



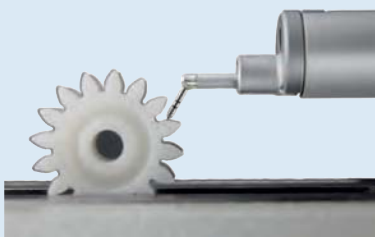
Surface Roughness Measuring Instruments
Surftest
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Contour Measuring Instruments
Contracer
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Surface Roughness & Contour Measuring Instruments
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Accessories Surftest, Contracer, Formtracer
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Surftest SJ-210

Series 178 - Portable Surface Roughness Measuring Instrument

This is a portable measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SJ-210 offers you the following benefits:

- It works independently of mains power, allowing you to make on-site measurements.
- The **6 cm** [2,4"] colour graphic, back-lit LCD gives you excellent readability.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- Different drivers expanding the range of applications.
- Calculation results, assessed profiles, bearing and amplitude curves can be displayed.
- Support of 21 languages.
- Operation by keys on the front and under the sliding cover.



SJ-210

Metric Switchable between 16 languages:
Japanese, English, German, French, Italian, Spanish, Portuguese, Czech, Polish, Hungarian, Turkish, Swedish, Dutch, Korean, Traditional Chinese, Simplified Chinese

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [µm]	Description	Mass
178-560-01D	0,75	60°	2	SJ-210 model	500g
178-562-01D	0,75	60°	2	SJ-210R model	500g
178-564-01D	0,75	60°	2	SJ-210S model	500g

Metric Switchable between 16 languages:
Japanese, English, Russian, Slovenian, Rumanian, Bulgarian, Finnish, German, French, Italian, Spanish, Czech, Polish, Hungarian, Turkish, Swedish

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [µm]	Description	Mass
178-560-03D	0,75	60°	2	SJ-210 model	500g



Standard



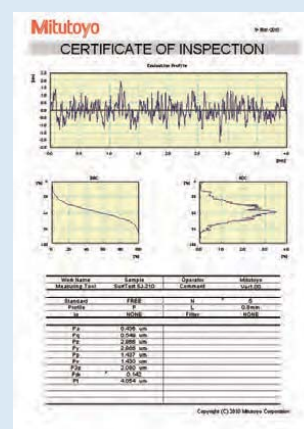
R-type



S-type

Specifications

Drive unit	
Measuring range	16 mm 4,8 mm [S-type]
Traverse	17,5 mm 5,6 mm [S-type]
Measuring speed	0,25 mm/s ; 0,5 mm/s; 0,75 mm/s
Detector	
Measuring method	Differential inductance
Range	360 µm
Stylus	Diamond Tip
Skid radius	40 mm
Display unit	
Profiles	Roughness Profile (R), R-Motif, DF-Profile and more
Roughness standards	EN ISO, VDA, JIS, ANSI and customize settings
Digital filter	Gauss, 2CR75, PC75
Cut-off length	λc : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm λs : 2,5 µm; 8 µm
Tolerance	Coloured upper / lower limit
Interface	USB, Digimatic, RS-232C, Foot switch
Power supply	AC adapter or rechargeable battery



Software
USB COMMUNICATION TOOL
as a free download on www.mitutoyo.eu
registration required
(refer to page Optional Software USB Communication Tool)



Refer to Surftest SJ-210 brochure



Scan QR Code with your mobile device and watch our product videos on YouTube

Surftest SJ-210

Series 178 - Portable Surface Roughness Measuring Instrument

The SJ-210R – Retract System is a portable measuring instrument for surface roughness that includes a safety system.

- The detector starts in a safety position, not in contact with the workpiece surface. When measurement starts, the detector is lowered onto the workpiece while the drive unit moves in X measuring direction. During the return movement, the detector lifts up from the workpiece surface before returning to the start position. This is useful for avoiding stylus damage in applications where you cannot easily see the test surface.

SJ-210S (detailed information further on in this chapter)

- The SJ-210S model is a portable measuring instrument for surface roughness that has a transverse drive capability. This allows you to test shrouded surfaces in the transverse direction, such as crankshaft bearing surfaces, flanged features or deep grooves.

Additional Specifications

Other accessories	Other optional and standard accessories are listed later in this section
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Optional accessories

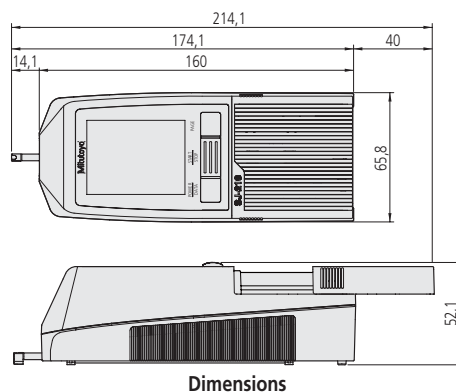
No.	Description
178-029	Granite stand (12AAA221 is needed for SJ-210/310)
178-033	Measuring device for cylindrical workpieces
178-034	Measuring device as universal fixture
178-035	Measuring device for measuring inside diameter
12AAA221	Adapter for magnetic stand
178-230-2	Standard drive unit 17,5 mm
178-235	R-Type drive unit 17,5 mm
178-233-2	S-Type drive unit 5,6 mm
936937	Digimatic cable (1 m)
965014	Digimatic cable (2 m)
02AZD790D	Connecting cable U-Wave
06ADV380D	USB Input Tool Direct cable (2 m)
12BAA303	Connecting cable for extension 1 m



Keyboard protective cover open



Back view



Dimensions



SJ-210



178-029 (displayed with SJ-210)

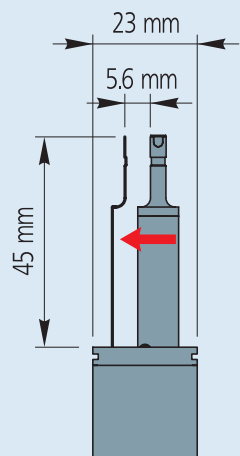
Surftest SJ-210 and SJ-310 - S-Type

Specifications

Traverse	5,6 mm
Measuring speed	0,25 mm/s; 0,5 mm/s; 0,75 mm/s

Optional accessories

No.	Description
178-029	Granite stand (12AAA221 is needed for SJ-210/310)
12AAA221	Adapter for magnetic stand
178-230-2	Standard drive unit 17,5 mm
178-235	R-Type drive unit 17,5 mm
178-233-2	S-Type drive unit 5,6 mm



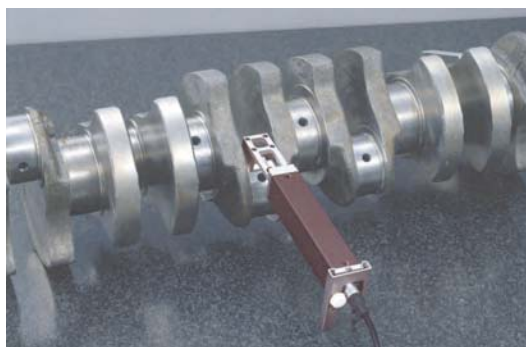
Linear movement of S-Type

Series 178 – Portable Transverse Measurement with S-Type Drive Unit

This is an S-Type drive unit for the Surftest SJ-210 and SJ-310 that provides portable transverse measurement.

It offers you the following benefits:

- It is compatible with the conventional drive units of the Surftest SJ-210 and SJ-310.
- You can simply connected it to the display unit.
- A typical application would be to position the S-Type unit on a crankshaft journal bearing, as shown in the photograph below. Once started the S-Type drive will track the stylus across the surface transversely to its own axis and reliably measure surface roughness in the direction of the crankshaft axis. Transverse tracking simplifies the measurement of surface roughness even in very confined situations, which has long been a problem with conventional instruments which allow only longitudinal measurement.



S - Type Drive Unit Set: [incl. 178-233-2 - 12AAE644 - 12AAE643]

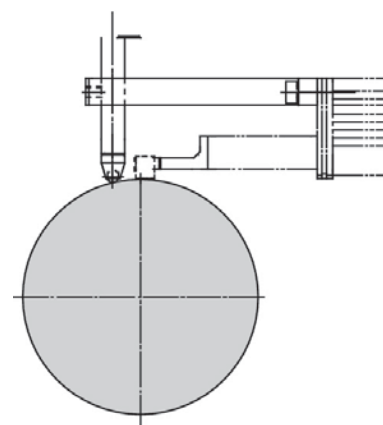
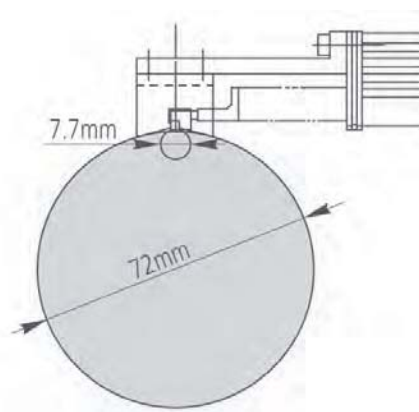
No.	Traverse [mm]	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-234-2	5,6 mm	0,75	60°	2



12AAE644
V-type adapter



12AAE643
Point - contact adapter



Accessories for SJ-210 and SJ-310

Series 178 - Standard and Optional Accessories for Surftest SJ-210 / SJ-310

Model		Surftest SJ-210		Surftest SJ-210R		Surftest SJ-210S		Surftest SJ-310		Surftest SJ-310R		Surftest SJ-310S	
No.	Description	Std	Opt	Std	Opt	Std	Opt	Std	Opt	Std	Opt	Std	Opt
12AAA210	Extension rod length 50 mm		●		●				●		●		
12AAA216	Height adjustment feet		●		●			●					
12AAA217	Nosepiece (flat)		●		●			●		●			
12AAA218	Nosepiece (cylindrical)		●		●			●		●			
12AAA219	Adapter for vertical position		●		●				●		●		
12AAA221	Adapter for magnetic stand		●		●		●		●		●		●
12AAA222	Height gauge adapter		●		●		●		●		●		●
12AAD510	USB cable for SJ-310 / SJ-410								●		●		●
12AAE643	Point - contact adapter					●						●	
12AAE644	V-type adapter					●						●	
12AAJ088	Footswitch		●		●		●		●		●		●
12AAL066	Protective sheets for display (5 sheets)		●		●		●						
12AAL067	RS-232C cable for printer		●		●		●						
12AAL068D	USB cable for SJ-210		●		●		●						
12AAL069	Memory card		●		●		●		●		●		●
12AAN040	Protective film								●		●		●
12AAN046	Battery							●		●		●	
12BAA303	Connecting cable for extension 1 m	●		●		●			●		●		●
12BAG834	Touch pen							●		●		●	
12BAK700	Calibration table	●		●		●		●		●		●	
12BAK728	AC adapter 9V	●		●		●							
12BAL402	Touch Panel Protection							●		●		●	
357651	AC Adapter 12V							●		●		●	
178-029	Granite stand		●		●		●		●		●		●
178-230-2	Standard Drive unit 17,5 mm	●			●		●	●			●		●
178-233-2	S-Type drive unit 5,6 mm		●		●	●			●		●	●	
178-235	R-Type drive unit 17,5 mm		●	●			●		●	●			●
178-296	Standard detector 2 µm; 0,75 mN	●		●				●		●			
178-383	Detector for small holes Ø4,5 mm; 2 µm; 0,75 mN		●		●				●		●		
178-384	Detector for small holes Ø2,8mm		●		●				●		●		
178-385	Deep groove detector 2 µm; 0,75 mN		●		●				●		●		
178-386	Detector for S-drive 5 µm; 4 mN		●		●	●			●		●	●	
178-387	Detector for S-drive 2 µm; 0,75 mN		●		●	●			●		●	●	
178-388	Detector for gear tooth surface 2 µm; 0,75 mN		●		●				●		●		
178-390	Detector 5 µm; 4 mN		●		●				●		●		
178-391	Detector for soft materials 10 µm; 4 mN		●		●				●		●		
178-392	Detector for small holes Ø4,5 mm; 5 µm; 4 mN		●		●				●		●		
178-393	Detector for small holes Ø2,8 mm; 5 µm; 4 mN		●		●				●		●		
178-394	Deep groove detector 5 µm; 4 mN		●		●				●		●		
178-398	Detector for gear tooth surface 5 µm; 4 mN; 90°		●		●				●		●		
178-421DDS	Printer set for SJ-210		●		●		●						
178-601	Roughness specimen Ra 3 µm	●		●			●	●		●		●	
178-604	Roughness specimen Ra 0,4 µm /3 µm		●		●		●		●		●		●
178-605	Roughness specimen Ra 1 µm		●		●	●			●		●	●	
270732	Printer papers (5 rolls)		●		●		●	●		●		●	

Optional accessories

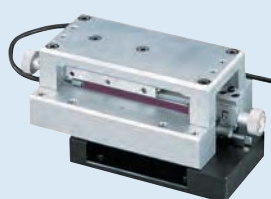
No.	Description
178-033	Measuring device for cylindrical workpieces
178-034	Measuring device as universal fixture
178-035	Measuring device for measuring inside diameter



178-029
(displayed with 12AAA221 + SJ-210)



178-033



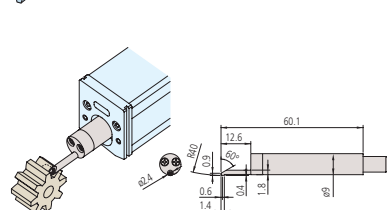
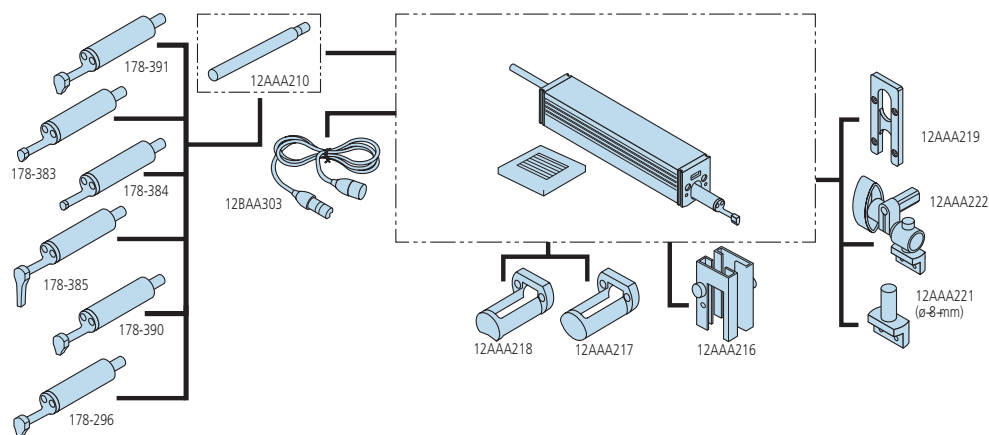
178-034



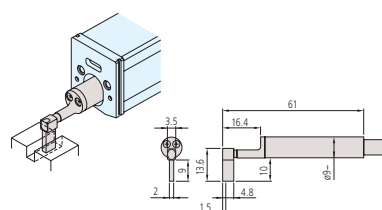
178-035

Accessories for SJ-210 and SJ-310

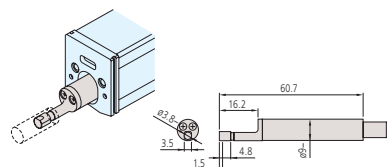
Series 178



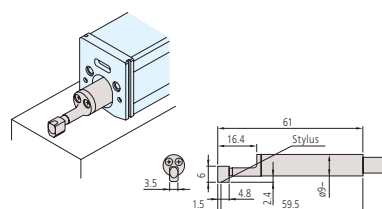
178-388/178-398



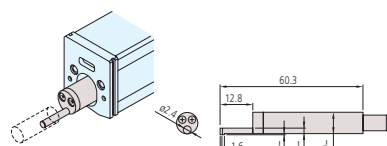
178-385/178-394



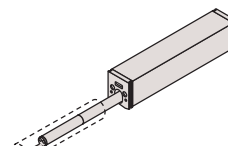
178-383/178-392



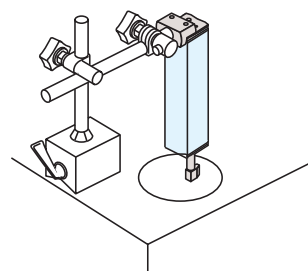
178-390/178-387
178-296/178-386



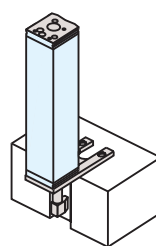
178-384/178-393



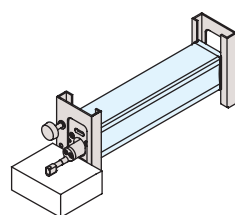
12AAA210



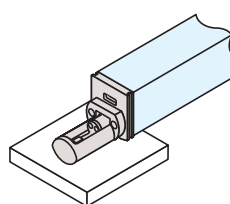
12AAA221



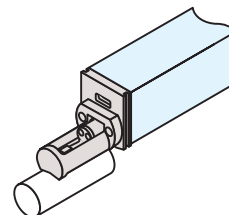
12AAA219



12AAA216



12AAA217



12AAA218

Surftest SJ-410

Series 178 - Portable Surface Roughness Measuring Instrument

This is a portable measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SJ-410 offers you the following benefits:

- Skidless system with touch-screen functionality and built-in printer.
- It works independently of mains power, allowing you to make on-site measurements.
- Easy and intuitive menu navigation.
- The large **14,5cm** [5,7"] colour LCD gives you high visibility.
- The skidless detector allows you to measure the primary profile (P), roughness profile (R), waviness profile (W) and more.
- Surface compensation of curved, radial and tilted surfaces.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- You can store up to 10 different measuring conditions inside the SJ-410, and up to 500 with an optional SD card.
- It allows two different evaluation conditions within one measurement adjustable.
- You can separately password protect many functions.
- It comes with support for 16 languages.
- Available options include an auto-set unit, X-axis fine adjustment and digital levelling unit.



SJ-410

Surftest SJ-411

Traverse : 25 mm

Traverse straightness : 0,3 µm / 25 mm

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [µm]
178-580-01D	0,75	60°	2
178-580-02D	4	90°	5

Surftest SJ-412

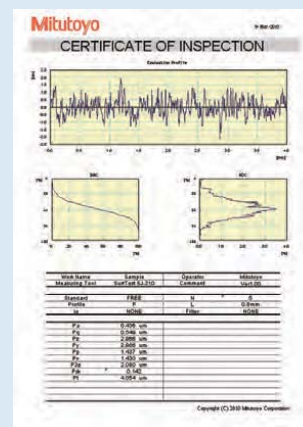
Traverse : 50 mm

Traverse straightness : 0,5 µm / 50 mm

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [µm]
178-582-01D	0,75	60°	2
178-582-02D	4	90°	5

Specifications

Drive unit	
Traverse	SJ-411: 25 mm SJ-412: 50 mm
Measuring speed	0,05 mm/s; 0,1 mm/s; 0,2 mm/s; 0,5 mm/s; 1 mm/s
Detector	
Measuring method	Skidless - Differential inductance
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Positioning	±1,5° (tilting), 10 mm (up/down)
Display unit	
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standards	EN ISO, VDA, JIS, ANSI and customize settings
Analysis graphs	BAC, ADC
Digital filter	Gauss, 2CR75, PC75
Cut-off length	λc : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm λs : 2,5 µm; 8 µm; 25 µm
Printer	Thermal Printer
Tolerance	Coloured upper / lower limit
Interface	USB, Digimatic, RS-232C, Foot switch
Power supply	AC adapter or rechargeable battery



Software

USB COMMUNICATION TOOL

as a free download on www.mitutoyo.eu
registration required
(refer to page Optional Software USB Communication Tool)



Refer to Surftest SJ-410 brochure



Scan QR Code with your mobile device and watch our product videos on YouTube

Surftest SJ-410

Series 178 - Portable Surface Roughness Measuring Instrument

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
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Optional accessories

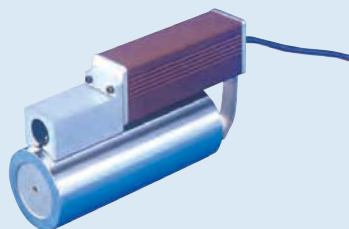
No.	Description
178-396-2	Detector 0,75 mN
178-397-2	Detector 4 mN
178-047	Three-axis adjustment table
178-048	Leveling table D.A.T.
178-042-1	Digimatic XY leveling table 25 mm x 25 mm
178-043-1	XY leveling table 25 mm x 25 mm
178-605	Roughness specimen Ra = 1 µm
178-610	Step gauge (1, 2, 5, 10) µm
178-611	Reference step specimen (2, 10) µm
178-019	Precision vise
12AAB358	Cylinder attachment ø15 - 60 mm
936937	Digimatic cable (1 m)
965014	Digimatic cable (2 m)
02AZD790D	Connecting cable U-Wave
12AAD510	USB cable
12AAL069	Memory card
12AAG202	Extension rod 50 mm
12AAG203	Extension rod 100 mm
178-093	Desktop Vibration Isolation Stand
Stands	
178-039	Granite stand

Consumable spares

No.	Description
12AAB355	Nosepiece
12BAG834	Touch pen
12BAL402	Touch Panel Protection
12AAN046	Battery
270732	Printer paper (5 rolls)



178-048
Leveling table D.A.T.



