Mitutoyo

Mitutoyo Quality

Non-contact Line-Laser Probe for Coordinate Measuring Machines

SurfaceMeasure

COORDINATE MEASURING MACHINES

Bulletin No. 2134(2)

Mitutoyo

Accurate, efficient high-speed measurements

The SurfaceMeasure probe captures shape data on reflective workpieces.

Non-contact laser probe

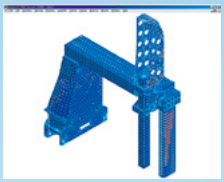
The SurfaceMeasure makes it possible to use coordinate measuring machines as production systems that can be used throughout the entire process, from development and prototyping to production.

SurfaceMeasure series

The SurfaceMeasure lineup offers five models of non-contact probes using three different laser irradiation methods and measuring ranges.

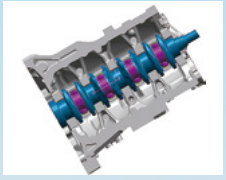
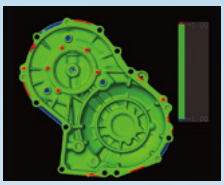
Development

Optimized design using measurement point cloud data significantly improves the efficiency of the development process, even without a master model or CAD data.

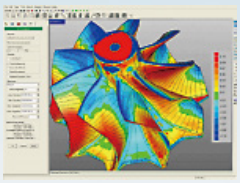
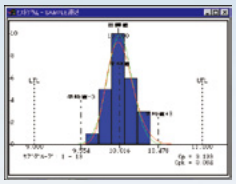

Prototype

Shorten the entire process from prototyping to mass production with simulations that compare prototypes with CAD data, check for parts interference, set clearances and optimize machining settings.

Production

Allows the collected data to be used for correcting dies, for example, by controlling the variability in mass-produced products and relaying analysis data back to the process.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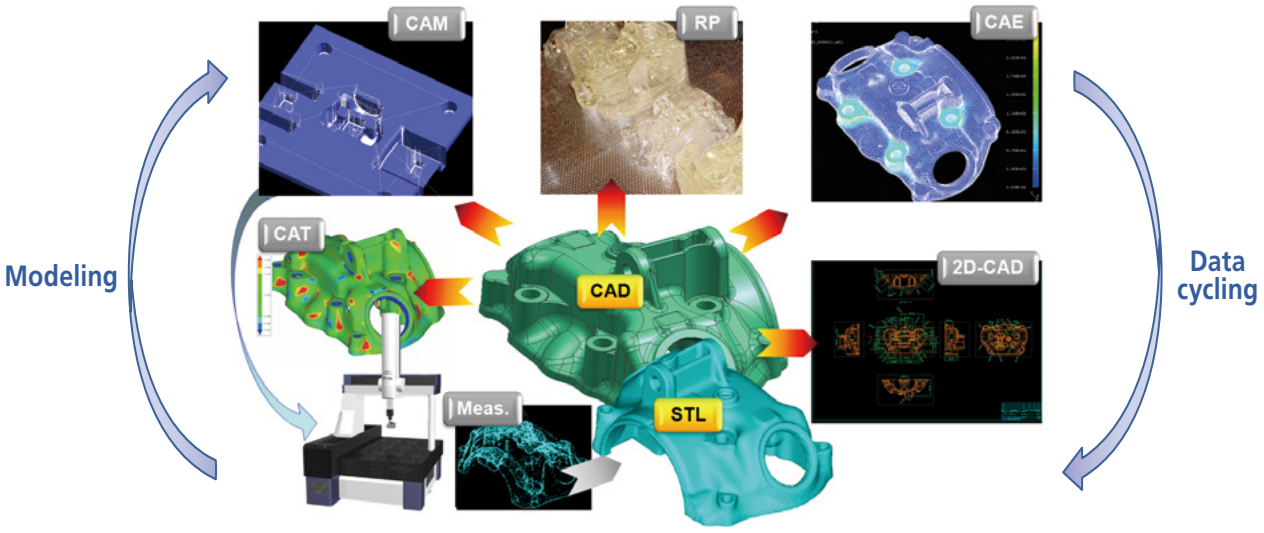
Non-contact Line-Laser Probe

Measure workpieces regardless of color or reflectivity.

