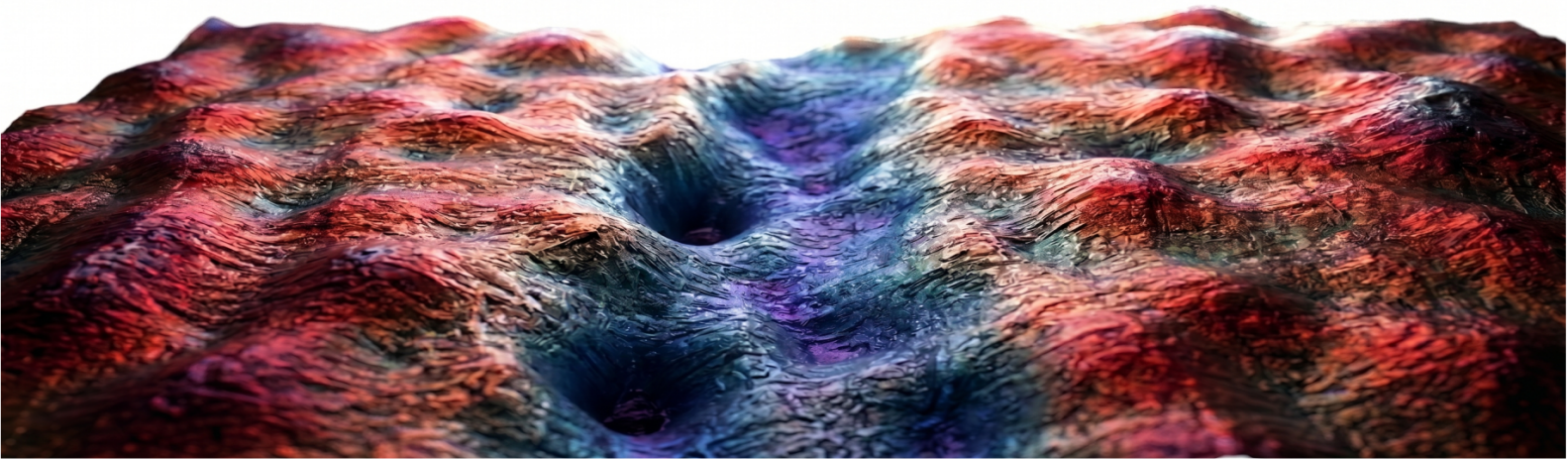
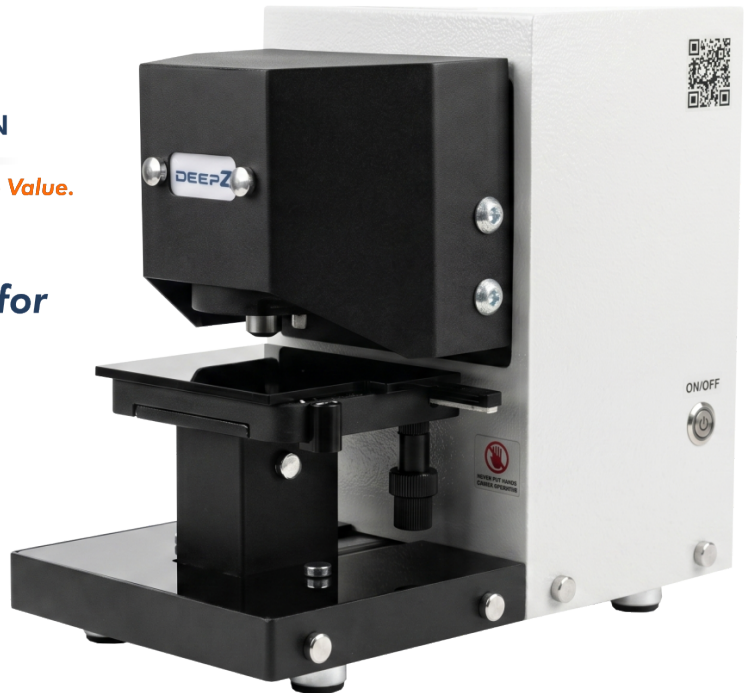




3D WEAR & SCRATCH MEASUREMENT STATION

Professional Metrology. Industrial Ruggedness. Disruptive Value.

Quantitative 3D surface metrology for
wear
scratches
coating damage
surface defects



Designed for quality control, R&D and tribology laboratories requiring fast, quantitative 3D wear and scratch analysis

Micron-Scale Measurement:

High-resolution 3D surface measurement for quantitative depth, profile, area and volume analysis.

