Mitaka

MITAKA KOHKI CO., LTD.

1-18-8 Nozaki, Mitakashi, Tokyo 181-0014 Japan
TEL +81(0)422-49-1491 FAX +81(0)422-49-1117
http://www.mitakakohki.co.jp
E-mail: sales@mitakakohki.co.jp

For information only.
Specifications subject to change without prior notice.

Distributor

志隆國際科技有限公司
http://www.g-long.com.tw
e-mail:service@g-long.com.tw
TEL: +886-2-23702678
台北市重慶南路一段121號4樓之3

2016.05

POINT AUTOFOCUS PROBE

3D FORM MEASURING INSTRUMENT

MLP-3
MLP-3SP

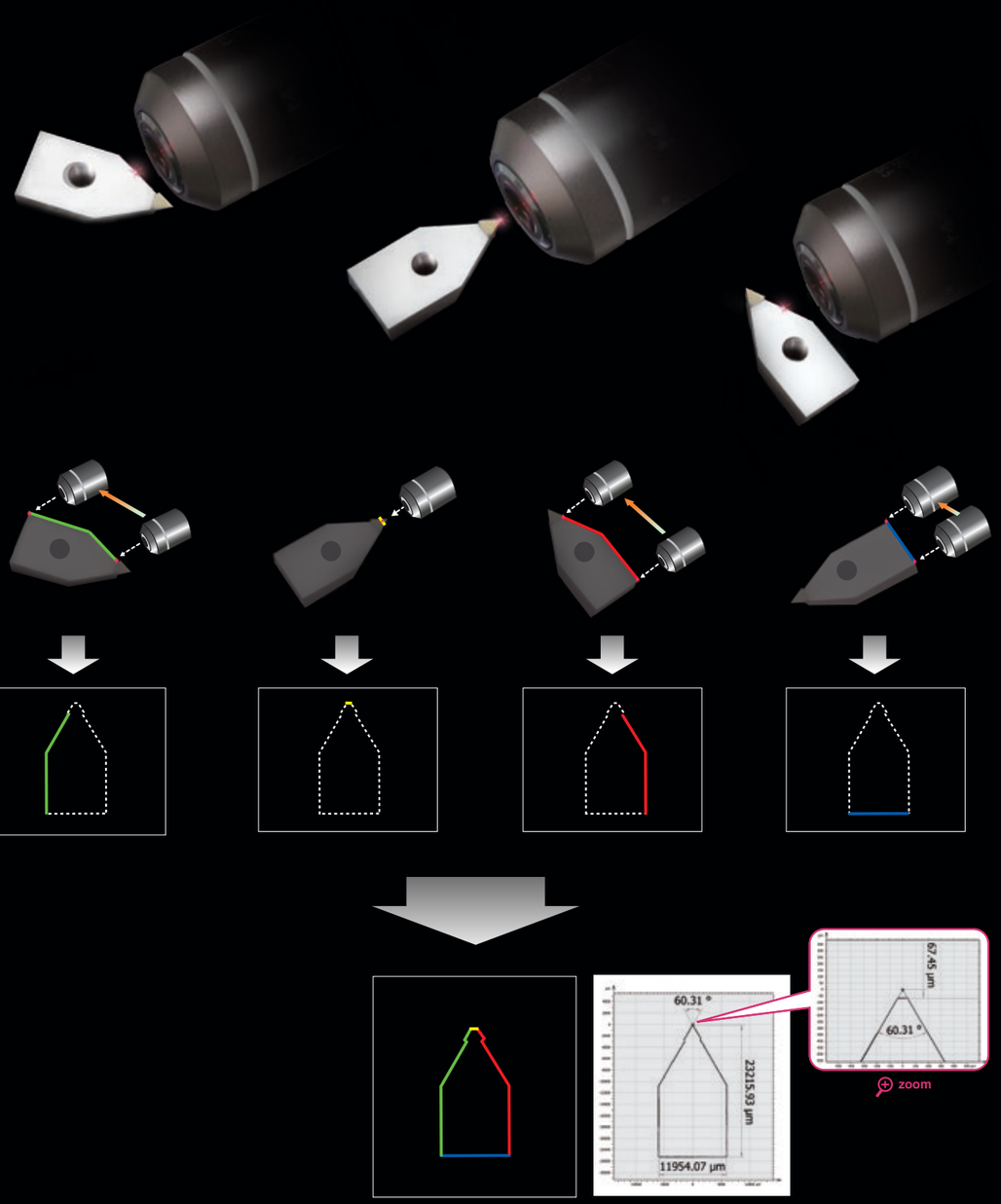
FOR THE TOPOGRAPHY MEASUREMENT
OF A LARGE RANGE OF SURFACES

Mitaka

Point autofocus measurement exceed ing the capability of conventional non-co ntact measurement

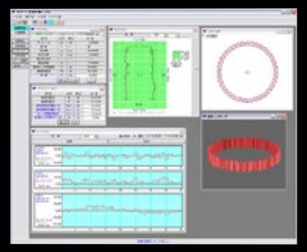
MLP-3 offers all-round contour measurement

The combination of a fully non-contact point autofocus probe and a high-precision five-axis stage offer the submicron contour measurement of all kinds of workpieces.



