

Worked Example:

Step 1 uses the Application Matrix for type of equipment and installation site or location to determine the preferred Mounting Product Groups that can be considered.

If the unit in the Step 2 example is a Pump, to be sited internally within a Factory.
Step 1 identifies that Product Groups 09, 40, 41, 48, 50, 52, 57, 94, 95 and 96 as possibilities.

Note: Other Product Groups may also be acceptable, particularly where specific fixings are required. In these circumstances or if in doubt, consult Vibracoustics Ltd.

If we consider the 1670 kg unit is to be supported on 4 mountings only, from Stage 2.3 we identify mounting loadings to be 431.5kg at one end and 403.5kg per mounting at the other.

If the pump is to run at 1200 rpm and we wish to achieve a minimum 75% isolation, then by using our Isolation Calculator we determine that we require the following mounting **minimum** deflections:

3.3mm	in 45 Compound
3.6mm	in 55 Compound
3.8mm	in 65 Compound
4.0mm	in 70 Compound

Note: Air and Steel Spring mountings would normally only be used where higher deflections are required.

Consider the individual mountings that might be used:

From Product Group 40, 'V' Mountings 'S' Range, Cat ref: 40-A-30 Issue** we can identify VS4050N40 which will carry 450Kg at 5mm deflection.

431.5kg will therefore deflect the mounting $(431.5/450) \times 5 = 4.8$ mm.
This is greater than required and will provide extra isolation.
The mountings at the other end will deflect $(403.5/450) \times 5 = 4.5$ mm.

The deflection difference is negligible and all mountings of the same type can be selected.

An alternative is the 'V' Mounting 'HD' Range, Cat ref: 40-A-40 Issue** from which we can select VS4054N60 which will carry 645kg at 6mm.

403.5kg will deflect the mounting $(403.5/645) \times 6 = 3.8$ mm and
431.5kg will deflect the mounting $(431.5/645) \times 6 = 4.0$ mm.

Increased performance could be achieved using higher deflections, e.g. VS4054N40 which will support 450kg at 9mm deflection. Achieving the additional performance may be the preferred option.

The final choice will be based on fixing dimensions, physical envelope, availability and cost.

Other Application Considerations

If the Pump unit were to be fitted on board ship, instead of in a factory, then in addition to the Product Group changes, other factors must also be considered. Whilst the mounting static loads remain the same, seaway motion imposes additional loads onto the support mountings.

For Marine and Mobile applications, it is therefore necessary to select mountings with additional load capacity. Select mountings with typically 20 % more load capacity than required statically, or in particularly demanding environments, use an even higher factor.

For applications and technical assistance please refer to VIBRACOUSTICS Ltd.

Vibracoustics is continually seeking to improve products and reserves the right to change designs and specification without prior notice or alteration of literature.

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CAT REF.04-S-50 05C

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COMPOUND OPTIONS

Vibracoustics standard products are typically produced in Natural rubber although Nitrile, Polychloroprene, EPDM, Butyl and Silicon versions of selected products and Product Groups are available.

Special polymers are available for use where the environmental conditions are particularly arduous.

Vibracoustics will produce special polymer versions of their standard products in economic batch sizes or for an agreed batch cost.

New Special products can also be produced to meet a Customer application requirements.

Typical polymer properties are outlined in the table below.

