

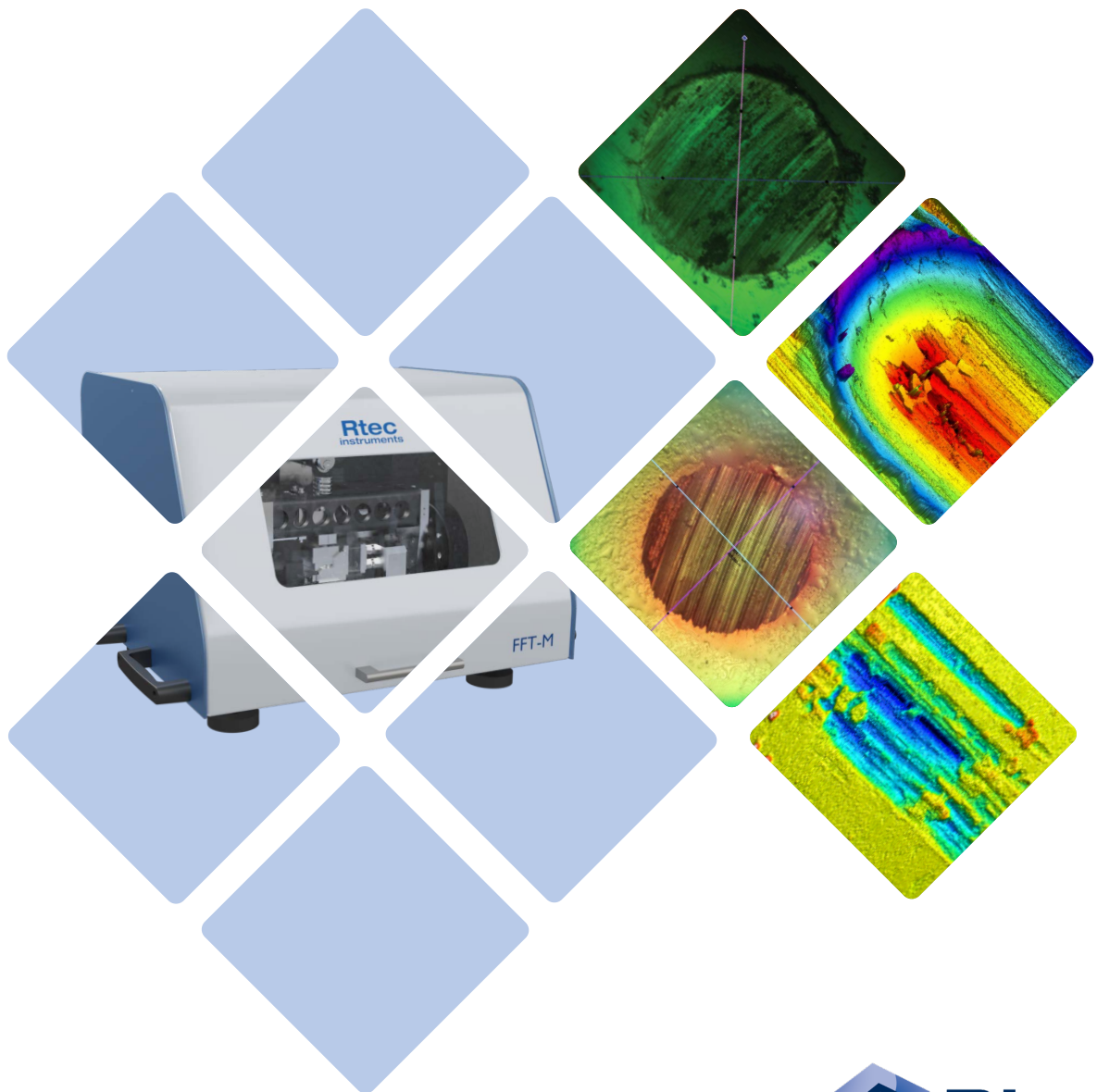
# High Frequency Fretting Rig

HFRR

Next Generation lubricity tester with real-time force and stroke control, piezo sensors, and a wide temperature range

Tests Diesel, Oil, Additive, and Gasoline

ASTM, DIN, ISO Compliant



## Next Generation HFRR

- Lubricity
- Wear
- Linear Friction
- Fretting

### Closed-loop Down Force Control

Real-time measurement and control of down force. Programmable constant, linear or step force profiles.

### Closed-loop Environmental Control

Humidity, temperature & inert gas for real-life simulation.

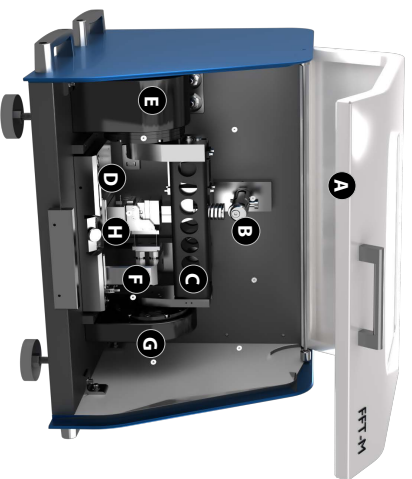
### High Reliability - Flexure Design

Voice coil based flexural suspension design without any bearings.

