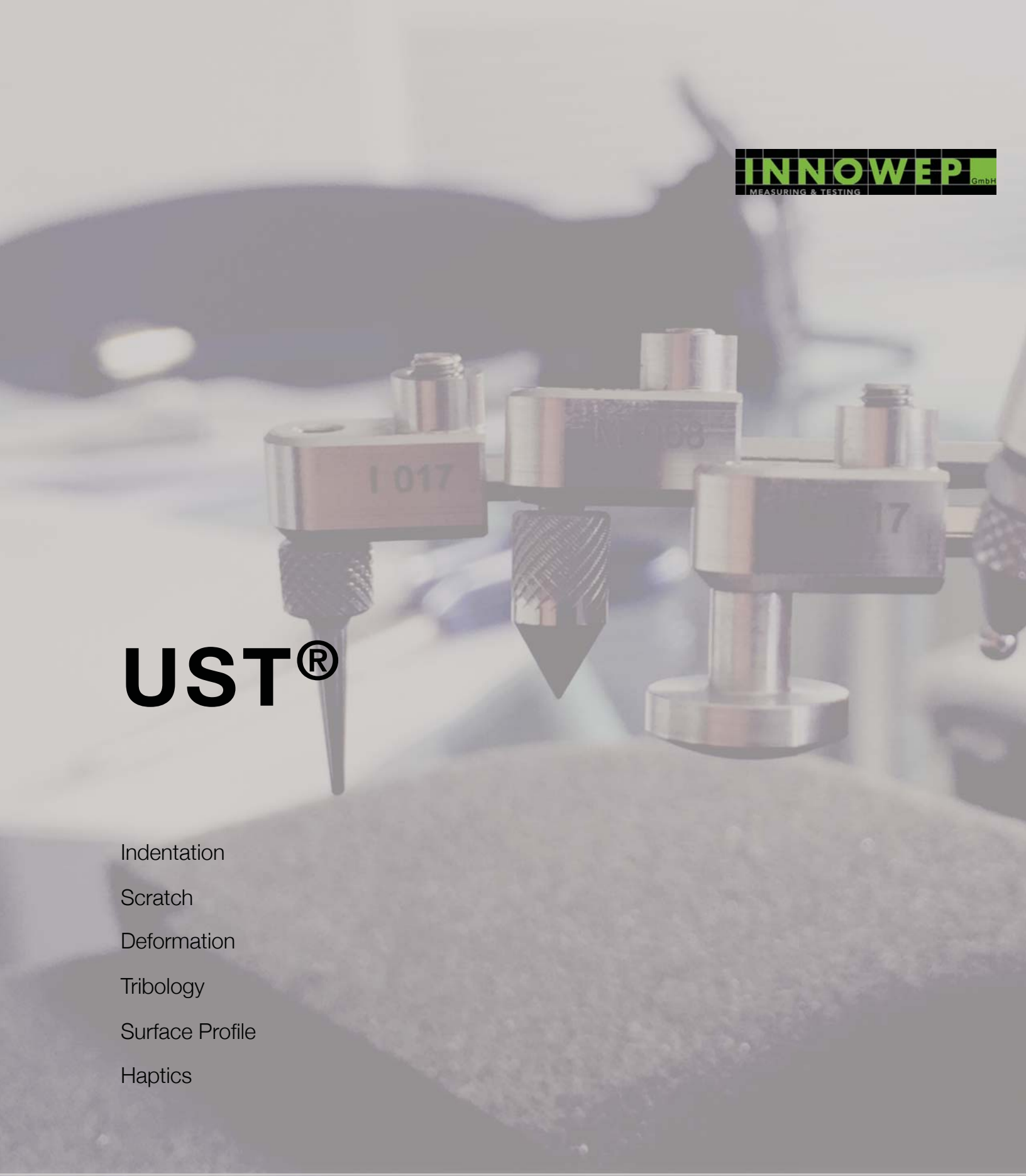


UST®

Indentation

Scratch

Deformation

Tribology

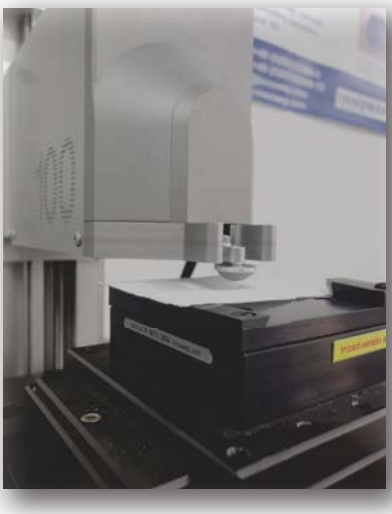
Surface Profile

Haptics

Innowep GmbH Haugerring 6, Würzburg, Germany 97070 **T** 0049 931 322 980 **F** 0049 931 322 9812 info@innowep.com www.innowep.com

Highlights

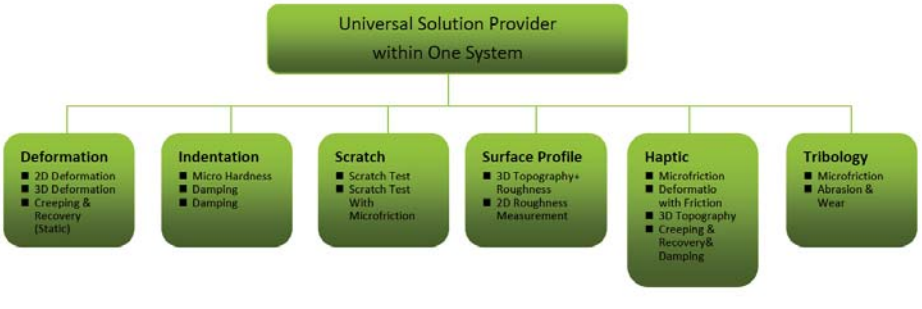
- One machine for all measurements
- All measurements with same resolution
- All measurements in real time, continuous and in-situ
- Mechanical property with local surface profile resolution
- Wide selection of tips from nanometer to centimeter



Basic Functions

Adequate measurements are of great importance for a reliable simulation and evaluation of micromechanical properties of materials and surface coatings, such as deformation or haptics. As material and coating behaviour can vary considerably, a series of proper, real-time, quantitative measurements have to be performed with high resolution in the right dimension.

