

A New Approach for Measurement Uncertainty Estimation in Material Testing

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Abstract

The article addresses a more meaningful approach for measurement uncertainty (MU) estimation, particularly in the materials' testing field. The paper contributes to the state of the art by the development of a consistent approach for calculating the probability density function (pdf) of the sample mean statistic based on uniform pdfs. The MU estimation is based on multiconvolutional approach of the pdfs of the measurand. The MU of the Rockwell C hardness test was estimated by GUM approach and by the author's approach. The paper underline that the GUM approach given in ISO 6508-1 does not provide clear evidence for assigning Gaussian distribution to the hardness HRC. The pdf of the sample mean was obtained by 5-fold convolved product of uniform pdf assigned to the measurand. The most important result is that, when dealing with a measurand whose pdf is not known or is insufficiently documented, the best approach is to consider it has a uniform distribution. The interval of variance of the outcomes may be considered as the distribution width. Another important issue is that for estimating MU using the multiconvolutional approach, only data provided by the testing process are used, while the classical approach uses supplementary data.

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