Anton Paar

Friction, Wear, and Lubrication

Tribometers

Where Surfaces Meet, Performance Begins

Every moving part depends on how two surfaces interact. Friction, wear, and lubrication determine whether something runs smoothly or fails too soon.

Tribological testing reveals how materials behave in contact — turning surface interactions into measurable performance data that drive better, longer-lasting designs.

A complete range for every tribological challenge
From quick screening to complex research setups, our tribology portfolio covers the full spectrum of applications. Each system combines precise force control, flexible motion, and reproducible results — helping you compare coatings, optimize lubricants, and ensure reliable performance in every step from R&D to production.

Real conditions, real answers
Our tribological testing solutions replicate real operating conditions – from dry contact to fully lubricated motion, and from ambient environments to extreme temperatures, humidity, and more. Each test reveals exactly how your materials behave when it counts most: in actual use.

Every contact counts
Tribological interactions take many forms, and we offer a wide range of solutions to match – round-on-flat, flat-on-flat, and round-on-round – each revealing different aspects of material behavior. With linear reciprocating and rotational reciprocating motion modes, you can simulate realistic movement patterns and contact pressures. This flexibility enables you to replicate real mechanical stresses, giving you the insights needed to boost the durability and efficiency of your materials.

Diamond Hard coating Ceramics Glass Metals Wood Polymers Food Cosmetics Cartilage Hydrogels Grease Oil Fuel

TRB³ Tribometer

MCR Tribometer

TRB and THT Tribometers

Pin-on-disk tribometer (TRB³)
With over 1,000 installed bases worldwide over the last 35 years, our pin-on-disk tribometer is the standard for measurement of friction, wear, and lubrication. Its wide range of testing parameters, contact geometries, and add-on options allows users to conduct tribology testing by simulating all in-service conditions, such as different movement modes (rotating, linear reciprocating, and angular reciprocating), contact modes, speed, lubrication, materials, high temperature, humidity, etc.

- Two friction force sensors to minimize errors caused by thermal drift
- Independent normal load application and friction force measurement to avoid mutual influence between different force signals
- Integrated temperature and humidity sensors for real-time environment monitoring
- Easy friction force and rotation speed calibration
- Reference sample kit for easy performance verification
- Integrated Python programming environment equipped with scripting function for data analysis and customized testing sequences
- Compliant with ASTM G99 and ASTM G133 standards

High-temperature tribometer (THT 800 °C)
Analysis of materials' friction and wear properties at elevated temperatures is becoming increasingly important, especially for the development and quality control of cutting tools, combustion engines, and power plants. To meet this requirement of material testing, we offer powerful high-temperature tribometers, which heat the sample homogeneously and accurately control sample temperature up to 800 °C to simulate the materials' in-service condition.

- Dual friction force sensors to minimize thermal drift error in friction measurement
- Circular heating element and water cooling system to allow for precise and homogeneous temperature control up to 800 °C
- Independent normal load application and friction force measurement design to avoid mutual influence between different force signals
- Highly linear and precise elastic arm for friction load measurement
- Compliant with ASTM G99 and ASTM G133 standards

High-temperature tribometer (THT 1000 °C)
With its unique dual-heating-elements layout, THT 1000 °C brings high-temperature tribology testing to a new level of reliability and stability. Differential friction force measurement ensures negligible signal drift at extremely high temperatures. Careful design of the static partner and sample holders ensures trouble-free measurements for the user – even during tribology tests at 1,000 °C.

- Dual friction force sensors to minimize thermal drift errors in friction measurement
- Top and circular heating elements combined with water cooling system to allow for precise and homogeneous temperature control up to 1,000 °C
- Independent normal load application and friction force measurement design to avoid mutual influence between different force signals
- Highly linear and precise elastic arm for friction load measurement
- Compliant with ASTM G99, and ASTM G133 standards

