

MEASUREMENT OF "ACOUSTICAL PERFORMANCE" OF SOUND-DEADENING MATERIALS

Application

This procedure is used to determine the "Acoustical Performance" of sound-deadening materials under simulated vehicle body conditions, in the 100 - 10,000 Hz frequency range.

Apparatus Required

Test Apparatus - 'Apamat II' - refer to Figure 1

The test material is applied to the test panel which is positioned in the clamping device. The "noise source chamber" contains steel balls which are projected against the test panel. The impact of the steel balls, and the air turbulence in the chamber causes the test panel to emit various harmonic vibrations.

The noise emitted from the test panel is picked up by a microphone placed in the "receiver room". The acoustic conditions in this chamber are equivalent to those found in an average vehicle.

The definition of "Acoustical Performance" is given as the difference in the noise spectrum between an uncoated and coated test panel.

The 'Apamat II' consists basically of:

The Clamping Device 'A'

The Noise Source Chamber 'B'

The Receiver Room 'C'

Source: Inter-Keller A.G.
Zurich, Switzerland

Measuring Instrument - refer to Figure 2

Consists of:

The Spectrometer - type 2112 - 'D'

Recorder - type 2305 - 'E'

Source: Bruel & Kjaer A.G.
Copenhagen, Denmark

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Materials Required

Test Panel

Material - Steel Body Skin Panels - clean and degreased.
Surface Finish - 0.9 - 1.8 micro m C.L.A.
Dimensions - 840 +/- 0.5 mm x 840 0.5 mm x 0.8 +/- 0.05 mm.
Unless otherwise required by the applicable Engineering Material Specification.

Conditioning and Test Conditions

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 °C and 50 +/- 5 % relative humidity for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

Procedure

To determine the acoustical performance of a material, the following must be measured on the same panel:

- a. The noise spectrum of an uncoated test panel.
- b. The noise spectrum of a test panel coated with the material under test.

The acoustical performance of the material is then given by the difference in dB (decibels) between the noise spectrum of the coated panel and the uncoated panel at specific frequencies in Hz (Hertz).

1. The closed container of sound-deadening material shall be conditioned for 24 h minimum at 23 +/- 2 °C prior to application.
2. The uncoated test panel is placed in the Clamping Device (A), and the drawer closed.
3. The noise source chamber (B) is lifted to contact the receiver room (C) so that the acoustical insulation between noise source, test panel and the receiver room is completed.
4. Connect the microphone output of the Apamat to the spectrometer (D) and the recorder (E), refer to Figure 2, and switch on.
5. Switch on the exciter. The damping is set to 100 dB sound level by the meter range of the spectrometer. The recorder automatically picks up the noise spectrum between 10 and 10,000 Hz. It is recorded at each 1/3 octave in this range. Refer to Figure 3, Curve 'a'.
6. Remove the uncoated test panel from the apparatus.

7. Cut a specimen 840 +/- 0.5 mm x 840 +/- 0.5 mm from the sound-deadening material under test. (This must be one complete piece in order not to affect the acoustical performance of the material). Apply the sound deadening specimen to the uncoated test panel by the normal manufacturing process (i.e., by bonding, heat fusion or clamping).
8. Repeat steps 1 - 4, ensuring that test assembly is placed in the drawer with deadener material surface uppermost.
9. Record the noise spectrum for the coated test panel on the same graph as the one used for the uncoated panel but using a different colored ink. A graph similar to that shown in Figure 3, Curve 'b' is obtained.

Note: The signal from a high efficiency damping material is too weak for the recorder, in which case it falls below the lower limit of the apparatus (under 60 dB). In this case, the meter range is adjusted on the spectrometer, i.e., the range is reduced by 20 dB (see point A or B - Figure 3).

Evaluation

1. From Figure 3, the logarithmic values are plotted for both spectra in each 1/3 Octave band as a function of frequency. The difference between the curves in dB gives the acoustical performance of the sound-deadening material.
2. A further curve (Figure 5) is established to indicate the quality of the sound-deadening material by plotting the difference between the uncoated test panel values and the coated test panel values against the frequency (Hz).
3. Compare the curve obtained in Para 2 with the curve given in the applicable Engineering Material Specification. Report whether minimum performance is obtained.

Chemicals, materials, parts, and equipment referenced in this document must be used and handled properly. Each party is responsible for determining proper use and handling in its facilities.