

# MCOSMOS

## Software for Manual / CNC Coordinate Measuring Machines

### Three levels of module configuration

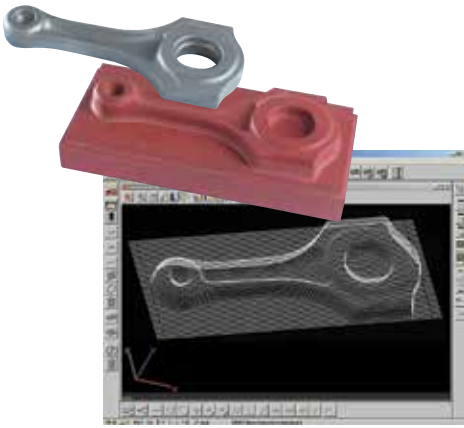
MCOSMOS has three choices of module configuration. From the basic MCOSMOS-1 to the advanced MCOSMOS-3, choose a configuration for your measurement applications.

	MCOSMOS Coordinate Measuring Machine Software			
	CNC			Manual
	MCOSMOS-1	MCOSMOS-2	MCOSMOS-3	MCOSMOS-M
GEOPAK	●	●	●	●
CAT1000P	▲	●	●	—
CAT1000S	▲	●	●	▲
Scanpak	▲	▲	●	▲
Gearpak	▲	▲	●	—
MAFIS*	▲	▲	▲	—

● Standard ▲ Option — Not supported \* Requires Scanpak

#### GEOPAK (Basic Geometry Module)

Geopak provides an easy graphical console through the use of tool bars and windows which can be personalized to the operator's preference. Geographically enhanced displays provide step-by-step on-screen wizards that prompt the operator, allowing even inexperienced users to create routines to measure parts. The entry-level MCOSMOS-1 software includes flexible advanced tools demanded by the most experienced operators; e.g. looping, formula calculations or expressions that use variables, libraries of day-to-day subroutines and conditional statements, which can add logic for a variety of applications.



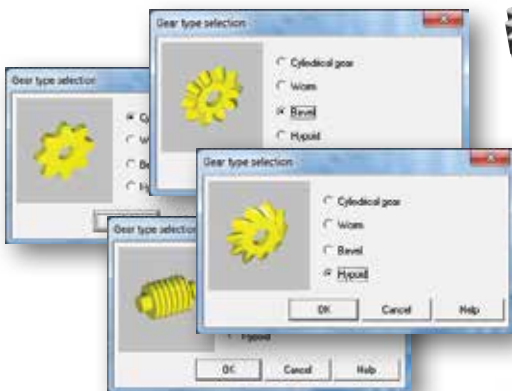
#### SCANPAK (2D Profile Evaluation Module)

For the scanning and evaluation of workpiece contours (2D), and data transfer to CAD system.



#### MAFIS (Mitutoyo Airfoil Inspection System)

Evaluation and analysis of airfoil shapes such as turbine blades that require special calculations according to the particular design specifications. The MAFIS system uses cross sectional data of the shape obtained by Scanpak to perform these calculations and outputs the result via the standard geometry program.



#### GEARPAK

##### (Gear Measurement and Analysis Module)

Advances in CMM controller techniques make the measurement of gears feasible, and the Gearpak module takes advantage of this to bring sophisticated measurement capabilities within reach.

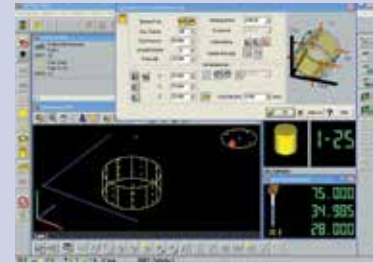


**MiCAT**

Mitutoyo Intelligent Computer Aided Technology

the standard in world  
metrology software

**cmm**



## Mitutoyo Controlled Open Systems for Modular Operation Support

MCOSMOS by Mitutoyo is a proprietary metrology suite of inter-related modules and dedicated expansion modules for the Microsoft Windows 7 operating system. The world's standard in metrology software, MCOSMOS is supported in 37 locations worldwide and in 12 languages. (A proud Microsoft Gold Partner.)

Developed with MiCAT (Mitutoyo Intelligent Computer Aided Technology), your Mitutoyo CMM is streamlined with intuitive user interfaces that provide a familiar look and feel to operate multiple modules. They work together seamlessly for applications throughout the entire production process to put reliable metrology at you fingertips.

MCOSMOS allows integration among a whole series of applications, improving the efficiency of your CMM and the productivity of your quality control functions. Specific expansion modules are available including GEOPAK or for specific applications such as gear measurement, airfoil analysis, reverse engineering and integrating CAD with metrology.



### CAT-1000P (Prismatic)

Not available for manual CMMs

CAT1000P significantly facilitates the programming of measurement tasks during the GEOPAK learn mode. All data for measuring parts and tolerance evaluations are taken from the CAD model via pointing device (mouse, trackball, etc.). The same principles apply for programming probe paths (clearance and measurement), while at the same time using the nominal directly from the CAD model for tolerance comparison.

Spatial's 3D InterOp delivers the highest quality data exchange between CAD formats, enabling superior CAD file translation.

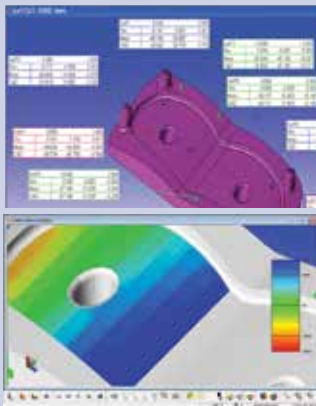
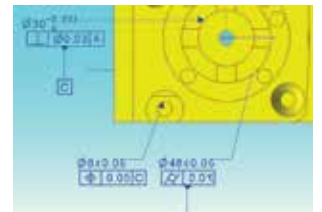
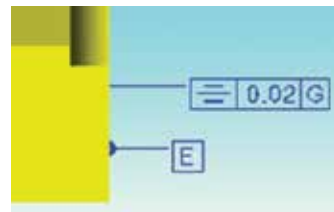
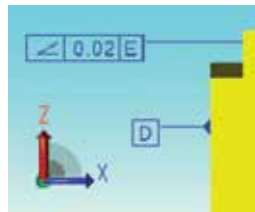
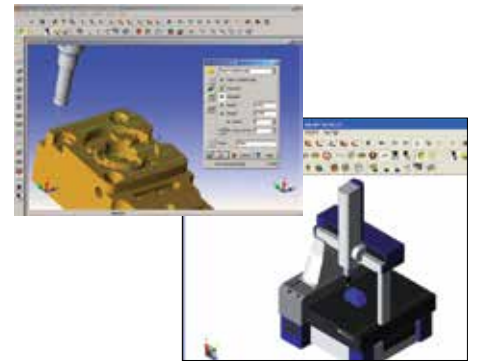
Standard with CAT-1000 is ACIS (\*.sat) and STEP AP203, which are both licensed copies from Spatial InterOp. CATIA V5, SolidWorks, NX Siemens (Unigraphics), Parasolids, AutoDesk Inventor, Pro-Engineer and IGES or VDAFS exchange formats are available as an option.

