

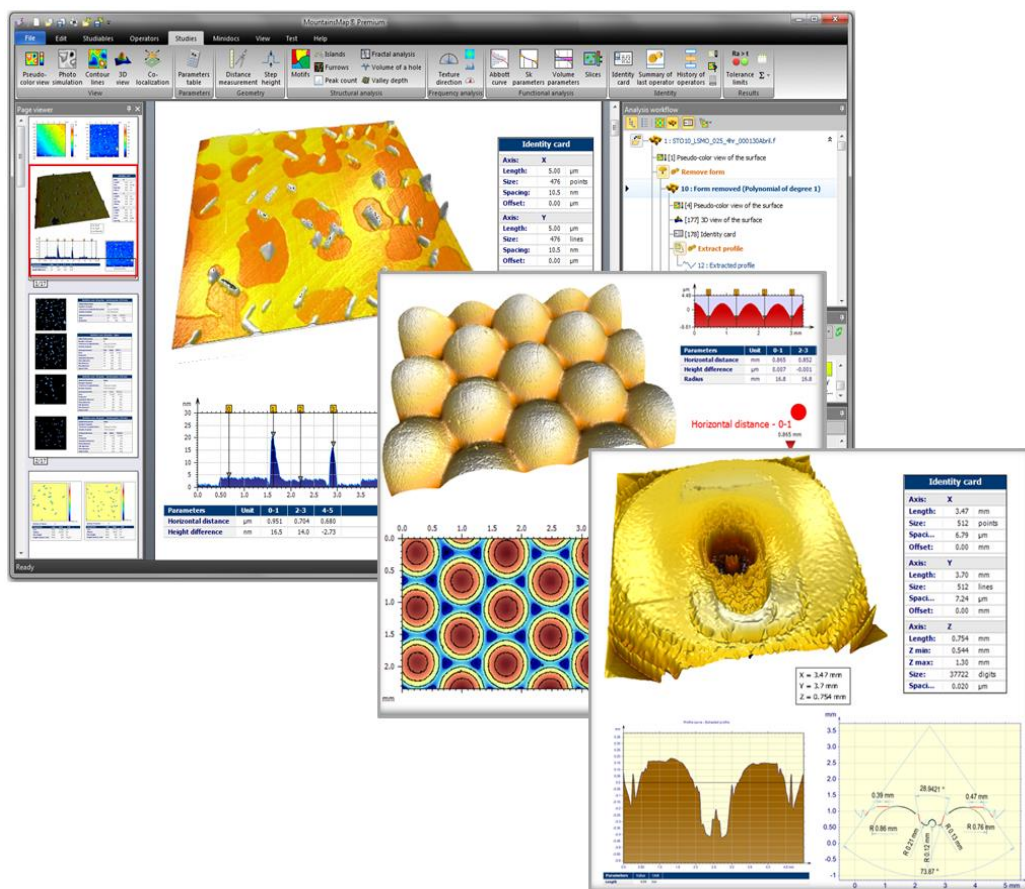


MountainsMap® Premium

Surface imaging, analysis & metrology software *par excellence*

for confocal microscopes - optical interferometric microscopes - scanning probe microscopes - contact and non-contact profilometers - form & vision systems - more + extensions for scanning electron microscopes - hyperspectral microscopes

- The most complete surface imaging & metrology software on the market
- Cutting edge surface imaging - image overlays on 3D topography
- Correction of measurement defects & anomalies - intelligent image enhancement
- State of the art analysis of surface geometry and texture at any scale
- Grains & particles analysis, 3D Fourier analysis, functional analysis, statistics & more
- Smart metrology report creation with powerful automation features
- Easy integration into research and production environments

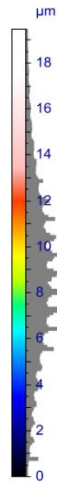
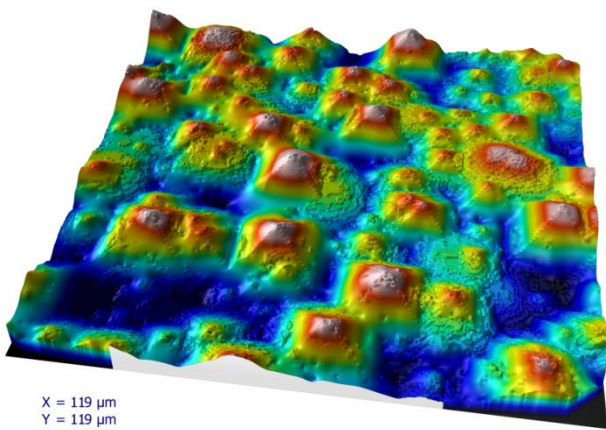




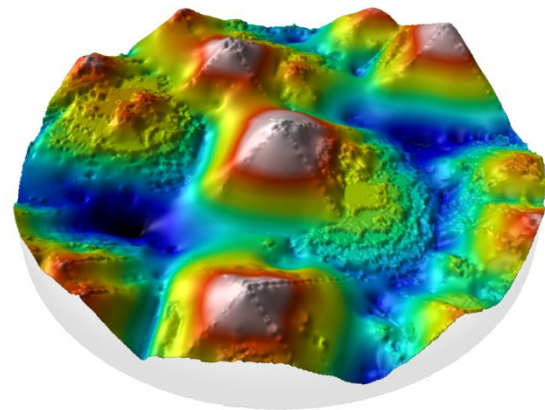
See everything that you measure

Real time visualization of 3D surface topography

- ✓ Zoom in on 3D surface topography and rotate it in real time.
- ✓ Apply image enhancement tools.
- ✓ Choose the best lighting conditions.
- ✓ Select renderings.
- ✓ Set surface height amplification.
- ✓ Optimize your color palette for the vertical scale.
- ✓ Define a flight plan, fly over features of interest on a surface and save your flight as a video for presentations.
- ✓ Display contour diagrams and photo simulations.
- ✓ Extract 2D profiles from a 3D surface for visualization and analysis.
- ✓ Convert RGB images into pseudo 3D images with the z axis in intensity units.

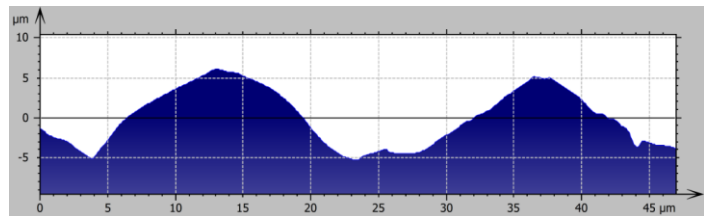
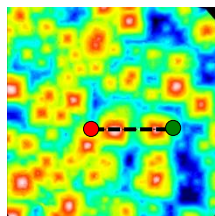


3D surface topography of solar cell – the histogram on the z axis color palette shows the distribution of data points on the surface.

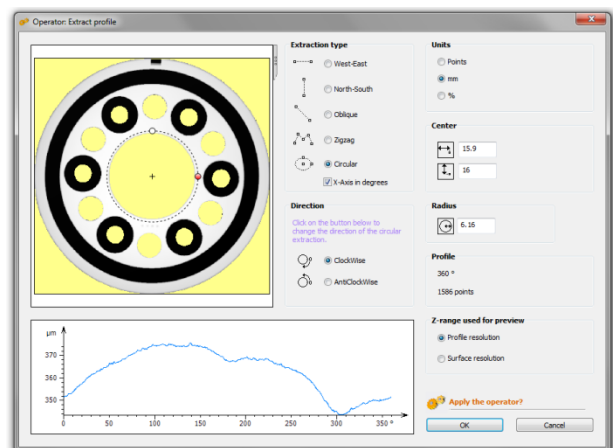
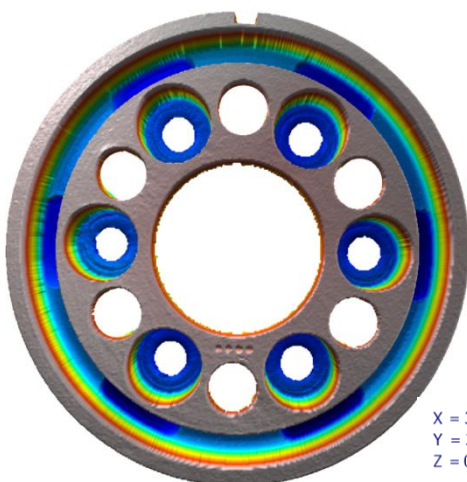


Easy management of non-rectangular data sets.

