

CONTOUR AND SURFACE MEASUREMENT

FORMTRACER: COMPLETE SURFACE AND CONTOUR
MEASUREMENT, COMBINED IN ONE SPACE-SAVING SYSTEM.



Intelligent combinations for efficient measuring.

Surface and contour measurement in a single device. No compromise, with all the options.

Meticulous surface and contour measurement to the highest quality standards requires enormous technical competence. As an international supplier of a wide range of production measurement technology, Mitutoyo sets the standard in knowledge and competence in its field. This applies in particular to the economical combination of both measuring processes into a single system that can be adapted to your requirements. FORMTRACER machines meet the requirements of unlimited capacity for surface and contour measurement – intelligently combined into one space-saving, economical device.

This brochure gives you an overview of the broad and intelligently structured Mitutoyo range of models for combined surface and contour measurement. Here you will find the perfect FORMTRACER configuration for roughness and waviness testing as well as for the evaluation of profiles on the production line itself, in the measuring room or in the test laboratory. From semi-automatic through to CNC-controlled high-performance systems, fast, safe and efficient guidance on the best solution for your specific measurement needs. You can request to see more detailed single-product brochures on the FORMTRACER of your choice, the range of accessories and software available.

Whatever you choose: with a Mitutoyo measuring system, you will secure the experience, competence and performance of an internationally successful technology leader, and customer-oriented service worth getting excited about.

Mitutoyo: all the benefits, intelligently combined!

COMBINED MEASURING
MACHINES

FORMTRACER

RACER



The best connections for versatile applications. FORMTRACER variants.

Measuring method Model

Brief profile

SV-C (separate sensor)	Semi-automatic	FORMTRACER SV-C 3200	Intelligent combination of two complete systems for contour measurement and comprehensive surface analysis.
		FORMTRACER SV-C 4500	For particularly stringent requirements in contour measurement in the measuring room and laboratory. With dual stylus system for upward/downward contour measurement.
	CNC	FORMTRACER EXTREME SV-C4500CNC	Powerful CNC-capable connection of two unlimited contour measurement and comprehensive surface analysis systems. With CNC control in all axes for efficient series testing.
CS (combined sensor)	Semi-automatic	FORMTRACER CS-3200	Powerful device with combined sensor for efficient simultaneous measuring of contour and surface in one measuring process.
	CNC	FORMTRACER EXTREME CS-5000 CNC CS-H 5000 CNC	CNC reference system with a large measuring range for maximum precision tasks in research, development and quality assurance. The high end system with integrated laser holoscale for maximum precision in the test room and laboratory.

SV-C



FORMTRACER SV-C 3200
FORMTRACER SV-C 4500



FORMTRACER EXTREME SV-C 4500 CNC

Mitutoyo has a wide range of models for different fields of application.

Specific features

- Two separate, interchangeable sensors
- Digital scale
- Motor-driven height-adjustment of the Z axis
- Fully-automatic sequence of measuring programs

- Two separate, interchangeable sensors
- Dual stylus contour measuring unit
- Motor-driven height adjustment of the Z axis
- Fully automatic sequence of measuring programs

- Powerful as two separate, fully CNC instruments.
- Measurement of long distances in Z2-axis for models without α axis.
- Each axis has a drive speed up to 200 mm/s.
- Dual stylus system for upward and downward contour measurement at doubled sided contours.

- A combined sensor
- Digital scale
- Motor-driven height adjustment of the Z axis
- Fully-automatic sequence of measuring programs

- A combined sensor
- Laser holoscale
- Vibration-absorbing air bearings
- Up to six axes CNC controlled

Model	Measuring range X axis	Height adjustment	Base plate dimensions
SV-C 3200 S4	100 mm	300 mm	600 x 450 mm
SV-C 3200 H4	100 mm	500 mm	600 x 450 mm
SV-C 3200 W4	100 mm	500 mm	1000 x 450 mm
SV-C 3200 L4	100 mm	700 mm	1000 x 450 mm
SV-C 3200 S8	200 mm	300 mm	600 x 450 mm
SV-C 3200 H8	200 mm	500 mm	600 x 450 mm
SV-C 3200 W8	200 mm	500 mm	1000 x 450 mm
SV-C 3200 L8	200 mm	700 mm	1000 x 450 mm
SV-C 4500 S4	100 mm	300 mm	600 x 450 mm
SV-C 4500 H4	100 mm	500 mm	600 x 450 mm
SV-C 4500 W4	100 mm	500 mm	1000 x 450 mm
SV-C 4500 L4	100 mm	700 mm	1000 x 450 mm
SV-C 4500 S8	200 mm	300 mm	600 x 450 mm
SV-C 4500 H8	200 mm	500 mm	600 x 450 mm
SV-C 4500 W8	200 mm	500 mm	1000 x 450 mm
SV-C 4500 L8	200 mm	500 mm	1000 x 450 mm
SV-C 4500 CNC S	200 mm	300 mm	1000 x 450 mm
SV-C 4500 CNC H	200 mm	500 mm	1000 x 450 mm
CS-3200 S4	100 mm	300 mm	600 x 450 mm
CS-5000 CNC S8	200 mm	300 mm	1000 x 450 mm
CS-5000 CNC H8	200 mm	500 mm	1000 x 450 mm
CS-H 5000 CNC	200 mm	300 mm	1000 x 450 mm



FORMTRACER CS-3200



FORMTRACER CS-5000 CNC



CS

FORMTRACER technology: Simply more capable.