The comprehensive suite of translators provides import/export for all applications, including ACIS, CGM and Parasolid-based applications.

3D InterOp is embedded in many of today's leading design, engineering and manufacturing applications.

CAT-1000 uses 3D ACIS® Modeler, Spatial's prominent modeling component used in more than 350 customer applications with more than 2 million seats worldwide.

CAT-1000 fully supports and reads PMI (Product Manufacturing Information), which is embedded in the model for datum alignment and GD&T (Geometric Dimensioning and Tolerancing).

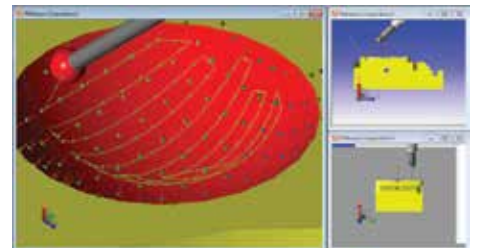


### CAT-1000S (Free-form Sculpted)

CAT-1000S is a highly versatile tool that can be used on a manual CMM or a CNC CMM. A coordinate system in GEOPAK is compared to the CAD model. Real-time surface disposition is displayed by showing a color class to determine if there is material to remove or replace.

Surface deviation can be displayed as spherical points or as a gradient surface. Cones also can be used to show the direction of the deviation.

GEOPAK CNC can create grid pattern to verify the surface points. A one-click tool calculates a collision-free probe path to measure a grid of surface points offset from the edge.



If the CAD model has specific points, GEOPAK-CNC can drive the machine to the defined points or vertices.



In addition to the online/offline part program creation, CAD model-based generation of surface measurement points, and comparison of actual/nominal data, with graphical output is available.



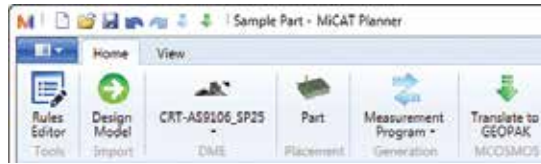
# MiCAT Planner

## Automatic Measurement Program Generation Software

MiCAT Planner is Mitutoyo's latest software development for fast and efficient CMM part programming. Operation of MiCAT Planner is easy and intuitive. Programs are made with a few mouse clicks in jminutes instead of hours or days.

### WORKFLOW:

- 1) Load design model
- 2) Select target CMM
- 3) Part placement via virtual alignment
- 4) Measurement program creation
- 5) Translate to Geopak MCOSMOS



MiCAT Planner toolbar is workflow based.

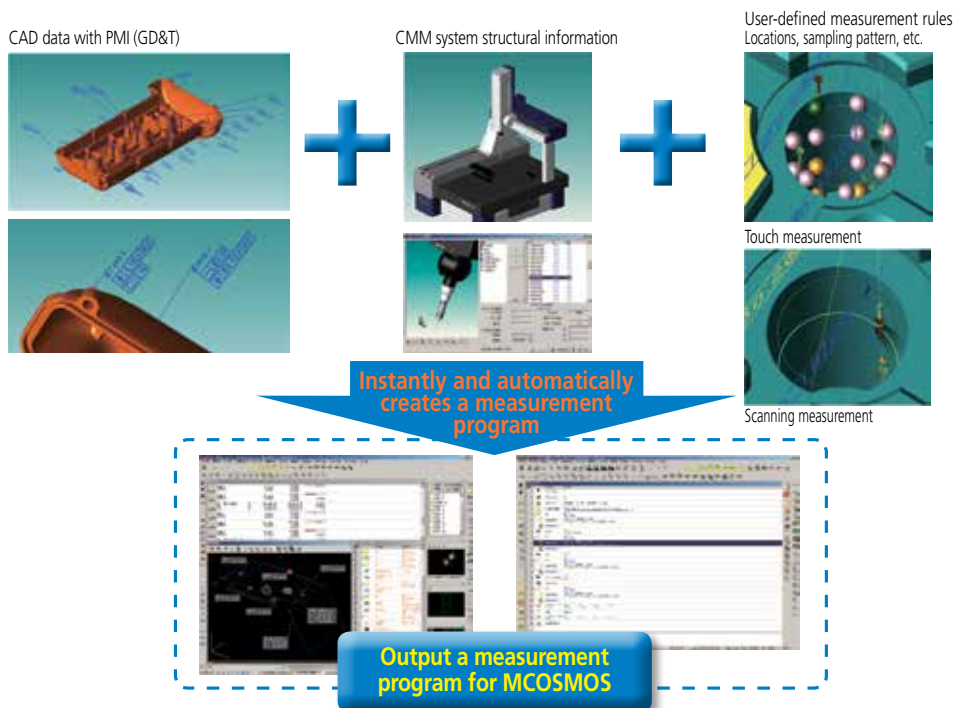
In order to generate a measurement plan, GD&T information attached to the 3D Design Model is needed. Design Model formats marked "w/PMI" will read GD&T information created in the CAD system and stored in the Design Model file. Design Model formats without PMI can be annotated with GD&T in MiCAT Planner.

