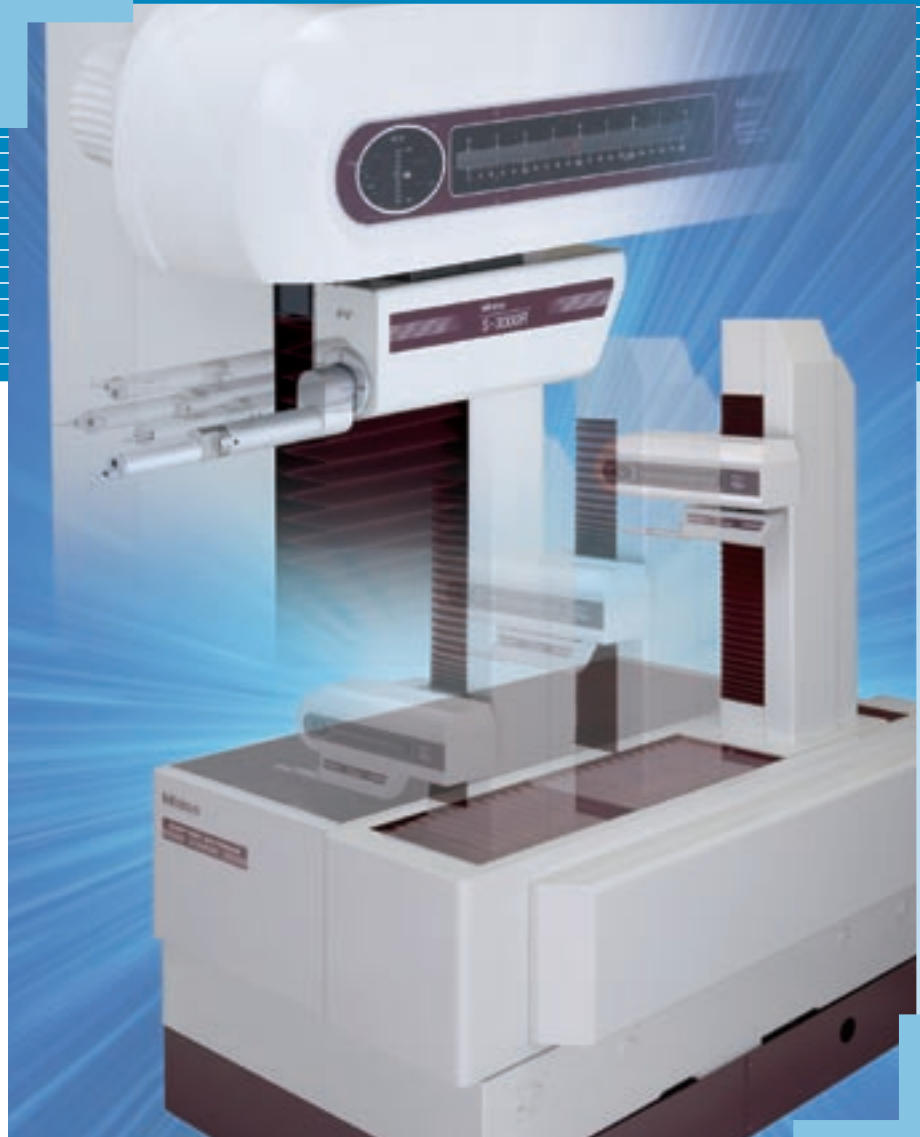


CNC FORM MEASURING INSTRUMENT SERIES

Catalog No. E15021



The world's leading range of CNC Form Measuring Machines ushers in a new age of automated measurement. Simply switching to the dedicated part program for each workpiece greatly improves measurement throughput and helps maximize productivity.

Mitutoyo

Towards improved measurement efficiency

CNC Surface Roughness Tester **Surftest Extreme**

CNC Surface Texture Measuring Instrument CNC Contour Measuring Instrument **Formtracer Extreme**



Existing measurement process

- ➔ ○ Workpiece loading / unloading
- ▼ ○ Workpiece leveling, etc.
- ▼ ○ Positioning the measurement start point
- ▼ ○ Measurement
- ▼ ○ Analysis of recorded geometrical data
- ▼ ○ Print

To be repeated for all workpieces.



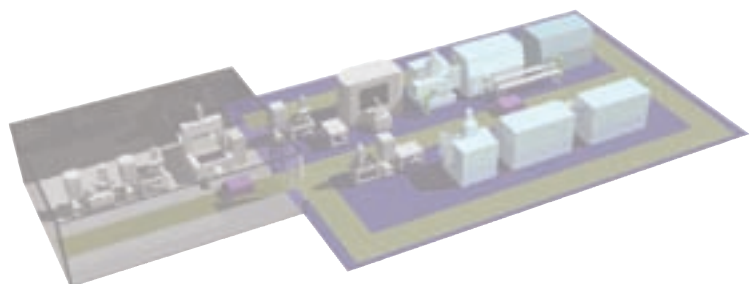
Ties up the operator for an extended period of time.

CNC Measurement

- As soon as a workpiece pallet is loaded, measurement can be started.



**A CNC measuring machine runs unmanned.
Now the operator can commit to other tasks.**



Applicable workpiece

Measurement conditions

Time for measurement

Crankshaft



Number of measurement points: Approx. 40 points
Measuring position: Pin/Journal/Thrust surface. Measuring direction: Along the axis of each cylindrical unit/On the surface of each thrust bearing.
Preliminary arrangements: Shifting workpiece/Changing workpiece position/Alignment
Analysis items: Surface roughness/Straightness
*Alignment in the direction of measurement or mounting the shaft takes time, and can require two people!

Manual: 90 minutes



CNC: 20 minutes

Cylinder head



Number of measurement points: Approx. 60 points
Measuring position: Six surfaces and the inside diameter of each bore.
Measuring direction: Multiple directions including the top, bottom, and side surfaces; and in the inclined holes.
Preliminary arrangements: Shifting workpiece/Changing workpiece position/Alignment, etc.
Analysis items: Surface roughness/Contour and profile
*Since more than ten position changes are required to set the workpiece at the measuring point, the measurement efficiency is badly affected!

Manual: 90 minutes



CNC: 30 minutes

Transmission gear



Number of measurement points: Approx. 4 points
Measuring position: Near tip of tooth. Measuring direction: Tangent line
Preliminary arrangements: Workpiece rotation/Workpiece positioning
Analysis item: Contour and profile
*Although the rotary positioning at every 90 degrees requires simple repetitive operations, a significant difference will result in the amount of time required and the accuracy depending on the operator's skill.

Manual: 20 minutes



CNC: 5 minutes

(Each estimated time covers measurement of four teeth.)

Valve body



Number of measurement points: Approx. 20 points
Measuring position: Seating surface and holes
Measurement direction: Top surface and the hole inside diameter in any of the three directions.
Preliminary arrangements: Shifting workpiece/Changing workpiece position/Alignment, etc.
Analysis items: Surface roughness
*The seating surface can be measured easily after shifting the workpiece appropriately. However, it is not so easy to measure the inside surface roughness of a hole, since the measuring position may be difficult to see by the operator during positioning!

Manual: 40 minutes



CNC: 15 minutes

Printer roll



Number of measurement points: Approx. 3 points/workpiece
Measuring position: On the cylinder's generatrix. Measurement direction: Along the generatrix axis
Preliminary arrangements: Workpiece change/Alignment
Analysis items: Surface roughness/Straightness
*Little time is required to measure only one piece. However, as the number of pieces to be measured within a day becomes large, so does the total time required for alignment, resulting in a time-consuming job!

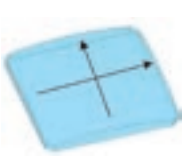
Manual: 50 minutes



CNC: 15 minutes

(Each estimated time covers measurement of ten rolls.)

Aspheric surface lens



Number of measurement points: Approx. 2 points
Measurement position: Along two lines crossing each other on the sectional plane perpendicular to the optical axis
Measurement direction: In the direction of stylus retraction
Preliminary Arrangements: Workpiece rotation/Workpiece leveling/Optical axis positioning
Analysis items: Contour and profile/Tolerance zone measurement data/Surface roughness
*It is critical to measure at the sectional profile, which is perpendicular to the optical axis and necessitates a significant amount of time for establishing the complete settings!

Manual: 40 minutes



CNC: 5 minutes

Rotor/Spindle for motors



Number of measurement points: Approx. 2 points/workpiece
Measuring position: On the cylinder's generatrix
Measurement direction: Along the generatrix axis
Preliminary arrangements: Workpiece change/Alignment
Analysis items: Surface roughness/Straightness
*It takes little time to measure only one piece. However, since it is often the case that many workpieces are measured during each job, the total setting time required may become too large for piece-by-piece setting!

Manual: 40 minutes



CNC: 20 minutes

(Measurement of 20 workpieces is estimated within each time period.)

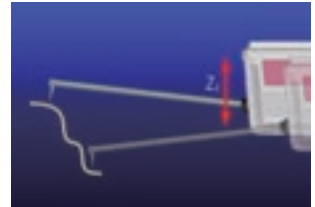
A Range of Functions Enhance Your Measurement Efficiency

Accelerating measurement efficiency through new measuring functions under CNC control

> Tracking measurement function

The Z₂-axis* control makes the target range of form (contour) tracing measurement wider than that covered by only the detector unit.

*Upward and downward movement of detector unit

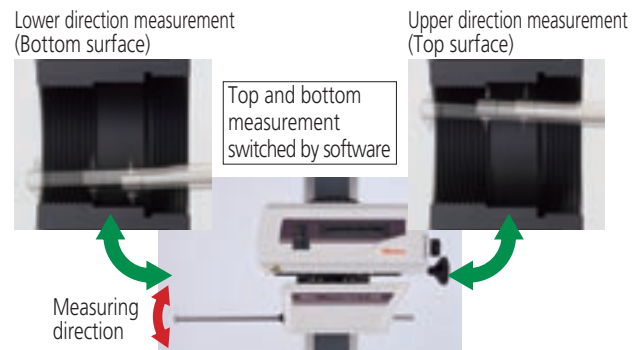


>

Upper and lower surfaces can be measured continuously by using

Mitutoyo's double-sided conical stylus.

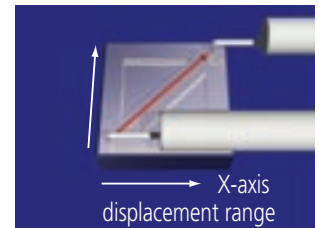
This continuous measurement data can be used to facilitate analysis of features that were difficult to measure before, such as the effective diameter of an internal screw-thread.



> Inclined plane measurement function (surface roughness)

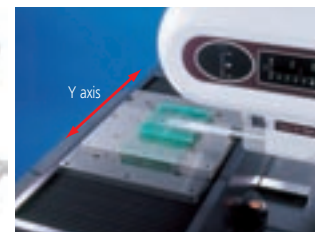
Simultaneous control over the X axis and Y axis enables oblique-movement measurement to be performed.

Even continuous measurement can be achieved without re-setting the workpiece so that the measuring direction can be parallel to the drive unit.



Part program-guided automatic continuous measurement of multiple points/multiple workpieces

The use of the Y-axis table makes it possible to perform automatic continuous measurement of multiple workpieces (measurement points).



With Y-axis table

> Models with the α axis (incorporated with the drive unit tilting function) enable continuous measurement on multiple sections of surfaces including inclined portions without changing the initial set up.

> Installs the Automatic Leveling Function using the α axis or optional Auto Leveling Table.