TWO in ONE – two measuring processes in a single system

FORMTRACER machines open up the whole range of surface and contour measurement techniques – intelligence and compactness, combined in a single space-saving device. FORMTRACER machines, depending on the version, will also operate either with two separate measuring sequences for each process – or, with combined sensor, in a single measuring sequence for simultaneous surface and contour testing.

SV-C System

Measurement in two separate measuring sequences
FORMTRACER variants with SV-C system are fitted with two separate interchangeable sensors for separate surface and contour measurement. Evaluation and documentation of test results can either be separate or combined using Mitutoyo's FORMTRACEPAK software.



Contour testing

Surface testing

CS System

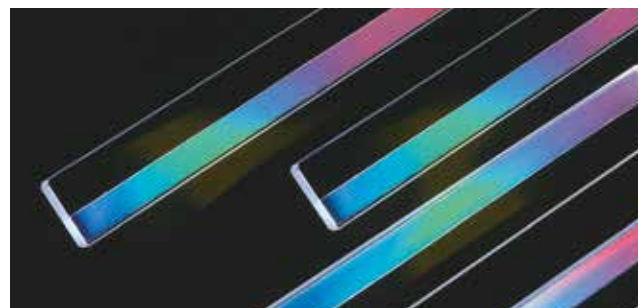
Measurement in a single measuring sequence
FORMTRACER CS machines check the surface and contour of a workpiece in a single measuring sequence. They have a combined sensor for both processes. The FORMTRACEPAK software can either carry out separate or joint evaluation and documentation.



Contour and surface testing

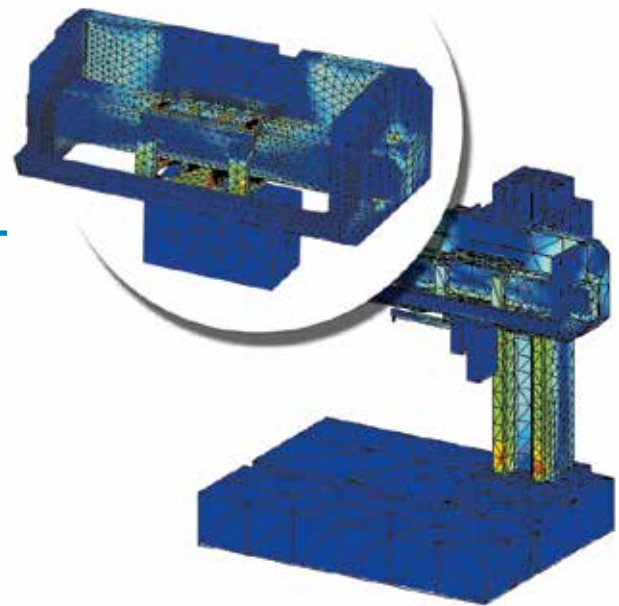
Laser holoscale

Several models in the FORMTRACER series are fitted with highly sophisticated laser holoscales for maximum precision work. Laser holoscales are glass scales which use the diffraction phenomenon of light to make the measurement by projecting an interference pattern from a laser onto a holographic screen. A photoelement then transforms the pattern into an electrical sinusoidal wave. This innovative technology can achieve highest resolutions over the entire measuring range.

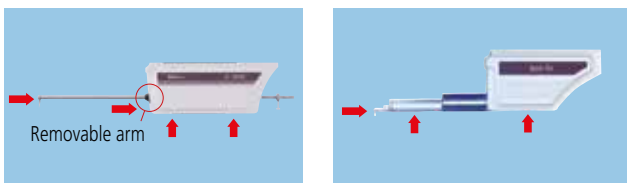


New design principles for even greater stability

Higher stability and guidance quality due to modern design processes: FORMTRACER measuring machines are designed using the finite element method (FEM). This ensures considerably greater rigidity and straightness of the guide elements and effective vibration reduction – essential factors in giving these systems their impressive power.



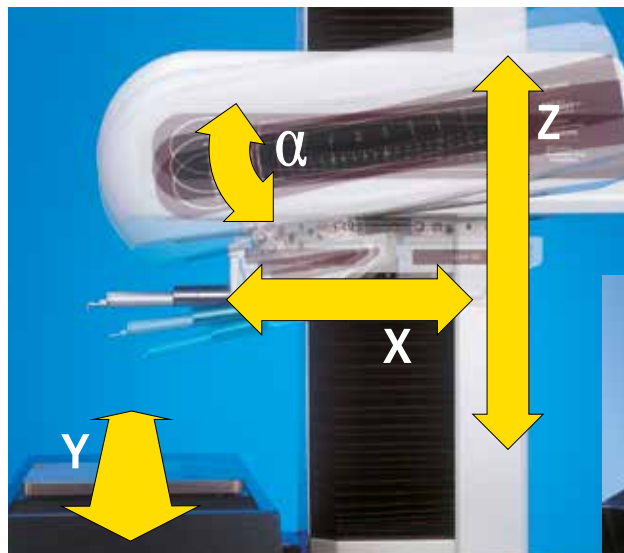
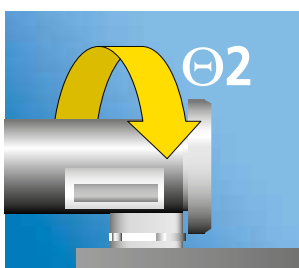
Collision prevention



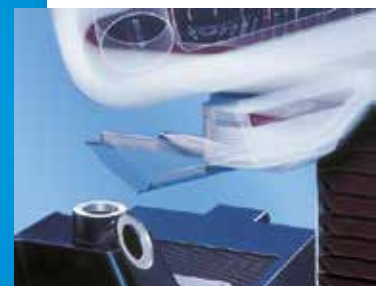
FORMTRACER machines in the SV-C, CS-3200 and CS-5000 CNC series are equipped with collision prevention.

