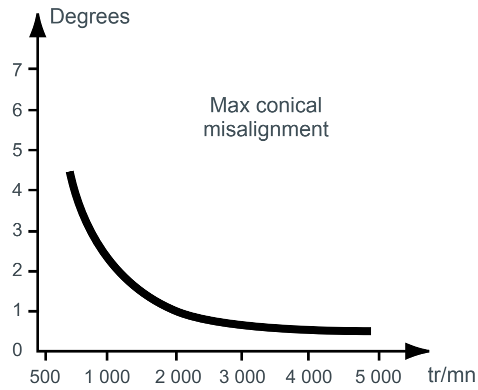
The flexible elements are delivered precompressed using a precompression band which should be removed after installation.

Coupling reference	Flexible element reference	Qty	Flange reference	Qty	MOYEU AMOVIBLE	
					Current reference	Universal reference
632205	**632502**	1	321316	2	28 - 20	11 - 08
632210	**632503**	1	321326	2	30 - 25	12 - 10
632217	**632505**	1	321336	2	40 - 25	16 - 10
632226	**632507**	1	321346	2	50 - 30	20 - 12

OPERATING LIMITS

POWER RANGE

CONICAL MISALIGNMENT



DÉSALIGNEMENT RADIAL

Nominal torque N.m	Radial misalignment at 1,500 rpm
40	0,7 mm
90	0,9 mm
160	1,4 mm
250	1,5 mm
350	1,8 mm
500	2,0 mm
700	2,1 mm
1 200	2,4 mm

OPERATING CHARACTERISTICS

Nominal torque (N.m)	Vibratory coupling (N.m)	Torsion under NT (degrees)	STIFFNESS			
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)	CONICAL (m.KN/rad.)
40	20	8	6	20	0,285	0,04
90	45	8	8	30	0,57	0,057
160	80	8	11	45	1,14	1,143
250	125	7	11,5	30	2,12	0,57
350	175	7	10	30	2,75	0,57
500	250	7	11	30	4,3	0,57
700	350	8	12	35	4,5	0,86
1 200	600	6,30	15	60	10,6	1,14

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

ASSEMBLY

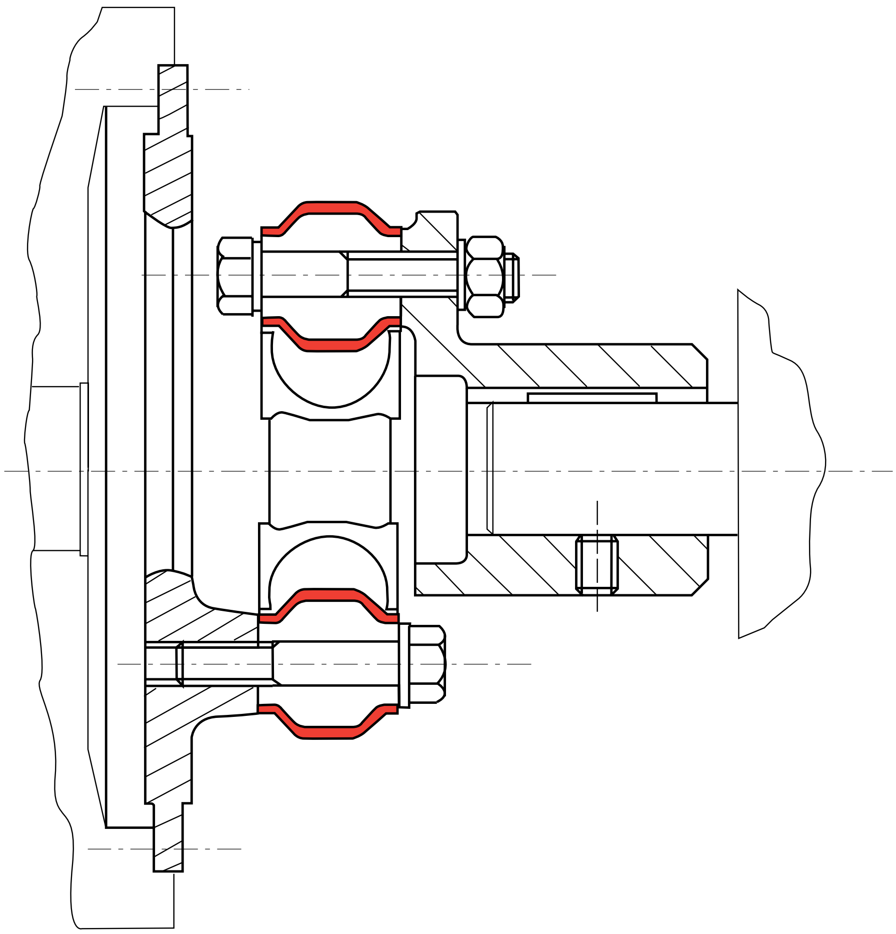
- Precompression for the initial installation is achieved by a band ❸ placed round the outside (our flexible elements are delivered with this band).

- Position the flexible element with its band to attach three non-adjacent holes to the three arms of one flange, and then the three other holes to the other flange.

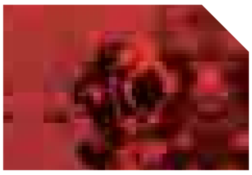
- Tighten the bolts to the following torques :

Nominal torque TCN (N.m)	Reference	Torque value (N.m)
40	**632027/632205**	21
90	**632023/632210**	41
160	**632017/632217**	72
250	**632029/632226**	113
350	**632031**	240
500	**632043**	350
700	**632025**	350
1 200	632320	350

- Cut the original band or remove th disassembly band.

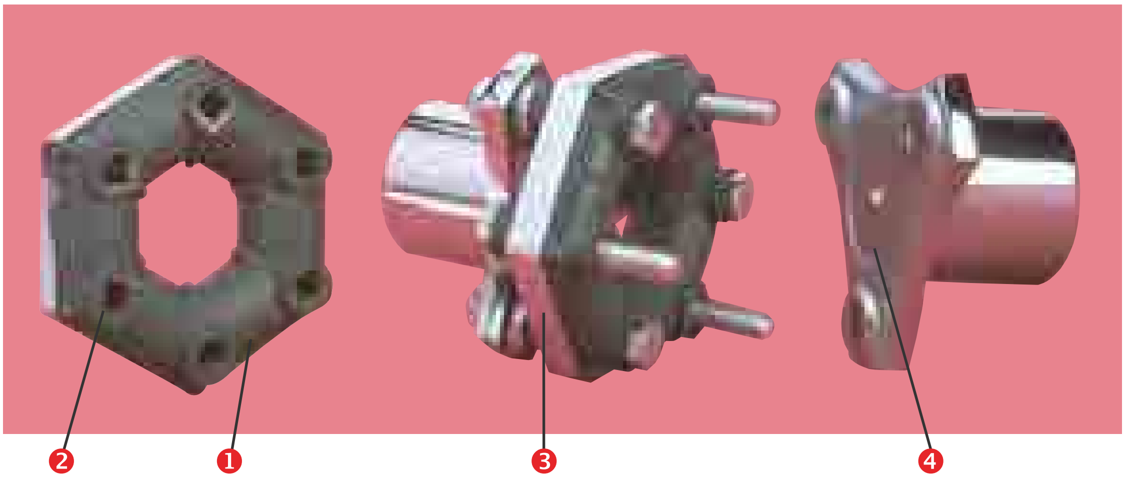


Example : internal combustion engine/generator coupling mounted on a ring attached to the fly wheel.



JUBOFLEX® "S"

***	Torsional flexibility	**	Radial flexibility	***	Axial flexibility	***	Conical flexibility



DESCRIPTION

- Flexible element
  1. Precompressed natural rubber.
  2. Bonded metal reinforcing mountings.
  3. Precompression band (to be removed after installation).

- Flange
  4. Die-cast steel (except 632267 which is cast-iron).

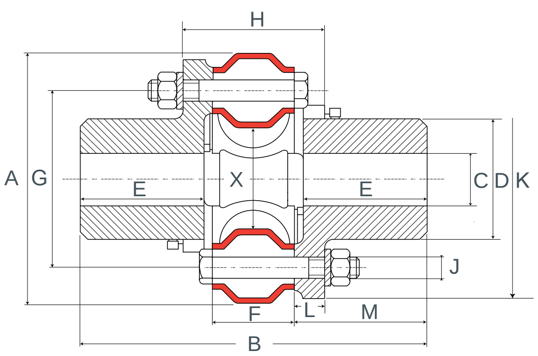
OPERATION

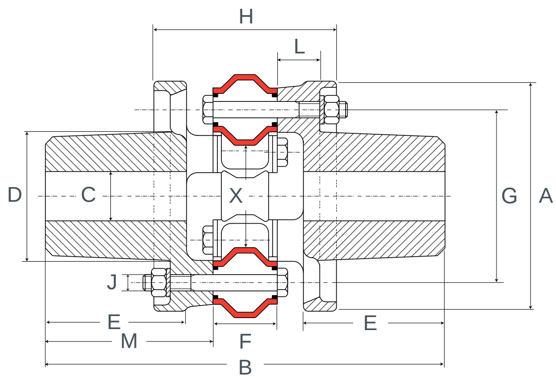
The JUBOFLEX «S» coupling is designed with the following features :
- radial disassembly without moving the machines that are coupled;
- the flexible element is compressed during assembly, which extends the range of operating conditions where the rubber is not subject to tension.

Advantages
- JUBOFLEX «S» has a greater load capacity than the standard JUBOFLEX.
- Highly effective attenuation of cyclic irregularities and peaks in the torque.
- Due to the precompression, the JUBOFLEX «S» has very good resistance to torsional peaks.
- Tolerance to large misalignment: avoids the need for precise alignment of the machines to be coupled.

Recommendation
- In use, precompression is achieved by the fixing bolts, and the JUBOFLEX «S» coupling operates without the precompression band round the flexible element.

DIMENSIONS





Flanges supplied unbored

JUBOFLEX Steel flanges except 632267 JUBOFLEX Cast-iron flanges : ref. 632267

Nominal torque (N.m)	Vibrat. torque (N.m)	Max torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Ref.	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	M (mm)	X* (mm)	Weight (kg)
				min	max														
60	30	120	6 000		30	91	128	42	47	**632260**	28	65	50	8	87	11	50	23	2
130	65	270	5 000		40	117	172	56	66	**632261**	32	85	60	10	113	14	70	35	3
240	120	480	4 500		48	142	196	68	70	**632262**	46	100	80	12	135	17	75	40	5
370	185	750	3 500		60	181	247	90	93	**632263**	51	132	93	14	172	21	98	63	12
520	260	1 050	3 000		70	202	284	105	109	**632264**	54	150	96	18	196	21	115	68	18
750	375	1 500	2 800		75	232	322	115	124	**632265**	62	170	108	20	225	23	130	75	25
1 050	1 050	2 100	2 400		80	263	346	122	133	632266	68	190	116	20	246	24	139	82	32
1 800	1 800	3 600	2 400	60	100	280	486	156	172	632267	78	210	222	20	-	52	204	110	57

* Diameter of passage in flexible element under the nominal torque.
1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

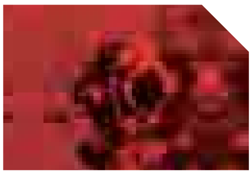
The maximum torque is considered to be an infrequent start-up torque and is not periodic.

PARTS LIST

The flexible elements are delivered precompressed using a precompression band which should be removed after installation.

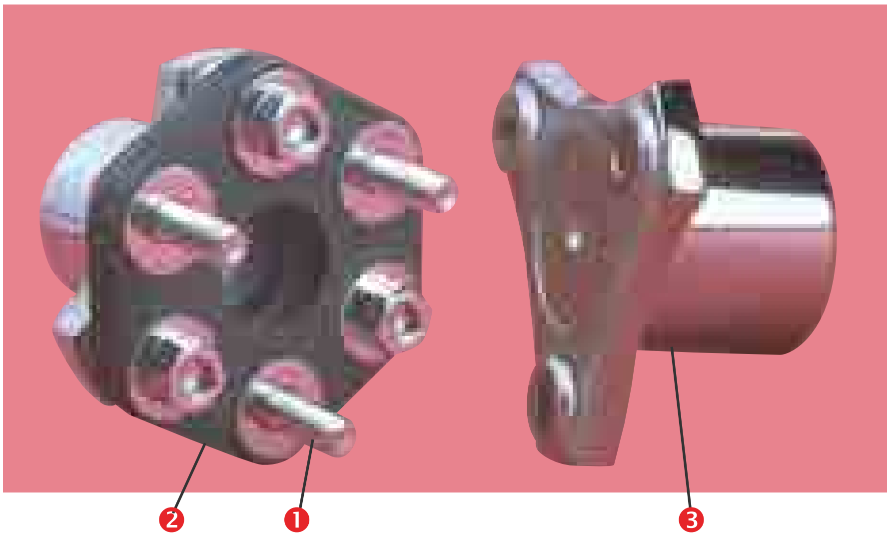
Coupling without protector	Reference	Qty	Flange reference	Qty
632260	**632550**	1	321314	2
632261	**632551**	1	321324	2
632262	**632552**	1	321334	2
632263	**632553**	1	321344	2
632264	**632554**	1	321354	2
632265	**632555**	1	321374	2
632266	632556	1	321364	2
632267	632557*	1	321390	2

* This element has 8 mounting holes.



STRAFLEX®

*	Torsional flexibility	*	Radial flexibility	**	Axial flexibility	**	Conical flexibility



DESCRIPTION

- Flexible element
  ❶ Metallic bobbins linked together by rayon fibres.
  ❷ The whole unit ❶ is potted in natural rubber and is hexagonal.

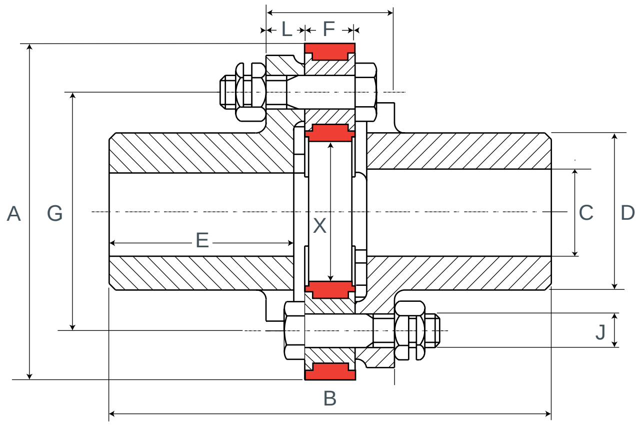
- Flange
  ❸ forged steel.

Operation

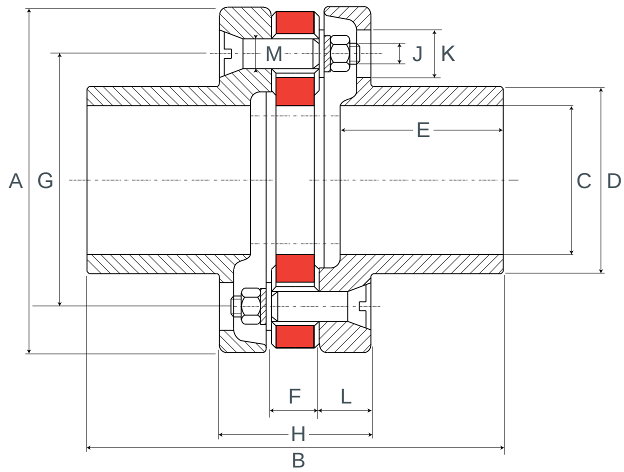
The STRAFLEX coupling is designed with the following features :
- radial disassembly wihout moving the machines that are coupled;
- reduced size;
- used at relatively high rotational speeds.

Recommendation
- The reinforced textile structure means that it has a low tolerance to irregularities in the torque.

DIMENSIONS



Assembly of models ref. 635301, 635302, 635303, 635304



Flanges supplied unbored

Assembly of models ref. 635105, 635106, 635107: screws with countersunk heads

Warning : the coupling ref. 635100 is equiped with melded studs instead of the standard bolts. It's assembly is done simply by pushing the elements on the flanges.

Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Ref.	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	M (mm)	X* (mm)	Weight (kg)
			min	max														
50	100	6 000	-	30	78	80	43	32	**635100**	12	50	32	-	-	8	7,8	20	1,3
100	200	5 500	-	30	94	115	42	40	**635301**	15	65	37	10	-	11	-	28	1,6
200	400	5 000	-	40	120	158	56	66	**635302**	18	85	46	12	-	14	-	40	3
400	800	4 500	-	48	140	171	68	70	**635303**	21	100	55	14	-	17	-	44	5,5
800	1 600	3 500	-	60	178	222	90	93	**635304**	26	132	68	16	-	21	-	66	12
1 600	3 200	2 800	-	100	232	280	126	110	**635105**	32	170	102	14	32	35	20	86	36
3 200	6 400	2 400	-	110	268	340	142	123	**635106**	42	190	130	16	37	44	24	94	50
6 000	12 000	2 000	-	145	330	424	184	160	635107	48	240	136	16	37	44	24	120	97

1 N.m ≈ 0,1 mkg

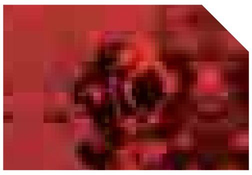
Please see current price list for availability of items.

The maximum torque is considered to be an infrequent start-up torque and is not periodic.

PARTS LIST

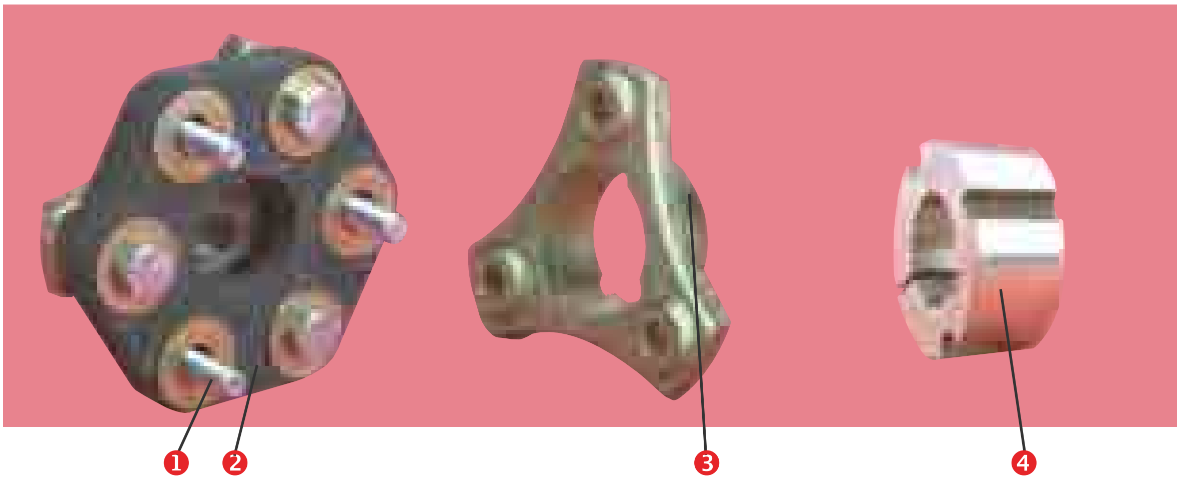
Coupling reference	Flexible element ref.	Qty	Flange reference	Qty
635100	**635631**	1	331100	2
635105	**635636**	1	321826	2
635106	**635637**	1	331106	2
635107	**635619**	1	331107	2

Coupling reference	Flexible element ref.	Qty	Flange reference	Qty
635301	**635632**	1	321315	2
635302	**635633**	1	321325	2
635303	**635634**	1	321335	2
635304	**635635**	1	321345	2



STRAFLEX ®
WITH SEPARATE HUB

*	Torsional flexibility	*	Radial flexibility	**	Axial flexibility	**	Conical flexibility



DESCRIPTION

- Flexible element
  1. Metallic bobbins linked together by rayon fibres.
  2. The whole unit 1 is potted in natural rubber and is hexagonal.

- Flange
  3. Forged steel specially bored to accommodate the separate hub.
  4. Universal separate hub (not supplied by PAULSTRA).

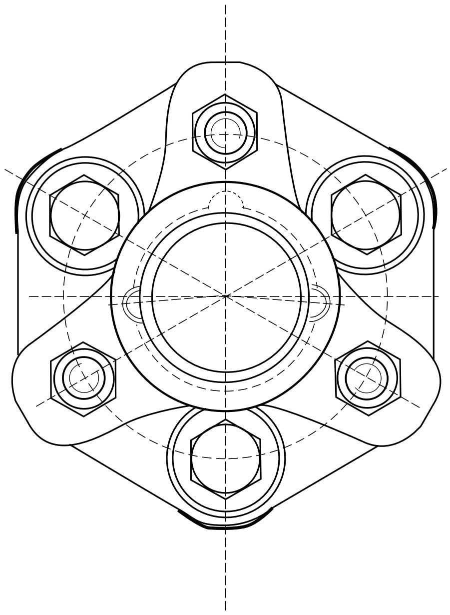
OPERATION

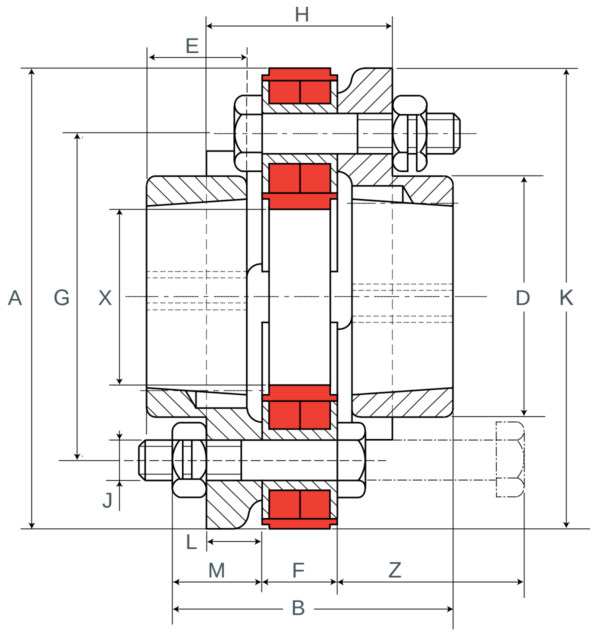
In addition to the characteristics described above, the separate hub used in conjunction with the STRAFLEX coupling provides the advantage: ready to assemble without machining.

Advantages
- Reduced size.
- Simplified axial positionning.
- Easy to assemble and disassemble.
- Reduction of costs by simplifying the machining required for the shafts and flanges.

Recommendation
- The reinforced textile structure means that it has a low tolerance to irregularities in the torque.

DIMENSIONS





Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Separate hub*	Ref.	A (mm)	B (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	M (mm)	X (mm)	Z (mm)	Weight (kg)
100	200	5 500	SEE PARTS LIST	**635305**	94	61	48	20	15	65	41	8	91	11	23	28	45	0,9
200	400	5 000		**635306**	120	76	60	25	18	85	51	12	121	14	29	40	60	1,6
400	800	4 500		**635307**	140	81	70	25	21	100	56	14	140	17	30	44	70	2,7
800	1 600	3 500		**635308**	178	96	95	30	26	132	66	16	177	21	35	66	80	5

1 N.m ≈ 0,1 mkg

*** For shaft diameters, please refer to the hub manufacturers' specifications.**

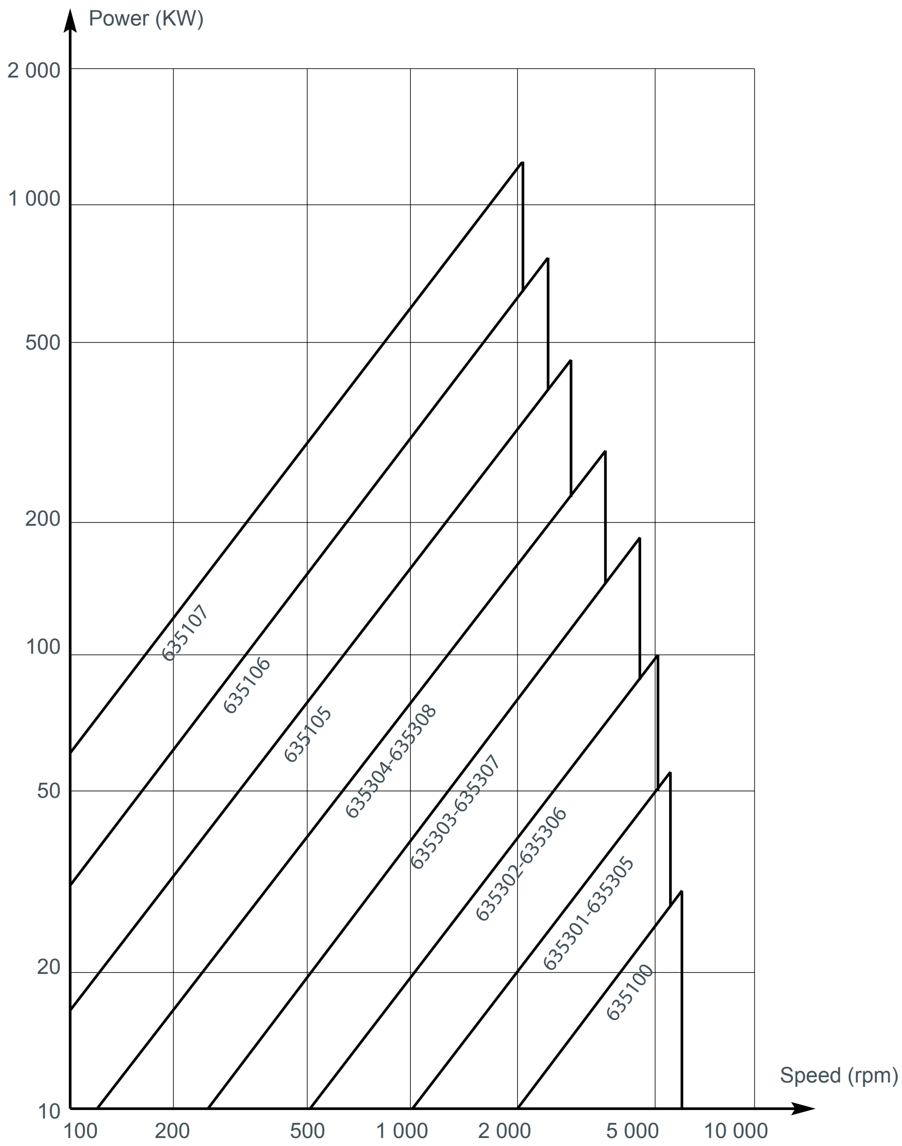
The maximum torque is considered to be an infrequent start-up torque and not periodic.