### Design Model Support:

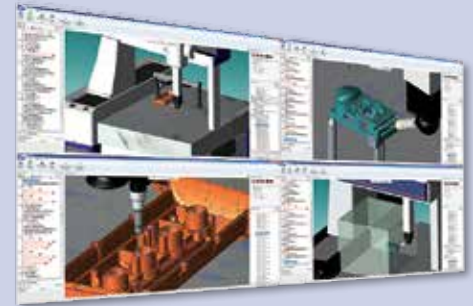
- Siemens NX w/PMI
- CATIA v5 w/PMI
- PRO/E w/PMI
- SOLIDWORKS w/PMI
- ACIS (SAT)

If the Design Model does not contain GD&T information, or the information is incomplete, GD&T information can be added or edited with MiCAT Planner with the following:

- Add new GD&T to an existing feature
- Add GD&T to a new feature
- Edit exiting GD&T information
- Modify display of GD&T in 3D view



# MiCAT



### Feature/Benefits of MiCAT Planner:

#### Automatic part program generation

- Up to 90% time savings in CMM part program creation

#### Collision control

- Minimize potential costly and damaging probe collisions

#### Program simulation

- Virtual pre-run of measurement program ensures maxim efficiency

#### Rule editor

- Automatically apply individual or global measurement strategies for all part programs or specific programs

#### Plan view

- Easy selection of characteristics, features and measurement point sets to include or exclude from the measurement plan

#### Property pane

- Feature parameter settings for the current selected item can be an exception to a user-defined rule

#### Direct Help

- Clear, concise explanation for features that can't be measured (missing GD&T, probe angle not defined, etc.)

#### GD&T Wizard

- The GD&T Wizard enables the use of Design Models that do not include any PMI by allowing the user to add, edit or delete PMI information without modifying the original CAD file. All additions, changes or deletions reside solely within the MiCAT Planner project database. (See Design Model Support above left for the current list)



[www.mitutoyo.com/MiCAT](http://www.mitutoyo.com/MiCAT)

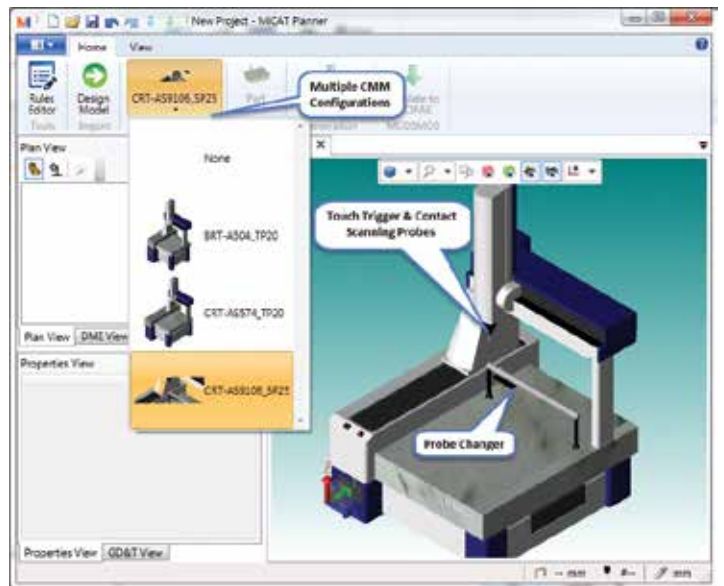
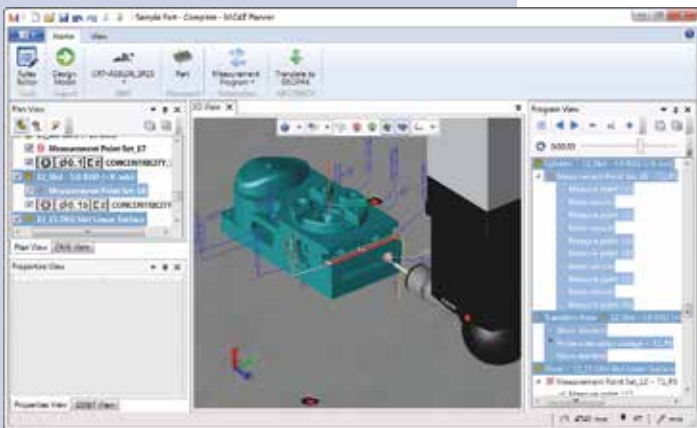
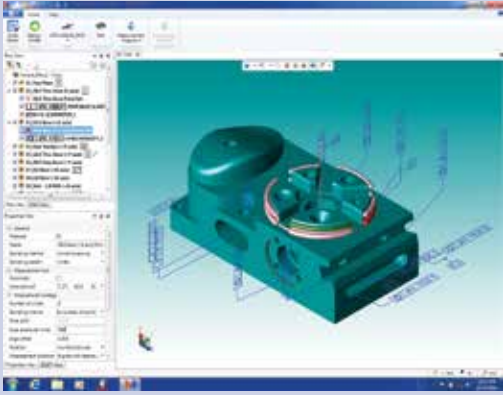
## Measurement Plan

The measurement plan is synchronized with the 3D view and Program View. For example, a feature can be selected in any of the views (Plan View, 3D View, Program View) and is highlighted in the other views. Manual reordering of the feature measurement order is possible by drag and drop of the features in the Plan View. Users can select a feature, characteristic or point set in the Plan View to modify the corresponding properties in the Property View.

## Load and Use MCOSMOS DME Configurations:

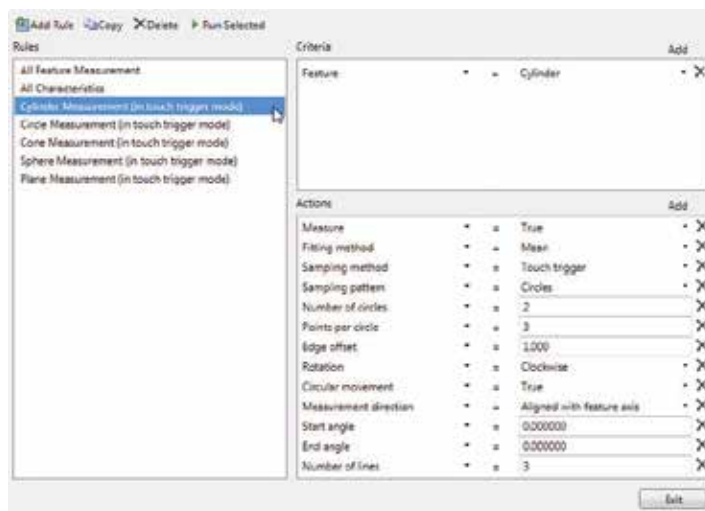
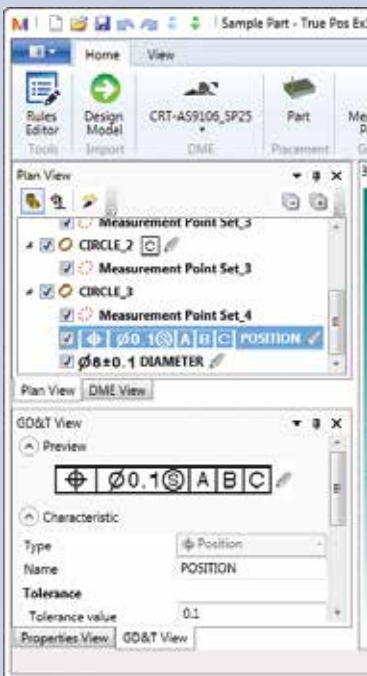
(DME: Dimensional Measuring Equipment)

