Mitutoyo

Non-Contact Line-Laser Probe
For Coordinate Measuring Machines
SurfaceMeasure

Highly accurate, quick, and efficient

SurfaceMeasure

Introducing the new non-contact laser probe

The SurfaceMeasure makes it possible to use coordinate measuring machines, until now used primarily as inspection systems, as production systems, which can be can be used throughout the entire process, from development and prototyping to production.

SurfaceMeasure series

The SurfaceMeasure lineup offers 3 models of non-contact probes using two different laser irradiation methods and measuring ranges. Due to this, Mitutoyo can recommend the optimal laser probe in consideration of the workpiece surface texture, operation method, etc., for each client.

Development Phase

Optimized designs utilizing measurement point cloud data significantly improves the efficiency of the development process, even when no master model or CAD data is available for a product.

Prototyping Phase

Shortens the entire process from prototyping to mass production because the simulations can be used to compare prototypes with CAD data, check for parts interference and set clearances, and optimize machining settings.
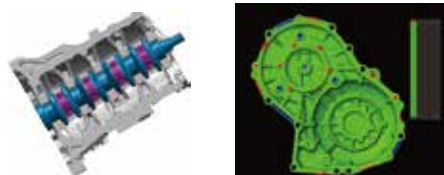
Production Phase

Allows the obtained data to be used for correcting dies, for example, by controlling the variability in mass-produced products, and feeding analysis data back to the preceding process step.
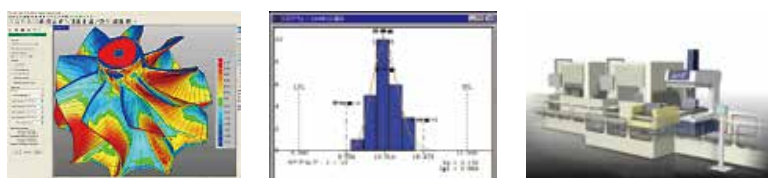
Non-contact Laser Probe Benefits

Measure workpieces without being concerned about their color tone or glossiness.

## Powder-sprayless measurement and high-speed scanning

The SurfaceMeasure is a lightweight, high-performance, non-contact, laser probe developed for use with CNC coordinate measuring machines. The use of digital signals has eliminated the effects of signal deterioration on measurement accuracy and also improved measuring speed. Furthermore, by automatically adjusting the laser intensity and camera sensitivity according to the environment and the workpiece material, the SurfaceMeasure has achieved powder-sprayless measurement,

providing a simpler and more comfortable laser-scanning environment. The large amount of measurement point data (point cloud) provided by laser scanning facilitates the development to the manufacturing. SurfaceMeasure probes can be used not only for dimensional measurement but also for modeling from point group data using commercial software, structural/fluid analysis, and data transfer to a molding machine as a tool for digital engineering.
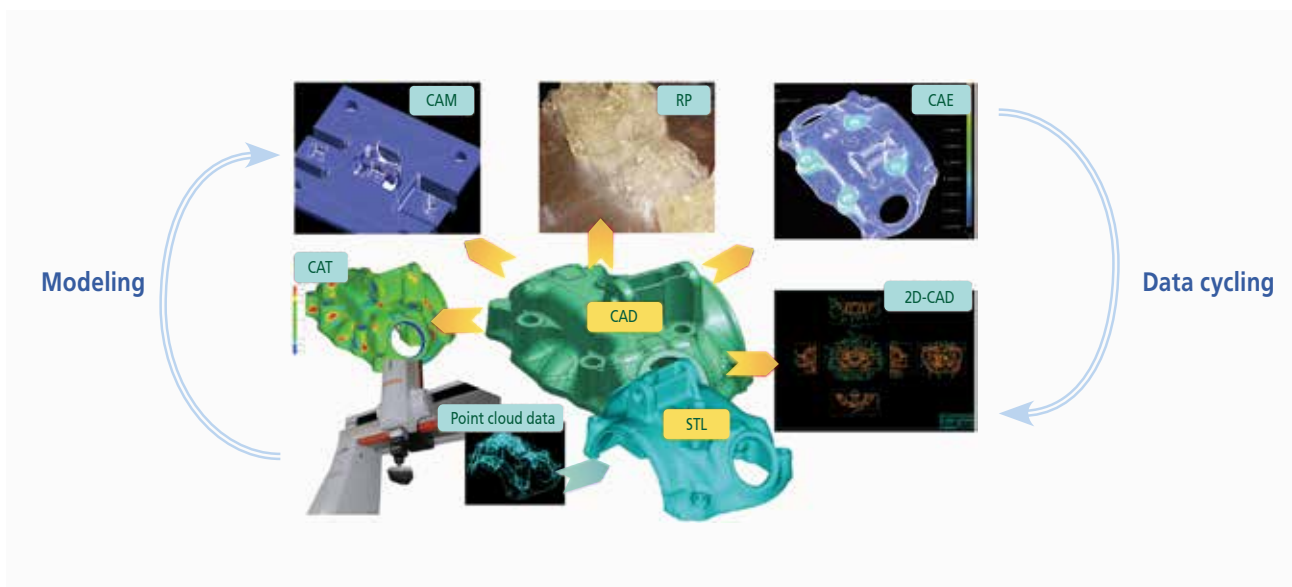
Main Benefits

