Mitutoyo

Mitutoyo **Quality**

Non-contact Line-Laser Probe for
Coordinate Measuring Machines

SurfaceMeasure

Mitutoyo

Highly accurate, high speed, and highly efficient

The SurfaceMeasure probe captures stable shape data on workpieces without being

SurfaceMeasure

measurements
affected by their reflectance.

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 that can be used throughout the entire process, from development and prototyping to production.

SurfaceMeasure series

The SurfaceMeasure lineup offers six models of non-contact probe using three different laser irradiation methods and measuring range. Mitutoyo can recommend the optimal laser probe in consideration of the workpiece surface texture, operation method, etc., for each client.
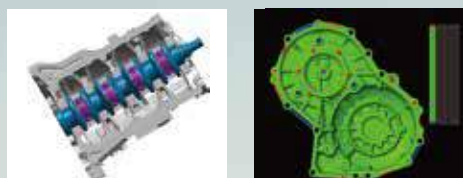
In the development phase

Optimized design 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.
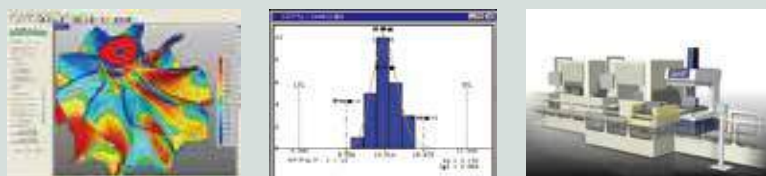
In the prototyping phase

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

In the 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 Line-Laser Probe with Mitutoyo Quality

Now you can measure a workpiece without being concerned about its color tone or glossiness.

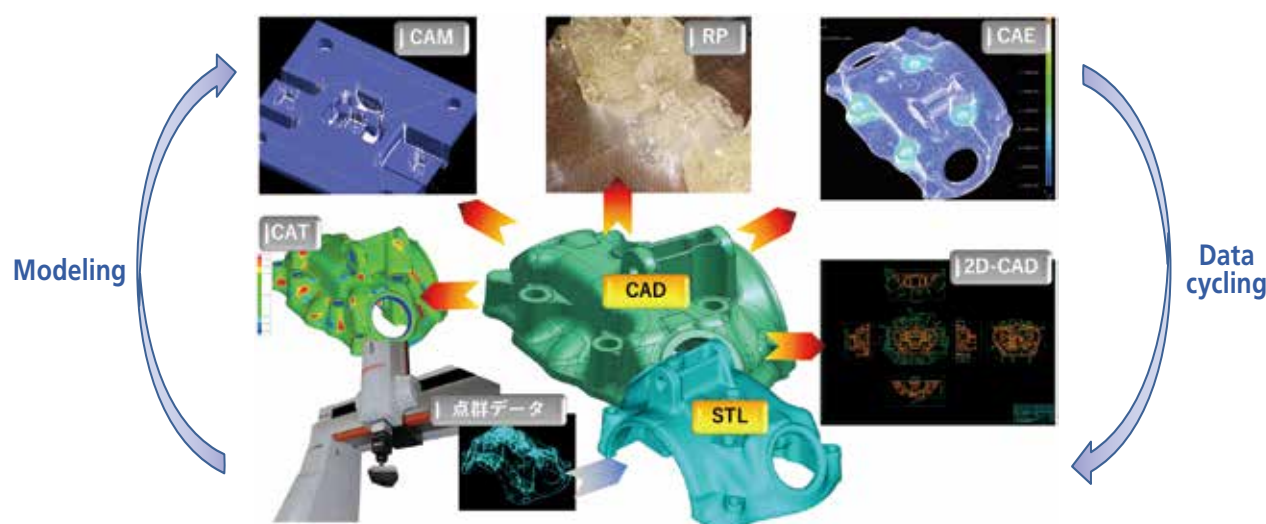## Powder-sprayless measurement and high-speed scanning

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 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.
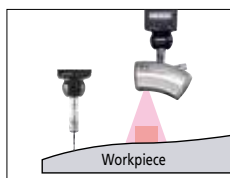
SurfaceMeasure probes can be used not only for dimensional measurement but also for modeling from point group data using commercial software, structural/fluid analysis and data transfer to a molding machine as a tool for digital engineering.
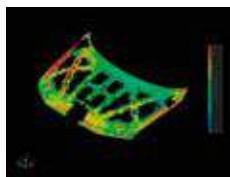
* SurfaceMeasure FS201 is not a line-laser probe.

Modeling / Data cycling

Features of Non-contact CMM by 3 Keywords:

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

Workpiece

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 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 ACR3 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.
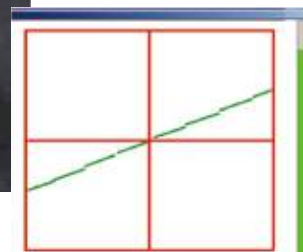
- The flying spot type achieves high-reproducibility in edge detection that contributes to attaining best-in-class scanning accuracy (in the case of SurfaceMeasure 201FS).
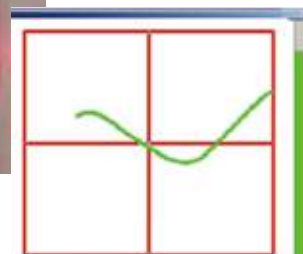
Powderspray-less measurement

- 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.

