

# 4D InSpec® XL Surface Gauge

## 4D Technology

- XL: Instant 3D Surface Measurement with Added Depth, Width, and Height Capabilities
- Measure Defects and Features from 0.0003" to 0.35" Deep
- Eliminates Messy Replication from Large Parts
- Measures Complex Geometries Easily

Using 4D InSpec XL, machine shops and rework centers increase yield 20 to 40% over fingernail roughness and visual comparator methods. With micrometer-level resolution, portability, affordability and ease-of-use, 4D InSpec XL puts high resolution 3D surface feature and defect measurement on the factory floor, inside machine shops and in deployed environments—with a larger field of view and deeper step height scan range, as compared to the base model.

While it saves transport, wait and disassembly/reassembly time in metrology queue, user's greatest ROI is that it measures defects right up to the pass/fail spec, ensuring a maximum yield of reworkable parts, and minimizing rejects.

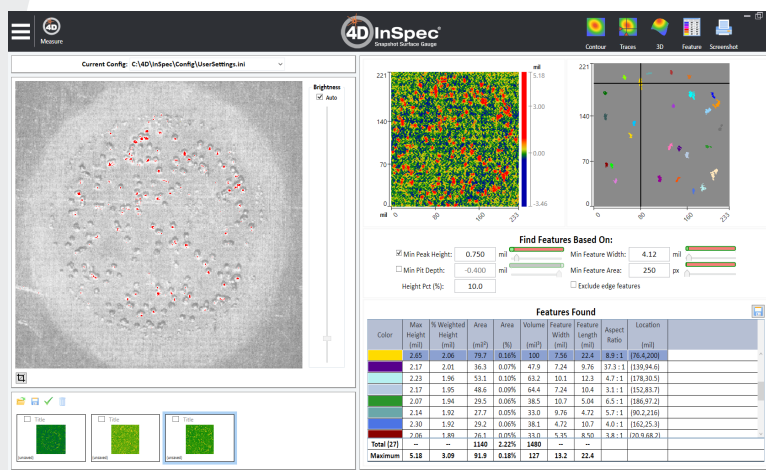
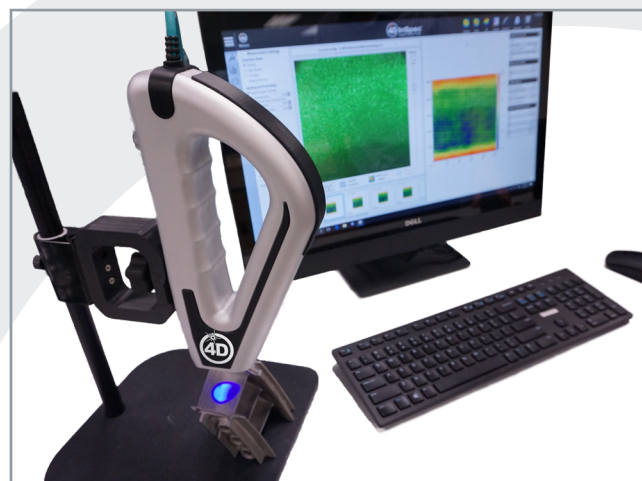
4D InSpec XL quantifies and measures pits, scratches, nicks, dents, bumps, porosity, and other features from 0.0003" to 0.35" (7 µm–9 mm) deep or tall, in a large, versatile 0.6"x0.6" field of view. It's more rugged and versatile than high-end metrology systems and its accuracy makes comparators and fingernail tests worthless.

The handheld measurement tool reaches into tight corners or across large surfaces. Accessories measure inside blind holes and inner diameters. One-button operation and immunity to sensor movement make it easy to align and measure. A rugged design and single cable tether withstand the rigors of daily use.

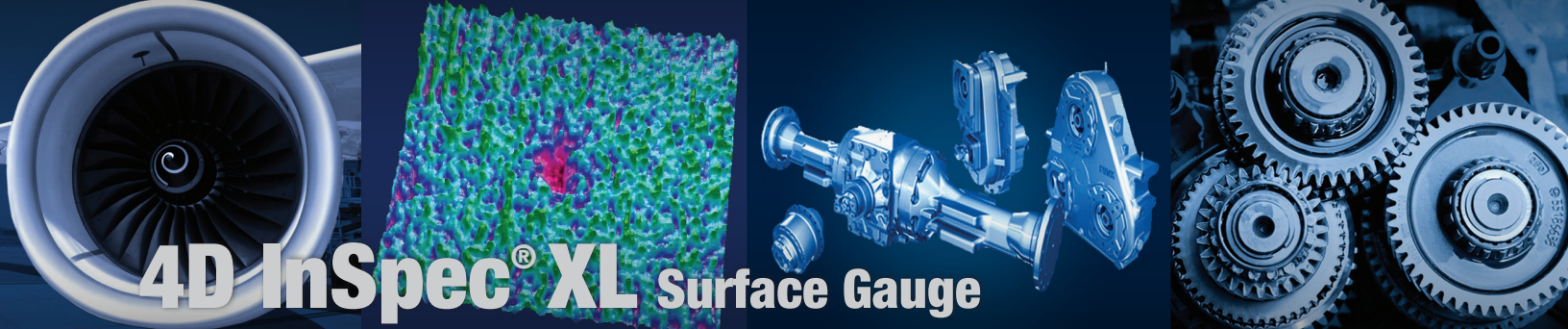
Super-quick setup, operation, analysis and report generation whether handheld or fixed in a workstation. Mounted on a robotic manipulator, 4D InSpec makes fully automated measurements of complex components.

