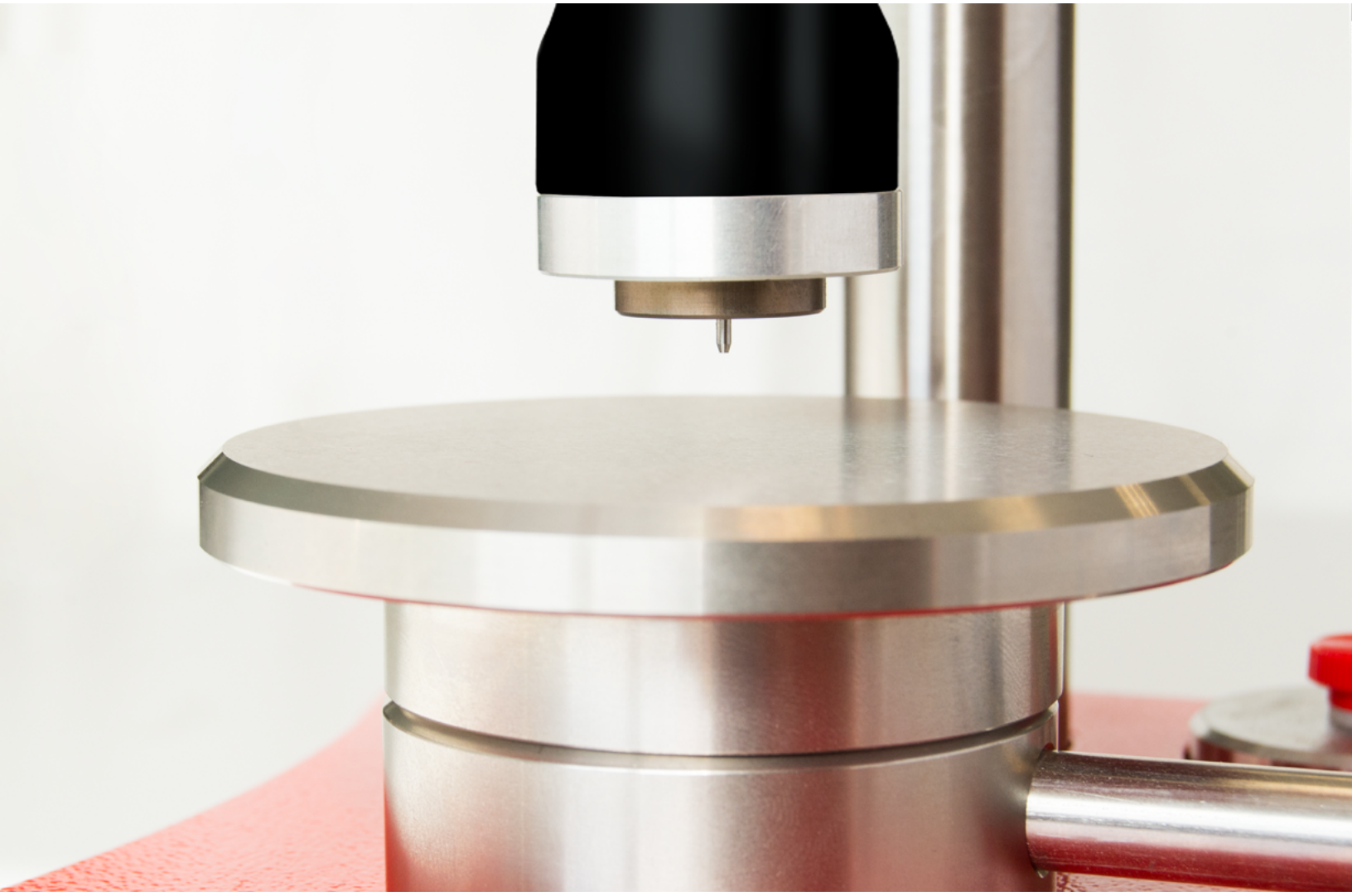
IRHD vs Shore: Hardness Testing

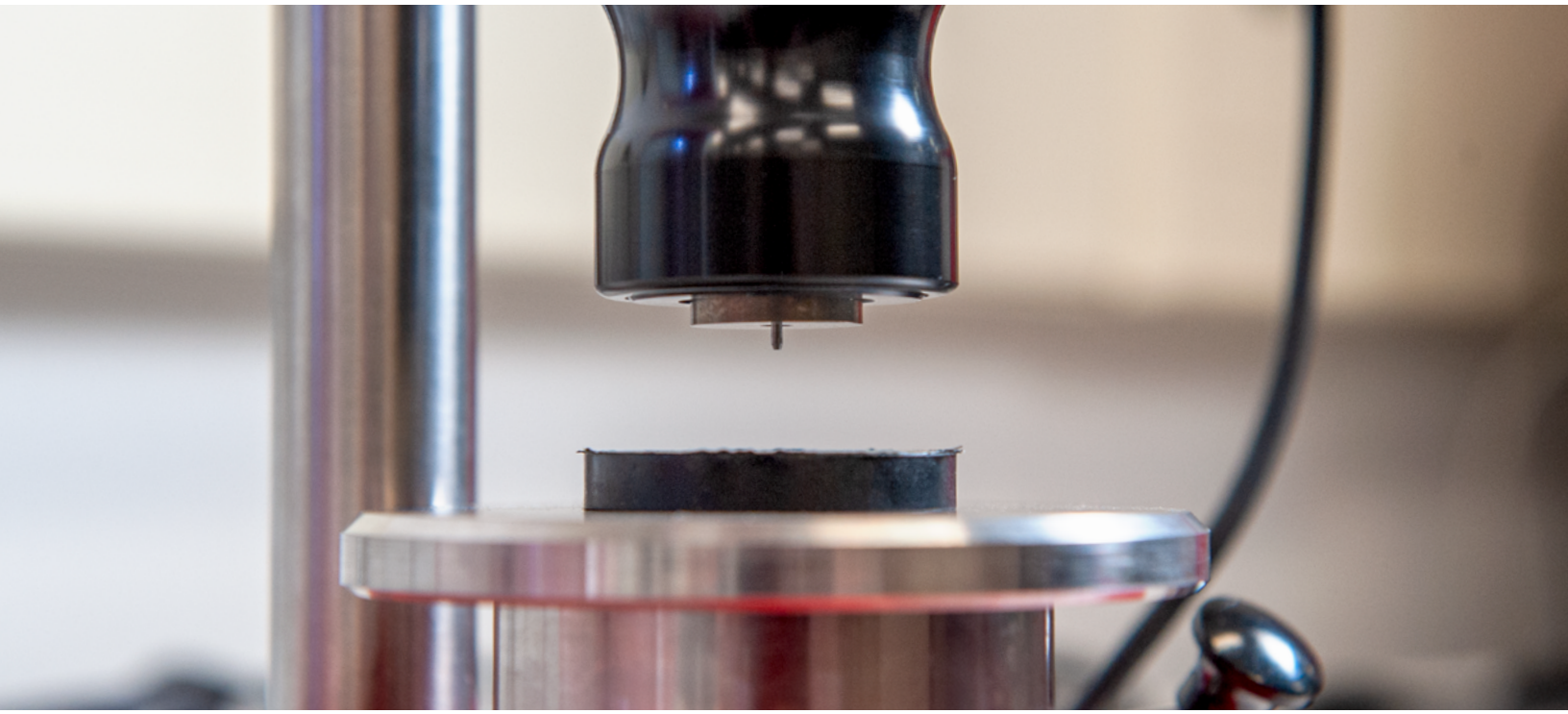


MonTech®
Rubber Testing Solutions

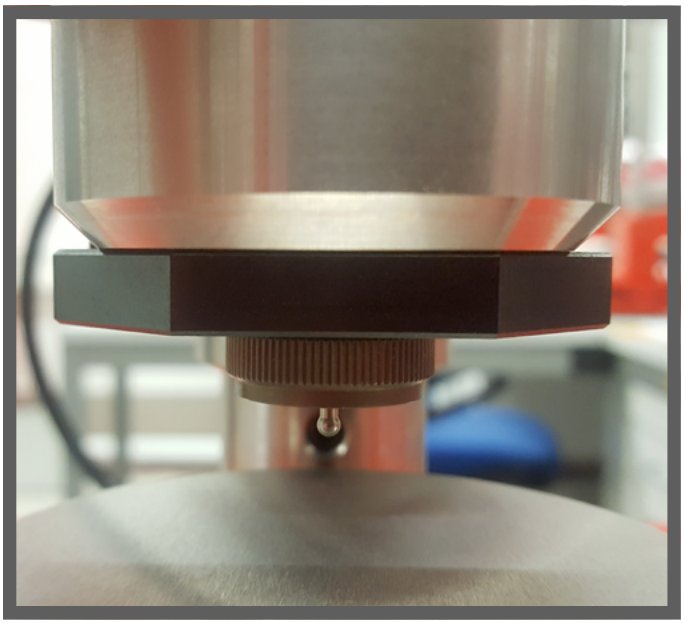
Introduction

One of the most important properties used to characterize rubber is hardness. The two primary scales for this measurement are the Shore scale and IRHD scale.

This eBook outlines the primary differences between each scale and instrument. It also highlights when and how to use the instruments and elaborates on each different durometer head type. There are positives and negatives to each test method. However, with a trend of incorporating IRHD durometers into R&D laboratories or final goods inspection, it's time to unfold the differences.



International Rubber Hardness Degree (IRHD)



IRHD N hardness tester

Within 35 seconds, IRHD durometer efficiently measures the hardness of cured rubber. Opposite of the Shore method, the IRHD method is non-destructive. Every IRHD durometer test method requires a spherically tipped indenter to prevent damage to the test specimen. However, the diameter of each spherical indenter is different per test method.