Control in up to six axes

Control in up to six axes – including tilting and rotational movements – means that the CNC systems in the FORMTRACER series can position workpieces extremely quickly and therefore achieve optimum throughput rates during series measurements. Particularly useful is the option of controlling all axes via the double joystick supplied as standard.

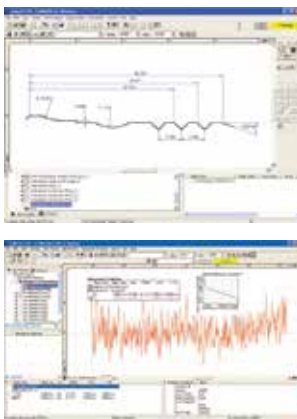


Tilting of the measuring system



FORMTRACER SV-C 3200 and SV-C 4500. Double benefits, no compromise.

Measuring range:	
X axis	100/200 mm
Z2 axis	300/500/700 mm
CONTOUR MEASUREMENT:	
Measuring range Z1	60 mm
Resolution Z1	0.04 μm
Accuracy X [S4,H4,W4, L4]	$\pm(0.8+0.01L)$ μm
Accuracy X [S8,H8,W8, L8]	$\pm(0.8+0.02L)$ μm
Accuracy Z1	$\pm(1.4+0.02H)$ μm
Straightness X	0.8 $\mu\text{m}/100$ mm 2 $\mu\text{m}/200$ mm
SURFACE MEASUREMENT:	
Measuring range Z1	800/80/8 μm
Resolution Z1	up to 0.0001 μm
Straightn. X [SHWL4]	(0.05+0.0001L) μm
Straightn. X [SHWL8]	(0.1+0.002L) μm



Measuring and analytical software

Measuring range:	
X axis	100/200 mm
Z2 axis	300/500/700 mm
CONTOUR MEASUREMENT:	
Measuring range Z1	60 mm
Resolution Z1	0.02 μm
Accuracy X [S4,H4,W4,L4]	$\pm(0.8+0.01L)$ μm
Accuracy X [S8,H8,W8,L8]	$\pm(0.8+0.02L)$ μm
Accuracy Z1	$\pm(0.8+0.02H)$ μm
Straightness X	0.8 $\mu\text{m}/100$ mm 2 $\mu\text{m}/200$ mm
SURFACE MEASUREMENT:	
Measuring range Z1	800/80/8 μm
Resolution Z1	up to 0.0001 μm
Straightn. X [SHWL4]	(0.05+0.001L) μm
Straightn. X [SHWL8]	(0.1+0.002L) μm

FORMTRACER SV-C 3200

As powerful as two separate specialized systems.
Economically combined into a single device.

- Two separate sensors for contour and surface analysis
- Expanded contour measuring range of Z1 = 60 mm as standard
- Surface measurement range of 800 μm as standard
- Easy exchange of magnetic contour stylus arm gives excellent flexibility
- Measurement and analytical software FORMTRACEPAK
- Excellent accuracy and resolution
- Highest positioning speed up to 80 mm/s



SV-C 3200

FORMTRACER SV-C 4500

High accurate system for high-precision testing in
measuring rooms and laboratories.

- Dual stylus contour measuring unit for upward / downward measurement at double sided contours
- Contour measuring range of Z1 = 60 mm as standard
- Surface measurement range of 800 μm as standard
- Measuring force controlled by software FORMTRACEPAK
- Easy exchange of magnetic contour stylus arm gives excellent flexibility
- Highest accuracy and resolution
- Highest positioning speed up to 80 mm/s



SV-C 3200

SV-C 4500

FORMTRACER

Semi-automatic



SV-C 4500



FORMTRACER EXTREME SV-C 4500 CNC.

Production-ready measurement competence.

SV-C 4500 CNC

Measuring range:

X axis	200 mm
Z2 axis	300/500 mm

CONTOUR MEASUREMENT:

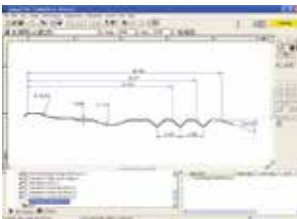
Measuring range Z1	60 mm
Measuring range Z2	300/500 mm
Accuracy X	$\pm(0.8+4L/200) \mu\text{m}$
Accuracy Z1	$\pm(0.8+0.02H) \mu\text{m}$
Accuracy Z2 for model w/o α -axis	$\pm(1.5+0.01H) \mu\text{m}$
Straightness X	2 $\mu\text{m}/200 \text{ mm}$

SURFACE MEASUREMENT:

Measuring range Z1	800/80/8 μm
Resolution Z1	up to 0.0001 μm
Straightness X	0.5 $\mu\text{m}/200 \text{ mm}$

Traversing speed:

CNC	max. 200 mm/s
Joystick	0-60 mm/s

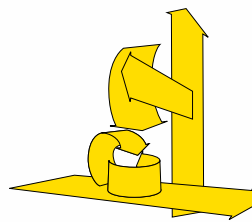


Measuring and analytical software

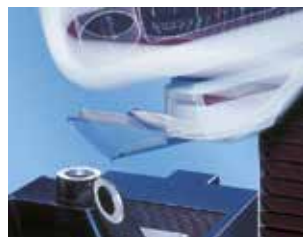
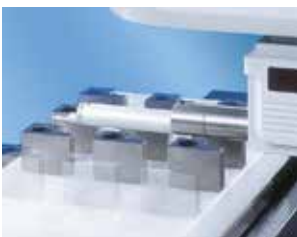
FORMTRACER EXTREME SV-C 4500 CNC

Perfect combination of two powerful systems for contour and surface analysis. With CNC control in six axes for comprehensive serial measurements.