### The Smallest Controllable Stroke - 10 µm to 2.8 mm, up to 200 Hz

Real-time stroke, frequency monitoring, and correction using LVDT.

ASTM, ISO, DIN Compliant  
Next-generation tester – compliant with current standards  
and future testing needs



- A** Enclosure
- B** Down Force Control
- C** Position Control
- D** Environmental Controller
- E** Voice Coil
- F** Friction Measurement
- G** Addition In-line Sensors
- H** Liquid Containers, Sample Holder

## Automation and Analysis

### Introduction

Rec-Instruments' benchtop high-frequency reciprocating tester tests the lubricity of diesel fuels and screens the lubrication performance of engine oils, additives, and more.

This next-generation HFRR testing machine uses programmable force control (no dead weights), its unique flexure based design, rigid platform, in-line friction monitoring at high frequencies, and fully automated test programs allows for high repeatability and precision measurements.

### Down Force

The applied force is measured and controlled in real-time using a servo-controlled motor. The real-time force control (no dead weights) allows it to perform tests in constant, linear, or step force profiles. Hence it can run both standard or non-standard tests with ease.

### Precise Waveform Control

Without the friction of rolling or bearings, the flexure-based design with a voice coil actuator provides the control required for the most sensitive of tests. In addition, the tester uses the most accurate and precise displacement control in the market with a 1 nm resolution and micron level of accuracy.

### Accurate determination of failure events

The tester comes with advanced dial piezo sensors to measure real-time friction at high frequencies. Coupled with in-line acoustic emission and an electrical contact resistance sensor, it allows accurate determination of failure events during the test.

### Standard compliance

The tester comes with certified standard oil samples, balls, and disks.

### Software

The tester comes with a windows based computer that has an operation and data analysis software package.

The operation software is a recipe-based software that allows it to run standard or previously created standard programs with a click of a button. The software provides change force, temperature, frequency, stroke, time, cycles, and humidity during each step. It also allows you to define endpoints based on several in-line data that are monitored. The software can be used for simple standard tests or advanced complex test methods.

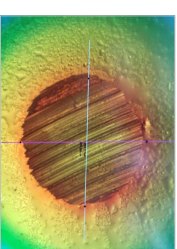
The analysis package comes with visualization and statistical data analysis. Multiple files and reports can be opened for easy comparison. Data can be stored in binary or ASCII format.

### Environmental Control

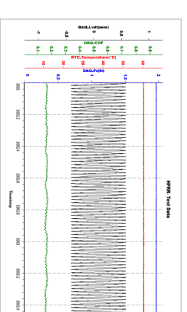
The tester comes with several environmental control options. Including a closed-loop humidity control that uses a humidifier to reach 5 to 95% RH. Several temperature ranges for both heating and cooling are available on the tester.

### Applications

Wide testing conditions allow the HFRR Tester to be used across several applications such as automotive, aerospace, lubricant, railways, coatings, turbines, EV vehicles, motors, turbines, and much more.



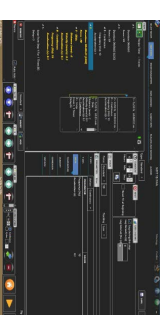
3D Wear Scar Mark



High Frequency Data



Top view of the FFT-M



Software Interface

# Platform Specification

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## Platform

- Bench top FFT-M HFRR
- Up to 20 N force (more options available)
- Enclosure

## Standards Conforms To

- D6079
- ASTM D7688
- CEC F-06-A-96
- ISO 12156-1
- IP450
- BS-EC590
- Many More

\*Standard reference oils (high and low viscosity) and disk provided for calibration.

## Actuators

- Displacement 10  $\mu\text{m}$  - 2.8 mm
- Resolution: 0.1  $\mu\text{m}$
- Oscillation frequency: up to 200 Hz

## Sensors

- Piezo Friction Sensor

## Environmental

- Up to -35°C, 180°C, 400°C
- Humidity controller 5 to 95% RH

## Standard Samples

- 6 mm balls
- 10 mm diameter disks
- More options available

## Computer console

- Control Software and Data Analysis Software
- Windows 10 Operating System
- Monitor, keyboard, mouse

## About us

Rtec-Instruments develops and manufactures advanced imaging and surface mechanical property measurement solutions for research and industrial applications. Based in Silicon Valley, we are the leading provider of testing instrumentation such as tribometer, optical profilometer, 3D scratch tester and micro/nano hardness tester.

We share a philosophy that embraces collaboration and partnership with customers, leaders in academia and industry, to ensure that our products answer real needs with innovative solutions.



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