UST®-Universal Surface Tester, is by far the only open multi-modular system that provides a complete mechanical testing solution for the evaluation of bulk materials and surface coatings. Its unique configuration allows for a wide range of tip choices with various materials and sizes ranging from nanometer to centimeter.



UST®

- One machine for all tests
- Same resolution (60nm)
- No need for correlation
- Local resolution
- Continuous measurement
- Surface structure combined with properties

VS

Other Systems

- One machine for one type measurement
- Different resolution
- Need for further correlation
- No record with local resolution
- Point by point measurement
- No surface structure vs. properties

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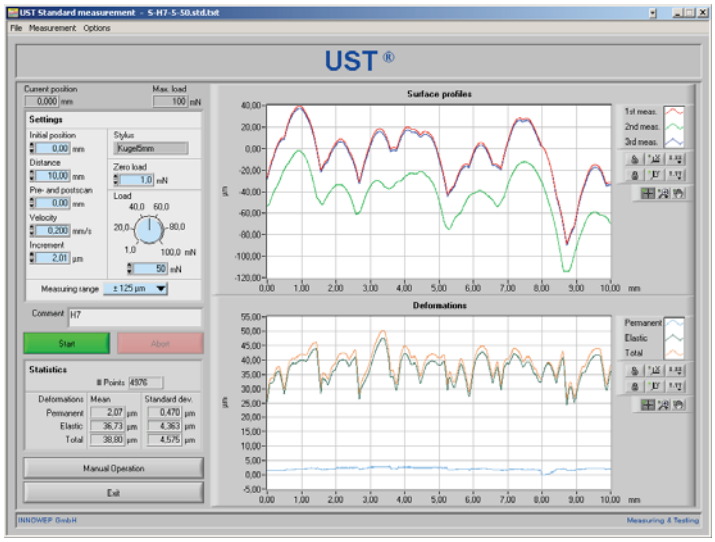
Basic Unit