PARTS LIST

Coupling reference	Flexible element reference	Qty	Flange reference	Qty	SEPARATE HUB	
					Current reference	Universal reference
635305	**635632**	1	321316	2	28 - 20	11 - 08
635306	**635633**	1	321815	2	30 - 25	12 - 10
635307	**635634**	1	321819	2	40 - 25	16 - 10
635308	**635635**	1	321827	2	50 - 30	20 - 12

OPERATING LIMITS

POWER RANGE



OPERATING CHARACTERISTICS

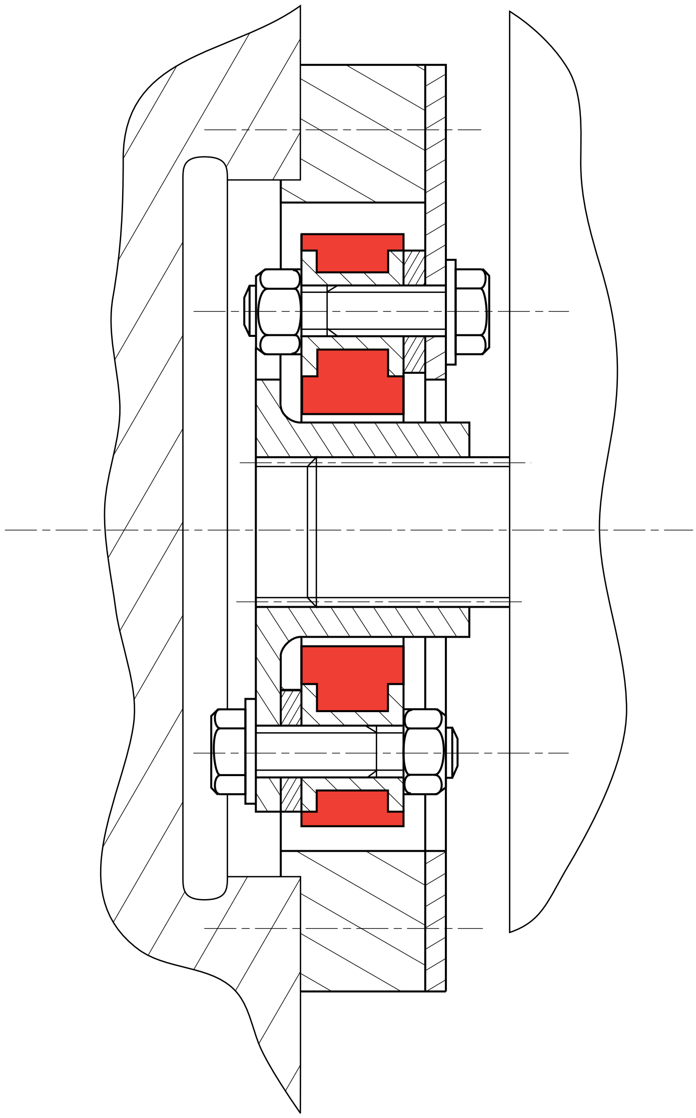
Nominal torque (N.m)	Vibrat. coupling (N.m)	Torsion under NT (degrees)	STIFFNESS			
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)	CONICAL (m.KN/rad.)
50	25	6	30	150	0,46	0,08
100	50	3	20	70	1,9	0,114
200	100	1°45	25	180	6,6	0,2
400	200	2°30	60	150	9,2	0,29
800	400	1°45	30	150	26	0,57
1 600	800	2°20	50	150	40	1,43
3 200	1 600	2	120	180	73	2,3
6 000	3 000	2	75	200	172	3,44

1 N.m ≈ 0,1 mkg

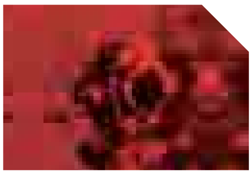
ASSEMBLY

Method :
- mount the flanges on the shafts of the machines to be coupled;
- position the flexible element to attach three non-adjacent bobbins to one flange with bolts, then attach the three other bobbins to the second flange.

NOTE : For the 635100 coupling, the bolts are replaced by welded studs and so this must be assembled by pushing the flanges together.

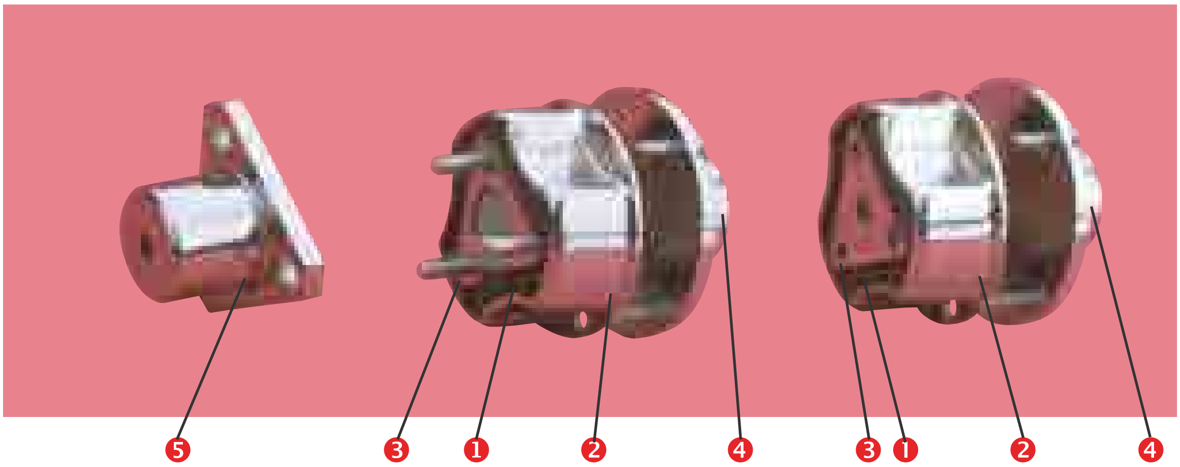


Example : electric motor/volumetric pump coupling : mounted on channelled shaft and flywheel.



CARDAFLEX®

**	Torsional flexibility	*	Radial flexibility	**	Axial flexibility	**	Conical flexibility



Hollow hub coupling

Solid hub coupling

DESCRIPTION

There are two variations of the CARDAFLEX coupling : hollow hub and solid hub :

- Flexible element
  ❶ Formed of solid natural rubber.
  ❷ External steel surround, bonded to the rubber.
  ❸ Triangular hub: a hollow hub bonded to the rubber and attached to the flange ❺, or a solid hub which accommodates a grooved or keyed shaft.

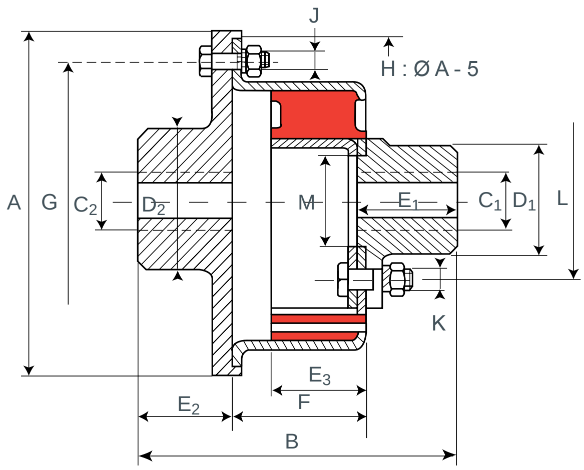
- Steel flanges
  ❹ round.
  ❺ triangular.

OPERATION

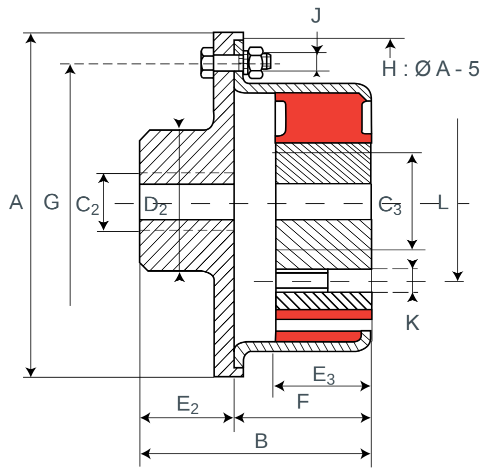
The CARDAFLEX coupling is designed with the following features :
- safe in use;
- fairly low conical stiffness;
- compact shape;
- Good performance at high speeds.

Advantages
- Especially in the case of the CARDAFLEX solid hub coupling, the space occupied by the unit is much reduced.
- The outer surround of the flexible element can be centred directly onto the flywheel of one of the machines to be coupled.

DIMENSIONS



Hollow hub coupling



Solid hub coupling

HOLLOW HUB

Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Hole size C_1 (mm)		Hole size C_2 (mm)		A (mm)	B (mm)	D_1 (mm)	D_2 (mm)	E_1 (mm)	E_2 (mm)	Ref.	E_3 (mm)	F (mm)	G (mm)	J (mm)	K (mm)	L (mm)	M (mm)	Weight (kg)
			min	max	min	max															
50	100	6 500	7	19	7	28	105	100	34	45	33	30	**622310**	28	40	86	6	8	52	30	1,6
80	160	6 000	9	20	9	30	120	125	32	50	44	40	**622311**	35	45	100	6	8	52	30	2,3
120	240	5 500	9	25	9	36	130	140	40	55	49	45	**622312**	35	50	108	8	10	64	36	2,8
160	320	5 500	9	32	9	42	155	155	49	60	55	50	**622315**	43	55	130	10	12	76	42	4,5
520	1 040	4 500	11	42	11	56	205	203	67	80	71	65	**622320**	57	73	175	12	16	100	56	10,7

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

SOLID HUB

Couple nominal TCN (N.m)	Couple maxi (N.m)	Max speed (rpm)	Hole size C_2 (mm)		Hole size C_3 (mm)		A (mm)	B (mm)	D_2 (mm)	E_2 (mm)	E_3 (mm)	Ref.	F (mm)	G (mm)	J (mm)	K (mm)	L (mm)	M (mm)	Weight (kg)
			mini	maxi	mini	maxi													
30	60	7 000	7	24	10	21	85	60	40	28	26	**622401**	32	68	6	7	42	42	0,4
50	100	6 500	7	28	16	28	105	70	45	30	28	**622402**	40	86	6	8	52	52	0,7
80	160	6 000	9	30	17	28	120	85	50	40	35	**622403**	45	100	6	8	52	52	1
120	240	5 500	9	36	18	36	130	95	55	45	35	**622404**	50	108	8	10	64	64	1,2
160	320	5 500	9	42	22	42	155	105	60	50	43	**622405**	55	130	12	12	76	76	2,3
520	1 040	4 500	11	56	30	56	205	138	80	65	57	**622406**	73	175	16	16	100	100	5

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

The maximum torque is considered to be an infrequent start-up torque and is not periodic.

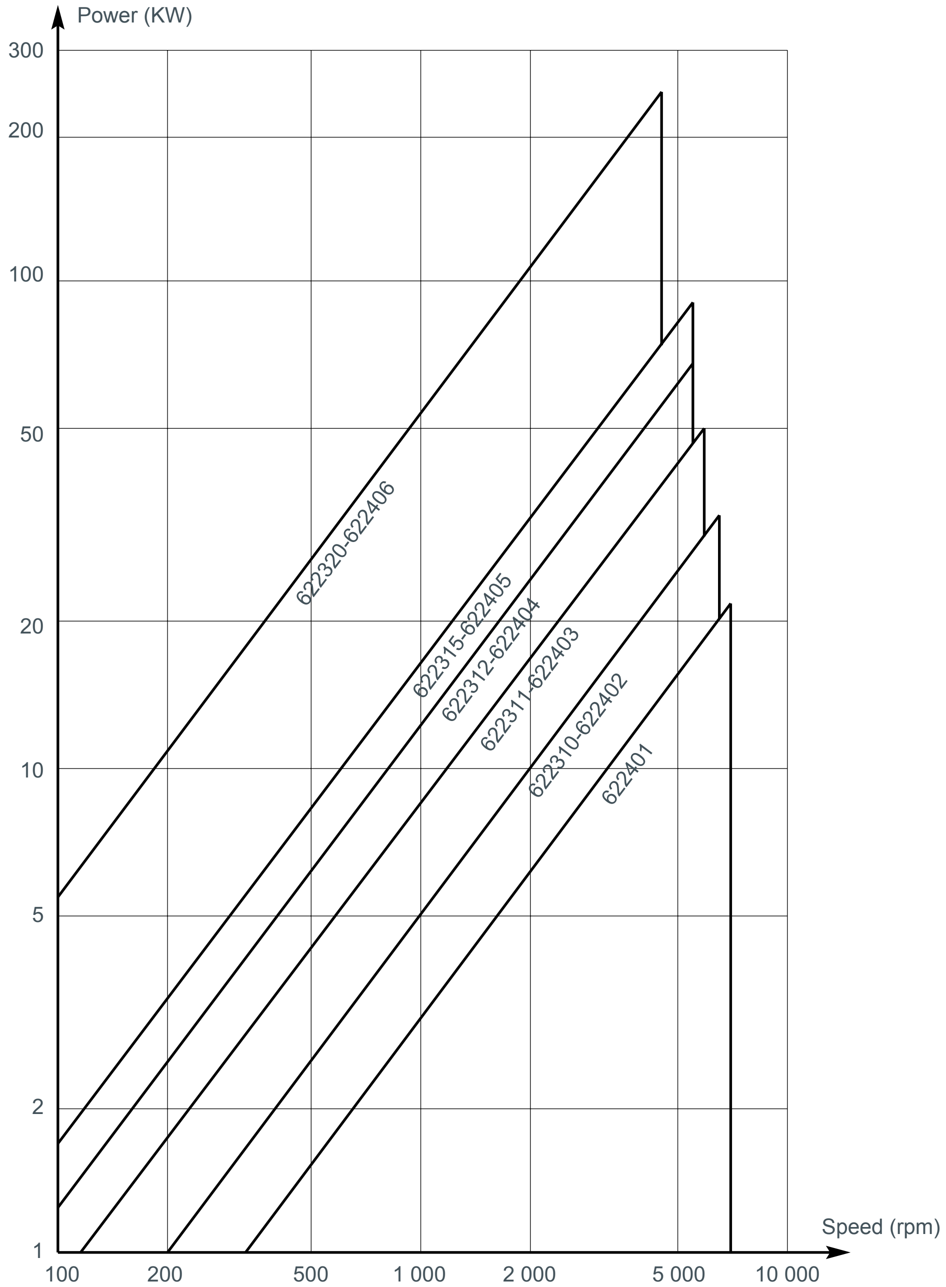
PARTS LIST

Coupling reference	Flexible element reference	Qty	Round flange reference	Qty	Triangular flange reference	Qty
622310	**622210**	1	321631	1	321636	1
622311	**622211**	1	321641	1	321646	1
622312	**622212**	1	321651	1	321656	1
622315	**622215**	1	321661	1	321666	1
622320	**622220**	1	321671	1	321676	1
622325	622225	1	321681	1	321686	1

Coupling reference	Flexible element reference	Qty	Round flange reference	Qty
622401	**622108**	1	321621	1
622402	**622110**	1	321631	1
622403	**622111**	1	321641	1
622404	**622112**	1	321651	1
622405	**622115**	1	321661	1
622406	**622120**	1	321671	1
622407	622125	1	321681	1

OPERATING LIMITS

POWER RANGE



OPERATING CHARACTERISTICS

Nominal torque (N.m)	Vibrat. coupling (N.m)	Torsion under NT (degrees)	STIFFNESS			
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)	CONICAL (m.KN/rad.)
30	15	6	30	100	0,286	0,114
50	25	7	16	65	0,400	0,114
80	40	5	30	90	0,860	0,23
120	60	8	25	80	0,860	0,23
160	80	5	32	90	1,72	0,46
520	260	7	40	150	4	1,14

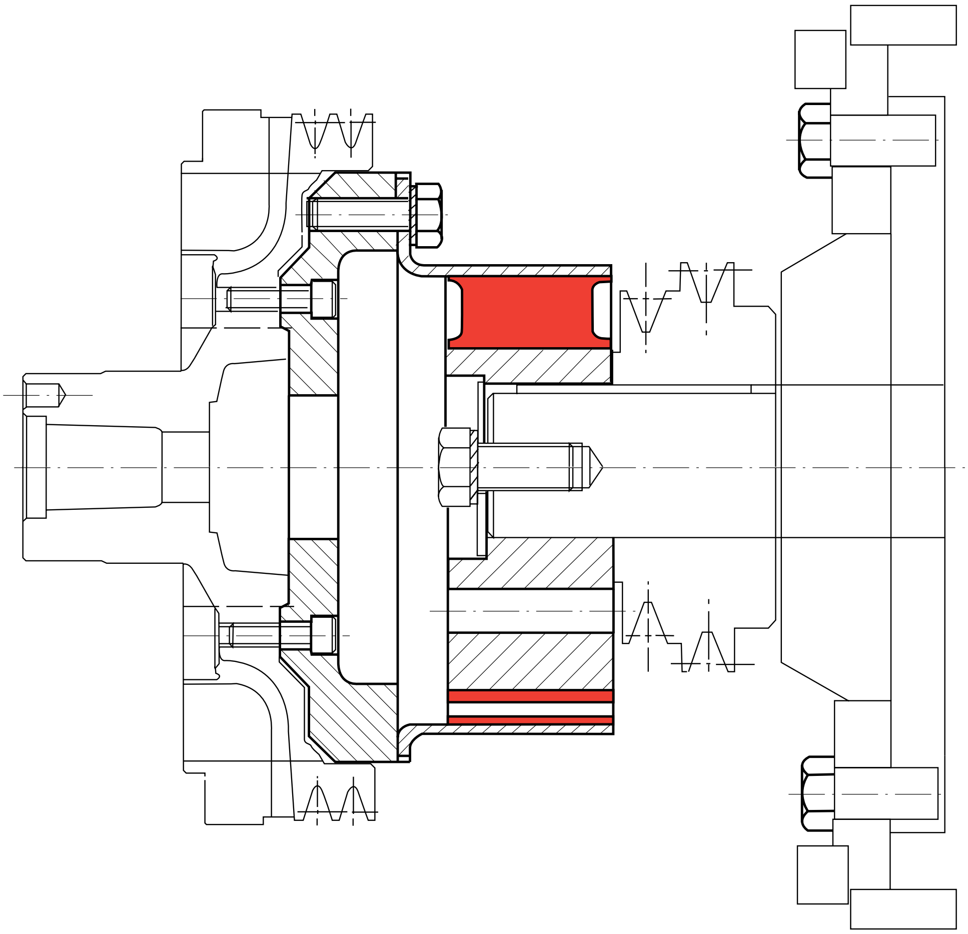
1 N.m ≈ 0,1 mkg

ASSEMBLY

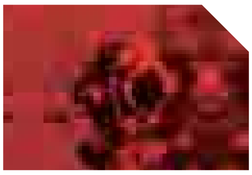
Method :

- mount the round flange onto the shaft of one machine.

- Mount :
  - the triangular flange onto the other shaft (hollow hub coupling);
  - the flexible element onto the other shaft (solid hub coupling).
- Attach the flexible element to the round flange.

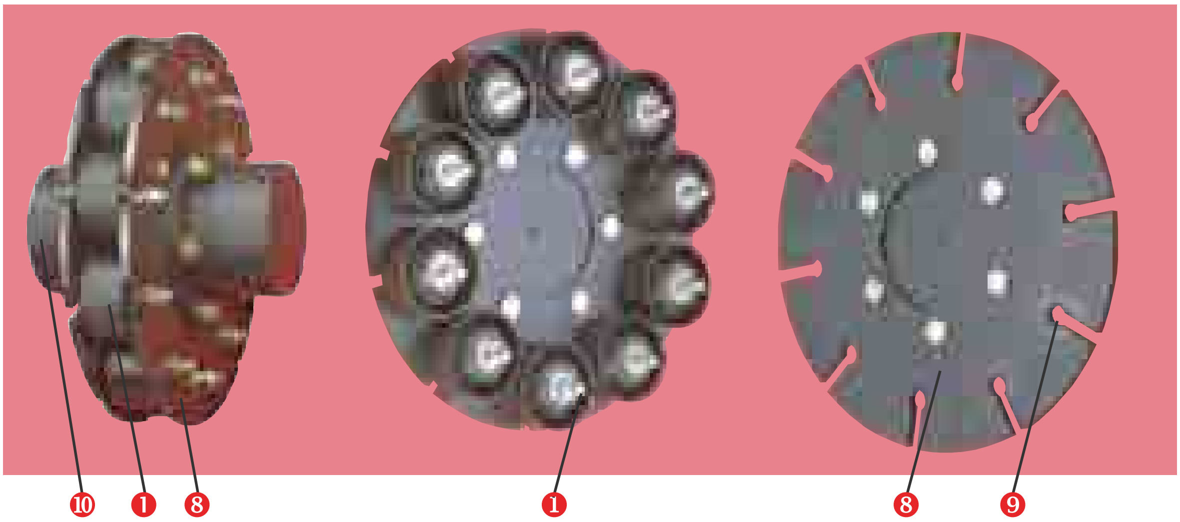


Example : internal combustion engine/hydraulic pump coupling : mounted on keyed shaft and on pulley.

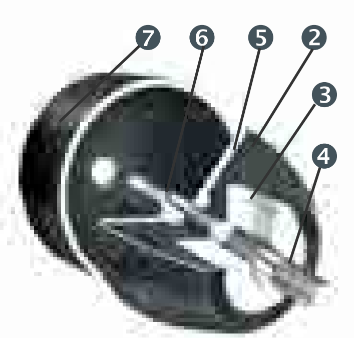


RADIAFLEX®
RTP

*	Torsional flexibility	*	Radial flexibility	See Data Sheet	Axial flexibility		Conical flexibility



DESCRIPTION



- Flexible element made up of a variable number of flexible studs
  ❶ depending on the torque to be transmitted.
  ❷ Solid natural rubber blocks in the form of a truncated cone.
  ❸ Internal armature bonded to the rubber.
  ❹ Threaded stud.
  ❺ External armature bonded to the rubber.
  ❻ Studding welded to armature.
  ❼ Cylindrical metal cover.

- Steel disks
  ❽ Two identical disks, bolted to the flanges ❿ and with slits ❶ to house the studs ❾.

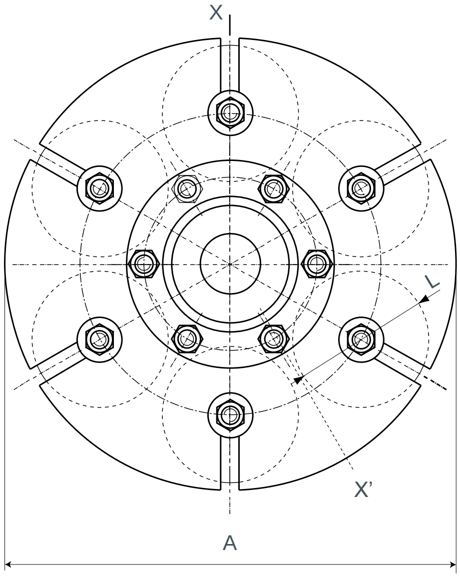
- Flanges
  ❿ die-cast steel.

OPERATION

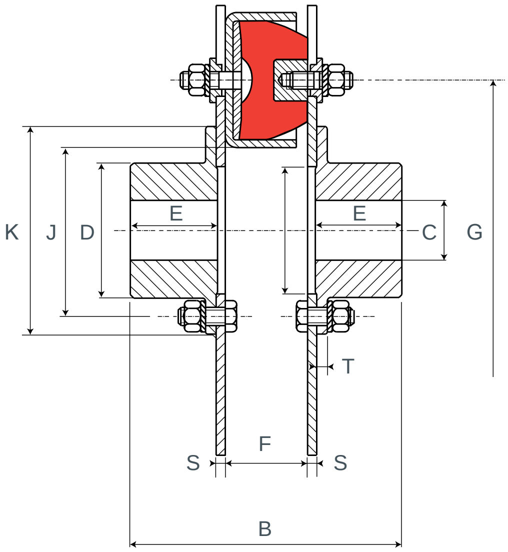
The RADIAFLEX RTP coupling is designed with the following features :
- the studs can be removed radially without moving the coupled machines;
- at low and average torque : the rubber operates under compression;
- at high torque : there is progressive thrust of the rubber against the metal cover ❸;
- safe in use;
- it can absorb the effects of tension or compression axially (for example: push and pull of a helical screw).

DIMENSIONS

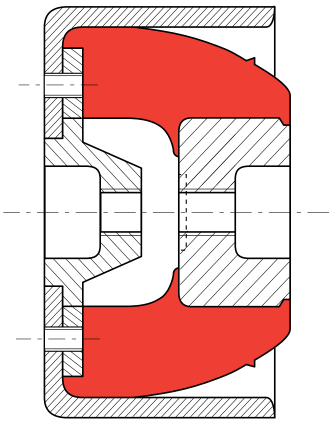
View from F_1



XX' Section



Alternative mount :



Ref. 526401Δ60

The alternative mount **526401Δ60** is softened. It's radial stiffness is equal to 2/3 of the standard mounting ref. **522131Δ60**.

Warning : a coupling equiped with the alternative mounts **526401** can only transmit 80% of the torque of the standard version.

Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Type	Ref.	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	L (mm)	S (mm)	T (mm)	Weight (kg)
			min	max															
470	1 000	3 000	18	60	270	181	86	60	RTP 2.3	**612203**	55	180	85	115	138	90	6	7	13
630	1 250	3 000	18	60	270	181	86	60	RTP 2.4	**612204**	55	180	85	115	138	90	6	7	15
1 100	2 200	3 000	18	60	300	185	86	60	RTP 2.6	**612206**	55	200	85	115	138	90	8	7	28
1 800	3 600	2 500	23	80	364	235	115	85	RTP 2.8	**612208**	55	264	115	145	168	90	8	9,5	45
2 500	5 000	1 500	28	100	420	299	145	102	RTP 4.6	**612406**	80	280	145	180	210	130	10	12,5	77
2 800	5 600	2 500	28	100	424	274	145	102	RTP 2.10	**612210**	55	324	145	180	210	90	10	12,5	72
4 100	8 200	2 000	28	120	475	345	177	136	RTP 2.12	**612212**	55	380	178	213	247	90	12	16	103
4 500	9 000	1 500	28	120	510	370	177	136	RTP 4.8	**612408**	80	370	178	213	247	130	12	16	127
6 900	13 500	1 500	28	120	600	382	177	136	RTP 4.10	**612410**	80	460	178	213	247	130	18	16	178
9 700	20 000		32	150	680	424	210	155	RTP 4.12	**612412**	80	540	178	260	290	130	20	18	253
17 500	35 000		32	150	860	424	210	155	RTP 4.16	**612416**	80	720	178	260	290	130	20	18	330
17 500	35 000		32	155	826	687	220	250	RTP 6.6	**612606**	147	580	200			246	30		590
34 000	68 000		32	220	1 096	827	320	320	RTP 6.8	**612608**	147	850	320			246	30		1 140
60 000	120 000		32	200	1 246	827	275	320	RTP 6.12	**612612**	147	1 000	250			246	30		1 200
72 000	140 000		32	360	1 446	827	540	320	RTP 6.12	**612613**	147	1 200	500			246	30		2 200
104 000	200 000		35	360	1 546	887	540	350	RTP 6.16	**612616**	147	1 300	500			246	30		2 500

1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

The maximum torque is considered to be an infrequent start-up torque and is not periodic.