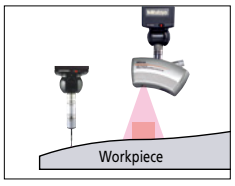
Powderless measurement and high-speed scanning

The SurfaceMeasure is a lightweight, high-performance, non-contact line-laser probe* developed for use with CNC coordinate measuring machines. The use of digital signals eliminates the effects of signal deterioration on measurement accuracy and thereby improves measuring speed.
By automatically adjusting the laser intensity and camera sensitivity for the environment and the workpiece material, the SurfaceMeasure achieves powderless measurement, providing a simpler laser-scanning environment. The large amount of measurement point cloud data provided by laser scanning facilitates the development of manufacturing.
SurfaceMeasure probes can be used for dimensional measurement, as well as for modeling from point group data using commercial software, structural/fluid analysis and data transfer to a molding machine for digital engineering.
* The SurfaceMeasure FS201 is a single-point laser probe.



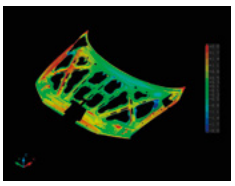
Features

Reliability



- Allows verification of non-contact measurement data with a contact probe.

Hybrid measurement



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

Fully automatic measurement

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

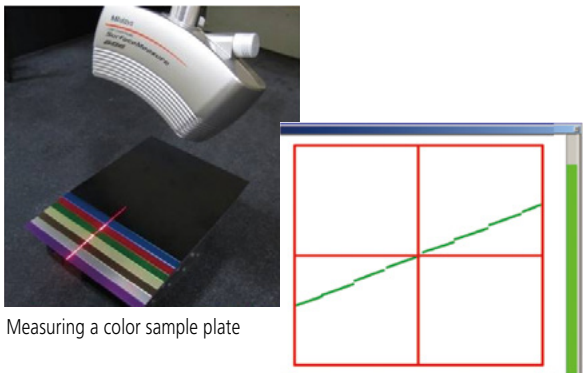
High-speed scanning

- Positioning control in a maximum of 720 directions enables high-speed scanning of complex workpieces in the optimal orientation.
  Use of the ACR3 allows fully automated measurements with both non-contact and contact probes.

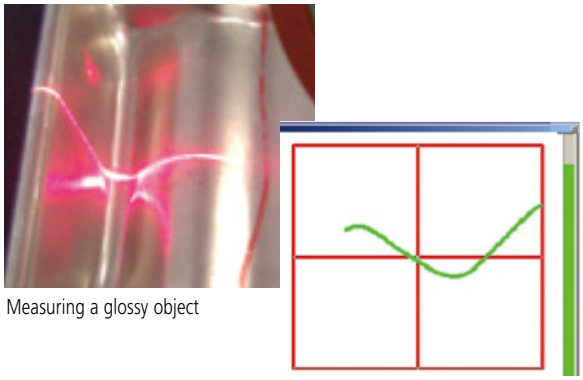
* Using the optional ACR3 equipped with a power supply port for the laser probe eliminates the need for warming up the laser probe.

Powderless measurement

- The laser intensity and camera sensitivity are automatically adjusted to obtain stable shape data even with multiple color workpieces and varying degrees of reflectivity.

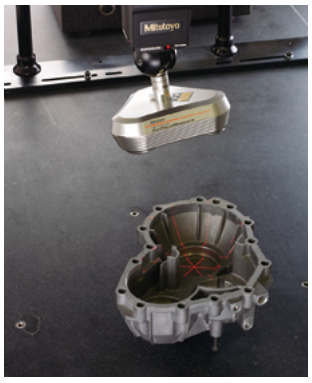


Measuring a color sample plate

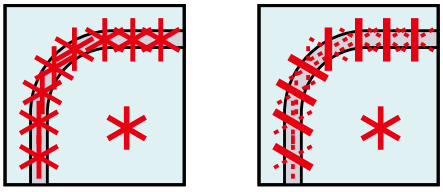


Measuring a glossy object

- The line laser crossing type enables simultaneous scanning by three laser beams, allowing efficient measurement of complicated shapes. (Applies to SurfaceMeasure 606T)



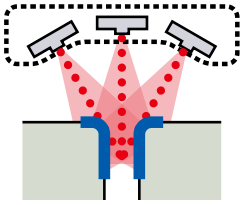
Improvement in measurement efficiency by reducing the frequency of probe attitude change.



No change of probe attitude

Individual beam selectable

Simultaneous measurement of top and side by concurrently scanning 3-directional laser beams.



The laser beams converge from three directions toward a central point.