Option 1: UST®-100

Load range: 1 mN-100 mN

Option 2: UST®-1000

Load range: 10 mN-1,000 mN
for harder surfaces and coatings

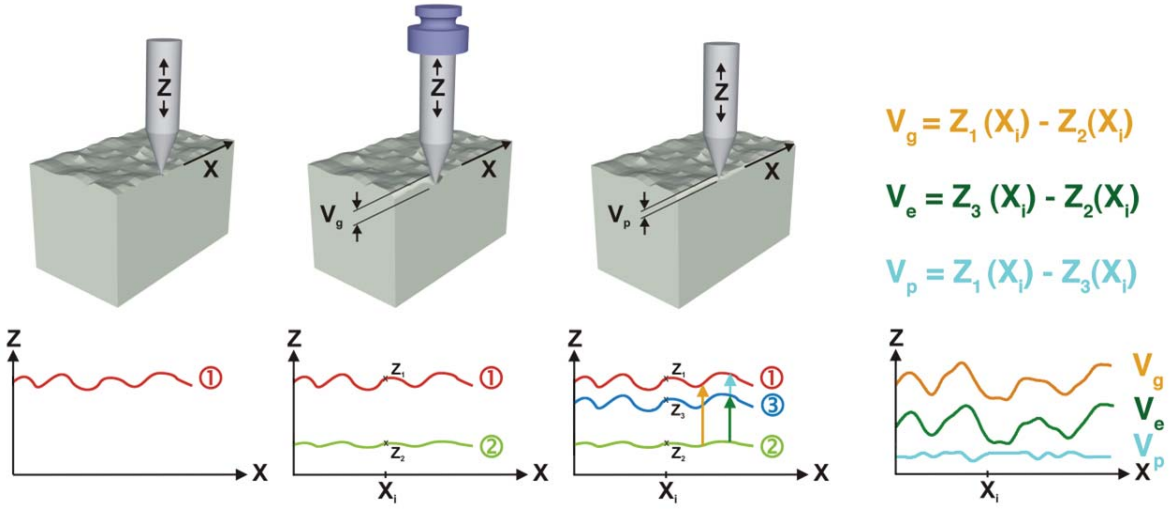


Standard Measurement: 2D Deformation
(total, permanent and elastic deformation)

UST® Basic Unit includes:

- 2D Deformation Measurement
- Tip check/Calibration
- 3 Standard Tips (2 Steel Cones, Ball)
- 1 Big Clamp/1 Small Clamp/Tools/Screws

Test Principle



Step 1 Step 2 Step 3 Step 4

Step 1: Scan with no load. Surface structure is continuously determined.

Step 2: Scan on the same path with additional load to determine total deformation.

Step 3: Scan on the same path with no load to determine the elastistic deformation.

Total deformation = Step 1-Step 2;

Elastic deformation = Step 3- Step 2;

