Manufacturing Metrology Team – Instrument Data Sheet

Mitaka MLP-3SP

Purpose

- Optical 3D measurement of surface form and texture

Working principle

- The Mitaka MLP-3SP is a point autofocus measuring instrument. It measures surface texture by automatically focusing a laser beam at a point on a specimen surface, moving the specimen surface in a fixed measurement pitch using an XY scanning stage, and measuring the specimen surface height at each focused point. During measurement the autofocus sensor detects the laser spot displacement and feeds back the information to the autofocus mechanism in order to keep the objective at in-focus position.

Advantages

- Large measuring range with high resolution
- High speed contour measurement
- Capable of measuring steep angles over 45 °
- High autofocus repeatability (nanometre level)
- Immune to surface reflectance properties
- Special objective setup for inner contour measurement

Limitations

- Long 3D measurement time compared to typical areal measurement instruments
- Smaller acceptable slope angle for specular surfaces
- Only one objective lens can be mounted

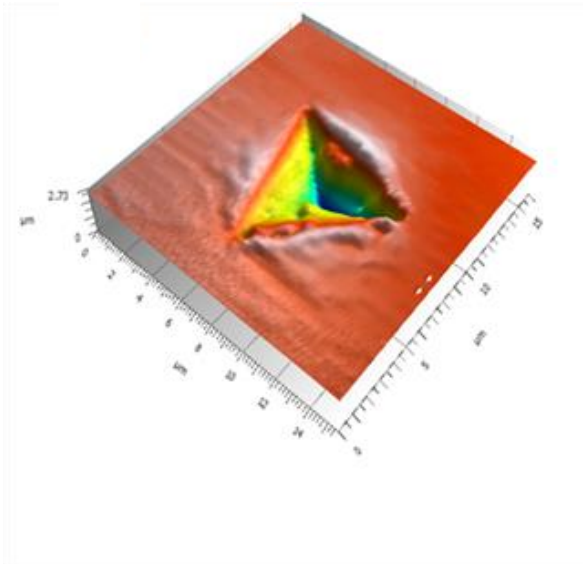
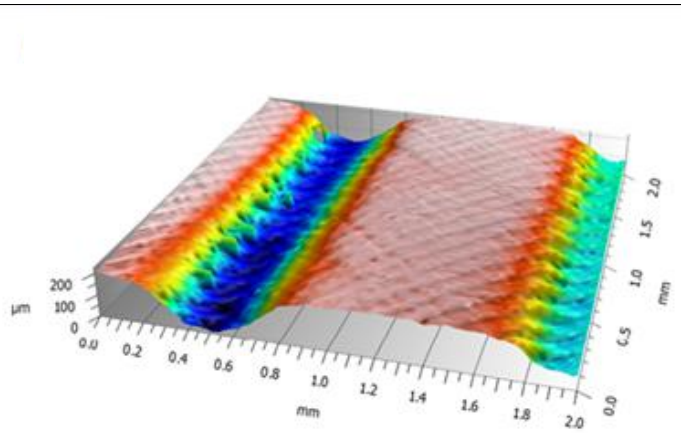
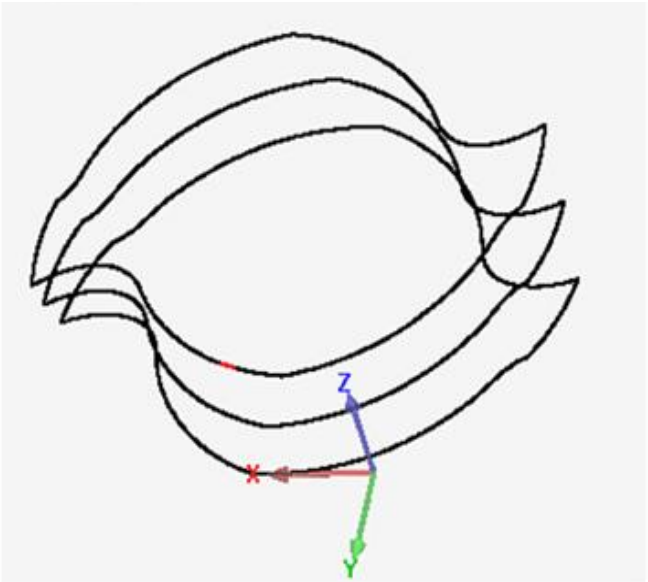
Related research focus