12AAB358
Cylinder attachment



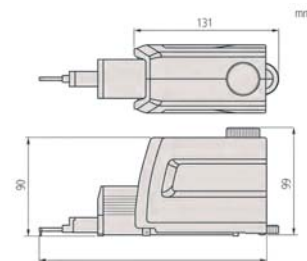
Deep groove measurement



Upside down measurement



R-surface measurement



SJ-411: 207,5 mm / SJ-412: 234 mm
Drive unit



Optional:

- Autoset unit 178-010
- X-axis adjustment 178-020
- Tilting adjustment unit 178-030



Scope of delivery



178-039
(displayed with SJ-411)

Surftest SJ-500

Series 178 - Surface Roughness Measuring Instrument

This is a portable measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SJ-500 offers you the following benefits:

- The skidless detector allows you to measure the primary profile (P), roughness profile (R), waviness profile (W) and more.
- User friendly control unit for high precision surface roughness measurement.
- The large **19cm [7,5"]** colour TFT LCD with touch-screen functionality gives you high visibility and ease of use.
- The display menu is easy to read and simple to operate.
- It performs roughness anylses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- The built-in joystick on the control unit enables quick and easy positioning. The manual adjustment knob allows you to finely position a small stylus to measure the inside surface of small holes.
- The detector unit allows a 90° displacement of the stylus, which is ideal for crankshaft and narrow space measurement.
- You can use the instrument stand-alone or mounted on a stand.

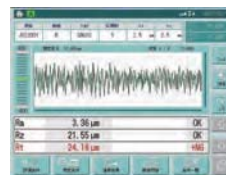


SJ-500

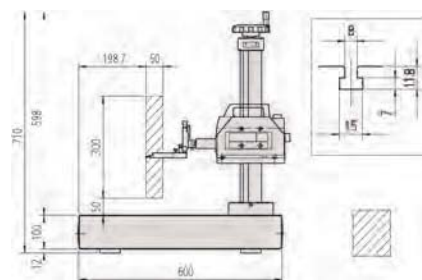
No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-532-02D	4	90°	5
178-532-01D	0,75	60°	2



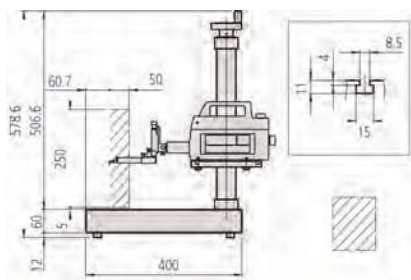
SJ-500 with optional manual column stand



Preview



178-085
600x450x710 mm



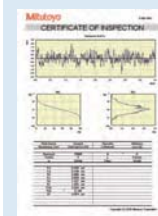
178-089
400x250x578 mm

Specifications

Drive unit	
Traverse	50 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	0 - 20 mm/s or joystick operation
Traverse straightness	0,2 μm / 50 mm
Detector	
Measuring method	Skidless - Differential inductance
Range	800 μm; 80 μm; 8 μm (up to 2,4 mm with an optional stylus)
Positioning	±1,5° (tilting) 30 mm (up/down)
Display unit	
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (R, W) and more
Standards	EN ISO, VDA, JIS, ANSI and customize setting
Analysis graphs	BAC, ADC
Digital filter	Gauss, 2CR75, PC75, RobustSpline
Cut-off length	λc : 0,025 mm; 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm; 25 mm λs : 0,25 μm; 0,8 μm; 2,5 μm; 8 μm; 25 μm; 80μm; 250μm; None λf : 0,08mm; 0,25mm; 0,8mm; 2,5mm; 8mm; 25mm; None
Printer	Thermal printer

Optional accessories

No.	Description
178-396-2	Detector 0,75 mN
178-397-2	Detector 4 mN
178-085	Granite stand 600x450x710 mm
178-089	Granite stand 400x250x578 mm
178-047	Three-axis adjustment table
178-048	Leveling table D.A.T.
178-042-1	Digimatic XY leveling table 25 mm x 25 mm
178-043-1	XY leveling table 25 mm x 25 mm
12AAG202	Extension rod 50 mm
12AAG203	Extension rod 100 mm
178-093	Desktop Vibration Isolation Stand



Software

USB COMMUNICATION TOOL

as a free download on www.mitutoyo.eu
registration required
(refer to page Optional Software USB Communication Tool)



Refer to SURFACE MEASUREMENT brochure

Surftest SV-2100

Series 178 - Surface Roughness Measuring Instrument

This is a stationary measuring instrument that allows you to easily and accurately measure surface roughness.

The Surftest SV-2100 offers you the following benefits:

- It is mounted on a granite base with a manual or power column.
- The large **19cm** [7,5"] colour TFT LCD gives you high visibility and touch-screen functionality.
- It has a user friendly display unit for high precision surface roughness measurement.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- Designed for usage in workshop areas.



SV-2100S4



SV-2100M4

SV-2100H4 model

Vertical travel : 550 mm power column
Granite base size (WxD) : 600 x 450 mm

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-682-01D	0,75	60°	2
178-682-02D	4	90°	5

SV-2100M4 model

Vertical travel : 350 mm manual column
Granite base size (WxD) : 600 x 450 mm

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-636-01D	0,75	60°	2
178-636-02D	4	90°	5

SV-2100S4 model

Vertical travel : 350 mm power column
Granite base size (WxD) : 600 x 450 mm

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-680-01D	0,75	60°	2
178-680-02D	4	90°	5

SV-2100W4 model

Vertical travel : 550 mm power column
Granite base size (WxD) : 1000 x 450 mm

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-684-01D	0,75	60°	2
178-684-02D	4	90°	5

Specifications

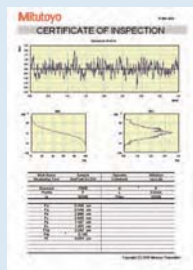
Drive unit	
Traverse	100 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0-40 mm/s Z2 = 0-20 mm/s or joystick operation
Traverse straightness	0,15 μm / 100 mm
Detector	
Measuring method	Skidless - Differential inductance
Range	800 μm; 80 μm; 8 μm (up to 2,4 mm with an optional stylus)
Display unit	
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (P, R, W) and more
Standards	EN ISO, VDA, JIS, ANSI and customize settings
Analysis graphs	BAC, ADC
Digital filter	Gauss, 2CR75, PC75, RobustSpline
Cut-off length	λc : 0,025 mm; 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm; 25 mm; 80 mm λs : 0,25 μm; 0,8 μm; 2,5 μm; 8 μm; 25 μm; 80 μm; 250 μm; none λf : 0,08 mm; 0,25 mm; 0,8 mm; 2,5 mm; 8 mm; 25 mm; 80 mm; none
Printer	Thermal printer

Optional accessories

No.	Description
12AAG202	Extension rod 50 mm
12AAG203	Extension rod 100 mm
218-001	Cross-travel table XY range : 100x50 mm
218-003	Rotary vise (heavy-duty type)



Preview



Software

USB COMMUNICATION TOOL

as a free download on www.mitutoyo.eu
registration required
(refer to page Optional Software USB Communication Tool)



Refer to SURFACE MEASUREMENT brochure

Surftest SJ-500P - SV-2100P

Series 178 - Surface Roughness Measuring Instruments with Software FORMTRACEPAK

These are surface roughness measuring instruments with software FORMTRACEPAK.

Software FORMTRACEPAK offers you the following benefits:

- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- It can be used for contour calculation within the measuring range.
- It offers total support for measurement system control, analysis and inspection report.
- All advantages of the SJ-500 and SV-2100 also apply to the P Type.



SJ-500P

No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-530-01D	0,75	60°	2
178-530-02D	4	90°	5

Surftest SV-2100M4P



SV-2100P

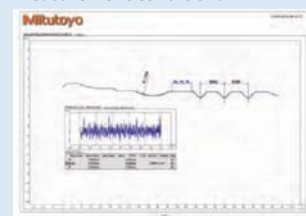
No.	Detector measuring force [mN]	Stylus Tip angle	Stylus Tip radius [μm]
178-634-01D	0,75	60°	2
178-634-02D	4	90°	5

Specifications

Drive unit	
Traverse	50 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	0-20 mm/s
Traverse straightness	0,2 μm / 50 mm
Detector	
Measuring method	Skidless - Differential inductance
Range	800 μm; 80 μm; 8 μm (up to 2,4 mm with an optional stylus)
Positioning	±1,5° (tilting) 30 mm (up/down)
Software	FORMTRACEPAK



Measurement conditions



Formtracepak layout Specifications

Drive unit	
Traverse	100 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0-40 mm/s Z2 = 0-20 mm/s
Traverse straightness	0,15 μm / 100 mm
Detector	
Measuring method	Skidless - Differential inductance
Range	800 μm; 80 μm; 8 μm (up to 2,4 mm with an optional stylus)
Software	FORMTRACEPAK



Refer to SURFACE MEASUREMENT brochure

Surftest SV-3200

Series 178 - Surface Roughness Measuring Instrument

This is a stationary surface roughness measuring instrument with FORMTRACEPAK software that allows you to take highly accurate measurements.

The Surftest SV-3200 offers you the following benefits:

- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- It also supports contour calculation within the measuring range of the styli software.
- Part programming as well as motorised axes give you many features of a CNC instrument.
- You can choose from a huge number of styli that are easy to replace.
- Detector holders for downward/upward measurement and crank position available as option
- Optional accessories like DAT unit and 3D/Y-axis table have been added to product line.

Specifications

Traverse	100 mm / 200 mm
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Drive speed	X = 0 - 80 mm/s Z = 0 - 30 mm/s
Measuring speed	0,02 - 5 mm/s
Inclining range	±45°
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (P, R, W) and more
Standards	EN ISO, VDA, JIS, ANSI and customize setting
Software	FORMTRACEPAK <ul style="list-style-type: none"> • Enables control of all axes and rotary table for realizing efficient measurement automation. • Perform contour evaluation that allows free analysis of level differences, angles, pitch, area and other characteristics as well as surface roughness evaluation. • Able to create an original inspection certificate by setting the print format to suit particular requirements.



Detector holder S-3000C



Detector holder S-3000CR



Detector holder S-3000MR



SV-3200H4 with optional DAT unit

X-axis measuring range : 100 mm

X-axis Traverse straightness : (0,05+0,001L) µm, L = Measurement length (mm)

Model	SV-3200S4	SV-3200S4.	SV-3200H4	SV-3200H4.	SV-3200W4.	SV-3200W4
No.	178-434D-1	178-434D-2	178-435D-1	178-435D-2	178-436D-1	178-436D-2
Detector measuring force [mN]	0,75	4	0,75	4	0,75	4
Stylus Tip angle	60°	90°	60°	90°	60°	90°
Stylus Tip radius [µm]	2	5	2	5	2	5
Vertical travel [mm]	300	300	500	500	500	500
Granite base size (WxD) [mm]	600x450	600x450	600x450	600x450	1000x450	1000x450

X-axis measuring range : 200 mm

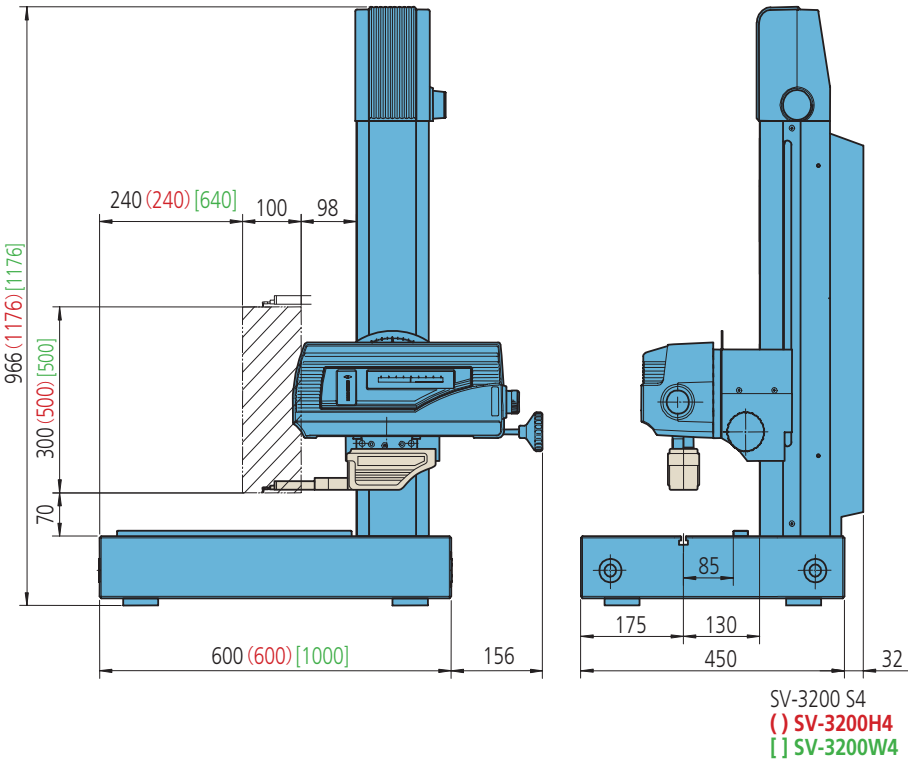
X-axis Traverse straightness : (0,1+0,002L) µm, L=Measurement length (mm)

Model	SV-3200S8	SV-3200S8.	SV-3200H8	SV-3200H8.	SV-3200W8	SV-3200W8.
No.	178-437D-1	178-437D-2	178-438D-1	178-438D-2	178-439D-1	178-439D-2
Detector measuring force [mN]	0,75	4	0,75	4	0,75	4
Stylus Tip angle	60°	90°	60°	90°	60°	90°
Stylus Tip radius [µm]	2	5	2	5	2	5
Vertical travel [mm]	300	300	500	500	500	500
Granite base size (WxD) [mm]	600 x 450	600 x 450	600 x 450	600 x 450	1000 x 450	1000 x 450

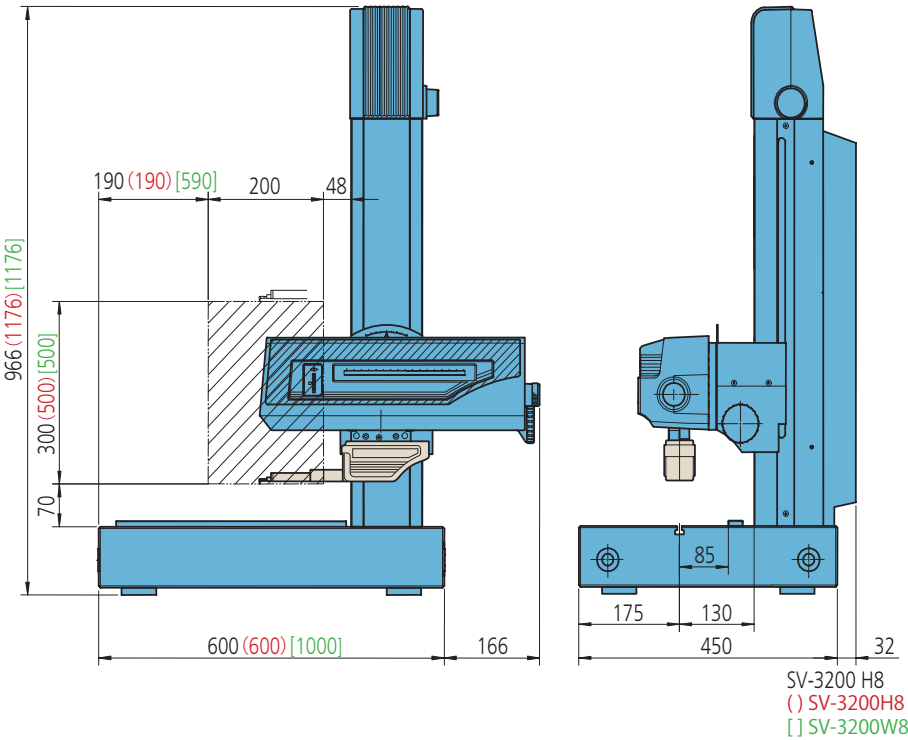
Surftest SV-3200

Series 178 - Surface Roughness Measuring Instrument

Dimensions and Optional accessories



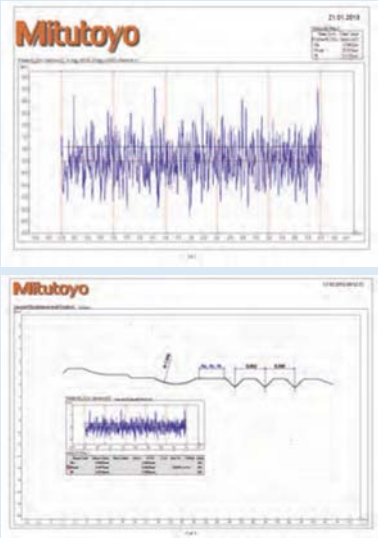
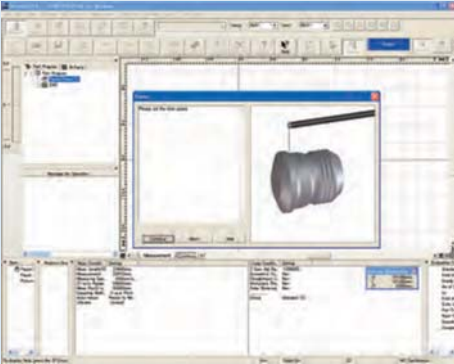
SV-3200S4 - SV-3200H4 - SV3200W4



SV-3200S8 - SV-3200H8 - SV-3200W8

Optional accessories

No.	Description
178-097	Y-axis table
12AAD975	Ø1-axis table
178-078	Ø2-axis table
178-023	Manual vibration isolator
178-024	Stand for vibration isolator
178-025	Dynamic vibration isolator
218-001	Cross-travel table XY range : 100x50 mm
218-003	Rotary vise (heavy-duty type)
12AAG202	Extension rod 50 mm
12AAG203	Extension rod 100 mm
178-611	Reference step specimen (2, 10) µm
178-087	Automatic leveling table SV-, CV-series, CS-3200
178-396-2	Detector 0,75 mN
178-397-2	Detector 4 mN
178-074	Detector holder S-3000C
178-075	Detector holder S-3000CR
178-076	Detector holder S-3000MR
178-040	DAT unit
178-096	3 D/Y-axis table



FORMTRACER

Surftest Extreme SV-3000CNC

Series 178 – CNC Surface Roughness Measuring Instrument

These is a fully CNC surface roughness measuring instrument with powerful software FORMTRACEPAK.

The Surftest Extreme SV-3000CNC offers you the following benefits:

- It is perfectly made for increased throughput of multiple profile and workpiece measurement tasks.
- Each axis has a drive speed of up to 200 mm/s.
- You can take continuous measurement over horizontal and inclined surfaces by power-tilting the drive unit.
- Within the measuring range of the styli software FORMTRACEPAK supports contour calculation
- 3D topography measurement as option available
- Inclined plane measurement is possible through 2-axis simultaneous control in the X and Y directions.
- The detector unit incorporates an anti-collision safety device, causing it to automatically stop if its main body collides with a workpiece or jig.

Specifications

Traverse	X = 200 mm Y = 200mm
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode: 0 - 60 mm/s
Traverse straightness	0,5 µm / 200 mm
Inclining range	+45° (CCW) to -10° (CW)
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (P, R, W) and more
Standards	EN ISO, VDA, JIS, ANSI and customize setting
Software	FORMTRACEPAK <ul style="list-style-type: none"> • Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement. • Surface roughness analysis and contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
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Optional accessories

No.	Description
12AAD975	Ø1-axis table
178-078	Ø2-axis table
178-037	Automatic leveling table CNC
178-077	3D leveling table
12AAE032	Vibration isolator stand
12AAE449	Cabin for H-type

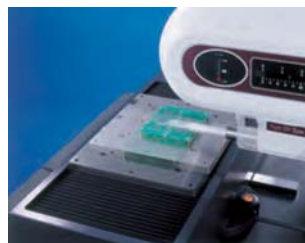


Refer to SURFACE MEASUREMENT brochure



SV-3000CNC

Model	SV-3000CNC-S	SV-3000CNC-H	SV-3000CNC-S.	SV-3000CNC-H.
No.	178-522-2	178-542-2	178-524-2	178-544-2
Z2-axis vertical travel [mm]	300	500	300	500
Y-axis table unit	-	-	Installed	Installed
α-axis unit	Installed	Installed	Installed	Installed



Automatic measurement

Surftest Extreme SV-M3000CNC

Series 178 - CNC Surface Roughness Measuring Instrument

This is a top performance CNC surface roughness measuring instrument with powerful software FORMTRACEPAK.

The Surftest Extreme SV-M3000CNC offers you the following benefits:

- You can measure large and heavy workpieces such as engine blocks and crankshafts.
- It has an 800mm moving column configuration to largely eliminate workpiece size restrictions.
- Each axis has a drive speed of up to 200 mm/s.
- When combined with the optional detector swivelling unit, continuous measurement over the bottom, top and side surface of a workpiece is possible.
- The huge load table has a self-contained structure ensuring that you can easily accommodate various size workpieces, standard and custom jigs, and auto-feed devices.