Permanent deformation = Step 1-Step 3

Standards and Specifications

DIN EN ISO 14577-1; DIN 4762, 4768, ISO 4287, 4288

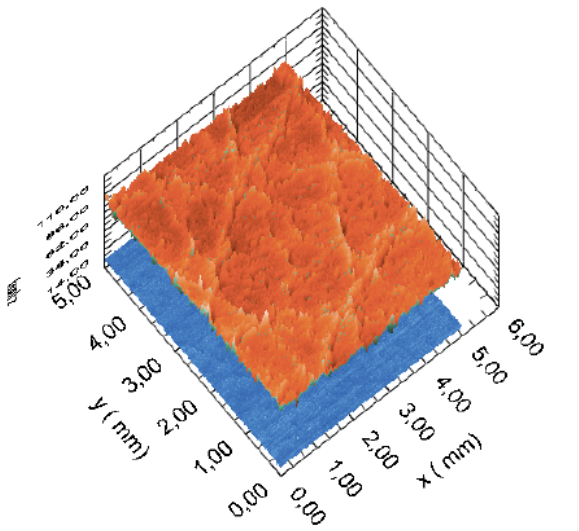
Modules

A selection of 10 different modules is available for all types of measurements and applications. Each module includes all necessary hardware, software, suggested tip and necessary tools.

Module 1: 3D Deformation

Performs several single scans automatically on an area and registers the 3D deformation properties of a complete surface.

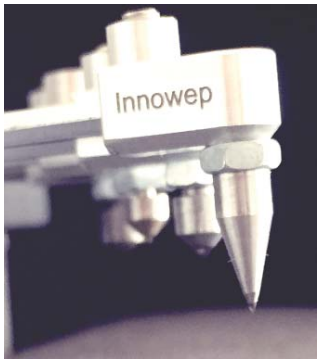
- 3D Deformation
- Tips:
  Diamond Cone 60°/90°/120°
  Steel Cone 60°

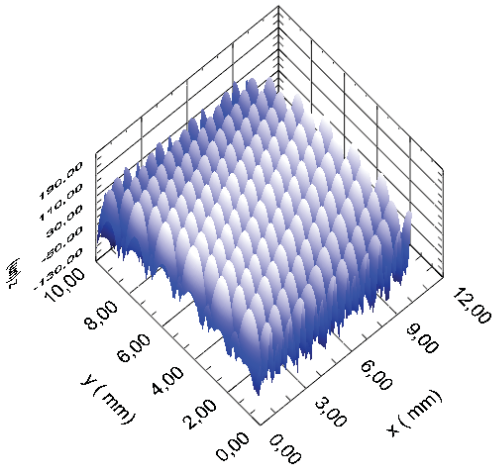


Module 2: 3D Topography

Performs several single scans automatically on an area and registers both the 3D topography and the material properties of a complete surface.

- 3D Topography
- 3D Roughness
- Particle Mode
- Tips:
  Diamond Cone 60°/90°/120°
  Steel Cone 60°

