

## Dimensional measurements with submicrometer uncertainty in production environment - DTU Orbit (08/11/2017)

### Dimensional measurements with submicrometer uncertainty in production environment

The work concerns a laboratory investigation of a method to achieve dimensional measurements with submicrometer uncertainty under conditions that are typical of a production environment. The method involves the concurrent determination of dimensions and material properties from measurements carried out over time. A laboratory set-up was developed comprising a pair of electronic probes mounted on a Zerodur block featuring near zero thermal expansion. Three temperature sensors, data acquisition system, and a temperature regulated plate for heating the workpiece were implemented. Investigations with synchronous measurements of length and temperature during cooling from 25 °C to 20 °C were carried out, using two calibrated gauge blocks as workpieces, i.e., a steel gauge block and a tungsten carbide gauge block. Each measurement was repeated 9 times. Coefficients of thermal expansion (CTE) for the two gauge blocks along with their uncertainties were estimated directly from the measurements. The length of the two workpieces at the reference temperature of 20 °C was extrapolated from the measurements and compared to certificate values. The investigations have documented that the developed approach and laboratory equipment allow traceable length measurements with expanded uncertainties ( $k=2$ ) below 1  $\mu\text{m}$ .

### General information

State: Published

Organisations: Department of Mechanical Engineering, Manufacturing Engineering

Authors: De Chiffre, L. (Intern), Gudnason, M. M. (Intern), Madruga, D. (Intern)

Pages: 163-4

Publication date: 2015

### Host publication information

Title of host publication: Proceedings of the 15th International Conference of the European Society for Precision Engineering and Nanotechnology

ISBN (Print): 9780956679079

Main Research Area: Technical/natural sciences

Conference: 15th euspen International Conference & Exhibition (2015), Leuven, Belgium, 01/06/2015 - 01/06/2015

Publication: Research - peer-review › Article in proceedings – Annual report year: 2015