With α -axis

High-throughput measurement enabled by fast positioning

> Thanks to its high drive speed (a maximum of 200mm/s*), which is the fastest in the world, and multiple-axis simultaneous control, the detector can be positioned practically instantaneously on the target measurement point.

(* Maximum 40mm/s for CS-5000CNC)



Easy-to-use Remote Box allows the operator to control the measuring unit at hand

- > Easy-to-understand operation buttons identified by each icon marked on the top.
- > Also provided with the Speed Override Knob, which allows the operator to change the traveling speed even during automatic execution.

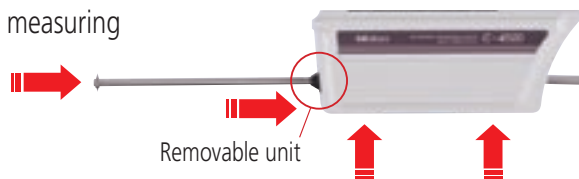


An anti-collision safety function is also provided to protect the operator, measuring unit, and/or workpiece from damage.

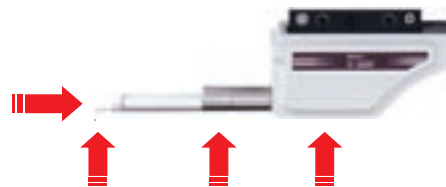
- > This safety device will automatically stop the measuring unit should a collision occur.

Direction of collision that may cause the safety device to be triggered

- Detector for contour measuring



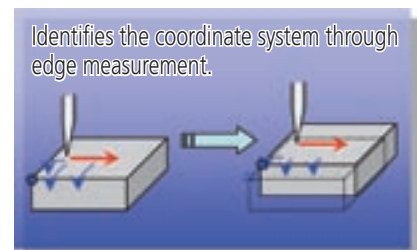
- Detector for surface roughness measuring



FORMTRACEPAK, the surface roughness/form analysis software that strongly supports CNC measurement

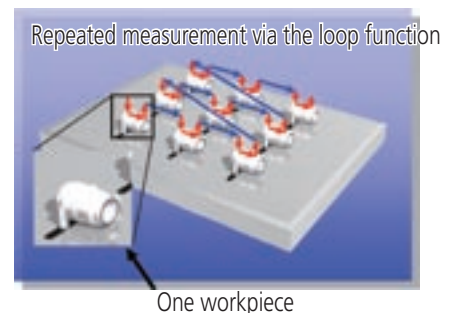
- > Workpiece identification (coordinate system alignment)

It is possible to measure the same point even when the current workpiece is positioned in a place offset from that which was set at the time of creating the part program, if the operator establishes the workpiece coordinate system another time.



Supports multiple-part measurement.

- > By repeatedly running one section of a part program using the loop function, it is possible to batch-measure more than workpiece having an identical form.



CNC Form Measuring Instrument Line-Up

Contributes greatly to your productivity improvement by increasing measurement throughput. The world's leading range of CNC Form Measuring Machines ushers in a new age of automated measurement.



Surftest Extreme SV-3000CNC
(With drive unit inclination mechanism and Y-axis table)



Surftest Extreme SV-M3000CNC
(Y-axis column moving type Surface Roughness Tester)
(Picture above is special specification)



Formtracer Extreme SV-C4500CNC
(Example of mounting detector for contour measurement)
(With drive unit inclination mechanism and Y-axis table)



Formtracer Extreme CS-5000CNC



Formtracer Extreme CS-H5000CNC
With Y-axis table

CNC Surface Roughness Measuring Instrument Surftest Extreme SV-3000CNC

Features

- › The X₁-, Y- and Z₂-axes have a maximum drive speed of 200mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- › For models with the Y-axis table, it is possible to perform inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- › For models with the α -axis drive, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X₁ axis.
- › For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in Y.
- › Measuring force for the Z₁-axis detector is selectable from 4mN or 0.75mN.
- › Confining all cables needed for the detector and drive unit internally has eliminated cable friction that could potentially cause a measurement error, while at the same time achieving high-speed drive.
- › The Z₁-axis detector incorporates an anti-collision safety device to automatically stop the machine if the detector body touches a workpiece or jig.
- › Mitutoyo's lineup of CNC Surface Roughness Testers offers 8 models that cover all possible combinations of standard and high column types, α -axis drive and Y-axis drive to suit every application.
- › Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.



SV-3000CNC
(With drive unit inclination mechanism and Y-axis table)

Specifications

SV-3000CNC

Column type		Type S	Type H	
X1 axis	Measuring range	200mm		
	Resolution	0.05μm		
	Scale unit	Reflective-type Linear Encoder		
	Drive speed	CNC mode	Max. 200mm/s	
		Joystick control mode	0-60mm/s	
	Measuring speed	0.02-2mm/s		
	Measuring direction	Retracting direction		
Traverse linearity	0.5μm/200mm			
Zz axis(column)	Travel range	300mm	500mm	
	Resolution	0.05μm		
	Scale unit	Reflective-type Linear Encoder		
	Drive speed	CNC mode	Max. 200mm/s	
		Joystick control mode	0-60mm/s	
	Base size (WxD)	750×600mm		
Base material	Granite			
Measurement analysis	Refer to the FORMTRACEPAK surface roughness measurement/analysis on page 23.			
External dimensions(WxDxH)	800×620×1000mm	800×620×1200mm		
Mass (excluding Y-axis table unit and Vibration Insulating Stand)	240kg (not including the Y-axis Table unit and Vibration Insulating Stand)	250kg (not including the Y-axis Table unit and Vibration Insulating Stand)		
Operating temperature and humidity ranges	15-25°C, 20-80% RH (without condensation)			
Storage temperature and humidity ranges	-10-50°C, 5-90% RH (without condensation)			

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

α-axis unit (common to only the installed models)

Inclination angle	-45° (counterclockwise), +10° (clockwise)
Rotating speed under inclined condition	1rpm
Resolution of inclination angle	0.000225°
Mass	9kg

Y-axis table unit (common to only the installed models)

Measuring range	200mm	
Minimum reading	0.05μm	
Scale unit	Reflective-type Linear Encoder	
Drive speed	CNC mode	Max. 200mm/s
	Joystick control mode	0-50mm/s
Maximum loading capacity	20kg (the center of gravity should be placed within 50mm from the table center)	
Traverse linearity	Surface roughness mode	0.5μm/200mm
	Contour mode	2μm/200mm
Linear displacement accuracy (at 20°C, contour mode)	±(2+2L/100)μm L: Dimension between two measured points (mm)	
Table size	200×200mm	
External dimensions(WxDxH)	320×646×105mm	
Mass	35kg	

Vibration Insulating Stand (optional)

Vibration insulating mechanism	Diaphragm air spring
Natural frequency	2.5-3.5Hz
Damping mechanism	Orifice
Leveling mechanism	Automatic control with mechanical valves
Air supply pressure	0.4MPa
Allowable loading capacity	350kg
External dimensions (WxDxH)	1000×895×715mm
Mass	280kg

Moving Column Surface Roughness Tester Surftest Extreme SV-M3000CNC

Features

- > A CNC Surface Roughness Tester that covers measurement of large/heavy workpieces such as engine blocks, crankshafts, etc.
- > The X₁, Y and Z₂ axes have a maximum drive speed of 200mm/s. This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile / multiple workpiece measurement tasks.
- > A highly accurate surface roughness tester featuring column (Z₂ axis) CNC drive. This allows comprehensive surface roughness measurement on large and heavy workpieces that cannot otherwise be tested except by using a compact surface roughness tester (handy-type).
- > The following three types of detector are available to suit the intended use.
 1. Standard type (downward facing)
 2. Long type (downward facing, particularly suitable for measurement of deep holes, etc.)
 3. Rotary type (orientation indexable for downward, upward, forward and backward facing.)
- > A large rotary table (option) with a loading capacity of 100kg is available by special order.
- > Measuring force for the Z₁-axis detector is selectable from 4mN or 0.75mN.
- > Confining all cables needed for the detector and drive unit internally has eliminated cable friction that could potentially cause a measurement error, while at the same time achieving high-speed drive.
- > The Z₁-axis detector incorporates an anti-collision safety device to automatically stop the machine if the detector body touches a workpiece or jig.
- > Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.



Standard-type detector holder



Long-type detector holder



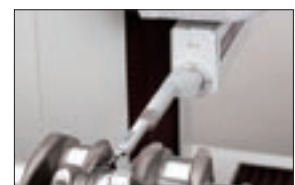
Measurement example for long-type detector holder



Rotary-type detector holder (downward facing)



Rotary-type detector holder (upward facing)



Measurement example for rotary-type detector holder (backward facing)



Large θ -axis table



SV-M3000CNC
(Moving Column Surface Roughness Tester)
(Picture above is special specification)

Mitutoyo

Specifications

SV-M3000CNC

X1 axis	Measuring range		200mm	
	Resolution		0.05 μ m	
	Scale unit		Reflective-type Linear Encoder	
	Drive speed	CNC mode	Max. 200mm/s	
		Joystick control mode	0-50mm/s	
	Measuring speed		0.02-2mm/s	
	Traverse linearity	Using standard-type detector		0.5 μ m/200mm
		Using long-type detector		0.7 μ m/200mm
		Using rotary type detector	Up/down direction	0.5 μ m/200mm
	Forward/backward direction		0.7 μ m/200mm	
System noise Rz*	Using standard-type detector		Rz<0.1 μ m	
	Using long-type detector		Rz<0.2 μ m	
	Using rotary type detector	Up/down direction	0.5 μ m/200mm	
		Forward/backward direction	0.7 μ m/200mm	
Zz axis (column)	Measuring range		500mm	
	Resolution		0.05 μ m	
	Scale unit		Reflective-type Linear Encoder	
	Measuring force	CNC mode	Max. 200mm/s	
		Joystick control mode	0-50mm/s	
Y-axis	Measuring range		800mm	
	Resolution		0.05 μ m	
	Scale unit		Reflective-type Linear Encoder	
	Drive speed	CNC mode	Max. 200mm/s	
		Joystick control mode	0-50mm/s	
	Measuring speed		0.02-2mm/s	
	Traverse linearity	Using standard-type detector		Narrow range: 0.5 μ m/50mm, Wide range: 2 μ m/800mm
		Using long-type detector		Narrow range: 0.7 μ m/50mm, Wide range: 3 μ m/800mm
		Using rotary type detector (up/down direction)		Narrow range: 0.7 μ m/50mm, Wide range: 3 μ m/800mm
	System noise Rz*	Using standard-type detector		Rz<0.2 μ m
Using long-type detector		Rz<0.3 μ m		
Using rotary type detector		Rz<0.3 μ m		
Measurement analysis		Refer to the FORMTRACEPAK surface roughness measurement/analysis on page 23.		
Base unit	Base size (WxD)		600x1500mm	
	Base material		Steel	
	Allowable loading capacity		300kg	
Vibration isolating unit	Air supply pressure		0.4MPa	
	Vibration insulating mechanism		Diaphragm air spring	
	Natural frequency		4.0-5.0Hz	
	Damping mechanism		Orifice & Oil damper	
	Leveling mechanism		Automatic control with mechanical valves	
External dimensions (WxDxH)		1085x1695x1922mm		
Mass (including the vibration isolating unit)		1600kg		
Operating temperature and humidity ranges		15-25°C, 20-80% RH (without condensation)		
Storage temperature and humidity ranges		-10-5°C, 5-90% RH (without condensation)		

* System noise Rz is determined when measuring the glass optical flat under condition below: (1) X1-axis is horizontal (2) Measuring speed: 0.5mm/sec (3) λ c: 0.8 (4) Number of intervals: 5 (ISO 4287 1997)

α -axis unit (common to only the installed models)

Inclination angle	-45° (counterclockwise), +10° (clockwise)
Rotating speed under inclined condition	1rpm
Resolution of inclination angle	0.000225°
Mass	9kg

CNC Surface Roughness/Contour Measuring System Formtracer Extreme SV-C4500CNC

Features

- > A Surface Roughness /Contour Measuring System that allows measurement of surface roughness and form/contour with one unit through detector replacement.