Profile extracted from surface. Moving the segment in the frame on the left updates the extracted profile in the frame on the right in real time.



Images courtesy of Carl Zeiss



Circular profile extracted from the rim of a disk fixture after leveling (the abscissa is in degree units).



Overlay any image on 3D topography

Locate surface features faster

Manipulate multi-channel image and topography layers generated by a *3D optical profiler* or a *scanning probe microscope* simultaneously:

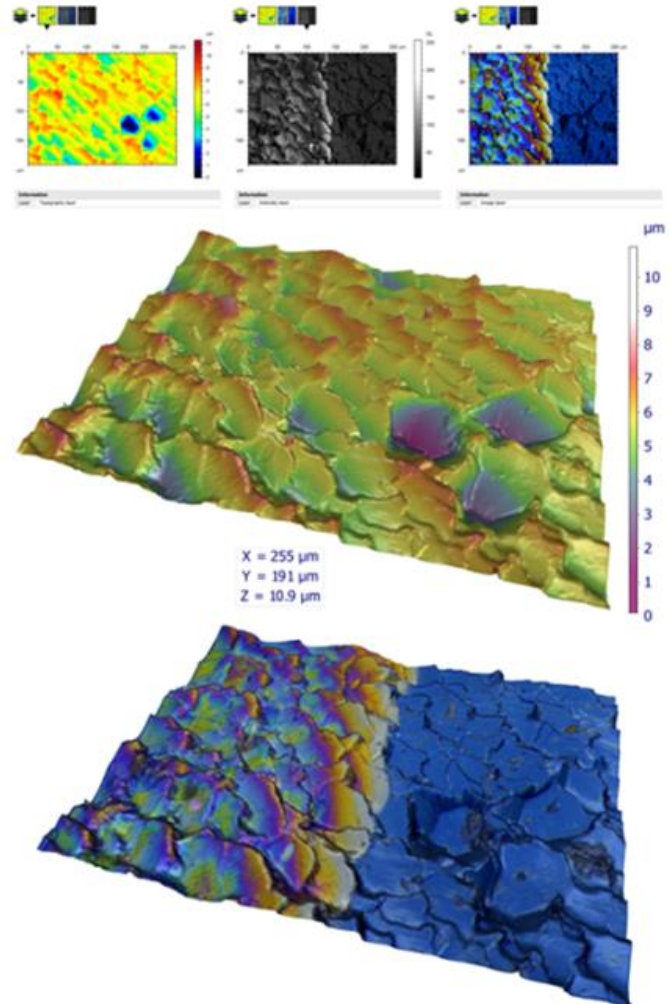
- ✓ Overlay the true color image or intensity image from your 3D optical profiler on the 3D surface topography to speed up location of surface features.
- ✓ Overlay any non-topography image (phase, current, etc.) obtained by an atomic force microscope on 3D surface topography.
- ✓ Overlay a photo of a sample on 3D surface topography obtained by a scanning profilometer or other instrument.
- ✓ Select the best overlay image transparency level (in the range 0 to 100%) to achieve best surface rendering.

Right, top:

Miniature icons used to select topography/intensity/color layers obtained by a 3D optical profiler.

Middle: corresponding 3D surface topography.

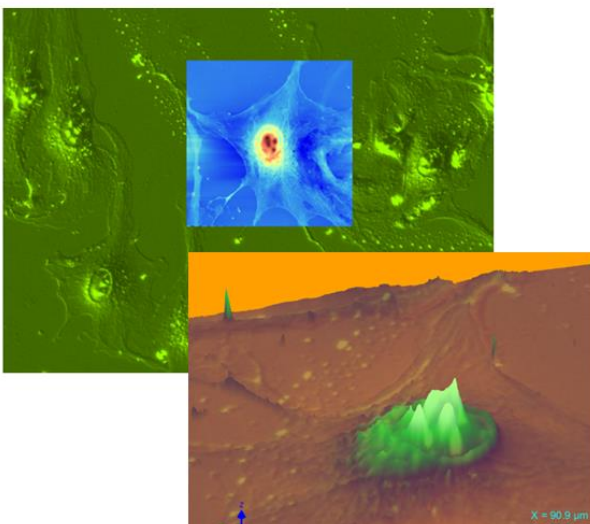
Bottom: MountainsMap® Premium overlays a true color image on the 3D topography.



Images courtesy of Sensorfar

Colocalize surface data from different instruments

Carry out correlative studies



Images courtesy of Agilent Technologies

MountainsMap® Premium provides powerful tools for colocalizing an *image* obtained by a scanning electron microscope (SEM), a fluorescence microscope or other wide-field microscope with *surface topography* obtained by a 3D optical profiler, scanning probe microscope or other metrology instrument. Images can be overlaid on 3D surface topography and on other images. Correlations are revealed by adjusting the transparency level.

Left. Colocalization of atomic force microscope (AFM) topography image and simultaneous fluorescence image of a cell. Overlay of fluorescence image on 3D surface topography (with user-selected transparency).



Powerful tools prepare surface data for analysis

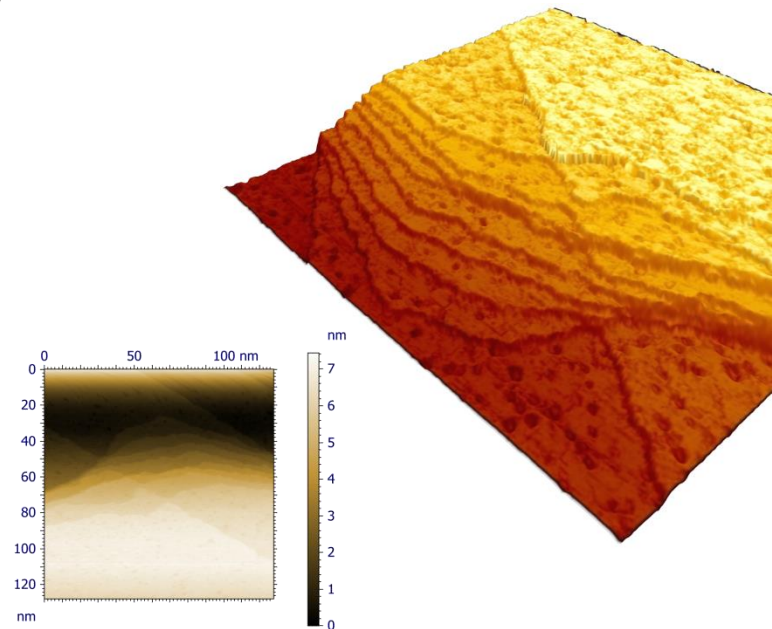
Data normalization, correction and assembly

Intelligent filters and operators

MountainsMap® Premium includes a full set of intelligent filters for normalizing surface data and removing measurement artifacts prior to analysis. They include:

- ✓ Leveling.
- ✓ Flipping in the horizontal or vertical axis.
- ✓ Rotation.
- ✓ Zone extraction.
- ✓ Correction or removal of anomalous scan lines.
- ✓ Thresholding to remove spikes.
- ✓ Tip deconvolution to minimize tip impact on measurement data.
- ✓ Filling in missing data points.
- ✓ Surface subtraction.
- ✓ Spatial filtering and surface smoothing.
- ✓ Denoising by direct edition of the FFT.
- ✓ Retouching of isolated artifacts.
- ✓ Resampling to improve image resolution.

In addition, thanks to MATLAB™ compatibility, you can define your own custom filters using MATLAB™ and execute them in MountainsMap® Premium.