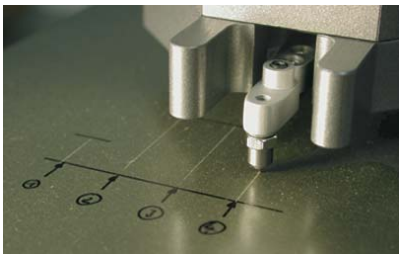




Module 3: Scratch

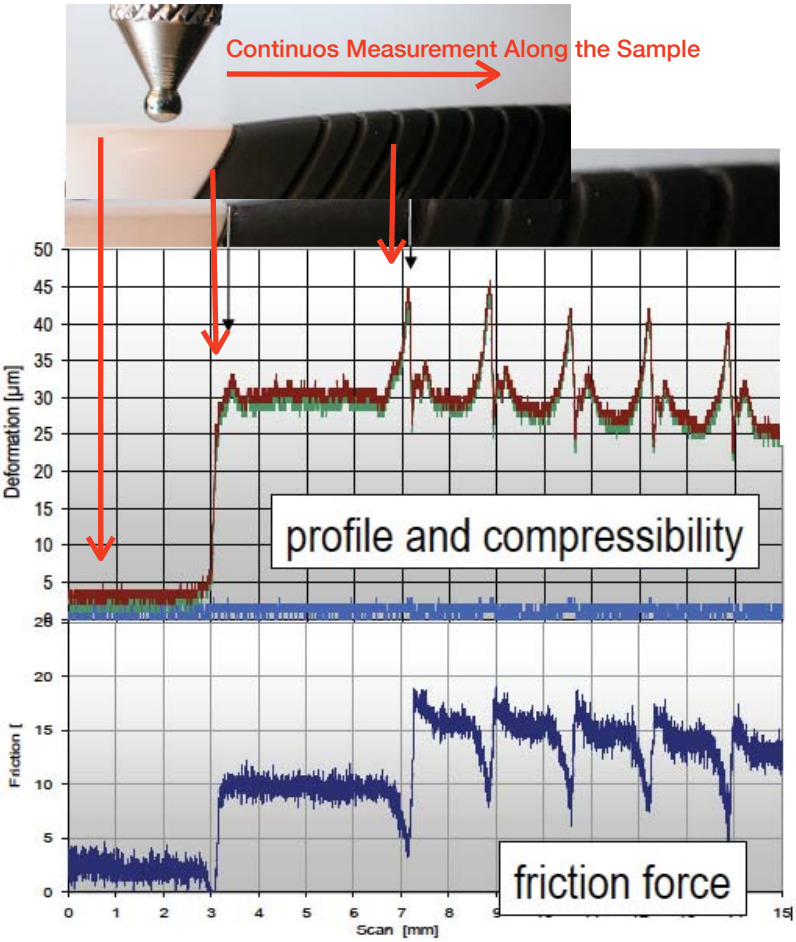
Standard Scratch (Budget Version)

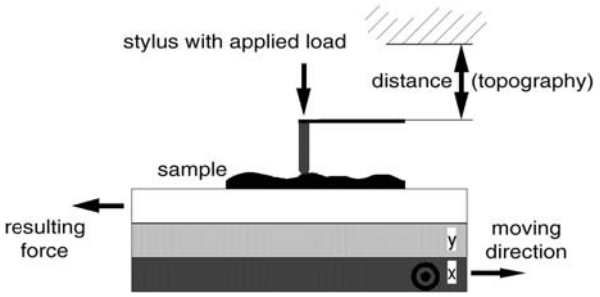
- Standard scratch test with local surface profile
- Tip: Scratch Diamond 5° undercut



Micro Scratch with Microfriction (Premium Version)

- Hardware:
  - Friction table with high resolution piezo sensor
  - Controller card for PC
  - Sample fixing and clamping set
- Tip: Scratch Diamond 5° undercut



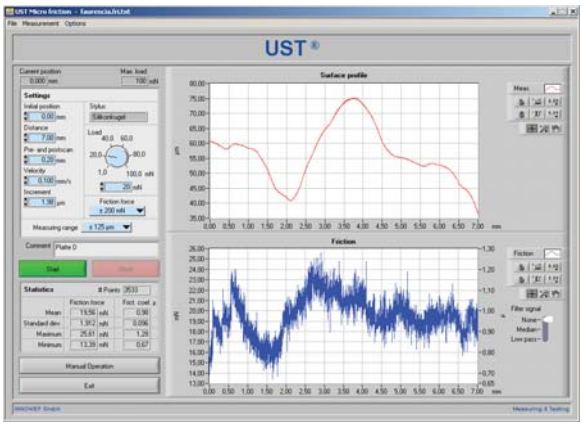


Continuous measurement along one line on a sample made out of three different materials: wood, flat polymer, polymer with grooves for the correlation of surface profile and microfriction.

Module 4: Microfriction (Standard)

Measures the friction force between a sample and the tip during a scan with an accuracy in nm.