OPERATING CHARACTERISTICS

Nominal torque (N.m)	Vibrat. coupling (N.m)	Torsion under NT (degrees)	STIFFNESS				
			Axial compr. (daN/mm)	Axial compres. (daN/mm)	Axial tension (daN/mm)	Radial (daN/mm)	Torsional (m. KN/radian)
470	235	3° 10’	375	300	105	8,6	10,3
630	315	3° 10’	500	400	140	11,4	20,6
1 100	550	2° 50’	750	600	210	21,2	86
1 800	900	2° 10’	1 000	800	280	49,3	114
2 500	1 250	2° 15’	1 500	1 200	330	65,5	86
2 800	1 400	1° 50’	1 250	1 000	350	92,6	229
4 100	2 050	1° 30’	1 500	1 200	420	160	573
4 500	2 250	1° 40’	2 000	1 600	440	152	460
6 900	3 450	1° 25’	2 500	2 000	550	292	1 030
9 700	4 850	1° 10’	3 000	2 400	660	482	
17 500	8 750	0° 50’	4 000	3 200	880	1 140	
17 500	8 750	2° 10’	3 000	1 800	550	458	
34 000	17 000	1° 30’	4 000	2 400	730	1 320	
60 000	30 000	1° 15’	6 000	3 600	1 100	2 700	
72 000	36 000	1°	6 000	3 600	1 100	3 900	
104 000	52 000	0°50’	8 000	4 800	6 100	6 100	

PARTS LIST

FLEXIBLE STUDS, DISK AND FLANGES

Coupling part number	Flexible stud reference	Qty	Flange reference	Qty	Disk reference	Qty
612203	**522090 Δ 60**	3	321138	2	351103	2
612204	**522090 Δ 60**	4	321136	2	351110	2
612206	**522090 Δ 60**	6	321138	2	351122	2
612208	**522090 Δ 60**	8	321147	2	351133	2
612210	**522090 Δ 60**	10	321154	2	351142	2
612212	**522090 Δ 60**	12	321167	2	351152	2
612406	**522131 Δ 60**	6	321154	2	351125	2
612408	**522131 Δ 60**	8	321167	2	351134	2
612410	**522131 Δ 60**	10	321167	2	351143	2
612412	**522131 Δ 60**	12	321191	2	351157	2
612416	**522131 Δ 60**	16	321191	2	351170	2
612606	522240 Δ 45 et 60	6	321189	2	351124	2
612608	522240 Δ 45 et 60	8	321193	2	351135	2
612612	522240 Δ 45 et 60	12	321182	2	351155	2
612613	522240 Δ 45 et 60	12	321195	2	351156	2
612616	522240 Δ 45 et 60	16	321197	2	351169	2

1 N.m ≈ 0,1 mkg

FIXING FOR FLANGES AND DISCS. LOCATING SLEEVES

Coupling part number	Flange fixing reference	Qty	Locating sleeve reference	Qty	Elastic element reference	Qty
612203	337216	1	337217	1	337217	1
612204	337206	1	337207	1	337208	1
612206	337209	1	337210	3	337211	2
6122008	337206	2	337210	4	337208	2
612210	337565	1	337227	1	337208 - 337228	2 - 1
612212	337229	1	337230	1	337208	3
612406	337675	1	337226	1	337215	1
612408	337229	1	337231	1	337232	2
612410	337233	1	337234	1	337215 - 337232	1 - 1
612412	337676	1	337237	3	337232	3
612416	337676	1	337237	4	337232	4
612606	Please consult our Technical Service		351282	12	Please consult our Technical Service	
612608			351282	16		
612612			351282	24		
612613			351282	24		
612616			351282	32		

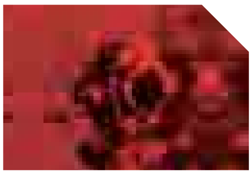
References written in bold are kept in stock.

ASSEMBLY

Method :
- mount each of the flanges onto the ends of the corresponding shafts;
- use the specially machined recess to centre the disks onto the flanges and screw together;
- attach the external armature of the studs to the appropriate disk;
- attach the internal armature of the studs to the other disk.

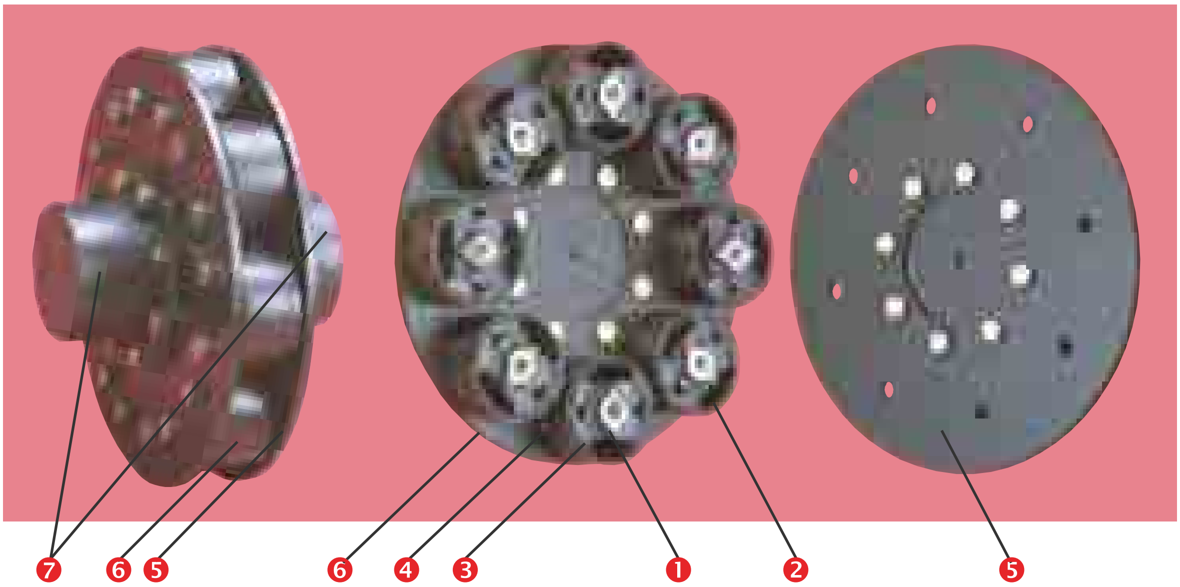
Note :
The slits 9 are designed to take the loose locating sleeves 11 to enable the individual flexible studs 1 to be mounted and removed radially.

Torque to be applied to the stud fixing bolts :
- Stud RTP2 : 522090 Ø 12 ➔ 75 N.m.
- Stud RTP4 : 522131 Ø 16 ➔ 185 N.m.
- Stud RTP6 : 522240 Ø 24 ➔ 640 N.m.



AXOFLEX®

*	Torsional flexibility	*	Radial flexibility	**	Axial flexibility	*	Conical flexibility



DESCRIPTION

- **Flexible element** comprising a variable number of flexible bushes,depending on the torque to be transmitted.
  ❶ Inner with tapped or smooth holes (normal mounting or on flywheel).
  ❷ Precompressed natural rubber bonded to inner ❶ and to outer the half-cylinders ❸.
  ❸ Half-cylinders bonded to the rubber.
  ❹ Outer housing ensuring precompression of rubber by exerting pressure on the half-cylinders ❸.

- **Steel disks**
  ❺ Flange to which the inner studs are attached (normal mounting).
  ❻ Disk to which the studs are attached (flywheel mounting).

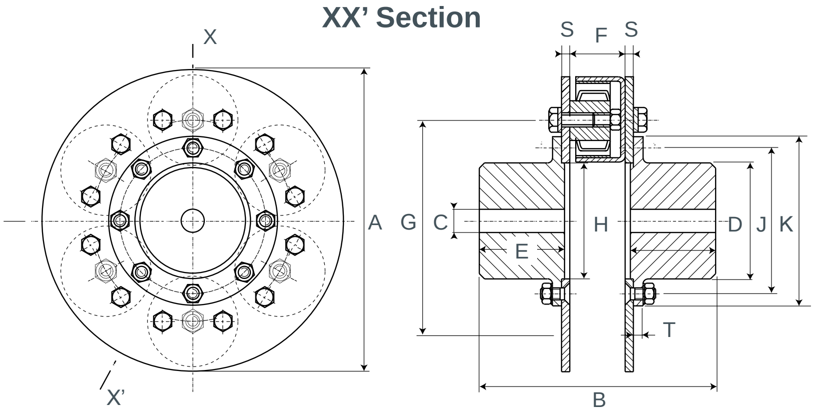
- **Die cast steel hubs**
  ❼ The two hubs are identical. They may be bolted to disks ❺ or ❻ depending on the mounting used.

OPERATION

The AXOFLEX coupling is designed with the following features :
- radial disassembly without moving the machines that are coupled (usually very large machines);
- precompression of the rubber which limits operation under tension.

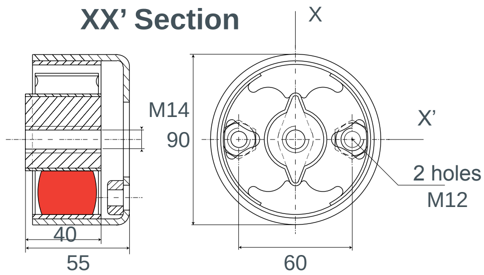
Advantage
- Good axial flexibility which allows great axial displacement, for example in the case of conical rotor machines.

DIMENSIONS AXO 2

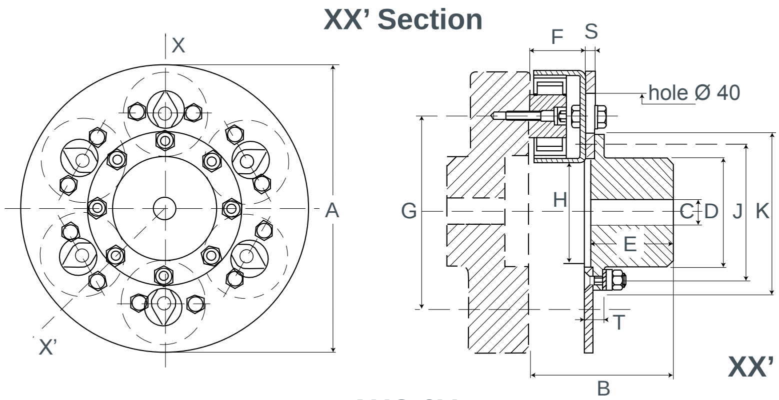


AXO 2

AXO 2 Coupling

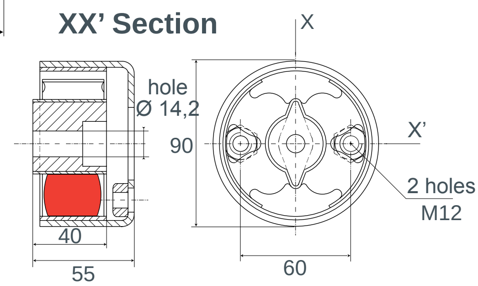


AXO 2 stud N° **525210-60** Weight : 0.9 kg



AXO 2V

AXO 2V Flywheel coupling



AXO 2V stud N° **525211-60** Weight : 0.9 kg

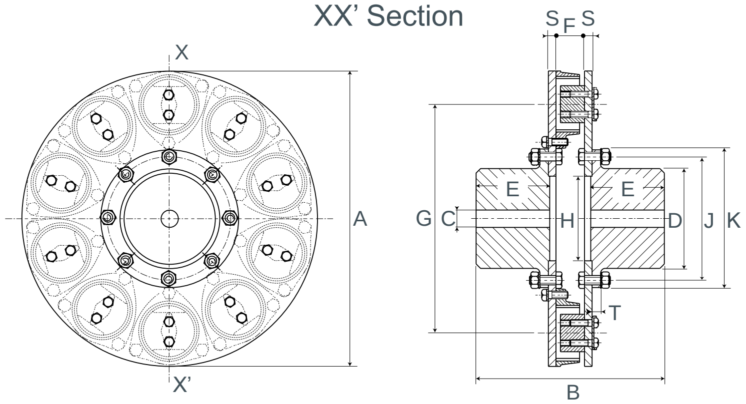
Flanges supplied unbored

Nominal torque (N.m)	Max torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)		D (mm)	E (mm)	Ref. Standard coupling	Ref Flywheel coupling	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	S (mm)	T (mm)	Weight stand. coupling
			min	max		stan.	flyw.												
600	1 200	3 000	18	60	270	181	138	86	60	615203	615253	55	180	85	115	138	6	7	14
800	1 600	3 000	18	60	270	181	138	86	60	615254	615254	55	180	85	115	138	6	7	15
1 300	2 600	3 000	23	80	300	235	145	115	85	615206	615256	55	200	115	145	168	8	9,5	28
2 300	4 600	2 500	23	80	364	235	145	115	85	615208	615258	55	268	115	145	168	8	9,5	45
3 600	7 200	2 500	28	100	424	274	164	145	102	615210	615260	55	324	145	180	210	10	12,5	72
5 000	10 000	2 000	28	120	475	345	200	177	136	615212	615262	55	380	178	213	247	12	16	103

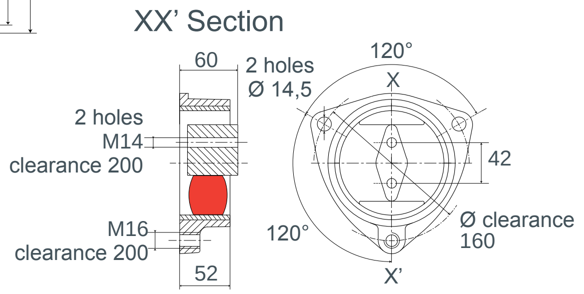
1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

DIMENSIONS AXO 4

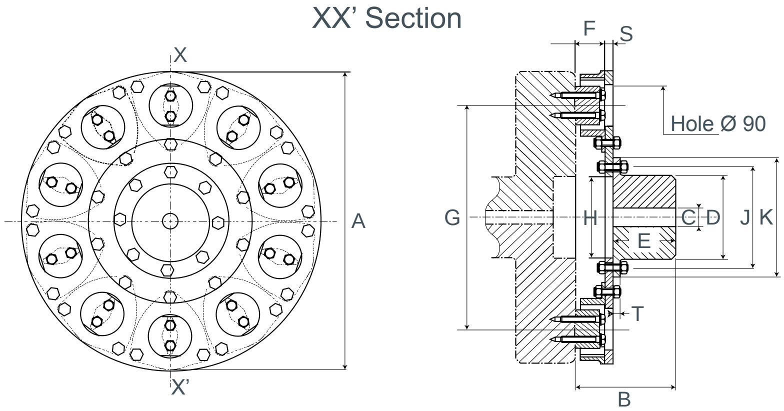


AXO 4

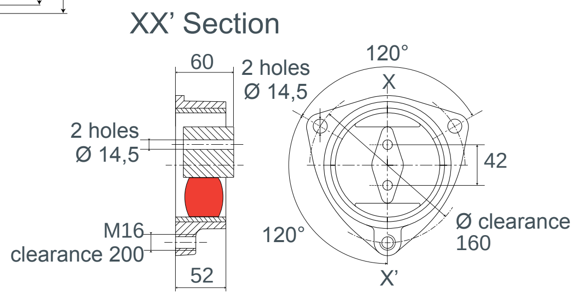


AXO 4 Coupling

AXO 4 stud N° **525400-60** Weight : 2.7 kg



AXO 4V



AXO 4V Flywheel coupling

AXO 4V stud N° **525403-60** Weight: 2.7 kg

Flanges supplied unbored

Nominal torque (N.m)	Max torque N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)		D (mm)	E (mm)	Ref. Standard coupling	Ref Flywheel coupling	F (mm)	G (mm)	H (mm)	J (mm)	K (mm)	S (mm)	T (mm)	Weight stand. coupling
			min	max		stan.	flyw.												
5 000	10 000	1 800	28	100	480	279	170	145	102	615406	615456	60	340	145	180	210	10	12,5	80
7 500	15 000	1 800	28	120	513	346	203	177	136	615408	615458	60	373	178	213	247	10	16	115
12 000	24 000	1 500	28	120	622	358	209	177	136	615410	615460	60	482	178	213	247	16	16	178
12 000	24 000	1 500	32	150	622	396	228	210	155	615440	615490	60	482	178	260	290	16	18	200
17 500	35 000	1 500	32	150	720	396	228	210	155	615412	615462	60	580	178	260	290	16	18	240
17 500	35 000	1 500	36	170	720	516	288	240	215	615442	615492	60	580	240	290	335	16	24	300
24 000		1 400	36	170	840	524	292	240	215	615414	615464	60	700	240	290	335	20	24	400
24 000		1 400	36	200	840	570	315	285	240	615444	615494	60	700	240	335	380	20	40	500
40 000		1 200	36	200	1 040	590	325	285	240	615418	615468	60	900	240	335	380	30	40	700

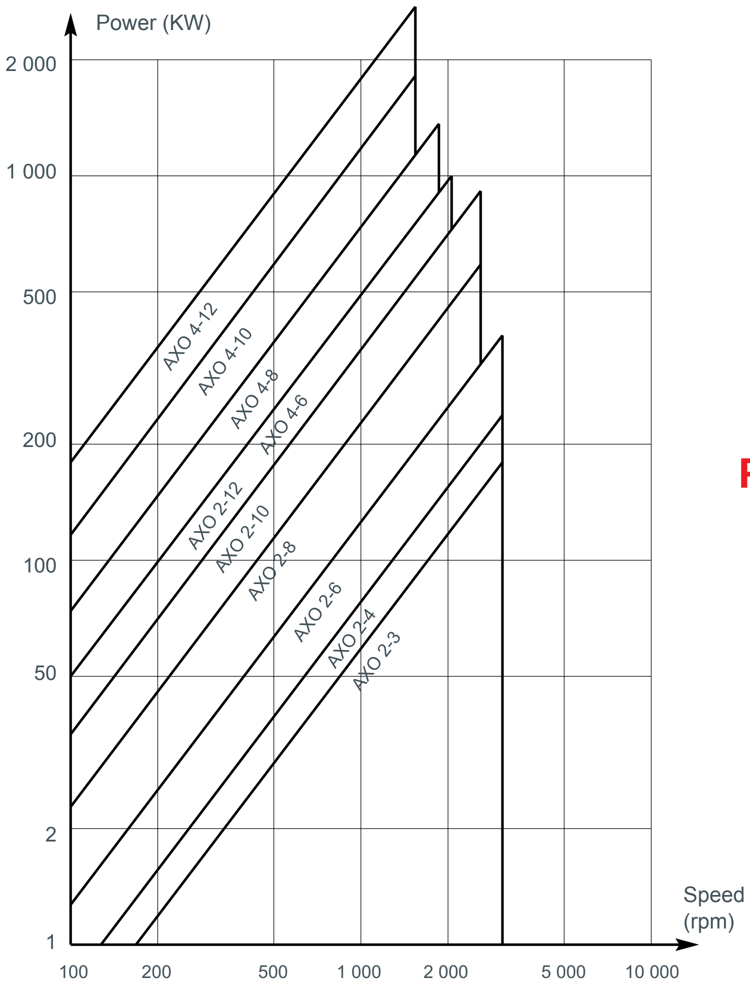
1 N.m ≈ 0,1 mkg

Please see current price list for availability of items.

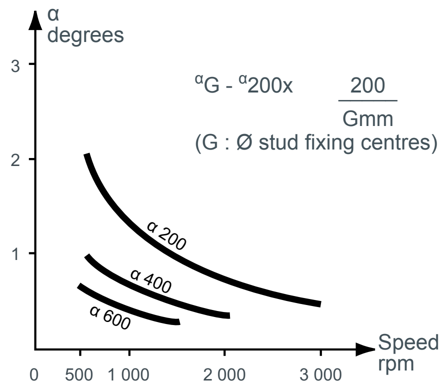
The maximum torque is considered to be an infrequent start-up torque and is not periodic.

OPERATING LIMITS

POWER RANGE



CONICAL MISALIGNMENT



RADIAL MISALIGNMENT

Nominal torque N.m	Axial displacement at 1,500 rpm
600	2 rpm
800	2 rpm
1 300	2 rpm
2 300	2 rpm
3 600	2 rpm
5 000	3 rpm
7 500	3 rpm
12 000	3 rpm
17 500	3 rpm

OPERATING CHARACTERISTICS AXO 2

Nominal torque (N.m)	Vibrating coupling (N.m)	Torsion under NT (degrees)	STIFFNESS		
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)
600	300	3° 30'	22	75	10,9
800	400	3° 30'	30	100	14,3
1 300	650	3°	45	150	25,8

Nominal torque (N.m)	Vibrating coupling (N.m)	Torsion under NT (degrees)	STIFFNESS		
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)
2 300	1 150	2° 20'	60	210	53,3
3 600	1 800	2°	75	250	114,6
5 000	2 500	1° 50'	90	300	190

1 N.m ≈ 0,1 mkg

OPERATING CHARACTERISTICS AXO 4

Nominal torque (N.m)	Vibrating coupling (N.m)	Torsion under NT (degrees)	STIFFNESS		
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)
5 000	2 500	1° 50'	100	360	157
8 000	4 000	1° 40'	130	480	252
12 000	6 000	1° 20'	170	600	528

Nominal torque (N.m)	Vibrating coupling (N.m)	Torsion under NT (degrees)	STIFFNESS		
			AXIAL (daN/mm)	RADIAL (daN/mm)	TORSIONAL (m.KN/rad.)
17 500	8 750	1°	200	720	916
24 000	12 000	0° 50'	240	850	1 550
40 000	20 000	0° 40'	300	1 100	3 300

1 N.m ≈ 0,1 mkg

PARTS LIST

Coupling reference	Flexible stud reference	Quantity	Flange reference	Quantity	Disk reference	Quantity
615203	**525210-60**	3	321138	2	351026 - 351027	1 - 1
615204	**525210-60**	4	321136	2	351028 - 351029	1 - 1
615206	**525210-60**	6	321147	2	351011 - 351012	1 - 1
615208	**525210-60**	8	321147	2	351013 - 351014	1 - 1
615210	**525210-60**	10	321154	2	351015 - 351016	1 - 1
615212	**525210-60**	12	321167	2	351017 - 351018	1 - 1
615253	**525211-60**	3	321138	1	351042	1
615254	**525211-60**	4	321136	1	351043	1
615256	**525211-60**	6	321147	1	351044	1
615258	**525211-60**	8	321147	1	351045	1
615260	**525211-60**	10	321154	1	351046	1
615262	**525211-60**	12	321167	1	351047	1

Coupling reference	Flexible stud reference	Quantity	Flange reference	Quantity	Disk reference	Quantity
615406	**525400-60**	6	321154	2	351665 - 351666	1 - 1
615408	**525400-60**	8	321167	2	351667 - 351668	1 - 1
615410	**525400-60**	10	321167	2	351663 - 351664	1 - 1
615412	**525400-60**	12	321191	2	351659 - 351660	1 - 1
615414	**525400-60**	14	324602	2	351655 - 351656	1 - 1
615418	**525400-60**	18	324601	2	351651 - 351652	1 - 1
615440	**525400-60**	10	321191	2	351661 - 351662	1 - 1
615442	**525400-60**	12	324602	2	351657 - 351658	1 - 1
615444	**525400-60**	14	324601	2	351653 - 351654	1 - 1
615456	**525403-60**	6	321154	1	351669	1
615458	**525403-60**	8	321167	1	351670	1
615460	**525403-60**	10	321167	1	351671	1
615462	**525403-60**	12	321191	1	351672	1
615464	**525403-60**	14	324602	1	351675	1
615468	**525403-60**	18	324601	1	351677	1
615490	**525403-60**	10	321191	1	351673	1
615492	**525403-60**	12	324602	1	351676	1
615494	**525403-60**	14	324601	1	351674	1

ASSEMBLY

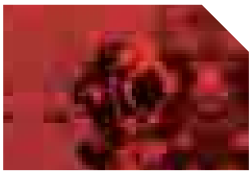
Method : (normal) :

- attach each of the flanges to the ends of the appropriate shafts;
- use the specially machined recess to centre the disks onto the flanges and screw together;
- attach the external armature of the studs to the appropriate disk;
- attach the internal armature of the studs to the other disk.

Torque for the bolts attaching the studs.
Ø 12 ➔ 75 N.m Ø 14 ➔ 122 N.m Ø 16 ➔ 185 N.m

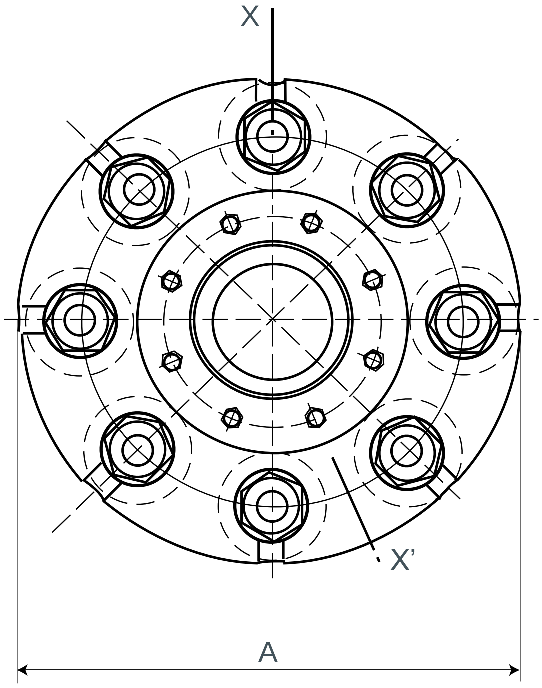
Method : (flywheel) :

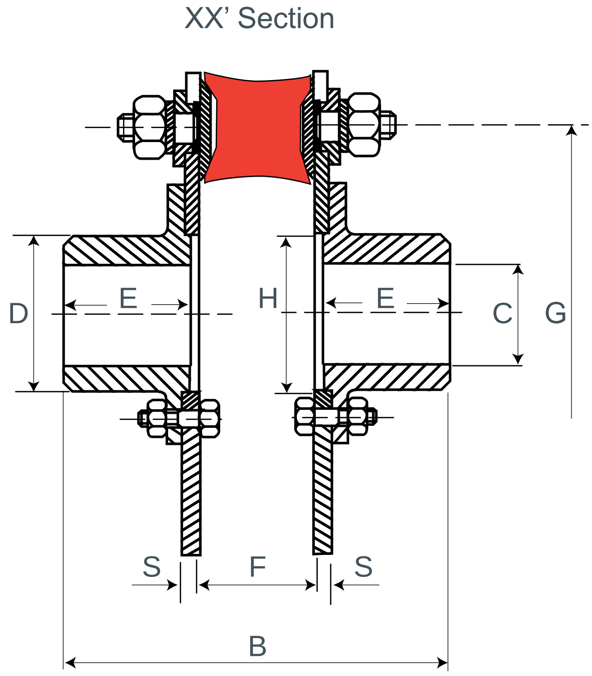
- mount the flange onto the shaft end;
- bolt the disk onto the flange;
- attach the external armature of the studs to the disk;
- attach the internal armature of the studs to the flywheel of the second machine.