- The SurfaceMeasure 201FS achieves high-reproducibility in edge detection for best-in-class scanning accuracy.

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

Specification

Item/Model		Surface Measure 606	Surface Measure 610	Surface Measure 1010	Surface Measure 606T	Surface Measure 201FS
Laser irradiation method		Line Laser (single)			Line Laser (cross)	Flying spot
Max. scan width		60mm	60mm	Max. 100mm	3×65mm	Max. 23mm
Max. scan depth		60mm	100mm	100mm	65mm	15mm
Working distance		123mm	165mm	165mm	203.5mm	57.5mm
Scanning error *[1]		12μm	15μm	18μm	17μm	1.8μm
Max. Acquisition rate		75,000 points/sec			3×25,500 points/sec	25,000 points/sec.
Mass		430g	400g	400g	480g	500g
Laser Class	EN/IEC	Class2 [EN/IEC 60825-1(2007)]				
	JIS	Class2 [JIS C 6802 : 2011]				
	Laser Type	Red semiconductor				Semiconductor
Line Laser	Wave length	660nm				670nm
	Output	4mW				1mW
Point Laser	Wavelength	—	635nm		—	
	Output	—	1mW		—	

* According to Mitutoyo's acceptance procedure. (1σ/sphere measurement, probe alone)
1 Probe scanning error may be application specific

606/610/1010

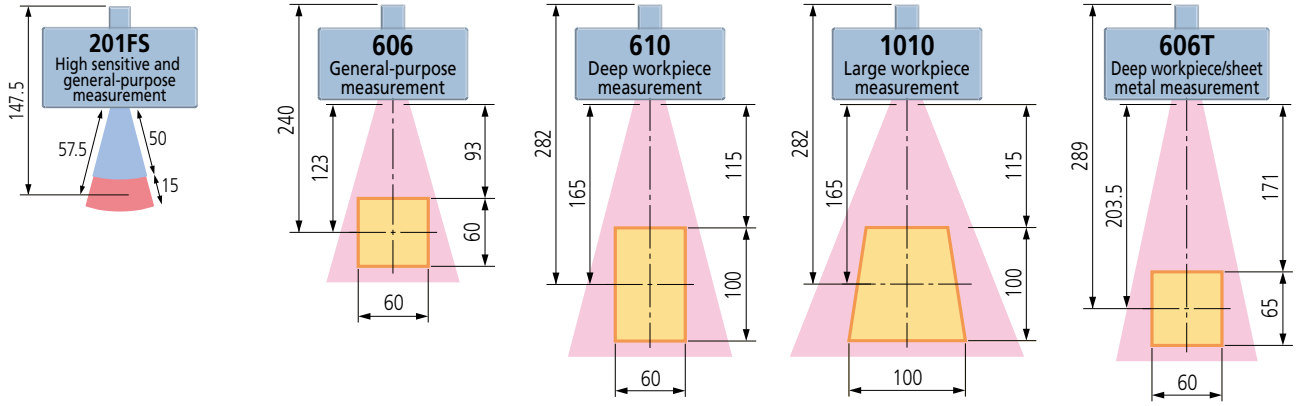
606T

201FS

Probe Features and Applications

SurfaceMeasure	Features	Applications
606	Can be used for CNC CMMs with the size of 700mm	Power train parts, domestic electric parts, as well as small parts
610	Greater depth measuring range than the 606 series to support deep workpieces.	General power train parts, car body inner panels
1010	Greater width measuring range than the 610 series to reduce measuring time.	Car body inner panels
606T	Implements 3D measurement using 3 laser beams, reducing the frequency of probe attitude change.	Transmission cases, sheet metal, car body inner panels
201FS	The highest-accuracy model in the SurfaceMeasure series. Its single-point laser removes multiple reflections.	Small parts and high-accuracy parts

Measuring Range



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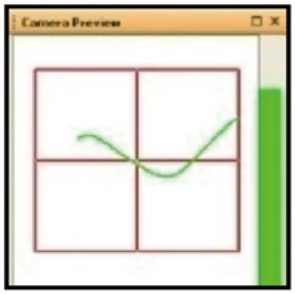
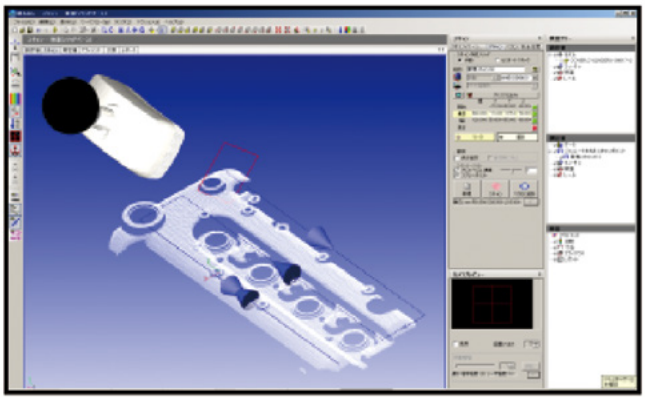
Data Processing Software