- Hardware:
  - Friction table with sensor
  - Controller card for PC
  - Sample fixing and clamping
- Micro Friction + 2D Topography
- Micro Friction + 2D Deformation
- Tip: Customized tip on request (e.g. haptical tip)

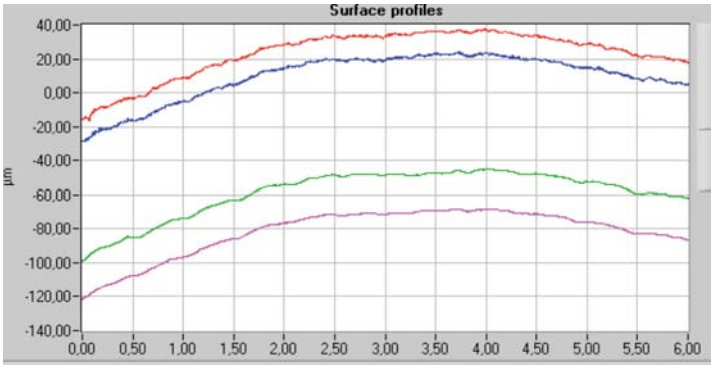


Module 5: Abrasion and Wear

Measures the abrasion rate with certain load repeating several times.

- Total Abrasion
- Wear Rate
- Tip: Steel ball 20mm

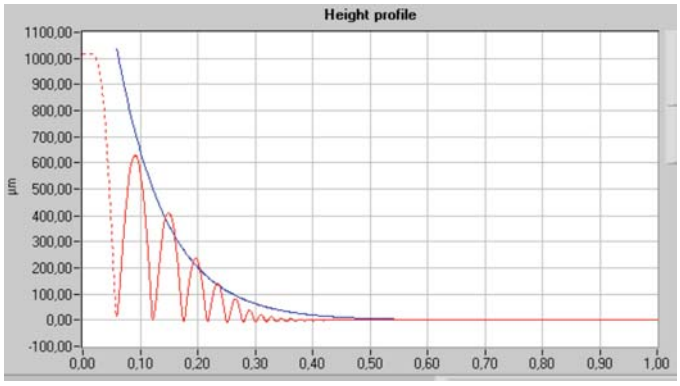
Red line (1st meas.): surface profile
Blue line (4th meas.) : last measurement
Green line (2nd meas.): with 1st load
Purple line (3rd meas.): 50th abrasion time



Module 6: Damping

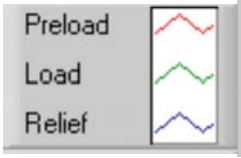
Special measuring mode for examining the elastic behaviour of soft materials.

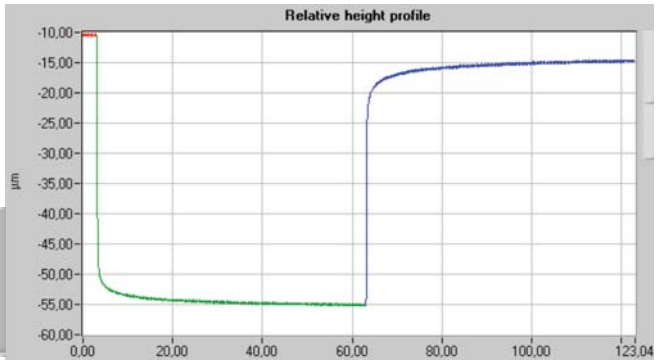
- Surface height profile is continuously recorded
- Damping Oscillation
- Tip: Papillary stylus or customized tip on request



Module 7: Viscoelasticity (Creeping & Recovery)

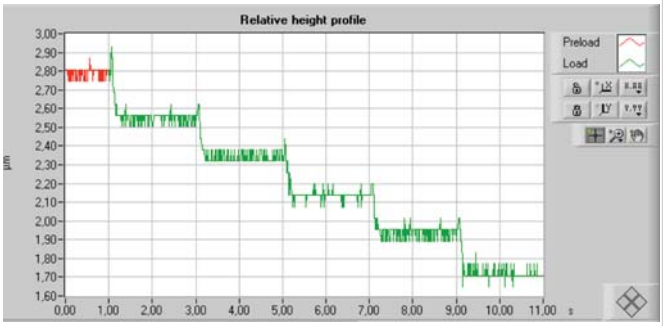
- 3-Step Measurement
- Material's reaction under strain and the relief property
- Tip: Customized tip on request