Reliability
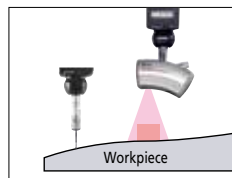
- Based on a CMM that supports quality assurance operations.
- Allows the verification of non-contact measurement data with a contact probe.

Hybrid Measurement

- Visualizes a shape that was previously invisible by establishing a plane from measured points.
- Allows interchange between contact and non-contact probes according to the required measuring accuracy or workpiece shape.

Fully Automatic Measurement

- Automatic probe change with a probe changing rack.
- Allows for programming a series of jobs from measurement to report creation.

High-speed scanning

> Positioning control in a maximum of 720 directions enables high-speed scanning of even complex workpieces in the optimum orientation. Additionally, the use of a quick change rack allows you to make fully automated measurements while selecting "non-contact" and "contact" probes as desired.

Note: Even after using the warm-up unit such as ACR3 (special order), it is necessary to warm up the laser for about 10 minutes.

> The flying spot type achieves high repeatability in edge detection that contributes to attaining best-in-class scanning accuracy (in the case of SurfaceMeasure 201FS).

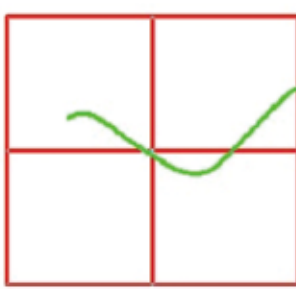
Powder-sprayless measurement

> Since the laser intensity and camera sensitivity are automatically adjusted, stable shape data can be obtained even when the workpiece has multiple colors and varying degrees of reflectance.

Measuring a color-sample plate
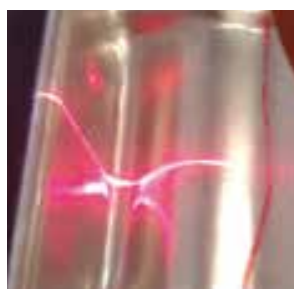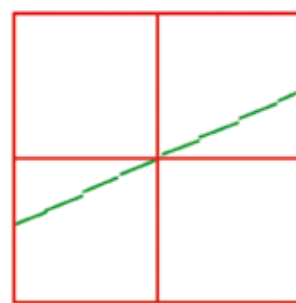
Measuring a glossy object

Specifications of the SurfaceMeasure Series

Mitutoyo offers an optimal choice of non-contact probes to satisfy practically any desired combination of accuracy, measuring speed, and measuring range.

SurfaceMeasure Lineup

The four probes that make up the SurfaceMeasure lineup operate on any Mitutoyo CNC CMM such as the CRYSTA and STRATO series machines.