To perform the test, the sample must first be placed on the specimen holding plate and held under the datum with a primary specified force for five seconds. Following the five seconds, a secondary load force is applied for the remaining thirty seconds. From there, the durometer converts the displacement of the datum's movement into IRHD units.

The Four Primary IRHD Measurements

Refer to ASTM 1415 and ISO 48 for additional information.

IRHD M: Micro

- *Measurement Range:* 35-85 IRHD
- *Sample Thickness Required:* 4mm or less
- *Example Applications:* Thin molded parts
- *Primary Load Force:* 235mN
- *Secondary Load Force:* 145mN

IRHD N: Normal

- *Measurement Range:* 35-85 IRHD
- *Sample Thickness Required:* 4mm or greater
- *Example Applications:* Soft rubber, high elastic materials, plastic ductile materials
- *Primary Load Force:* 8.3 N
- *Secondary Load Force:* 5.4 N

IRHD H: High

- *Measurement Range:* 85-100 IRHD
- *Sample Thickness Required:* 4mm or greater
- *Example Applications:* hard rubber, hard plastics, acrylic glass, polystyrene, rigid thermoplastics, pressure rollers, cellulose-acetate.
- *Primary Load Force:* 8.3 N
- *Secondary Load Force:* 5.4 N

IRHD L: Low

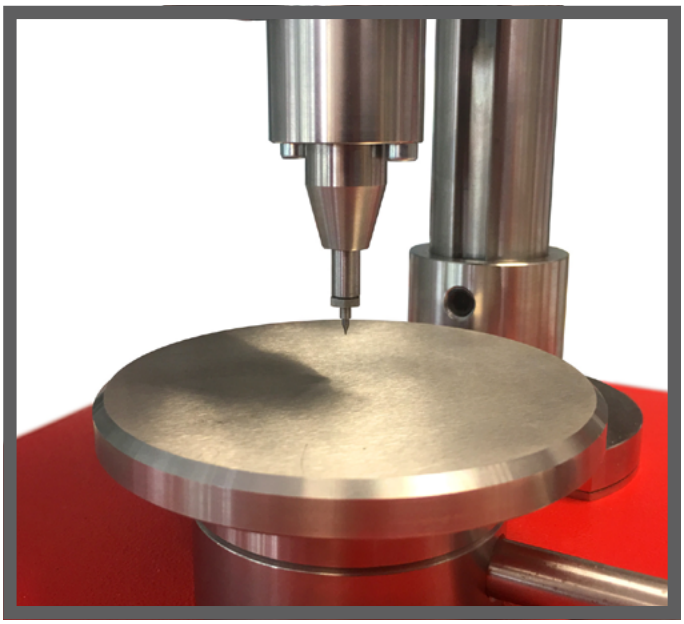
- *Measurement Range:* 10-35 IRHD
- *Sample Thickness Required:* 6 mm or greater
- *Example Applications:* sponging-foam rubber cellular rubber, silicones
- *Primary Load Force:* 8.3 N
- *Secondary Load Force:* 5.4 N

Shore Hardness Testing

Shore hardness test methods are the most commonly used hardness tests for rubber. The most popular Shore test types include *A, B, C, D, DO, O,* and *OO*. All Shore hardness tests are destructive as the sample will be pierced by the indenter.

The main difference between the two hardness methods is Shore's usage of spring forces and a sample indenter to calculate hardness instead of relying on load forces. The shore test also takes significantly less time than the IRHD method. Each Shore method requires a pre-set dwell time, or a time that the durometer head contacts and pierces the sample. Standard ASTM dwell times are between one and three seconds.

The test may utilize hand held Shore durometers but for the best accuracy and repeatability it is recommended to use test stands or automated instruments.



Shore D hardness tester

Primary Shore Measurements

Shore A:
Application: Standard elastomers and rubber materials (Most popular method)

Shore B:
Application: Moderately hard rubber (30d indenter)

Shore C:
Application: Medium to moderately hard rubber materials

Shore D:
Application: Hard rubber and plastics (30d indenter)

Shore DO:
Application: Granular material

Shore O:
Application: Softer rubber

Shore OO:
Application: Sponge, gels and very soft materials

Shore vs IRHD?

Rubber hardness will always be an essential test for any compound and its application. IRHD test methods are the best choice if a user is trying to perform a non-destructive test. On the other hand, the Shore method pierces the sample, making it a destructive test.

Test method times also play a factor in choice. Shore test methods typically take one to three seconds whereas IRHD tests take 35 seconds to complete. Not all laboratories can accommodate an operator's time for 35 seconds, especially if a high number of tests need to be accomplished each day.

There is no wrong or right. Selection depends on the requirements users feel best for their applications.

For more information on Hardness Testing
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or call us at **1-800-552-5115**