SPARE PARTS

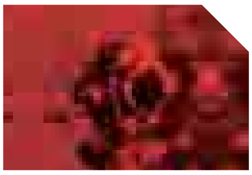
RADIAFLEX® COUPLING





Nominal torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Coupling reference	Flexible stud reference	Qty	F (mm)	G (mm)	H (mm)	S (mm)
		min	max											
0,8	4 000	5	10	45	40	20	15	610503	**521128**	3	15	33	-	3
10	4 000	0	26	80	59	40	20	610406	**521201**	6	19	60	-	5
30	3 000	0	38	172	120	73	38	611113	**521571**	3	44	114	50	4
50	3 000	0	38	172	120	73	38	611213	**521572**	3	44	114	50	4
80	3 000	18	48	187	138	69	46	611116	**521571**	6	44	130	70	4
120	3 000	18	48	187	138	69	46	611216	**521572**	6	44	130	70	4
160	3 000	18	60	248	166	90	60	611108	**521571**	8	44	190	85	4
220	2 500	18	60	248	166	90	60	611208	**521572**	8	44	190	85	4
300	2 000	18	60	240	190	90	60	611408	**521602**	8	60	180	85	8
550	1 500	23	80	300	240	115	85	611412	**521602**	12	60	236	115	8
1 050	1 500	28	100	395	275	145	102,5	611416	**621602**	16	60	330	145	8
1 460	1 500	28	120	430	356	177	136	611512	**521801**	12	70	340	178	10
2 320	1 500	28	120	475	366	177	136	611612	**521951**	12	76	380	178	12

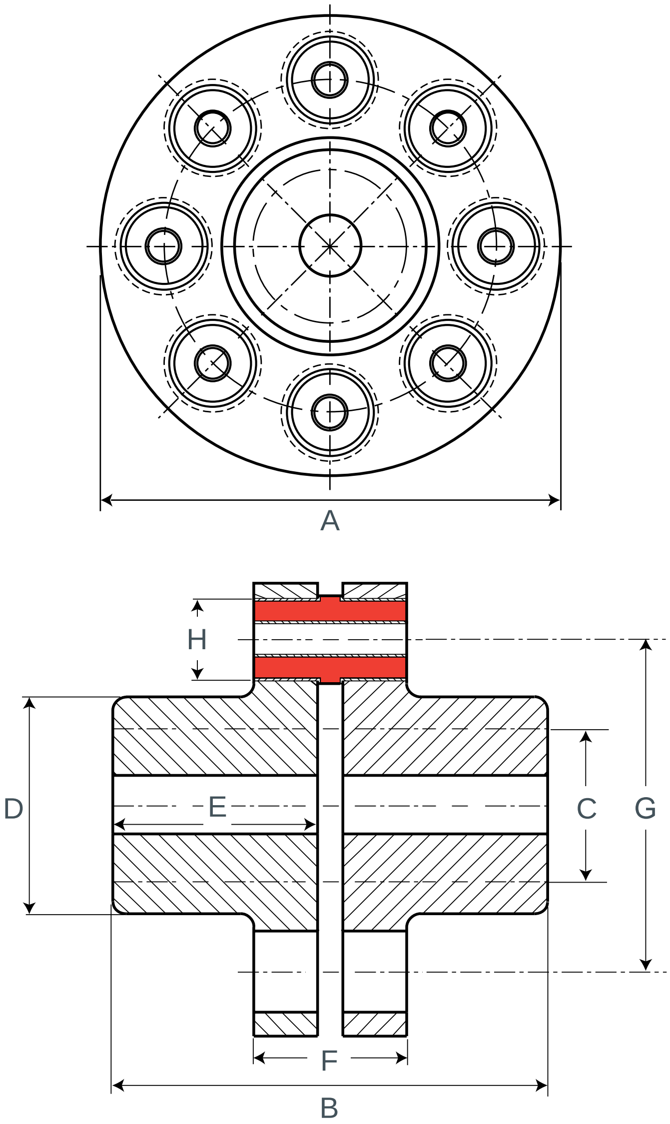
1 N.m ≈ 0,1 mkg



SPARE PARTS

GV Coupling

Recommended in case of very high speed of rotation.



Nominal torque (N.m)	Max speed (rpm)	Hole size C (mm)		A (mm)	B (mm)	D (mm)	E (mm)	Type	Coupling reference	Stud reference	Nber of studs	F (mm)	G (mm)	H (mm)
		min	max											
80	9 000	10	35	100	125	56	60	G.V.10-8	613101	523102	8	35	76	16
450	7 000	24	60	180	170	85	80	G.V.40-8	613400	523401	8	70	130	32
1 000	5 000	35	70	220	235	100	110	G.V.80-8	613800	523801	8	115	150	40
3 800	3 500	35	120	330	320	170	150	G.V.150-10	613901	523902	10	120	250	50
5 400	3 000	35	140	380	340	200	160	G.V.150-12	613902	523902	12	120	300	50
9 000	2 500	40	180	480	400	250	190	G.V.150-16	613903	523902	16	120	400	50

1 N.m ≈ 0,1 mkg

DYNAMIC SEALING

HUTCHINSON®

DYNAMIC SEALING

DYNAMIC SEALING

CONTENTS

Please contact us to see current price list for availability of items.
We reserve the right to modify the design and manufacture of the products and materials described in this catalogue.
The pictures of the products are supplied for information only.

I - GENERAL

I.1 - WHAT IS A SEAL ?

An element forms a sealing function when it prevents the passage of a fluid from a one enclosure to another. Such elements are called “Seals”.

If the object is to prevent the flow of a fluid from an enclosure into a neighbouring enclosure **the seal is called a single seal**. If the seal must prevent the flow of another fluid which may be in the second enclosure into the first, **the seal is called a double seal**.

If the two mechanical parts between which the leakage is likely to occur are fixed with relation to each other, **the seal is called a static seal**. If one or both of these parts is moving relative to the other, **the seal is called a dynamic seal**.
In this document, we will only be dealing with **dynamic seals**.

In practice, we only meet two sorts of relative movement, which may or may not be combined:
- linear translation (such as the sliding of a piston in a cylinder);
- rotation (the relative rotation about a common axis of a shaft in a hub or a crank case).

I.2 - TYPES OF SEALS

Many different methods have been or are still used for sealing such as :
- labyrinth glands;
- stuffing-boxes;
- O-rings;
- lip seals;
- surface seals.

- **Labyrinth glands** are frictionless seals. They do not provide total sealing and do not seal if completely immersed in the fluid.

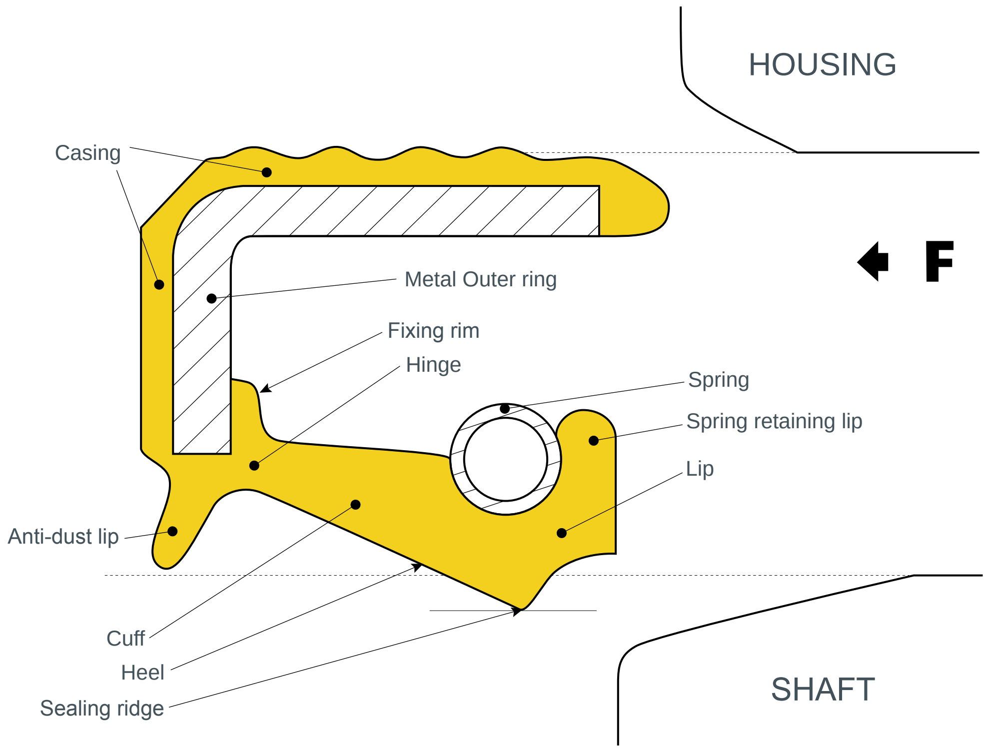
- **Stuffing-boxes** work by packing fibrous material which may or may not be braided tightly around a shaft by means of axial pressure applied by a screw cap or a flange tightened by a bolt. For many years, they have been the most common type of seals used. They produce a high frictional torque and absorb a relatively high amount of power. Although for many applications they have been replaced by lip seals or "surface" seals, they are still used a great deal, especially in the case of fluids under high pressure.

- **O-rings** are rings of synthetic elastomer of various cross-sections, most often circular (hence the name) but sometimes in the form of an X or a cross. They are most often used for static seals but can also be used in some cases as seals for rotating shafts, particularly at low speeds. They also give rise to a high frictional torque.

- **Lip seals for rotating shafts**. Lip seals first appeared about fifty years ago. They consisted of a leather cuff (which could be chromed) whose lip was kept in contact with the rotating shaft by an annular spring. In order to keep both the spring and the leather cuff in position, the parts were encased in a set of metallic collars and rings (normally at least three) which were crimped into each other. The external collar would usually be ground to size and "hard" mounted in a fixed hub. This type of seal was used a great deal, but its life was restricted as the leather wore out particularly in high temperatures. Nowadays, the leather has been replaced by synthetic elastomers which appeared on the market some forty years ago and gradually took over the role of the leather.
  The first of these elastomers to appear is today known as N.B.R. (Nitrile Butadiene Rubber) and was noted for its resistance to organic solvents, in particular liquid fuels and lubricating oils, even at high temperatures. The first seals manufactured had the same structure as the leather seal with its three crimped metal rings. The development of processes which ensure a very good bonding of N.B.R. to metal has enabled the structure of the seal to be simplified and has given it its present classic general shape.
  The discovery of new elastomers enables us to offer the user an increasingly varied range of seals, which are capable of solving increasingly difficult problems.

Segré's Plant (Maine-et-Loire) - ISO 9001

I.3 - DESCRIPTION OF LIP SEALS



In outline, a seal for a rotating shaft consists of three essential parts :

- the outer ring;
- the elastomer;
- the spring.

- **The Outer ring usually** consists of a metal ring in stamped steel with a right-angled cross-section.

- **The elastomer** is itself made up of 3 parts :

- the casing;
- the cuff;
- the lip.

- The casing (from the front surface to the back of the seal) is the part of the elastomer which is bonded to the Outer ring. It can cover it more or less entirely on the interior and/or the exterior.

- The cuff is cylindrical or slightly conical in shape and joins the Outer ring and the casing to the lip. It ensures a static seal and due to its elasticity - which is greater as it is longer - it allows slight movement of the lip due to movement of the shaft other than rotation.

- The lip is the element which ensures the dynamic seal by direct frictional contact with the shaft. It is made up of an annular beading including a double bevel forming a sharp ridge which is concentric with the perpendicular axis of the seal. The inclination of the surfaces of the bevel is designed to ensure the seal against leakage of a fluid situated on the side marked F.

- **The spring** is a spiral prestressed spring. It forms an annular ring. The join is usually effected by screwing into one end the conical spiral parts of the other end. The spring is fitted by light pressure into a groove in the beading of the lip.

II - MATERIALS USED

II.1 - ARMATURES

Standard material : sheet steel of XE quality (AFNOR standard A 36 401)
Special outer rings can be produced using other materials for special applications.

II.2 - SPRINGS

Standard : Stabilised XC 70 steel
On request : Z10 CN 18-09 stainless steel (AFNOR standard A 35 586).

NOTA : All the PAULSTRA range of fluorinated elastomer seals fluorocarbon (FKM) are equiped with stainless steel springs.

II.3 - ELASTOMERS

	Mixes	Symbols	*Temperature range
STANDARD MIXES	**NITRILE (acrylo-nitrile butadiene)** This material is particularly resistant to the action of mineral oils and grease. Suitable in most other cases.	NBR	- 30°C to + 110°C
	FLUOROCARBON ELASTOMER This elastomer has the best chemical and heat resistant characteristics. The new fluorocarbon formula offers very low abrasion and : - low shaft and lip wear. - resistance to ageing.	FKM	- 20°C to + 200°C

*** Temperatures on samples**

III - THE SELECTION OF A SEAL FOR A ROTATING SHAFT*

III.1 - THE TYPE OF FLUID TO BE SEALED

The fluids in contact with each face of the seal can be gases or liquids which are more or less viscous even pasty (in the case of greases). They must not have too aggressive actions on the materials which make up the seal (the outer ring, spring and elastomer).

III.1.1 - ARMATURE AND SPRING

The armature and spring of standard seals are steel, so they have a good resistance to all the chemical solvents which are currently used in industry with the exception of water and aqueous liquids which can cause rust and corrosion.
For any other kind of material, please consult our technical services.

III.1.2 - ELASTOMER

Chemical resistance
The standard seals made from a nitrile elastomer based mix have been designed to resist most current lubricating oils.
For more aggressive fluids, a formula based on fluorinated elastomer fluorocarbon (FKM) would be more appropriate.

FLUIDS	ELASTOMERS	
	Nitrile (NBR)	Fluoro-carbon elastomer (FKM)
Acetone	D	D
Acetic acid	A	D
10 % Hydrochloric acid	A	A
Concentrated Hydrochloric acid	D	A
20 % Nitric acid	D	A
10 % Sulphuric acid	A	A
Concentrated Sulphuric acid	D	A
Atmospheric air at 100 °C	C	A
Atmospheric air at 200 °C	D	A
Concentrated Ethyl alcohol	A	B
Methyl alcohol	A	B
Propyl alcohol	A	B
Ammonia	C	A
Benzene	D	B
Butter	A	A
Butane	A	A
Petrol	A	A
Super petrol	C	A
Chlorine	B	A
Cyclohexane	B	A
Water	A	A
Sewage	A	B
Concentrated Eau de Javel	C	A
Sea water	A	A
Freon	C	C
Freon 12	B	B
Carbonic gas	A	A
Smoke	C	A
Diesel oil	A	A
Diesel oil at 100 °C	C	A
Glycerine	A	A
Cereal oils	A	A
ASTM1 oil at 100 °C	A	A
ASTM1 oil at 150 °C	D	A
ASTM2 oil at 100 °C	A	A
ASTM2 oil at 150 °C	D	A
ASTM3 oil at 100 °C	A	A
ASTM3 oil at 150 °C	D	A
Gear oil at 100 °C	A	A
Gear oil at 130 °C	D	A
EP hypoid oil at 100 °C	A	A
EP hypoid oil at 130 °C	D	A
ATF oil at 100 °C	A	A
ATF oil at 150 °C	D	A
Mineral motor oil at 100 °C	A	A
Mineral motor oil at 150 °C	D	A
Synthetic motor oil at 100 °C	A	A
Synthetic motor oil at 150 °C	D	A
Silicone oil	A	A
Isooctane fuel (Fuel A)	A	A
Isooctane-toluene (Fuel B)	B	A
Kerosene JP 1	A	A
Milk	A	A
Antifreeze (water + glycol)	B	B
Brake fluid (Lockheed)	D	C
Brake fluid (Lockheed) at 50 °C	D	D
Ozone	D	A
Paraffin	A	A
Propane	A	A
Saline aluminium solutions	A	A
Magnesium salt solutions	A	A
Sodium chloride solutions	A	A
Soda	C	A
Toluene	C	A
Trichlorethylene	D	A

A: Good chemical resistance B: Average performance
C: Acceptable (depending on conditions of use) D: Unsuitable
* For rotating housing applications please consult us.

Mechanical resistance

The new brown colored fluorocarbon (FKM) formula presents a very low abrasivity and :
- low shaft and lip wear;
- resistance to ageing.

Heat resistance

For good performance an elastomeric seal must be used within its operating temperature range. The standard elastomeric mix is not only sensitive to high temperatures which harden it causing cracks and fissures, but also to intense cold which makes it hard and hardens it. The temperature which must be considered is that at the contact lip. It must be borne in mind that this gets much hotter than the ambient fluid, due to friction. For example, the temperature of the lip of a seal which seals the motor oil of a crankcase, where the shaft is rotating at high velocity (more than 8 m/s), can increase by about fifty degrees after a few minutes of service, whereas the oil, even next to the seal, will only warm up by a few degrees in the same period. The temperature displayed by a thermometer dipped into the crankcase oil is not therefore a determining factor.

In addition to the shaft speed, which is the most important factor, other parameters influence the heating of the lip such as the condition of the shaft surface, the tightness of the seal, the ventilation of the crankcase, and so on, so that it is very difficult to know the temperature of the lip in continuous operation.

The temperatures indicated in the table below are only valid if the fluid being sealed is not degraded at these temperatures.

Where high temperatures exceed the values shown in the table below, use seals in fluorinated elastomer.

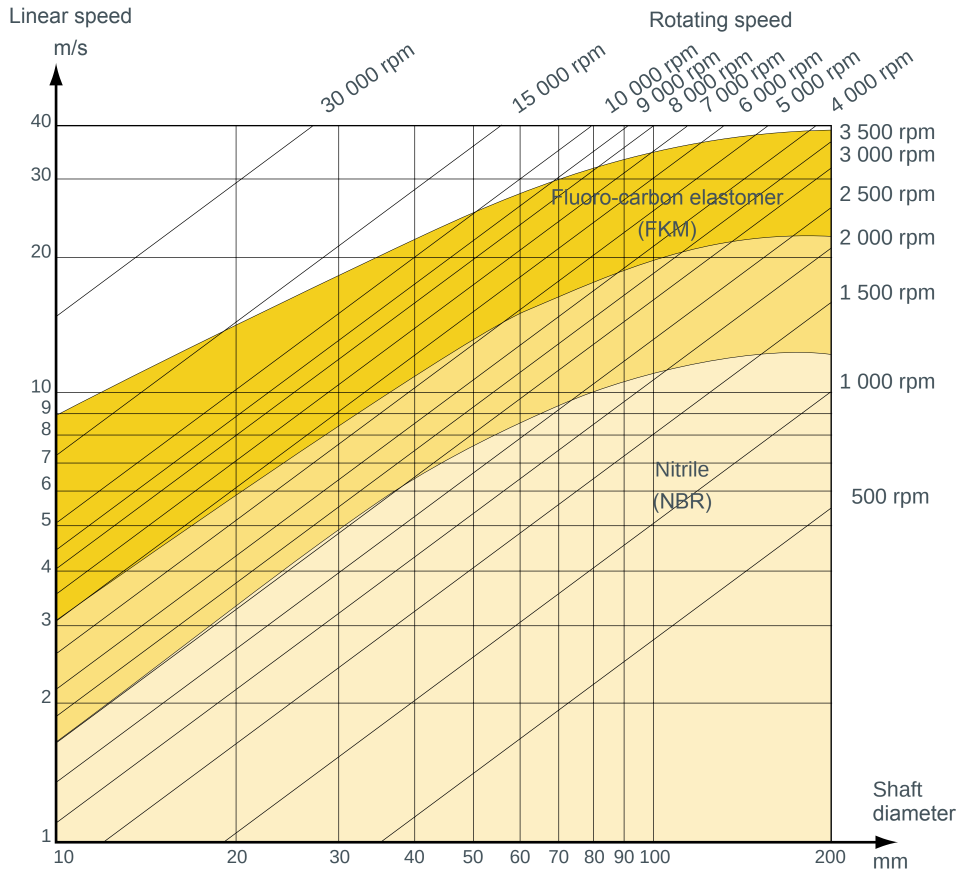
Our technical services are at your disposal to reply to your questions about the properties of various mixes.

		Nitrile (NBR)		Fluoro-carbon elastomer (FKM)	
	Low temperature in °C (1)	- 40		- 30	
	Temperature in °C	Av. (2)	Max (3)	Av. (2)	Max (3)
Products to be sealed					
Mineral oil based	Motor oils	100	120	150	175
	Gear box oils	90	110	130	150
	Hypoid gear oils	90	110	130	150
	ATF oils	100	120	150	175
	Hydraulic oils	100	120	150	175
	EL and L diesel oils	90	100	+	
	Greases	100	120	150	175
Hydraulic liquids hard to ignite	HSB oil/water emulsion	80	100	-	
	HSC aqueous solution	80	100	-	
	HSD non-aqueous solution	--		130	150
Other products	Water	80	100	+	
	Detergents	80	100	+	
	Brake fluid	--		--	

(1) Temperature at which the seal continues to function.
(2) Average operating temperature.
(3) Maximum permissible temperature for not more than 10 hours over the life of the seal.
\+ Resistant. but normally not used.
\- Resistant. under certain conditions.
-- Does not resist.

III.2 - SHAFT SPEED

The graph below gives an indication of the rotary or linear velocity of the shaft in relation to various elastomers which are permissible under normal conditions of use.

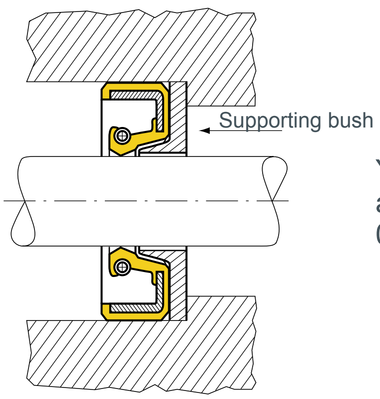


III.3 - PRESSURE

The effective pressure to which a seal is submitted is the difference between the pressures of the fluids on each of its two sides (one of which is often the atmosphere). It is clear that the sealing lip should be found on the side which has the higher pressure. In theory, the lip seal for rotary shafts is not a pressure seal.

However, most PAULSTRA seals will resist pressures of the order of 0.5 bars without special precautions if the velocities do not exceed 3 m/s. At higher pressures, there is a risk that the lip may be turned back on itself or pressed onto the shaft with a force which gives rise to an unacceptable tightness and frictional torque. At low velocities most PAULSTRA seals will bear pressures of up to 3 or 4 bars with the addition of a supporting bush. This is not provided by PAULSTRA but it can be made up by the customer according to PAULSTRA's drawings.

The effective pressure is not necessarily constant. If the variations are slow and remain within the limits above. this is not a big problem. On the other hand, if they pulsate rapidly they can interfere with the performance of the seal.



You are advised to consult our technical services for any application which involves an effective pressure greater than 0.5 bars or a pulsating pressure.

III - CONDITIONS FOR GOOD OPERATION

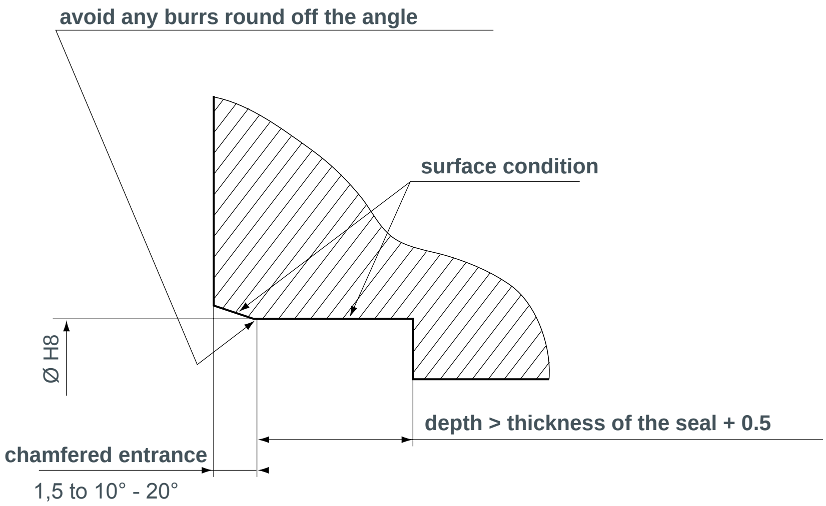
IV.1 - THE HOUSING

It is extremely important that there be no sharp edges.

Our recommendations are shown on the figure below :

Recommended shape of the housing :

- for a covered seal :	R = 4 to 12,5 µ Ra = 1,6 to 4 µ
- for an external outer ring :	R = 3 to 8 µ Ra = 1,2 to 2,5 µ



Note : if the housing is made of a material with a high coefficient of expansion, this must be taken into consideration when defining the interference (tightness) with the seal.

The lack of a chamfer or too small a chamfer can cause :

- a deterioration of the exterior of the seals (cutting of the elastomer or stripping of the sealing lacquer);
- a big increase in the force of insertion which could cause deformation of the outer ring;
- a defective axial positioning.

A surface with a very rough finish can cause the same problems and can therefore also be the reason for a leak. On the other hand, if the finish is too smooth the extraction force may be too low.

IV.2 - THE SHAFT

The PAULSTRA recommendations are as follows :

- **Tolerance on the diameter :** h 11.

- **Surface state :** R = 0.4 to 1.2 ED (so Ra ≃0.2 to 0.5).

- **Hardness** : if V ≤ 4 m/s : 45 HRC minimum (say 455 HV or 155 kg/mm2).
if V > 4 m/s : 55 HRC minimum (say 625 HV or 195 kg/mm2).

- **Thickness of the treated zone** : 0.3 mm minimum.

- **Circularity** : 5 microns.

- **Neutrality** : All machined surfaces have grooves from the machining process. If these grooves are inclined in relation to the axis of the shaft, they form a helix which will produce a hydrodynamic action.

The bearing surfaces of a seal must be neutral (i.e. there must be no orientation of the machining grooves).

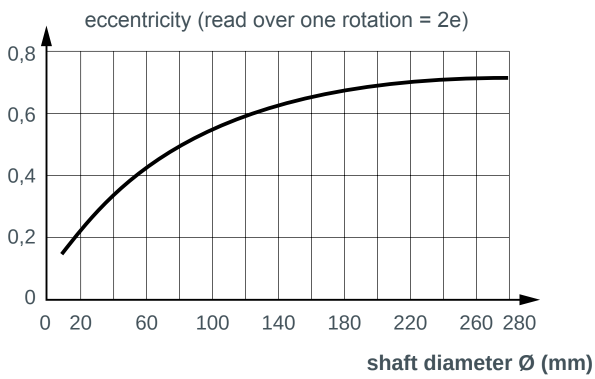
It is possible to orient the machine grooves deliberately to produce pumping from the exterior to the interior of the mechanism. However, **we advise against this as there will be increased wear of the seal.**

Hard chroming is also not to be recommended, unless it is of sufficient thickness and quality.

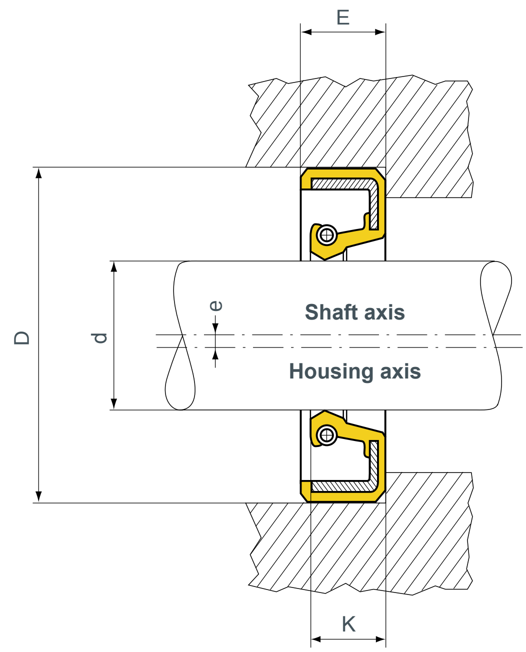
IV.3 - ECCENTRICITY BETWEEN THE HOUSING AND THE SHAFT

The housing and the shaft should be centred on one another as precisely as possible. If there is a radial displacement between the axis of the seal and the axis of the shaft, the suppleness of the rubber lip enables assembly without “yawning” within certain limits.
The eccentricity is the distance between the axis of the seal housing and the axis of the shaft, the two axes being parallel to each other.

The curve below shows the maximum permitted eccentricities as a function of the shaft diameter.

