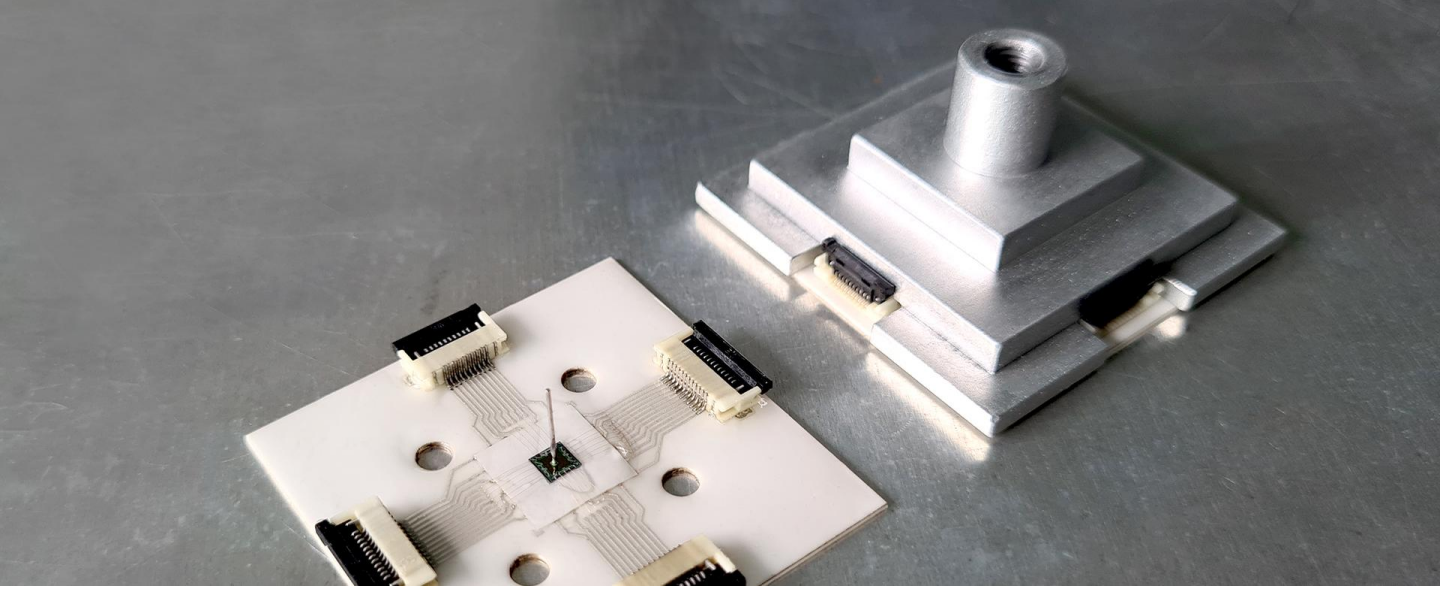


MEMS Nanointender for hardness measurements

MOTIVATION

- Development of a combined force-displacement sensor for quasi-non-destructive hardness testing of a wide range of materials
- Replacement of time-consuming manual calibrations with a highly precise self-calibration method using silicon leaf springs
- Avoidance of optical indentation evaluation, which is no longer feasible with light microscopy for very small indentations and is costly with electron microscopy
- Reduction of measurement errors through an Abbe-compliant arrangement of force and displacement measurement along a single line

APPLICATION

- Integration into or retrofitting of universal testing machines and XY manipulators
- Testing of large or complex components at freely selectable positions
- For extremely thin layers below 10 nm
- Determination of hardness, reduced elastic modulus, and creep behavior

FEATURES

- Complete closed-loop nanoindentation sensor system
- Recording of the force–penetration-depth curve as the basis for evaluation
- Force resolution down to 5 µN
- Combined measurement module for the indenter, force measurement, and displacement measurement
- Two three-dimensional force sensors: a stiff upper force sensor and a compliant lower displacement sensor
- The force-displacement line is defined by the flexure plate geometry
- A printed circuit board connects the sensor blocks and silicon strain gauges to the external electronics
- Threaded mounting of the nanoindenter to the piezo actuator for precise and compact integration

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CiS Forschungsinstitut für Mikrosensorik GmbH

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