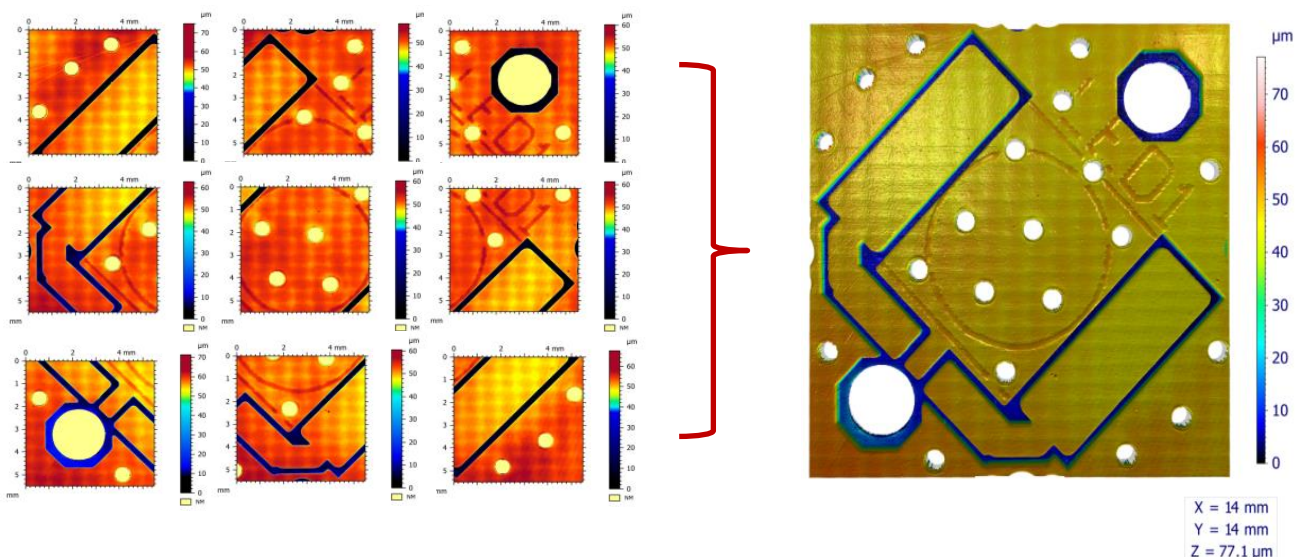


Left: raw scanning tunneling microscope (STM) image. Right: atomic step heights in 3D after filtering.

Increase field of view and vertical range virtually

In some cases the field of view of an optical microscope or an SPM is too limited to measure the whole surface under study. MountainsMap® Premium overcomes this limitation by stitching multiple overlapping measurements together to form a single surface that is ready for analysis.

Similarly, the vertical range of a 3D profilometer may be too limited to scan an entire surface. In this case the answer is to scan the surface at different heights and then use MountainsMap® Premium interactive tools to patch the measurements together into a single surface.



Automatic surface stitching of overlapping measurements on the horizontal plane.

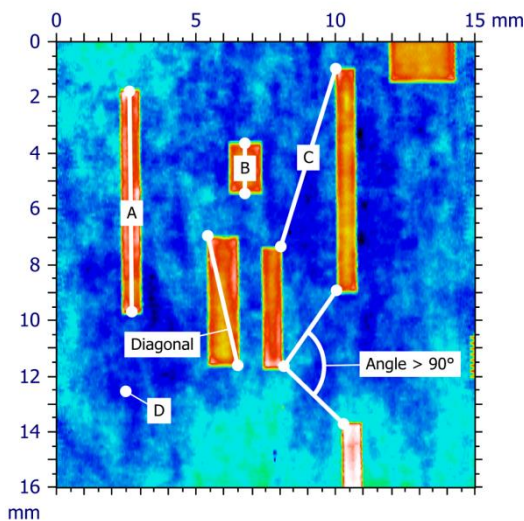


Analyze surface geometry

From distance, area, step height and volume calculation to full dimensional analysis

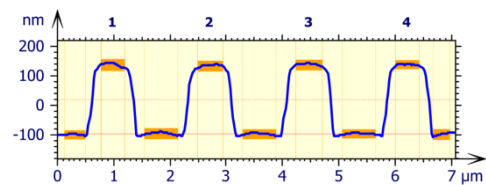
Geometric analysis

MountainsMap® Premium assures the fast and accurate analysis of surface geometry with tools for measuring distances, angles, areas of peaks and valleys, volumes of bumps and holes, step heights on surfaces and profiles, and coplanarity. In addition it is possible to select two or three vertical surface slices interactively and calculate their material/void volume and thickness.



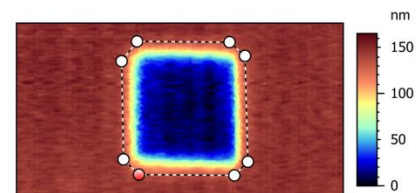
Distances	Unit	A	B	Diagonal	C
HDist	mm	7.90	1.80	4.77	6.68
Angles	Unit	Angle > 90°			
Angle	°	99.4			
Points	Unit	D			
X	mm	2.48			
Y	mm	12.5			
Z	µm	4.33			

Calculation of multiple distances, angles and point coordinates - all in a single frame.



Parameters	Unit	Step 1	Step 2	Step 3	Step 4
Width	µm	0.425	0.450	0.475	0.425
Mean height	nm	234	231	235	234

Step height measurements

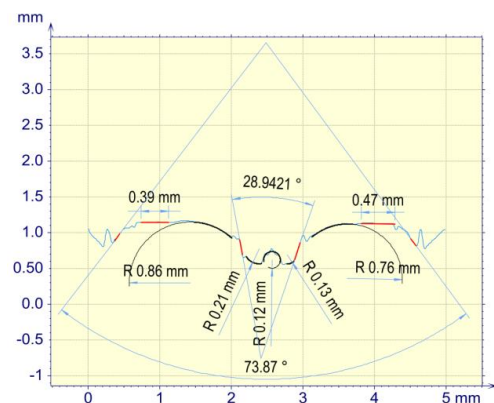
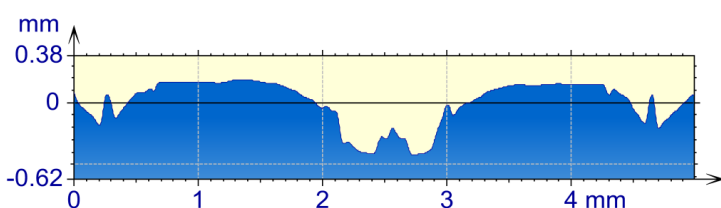


Parameters	Unit	Hole
Surface	µm ²	114563
Volume	µm ³	9423
Max. depth/height	nm	132
Mean depth/height	nm	82.3

Hole volume calculation

Contour (dimensional) analysis

MountainsMap® Premium provides comprehensive geometric dimensioning both for vertical (cross sections) extracted on the Z axis and for horizontal profiles extracted on the XY plane. Geometric elements are associated with line segments and arcs on profiles. Dimensions (distances, radii, diameters, angles) are calculated using auto-dimensioning and interactive tools.



Dimensional analysis of a vertical (XZ) profile



Surface texture characterization in accordance with international standards

Advanced ISO 16610 filtering techniques and ISO 25178 3D parameters

From Gaussian to advanced ISO 16610 filtering techniques

The roughness and waviness components of surfaces are separated using the latest ISO 16610 advanced filtering techniques, including robust Gaussian and spline filters. Previous filtering techniques are also supported.

