IEEE SW Test Workshop

Semiconductor Wafer Test Workshop

June 9 - 12, 2013 | San Diego, California

Automated Probe Card Repair

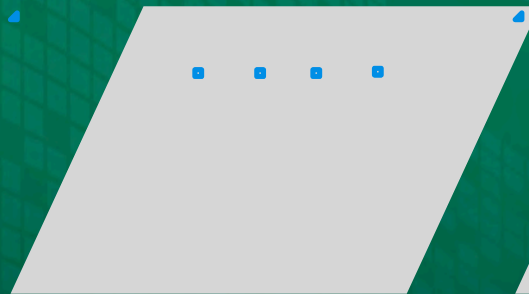
Based on an Advanced Closed Loop Manufacturing Approach

Stefan Scherer
Mark Raleigh

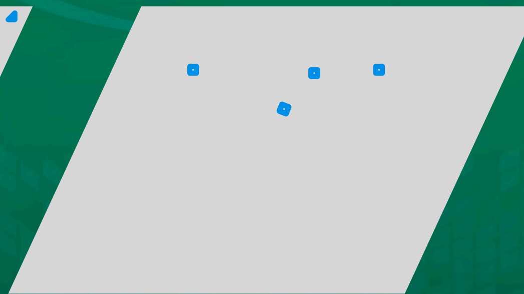
Alicona Manufacturing

Probe Card Repair Situation

- **Probe card repair is a costly and demanding manual challenge**



probe card with correct probes



probe card with damaged probe

The card is designed with a certain redundancy thus if the card is malfunctioning multiple probes are damaged.

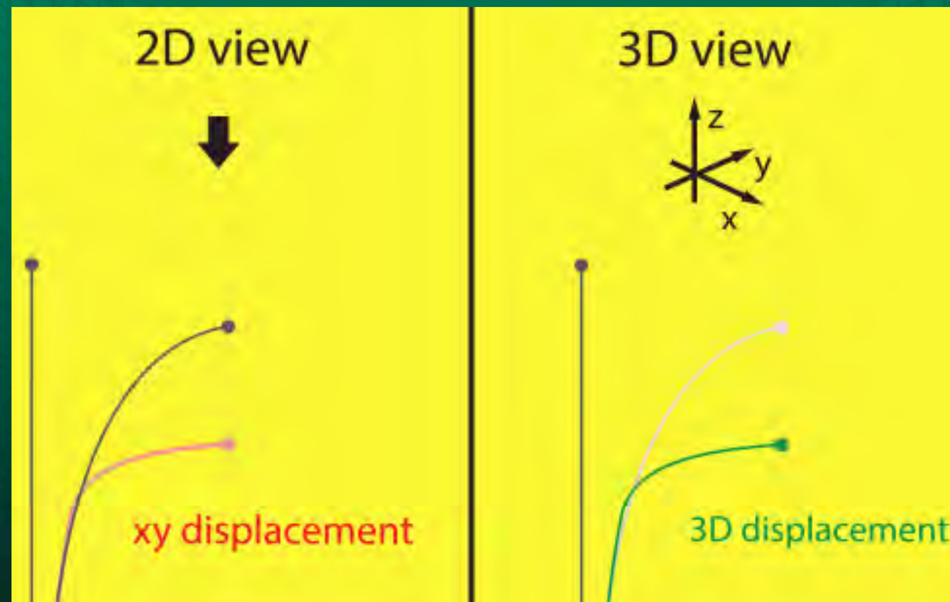
Current Situation

- **Situation 1:**
  Manual repair station

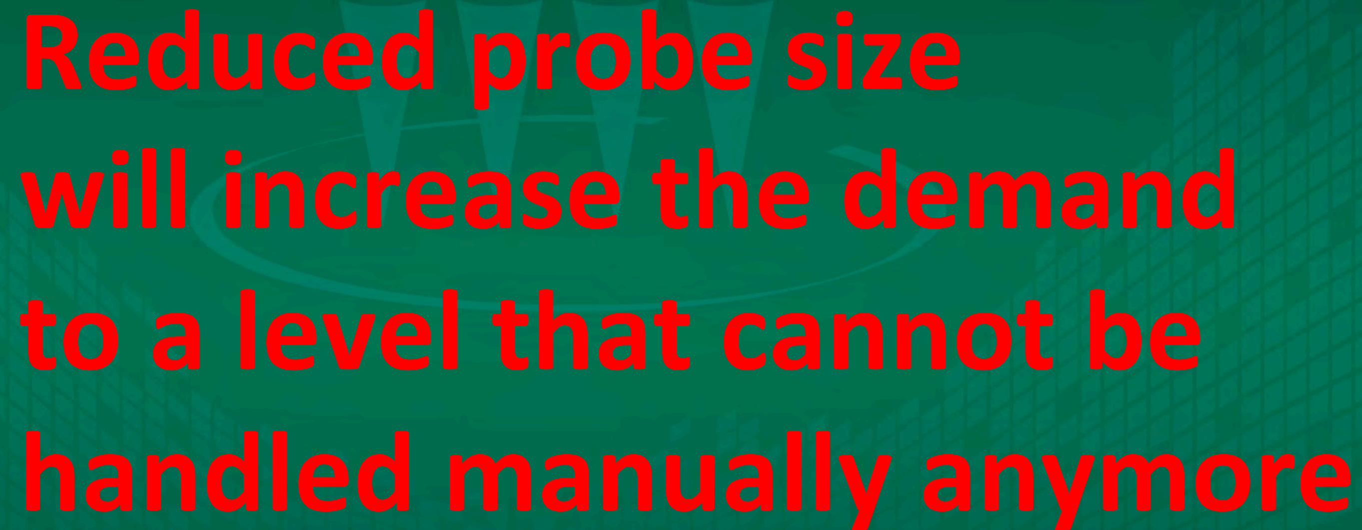
- **Situation 2:**
  Manual repair station with metrology support

Current Challenges

- Systems mostly just "support" the manual repair procedure
- Probe array is challenging to deal with
- Semi automated metrology has referencing limitations
- 2D metrology provides limited position accuracy



And in the Future?



