

# UST®

Indentation

Scratch

Deformation

Tribology

Surface Profile

Haptics

## Basic Functions

Simulation and performing a fatigue test eg. abrasion, or scratch under real application is important to evaluate how durable the material and surface is. However, to understand why the performance of the material and surface coating is poor or good, a series of proper, real-time, quantitative measurements have to be realized with high resolution and the right dimension.

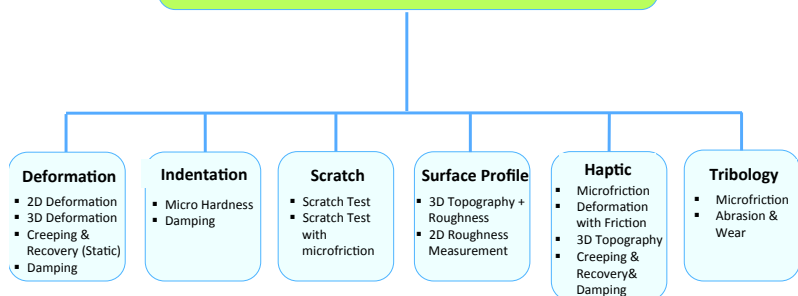
**UST®-Universal Surface Tester**, is by far the only open multi-module system that provides a complete mechanical testing solution for the evaluation of bulk materials and surface coatings. Its unique configuration allows the wide range of tip choices with various materials and sizes from nanometer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

## Highlights

- One machine for all measurements
- Real-time in-situ measurement
- Mechanical property with local surface profile resolution
- Wide range of tip choice from nanometer to centimeter applications



### UST: Universal Solution Provider within One System



### UST®

- One machine for all
- Same resolution
- No need for correlation
- Local resolution
- Surface structure combined with properties