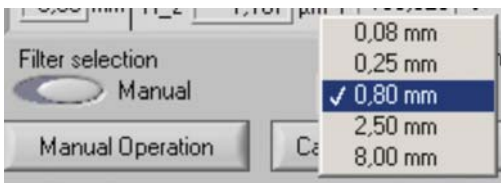
Module 8: Universal Hardness

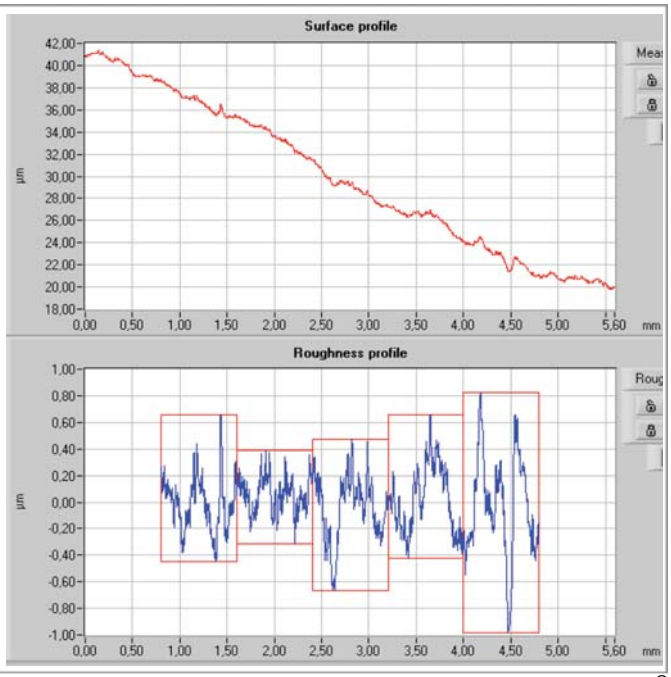
- According to DIN EN ISO 14577-1
- Two-Step Measurement
- Total Deformation
- Tip: Vickers Diamond
  Berkovich-Diamond, or customized tip on request



Module 9: 2D Roughness

- According to DIN 4762, 4768, ISO 4287, 4288
- Scan once with a certain load
- Ra, Rq, Rz
- Automatic filter selection
- Tip: Diamond Cone 60°/90°/120°
  Steel Cone 60°





Module 10: TAX

High quality measurement module for the evaluation of the abrasive wear resistance on the micro and macro scale.
It is available as a module on UST®, or provided as a micro-calotester: **TAPERADER®**

Hardware Options

1. Exchangable Measurement Head: UST 100 mN and UST 1000 mN

2. Microcope: for documentation of the measurement process and results (photo function)

3. Videocamera: for documentation of the measurement process and results (video function)

4. Optical 3D Topography Module: non-tactile optical measurement of 3D topography

5. Vacuum Plate Package: for fixing samples. Vacuum pump is included.

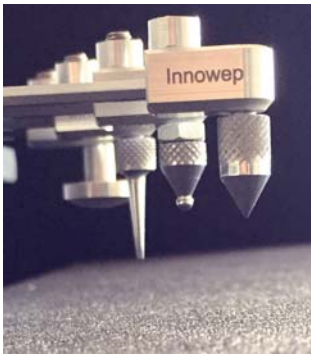
6. Mini-Clamping Tool Set: fixing tool for harder samples

7. Quick Plates: for easy and quick fixture of samples

Upgrade Options

New X-Y automatic sample table and all software are available for upgrade. Please contact our technical engineers for detailed information.

Tip Options



Steel Tip Groups

Steel ball: 0.8 mm

1.8 mm

5.0 mm

Steel Cone: 60°

Other Tip Groups

Cutting tool

Aluminum ball 20mm

Table tennis

Juby

Leather

Papillar

Diamond Tip Groups

Diamond pyramid: 60°

Diamond: 60°

90°

120°