Complete Wear Analysis:

Measure wear depth, material loss, pile-up, cross-sections, surface parameters and specific wear rate within a single analysis platform.

Extended-Area 3D Measurement:

3D stitching extends the measurement area beyond the native field of view, enabling complete analysis of larger wear tracks and surface damage.

Efficient & Repeatable Workflow:

Reusable sample-specific measurement settings, intuitive analysis tools and configurable reporting support consistent measurements from sample to sample.

Applications:

Wear testing · Scratch analysis · Coating evaluation · Abrasion studies · Surface damage characterization · Microscopic dimensional inspection



DeepZ SYSTEM SPECIFICATIONS

General

Specification	DEEPZ
System type	Optical 3D wear and scratch analysis station
Primary purpose	Quantitative measurement and analysis of wear tracks, scratches, coating damage, abrasion marks and localized surface defects
Typical environments	Quality control, R&D, tribology and industrial laboratories
Typical applications	Pin-on-disc wear, linear/reciprocating wear, scratch testing, abrasion studies, coating evaluation, surface-damage analysis and microscopic dimensional inspection
Measurement principle	Optical 3D surface measurement
Native field of view	1.9 × 1.1 mm
Extended field of view	3D stitching
Lateral sampling	Approx. 1 µm/pixel
Nominal Z sampling interval	0.8 µm
Motorized Z-axis travel	50 mm

Measurement Performance

Metrological Characteristic	Performance
Lateral sampling	Approx. 1 µm/pixel
Lateral measurement accuracy	1.3 µm over 1 mm ^a
Lateral measurement repeatability	0.15 µm, 1σ ^a
Nominal Z sampling interval	0.8 µm
Height measurement accuracy	5 µm ^b
Height measurement repeatability	1.3 µm, 1σ ^c
Typical measurement noise, Sq	≤ 0.5 µm ^d
Wear-volume repeatability	≤ 4% CV ^e
Pile-up volume repeatability	≤ 3% CV ^e

^a Verified using a traceably calibrated dimensional artefact at multiple field positions and orientations, with reference to ISO 25178-600 and ISO 25178-700. Repeatability is stated as 1σ.

^b 95% of 240 verification points were within ±5 µm of the reference value over a 310 µm verified vertical range. RMSE over the same verification dataset was 2.5 µm. Verified using a traceably calibrated inclined-plane artefact with reference to ISO 25178-600 and ISO 25178-700.

^c Determined from repeated complete measurements at a fixed sample location and fixed scan range. Pooled pointwise repeatability over 480 height points is reported as 1σ, with reference to ISO 25178-600 and ISO 25178-700.

^d Determined from repeated pairs of consecutive height maps at a fixed sample location, with reference to ISO 25178-600 and ISO 25178-700.

^e Determined from repeated complete 3D measurements of a pin-on-disc wear track with approximately 30 µm maximum depth under fixed acquisition and analysis conditions. Repeatability is reported as 1σ coefficient of variation, with reference to ISO 25178-600/-700 and ISO 5725 statistical principles.



DeepZ SYSTEM SPECIFICATIONS

Physical & Electrical Specifications

Specification	DEEPZ
Design	Compact benchtop measurement station
Width x Depth x Height	185 x 325 x 305 mm
Weight	Approx. 12 kg
Power supply	24 V DC
Maximum power	40 W
Interface	USB 2.0 / USB 3.0

Measurement & Analysis Capabilities

Measurement Group	Available Parameters
Depth	Maximum depth, mean depth, median depth, minimum/maximum height, peak-to-valley depth
Geometry	Track width, track length, projected area, 3D surface area, perimeter
Volume	Material-loss volume, volume below reference, raised-material/pile-up volume, volume gain, net volume change
Cross-section	Cross-section profile, averaged profile, cross-sectional area, profile slope, profile asymmetry
Areal surface parameters	Sa, Sq, Sp, Sv, Sz
Profile parameters	Ra, Rq, Rp, Rv, Rt
Statistical height parameters	Equivalent heights, P5, P50 and P95 percentiles

3D Measurement Tools

Function	Capability
Region analysis	Quantitative analysis of selected 3D regions
Freehand region analysis	User-defined irregular regions of interest
Line profile	Profile extraction along a user-defined line
Custom profile path	Profile extraction along a drawn path
Wear-region analysis	Depth, area and volume evaluation of selected wear regions
Surface rotation	Rotation/alignment of measured topography before analysis
Cropping	User-selectable measurement-area cropping
Depth limits	Adjustable minimum and maximum analysis depths
Depth reference	Mean, median, minimum or maximum reference level
Outlier rejection	Configurable robust outlier rejection