Our Approach

- Fully automated system
- Based on an intelligent 3D measuring system combined with a gripping system
- Both mounted on a high precision three axis machine
- Closed loop verification of repair process
- Patent pending manipulator

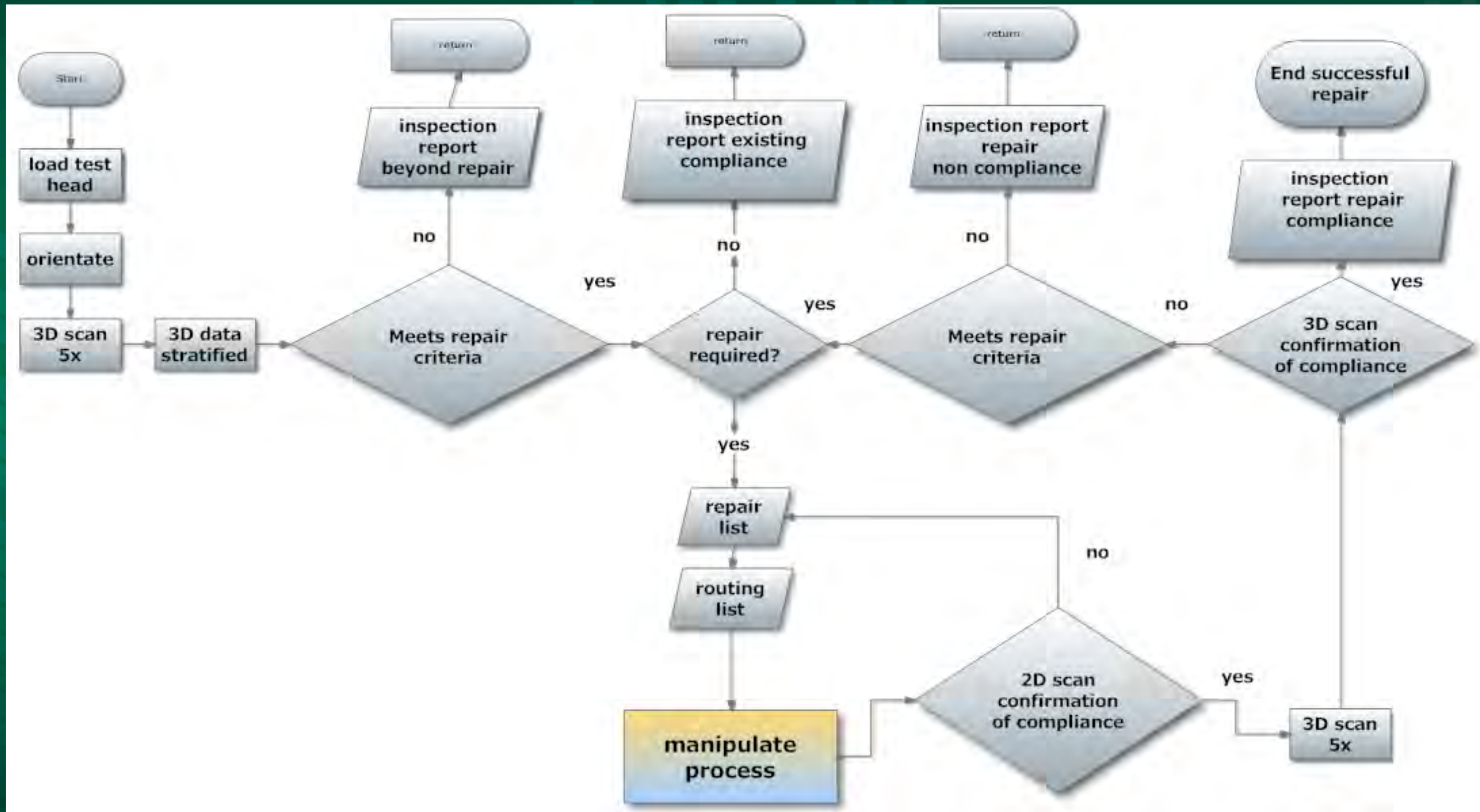
Automated Probe Head Repair

Machining platform
(high precision xyz movement plus tactile touch sensoring)

