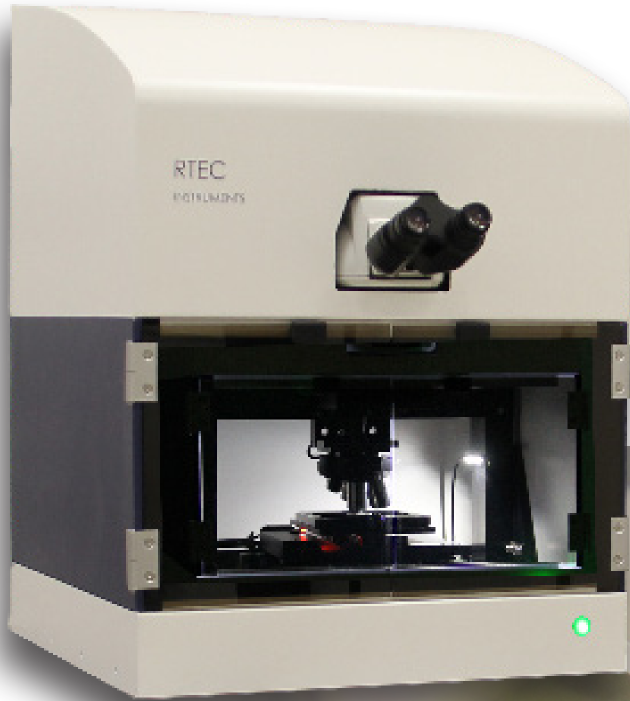
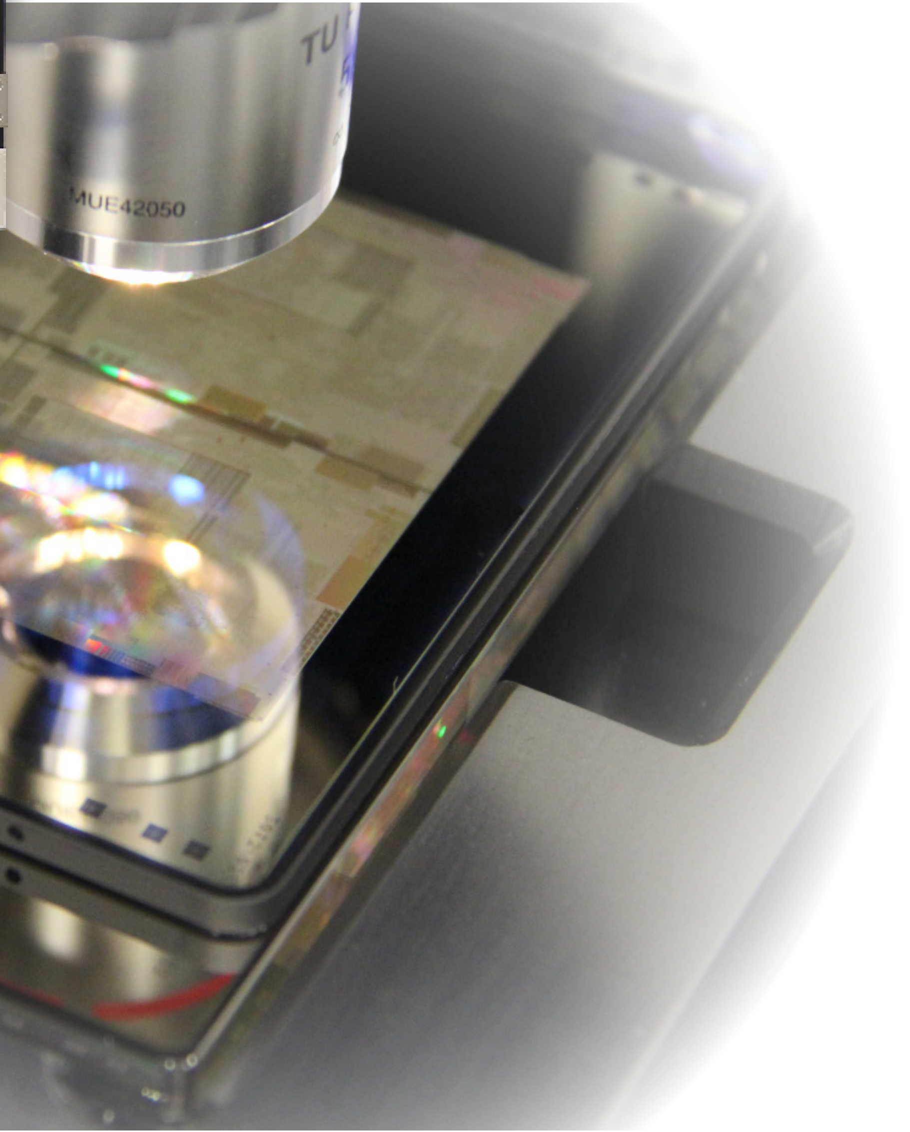
Universal 3D Profilometer