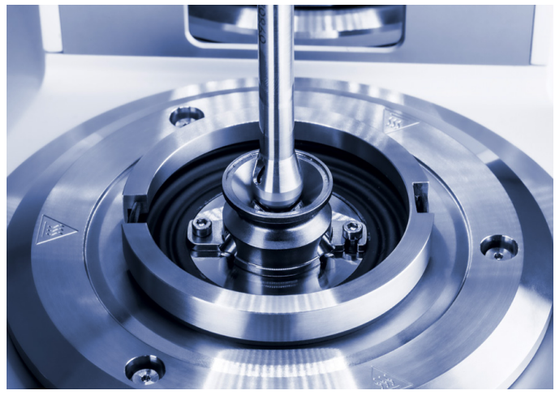
Vacuum tribometer / vacuum high-temperature tribometer (TRB V/THT V)
Our vacuum tribometers are designed to provide precisely controlled vacuum levels down to 10^{-7} mbar or gaseous environments for friction and wear studies at room or high temperatures. The professional vacuum system allows the user to reach the required atmospheric condition in a well-controlled and reliable manner.

- Primary (10^{-3} mbar) or secondary (10^{-7} mbar) vacuum control
- Mixture of up to three kinds of gases with precise feedback control on pressure or on mass flow
- Independent normal load application and friction force measurement design to avoid mutual influence between different force signals
- Highly linear and precise elastic arm for friction load measurement
- Compliant with ASTM G99 and ASTM G133 standards

MCR Tribometer

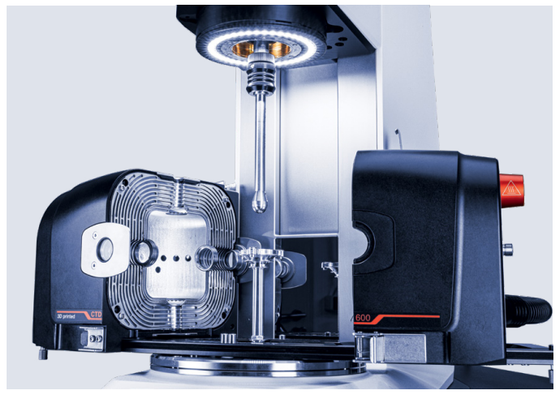
MCR tribometer: An evolution in tribological testing
Employ the precise motion and normal force control of MCR tribometers for your tribological measurements. Expand your traditional tribological tests by opening up entirely new measuring ranges on one single instrument. MCR tribometers come with numerous test setups and contact geometries to suit your requirements. Benefit from our decades of experience in precision instrumentation.

- Seamlessly measure breakaway forces as well as static and limiting friction of dry and lubricated contacts
- Plot Stribeck curves over nine decades of sliding speeds – a few nanometers per second to 3.3 meters per second
- For food and beverages, lubes and greases, polymers, ophthalmics, biomedicine, etc.
- Full benefits of the extended atmosphere control
- Temperature range between -160 °C and +600 °C
- Humidity control from 5 % to 95 %
- In addition to the existing setups, there's always scope for customization to perfectly suit your application



Ball-on-three-plates: (or T-PTD 200)
Full motion flexibility and precision
The ball-on-three-plates setup is a well-established method for measuring both lubricated as well as dry tribological systems. Different measuring geometries (plates, cylinders) are available and can be adapted to specific sample needs. The heart of this setup is the T-PTD 200 tribology cell which ensures precise alignment and therefore a homogeneous distribution of normal forces on the measured specimen.

- Nine decades of sliding speeds – from a few nanometers per second to 3.3 meters per second
- Contact pressure of a few kPa to 1.2 GPa
- Broad range of applications – from food and beverages to lubricants and greases, metalworking, fluids, etc.
- Wide range of specimen and holders catering to individual applications
- The Peltier heating system allows excellent temperature control from -40 °C up to +200 °C
- Also available in the T-PTD 200E variant for characterizing electrical properties of the tribosystem



Ball-on-three-plates: (or T-BTP)
Extended atmosphere control
This setup allows for measurements in a temperature range from -160 °C to +600 °C or with a relative humidity between 5 % and 95 %. Normal forces as low as 0.1 N can be applied. The stiffness of the measuring system can be adjusted by the patented spring system, which transfers the normal forces applied in a vertical direction (Pat. No. AT514726A1).