Probe manipulator for 3D probe positioning

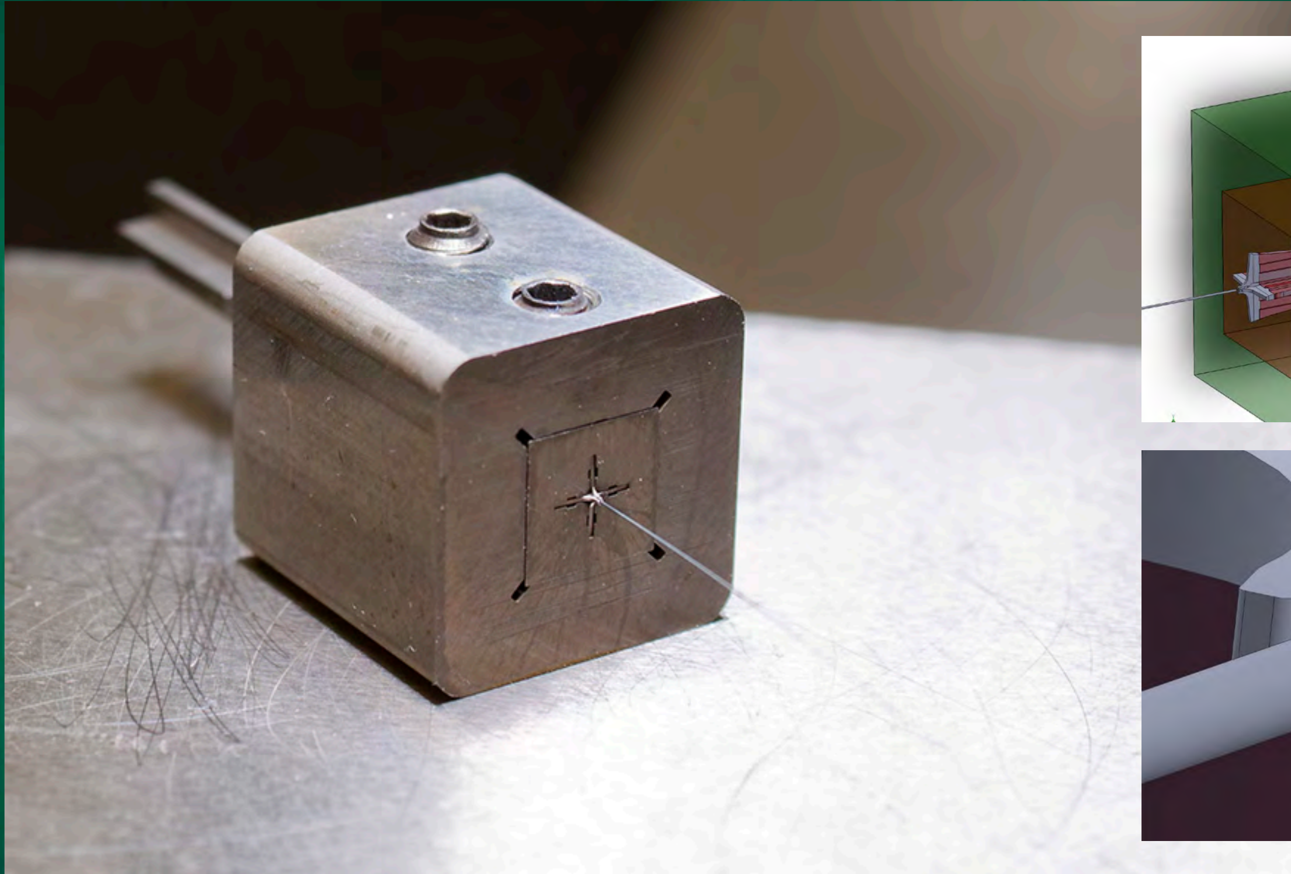
3D vision and metrology sensor

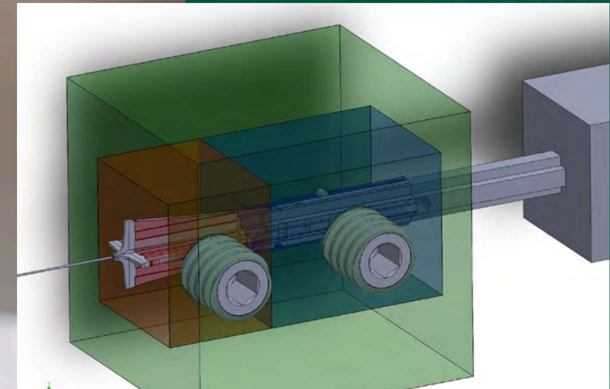
The Process

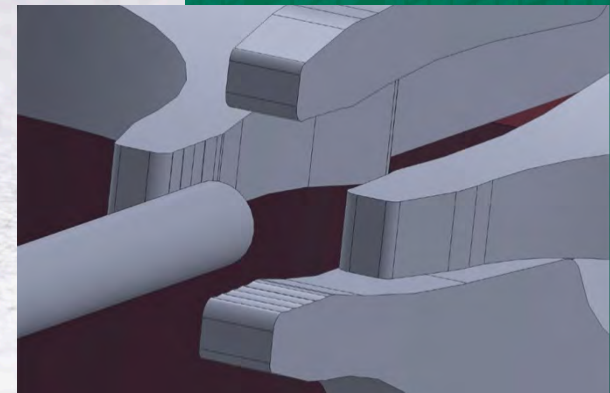


June 9 - 12, 2013
IEEE Workshop