Hybrid Technology for Surface Metrology With Modular Design



3D Confocal Microscope +
White Light Interferometer +
Variable Focus +
AFM



UP Series

Universal Combination Profilometer

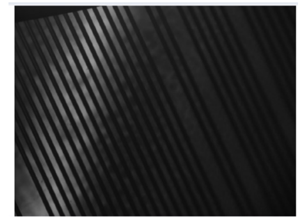
Optimized for any sample and multiple applications

The universal 3D profiler is able to run multiple techniques on the same tester. Combination choice depends on the application. Same area of the sample can move between different techniques automatically. The combination of various techniques on one platform allows to exploit advantages of all methods on one tester. The combination not only helps for comprehensive data analysis but also reduces maintenance cost, foot print etc.

- Surface roughness
- Film thickness
- Step height
- Topography
- Wear track, volume wear
- Thin film stress (curvature)
- Cracks, defects
- Slope measurement
- Micro fluidics

Confocal

- Spinning disc (Nipkow) confocal technology for fast vertical scanning
- Best technology for surface and sub-surface feature measurement, full field 3D characterization of steep slope analysis (Maximal slope: 72^0 vs. 44^0 from Interferometry)
- Highest lateral resolution in optical profiling. With 5M digitalized resolution camera, the spatial sampling down to 0.04um, best for surface feature and profiling measurement
- No limitation on surface roughness/surface reflectivity (from 0.05% to 100%)
- Technology works for transparent layers/films/liquid
- Both bright field and dark field; optical DIC
- Long working distance objectives is ideal for measuring high aspect ratio features, steep slopes
- Non sensitive to vibration

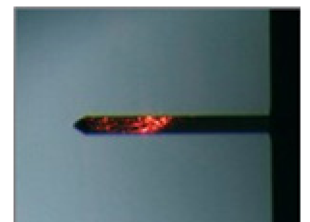


White Light Interferometer (WLI)

- Highest Z resolution, sub-nanometer
- Both phases shifting (PSI) and vertical scanning (VSI) modes
- Z resolution independent of magnification
- User selectable four color LED light source (white, red-630nm, green-530nm, and blue-460nm) improves lateral resolution and optical coherence length (blue light provides higher lateral resolution)
- Up to 5M digitalized resolution camera
- Fast processor allows for industry leading process time
- Auto focus

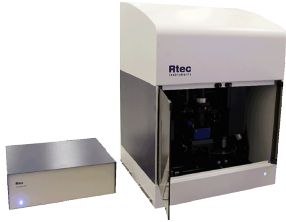
AFM

- Tip scan works for large sample
- Atomic level resolution for both XY and Z
- Large piezo tip scan XY: up to 110x110um



Variable Focus

- Rough surface analysis
- Fast analysis



Standard features

- Automatic Z stage
- 6 objective turret
- Controller
- Acoustic enclosure
- Automatic XY Stage
- Tip tilt stage
- Basic joy stick
- Full suite software
- Automatic stitching

Standard technique choices

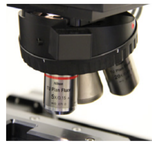
- White light Interferometer
- Confocal microscopy
- Atomic force microscopy
- Variable Focus

Optional techniques

- Triangulation sensor
- Raman microscopy

Optional hardware upgrades

Larger stage/platform



Automatic turret

Ergonomics joystick

Seismic restraints, anti vibration table

Eye piece

Specification Summary

Platform summary

- Objective turret, motorized turret optional
- Standard motorized stage 150x150mm (Option 210x310mm)
- XY resolution 0.1um
- Tip tilt stage 6 degree
- Theta stage (360 Degree) optional
- Vertical range up to 100mm
- Optional clean room class 1 compatible

Atomic force microscope

- Actuator type: piezo
- XY scan: 110x110 um scan area
- Z range: > 20 um
- Several standard modes available

Triangulation sensor

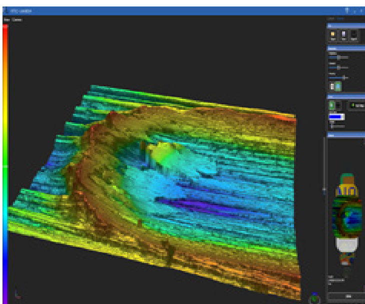
- Multiple wavelengths
- Repeatability up to 0.001um
- Data sampling rate up to 350KHz
- Data display : 2D line and 3D map

