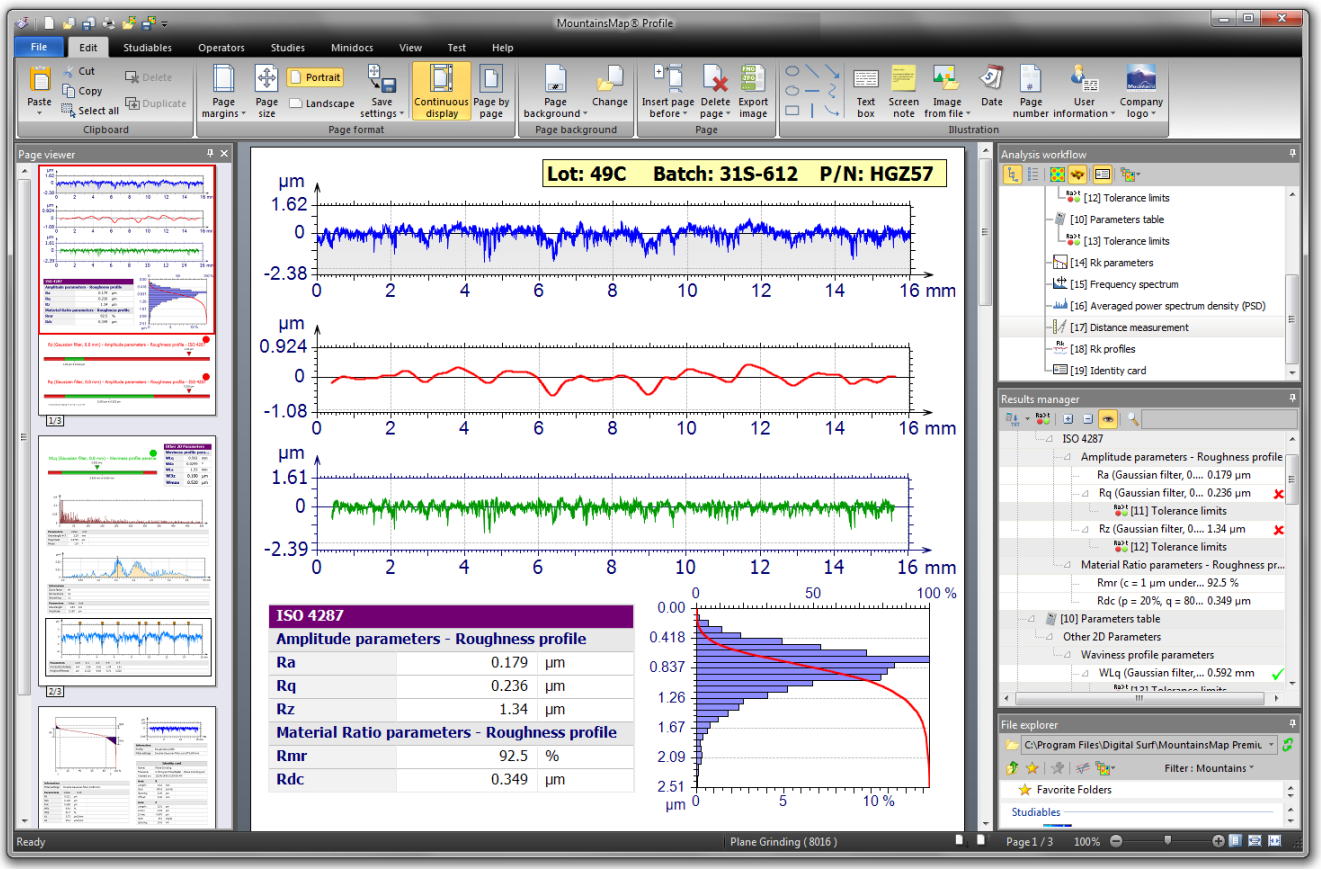
MountainsMap® Profile

2D profilometry software

for laboratory scanning profilometers (contact and non-contact)