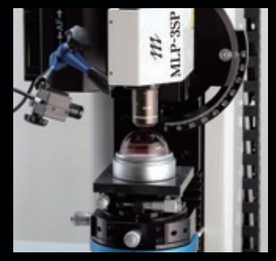
High-precision measurement with no influence of surface colors / reflectance

MLP-3 directly measures various types of surfaces, from coated glass with very low reflectance of approximately 0.5% to mirror surface with reflectance of 90% or greater.



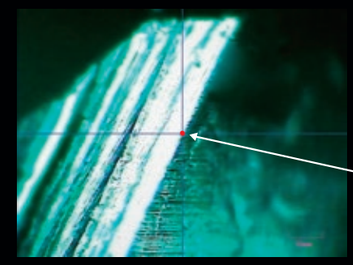
Approach to a workpiece in various direction

The theta (θ) axis of MLP-3 offers the most appropriate angles and positions for the high-precision quantitative measurement of 2D / 3D forms.



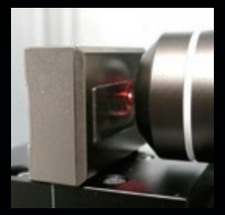
Capable of observing the measurement point

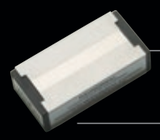
The built-in CCD camera offers a live view of the laser spot at each measurement point and surfaces of the workpiece for easy setup of measurement points.



High correlation with international standards for roughness measurement

Point autofocus profiling has a high correlation with roughness standards for stylus instruments and obtains reliable data.





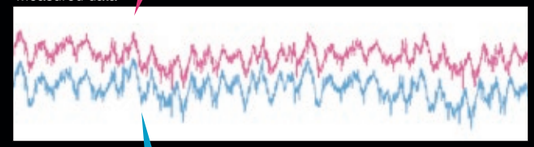
- Roughness standard : TypeD1(ISO5436-1)
- Calibration : PTB (Germany)
- Cutoff value (λc) : 0.8mm
- Measurement method : stylus
- Tip radius : 5µm
- Evaluation length (ln) : 4mm

(Stylus: tip radius R=5µm)

PTB inspection result

Roughness parameters	PTB
Ra	0.227µm (±3%)
Rz	1.50µm (±4%)

Measured data



MLP-3 measurement

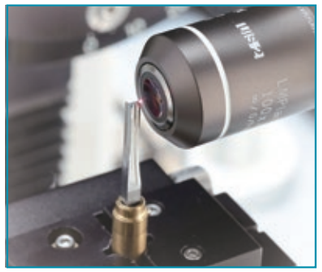
Roughness parameters	MLP-3
Ra	0.226 µm
Rz	1.46 µm

(PAP: Laser spot radius R=0.5µm)

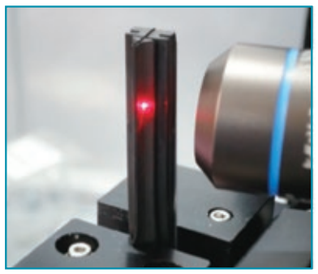
Measurements that can be ONLY done by MLP-3

〔measurement example〕

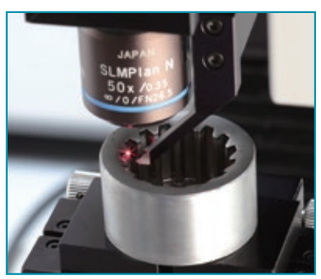
Multi-function measurements that cannot be carried out by any coordinate measuring machines, profile projectors, or laser microscopes — that is the field in which MLP-3 excels. The point autofocus probe with the 5-axis stage help measurers solve problems.



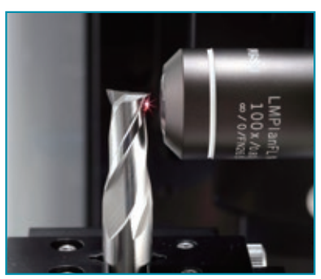
all-round measurement
(Pg. 5)



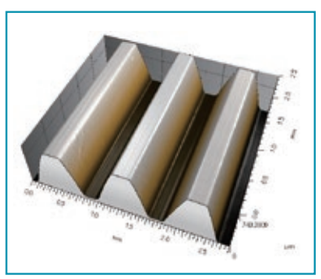
soft and transparant workpiece
(Pg. 6)



comparison to the design value
(Pg. 9)



cutting tool measurement
(Pg. 8)



profile and surface texture
(Pg. 7)

CASE 1

All-round measurement of complex forms

Problem **Cut samples for contour measurements**

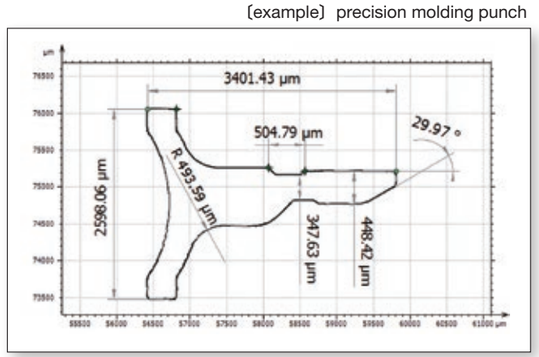
It is difficult to measure the contours of complex formed molding dies, punches, tools, etc. as the probe of a 3D measuring instrument cannot trace their entire forms. In such cases, you may need to give up on measurement, use transfer agent to make replicas of the complexed forms that may not restore the precise forms of the original resources, or cut your workpiece which may end up deforming it. There may be a case where you are not allowed to cut the workpiece due to its value.

