

The Nanovea Tribometer offers precise and repeatable wear and friction testing using rotative and linear modes on a single system. Designed, at the core, with a high quality motor and a 20bit position encoder, the Tribometer provides access to an unmatched range of rotational speeds from 0.01 to 2000rpm. High resolution means that data can be accurately recorded at specified interval of time or position ($>0.006^\circ$). Full and precise control of the motor ensures that a series of step speeds can be run continuously during the tests. Several testing options are available to closely match real environment conditions. The Tribometer comes standard with an acrylic enclosure and attached valves which brings inert and other gases to achieve a controlled environment. An optional humidifier and dehumidifier module allows precise control of the humidity levels. An oven is available for rotative test up to 900°C and a heating plate is used for the linear test up to 300°C . Tests can either be done under full immersion in a cup or using the Lubrication system with drop by drop or control spray. A liquid heating module is also available to provide controlled liquid heating up to 150°C . To precisely measure wear track volume, a full 3D non-contact optical profiler, integrated on Tribometer platform, is available to quantify wear loss in a fast and convenient method without sample removal. The Tribometer Software uses this information and the test parameters to calculate a precise wear rate for the specific test. The profiler, which has extended capability, can also be used for surface topography measurement including roughness. A Flexible mobile imaging option allows zoom-in ability to record the sample surface before and after the test.

Rotative Mode (ASTM G99): a flat, pin or ball is loaded onto a test sample with a precisely known weight and at a specific position from the center to create a circular wear track as the bottom plate rotates. The friction coefficient is determined during the test by measuring the deflection of the direct load cell. Wear rates for the pin and the disk are calculated from the volume of material lost during the test. Linear Mode (ASTM G133): reproduces the reciprocating motion typical in many real-world mechanisms. The instrument produces a friction coefficient for both the forward and backward movements of the stroke. This reciprocating technique is very useful for studying the static coefficient of friction over time, as opposed to the kinetic coefficient measured with the Pin-on-Disk wear testing geometry. The software allows change of friction at any specific point along one lap to be plotted versus time.