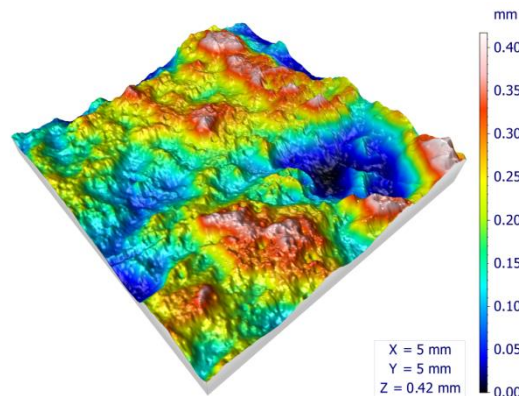
From Ra to ISO 25178 3D parameters

MountainsMap® Premium supports the widest range of ISO parameters:

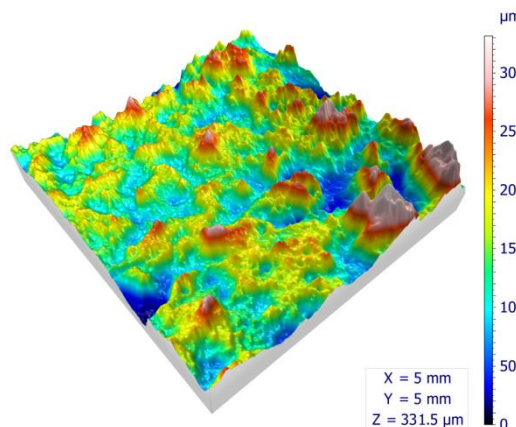
- ✓ New 3D parameters defined in ISO 25178 including height (*Sa, Sq, Ssk, Sku, Sz*, etc.), bearing ratio (*Smr, Sdc, Sxp*), volume (*Vmp, Vmc, Vvv*, etc.), hybrid & spatial (*Sal, Str, Sdr*, etc.) and features (*Spd, S10z, Sda*, etc.) parameters.
- ✓ ISO 12781 flatness parameters (*FLTt, FLTp, FLTv, FLTq*)
- ✓ ISO 4287 primary, waviness and roughness parameters (*Ra, Rq, Rsk, Rmr, Rdc, Rdq, RPC*, etc.).
- ✓ ISO 13565-2 *Rk* parameters.
- ✓ ISO 13565-3 primary and roughness parameters (*Rpq, Rvq, Rmq*).
- ✓ 12085 R&W parameters (*R, AR, Rx*, etc.).
- ✓ ISO 12780 straightness parameters (*STRt, STRp, SRTv, STRq*).
- ✓ ISO 12780 roundness parameters (*RONt, RONp, RONv, RONq*, etc.).

The right standards, wherever you are

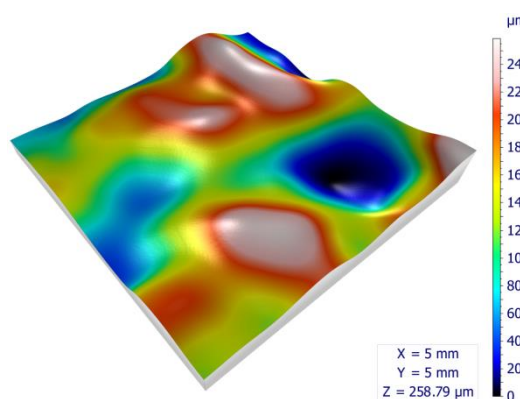
Wherever you are, with MountainsMap® Premium you can work with national standards and international standards. MountainsMap® Premium not only calculates ISO parameters, it also calculates ASME B46.1 2D and 3D parameters (USA), displays GB/T (China), DIN (Germany), JIS (Japan), NF (France), BSI (UK), UNE (Spain) and UNI (Italy) equivalents of ISO parameters when they are available, and calculates the older EUR 15178 3D parameters.



Raw surface



Roughness surface



Waviness surface

ISO 25178

Height Parameters

Sq	33.98	µm
Ssk	0.1846	
Sku	5.404	
Sp	181.8	µm
Sv	149.7	µm
Sz	331.5	µm
Sa	24.71	µm

Functional Parameters

Smr	0.0007968	%
Smc	38.14	µm
Sxp	70.50	µm

Spatial Parameters

Sal	0.2933	mm
Str	0.8646	
Std	50.75	°

Hybrid Parameters

Sdq	0.4538	
Sdr	9.374	%

Feature Parameters

Spd	2.840	1/mm ²
Spc	51.81	1/mm
S10z	156.1	µm
S5p	87.46	µm
S5v	68.68	µm
Sda	0.2223	mm ²
Sha	0.2774	mm ²
Sdv	0.0006394	mm ³
Shv	0.0009801	mm ³

ISO 25178 parameters



Sub-surface analysis

Extract a region of interest and analyze it just like a complete surface

With MountainsMap® Premium you can not only visualize and analyze a full surface image or measurement, you can also extract a region of interest or sub-surface and analyze it in exactly the same way as a full surface.

Sub-surface extraction methods

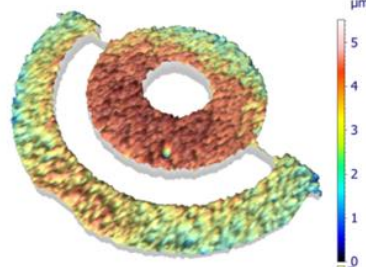
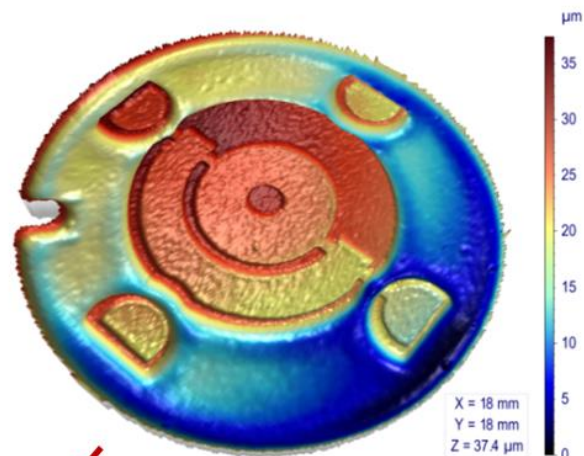
There are several methods for extracting sub-surfaces:

- ✓ Extract a rectangular or non-rectangular zone.
- ✓ Remove the upper or lower slice of a surface by thresholding.
- ✓ Apply a binary mask.
- ✓ Automatically partition a surface into motifs (texture cells), then use the Partition and Level operator to extract a sub-surface and level it so that it is ready for independent study.

Calculate parameters for a sub-surface only

Once a sub-surface or region of interest has been extracted it can be analyzed in exactly the same way as a full surface - parameters are calculated on the sub-surface only.

This makes it possible, for example, to study the roughness, flatness and coplanarity of planes on MEMS and mechanical and electronic components.



ISO 25178		
Height Parameters		
Sq	0.804	µm
Sz	5.52	µm
ISO 12781		
Flatness Parameters		
FLTt	3.38	µm
FLTp	1.41	µm
FLTv	1.98	µm
FLTq	0.728	µm

A sub-surface of a MEMS is extracted and leveled using the Partition and Level operator.

This operation can be carried out in a few mouse clicks because the contour of the extracted area is automatically detected by MountainsMap® Premium.

Then flatness and other parameters (for the sub-surface only) are calculated and displayed.



Functional, 3D Fourier and wavelets analysis

Bearing ratio, functional volume, spectral plots, multi-scale analysis, fractals

Functional analysis

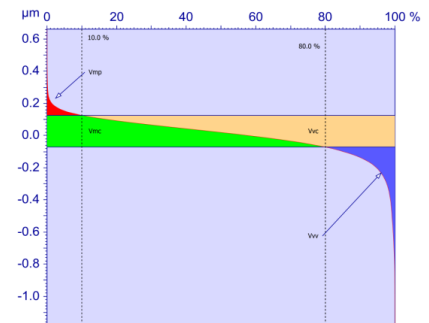
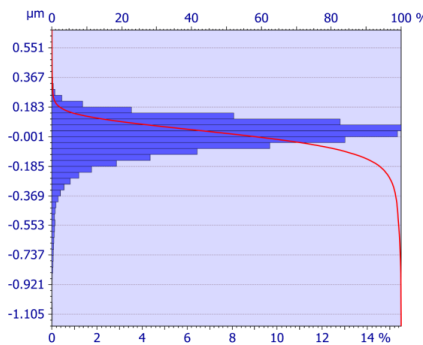
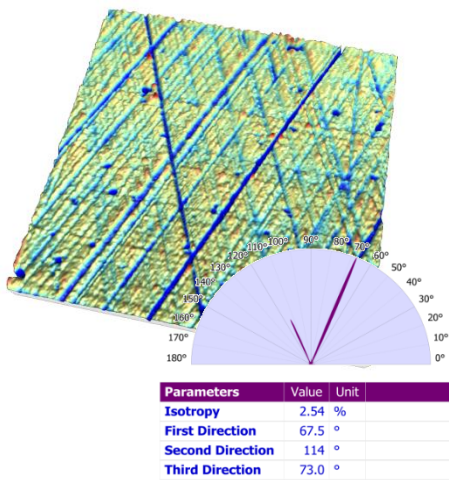
Functional studies facilitate the assessment of friction and wear in automotive engineering, medical engineering and other applications. They include the Abbott-Firestone bearing ratio curve and depth distribution histogram, the subtraction of one surface from another, and the calculation of the material/void volume ratio and thickness of up to three vertical slices of a surface. A graphical study of functional volume parameters analyzes burn-off peaks, core zones and lubrication valleys.