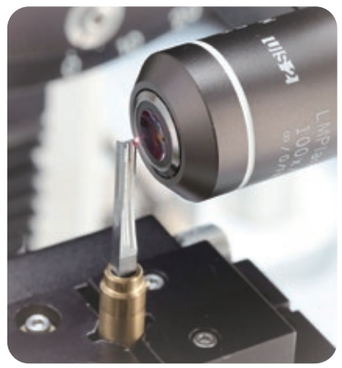
Solution

Polygon measurement offers the entire contour measurements of the complex formed workpieces

MLP-3 rotates its theta (θ) axis to the most appropriate angles and positions for the measurements. You can check the measurement point during the setup, hence you can easily obtain the contours of any part of the workpiece. Polygon measurement offers non-destructive measurements and restores the workpieces.

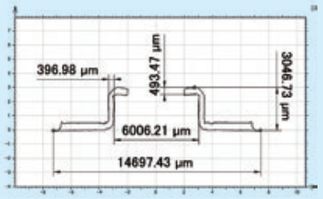
〔example〕 precision molding punch





application example

thin part measurement



CASE 2

Soft and delicate workpiece

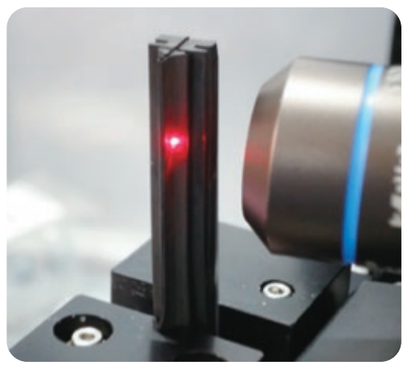
Problem **Stylus damages and cutting deforms**

It is difficult for stylus instruments to measure soft materials, such as rubber, plastic and lens, and delicate workpieces, such as precision moldings and thin pressed parts, as contact pressure from the measuring probe damages them.

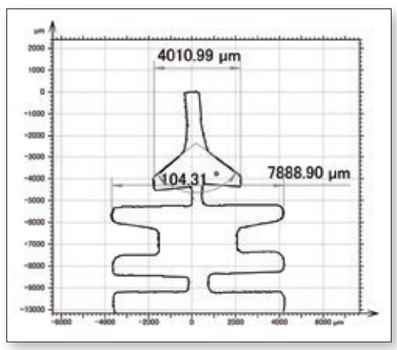
Solution

A fully non-contact measurement never damage or deform the workpiece during the measurement.

The fully non-contact point autofocus probe and the Poligon measurement offer flawless and non-destructive measurements. Wear and deformation volumes can be easily measured for product life assessment.



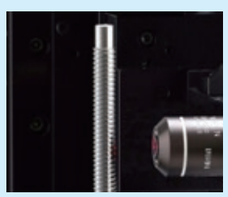
〔example〕 rubber blade



application example

optical parts and
precision processing parts

glass sphere



small diameter ball screw

CASE 3

Form and surface texture evaluations

Problem **Different instruments for different measurements**

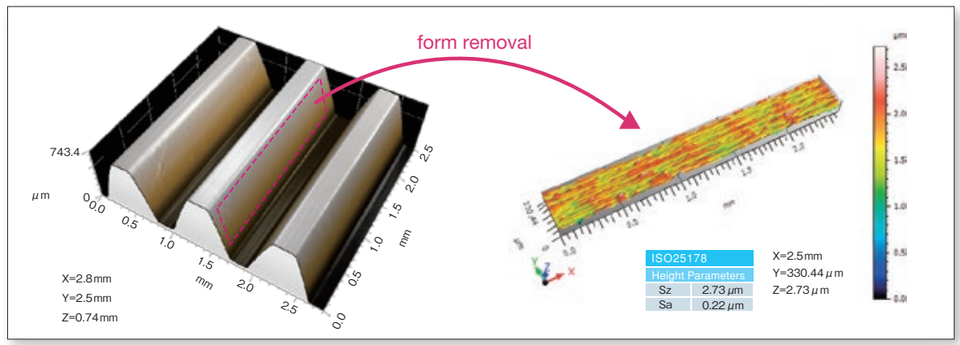
A micrometer or a 3D measuring instrument for form and size measurements. A roughness measuring instrument for roughness measurement.

Solution

The multi-function measurements offer roughness, form and surface texture measurements.

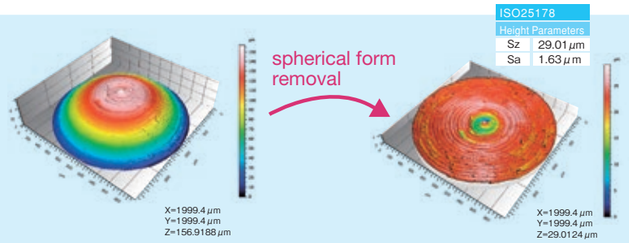
MLP-3 is a multi-function measuring instrument and offers roughness, form and surface texture measurements and evaluations in one system. Its measurement method is fully conformed with ISO 25178: Geometrical product specifications (GPS) - Surface texture: Areal (see Pg.10). It also offers surface texture evaluations by removing the forms from the 3D measurement data (see below). For gear profile and evaluation, the optional software, dedicated to gear evaluation, is available (see Pg.12).