No.	Detector hold type (Essential option)	Model
178-549-2	Standard	178-071
	Long type	178-072
	Rotary type	178-073



Typical measurement task

Specifications	
Traverse	X = 200 mm Y = 800 mm Zz = 500 mm
Range	800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode: 0 - 50 mm/s
Traverse straightness	X = 0,5 µm / 200 mm (standard) X = 0,7 µm / 200 mm (long-type detector) X = 0,5 µm / 200 mm (rotary-type detector) Y = 0,5 µm / 50 mm; 2 µm / 800 mm (standard) Y = 0,7 µm / 50 mm; 3 µm / 800 mm (long-type detector) Y = 0,7 µm / 50 mm; 3 µm / 800 mm (rotary-type detector)
Inclining range	-45° (CCW) to +10° (CW)
Profiles	Primary Profile (P), Roughness Profile (R), Waviness (W), MOTIF (P, R, W) and more
Standards	EN ISO, VDA, JIS, ANSI and customize setting
Loading weight	300 kg
Software	FORMTRACEPAK <ul style="list-style-type: none">• Enables control of all axes for realizing efficient measurement automation.• Perform contour evaluation that allows free analysis of level differences, angles, pitch, area and other characteristics as well as surface roughness evaluation.• Able to create an original inspection certificate by setting the print format to suit particular requirements.

Additional Specifications	
Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.



Refer to SURFACE MEASUREMENT brochure

Quick Guide to Precision Measuring Instruments



Surftest (Surface Roughness Testers)

■ Profiles and filters

(EN ISO 4287 and EN ISO 16610-21)

The **actual surface profile** is the result of the actual surface of the workpiece intersecting with a plane that is perpendicular to this surface. The plane should run approximately vertical to the tool marks.

The **measured surface profile** is the profile after tracing the actual surface profile using a probe. The measured values are filtered due to the effect of the stylus tip radius r and, if applicable, due to the skid of the probe system. Surface imperfections, such as cracks, scratches and dents, are not considered roughness and should not be measured. If necessary, specify the tolerances in accordance with DIN EN ISO 8785.

The **primary profiles** the profile after low-pass filtering of the measurement values with the cutoff wavelength λ_s . For this, the short-wave profile segments are segregated. The parameters are identified by **P** and are evaluated within the individual sampling length. In this case, this is equal to the evaluation length or the length of the measured surface profile.

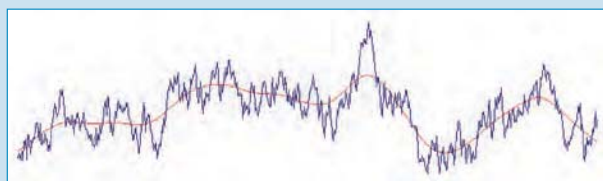


Fig. 1: Primary profile and mean line for the λ_s profile filter

The **roughness profile** is the result of high-pass filtering of the primary profile with the cutoff wavelength λ_c . For this, the long-wave profile segments are segregated. The parameters are identified by **R** and are analyzed across the evaluation length l_n , which usually consists of five individual sampling lengths l_r . The sampling length is equal to the cutoff wavelength λ_c of the profile filter.

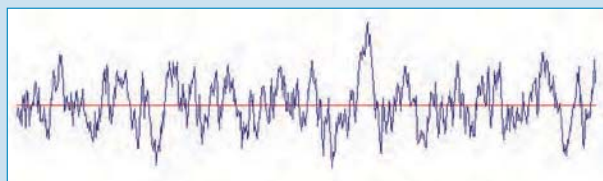


Fig. 2: Roughness profile with mean line (high-pass filtering of the primary profile using the λ_c profile filter)

The **waviness profile** is the result of low-pass filtering of the primary profile with the cutoff wavelength λ_c and high-pass filtering with the cutoff wavelength λ_f . The parameters are identified by **W** and are evaluated over the evaluation length l_n , which consists of several sampling lengths l_w . The sampling length l_w corresponds to the cutoff wavelength λ_f of the high-pass filter. However, the number of sampling lengths is not standardized and must therefore always be specified on the drawing. It should be between five and ten.

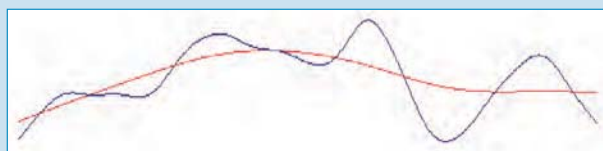


Fig. 3: Mean line from the primary profile and mean line for the λ_f profile filter after high-pass filtering

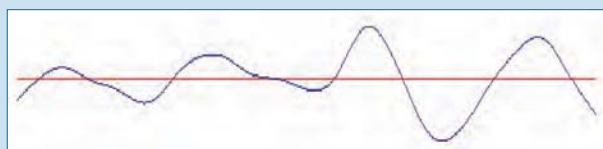


Fig. 4: Waviness profile with mean line after low-pass filtering using the λ_c profile filter

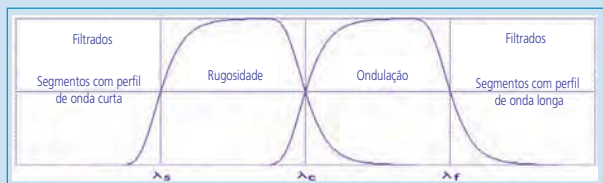


Fig. 5: Transmission characteristics of the filters for the different profiles, Gaussian filter as per EN ISO 16610-21

■ Roughness parameters (EN ISO 4287)

Ra – Arithmetic average roughness value: arithmetic mean of the sums of all profile values

Rmr(c) – Material portion of profile: quotient from the sum of the material lengths of the profile elements at the specified section height c (in μm) and of the evaluation length l_n (specified as a percentage)

RSm – Mean groove width: mean value of the width of the profile elements X_{si} (previously S_m); horizontal and vertical counting thresholds have been defined for the evaluation

Rt – Total height of the roughness profile: Sum from the height Z_p of the highest profile peak and the depth Z_v of the lowest profile valley within the evaluation length l_n

Rzi – Maximum height of the roughness profile: Sum from the height of the highest profile peak and the depth of the lowest profile valley within a sampling length l_r

Rz1max – Maximum roughness depth: Largest of the five Rz_i values from the five sampling lengths l_r within the evaluation length l_n

Rz – Mean roughness depth: mean value of the five Rz_i values from the five sampling lengths l_r within the evaluation length l_n

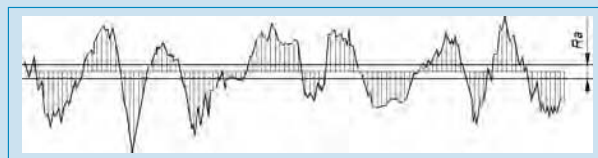


Fig. 6: Arithmetic average roughness value R_a

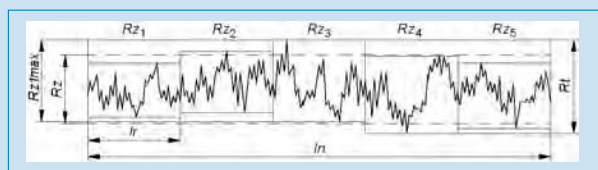


Fig. 7: Total height of the roughness profile R_t , mean roughness depth R_z and maximum roughness depth R_{z1max}

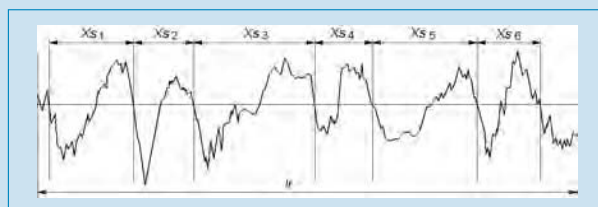


Fig. 8: The mean groove width R_{Sm} is the mean value of the width X_s of the profile elements

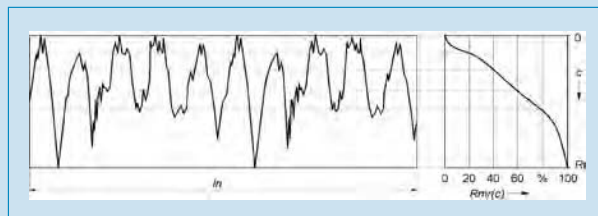


Fig. 9: The material ratio curve of the profile represents the material portion $R_{mr}(c)$ of the profile as a function of the section height c (Abbott-Firestone curve)

■ Preferred parameters

Maximum roughness depth R_{z1max} for surfaces where individual deviations strongly affect the function of the surface, e.g. sealing surfaces.

Material portion of the profile $R_{mr}(c)$ for guide surfaces and opposing sealing surfaces

Mean roughness depth R_z usually applies to all other surfaces.

The arithmetic mean roughness value R_a hardly reacts to individual peaks or valleys due to the mean value formed from all profile values; its significance is therefore rather low.

Roughness measuring conditions (EN ISO 4288)

Non-periodic profiles		Periodic profiles	Measuring conditions as per EN ISO 4288 and EN ISO 3274			
Grinding, honing, lapping, eroding ↓ or ↓		Turning, milling, planing ↓	r_{tip} Maximum stylus tip radius l_r Sampling length l_n Evaluation length l_t Traversing length (evaluation length plus pre-travel and post-travel lengths)			
Rt, Rz μm	Ra μm	RSm mm	r_{tip} μm	$\lambda_c = l_r$ mm	ln mm	lt mm
> 0,025...0,1	> 0,006...0,02	> 0,013...0,04	2	0,08	0,4	0,48
> 0,1...0,5	> 0,02...0,1	> 0,04...0,13	2	0,25	1,25	1,5
> 0,5...10	> 0,1...2	> 0,13...0,4	2*)	0,8	4	4,8
> 10...50	> 2...10	> 0,4...1,3	5	2,5	12,5	15
> 50...200	> 10...80	> 1,3...4	10	8	40	48

*) For **Rz** > 3 μm or **Ra** > 0.5 μm, the stylus tip radius r_{tip} = 5 μm may be used.

In addition, the measuring point distance Δx and the cutoff wavelength λ_s of the low-pass filter are standardized. However, these values have already been set in the roughness measuring devices.

Practical tip 1: If there is insufficient space on the workpiece surface for the required traversing length **lt**, the number of evaluation lengths must be reduced and indicated in the drawing.

Practical tip 2: If there is still insufficient space, the total height of the primary profile **Pt** is measured over the available length instead of **Rt** or **Rz**. **Pt** is still equal to **Rt**, but defined at the primary profile, and the measurement value is always larger.

Evaluation of roughness measurements (EN ISO 4288)

Roughness measurement values, particularly the vertical parameters **Rt**, **Rz**, **Rz1max** and **Ra**, have a spread of somewhere between -20 % and +30 %. A single measurement value can therefore not provide a complete statement with regard to compliance with the permissible parameter tolerances. The following procedure is specified in the DIN EN ISO 4288 Appendix A:

Max rule

All roughness parameters with the addition of „max“ as the maximum of the mean value from the five sampling lengths: Measure at least three points on the surface where the highest values are expected; the stated limit must not be exceeded at any point.

16% rule

All roughness parameters without the addition of „max“ as the mean value from the five sampling lengths:

16% of the measured values may exceed the stated limit; the step-by-step procedure is as follows:

1. If the first measured value is less than 70% of the stated limit, this is considered compliant.
2. If the result is otherwise, two additional measurements are taken at other locations on the surface; if all three measured values are less than the stated limit, this is considered compliant.
3. If the result is otherwise, nine additional measurements are taken at other locations on the surface; if no more than two of the measured values exceed the stated limit, this is considered compliant.



Drawing symbols (EN ISO 1302)

	Basic symbol	a A single surface finish requirement b Additional surface requirement
	Material removal through mechanical processing required	c Production process (e.g. turned, ground, chrome-plated)
	Material removal not permitted	d Symbol for direction of lay (surface grooves) e Machining allowance (in mm)
	Identical texture of all surfaces	x Letter for simplified benchmarking, if space is limited

	Symbol entries (top) Symbols for direction of lay (position d, bottom)	
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= Parallel *	⊥ Vertical *)	X Intersecting	M Mixed	C Concentric	R Radial	P Undirected

*)... to projection plane of view in which the symbol is entered

Examples	Explanation
	No material removal allowed, default transmission band, R profile, 16% rule, mean roughness depth 5 μm (upper limit)
	Material removal allowed, default transmission band, R profile, max rule, maximum roughness depth 3 μm (upper limit); machining allowance 0.2 mm
	Material removal permitted, default transmission band, R profile, evaluation length of 3 sampling lengths, 16% rule, mean roughness depth 4 μm (upper limit); concentric surface grooves
	Material removal allowed, default transmission band, R profile, 16% rule, mean roughness depth 5 μm; arithmetic average roughness value 1 μm (upper limit)
	Material removal allowed, default transmission band, R profile, 16% rule, mean roughness depth between 1 μm (lower limit) and 3 μm (upper limit)
	Material removal allowed, default transmission band for λ_s , no λ_c filter, P profile, evaluation length equals workpiece length, 16% rule, total height of primary profile 25 μm (upper limit)
	Material removal allowed, default transmission band 0.8 (=λc) 25 (=λf=lt) mm, W profile, evaluation length of 5 sampling lengths ln=5*lw=125 mm, 16% rule, total height of profile 10 μm (upper limit)
	Material removal allowed, default transmission band, R profile, 16% rule, total height of roughness profile 1 μm (upper limit); material portion of profile is 90% in cutting height c=0.3 μm (lower limit)
	Material removal allowed, default transmission band, R profile, mean groove width between 0.1 mm (lower limit) and 0.3 mm (upper limit)
	Explanation of the meaning (right) of simplified benchmarking (left), if space is limited.

Contracer CV-2100

Series 218 - Contour Measuring Instruments

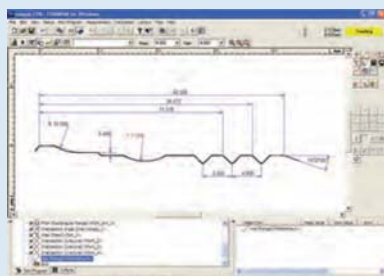
This contour measuring instrument is designed to support "easy to use" and "speedy" measurements.

The Contracer CV-2100N4 and CV-2100M4 offer you the following benefits:

- Extensive contour measurement quick and easy.
- Quick movement in Z2 because of an easy to use quick grip. [M4 type]
- Auto execution and multi point measurement with the new stylus up-and-down function.
- X-axis drive up to 20mm/s by jog shuttle.
- Easy part programming as well as single measurement with software FORMTRACEPAK.
- Automatic evaluation, best fit of contours, CAD comparison and many more features as standard.
- CV-2100 M4 mounted with quick grip stand on a granite base.
- CV-2100 N4 can be mounted on an optional granite base with a manual column.
- Centralized front control panel

Specifications

Measuring range	Z1 = 50mm X = 100mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0 - 20 mm/s
Accuracy	X = $(2,5 + 0,02L) \mu\text{m}$ [L: drive length (mm)] Z1 = $(2,5 + 10,1H) \mu\text{m}$ [H: Measurement height from the horizontal position (mm)]
Traverse straightness	2,5 μm / 100 mm
Column type	M4: 350 mm
Software	FORMTRACEPAK <ul style="list-style-type: none"> • Allows control of measuring conditions for efficient automated measurement. • Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.



FORMTRACEPAK



Refer to CV-2100 brochure



Scan QR Code with your mobile device and watch our product videos on YouTube



CV-2100M4



CV-2100N4

Contracer CV-2100

Series 218 - Contour Measuring Instruments

Specifications and accessories

Model No.	CV-2100N4 218-613D	CV-2100M4 218-633D
Z2-axis vertical travel [mm]	-	350
Z1-axis measuring range [mm]	50	50
Z2-axis column type	Optional: Manual	Manual: Quick up-and-down motion, fine feed
X1-axis measuring range [mm]	100	100

Additional Specifications

Other optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
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Optional accessories

No.	Description
218-001	Cross-travel table XY range : 100x50 mm
218-003	Rotary vise (heavy-duty type)
178-023	Manual vibration isolator
178-024	Stand for vibration isolator
218-042	Column stand for CV-2100N4



Optional column stand 218-042



CV-2100 Stylus up-and-down function



CV-2100M4 with column and quick grip



Easy and quick movement in Z2

Contracer CV-3200 and CV-4500

Series 218 - Contour Measuring Instruments

These are high accuracy semi-automatic contour measuring instruments equipped with powerful software FORMTRACEPAK.

The Contracer CV-3200 offers you the following benefits:

- Huge measuring range of Z=60 mm comes as standard.
- Easy exchange of magnetic stylus arm gives you excellent flexibility.
- The CV-3200 provides excellent accuracy and resolution in Z1-axis measurement.
- Its high positioning speed reduces the total measurement time.
- It has a fully automatic calibration routine.

The Contracer CV-4500 offers you the following benefits:

- It has a dual stylus system for upward/downward measurement at double sided contours.
- Variable measuring force is controlled by software FORMTRACEPAK.
- Easy exchange of magnetic stylus arm gives you excellent flexibility.
- The CV-4500 provides the highest accuracy and resolution possible.
- The motorised axes have a high positioning speed.
- The dual stylus system has a fully automatic calibration routine.

Specifications

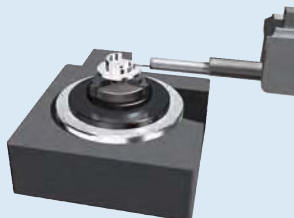
Traverse	Z2 = 300 mm / 500 mm
Measuring range	Z1 = 60 mm X = 100 mm / 200 mm
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 30 mm/s
Accuracy	X = (0,8+0,01L) µm (S4, H4, W4 model) X = (0,8+0,02L) µm (S8, H8, W8 model) [L : Drive length (mm)] CV-3200 : Z1 = (1,6+I2HI/100) µm CV-4500 : Z1 = (0,8+I2HI/100) µm [H : Measurement height from the horizontal position (mm)]
Inclining range	±45°
Measuring force	CV-3200 : 30 mN CV-4500 : 10, 20, 30, 40, 50 mN (software controlled) N
Software	FORMTRACEPAK

Additional Specifications

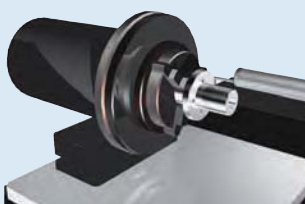
Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
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Optional Y-axis - 178-097



Optional Rotary Table 01 - 12AAD975



Optional Rotary Table 02 - 178-078



Refer to CONTOUR MEASUREMENT brochure



Contracer CV-3200
(CV-4500 equipped with dual stylus system)



Drive unit CV-3200

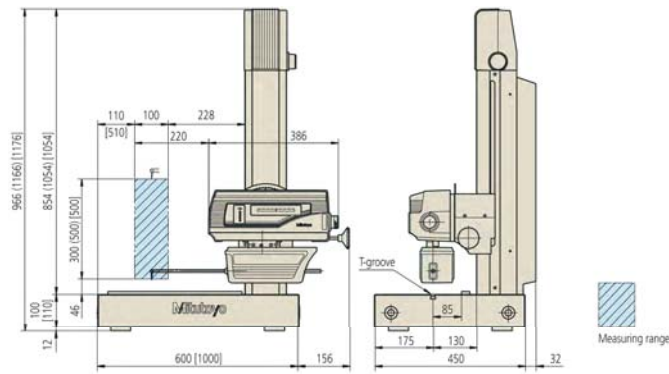


Drive unit CV-4500

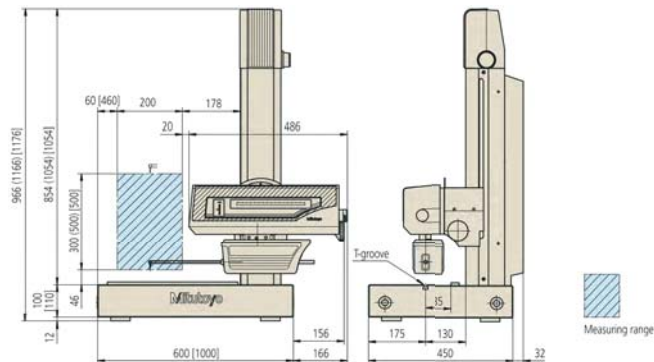
Contracer CV-3200 and CV-4500

Series 218 - Contour Measuring Instruments

Dimensions and specifications



S4, (H4), [W4] - mm



S8, (H8), [W8] - mm

CV-3200

Model	CV-3200S4	CV-3200H4	CV-3200W4	CV-3200S8	CV-3200H8	CV-3200W8
No.	218-481D	218-482D	218-483D	218-486D	218-487D	218-488D
Dimensions main unit (WxDxH) [mm]	756x482x966	756x482x1166	1156x482x1176	766x482x966	768x482x1166	1166x482x1176
X1-axis measuring range [mm]	100	100	100	200	200	200
Vertical travel [mm]	300	500	500	300	500	500
Granite base size (WxD) [mm]	600x450	600x450	1000x450	600x450	600x450	1000x450

CV-4500

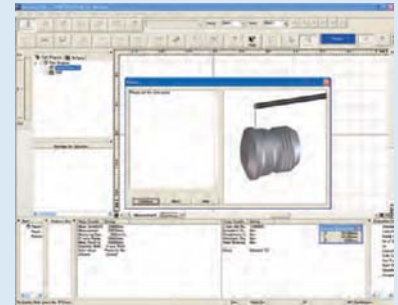
Model	CV-4500S4	CV-4500H4	CV-4500W4	CV-4500S8	CV-4500H8	CV-4500W8
No.	218-441D	218-442D	218-443D	218-446D	218-447D	218-448D
Dimensions main unit (WxDxH) [mm]	756x482x966	756x482x1166	1156x482x1176	766x482x966	768x482x1166	1166x482x1176
X1-axis measuring range [mm]	100	100	100	200	200	200
Vertical travel [mm]	300	500	500	300	500	500
Granite base size (WxD) [mm]	600x450	600x450	1000x450	600x450	600x450	1000x450

Specifications

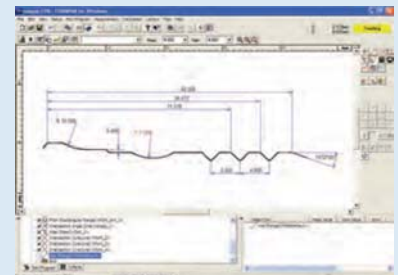
Software

FORMTRACEPAK

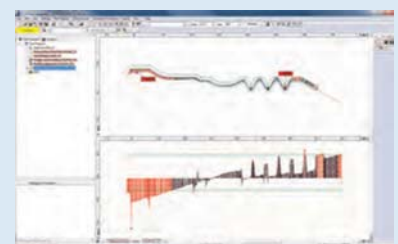
- Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement.
- Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard.
- An inspection certificate can be created by setting the print format as required.