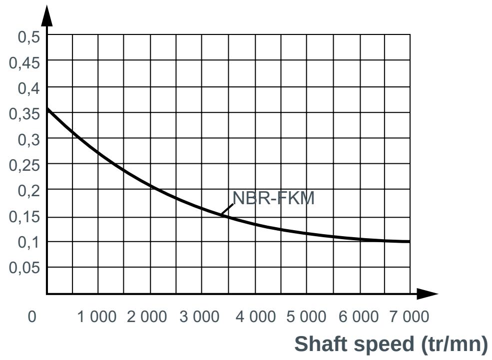


eccentricity = f (Ø)

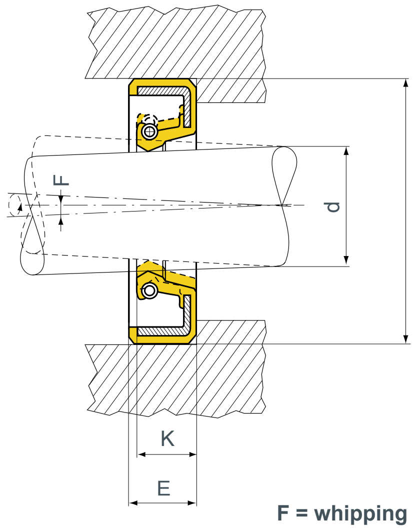


IV.4 - WHIPPING AND OUT OF TRUE

This phenomenon occurs when the geometric axis of the shaft does not coincide exactly with the rotational axis. This can be the result, for example, of a worn bearing or the bending of the shaft. The amplitude of whipping increases with distance from a bearing. so the seal should be placed as near as possible to the bearings. Whipping is measured in mm by the radius of the circle described by a point on the axis of the shaft which is in the same plane as the lip.
The curve below shows the maximum whipping permissible as a function of the rotational velocity of the shaft.



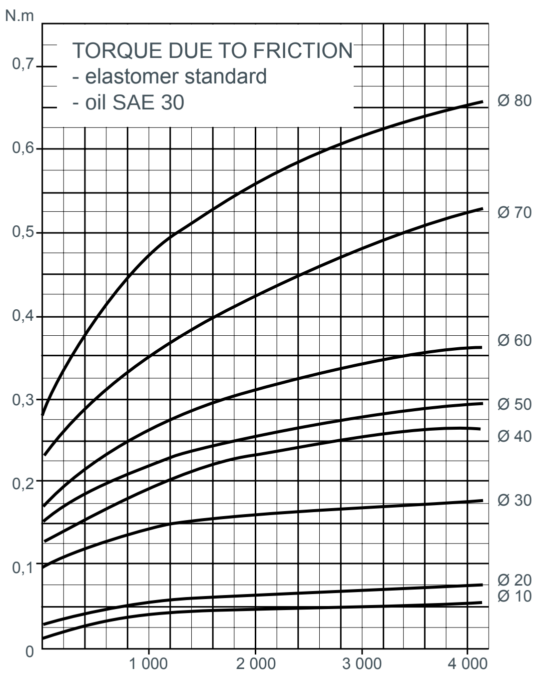
Whipping = f (V)

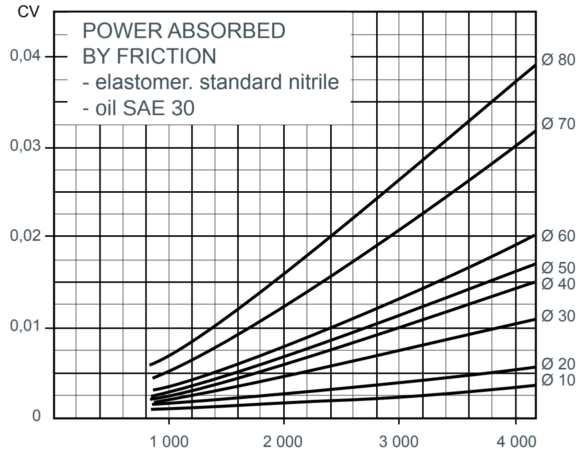


F = whipping

IV.5 - POWER ABSORBED DUE FRICTION

Due to it's design, a lip seal produces friction which will provide some resistance to the rotation of the shaft. For a chosen speed, the resisting torque is function of : the shape of the seal, the friction coefficient and other environment factors such as (materials. tightness of the seal on the shaft, roughness of the shaft, wear, lubrication, temperature ...).





The curves above gives a first indication for the standard Nitrile elastomer. They were plotted under average working conditions using a standard seal with little wear and a lubricated shaft with good surface finish and running temperature of less than 100 °C.

V - THE ASSEMBLY OF SEALS

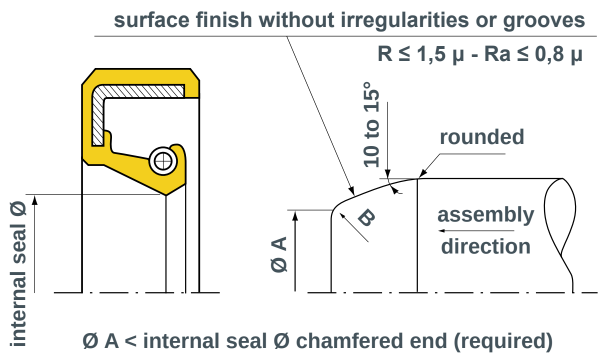
The assembly of seals is a very delicate operation which can ruin the efficiency of a very good product if it is not done properly.
The assembly of a seal must be done in accordance with the following rules :

- avoid damage to the lip;
- avoid damage to the cover of the external diameter;
- lubricate the sealing ridge to avoid damage at the first start-up;
- position the seal correctly :
  - misalignment (the seal must be perpendicular in relation to the axis);
  - axial position.

The information given below should help constructors to put these rules into practice.

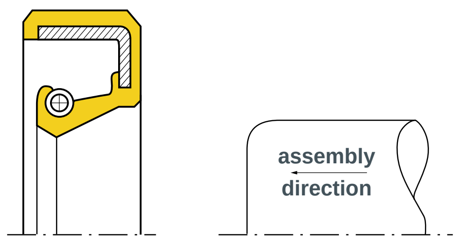
V.I - ASSEMBLY ON A SHAFT WITHOUT SPLINES

fitting against the lip



Ø A < internal seal Ø chamfered end (required)

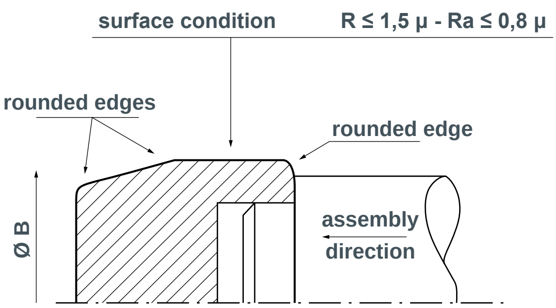
fitting with the lip



rounded or chamfered end
(sharp edges removed)

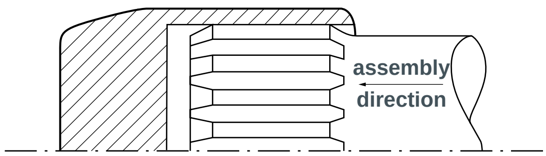
V.2 - ASSEMBLY ON A SHAFT WITH SPLINES OR A SHOULDER

assembly tool for shouldered shaft



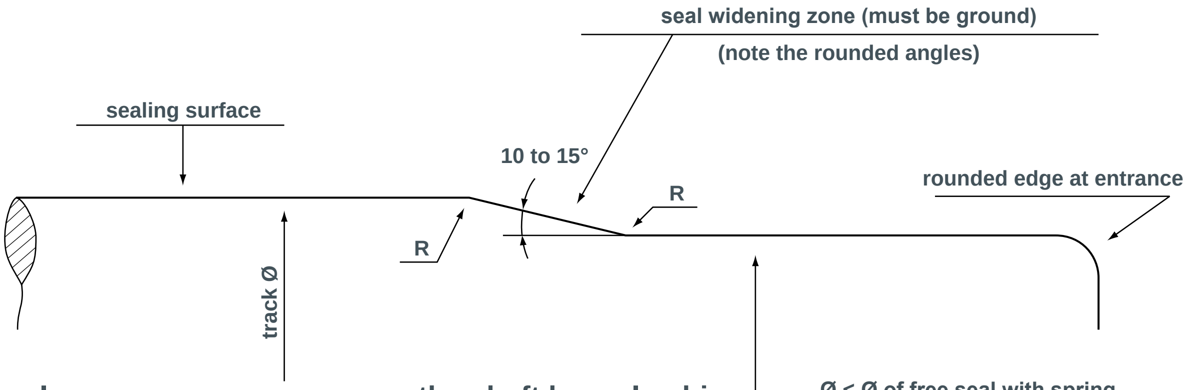
Ø B = Ø nominal shaft + 0,2

assembly tool for splined shaft



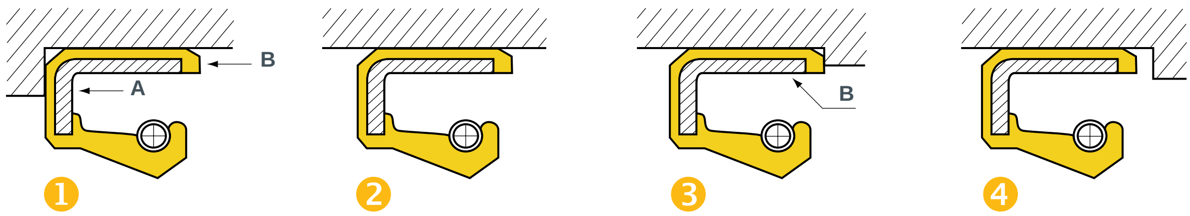
The use of these assembly tools is helpful. However, we recommend the use of a lead-in on the shaft whenever possible.

V.3 - PAULSTRA RECOMMENDATIONS FOR THE SHAPE OF THE SHAFT



Mounting sleeves are unnecessary as the shaft has a lead-in

V.4 - AXIAL POSITIONNING AND ALIGNEMENT



1 The seal is mounted against a stop on the rear side. This presents no particular problem provided that pressure is applied at “A” to insert it and not “B”.

2 Here there is no axial stop. The mounting tool positions the seal both axially and perpendicularly.

3 The seal is mounted against a stop on the front side. This should be avoided as the elastomer at B could be compressed and the seal will tend to move out of position.

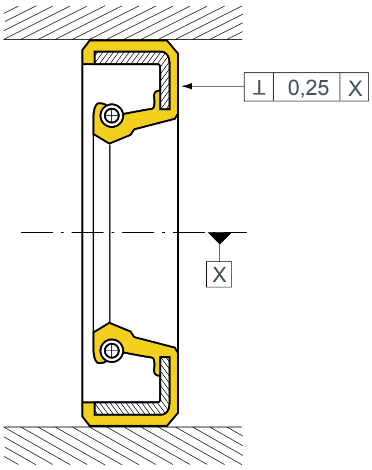
4 The housing has a shoulder as in 3, but the seal is positioned by the mounting tool. This case joint is preferable to case 3.

The mounting tool should be designed to position the seal correctly both axially and perpendicularly but its shape should be such as to allow deformation of the elastomer covering the outer ring towards the rear, thus avoiding cutting the covering at the time of insertion. In some cases, the bead “C” does not get cut off and sticks between the housing and the assembly mandrel in which case it is impossible to locate the seal. When the seals have an anti-dust lip, care should be taken that the mounting tools do not turn it back on itself.

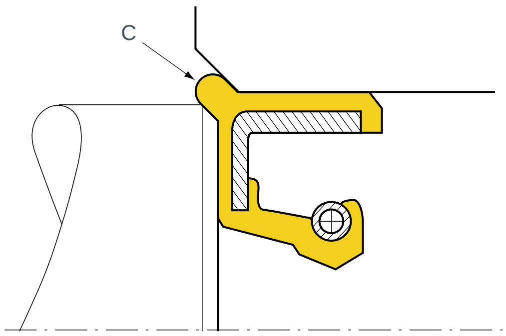
While it is true that modern seal design (corrugations on the outside, pre-centred shape chamfers without burrs, etc.) tends to reduce problems during assembly, the comments made are still worth noting.
Also, the elastomer part of a semi-covered seal behaves in the same way as a fully covered seal.

- Time should be allowed during assembly to allow in order to allow the elastomer time to settle.
- The seal must be held in position for a few seconds once mounted to avoid too large a return movement.

We recommend the following :
- V = 1200 mm/mn (maximum : 1500 mm/mn).
- time held in position: 5 seconds (minimum 2 seconds).

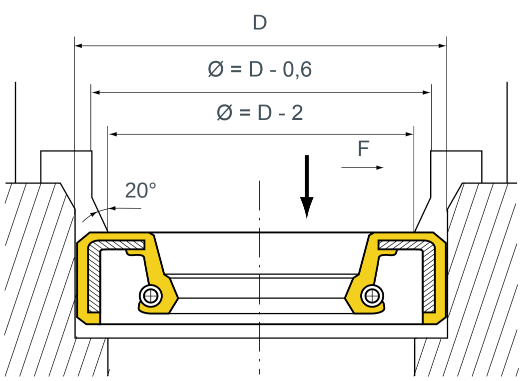


Perpendicular tolerance

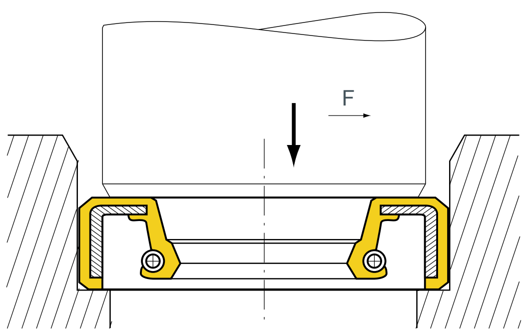


Formation of the bead

V.5 - RECOMMENDATIONS FOR THE ASSEMBLY TOOL



GOOD



TO BE AVOIDED

V.6 - LUBRICATION DURING ASSEMBLY

While the first means of avoiding damage to the outside of the seal is to pay attention to the housing characteristics, the second means, which is just as important, is lubrication :
- be it of the housing;
- or the outside of the seals;
- or both at the same time.

This not only avoids damage to the seal but also ensures a better axial positioning.
A seal whose outside diameter is not lubricated will certainly be damaged on the outside when it is mounted in a dry housing (elastomer cover cut or ripped sealing lacquer removed).
Also, when the unit is started up, the oil will always take some time before it reaches the lip of the seal (from a few seconds to a few tenths of seconds depending to the application).
If it is the first start, and if the lip has not been lubricated at assembly, it will function “dry” dynamically which will lead to great wear and the risk of total deterioration.

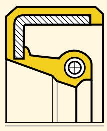
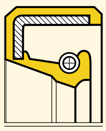
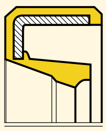
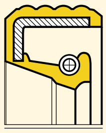
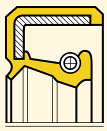
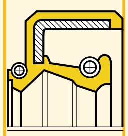
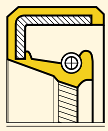
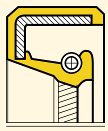
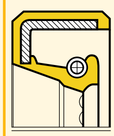
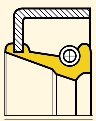
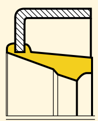
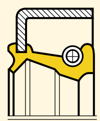
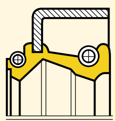
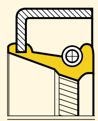
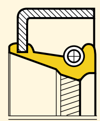
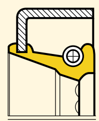
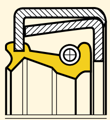
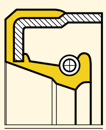
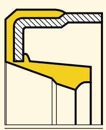
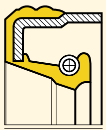
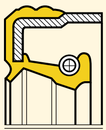
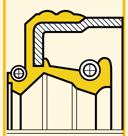
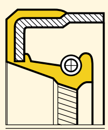
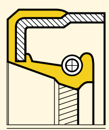
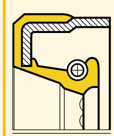
It is therefore essential to lubricate the sealing ridge.

For later starts, the problem is different because a film of oil will be retained under the lip by capillarity action.

V.7 - REMINDER OF THE MAIN PRINCIPLES OF ASSEMBLY

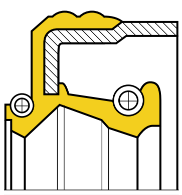
- **Protect the lip and the outside of the seal by paying attention to the recommendations for the Shaft and the housing.**
- **Apply the insertion force to the rigid part of the outer ring.**
- **Centre the seal correctly in relation to the housing and/or the shaft.**
- **Lubricate the outside diameter and/or the housing.**
- **Lubricate the sealing ridge.**

V - CLASSIFICATION OF THE MAIN PROFILES OF LIP SEALS

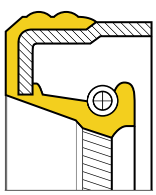
	SPRING			CORRUGATED COVER (W)	ANTI-DUST LIP		RIDGES		
	embedded (I)	visible (E)	none (O)		WITHOUT SPRING (L)	WITH SPRING (R)	on the left (G)	to the right (D)	bi-direct. (V)
I Covered outer ring	II 	IE 	IO 	IEW 	IEL 	IELR 	IEG 	IED 	IEV 
E Bare outer ring	-	EE 	EO 	-	EEL 	EELR 	EEG 	EED 	EEV 
CS Bare outer ring reinforced	-	-	-	-	CSEL 	-	-	-	-
M Semico-vered outer ring	-	ME 	MO 	MEW 	MEWL 	MEWLR 	MEG 	MED 	MEV 

Note : other cases are available
X = exterior lip
S = special cross-section
P = protector

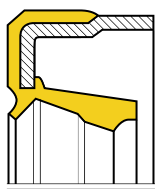
CLASSIFICATION EXAMPLE



MEWLR

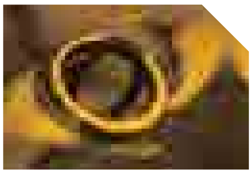


MEWG



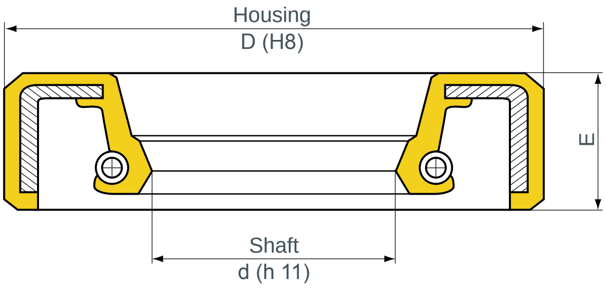
MOWL

M	Semi-covered	M	Semi-covered	M	Semi-covered
E	Spring visible	E	Spring visible	O	No spring
W	With corrugations	W	With corrugations	W	With corrugations
LR	Anti-dust lip with spring	G	Ridges to the left	L	Anti-dust lip



CATALOGUE OF SEALS FOR ROTATING SHAFTS

SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER



- The part numbers indicated in bold type are normally kept in stock.
- All important orders or special elastomers are available on request. Part numbers ending in “01” include a STAINLESS STEEL SPRING.

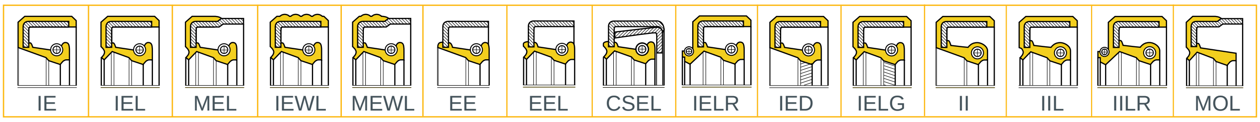
Due to low demand we have now stopped making the II/IIL range of seals (with moulded in spring). Please refer to our cost effective standard rangeof seals (IE/IEL or CSEL type in both Nitrile or Fluorocarbon elastomer) to find the nearest equivalent. Our Technical support service is at your disposal to help you.

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
5	15	6	IE	NBR	**722034**
	15	6	IE	FKM	**722034/81**
	15	6	IEL	NBR	**792593**
	16	5	IO	NBR	723218
5,5	16	7	IE	FKM	772145
6	12	3,5	IE	NBR	772315
	15	7	IE	NBR	772309
	16	7	IE	NBR	**722987**
	22	7	IE	NBR	**722196**
	22	7	IOS	NBR	726167
6,3	19	5	IEW	NBR	772402
	19	6,3	IE	NBR	**722416**
	19	6,3	IE	FKM	772122
7	16	7	IE	NBR	**722290**
	19	6	IE	NBR	**722399**
	22	7	IE	NBR	**722721**
8	11,5	2,5	OOS	NBR	727093
	14	3	IO	NBR	723227
	14	3	IO	NBR	723250
	14	3	IO	NBR	723279
	15	5	IE	NBR	772233
	16	6,5	IE	NBR	**722455**
	16	6,5	IO	NBR	723216
	18	5	IE	NBR	**722477**
	18	5	IE	FKM	722477
	18	5	IEL	NBR	**792594**
	22	6	IEWL	NBR	725696
	22	7	IE	NBR	**772023**
	22	7	IEL	NBR	**792595**
	22	8	IE	NBR	**722211**
	22	8	IE	FKM	722907
8,4	16	6,5	IE	NBR	722061
9	22	7	IE	NBR	**722981**
	24	7	IE	NBR	772026
	25	8	IE	NBR	**722273**
	26	7	IE	NBR	**772028**
	28	8	IE	NBR	772330

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
9,2	19	5,3	IE	NBR	**722003**
9,8	18	5	IOS	NBR	726787
	16	5	IE	FKM	722393
10	18	5	IE	NBR	**722495**
	19	7	IE	NBR	**722164**
	22	7	IE	NBR	**722940**
	22	7x8	IEL	NBR	**725331**
	22	8	IE	NBR	**722294**
	25	8	IE	NBR	**722267**
	26	7	IE	NBR	**722983**
	28,5	8	IE	NBR	722783
	35	8	IE	NBR	722784
10,3	22	8	IE	NBR	772311
10,8	22,2	6,3	IE	NBR	722417
11	17	4	IE	NBR	772379
	17	4	IEWL	NBR	725694
	22	7	IE	NBR	**772010**
	24	8	IEL	NBR	725183
	26	7	IE	NBR	**772027**
	26,9	8	IE	NBR	722007
	28,5	8	IE	NBR	722785
12	18	4	IOS	NBR	726024
	18,2	4	IOS	NBR	726072
	19	5	IE	NBR	**792700**
	20	5x6	EELS	NBR	725519
	22	4	IE	NBR	722372
	22	4	IE	NBR	772314
	22	4	IE	NBR	**792701**
	22	4	IEL	NBR	**792596**
	22	4,5	IE	NBR	**722303**
	22	7	IE	NBR	722660
	22	7	IEL	NBR	**792507**
	22	8	IE	NBR	722295
	24	6,5	IE	NBR	**722395**
	24	6,5	IEL	NBR	**792597**
	24	7	IE	NBR	**772204**
	26	8	IE	NBR	**722109**
	26	8	IEL	NBR	**725352**
	26	8x13	IES	NBR	726223

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon



d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
12	26	10	IELRS	NBR	725735
	28	7	IE	NBR	**722992**
	28	7	IE	NBR	772346
	28	8	IE	NBR	**722268**
	28	8	IEL	NBR	**725589**
	28,5	8	IE	NBR	722786
	30	7	IE	NBR	**772011**
	30	8	IE	NBR	**722189**
	30	8x13	IELS	NBR	725492
	30	8x13	IOS	NBR	726342
	32	8x13	IES	NBR	726594
	32	8	IE	NBR	722320
	32	10	IE	NBR	**792702**
	32,9	5	EOS	NBR	726407
	35,9	5	EOS	NBR	726397
12,5	22	4,5	IE	NBR	**722810**
	22	8	IE	NBR	722545
13	24	7	IEL	NBR	725330
	25	8x14	IELS	NBR	725134
	26	6	IE	NBR	**792703**
	26	9	IEL	NBR	**725297**
	26	9	IOS	NBR	726075
	30	8	IE	NBR	**722013**
	35	10	IE	NBR	772345
14	22	4	IE	NBR	**722234**
	22	4	IE	NBR	772308
	22	4	IEL	NBR	**792598**
	22	4	IOS	NBR	726385
	22	7	IE	NBR	722453
	24	6	IEL	FKM	**725628/81**
	24	7	IE	NBR	**722659**
	24	7	IE	FKM	**722659/81**
	26	8	IE	NBR	**722177**
	26	8x10	IELS	NBR	725342
	28	7	IE	NBR	**722986**
	30	7	IE	NBR	**772029**
	30	8	IE	NBR	**722451**
	30	7	IEL	NBR	725140
	35	10	IE	NBR	**772030**
	43	10	IELS	NBR	725566
	45,9		IELS	NBR	725512
14,5	24	7	IE	NBR	722249
15	21	4	IO	NBR	**723412**
	21	4,4	EEL	NBR	725333
	23	4	IEWL	NBR	725691
	24	4,5	IE	NBR	772303
	24	4,5x5,5	IELS	NBR	725611
	24	7	IE	NBR	**722266**
	24	7	IE	FKM	**722266/81**
	24	7	IE	FKM	772289
	24	7	IEL	FKM	725658
	24	7	IEL	NBR	**792599**
	25	5	IE	NBR	**792704**
	25,5	4,6	IE	NBR	**722494**
	25,5	4,6	IE	NBR	772344
	25,5	4,6	IE	FKM	**772344/81**
	26	6	EEL	NBR	725483
	26	7	IE	NBR	**722616**
	26	7	IE	NBR	722832
	26	7	IE	FKM	**722616/81**
	26	9	EEL	NBR	725443
	26,5	4,6	IE	FKM	**772326/81**
	28	4	IE	NBR	**722001**
	28	4	IEL	NBR	**792600**
	28	9	IE	NBR	**792706**
	30	4,5	IE	NBR	**722257**
	30	6	IE	NBR	**722780**
	30	7	IE	NBR	**722106**
	30	7	IE	FKM	**722106/81**
	30	7	IEL	NBR	**792601**
	30	8	IE	NBR	**722788**
	32	7	IE	NBR	**722165**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
15	32	7	IE	FKM	772130
	32	7	IEL	NBR	**792508**
	33	5,5	IE	NBR	722787
	33	7	IE	NBR	722042
	33	8	IE	NBR	722347
	33	10	IEL	NBR	**725669**
	35	7	IE	NBR	**772007**
	35	7	IE	FKM	**772007/81**
	35	7	IEL	NBR	**792602**
	35	8	IE	NBR	**722316**
	35	10	IE	NBR	**722300**
	35	10	IEL	NBR	**725739**
	42	8	IE	NBR	**722296**
15,2	30	4,6	IOS	NBR	726188
15,6	25	7	IE	NBR	**722006**
15,7	25,5	4,6	IE	NBR	**722021**
15,8	28,5	9,5	IE	NBR	722104
	28,5	9,5	IEL	NBR	**725045**
15,9	28,6	9,5	IE	NBR	**722150**
	35	8x11,5	IOLS	NBR	723260
16	22	3	IOS	NBR	726303
	22	4	EE	NBR	720047
	22	4	EEL	NBR	726353
	22,7	4,2	IE	NBR	772278
	24	6	IEL	NBR	725659
	24	7	IE	NBR	**722769**
	26	7	IEL	NBR	**725811**
	28	7	IEL	NBR	**792603**
	28	7	IE	NBR	**772012**
	28	8	IE	NBR	722613
	28	8	IE	NBR	**722742**
	28,5	6,3	IE	NBR	722256
	28,7	9,5	IE	NBR	722141
	30	4,5	IE	NBR	**722184**
	30	7	IE	FKM	**772021/81**
	30	10	IE	FKM	772291
	32	7	IE	NBR	**772031**
	32	7	IE	FKM	**772031/81**
	33	8	IE	NBR	**722717**
	35	6x6,5	IES	NBR	726339
	35	7	IE	NBR	**722043**
	35	7	IEL	NBR	**792604**
	35	10	IEL	NBR	725141
	38	4	IE	NBR	722593
16,8	24	4	IO	NBR	723801
	47	7	IE	NBR	722798
17	26	6	IE	NBR	**792707**
	27	6	IEL	NBR	725668
	28	6	IE	NBR	772288
	28	6	IEL	NBR	**792830**
	28	6x6,3	IELV	FKM	704020
	28	7	IE	NBR	**722969**
	28	7	IE	FKM	**722969/81**
	28	7	IEL	NBR	725602
	28	7x13	EESD	NBR	702224
	28	8	IELR	FKM	725649
	28	8	IELR	FKM	725661
	29	7x13	EESG	NBR	702225
	30	7	IE	NBR	**722726**
	30	7	IEL	NBR	**792509**
	30	7	IE	FKM	**722726/81**
	32	7	IE	NBR	**722123**
	32	7	IE	FKM	**722123/81**
	32	9	IE	NBR	**722696**
	34	4	IE	NBR	**722603**
	35	7	IE	NBR	**722989**
	35	7	IE	NBR	772385
	35	7	IE	FKM	**722989/81**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

