PRODUCT DATA

Mechanical Filter for Accelerometers UA-0559
and Mechanical Filter Set UA-0553

Mechanical Filter UA-0559 is supplied in packs of five as: Mechanical Filter Set UA-0553.


UA-0559


UA-0553

100003

Uses
- Measurement of general vibrations, particularly where instrumentation is not equipped with a ranged of low-pass filters
- Measurement of low-frequency, low-level vibration that is masked by high-frequency, high-acceleration levels often found in hand-held power tools
- Protection of accelerometer and preamplifier from high-level shocks
- Reduction of sensitivity to transverse vibrations

Features
- Prevents the accelerometer from detecting high-frequency vibration
- Prevents the excitation of accelerometer resonance
- Works with all types of piezoelectric accelerometers
- Selects cut-off frequency when load mass is adjusted
- Breaks ground-loop paths

Benefits of the Mechanical Filter

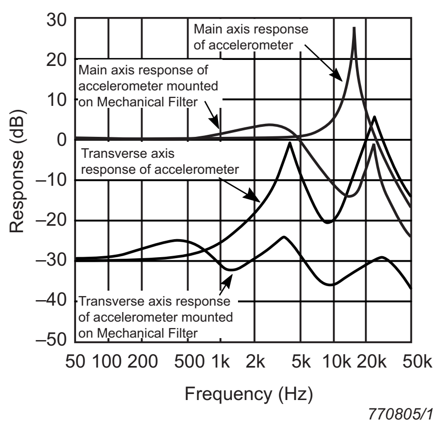
Mechanical Filter UA-0559 is interposed between an accelerometer and the mounting point on the test object in order to prevent the accelerometer from detecting high-frequency vibration. There are several instances where this may be desirable:
- Where measurements of low-frequency vibration, possibly at low levels, and high-level, high- frequency acceleration masks the low-frequency components because of preamplifier overload, distortion, lack of electronic filters, etc.
- Where the accelerometer’s resonance frequency is being excited by high-frequency vibration of a possibly insignificant level, causing wideband measurement errors and overloads. Using the mechanical filter would then increase the useful dynamic range of the measuring instrument by more than 20 dB
- Where the accelerometer could be subjected to transient shock levels beyond its maximum capability – the mechanical filter could prevent possible damage
- Where the measuring instrument has a high-frequency response in excess of that required and is not equipped with suitable low-pass filters. Vibration measurements with a wide-band sound level meter is a notable example of this case
- Where a specific cut-off frequency is required without the use of specially built electronic filters or elaborate tunable filters. For example, when measuring vibration as applied to the human hand, arm or body, the measuring range is normally limited to below 1000 Hz

Description

The filter consists of upper and lower parts of stainless steel bonded together and electrically separated by a specially formulated butyl rubber core. The two halves are equipped with standard accelerometer threads (10–32 UNF), male and female respectively. A tommy bar can be inserted transversely through the two halves to protect the rubber core from excessive torque when the accelerometer is tightened down. Where the butyl rubber core can be contaminated with hydrocarbon substances such as oil or fuel, a resistant silicone rubber sealer should be used (for example, Dow Corning® Type 733 RTV).

The effect of the mechanical filter on the frequency response of an accelerometer is shown in Fig. 1. Transverse and main axis resonances, which are typically 30 dB in amplitude, are substituted by a highly damped resonance response of only 3 to 4 dB amplitude. The accelerometer's own axial resonance is suppressed by 25 to 30 dB and shifted up in frequency due to decoupling of the mass above the filter.

Fig. 1
Typical main axis and transverse axis frequency response of Piezoelectric Charge Accelerometer Type 4370, demonstrating the effect of Mechanical Filter UA-0559



If a particular accelerometer, when combined with the mechanical filter, does not cover a high enough frequency, an accelerometer with a lower mass should be used, see Fig. 2. Conversely, to reduce the cut-off frequency at the high-frequency end, additional mass loads can be added. These can be added in the form of suitable washers or nuts. The curve in Fig. 3 shows the cut-off frequency (–3 dB) as a function of the load mass on the filter.

Fig. 2
Typical frequency response of various Brüel & Kjær general-purpose accelerometers when mounted on UA-0559