3D Fourier and wavelets analysis

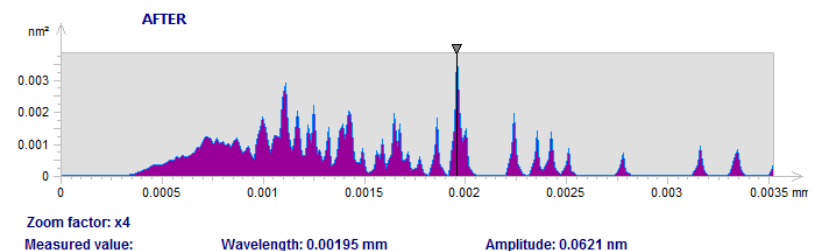
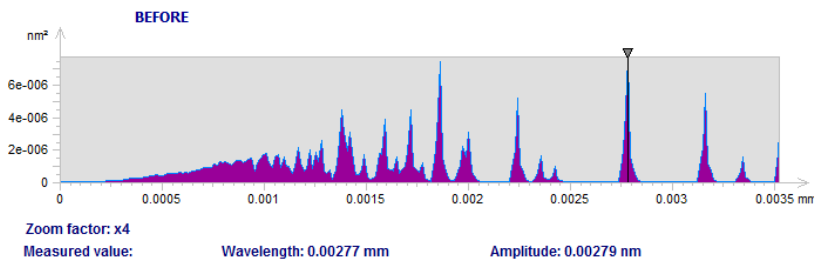
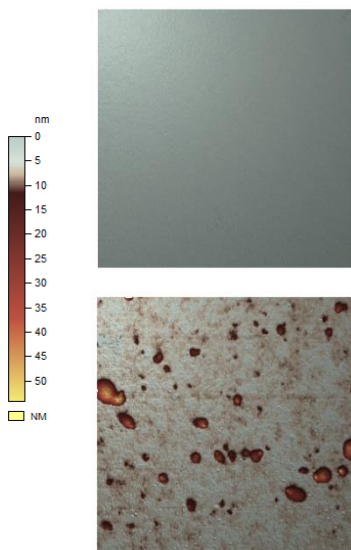
3D spatial frequency analysis of process-surface interactions includes studies of frequency spectrum, power spectrum density, isotropy, directionality, periodicity, autocorrelation and intercorrelation. In addition, multi-scale wavelets analysis provides discrete wavelet filtering for 2D profiles and 3D surfaces and continuous wavelets decomposition for 2D profiles.

Fractal analysis

Fractal dimensions of surfaces can be studied using the enclosing boxes and morphological envelopes methods.



Honed motor cylinder with studies of isotropy and directionality, Abbott-Firestone curve and ISO 25178 volume parameters.



Acid attack on glass: power spectrum density study. (Images courtesy of LNE, the French National Metrology Institute.)



Grains, particles, islands, bumps, holes and motifs

Analyze and surface texture from random to organized patterns

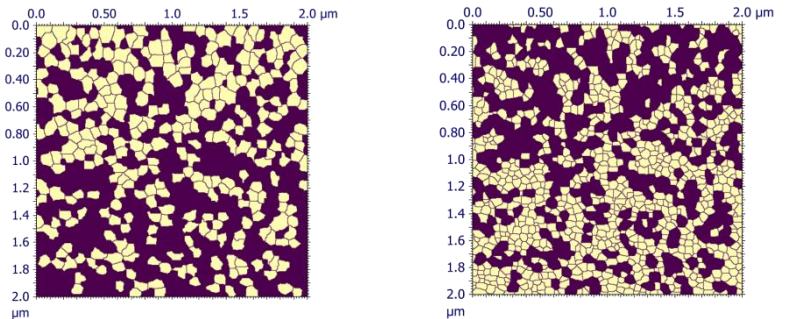
MountainsMap® Premium provides powerful complementary tools for analyzing grains, particles, islands, bumps, holes, motifs and texture cells.

Grains analysis on a selected horizontal plane

Grains separated from a 3D topography or image background by binarization can be quantified using a wide range of criteria including area, perimeter, diameter, form factor, aspect ratio, roundness and orientation. Grains can be sorted into subsets with respect to a threshold value on any of these parameters. Statistics are generated on all grains, a sub-set of grains or individual grains.

3D grains (islands) analysis

Grains can be detected above a threshold height that is selected interactively. Grain height and volume parameters are studied in addition to area, etc., and statistics for all or individual grains are calculated.



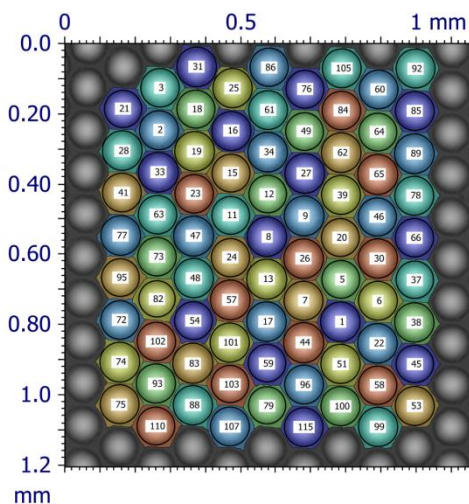
Statistics over all grains - Sorted grains (65.9 nm)

Global information	Value		
Number of grains	304		
Total area occupied by the grains	1.54 μm^2 (38.6%)		
Density of grains	76.0 Grains/ μm^2		
Grain parameters	Unit	Value	Std...
Area	nm^2	5076	1606
Perimeter	nm	305	51.8
Equivalent diameter	nm	79.5	11.8
Mean diameter	nm	78.4	11.6
Min diameter	nm	59.8	11.3
Max diameter	nm	104	18.0
Form factor		0.680	0.0823
Aspect ratio		1.77	0.379
Roundness		0.604	0.109
Compactness		0.774	0.0716
Orientation	$^\circ$	97.7	51.9

Statistics over all grains - Sorted grains (65.9 nm)

Global information	Value		
Number of grains	829		
Total area occupied by the grains	1.46 μm^2 (36.4%)		
Density of grains	207 Grains/ μm^2		
Grain parameters	Unit	Value	Std...
Area	nm^2	1756	833
Perimeter	nm	178	47.4
Equivalent diameter	nm	45.8	11.8
Mean diameter	nm	45.0	11.7
Min diameter	nm	33.0	10.6
Max diameter	nm	62.9	16.2
Form factor		0.667	0.105
Aspect ratio		2.06	0.944
Roundness		0.543	0.121
Compactness		0.732	0.0865
Orientation	$^\circ$	95.4	56.7

Grains analysis: statistics on larger and smaller grains following binarization on horizontal plane and grain sort with respect to diameter.



Parameters	Stat.	Value	Unit
Number of motifs		80	
Height	Mean	15.8	μm
Area	Mean	0.0126	mm^2
Volume	Mean	7.16e-005	mm^3
Mean diameter	Mean	0.126	mm
Sphere radius	Mean	0.103	μm

Motifs analysis of microlens array (with spherical caps)

3D motifs analysis

The ISO 25178 standard introduced a new segmentation method that identifies texture cells, or hill and dale “motifs”, on a surface. Segmentation is carried out by applying a watersheds algorithm. This algorithm is coupled with a “Wolf pruning” algorithm that eliminates insignificant motifs by merging them into larger ones. Once they have been identified, motifs are characterized by morphological parameters including mean diameter, equivalent diameter, compactness, aspect ratio and orientation. These parameters are calculated for individual motifs or statistically. In addition, spheres can be fitted to identified motifs, for example in the study of microlens arrays, and the center and radius of each sphere is calculated.

