

Determination of phase correction for interferometrically measured gauge blocks based on 3D surface roughness analysis

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Phase correction is necessary for interferometric measurements of gauge blocks length using an auxiliary platen. The phase correction compensates the differences in the reflecting properties of the gauge block and the platen surfaces.

Different phase corrections are reported for gauge blocks of different producers, made from different materials and with different surface roughness of the gauge block and the platen. Experiments prove inadequacy of applying standard surface roughness parameters in order to find the relation between the phase correction and surface roughness. In the paper the process of selection of the best surface roughness parameter for this purpose is analyzed. The new parameter based on the difference between the weighted mean of maximum and minimum asperities of 3D surface roughness measured by using modernized Linnik's phase shifting interferometer is introduced. The results of comparison of the values of phase correction calculated from the difference between the weighted mean values and calculated from stack method measurement are presented and discussed. The complementary method of phase correction measurement based on cross wringing method with the use of modernized phase shifting Kösters interferometer is proposed. The cross wringing method allows to measure under the same ambient conditions the length deviation of the gauge block wrung simultaneously to another gauge block and the platen of different material or different surface roughness. The sum of the difference between the results of the measured length deviations and the difference between the roughnesses of both surfaces is the difference in platen materials phase shift correction. The results obtained by cross wringing method are presented and discussed.