

## **Elastomer Hardness Gages, Type A vs. Type M**

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For decades rubber was measured with a type A durometer gage. According to ASTM D2240, "Standard test Method for Rubber Property — Durometer Hardness," you need a 6mm (.240 inch) min thick piece of rubber and large enough to be 12mm (.480 inch) away from the edge and previous test point. This and the geometry of the gage make it unsuitable for measuring small cross section O-rings or thin pieces of rubber. Shore Instruments came out with the Type M gage, Micro O-Ring System, specifically for measuring small cross section O-rings and thin pieces of rubber (not less than 1.25mm thick). This system was designed to give similar reading to the type A gage, but the gages will not yield exactly the same reading. It is not uncommon to get 4-5 points difference in the readings (given that all gages are properly calibrated). These scales are different, and according to Instron, there is no correlation between the Shore A and Shore M scales. In other words you can not measure a piece of rubber with a type M gage and convert the reading to type A scale and vice versa.

The major differences between the type A and Type M durometer gages are the indenter geometry (its shape) the spring force on the indenter and the size of the foot. The type A gage has a "Frustum Cone" indenter with 821 gram max spring force. The type M gage has a "Sharp 30° Angle" indenter with a 78 gram max spring force. The type M has a much smaller diameter indenter, .7874mm (.030 inches), with a sharp point as compared to the larger diameter type A indenter, 1.27mm (.050 inches) with a .79mm (.031 inch) diameter flat bottom instead of a point.

When you have a durometer Type A gage calibrated, after calibration it is accurate to only +/-2 points. After calibrating a type M gage it is accurate to +/-4 points. It's repeatability (variation caused by equipment) and reproducibility (variation caused by the operator) are not real accurate. Hardness instruments with a GR&R study of 10% to 30% is acceptable in most industries. Repeatability and reproducibility can be calculated by performing a Gage R & R Study. (Google Gage R & R and you will find several web sites that will describe how to perform this study). What this means is, it is not uncommon to get different readings from the same operator (repeatability) and different reading from two or more operators (reproducibility) on the same rubber samples.

Factors like temperature, humidity, the rate at which you apply the gage, how much pressure you apply to the gage, how the test specimens were conditioned prior to testing will effect your readings. This is why we recommend using a durometer gage on a conveloader stand such as the Shore Instruments CV71200 Conveloader for the type A gage. The conveloader controls the rate of application, the amount of force applied to the gage and keeps the gage's indenter perpendicular to the sample which help to increase repeatability and reproducibility of your readings.