- State of the art metrology for 2D profilometers
- View primary, waviness and roughness profiles
- Study profile geometry
- Calculate 2D surface texture parameters according to the latest standards
- Secure batch processing
- Add modules for advanced analysis
- Automate analysis and publish results easily



Mountains7

Digital Surf

Analyze surface geometry and texture

Distances, angles, areas, step heights, roughness, bearing ratio, depth distribution

Visualization of measurement data

Visualize primary, roughness and waviness profiles independently.
Level a profile, invert it on the X or Z axis, zoom in on a section, set thresholds to remove anomalous spikes, resample to achieve better resolution, and retouch points on the profile.

Geometric analysis

Measure distances, height differences, slopes, angles, areas of peaks and holes, and up to six step height measurements on a single profile.

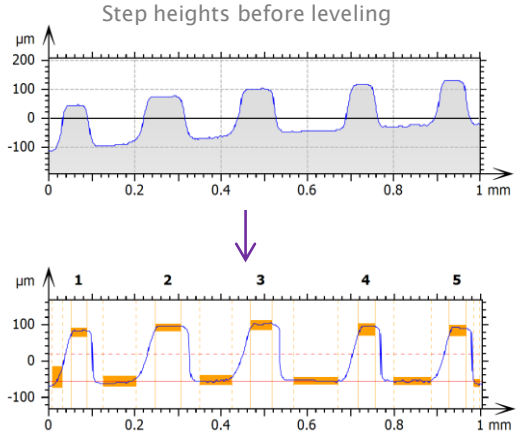
Functional analysis

The Abbott-Firestone bearing ratio curve and depth distribution histogram facilitates the analysis of friction and wear.

Roughness parameters

Calculate the most commonly used 2D parameters: ISO 4287 primary profile, waviness and roughness parameters (*Ra*, *Rq*, *Rsk*, *Rmr*, *Rdc*, *Rdq*, *RPc*, etc.) and ASME B46.1 2D parameters.

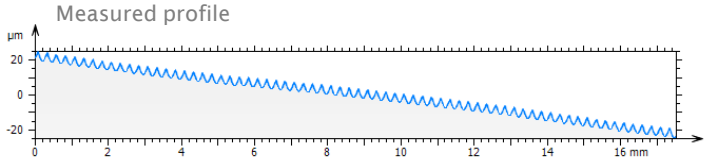
Step heights before leveling



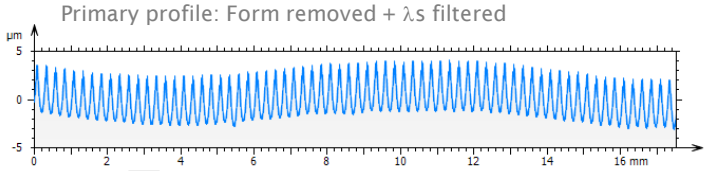
Parameters	Unit	Step 1	Step 2	Step 3	Step 4	Step 5
Width	mm	0.0372	0.0598	0.0505	0.0399	0.0399
Maximum height	µm	140	152	161	153	148
Mean height	µm	139	151	157	150	145

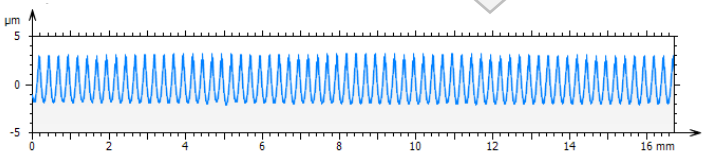
Automatic step height calculations

Measured profile

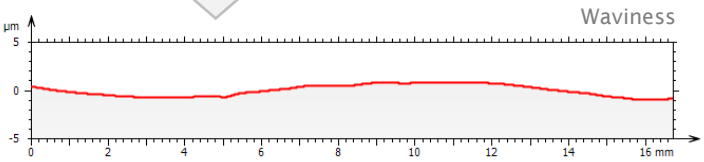


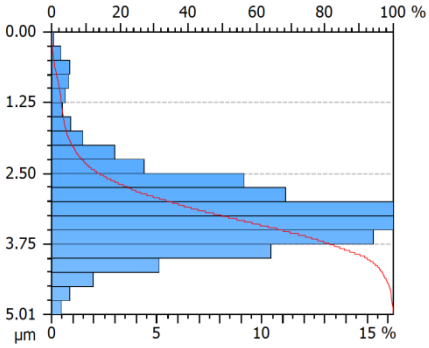
Primary profile: Form removed + λs filtered