Measurement control screen



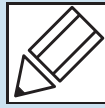
Contour analysis screen



Contour comparison

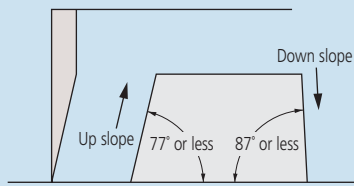
FORMTRACEPAK

Quick Guide to Precision Measuring Instruments



Contracer (Contour Measuring Instruments)

Traceable Angle

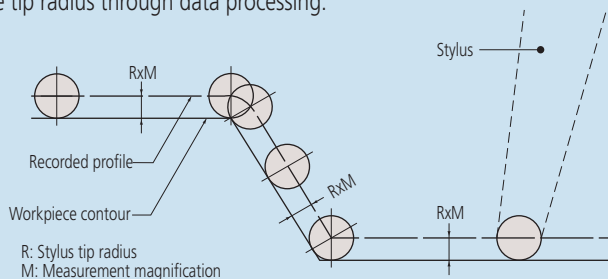


The maximum angle at which a stylus can trace upwards or downwards along the contour of a workpiece, in the stylus travel direction, is referred to as the traceable angle. A one-sided sharp stylus with a tip angle of 12° (as in the above figure) can trace a maximum 77° of up slope and a maximum 87° of down slope. For a conical stylus (30° cone), the traceable angle is smaller. An up slope with an angle of 77° or less overall may actually include an angle of more than 77° due to the effect of surface roughness. Surface roughness also affects the measuring force.

For model CV-3200/4500, the same type of stylus (SPH-71: one-sided sharp stylus with a tip angle of 12°) can trace a maximum 77° of up slope and a maximum 83° of down slope.

Compensating for Stylus Tip Radius

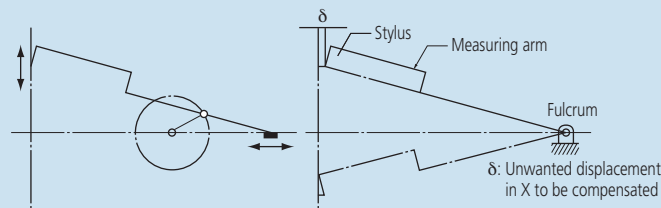
A recorded profile represents the locus of the center of the ball tip rolling on a workpiece surface. (A typical radius is 0.025mm.) Obviously this is not the same as the true surface profile so, in order to obtain an accurate profile record, it is necessary to compensate for the effect of the tip radius through data processing.



Compensating for Arm Rotation

The stylus is carried on a pivoted arm so it rotates as the surface is traced and the contact tip does not track purely in the Z direction. Therefore it is necessary to apply compensation in the X direction to ensure accuracy. There are three methods of compensating for arm rotation.

- 1: Mechanical compensation
- 2: Electrical compensation



- 3: Software processing. To measure a workpiece contour that involves a large displacement in the vertical direction with high accuracy, one of these compensation methods needs to be implemented.

Overload Safety Cutout

If an excessive force (overload) is exerted on the stylus tip due, perhaps, to the tip encountering a too-steep slope on a workpiece feature, or a burr, etc., a safety device automatically stops operation and sounds an alarm buzzer. This type of instrument is commonly equipped with separate safety devices for the tracing direction (X axis) load and vertical direction (Y axis) load.

For model CV-3200/4500, a safety device functions if the arm comes off the detector mount.

Simple or Complex Arm Guidance

In the case of a simple pivoted arm, the locus that the stylus tip traces during vertical movement (Z direction) is a circular arc that results in an unwanted offset in X, for which compensation has to be made. The larger the arc movement, the larger is the unwanted X displacement (δ) that has to be compensated. (See figure, lower left.) The alternative is to use a complex mechanical linkage arrangement to obtain a linear translation locus in Z, and therefore avoid the need to compensate in X.

Z axis Measurement Methods

Though the X axis measurement method commonly adopted is by means of a digital scale, the Z axis measurement divides into analog methods (using a differential transformer, etc.) and digital scale methods.

Analog methods vary in Z axis resolution depending on the measurement magnification and measuring range. Digital scale methods have fixed resolution.

■ Contour analysis methods

You can analyze the contour with one of the following two methods after completing the measurement operation.

Data processing section and analysis program

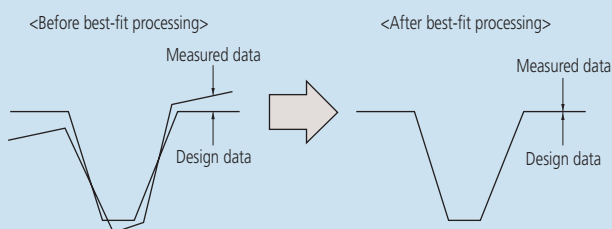
The measured contour is input into the data processing section in real time and a dedicated program performs the analysis using the mouse and/or keyboard. The angle, radius, step, pitch and other data are directly displayed as numerical values. Analysis combining coordinate systems can be easily performed. The graph that goes through stylus radius correction is output to the printer as the recorded profile.

■ Tolerancing with Design Data

Measured workpiece contour data can be compared with design data in terms of actual and designed shapes rather than just analysis of individual dimensions. In this technique each deviation of the measured contour from the intended contour is displayed and recorded. Also, data from one workpiece example can be processed so as to become the master design data to which other workpieces are compared. This function is particularly useful when the shape of a section greatly affects product performance, or when its shape has an influence on the relationship between mating or assembled parts.

■ Best-fitting

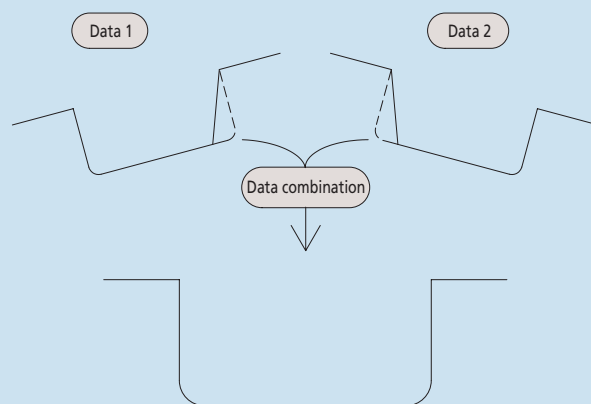
If there is a standard for surface profile data, tolerancing with design data is performed according to the standard. If there is no standard, or if tolerancing only with shape is desired, best-fitting between design data and measurement data can be performed.



The best-fit processing algorithm searches for deviations between both sets of data and derives a coordinate system in which the sum of squares of the deviations is a minimum when the measured data is overlaid on the design data.

■ Data Combination

Conventionally, if tracing a complete contour is prevented by stylus traceable-angle restrictions then it has to be divided into several sections that are then measured and evaluated separately. This function avoids this undesirable situation by combining the separate sections into one contour by overlaying common elements (lines, points) onto each other. With this function the complete contour can be displayed and various analyses performed in the usual way.



■ Measurement Examples



Dual stylus for upward and downward measurement



Inner/outer ring contour of a bearing



Internal gear teeth



Female thread form



Male thread form



Gage contour

Formtracer SV-C3200 and SV-C4500

Series 525 - Surface and Contour Measuring System

These are high accuracy semi-automatic contour and roughness measuring instruments equipped with powerful software FORMTRACEPAK.

The Formtracer SV-C3200 offers you the following benefits:

- It is as powerful as two separate, specialised instruments.
- It economically combines roughness & contour measurement into a single device.
- You have access to a huge contour measuring range of Z=60mm as standard, and a roughness measurement range of 800µm as standard.
- Easy exchange of the magnetic contour stylus arm gives you excellent flexibility.
- The SV-C3200 provides you with excellent accuracy and resolution in Z1-axis measurement.

The Formtracer SV-C4500 offers you the following benefits:

- It economically combines roughness & dual stylus upward/downward contour measurement into a single device.
- You have access to a huge contour measuring range of Z=60mm as standard, and a roughness measurement range of 800µm as standard.
- Its variable measuring force is controlled by software FORMTRACEPAK.
- Easy exchange of the magnetic contour stylus arm gives you excellent flexibility.
- The SV-C4500 provides you with high accuracy and resolution.

Specifications

Traverse	Z2 = 300 mm / 500 mm
Measuring range	X = 100 mm / 200 mm Contour: Z1 = 60 mm Roughness: Z1 = 800 µm; 80 µm; 8 µm (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 5 mm/s
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 30 mm/s
Accuracy	X = (0,8+0,01L) µm (S4, H4, W4 model) X = (0,8+0,02L) µm (S8, H8, W8 model) [L : Drive length (mm)] SV-C3200 : Z1 = (1,6+12HI/100) µm SV-C4500 : Z1 = (0,8+12HI/100) µm [H : Measurement height from the horizontal position (mm)]
Inclining range	±45°
Measuring force	SV-C3200 Contour : 30 mN SV-C4500 Contour : 10, 20, 30, 40, 50 mN software controlled Roughness : 0,75 mN / 4mN
Software	FORMTRACEPAK

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
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Refer to Formtracer SV-C3200 / 4500 brochure



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Formtracer SV-C3200



Surface Roughness drive unit

[Surface Roughness Measurement : Complies with EN ISO, VDA, JIS, ANSI and other international surface roughness standards.]



Contour drive unit SV-C3200



Contour drive unit SV-C4500

Formtracer SV-C3200 and SV-C4500

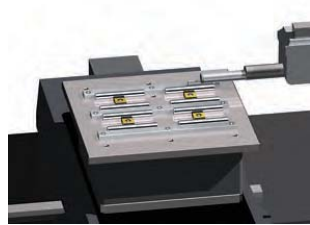
Series 525 - Surface and Contour Measuring System

Metric SV-C3200

No.	Model	Detector 0,75 mN	Detector 4 mN	Z2-axis 300 mm	Z2-axis 500 mm	X-axis 100 mm	X-axis 200 mm
525-481D-1	SV-C3200S4	●		●		●	
525-481D-2	"		●	●		●	
525-482D-1	SV-C3200H4	●			●	●	
525-482D-2	"		●		●	●	
525-483D-1	SV-C3200W4	●			●	●	
525-483D-2	"		●		●	●	
525-486D-1	SV-C3200S8	●		●			●
525-486D-2	"		●	●			●
525-487D-1	SV-C3200H8	●			●		●
525-487D-2	"		●		●		●
525-488D-1	SV-C3200W8	●			●		●
525-488D-2	"		●		●		●

Metric SV-C4500

No.	Model	Detector 0,75 mN	Detector 4 mN	Z2-axis 300 mm	Z2-axis 500 mm	X-axis 100 mm	X-axis 200 mm
525-441D-1	SV-C4500S4	●		●		●	
525-441D-2	"		●	●		●	
525-442D-1	SV-C4500H4	●			●	●	
525-442D-2	"		●		●	●	
525-443D-1	SV-C4500W4	●			●	●	
525-443D-2	"		●		●	●	
525-446D-1	SV-C4500S8	●		●			●
525-446D-2	"		●	●			●
525-447D-1	SV-C4500H8	●			●		●
525-447D-2	"		●		●		●
525-448D-1	SV-C4500W8	●			●		●
525-448D-2	"		●		●		●



Using Y-axis table



Using rotary table 01

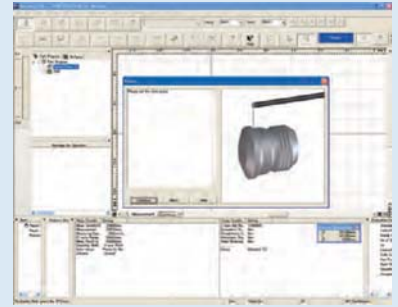


Using rotary Table 02

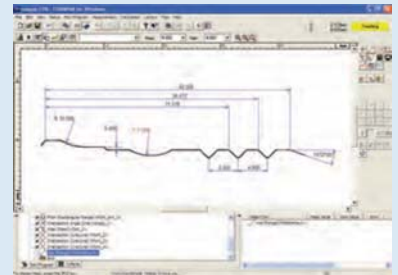
Specifications

Software FORMTRACEPAK

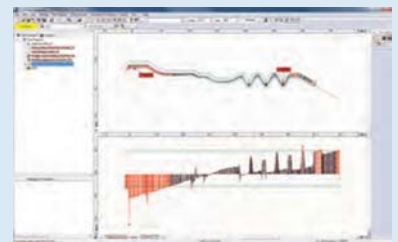
- Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement.
- Surface roughness analysis and contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard.
- An inspection certificate can be created by setting the print format as required.



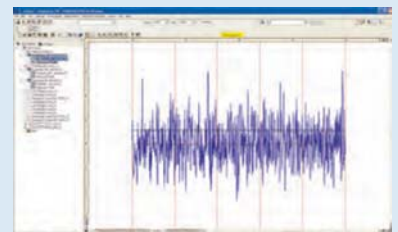
Measurement control screen



Contour analysis screen



Contour comparison



Roughness analysis

Formtracer CS-3200

Series 525 - Surface and Contour Measuring System

This provides all-in-one surface roughness and contour measurement within one drive unit. The Formtracer CS-3200 offers you the following benefits:

- You can carry out simultaneous analysis of roughness and contour with one measurement.
- It performs roughness analyses conform to various international standards (EN ISO, VDA, ANSI, JIS) and customized settings.
- It gives you the best measuring condition with a vibration stand as standard.
- The high drive speed reduces the total measurement time.
- The detector unit can be extended to avoid interference between the drive unit and workpiece.

Specifications

Traverse	Z2 = 300 mm
Measuring range	X = 100 mm Z1 = 5 mm (up to 10 mm with an optional stylus)
Measuring speed	Roughness measurement: 0,02 / 0,05 / 0,1 / 0,2 mm/s Contour measurement: 0,02 / 0,05 / 0,1 / 0,2 / 0,5 / 1 / 2 mm/s
Drive speed	X = 0 - 80 mm/s Z2 = 0 - 20 mm/s
Accuracy	X = (0,8+0,01L) μ m [L : Drive length (mm)] Z1 = (1,5+12H/100) μ m H : Measurement height from the horizontal position (mm)
Inclining range	$\pm 45^\circ$
Traverse straightness	X = 0,2 μ m / 100 mm
Software	FORMTRACEPAK <ul style="list-style-type: none"> • Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement. • Surface roughness analysis and contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.



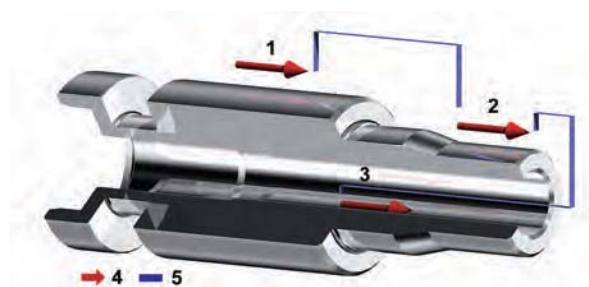
Refer to Formtracer CS-3200 brochure



Scan QR Code with your mobile device and watch our product videos on YouTube



CS-3200S4
(with optional Y-axis 178-097)



- 1: Outside diameter
- 2: Outside diameter
- 3: Inside diameter
- 4: Measurement element
- 5: Positioning element

Continuous measurement example:

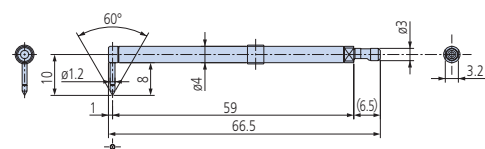
The drive unit (X-axis) and column (Z2-axis) are equipped with high-accuracy linear scales (ABS type) enabling fully automatic measurement combining vertical and horizontal movement. This improves reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurements of parts which are difficult to position

Formtracer CS-3200

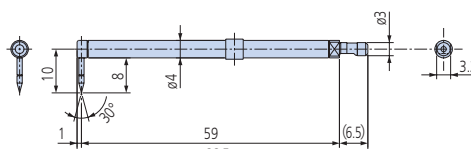
Series 525 - Surface and Contour Measuring System

Specifications and Styli

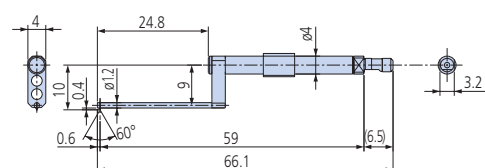
Model	CS-3200S4
No.	525-401D
Z2-axis vertical travel [mm]	300
X1-axis measuring range [mm]	100



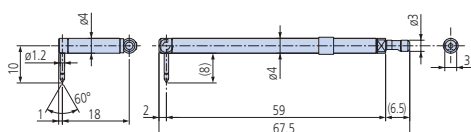
12AAD554
Standard stylus
Radius of tip curvature = 2 μm
Tip Material: Diamond



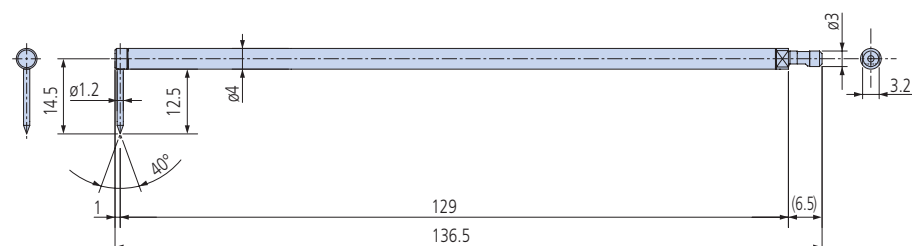
12AAD552
Cone stylus
Radius of tip curvature = 25 μm
Tip Material: Sapphire



12AAD556
Small hole stylus
Radius of tip curvature = 2 μm
Tip Material: Diamond

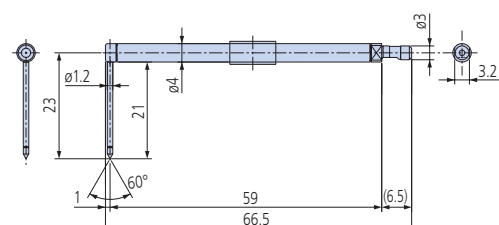


12AAD558
Eccentric type stylus
Radius of tip curvature = 2 μm
Tip Material: Diamond



12AAD562
2x-long stylus*1
Radius of tip curvature = 5 μm
Tip Material: Diamond

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



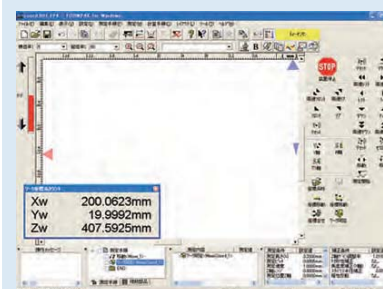
12AAD560
Deep groove stylus
Radius of tip curvature = 2 μm
Tip Material: Diamond



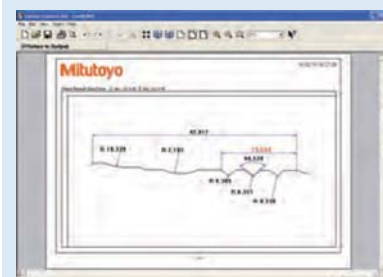
Additional Specifications

Optional accessories

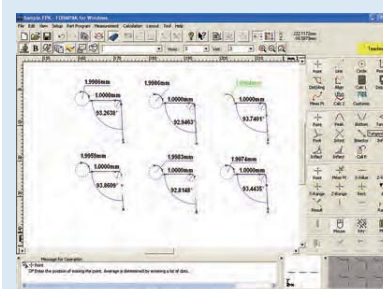
Other optional and standard accessories are listed later in different sections for accessories and styli.



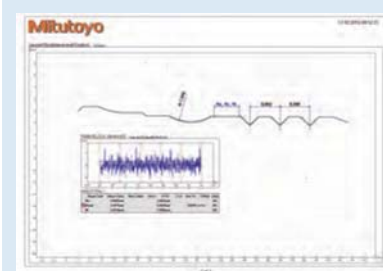
Measuring instrument control



Contour analysis screen



Contour analysis screen



Contour and roughness layout

Formtracer Extreme SV-C4500CNC

Series 525 - Surface and Contour Measuring Instrument

High accurate fully CNC surface and contour measuring instrument.

The Formtracer Extreme SV-C4500CNC offers you the following benefits:

- 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 200mm/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 stop automatically if its main body collides with a workpiece or jig.