Property	Natural Rubber	SBR	EPDM	Neoprene* (Polychloroprene)	Hypalon	Nitrile	Butyl	Silicon	Flouro Silicon
Shortform	NR	SBR	EPDM	CR	CSM	BNR	IIR	Si	FSi
Cost Factor	1	1	1	2	3	2	2	15	40
Hardness Range	30-95	40-95	30-85	30-90	40-85	40-90	35-85	40-80	40-80
Heat Resistance									
Max Continuous	75C	85C	130C	95C	130C	100C	80C	205C	180C
Max Intermittent	105C	115C	150C	125C	160C	130C	110C	300C	200C
Low Temperature	-60C	-55C	-50C	-40C	-25C	-20C	-40C	-60C	-60C
Resistance									
Oxidation	Fair	Fair	Excellent	Very Good	Excellent	Good	Excellent	Excellent	Excellent
Ozone/Weathering	Poor	Poor	Outstanding	Very Good	Outstanding	Fair	Good	Outstanding	Outstanding
Oil Resistance	Poor	Poor	Fair	Excellent	Excellent	Excellent	Poor	Excellent	Excellent
Fuel Resistance									
ASTM Fuel B @40C	Unsuitable	Unsuitable	Unsuitable	Poor	Poor	Fair	Unsuitable	Unsuitable	Fair (Good at Low Temperatures)
Chemical Resistance									
Acids	Fair	Fair	Good	Good	Very Good	Good	Very Good	Fair	Good
Bases	Good	Good	Good	Fair	Good	Fair	Good	Fair	Fair
Physical Strength	Excellent	Good	Good	Good	Good	Good	Good	Poor	Poor
Compression Set	Good	Good	Good	Fair to Good	Fair	Good	Good	Good	Good
Resilience	Excellent	Good	Very Good	Very Good	Fair	Good	Poor	Fair	Fair
Tear & Abrasion Resistance	Excellent	Good	Good	Good	Good	Good	Good	Poor	Poor
Electrical Strength	Excellent	Excellent	Excellent	Good	Good	Poor	Good	Excellent	Excellent
Flame Resistance	Poor	Poor	Poor	Self Extinguishing	Good	Poor	Poor	Good	Self Extinguishing
Water Resistance	Very Good	Good	Excellent	Good	Very Good	Good	Very Good	Good	Good
Gas Permeability	Poor	Fairly Low	Fairly Low	Low	Low	Low	Very Low	Fairly Low	Fairly Low

*Du Pont registered trademark

METAL, PLASTICS OR NON-RUBBER PRODUCT COMPONENTS

Vibracoustics standard products are normally produced with mild steel metals with selected ranges available with Stainless Steel. Other materials e.g. PTFE, Polythene and Nylon etc are also available for special applications.

PROTECTIVE FINISHES

In situations where quantities do not warrant the manufacture of special polymer or special metal versions protective treatments may be offered to enhance product lifetime in service.

For applications and technical assistance please refer to VIBRACOUSTICS Ltd.

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Introduction

The temperature range for Vibracoustics' components produced in its general purpose compound series is - 40°C to + 70°C. If the operating temperature is a constant 70°C then the functional life of the product must be reduced accordingly; dependent on the dynamic conditions this would be typically 10,000 hours. Special compounds can be used to extend the life at 70°C and such compounds may also be considered for application with operating temperature up to 100°C for shorter duration.

Creep/Stress Relaxation

Creep or rate of increase in deflection with time, is obviously an important factor to be considered in the application of Vibracoustics' springs. Whereas the physical or primary creep is largely unaffected by change in temperature the secondary or chemical relaxation process is accelerated significantly at elevated temperature.

Gough-Joule Effect

Due to the changes that occur in the long chain molecules of rubber structures with change in temperature, there is a fundamental difference in behaviour compared with metals; whereas with a stressed metal the retractive force decreases with rise in temperature, with rubber it increases.

The force in a rubber element, maintained at constant deformation varies directly with absolute temperature. Conversely, at constant force the deformation varies approximately in an inverse manner with the absolute temperature.

The Gough-Joule Effect is present in all of the softer rubber compounds, but the presence of fillers mask the effect.

Change of Stiffness

The major change in stiffness occurs with reduction in temperature and the degree of change from that at ambient is influenced by the dynamic operating conditions; the increase in stiffness at lower temperature levels being more significant at higher operating frequencies.

Change in Damping

Although the actual damping levels in natural rubber compounds are comparatively low the changes occurring with change in temperature are now more significant and may influence critical spring applications where vibration attenuation at extreme operating temperature is a requirement.

Low Temperature Crystallisation

For natural rubber this transition occurs most readily at approximately -25°C the degree of change occurring being influenced greatly by compound type and hardness.

For specific data contact Vibracoustics with details of the application and the environment.

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