Peak curvature, plasticity and elasticity

Using motifs analysis it is possible to calculate the curvature of significant hills. When a hill with small curvature is in contact with another surface it is likely to be eroded or plastically deformed, whereas a hill with large curvature will provide an elastic contact with a greater surface area.



Automated statistical analysis of static and dynamic populations

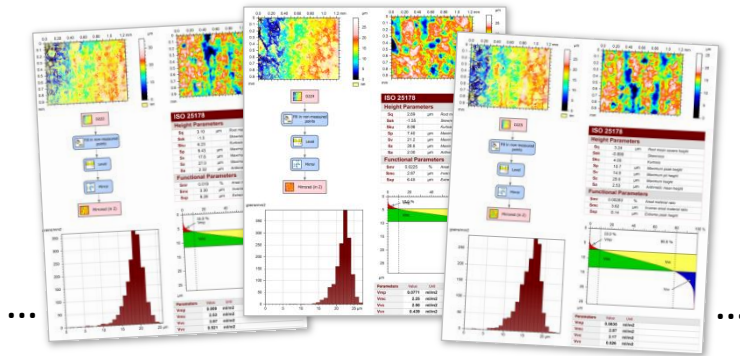
Monitor key parameters and process capability

Automatic data preparation

Analysis reports - containing geometric and surface texture parameters - can be generated automatically for each data set in one or more measurement populations using a predefined analysis workflow as a template,

Statistics report

A statistical report on key parameters for selected populations is created by loading the populations and adding parameter tables, control charts, histograms, box plots, scatter plots as required. All statistical data can be exported to quality management systems in Excel-compatible text files.



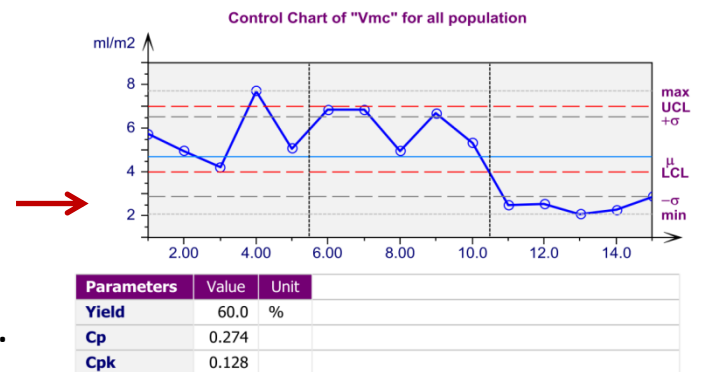
Automatically generated analysis reports on 3 measurements in a series. The reports contain parameters for statistical analysis.

Control charts: metrological and process parameters

Control charts give an instant picture of whether or not a metrological parameter is out of limits. They include standard deviation limits (1 to 3 sigma), control limits, and vertical bars separating different populations, together with yield, capability (Cpk) and other process parameters.

Automatic updating

New measurement data files in dynamic populations are analyzed automatically and the statistics report is updated accordingly.



Control chart for a metrological parameter in a statistics report on three small series, together with yield and capability parameters.

Visualize, filter & analyze series of surfaces and images

Study surface change in 4 dimensions

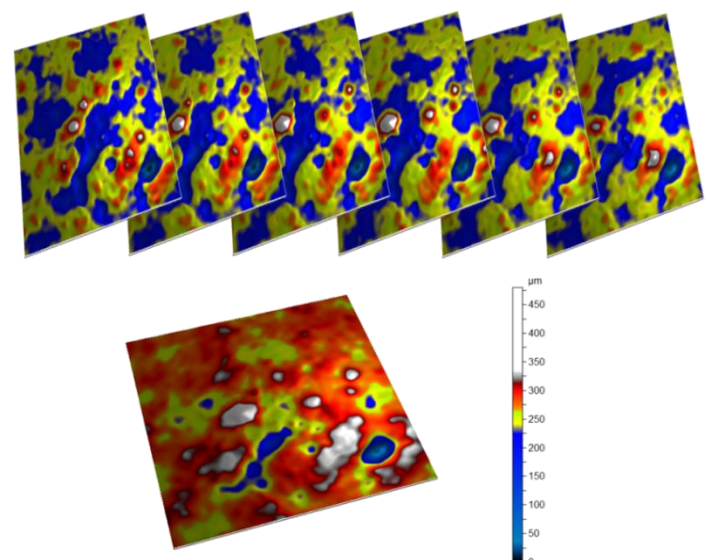
MountainsMap® Premium makes it possible to visualize surface, profile and point evolution, to fly over the surface as it changes, and to record a movie for presentations.

A series of surfaces (z axis height) or converted images (z axis intensity) is loaded. The members of the series are combined for 4D visualization, filtering and analysis with respect to a physical dimension T. This fourth dimension can be time, temperature, magnetic field or any other dimension (linear or non-linear).

The Karhunen-Loève transform (principal component analysis) is used to filter out noise and to highlight areas with different kinetic behavior.

Statistics are generated that show how one or more parameters evolve as the surface changes.

Right: evolution of a medical surface and visualization of areas of preponderant change.





Highly intuitive desktop publishing environment

Full metrological traceability, automation, fine tuning on the fly

Visual analysis reports

In MountainsMap® Premium you build a visual analysis report frame by frame, page by page, working in a comfortable desktop publishing environment. Frames contain 3D and other views of surface data, the results of applying filters, analytical studies, ISO and national parameters, measurement identity cards, comments and illustrations. You can navigate to any frame in a report by selecting it in the page viewer.

Smart user environment

The smart user environment - with logical top-down organization of all functions and contextual object-oriented ribbons - means that you can go from idea to action with minimum effort. A full screen mode provides maximum comfort when you are carrying out a specific analytical study. Furthermore you can work in your own language: the user interface - including expanded graphical tooltips that provide a first level of help - is available in ten languages (EN, FR, DE, ES, IT, PL, BR, JP, CN, KR). In addition, a complete reference manual (EN, FR, DE, JP) with illustrations and examples can be accessed simply by pressing the F1 key.

Full metrological traceability

Every analysis step is recorded in a hierarchical analysis workflow to assure full metrological traceability. Analysis steps in the workflow can be fine tuned at any time, dependent steps being recalculated accordingly and automatically.

Powerful automation features

Any analysis report made can be applied at any time as a template to automate the analysis of multiple measurement data files. In addition common sequences of analysis steps can be saved in a library for insertion into future analysis reports to gain time.

Pass/fail with tolerancing

Pass/fail criteria with tolerances can be defined for any monitored parameter. Green/red pass fail traffic lights are displayed automatically and the parameter value and tolerance limits are shown graphically.

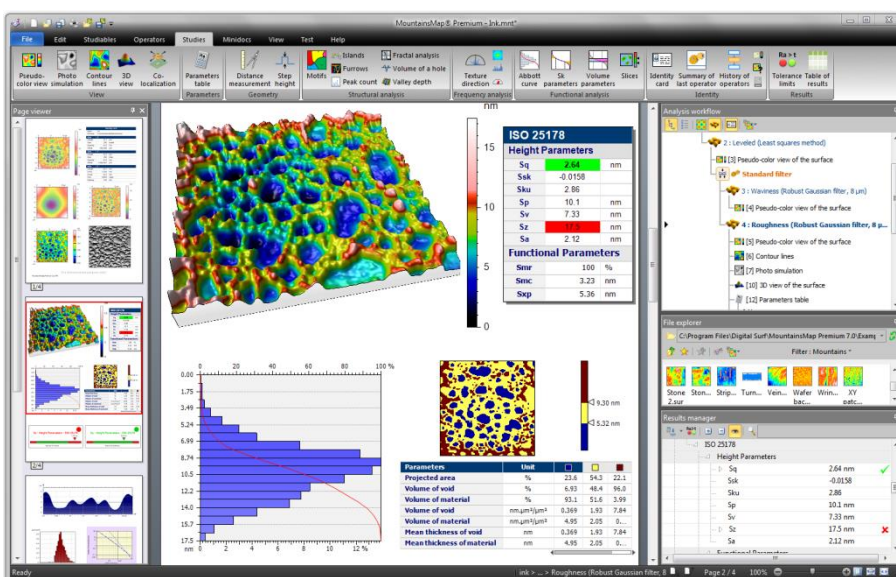
Data export

Frames and pages can be exported as bitmaps up to 1200 dpi for poster sessions. Finished reports can be exported in PDF and RTF (Word™-compatible) formats for easy circulation.