**VS**

### Other System

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

**Basic Unit**

**Option 1: UST®-100**

Load range: 1mN-100mN

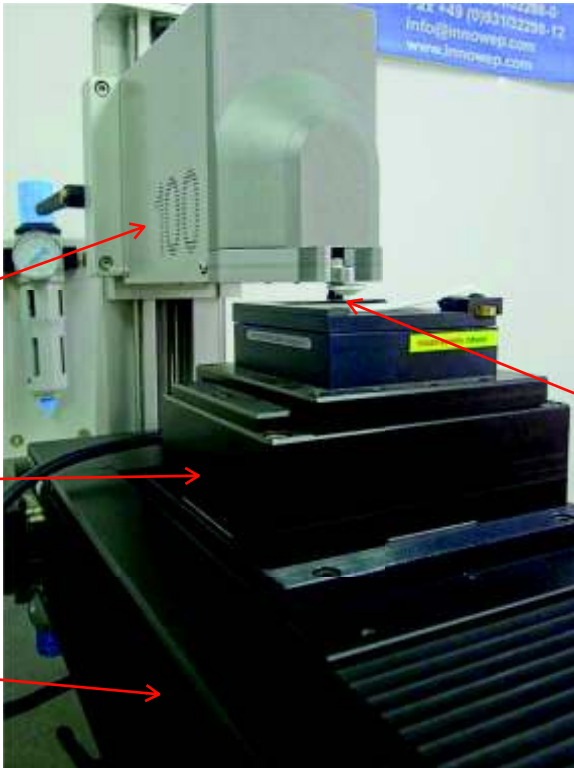
**Option 2: UST®-1000**

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

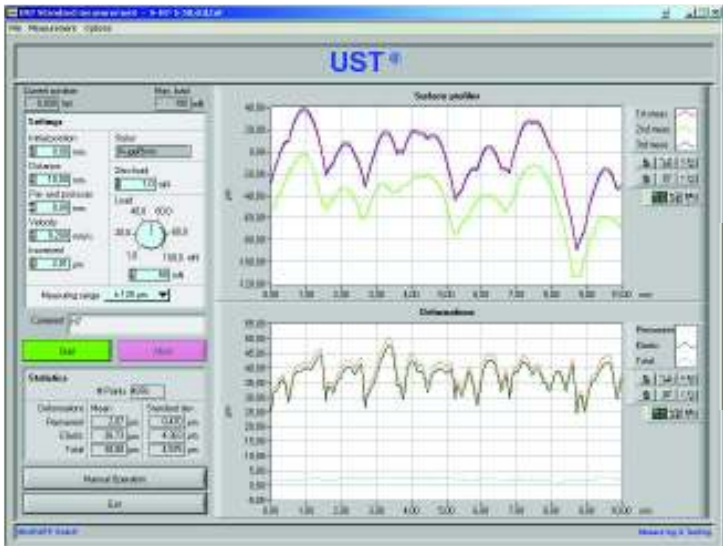
Measurement Head

X-Y Automatic  
Sample Stage

Base Plate



Stylus

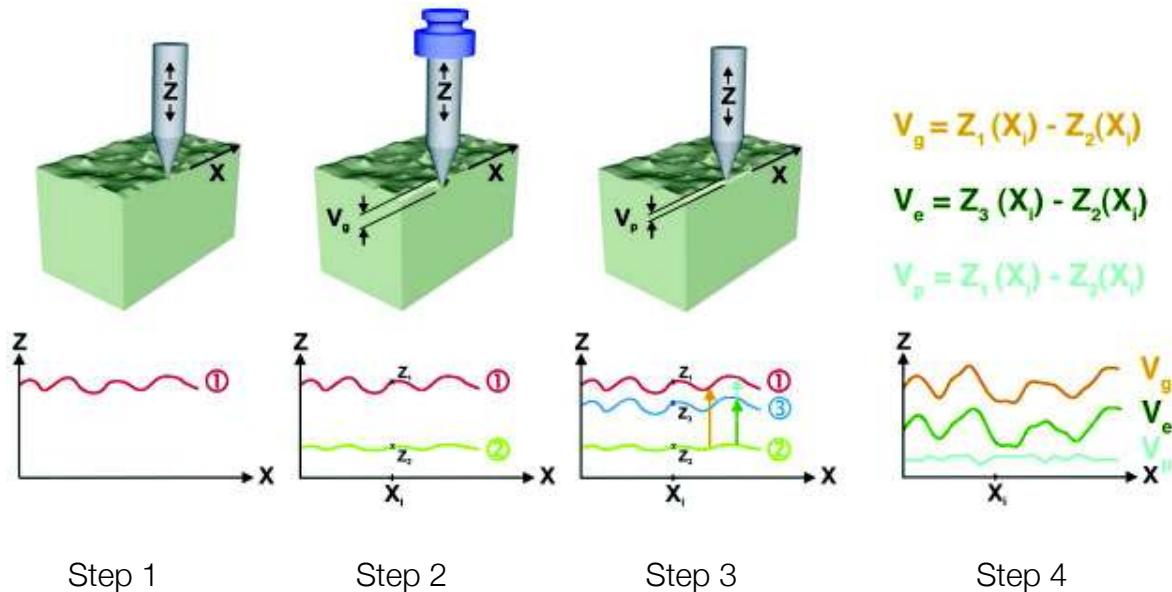


**Standard Measurement: 2D Deformation**  
(total, permanent and elastic deformation)

**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: Scan with no load. Surface structure is 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 elastic deformation.

Total deformation = Step 1-Step 2;

Elastic deformation = Step 3- Step 2;

Permanent deformation = Step 1-Step 3

## Standards and Specifications

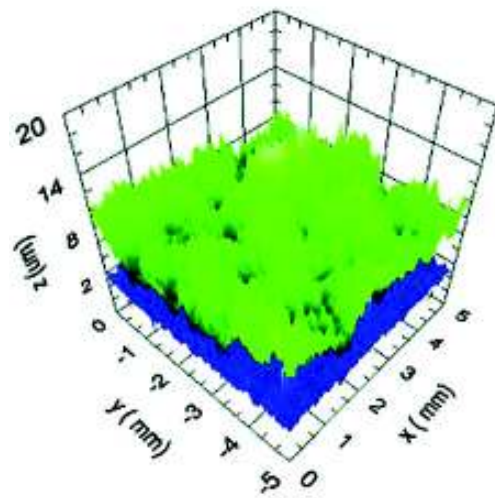
DIN EN ISO 114577-1; DIN 4762, 4768, ISO 4287, 4288