Innovative Gripping Design

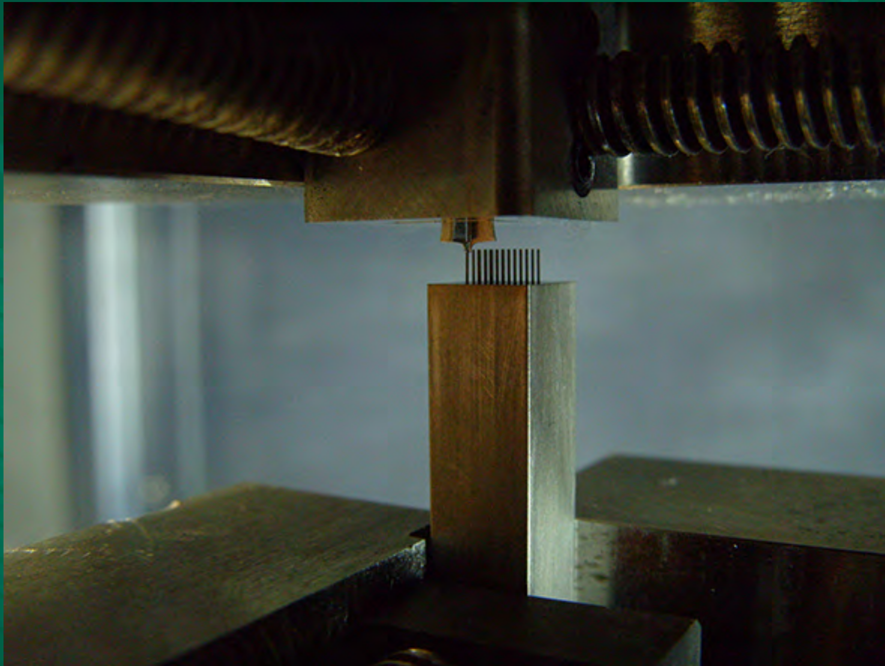


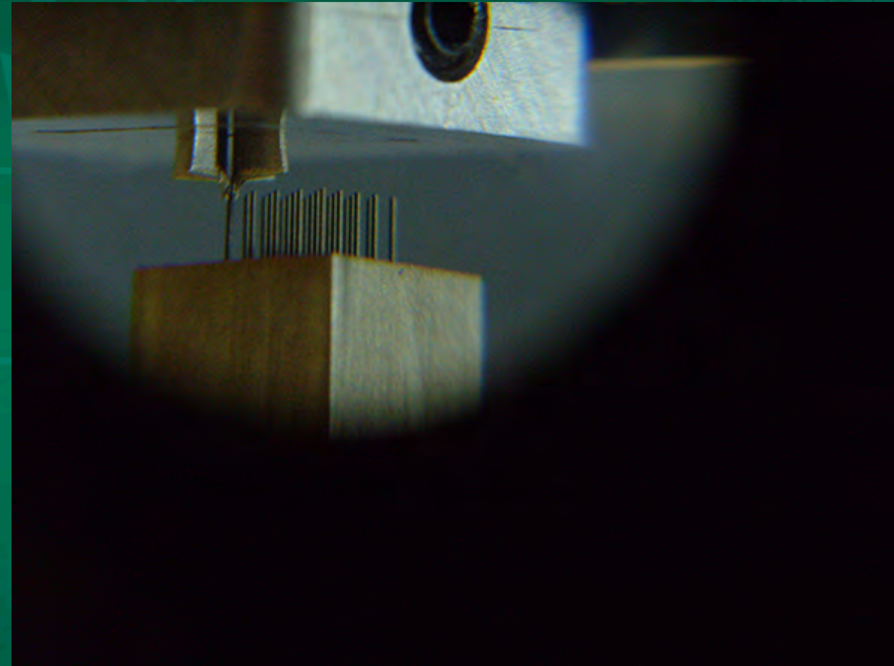




75micron Gripper

Gripper in Use

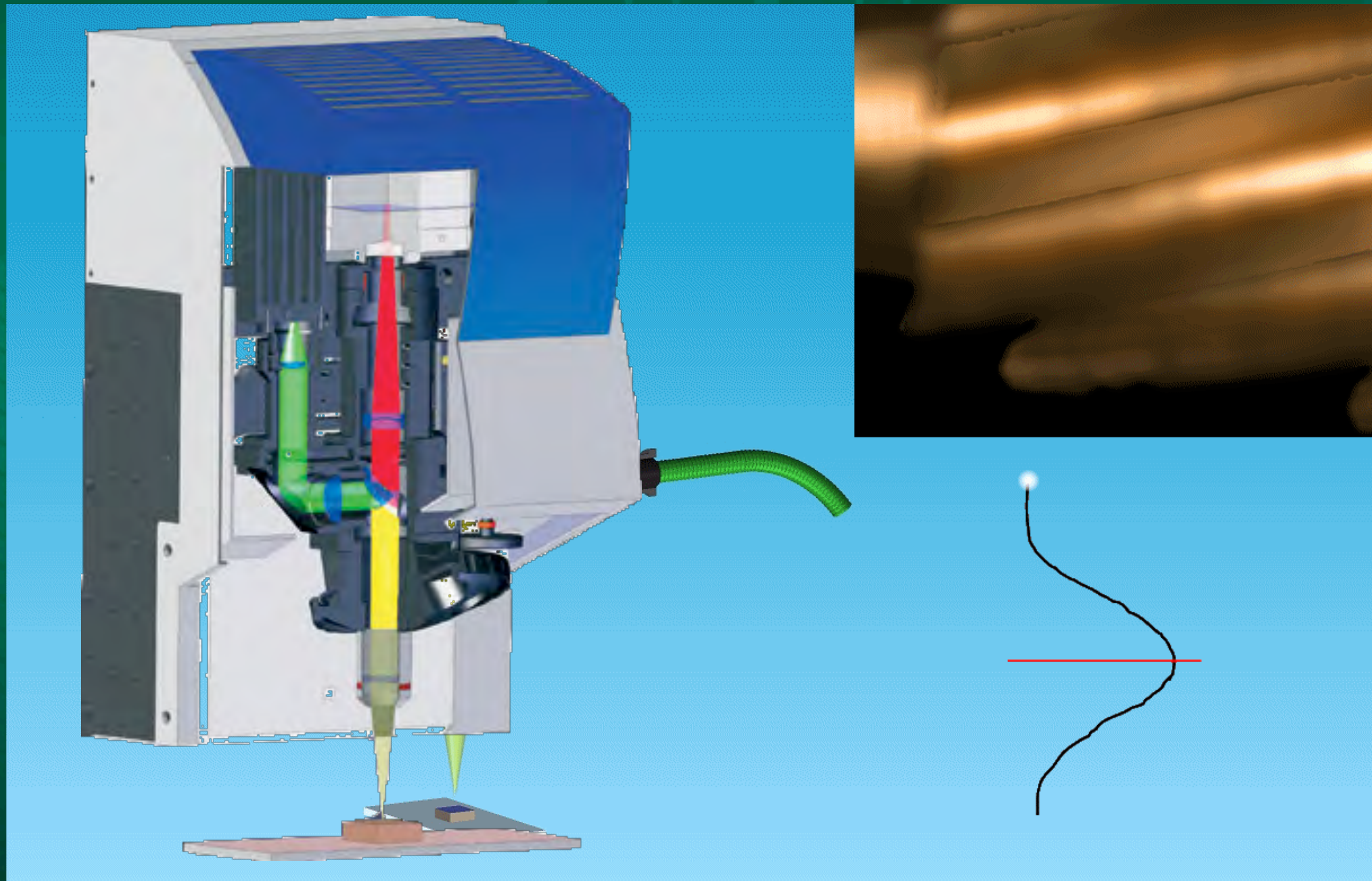




SWTW

3D rather than 2D