- Powerful as two separate, fully CNC instruments.
- Measurement of long distances in Z2-axis for models without α axis.
- Each axis has a drive speed up to 200 mm/s.
- Dual stylus system for upward and downward contour measurement at doubled sided contours.
- It's variable contour measuring force is controlled by software FORMTRACEPAK.
- The contour drive unit is equipped with an arc encoder detector giving excellent accuracy and resolution in Z1-axis.
- Perfectly made for increased throughput of multiple profile and workpiece measurement tasks.
- The detector unit incorporates an anti-collision safety device, causing it to automatically stop if its main body collides with a workpiece or jig.



Control in up to 6 axes



FORMTRACER CNC



Surface Roughness drive unit



Contour drive unit

FORMTRACER CS-3200. Double the value – half the cost.

CS-3200

Measuring range:

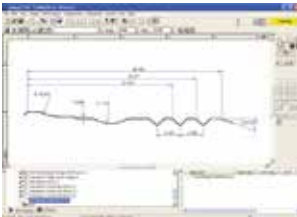
X axis	100 mm
Z1 axis	5 mm

Accuracy:

X axis	$\pm(0.8+0.01L) \mu\text{m}$
Z1 axis	$\pm(1.5+0.02H) \mu\text{m}$

Resolution:

X axis	0.05 μm
Z1 axis	0.08 $\mu\text{m}/5 \text{ mm}$ 0.0008 $\mu\text{m}/0.05 \text{ mm}$



Measuring and analytical software



FORMTRACER CS-3200

Simultaneous surface and contour testing over a wide measuring range in a single pass. For maximum savings in time and cost.

- A combined sensor
- Inclination of the sensor up to $\pm 45^\circ$ possible
- Straightness of the X axis (feed): 0.2 $\mu\text{m}/100 \text{ mm}$
- Ceramic guides on the X axis (feed)
- Inductive measuring system in the Z1 axis
- Motor-driven height adjustment of the Z2 axis
- Automatic raising and lowering of the probe tip
- Joystick operation for moving all axes and among other things for starting and stopping the measuring process
- Measurement and analytical software FORMTRACEPAK supplied as standard
- Data transmission via USB interface
- ABS scale in the Z2 axis
- High traversing speed
- Automatic calibration function
- Collision prevention

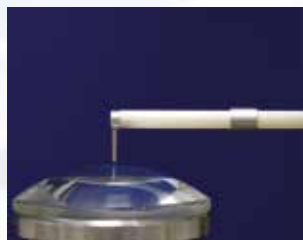


PLEASE NOTE: A start-up system (relocation detection sensor) is an integral security feature of this machine and will disable its operation if subject to relocation or strong vibration. Please be advised to contact your nearest Mitutoyo Service Centre as soon as possible or in advance of such circumstance.



FORMTRACER

Semi-automatic



FORMTRACER EXTREME CS-5000 CNC/CS-H 5000 CNC. Setting the standards.

CS-5000 CNC / CS-H 5000 CNC

CS-5000 CNC

Measuring range:

X axis	200 mm
Z1 axis	12 mm / 24 mm
Z2 axis	300 / 500 mm

Accuracy:

X axis	$\pm(0.3+0.02H) \mu\text{m}$
Z1 axis	$\pm(0.3+0.02H) \mu\text{m}$

Resolution:

X axis	0.00625 μm
Z1 axis	0.0008 μm

Traversing speed:

CNC	max. 200 mm/s
Joystick	0-50 mm/s

CS-H 5000 CNC

Measuring range:

X axis	200 mm
Z1 axis	12 mm / 24 mm
Z2 axis	300 mm

Accuracy:

X axis	$\pm(0.16+0.001L) \mu\text{m}$
Z1 axis	$\pm(0.07+0.02H) \mu\text{m}$

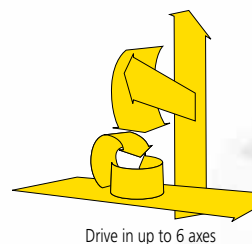
Resolution:

X axis	0.00625 μm
Z1 axis	0.0008 μm

FORMTRACER EXTREME CS-5000 CNC/CS-H 5000 CNC

Perfect CNC precision for research, development, quality assurance and series testing. Better, high speed performance and a wide measuring range.