[Contour measuring function]

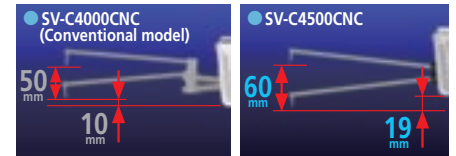
- > Equipped with a new, more-powerful detector (specific to contour measurement).
 1. The measuring range has increased by 10mm (compared to the previous model).
 2. The use of a magnet joint on the arm mount allows speedy replacement of an arm.
 3. Upward and downward facing surfaces can be continuously measured in combination with a dual-sided cone stylus.
 4. The measuring force can be specified (in 5 steps) from the software interface (FORMTRACEPAK).

[Surface roughness testing function]

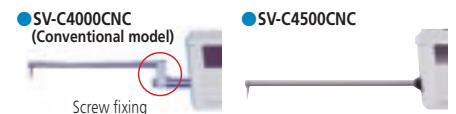
- > Compliant with JIS 1982/1994/2001, ISO, ANSI, DIN, VDA, and other international surface roughness standards.
- > Measuring force for the detector is selectable from 4mN or 0.75mN.

[Common specifications]

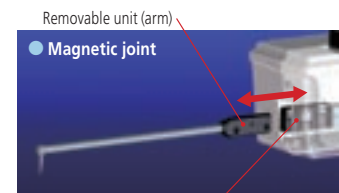
- > The X₁, Y and Z₂ axes have a maximum drive speed of 200mm/s. This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile / multiple workpiece measurement tasks.
- > For models with the Y-axis table, it is possible to perform inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- > For models with the α axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X₁ axis.
- > For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in Y.
- > Confining all cables needed for the detector and drive unit internally has eliminated cable friction that could potentially cause a measurement error, while at the same time achieving high-speed drive.
- > The Z₁-axis detector incorporates an anti-collision safety device to automatically stop the machine if the detector body touches a workpiece or jig.
- > Mitutoyo's lineup of CNC Surface Roughness Testers offers 8 models that cover all possible combinations of standard and high column types, a-axis drive and Y-axis drive to suit every application.
- > Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.



Detector measurement range expanded by 10mm (When using the SPH-71 one-sided cut stylus)

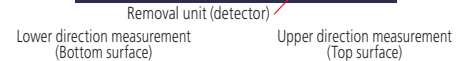


Screw fixing



Removable unit (arm)

Magnetic joint



Lower direction measurement (Bottom surface)

Upper direction measurement (Top surface)



Top and bottom measurement switched by software



Effective diameter

Plain-section diameter

Continuous top-bottom measurement function



Detector stand



SV-C4500CNC (Contour measuring detector shown mounted)



SV-C4500CNC (Surface roughness measuring detector shown mounted)

Specifications

SV-C4500CNC

Column type		Type S	Type H	
X1 axis	Measuring range	200mm		
	Resolution	0.05μm		
	Scale unit	Reflective-type Linear Encoder		
	Drive speed	CNC mode	Max. 200mm/s	
		Joystick control mode	0-50mm/s	
	Measuring speed	0.02-2mm/s		
	Form/contour mode	Measuring direction	Forward/backward direction	
		Traverse linearity	2μm/200mm	
		Linear displacement accuracy (at 20°C)	±(0.8+4L/200)μm L: Measurement length (mm)	
	Surface roughness mode	Measuring direction	Retracting direction	
Traverse linearity		0.5μm/200mm		
Z1 axis (detector unit)	Form/contour mode	Measuring range	60mm (±30mm from the horizontal plane)	
		Resolution	0.02μm	
		Measuring direction	Upward/downward direction (Direction can be switched by FORMTRACEPAK)	
		Stylus up/down operation	Arc movement	
		Scale unit	Arc scale	
		Linear displacement accuracy (at 20°C)	±(0.8+ 2H /100)μm H: Measurement height from the horizontal position (mm)	
		Measuring force	10, 20, 30, 40, 50mN (Can be switched by software)	
		Traceable angle	70° for ascent, 70° for descent (depending on the surface texture)	
	Surface roughness mode	Stylus tip	30° cone, Carbide	
		Measuring range	800μm/80μm/8μm	
Z2 axis (column)	Travel range	300 mm	500 mm	
		Resolution	0.05μm	
	Scale unit	Reflective-type Linear Encoder		
	Drive speed	CNC mode	Max. 200mm/s	
		Joystick control mode	0-50mm/s	
	Accuracy (20°C)	Model without α-axis	±(1.5+10H /1000)μm H: Z2 axis measurement height (mm)	
		Model with α-axis	-	
	Base size (WxD)	750×600mm		
	Base material	Granite		
	Measurement analysis	Refer to the page 23.		

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

α-axis unit (common to only the installed models)

Inclination angle	-45° (counterclockwise), +10° (clockwise)
Rotating speed under inclined condition	1rpm
Resolution of inclination angle	0.000225°
Mass	9kg

Y-axis table unit (common to only the installed models)

Measuring range	200mm	
Minimum reading	0.05μm	
Scale unit	Reflective-type Linear Encoder	
Drive speed	CNC mode	Max. 200mm/s
	Joystick control mode	0-50mm/s
Maximum loading capacity	20kg (the center of gravity should be placed within 50mm from the table center)	
Traverse linearity	Surface roughness mode	0.5μm/200mm
	Contour mode	2μm/200mm
Linear displacement accuracy (at 20°C, contour mode)	±(2+2L/100)μm L: Dimension between two measured points (mm)	
Table size	200×200mm	
External dimensions (WxDxH)	320×646×105mm	
Mass	35kg	

CNC Surface Texture Measuring Instrument

Formtracer Extreme CS-5000CNC/CS-H5000CNC

Features

- High-accuracy stylus type CNC Surface Measuring System that allows batch measurement of surface roughness and form/contour.
- The X₁ and Z₂ axes have maximum drive speeds of 40mm/s and 200mm/s, respectively.
This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile /multiple workpiece measurement tasks.
- A Mitutoyo Laser Holescale and Transmission type linear encoder is incorporated in the X₁- and Z₁-axes so that high resolution is achieved and batch measurement of form/contour and surface roughness can be made.
- The active control method is employed for the Z₁-axis detector to implement a wide-range measurement capability wherein the variation in dynamic measuring force is restricted.
- It is possible to perform inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- The Z₁-axis detector incorporates an anti-collision safety device to automatically stop the machine if the detector body touches a workpiece or jig.
- For models with the axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X₁ axis. (CS-5000CNC only)
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- Enables inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- This system has a track record in an application to measure an aspheric lens to a high level of accuracy.
The system is being well received because of its options (Y-axis Table and 3D Auto-leveling Table) that allow easy and automatic workpiece setting (inclination and peak/valley-point detection) and the dedicated software (ASLPAK: refer to page 24) that allows easy part-program creation and analysis in addition to the high-accuracy main unit.
- Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.



CS-H5000CNC
(with Y-axis table)



Wide range detector employing active control technology

Specifications

Model		CS-5000CNC		CS-H5000CNC	
Column type		Type S	Type H	Type S	
X1 axis	Measuring range		200mm		
	Resolution		0.00625μm		
	Scale unit		Laser HoloScale		
	Drive speed	CNC mode	Max. 40mm/s		
		Joystick control mode	0 to 40mm/s		
	Measuring speed		0.02 to 0.2mm/s (surface roughness), 0.02 to 2mm/s (form/contour)		
	Measuring direction		Forward / backward		
	Straightness	(with standard stylus)	(0.1+0.0015L)μm L: traverse length (mm)	(0.05+0.0003L)μm L: traverse length (mm)	
		(with 2X-long stylus)	(0.2+0.0015L)μm L: traverse length (mm)	(0.1+0.0015L)μm L: traverse length (mm)	
Accuracy (20°C)		±(0.3+0.002L)μm L: traverse length (mm)	±(0.16+0.001L)μm L: traverse length (mm)		
Z1 axis (detector unit)	Measuring range	(with standard stylus)	12mm		
		(with 2X-long stylus)	24mm		
	Resolution	(with standard stylus)	0.0008μm	0.0008μm	
		(with 2X-long stylus)	0.0016μm	0.0016μm	
	Vertical movement of the stylus		Arc motion		
	Scale type		Transmitted-type linear encoder		
	Accuracy (20°C)		±(0.3+ 0.02H)μm H: probing height (mm)	±(0.07+ 0.02H)μm H: probing height (mm)	
	Measuring force	(with standard stylus)	4mN (Fixed)		
		(with 2X-long stylus)	0.75mN (Fixed)		
	Traceable angle		Ascent: 60°, Descent: 60°, (Depends on the surface texture.)		
	Stylus tip shape	Standard stylus	Tip angle: 40°, Tip radius: 5μm, Diamond tip		
		Standard ball stylus	Tip ball radius: 0.25mm, Sapphire		
		2X-long stylus	Tip angle: 40°, Tip radius: 5μm, Diamond tip		
		2X-long stylus	—	Tip angle: 60°, Tip radius: 2μm, Diamond tip	
2X-long ball stylus		Tip ball radius: 0.25mm, Sapphire			
Face of stylus		Downward			
Zz axis (column)	Travel range		300mm	500mm	300mm
	Resolution		0.05μm		
	Scale type		Reflective-type linear encoder		
	Drive speed	CNC mode	Max. 200mm/s		
		Joystick mode	0 to 50mm/s		
	Base size (width×depth)		750×600mm		
	Base material		Gabbro		
Measurement analysis		Refer to the page 23.			

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

α-axis unit (for only CS-5000CNC)

Inclination angle	-45° (counterclockwise), +10° (clockwise)
Rotating speed under inclined condition	1rpm
Resolution of inclination angle	0.000225°
Mass	9kg

Y-axis table unit (common to only the installed models)

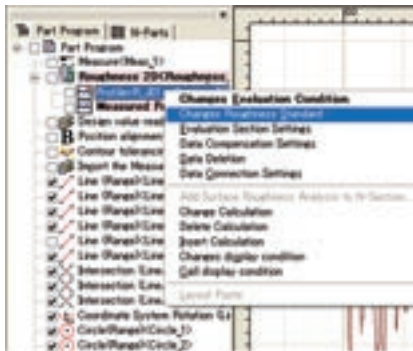
Measuring range		200mm
Minimum reading		0.05μm
Scale unit		Reflective-type Linear Encoder
Drive speed	CNC mode	Max. 200mm/s
	Joystick control mode	0-50mm/s
Maximum loading capacity		20kg (the center of gravity should be placed within 50mm from the table center)
Traverse linearity	Surface roughness mode	0.5μm/200mm
	Contour mode	2μm/200mm
Linear displacement accuracy (at 20°C, contour mode)		±(2+2L/100)μm L: Dimension between two measured points (mm)
Table size		200×200mm
External dimensions (WxDxH)		320×646×105mm
Mass		35kg

FORMTRACEPAK

FORMTRACEPAK functions offer total support for measurement system control, surface roughness analysis, contour analysis, contour tolerancing, and inspection report creation.