Tribometers

60 x 39 x 62cm

Tribometer Modules

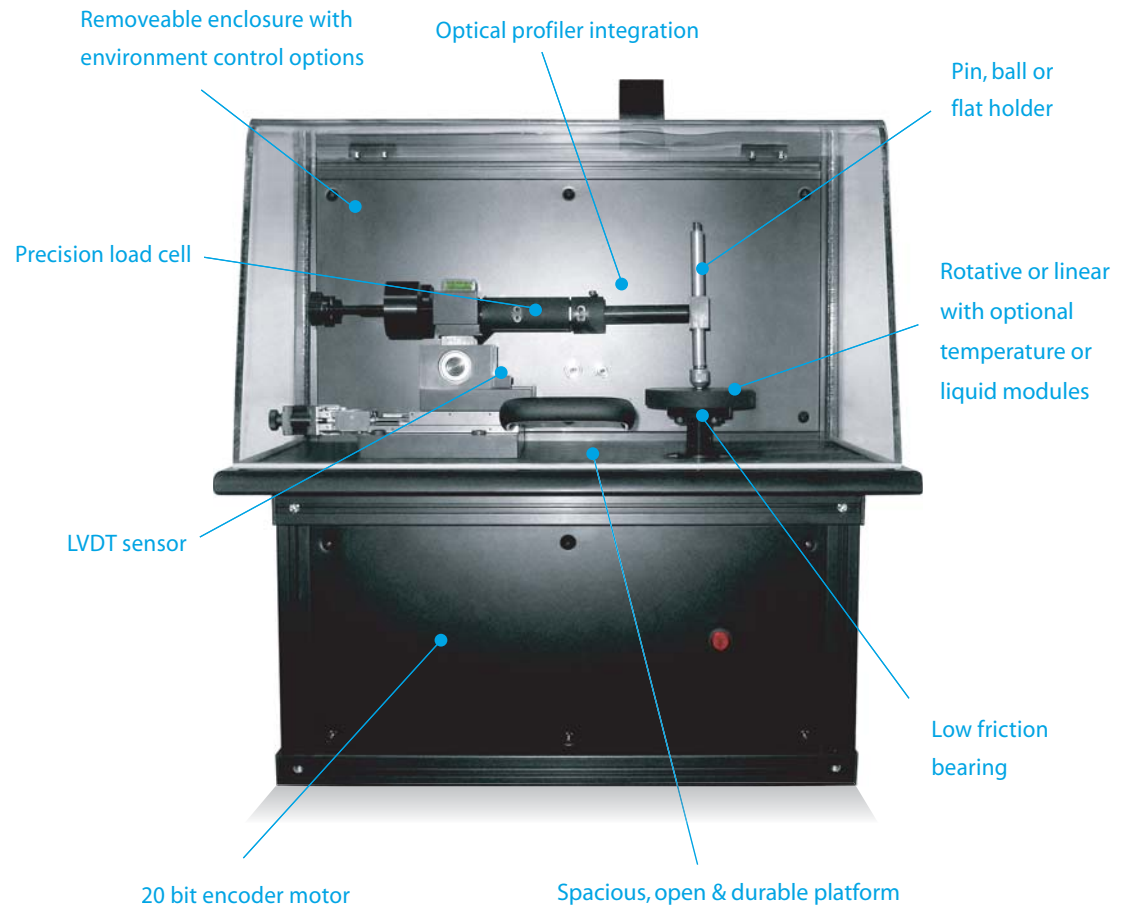
Rotative

Linear



Temperature

Liquid



Optics

3D Optical Profiler | To precisely measure the wear track with 2D and 3D, a full non-contact optical profiler can be integrated on the Tribometer platform. This advanced feature provides measurement of volume while software uses the information and the test parameters to calculate a precise wear rate for the specific test. The profiler, which has extended capability, can also be used for roughness, dimensions and many other surface topography studies. The optical profiler has zero influence from sample reflectivity, variations require no sample preparation and has advanced ability to measure high surface angles. Unlike other optical techniques, Nanovea optical profiler provides ability to measure any material, whether transparent, opaque, specular, diffusive, polished or rough. Large pen selection for varying dynamic vertical measurements. Excellent vertical and spatial resolution. The superior availability to surface topography measurement during tribological study is ideal for determining the correlation between surface characteristics and wear and friction results.

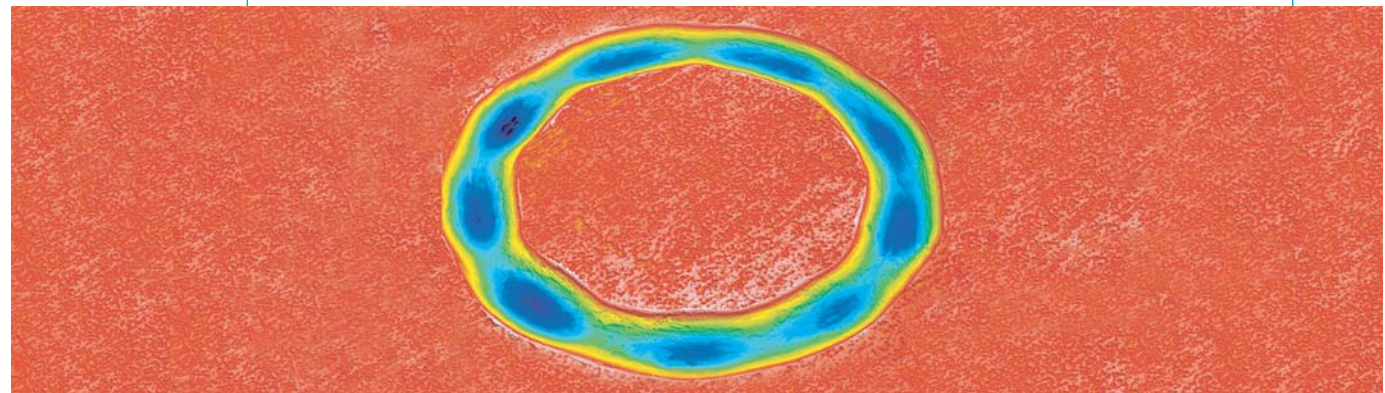
Digital Mobile Imaging | The flexible mobile zoom imaging capture can be moved by hand to conveniently allow zoom-in microscope capability while recording for play back review. This feature is especially useful for later review of surface wear during actual testing. Zoom from 5x to 200x is available.



