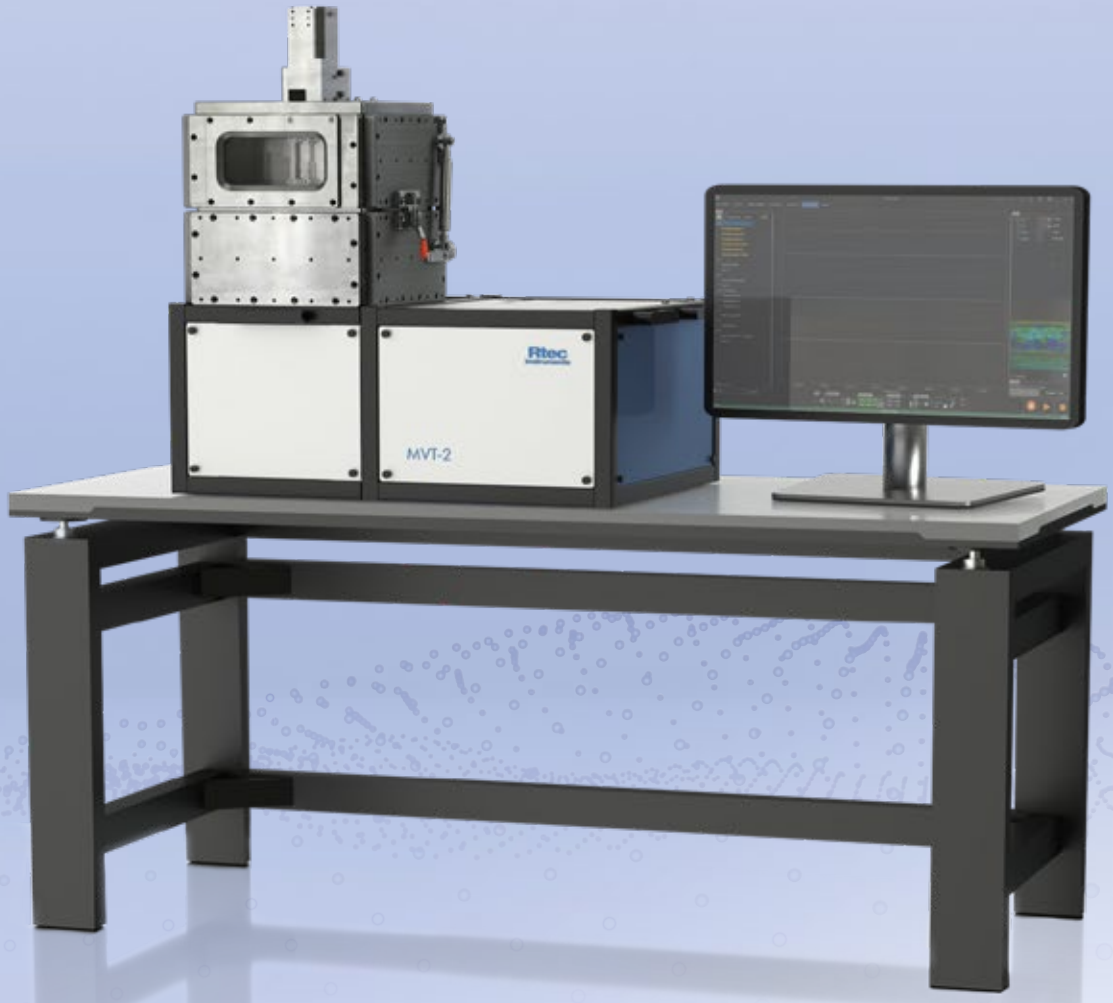
# Multi Function Vacuum Tribometer

## MVT-2




Wear, Friction, Coefficient of Friction, Adhesion, Scratch Hardness, Modulus, High Temperature, Cryogenic

# Versatile Vacuum Testing

- Wear
- Friction
- Coefficient of Friction
- Hardness
- Adhesion
- Scratch Hardness

### Environmental Control
Study properties under vacuum and a wide temperature range of -150 to 1000 °C.

### Closed-Loop Down Force Control - Nano, Micro, Macro Range
Patented capacitive sensors with a test range from mN to 200 N.