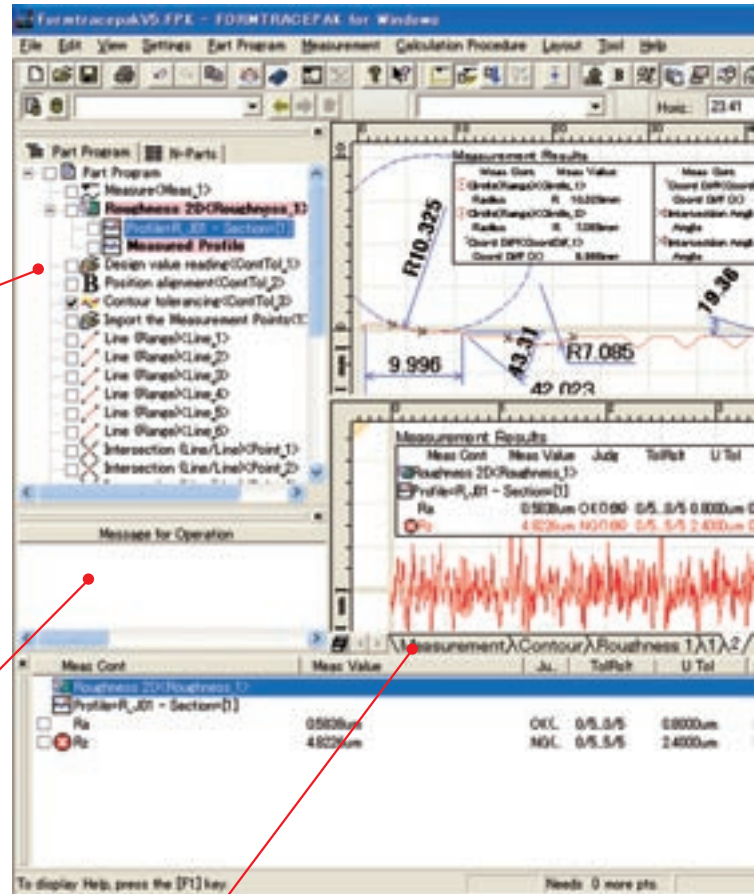
Editing measurement procedures

The items displayed in the measurement procedure window can be directly modified. You can, for example, perform new analyses by modifying the evaluation setup or roughness standard.

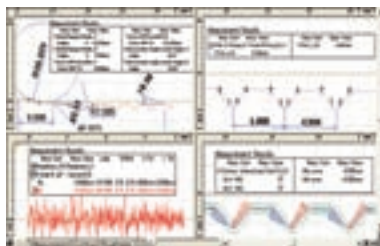
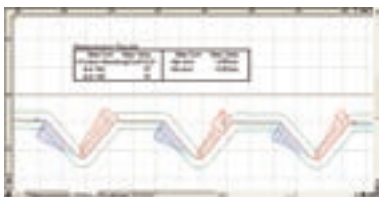
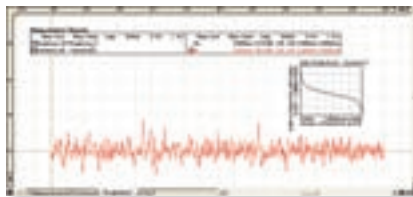
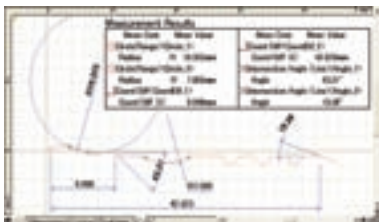


Operation messaging

The operation message window for explaining the next step is incorporated.



Versatile graphics windowing for data and analysis



● Tab-selection graphics window

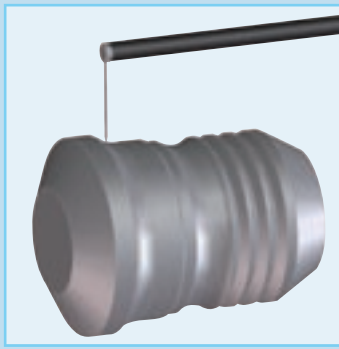
Just select a tab to display the measurement data required, such as contour, roughness, or tolerancing results.

● Dividing the screen into two or four windows

The screen can be divided into two, or four, windows for the convenient display of measurement data (for contour and roughness), analysis results, and contour tolerancing data, as required.

● Displaying the results in the graphics window

You can paste the graphics obtained from measurements, as well as measurement values (including pass/fail results) and an analysis graph, into the graphics window. This enables you to check the graphics and measurement results at a glance using the graphics window alone.

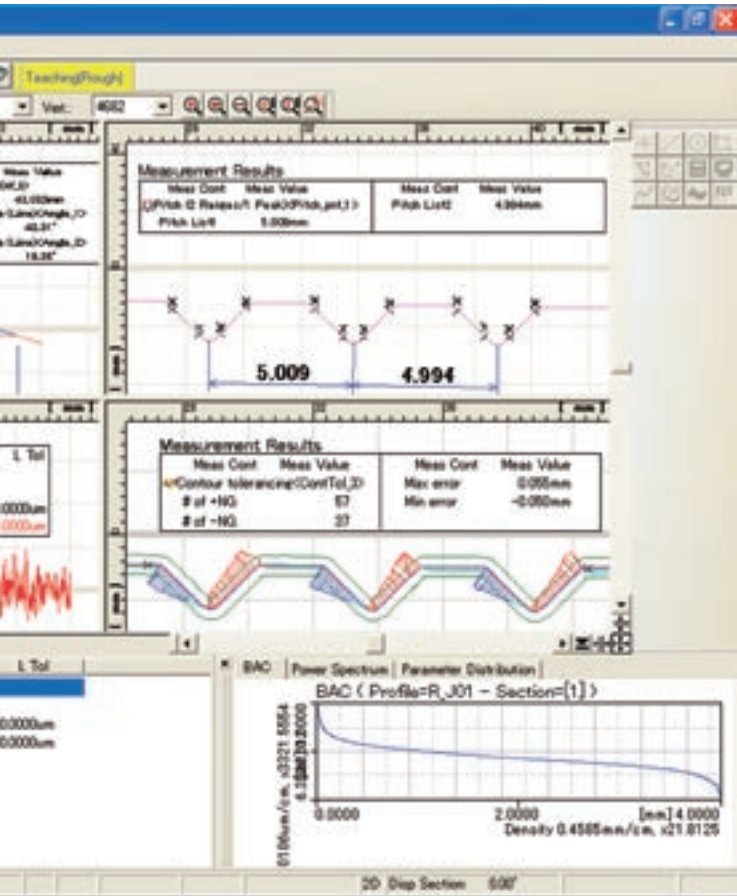


MiCAT

Mitutoyo Intelligent Computer Aided Technology

the standard in world metrology software

FORM



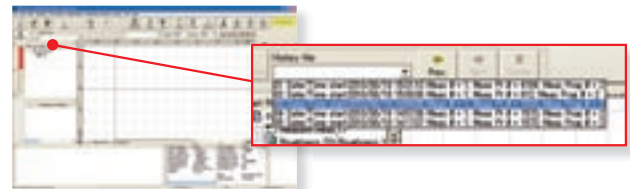
Measurement control

To make only a single measurement, you can create a part program in the single mode. To measure multiple workpieces of an identical shape, you can use the teaching mode.

Since you can embed the entire flow, from making measurement to printing a report, into a part program, you can efficiently make measurements, analyze data, and output a report. A function is also provided that enables you to insert comments accompanied with photographs at desired timings, enabling you to embed the roles described in a measurement procedure document that specifies important points such as work settings.

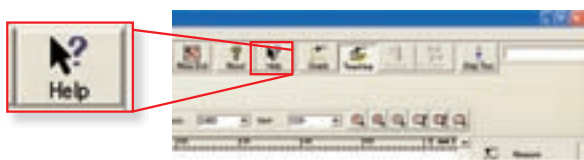


To make immediate measurements, you can use the pull-down menu to easily select and call up the desired operating procedure.



Online help functions*

Online help that can be viewed any time is incorporated into the software. In addition to index and keyword searches, a status-saving help button, which displays menus and Windows help with a click of the mouse, is provided.



*Online help function supports only Japanese and English.

Multiple language support

You can switch the language* to be used in the measurement, analysis, and layout windows.

After measurements have been made, you can switch to another language and create a report in that language. This function can be used worldwide.

*Supported languages: Japanese, English, German, French, Italian, Spanish, Polish, Hungarian, Swedish, Czech, Simplified Chinese, Traditional Chinese, Korean, Turkish, Portuguese.

Button-editing function

You can hide buttons that are not used frequently. For example, you can choose to display only those buttons that are used frequently and increase the size of the displayed graphics window, thereby customizing the window to suit your needs.



Simple statistical commands

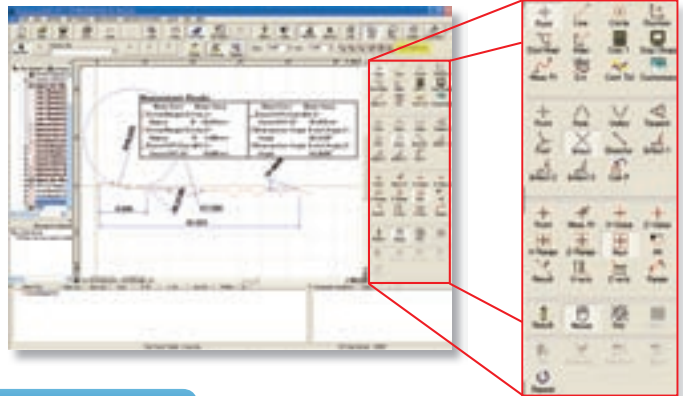
You can perform statistical calculations of roughness parameters and contour analysis results without using a separate program such as Excel.

FORMTRACEPAK

Contour Analysis

Contour analysis function

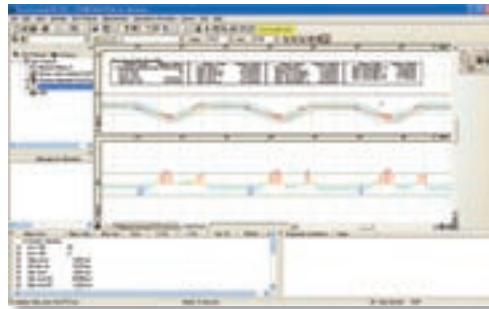
A wide variety of commands, which form the basic elements for analysis, are provided, including those for points (10 kinds), lines (6 kinds), and circles (6 kinds). A rich set of commands that combine these elements to calculate angles, pitches, and distances, a contour tolerancing function, and a design value generation function are also provided as standard features. These functions, combined with the function that allows you to customize the calculation command buttons by hiding less frequently used commands, let you tailor the window according to the user environment.



Contour-tolerancing function as a standard feature

Patent registered in Japan

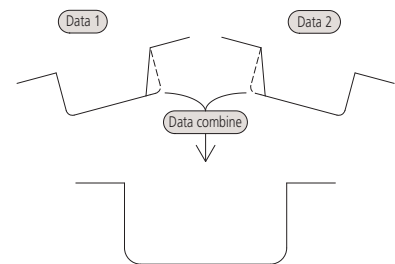
The best-fit processing function that moves the coordinate values of the design data and measurement data to the optimum positions is provided as a standard feature. Since the tolerancing results can be visually displayed as graphics, displayed as tolerance values and tolerance expansions in each coordinate, or output as a text file, they can be utilized as feedback data for machining systems.