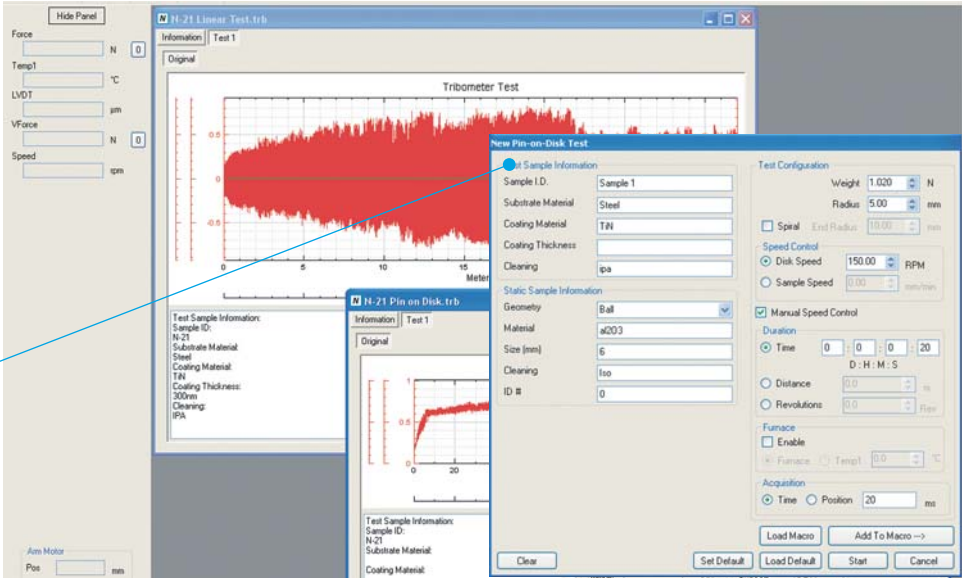
Digital Mobile Imaging



3D Profiler

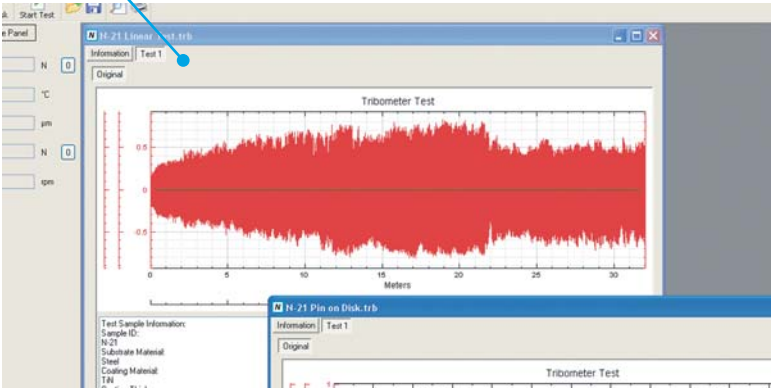


Includes a complete set of features for setting up a test and analyzing wear and friction data. Control of parameters: speed, time, distance, revolutions, temperature and acquisition rate. Automated motorized radial positioning for position and spiral test (constant linear speed). High temperature furnace control and ON-OFF lubrication control. Coefficient of friction safety monitor with automatic shut off at friction threshold. Macro test running single sample at varying speeds during the same test. Real-time display of coefficient of friction, temperature, depth and pin-substrate electrical contact. Powerful friction analysis tools including: fixed position friction vs. cycle view and a 360° coefficient of friction view (one lap per choice of # of laps). Wear rate calculation of ball and sample. For Area/volume of wear track calculation see 3D Mechanical Software. Exportable data in CSV format