- Load predefined DME configurations from CMM SystemManager
- Default DME is read directly from the MCOSMOS settings
- MiCAT Planner generates a program specifically for the selected DME
- Align DME and Design Model by mating, dragging, center of table or volume, or by direct numerical input
- Import PCS (part coordinate system) information from MCOSMOS

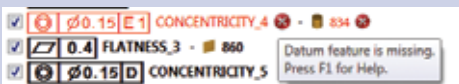


## Rules Editor

The Rules Editor allows users to create rules to define measurement approaches, such as number of points per feature, sensor type, fitting method and automatic sensor selection.



Rules are applied during CAD import and can be re-applied after design model import. The Run Selected command automatically updates the measurement plan with the current defined rules and updates changes in the Plan and Program views.



# CMM Probe & Change Rack Options

## Touch-trigger Probe System



**MH20i** - Manual head

**CMM:MANUAL | CNC**  
MH20i is a manually adjustable probe head with an integral TP20 kinematic stylus module mount with two-axis indexing. The A-axis rotates through  $\pm 180^\circ$  in the X-Y plane. The B-axis rotates through  $90^\circ$  in the Z plane. A lever locks the head in one of up to 168 repeatable positions, set at  $15^\circ$  increments. Capable of carrying the full range of TP20 modules, which can be changed without re-qualification, providing qualification has taken place in each position with each stylus/module combination.



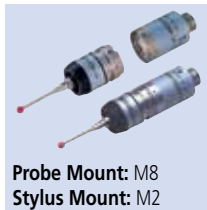
**PH1** - Manual probe head

**CMM:MANUAL | CNC**  
The PH1 is a general purpose, swivel-type probe head. Its compact design makes it ideally suited to a CMM where manual orientation of an M8 thread-mounted touch-trigger probe is required (TP20, TP200). The PH1 provides two axes of movement. The A-axis allows probe orientation in the vertical plane; the B-axis allows rotational probe orientation. Axis rotation is in relation to the shank mount. Probe re-qualification is required after each re-orientation of the PH1. TP200 not supported on manual CMM..



**MIH** - Manual indexable probe head

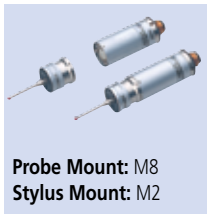
**CMM:MANUAL | CNC**  
The manually indexable head (MIH) has 720 repeatable positions and features an autojoint probe mount for fast, repeatable probe changing. This probe head is compatible with the TP6A touch probe directly and supports the TP20, and TP200 probe with the use of the autojoint extension bars (e.g. PAA1). An integral LCD enables easy programming with the facility to memorize up to 20 probe positions. Not for use with multi-wire probes.



Probe Mount: M8  
Stylus Mount: M2

**TP20** - Touch-trigger probe

**CMM:MANUAL | CNC**  
The TP20 is a compact kinematic touch-trigger probe system featuring a two-piece design, comprising probe body and detachable stylus module(s), connected using a highly repeatable magnetic kinematic coupling. This provides the facility to change stylus configurations either manually or automatically without the need for requalification of the stylus tips. Modules offering a range of trigger forces allow the probe performance to be best matched to the measurement task.



Probe Mount: M8  
Stylus Mount: M2

**TP200** - Touch-trigger probe

**CMM:CNC**  
The TP200 features quick-change stylus configurations without the need for requalification, utilizing electronic strain sensing techniques to improve on the form measuring accuracy and operating life that can be achieved when compared with kinematic touch-trigger probes. The TP200 probe is a two-piece design comprising the probe body and a detachable stylus module that holds the stylus assembly.



Probe Mount: Autojoint  
Stylus Mount: M4

**TP7** - High-accuracy, touch-trigger probe

**CMM:CNC**  
The TP7M is a high-accuracy touch-trigger probe with a maximum repeatability of  $2\sigma \leq 0.25\mu\text{m}$ . The TP7M can mount a long stylus up to 150mm. In combination with the longest autojoint probe extension of 200mm for direct mounting to the PH10M or PH10MQ, gives the TP7M a maximum access distance of 350mm.



**UMAP-CMM** - Micro-touch probe

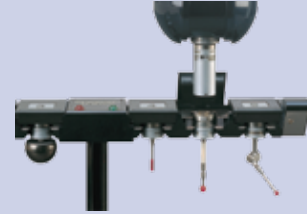
**CMM:CNC**  
A stylus with an ultra-small diameter of  $\varnothing 0.1\text{mm}$  or  $\varnothing 0.3\text{mm}$  can be used. Measurement of miniscule form and dimensions from practically any direction is possible by mounting on the PH10MQ.

**MCR20** - Module Change Rack (TP20)



The MCR20 is designed to securely hold the stored TP20 probe modules for automatic changing (CNC CMM only) and to protect from airborne contaminants.

**SCR200** - Module Change Rack (TP200)



The SCR200 provides automatic, high-speed changing between up to six TP200 stylus modules (CNC CMM only). The SCR200 is powered by the separate probe interface, PI 200, and provides features to facilitate safe stylus changing.

**MSR** - Manual Storage Rack (TP20/TP200)



The MSR1 manual storage rack holds up to 6 pre-qualified stylus assemblies fitted to TP20 or TP200 probe modules to simplify manual module changing. The MSR1 can be mounted on the CMM table or on a vertical surface.