Specifications

Traverse	Z2= 300 mm / 500 mm
Measuring range	X= 200 mm Y= 200 mm Contour: Z1= 60 mm Z2= 300 mm / 500 mm Roughness: Z1= 800 μ m; 80 μ m; 8 μ m (up to 2,4 mm with an optional stylus)
Measuring speed	0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode: 0-50 mm/s
Accuracy	X= (0,8 + 4L/200) μ m [L: Drive length (mm)] Z1= (0,8 + 12HI/100) μ m [H: Measurement height from the horizontal position (mm)] Model without α -axis: Z2= (1,5 + 10HI/1000) μ m
Inclining range	-45° (CCW) to +10° (CW)
Measuring force	0,75 mN
Software	FORMTRACEPAK <ul style="list-style-type: none"> • Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement. • Contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard. • An inspection certificate can be created by setting the print format as required.



Refer to **CONTOUR AND SURFACE MEASUREMENT** brochure



SV-C4500CNC equipped with two powerful exchangeable drive units



Surface Roughness drive unit



Contour drive unit

Formtracer Extreme SV-C4500CNC

Series 525 - Surface and Contour Measuring Instrument

SV-C4500CNC-S

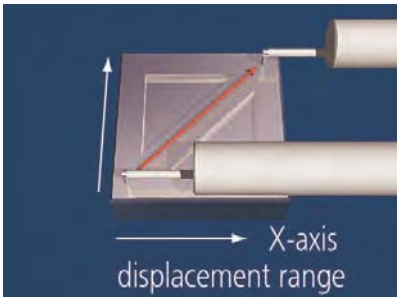
No.	Z2-axis vertical travel [mm]	Y-axis table unit	α -axis unit
525-661-1D	300	-	-
525-662-1D	300	-	Installed
552-663-1D	300	Installed	-
552-664-1D	300	Installed	Installed

SV-C4500CNC-H

No.	Z2-axis vertical travel [mm]	Y-axis table unit	α -axis unit
525-681-1D	500	-	-
525-682-1D	500	-	Installed
525-683-1D	500	Installed	-
525-684-1D	500	Installed	Installed



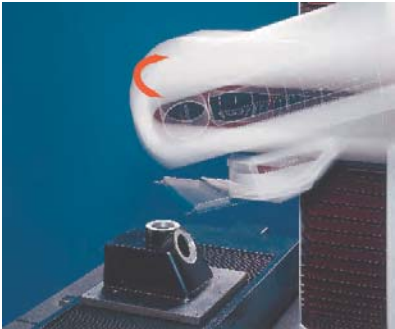
Multiple measurements



Through 2-axis simultaneous control in the X and Y directions



Y-axis



α -axis

Specifications

Optional accessories	Other optional and standard accessories are listed later in different sections for accessories and styli.
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Optional accessories

No.	Description
178-397-2	Detector 4 mN
12AAD975	θ 1-axis table
178-078	θ 2-axis table
178-037	Automatic leveling table CNC
178-077	3D leveling table
12AAE449	Cabin for H-type
12AAE287	Cabin for S-type

Formtracer Extreme CS-5000CNC and CS-H5000CNC

Series 525 - CNC Surface and Contour Measuring Instruments

This is the highest-accuracy stylus type CNC surface roughness and contour measuring instrument. The Formtracer Extreme CS-5000CNC / CS-H5000CNC offers you the following benefits:

- It meets the highest demands of accuracy and repeatability.
- You can carry out simultaneous analysis of roughness and contour within one measurement.
- It includes a cabin and a vibration stand as standard to avoid external influences.
- A Mitutoyo Laser Holescale and Transmission-type linear encoder is incorporated in the X1- and Z1-axes so you can achieve high resolution of X1-axis : 6,25 nm and Z1-axis : 0,8 nm/ 1,6nm.
- The X1 and Z2-axis have maximum drive speeds of 40mm/s and 200mm/s respectively.

Specifications

Traverse	Z2 = 300 mm / 500 mm
Measuring range	X = 200mm Z1 = 12 mm [standard lenght stylus] Z1 = 24 mm [double lenght stylus]
Measuring speed	Roughness measurement: 0,02 - 0,2 mm/s Contour measurement: 0,02 - 2 mm/s
Drive speed	CNC mode: max. 200 mm/s Joystick mode 0 - 50 mm/s
Accuracy	CS-5000CNC: X = (0,3+0,002L) µm Z1 = (0,3+0,02H) µm CS-H5000CNC: X = (0,16+0,001L) µm Z1 = (0,07+0,02H) µm [L : Drive length (mm)] [H : Measurement height from the horizontal position (mm)]
Traverse straightness	CS-5000CNC: X = (0,1+0,0015L) µm [standard stylus] X = (0,2+0,0015L) µm [double length stylus] CS-H5000CNC: X = (0,05+0,0003L) µm [standard stylus] X = (0,1+0,0015L) µm [double length stylus]
Measuring Force	4 mN (with standard stylus) 0,75 mN (with 2X-long stylus)
Resolution	X = 0,00625 µm CS-5000CNC: Z1 = 0,0008 µm [standard stylus] Z1 = 0,0016 µm [double length stylus] CS-H5000CNC: Z1 = 0,0008 µm [standard stylus] Z1 = 0,0016 µm [double length stylus]
Software	FORMTRACEPAK



Refer to **CONTOUR AND SURFACE MEASUREMENT** brochure



CS-H5000CNC



Formtracer Extreme CS-5000CNC and CS-H5000CNC

Series 525 - CNC Surface and Contour Measuring Instruments

Specifications and Styli

CS-5000CNC

Model	CS-5000CNC	CS-5000CNC + α -axis unit	CS-5000CNC + Y-axis table unit	CS-5000CNC + Y-axis table unit + α -axis unit
No.	525-746D	525-747D	525-748D	525-749D
Z2-axis vertical travel [mm]	500	500	500	500
Y-axis table unit	-	-	Installed	Installed
α -axis unit	-	Installed	-	Installed

CS-5000CNCs

Model	CS-5000CNCs	CS-5000CNCs + α -axis unit	CS-5000CNCs + Y-axis table unit	CS-5000CNCs + Y-axis table unit + α -axis unit
No.	525-726D	525-727D	525-728D	525-729D
Z2-axis vertical travel [mm]	300	300	300	300
Y-axis table unit	-	-	Installed	Installed
α -axis unit	-	Installed	-	Installed

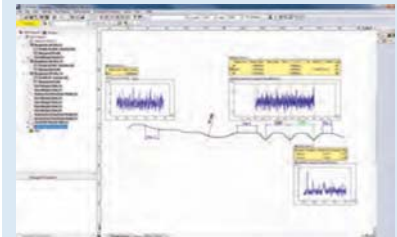
CS-H5000CNCs

Model	CS-H5000CNCs	CS-H5000CNCs + Y-axis table unit
No.	525-776D	525-777D
Z2-axis vertical travel [mm]	300	300
Y-axis table unit	-	Installed
α -axis unit	-	-

Specifications

Software FORMTRACEPAK

- Allows control of all axis, optional motor-driven Y-axis table and rotary table for efficient automated measurement.
- Surface roughness analysis and contour evaluation can be performed using analysis of level differences, angle, pitch, area and contour tolerancing as standard.
- An inspection certificate can be created by setting the print format as required.

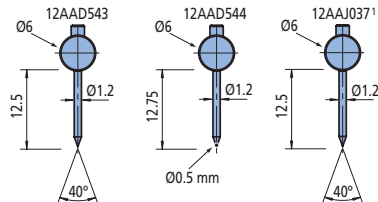
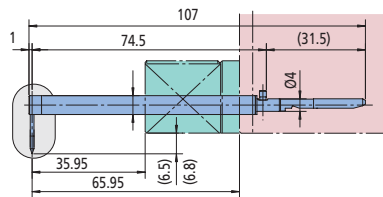


Contour and roughness analysis

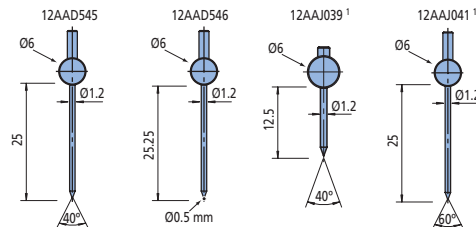
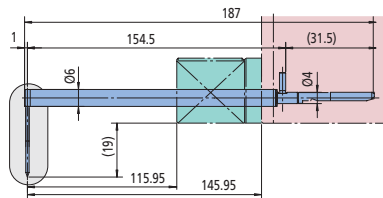


Optional:
Aspherical lens analysis program
ASLPAK

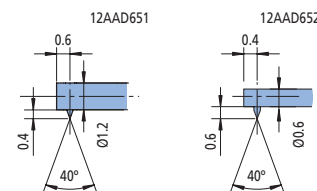
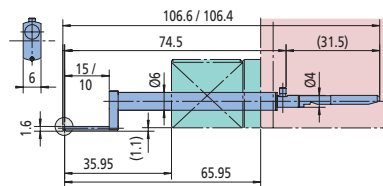
Standard



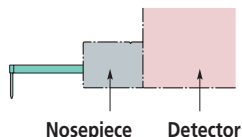
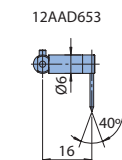
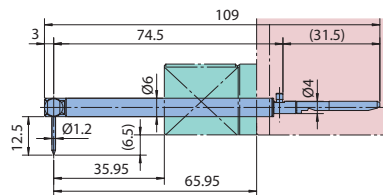
Double length



For small holes



Eccentric



1 = additional for CS-H5000CNC

Optional Software USB Communication Tool

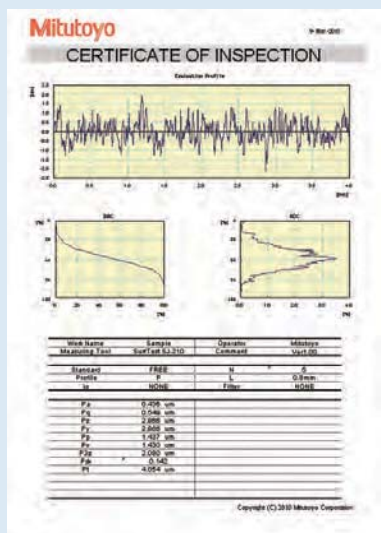
Optional accessories

No.	Description
12AAL068D	USB cable for SJ-210
12AAD510	USB cable
12AAH490	USB cable for SJ-500 / SV-2100

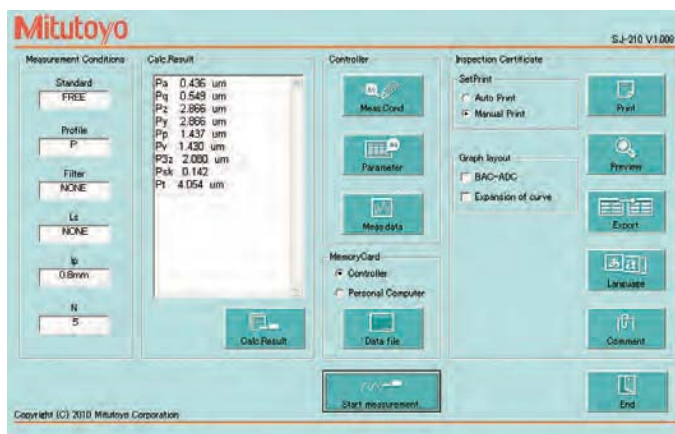
Series 178 - Control Software for SJ series, SV-2100

This is a control software for Surftest SJ-210 / SJ-310 / SJ-410 / SJ-500 and SV-2100 which offers you the following benefits:

- It is available as a free download on www.mitutoyo.eu (registration required).
- Output software is based on Microsoft® Excel® for controlling the devices, reproducing and storing measurement data.
- Measurement device control.
- It provides definition of measurement variables.
- Graphic representation of the profile.
- Storage of measurement records.
- Documentation of measurements result.
- A USB connecting cable is necessary.



Output record from Microsoft® Excel®

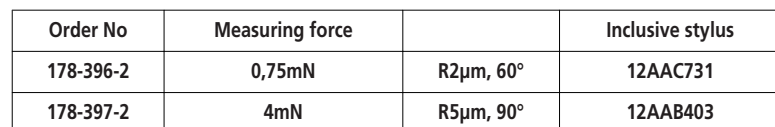


Input mask for Surftest SJ series



Output record from Microsoft® Excel® in 18 languages as standard.

Detectors



No.	Radius	Angle [°]
12AAE882	1 μm	60°
12AAE924	1 μm	90°
12AAC731	2 μm	60°
12AAB403	5 μm	90°
12AAB415	10 μm	90°
12AAE883	250 μm	60°



No.	Radius	Angle [°]
12AAC732	2 μm	60°
12AAB404	5 μm	90°
12AAB416	10 μm	90°



No.	Radius	Angle [°]
12AAC733	2 μm	60°
12AAB405	5 μm	90°
12AAB417	10 μm	90°

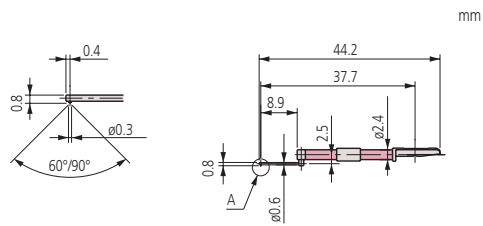


No.	Radius	Angle [°]
12AAJ662	250 μm	-



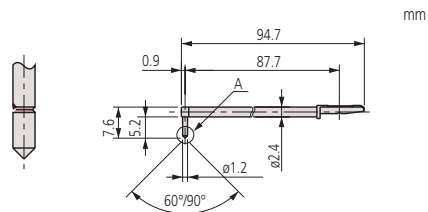
Optional Styli for Surftest and Formtracer SV-C series

No.	Radius	Angle [°]
12AAC734	2 µm	60°
12AAB406	5 µm	90°
12AAB418	10 µm	90°



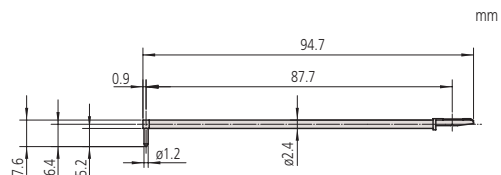
For ultra-small hole

No.	Radius	Angle [°]
12AAC740	2 µm	60°
12AAB413	5 µm	90°
12AAB425	10 µm	90°



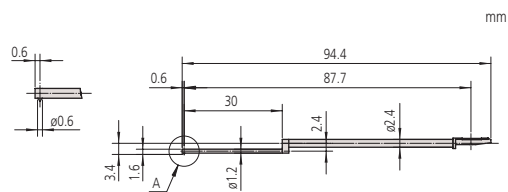
For deep hole [double-length]

No.	Radius	Angle [°]
12AAE886	250 µm	60°



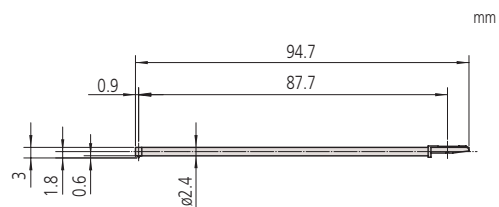
For rolling circle waviness [double-length]

No.	Radius	Angle [°]
12AAE892	2 µm	60°
12AAE908	5 µm	90°



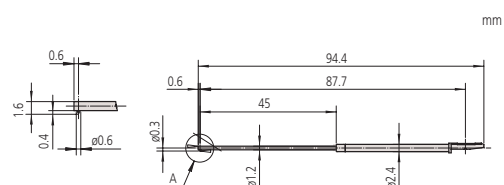
For small deep hole [double-length]

No.	Radius	Angle [°]
12AAE898	2 µm	60°
12AAE914	5 µm	90°



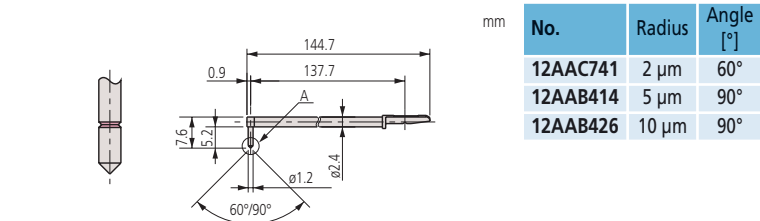
For deep hole [double-length]

No.	Radius	Angle [°]
12AAE938	2 µm	60°
12AAE940	5 µm	90°

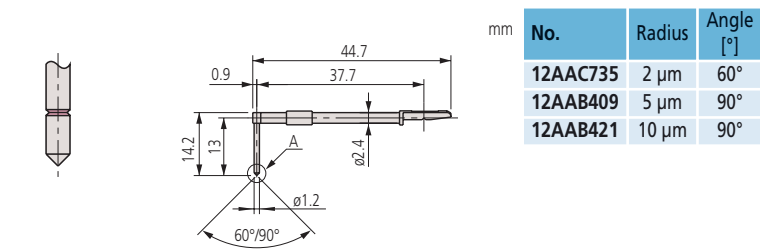


For small slotted hole [double-length]

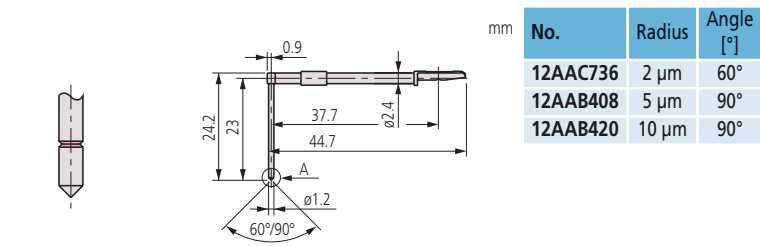
Optional Styli for Surftest and Formtracer SV-C series



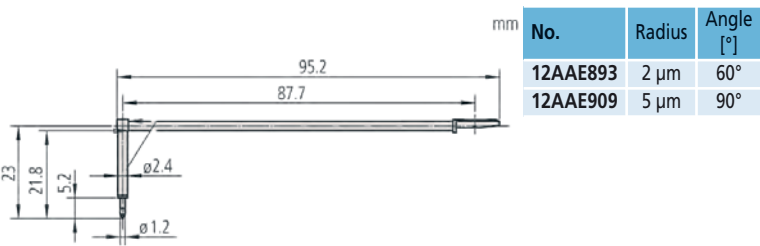
For deep hole [triple-length]



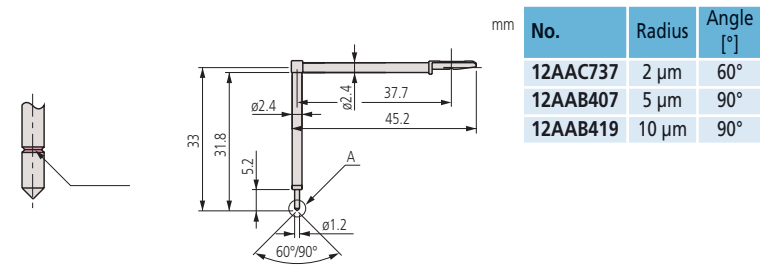
For deep groove 10 mm



For deep groove 20 mm



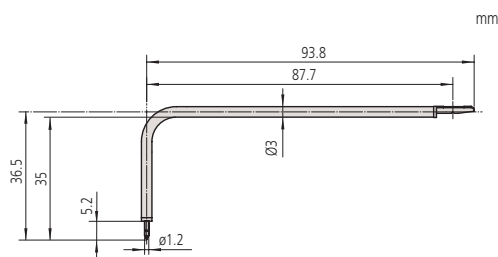
For deep groove 20 mm [double-length]



For deep groove 30 mm

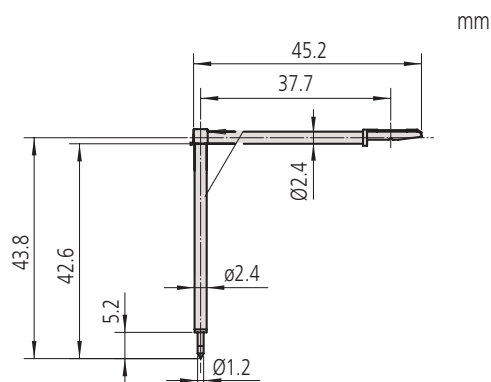
Optional Styli for Surftest and Formtracer SV-C series

No.	Radius	Angle [°]
12AAE894	2 µm	60°
12AAE910	5 µm	90°



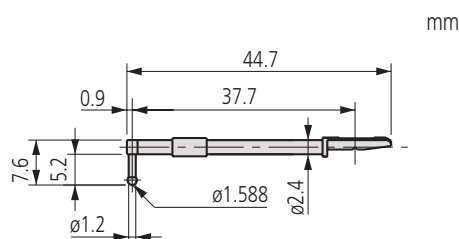
For deep groove 30 mm [double-length]

No.	Radius	Angle [°]
12AAE895	2 µm	60°
12AAE911	5 µm	90°



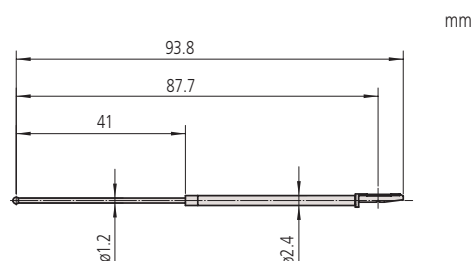
For deep groove 40 mm

No.	Radius
12AAB338	0,8 mm



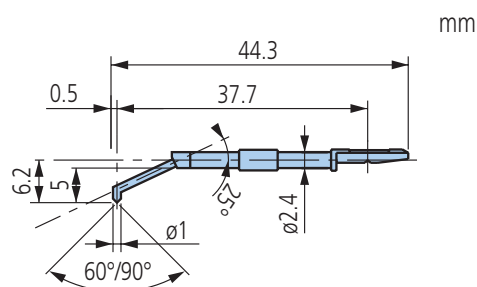
For rolling circle waviness surface roughness
(Roughness specimen 178-611 required)