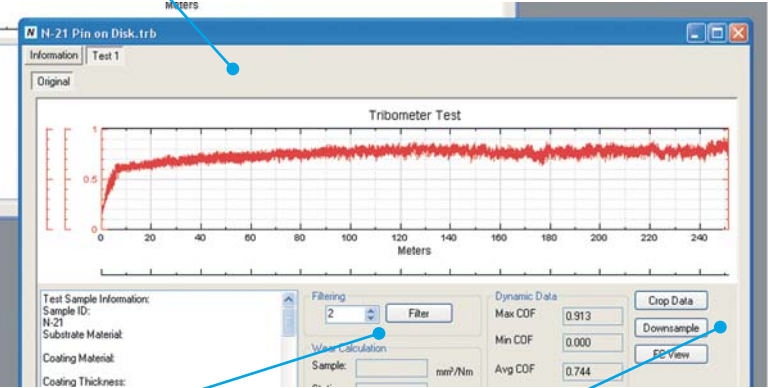


Test parameters

Linear Coefficient of Friction Graph



Rotational Coefficient of Friction Graph



Data filtering options

Data view options

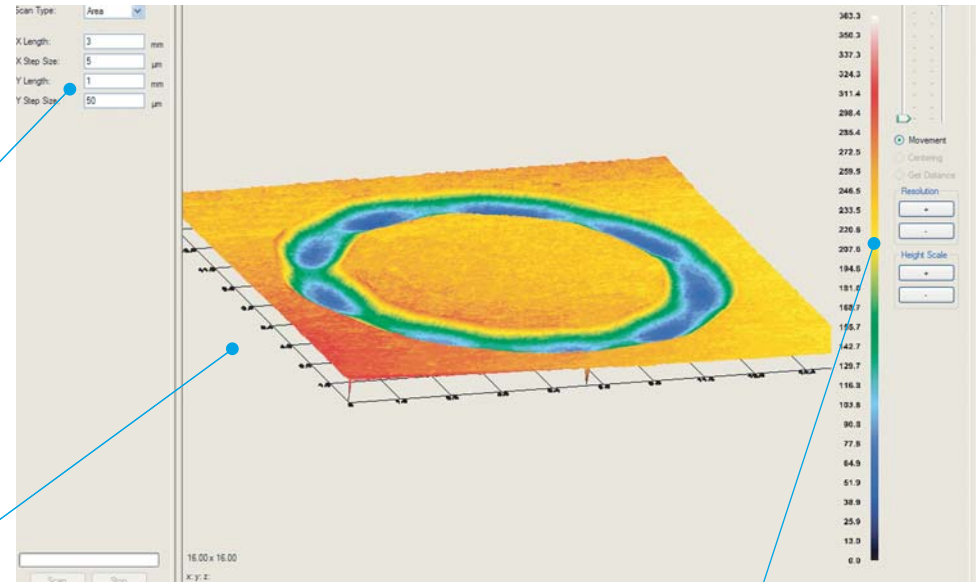
The 3D Mechanical Software is the acquisition software used with optical profiler integration. User friendly ability to scan specified areas of interest or a single profile of the wear track. Scan can be compared with optical microscope observation. The software provides three different views in real-time: 3D false color, 2D false color and 2D analysis of roughness, step height and area used for wear volume calculation. Zoom Functions. Data export in ASCII format & Mountain analysis software for extended surface analysis capability.