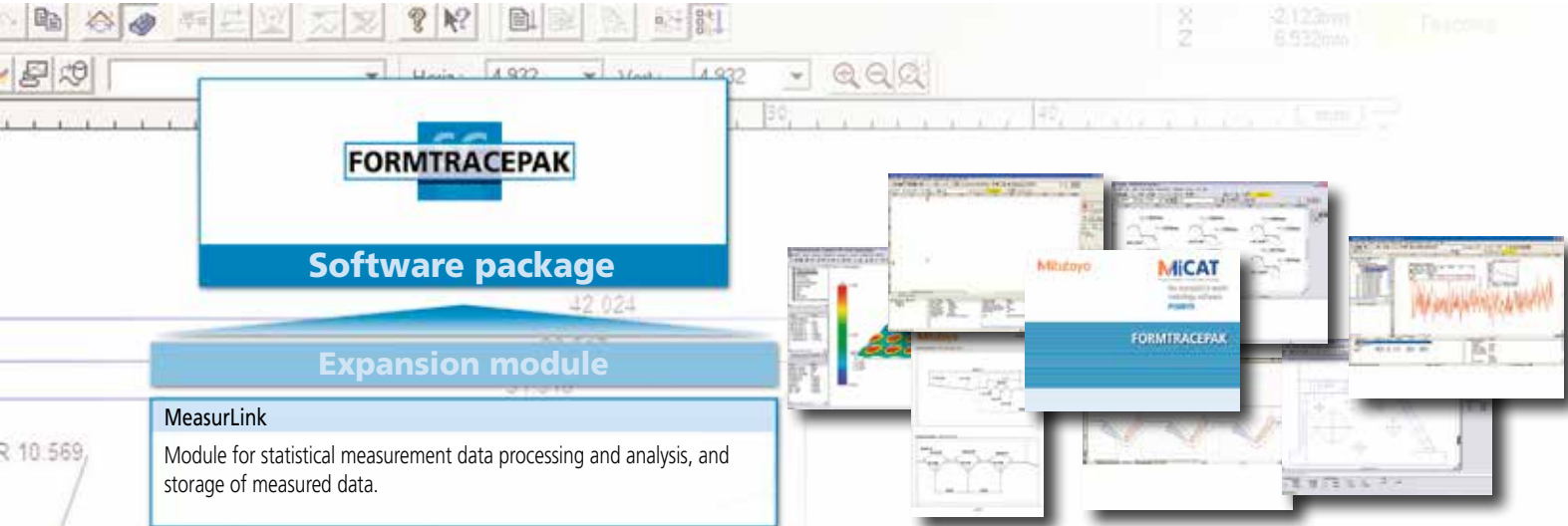
- A combined sensor
- Laser holoscale in the X and Z axes
- Ceramic guides on the X axis (feed)
- Drive is possible in up to six axes (CS-H up to 5 axes)
- Active control of the probe system
- Automatic positioning of the workpiece with controllable rotary table and Y table
- Vibration-absorbing air bearing
- Double joystick operation for programming all six axes and for starting and stopping the measuring process, etc.
- Measurement and analytical software FORMTRACEPAK supplied as standard
- Data transmission via USB interface
- Highest accuracy with CS-H 5000 CNC



FORMTRACER CNC



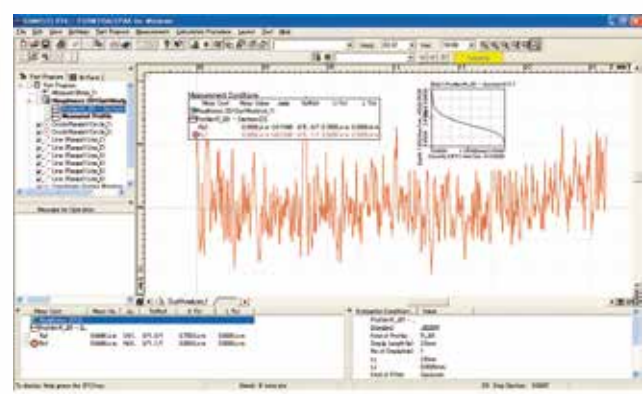
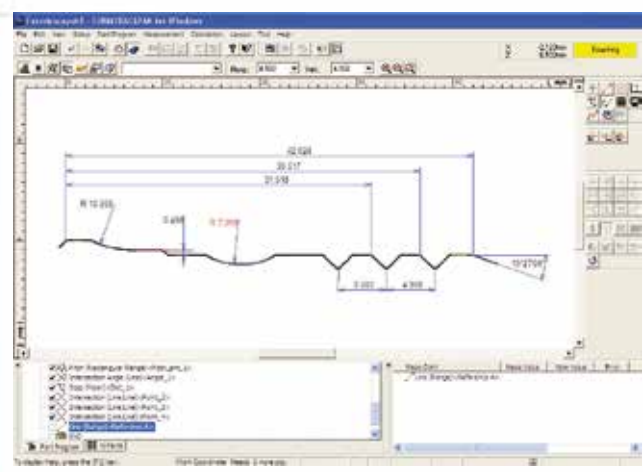
Software FORMTRACEPAK



With all systems in the SV-C and CS series, multilanguage FORMTRACEPAK software covers machine control and the evaluation and documentation of test results. Depending on the system used, FORMTRACEPAK also controls the machine axes.

This software solution offers the user the full program of maximum efficiency surface and contour measurement with versatile evaluation and documentation options. Some examples follow:

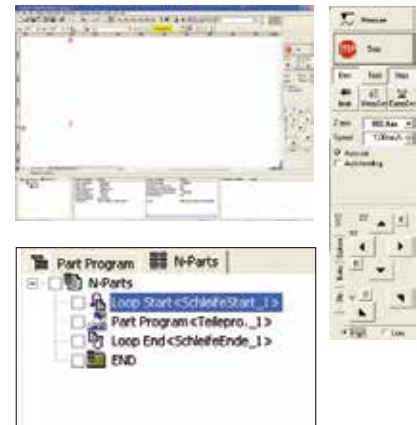
- Automatic measurement program sequences
- Best fit for automatic measuring sequence
- Representation of results as a drawing and table
- Graphic representation of contour or surface profile
- Construction of help geometries
- Contour comparison
- Freely-definable tolerance ranges
- Editing function
- Automatic storage of the measurement results
- Layout editor for representation of the test results
- Automatic calibration function
- Archiving of calibration data



All FORMTRACER machines are supplied as standard with perfectly configured software tailored to the specific performance profiles.

