Anton Paar

Low-Force and Low-Torque Testing of Mechanical Parts

Universal Testing Machine Micro

UTM Micro:
Making Things Measurable

Anton Paar's universal testing machine, UTM Micro, based on the renowned Anton Paar MCR rheometer, opens up a new world of material testing: delicate and small mechanical parts such as bearings, springs, microwires, organic fibers, micro-electro-mechanical devices, and much more. The versatile UTM machine's sensitive MCR technology, combined with proven modularity and an integrated extensometer and load cell, sends you beyond just tensile testing. You're now able to rise to all kinds of challenges, even in the fields of DMA and optical methods.

FIND OUT MORE

www.anton-paar.com/apb-utm

TYPICAL TEST METHODS

- TENSILE
- FRICTION
- TORSION
- TEAR
- COMPRESSION
- FATIGUE
- BENDING
- CREEP
- SHEAR
- PEEL

MUCH MORE THAN "JUST ANOTHER UTM":

- ✓ A whole new world of low-force mechanical parts testing down to 0.0005 N – a never-before-accessible micro range
- ✓ Low torque and deflections measurable down to 0.5 nNm and 0.05 µrad
- ✓ Testing under real-life conditions: Set temperatures from -160 °C to +1000 °C, humidity from 5 % RH to 95 % RH, and measurement in inert gas atmosphere
- ✓ Custom adaptation via 200+ accessories
- ✓ Use as a UTM or as a sophisticated combination of rheometer, tribometer, and device for dynamic mechanical analysis (DMA) with optical methods to further investigate the behavior of components
- ✓ Time and personnel cost optimization: Minimal training required and automated test procedures in the software

Applications

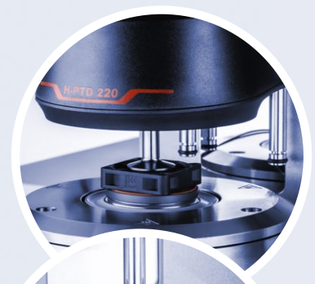
COMBINE TRADITIONAL MECHANICAL TESTING METHODS WITH THE PRECISION OF AN MCR RHEOMETER

The UTM Micro can measure even the smallest torques and forces due to its renowned EC motor technology and the capacitive normal load sensors built into the air bearing. In combination with a separate linear motor, a normal force resolution down to 0.5 mN can be achieved. Additionally, the optical encoders allow the measurement of linear displacements and angular deflections with unrivaled accuracy of 0.01 µm and 0.05 µrad. This allows the mechanical characterization of parts and components previously not measurable with readily available commercial instruments.

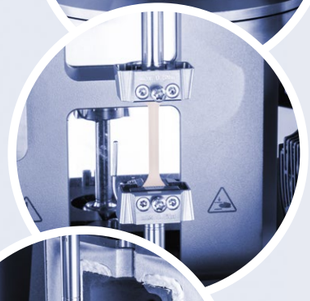
UTM Micro is **more than just a UTM**. It's a fully-fledged measurement platform, with the flexibility of a high-end rheometer.

THE UNIVERSAL TESTING MACHINE MICRO PERFORMS TORSIONAL AS WELL AS TENSILE, COMPRESSION, FLEXURAL, PEEL, SHEAR, TEAR, AND FRICTION TESTS

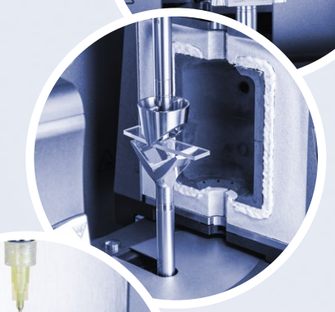
Typical test applications include fibers, foils and films, consumer products, and biomaterials. The UTM Micro can be used to evaluate component durability and for quality control.



TORSIONAL TESTING



TENSILE AND COMPRESSION TESTING



FLEXURE TESTING

PEEL, PUNCTURE, AND FRICTION TESTING

(MICRO-) ELECTRONICS

MATERIAL RESEARCH

AUTOMOTIVE

METROLOGY AND WATCHMAKING

PACKAGING

BIOMEDICAL

FOOD

Fixtures

Secure clamping is essential for the testing of parts and materials. Choose from a wide range of readily available fixtures that fit your specimen.