No.	Radius
12AAE884	0,8 mm



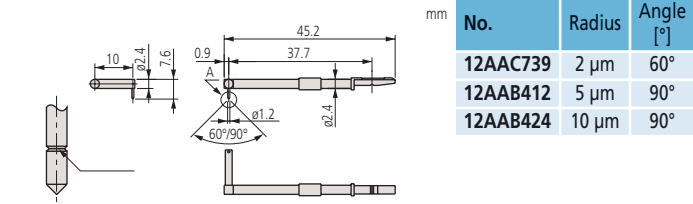
For rolling circle waviness surface roughness
[double-length] (178-611 required)

No.	Radius	Angle [°]
12AAE899	2 µm	60°
12AAE915	5 µm	90°

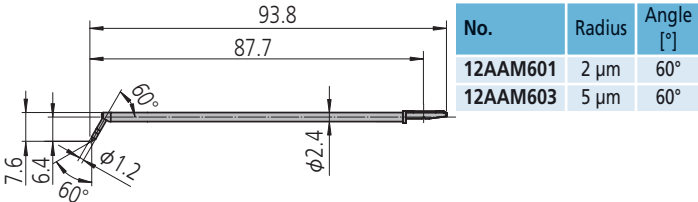


For hole bottom

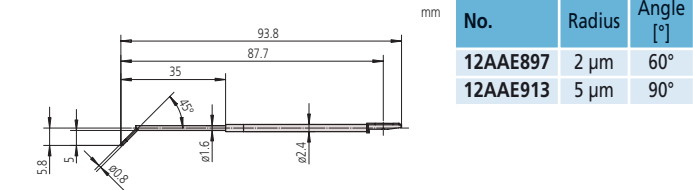
Optional Styli for Surftest and Formtracer SV-C series



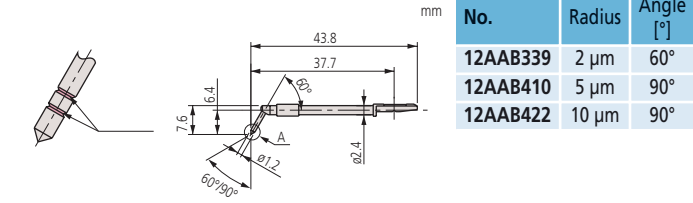
For eccentric arm



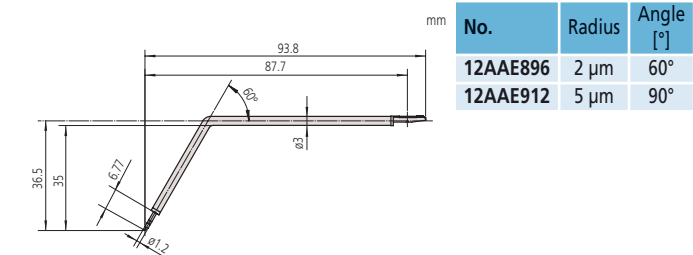
For corner hole [double-length]



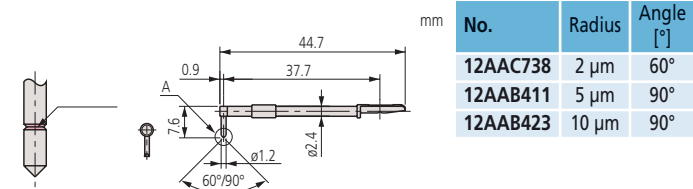
For corner hole [double-length]



For gear tooth

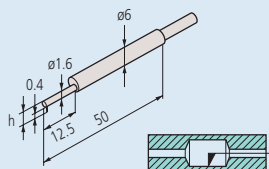


For gear tooth [double-length]

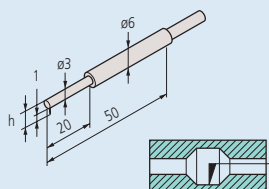


For knife-edge

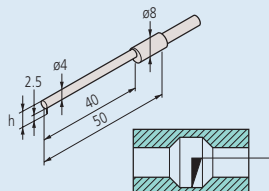
Optional Styli and Arms for Contracer and Formtracer SV-C Series



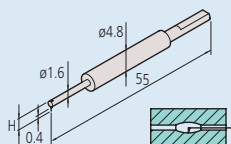
Small hole: 932693 / 12AAE873
Tip shape: Single bevel / Cone
Tip angle: 20° / 30°
Tip radius: 25 µm / 25 µm
Tip material: Carbide / Carbide



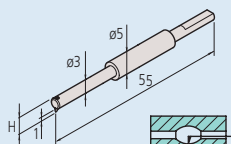
Small hole: 932694 / 12AAE874
Tip shape: Single bevel / Cone
Tip angle: 20° / 30°
Tip radius: 25 µm / 25 µm
Tip material: Carbide / Carbide



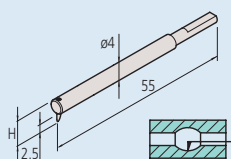
Small hole: 932695 / 12AAE875
Tip shape: Single bevel / Cone
Tip angle: 20° / 30°
Tip radius: 25 µm / 25 µm
Tip material: Carbide / Carbide



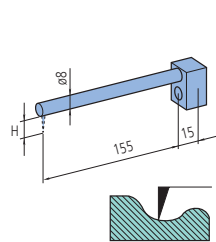
Small hole: 12AAM104
Tip shape: One-sided cut
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide



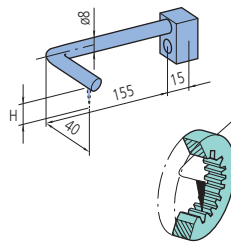
Small hole: 12AAM105
Tip shape: One-sided cut
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide



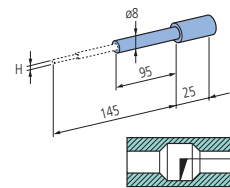
Small hole: 12AAM106
Tip shape: One-sided cut
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide



Arm Straight type
CV-2100



Arm Eccentric type
CV-2100



Arm for small-hole stylus
CV-2100

Applicable arms for CV-2100

No.	Arm	Arm No.	Compatible stylus height (H) [mm]
935110	Small hole	AB-11	0,4 / 1 / 2,5
935111	Straight type	AB-51	6
935112	Straight type	AB-61	12
935113	Straight type	AB-71	20
935114	Straight type	AB-81	30
935115	Straight type	AB-91	42
935116	Eccentric type	AB-52	6
935117	Eccentric type	AB-62	12
935118	Eccentric type	AB-72	20
935119	Eccentric type	AB-82	30
935120	Eccentric type	AB-92	42

Applicable Arms for CV-3200 / CV-4500 / SV-C3200 / SV-C4500 / SV-C4500CNC

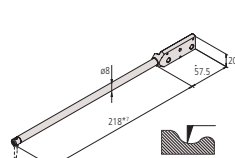
No.	Arm	Arm No.	Compatible stylus height (H) [mm]
12AAQ762	Eccentric Arm	AB-37	all
12AAM101	Straight type	AB-31	all
12AAM103	Small hole	AB-33	SPH-41, SPH-42, SPH-43

Applicable Styli for CV-2100

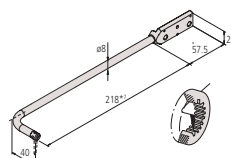
No.	Stylus	Stylus No.	Stylus height (H) [mm]
932693	Small hole, carbide-tipped one-sided cut	SP-11	0,4
932694	Small hole, carbide-tipped one-sided cut	SP-12	1
932695	Small hole, carbide-tipped one-sided cut	SP-13	2,5
12AAE873	Small hole, carbide-tipped cone	SP-31	0,4
12AAE874	Small hole, carbide-tipped cone	SP-32	1
12AAE875	Small hole, carbide-tipped cone	SP-33	2,5

Applicable Styli for CV-3200 / CV-4500 / SV-C3200 / SV-C4500 / SV-C4500CNC

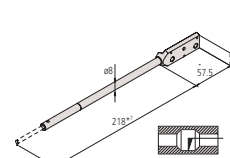
No.	Stylus	Stylus No.	Stylus height (H) [mm]
12AAM104	Small hole, carbide tipped one sided cut	SPH-41	2
12AAM105	Small hole, carbide tipped one sided cut	SPH-42	4
12AAM106	Small hole, carbide tipped one sided cut	SPH-43	6,5



Arm straight type
CV-3200/CV-4500
SV-C3200/SV-C4500
SV-C4500CNC



Arm eccentric type
CV-3200/CV-4500
SV-C3200/SV-C4500
SV-C4500CNC



Arm for small-hole stylus
CV-3200/CV-4500
SV-C3200/SV-C4500
SV-C4500CNC

Optional Styli and Arms for Contracer and Formtracer SV-C Series

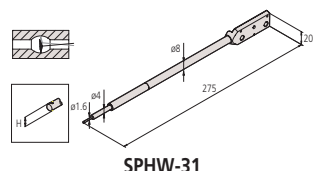
Styli

Applicable Styli for
CV-2100 / CV-3200 / CV-4500 / SV-C3200 / SV-C4500 / SV-C4500CNC

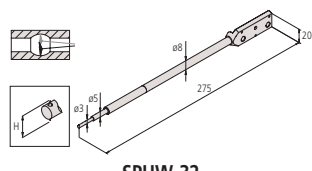
No.	Stylus	Stylus No.	Stylus height (H) [mm]
354882	Single bevel, carbide tipped	SPH-51	6
354883	Single bevel, carbide tipped	SPH-61	12
354884	Single bevel, carbide tipped	SPH-71	20
354885	Single bevel, carbide tipped	SPH-81	30
354886	Single bevel, carbide tipped	SPH-91	42
354887	Cross ground, carbide tipped	SPH-52	6
354888	Cross ground, carbide tipped	SPH-62	12
354889	Cross ground, carbide tipped	SPH-72	20
354890	Cross ground, carbide tipped	SPH-82	30
354891	Cross ground, carbide tipped	SPH-92	42
12AAE865	Cone, carbide-tipped angle 20°	SPH-57	6
12AAE866	Cone, carbide-tipped angle 20°	SPH-67	12
12AAE867	Cone, carbide-tipped angle 20°	SPH-77	20
12AAE868	Cone, carbide-tipped angle 20°	SPH-87	30
12AAE869	Cone, carbide-tipped angle 20°	SPH-97	42
354892	Cone, sapphire-tipped angle 30°	SPH-53	6
354893	Cone, sapphire-tipped angle 30°	SPH-63	12
354894	Cone, sapphire-tipped angle 30°	SPH-73	20
355129	Cone, diamond-tipped angle 50°	SPH-79	20
354895	Cone, sapphire-tipped angle 30°	SPH-83	30
354896	Cone, sapphire-tipped angle 30°	SPH-93	42
12AAA566	Cone, carbide-tipped angle 30°	SPH-56	6
12AAA567	Cone, carbide-tipped angle 30°	SPH-66	12
12AAA568	Cone, carbide-tipped angle 30°	SPH-76	20
12AAA569	Cone, carbide-tipped angle 30°	SPH-86	30
12AAA570	Cone, carbide-tipped angle 30°	SPH-96	42
354897	Knife edge, carbide tipped	SPH-54	6
354898	Knife edge, carbide tipped	SPH-64	12
354899	Knife edge, carbide tipped	SPH-74	20
354900	Knife edge, carbide tipped	SPH-84	30
354901	Knife edge, carbide tipped	SPH-94	42
354902	Ball, carbide tipped	SPH-55	6
354903	Ball, carbide tipped	SPH-65	12
354904	Ball, carbide tipped	SPH-75	20
354905	Ball, carbide tipped	SPH-85	30
354906	Ball, carbide tipped	SPH-95	42

Applicable Styli for only CV-4500 / SV-C4500 / SV-C4500CNC

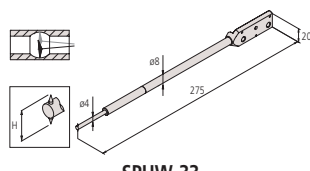
No.	Stylus	Stylus No.	Stylus height (H) [mm]
12AAM095	Both sides conical stylus	SPHW-56	20
12AAM096	Both sides conical stylus	SPHW-66	32
12AAM097	Both sides conical stylus	SPHW-76	48
12AAM108	Both sides small hole arm stylus	SPHW-31	2,4
12AAM109	Both sides small hole arm stylus	SPHW-32	5
12AAM110	Both sides small hole arm stylus	SPHW-33	9



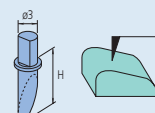
SPHW-31



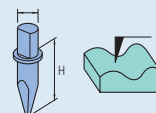
SPHW-32



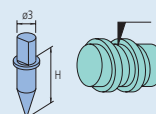
SPHW-33



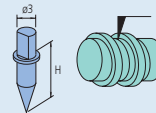
Single bevel
Tip angle: 12°
Tip radius: 25 µm
Tip material: Carbide



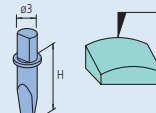
Cross ground
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide



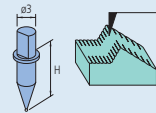
Cone
Tip angle: 30°/50°
Tip radius: 25 µm
Tip material: Carbide/Sapphire/Diamond
(355129: 50°, Diamond)



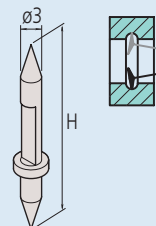
Cone
Tip angle: 20°
Tip radius: 25 µm
Tip material: Carbide



Knife edge
Tip angle: 20°
Edge width: 3 mm
Tip radius: 25 µm
Tip material: Carbide



Ball
Ball: Ø1 mm
Tip material: Carbide



Both sides conical stylus
Tip angle: 30°
Tip radius: 25 µm
Tip material: Carbide

Optional Accessories for Surftest, Contracer and Formtracer

For SV series, SV-C series, CV series, CS series and CNC Models



178-087



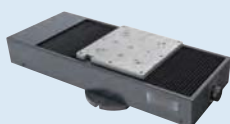
Using 178-087



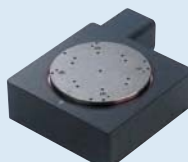
211-031



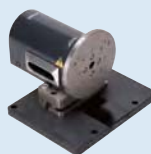
211-032



178-097



12AAD975



178-078

Automatic-leveling table : 178-087 (for SV, CV, SV-C, CS)

Automatic-leveling table : 178-037 (for CNC Models)

This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this troublesome operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.

No.	Inclination adjustment angle	Maximum load [kg]	Effective table dimensions [mm]
178-087	± 2°	7	130 x 112
178-037	± 2°	7	130 x 112

Micro-chuck

This chuck is suitable for clamping extra-small diameter workpieces (ø1,5 mm or less), which cannot be retained with the centering chuck.

No.	Dimensions [mm]	Retention range [mm]
211-031	ø118 x 48,5	OD : ø0 - ø1,5

Quick chuck

This Chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

No.	Dimensions [mm]	Retention range [mm]
211-032	ø118 x 41	Inner latch : OD ø1 - ø36 Inner latch : ID ø16 - ø69 outer latch : OD ø25 - ø79

Y-axis table

for SV-3200, SV-C, CS and CV models (not CNC models)

Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single measurement surface. It allows semi-automatic measurement with a semi-automatic with non CNC models by using these items.

No.	Travel range [mm]	Resolution	Positioning accuracy [μm]	Maximum load [kg]	Drive speed
178-097	200	0,05	±3	50	Max. 80 mm/s

01-axis:*1

For efficient measurement in the axial / transverse directions. When measuring a cylindrical workpiece, automatic alignment can be performed in combination with the Y-axis table.

*1 = 12AAE630 mounting plate is required when directly installing on the base of the machine.

No.	Resolution	Rotational speed	Displacement	Maximum load [kg]
12AAD975	0,004°	Max. 10°/s	360°	12

02-axis:*1

For efficient measurement of multiple points on a cylindrical workpiece and automate front/rear-side measurement.

*1 = 12AAE718 mounting plate is required when directly installing on the base of the machine.

*1 = 12AAE705 attachment plate is required when installing on 01-axis table.

*1 = 12AAE707 mounting plate is required when directly installing on Y-axis table with automatic leveling table.

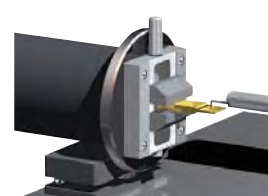
No.	Resolution	Rotational speed	Displacement	Maximum load [kg]
178-078	0,0072°	Max. 18°/s	360°	4



178-097
using Y-axis



12AAD975
using 01-axis



178-078
using 02-axis

Optional Accessories for Surftest, Contracer and Formtracer

3 - Axis Adjustment Table

No.	Description
178-047	This table helps to make the alignment adjustments required when measuring cylindrical surfaces. The corrections for the pitch angle and the swivel angle are determined from a preliminary measurement and the Digital micrometers are adjusted accordingly. A flat-surfaced workpiece can also be leveled with this table.

Calibration Stand

No.	Description
12AAG175	For mounting a roughness specimen or step gauge during calibration

Cross-travel Table

No.	Table top [mm]	XY travel [mm]
218-001	280 x 180	100 x 50
218-041	280 x 152	50 x 25

Digital Leveling Table

No.	Table top [mm]	XY travel [mm]	Leveling range
178-042-1	130 x 100	±12,5	±1,5°

Leveling Table

No.	Table top [mm]	XY travel [mm]	Leveling range
178-043-1	130 x 100	±12,5	±1,5°
178-016	130 x 100	40	±1,5°

Precision Vise

No.	Description
178-019	Max. workpiece size : 36 mm Can be mounted on a leveling table

Rotary Vise

No.	Description
218-003	Two-slide jaw type Max. workpiece size : ø60 mm Minimum reading : 1°

V-Block

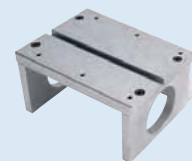
No.	Description
998291	Workpiece diameter : 1 mm to 160 mm Can be mounted on a leveling table

Vibration Isolator

No.	Vibration isolation method	Packing size	Description
178-119	Automatically charged Pneumatic type	1000 x 1340 x 880 mm	For SV-2100/3100 series (wide base) For CV-3200/4500 series (wide base) For SV-C3200/4500 series (wide base)
178-115	Automatically charged Pneumatic type	600 x 1050 x 260 mm	Desktop type For SV-2100/3100 series (wide base) CV-3200/4500 series (wide base) SV-C3200/4500 (wide base)



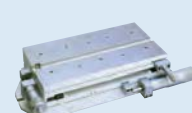
178-047



12AAG175



218-001



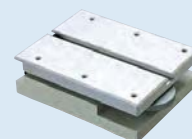
218-041



178-042-1



178-043-1



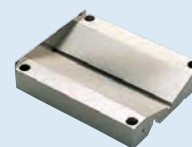
178-016



178-019



218-003



998291

eco-fix Fixtures Form

eco-fix Kit Form S

Adapter plate Ø150mm usable with:

- Roundtest RA-10
- Roundtest RA-120
- Roundtest RA-120P
- Roundtest RA-1600
- THETA 1 for CV, SV, SV-C and CS types



No.
K551133

eco-fix Kit Form L

Adapter plate Ø200mm usable with:

- Roundtest RA-2200
- Roundtest RA-H5200
- Roundtest RA-2200CNC
- Roundtest RA-H5200CNC
- THETA 1 for CV, SV, SV-C and CS types



No.
K551134

Roundtest RA-10

Series 211 - Form Measuring Instrument

This is a compact and affordable form measuring instrument.
The Roundtest RA-10 offers you the following benefits:

- It combines outstanding cost and performance with full measurement capabilities.
- The machine has a compact body with integrated electronics and printer, making it ideal for installation in space-restricted locations.
- You can easily view measurement results and recorded profiles on the large coloured LCD panel display.
- Despite being a low-priced model, the turntable with air bearings gives you rotational accuracy as high as $(0,04+0,0006H)\mu\text{m}$, assuring a precision that compares well with that of higher priced models.
- The control panel has large keys and an intuitive layout for easy operation.
- One-key calling function.
- One-key zero-set function.
- Support of 16 languages.
- It complies with EN ISO standard like 12181-1, 12181-2, 12781-1 and 12781-2.
- USB Communication Program – Microsoft® Excel® based – to import results and create, save and print out inspection certificates on PC.



