

Technical Notes on Durometer Hardness Testing

The Durometer is the international standard for the hardness measurement of rubber, plastic and other non-metallic materials. Durometers are described in the American Society for Testing and Material specification ASTM D2240, which is the recognized specification for the instrument and test procedures.

There are a number of brands of durometers, all of which must conform to the same ASTM specifications if they are to be known as genuine Durometers. Sometimes a Durometer Scale may be referred to by its' brand name. The "A" scale is the Durometer A scale (or type A) and all brands will, or should, give interchangeable readings.

Hardness and other Related Characteristics

The Durometer Hardness test is non-destructive and the small instrument size, with no need for elaborate specimen preparation, makes it an ideal method for checking materials under any condition with accuracy and reliability. All durometers have a springloaded indenter which applies an indentation load to the specimen, thus sensing the "hardness", which can be related to other material characteristics. Use of a Durometer provides a quick yet accurate way to indirectly measure other material properties, such as tensile modulus, resilience, plasticity, compression resistance, and elasticity.

It is relatively simple to determine the correlation between Durometer hardness and other properties for a given material. A set of specimens of the material (or family of materials) is first tested on a standard tester for property desired, eg. tensile strength. A set of Durometer readings for the same samples is then observed and noted. Thereafter, only the Durometer hardness need be observed on similar material specimens to obtain a reasonable measure of the other property. Some properties correlate exactly, while others are sufficiently close for practical use as an initial quality control or materials engineering test.

Calibration, Checking, Etc.

"My Durometer rests below zero, is it out of calibration?"-This is a common question asked by many first-time durometer users. The answer to the question, in most cases, is no. Certain Rex gauges and models rest at roughly six points below zero: this is because the gauges are made in accordance with ASTM D2240, which states that some Durometers have a preload of 56g at a zero reading. Therefore, a Durometer giving a less-than-zero reading at rest is not out of calibration.

To make a simple calibration check, take a reading on smooth glass or steel (WARNING: THIS IS NOT RECOMMENDED FOR TYPE D DUROMETERS-THE GAUGE MAY BE SEVERLY DAMAGED). The gauge should read within ½ point of 100. In a Rex Durometer, the unique built-in linearity assures the gauge is in proper calibration throughout the entire scale. Should a Rex Durometer not give the above reading on a smooth, hard surface, it may be assumed that the Durometer has been damaged, and it should be sent to Rex for inspection and/or repair.

Testing Procedures

Because Durometers measure hardness by relating the penetration of an indenter into a specimen, and because the indenter travel may reach .100", it follows that a specimen must be of sufficient thickness to ensure a proper, sensitive test. Generally, samples to be tested should not be less than 1/4" (6mm) thick. Exceptions may be made for harder materials because the indenter is at less than half stroke. For example, a material that checks near 80 durometer points can be as thin as .118" (3mm), because the indenter will only extend out .020" during testing. *What must be avoided is a specimen so thin that the indenter may sense the hardness of the underlying surface.* This will give a false reading due to the "anvil effect". The Rex type M durometer can be used when checking materials thinner than ¼" (as thin as .050").

When testing flat specimens too thin to give accurate readings, the specimens may be stacked to provide the required thickness.

In addition to sufficient thickness for testing, sufficient material around the sides of the indenter must be present. With soft materials, a minimum 1/4" (6mm) is recommended. Hence, all Rex Durometers are made with a 1/2" diameter foot which provides the necessary area of contact. Rex offers an extended foot useful for testing very soft materials, or for enhancing repeatability in a lab-type environment.