

# UST<sup>®</sup>



Indentation  
Scratch  
Deformation  
Tribology  
Surface Profile  
Haptics

 **INNOWEP**<sup>®</sup> **THE ORIGINAL UST<sup>®</sup>**



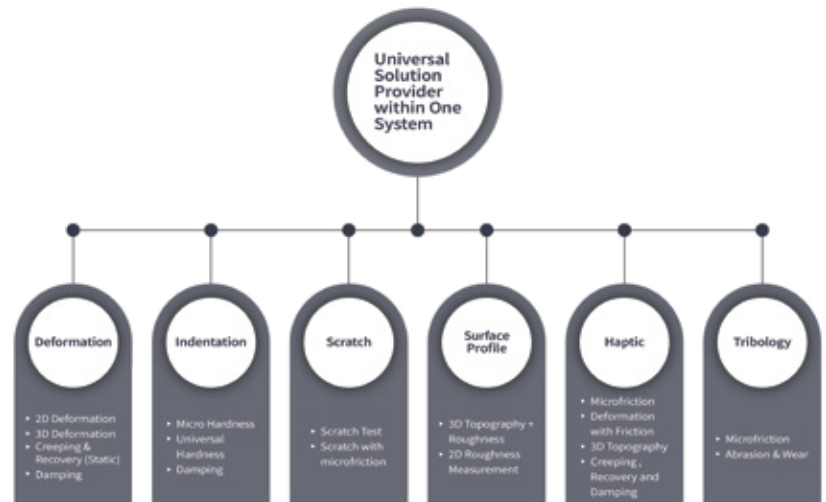
## HIGHLIGHTS

- 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 of haptics. As material and coating behavior 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® - Universal Surface Tester

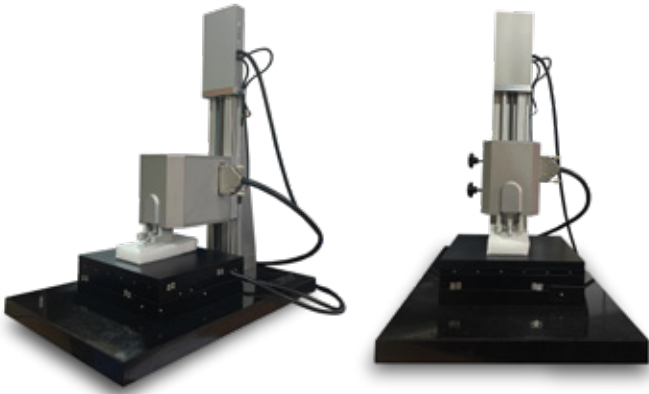
- One machine for all tests
- Same Resolution (60nm)
- No need for correlation
- Local resolution
- Continuous measurement
- Surface structure combined with properties



### 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





MEASUREMENT HEAD	100mN	1000mN	50N
Height Range	4 mm	4 mm	10 mm
Height Accuracy	60 nm	60 nm	50 nm
Load Range	1-100mN	10-1000mN	2-50N
Measure the Applied Load	NO	NO	YES
Auto Calibrate Tips	NO	NO	YES

#### X-Y TABLE TECHNICAL DATA

Speed	0,1 - 2 mm/s
Measurement Area	50mm x 50mm
X-Y Axis Displacement Resolution	1µm

#### NEW FEATURES - 2024 MODELS

Automated Z-Axis (also allows for automatic approach to the sample)
A step sequence programmer for defining measurement routines and introducing new modules
Auto-detection of the connected head



## BASIC UNIT

### Option 1:

#### UST<sup>®</sup> - 100

Load range: 1mN - 100mN

### Option 2:

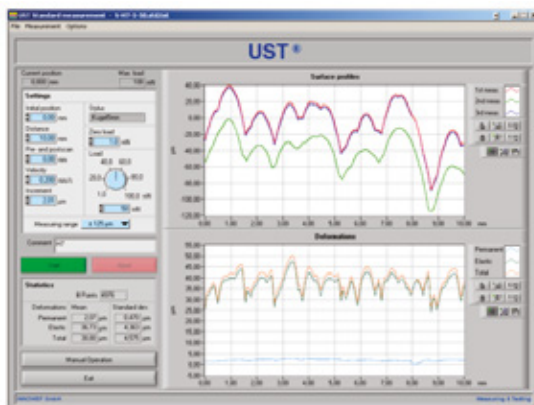
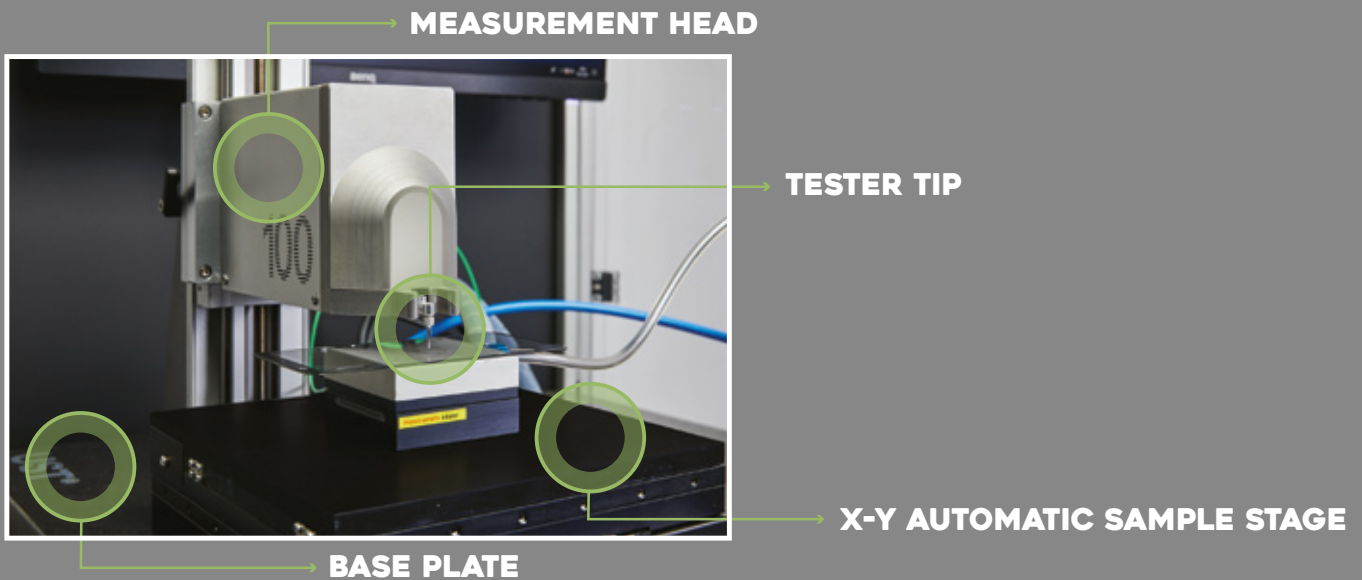
#### UST<sup>®</sup> - 1000

Load range: 10mN - 1000mN  
(for harder surfaces and coatings)

### Option 3:

#### UST<sup>®</sup> - 50N

Load range: 2N - 50N



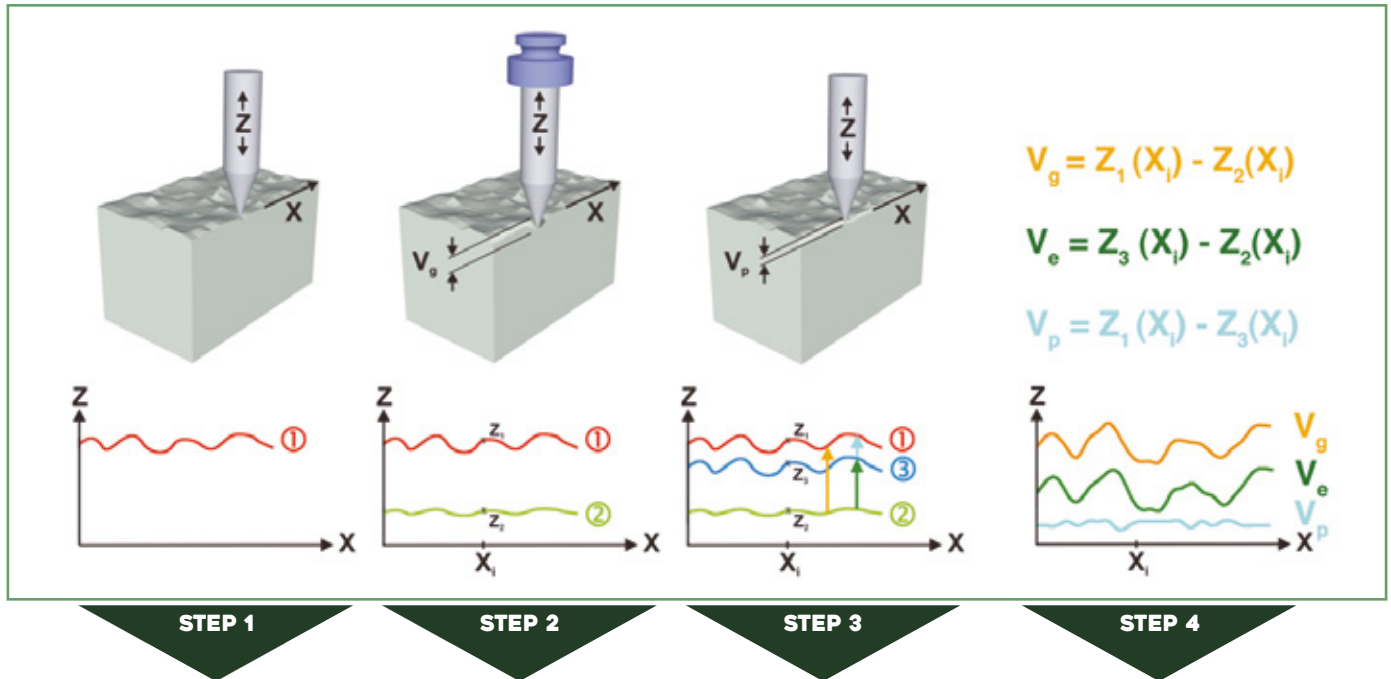
**Standard Measurement: 2D Deformation**  
(total, permanent and elastic deformation)

**UST<sup>®</sup> - Universal Surface Tester** includes:

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



## TEST PRINCIPLE OF UST® - WEINHOLD'S METHOD



**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 elastic deformation.

Total deformation = Step 1 - Step 2

Elastic deformation = Step 3 - Step 2

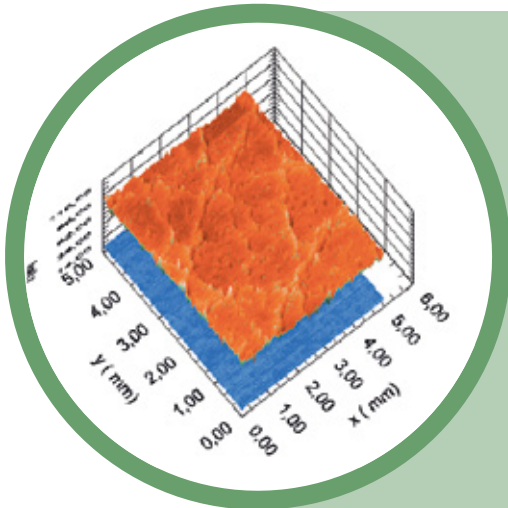
Permanent deformation = Step 1 - Step 3

### STANDARDS AND SPECIFICATIONS

**DIN EN ISO 14577-1 | DIN 4762, 4768 | ISO 4287, 4288**

## MODULES

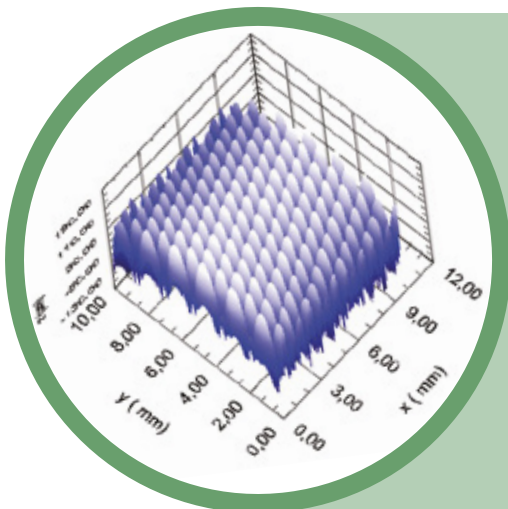
A selection of 10 different modules is available for all types of measurements and applications. Each module includes all necessary hardware, software, suggested tip and necessary tools.



### 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 60o | 90o | 120o  
Steel Cone 60o

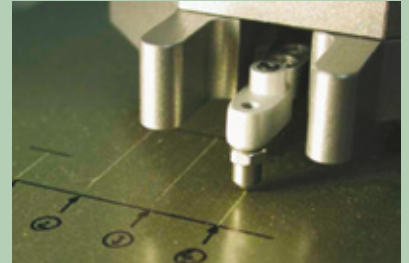


## MODULE 3: SCRATCH

### Standard Scratch (Budget Version)

Standard scratch test with local surface profile

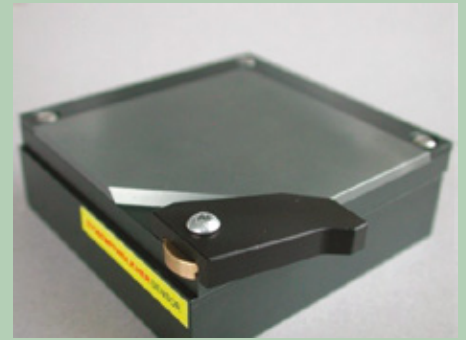
Tip: Scratch Diamond 5° undercut



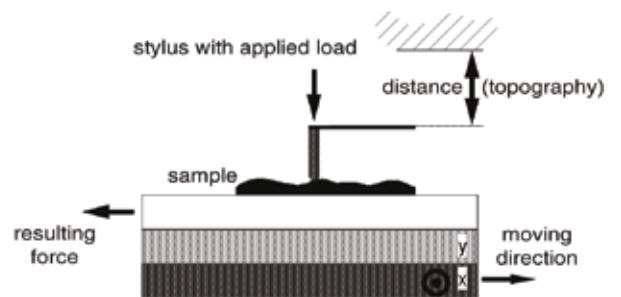
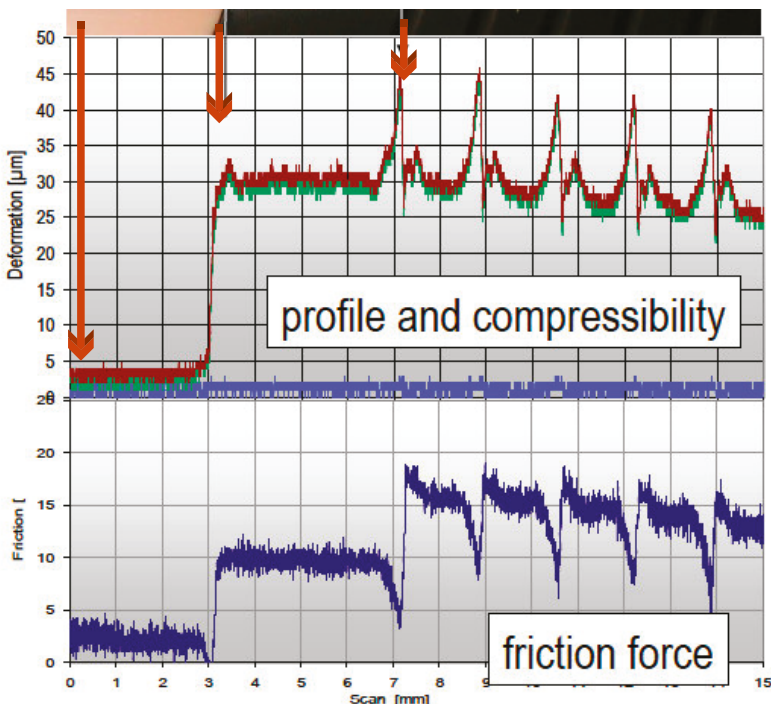
### Micro Scratch with Microfriction (Premium Version)

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 the Sample



Continuous measurements 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: MICROFICTION (STANDARD)

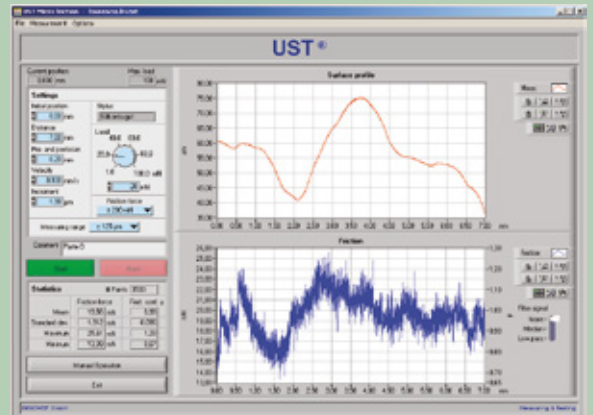
Measures the friction force between a sample and the tip during a scan with an accuracy in nM.

- Hardware:
- Friction table with sensor
  - Controller card for PC
  - Sample fixing and clamping

Micro Fiction + 2D Topography

Micro Fiction + 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.

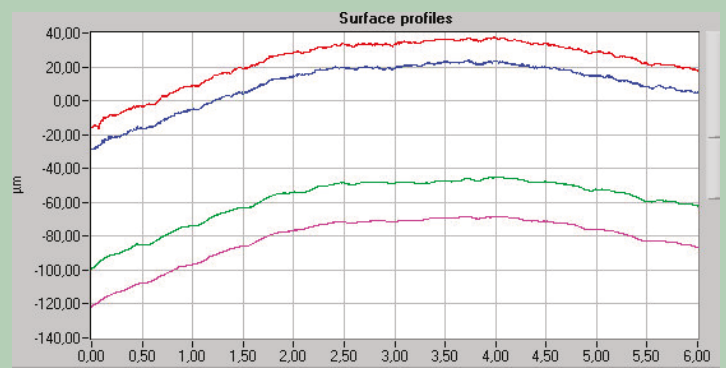
- Total Abrasion'
- Wear Rate
- Tip: Steel Ball 20mm

Red Line (1<sup>st</sup> measurement): surface profile

Blue Line (4<sup>th</sup> measurement): last measurement

Green Line (2<sup>nd</sup> measurement): with 1<sup>st</sup> load

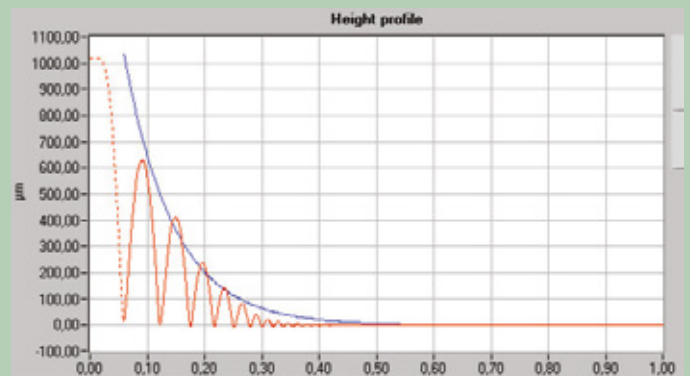
Purple Line (3<sup>rd</sup> measurement): 50<sup>th</sup> Abrasion time



## MODULE 6: DAMPING

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

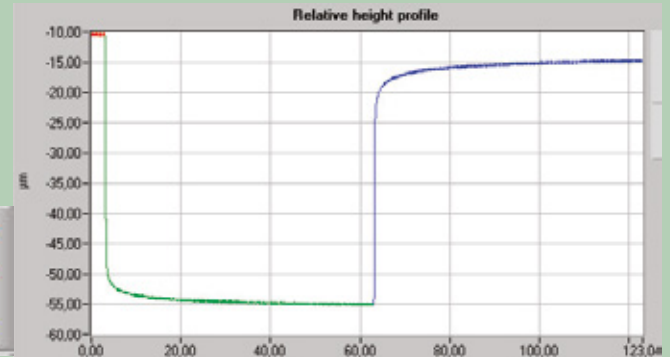
- Surface height profile is continuously recorded.
- Damping Oscillation
- Tip: Papillary stylus or customized tip on request.





## MODULE 7: VISCOELASTICITY (CREEPING & RECOVERY)

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



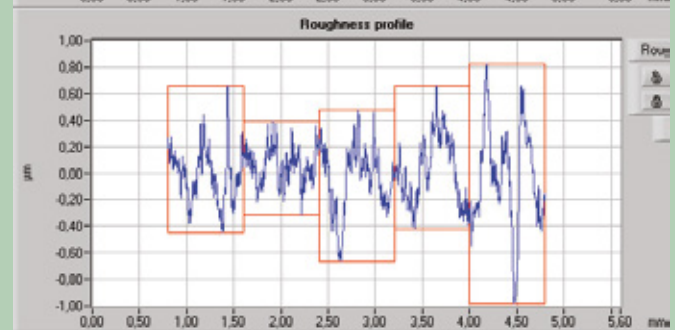
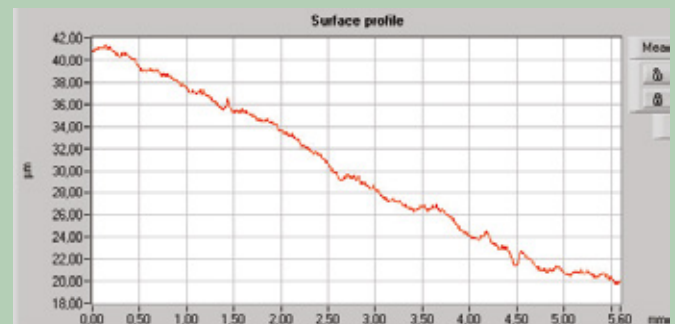
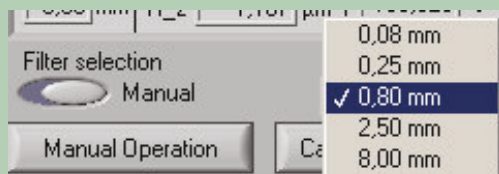
## MODULE 8: UNIVERSAL HARDNESS

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



## MODULE 9: UNIVERSAL HARDNESS

- 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**<sup>®</sup> or provide as a micro-calotester: **TAPERADER**<sup>®</sup>



## HARDWARE OPTIONS

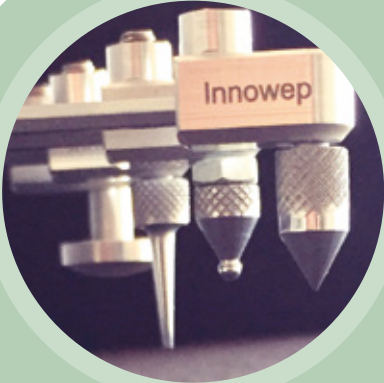
- 1- Exchangeable Measurement Head: **UST**<sup>®</sup> **100 mN** and **UST**<sup>®</sup> **1000 mN**
- 2- Microscope: for documentation of the measurement process and results (photo function)
- 3- Videocamera: for documentation of the measurement process and results (video function)
- 4- Optical 3D 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 engineer department for detailed information.



## TIP OPTIONS



### Steel Tip Groups

Steel ball: 0.8 mm  
1.8 mm  
5.0 mm  
Steel Cibe: 60°



### Other Tip Groups

Cutting tool  
Aluminum ball 20mm  
Table Tennis  
Juby | Leather | Papillar



### Diamond Tip Groups

Diamond Pyramid 60°  
Diamond 60°  
Diamond 90°  
Diamond 120°