- Enjoy complete motion and force ranges of the MCR tribometer with added low-force sensitivity
- Enjoy the advantages of the Convection Temperature Device (CTD) for tribological measurements
- Temperature range between -160 °C and +600 °C
- Humidity control from 5 % to 95 %
- Spring stiffness adjustable in z-direction offering excellent damping characteristics

Pin-on-disk (or T-PID/44)
The T-PID/44 allows for round-on-flat, flat-on-flat, or line contacts in dry and lubricated conditions. The spring stiffness can be adjusted in the z-direction, which enables optimal damping characteristics. Various specimen materials can be fixed in the upper and lower holder allowing a broad range of applications.

- Contact geometries ranging from flat-on-flat contact to point contact, abrasive contact, line contact, etc.
- Temperature range between -30 °C and +210 °C
- Diverse applications: asphalt, lubes and greases, cosmetics, food and beverages, ice, cartilage, bio-medicine, etc.
- Make use of the flat-on-flat contact geometry for low-contact pressure applications
- Possibility to adapt the setup to accommodate a ring-on-disc test configuration

	Standard tribometer (TRB³)	High temperature tribometer (THT)
Force specification		
Normal force range	Up to 60 N	Up to 60 N
Normal force resolution	× (Dead weight)	× (Dead weight)
Friction force range	Up to 20 N (5 N option)	Up to 10 N (20 N option)
Friction force resolution	0.06 mN (0.015 mN option)	0.03 mN
Rotating movement		
Speed	0.2 rpm to 2,000 rpm	0.3 rpm to 600 rpm (1,500 rpm option)
Radius	Up to 40 mm	0.5 mm to 35 mm
Maximum torque	450 mN.m	450 mN.m
Linear reciprocating movement[1)]		
Stroke length	Up to 60 mm	×
Speed	Up to 370 mm/s	×
Frequency	0.01 Hz to 10 Hz	×
Rotational reciprocating movement[2)]		
Frequency	0.01 Hz to 7 Hz	0.01 Hz to 7 Hz
Angular amplitude	±5° to ±150°	±10° to ±150°
Angular resolution	0.1°	0.1°
Options		
Online wear depth	-2 mm to 2 mm	Up to 1.2 mm
Heating capability	Up to 450 °C in dry condition Up to 150 °C in liquid condition	Up to 1,000 °C
Electrical contact resistance	Up to 1,000 Ohms	Up to 1,000 Ohms
Vacuum level	Down to 10^{-7} mbar	Down to 10^{-7} mbar
Relative humidity level	15 % to 95 %[3)]	×

1) Linear reciprocating movement specifications depend on the combination of stroke length, frequency, and mass on the stage.
2) Rotational reciprocating movement specifications depend on the combination of angular amplitude, frequency, and mass on the stage.
3) For humidity-controlled tribometers, customized solutions can be offered.

	MCR tribometer				
Contact conditions					
Normal force range	1 N to 50 N			0.1 N to 70 N	
Normal force resolution	0.005 N				
Contact type	Point, bearing	Point	Point, line, flat	Point	
Motion conditions, continuous rotation					
Speed range	10^{-6} rpm to 3,000 rpm	10^{-6} rpm to 3,000 rpm	10^{-6} rpm to 1,000 rpm	10^{-6} rpm to 3,000 rpm	
Sliding speed range	10^{-8} m/s to 3.3 m/s	10^{-8} m/s to 1.4 m/s	10^{-8} m/s to 2.3 m/s	10^{-8} m/s to 1.4 m/s	
Electro-tribology	×	Voltage: 0 kV to 4 kV Current: up to 1 mA	×	×	
Torque range	Up to 300 mNm				
Torque resolution	0.1 nNm				
Motion conditions, oscillatory rotation					
Frequency	10^{-7} Hz to 100 Hz				
Angular amplitude	1 µrad to ∞ µrad				
Angular resolution	10 nrad				
Temperature devices					
Temperature control technology	Peltier				Electrical
Measuring cell	T-PTD 200	T-PTD 200E	T-PID/44	T-BTP	
Environmental conditions					
Temperature range	-40 °C to +200 °C	-40 °C to +200 °C	-30 °C to +210 °C	-20 °C to +180 °C	-160 °C to +600 °C
Relative humidity level	×	×	×	5 % to 95 %	×
Additional parameters					
Min. online wear depth	0.065 µm				

Software for Tribological Excellence

Advanced tools that streamline setup, control, and analysis.