Example of contour-tolerancing result

Data combination function

You can combine partial data collected separately from a workpiece because of its external shape into a single graphic and analyze it.



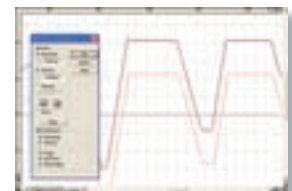
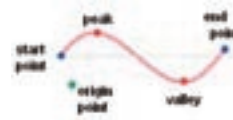
Best-fit processing function for measurement point strings

This function tries to fit the measurement points to the pre-registered reference data on the same coordinate system. It can eliminate the effects of a shift that may occur when setting the workpiece during automatic analysis.



Data superimposition command

You can superimpose two sets of data by detecting their characteristic points. Use the mouse to drag and move the measurement point strings to the desired positions to be superimposed.



Calculation command repetition setting

When identical shapes have the same pitch, you can analyze all of the shapes in a batch by specifying a single analysis location and the pitch.



Circle and line automatic determination function

Patent registered in Japan

Using the circle/line auto-fitting command, you can automatically calculate all circles and lines contained in the data without having to click the command button each time.

FORMTRACEPAK

Surface Roughness Analysis



Mitutoyo Intelligent Computer Aided Technology

the standard in world metrology software

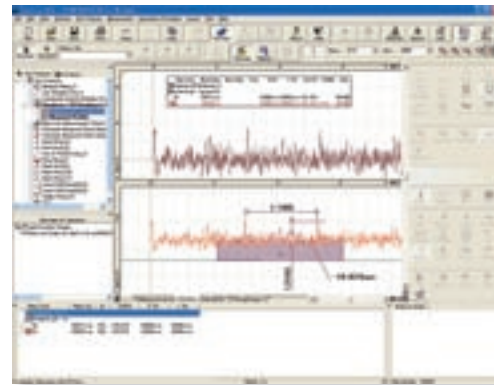
FORM

Surface Roughness analysis function

FORMTRACEPAK can perform surface roughness analyses that conform to various standards such as ISO, JIS ANSI, and VDA. For comparing the measurement values with the tolerance limits, you can use the 16% rule or the maximum value rule. Furthermore, since FORMTRACEPAK comes with parameter calculation functions as well as a rich set of graphic analysis functions, it can be widely utilized for everything from routine quality control to R&D applications. It also includes many other functions, such as the function for eliminating (compensating) shapes, such as slopes and R-surface, and a data deletion function.

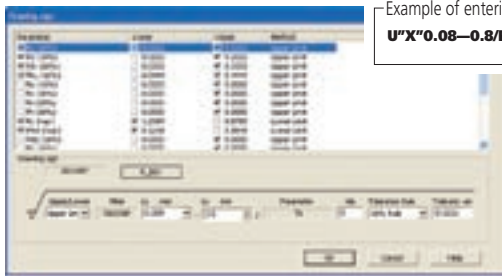
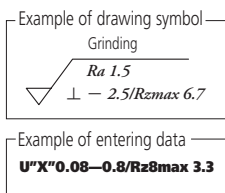
Microscopic contour analysis function

This function can calculate steps and surface areas from the roughness data. Furthermore, as with the contour analysis function, a rich set of calculation commands that combine various elements, such as points, lines, and circles, to calculate angles, pitches, and distances are provided as standard features.



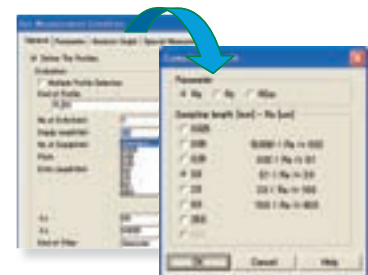
Simple input using drawing symbols

You can easily set up cumbersome measurement conditions by simply entering data according to the drawing symbols of the ISO/JIS roughness standard.



Reference length dialog box

When setting up the reference length in a measurement condition, you can display the standard values defined by the ISO/JIS standards by selecting the applicable standard.

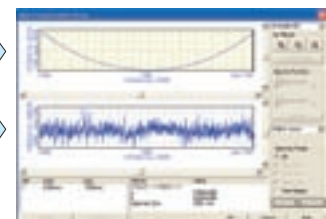


Analysis condition modification with a preview function

You can easily modify various types of analysis conditions such as the standard to be used, curve type, and filter. Furthermore, before eliminating (compensating) shapes such as slopes, R-surfaces, and parabolas, the preview function allows you to check the impact on the spot.

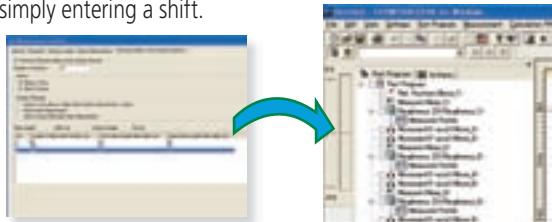
Before compensation →

After compensation →



Multiple-point measurement function

You can easily create a part program that measures multiple points by simply entering a shift.



Analysis function using multiple-point measurements

For a workpiece that cannot be measured over the evaluation distance specified by a standard, you can calculate the roughness parameter from the data obtained by measuring multiple points, and compare the measurement data with the tolerance limits using the 16% rule, for example.

R-surface automatic measurement function

Based on the preliminary measurement results, you can automatically measure an R-surface by allocating measurement distances using the peak or bottom of the R-surface as the reference.



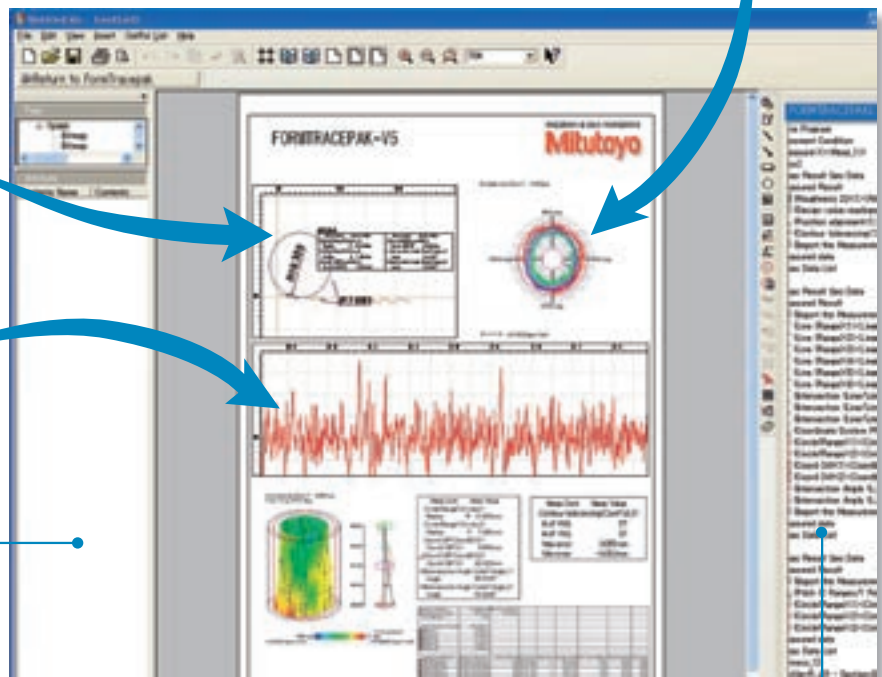
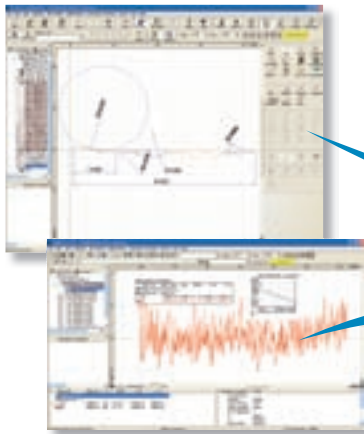
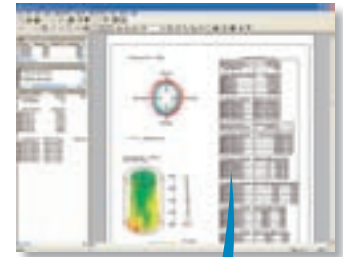
FORMTRACEPAK Layout program

Integrating Contour, Surface Roughness, and Roundness
Measurement Results onto a Single Page!

Integrated layout

You can use simple operations to lay out graphics obtained from measurements as well as measurement results for surface roughness, contour, and roundness on a single page. Furthermore, since the program now allows you to specify a saved file and paste it, you can easily paste results from multiple files.

*Note that the optional ROUNDPAK roundness/cylindricity analysis program is required.
(Ver. 7 or higher)



● Report creation function

You can freely assemble measurement results/conditions/graphics as well as comments/circles/lines/arrows, and print them out in a measurement result report. You can also save the created layout and use it again later for similar measurements.

● System layout printing

This function allows automatic layout and print of an inspection certificate with an easy operation just by selecting print items such as calculation result, measurement condition and measurement graphs. It also allows detailed setting of measurement graph size, measurement result, font, etc. Use this function for an easy print solution.

● PDF file output

Measurement result report can be output as a PDF format file.

● Element insertion bar

Using the mouse to drag and drop the analysis content displayed in the element insertion bar, you can paste it into the layout.

● Saving the result as a web page

Since the measurement result report can be output as a PDF file or html format, you can check the result even on a PC in which no layout-editing program is installed.

Specifications

FORMTRACEPAK Contour Measurement/Analysis Specifications

Arithmetic processing	Point	Point, peak point, valley point, contact point, foot of a perpendicular, intersection point, midpoint, inflection point (distance), inflection point (angle), inflection point (angular variation), point readout
	Line	Line, tangent line, perpendicular line, parallel line, median line, line (point, angle), line readout
	Circle	Circle, circle (center - radius), circle (2 points), contact circle, contact circle (measurement point), circle (radius/center fixed), circle readout, ellipse (calculated with the quadratic curve command)
	Coordinate	Coordinate difference (X-axis coordinate difference, Z-axis coordinate difference, angular difference, radial difference), positional judgment
	Distance/angle	Distance, step height (mean, maximum, minimum), groove dimensions, pitch (pitch, pitch [between centers]), angle, travel distance
	Arithmetic operations/compilation	Arithmetic operations (addition, subtraction, multiplication, division, absolute value, square root), statistics (mean, maximum value, minimum value, standard deviation, unbiased standard deviation, total sum), data entry, data deletion
	Measurement point compilation	Deletion, translation, rotation, inversion, positioning, segmentation, offset, idealization, fairing, filtering, scale handling of measurement points (polar coordinate spreading), combination
	Extended functions	Area, quadratic curve (ellipse, hyperbola, parabola), circle/line auto-determination command (automatically determines multiple circle/line features included in the specified area)
	Contouring	Contour tolerancing, best-fitting, design value generation, design value reading, balloon display of arbitrarily-positioned data
Other functions	Tolerancing, dimension display, simplified display	
Calculation support	Auto-display of calculation command help (ON/OFF)	
Measurement support function (common to contour/roughness measurement)	Peak/valley detection (manual), ball measurement, workpiece identification function, leveling, squareness alignment, straightness alignment, R-surface auto-measurement function (for roughness measurement only)	
CNC measurement	Measurement part program, multiple parts	
Statistical processing	Simplified statistical functions	
Data file input/output	Output: text, design value, IGES, DXF Input: text, design value (IGES and DXF are loaded by the design value generation utility), data import from SJ-series	
Coordinate control	Origin setting, coordinate system rotation, coordinate system configuration through workpiece identification, zero-setting or resetting of each axis	
Stylus calibration	Auto-calibration with the batch calibration kit, manual calibration with GB, reference hemisphere or pin gauge Calibration history: Any stylus has no restriction on the number of events to be stored.	
Straightness correction	Equipped with the straightness correction function	
Sampling pitch	0.1 to 2000 μ m (depending on the measuring machine)	
Memory capacity	Up to 100,000 points (depending on the measuring machine)	
Magnified display Vertical	Arbitrary value (in steps of 0.001), automatic and 0.001 to 10,000,000 times	
Magnified display Horizontal	Arbitrary value (in steps of 0.001), automatic and 0.001 to 10,000,000 times	

