Calibration standards for surface topography measuring systems down to nanometric range

Fact Sheet

Project Information

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FP4-SMT

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1 November 1997

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31 December 2000

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€ 0

EU contribution
€ 0

Coordinated by
Technische Universität Chemnitz
Germany

Objective

For competitiveness in the global market, the ability to manufacture goods to increasingly lower surface roughness of the functionally relevant surfaces, e.g. video recorders, microelectronic devices, machine tools, and automobile components is a simple necessity. For Quality Assurance and Process Control the precise and accurate measurement of surface topography is therefore a major technological problem in science, engineering and manufacturing industry. The problem arises due to the lack of traceable standard artefacts for instrument calibration in the X, Y and Z directions and for the calibration of filters. These problems restrict the ability quantitatively to define surface topography and create conflict between customer and
manufacturer and among metrology laboratories.

For the most demanding applications a whole range of recently developed and functionally related surface detection systems with resolutions down to the nanometric range are being used, none of them currently well standardised and calibrated. Therefore, for ease of trade within the EU and between the EU and the rest of the world these problems must be resolved. Existing ISO standards on calibration specimens (ISO 5436) are inadequate and extremely limited in that they only cover contacting stylus instruments and only partially the standardised measuring ranges for these instruments. The whole range of non-contacting instruments are not covered by any National or International Standards despite their widespread use in industries ranging from automotive manufacture to ultraprecision manufacture of video recorders, compact discs and data storage systems.

The project is to address these problems in the following way. To devise novel traceable calibration techniques for Surface Topography Measuring Systems to include methods and procedures applicable across the full range of instrumentation including the nanometric regime. It is expected that this could be achieved by a 3 year research programme with the objectives:
(1) Primary calibration standards (artefacts), also suited for replication processes and covering the whole measuring ranges of available instruments in X, Y and Z direction
(2) Active calibration devices able to be calibrated to sub-nanometre range
(3) Technologies for industrial reproduceable manufacture of low cost replicas
(4) Calibration procedures for calibration specimens and instruments
(5) Non-invasive cleaning methods for calibration standards.

Keywords: Metrology, Traceability, Calibration, Nanotechnology, Surface Characterization, Surface Topography, Surface Roughness

Programme(s)

Topic(s)

Funding Scheme

CSC - Cost-sharing contracts

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