〔example〕 precision gear tooth surface



application example

processing error of
a semispherical surface



CASE 4

Cutting tool measurement

Problem **Cutting edge and form measurements**

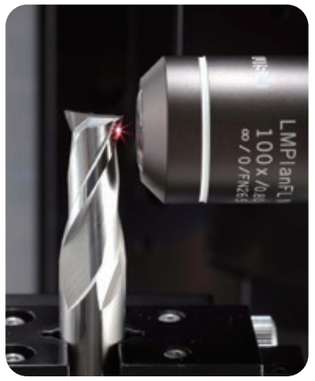
Tool measuring instruments in general cannot measure the form of the cutting edge and the web thickness of cutting tools. Laser microscopes may be able to measure the cutting edge of a tool, but it only offers to evaluate the tip of the cutting edge.

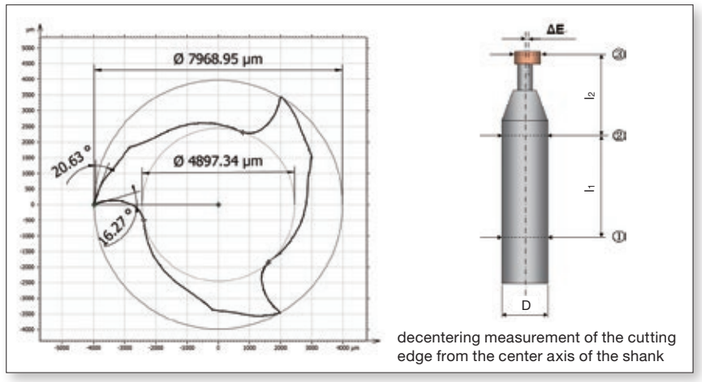
Solution

The multi-function measurements offer the entire form meausrement of the cutting tool and its cutting edge in detail.

MLP-3 measures the rake face of an end mill, which tends to be a dead angle, in detail and evaluates the web thickness of the end mill, which determines the strength of cutting tools. It also measures its cutting edge as well. In addition, MLP-3 quantitatively evaluates the decentering of the cutting edge from the center axis of its shank by measuring the center of the shank.

〔example〕 end mill

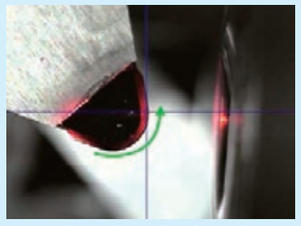




decentering measurement of the cutting edge from the center axis of the shank

application example

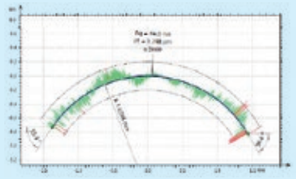
ultra-precision processing tools



diamond round turning tool

size and profile tolerance evaluations

total height of raw profile: Pt=0.298µm
root-mean-square deviation of the raw profile: Pq=0.044µm



CASE 5

Fitting comparison with submicron accuracy

Problem **Unable to measure inner / outer contours**

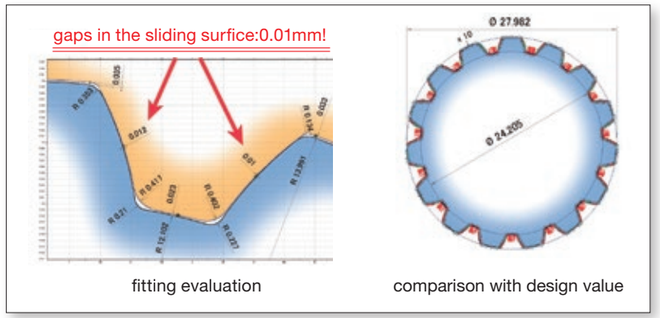
3D laser microscopes are popular to measure forms in submicron level, however, their measuring ranges are limited. It is not easy to measure a large area with submicron accuracy. In addition, they cannot measure inner / outer forms of the entire workpiece.

Solution

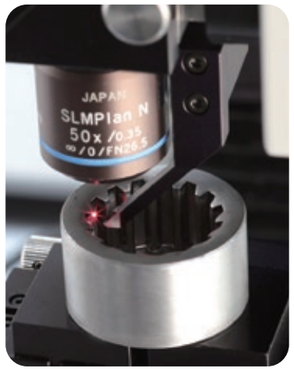
MLP-3 directly measures inner / outer contours in a large area with submicron accuracy.

MLP-3 evaluates the entire form of the workpiece with submicron accuracy if it fits within the measuring range. The inner diameter measuring module (optional) measures the inner and outer forcus of two gears and offers fitting evaluation and CAD comparison, shown in the example below. The standard evaluation software (see Pg.11) visualizes the deviation between two measured profiles and profile-design values (i.e. DXF data). Furthermore, the 3D CAD comparison / evaluation software (optional) visualizes surface deviation between a measured profile and its 3D design values.