Point cloud data processing software MSURF

The point cloud data processing software performs operations from measurement to evaluation on the same platform when using the MSURF non-contact laser probe SurfaceMeasure.



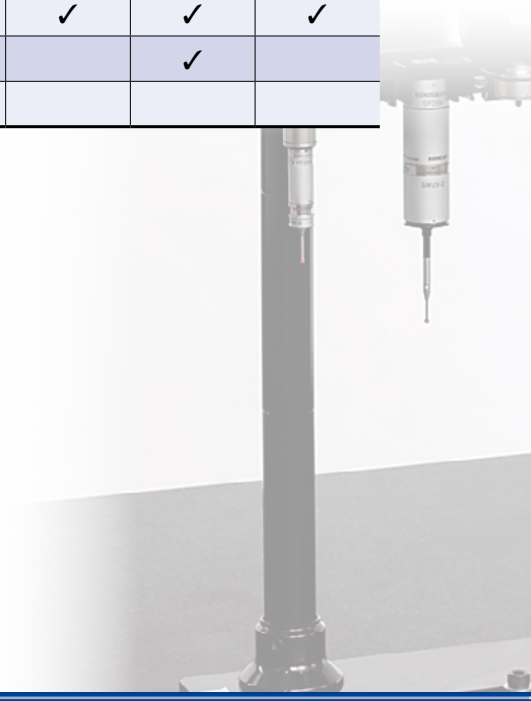


MSURF V5.1 software packages

Software	On-line				Off-line			
	MSURF-S RUN	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[*1]			✓	✓		✓	✓	
MSURF-MESH PRO			✓	✓		✓	✓	✓
MSURF-PLANNER[*2]		✓		✓	✓		✓	
MSURF-PLANNER RUN[*2]	✓							

*1: If you use both MSURF-S and MSURF-I on the same PC, please purchase MSURF-S and MSURF-I Option.
*2: To run a measurement macro created by MSURF-PLANNER, software "MSURF-PLANNER RUN" is required separately.
* The MSURF series operates on Windows 7 (32/64bit) or Windows 10 (32/64bit). (As of V.1 - March, 2017)

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



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.