**MAP** - Manual Autojoint Probe (TP6A/TP7)



The MAP (manual autojoint probe) stand is a low-cost storage rack capable of holding up to six autojoint mounted probes and extension bars. The MAP stand can be mounted directly on the table of a CMM, cabinet, wall or any vertical surface.

See page L-28 for stylus information.

# CMM Probe & Change Rack Options

## Motorized Probe Heads

SC6 - Stylus Changer (MPP-310Q)



ACR3 - Autojoint Change Rack (SP25M)



FCR25 - Flexible Change Rack (SP25M)



FCR25-L3 - Flexible Change Rack (SP25M)



FCR25-L6 - Flexible Change Rack (SP25M)



SCP80 - Stylus Change Port (SP80)



The range of PH10 PLUS motorized probe heads increases throughput by giving CNC CMMs the added capability of program controlled probe re-orientation. This enables the inspection of features at different angles without the need for frequent, time-consuming stylus cluster changes.



### PH10T

Shank-mounted head with two-wired probe capability and an M8 thread supporting TP20, TP200 and TP6 touch-trigger probes.

### PH10M/10MQ

The PH10M PLUS can carry long extension bars and multi-wire probes such as QVP, SP25M, SurfaceMeasure, SurfTest, UMAP-CMM or TP7M. The highly repeatable autojoint allows rapid probe or extension bar changing without the need for re-qualification. The PH10MQ PLUS is a variant of the PH10M PLUS that allows the motorized head to be attached directly to the quill with the B-axis of the head inside the quill itself. This option provides a neater and shorter probe mount, with only the A-axis protruding from the quill.



PH10M



PH10MQ

## Scanning Probe Systems



### MPP-310Q Ultra-High Accuracy Scanning

The MPP310Q is a multifunctional measuring head for CNC CMMs. It not only performs continuous contact scanning measurements at  $V2 \leq 0.3 \mu\text{m}$ , it also allows highly precise point measurements and self-centering measurements. The MPP-310Q incorporates  $0.01 \mu\text{m}$  resolution high-precision scales for each axis (XYZ). Air bearings on all axes ensures smooth measuring with minimal measuring force. Software-controlled clamps in each axis eliminate probe deflection while scanning slanted or arched surfaces to reduce measurement errors. The MPP-310Q allows for contact force as low as 0.03 Newtons for sensitive workpieces or when using very small stylus tips. Scanning speed up to 120mm/second can be achieved on known path geometry. Stylus holder changing is supported with the SCR6.

### SP25M Compact High-Accuracy Scanning Probe

The SP25 is a compact high-accuracy scanning probe with an outside diameter of  $\varnothing 25 \text{ mm}$ . This multi-functional probe is suitable for CNC coordinate measuring machines that perform not only scanning measurement, but also high-accuracy point measurement, as well as data collection from a centering-point measurement. The SP25M measuring head is extremely flexible, in addition to its measuring accuracy at very low contact forces, the SP25M can be used with probe systems ranging in lengths from 20mm (SP25-1) up to 400mm (SP25-4). The SP25M can be used on a fixed probe head (PH6M), or a motorized probe head (PH10M/10MQ). Probe systems, probe module and stylus holder changing is supported with the ACR3 and FCR25 rack changing systems.



### SP80 Extended-Length High-Accuracy Scanning

The SP80 scanning measuring head is specially designed for extended length stylus with high-accuracy measurement for lengths up to 500mm (measured in the vertical and horizontal directions). The multifunctional head for CNC CMM' allows not only scanning measurements but also high-precision point measurements and self-centering measurements. Stylus holder changing is supported with the SCP80.



See page L-28 for stylus information.

# Non-Contact CMM Probe Options

SurfaceMeasure 606/610/1010/606T

## FEATURES

Mitutoyo's line of laser scanning probes automatically adjusts to workpiece surface characteristics to deliver highly efficient measurements. With a conventional laser probe, laser intensity and camera sensitivity must be adjusted according to the environment and workpiece material. In contrast, the SurfaceMeasure line laser probes, which automatically adjust for these factors, enable hassle-free and more reliable laser scanning results.

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.

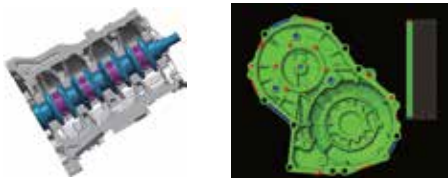
## Development phase

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.



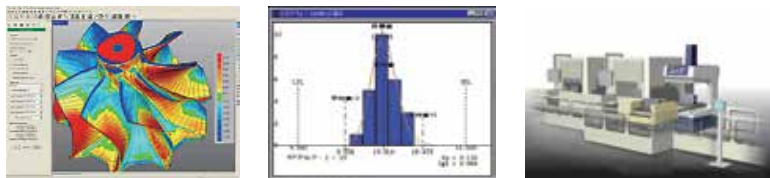
## Prototyping phase

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

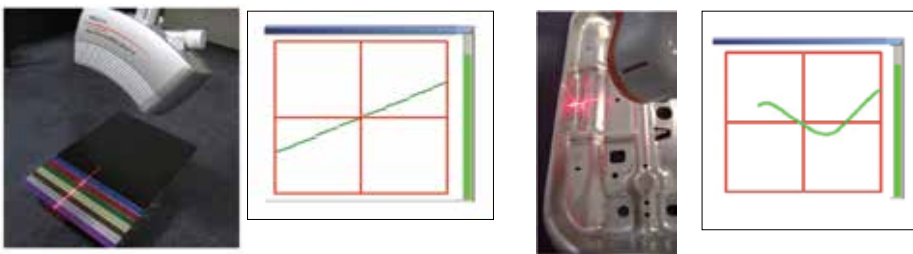


## Production phase

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.