〔example〕 spline shaft and boss



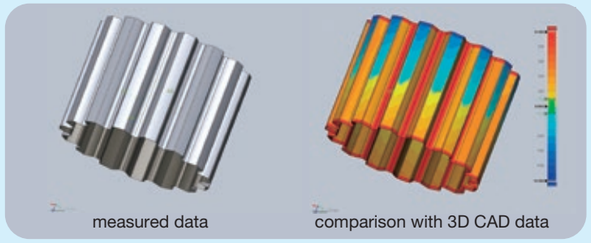
fitting evaluation　　comparison with design value



additional benefit

3D CAD comparison

optional software



measured data　　comparison with 3D CAD data

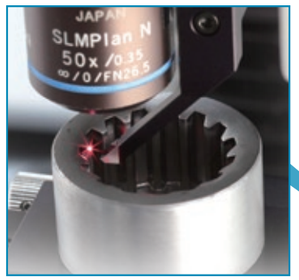
ISO-approved measurement method

the Fifth Monozukuri Nippon Grand Award
Winner of the METI Minister's Award

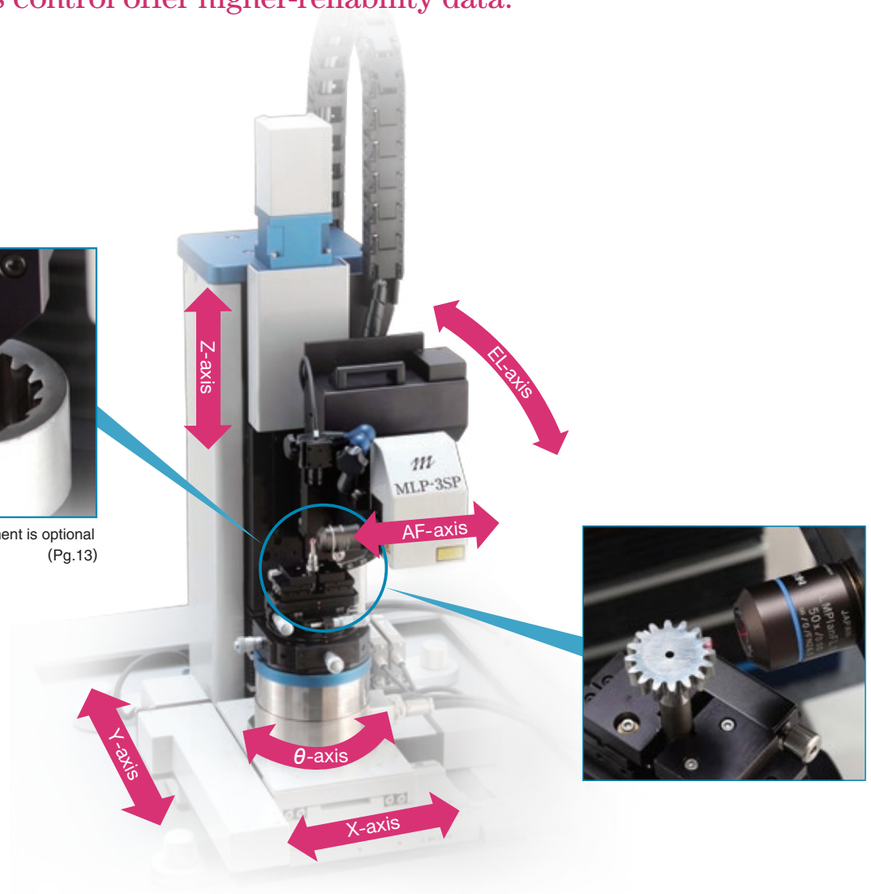
The Japan Society for Precision Engineering Award
Winner of Technology Award

ISO25178-605 3D surface texture - non-contact measuring instrument (point autofocus probe)

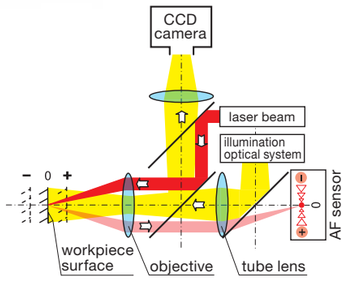
The measurement principle fullly conformed with the ISO Standards and the multi-axis control offer higher-reliability data.



※inner diameter measurement is optional (Pg.13)



The laser beam from the optical system reflects on a workpiece surface and its scattering light is captured by the objective to form a laser spot on the Autofocus (AF) sensor. The laser spot is positioned at the center of the AF sensor when the workpiece surface is in focus. The laser spot position displaces upward or downward when the workpiece surface is out of focus. The AF sensor detects the laser spot displacement and feeds back the information to the AF mechanism in order to adjust the objective back to the in-focus position. The workpiece is controlled in three axes (X, Y, and θ) and the laser probe is controlled in two axes (AF and Z) axes. This control mechanism offers profile measurements of various kinds of workpieces by obtaining each coordinate value at each in-focus point.



laser probe optical system

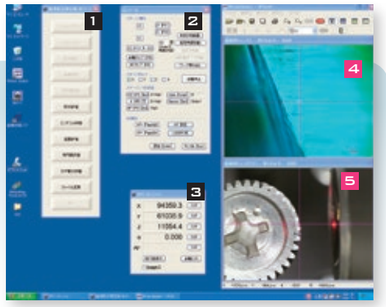
Measurement and evaluation functions

Measurement software

The built-in CCD camera offers user-friendly operation by visualizing the measurement point.