TRB and THT software
The TRB and THT software provides precise, real-time insight into tribological behavior while giving users full control over complex test sequences. High-speed data acquisition, intelligent modeling tools, and automated safety features ensure reliable and repeatable results.

Key capabilities include:

- Continuous real-time friction signal acquisition
- Adjustable data-acquisition rate up to 400 Hz
- Programmable incremental speed and normal force within a single measurement
- User-defined testing for flexible experiment design
- Integrated Hertzian stress modeling for optimal test-parameter selection
- Multi-cycle angular reciprocating mode to minimize misalignment effects
- Automatic threshold protection for friction force and coefficient

RheoCompass software
RheoCompass streamlines the setup, execution, and analysis of tribological experiments. Clear action blocks and intuitive parameter control make test creation straightforward, while powerful visualization and analysis tools support deep scientific evaluation.

Highlights:

- Easy control of normal force, breakaway torque, speed, deflection, temperature, and optional humidity
- Predefined templates for Stribeck, static friction, and wear tests
- Guided test designer for building custom workflows
- Combination of sequential actions with a clean, structured data layout
- Multi-axis graphing for flexible visualization
- Customizable post-test analysis routines
- Automatic export of data and reports at test completion

Reliable. Compliant. Qualified.

Find out more

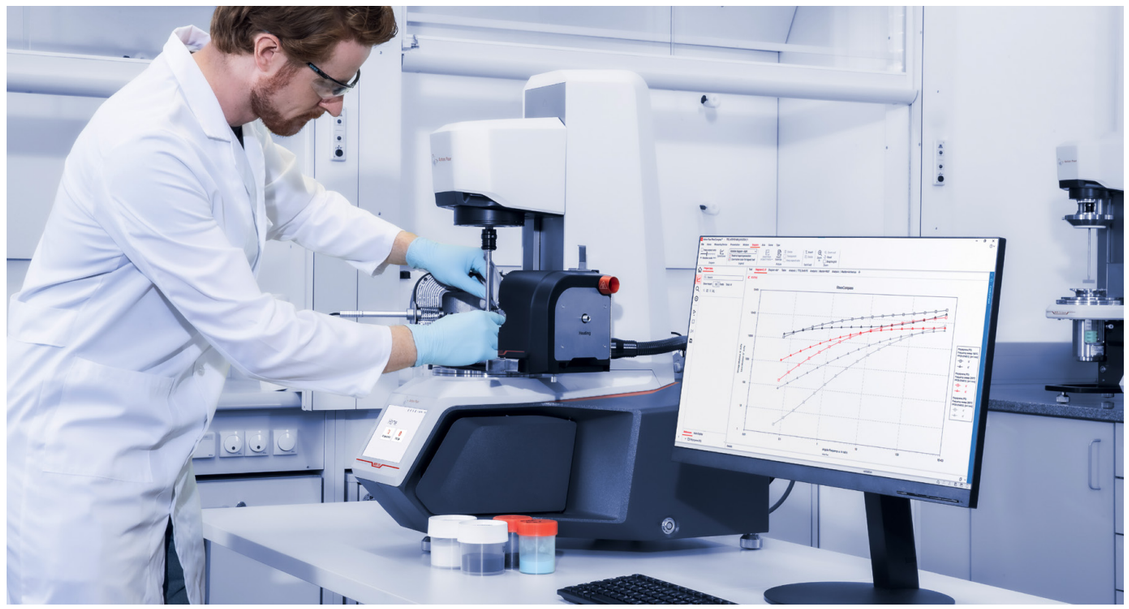
Our well-trained and certified technicians are ready to keep your instrument running smoothly.

Maximum uptime
Regardless of how intensively you use your instrument, we help you keep your device in perfect shape and safeguard your investment. For at least 10 years after the discontinuation of a device, we'll provide you with any service and spare part that you might need.

Warranty program
We're confident in the high quality of our instruments. That's why we provide a full three-year warranty. Just make sure to follow the relevant maintenance schedule. You can also extend your instrument's warranty beyond its expiration date.

Short response times
We know that sometimes it's urgent. That's why we provide a response to your inquiry within 24 hours. We give you straightforward help from experienced people, not from bots.

Global service network
Our large service network for customers spans 85+ locations with more than 600 certified service technicians. Wherever you're located, there's always an Anton Paar service technician nearby.



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