## Modules

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

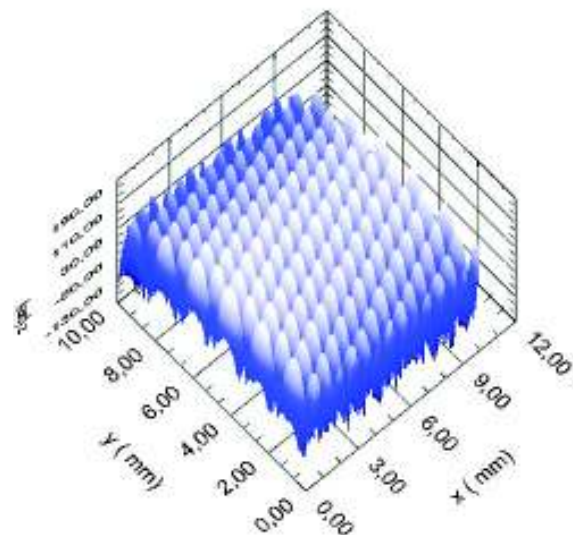
### Module 1: 3D Deformation

- 3D Deformation measurement
- Tip Choice:
  - Diamond Cone 60°/ 90°/120°
  - Steel Cone 60°



### Module 2: 3D Topography

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



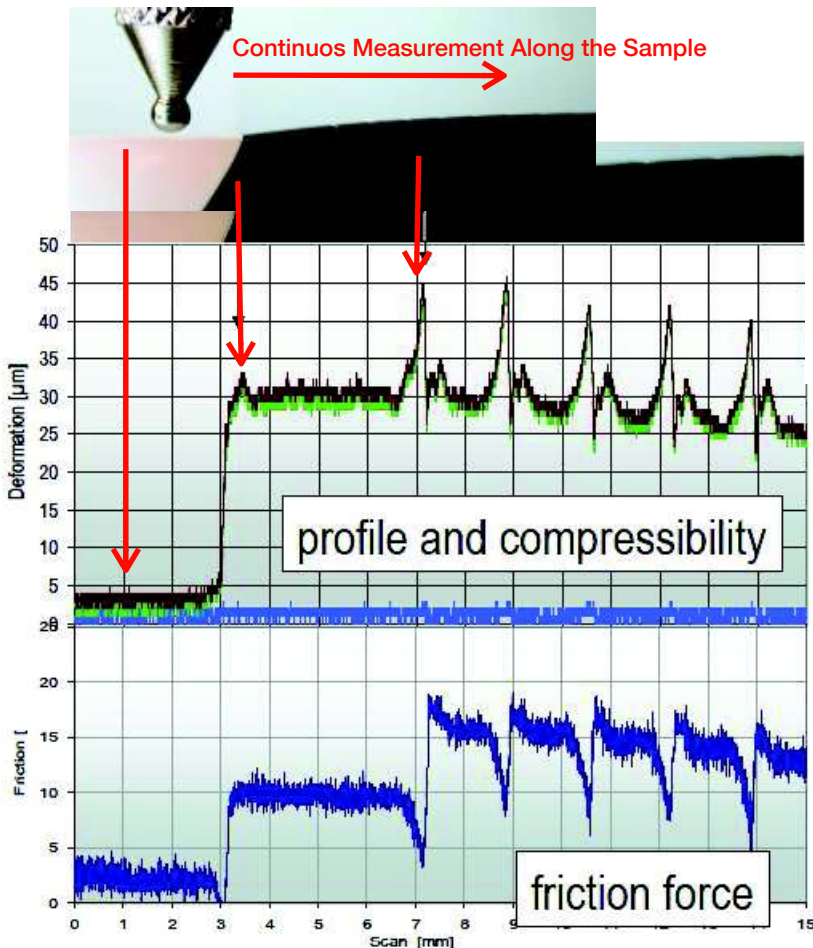
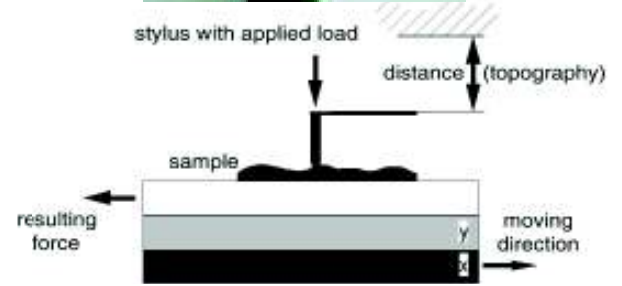
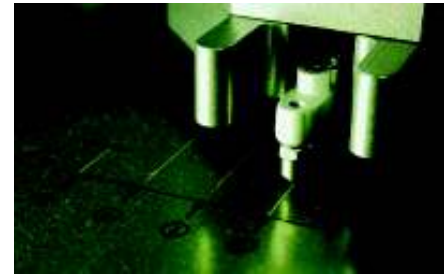
Module 3: Scratch