Waviness





Material ratio and depth distribution

ISO 4287			
Amplitude parameters - Roughness profile			
Rp	2.70	µm	*Gaussian filter, 0.8 mm*
Rv	1.00	µm	*Gaussian filter, 0.8 mm*
Rz	3.70	µm	*Gaussian filter, 0.8 mm*
Rc	1.75	µm	*Gaussian filter, 0.8 mm*
Rt	4.11	µm	*Gaussian filter, 0.8 mm*
Ra	0.459	µm	*Gaussian filter, 0.8 mm*
Rq	0.632	µm	*Gaussian filter, 0.8 mm*
Rsk	1.55		*Gaussian filter, 0.8 mm*
Rku	6.46		*Gaussian filter, 0.8 mm*
Material Ratio parameters - Roughness profile			
Rmr	2.98	%	*c = 1 µm under the highest peak, Gaussian filter, 0.8 mm*
Rdc	0.872	µm	*p = 20%, q = 80%, Gaussian filter, 0.8 mm*

Standard surface texture analysis in MountainsMap® Profile including LS form removal, separation of roughness and waviness profiles and calculation of ISO 4287 roughness parameters.

Highly intuitive desktop publishing environment

Full metrological traceability, powerful automation features

Visual analysis reports

Build a visual analysis report as you analyze the profile, working in a comfortable desktop publishing environment. Frames contain the 2D profiles under study, analytical studies, surface texture parameters, illustrations and measurement identity cards.

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.
Work in portrait or landscape format, or on full screen mode for maximum comfort.
Work in your own language – the user interface provide a first level of help – is available in ten languages. In addition, a complete reference manual 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. All dependent steps are recalculated automatically.

Powerful, automation features

Once an analysis report has been completed it can be applied as a template to automate the analysis of multiple measurement data files.
Templates that are applied by operators in a workshop or production environment can be locked to prevent modification.

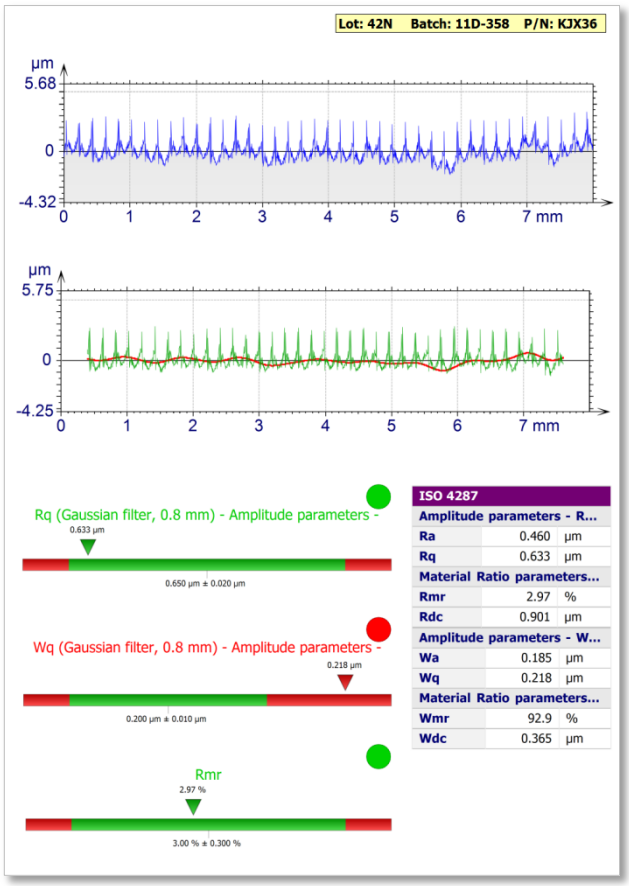
Pass/fail with tolerancing

Pass/fail criteria with tolerances can be defined for any 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. Finished reports can be exported in PDF and RTF formats for easy circulation.