1 measurement / evaluation menu　2 console　3 counter

MitakaViewer　4 microscope image　5 upper camera view

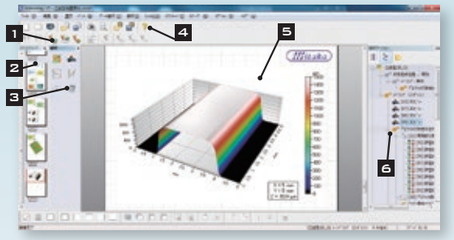


3D Surface texture analysis software*

MitakaMap ST

standard for MLP-3

Interactive and user-friendly software complete with powerful online help. Advanced analysis is carried out by applying straightforward operations to measurement data.



1 Minidocs
Automatic analysis by insertion of pre-defined sequences of analysis steps

2 Page viewer
Fast navigation to every page in the analysis report

3 Studies
Icons for analytical studies applicable to the selected data set

4 Online help
Detailed descriptions of all studies and operations

5 Document page
Current page in the analysis report

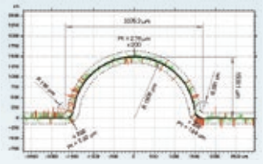
6 Analysis workflow
Tree view of all analysis steps in the report

Areal surface texture analysis Parameters defined in ISO 25178 are pre-installed

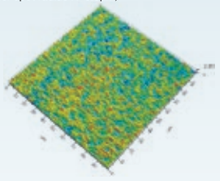
Standard parameters
- Height : *Sz, Sa, Sp, SV, Sq, Ssk, Sku,* ISO 4287-2, ASME B46.1, EUR15178N
- Flatness : *FLT*t, *FLT*p, *FLT*v, *FLT*q (ISO12781)

CAD data comparison

Loading CAD data in order to compare measured profiles with design specifications

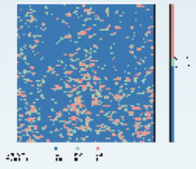


Surface after electrical discharge machining
(laser spot radius R=0.5μm)



ISO25178 Height Parameters		
Sz	3.2665	μm
Sa	0.2167	μm
Sq	0.2779	μm
Ssk	0.6995	
Sku	5.6783	

Area and volume analysis

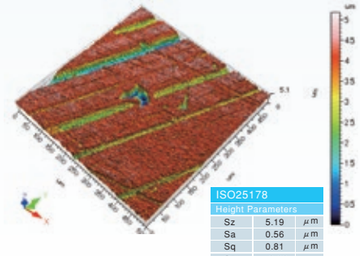


MitakaMap XT *Expert*

standard for MLP-3SP

MitakaMap XT is available as an upgrade to MitakaMap ST (standard software) and contains parameters for specialized applications.

Worn metal surface



ISO25178 Height Parameters		
Sz	5.19	μm
Sa	0.56	μm
Sq	0.81	μm
Ssk	-2.02	
Sku	7.31	

Additional functions

2D advanced surface textyre analysis
- ISO, JIS and other 2D parameters (ten point height of the roughness profile (Rz jis), etc.
- Frequency spectrum (FFT) analysis
- Fractal analysis
- Morphological filtering

2D automotive analysis
- R&W motifs analysis (ISO 12085)
- Graphical study of Rk parameters (ISO 13565)
- Rk profile

3D advanced surface texture analysis
- All the 3D parameters defined in ISO 25178 (Height, Functional, Spatial, Hybrid, Functional (volume) Parameters)
- Graphical study of Sk parameters
- Graphical study of volume parameters
- Peak distribution
- Frequency spectrum (FFT) analysis
- Averaged power spectrum density
- Fractal analysis
- Measurement of wrinkle
- Vectorization of the micro-valleys network
- Texture direction, isotropy

* The Advanced Contour Analysis is included.

Options

Measurement / evaluation func tions for specific needs

〔evaluation example〕

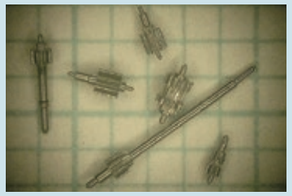
Gear measurement and evaluation

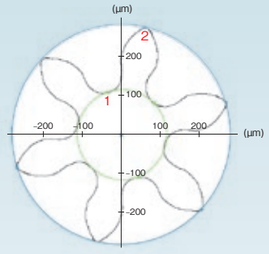
MLP-3 measures contours of small-diameter gears, that contact measuring instruments cannot measure.