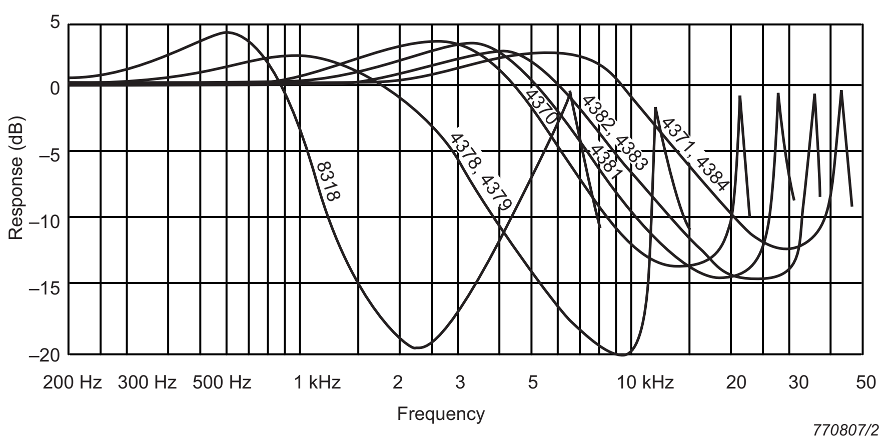
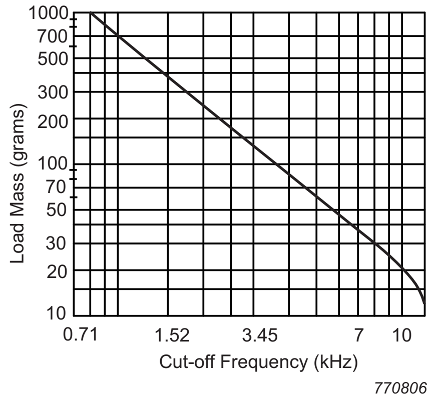


Fig. 3
Typical cut-off frequency (–3 dB) plotted as a function of load mass on filter

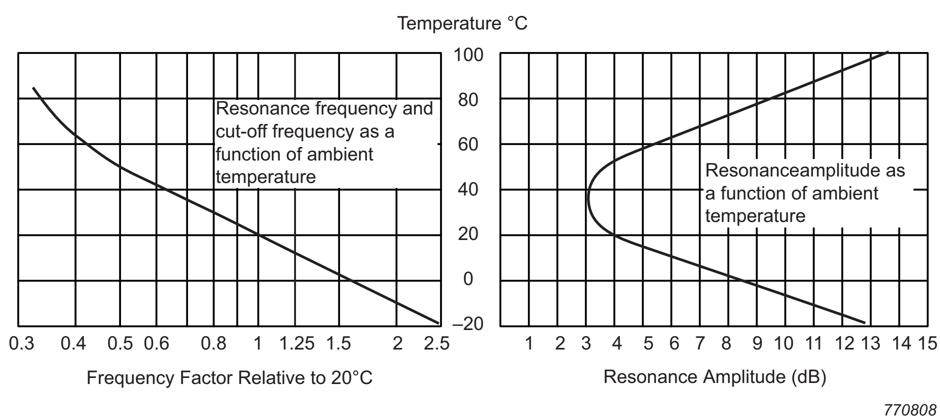


The mechanical filter can be used to isolate the accelerometer from transverse vibrations. This is particularly useful when measuring complex vibration environments.

Although it is possible to use the mechanical filter with accelerometers that have a larger base radius than itself, care must be taken with the choice of mounting location in order to avoid undue bending moments. Often it is unnecessary to use the mechanical filter with Accelerometer Type 8318 due to its built-in low-pass filter.

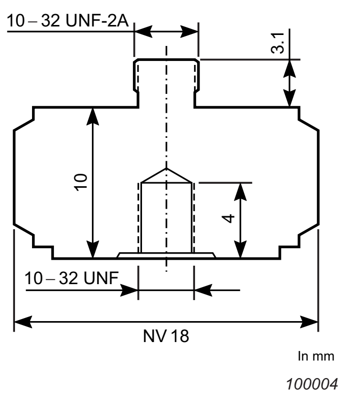
The stiffness and damping effect of the filter medium, butyl rubber, is dependent on ambient temperatures: optimum damping is obtained between 20 and 50°C. At higher temperatures, the stiffness and damping are reduced resulting in a reduction in resonant frequency and an increase in the amplification at resonance. At lower temperatures, the resonant frequency is increased while the amplification at resonance is also increased. These characteristics are shown in Fig. 4.

Fig. 4
Typical temperature response of UA-0559



Specifications – Mechanical Filter UA-0559

Response at Resonance: <4 dB (+ 60%) for temperatures +20°C to + 50°C. See Fig. 4
Cut-off Frequency (–3 dB): At 20°C, approx. 35% of accelerometer's normal mounted resonance frequency. It is a function of load mass and temperature, see Fig. 3 and Fig. 4
Filter Slope: Approx. 12 dB/octave
Temperature Range: –50°C to 100°C
Transmission Linearity: Deviation <2% up to 10 N_{RMS} dynamic load
Electrical Resistance: >100 MΩ top to base
Dimensions:



(all dimensions in mm)

Max. Continuous Dynamic Load: 30 N_{RMS} axial (corresponding to 550 m/s^2 (55 g) with 54 g accelerometer (Type 4370), 15 Nm_{RMS} transverse
Max. Accelerometer Mounting Torque: 1 Nm. When using a tommy bar: 7 Nm
Weight: 16 g
Materials: Stainless steel AISI 303, Butyl rubber

Ordering Information

UA-0553 Mechanical Filter Set
Includes the following:
- UA-0559: 5 × Mechanical Filters
- DA-1084: 1 × Locking Pin (Tommy Bar)

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TRADEMARK
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