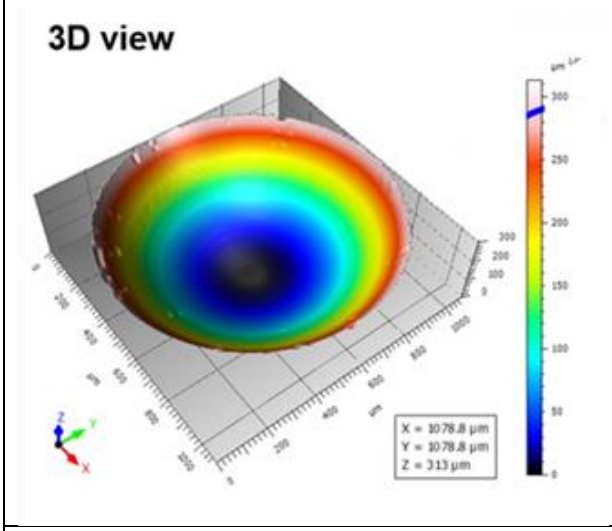
- Sphere roundness and profile measurement
- Optical lenses measurement
- Cutting tool profile measurement
- Surface texture measurement
- Small gear measurement
- Performance verification of the instrument for geometrical metrology
- Measurement uncertainty estimation

Instrument specifications

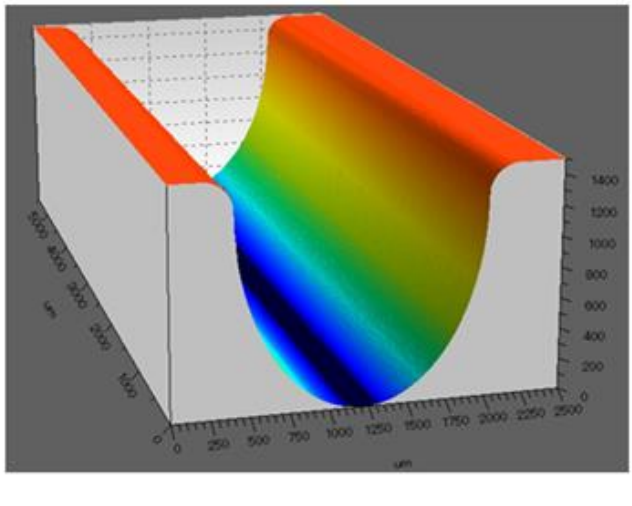
Axis	Moving range	Scale resolution	Measuring accuracy	Positioning repeatability
X	120 mm	10 nm	±4.4 µm / 120 mm	3 µm p-v
Y	120 mm	10 nm	±4.4 µm / 120 mm	3 µm p-v
Z	130 mm	10 nm	±4.6 µm / 130 mm	3 µm p-v
AF	40 mm	1 nm	±2.8 µm / 40 mm	σ=0.015 µm (100×) σ=0.015 µm (50×)
θ	360°	0.0002°	±0.01°	±0.005°