MLP-3 can measure the entire contours of small-diameter gears and small modules with its 1μm laser spot diameter. The user-friendly gear measurement software offers easy measurement setup by simply entering the gear specifications and specifying measurement positions.

micro gear

m=0.06 d=0.36

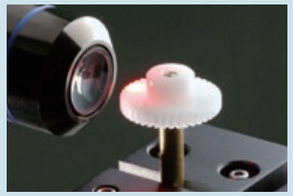


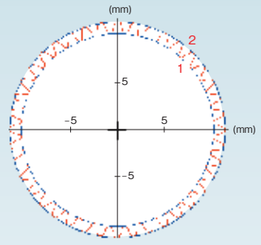


1: root diameter 234μm
2: tip diameter 575μm

plastic gear

m=0.5 d=20

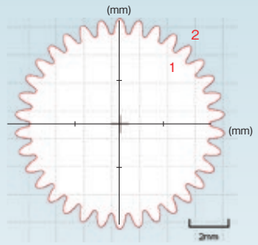




1: root diameter 18.729mm
2: tip diameter 20.971mm

precision grinded gear

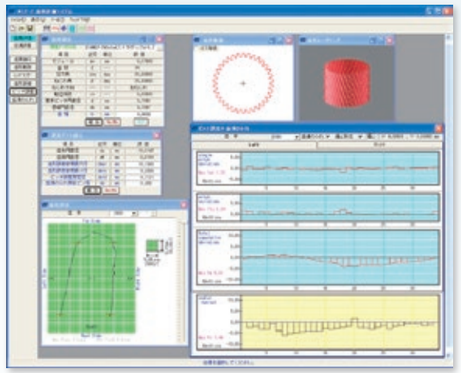
m=0.27 d=9.18



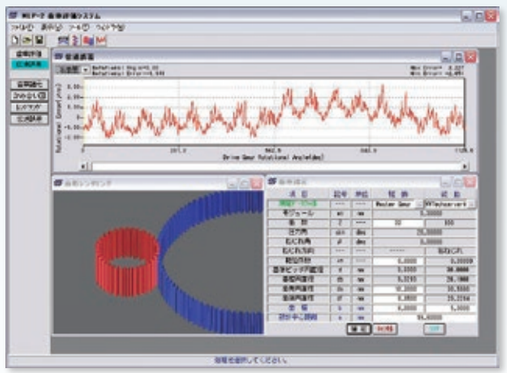
1: root diameter 8.910mm
2: tip diameter 10.315mm

Easy-to-use gear evaluation software

Gear evaluation software is conformed with ISO Standards and carries out the simulation of meshing gears and transmission errors with simple operations. It helps produce high-precision gears and manage quality control.



gear evaluation: profile deviation, pitch deviation, runout



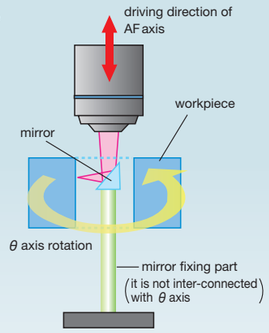
transmission error / mesh simulation

Inner diameter measurement and evaluation

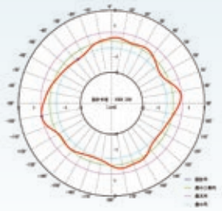
2 types of modules

fixed mirror type

- ϕ1～8mm doughnut hole measurement
- perfect for through hole measurement



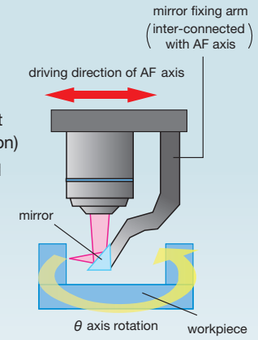
ϕ2mm ring gauge measurement (fixed mirror type)



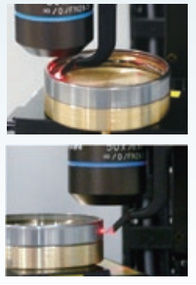
result: roundness 1.02μm

objective type

- over ϕ8mm doughnut hole measurement
- perfect for through and non-through holes
- complex form measurement (select either R-θ or polygon)
- evaluation of both inner and outer forms in the same coordinate system

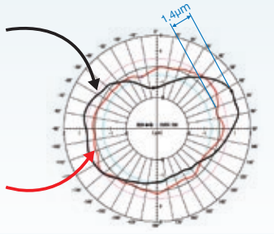


inner and outer diameter measurement of a bearing (objective type)



evaluation of roundness and irregularities in thickness

inner roundness = 2.74μm outer roundness = 1.04μm

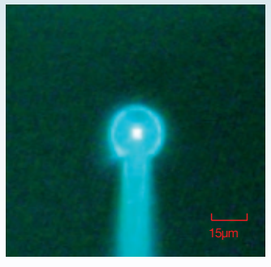


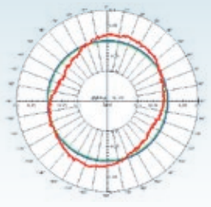
Roundness measurement and evaluation

World first roundness measurement of a ϕ20μm glass sphere

Roundness and diameter can be measured simultaneously. A perfect solution for development and quality control of microparts

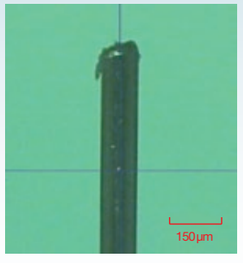
ϕ20μm glass sphere

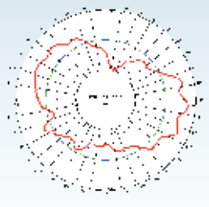




roundness: 0.065μm
diameter: ϕ20.74μm

ϕ100μm gold wire





roundness: 0.91μm
diameter: ϕ99.78μm

MLP-3 Standard model

A perfect solution for meausring and evaluating various workpieces

■ [MitakaMap ST] [Advanced Contour Analysis] [3D measuring software] are included as standard equipment