Specification

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	155 mm	57.5 mm
Scanning error *		8 µm	9 µm	1.8 µm
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	Wave length	660 nm		670 nm
	Output	4 mW	2.5 mW	1 mW

*According to Mitutoyo's acceptance procedure. (1σ/sphere measurement, probe alone)

403

1110

201FS

Probe Features and Applications

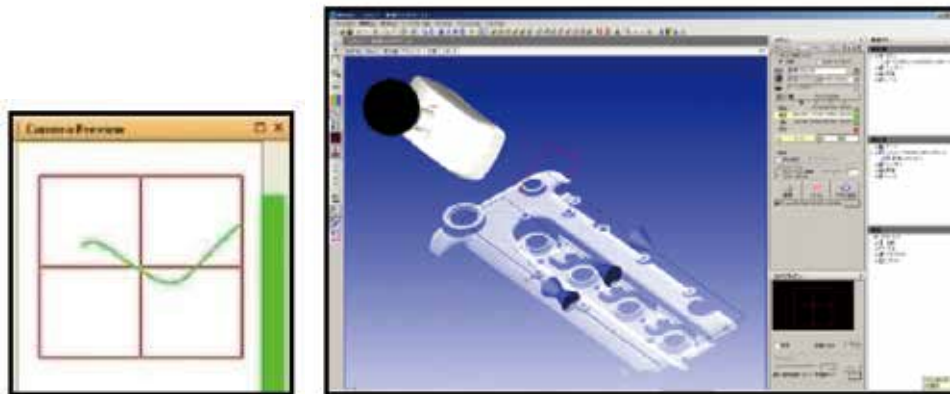| SurfaceMeasure	Features	Applications
403	Can be used for CNC CMMs with the size of 700mm	Small parts and high accuracy parts
1110	The Max. Acquisition rate is 4 times faster than the conventional systems. The workpieces with depth can be measured, it is effective to reduce maesuring time for wide range.	Car body inner panels, Castings, Aircraft bodies, Blades
201FS	The highest-accuracy model in the SurfaceMeasure series. Due to its flying spot type irradiation, it is insulated from the influence of multiple reflection.	Small parts and high accuracy parts

Measuring Range

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 the MSURF non-contact laser probe SurfaceMeasure.

MSURF V5.3 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 V5.0 and MSURF-I V5.0 on the same PC, please purchase MSURF-S V5.0 and MSURF-I Option V5.0.
*2: To run a measurement macro created by MSURF-PLANNER, software "MSURF-PLANNER RUN" is required separately.
* The MSURF series operates on Windows 7 (64bit) or Windows 10 (64bit). (As of February, 2021)