All numerical results, including pass/fail status, are accessible in the Results Manager and can be exported in Excel-compatible text files for interfacing with 3rd party software, including quality management software.

Page format

Pages in analysis reports have standard or user-defined portrait, landscape or onscreen formats. A master page can be set up with elements that will be repeated on all pages (company information, logo, page number, etc.).



Left: page viewer for easy navigation. **Middle:** workspace in configurable portrait, landscape or onscreen format. **Right:** configurable panels including the hierarchical analysis workflow showing every analysis step and the results manager with all results including pass/fail status. The user interface, including expanded graphical tooltips for a first level of help, is available in ten languages.

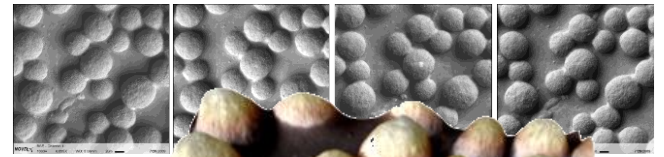


MountainsMap® Premium Optional Modules

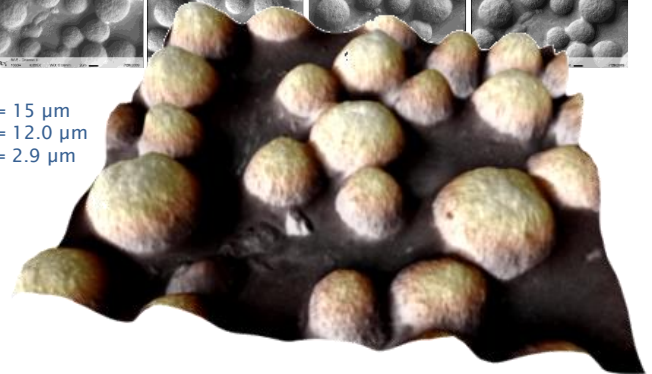
+ SEM extension module

SEM image enhancement & metrology

- **Color and enhance SEM images** - convert SEM images into colored pseudo 3D intensity maps - improve image quality with image enhancement tools and denoising filters.
- **Analyze geometry** - distance and angle measurement.
- **Reconstruct 3D surface topography** from stereo image pairs, anaglyphs and quads.
- **Generate anaglyphs** from 3D topography for viewing with stereoscopic glasses.
- **Extract vertical (x,z cross-sectional) and horizontal (x,y) profiles** from reconstructed 3D surfaces.
- **Analyze contour dimensions** of extracted profiles.
- **Colocalize SEM images with other surface data** - for example colocalize SEM images with surface topography obtained by other instruments and then overlay the images on 3D surface topography.



X = 15 μm
Y = 12.0 μm
Z = 2.9 μm

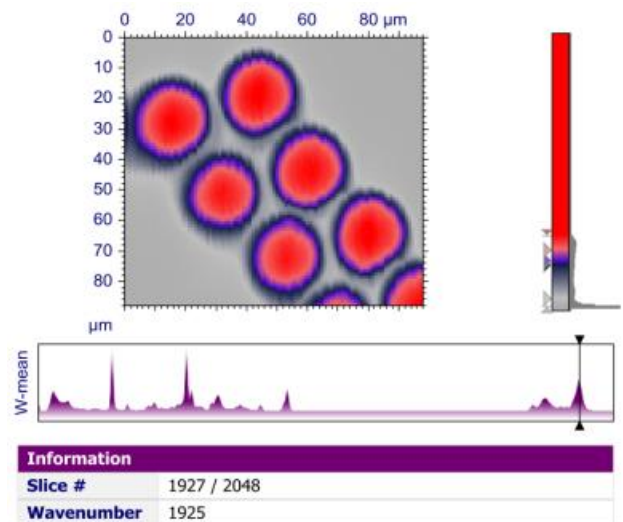


Toner - 3D reconstruction from images captured on quad detector, courtesy of Agilent Technologies

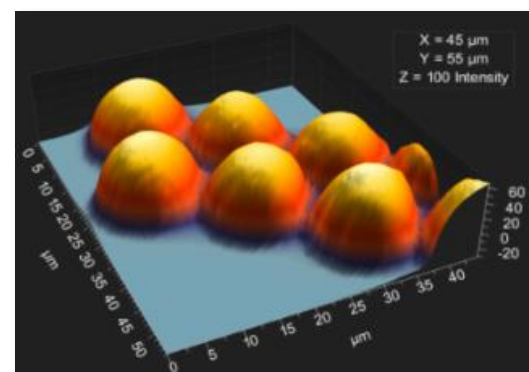
+ Spectrometry module

Visualize and analyze hyperspectral data

- **Visualize spectra, series of spectra and hyperspectral cubes** obtained by Raman, FT-IR spectrometers, EELS, EDX ...
- **Create compositional density maps** with respect to reference spectra.
- **Visualize 3D intensity maps** of "flattened" hypercubes in real time.
- **Colocalize** hyperspectral data with surface data from other instruments including overlays on 3D intensity maps and surface topography.



Visualization of wavenumbers (selected using slider) in a hyperspectral cube.



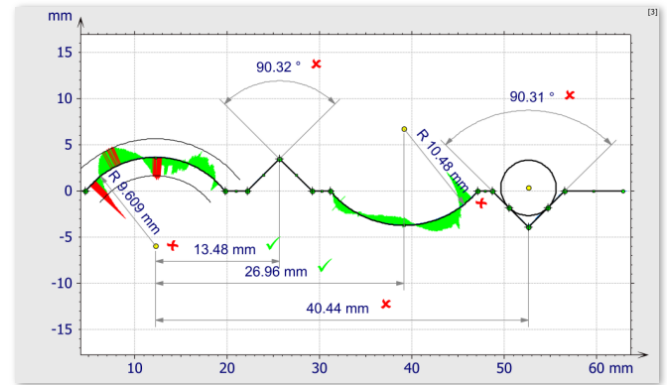
3D view of "flattened" hypercube.



+ Advanced contour analysis module

Form deviation analysis with tolerancing

- Compare measured contours with CAD data (DXF) or user-defined nominal form.
- Specify tolerances including large positional tolerances if required.
- Visualize form deviations easily with magnified graphics.
- Automatically generate a table of results including pass/fail status.
- Gothic arch analysis of bearings.

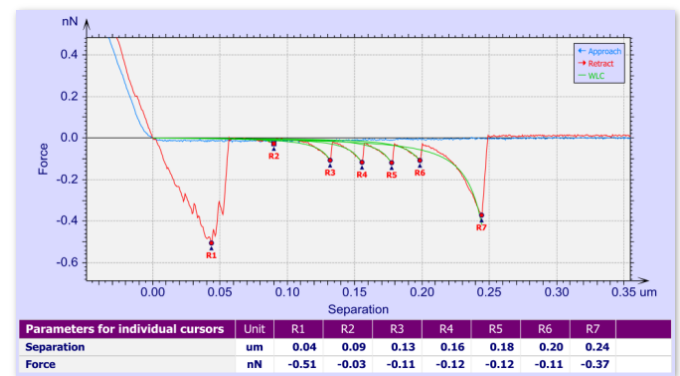


Magnified form deviation graphics

+ AFM force curves module

Visualize and analyze force curves

- Automated preprocessing denoises force curves obtained by atomic force microscopes, normalizes baselines and calibrates cantilever sensitivity.
- Visualize force curves and series of force curves - display attract and/or retract curves, select axis units.
- Detect adhesion events and calculate parameters automatically, with optional fine tuning.
- Generate wormlike chain (WLC) models of protein unfolding.
- Generate statistics for series of force curves.