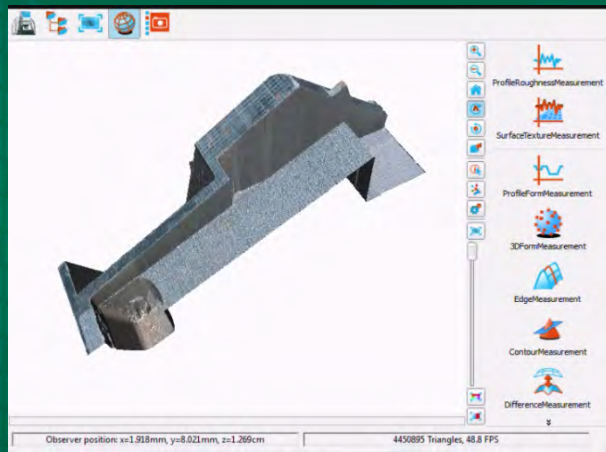
- Our solution: Focus-Variation

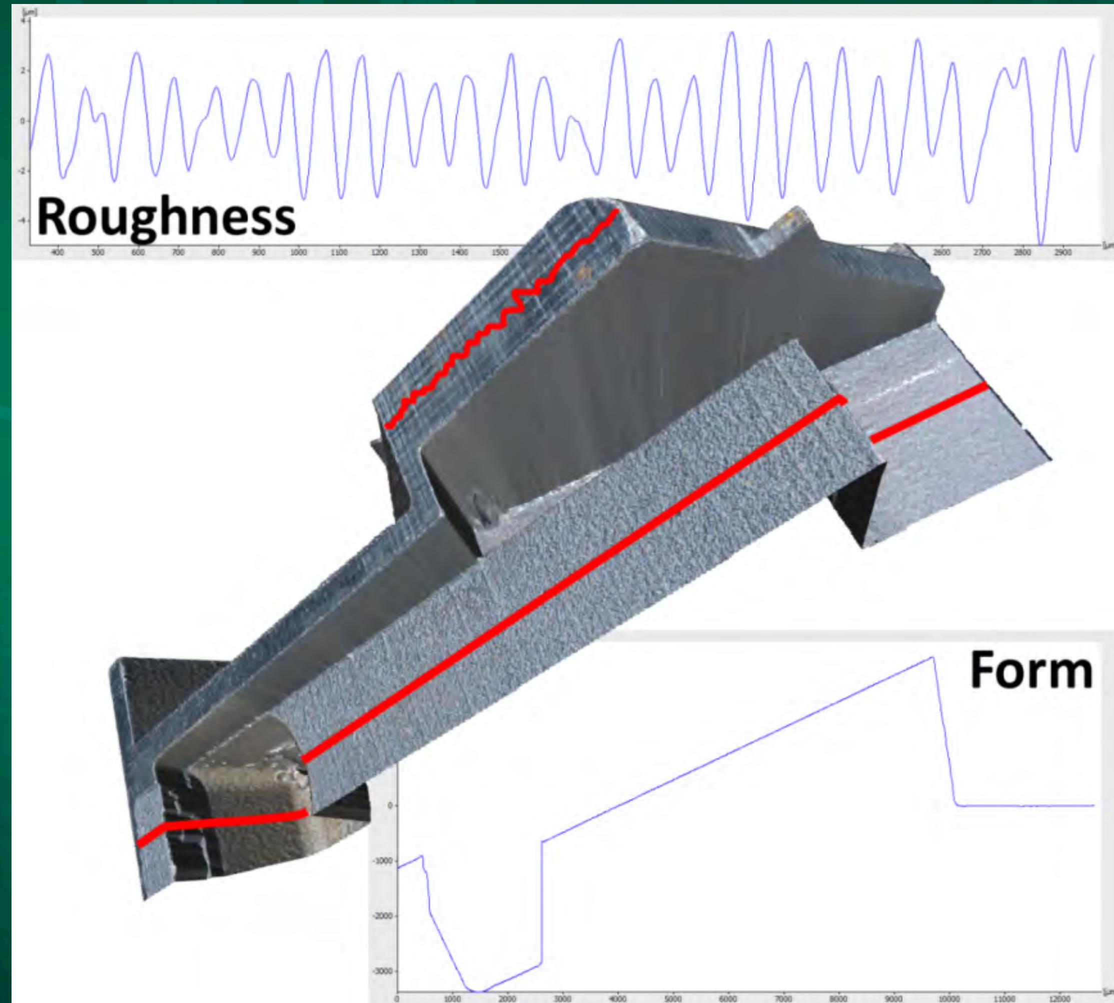


Information of a Measurement

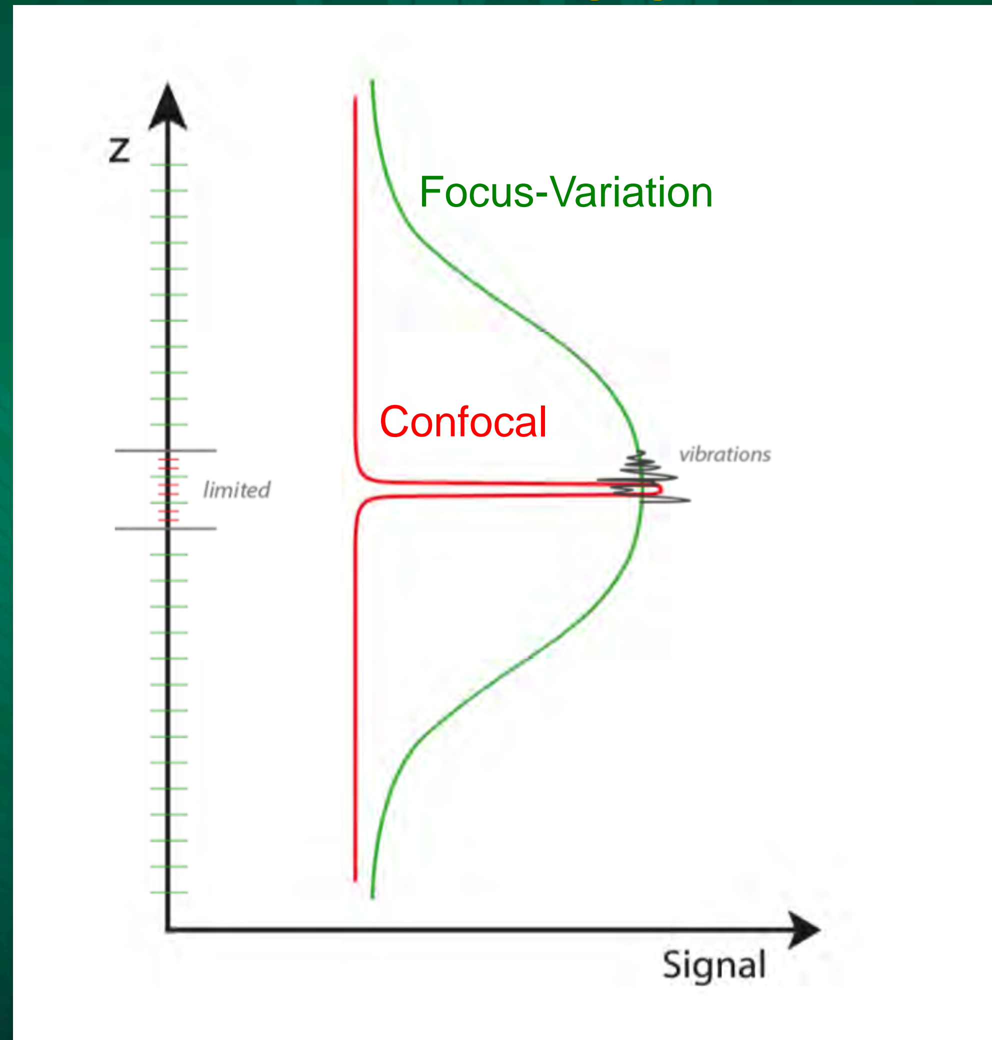
- 3D position (x, y, z)
- Repeatability
- Registered true color