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



Pagesextracted from analysis reports

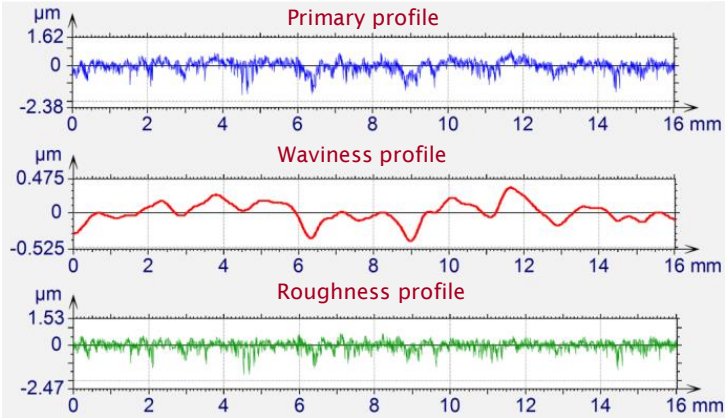
MountainsMap® Profile Optional Modules

For advanced and specialized applications

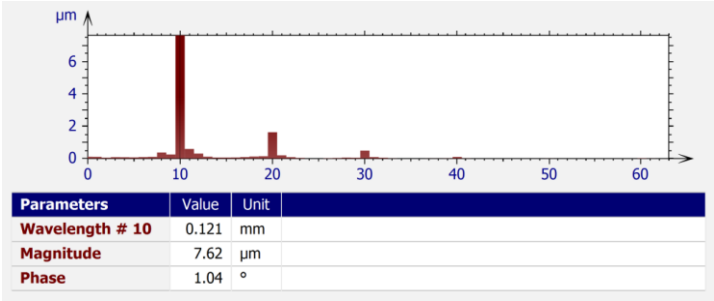
2D advanced surface texture module

Advanced 2D analytical studies and filters

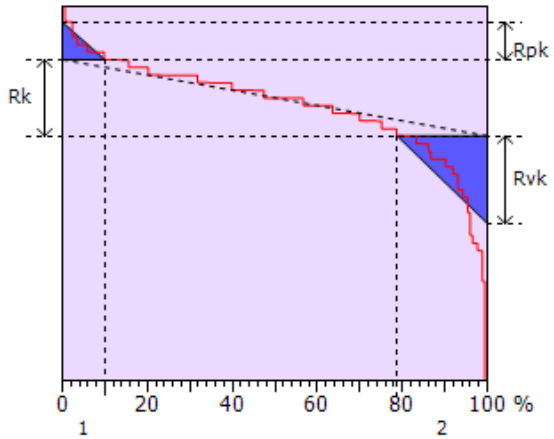
- Apply advanced 2D filtering techniques – remove form and apply roughness/waviness filters from Gaussian to ISO 16610 – apply morphological filters – denoise profiles using the FFT plot editor.
- 2D Fourier analysis for studying process-surface interaction - frequency spectrum – power spectrum density – autocorrelation – intercorrelation.
- Analyze fractal dimensions of profiles using the enclosing boxes and morphological envelopes methods.
- Compatibility with 3D profilers – display of pseudo-color images of 3D surfaces – extraction of 2D profiles from these surfaces.
- Overcome measurement limits virtually – join overlapping profiles.
- Generate statistics on series of profiles – the profiles in the series can be extracted from a series of surfaces or from the same surface.
- MATLAB™ compatibility – use Matlab™ scripts to define custom filters for 2D profiles - execute the scripts in MountainsMap®.