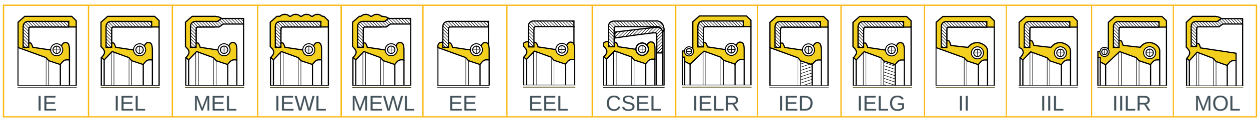
SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
17	35	7	IEL	NBR	**792605**
	35	8	IE	NBR	**722201**
	35	8	IEL	NBR	**725351**
	35	8	IED	NBR	702003
	35	8x13	IESG	NBR	702012
	35	8x13	IESD	NBR	702066
	40	7	IE	NBR	**722735**
	40	7	IEL	NBR	**792606**
	40	10	IE	NBR	**722314**
	47	8	IE	NBR	**722674**
17,5	34	8x15	IESD	NBR	702051
17,7	30	5	IO	NBR	723264
17,9	35,5	8,2	IEL	NBR	725652
18	25	7	IE	NBR	**722628**
	26	4,5	IE	NBR	772389
	28	6	IE	NBR	**722774**
	28	7	IEL	NBR	**792607**
	30	5	IELD	NBR	702177
	30	5	IOS	NBR	726302
	30	7	IE	NBR	**722107**
	32	5	IE	NBR	**722663**
	32	7	IE	NBR	**722105**
	32	7	IE	FKM	**722105/81**
	33	8	IE	NBR	**722120**
	35	7	IE	NBR	**772102**
	35	8	IE	NBR	**722026**
	35	10	IE	NBR	722252
	40	7	IE	NBR	**772032**
	40	10	IEL	NBR	725142
	43	8,5	IE	NBR	722015
	43	9,5	IES	NBR	726140
18,6	30	4,7	IOS	NBR	726461
19	27	6	IE	NBR	722384
	27	6	IE	NBR	**792708**
	30	7	IEL	NBR	725648
	34,9	6	IE	NBR	**722143**
	36	8	IE	NBR	**722009**
	40	8	IE	NBR	**722346**
	43	8	IEL	NBR	725681
19,3	30	4,7	IOS	NBR	726462
19,6	31,1	8	IE	NBR	722244
19,8	38	9,9	IE	NBR	722600
19,9	28	5	IEW	NBR	772408
20	28	4	IE	NBR	**792709**
	28	7	IE	NBR	**722133**
	30	3	IO	NBR	723551
	30	4,5	IES	NBR	726304
	30	4,6	IOS	NBR	726187
	30	4,7	IE	NBR	**722342**
	30	4,7	IE	NBR	722146
	30	5	IEL	NBR	725349
	30	5	IEL	NBR	**792608**
	30	7	IE	NBR	**722258**
	30	7	IE	FKM	**722258/81**
	30	7	IEL	NBR	**792510**
	30	7	IEL	FKM	725660
	31	8	IEWLD	FKM	702416
	32	7	IE	NBR	**722479**
	32	7	IE	FKM	**722479/81**
	32	7	IEL	NBR	**725280**
	33	8	IE	NBR	**722002**
	33	8	IEWLG	FKM	702415
	33,2	8	EOS	NBR	726155
	35	6	IO	NBR	723626
	35	7	IE	NBR	**722952**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
20	35	7	IE	FKM	**722952/81**
	35	7	IEL	NBR	**792511**
	35	8	IE	NBR	**722506**
	35	8	II	NBR	**721220**
	35	10	IE	NBR	**722521**
	35	10	II	NBR	721182
	36,5	8x15	IESPD	NBR	702254
	37	8	IE	NBR	**722789**
	38	6	IE	NBR	722773
	38	8	IE	NBR	**722163**
	38	8	IEL	NBR	**725476**
	40	6x10	IELS	NBR	725120
	40	7	IE	NBR	**722642**
	40	7	IE	NBR	772185
	40	7	IE	FKM	**722642/81**
	40	7	IEL	NBR	**792512**
	40	7	IES	NBR	726104
	40	7	EES	NBR	726139
	40	8	IE	NBR	**722226**
	40	8	IEL	NBR	725682
	40	10	IE	NBR	**722119**
	40	10	IELS	NBR	725455
	42	6	IE	NBR	**722772**
	42	6	IEL	NBR	**792609**
	43	8,5	II	NBR	721250
	45	10	IELS	NBR	725503
	46	10	EELS	NBR	725535
	46,4	10	EELS	NBR	725541
	46,4	10	EELS	NBR	725561
	46,5	10	IELS	NBR	725328
	47	7	IE	NBR	**722671**
	47	7	IE	FKM	**722671/81**
	47	7	IEL	NBR	**792513**
	47	10	IE	NBR	**722083**
	52	10	IE	NBR	**722155**
	52	10	IEL	NBR	**792610**
	52	10	IE	FKM	**772432/81**
	57	6,5	EES	NBR	726963
	62	6,5	IES	NBR	726134
20,5	35	8x13	IEL	NBR	725286
20,8	32	8	IE	NBR	**722419**
21	31	3,5x4,5	IES	FKM	726380
	31	3,5x4,5	IES	NBR	726309
	31	8	IE	NBR	**722360**
	35	8	IE	NBR	772121
21,9	47	8	EED	FKM	702356
22	32	4,6	IEL	NBR	725614
	32	4,6	IOS	NBR	726017
	32	7	IE	NBR	**722850**
	32	7	IE	NBR	772310
	32	7	IE	FKM	722850/81
	32	7	IE	NBR	772123
	32	7	IEL	NBR	**792514**
	33	7	IE	NBR	**792710**
	35	5	IE	NBR	**722732**
	35	5	IEL	NBR	**792611**
	35	7	IE	NBR	**722727**
	35	7	IEL	NBR	**792515**
	35	8	IE	NBR	722675
	35	8	IEL	NBR	**725027**
	35	10	IE	NBR	**722285**
	38	8	IE	NBR	**792500**
	40	7	IE	FKM	772179
	40	7	IE	FKM	**772338/81**
	40	7	IE	FKM	772366
	40	7	IEL	NBR	725438
	40	7	II	NBR	**721404**
	40	8	IE	NBR	**722519**
	40	8	IE	FKM	**722519/81**
	40	8	IEL	NBR	**725421**
	40	8	II	NBR	**721165**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon



d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
22	40	8x10	IEL	NBR	**725191**
	40	13x15,5	IES	NBR	726142
	43	8	IE	NBR	**722699**
	45	7	IEWLG	FKM	702623
	45	8	IOS	NBR	726168
	47	7	IE	NBR	**772033**
	47	10	IE	NBR	**792711**
22,2	38,2	9,7	IE	NBR	722920
23	33	4,8	IOS	NBR	726143
	36	6,5	EED	FKM	732373
	38,5	8	II	NBR	**721173**
	40	10	IE	NBR	**792712**
23,5	29,5	3,3	IO	NBR	723283
24	30	4	IOS	NBR	726050
	30	5,4	IOLS	NBR	726288
	34,4	5	IES	NBR	726079
	34,6	14,3x19,5	EES	NBR	726472
	35	7	IE	NBR	**772034**
	35	7	IEL	NBR	**792612**
	36	7	IE	NBR	772328
	36	8x12	IESD	NBR	702028
	37	7	IE	NBR	**722909**
	37	7	IE	FKM	722909/81
	38,5	7	IIL	NBR	724028
	38,5	10	IE	NBR	**722227**
	38,5	10	IED	NBR	702005
	40	7	IE	NBR	**772035**
	40	8	IEL	NBR	**725406**
	42	8	IE	NBR	**792713**
	46	10	IE	NBR	**722028**
	47	7	IE	NBR	**722977**
	47	7	IE	FKM	772367
	47	10	IE	NBR	**722176**
	50	10	IE	NBR	**792714**
	50,5	11	II	NBR	721151
24,5	40	8,4	IEWD	FKM	702565
	42	6	IED	FKM	702598
24,7	35	4,8	IOS	NBR	726313
	40	7	IEL	NBR	725205
	40	7	II	NBR	721009
24,8	42	8	IE	NBR	722584
24,9	40	8	IELD	NBR	702231
25	33	7	IE	NBR	**722132**
	35	5	IE	NBR	**722401**
	35	5	IE	FKM	722702
	35	6	IE	NBR	**722771**
	35	7	IE	NBR	**722670**
	35	7	IE	FKM	**722670/81**
	35	7	IEL	NBR	**725301**
	35	7	IEL	NBR	725638
	35	5	IEL	NBR	**792613**
	35	7	IELR	NBR	725703
	35	7	IELR	FKM	725705
	35	10	IE	NBR	**722161**
	35	10,5	IEDP	NBR	702275
	36	7	IE	NBR	**792715**
	36	8	IOS	NBR	726123
	36	8	OOS	NBR	727034
	36	10	IE	NBR	**722588**
	37	6	IE	NBR	**792716**
	38	7	IE	NBR	**722259**
	38	7	IEL	NBR	**792614**
	38,3	10	IE	NBR	**722147**
	40	6	IE	NBR	**722761**
	40	7	IE	NBR	**722799**
	40	7	IE	FKM	**722799/81**
	40	7	IEL	NBR	**725767**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
25	40	8	IE	NBR	**722508**
	40	8	IE	NBR	**722508/81**
	40	8	IEL	NBR	**725067**
	40	8	II	NBR	**721174**
	40	10	IE	NBR	**792717**
	42	5x75	IELS	NBR	725650
	42	6,5	IE	NBR	**722439**
	42	7	IE	NBR	**772201**
	42	7	IEL	NBR	**792615**
	42	7	IEWLD	FKM	702621
	42	8	IE	NBR	**722517**
	42	8	IE	FKM	**722517/81**
	42	8	IEL	NBR	**725621**
	42	8	IED	FKM	702410
	42	10	IEL	NBR	**792501**
	42	10,3x11	IELS	NBR	725466
	43	7	IE	NBR	**722091**
	43	8	IE	NBR	**722683**
	45	7	IE	NBR	722310
	45	11	II	NBR	721898
	46	7	IE	NBR	**792718**
	46	7,5	II	NBR	721153
	47	7	IE	NBR	**722523**
	47	7	IE	FKM	**772339/81**
	47	7	IEL	NBR	**792517**
	47	7	II	NBR	**721353**
	47	10	IE	NBR	**722524**
	47	13,5	IELS	NBR	725400
	49	10	IE	NBR	722117
	50	10	IE	NBR	**722260**
	52	7	IE	NBR	**722910**
	52	7	IEL	NBR	**792518**
	52	7	IEL	NBR	**792616**
	52	7	IE	FKM	**722910/81**
	52	8	IEL	NBR	**725037**
	52	10	IE	NBR	**792719**
	62	10	IE	NBR	**792720**
25,4	41,2	11	II	NBR	721657
	42,9	5	IE	NBR	772220
	44,4	5	IE	NBR	**722094**
26	36	7	IE	NBR	**792721**
	37	7	IE	NBR	**722990**
	37	7	IE	FKM	**722990/81**
	42	8	IE	NBR	**722411**
	42	8	IEL	NBR	725080
	42	8	IEWLD	FKM	702554
	52	8	IE	NBR	**792722**
26,7	46,5	11,3	IE	NBR	722757
	46,5	11,3	II	NBR	721172
27	37	7	IE	NBR	**722171**
	42	10	IEL	NBR	**725733**
	42	10x13	IED	NBR	702014
	45	6	IE	NBR	722790
	47	7	IE	NBR	**722797**
	47	8	IE	NBR	**722509**
	47	8	II	NBR	723104
27,5	34	4	IO	NBR	723800
	35	4	IO	NBR	723277
28	36	8	IE	NBR	**722031**
	36	8	IEL	NBR	**792617**
	37	7	IEWL	NBR	725685
	38	7	IE	NBR	772164
	38	7	IE	NBR	**792723**
	38	7	IEWG	FKM	702549
	40	7	IE	NBR	**722212**
	40	7	IE	NBR	772312
	40	7	IE	FKM	**722212/81**
	40	7	IEL	NBR	**792519**
	40	7	IEWD	NBR	702497
	42	8	IE	NBR	**722193**
	43	8	II	NBR	**721456**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
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The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
28	43		IE	NBR	**792724**
	43		IEL	NBR	725131
	45	10	IE	NBR	**722967**
	45	10	IE	FKM	**722967/81**
	45	888	IEL	NBR	**792618**
	45	11,5	EESF	NBR	726348
	47	777	IE	NBR	**722911**
	47	10	IED	NBR	702257
	47	10	IEL	NBR	**792619**
	47	10	IE	NBR	722490
	47	10	IEL	NBR	725606
	47	10	II	NBR	**721194**
	47	7	IIL	NBR	**724229**
	50	10	IE	NBR	**792725**
	52	10	IE	NBR	**772038**
	52	10	IEL	NBR	**79281901**
	52	10x11	II	NBR	721222
	52	10	IOS	NBR	726323
	52		IELS	NBR	725377
	65		IE	NBR	772286
28,5	45	8,5	IE	NBR	725062
28,6	38,1	6,3	IE	NBR	722305
	39,6	4,7	IOS	NBR	726311
28,8	46,5	11,2	IE	NBR	722959
	46,5	11,2	II	NBR	725950
	46,5	11,2	II	NBR	721022
	46,5	11,2	IE	NBR	724215
29	46	10	IE	NBR	**722966**
	46	10	II	NBR	721183
	46,4	12	II	NBR	721148
29,8	50	10	IE	NBR	**722066**
	47	9,9	IEL	NBR	725631
	47	9,9	ESWLD	NBR	702686
29,9	48,4	6,3	IOS	NBR	726566
30	40	7	IE	NBR	**722623**
	40	7	IE	FKM	**722623/81**
	40	7	IEL	NBR	**792520**
	40	7	IED	FKM	702409
	40	7	IEWLD	FKM	702622
	41	4,7	IOS	NBR	726312
	42	5,7	IE	NBR	722583
	42	6	IEWL	NBR	725637
	42	6x6,5	IELV	NBR	704033
	42	7	IE	NBR	**722737**
	42	7	IE	FKM	**722737/81**
	42	7	IEL	NBR	**792521**
	42	7	IEW	FKM	772409
	42	8	IE	NBR	**722722**
	42	8	IEL	NBR	**725143**
	42	8	IEG	NBR	702107
	42	8	IELD	NBR	702408
	42	8	IOS	NBR	**726236**
	45	5	IEL	NBR	**792620**
	45	5	IE	NBR	**722402**
	45	8	IE	NBR	**722684**
	45	8	IEL	NBR	**792621**
	45	10	IE	NBR	**722541**
	45	10	II	NBR	**721175**
	45	13	IEL	NBR	**725085**
	47	6	IEWD	FKM	702522
	47	7	IE	NBR	**772039**
	47	7	IE	FKM	**772039/81**
	47	7	IEL	NBR	**792522**
	47	8	IE	NBR	**722204**
	47	8	IEL	NBR	**725293**
	47	10	IE	NBR	**792726**
	48	8	IE	NBR	**722500**
	48	8	IE	NBR	**72250001**
30	48	8	IE	NBR	722901
	48	8	IE	FKM	**722500/81**
	48	8	IEL	NBR	**792523**
	48	10	IE	NBR	**792727**
	50	7	IEW	FKM	772410
	50	7	MEWLD	FKM	702540
	50	10	IE	NBR	**722836**
	50	10	IEL	NBR	**792524**
	50	10	II	NBR	**721184**
	50	11	II	NBR	**721149**
	52	7	IE	NBR	**722912**
	52	7	IE	FKM	**722912/81**
	52	7	IEL	NBR	**792525**
	52	10	IE	NBR	**792728**
	52	10	IEL	NBR	**792622**
	55	7	IE	NBR	772342
	55	10	IE	NBR	**722892**
	55	10	IEL	NBR	**792526**
	55	10	II	NBR	**721102**
	56	10	IEL	NBR	**792623**
	60	10	IE	NBR	**792729**
	62	7	IE	NBR	**772040**
	62	7	IE	FKM	**772040/81**
	62	7	IEL	NBR	**792527**
	62	8	IES	NBR	726113
	62	10	IE	NBR	**792730**
	62	10	IEL	NBR	**792624**
	72	10	IE	NBR	**792731**
30,1	50,7	11	II	NBR	721329
31	42	8	IE	NBR	**722691**
	47	7	IE	NBR	**722672**
	55	10	II	NBR	721156
31,7	42,9	4,7	IOS	NBR	726463
32	42	7	IEW	NBR	702498
	45	6	IE	NBR	**792732**
	45	7	IE	NBR	**722913**
	45	7	IEL	NBR	**792528**
	45	10	IE	NBR	**722409**
	45	10	IEG	NBR	702240
	46	7	IEL	NBR	725208
	46	7x9,7	IELS	NBR	725563
	47	7	IE	NBR	**772013**
	47	7	IE	FKM	**772013/81**
	47	7	IEL	NBR	**792625**
	47	8	IE	NBR	**722617**
	47	8	IEL	NBR	**792626**
	47	12	IILR	NBR	**724851**
	48	8	IE	NBR	**792734**
	50	8	IE	FKM	**722518/81**
	50	8	IE	NBR	**722518**
	50	8	IEL	NBR	**792529**
	50	9	IOS	NBR	726015
	50	10	IE	NBR	**722607**
	50	10	II	NBR	721185
	50	10	IELS	NBR	**725408**
	52	7	IE	NBR	**772202**
	52	7	IEL	NBR	**792628**
	52	7	IE	FKM	**772202/81**
	52	7,5	IE	NBR	**722478**
	52	7,5	II	NBR	721154
	52	7,5x13,5	IELR	NBR	725897
	52	10	IEL	NBR	725565
	52	10	IEL	NBR	**792627**
	52	10	IEG	NBR	702342
	54	8	IE	NBR	**722039**
	54	8	II	NBR	721068
	55	10	IE	NBR	**792735**
	55	10	IEL	NBR	79281801
	56	10	II	NBR	**721162**
	56	12	IE	NBR	722038
	56	12	II	NBR	**721096**
	62	10	IE	NBR	**792736**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
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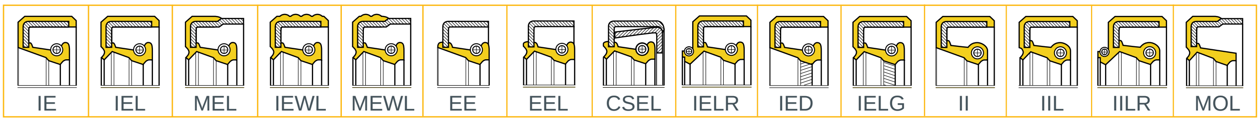
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon



d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
33	45	7	IE	NBR	**792737**
	48	8	IE	NBR	**722971**
	48	8	II	NBR	721145
33,5	47	4	IO	NBR	723252
34	46	8	IE	NBR	**792738**
	50	10	IE	NBR	**792739**
	52	7	IE	NBR	**792814**
	52	7,5	II	NBR	**721279**
	54	9	IE	NBR	**722092**
	54	10	IE	NBR	**722685**
34,8	50	7	IE	FKM	772400
34,9	54	11	IE	NBR	722023
	55,8	9,3	IELG	NBR	702299
	57,2	12,7	IE	NBR	722985
	57,2	12,7	II	NBR	721468
	58	9,8	IE	NBR	772276
	63,5	12,5	IELG	NBR	702183
35	45	6	IE	NBR	**722400**
	45	6	IE	FKM	**722400/81**
	45	7	IEL	NBR	**792629**
	47	6	IEWLD	FKM	702535
	47	7	IE	NBR	**722915**
	47	7	IE	FKM	**722915/81**
	47	7	IEL	NBR	**725411**
	47	8	IE	NBR	**722554**
	50	5,8	IE	NBR	**722484**
	50	7	IE	NBR	**772022**
	50	7	IE	FKM	**772022/81**
	50	7	IEL	NBR	**792530**
	50	7	MEWD	FKM	702371
	50	8	IE	NBR	**722389**
	50	8	IEL	NBR	725489
	50	8	IED	NBR	702239
	50	10	IIL	NBR	**724001**
	50	10	IEL	NBR	**792630**
	50	12	IE	NBR	**722525**
	50	12	II	NBR	**721069**
	52	7	IE	NBR	**772014**
	52	7	IE	FKM	**772014/81**
	52	7	IEL	NBR	**792531**
	52	8	IE	NBR	**722778**
	52	8	IEL	NBR	**792532**
	52	8	IES	NBR	726705
	52	10	IE	NBR	**722526**
	52	10	IEL	NBR	725026
	52	10	IEL	NBR	**725747**
	52	10	IELR	NBR	**792504**
	52	10	II	NBR	721008
	52	10	IIL	NBR	**724198**
	52	10,5	IIS	NBR	726640
	54	10	IE	NBR	**722893**
	54	10	II	NBR	721195
	55	8	IE	NBR	**792740**
	55	10	IE	NBR	722192
	55	10	IE	NBR	**792741**
	55	10	IEL	NBR	**792631**
	56	10	IE	NBR	**722499**
	56	10	II	NBR	**721192**
	56	10	IEWLG	FKM	702496
	59	12x14	IES	NBR	726718
	60,3	12,5	II	NBR	**721206**
	62	7	IE	NBR	**722918**
	62	7	IEL	NBR	**792534**
	62	7	IE	FKM	**722918/81**
	62	10	IE	NBR	**792742**
	62	10	IEL	NBR	**792632**
	62	12	IE	NBR	**722493**
	62	12	IEL	NBR	**792633**
	64	7	IEWLD	FKM	702531
	65	10	IE	NBR	722288
	68	6	IE	NBR	**722815**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
35	68	6	IEL	NBR	**792634**
	68	10	IE	FKM	772244
	68	10x12	IEL	NBR	725608
	72	7	IE	NBR	**722245**
	72	7	IEL	NBR	**792635**
	72	10	IE	NBR	722170
	72	10	IEL	NBR	**792636**
	72	10	IEL	NBR	**79263601**
	72	12	IE	NBR	**792743**
	72	12	IEL	NBR	**792637**
35,1	58	11,5	IE	NBR	722560
	58	11,5	II	NBR	721457
36	47	7	IE	NBR	**722950**
	50	7	IE	NBR	**772041**
	50	7	IEWLD	FKM	702659
	52	4	IOX	NBR	726394
	52	7	IE	FKM	**722991/81**
	52	7	IEL	NBR	**792638**
	52	10	II	NBR	**721309**
	54	7,5	IE	NBR	**722496**
	54	7,5	IE	NBR	722895
	54	7,5	II	NBR	721278
	54	11	EESF	NBR	726349
	58	15	IEL	NBR	725494
	62	7	IE	NBR	**722404**
	62	12	II	NBR	**721117**
	62	12,5	II	NBR	721076
	68	10	IEL	NBR	**792639**
	83	12	II	NBR	**721129**
37	50	10	IE	NBR	**792744**
	58	13	IE	NBR	**792745**
	58	13	IEL	NBR	**725568**
	58	13	II	NBR	**721444**
	70	13	IE	NBR	722804
	70	13	IE	FKM	722904
38	50	7	IE	NBR	**792746**
	52	7	IE	NBR	**722338**
	52	7	IE	FKM	**722338/81**
	52	7	IEL	NBR	**792640**
	52	8	IE	NBR	**722791**
	54	5	IE	NBR	**722293**
	54	10	II	NBR	**721212**
	55	10	IE	NBR	**722641**
	55	10	IE	FKM	**722641/81**
	55	10	IEL	NBR	**725486**
	55	10	II	NBR	721029
	55	12	IE	NBR	772226
	56	10	IE	NBR	**792747**
	56	10	II	NBR	**721142**
	60	10	IEL	NBR	**792641**
	61	12	IE	NBR	722606
	62	7	IE	NBR	772042
	62	7	IE	FKM	**772042/81**
	62	10	IE	NBR	**722556**
	62	10	IEL	NBR	**792642**
	65	8	IE	NBR	772368
38,1	52,5	11,1	IE	NBR	722921
	60,3	19	IEL	NBR	725212
	63,5	12,7	IE	NBR	722251
	73	11	IE	NBR	722558
	78	11	IE	NBR	722667
38,7	50,8	6,4	IES	NBR	726073
39	55	8	IE	NBR	722665
	61	12	II	NBR	**721134**
39,3	63,7	12,8	II	NBR	721140
39,7	63,6	12,7	IE	NBR	722151

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
39,8	65	8	IEW	FKM	772406
	65	8	IEWD	FKM	702504
40	46	4	IOS	NBR	726098
	48	4	EO	NBR	727124
	52	7	IE	NBR	**722325**
	52	7	IE	FKM	**722325/81**
	52	7	IEL	NBR	**792505**
	52	7	IEL	NBR	725363
	52	7	IED	FKM	**702546**
	52	7	EIWLD	FKM	**702511**
	52	9	IEWLG	FKM	**702532**
	55	6,5	IE	NBR	**722746**
	55	7	IE	NBR	**722919**
	55	7	IE	FKM	**722919/81**
	55	7	IEL	NBR	**792535**
	55	8	IE	NBR	**722792**
	55	8	IEL	NBR	**725355**
	55	10	IE	NBR	**722166**
	55	10	IE	NBR	772364
	55	10	IEWG	NBR	702298
	56	8	IE	NBR	**792748**
	56	8	IEL	NBR	**792644**
	56	10	IE	NBR	**722152**
	56	10	IEL	NBR	**792643**
	58	10	IE	NBR	**72250101**
	58	10	IE	NBR	**722501**
	58	10	IE	FKM	**722501/81**
	58	10	IEL	NBR	**725123**
	58	10	IELV	NBR	704031
	58	10	IELWG	FKM	702476
	58	10x14	IESPD	NBR	702222
	58	15	IELR	NBR	**725745**
	58	15	IILR	NBR	**724087**
	60	7	IE	NBR	**792749**
	60	7	IEWLG	FKM	702536
	60	10	IE	NBR	**792750**
	60	10	IEL	NBR	**792645**
	60	12	II	NBR	**721301**
	61	12	IE	NBR	**722498**
	61	12	II	NBR	721100
	62	7	IE	NBR	**772043**
	62	7	IE	FKM	**772043/81**
	62	7	IEL	NBR	**792536**
	62	10	IE	NBR	**722505**
	62	10	IE	FKM	722505/81
	62	10	IE	FKM	722828
	62	10	IEL	NBR	**725802**
	62	10	IELR	NBR	**792503**
	62	10	II	NBR	**721031**
	62	10	MEWLG	NBR	702369
	62	10x11	IELS	NBR	725467
	62	12	IE	NBR	**722972**
	62	12	II	NBR	**721168**
	62	11x13,5	IELS	NBR	725401
	62	10,25x13	IELS	NBR	725600
	65	12	II	NBR	**721123**
	68	7	IEL	NBR	792537
	68	8	IE	NBR	722174
	68	10	IE	NBR	**792751**
	70	12	IE	NBR	**722203**
	70	12	II	NBR	**721251**
	71,5	12	II	NBR	721144
	72	7	IE	NBR	**772044**
	72	7	IEL	NBR	**792538**
	72	7	IE	FKM	**772044/81**
	72	8	IE	NBR	**722169**
	72	10	IEL	NBR	**792646**
	72	12	II	NBR	**721467**
	80	10	IE	NBR	**792752**
	80	10	IEL	NBR	**792647**
	85	13	IEL	NBR	725376
	90	8	IEL	NBR	**792648**
41	54	12	EEL	NBR	725615
	63,4	6	IE	NBR	722550