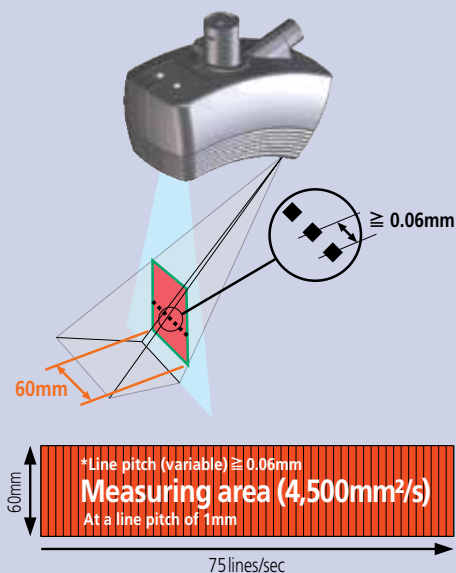
With a conventional laser probe, laser intensity and camera sensitivity must be adjusted according to the environment and the workpiece material. In contrast, the **SurfaceMeasure Series**, which automatically adjusts for these factors, enables simpler and more comfortable laser scanning.



Measuring a color sample plate

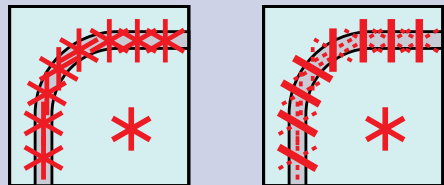
Measuring a glossy object

Because 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.



The line-laser crossing enables simultaneous scanning by 3 laser beams, thus allowing efficient measurement of complicated shapes.  
(Applies to **SurfaceMeasure 606T**)

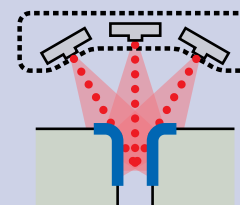
Improvement in measurement efficiency by reducing the frequency of probe attitude change.



No change of probe attitude

Individual beam selectable

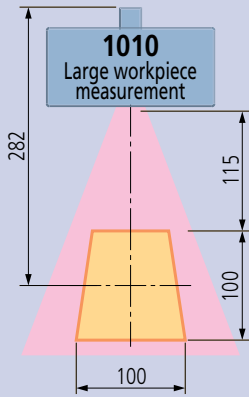
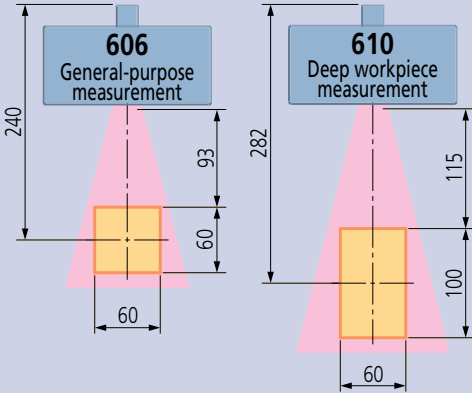
Simultaneous measurement of top and side by concurrently scanning 3-directional laser beams



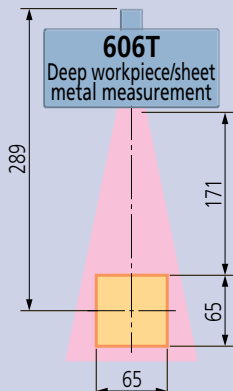
The laser beams converge from 3 directions toward a central point.



606/610/1010



606T



## Specifications of the SurfaceMeasure Series

Mitutoyo offers an optimal choice of non-contact probes to satisfy combinations of accuracy, measuring speed and measuring range.

### SPECIFICATIONS

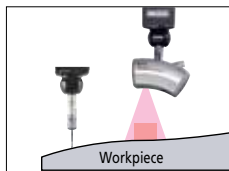
Item/Model	SurfaceMeasure 606	SurfaceMeasure 610	SurfaceMeasure 1010	SurfaceMeasure 606T
Laser irradiation method	Line Laser (single)			Line Laser (cross)
Max. scan width	2.36" (60mm)	2.36" (60mm)	3.94" (100mm)	.2"x2.56"(3x65mm)
Max. scan depth	2.36" (60mm)	3.94" (100mm)	3.94" (100mm)	2.56" (65mm)
Working distance	3.54" (93mm)	4.53" (115mm)	4.53" (115mm)	6.85" (174mm)
Scanning error *	12µm	15µm	18µm	17µm
Max. Acquisition rate	75,000 points/sec			3x25,000 points/sec
Mass	0.95 lbs (430g)	0.88 lbs (400g)	0.88 lbs (400g)	1.06 lbs (480g)
Laser Class	EN/IEC	Class2 [ EN/IEC 60825-1(2007) ]		
	JIS	Class2 [ JIS C 6802 : 2011 ]		
Laser type	Red semiconductor			
Line Laser	Wavelength	660nm		
	Output	4mW		
Point Laser	Wavelength	635nm		—
	Output	1mW		—

Accuracy inspection environment	Temperature: 20°C±1°C / Humidity: 50%±10%
* Target workpiece	Specified master ball for inspection (Diameter 30mm)
Inspection method	According to Mitutoyo's acceptance procedure. (1σ/sphere measurement, probe alone)

### Probe Features and Applications

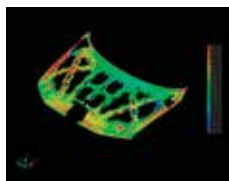
SurfaceMeasure	Features	Applications
606	The highest-accuracy model in the SurfaceMeasure series	Powertrain parts, domestic electric parts, as well as small parts
610	Greater measuring range in the depth direction than that of series 606 to support deep workpieces	General power train parts, car body inner panels
1010	Greater measuring range in the width direction than that of series 610, thus effective at reducing measuring time	Car body inner panels
606T	Implements 3D measurement using 3 laser beams, thereby reducing the frequency of probe attitude change	Transmission cases, sheet metal, car body inner panels

### Features of non-contact CMM:



#### 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 cutting 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.



# MSURF

## Software for SurfaceMeasure Probe for CNC CMMs

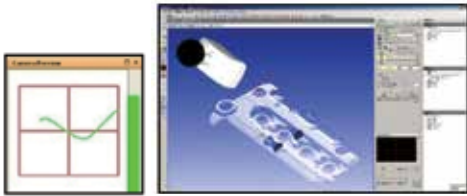


### Laser Scanning: MSURF-S

A scanning path can be created by defining a scanning start point, a scanning length and a scanning width.

- Specify the 3 points using the joystick while watching the camera view.
- When a point group or master data exists on the screen, 3 points can be defined by selecting the data using the mouse. Automation of measuring paths from start to finish reduces measuring time.
- Operating of a joystick and buttons enables configuration and execution of a scanning path,

and registration to or deletion from a macro. The ability to measure without using a PC has significantly improved operational efficiency, particularly for large-sized CMMs.