3D Mechanical Software

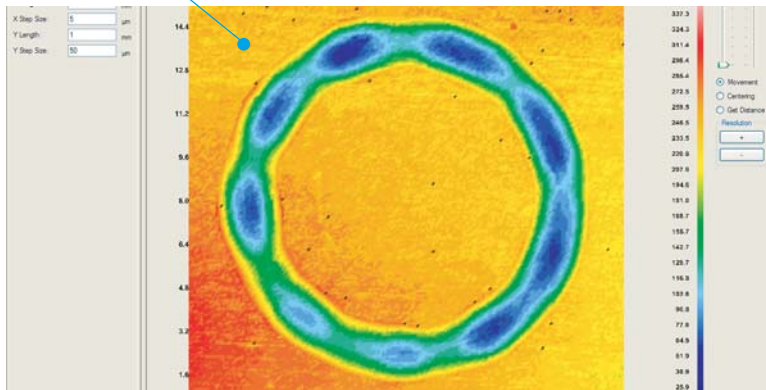
User defined scan parameters

3D false color

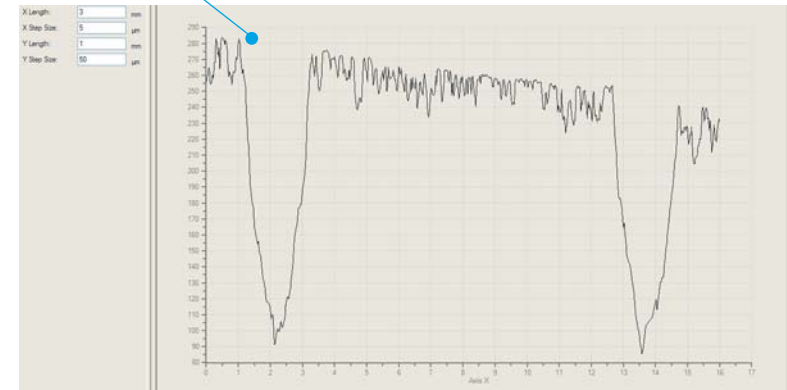
Height scale



2D false color

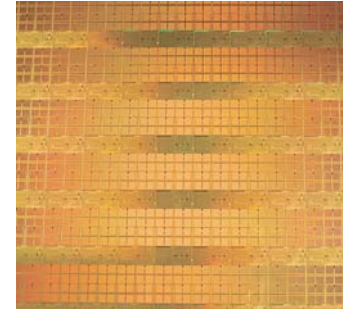


2D preview with roughness, step height and area capability



Nanovea Tribometers measure rotative and linear wear friction on a single system, with temperature, atmosphere and liquid control options. Tribology is an important study in nearly all industries including: Automotive, Aerospace, Metallurgy, Machining, Coatings, Pharmaceutical, Biomedical, Environmental and many others.

Applications



PIN-ON-DISK MODULE

	MICRO	MACRO
Maximum Load	40N	200N 500N
Normal Force (Weights)	(1) 1N, (2) 2N, (1) 5N, (1) 10N, (1) 20N	(2) 5N, (2) 10N, (1) 20N, (1) 50N, (1) 100N
Load Resolution	30mN	125mN
Rotational Speed	0.01 to 2000 rpm	0.01 to 2000 rpm
Maximum Torque	1.27Nm	18.6Nm
Friction Force Maximum	20N	100N
Friction Resolution (Theoretical)	0.6mN	3.05mN
Friction Resolution (Noise Floor)	0.75mN	3.8mN
X Motorized table for controlled radius	50mm	50mm
Maximum speed of X radius Motorized Table	0 to 5mm/s	0 to 1mm/s
Resolution of X radius position	2.5µm	0.25µm
Instrument Dimension (Table Top)	60 x 39 x 62 cm	94 x 59 x 50 cm
Weight Approx.	67kg	185kg
Disk Size	100mm	100mm

LINEAR RECIPROCATING MODULE

Linear Speed	Up to 140mm/s
Stroke Length (Amplitude)	0 to 35mm Adjustable
Frequency at full stroke	2Hz
Frequency maximum	40Hz

LVDT DEPTH MODULE

Maximum Displacement	1 mm
Resolution (Noise Floor)	0.1µm

PIN-ON-DISK HIGH TEMPERATURE

Maximum Temperature	600°C or 900°C +/-1°C
Oven Size	Diam. 250mm x 70mm

LINEAR HIGH TEMPERATURE

Maximum Temperature	300°C +/-1°C
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LUBRICATION CUPS

Linear Cup Inner Size	54x90x30
Pin-on-Disk Cup Inner Size	100x30mm

LUBRICATION SYSTEM

Pulverization Module - Liquid Consumption	60 - 90 cm ³ /hour
Drop Count Reservoir	120ml

LIQUID HEATING MODULE

Maximum Temperature	150°C +/-1°C
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ELECTRICAL RESISTANCE CONTACT DETECTOR

Maximum resistance	0 to 1000Ohms
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3D OPTICAL PROFILER MODULE

Range	50mm
Height Range	100 µm
Height Resolution	14nm
Lateral Resolution	3micron

DIGITAL MOBILE IMAGING

Resolution	1.3 Megapixel (1280x1024 res)
Magnification	10x - 230x