Raman spectroscopy

- Wavelength 532, 785, 1064nm
- Resolution from 1 to 4 cm-1

Facility

- Voltage: 90 - 240 VAC, 50/60Hz
- Compressor air: 40-80 psi



Software Interface

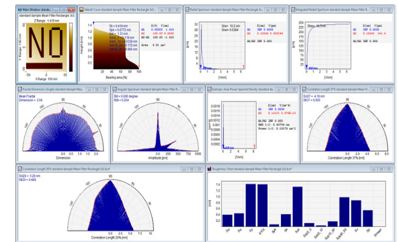
Interferometry Objectives						
	2.5X	5X	10X	20X	50X	100X
Numerical Aperture (NA)	0.075	0.13	0.3	0.4	0.55	0.7
Working Distance (mm)	10.3	9.3	7.4	4.7	3.4	2
FOV (um)	6910x5180	3460x2590	1730x1300	860x650	350x260	170x130
Spatial Sampling (um) 5MP CCD	2.7	1.35	0.67	0.34	0.13	0.07
Optical Resolution (L&S 460 nm) (um)	1.87	1.08	0.47	0.35	0.26	0.20
Maximum Slope (arcsin(NA))	4	7	17	24	33	44
Vertical Resolution	Better than 0.01nm					
Vertical RMS repeatability RMS	0.01nm					
Vertical measurement range	Up to 10mm					

Confocal Platform									
	Standard Working Distance						Long Working Distance		
	5X	10X	20X	50X	100X	150X	20X	50X	100X
Numerical Aperture (NA)	0.15	0.3	0.45	0.8	0.9	0.95	0.4	0.6	0.8
Working Distance (mm)	23.5	17.5	4.5	1	1	0.3	19	11	4.5
Field of view (um)	3460x2590	1730x1300	860x650	350x260	170x130	120x90	860x650	350x260	170x130
Spatial Sampling 5MP	1.35	0.67	0.34	0.13	0.07	0.04	0.34	0.13	0.07
Optical Resolution (L&S 460nm)(um)**	0.94	0.47	0.31	0.18	0.16	0.15	0.35	0.23	0.18
Maximum Slope (arcsin(NA))	9	17	27	53	64	72	24	37	53
Vertical Resolution (nm)	72.0	18.0	8.0	2.5	2	1.8	10.1	4.5	2.5
Confocal Frame Rate 5MP/1MP	15/30 fps typical (>100 with binning)								
Typical Measurement Time (s)	<1s for 30 Confocal Slices								
Vertical Measurement Range (mm)	Up to 15 mm								

* Specifications are subject to change.
** L&S - line and space, half of the diffraction limit according to the Rayleigh criteria, values for blue LED

Software and Hardware

The software allows total system flexibility and allows for rapid data processing and analysis.

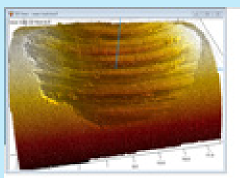


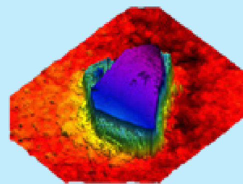
In addition, the full suite of metrology and 3D imaging tools is optimized for both research and industrial needs, from advanced analysis to simple fully au-tomated tests. The software can integrate with multiple professional third party analysis software package, for post data processing.

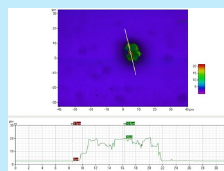
High end objectives, high intensity multi-color LED, open platform architect, acoustic enclosure, safety switches etc. making this platform a potent tool in hands of the users, and is suited for both research and manufacturing environ-ment.

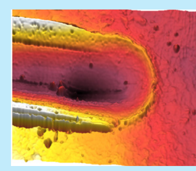
Applications

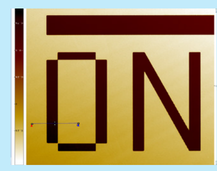
- •Semiconductor : Wafer, TSV, Mask, MEMS, PCB, Microlens, insulation, etc.
- •Energy : thin film, solar cells, surface texture, power cells, ceramics, etc.
- •Optics: roughness, profile of aspheric, transmission, anti-fog, etc.
- •Flat Panel: particle/defect, coating, RGB, photospacers,etc.
- •LED: Emission substrate (sapphire, SiC, GaN etc.).
- •Coating : solar, hard, soft, cutting tool, protective, decorative
- •Thin film : mems, solar cells, semiconductor, pvd, cvd etc.
- •Paint : corrosion, adhesion
- •Materials :wear scar/scratch, corrosion, fatigue, tribology, particle inspection.
- •Biomedical : micro-fluidics, drug coating, balloon, hip joints, skin, contact lenses, stent, etc.


Ball wear


Diamond


Particle Size


Wear Scar


Semiconductor

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