Specifications

Item/Model		SurfaceMeasure 403	SurfaceMeasure 1110	SurfaceMeasure 201FS
Laser irradiation method		Line Laser		Flying spot
Max. scan width		40 mm	110 mm	Max. 23 mm
Max. scan depth		30 mm	100 mm	15 mm
Working distance		66 mm	156.5 mm	57.5 mm
Scanning error		8 µm [*1]	9 µm [*1]	1.8 µm [*1]
			PForm.Sph.D95%:Tr:ODS: 36 µm [*2]	PForm.Sph.D95%:Tr:ODS: 8 µm [*2]
Max. Acquisition rate		60,000 points/sec	300,000 points/sec	25,000 points/sec.
Mass		430 g	440 g	500 g
Laser Class	EN/IEC	Class2 [EN/IEC 60825-1: 2014]		
	JIS	Class2 [JIS C 6802: 2014]		
	Laser Type	Red semiconductor		Semiconductor
Line Laser	Wavelength	660 nm		670 nm
	Output	4 mW	2.5 mW	1 mW

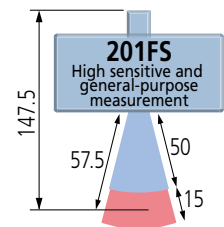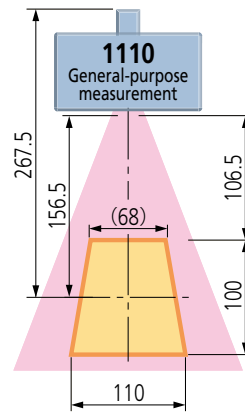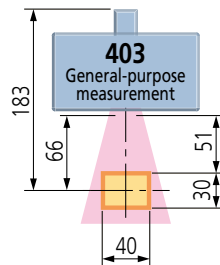*1 According to Mitutoyo's test procedure. (1σ/sphere measurement, probe alone)
*2 According to ISO10360-8 test procedure. (4σ/sphere measurement)

SurfaceMeasure	Applications
403	Small parts and high-accuracy parts.
1110	Car body inner panels, castings, aircraft bodies, and blades.
201FS	Small parts and high-accuracy parts.

403

1110

201FS

Measuring range

403
General-purpose measurement

183
66
51
30
40

1110
General-purpose measurement

267.5
156.5
(68)
106.5
100
110

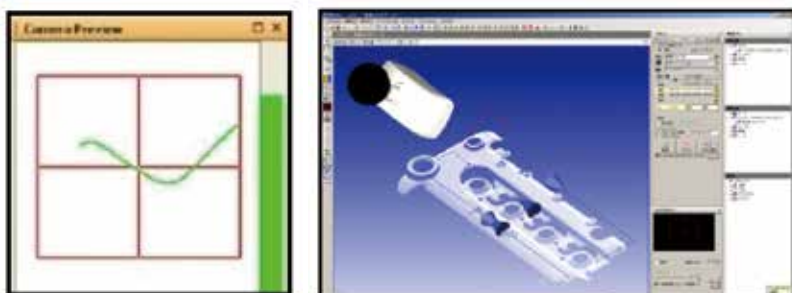**201FS**
High sensitive and general-purpose measurement

147.5
57.5
50
15

Data Processing Software

Point cloud data processing software MSURF V5.3

This is a package of point cloud data processing software that allows you to perform operations from measurement to evaluation on the same platform when using non-contact laser probes from Mitutoyo.

MSURF V5.3 software packages

Software	Online			Offline			
	MSURF-S 1	MSURF-S 2	MSURF-S 3	MSURF-G 1	MSURF-G 2	MSURF-G 3	MSURF-I PRO
MSURF-S	✓	✓	✓				
MSURF-G				✓	✓	✓	
MSURF-I							✓
MSURF-I Option		✓	✓		✓	✓	
MSURF-MESH PRO		✓	✓		✓	✓	✓
MSURF-PLANNER	✓		✓	✓		✓	

An evaluation based on non-contact measurement begins with the process of accurately capturing the surfaces of a part that has been formed.

The high-density point cloud data obtained from the surface of a part is utilized by MSURF for data analysis purposes, such as extraction of geometric features, evaluation of free-form surfaces and profile shapes, and tolerance verification compared with master data. Furthermore, the development of data analysis into reverse engineering promises to be revitalized in the creative and manufacturing cycle that uses 3D data as its core.