MSURF software enables users to perform operations from measurement to evaluation on the same platform when the non-contact line laser probe, SurfaceMeasure, is used. Three types of software are provided according to the task:

**MSURF-S:** Calculates point cloud data measured by CNC CMM with SurfaceMeasure. Generates scanning paths by defining the scanning start position, length and width.

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

**MSURF-G:** Primarily creates part programs (measurement procedure programs) using CAD data.

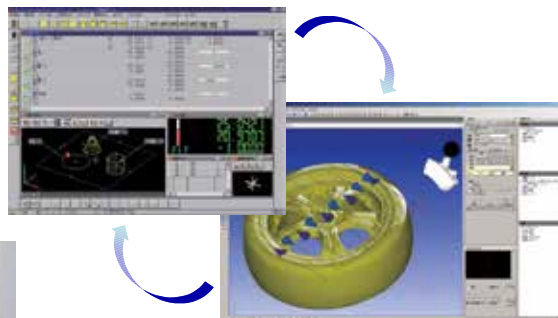
Scanning paths can be registered as a measurement macro.

- The measurement conditions of a measurement macro can be partly or wholly changed by the override function.
- The sub-macro function is effective for measuring multiple identical workpieces.
- A trial calculation of measurement macro execution time is based on the measurement conditions and the specifications of the CMM.



MSURF-S can be started from MCOSMOS.

- A work coordinate system created with MCOSMOS can be used with MSURF-S. Therefore, fully automatic measurement combined with contact measurement/non-contact measurement can be performed.



Note: If not using ACR3, probe replacement is performed manually.

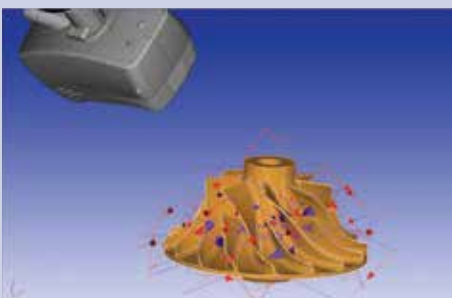
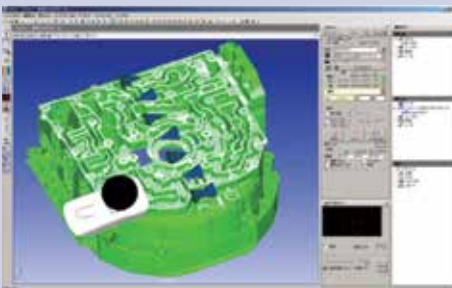
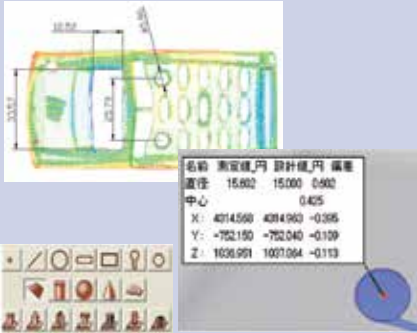
**Inspection: MSURF-I**

**CAD data import**

- SAT and STEP format are supported as standard.
- As an option, CATIA V4, CATIA V5, Creo, Unigraphics/NX, IGES, VDAFS, Parasolid, and Solidworks are available.

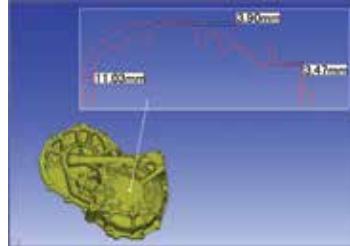
**Comparison by features**

- MSURF-I can detect various features from point cloud or mesh data and compare with nominal data. It also can calculate distances between features that have point data such as circle elements.
- Detectable features include basic plane, point, straight line, circle, slot, cylinder, cone, sphere, etc., and also weld bolt, weld nut, cylindrical pin, T-shaped stud and more.



**Comparison of cross-sectional shape**

- Cut of a point cloud, mesh data or master data allows for comparison of cross-sectional shapes and calculation of angle, distance, radius of curvature and more.
- The turbine blade analysis function enables calculation of LE thickness, TE thickness, maximum thickness, cord length, etc.



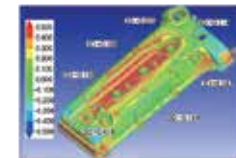
Section evaluation (dimensional calculation)



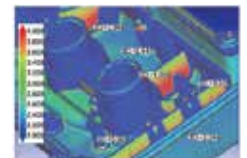
Turbine blade analysis (optional function)

**Comparison of plane shape**

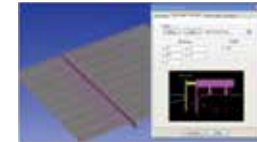
- The plane shape error will be displayed on a color map by comparing a point cloud or mesh data with CAD data.
- Thickness can be displayed on a color map, therefore, it is not necessary to cut a real workpiece.
- Capability of defining the shape of digital calipers enables evaluation of various types of uneven gaps.
- The evaluation of surface curvature can be used for evaluating an angle R within a specified dimensional tolerance.



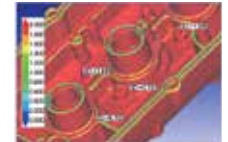
Error color map



Thickness color map



Evaluation of step/clearance



Surface curvature evaluation

**Creation of operating procedure macro by automation function**

- The automation function allows users to record the operating procedure including execution of a measurement macro.
- A series of operations from measurement to evaluation and report can be automated.

**Off-line teaching: MSURF-G**

MSURF-G allows users to create measurement macros using model data. Therefore, users can start measurement immediately when a real workpiece is available. MSURF-G can improve the operating rate of your measuring instrument. Combining it with MSURF-I can reduce the man-hours from measurement to product evaluation.

- CMM time for creating measurement macros can be reduced.
- Measurement macros are created regardless of operator's skill level.
- The workflow from measurement to evaluation can be optimized.

**MSURF-PLANNER**

MSURF-PLANNER software automatically creates 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 contributes to improvements in productivity.

\*MSURF-PLANNER is optional software for MSURF-S and MSURF-G.

# Non-Contact CMM Probe Options

## QVP Quick Vision Probe

Provides image measuring capability for coordinate measuring machines.

The QVP probe performs form measurement by image processing micro geometry that cannot be measured by a contact-type probe or flexible bodies that are easily deformed by slight measuring forces. Although the method of microscopic measurement with the centering microscope mounted on the coordinate measuring machine has been used since CMMs came into use in the industry, they have an inherent disadvantage in that the operation of identifying positions is dependent on the operator, possibly resulting in measurement errors. Even with a CNC CMM, manual measurement may still need to be performed, such as with an installed centering microscope. The QVP probe is a vision probe for CMMs and was developed based on Mitutoyo's state-of-the-art technology in order to enable full automation of image measurement with a CNC CMM. This technology was originally developed for Mitutoyo vision measuring machines.

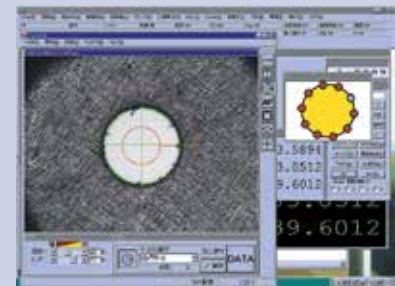


Objective ML1X **375-036**  
 Objective ML5X **375-034**  
 Objective ML10X **375-035**



### Automatic detection of workpiece edge

The QVP-captured image will have various automatic edge detections performed by the dedicated software, Visionpak, and then various calculation processes (calculation of dimensions and geometrical deviations) will be performed with the general purpose measurement program, Geopak.



### VISIONPAK

#### Dedicated data processing software

VISIONPAK operates using the Microsoft Windows operating system and is a general purpose measurement program for coordinate measuring machines. It displays the image window when it detects a workpiece edge. After detecting an edge, it undertakes various calculations with regular general purpose measurement programs.

#### Variety of image processing functions

With the powerful image processing functions (tools), it can detect various forms of edges at high speed. It can measure in the height direction by means of its auto-focus function, and save the captured image as the image data (bitmap format).

#### Outlier removal function

In ordinary micro-form measurement it is often difficult to remove burrs and dusts from the objective workpiece, resulting in an inevitable measurement error. In contrast, VISIONPAK can recognize, for example, the obstruction as an outlier and bypass it during measurement.



### Standard provision of white LED illumination

Since the QVP is equipped with the standard co-axial light running through the lens system, as well as white-light LED ring illumination, which is bright and has a long service life, no auxiliary illumination is required. The light volume can be set to between 0 and 100% in 1% increments.

### Mounting on the automatic probe changer

The QVP also can be mounted on an automatic probe changer (ACR3), allowing full-automatic measurement including both the contact and non-contact types in combination with the contact-type probes. QVP requires PH10M, PH10MQ or PH6M probe head.



## QVP Specifications

<b>QVP Main Unit</b>	CCD Size	1/3 inch (B/W)				
	Optical tube magnification	0.375x				
	Illuminating function	Co-axial	White light LED source (built-in): Power dissipation 5W or less			
		Ring	White light LED source: Power dissipation 10W or less			
	Mass	Automatic-joint type: 315g, shank type: 390g				
	Optical magnification	0.375x	1.125x	1.875x	3.75x	
	Observation range (mm)	9.6x12.8	3.2x4.3	1.9x2.6	1x1.3	
	Working distance (mm)	61	72.3	61	51	
<b>Objective</b>	Magnification	ML1x	ML3x	ML5x	ML10x	
		Optional	Standard	Optional	Optional	
	Numerical Aperture N.A.	0.03	0.09	0.13	0.21	
	Depth of focus (μm)	306	34	16.3	6.2	
	Mass	80g	55g	60g	95g	
<b>QVP I/F BOX</b>	Supply voltage	AC100 to 240V				
	Frequency	50/60Hz				
	Power capacity	45W				
	Mass	3800g				

### Standard-type detector



- 4mN (Stylus R5  $\mu\text{m}$ )
- 4mN (Stylus R10  $\mu\text{m}$ )

### Small hole detector



- 4mN (Stylus R5  $\mu\text{m}$ )

### Extra-small hole detector



- 4mN (Stylus R5  $\mu\text{m}$ )

### Deep groove detector



- 4mN (Stylus R5  $\mu\text{m}$ )

### Gear-tooth surface detector



- 4mN (Stylus R5  $\mu\text{m}$ )



Note: For new purchase of Crysta-AS700 and larger, retrofit of existing Crysta-AS CMM by request.

# CMM Surface Roughness Measuring

## CMM SurfTest Probe

CNC CMMs can be used to measure surface roughness, eliminating workpiece changeover to a second measurement device.

Mitutoyo has developed a range of surface roughness analysis products from handheld portable units to CNC-type SurfTest with broader functions and higher accuracy. By utilizing the technologies developed over the years on surface roughness measuring machines, our coordinate measuring machines can execute surface roughness analysis by implementing a SurfTest Probe and the dedicated software. The SurfTest probe requires PH10M or PH10MQ probe head.



### FEATURES

- Can be attached to our CNC CMM. (Retro-fitting is possible depending on the model.)
- The auto joint-probe system allows probe changing automatically between scanning (SP25M) and the CMM SurfTest surface analysis probe. The measurement and evaluation of size, shape and roughness, is completely automated with auto joint-probe changing.\*
- PH10M(Q) allows surface roughness measurement for features requiring rotation.
- The CMM SurfTest Probe is derived from the successful Mitutoyo SJ-210/310 Series of portable surface finish units.

\* Requires ACR3 change rack (OPTION)

### Skid Measurement Specifications

Item		Specifications
<b>Probe (Detector specifications)</b>	Measurement range	AUTO, 25, 100, 360 $\mu\text{m}$
	Driving range	17.5 mm
	Measurement speed	0.25, 0.5, 0.75 mm/s
	Stylus tip radius	2, 5, 10* $\mu\text{m}$ *Standard-type detector only
	Measuring force	4mN (Std) , 0.75mN (Opt.)
<b>Evaluation software</b>	Analysis software	SURFPAK-SP
	Control software	MCOSMOS
	Miscellaneous	Multi-wire autojoint probe head required (PH6M, PH10M, PH10MQ)

### Skidded Measurement

In skidded measurements, surface features are measured with reference to a skid following close behind the stylus. This cannot measure waviness and stepped features exactly, but the range of movement within which measurement can be made is greater because the skid tracks the workpiece surface contour.