FORMTRACEPAK Surface Roughness Measurement/Analysis Specifications

Compliant roughness standards	JIS1982, JIS1994, JIS2001, ISO1997, ANSI, VDA, OLDMIX
Parameters	Ra, Rq, Sk, Ku, Rp, Rv, Ry, RyDIN, RzDIN, Rt, Rc, Rz, R3z, R3t, S, Δa , Δq , λa , λq , Lo, Ir, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Sm, Pc, HSC, mr, mrd, δc , Vo, Rx, AR, R, NR, NCRX, CPM, SR, SAR, Wx, AW, W, Wte, NW, SW, SAW (Area and height-related parameters are analyzable with the contour analysis command.)
GO/NG judgment methods	Mean or maximum value rule, 16% rule
Assessed profiles	Primary (unfiltered) profile, roughness profile, filtered waviness profile, waviness profile, unfiltered rolling circle waviness profile, rolling circle waviness profile, envelope residual profile, DF profile (DIN4776/ISO13565-1), roughness motif profile (An envelope waviness profile is displayed at the time of motif assessment.)
Analysis graph	Material ratio curve (BAC), amplitude distribution curve (ADC), power spectrum, autocorrelation, Walsh power spectrum, Walsh autocorrelation, peak height distribution, tilt angle distribution, parameter distribution (As for abrasion amount or multilayer, area, etc. are analyzable through contour analysis.)
Form removal	Least square line, R-surface correction, elliptic correction, parabolic correction, hyperbolic correction, conic correction, polynomial correction (automatic or optional 2nd to 7th-order correction)
Filter type	Gaussian, 2CRPC75, 2CRPC50, 2CR75, 2CR50, robust spline
Cutoff wavelengths	(λc): 0.025, 0.08, 0.25, 0.8, 2.5, 8, 25, 80mm optional (λs): 0.8, 2.5, 8, 25, 80, 250, 800 μ m optional
Micro-contour analysis	Refer to Arithmetic processing in FORMTRACEPAK Contour Measurement/Analysis Specifications.
Statistical processing	Simplified statistical functions
Measurement support functions (common to contour/roughness measurement)	Peak/valley detection (manual), ball measurement, workpiece identification function, leveling, squareness alignment, straightness alignment, R-surface auto-measurement function (for roughness measurement only)
Measurement support functions	Simplified input according to drawing instruction marks, sampling length setting dialog box, N-points measuring function
Stylus calibration	Roughness specimen, step-gage (Calibration history: no restriction on the number of events that can be stored for any stylus)
Memory capacity	Up to 100,000 points
Magnified display Vertical	Arbitrary value (in steps of 0.001), automatic and 0.001 to 10,000,000 times
Magnified display Horizontal	Arbitrary value (in steps of 0.001), automatic and 0.001 to 10,000,000 times
Natural language selection	Japanese, English, German, French, Italian, Spanish, Polish, Hungarian, Swedish, Czech, Chinese (simplified characters), Chinese (traditional characters), Korean, Turkish, Portuguese

Note: Online help is provided only in Japanese and English.

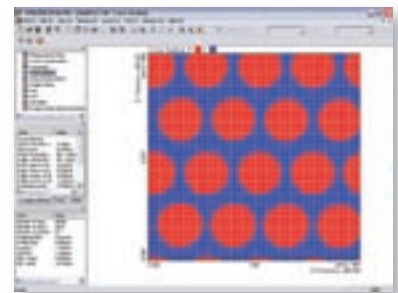
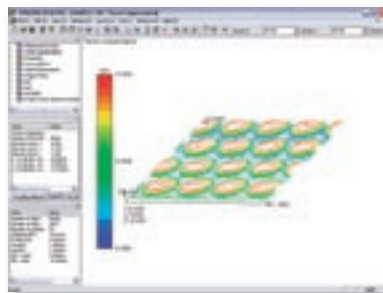
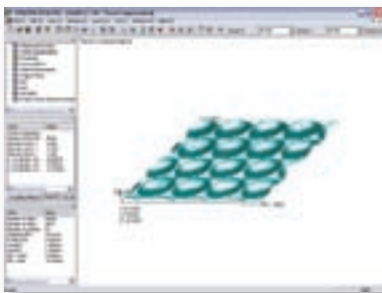
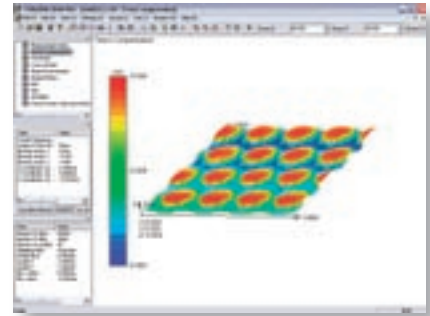
Software FORMTRACEPAK

3D Data Analysis Program, FORMTRACEPAK-Pro (optional)

This software will analyze the three-dimensional surface roughness data collected from coordinate measurement with the Y-axis table.

It can offer various visual representation methods, such as shading display, mesh display, and contour-line display.

Thus, the user can analyze the target surface texture from various angles by making use of not only the 3D Roughness Parameter Calculation, Profile Analysis (area, volume), but also Bearing Area Curve (BAC), Amplitude Distribution Curve and Power Spectrum Analysis, etc.



Aspheric Lens Analysis Program ASLPAK (Optional)

This software allows you to create a part program for assessing an aspheric lens by merely entering the data of general that defines the aspheric surface and effective lens diameter. It allows not only analysis of designed R and best-fit R, but also easy determination of the pseudo roughness parameters for the aspheric surface from those results.



Aspheric Simple Program Creation Screen



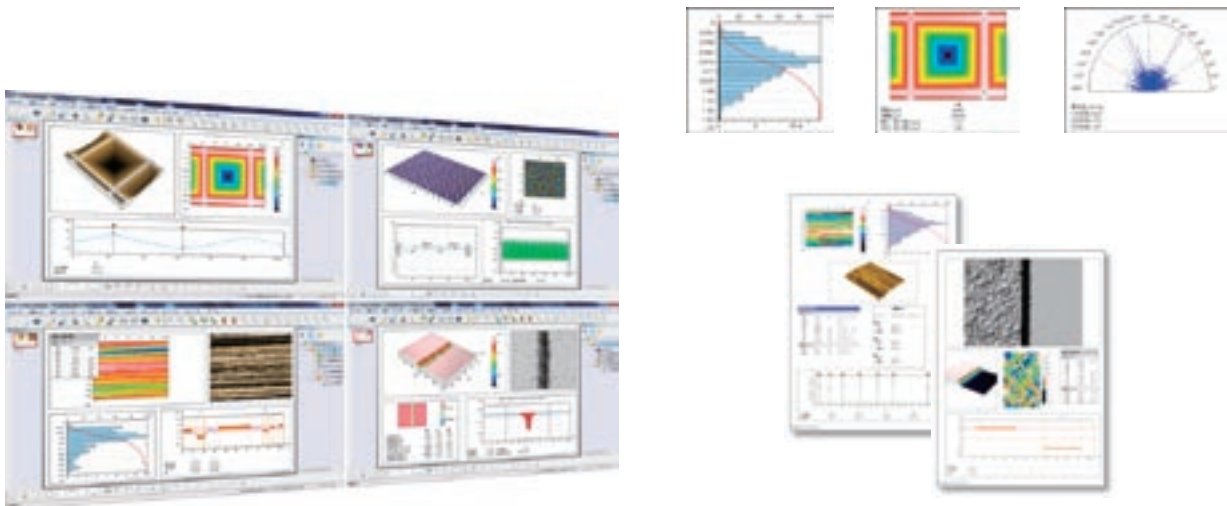
Aspheric Pseudo Roughness Parameter Analysis



Aspheric Accuracy Assessed Values (F', A', S') Analysis

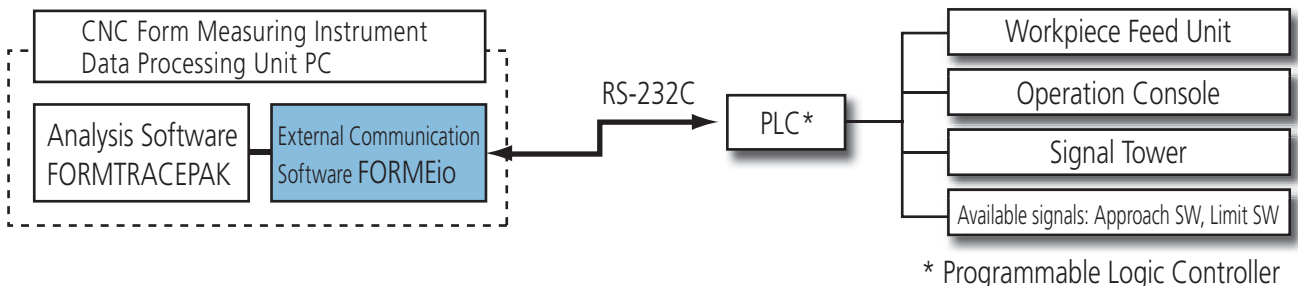
3D Surface Texture Analysis Program MCubeMap (option)

This software is a 3D surface texture analysis program oriented to CNC Surface Roughness Testers and CNC Surface Texture Measuring Instruments. Its abundant display functionality for measured data includes colored view, contour lines, 3D view, 3D view plus mesh plot, photomicrography, etc., allowing easy and clear recognition of surface features. The software allows you to create a graphical report with analysis results presented in your own customized layout. (This software is compatible with the 3D Surface Texture Parameter Standard in the latest issue of ISO 25178-2.)



External Communication Program, FORMEio (optional)

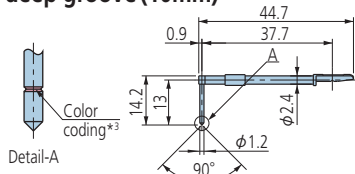
This is optional software for installing the external control function in the CNC form measuring instrument. With this function it is possible to monitor and control the measuring instrument conditions via RS-232C communication from the PLC.



* Except for CS-5000CNC/CS-H5000CNC.