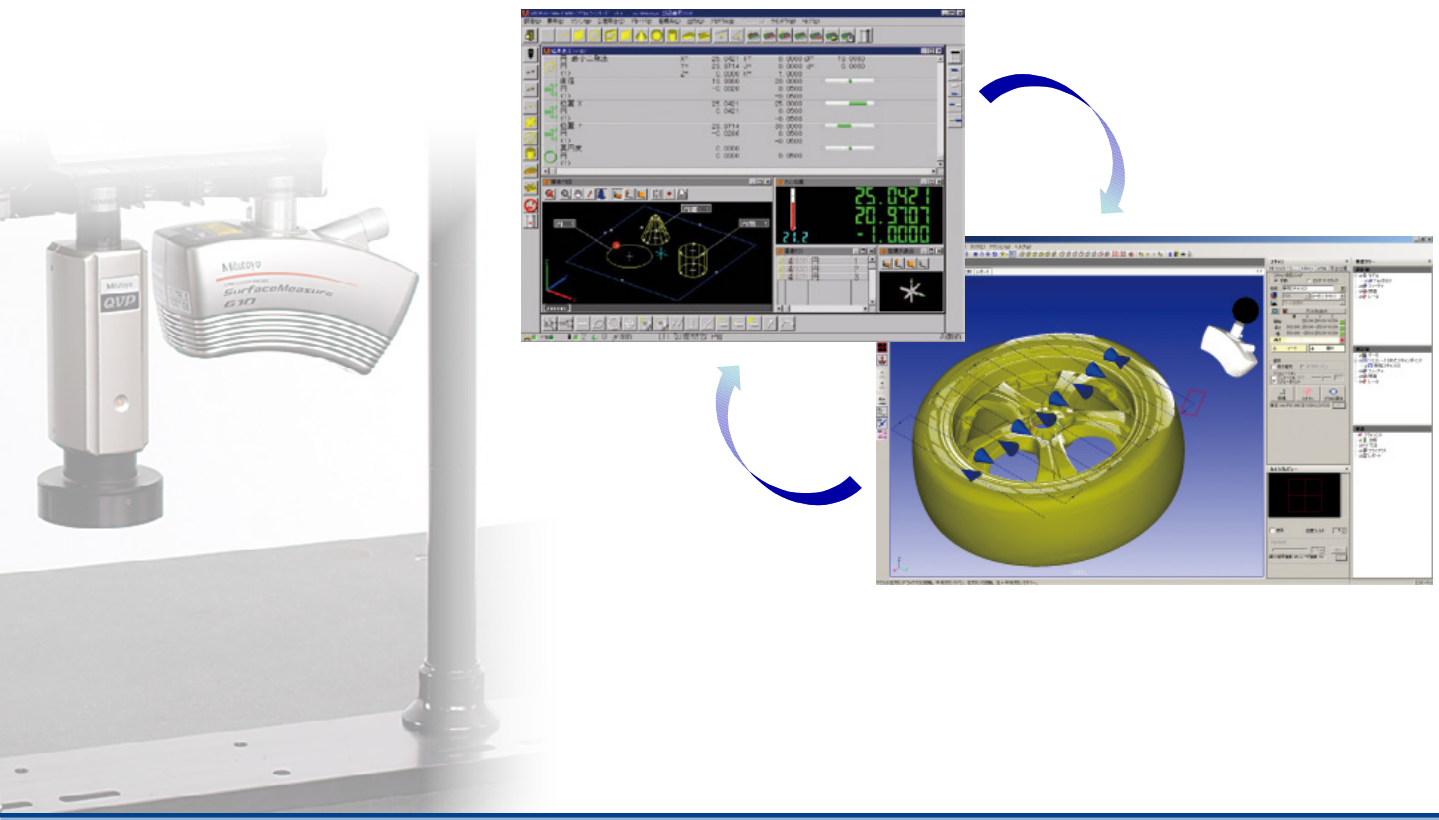
- Easily define these three items using the joystick while checking the camera preview.
- If point cloud data or master data is displayed on the screen, you can define the three items using the mouse, making it convenient for creating a measurement path based on simulation and for specifying areas where data needs to be remeasured. The joystick also can be used.
- It allows 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.

- Use the override function to modify all or some of the measurement conditions in the created measurement macros.
- The submacro function is effective for measuring multiple units of the same workpiece.
- Execution time of a measurement macro is computed from the measurement conditions and 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, fully automatic measurements that combine both contact and noncontact measurements can be executed.



MSURF-I

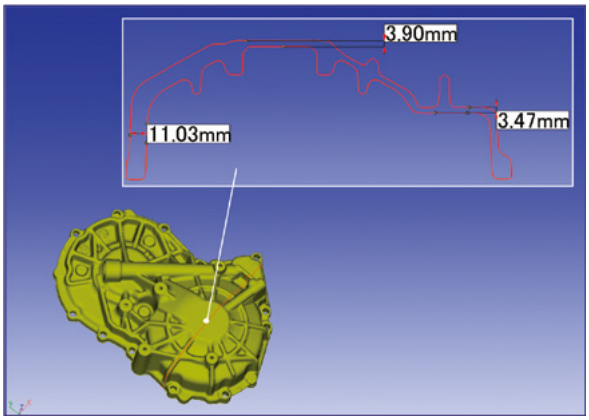
Conducts analysis or comparison verification of measured point cloud data in reference to nominal data (supporting CAD data import).

Importing CAD data

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

Comparison of cross-sectional shapes

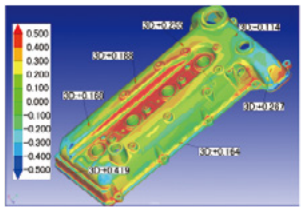
- Cut point cloud data or mesh data to compare cross-sectional shapes or compute angles, distances, radii, etc.



