Correlation of a phase change correction and surface roughness

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Abstract

The interferometric phase correction has a fairly high uncertainty because of the difficulty of the measurements. In addition, phase measurement is much too difficult to make on each block and so only a few blocks from each manufacturer are tested and the average of these measurements are assigned to all blocks from the same manufacturer. Estimated uncertainty in the phase correction is typically around 6 nm. There have been a number of attempts to measure phase by other means such as integrating sphere, but none have been particularly successful due to complexity of the measuring process.

However, gauge blocks from the same manufacturer but with different materials, or the same material from different manufacturers, generally have different phases. One way to reduce phase problems is to restrict your master blocks to one manufacturer and one material. Another way to reduce effects of phase change is to use gauge blocks and platens of the same material and manufacturer. While this seems simple in principle, it is not as easy in practice. Most manufacturers of gauge blocks do not make platens.

Here we present an alternative method to determine phase correction of an individual gauge block by measuring roughness of the gauge block's face. By applying this technique, phase correction of each block can be determined with a simple measurement. Figure 1 illustrates a good agreement between the phase correction obtained from the stacking method and those obtained from the roughness measurement. The advantage of this method is that not only the procedure is simple but the experience of the operator does not have impact of the accuracy of measurement.

Image

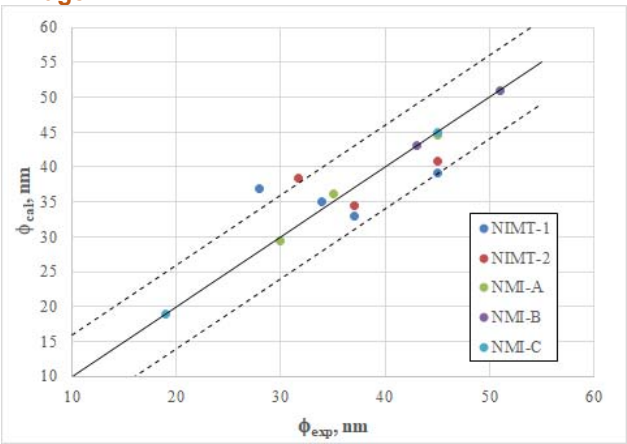


Figure 1: Correlation between measured phase correction and calculated phase correction

Recent Publications

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3. J. Buajarern, T. Somthong, S. H. R. Ali and A. Tonmeuanwai 'Effect of Step Number on Roundness Determination Using Multi-Step Method' Int. J. Precis. Eng. Manuf. 14 (11), 2047-2050, 2013
4. J. Buajarern, P. Phuaknoi , T. Somthong, and A. Tonmueanwai 'Development of the probe calibration system for the roundness measuring machine' J. Indus. Tech. 9 (1), 33-39, 2013
5. P. Phuaknoi, J. Buajarern, S. Piengbangyang, and A. Tonmueanwai 'Determination Model of Phase-Change Correction for High Precision Gauge Block Calibration' J. Indus. Tech. 8 (3), 63-68, 2012



Biography

Pawat Phuaknoi has his expertise in length measurement and passion in inventing measuring equipment in order to improving product quality of the local industrial sector. His main responsibility at NIMT is not limited to providing measurement service to the customer but also giving consultancy to the private calibration laboratories. He has developed gauge block interferometer system for gauge block calibration. As a result, he is expertise in uncertainty evaluation for gauge block measurement.

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Notes/Comments: