



UMT Universal Mechanical Tester

- Accuracy & Versatility without Compromise

Universal Mechanical Tester — Proven Innovation

Bruker's UMT Universal Mechanical Tester is the most versatile mechanical test tool on the market. Thanks to a wide range of interchangeable drives and fixtures, samples can be tested under multiple different wear patterns on a single test platform. With fast-changeover fixtures, transforming from one configuration to another takes mere minutes. Advanced servo control and patented force sensor designs allow all of this versatility to be achieved without compromising industry-leading accuracy and repeatability.

The first UMT model debuted in 2000 and rapidly became the standard for tribology and mechanical test labs around the world. Now in its third generation, there are over four hundred systems in use globally in the research laboratories of industry leaders, top universities, and national labs.

The majority of instruments available for tribology testing are single-function testers, and by definition none are designed with the same range of modularity as UMT. Within minutes the platform can be transformed from rotary to reciprocating motion, from sub-newton to kilo-newton force measurement, or to environmental testing from room temperature up to 1000°C. Advanced, intuitive software allows users to program complex motions and to control applied forces with unprecedented accuracy to simulate real-world conditions. Materials scientists and researchers around the world choose UMT for its:

- Broader test capabilities
- Fast changeover between configurations
- High accuracy and repeatability
- Real-time control and data analysis software



"Our work at a university research laboratory places a very high premium on the universal nature of the UMT. The reconfigurable nature of the platform, along with the extensive options and accessories, allows for specialized testing and operation."

—Professor John A Patten, West Michigan University

● Single-Platform Testing of Multiple Parameters

Infinite Options for Motion

UMT offers users infinite combinations of synchronized motion control for both upper and lower samples. The upper sample can be translated along any axis or rotated. Motion can occur either unidirectionally or in a programmed combination of axes and speeds. The lower sample has a wide range of available motion control. Linear translation is available in X and Y axes, as well as fast reciprocating linear motion for fretting and wear tests. Changeover from reciprocating to rotary motion takes just a few minutes and the lower sample can be rotated along the vertical axis (pin-on-disk) or horizontal axis (block-on-ring). Since all of the motions are precision controlled, tests can be designed to maintain constant position, constant force, constant motion, or any possible combination.

Unique Sensing Technology

UMT features patented force sensor designs that are optimized to generate highly accurate force readings. Force sensors are available in multiple ranges from 1 to 100mN all the way up to 10 to 1,000N. The platform can also be configured with torque sensors up to 22N-m. Two-axis sensors are frequently used to monitor friction and normal forces simultaneously, and sensors can be combined to measure multiple forces. UMT has the capacity to receive input from sixteen unique sensors with 16-bit resolution and data rates up to 200kHz.

Widest Range of Standard Test Configurations

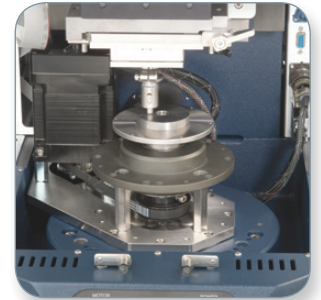
UMT and its drives and accessories can be configured to conduct over 20 standard ASTM, ISO or DIN tribology tests. The most common are:

- Pin/Ball-on-Disk
- Disc/Plate-on-Disc/Plate
- Indenter-on-Plate
- Crossed Cylinders
- 4-Ball Test

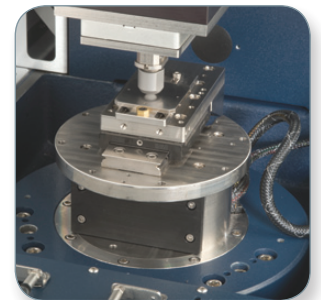
These tests can be performed dry or in liquid, at room temperature or at elevated temperatures, and under humidity or in vacuum.