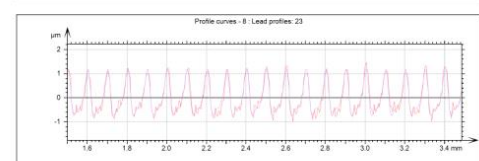
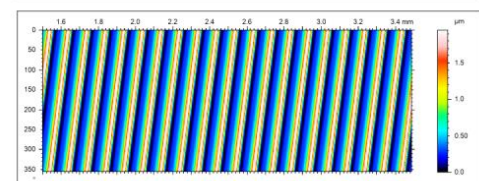
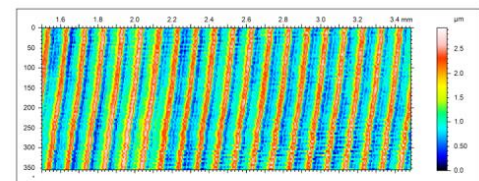
AFM force curves

+ Lead (twist) analysis

2nd generation lead analysis (automotive industry)

- Automatically generate a lead analysis report (for manufacturing efficient radial seals that reduce oil consumption) in accordance with the Mercedes-Benz 2009 engineering standard - including lead parameters and visualization of dewobbed measured surface structure and lead surface topography.

Daimler Lead Twist Analysis:					
Parameters	Value	Unit	Parameters	Value	Unit
Diameter	40.0	mm	Period length	DP	0.100 mm
Evaluation length	2.00	mm	Theoretical supply cross section	DF	120 µm²
Maximum run length	0.400	mm	Theoretical supply cross section per turn	DFL	120 µm²/10
Number of threads	DG	-1.0	Contact length in percent	DLu	17.8 %
Lead depth	Dt	1.96 µm	Lead angle	Dy	-0.0458 °



2nd generation lead (twist) analysis report in accordance with the Mercedes-Benz engineering standard.



Selected standard and optional features

MountainsMap® Premium

Compatibility	Confocal microscopes - interferometric microscopes - digital holographic microscopes - focus variation microscopes - structured light systems - scanning probe microscopes (AFM, MFM, CSAFM, STM, SNOM, etc.) - contact (stylus) and non-contact (chromatic confocal, auto-focusing, laser triangulation, single point WLI) profilometers - form measuring systems (vision, fringe projection, CMM with scanning mode) - portable roughness meters - plus (with optional extensions): scanning electron microscopes (including 3D reconstruction) and hyperspectral instruments
Smart desktop publishing user environment	Frame-based desktop publishing environment - logical top-down organization of all functions - contextual-object oriented ribbons - multi-language user interface (EN, FR, DE, ES, IT, PL, JP, CN, KR, BR) - integrated reference manual (EN, FR, DE, JP) - automatic analysis of series of measurements using templates - library of common analysis sequences - single-click in-document navigation via page viewer - analysis workflow for full metrological traceability - tolerances for any parameter with pass/fail traffic lights - frame and page bitmap export (up to 1200 dpi) - Excel-compatible ASCII export of numeric results - PDF and RTF export of multi-page documents - standard and user-defined portrait, landscape and onscreen page formats - master page with common elements (logo, etc.) - auto-save
Surface visualization	Real time imaging of 3D surface topography (z axis in height units) - visualization and manipulation of multi-channel 3D optical profiler and SPM data files with overlays of non-topographical layers on 3D surface topography - selectable rendering, lighting and height amplification - color coded Z-axis palettes with data point distribution histogram - surface flyovers with video export - contour diagrams - photo-simulations - 2D profile extraction - conversion of RGB images into 3D images with z axis in intensity units
Data preparation and correction	Leveling - XY or Z inversion - rotation - zone extraction - thresholding - filling in missing points - retouching - resampling - smoothing - tip deconvolution - scan line correction - scan line removal - stitching of multiple overlapping measurements made on the horizontal plane into a single surface - patching of multiple measurements made at different heights into a single surface
Filters	Form removal - comprehensive range of roughness/waviness filters from Gaussian to ISO 16610 - spatial filters with configurable matrices - FFT plot editor for advanced filtering - surface subtraction - profile subtraction - MATLAB™ compatibility (for custom filters)
Geometric analysis	Measurement of distances, angles, areas, volumes, step heights - extraction of vertical (X,Z) and horizontal (X,Y) profiles/contours (profile) from surfaces - nominal form definition (by association of geometric elements with contour) - geometric dimensioning of contours
Functional analysis	Bearing ratio curve and depth histogram - material/void volume and thickness of vertical slices - graphical study of functional volume parameters - graphical study of functional Rk parameters - fractal analysis
Surface texture, form and other parameters	ISO 25178 3D height, bearing ratio, functional volume, hybrid, spatial and feature parameters - ISO 12178 flatness parameters - EUR 15178 amplitude, area and volume parameters - ASME B46.1 3D and 2D parameters - ISO 4287 amplitude, spacing, material ratio and peak parameters - ISO 13565-2 Rk parameters - ISO 13565-3 primary and roughness parameters - ISO 12085 R&W parameters - ISO 12780 straightness parameters - ISO 12781 roundness parameters
3D Fourier and wavelets analysis	Frequency spectrum - power spectrum density - autocorrelation and intercorrelation - isotropy, directionality and periodicity - discrete wavelet filtering (2D profiles and 3D surfaces) - continuous wavelets decomposition (2D profiles).
Grains and particles analysis	Grains analysis on horizontal axis - 3D grains (islands) analysis - 3D motifs analysis (applying segmentation by watersheds and Wolf pruning) and ISO 25178 features parameters - statistics
Sub-surface analysis	Sub-surface extraction (by zoom, thresholding, masking or segmentation by watersheds) and analysis
Surface evolution	4D visualization, filtering and analysis of series of surfaces and images (z axis: height or intensity) - surface, profile and point evolution - surface flyover movie export - statistics on surface texture parameters - Karhunen-Loève transform (principal component analysis) for noise filtering and highlighting areas with different kinetic behavior
Series of profiles	Create and analyze series of profiles, generate statistics
Statistics	Monitor numerical results from one or more static or dynamic measurement populations - control charts - parameter tables - histograms - box charts - scatter plots - Cpk capability parameters
Colocalization	Colocalization of surface data (images and/or topography) obtained by different instrument types or detectors - overlay images on 3D surface topography

MountainsMap® Premium Optional Modules

SEM Extension	Colored 3D intensity maps of SEM images - reconstruction of 3D surface topography from SEM stereo image pairs and four SEM images captured by a quad detector
AFM Force Curves	Automated pre-processing of force curve data (denoising, base line normalization, calibration) - force curve visualization and analysis - automatic adhesion event detection - interactive adhesion event definition - automatic protein unfolding event detection in accordance with WLC (wormlike chain) model - series of force curves visualization and analysis including statistics
Spectrometry	Extension for hyperspectral instruments (including Raman and FT-IR spectrometers, EELS, EDX) - visualization of spectra and hyperspectral cubes - compositional density maps - 3D intensity maps
Advanced Contour Analysis	Comparison of profile with CAD model (DXF) or user-defined nominal form - tolerancing including large positional tolerances - magnified form deviation graphics - form deviation parameters - Gothic arch
Lead (Twist) Analysis	2nd generation lead analysis (for manufacturing efficient radial seals that reduce oil consumption) in accordance with the 2009 Mercedes-Benz engineering standard - automatic generation of lead analysis report.



Requirements

PC requirements

Minimum requirements	Operating system	Windows 8 (64-bit or 32-bit) or Windows 7 (64-bit or 32-bit) or Windows Vista (64-bit or 32-bit)
	RAM	4 GB
	Graphics board	Hardware accelerated OpenGL or Direct3D
	Resolution	1280 x 768 in thousands of colors
	HDD free space	800 MB
	Other	1 free USB port
Recommended	Operating system	Windows 8 (64-bit) or Windows 7 (64-bit)
	Processor	Quadcore
	Resolution	1600 x 1024 in thousands of colors



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Digital Surf Head Office & R&D Center
Digital Surf SARL, 16 rue Lavoisier,
25000 Besançon, France
Tel +33 3 81 50 48 00
contact@digitalsurf.fr www.digitalsurf.com