YOUR BENEFITS:

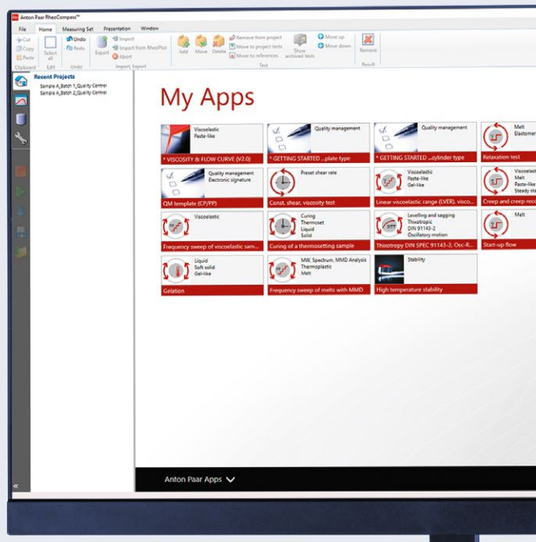
- ✓ QuickConnect functionality offers fast, screwless changes of holders and fixtures
- ✓ Automatic ZeroGap/ZeroAngle functionality guarantees reproducible positioning of the fixtures without complex, error-prone alignment procedures
- ✓ The robust holders ensure characterization of stiff samples without compliance issues
- ✓ Different temperature chambers allow testing of parts under real-life environmental conditions
- ✓ Custom solutions to securely hold small parts in place during testing

Application Software

Investigate whatever you want: UTM Micro's application software ensures efficient operation of your device, provides templates you can use or adapt, and helps you analyze the results.

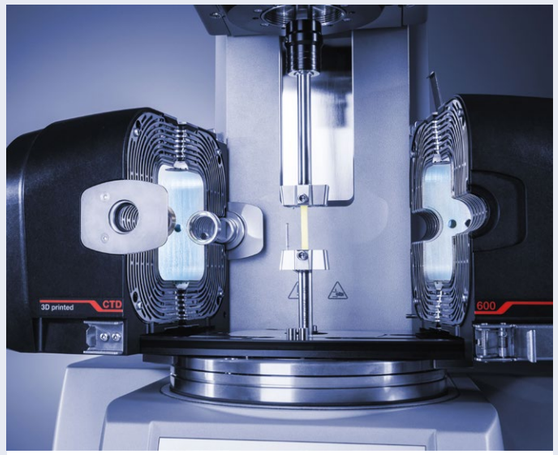
This powerful software automates the entire process from sample preparation to printed results (using the test, analysis, and report designers). It can even be remote-controlled via the device display to minimize the time you spend on sample preparation.

- Meets every challenge – from routine QC testing to scientific analysis
- Available in eight languages
- Central database handles all relevant data and guarantees data security
- Automatic data exchange with a lab information management system (LIMS)



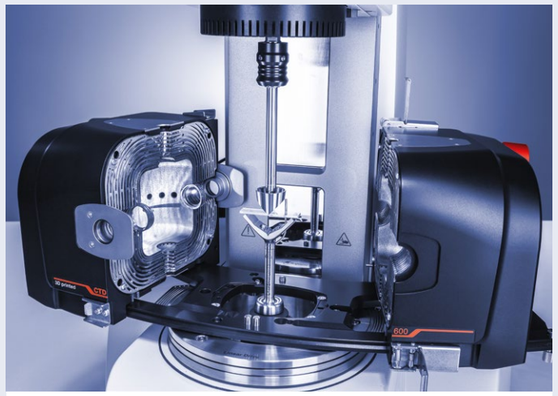
FIND OUT MORE

www.anton-paar.com/apb-rheocompass



SOLID RECTANGULAR FIXTURE

For uniaxial deformation of films, fibers, and thin bars. Due to its special design, this fixture ensures the exact alignment of samples with different thickness with the axis of the measuring system so that reproducible results can be obtained.



THREE-POINT-BENDING SYSTEM

Material can be positioned on two supports with a static shaft positioned in the middle. No additional clamping is needed, and measurement errors due to restraints are minimized. This fixture is suitable for characterizing stiff materials, such as composites and thermoplastics below their Tg, thermosets, and metals and ceramics.

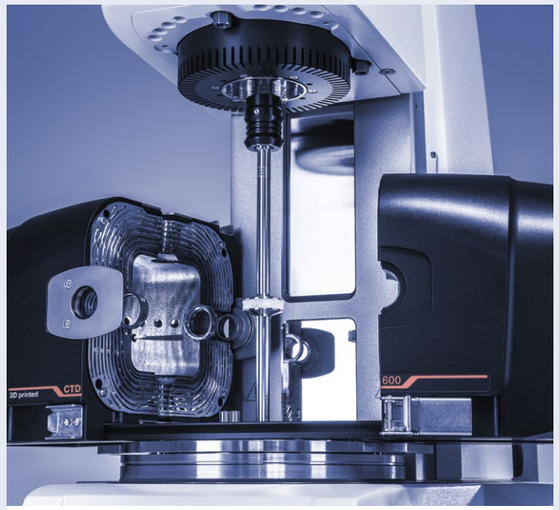
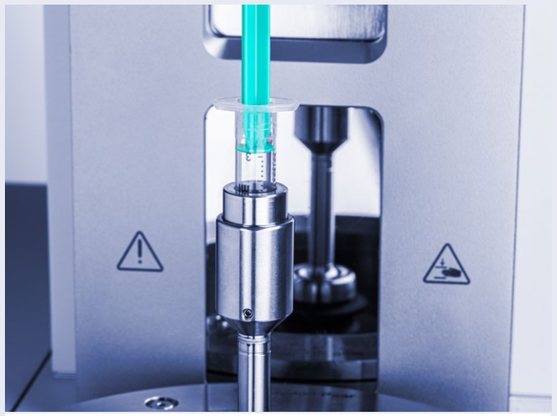


