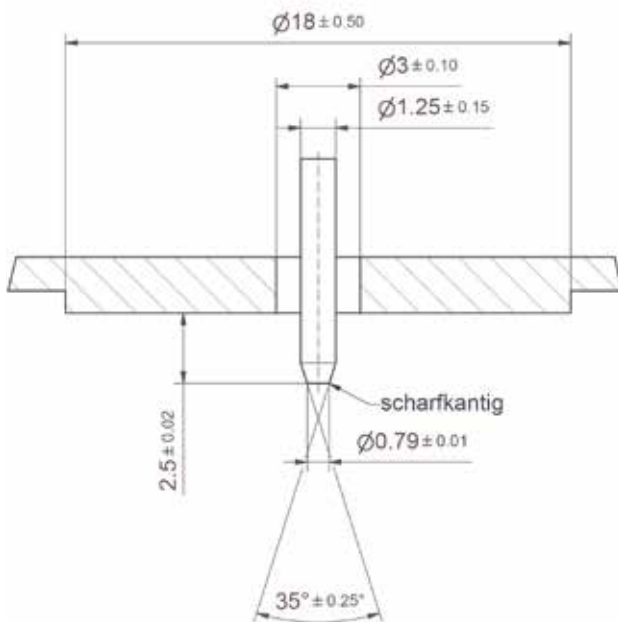


### General information

The Shore-A-hardness is an essential inspection criterion for elastic materials. With this method the quality and the application range of products can be determined.

### Standard measurement

The standard method describes the penetration of a cone-tipped needle into the specimen, whereby the load decreases during the increasing penetration depth. This is measured as a function of time. Due to the decreasing load it is possible to measure a very large range of elasticity. On hard specimen a high load together with an inferior cross-sectional area (top) is effective. Soft elastomers, however, can be measured by a deep penetration of the needle into the specimen. Thereby the cross-sectional area increases and the load is reduced.



As for standardized measurements minimum sizes are required, this can often cause a limitation. For conventional units, a specimen with a minimum wall thickness of 6 mm and a 18 mm supporting space in diameter is presupposed.

### Technical solution

In order to measure finished parts whose dimensions are too small for the standard method, the measuring system was scaled.

Therefore the needle geometry defined in standards was scaled linearly by a factor of 10. To create identical loading conditions for Shore-A- measurements and to obtain comparable measurement results, the pressure load ( $p$ ) had to be re-calculated (see formula). This means that the load characteristics is scaled down by a factor of  $10^2 = 100$ .

Using the miniaturized Shore-A method, it is possible to determine the hardness of finished parts independently of their size and geometry.

$$p = \frac{F}{d^2 \cdot \pi/4}$$

### Comparability

The testing corresponds to the specific physical load parameters of the Shore-A measurement and thus the results obtained are absolutely comparable. Since unfavorable specimen characteristics such as geometry deviations do not affect the measuring, very high measurement and repetition accuracies are obtained. Comparative measurements on different products have shown that the miniaturization of the geometry to a needle tip diameter of 0.079 mm does not influence the measuring results.

### Conclusion

By using a miniaturized needle Shore-A measurements can be performed even on smallest components. Thereby a wall thickness of 0.6 mm is sufficient for the measurement. For comparative hardness measurements a wall thickness of even only 50  $\mu$  is enough.