

Experimental determination of influences on a gauge block's stack length

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ABSTRACT

Gauge blocks are an important basis for maintaining traceability in dimensional metrology, used for calibrating length measuring instruments and for adjustments in all branches of manufacturing. Their important feature is that they can be wrung with small dimensional uncertainty. An overview of the factors influencing the accuracy of a stack length, such as the quality of the gauge blocks (grade, wear), surface preparation (cleaning and usage of a lubricant), wringing (way and time, temperature of hands and gloves) is given in the paper. Experiments for determining these influences were performed with a highly precise gauge block comparator. Proper selection of gauge blocks, preparation of their surfaces and oiling improve the accuracy of a stack length. Application of a lubricant, wiped with a dry cloth or paper towel, helps to wring them more easily, but its contribution to the stack length in the experiment was 0.1 µm for oil and 0.2 µm for grease. Temperature changes of gauge blocks were estimated by holding them, and, during wringing in well controlled air conditions, monitoring them to yield the empirical coefficients of their warming up. The results showed that usage of gloves reduces the warming up by approximately half, but still the stack must be stabilised in well controlled conditions for at least one hour if it is used for micrometre-level precise measurements.

ARTICLE INFO

Keywords:
Gauge blocks;
Wringing;
Measurement uncertainty;
Dimensional metrology

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Article history:
Received 7 April 2022
Revised 25 September 2022
Accepted 28 September 2022



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