Standard Scratch (Budget Version)

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

Micro Scratch with Microfriction (Premium Version)

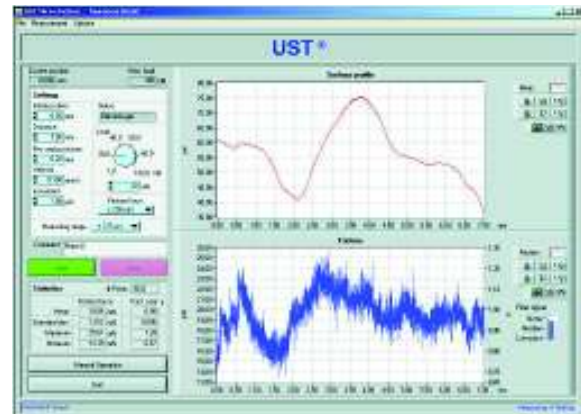
- Hardware:
  - Friction Table with high resolution piezo sensor
  - Controller Card for PC
  - Sample Fixing and Clamping Set
- Tip: Scratch Diamond 5° undercut



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

### Module 4: Microfriction (Standard)

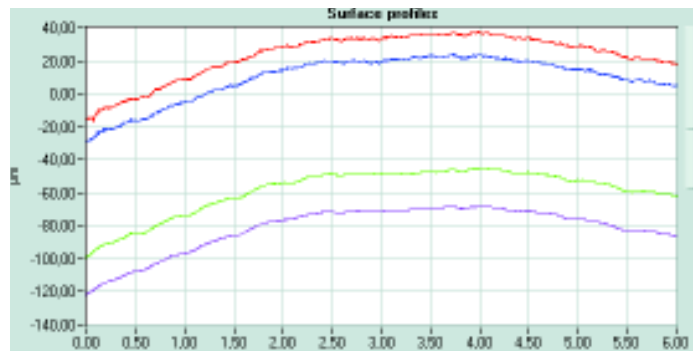
- Hardware:
  - Friction Table with Sensor
  - Controller Card for PC
  - Sample Fixing and Clamping
- Micro Friction + 2D Topography
- Micro Friction + 2D Deformation
- Tip: Customized tip on request