ISO 16610 filtering techniques with end effect management



Frequency spectrum showing periodicities



Parameters	Value	Unit
Rk	0.206	µm
Rpk	0.101	µm
Rvk	0.236	µm

Graphical study of Rk parameters

2D Automotive module

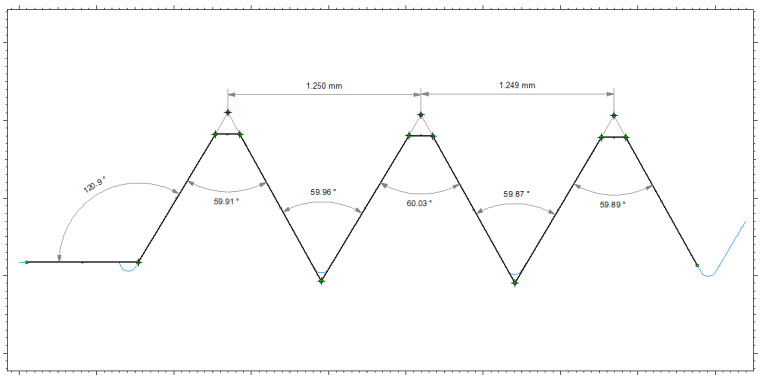
2D functional parameters and studies

- Calculate 2D parameters developed by the automotive industry - ISO 13565-2 Rk parameters (*Rk*, *Rpk*, *Rvk*, etc.) - ISO 13565-3 parameters – ISO 12085 motifs parameters (*R*, *AR*, *Rx*, etc.) – ISO 12780 straightness parameters (*STRt*, etc.) – ISO 12781 roundness parameters (*RONt*, etc.).
- Study Rk parameters associated with wear and lubrication graphically - visualize friction, core and lubrication zones on tribological profiles.

Contour analysis module

Straightforward component dimensioning

- Define nominal form of a profile using straightforward interactive tools to associate geometric elements with contours.
- Calculate dimensions (including distances, radii, diameters and angles) using autodimensioning and interactive tools.

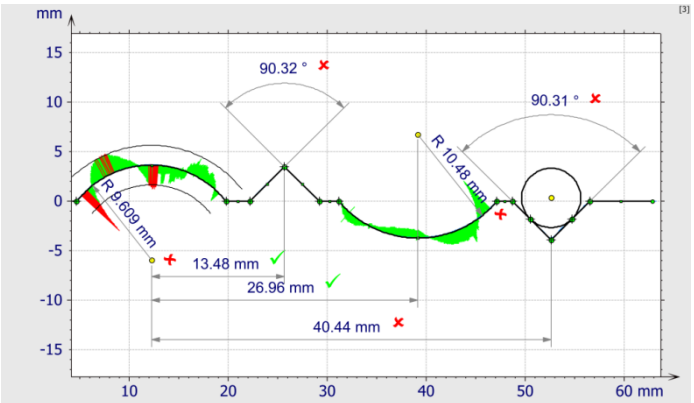


Geometric dimensioning of a lead screw

Advanced contour analysis module

Comprehensive form deviation analysis

- All features in the Contour Analysis module.
- 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.



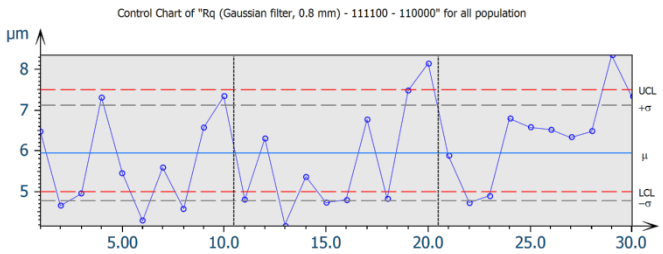
Parameters	Value	Unit	Tolerance	
Distance - Dimension 1	13.48	mm	13.50 mm ± 0.1000 mm	✓
Distance - Dimension 2	26.96	mm	27.00 mm ± 0.1000 mm	✓
Distance - Dimension 3	40.44	mm	40.00 mm ± 0.1000 mm	×
Radius (Rls) - Dimension 4	9.609	mm	10.00 mm ± 0.1000 mm	×
Radius (Rls) - Dimension 5	10.48	mm	10.00 mm ± 0.1000 mm	×
Angle - Dimension 6	90.32	°	90.00 ° ± 0.2500 °	×
Angle - Dimension 7	90.31	°	90.00 ° ± 0.2500 °	×

