

HYSTERESIS OF FLEXIBLE AUTOMOTIVE GRADE SEATING FOAM**Application**

This procedure is used to measure the hysteresis and/or resiliency characteristics of flexible foam padding material used for automotive seat cushions, seat backs and other applications.

Scope

An elastomeric foam deforms when a force is applied and recovers when a force is removed. The recovery, however, is not immediate; the deformation lags behind the applied force which gives rise to hysteresis or damping effects. These effects are important in seating foams since they affect vibration frequency and the transmissibility of forces through the foam. (Hysteresis, in a sense, is the direct opposite (or inverse) of resilience; e.g., 30 % hysteresis is equivalent to 70 % resilience.)

This procedure consists of subjecting a test specimen of the foam material to a number of ILD* load (65 % indentation-deflection) and unloading cycles under closely controlled conditions. The ratio of the energy absorbed to the total energy expended during the loading of the sample, obtained with the last cycle, is used to calculate the percent hysteresis (resiliency) of the material.

*Reference: ASTM D 1564, Load Deflection Test, Method A Indentation

Apparatus Required**Electronic Testing Machine**

Instron Universal Testing Equipment, Model TT-c or equivalent.

Source: Instron Engineering Corporation
2500 Washington Street
Canton, Massachusetts

Curve Integrating Device

Compensating Polar Planimeter (K & E Model No. 620015 or equivalent)
Automatic Integrator (Instron, Catalogue No. G-90-1 or equivalent)

Accessories

C-D Compression Load Cell, 10 - 500 kg load range
Indenter Foot, 323 cm²
Perforated Loading Table, 345 x 380 mm

Date	Action	Revisions
2001 03 27	Revised	Editorial – no technical change A. Cockman
1992 07 16		

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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

1. All test samples shall be 380 x 380 mm by full depth thickness (25 – 100 mm minimum) and shall contain skin on one side for molded foam samples. Larger samples should be bandsaw cut to these dimensions using care to obtain parallel sides and, where possible, a parallel top and bottom face.
2. Condition after cutting for 24 h at 50 +/- 5 % relative humidity and 23 +/-2 °C.
3. Set the crosshead and chart speed of the Instron to 250 mm per minute.
4. With the C-D compression load cell, the indenter foot and the loading table in place, calibrate and zero the Instron with the 5 kg standard weight and the FULL SCALE LOAD control set to the 900 g load designation (i.e. 10 kg scale load range).
5. Manually lower the crosshead with the 323 square cm indenter to contact the loading table and obtain a 45 g preload as noted on the recording chart.
6. Set 0 - 0 on the RETURN dial.
7. Raise the indenter, insert the test sample and with the surface skin side up for molded foam samples re-zero and recalibrate the Instron with the sample also on the loading table.
8. Determine the initial sample thickness by manually lowering the indenter until a 45 g preload is showing on the recording chart.
9. Read sample thickness on the RETURN dial and record.
10. Set 0 - 0 on the GAGE LENGTH dial.
11. Set LOWER EXTENSION dial to 80 % of the initial thickness of the specimen as obtained in Step 8 above.
12. Set CYCLE CONTROL indicator to the "extension" position; the SIMPLE-COMPOUND switch to "Simple"; and the two remaining CYCLE-STOP switches both to "Cycle".
13. Set the FULL SCALE LOAD control to the 500 kg load range.
14. Deflect the sample 80 % of the original height, twice.