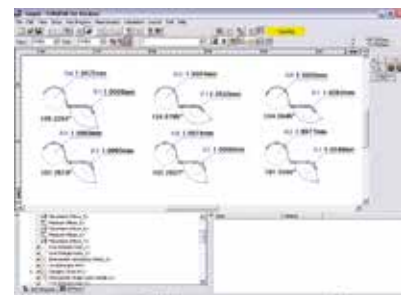
Measurement Control

- The Measurement Control screen has various command buttons appropriately arranged. They are required for creating and executing measurement procedures (part programs). Since the buttons and display areas not frequently used can be optionally set for display or no-display, the operator is permitted to arbitrarily customize the screen layout as easily as possible for operation.
- The "Workpiece Identification Function", for example, that detects the amount of offset brought up during datum setting and mechanically fine-adjusts each axis to the optimum setting position for the measurement, as well as the "Coordinate System Alignment" commands that generate the optimum coordinate system for each measurement part, allow fully automatic running.
- With the multi-axis translation command that simultaneously controls the movement along a maximum of six axes it is now possible to reduce the operation time required by the measuring instrument to a minimum and to further reduce the tracing time.
- For measuring multiple parts arranged on the palette, the use of the multiple-part loop function that repeats a set of movement, measurement, and analysis commands can reduce the time required to create the specific measurement steps.



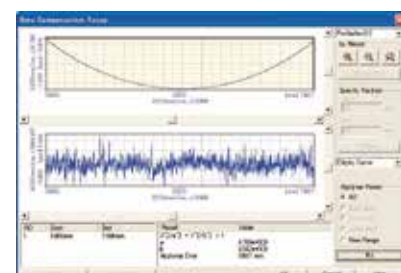
Profile Analysis Function

- Various commands including the point command (10 kinds), line command (6 kinds), and circle command (6 kinds) are provided to cover the basic elements of analysis. Standard calculation commands that combine these elements for angle, pitch, and distance calculations are also provided. The display method used by additional commands that are not regularly used can be optionally tailored by the customization function, e.g. "Hide", can be applied to the calculation command button to suit the application environment.
- The step from performing a single measurement using the intuitive menu functions to creating a part program is easily done with a few mouse clicks.
- Calculation results will be output as text (in the csv or txt format). The geometrical measurement data can be either output as a text file of point-series data or a CAD file (in the DXF or IGES format) or copied onto the clipboard. It is also possible to use some commercial documentation software and statistical processing software to share the data on a PC that is not equipped with Mitutoyo-original analysis software or if reverse engineering is intended with CAD.



Surface Roughness Analysis Function

- Using the surface roughness measurement data it is possible to conduct analysis that conforms to global standards including EN ISO, VDA, JIS, ANSI, MOTIF, etc.
- This software has integrated not only parameter calculating functions but also comprehensive graphical analysis functions, which can be widely used in daily quality control and R&D operations.
- Also enhanced with the data correction function (applicable to inclination and a curved surface) and data elimination function, etc.

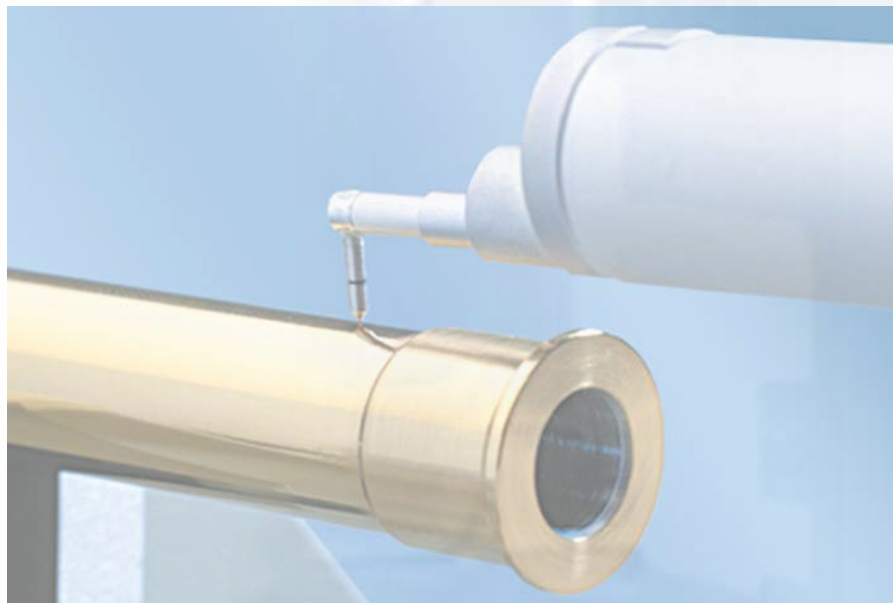


Possible combinations of probe components for the FORMTRACER models SV-C 3200, SV-C 4500 and SV-C 4500 CNC.