Measurement examples

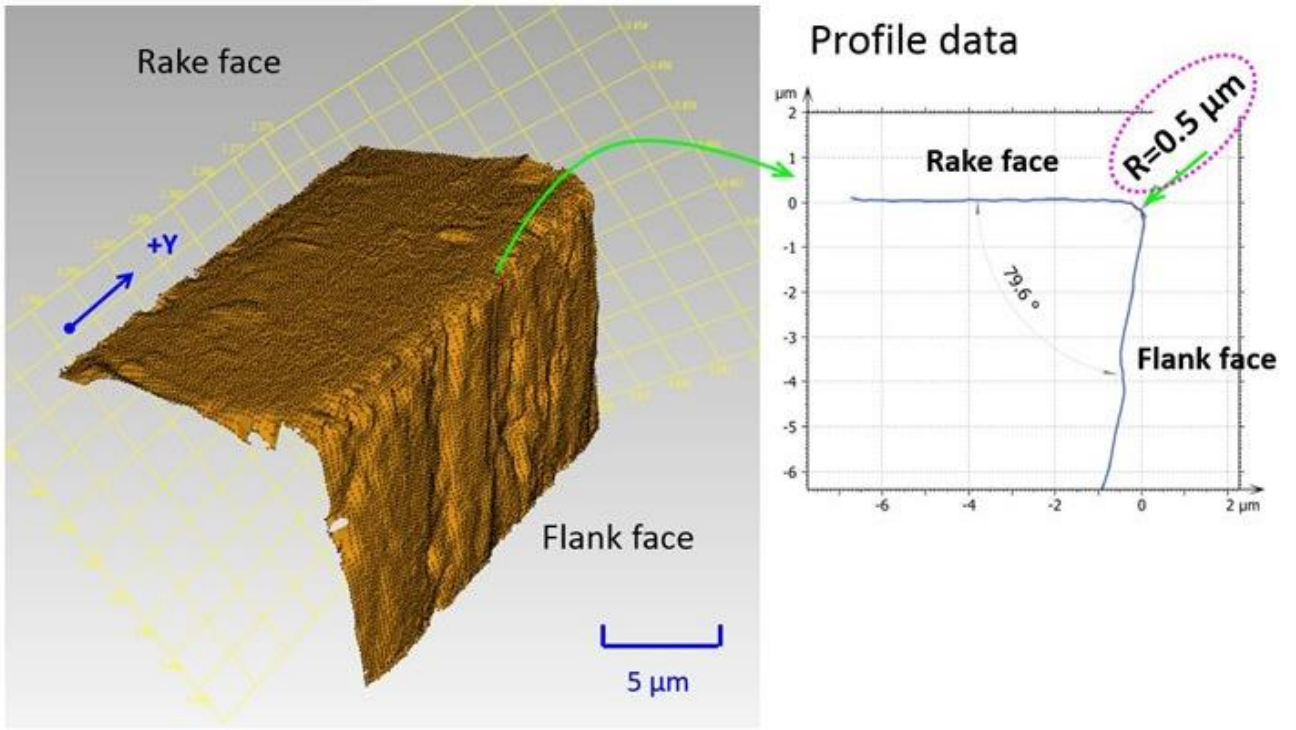
	
Difficult measurement of nanoindentation sample	Micro fluidic channels additively manufactured with transparent polymer
	
End milling tool contour measurement	Punch die measurement



Spherical moulding die



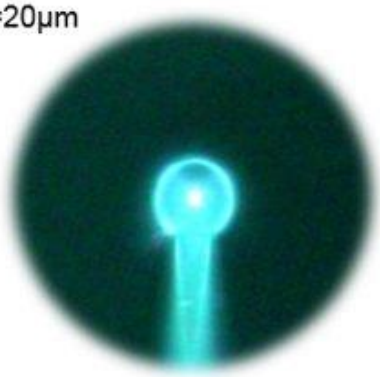
High-slope moulding die



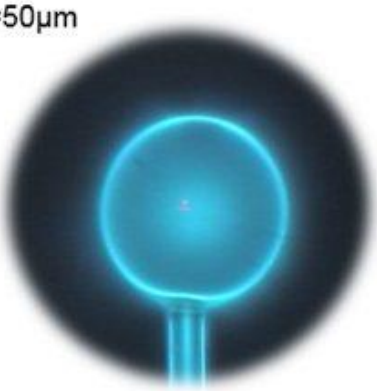
Carbide micro cutting tool radius measurement