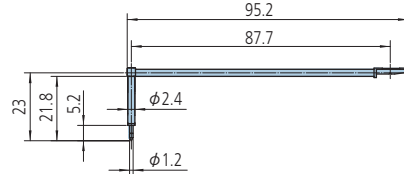
Styli

For deep groove (10mm)



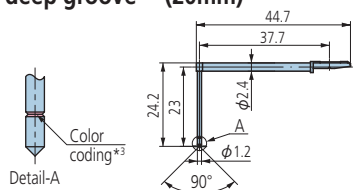
12AAC735 (2μm) *1
12AAB409 (5μm)
12AAB421 (10μm)
 (): Tip radius

For deep groove *2 (20mm)



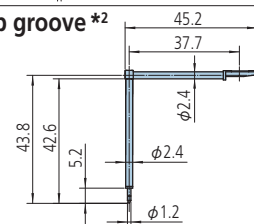
12AAE893 (2μm) *1
12AAE909 (5μm)
 (): Tip radius

For deep groove *2 (20mm)



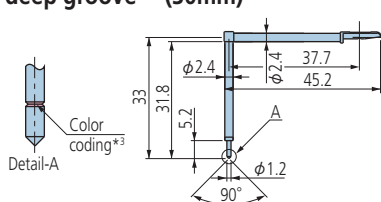
12AAC736 (2μm) *1
12AAB408 (5μm)
12AAB420 (10μm)
 (): Tip radius

For deep groove *2 (40mm)



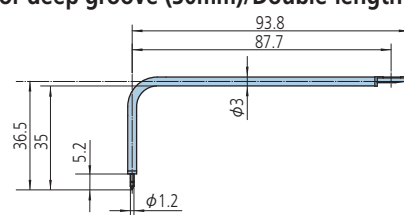
12AAE895 (2μm) *1
12AAE911 (5μm)
 (): Tip radius

For deep groove *2 (30mm)



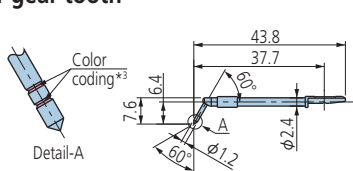
12AAC737 (2μm) *1
12AAB407 (5μm)
12AAB419 (10μm)
 (): Tip radius

For deep groove (30mm)/Double-length for deep hole *2



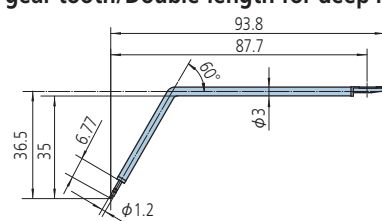
12AAE894 (2μm) *1
12AAE910 (5μm)
 (): Tip radius

For gear tooth



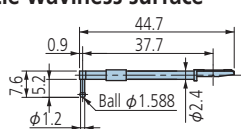
12AAB339 (2μm) *1
12AAB410 (5μm)
12AAB422 (10μm)
 (): Tip radius

For gear tooth/Double-length for deep hole *2



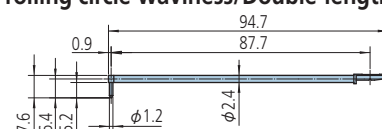
12AAE896 (2μm) *1
12AAE912 (5μm) *1
 (): Tip radius

For rolling circle waviness surface *4



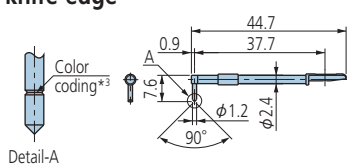
12AAB338 (φ1.588)
 (): Tip radius

For rolling circle waviness/Double-length for deep hole *2 *4



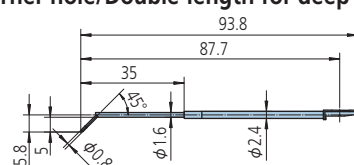
12AAE886 (250μm)
 (): Tip radius

For knife-edge *4



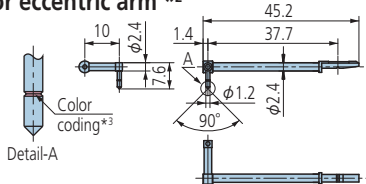
12AAC738 (2μm) *1
12AAB411 (5μm)
12AAB423 (10μm)
 (): Tip radius

For corner hole/Double-length for deep hole *2



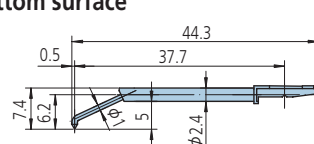
12AAE897 (2μm) *1
12AAE913 (5μm) *2
 (): Tip radius

For eccentric arm *2



12AAC739 (2μm) *1
12AAB412 (5μm)
12AAB424 (10μm)
 (): Tip radius

For bottom surface



12AAE899 (2μm) *1
12AAE915 (5μm)
 (): Tip radius

*1: Tip angle 60°

*2: For downward-facing measurement only.

※ Customized special interchangeable styli are available on request. Please contact any Mitutoyo office for more information.

*3:

Tip radius	2μm	5μm	10μm
Color coding	Black	No color	Yellow

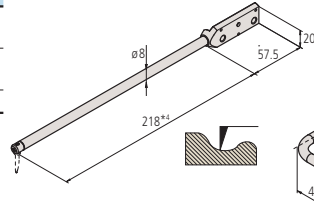
*4: Used for calibration, a standard step gauge (No.178-611, option) is also required

Arms / Styli (For SV-C4500CNC Contour Measuring)

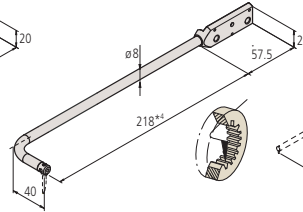
Arms

Description	Arm No.	Parts No.	Applicable stylus No.
Straight arm	AB-31	12AAM101*1	SPH-5*: 6*, 7*, 8*, 9*, SPHW-56, 66, 76
Eccentric arm	AB-32	12AAM102*2*3	SPH-5*: 6*, 7*, 8*, 9*, SPHW-56, 66, 76
Small-hole arm	AB-33	12AAM103*2*3	SPH-41, 42, 43

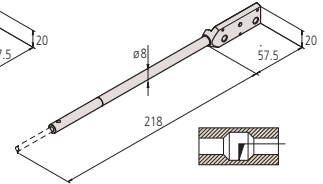
• Straight arm AB-31



• Eccentric arm AB-32



• Small-hole arm AB-33



Styli

Stylus name	Stylus No.	Parts No.	Application arm No.	H (mm)
Double-sided conical stylus	SPHW-56	12AAM095*1	AB-31, AB-32	20
	SPHW-66	12AAM096*3	AB-31, AB-32	32
	SPHW-76	12AAM097*3	AB-31, AB-32	48
One-sided cut stylus	SPH-51	354882*2*3	AB-31, AB-32	6
	SPH-61	354883	AB-31, AB-32	12
	SPH-71	354884	AB-31, AB-32	20
	SPH-81	354885	AB-31, AB-32	30
	SPH-91	354886	AB-31, AB-32	42
Intersecting cut stylus	SPH-52	354887	AB-31, AB-32	6
	SPH-62	354888	AB-31, AB-32	12
	SPH-72	354889*2*3	AB-31, AB-32	20
	SPH-82	354890	AB-31, AB-32	30
	SPH-92	354891	AB-31, AB-32	42
Cone stylus Tip angle 30° Sapphire tipped	SPH-53	354892	AB-31, AB-32	6
	SPH-63	354893	AB-31, AB-32	12
	SPH-73	354894	AB-31, AB-32	20
Cone stylus Tip angle 30° Carbide-tipped	SPH-83	354895	AB-31, AB-32	30
	SPH-93	354896	AB-31, AB-32	42
	SPH-56	12AAA566	AB-31, AB-32	6
Cone stylus Tip angle 30° Carbide-tipped	SPH-66	12AAA567	AB-31, AB-32	12
	SPH-76*1	12AAA568*2*3	AB-31, AB-32	20
	SPH-86	12AAA569	AB-31, AB-32	30
Cone stylus Tip angle 20° Carbide-tipped	SPH-96	12AAA570	AB-31, AB-32	42
	SPH-57	12AAE865	AB-31, AB-32	6
	SPH-67	12AAE866	AB-31, AB-32	12
Cone stylus Tip angle 20° Carbide-tipped	SPH-77	12AAE867	AB-31, AB-32	20
	SPH-87	12AAE868	AB-31, AB-32	30
	SPH-97	12AAE869	AB-31, AB-32	42
Cone stylus Tip angle 50° Diamond tipped	SPH-79	355129	AB-31, AB-32	20
Knife edge stylus	SPH-54	354897	AB-31, AB-32	6
	SPH-64	354898	AB-31, AB-32	12
	SPH-74	354899	AB-31, AB-32	20
	SPH-84	354900	AB-31, AB-32	30
	SPH-94	354901	AB-31, AB-32	42
Ball stylus	SPH-55	354902	AB-31, AB-32	6
	SPH-65	354903	AB-31, AB-32	12
	SPH-75	354904	AB-31, AB-32	20
	SPH-85	354905	AB-31, AB-32	30
	SPH-95	354906	AB-31, AB-32	42
Small hole stylus*5	SPH-41	12AAM104*2*3	AB-33	2
	SPH-42	12AAM105	AB-33	4
	SPH-43	12AAM106*2*3	AB-33	6.5

*1 Standard accessory for SV-C4500CNC series

*2 Arm stylus standard set (No. 12AAN461) component.

*3 Arm stylus up/downward measurement set (No. 12AAN462) component.

*4 When mounting conical stylus SPH-76 (standard accessory)

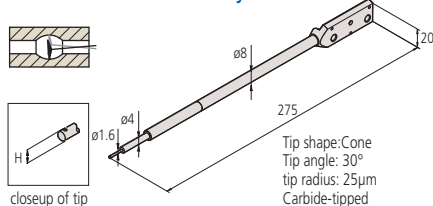
*5 Styli SPH-21, 22, and 23 for SV-C3100/4100 series are not available.

Arm stylus (comprising an arm and stylus)

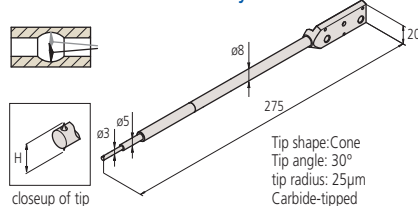
Arm stylus name	Stylus No.	Parts No.	H (mm)
Double-sided small hole arm stylus	SPHW-31	12AAM108	2.4
	SPHW-32	12AAM109*3	5
	SPHW-33	12AAM110	9

Styli SPH-21, 22, and 23 for SV-C3100/4100 series are not available.