Probe tips for surface measurement*

Version	Dimensions	Tip detail	Version	Dimensions	Tip detail
Standard 12AAC731 (2 µm) 12AAB403 (5 µm) 12AAB415 (10 µm)			For deep holes X 3 probes 12AAC741 (2 µm) 12AAB414 (5 µm) 12AAB426 (10 µm)		
For small holes 12AAC733 (2 µm) 12AAB405 (5 µm) 12AAB417 (10 µm)			For deep grooves 12AAC737 (2 µm) 12AAB407 (5 µm) 12AAB419 (10 µm)		
For deep holes X 2 probes 12AAC740 (2 µm) 12AAB413 (5 µm) 12AAB425 (10 µm)			Eccentric 12AAC739 (2 µm) 12AAB412 (5 µm) 12AAB424 (10 µm)		

* Extract from the wide range of styli.



For contour measurement

Version	Dimensions	Designation	H
Applicable arms for SV-C3200, SV-C4500, SV-C4500 CNC			
Straight 12AAM101		AB-31	
Eccentric 12AAQ762		AB-37	
Small hole 12AAM103		AB-33	

Version	Dimensions	Designation	H
Applicable styli for SV-C4500, SV-C4500 CNC			
Both sides conical 12AAM095		SPHW-56	20 mm
Both sides conical 12AAM096		SPHW-66	32 mm
Both sides conical 12AAM097		SPHW-76	48 mm
Both sides small hole 12AAM108		SPHW-31	2.4 mm
Both sides small hole 12AAM109		SPHW-32	5 mm
Both sides small hole 12AAM110		SPHW-33	9 mm

Applicable styli for SV-C3200, SV-C4500, SV-C4500CNC**

Flat on one side		SPH-51 SPH-61 SPH-71 SPH-81 SPH-91	6 mm 12 mm * 20 mm 30 mm 42 mm
Cross-ground		SPH-52 SPH-62 SPH-72 SPH-82 SPH-92	6 mm 12 mm 20 mm 30 mm 42 mm
Conical		SPH-53 SPH-63 SPH-73 SPH-83 SPH-93	6 mm 12 mm 20 mm 30 mm 42 mm
Knife edge		SPH-54 SPH-64 SPH-74 SPH-84 SPH-94	6 mm 12 mm 20 mm 30 mm 42 mm
Ball		SPH-55 SPH-65 SPH-75 SPH-85 SPH-95	6 mm 12 mm 20 mm 30 mm 42 mm

* Standard accessory

** Extract from the wide range of styli.

Applicable styli for SV-C3200, SV-C4500, SV-C4500 CNC

Small hole		SPH-41	2 mm
Small hole		SPH-42	4 mm
Small hole		SPH-43	6.5 mm

Possible styli with the FORMTRACER model CS-3200.

Styli for surface and contour measurement

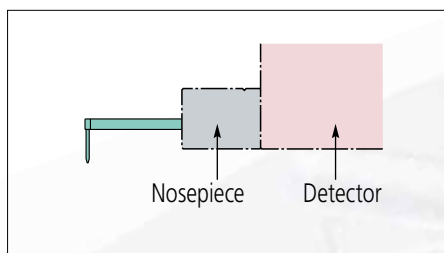
Type	Dimensions	Specifications
Standard stylus (No. 12AAD554) Standard accessory		<ul style="list-style-type: none"> • Radius of tip curvature: 2 μm • Tip form: 60° cone • Tip material: Diamond • For contour/surface roughness measurement • Measurable depth: 7 mm max.
Cone stylus (No. 12AAD552) Standard accessory		<ul style="list-style-type: none"> • Radius of tip curvature: 25 μm • Tip form: 30° cone • Tip material: Sapphire • For contour measurement • Measurable depth: 7 mm max.
Small hole stylus (No. 12AAD556)		<ul style="list-style-type: none"> • Radius of tip curvature: 2 μm • Tip form: 60° cone • Tip material: Diamond • For contour/surface roughness measurement • Applicable hole: ø 2 mm min. • Measurable depth: 15 mm max.
Eccentric type stylus (No. 12AAD558)		<ul style="list-style-type: none"> • Radius of tip curvature: 2 μm • Tip form: 60° cone • Tip material: Diamond • For contour/surface roughness measurement • Offset from center line: 15 mm
Deep groove stylus (No. 12AAD560)		<ul style="list-style-type: none"> • Radius of tip curvature: 2 μm • Tip form: 60° cone • Tip material: Diamond • For contour/surface roughness measurement • Measurable depth: 20 mm max.
2x-long stylus*1 (No. 12AAD562)		<ul style="list-style-type: none"> • Radius of tip curvature: 5 μm • Tip form: 40° cone • Tip material: Diamond • For contour/surface roughness measurement

*1: Measuring force is 4mN and the Z1 measuring range and resolution is double that of the standard stylus.

Possible styli with the FORMTRACER models CS-5000 CNC and CS-H 5000 CNC.