PLATE-PLATE SYSTEM

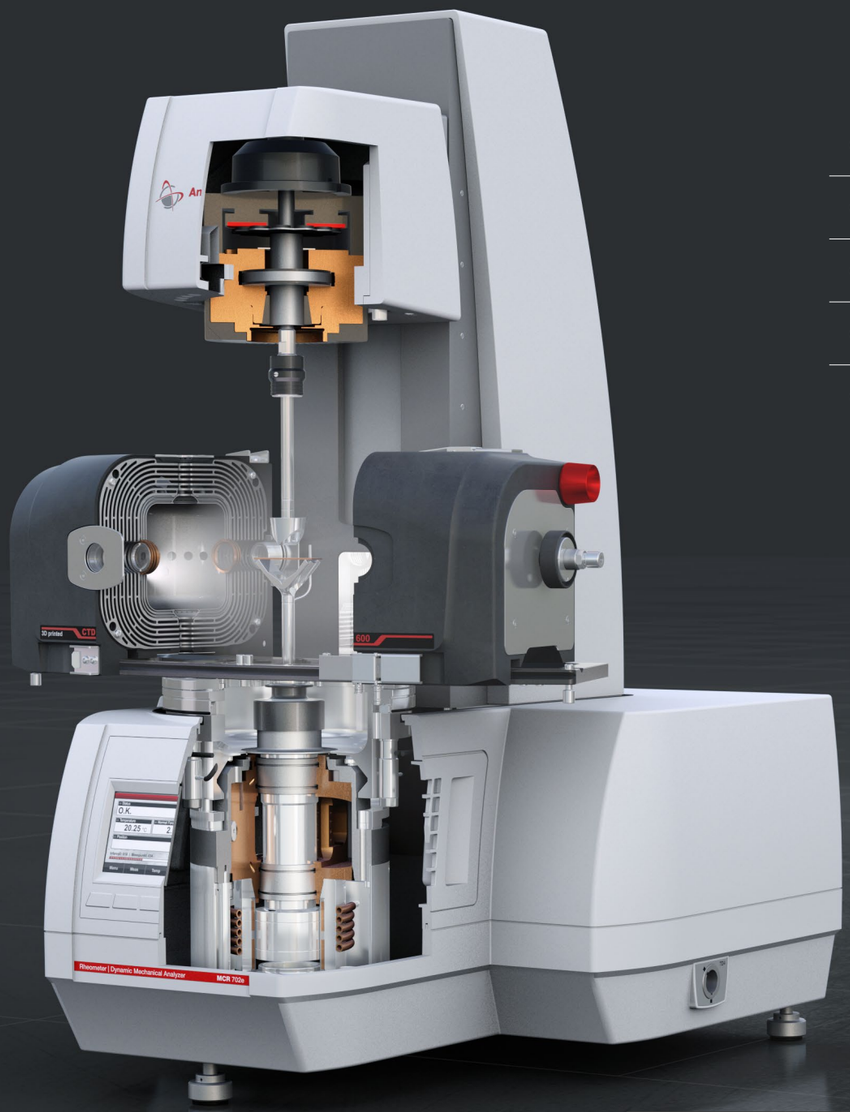
For uniaxial compression testing of foams, elastomers, and other soft solids like foods and gels, conventional plate-plate fixtures are available.



CUSTOM SOLUTIONS

Many small parts require custom solutions that ensure they are securely held in place during testing because of their unique geometry. Our experienced engineering team can quickly create competitively priced custom fixtures in-house to deliver the solution that is right for your application.

Key Features



① Open up a whole new world of low-force and low-torque universal material testing

② Test your mechanical parts under real-life conditions

③ Choose from a wide range of variable-geometry grips and test fixtures

④ More than “just” a universal testing machine

⑤ Save time and personnel costs

①

OPEN UP A WHOLE NEW WORLD OF LOW-FORCE AND LOW-TORQUE UNIVERSAL MATERIAL TESTING

Test small parts and components with forces down to 0.0005 N and torques down to 10^{-9} Nm, with an angular resolution of $6x10^{-7}$ degrees and a displacement accuracy of 0.01 µm – across a micro range never accessible before. Say goodbye to expensive self-made or limited commercial solutions, and complicated back-and-forth with external testing labs. Take product development, research, and quality control into your own hands.