MSURF-S

Calculates point cloud data measured by CNC CMM with SurfaceMeasure.

Scanning paths can be created by simply defining three items:
the scanning starting point, the scanning length, and the scanning width.

> You can easily define these three items using the joystick while checking the camera preview.

> If point cloud data or master data is displayed on the screen, you can define the three items by clicking on the data. This feature is convenient for creating a measurement path based on simulation and for specifying areas where data needs to be remeasured, both of which are useful in reducing the number of measurement steps. These operations can be easily carried out using the joystick.

> It allows for the setting and execution of scanning paths and registration and deletion of the macro by using the joystick. Since measurement can be performed without PC operation, measurement efficiency is dramatically improved, particularly for large Coordinate Measuring Machines.

Scanning paths can be registered as measurement macros.

> You can use the override function to modify all or some of the measurement conditions in the created measurement macros.

> The sub-macro function is effective for measuring multiple units of the same workpiece.

> The execution time of a measurement macro is computed from the measurement conditions & the coordinate measuring machine specifications.

MSURF-S can be started from MCOSMOS

> Since a work coordinate system created in MCOSMOS can be utilized by MSURF-S, you can execute fully automatic measurements that merge "contact" and "non-contact" measurements.
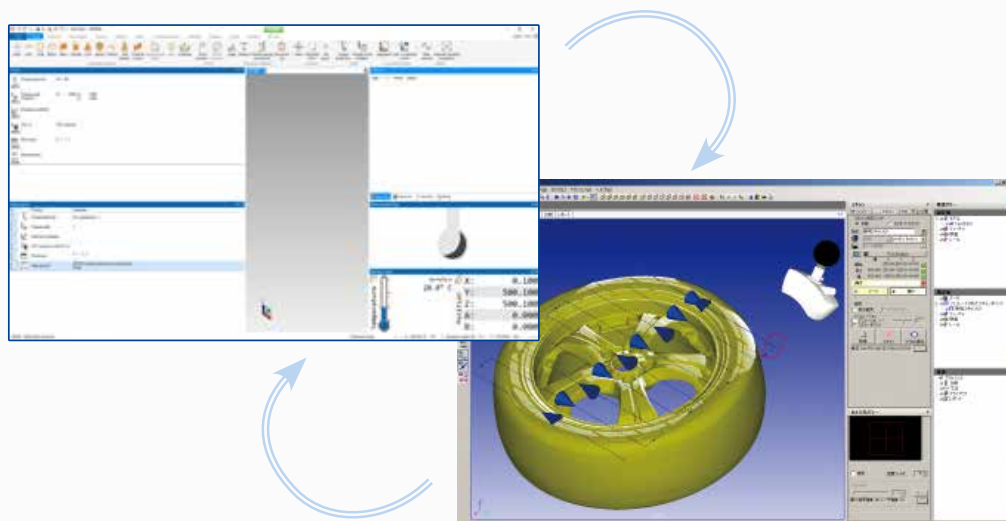
MSURF-I

Conducts analysis or comparison verification of measured point cloud data
in reference to nominal data (supporting CAD data import).

Importing CAD data

> Support of STEP and SAT formats is standard.
> Optional formats available include CATIA V4,
  CATIA V5, ProEngineer, Unigraphics, VDAFS,
  Parasolid, Solidworks, and IGES.

### Comparison of cross-sectional shapes

> You can cut point cloud data or mesh data
  to compare cross-sectional shapes or compute
 angles, distances, radii, etc.