RA-10 with optional collet



Z-axis scale unit



X-axis stop

Specifications	
Range	$\pm 1000 \mu\text{m}$
Turntable	
Rotational accuracy	Radial: $(0,04+0,0006H)\mu\text{m}$ H: Measuring height from turntable surface (mm) Axial: $(0,04+0,0006X)\mu\text{m}$ X: Radial distance from center (mm)
Max. probing \varnothing	100 mm
Max. workpiece \varnothing	320 mm
Max. turntable loading	10 kg
Vertical column	
Vertical travel	117 mm
Max. probing height	152 mm
Display unit	
Data analysis items	Roundness, Coaxiality, Concentricity, Flatness, Runout radial
Printer	Built-in thermal line printer



USB Communication Program
as a free download on www.mitutoyo.eu

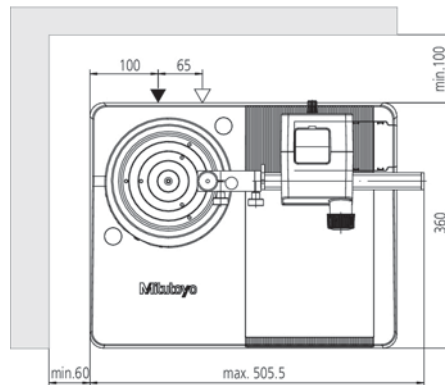
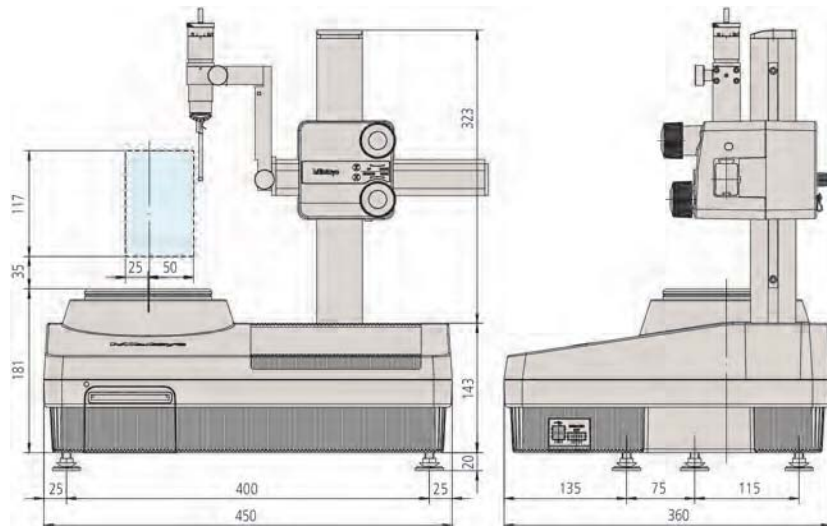


Refer to FORM MEASUREMENT brochure

Roundtest RA-10

Series 211 - Form Measuring Instrument

Dimensions and accessories

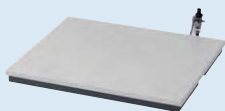


Optional accessories

No.	Description
12AAH402	Collet (ø0,5-1,0 mm)
12AAH403	Collet (ø1,0-1,5 mm)
12AAH404	Collet (ø1,5-2,0 mm)
12AAH405	Collet (ø2,0-2,5 mm)
12AAH406	Collet (ø2,5-3,0 mm)
12AAH407	Collet (ø3,0-3,5 mm)
12AAH408	Collet (ø3,5-4,0 mm)
12AAH409	Collet (ø4,0-5,0 mm)
12AAH410	Collet (ø5,0-6,0 mm)
12AAH411	Collet (ø6,0-7,0 mm)
12AAH412	Collet (ø7,0-8,0 mm)
12AAH413	Collet (ø8,0-9,0 mm)
12AAH414	Collet (ø9,0-10,0 mm)
211-013	Vibration damping stand
211-016	Reference hemisphere
211-031	Micro-chuck OD: 1-1,5 mm
211-032	Quick chuck OD: 1-79, ID: 16-79 mm
211-045	Magnification checking gauge
211-051*	Collet chuck holder (OD : 0,5- 10 mm)
211-052	Quick chuck
211-053	V-block A (screw clamp)
211-054	V-block B (spring clamp)
12AAH420	Spacer for reference hemisphere
12AAH425	Alignment table with D.A.T. (mm)
12AAH427	Alignment table with mechanical heads
12AAH318	Z-axis scale unit
12AAH320	X-axis stop
356038	Auxiliary stage for a low-height workpiece
997090	Gauge block set for calibration

Consumable spares

No.	Description
12AAH181	Printer paper (10 rolls)



211-013

* Individual collet for collect chuck holder should be ordered separately



211-031



211-032



211-051



211-052



211-053



211-054



211-055



12AAH425

No.	Model	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-541D	RA-10	320	100	10

Roundtest RA-120 and RA-120P

Series 211 - Form Measuring Instrument

These are compact, affordable and simple-to-use instruments for measuring roundform geometry. The Roundtest RA-120 and RA-120P offer you the following benefits:

- The turntable accuracy of $(0,04+0,0006H)\mu\text{m}$ provides high level form analysis.

RA-120

- The RA-120 has a compact body with integrated electronics and printer, making it ideal for installation in space-restricted locations.
- You can easily view measurement results and recorded profiles on the large coloured LCD panel display.
- One-key operations.
- Support of 16 languages.
- It complies with EN ISO standard like 12181-1, 12181-2, 12781-1 and 12781-2
- USB Communication Program – Microsoft® Excel® based – to import results and create, save and print out inspection certificates on PC.

RA-120P

- The RA-120P is a PC based model with all operations controlled via powerful ROUNDPAK software.
- Software ROUNDPAK gives you excellent possibilities for single measurement and part programming.



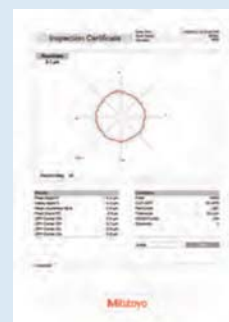
RA-120



RA-120P

Specifications

Turntable	
Rotational accuracy	Radial: $(0,04+0,0006H)\mu\text{m}$ H: Measuring height from turntable surface (mm) Axial: $(0,04+0,0006X)\mu\text{m}$ X: Radial distance from center (mm)
Max. probing Ø	280 mm 380 mm in reverse position
Max. workpiece Ø	440 mm
Max. turntable loading	25 kg
Centering range	± 3 mm
Leveling range	$\pm 1^\circ$
Vertical column	
Vertical travel	280 mm
Max. probing height	280 mm above turntable surface 480 mm in reverse position
Max. probing depth	100 mm (minimum ID: 30 mm)
Display unit	Only RA-120 (RA-120P with PC)
Data analysis items	Roundness, Coaxiality, Flatness, Runout (radial), Runout (axial), Thickness deviation, Parallelism, Perpendicularity
Printer	Built-in thermal line printer (RA-120)
Software	ROUNDPAK (only RA-120P)



USB Communication Program
as a free download on www.mitutoyo.eu
(registration required)



Refer to ROUNDTES RA-120 brochure



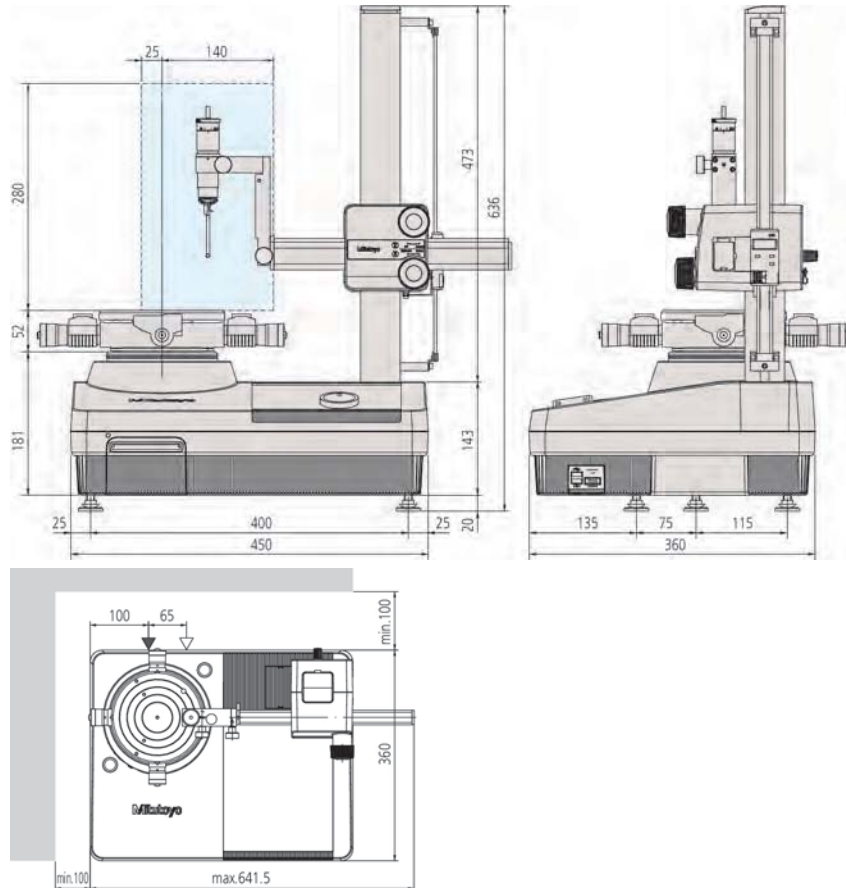
Scan QR Code with your mobile device to watch the product lines video on YouTube

Roundtest RA-120 and RA-120P

Series 211 - Form Measuring Instrument

This is a compact roundness tester with D.A.T. (Digital Adjustment Table) function. The Roundtest RA-120 and RA-120P give you the following benefits:

- The turntable displays centering and leveling adjustments digitally, making this challenging task easy enough for even an untrained operator to perform, through these four simple steps:
 1. Preliminary measurement of two cross sections on the workpiece.
 2. The centering and leveling adjustment values are displayed.
 3. The digital micrometer heads on the rotary table are adjusted to match the values displayed.
 4. Centering and leveling is complete. [Centering range : ± 3 mm - Leveling range : $\pm 1^\circ$]



No.	Model	Max. workpiece ϕ [mm]	Max. probing ϕ [mm]	Max. turntable loading [kg]
211-542D	RA-120 with D.A.T. function	440	280	25
211-544D	RA-120 with mechanical turntable	440	280	25
211-545D	RA-120P with D.A.T. function	440	280	25
211-547D	RA-120P with mechanical turntable	440	280	25

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.
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Optional accessories

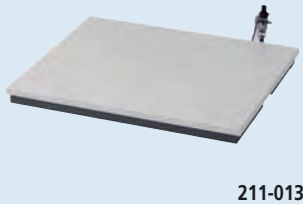
No.	Description
211-013	Vibration damping stand
211-014	Three jaw chuck OD: 2-78, ID: 25-68 mm
211-016	Reference hemisphere
211-031	Micro-chuck OD: 1-1,5 mm
211-032	Quick chuck OD: 1-79, ID: 16-79 mm
211-045	Magnification checking gauge
211-061	Collet chuck OD: 0,5-10 mm
12AAH320	X-axis stop
356038	Auxiliary stage for a low-height workpiece
997090	Gauge block set for calibration

Consumable spares

No.	Description
12AAH181	Printer paper (10 rolls)



211-016



211-013



Z-axis scale unit (optional)



X-axis stop



Scan QR Code with your mobile device and watch our product videos on YouTube

Roundtest RA-1600

Series 211 - Form Measuring System

This is a PC-compliant form measuring system which allows you to measure roundform geometry like cylindricity.

The Roundtest RA-1600 offers the following benefits:

- It is equipped with a high accurate turntable accuracy of $(0,02+0,0006H)\mu\text{m}$.
- You can carry out simple & accurate centering and leveling of the workpiece with D.A.T. (Digital Adjustment Table).
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- A remote control box is including allowing you easy operation.
- There is also an auto follow function for easy and quick pre-centering of the workpiece.



RA-1600 (+desktop vibration isolator)



Spiral Measurement/Analysis (RA-1600)

Provided with a spiral measurement function that combines turntable rotation and rectilinear motion allowing cylindricity, coaxiality and other form characteristics to be measured in continuous data stream mode.

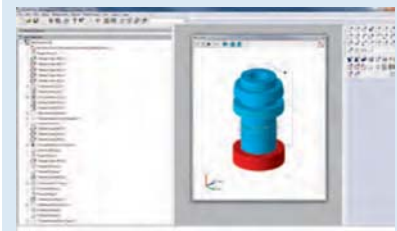


Measurement through X - axis tracking

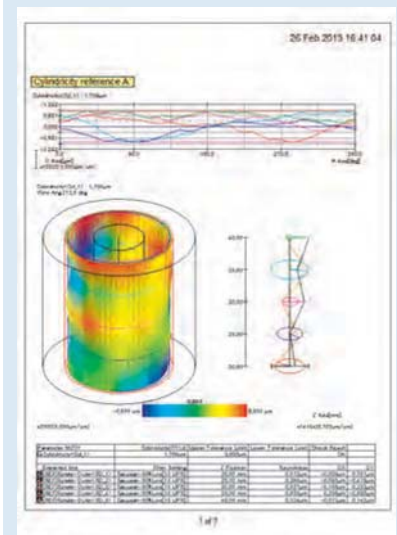
Measurement while tracing is possible through a built-in linear scale in the X - axis.

Specifications

Turntable	
Rotational accuracy	Radial: $(0,02+0,0006H)\mu\text{m}$ H: Measuring height from turntable surface (mm) Axial: $(0,02+0,0006X)\mu\text{m}$ X: Radial distance from center (mm)
Rotational speed	4, 6, 10 rpm
Max. probing \varnothing	280 mm
Max. workpiece \varnothing	560 mm
Max. turntable loading	25 kg
Centering range	± 3 mm
Leveling range	$\pm 1^\circ$
Vertical column	
Max. probing height	300 mm above turntable surface
Max. probing depth	91 mm (minimum ID : $\varnothing 32$ mm) 50 mm (minimum ID : $\varnothing 7$ mm)
Straightness	0,2 μm / 100 mm 0,3 μm / 300 mm
Parallelism with turntable axis	1,5 μm / 300 mm
Software	ROUNDPAK



Measuring screen



Result screen

ROUNDPAK

Simple to operate even with a full set of parameters and analysis functions.

Roundtest RA-1600

Series 211 - Roundness Measuring System

Additional Specifications

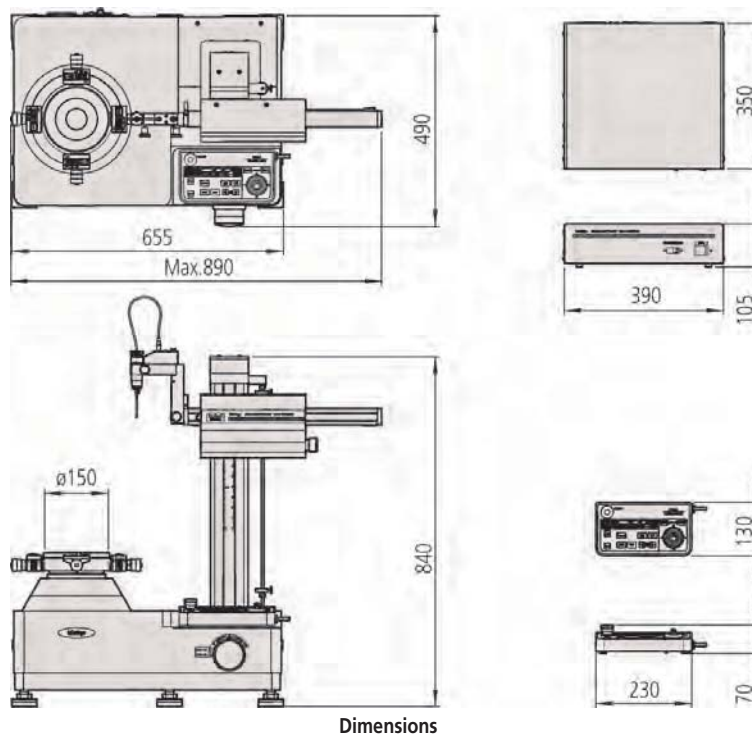
Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.
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Optional accessories

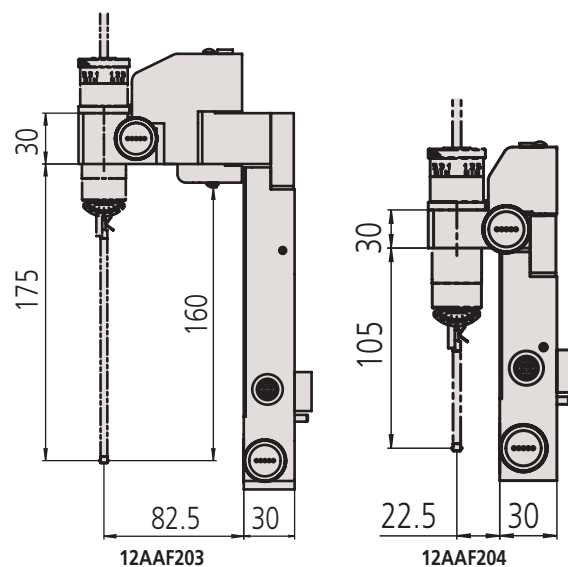
No.	Description
211-014	Three jaw chuck OD: 2-78, ID: 25-68 mm
211-031	Micro-chuck OD: 1-1,5 mm
211-032	Quick chuck OD: 1-79, ID: 16-79 mm
211-045	Magnification checking gauge
211-061	Collet chuck OD: 0,5-10 mm
12AAL019	Side table
12AAL090	Sliding detector holder
12AAF203	Double length detector holder
12AAF204	Large diameter detector holder
12AAK110	Vibration isolator
12AAK120	Monitor arm
356038	Auxiliary stage for a low-height workpiece
997090	Gauge block set for calibration



Refer to ROUNDTTEST RA-1600 brochure



No.	Model	Max. workpiece ϕ [mm]	Max. probing ϕ [mm]	Max. turntable loading [kg]
211-723D	RA-1600	560	280	25



Roundtest RA-2200

Series 211 - Form Measuring Instrument

This is a highly accurate form measuring system which allows you to measure roundform geometry like cylindricity.

The Roundtest RA-2200 offers the following benefits:

- It has fully motorised axes movement.
- Its extremely high turntable accuracy of $(0,02+0,00035H)\mu\text{m}$ gives you excellent form analysis.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- A huge number of styli provides you with maximum flexibility.
- There is an auto follow function for easy and quick pre-centering of the workpiece.

There is a wide variety of models available to suit any application.

RA-2200DS/DH: These models have a navigation function supplied as standard, to quickly and simply guides you through the centering and leveling task. The models are equipped with the D.A.T. (Digital Adjustment Table).

RA-2200AS/AH: The models have an automatic centering and leveling turntable supplied as standard, freeing you from the centering and leveling task. The models are equipped with the A.A.T. (Automatic Adjustment Table).



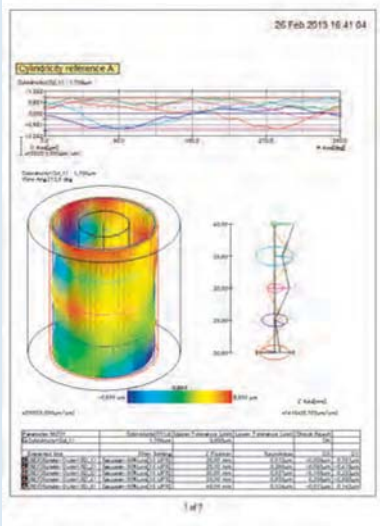
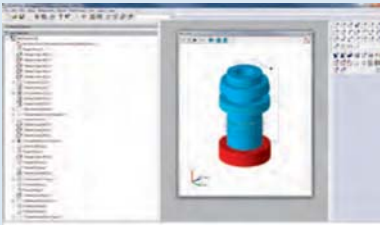
RA-2200



Automatic measurement

Specifications

Turntable	
Rotational accuracy	Radial: $(0,02+0,00035H)\mu\text{m}$ H: Measuring height from turntable surface (mm) Axial: $(0,02+0,00035X)\mu\text{m}$ X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm
Max. probing Ø	300 mm
Max. workpiece Ø	580 mm
Max. turntable loading	30 kg
Centering range	DS / DH: ± 5 mm AS / AH: ± 3 mm
Leveling range	$\pm 1^\circ$
Vertical column	
Max. probing height	AS / DS: 300 mm AH / DH: 500 mm above turntable surface
Max. probing depth	85 mm (minimum ID : $\phi 32$ mm) 50 mm (minimum ID : $\phi 7$ mm)
Straightness	AS / DS: $0,1 \mu\text{m} / 100$ mm AS / DS: $0,15 \mu\text{m} / 300$ mm AH / DH: $0,25 \mu\text{m} / 500$ mm
Parallelism with rotation center	AS / DS: $0,7 \mu\text{m} / 300$ mm AH / DH: $1,2 \mu\text{m} / 500$ mm
Horizontal axis	
Straightness	$0,7 \mu\text{m} / 300$ mm
Perpendicularity to rotation center	$1 \mu\text{m} / 150$ mm
Software	
ROUNDPAK	
FORMTRACEPAK-RA (optional for roughness detection unit)	

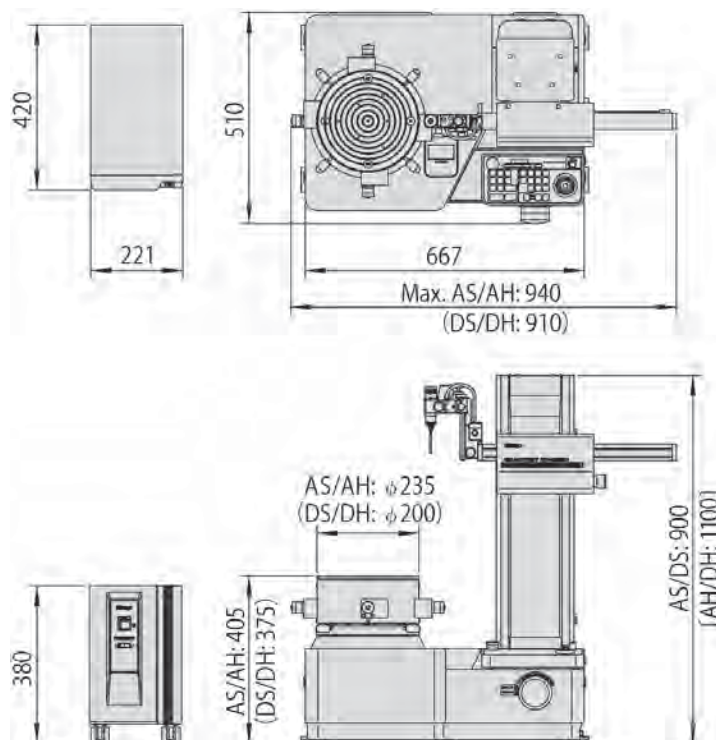


ROUNDPAK
Simple to operate even with a full set of parameters and analysis functions.