②

TEST YOUR MECHANICAL PARTS UNDER REAL-LIFE CONDITIONS

Choose from various temperature devices to set temperatures from -160 °C to +1000 °C and humidity from 5 % RH to 95 % RH, or measure in an inert gas atmosphere to reduce oxidation or avoid sample contamination. The unrivaled performance of the temperature devices, with minimized temperature gradients down to ≤0.1 °C and maximum heating rates up to 60 °C per minute, guarantees absolute and reproducible results.

③

CHOOSE FROM A WIDE RANGE OF VARIABLE-GEOMETRY GRIPS AND TEST FIXTURES

Adapt the instrument to your specific needs via 200+ accessories. Our experienced engineering team can quickly create competitively priced custom accessories in-house. From tensile testing machine to micro torque tester, your UTM Micro is as flexible as you need it to be, for years to come.

④

MORE THAN “JUST” A UNIVERSAL TESTING MACHINE

Make of the UTM Micro exactly what you need: a mechanical testing machine or a multi-performer that combines more than one method – it’s a rheometer, a tribometer, and a device for dynamic mechanical analysis in one. It also offers optical methods for further investigation of the behavior of your components.

⑤

SAVE TIME AND PERSONNEL COSTS

No experts are needed to handle the device, and its unique usability features are integrated into the software. In fact, every component is designed, and every handling step created, to be part of a smooth and intelligent whole. QuickConnect coupling, without the need for a screwing mechanism, allows the one-handed, one-second exchange of measuring geometries, testing fixtures, holders, and clamps. The patented Toolmaster™ technology is a completely automatic tool recognition and configuration system that recognizes measuring geometries and accessories. It is able to transfer all relevant parameters to the software without the risk of error associated with manually entering complex geometry data in the software.

Safe Operation, **Safe Investment**

OPERATOR SAFETY

Low normal forces and lift drive speeds minimize the risk of injury to the operator.

COLLISION MITIGATION

Instrument stops if a sudden increase in force or torque exceeding maximum capacity of the device is detected – preventing damage.

PROTECT YOUR SPECIMEN

Easy adjustment of movement profiles and event control in the application software limit the force and torque acting on delicate specimens and restricts lift drive speeds during loading, unloading, and testing.

Anton Paar
Certified Service

“We’re confident in the high quality of our instruments. That’s why we provide **a full warranty for three years**.”

All new instruments* include repair for three years.
You avoid unforeseen costs and can always rely on your instrument.
Alongside the warranty, we offer a wide range of additional services and maintenance options.

*Due to the technology they use, some instruments require maintenance according to a maintenance schedule. Complying with the maintenance schedule is a prerequisite for the three-year warranty.

Technical **Specifications**

	UTM Micro
Motor design (rotation)	EC permanent magnet synchronous motor
Motor designs (lift)	Stepper motor (upper drive) Moving magnet linear drive (lower linear drive)
Displacement transducer design	High-resolution optical encoder (upper drive)
Force capacity (lift drive)	-50 N to 50 N
Force capacity (linear drive)	0.0005 N to 40 N
Displacement (linear drive)	0.01 µm to 9400 µm[1]
Minimum torque (rotation)	1 nNm
Minimum torque (oscillation)	0.5 nNm
Maximum torque	230 mNm
Minimum angular deflection	0.05 µrad
Frequency (linear drive)	0.001 Hz to 100 Hz
Frequency (upper rotational drive)	~10^{-8} Hz to 100 Hz[2]
Maximum temperature	1000 °C[3]
Minimum temperature	-160 °C[4]
Heating rate (max.)	Up to 60 K/min[5]
Cooling rate (max.)	Up to 50 K/min[5]
Humidity	5 % RH to 95 % RH[6]
Dimensions (W x H x D)	444 mm x 753 mm x 586 mm
Weight	48 kg (61 kg with optional linear drive)
Performs torsion, tensile, compression, bending, shear, friction, peel, and other tests	✓
Toolmaster™ (measuring geometries and accessories, storing of zero-gap) (US Pat. 7275419. 2004)	✓
QuickConnect coupling for measuring geometries (one-hand operation, screwless)	✓
Specimen protection	✓
Auto-positioning	✓
Camera option	✓
Collision mitigation	✓
Trademarks	Toolmaster™ 3623873

[1] In oscillation, a maximum displacement of ± 4500 µm.
[2] Minimum frequency is a theoretical value (duration per cycle = two years).
[3] In combination with CTD 1000.
[4] In combination with CTD 600 MDR and low-temperature option.
[5] Depending on temperature device used.
[6] In combination with CTD 180 HR and humidity option.

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