Styli for surface and contour measurement

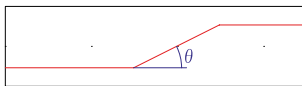
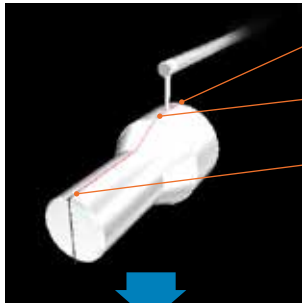
Type	Dimensions	Tip detail		Additional for CS-H5000CNC
Standard		Standard 12AAD543 	Ball tip 12AAD544 	12AAJ037
Double length		Standard 12AAD545 	Ball tip 12AAD546 	12AAJ039 12AAJ041
For small holes		12AAD651 	12AAD652 	
Eccentric		12AAD653 		



Accessories

Manual three-axis adjustment table

Aligned

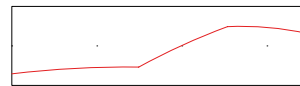
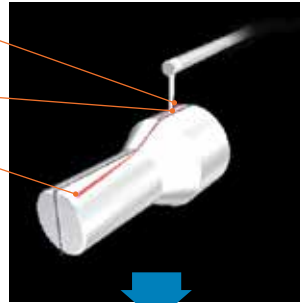


Measurement end point

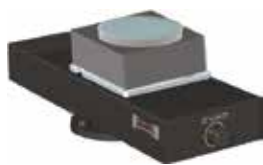
Path traced by stylus

Measurement start point

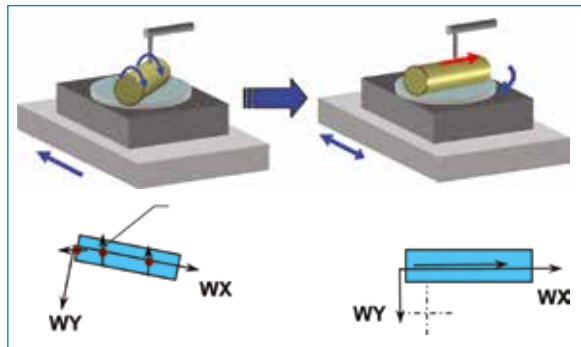
Not aligned



Measured contour



Combination Y table and $\theta 1$ axis



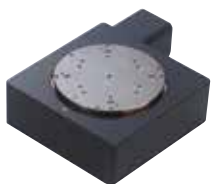
For significantly easier manual fine positioning of the workpiece using integral Digimatic micrometers. The information required for alignment is provided and displayed by the software. The triple-axis adjustment table also enables ideal alignment of cylindrical workpieces to the measurement axis – measurement errors by deviation from the axis of the parts tested can therefore be reliably avoided.

As an alternative to manual alignment, FORMTRACEPAK software, in combination with CNC accessories, will automatically align workpieces and ensure optimum measurement conditions.

Automatic leveling table

For automatically aligning the workpiece with the reference plane. After determining the workpiece inclination by the measuring system, the software calculates the optimal automatic setting of the levelling table.

Examples of accessories for CNC function support



$\theta 1$ axis



$\theta 2$ axis



Y table



2D/3D auto-leveling table

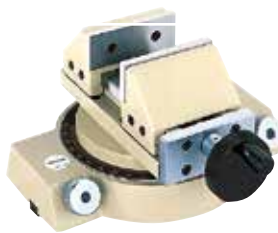


218-001



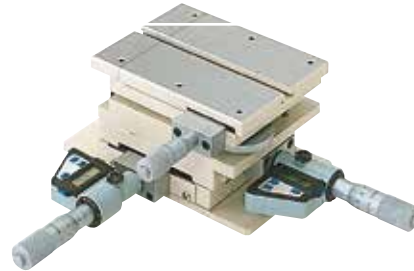
XY table

218-003



Rotary vice

178-052-1

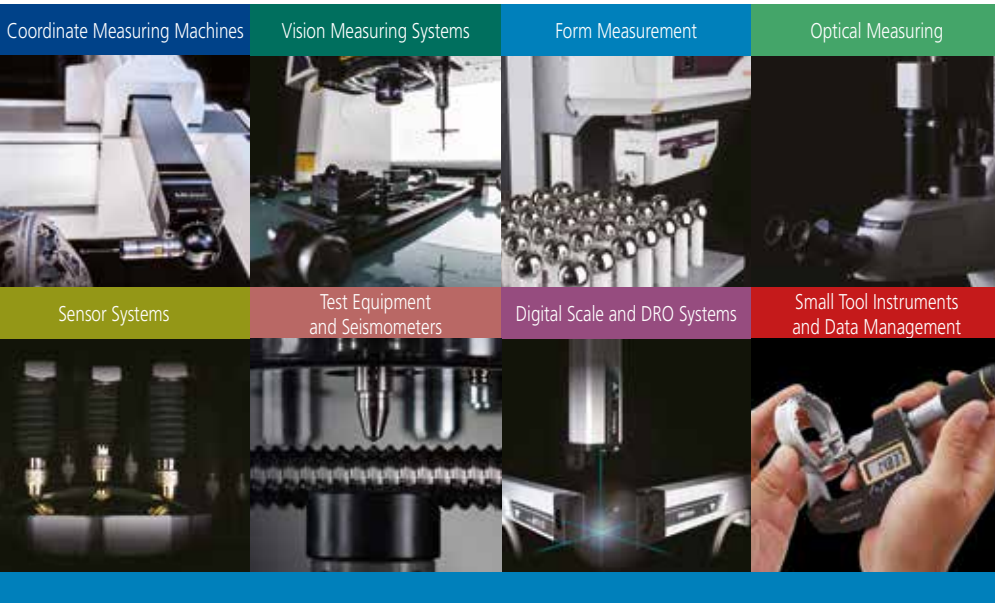


XY levelling table (DIGIMATIC)

178-019



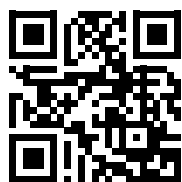
Vice



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