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
41	63,6	14	II	NBR	721108
	70	13	IE	NBR	722647
41,2	60,3	9,5	IEL	NBR	725204
	63,5	12,7	IE	NBR	772317
41,3	62,1	19	IE	NBR	725042
41,4	57,1	6,5	IE	NBR	**722723**
	57,1	12,2	IES	NBR	726744
	62	12,2	IES	NBR	726115
42	52	4	IOS	NBR	**726151**
	55	7	IED	FKM	702223
	55	7	IEWLD	FKM	702545
	55	8	IE	NBR	**772045**
	55	8	IE	FKM	**772045/81**
	55	8	IEL	NBR	**792539**
	56	7	IE	NBR	772386
	56	7	IE	NBR	**792753**
	58	7	IEL	NBR	725387
	58	7	EEL	NBR	725543
	58	9	IE	FKM	772265
	58	10x11,5	IELS	NBR	725184
	58	11	IESF	FKM	726483
	60	10	IE	NBR	**722682**
	60	12	IE	NBR	**722763**
	60	14	IEL	NBR	**725919**
	60	14	IIL	NBR	**724121**
	62	7	IEL	NBR	725552
	62	7	EEL	NBR	725544
	62	8	IE	NBR	**722931**
	62	8	IE	FKM	**722931/81**
	62	8	IEL	NBR	**792540**
	62	8	IELD	FKM	702406
	62	10	IE	NBR	**722057**
	63	8	IEWLG	FKM	702526
	64	7	IE	NBR	**722640**
	65	8,3x13	IELR	NBR	725016
	65	10	IE	NBR	**722064**
	65	10	IEL	NBR	**792649**
	65	10	II	NBR	721093
	67	10	IEL	NBR	725435
	71,5	13	II	NBR	721143
	72	8	IE	NBR	**772046**
	72	8	IEL	NBR	**792541**
42,1	63,6	14,6	II	NBR	721018
42,8	69,9	12,7	II	NBR	721469
43	58	7	MEWD	FKM	702370
	58	13,5	IE	NBR	722522
	58	13,5	II	NBR	721204
	60	10	IE	NBR	722136
	60	10	IE	NBR	**792754**
	60	10	IEL	NBR	**725975**
	65	10	IE	NBR	**722958**
	66	10	IEL	NBR	**792650**
	75	10	II	NBR	721441
44	59,2	12	IEL	NBR	725642
	62	10	IE	NBR	**792755**
	72	12	IE	NBR	**722741**
	78	7	IE	NBR	722190
44,4	54	4,8	IE	NBR	722036
44,5	62	8	IEL	NBR	725442
	62	10	IE	NBR	**722210**
	81	11,1	IE	NBR	722022
44,7	54	6x7,9	EOLS	NBR	727111
	54	6x8,5	IOLS	NBR	723258
44,8	61,4	11,7	II	NBR	721201

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
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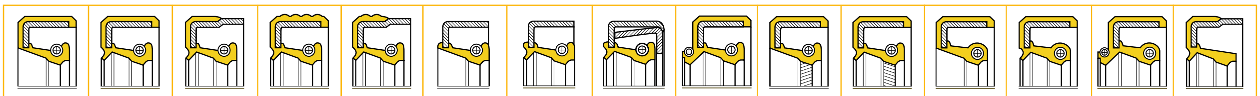
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon



d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
45	57	7	IEWLD	FKM	702567
	58	7	IE	NBR	**792756**
	58	7	IEWD	FKM	702775
	60	5	IE	NBR	722185
	60	6,5	IE	NBR	**722121**
	60	6,5	IEL	NBR	**792651**
	60	6,5x8,1	IOB	NBR	729009
	60	7	IE	NBR	722306
	60	8	IE	NBR	**772115**
	60	8	IE	FKM	**772115/81**
	60	8	IEL	NBR	**792542**
	60	10	IE	NBR	**722516**
	60	10	IE	FKM	**722516/81**
	60	10	IE	FKM	722988
	60	10	IEL	NBR	**792543**
	60	10	IEWLD	FKM	702614
	60	12	II	NBR	721071
	62	7	IEL	NBR	725459
	62	7	EEL	NBR	725547
	62	8	IE	NBR	**772018**
	62	8	IE	FKM	**772018/81**
	62	8	IEL	NBR	**725407**
	62	8	EEL	NBR	725549
	62	8	IEWLD	FKM	702465
	62	10	IE	NBR	**722621**
	62	10	IEL	NBR	**725748**
	62	10	IEL	FKM	725315
	62	10	IEL	NBR	**72574801**
	62	12	IE	NBR	**722504**
	62	12	IEL	NBR	**792544**
	65	8	IE	NBR	**772019**
	65	8	IE	FKM	**772019/81**
	65	8	IEL	NBR	**792652**
	65	8	IEX	NBR	726157
	65	9	IEWLD	FKM	702508
	65	10	IE	NBR	**722764**
	65	10	EELD	FKM	702251
	65	12	IE	NBR	**722858**
	65	12	II	NBR	**721217**
	65	15	IIL	NBR	724449
	66	6	IE	NBR	**792757**
	66	9	IEWL	FKM	702478
	67	8	IEWLD	FKM	702467
	68	10	IE	NBR	**792758**
	70	12	IE	NBR	**792760**
	70	12,5	II	NBR	**721341**
	70	12,5	IEL	NBR	**79282801**
	70	12,5	IELS	NBR	725794
	72	8	IE	NBR	**772104**
	72	8	IEL	NBR	**792653**
	72	8	IE	FKM	**772104/81**
	72	8,3x9	IELS	NBR	725468
	72	10	IE	NBR	**792761**
	75	9	IEWLD	FKM	702515
	75	10	IE	NBR	**792762**
	75	10	IELD	NBR	702126
	75	10	EELD	FKM	702250
	80	10	IE	NBR	**792763**
	80	10	IEL	NBR	**792654**
	85	8	IEL	NBR	**792655**
	100	8	IEL	NBR	**792656**
46	60	10X16	IES	NBR	726378
	64	8	IE	NBR	792764
	65	10	IE	NBR	722793
	65	10	IEL	NBR	792657
	65,5	9x13,5	IELS	NBR	725306
	78	9	IELS	FKM	725590
46,9	62	8	IE	NBR	**722271**
47	62	6	IE	NBR	**792765**
47,2	60,3	6,3	IE	NBR	772120
47,5	65	10	IEL	NBR	**725220**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
47,6	58,8	9,6	IE	NBR	722292
	66,7	9,3	IED	NBR	702245
	69,8	16,7	IEL	NBR	725006
	69,8	19	IIL	NBR	724003
	69,8	19	IIL	NBR	724428
	70	8	IEWLD	FKM	702544
	70,2	15	II	NBR	721082
	71,5	9,5	IE	NBR	772316
	73,5	16,7	IEL	NBR	725100
48	58	4	IOS	NBR	**726046**
	62	7	IE	NBR	772322
	62	8	IE	NBR	**722899**
	62	8	IEL	NBR	**725263**
	62	8	IEWG	FKM	702587
	63,5	12	II	NBR	**721072**
	65	10	IE	NBR	**722513**
	65	10	IEL	NBR	**792545**
	65	10	IELS	NBR	**725118**
	65	10	IOS	NBR	726010
	65,1	10	IOS	NBR	726286
	68	12	IE	NBR	**722873**
	68	12	IEL	NBR	**792658**
	68	12	II	NBR	**721166**
	68	12x15	IELS	NBR	725092
	68	14	IEL	NBR	725890
	70	10	IE	NBR	**792767**
	72	8	IE	NBR	**722200**
	72	8	IEL	NBR	**792659**
	72	10	IE	NBR	**722209**
	72	10	IED	FKM	702364
	72,2	12,5	IE	NBR	**722656**
	72,2	12,5	II	NBR	721146
	72,5	10	IEL	NBR	725369
	75	8	EED	FKM	702334
	80	10	IE	NBR	**792768**
49	65	10	IE	NBR	**792769**
49,7	65	10	IE	NBR	722960
	65	10	IE	FKM	722725
50	62	10	IE	NBR	**792770**
	65	8	IE	NBR	**722710**
	65	8	IE	FKM	**722710/81**
	65	8	IEL	NBR	**792546**
	65	10	IE	NBR	**722887**
	65	10	IEL	NBR	**792547**
	65	10	II	NBR	**721073**
	65	10	IEX	NBR	726357
	67,5	13,5	EEL	NBR	725572
	68	8	IE	NBR	**772047**
	68	8	IE	FKM	**772047/81**
	68	8	IEL	NBR	**792548**
	68	8	IEWLD	FKM	702620
	68	10	IE	NBR	**792771**
	68	10	IEL	NBR	**792660**
	70	10	IE	NBR	722219
	70	10	IE	NBR	**792772**
	70	10	IEL	NBR	**792661**
	70	10	IEL	NBR	**79266101**
	70	12	IEL	NBR	**79282001**
	70	13,5	EEL	NBR	725473
	72	6	IE	NBR	**722287**
	72	8	IE	NBR	**772199**
	72	8	IE	FKM	**772199/81**
	72	8	IEL	NBR	**792549**
	72	10	IE	NBR	**722756**
	72	10	IEL	NBR	**792662**
	72	12	IE	NBR	**722503**
	72	12	IE	FKM	**722503/81**
	72	12	IEL	NBR	**792551**
	72	12	EELD	FKM	702387
	72	15	IELR	NBR	**725003**
	72	15	II	NBR	**721322**
	72	15	IILR	NBR	**724088**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
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****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

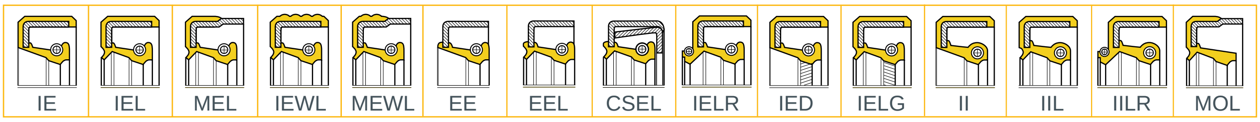
SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
50	74	10	IE	NBR	722906
	75	8	IEWLG	FKM	702521
	75	10	IE	NBR	772337
	75	10	IE	FKM	**772337/81**
	76,2	12,2	IE	NBR	**722650**
	78	10	IE	NBR	**792773**
	80	8	IE	NBR	**772048**
	80	8	IEL	NBR	**792552**
	80	8	IE	FKM	**772048/81**
	80	9	IEWLD	FKM	702530
	80	9	MEWLD	FKM	702624
	80	10	IE	NBR	**792774**
	80	10	IEL	NBR	**792663**
	80	13	IE	NBR	**722512**
	80	13	IEL	NBR	**725779**
	80	13	EELD	FKM	702263
	80	13	IEWLD	FKM	702477
	80	16	IELR	NBR	725612
	80	16	IIL	NBR	724089
	87	10	IE	NBR	722447
	90	8	IEL	NBR	**792664**
	90	10	IE	NBR	**722888**
	90	10	IEL	NBR	**792665**
	90	10x14	IES	FKM	726460
50,7	69,8	9,5	IE	NBR	**722596**
	76,1	17,5	II	NBR	721209
50,8	69,8	12,7	IE	NBR	722035
	70	12,7	IE	NBR	722206
	73,4	17	IIL	NBR	724308
	81	11,9	II	NBR	721355
50,9	101,8	11,5	II	NBR	721171
51	65	6,5	IEWD	FKM	702491
	76	19	II	NBR	721208
51,4	69	10	IEL	NBR	725373
52	68	7	IEL	NBR	725412
	68	8	IE	NBR	**722236**
	68	8	IE	FKM	**722236/81**
	68	8	IEL	NBR	**792553**
	68	8	II	NBR	**721047**
	68	8	IEWLG	FKM	702552
	69	10	IEL	NBR	725064
	69	10	IEL	FKM	**725064**
	69	10	IELS	NBR	725119
	69	10	IOS	NBR	726009
	69	10	IOS	NBR	726269
	72	8	IE	NBR	**772049**
	72	8	IEWD	FKM	702588
	72	10	IE	NBR	**722281**
	72	12	IE	NBR	**722611**
	72	12	IE	FKM	772137
	72	12	IEL	NBR	**792666**
	72	12	II	NBR	721199
	75	12	IE	NBR	**722502**
	75	12	IE	FKM	772345
	75	12	II	NBR	**721015**
	75	15	IEL	NBR	**725673**
	75	16	IIL	NBR	724562
	78	15	IELR	NBR	725610
	78	15	IIL	NBR	724261
	80	8	IE	NBR	**792506**
	80	10	IE	NBR	**722824**
	80	10	II	NBR	721048
	80	13	IE	NBR	722514
	80	13	II	NBR	721176
	85	10	IE	NBR	**792775**
52,5	72,7	8,5	IE	NBR	721019
	80	11	II	NBR	722652
53	60	4	IEL	NBR	725679

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
53	68	10,5	IE	NBR	**722605**
	68	10,5	II	NBR	721128
	68	13	IEL	NBR	**725048**
	68	13	IIL	NBR	724284
	97	10	IE	NBR	772281
53,6	73,1	19	IEL	NBR	725043
	77,8	13	IEL	NBR	725108
54	68	10,5	IE	NBR	**722167**
	70	10	IE	NBR	**792776**
	70	12	IE	NBR	722874
	72	5	IE	NBR	722738
	72	5x12,5	IES	NBR	726643
	72	10	IE	NBR	**722448**
	72	10	IEL	NBR	**725202**
	72	10	IED	FKM	702363
	72,5	9	IEL	NBR	725499
	72,5	9	EELS	NBR	725509
	72,5	9	EELS	NBR	725592
	72,5	9	EELS	NBR	725604
	75	7	IEL	NBR	725559
	76,2	12,5	II	NBR	721307
	77,7	12,7	IE	NBR	722025
	81	10	IEL	NBR	725651
	85	10	IEL	NBR	725501
54,2	73,1	6	IEX	NBR	726158
55	68	4	IOS	NBR	726285
	68	8	IE	NBR	**792777**
	68	8	IEL	NBR	**792667**
	70	7	IEWV	FKM	704039
	70	8	IE	NBR	**722938**
	70	8	IE	FKM	**722938/81**
	70	8	IEL	NBR	**792554**
	70	8x14	IELR	NBR	725896
	70	10	IE	NBR	722528
	70	10	EEL	FKM	702381
	71,5	10	II	NBR	**721349**
	72	8	IE	NBR	**772015**
	72	8	IE	FKM	**772015/81**
	72	8	IEL	NBR	**792555**
	72	8	EEL	NBR	725550
	72	10	IE	NBR	**722808**
	72	10	IEL	NBR	**792556**
	72	10	IEWLD	FKM	702615
	72	13	II	NBR	**721138**
	75	10	IEL	NBR	725102
	75	12	IE	NBR	**722749**
	75	12	IE	FKM	**722749/81**
	75	12	IEL	NBR	**725072**
	75	12	II	NBR	**721081**
	75	16	IIL	NBR	**724448**
	75,4	12	II	NBR	721253
	76	6,5x8,1	IOB	NBR	729008
	76	8	IEWLD	FKM	702534
	76	11	IE	NBR	722649
	76	12	IE	NBR	**722712**
	76	12	IEL	NBR	**725713**
	76	12	IEL	FKM	725713/81
	78	10	IE	FKM	**722392/81**
	80	8	IE	NBR	**722008**
	80	8	IE	FKM	**722008/81**
	80	8	IEL	NBR	**792557**
	80	8	II	NBR	721013
	80	10	IE	NBR	**792778**
	80	10	IEL	NBR	**792668**
	80	12	IEX	NBR	726711
	82	12	IE	NBR	**722655**
	85	8	IE	NBR	**772050**
	85	10	IE	NBR	**792779**
	85	12	IE	NBR	722222
	90	10	IE	NBR	**792780**
	90	10	IEL	NBR	**792669**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon



d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
55	90	13	IEL	NBR	725061
	90	13	IEL	NBR	**79282201**
	100	13	IE	NBR	**792781**
56	66	8,5	EOLS	NBR	727120
	69	10	IOS	NBR	726255
	70	8	IE	NBR	**772051**
	72	7	IEL	NBR	725338
	72	8	IE	NBR	**772052**
	72	8	IE	FKM	**772052/81**
	80	12	IE	NBR	**722615**
	85	8	IE	NBR	**772054**
	86	12	IE	NBR	**722033**
57	73	8	IEWLG	FKM	702561
	75,6	12	II	NBR	**721247**
	80	12	IE	NBR	722067
	85	15	IELR	NBR	**725625**
	85	15	IIL	NBR	**724306**
	90	13	IE	NBR	**722728**
	90	13	IEL	NBR	725760
57,1	73	12,7	II	NBR	721259
	76,2	12,7	IEL	NBR	725127
58	72	8	IE	NBR	**722359**
	72	8	IE	FKM	**722359/81**
	72	8	IEL	NBR	**792558**
	75	5	IE	NBR	**722622**
	75	10	IE	NBR	**792783**
	80	5	IE	NBR	**722707**
	80	8	IE	NBR	**722939**
	80	8	IEL	NBR	**792559**
	80	10	IE	NBR	722200
	80	10	IE	NBR	**792784**
	80	10	II	NBR	**721437**
	80	10	IEL	NBR	**79282501**
	80	12	IE	NBR	**722005**
	80	12	IE	FKM	**722005/81**
	80	12	IEL	NBR	**792670**
	80	12	II	NBR	**721059**
	81	5	IE	NBR	722254
	83,2	17	II	NBR	721210
	85	10	IE	NBR	**722559**
	85	10	II	NBR	**721135**
	85	12	II	NBR	**721124**
	90	10	IEL	NBR	**792672**
	102	10	IE	NBR	772282
59	72	12	MEWL	NBR	725588
	72	7	EELS	NBR	725358
	80	7	IE	NBR	**792785**
59,5	75	8	IE	NBR	722587
60	71,5	8	IE	NBR	772365
	75	8	IE	NBR	**722997**
	75	8	IE	NBR	**72299701**
	75	8	IE	FKM	**722997/81**
	75	8	IEL	NBR	**792560**
	75	8,8	II	NBR	721221
	78	8,8	EEL	NBR	**725307**
	78	10	IE	NBR	**792786**
	78	8	IEWLG	FKM	702502
	80	8	IE	NBR	**772016**
	80	8	IE	FKM	**772016/81**
	80	8	IEL	NBR	**725361**
	80	10	IEWLG	FKM	702564
	80	10	EEL	NBR	725545
	80	10	IE	NBR	**722213**
	80	10	IEL	NBR	**725163**
	80	12	IEL	FKM	**725163/81**
	80	12	IE	NBR	**722459**
	80	12	IE	FKM	**722459/81**
	80	12	IEL	NBR	**792671**
	80	13	IEX	NBR	726262

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
60	80	13	IE	NBR	722686
	80	13	II	NBR	**721275**
	82	12	IEX	NBR	726498
	85	8	IE	NBR	**772055**
	85	8	IEL	NBR	**792561**
	85	8	IEWLD	FKM	702555
	85	12	IEL	NBR	725107
	85	12	IEL	NBR	**79282101**
	90	8	IE	NBR	**772056**
	90	8	IEL	NBR	**792562**
	90	8	IE	FKM	**772056/81**
	90	13	IE	NBR	**722876**
	90	13	II	NBR	**721238**
	95	8	IE	FKM	772259
	95	10	IE	NBR	**792787**
	95	10	IEL	NBR	**792673**
	96	13	IEL	NBR	725106
	100	10	IE	NBR	**792788**
	110	13	IEL	NBR	**792674**
60,4	88,5	12,7	II	NBR	721480
61	97	12	IE	NBR	722175
62	74	6	IOS	NBR	726743
	80	10	IE	NBR	**792789**
	81	6	IE	NBR	722540
	85	10	IE	FKM	**722144/81**
	85	12	IE	NBR	**722750**
	85	12	IEL	NBR	**725762**
	85	12	II	NBR	721033
	85	12	IIL	NBR	724543
	90	10	IE	NBR	**722941**
	90	13	II	NBR	**721034**
	100	12	IE	NBR	722877
63	83	12	IE	NBR	**772375**
	85	12	IE	NBR	**772057**
	85	10	IE	FKM	**772057/81**
	90	10	IE	FKM	**772105**
	90	12	IE	NBR	**722648**
	110	13	II	NBR	721115
63,5	80	5,5	IOS	NBR	726816
	90	11,5	II	NBR	**721207**
64	80	13	IE	NBR	**722984**
	85	16	IEL	NBR	**725891**
	85	16	IIL	NBR	**724090**
	90	12	II	NBR	721125
	90	13	IE	NBR	**792791**
65	73,5	4	IOS	NBR	726049
	80	8	IE	NBR	**722507**
	80	8	IE	FKM	**722507/81**
	80	8	IE	FKM	772119
	80	8	IEL	NBR	**792675**
	80	10	IEL	NBR	725434
	80	12	IE	NBR	**722093**
	82	10	II	NBR	721319
	85	10	IE	NBR	**722591**
	85	10	IE	FKM	**722591/81**
	85	10	IEL	NBR	**725575**
	85	12	IE	NBR	**722770**
	85	12	IE	FKM	**722770/81**
	85	12	IEL	NBR	**725709**
	85	12	II	NBR	**721064**
	85	13	IEL	NBR	**792676**
	85	16	IEL	NBR	**725598**
	85,2	16	IIL	NBR	**724561**
	90	8	IEL	NBR	725513
	90	10	IE	NBR	**772017**
	90	10	IEL	NBR	**792563**
	90	10	IE	FKM	**772017/81**
	90	12	IE	NBR	**722859**
	95	12	II	NBR	721126

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

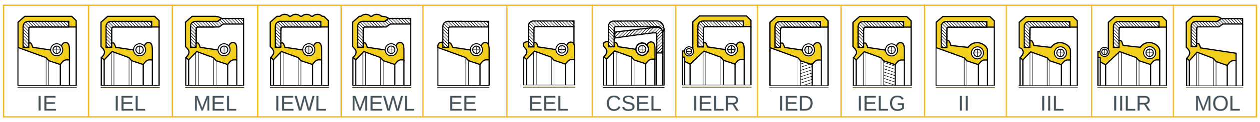
SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
65	95	10	IE	NBR	**792792**
	100	10	IE	NBR	**722794**
	100	10	IEL	NBR	**792564**
	100	10	IE	FKM	**722794/81**
	100	12	II	NBR	**721483**
66	88,5	12,5	II	NBR	721202
66,5	102	11	IE	NBR	722651
66,7	92	11,9	IE	NBR	722027
67	85	8	IEWLD	FKM	702529
68	90	10	IE	NBR	**722751**
	90	10	IE	FKM	**722751/81**
	90	10	IEL	NBR	**792565**
	90	10	II	NBR	721050
	90	13	IELD	FKM	702211
	100	10	IE	NBR	**772059**
	100	10	IEL	NBR	**792677**
	117	10	IE	NBR	772283
68,3	80	4,8x8,4	EOLS	NBR	723271
69	85	8	IE	NBR	**722900**
69,8	100	13	II	NBR	721274
70	85	8	IE	FKM	**722317/81**
	90	10	IE	NBR	**722458**
	90	10	IE	FKM	**722458/81**
	90	10	IEL	NBR	**792566**
	90	12	IE	NBR	**722639**
	90	12	IEL	NBR	**725758**
	90	12	IELR	NBR	**725634**
	90	12	II	NBR	**721051**
	90	12	IIL	NBR	**724544**
	95	10	IE	NBR	**792794**
	95	13	IE	NBR	**792795**
	100	10	IE	NBR	**722497**
	100	10	IEL	NBR	**792678**
	100	10	II	NBR	**721158**
	100	10	IE	FKM	**722497/81**
	100	13	IEL	NBR	**792679**
	110	12	IE	NBR	**792796**
	110	13	IE	NBR	**792797**
70,5	85	10	IELS	NBR	725335
72	86	7	IEL	NBR	725367
	88	7	IEL	NBR	725337
	95	10	IE	NBR	**722942**
	95	10	IE	FKM	**722942/81**
	95	10	IEL	NBR	**725444**
	95	13	IE	NBR	**722004**
	95	13	II	NBR	**721181**
	100	10	IE	NBR	**722944**
	100	12	IE	NBR	**722861**
	100	12	IEL	NBR	725653
	100	12	II	NBR	721104
	100	12	IIL	NBR	724485
	101,6	12,5	IE	NBR	722298
72,5	100,5	14	IE	NBR	722604
74	90	13	IE	NBR	722618
	90	13	II	NBR	721074
	90	15	IEL	NBR	725251
	90	15	IILR	NBR	724453
74,6	101,8	13	II	NBR	721150
75	90	8	IE	NBR	**722053**
	90	8	IEL	NBR	**792680**
	90	8	II	NBR	**721393**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
75	90	10	IED	FKM	702365
	95	8	IE	NBR	722902
	95	10	IE	NBR	**722379**
	95	10	IE	FKM	**722333/81**
	95	10	IEL	NBR	**792567**
	95	12	IE	NBR	**722333**
	95	12	IE	FKM	**722333/81**
	95	12	IE	FKM	722470
	95	12	II	NBR	721219
	100	10	IE	NBR	**722943**
	100	10	IE	FKM	**722943/81**
	100	10	IEL	NBR	**792568**
	100	12	IE	NBR	722585
	100	13	IE	NBR	**722687**
	100	13	IE	FKM	**722687/81**
	100	13	IEL	NBR	**792569**
	100	13	II	NBR	721190
	102	15	IE	NBR	722698
	110	13	IE	NBR	**722752**
	110	13	IEL	NBR	**792681**
	110	13	II	NBR	**721152**
	115	10	IEL	NBR	**792682**
	120	15	IE	NBR	722221
	120	15	IE	NBR	**792798**
76	100	16	IIL	NBR	**724245**
76,2	102	17,4	IIL	NBR	**724291**
78	100	10	IE	NBR	**772060**
	100	10	IEL	NBR	**725445**
	100	13	IE	NBR	**772020**
	100	13	IE	NBR	772313
80	95	6,5	IOS	NBR	726125
	95	8	IE	NBR	**722776**
	95	8	IEL	NBR	**792683**
	95	8	II	NBR	721012
	98	10	MEWLG	FKM	702569
	100	10	CSEL	NBR	**793100**
	100	10	IE	NBR	**722186**
	100	10	IE	FKM	**722847/81**
	100	10	IEL	NBR	**792570**
	100	10	IEL	FKM	725662
	100	13	IE	NBR	**722819**
	100	13	IE	FKM	**722819/81**
	100	13	IE	SIL	**722476**
	100	13	IE	FKM	772304
	100	13	IEL	NBR	725021
	100	14	IEL	NBR	**79282901**
	105	13	IE	NBR	**792799**
	110	10	IE	NBR	**772061**
	110	10	IEL	NBR	**792571**
	110	10	IE	FKM	**772061/81**
	110	13	CSEL	NBR	**793101**
	110	13	IELR	NBR	**725704**
	115	10	IE	NBR	**792800**
	125	12	IE	NBR	**792802**
	125	13	IE	NBR	**792803**
82	102	13	IE	NBR	**722195**
	102	13	II	NBR	**721036**
	105	13	IE	NBR	**722862**
	105	13	II	NBR	**721359**
84	100	13	IE	NBR	**722680**
	110	16	IEL	NBR	**725597**
	112	14	IELX	NBR	725281
85	100	9	IE	NBR	722973
	100	13	IE	NBR	722102
	102	13	IE	NBR	**722552**
	102	13	IEL	NBR	**79282601**
	105	8	IEWLG	FKM	702619
	105	10	EE	FKM	720037
	105	10	EEG	FKM	702333
	105	12	IEWLG	FKM	702596