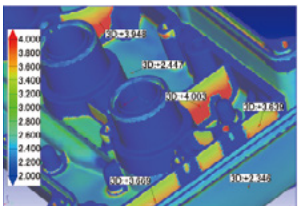
Cross-sectional evaluation (dimension computation)

Planar shape comparison

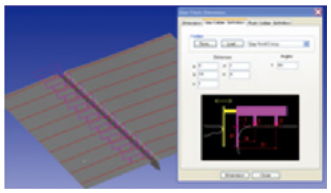
- Point cloud data or mesh data can be compared with CAD data, and the planar shape errors displayed on a color map.
- No need to cut the workpiece as with conventional methods. Wall thicknesses can be displayed on a color map.
- A simulated digital caliper function enables quick evaluation of a wide variety of steps and gaps.
- When evaluating the curvature of a surface, the angle R within the specified tolerance, for example, can be evaluated.



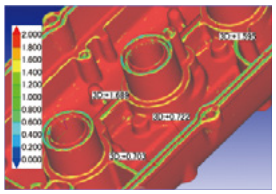
Color map of errors



Color map of wall thickness



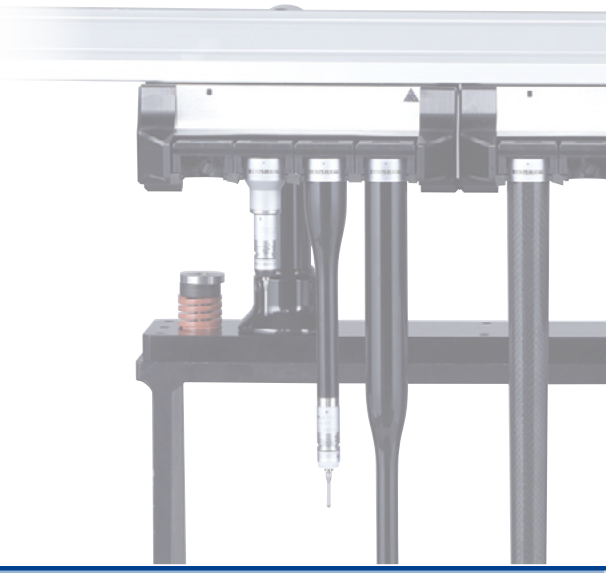
Evaluation of steps and gaps



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.
  Use this function to automate a series of operations, from measurement to evaluation to report creation.



MSURF-G

MSURF-G is the off-line version of MSURF. It uses model data to create measurement macros. Therefore, users can start measurement when the workpiece is ready. Since MSURF-G is a standalone PC application, only requiring installation by the user, it frees up valuable CMM time.

*MSURF-G cannot be combined with MSURF-S.

MSURF-MESH PRO

MSURF-MESH PRO includes various functions, such as filtering point cloud data and mesh data. Other functions include mesh data thinning-out, highlighting, interpolation and outlier removal.

*MSURF-MESH PRO has optional functions of MSURF-I.

MSURF-PLANNER

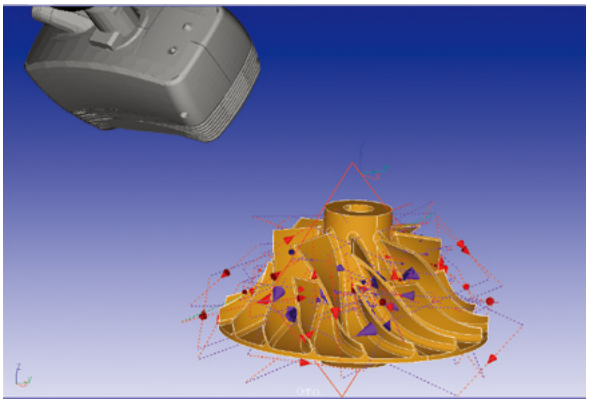
MSURF-PLANNER automatically creates measurement macros (surface form, feature form) from 3D CAD data for the line laser probe.
Optimized data (travel path, number of probe head revolutions, etc.) of a measurement path contributes to improved productivity.

MSURF-PLANNER RUN

MSURF-PLANNER RUN* is optional software required to execute and edit measurement macros created by MSURF-PLANNER.

*MSURF-PLANNER RUN is optional software added to MSURF-S or MSURF-G.

*This optional software is not required for the PC with MSURF-PLANNER installed.



Automatic generation of measurement macros by MSURF-PLANNER.

Coordinate Measuring Machines

Vision Measuring Systems

Form Measurement

Optical Measuring

Sensor Systems

Test Equipment and Seismometers

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 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 measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

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1.5M 0418-04 • Printed in USA • Aug. 2018