Form and Roughness with one System

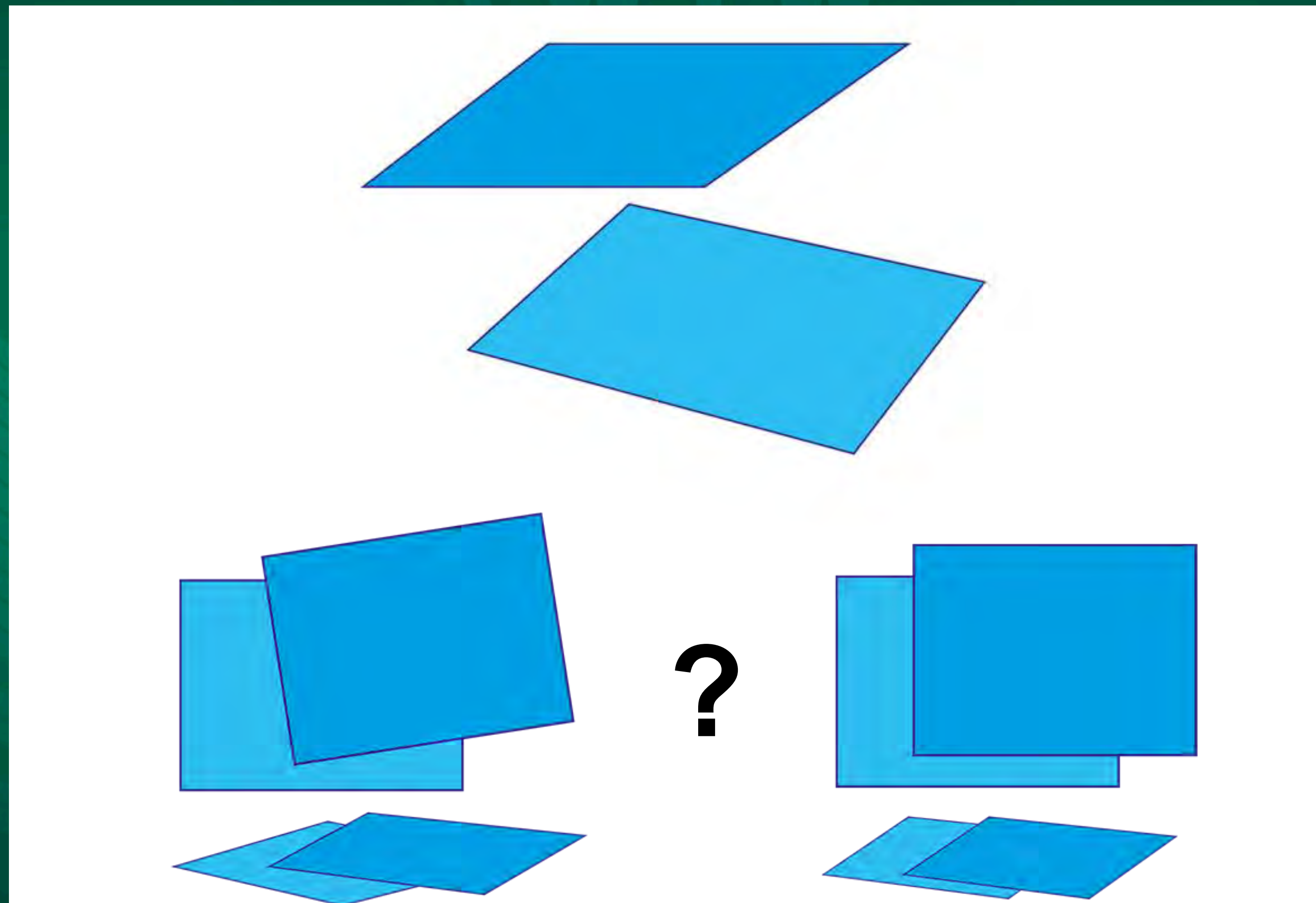




Especially Robust in Industrial Applications



Real 3D Technology

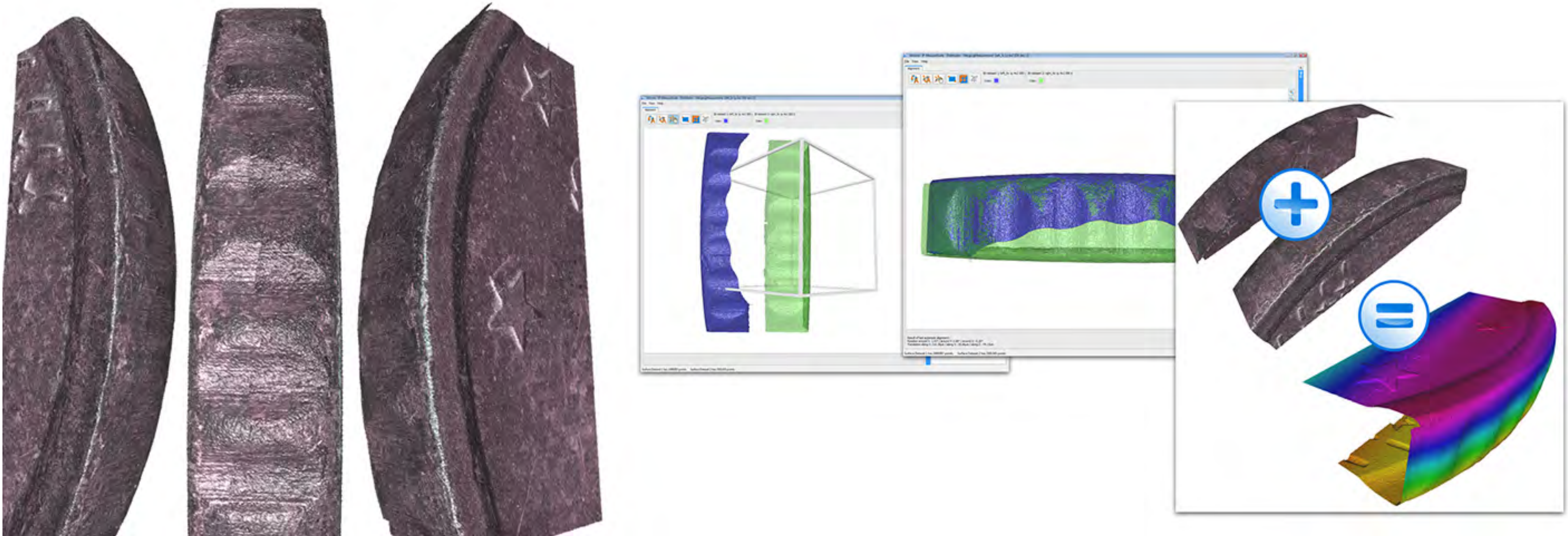


alicona

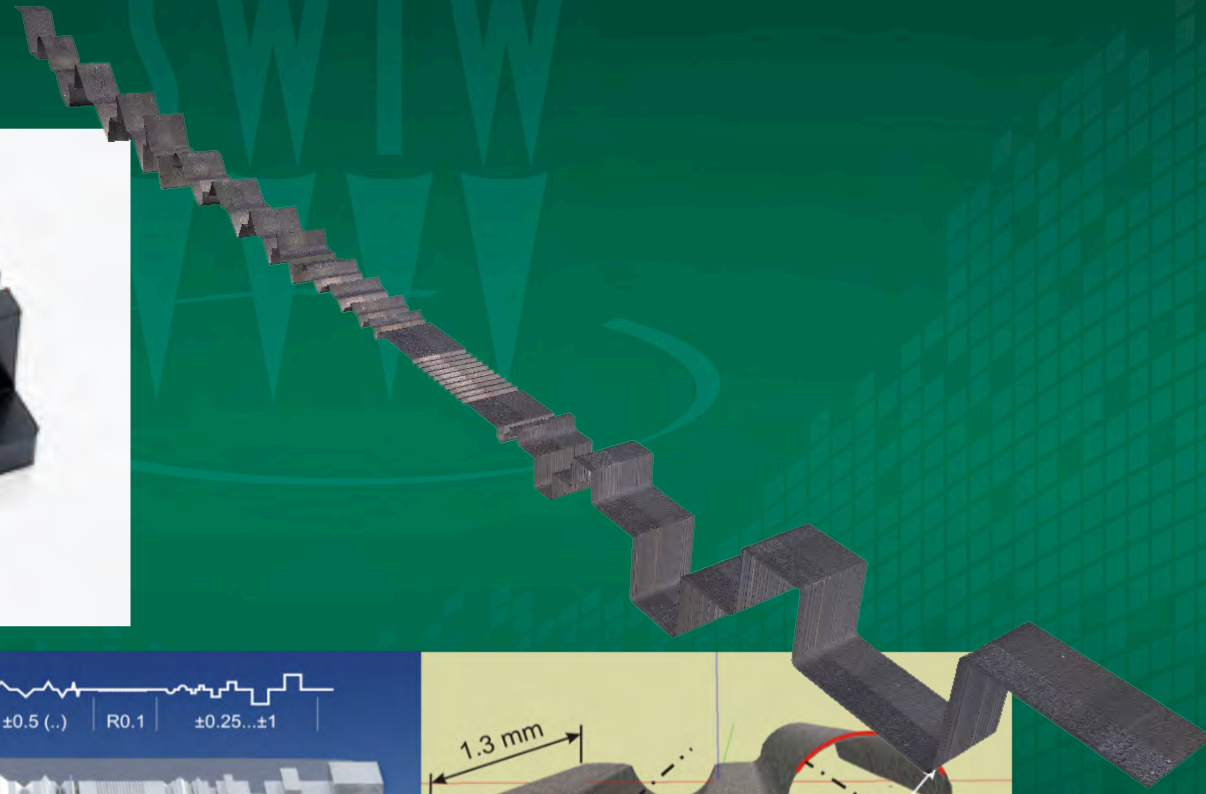
alicona

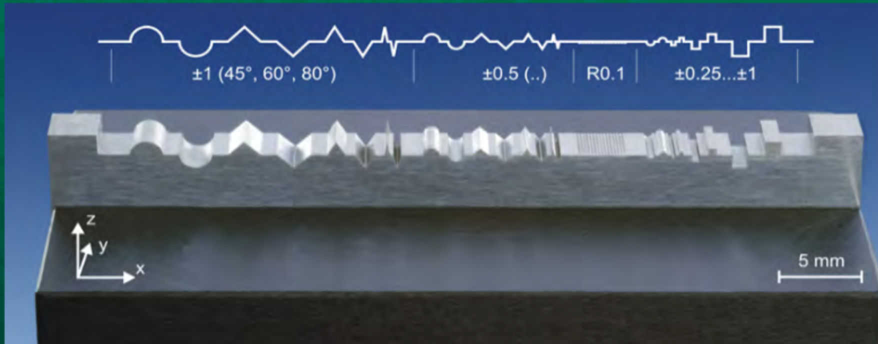
SWTW

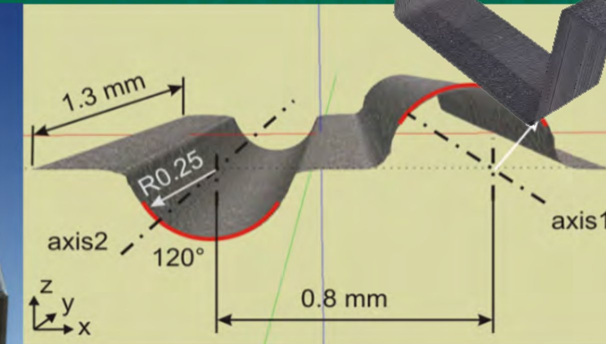
Fusion Technology