### Module 5: Abrasion and Wear

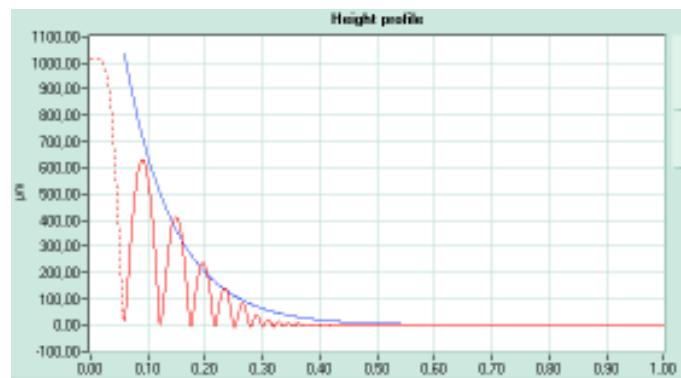
- Total abrasion
- Wear rate
- Tip: Customized tip on request

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



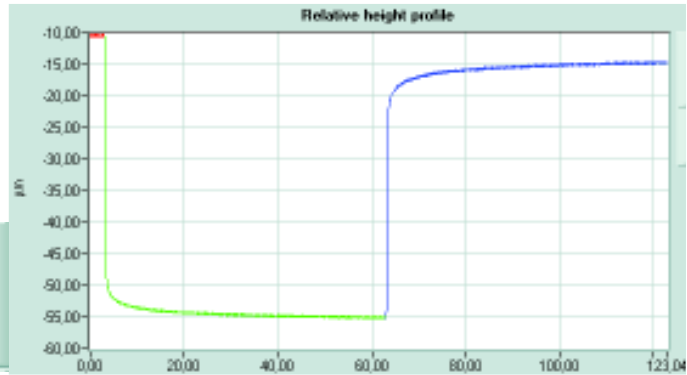
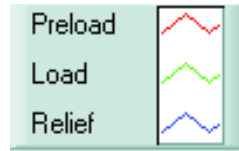
### Module 6: Damping

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



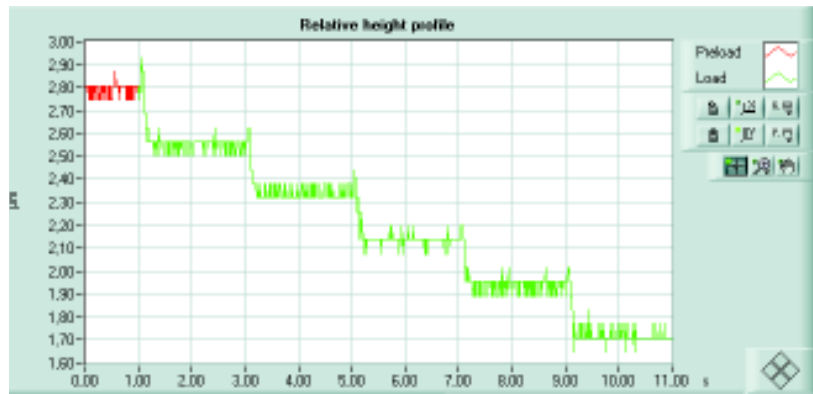
### Module 7: Viscoelasticity (Creeping & Recovery)

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



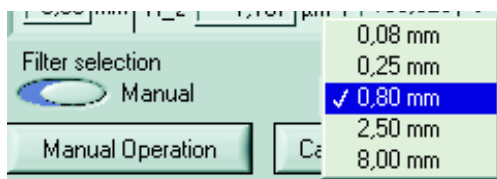
### Module 8: Universal Hardness

- 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 macroscopic scale. It is available as a module for UST®, or provided as micro-calotester: TAPERADER®



## Hardware Options

1. Exchangable Measurement Head: Head 100 and Head 1000
2. Microscope: for documentation of measurement process and results (photo function)
3. Videocamera: for documentation of measurement process and results (video function)
4. Optical 3D Topography Module: non-tactile optical measurement of 3D topography
5. Vacuum Plate Package: to fix samples with drillholes. Vacuum is included.
6. Mini-Clamping Tool Set: fixing tool for harder samples
7. Quick Plates: for easy and quick fuxture of samples

## Upgrade Options

X-Y Automatic sample table, all software are available for all our existing UST® customers. Please contact us 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°