Magnified form deviation graphics & table of results

Statistics module

Multiple static/dynamic data populations

- Prepare data automatically using templates – include all parameters for statistical analysis in a predefined analysis workflow - use it as a template for automatically generating analysis reports - option to lock templates for secure use on factory floor.
- Generate statistical reports – select the static or dynamic population(s) to be analyzed and create a report with parameter tables, control charts, histograms, box plots and scatter plots as required – statistics for dynamic populations are updated automatically.
- Monitor key metrological and process parameters - control charts include standard deviation limits (1 to 3 sigma), control limits and vertical bars separating different populations, together with yield, capability (Cpk) and other parameters.



Parameters	Value	Unit
Variance	1.37	µm²
Yield	56.7	%
Cpk	0.270	

Control chart for Rq parameter in three small populations

Selected standard and optional features

MountainsMap® Profile

Compatibility	Contact (stylus) and non-contact (chromatic confocal, auto-focusing, laser triangulation, single point WLI) 2D (x,z) profilometers –plus (with 2D Advanced Surface Texture Analysis option): 3D (x,z) profilometers (profiles can be extracted from surfaces for 2D analysis)
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
Profile visualization	Primary, roughness and waviness profiles (x,z)
Data preparation	Level profile - invert axes (x, z) – zone extraction - thresholding for removing anomalies - resampling to increase resolution – retouching of isolated artifacts
Geometric analysis of profiles	Horizontal and oblique distance, height difference, slope between two points, angle with respect to X axis, etc. - multiple step height measurements on positive steps (bumps) and negative steps (holes) using ISO 5436-1, automatic and manual methods - area of peaks and holes
Surface texture analysis of profiles	Form removal – configurable roughness/waviness filters - ISO 4287 primary, waviness and roughness profile parameters - ASME B46.1 2D parameters - older 2D parameters - Abbott-Firestone curve - depth distribution histogram

MountainsMap® Profile Optional Modules

2D Advanced Surface Texture	ISO 16610 2D roughness/waviness filters – morphological filters - 2D Fourier analysis including frequency spectrum and power spectrum density - FFT plot editor – profile data correction tools – profile joining – profile subtraction - 2D fractal analysis - series of profiles creation and analysis with statistics - MATLAB™ compatibility (custom filters) - load 3D profiler x,y,z data and view pseudo-color images of surfaces – extract profiles from surfaces for 2D analysis
Contour Analysis	Nominal form definition by association of geometric elements with x,z profile – geometric dimensioning
Advanced Contour Analysis	Comparison of profile with CAD model (DXF) or user-defined nominal form - definition of tolerances including large positional tolerances – magnified form deviation graphics - form deviation parameters – table of pass/fail results - Gothic arch bearings analysis
Statistics	Automated data preparation using templates (lockable for secure use on the factory floor) – statistical reports on multiple static and/or dynamic surface data populations - control charts for monitoring metrological and process parameters
2D Automotive	Graphical study of functional Rk parameters - ISO 13565-2 Rk parameters - ISO 13565-3 primary and roughness parameters - ISO 12085 R&W parameters - ISO 4287 waviness parameters - ISO 12780 straightness parameters, ISO 12781 roundness parameters

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

Digital Surf
Surface Intelligence

MountainsMap® Profile: Version 7.0
Doc Revision: 20130917

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