Accuracy Proof - Form





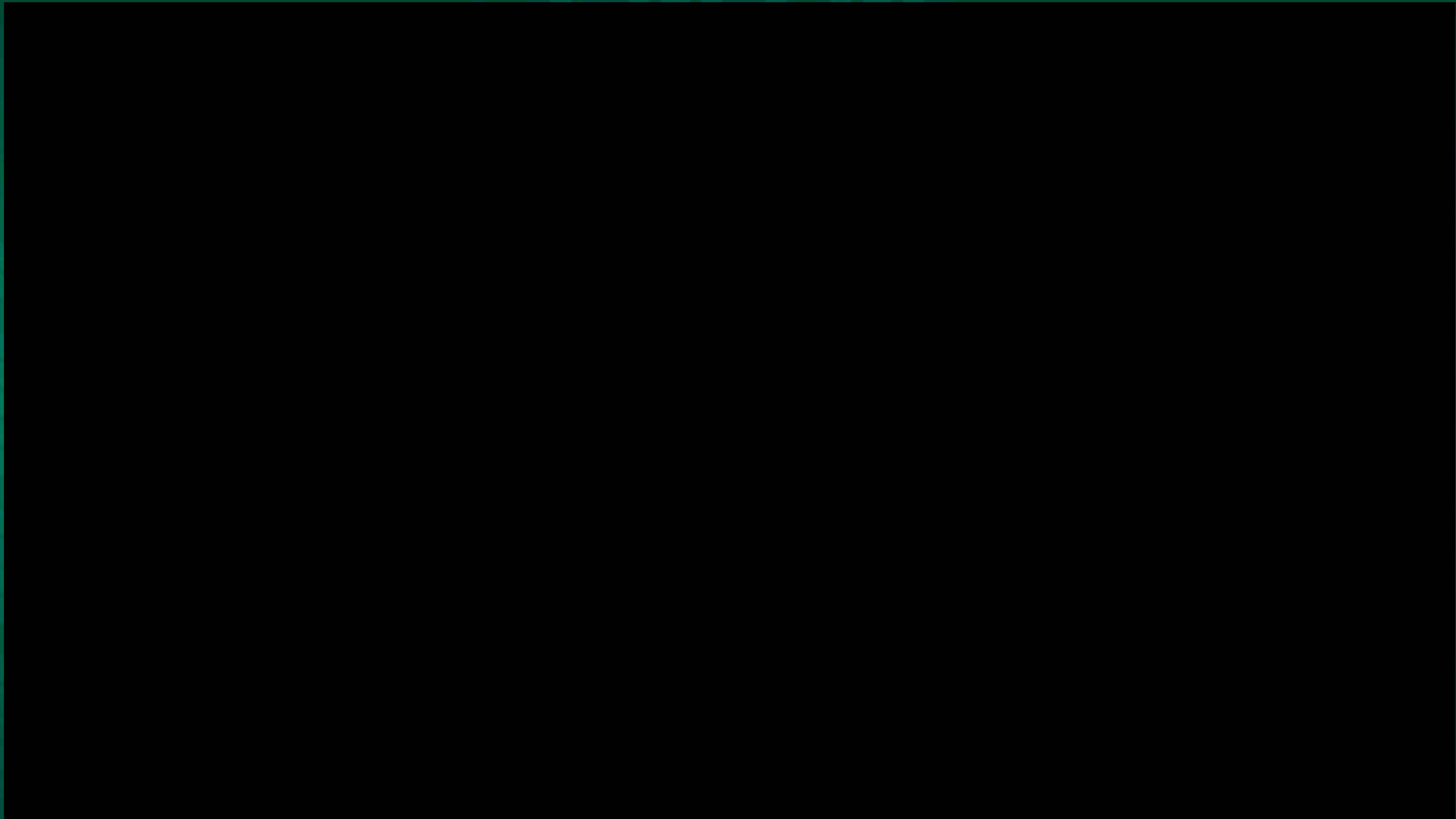


The Eye for Probe Card Repair

IF-SensorR25

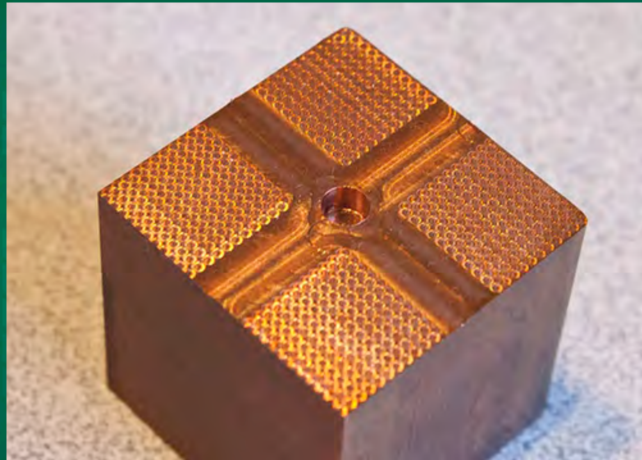
Sampling distance	µm	0.2
Min. repeatability (vertical)	nm	8
Min. measurable radius	µm	2
Min. measurable wedge angle	°	20
Min. measurable roughness (Ra)	nm	80
Min. measurable roughness (Sa)	nm	50