Analysis interface automatically locates defects and calculates height, volume, area, slopes, radii and location. Choose 2D traces or 3D plots to view defects in detail. Supports easy data transfer to quality control systems for rapid pass-fail analysis.

Comes complete with the instrument, computer, touch-screen monitor, single Ethernet cable tether, and measurement software. Optional portable workstation and Li-ion rechargeable battery provide up to 8 hours of deployed operation.



The 4D InSpec XL quantifies larger fields of damage, wear and corrosion directly on parts with complex geometries, such as this turbine blade section. Automatic feature finding, 2D traces and 3D plots make it easy to analyze surface features and defects.



## Specifications

Description	4D InSpec XL Surface Gauge
<b>Basic Specifications</b>	
Acquisition Time	Instantaneous, non-contact 3D surface measurement analyzed in <1 second
Measurable Range	Defects and features 0.0003 to 0.35 inches (7 $\mu$ m–9 mm) deep/tall
Field of View (module)	0.6 x 0.6 inches (15 x 15 mm)
Lateral Sampling	.00029 inches (7.5 $\mu$ m)
Vertical Resolution	0.00027 inches (7 $\mu$ m)
Mounting	Handheld, microscope stand or robotically mounting possible
Standoff Distance	2.1 inches (54 mm)
Max Step Height	0.1 inches (254 $\mu$ m)
<b>Software</b>	
Analysis	4D InSpec control and analysis software
Measurement Modes	Standard, High Vibration and Low Noise modes
Defect Detection	Identify features based on height, area, and width thresholds
Defect Calculations	Max height, volume, area, max slope, density, aspect ratio, XY location
Data Analyses	Contour, 3D, XY slice with arbitrary cursors, radius of curvature
Data Output	Tabular feature analysis statistics with 3D surface maps
Data Masking	Masking based on signal to noise ratio; rectangular ROI masks for analysis
Data Export	Export data to XYZ point cloud, CSV file, or 2D Trace
Computer	Multiple options including all-in-one touchscreen, laptop, or customer-supplied
Automation	Full support for robotic automation via customer-supplied robot or 4D-supplied UR3 cobot
<b>Electrical/Mechanical</b>	
Dimensions	10.2 x 5.9 x 1.8 inches (260 x 150 x 45 mm)
Light Source	450 nm LED with 100,000 hour MTBF
Sensor	2048 x 2048 pixels, 12-bit scientific CMOS camera
Power Consumption	< 10 W 4D InSpec unit; < 250 W with computer system @ 120 VAC
Weight	3.1 lbs (1.4 kg) instrument only
Cable Length	10 ft (3 m). Longer, upon request.
Operating Temperature	50–105° F (10–40° C)
Operating Humidity	> 98% non-condensing
<b>Performance</b>	
Noise Floor	0.00027 inches (7.0 $\mu$ m) <sup>1</sup>
Vertical Repeatability	0.00002 inches (0.5 $\mu$ m) <sup>2</sup>
Step Height Accuracy	< 0.5% <sup>3</sup>
Step Repeatability	< 0.1% <sup>4</sup>
Depth of Focus	> 0.35 in (9 mm)
Minimum Part Roughness	5 $\mu$ in (120 nm) Ra
<b>Warranty</b>	One Year, limited

1 Average RMS of difference between two measurements on 4D calibration sample.

2 1 $\sigma$  RMS for 30 measurements on 4D calibration sample.

3 Maximum difference vs. PTB-certified values sample for features from 0.00039-0.035 in (100-900  $\mu$ m) tall.

4 1 $\sigma$  standard deviation on 30 measurements of 50  $\mu$ m tall feature.

Patents US 7777895, 7489408 and US 7230717. Others pending.

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All specifications subject to change without notice.

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