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon



d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
85	105	13	IE	NBR	**792804**
	110	12	IEL	NBR	**792572**
	110	12x6	IIS	NBR	726637
	110	13	CSEL	NBR	**793102**
	110	13	IE	NBR	**722510**
	110	13	IE	FKM	**722510/81**
	110	13	IEL	NBR	**725884**
	110	13	II	NBR	**721037**
	110	13	IELG	FKM	702404
	110	13	IEX	NBR	726076
	120	13	CSEL	NBR	**793103**
	120	12	IE	NBR	**772062**
	130	17	EELD	FKM	702379
	130	13	IEL	NBR	**792684**
88,9	114,3	15,9	IE	NBR	722631
89,7	105	6	IE	NBR	722807
90	105	10	IE	NBR	**792805**
	105	10	II	NBR	721410
	105	10	IEL	NBR	79282301
	105	13	IE	NBR	**722720**
	110	10	IEWLG	FKM	702389
	110	11	IEWG	FKM	702486
	110	12	IE	NBR	**772063**
	110	12	IE	FKM	**772063/81**
	110	12	IEL	NBR	**792573**
	110	13	CSEL	NBR	**793104**
	110	13	IE	NBR	**722719**
	110	13	IE	FKM	**722719/81**
	110	13	IEL	NBR	**792574**
	110	13	II	NBR	721236
	110	13	IEX	NBR	726500
	110	15	IELG	FKM	702317
	110	16	IILR	NBR	724091
	115	9	IE	NBR	722975
	115	9	IE	NBR	772302
	115	13	IE	NBR	**722703**
	115	13	IEL	NBR	**725695**
	115	13	IEL	NBR	**72569501**
	120	13	CSEL	NBR	**793105**
	120	12	IE	NBR	**772064**
	120	12	IE	FKM	772064
	120	12	IEL	NBR	**792575**
	140	13	CSEL	NBR	**793106**
	140	13	IEL	NBR	**792685**
	150	12	IE	NBR	772343
92	107	12	IE	NBR	722970
	110	7	IEWLG	FKM	702644
	110	10	MEWLG	FKM	702518
	112	10	IE	NBR	722654
	120	13	IEL	NBR	725044
	121	16	II	NBR	**721203**
	139	12x30	IES	NBR	726173
	140	14x25	IELS	NBR	725225
93	114	13	IEWLG	FKM	702350
95	109,2	7	IOLS	NBR	723263
	109,5	7	IEW	NBR	772390
	115	13	IE	NBR	**792815**
	120	11,3	IELG	NBR	702355
	120	12	IE	NBR	**772065**
	120	12	IE	FKM	**772065/81**
	120	12	IEL	NBR	**792576**
	120	13	CSEL	NBR	**793107**
	120	13	IE	NBR	**722088**
	120	13	IE	FKM	**722088/81**
	120	13	IEL	NBR	**725410**
	120	13	IEL	FKM	725410
	120	13	IELR	NBR	**725697**
	125	12	IE	NBR	**772066**
	125	12	IEL	NBR	**792686**
	130	13	IE	NBR	**792808**

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
95	130	13	II	NBR	721213
	140	10x18	IIS	NBR	726452
95,2	127,1	11,9	IE	NBR	722924
96	112	10	IE	NBR	**722633**
	112	10	II	NBR	**721320**
98	110	7	IEWLG	FKM	702533
100	114	8	IEWLG	FKM	702578
	120	10	IE	NBR	**792809**
	120	10	IE	FKM	722704
	120	12	IE	NBR	**722993**
	120	12	IE	FKM	**722993/81**
	120	12	IEL	NBR	**792577**
	120	12	IEX	NBR	726258
	120	13	CSEL	NBR	**793108**
	120	13	IE	NBR	**722957**
	120	13	IE	FKM	772148
	120	13	IELG	FKM	702338
	120	14	IELR	NBR	725231
	120	17	IEL	NBR	725599
	125	12	IEL	NBR	**792578**
	125	13	CSEL	NBR	**793109**
	125	13	IE	NBR	**722949**
	125	13	IEL	NBR	**792579**
	125	13	II	NBR	**721080**
	130	13	CSEL	NBR	**793110**
	130	12	IE	NBR	**772068**
	130	12	IE	FKM	**772068/81**
	130	12	IEL	NBR	**792580**
	130	14	IE	NBR	**722464**
	130	14	II	NBR	**721241**
	150	12	IE	NBR	**792810**
	150	13	IEL	NBR	**792687**
101,6	130,2	14,3	IE	NBR	722168
102	120	12	IE	NBR	**722546**
	122	14	IELD	FKM	702136
	130	13	CSEL	NBR	**793111**
	135	14	II	NBR	**721130**
104	120	13	IE	NBR	**722688**
105	122	13	IE	NBR	772150
	125	13	IEX	NBR	726274
	130	12	IE	NBR	**772069**
	130	12	IE	FKM	**772069/81**
	130	12	IEL	NBR	725617
	130	12	IELR	NBR	**792502**
	130	13	CSEL	NBR	**793112**
	130	13	IE	NBR	**72268901**
	130	13	IE	FKM	**722689/81**
	130	13	IEL	NBR	**725103**
	130	13	IELD	FKM	702174
	132	13	II	NBR	721458
	140	12	IE	NBR	**772070**
	140	13	CSEL	NBR	**793113**
107,9	152,6	17,3	IEL	NBR	725478
109	122	7	IEW	NBR	772391
	122,2	7	IOLS	NBR	723262
110	130	12	IE	NBR	**772071**
	130	12	IE	FKM	**772071/81**
	130	12	IEL	NBR	**792581**
	130	13	CSEL	NBR	**793114**
	130	13	IE	NBR	**722465**
	130	13	IEL	NBR	**725114**
	140	10,2	IE	NBR	772357
	140	12	IE	NBR	**772072**
	140	12	IE	FKM	**772072/81**
	140	12	IEL	NBR	**792688**

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
Stainless steel spring

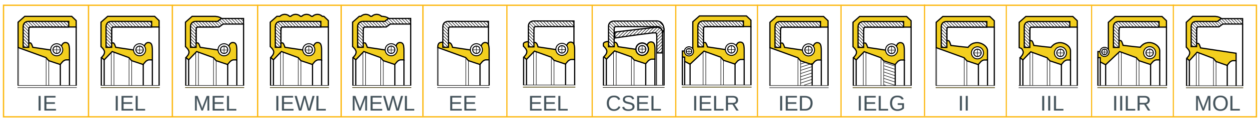
Abreviations : NBR = Nitrile; FKM = Fluorocarbon

SEALS WITH NITRILE AND FLUOROCARBON ELASTOMER

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
110	140	13	CSEL	NBR	**793115**
	140	13	IE	NBR	722708
	140	13	IEL	NBR	**792582**
112	130	13	IE	NBR	**722553**
	130	13	IEL	NBR	**79282701**
	140	13	CSEL	NBR	**793116**
	140	13	IE	NBR	**722820**
	140	13	IEL	NBR	**725353**
113	160	12	II	NBR	721098
	160	13	IE	NBR	722730
115	140	12	IE	NBR	**772073**
	140	12	IE	FKM	**772073/81**
	140	12	IEL	NBR	**792689**
	140	13	CSEL	NBR	**793117**
	140	13	IE	NBR	722374
	140	13	IEL	NBR	**725101**
	140	13	IELG	FKM	702176
	140	13	IEX	NBR	726260
	140	15	IEL	NBR	725054
	140	15	IELRG	FKM	702260
	150	12	IE	NBR	**772074**
	150	13	CSEL	NBR	**793118**
	150	13	II	NBR	**721053**
	150	13x24	IELS	NBR	725063
116	150	13	II	NBR	721237
119,1	152,7	11	II	NBR	721214
120	140	13	CSEL	NBR	**793119**
	140	13	IE	NBR	**722690**
	140	13	IE	FKM	**722690/81**
	140	13	IE	FKM	772133
	140	13x14,3	IEL	NBR	725644
	140	16	IELR	NBR	725706
	150	12	IE	FKM	**772075/81**
	150	12	IEL	NBR	**792583**
	150	13	CSEL	NBR	**793120**
	150	13	IE	NBR	**722573**
	150	13	IEL	NBR	**792584**
	150	13	IEX	NBR	726627
	160	13	CSEL	NBR	**793121**
	160	12	IE	NBR	**772076**
	160	15	IEL	FKM	**725654/81**
120,6	158,9	15	II	NBR	721482
122	150	12	IILR	NBR	724454
	150	13	CSEL	NBR	**793122**
	150	13	II	NBR	**721063**
122,2	152,4	6	IE	NBR	722548
122,3	152,4	6	II	NBR	721298
125	145	13	IEX	NBR	726257
	150	12	IE	NBR	772077
	150	12	IEL	NBR	**792585**
	150	13	CSEL	NBR	**793123**
	150	12	IE	FKM	**772077/81**
	150	12	IELG	FKM	702064
	150	14	II	NBR	721252
	160	12	IE	FKM	**772078/81**
	160	13	CSEL	NBR	**793124**
	160	13	II	NBR	**721133**
	160	15	IE	NBR	**722279**
	160	15	IEL	NBR	**792690**
127	158,7	14,3	II	NBR	721358
	158,7	18,5	IELS	NBR	725005
130	145	7	IE	NBR	772270
	150	12	IEX	NBR	726259
130	158,9	15,9	IE	NBR	722232
	160	12	IE	NBR	**772079**
	160	12	IE	FKM	**772079/81**
	160	13	CSEL	NBR	**793125**
	160	15	IE	NBR	**722881**
	160	15	IE	FKM	**722881/81**
	160	15	IEL	NBR	725115
	160	15	IEX	NBR	726077
	170	13	CSEL	NBR	**793126**
132	150	13	IE	NBR	**722134**
	150	13	II	NBR	721328
135	160	13	CSEL	NBR	793127
	160	14	IE	NBR	**722270**
	165	15	IE	NBR	722261
	165	15	IEX	NBR	726320
	170	12	IE	NBR	**772081**
	170	12	IE	FKM	**772081/81**
	170	15	IE	NBR	**722280**
	170	15	IE	FKM	722280/81
	170	16	IEL	NBR	725055
139,7	171,4	21	IELR	NBR	725542
	171,6	15,9	IE	NBR	722914
140	160	13	IE	NBR	772252
	170	13	CSEL	NBR	**793128**
	170	15	IE	NBR	**722700**
	170	15	IE	FKM	**722700/81**
	170	15	IEL	NBR	**725716**
	170	15	IEL	NBR	72571601
	175	15	IE	NBR	**772082**
	180	14	IE	NBR	**722662**
144	160	12	IE	NBR	**722113**
	180	12	II	NBR	721116
145	170	15x20	EELS	NBR	725596
	175	13	CSEL	NBR	**793129**
	175	14	EEL	NBR	725593
	175	15	IE	NBR	**772114**
	180	13	CSEL	NBR	**793130**
	180	14	IE	NBR	**722956**
	180	14	IE	NBR	721054
146	177,9	15,9	IE	NBR	722563
148	170	14,5	IELR	NBR	725630
	170	14,5	IIL	NBR	**724260**
	170	14,5	IELG	NBR	702099
150	168	12	II	NBR	721187
	170	15	CSEL	NBR	**793131**
	172	14	EELSG	FKM	702301
	175	16	IEX	NBR	726261
	180	15	CSEL	NBR	**793132**
	180	15	IE	NBR	**722731**
	180	15	IE	FKM	**722731/81**
	180	15	IEL	NBR	**792586**
	180	15	II	NBR	**721230**
152	190	15	IE	FKM	772195
155	180	15	CSEL	NBR	**793133**
	180	15	IE	NBR	**722754**
	180	15	IEL	NBR	**792587**
	180	15	II	NBR	721415
	180	15	MEWLG	NBR	702457
	190	15	CSEL	NBR	**793134**
	190	15	IE	NBR	**772083**
	190	15	IEL	NBR	**792691**
157,1	190,5	6	IE	NBR	722547
	190,5	6	II	NBR	721299

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

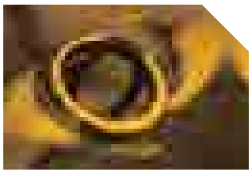


d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
158	180	16	IEL	NBR	725232
160	190	15	CSEL	NBR	**793135**
	190	15	IEL	NBR	**725715**
	190	15	IIL	NBR	724765
	190	15	IE	FKM	**722313/81**
165	190	13	CSEL	NBR	793136
	190	15	IE	NBR	772321
	190	15	IE	NBR	**792811**
	200	15	CSEL	NBR	**793137**
	200	15	IE	NBR	**772084**
170	200	15	CSEL	NBR	**793138**
	200	15	IE	NBR	**722377**
	200	15	IE	FKM	**722377/81**
	200	15	IEL	NBR	**792588**
175	200	13	II	NBR	**721122**
	200	13	IE	NBR	722979
	200	15	IEL	NBR	**792692**
	210	15	IE	NBR	**772085**
	210	15	IEL	NBR	**792693**
	230	10	IIS	NBR	726200
177,8	209,5	16	IEL	NBR	725018
180	210	15	CSEL	NBR	**793139**
	210	15	IE	FKM	**772086/81**
	210	15	IEL	FKM	**725655/81**
	210	15	IEL	NBR	**792589**
	215	15	CSEL	NBR	**793140**
	215	16	IE	NBR	**722661**
185	215	15	CSEL	NBR	**793141**
	215	16	IE	NBR	**722863**
	215	16	II	NBR	**721280**
190	220	15	CSEL	NBR	**793142**
	220	15	IE	FKM	**772088/81**
	220	15	IE	NBR	**772088**
	220	15	IEL	NBR	**792694**
	230	16	CSEL	NBR	**793143**
	230	17	IE	NBR	**722860**
	230	17	II	NBR	721235
190,5	228,6	16	IEL	NBR	725017
195	230	15	CSEL	NBR	**793144**
	230	15	IE	NBR	**772089**

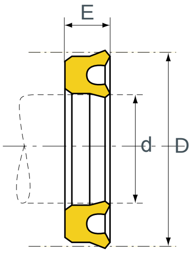
d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
195	230	17	IE	NBR	**722759**
	230	17	II	NBR	721362
196,8	228,6	16	IEL	NBR	725019
200	230	15	CSEL	NBR	**793145**
	230	15	IE	NBR	**772090**
	230	15	IE	FKM	**772090/81**
	230	15	IEL	NBR	**792695**
205	230	16	IEL	NBR	**79282401**
210	240	15	CSEL	NBR	793146
	240	15	IE	NBR	**772091**
	240	15	IE	FKM	**772091/81**
220	250	15	CSEL	NBR	**793147**
	250	15	IE	FKM	**772092/81**
	250	15	IEL	NBR	**792696**
230	260	15	IE	NBR	**772093**
240	270	15	IE	NBR	**772094**
	270	15	IE	FKM	**772094/81**
250	280	15	IE	NBR	**772095**
260	300	20	IE	NBR	772096
260,3	298,4	22	IEL	NBR	725009
265	290	16	IE	NBR	**722782**
280	320	20	IE	NBR	772097
300	340	20	IE	NBR	772098
320	360	20	IE	NBR	**772099**
340	380	20	IE	NBR	**772100**
380	420	20	IE	NBR	772203
440	480	20	IE	NBR	772110
460	500	20	IE	NBR	772111
480	520	20	IE	NBR	772112

The fluorocarbon seals previously with the suffix 83 now have the suffix 81.
Suffix 83 parts may be delivered until stocks are replaced with parts having the suffix 81.
The part numbers indicated in bold type are kept in stock.
****Stainless steel spring**

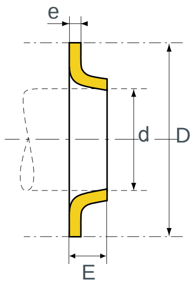
Abreviations : NBR = Nitrile; FKM = Fluorocarbon



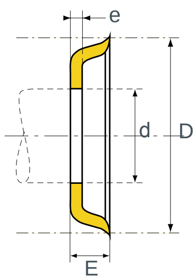
CATALOGUE OF SEALS FOR SLIDING SHAFTS



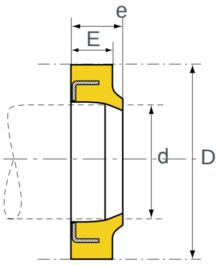
Type DL



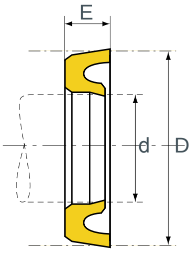
Type LIO



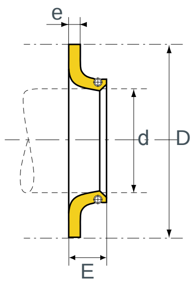
Type LEO



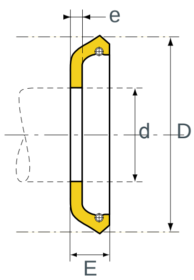
Type DRT



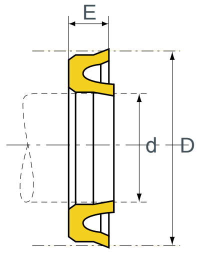
Type DLI



Type LIR



Type LER



Type DLE/DLES

- Width of the groove : E + 1 mm (for DL).
- Operating parameters :
  Maximum admissible pressure : 150 bars (for DL) ; 30 bars (for LIO. LEO).
  Linear speed admissible : up to 0.3 m/sec depending on the operating conditions.

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
4	14	12	DL	NBR	710093
6	14 32	11,5 10	DL LEO	NBR NBR	**710620** 714057
8	14 14 17,9	3,5x5 4 5,5x1,5	DRT DLI LEO	NBR NBR NBR	711700 716501 714432
9	20	4	DLS	NBR	710678
10	16 17,9 20	3,5x5 5,5 7	DRT LEO DLP	NBR NBR NBR	711701 714045 711001
11	28 36	7x2,5 12	LIO LEO	NBR NBR	712094 714020
12	18 22 22 22 25	3,5x5 55 5x1,5 6,5	DRT DLS DLI LIO DLS	NBR NBR NBR NBR NBR	711702 710679 716502 712350 710233
13	21	5x2	LIO	NBR	712414
14	20	3,5x5	DRT	NBR	711703

The part numbers indicated in bold type are kept in stock.

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
14	26 38,1	8 10	LIR DL	NBR NBR	713653 710132
15	21 25 25 30	3,5x5 8 10x3 10x3	DRT DLT LEO LEO	NBR NBR NBR NBR	711704 711404 **714178** **714179**
16	22 24 25 26 28 35 35 36 38 40 40	3,5x5 9 6,5 8 9,6 10 10x3 8x2,5 12 10 12x3	DRT DL DLE DLT DL LER LEO LIO LEO DL LEO	NBR NBR NBR NBR NBR NBR NBR NBR NBR NBR NBR	711705 710129 716506 711405 710218 715402 714418 712095 714442 710343 714864
18	28 30 30 32,9 36 36 38	5x7 8 10 7,2 6x2 7x2,5 10	DRT DLES DL DL LEO LIO LIR	NBR NBR NBR NBR NBR NBR NBR	711706 716531 710290 710431 714006 **712005** 713613

Abreviations : NBR = Nitrile; FKM = Fluorocarbon

DIMENSIONS

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
18	45	6x2	LEO	NBR	**714645**
	52	8x2	LEO	NBR	714013
	55	10x3	LEO	NBR	714471
19	37	12	LEO	NBR	714817
19,6	49	10,5	LEO	NBR	714486
20	28	4,8	DL	NBR	710777
	30	5	DLI	NBR	716503
	30	5x7	DRT	NBR	711707
	30	8	DLT	NBR	711407
	32	8	DL	NBR	710555
	35	6,5	DLS	NBR	710091
	35	12	DL	NBR	**710795**
	40	8x3	LIO	NBR	**712572**
	40	12	DL	NBR	710111
	65	10x3	LEO	NBR	**714472**
21	40	12	DL	NBR	710023
	45	12	DL	NBR	710344
22	32	5x7	DRT	NBR	711708
	32	7	DLP	NBR	711004
	32	8	DLT	NBR	711408
	32	12	DLES	NBR	716588
	40	12	DL	NBR	710527
	44	10x4	LIO	NBR	**712533**
22,2	38	6x2,5	LIO	NBR	712701
	38	10	LIR	NBR	713702
24	36	8x2,5	LIO	NBR	**712348**
	36	9,6	DL	NBR	710289
25	25	8x2,5	LIO	NBR	712012
	40	9	DLP	NBR	711005
	45	11	DL	NBR	**710061**
	49	10,8	DL	NBR	710060
	35	5x7	DRT	NBR	**711709**
	60	10x5	LEO	NBR	**714110**
25,4	38,1	8	DLE	NBR	716560
26	41	8,4	DL	NBR	710144
27	40	10	DLE	NBR	716507
28	38	5x7	DRT	NBR	711710
	46	10	DL	NBR	710528
	47,5	4x3	LEO	NBR	714047
	49	13x4	LIO	NBR	712534
29	41	10	DL	NBR	710570
30	40	5x7	DRT	NBR	711711
	40	12	DLES	NBR	716589
	42	8x2,5	LIO	NBR	**712092**
	45	8	DLI	NBR	716629
	46	12	DL	NBR	710433
	48	10	DLES	NBR	716532
	95	14x4	LEO	NBR	714539
32	42	5x7	DRT	NBR	711712
	47	10	DLT	NBR	711412
	50	9x3	LIO	NBR	712535
	50	12	DL	NBR	710470
34	44	12	DLES	NBR	716596
	50	14,4	DL	NBR	710073
	52	12x3,5	LIO	NBR	712694
35	45	7x10	DRT	NBR	711713
	50	9	DLP	NBR	711006
	51	9,6	DL	NBR	**710354**
36	46	5x7	DRT	NBR	711714
	50	8	DLI	NBR	716536
	55	12	DL	NBR	710490
	60	10x4	LIO	NBR	**712492**
40	50	5	DL	NBR	710190
	50	5x8	DRT	NBR	711715
	55	10	DLT	NBR	711415

The part numbers indicated in bold type are kept in stock.

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
40	62	14,5	DL	NBR	710489
	65	10x5	LIO	NBR	**712491**
42	52	5x7	DRT	NBR	**711716**
	52	12	DLES	NBR	716590
45	55	5x7	DRT	NBR	711717
	63	12	DL	NBR	**710529**
	74	17x5	LIO	NBR	712737
48	63	9	DLP	NBR	711008
	63,5	10	DLE	NBR	716561
	65	3,5x5	LEOS	NBR	714093
50	56	5x7	DRT	NBR	**711746**
	60	5x7	DRT	NBR	711718
	65	7x10	DRT	NBR	**711745**
	65	10	DLT	NBR	711417
	70	10x3	LIO	NBR	**712571**
	70	12	DL	NBR	710530
	74	15	DL	NBR	710078
	76	17	DL	NBR	710056
50,5	66,5	12	DL	NBR	710196
52	68	10	LIR	NBR	713809
55	63	7x10	DRT	NBR	711747
	65	12	DLES	NBR	716591
	71	12	DL	NBR	710629
	75	10	DLS	NBR	710057
56	66	5x7	DRT	NBR	711720
	72	12	DLES	NBR	716533
	80	12x3	LIO	NBR	712475
	80	14,5	DL	NBR	710474
57	73	9,6	DL	NBR	710086
58	78	10	DLS	NBR	710058
60	70	5x7	DRT	NBR	711721
	80	10	DL	NBR	710423
	80	12	LIR	NBR	713611
	85	7x2,5	LEO	NBR	714421
	89,5	20x5	LIO		712823
62	85	12x3	LIO	NBR	712131
63	73	5x7	DRT	NBR	711722
	93	18	DL	NBR	710531
63,5	203,2	28,5x8,7	LEO	NBR	714497
64	80	12	DL	NBR	710434
	82,5	13	DLE	NBR	716562
65	75	5x7	DRT	NBR	711723
	83	12	DL	NBR	710729
	90	10	LER	NBR	715403
	90	10x5	LIO	NBR	712624
70	80	5x7	DRT	NBR	711724
	80	12	DLES	NBR	716592
	86	12	DL	NBR	710635
	95	15	DL	NBR	710025
75	83	7x10	DRT	NBR	711725
	91	12	DL	NBR	710413
	100	10x3	LIO	NBR	712022
76,2	107,8	26,5	DL	NBR	710569
78	94	12	DL	NBR	710632
80	88	7x10	DRT	NBR	711726
	90	7x10	DRT	NBR	711744
	94	9	DLE	NBR	716335
	100	12	DLT	NBR	711425
	100	17	DL	NBR	710169
	117	14	LIR	NBR	713796

Abreviations: NBR = Nitrile; FKM = Fluorocarbon

DIMENSIONS

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
85	95 103	7x10 13x3	DRT LIO	NBR NBR	711743 712981
86	117	14	LIR	NBR	713740
88	110	8x3,5	LIO	NBR	712430
90	130	10x4	LIO	NBR	712821
92	112	12,6	DL	NBR	710068
94	112	12	DL	NBR	710079
98	114	12	DL	NBR	**710724**
100	110 116	7x10 7	DRT LER	NBR NBR	711728 715666
104	120	11	DLE	NBR	716549
106	122	12	DL	NBR	710805

The part numbers indicated in bold type are kept in stock.

d (mm)	D (mm)	E (mm)	Type	Elastomer	Reference
110	120 126	7x10 7	DRT LER	NBR NBR	**711729** 715667
115	130,2	6,5	LEOS	NBR	714008
116	202	20	LEOS	NBR	714004
120	136	7	LER	NBR	715668
125	140	9x12	DRT	NBR	711735
130	160	18	DLP	NBR	711013
140	160 160 170	18 18 18	DL DL DLT	NBR NBR NBR	710002 710047 711433
150	209	25	LEO	NBR	714781
196	228	24	DL	NBR	710001
196,3	232	21	DL	NBR	710004
278	304,8	24	DL	NBR	710564

Abreviations: NBR = Nitrile; FKM = Fluorocarbon

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