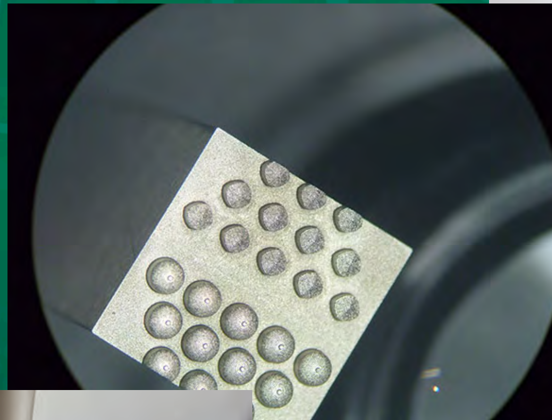
Experimental Result

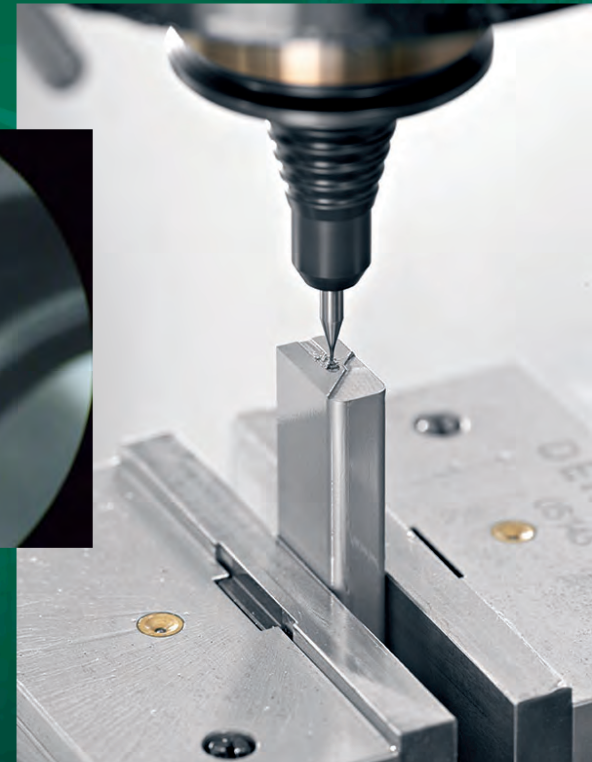


Repair station for manufacturing

- Repair station can be utilized for closed loop manufacturing of microparts







Outlook

- Serial tests are being performed
- Available as a commercial solution
- Various probe geometries have to be verified