Micro glass sphere

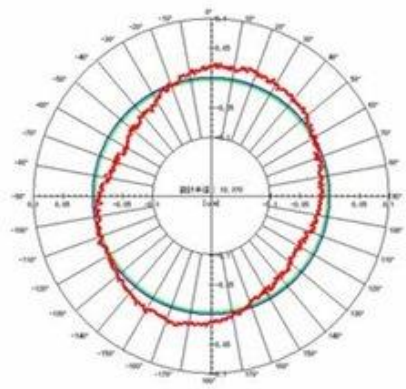
1) D=20μm



2) D=50μm

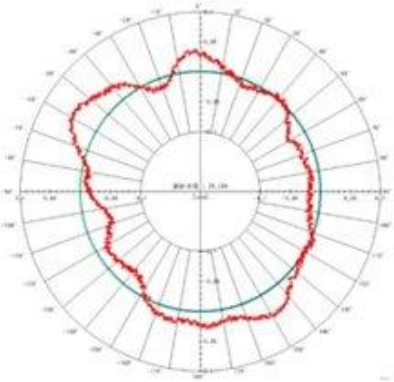


Roundness & Diameter



Roundness (LSC)
PV=0.064μm
RMS=0.022μm

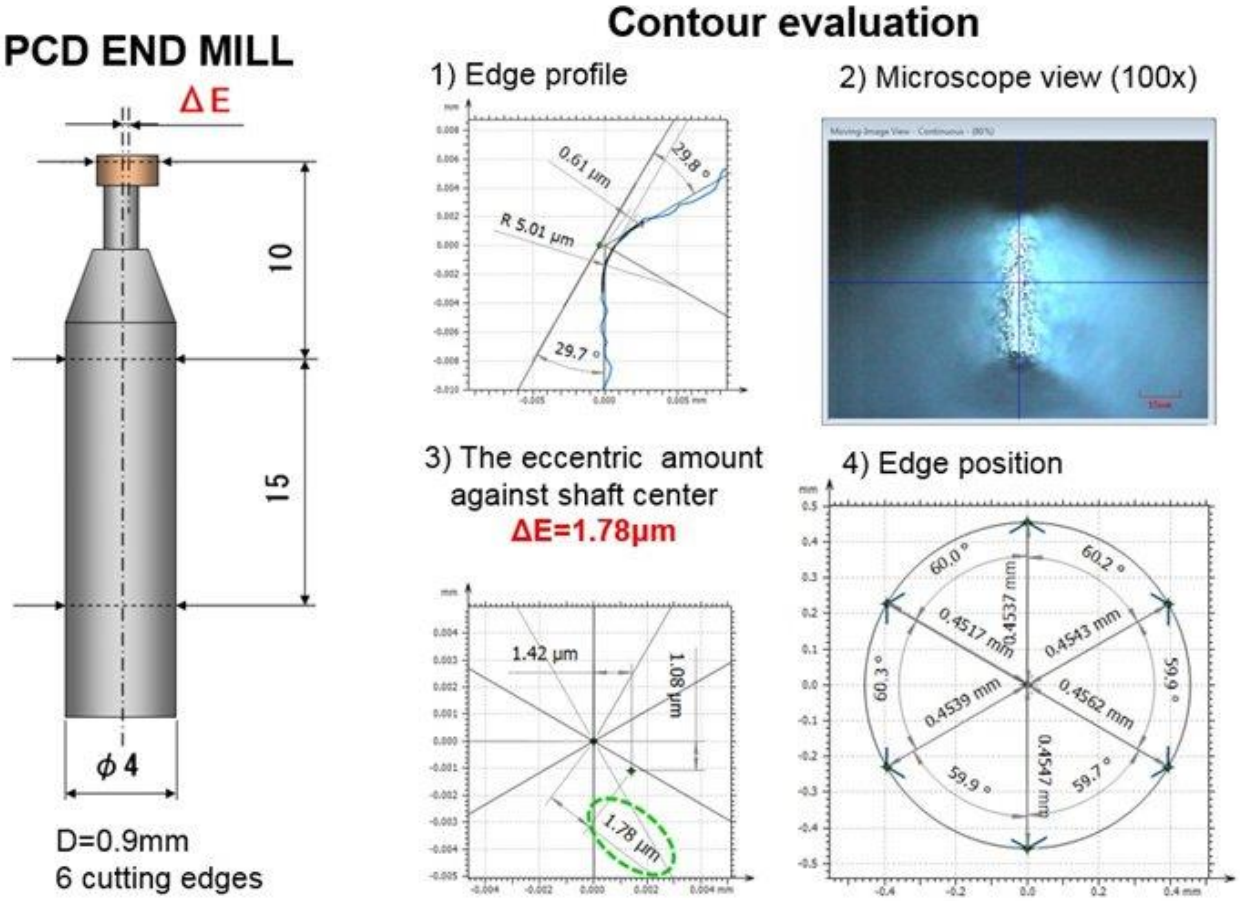
D=20.74μm



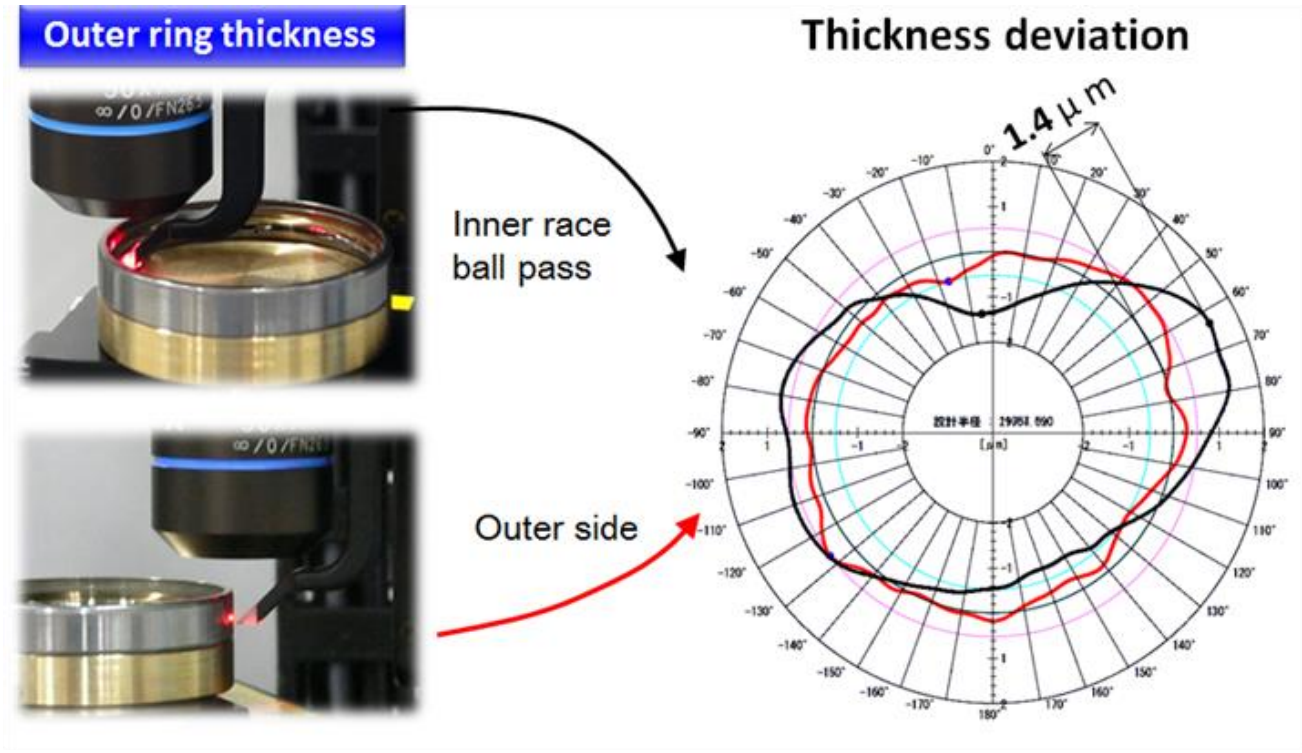
Roundness (LSC)
PV=0.097μm
RMS=0.022μm

D=50.56μm

Measurement of micro sphere made from translucent material



Cutting tool offset measurement



Bearing inner/outer ring measurement

For contract measurement enquiries, please contact:

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