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, 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.
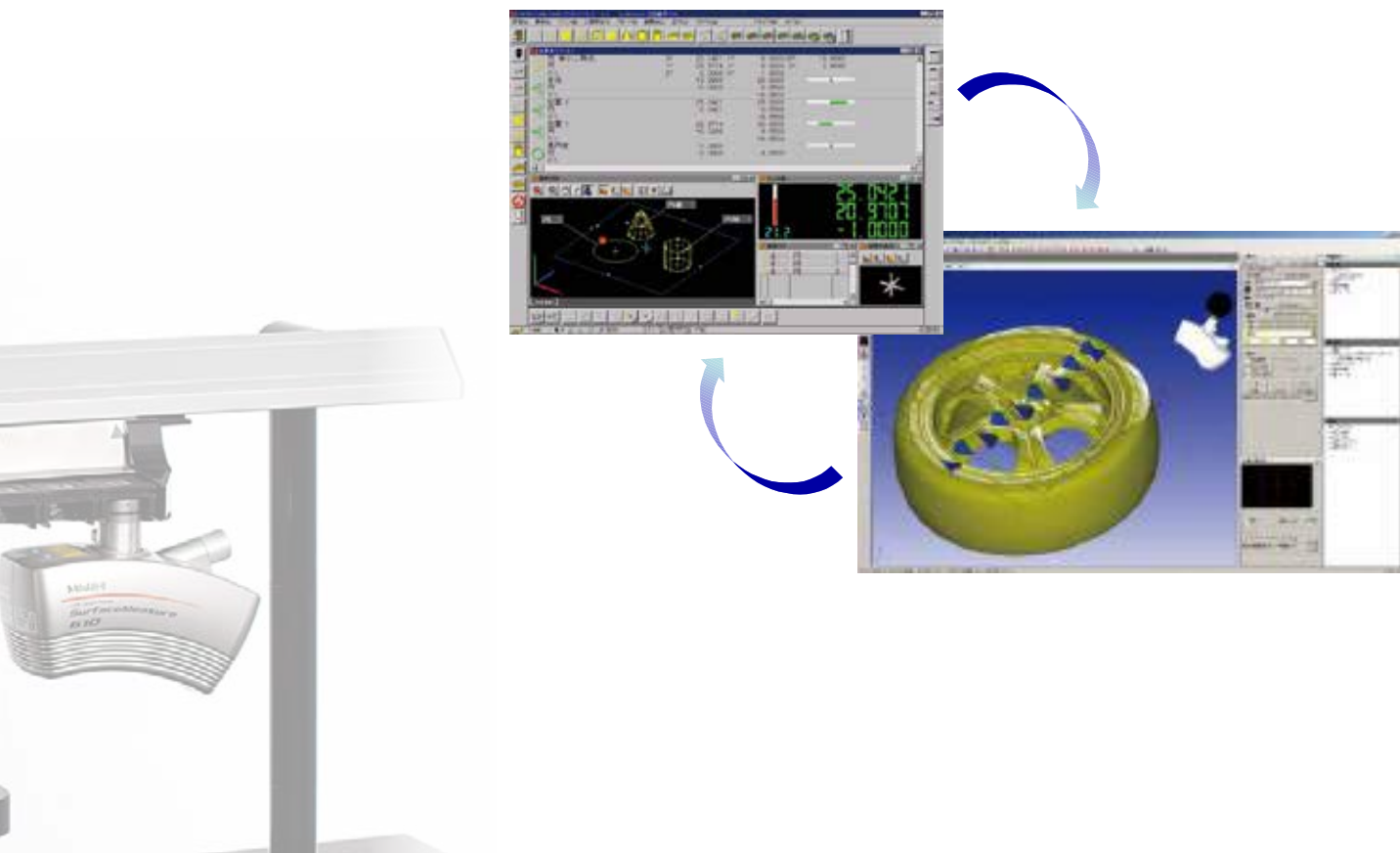
- You can easily define these three items using the joystick while checking the camera preview.
- If point cloud data or master data is displayed on the screen, you can define the three items using the mouse on the data. This feature is convenient for creating a measurement path based on simulation and 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 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 submacro function is effective for measuring multiple units of the same workpiece.
- The 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, you can execute fully automatic measurements that merge "contact" and "non-contact" measurements.
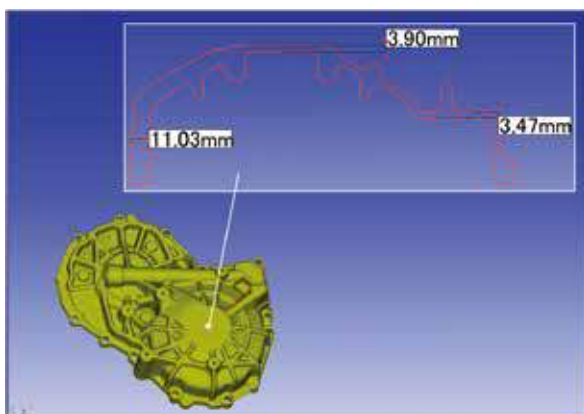
MSURF-I

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.
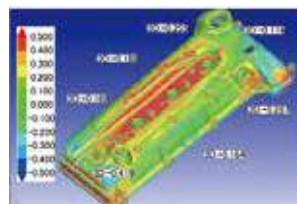
Comparison of cross-sectional shapes

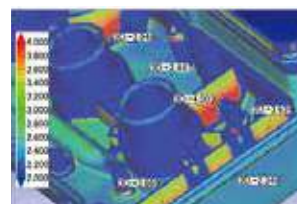- You can cut point cloud data or mesh data to compare crosssectional shapes or compute angles, distances, radii, etc.

Cross-sectional evaluation (dimension computation)
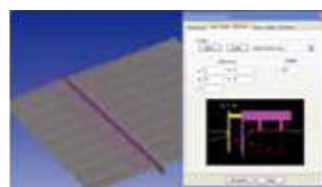
Planar shape comparison

- Point cloud data or mesh data can be compared with CAD data, and the planar shape errors displayed on a color map.
- 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.

Color map of errors
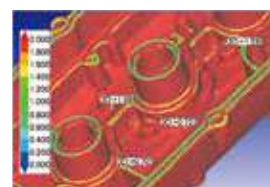

Color map of wall thickness

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

MSUR-G is off-line version of MSURF-G. It allows users to previously create measurement program 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.

*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. The software is enhanced by adding functions to standard ones. It also enables functions such as mesh data thinning-out, highlighting, interpolation and outlier removal that are unavailable as standard.

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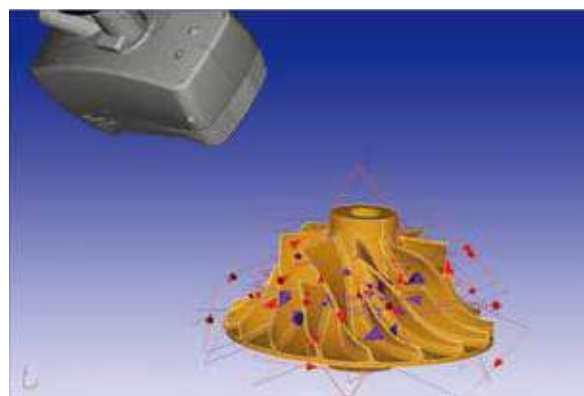
MSURF-PLANNER

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.

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 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.

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