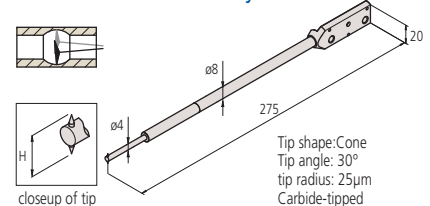
Double-sided small hole arm stylus SPHW-31



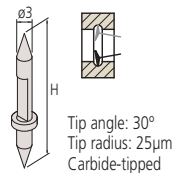
Double-sided small hole arm stylus SPHW-32



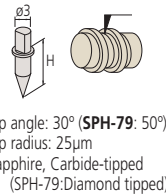
Double-sided small hole arm stylus SPHW-33



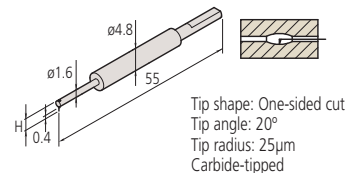
Double-sided conical stylus



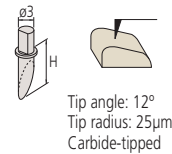
Cone stylus



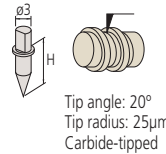
Small hole stylus SPH-41



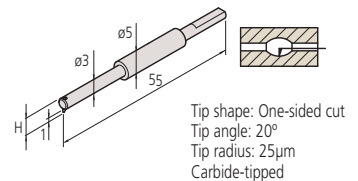
One-sided cut stylus



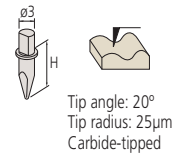
Cone stylus



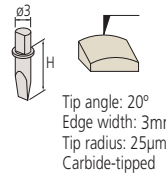
Small hole stylus SPH-42



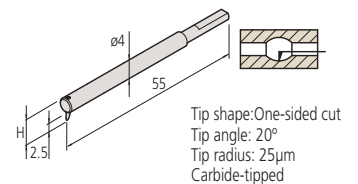
Intersecting cut stylus



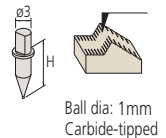
Knife edge stylus



Small hole stylus SPH-43







Ball stylus



Wide choice of functions expands the application range

Examples of optimal combinations of accessories

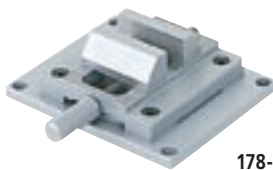
Function Item	Y-axis Table (wearable model only)	θ1 Table (optional)	θ2 Table (optional)	Drive unit tilting function (wearable model only)	2D Auto levelling table (optional)	3D Auto levelling table (optional)
*1: Applicable only to surface roughness measurement						
Automatic leveling	—	—	—	○	○	○
Automatic alignment	○	○	—	△	—	—
Multiple workpiece batch measurement	△	—	—	—	—	—
Measurement in the Y-axis direction	○	—	—	—	—	—
Oblique measurement of XY plane *1	○	—	—	—	—	—
Outside 3D surface roughness measurement/evaluation *1	○	—	—	△	—	—
Multiple-piece measurement in the Y-axis direction (Positioning in the Y-axis direction)	○	—	—	—	—	—
Multiple-piece measurement in the radius direction (Positioning in the rotating direction of XY plane)	△	○	—	—	—	—
Inclined surface measurement in the X-axis direction	△	—	—	○	—	—
Inclined hole inside measurement in the X-axis direction	△	—	—	○	—	—
Multiple cylinder generatrices measurement	△	—	○	—	—	—
Measurement of both top and bottom surfaces	△	—	○	—	—	—

○ : Essential △ : Recommended function — : Not necessary

Precision Vise

For use on a cross-travel stage, etc.

Clamping range	0-36mm
Jaw width	44mm
Jaw depth	16mm
Overall height	38mm



178-019

3-axis Adjustment Table

The use of this 3-axis Adjustment Table allows simple straightness alignment and leveling by merely adjusting the table according to guidance from FORMTRACEPAK. This does not need any experience or intuitive ability.



178-047

Centering chuck (ring operated)

This chuck is useful when measuring cylindrical workpieces, which are easily clamped by turning the knurled ring.

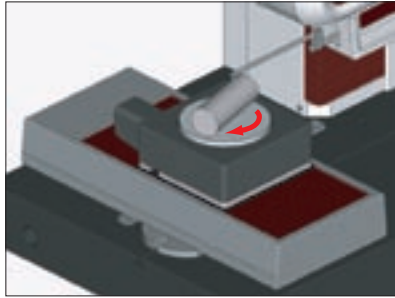
Clamping range	Jaws normal	OD: ø1 - ø36mm
	Jaws normal	ID: ø16 - ø69mm
	Jaws reversed	OD: ø25 - ø79mm
Dimensions	ø118x41mm	
Mass	1.2kg	



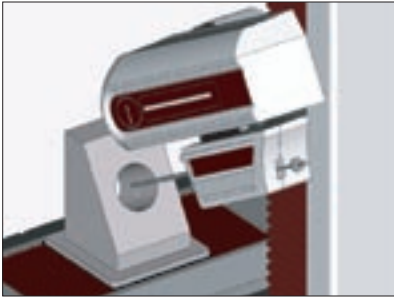
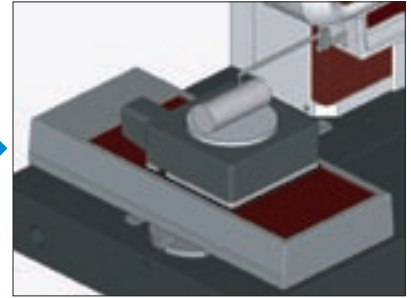
211-032



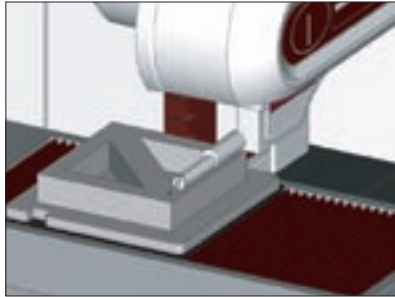
Inclined surface measurement in the X-axis direction



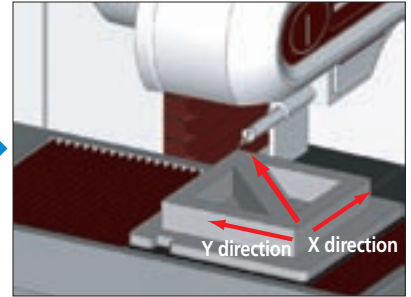
Automatic alignment



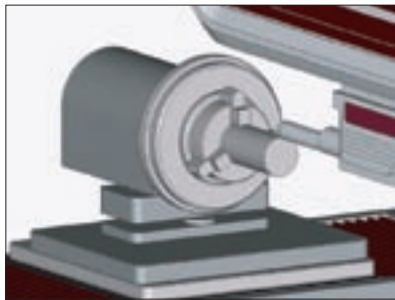
Inclined hole inside measurement in the X-axis direction



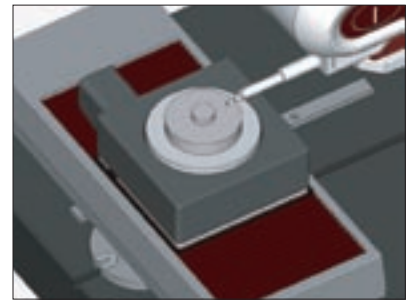
Oblique measurement of XY plane



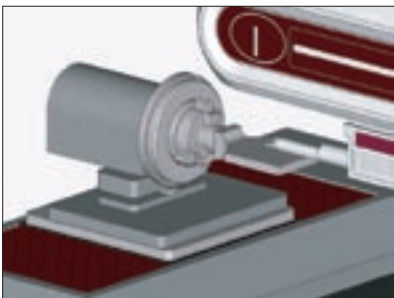
Multiple workpiece batch measurement



Multiple cylinder generatrices measurement



Multiple-piece measurement in the radius direction



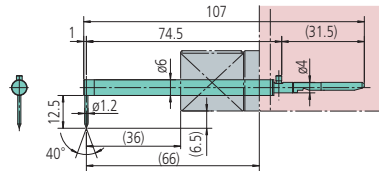
Measurement of both top and bottom surfaces

Styli (For CS-5000CNC/CS-H5000CNC)

Styli for CS-5000CNC and CS-H5000CNC

Standard-length stylus

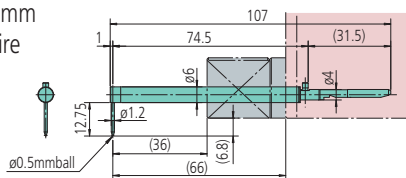
Stylus length: 12.5mm
Tip material: Diamond
Tip shape: 40° cone
Tip radius: 5µm



Parts No.: 12AAD543*1 / 12AAJ037*2

Standard-length ball stylus

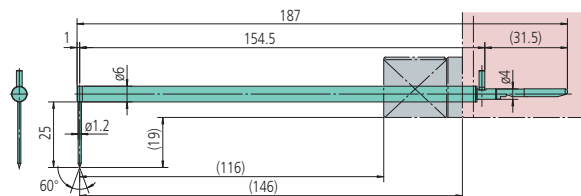
Stylus length: 12.75mm
Tip material: Sapphire
Tip ball dia: 0.5mm



Parts No.: 12AAD544 *1,*2

Double-length stylus

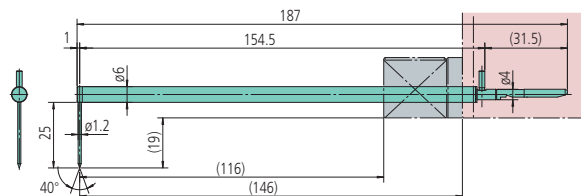
Stylus length: 25mm Tip material: Diamond
Tip shape: 60° cone Tip radius: 2µm



Parts No.: 12AAJ041*2

Double-length stylus

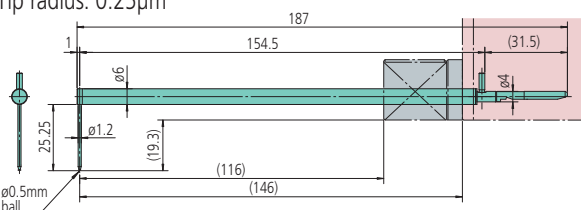
Stylus length: 25mm Tip material: Diamond
Tip shape: 40° cone Tip radius: 5µm



Parts No.: 12AAD545*1 / 12AAJ039*2

Double-length ball stylus

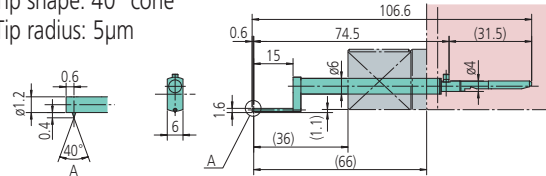
Stylus length: 25.25mm Tip material: Sapphire
Tip radius: 0.25µm



Parts No.: 12AAD546 *1,*2

Standard-length stylus for small hole

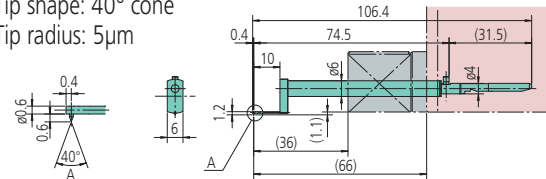
Stylus length: 0.4mm
Tip material: Diamond
Tip shape: 40° cone
Tip radius: 5µm



Parts No.: 12AAD651

Standard-length stylus for extra-small hole

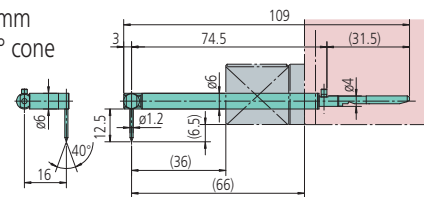
Stylus length: 0.6mm
Tip material: Diamond
Tip shape: 40° cone
Tip radius: 5µm



Parts No.: 12AAD652

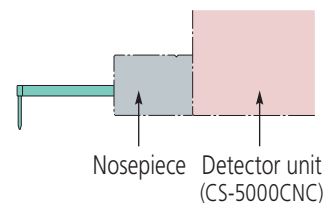
Standard-length eccentric stylus

Stylus length: 12.5mm
Tip material: Diamond
Tip ball dia: 5mm
Tip shape: 40° cone



Parts No.: 12AAD653

Unit: mm



Nosepiece Detector unit
(CS-5000CNC)

*1: Standard accessory for CS-5000CNC
*2: Standard accessory for CS-H5000CNC

CNC

CNC Surface Roughness Tester Surftest Extreme
CNC Surface Texture Measuring Instrument Formtracer Extreme
CNC Contour Measuring Instrument Contracer Extreme

+
~~optional accessory~~

+
~~Software
FORMTRACEPAK~~

+
+

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