Planar shape comparison

> Point cloud data or mesh data can be compared with
  CAD data, and the planar shape errors displayed
  on a color map.
> Since wall thicknesses can be displayed on a color map,
  there is no need to cut the workpiece as is necessary
  with conventional methods.
> A simulated digital caliper function enables quick
  evaluation of a wide variety of steps and gaps.
> When evaluating the curvature of a surface, the angle
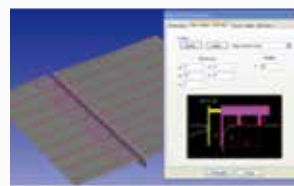 R within the specified tolerance, for example, can be
  evaluated.
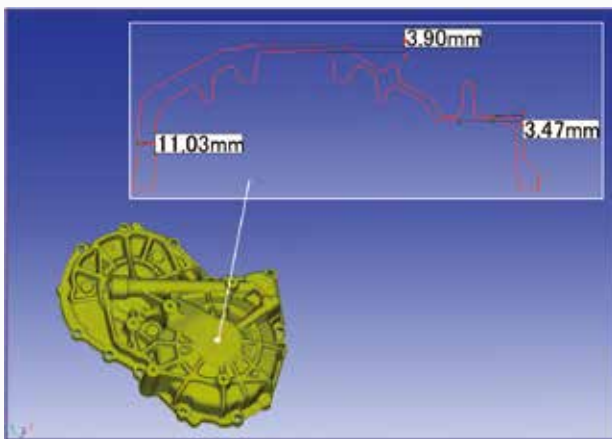
Cross-sectional evaluation (dimension computation)
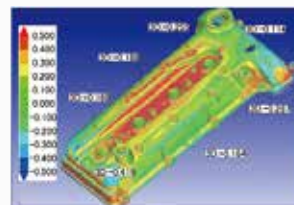
Color map of errors
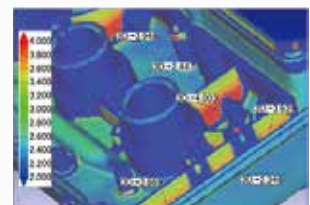
Color map of wall thickness

Evaluation of steps and gaps

Evaluation of surface curvature

Creation of an operating procedure macro using the automation function

> The automation function can record the operating procedure, including the execution
  of measurement macros. This function allows you to automate a series of operations,
  from measurement, to evaluation, to report creation.

MSURF-G

MSURF-G is the offline version of MSURF. It allows users to previously create measurement programs using CAD data. Therefore, users can start measurement immediately at the time a real workpiece is ready. Since MSURF-G is a standalone PC application, only requiring installation by the user, it helps preserve valuable CMM time exclusively for productive measurement.

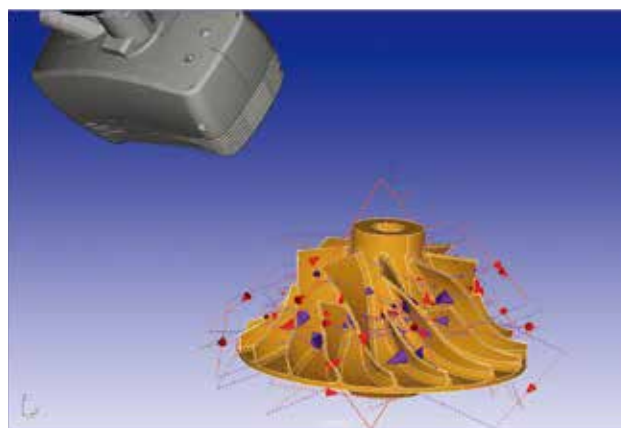Note: MSURF-G cannot be combined with MSURF-S.

MSURF-MESH PRO

This software is provided with various functions such as filtering point cloud data and mesh data. It also enables functions such as mesh data thinning out, highlighting, interpolation, and outlier removal that are unavailable as standard.

Note: MSURF-MESH PRO has optional functions of MSURF-I.

MSURF-PLANNER

MSURF-PLANNER is software to automatically create measurement macros (surface form, feature form) for the line laser probe from 3D CAD data. Optimized data (travel path, number of probe head revolutions, etc.) of a measurement path will contribute to improvements in productivity.

Automatic generation of measurement macros by MSURF-PLANNER.

Coordinate Measuring Machines	Vision Measuring Systems	Form Measurement	Optical Measuring

Sensor Systems	Test Equipment	Digital Scale and DRO Systems	Small Tool Instruments and Data Management

Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.
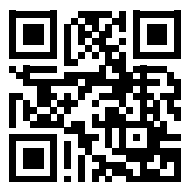
Find additional product literature and our complete catalog here.

www.mitutoyo.se

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