Advanced Scratch, Indentation and Materials Testing

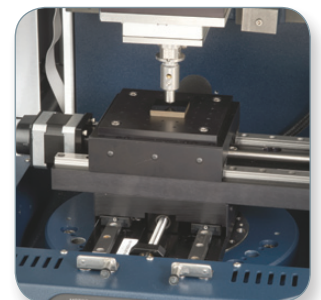
The same UMT platform that is used for tribology testing can easily be configured as a scratch or indentation tester to determine mechanical properties of materials and coatings. By replacing the conventional sensors with our proprietary micro- or nano-heads, and adding any combination of advanced sensors (Electrical Contact Resistance, Acoustic Emission, etc.), the system can accurately and reproducibly measure hardness, Young's modulus, and tensile and von Mises stresses of coatings and bulk materials. In addition, the adhesion strength and bulk properties of coatings can easily be determined using micro-scratch techniques.



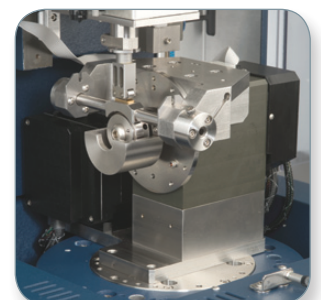
Rotary Drive



Reciprocating Drive



Linear Drive



Block-on-Ring Drive

One Platform, Endless Possibilities

Wear	Rotary, Linear, Reciprocating, Abrasive, Fretting, Galling, Seizure
Friction	Static, Dynamic, Stick-slip
Lubricity	Hydrodynamic, Mixed, Boundary
Environmental	Temperature, Humidity, Vacuum, Gases, Corrosive Atmospheres
Scratch	Adhesion, Delamination, Hardness
Indentation	Young's Modulus, Storage Modulus, Hardness
Strain	Multi-axis, Tension, Compression, Torsion, Elasticity, Plasticity, Creep

Customized Flexibility

Apart from the standard tribology and mechanical property tests, UMT users find huge benefit in adapting the platform for custom tests on real parts. Highly adaptable tests include:

- Automotive & Aerospace
- Microelectronics
- Electrical Components
- Metals, Ceramics
- Bio Materials, Medical
- MEMs, Optics
- Disk Drive Media
- Composite Materials
- Lubricants & Additives
- Thin Films & Coatings
- Polymers & Elastomers
- Paper & Fabric

Specifications

Friction/Load Sensing		
	Low range	5 to 500mN
	Resolution	50µN
	High range	10 to 1000N
	Resolution	50mN

Torque Sensing		
	Low range	0 to 0.17 N-m
	Resolution	8x10 ⁻⁴ N-m
	High range	0 to 22.6N-m
	Resolution	0.01N-m

Motion & Controls		
Max lateral travel		75mm
	Resolution	0.25µ
	Speed	0.002 to 10mm/s
Max. vertical travel		150mm
	Resolution	0.5µm
	Speed	0.002 to 10mm/s
	Wear-depth accuracy	5µm

Reciprocating Test- High Load		
	Max. travel	75mm
	Position resolution	1µm
	Speed	0.01 to 100mm/sec
	Max. Load	0.5kN

Pin/Ball-on-Disk Test - High Speed		
	Max. speed	5,000rpm
	Max. normal load	1kN
	Max. friction force	127N @ 80rpm

Block-on-Ring Test - High Speed		
	Max. speed	5,000rpm
	Max. load	1kN
	Max. friction force	110N @ 5,000rpm

Block-on-Ring Test - High Load		
	Max. speed	1,500rpm
	Max. load	1kN
	Max. load	1kN @ 1,500rpm

Environmental Test Chambers	
Temperature Controller	Standard
Test Chambers	150°C, 350°C & 1000°C
Vacuum, Inert Gas & Humidity	See data sheets

● Bruker Nano Surfaces Division

Campbell, CA • USA
 Phone +1.408.376.4040/866.262.4040
productinfo@bruker.com
www.bruker.com