DeepZ SYSTEM SPECIFICATIONS

Extended-Area 3D Measurement

Specification	Capability
Stitching type	3D topography stitching
Purpose	Measurement of wear tracks or surface regions exceeding the native field of view
Native field of view	1.9 × 1.1 mm
Extended field of view	Scalable through multiple stitched measurements
Maximum stitched area	Dependent on acquisition configuration and host-PC processing resources
Post-stitch analysis	Depth, profile, area, volume and surface-parameter analysis

Profile-Based Wear Estimation

Specification	Capability
Analysis method	Wear estimation from measured 2D cross-section profile
Profile source	Individual line profile or averaged profile
Track modes	Circular, linear pass, linear reciprocating
User inputs	Normal load, track radius or stroke length, revolutions/passes/cycles
Calculated results	Sliding distance, material-loss volume, pile-up volume, net volume change
Specific wear rate	mm ³ /N·m

Surface Processing & Form Correction

Function	Capability
Form removal	Planar, quadratic, cylindrical, spherical
Reference correction	Region-based form fitting and unworn baseline subtraction
Combined correction	Baseline subtraction can be combined with form removal
Surface alignment	Rotation and alignment of measured topography
Filtering	Configurable outlier rejection and S-/L-filters
Data preparation	Cropping and adjustable analysis depth limits
Height referencing	Mean, median, minimum or maximum



DeepZ SYSTEM SPECIFICATIONS

3D Reconstruction

Specification	Capability
Reconstruction methods	Multiple surface-adaptive 3D reconstruction algorithms
Number of reconstruction algorithms	6+ algorithms
Surface optimization	Algorithms selectable according to specimen/surface characteristics
Sub-pixel processing	Supported within applicable reconstruction/feature-localization algorithms
Reconstruction selection	User selectable

Visualization

Function	Capability
Visualization	3D surface, 2D depth map, cross-section plots, microscopic image, EDF image
Rendering	Multiple 3D rendering modes and selectable colour maps
Export & save	3D views, depth maps, profiles and analysis visualizations
Display tools	Scale-bar overlay

Extended Depth-of-Field, 2D Measurement & Image Processing

Function	Capability
EDF imaging	Extended Depth-of-Field microscopic imaging
2D measurements	Distance, angle, geometric shapes, paths and freehand regions
Image processing	Enhancement, denoising, edge/binary processing and scale-bar overlay

Measurement Workflow & Sample Library

Function	Capability
Sample library	Stores sample-specific acquisition, analysis and measurement settings
Reusable workflows	Previously defined procedures can be recalled for repeated or equivalent samples
Consistent analysis	Supports repeatable measurement and analysis across batches or sample types

Data Management & Reporting

Function	Capability
Data storage	Measurement data, results and analysis outputs
Report export	Excel (.xlsx)
Report customization	16 information fields, 14 user-renamable; selectable fields and measurement results
Visualization output	Saved 3D depth views and 2D slice/profile plots



DeepZ SYSTEM SPECIFICATIONS

Calibration

Specification	Capability
Calibration artefacts	Supplied with system
Calibration certificates	ISO/IEC 17025-accredited calibration certificates
Verification reference	ISO 25178-600 / ISO 25178-700
Repeatability evaluation	ISO 5725 statistical principles

Standards & Measurement References

Standard	Area
ISO 25178 series	Areal surface texture and topography
ISO 25178-600	Metrological characteristics of areal topography measuring methods
ISO 25178-700	Calibration, adjustment and verification of areal topography instruments
ISO 21920 series	Profile surface texture
ISO 16610 series	Surface-texture filtering
ISO 5725 series	Accuracy, repeatability and reproducibility
ISO/IEC Guide 98-3	Measurement uncertainty / GUM

Tribology & Scratch Application References

Standard	Application
ASTM G99	Pin-on-disc wear
ASTM G133	Linear reciprocating wear
ASTM G171	Scratch hardness
ASTM C1624	Quantitative scratch testing of ceramic coatings
ISO 20808	Ball-on-disc wear testing
ISO 18535	Friction and wear of DLC films
ISO 20502	Scratch testing of ceramic coatings

DEEPZ supports post-test measurement and quantitative analysis associated with these test methods. Applicability depends on the specimen, test configuration, calibration and measurement procedure.