[MLP-3] specification

Axes	X axis	Y axis	Z axis	AF(R) axis	AZ(θ) axis
Measuring range	120mm	120mm	130mm	40mm	360°
Positioning resolution	0.1μm	0.1μm	0.1μm	0.01μm	0.0002°
Scale	Glass Scale	Glass Scale	Pulse	Glass Scale	Glass Scale
Accuracy	(2+20L/1000)μm	(2+20L/1000)μm	(4+100L/1000)μm	(2+20L/1000)μm	±0.02/360°

L: length (mm)

■ Laser probe

Objective	100X (WD = 3.4mm)
	Color CCD camera
Laser output	1mW (Max.) λ=635nm Class 2
	Spot diameter 1μm (with 100X)
Tilting mechanism	EL axis (manually operated) : 0 ~ 90°
	Laser beam axis (manually operated) : 45 ~ −90°

■ Workpiece size

Cylinder	smaller than φ80mm (option : φ120mm)
Minimun diameter	φ0.02mm

■ Standard software

MitakaMapST+ Advanced Contour Analysis
Image capture (MitakaViewer)
Measuring software

■ Personal computer for controller / evaluation

OS	Windows 7
	19-inch monitor minimum

■ Utilities

Power consumption	AC100V(5A)

■ Accessories

Reference sphere 1 piece
Workpiece holder 1 set
Rubber type vibration isolator
Dust proof cover

■ Options

Hardware	1) 50X objective (WD=10.6 or 18mm)
	2) Z axis linear scale
	3) Motorized EL axis
	4) XY alignment stage
	5) XY tilt adjustment stage
Software	Gear measurement / evaluation
	Tool edge form evaluation
	Roundness measurement / evaluation
	Inner diameter measurement
	3D CAD comparative evaluation

MLP-3SP High-end model with high resolution

Z axis linear scale, XY alignment stage and XY tilt adjustment stage are included as standard equipment

■ [MitakaMap XT] is included as standard equipment. A perfect solution for R&D and specialized applications

[MLP-3SP] specification

Axes	X axis	Y axis	Z axis	AF(R) axis	AZ(θ) axis
Measuring range	120mm	120mm	130mm	40mm	360°
Positioning resolution	0.01μm	0.01μm	0.01μm	0.001μm	0.0002°
Scale	Glass Scale	Glass Scale	Glass Scale	Glass Scale	Glass Scale
Accuracy	(2+20L/1000)μm	(2+20L/1000)μm	(2+20L/1000)μm	(2+20L/1000)μm	±0.01/360°

L: length (mm)

■ Laser probe

Objective	100X (WD = 3.4mm)
	Color CCD camera
Laser output	1mW (Max.) λ=635nm Class 2
	Spot diameter 1μm (with 100X)
Tilting mechanism	EL axis (manually operated) : 0 ~ 90°
	Laser beam axis (manually operated) : 45 ~ −90°

■ Workpiece size

Cylinder	smaller than φ80mm (option : φ120mm)
Minimun diameter	φ0.02mm

■ Standard software

MitakaMapXT+ Advanced Contour Analysis
Image capture (MitakaViewer)
Measuring software

■ Standard hardware

Z axis linear scale
XY alignment stage
XY tilt adjustment stage

■ Personal computer for controller / evaluation

OS	Windows 7
	19-inch monitor minimum

■ Utilities

Power consumption	AC100V(5A)
Pressure supply for vibration isolator	over 4kgf/cm² (air hosediameter for pressure supply: φ6mm)

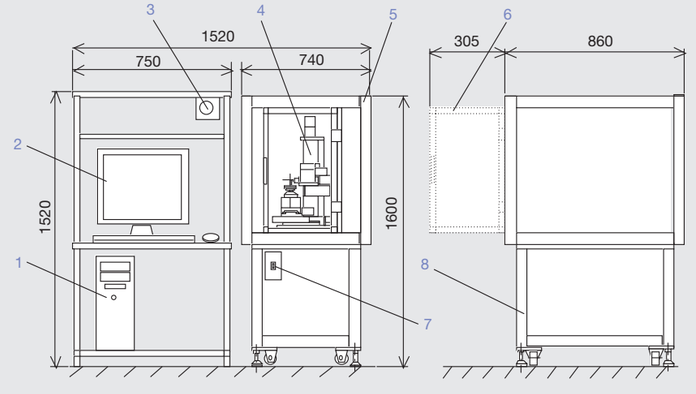
■ Accessories

Reference sphere 1 piece
Workpiece holder 1 set
Air spring vibration isolator
Dust proof cover

■ Options

Hardware	1) 50X objective (WD=10.6 or 18mm)
	2) Motorized EL axis
Software	Gear measurement / evaluation
	Tool edge form evaluation
	Roundness measurement / evaluation
	Inner diameter measurement
	3D CAD comparative evaluation

Outline drawing [for MLP-3 and MLP-3SP]



1. PC for control & evaluation
2. Monitor
3. Emergency stop button
4. Main body
5. Dust proof cover
6. Door
7. Main switch
8. Vibration isolator

Weight: Approx. 300kg