### Rotary and Linear Motions
Tests can be performed using both rotary and linear modes.

### System Design
The unique open-face system architecture allows for easy access and customization. It also allows for adding custom ports.


**A** Upper Z Gantry

**B** Force Sensor

**C** Lower Test Module

**D** Thermal Management

**E** Linear System

**F** Vacuum System

**G** Data Aquisition, Motion Controller



# Vacuum Tribology for R&D to QC

**Why Vacuum Tribology?**
Advancements in space, semiconductors, thin films, and 2D materials have resulted in several studies focused on material and coating properties under a vacuum environment.

The MVT-2 has vast force, speed, and test temperature ranges to analyze material properties under vacuum conditions. Our unique design with patented force sensors comes with easy wide front access, capable of generating data with high accuracy and repeatability. Run standard friction, scratch, adhesion, hardness, lubrication, and wear tests on the same platform.

### Active Feedback Loop Control
The tester comes with closed-loop active feedback controls over many channels. The applied force is controlled during the test using electro-servo drives. The force is measured using high-precision force sensors with negligible drift. The tester can operate at constant or linear changing force profiles. The rotation speed is controlled using servo-controlled feedback. This allows tests at constant or changing RPM.

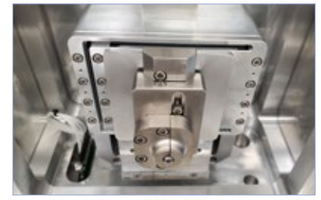
### Environmental Control
The tester allows for environmental control under vacuum conditions. A single setup allows testing across a wide temperature range -150°C to room/ 400 °C/ 1000 °C. In addition, the design enables circulating gases during the test. MVT-2 is equipped with water-cooled circulators and anti-condensation features for effective thermal management during the test. The advanced control system allows temperature measurement at multiple points simultaneously. The temperature is closed-loop controlled, and the requested conditions are controlled automatically using the software.

### Accurate Determination of Failure Events
The tester can accommodate various in-line monitoring sensors to quantify real-time surface dynamics. For example, the acoustic emission sensor is a wide frequency sensor that detects crack initiation points during the test.

### Ease of Use and Automation
The instrument comes standard with a powerful set of software, from control to post-analysis and imaging software. The data can export into many formats, including ASCII format. The software allows the user to stop the test using logic based on signals from several in-line sensors. Each test can be controlled by a series of command blocks forming a protocol or “recipe.” The MVT-2 has advanced high speed, low noise, fast feedback, and multiple channel data acquisition rate controllers.

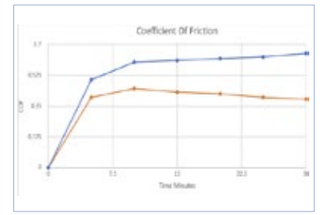
### Applications
The versatility of the tester allows the MVT-2 to play an essential role in several applications. It can be used for thin or thick films, lubricants, materials, soft materials, hydrogels biomaterials, smooth or rough surfaces, transparent or opaque surfaces, nano or macro scale, coating or bulk materials, and more.

Coated Sample Test View



Force Sensor and Holder

Nitrogen Controller




Friction Comparison

Software Interface

## Platform Specification

**Platform**
·Floor standing or bench top

**Vacuum**
·Up to $10^{-7}$ torr
·Rough and turbo molecular pump

**Z Stage**
·Max speed: 10 mm/s
·Motion resolution 0.25 µm

**Computer Console**
·Latest Windows OS
·LCD monitor, printer

**Facilities Requirement**
·Power Requirements: 240 VAC

**Environmental Chambers**
·-150°C to Room/ 400 °C/1000 °C

**Additional Sensors**
·ECR

**Various Mechanical Heads**
·Tribometer
·Indentation
·Scratch

**Load Range**
·mN to 200 N (various ranges available)

**Rotary Drive**
·Range 360°
·Up to 2500 RPM

**Linear Drive**
·Speed up to 50 mm/s
·Stroke 0.1 mm to 60 mm

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