Roundtest RA-2200

Series 211 - Roundness/Cylindricity Measuring System

Accessories and dimensions



No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. workpiece ϕ [mm]	Max. probing ϕ [mm]	Max. turntable loading [kg]
211-511D	RA-2200AS	AAT	300	580	300	30
211-512D	RA-2200AH	AAT	500	580	300	30
211-513D	RA-2200DS	DAT	300	580	300	30
211-515D	RA-2200DH	DAT	500	580	300	30

1* AAT : Automatic Adjustment Table
DAT : Digital Adjustment Table

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.
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Optional accessories

No.	Description
211-014	Three jaw chuck OD: 2-78, ID: 25-68 mm
211-031	Micro-chuck OD: 1-1,5 mm
211-032	Quick chuck OD: 1-79, ID: 16-79 mm
211-045	Magnification checking gauge
12AAL019	Side table
12AAF203	Double length detector holder
12AAF204	Large diameter detector holder
12AAK110	Vibration isolator
12AAK120	Monitor arm
356038	Auxiliary stage for a low-height workpiece
12AAF353	Roughness detection unit
178-396-2	Detector 0,75 mN



Refer to ROUNDTTEST RA-2200 brochure

Roundtest RA-H5200

Series 211 - High-precision Form Measuring Instrument

This is a highly accurate, precision form measuring system developed to give you the highest accuracy as well as high flexibility and analytical capability.

The Roundtest RA-H5200 offers the following benefits:

- Its integrated vibration isolator helps you to measure within the best conditions.
- It has a high measuring range and loading mass.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- A.A.T. (Automatic Adjustment Table) gives you fully automatic centering and leveling.
- There is an auto follow function for easy and quick pre-centering of the workpiece.



Highly accurate, automatic centering/leveling turntable

The performance of this turntable has been achieved through exceptional manufacturing accuracy of the critical components, in addition to a high-accuracy air-bearing that provides superior rigidity. The resulting rotational accuracy, the heart of a Roundtest measuring system, is world-class at $0.02+0.00035H \mu\text{m}$.

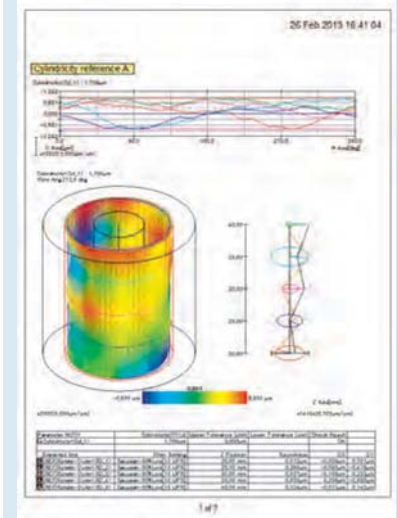
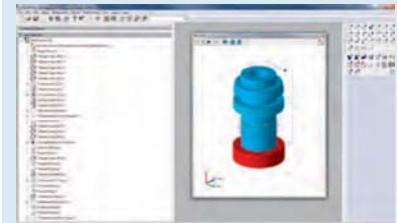


Sliding detector-unit holder provided as a standard feature

The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm. Sliding distance : 112 mm.

Specifications

Turntable	
Rotational accuracy	Radial: ($0.02+0.00035H$) μm H: Measuring height from turntable surface (mm) Axial: ($0.02+0.00035X$) μm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm
Max. probing \varnothing	400 mm
Max. workpiece \varnothing	680 mm
Max. turntable loading	65 kg 80 kg without auto centering
Centering range	± 5 mm
Leveling range	$\pm 1^\circ$
Vertical column	
Max. probing height	AS : 350 mm AH: 550 mm above turntable surface
Max. probing depth	85 mm (minimum ID : $\varnothing 32$ mm) 50 mm (minimum ID : $\varnothing 7$ mm)
Straightness	AS / AH : $0.05 \mu\text{m} / 100$ mm AS : $0.14 \mu\text{m} / 350$ mm AH : $0.2 \mu\text{m} / 550$ mm
Parallelism with rotation center	AS : $0.2 \mu\text{m} / 350$ mm AH : $0.32 \mu\text{m} / 550$ mm
Horizontal axis	
Straightness	$0.4 \mu\text{m} / 200$ mm
Perpendicularity to rotation center	$0.5 \mu\text{m} / 200$ mm
Software	
	ROUNDPAK FORMTRACEPAK-RA (optional for roughness detection unit)



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Simple to operate even with a full set of parameters and analysis functions.

Roundtest RA-H5200

Series 211

Dimensions and accessories

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.
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Optional accessories

No.	Description
211-014	Three jaw chuck OD: 2-78, ID: 25-68 mm
211-031	Micro-chuck OD: 1-1,5 mm
211-032	Quick chuck OD: 1-79, ID: 16-79 mm
211-045	Magnification checking gauge
12AAL019	Side table
12AAF203	Double length detector holder
12AAF204	Large diameter detector holder
12AAF205	Triple length holder for extra-deep holes
12AAF353	Roughness detection unit
178-396-2	Detector 0,75 mN



211-014



211-032



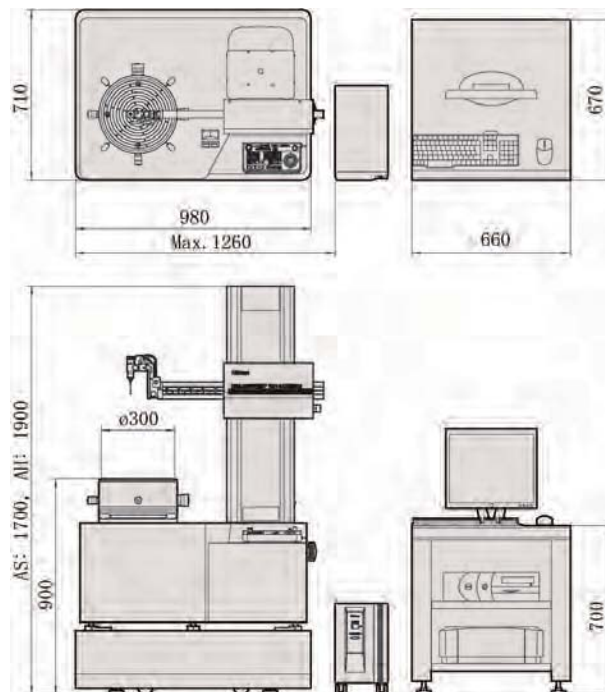
211-031



211-045



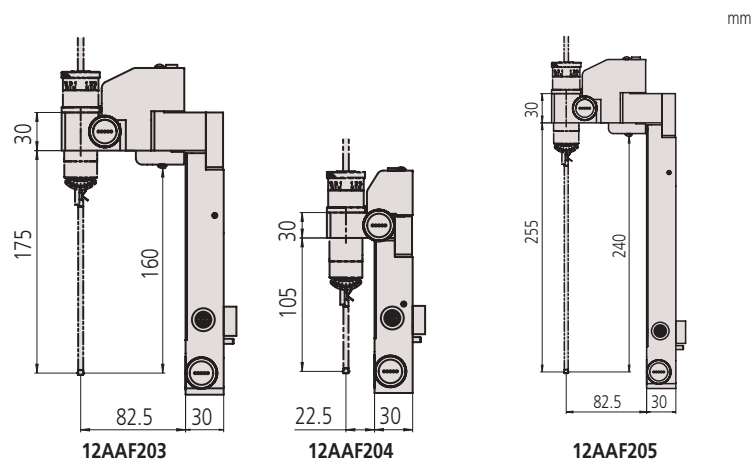
Refer to ROUNDTTEST RA-H5200 brochure



Dimensions

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. workpiece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-531D	RA-H5200AS	AAT	350	680	400	65
211-532D	RA-H5200AH	AAT	550	680	400	65

1* AAT : Automatic Adjustment Table



Roundtest Extreme RA-2200CNC

Series 211 - High-precision Form Measuring Instrument

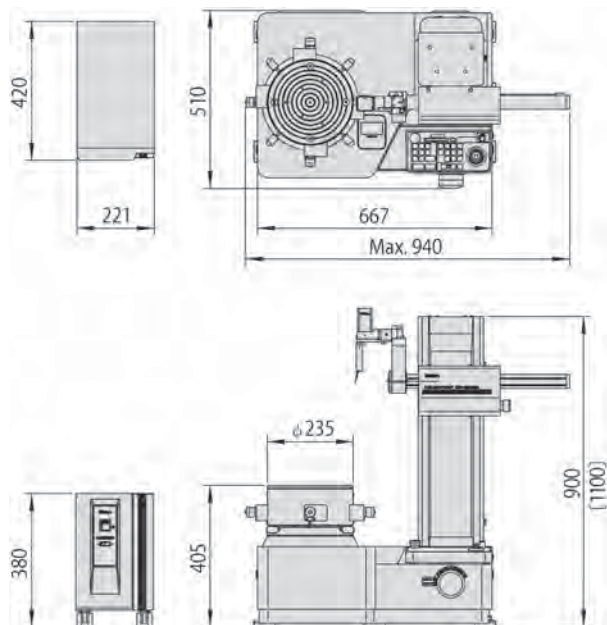
This is a fully automatic CNC form measuring instrument that gives highly accurate results.

The Roundtest Extreme RA-2200CNC offers you the following benefits:

- It has a CNC controlled measuring system with orientation steps of 1°.
- The extremely high turntable accuracy of (0,02+0,00035H)µm gives you highly accurate form analysis.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- An automatic centering and leveling turntable A.A.T. (Automatic Adjustment Table) is supplied as standard, freeing you from the centering and leveling task.



RA-2200 CNC
+ optional vibration isolator [12AAK110]
and side table [12AAL019]



No.	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. work-piece ø [mm]	Model	Max. probing Ø [mm]	Max. turntable loading [kg]
211-517D	AAT	300	580	RA-2200CNC AS	256	30
211-518D	AAT	500	580	RA-2200CNC AH	256	30

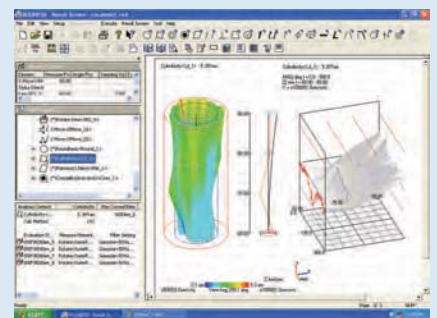
1* AAT : Automatic Adjustment Table

Specifications

Rotational accuracy	Radial: (0,02+0,00035H)µm H: Measuring height from turntable surface (mm) Axial: (0,02+0,00035X)µm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm
Max. probing Ø	256 mm
Max. workpiece Ø	580 mm
Max. turntable loading	30 kg
Centering range	±3 mm
Leveling range	±1°
Vertical column	
Max. probing height	AS : 300 mm AH: 500 mm above turntable surface
Max. probing depth	104 mm (minimum ID : ø32 mm) 26 mm (minimum ID : ø12,7 mm)
Straightness	AS / AH : 0,1 µm / 100 mm AS : 0,15 µm / 300 mm AH : 0,25 µm / 500 mm
Parallelism with rotation center	AS : 0,7 µm / 300 mm AH : 1,2 µm / 500 mm
Horizontal axis	
Perpendicularity to rotation center	1 µm / 150 mm
Straightness	0,7 µm / 150 mm
Software	ROUNDPAK FORMTRACEPAK-RA (optional for roughness detection unit)

Optional accessories

No.	Description
12AAL019	Side table
12AAK110	Vibration isolator
12AAK120	Monitor arm
12AAG419	Roughness detection unit CNC (0,75mN)



ROUNDPAK

Simple to operate even with a full set of parameters and analysis functions.



Refer to ROUNDTTEST RA-2200 brochure

Roundtest Extreme RA-H5200CNC

Series 211 - High-precision Roundness/Cylindricity Measuring System

This is a CNC form measuring instrument that combines high accuracy with automatic CNC measurements.

The Roundtest Extreme RA-H5200CNC offers you the following benefits:

- An integrated vibration isolator helps you to measure within best conditions.
- It will greatly improve your productivity and efficiency.
- You can take highly accurate, fast and operator-free measurements.
- The user friendly software, ROUNDPAK, gives you easy drag and drop usage and a wide range of parameters.
- ROUNDPAK also has easy-to-use part programming and single measurement functions.
- An automatic centering and leveling turntable A.A.T. (Automatic Adjustment Table) is supplied as standard, freeing you from the centering and leveling task.

Specifications

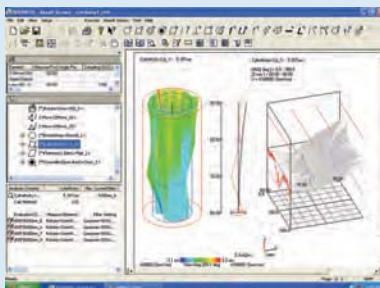
Turntable	
Rotational accuracy	Radial: (0,02+0,00035H)μm H: Measuring height from turntable surface (mm) Axial: (0,02+0,00035X)μm X: Radial distance from center (mm)
Rotational speed	2, 4, 6, 10 rpm Auto centering: 20 rpm
Max. probing Ø	356 mm
Max. workpiece Ø	680 mm
Max. turntable loading	65 kg 80 kg without auto centering
Centering range	±5 mm
Leveling range	±1°
Vertical column	
Max. probing height	AS : 350 mm AH: 550 mm above turntable surface
Max. probing depth	104 mm (minimum ID : ø32 mm) 26 mm (minimum ID : ø12,7 mm)
Parallelism with rotation center	AS : 0,2 μm / 350 mm AH : 0,32 μm / 550 mm
Horizontal axis	
Straightness	0,4 μm / 200 mm
Perpendicularity to rotation center	0,5 μm / 200 mm
Software	ROUNDPAK FORMTRACEPAK-RA (optional for roughness detection unit)

Additional Specifications

Optional accessories	Other optional and standard accessories are listed later in this section for accessories and styli.
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Optional accessories

No.	Description
12AAL019	Side table
12AAG419	Roughness detection unit CNC (0,75mN)

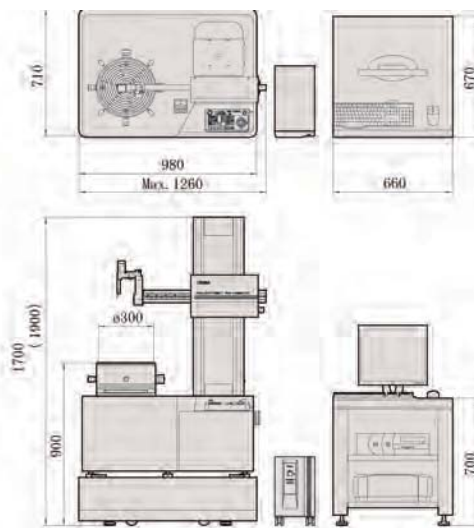


ROUNDPAK

Simple to operate even with a full set of parameters



**RA-H5200CNC
+ side table [12AAL019]**




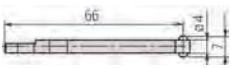
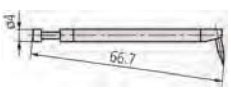
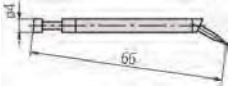

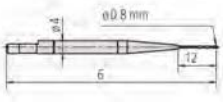
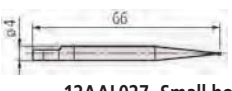
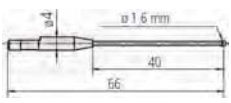
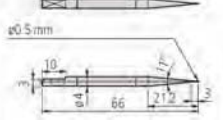
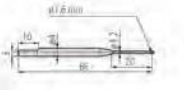
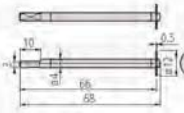

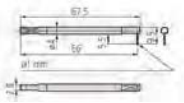
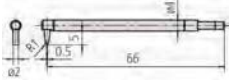
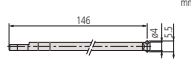

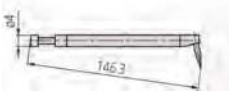
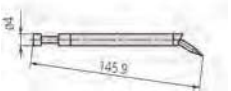
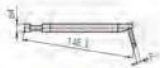
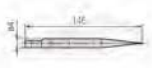
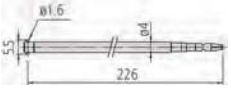
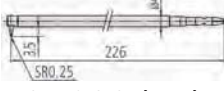
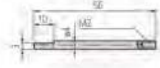
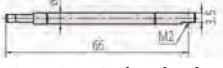
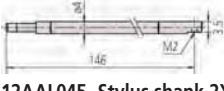
Dimensions

No.	Model	Centering/leveling adjustment 1*	Vertical travel [mm]	Max. work-piece ø [mm]	Max. probing Ø [mm]	Max. turntable loading [kg]
211-533D	RA-H5200CNC AS	AAT	350	680	356	65
211-534D	RA-H5200CNC AH	AAT	550	680	356	65

1* AAT : Automatic Adjustment Table

Optional Styli for Roundtest

Interchangeable styli for RA-10, RA-120, RA-120P, RA-1600, RA-2200, RA-H5200

 <p>12AAL021 - Standard ø 1,6 mm tungsten carbide</p>	 <p>12AAL022 - Notch ø 3 mm tungsten carbide</p>	 <p>12AAL023 - Deep groove R 0,25 mm sapphire</p>
 <p>12AAL024 - Corner R 0,25 mm sapphire</p>	 <p>12AAL025 - Cutter mark R 15 mm tungsten carbide</p>	 <p>12AAL026 - Small hole ø 0,8 mm tungsten carbide</p>
 <p>12AAL027 - Small hole ø 1 mm tungsten carbide</p>	 <p>12AAL028 - Small hole ø 1,6 mm tungsten carbide</p>	 <p>12AAL029 - Extra small hole ø 0,5 mm tungsten carbide</p>
 <p>12AAL030- ø 1,6 mm ball ø 1,6 mm tungsten carbide</p>	 <p>12AAL031- Disc ø 12 mm</p>	 <p>12AAL032- Crank ø 0,5 mm tungsten carbide</p>
 <p>12AAL033- Crank ø 1 mm tungsten carbide</p>	 <p>12AAL034- Flat surface Tungsten carbide</p>	 <p>12AAL035- 2X-long standard ø 1,6 mm tungsten carbide</p>
 <p>12AAL036- 2X-long notch ø 3 mm tungsten carbide</p>	 <p>12AAL037- 2X-long deep groove R 0,25 mm sapphire</p>	 <p>12AAL038- 2X-long corner R 0,25 mm sapphire</p>
 <p>12AAL039- 2X-long type cutter mark R 15 mm tungsten carbide</p>	 <p>12AAL040- 2X-long small hole ø 1 mm tungsten carbide</p>	 <p>12AAL041- 3X-long standard ø 1,6 mm tungsten carbide</p>
 <p>12AAL042- 3X-long deep groove R 0,25 mm sapphire</p>	 <p>12AAL043- Stylus shank for mounting M2 - CMM stylus</p>	 <p>12AAL044- Stylus shank groove for mounting M2 - CMM stylus</p>
 <p>12AAL045- Stylus shank 2X groove for mounting M2 - CMM stylus</p>		

Standard accessories

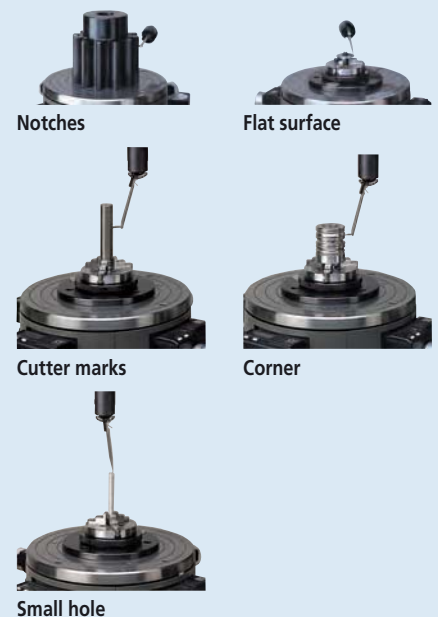
No.	Description
12AAL021	Stylus standard type

Optional accessories

No.	Description
12AAL022	Stylus for notches
12AAL023	Stylus for deep grooves
12AAL024	Stylus for corner
12AAL025	Stylus for cutter marks
12AAL026	Stylus ø0,8 mm for small holes
12AAL027	Stylus ø1 mm for small holes
12AAL028	Stylus ø1,6 mm for small holes
12AAL029	Stylus ø0,5 mm for extra small holes
12AAL030	Stylus ø1,6 mm ball type
12AAL031	Stylus disc type
12AAL032	Stylus ø0,5 mm for cranks
12AAL033	Stylus ø1 mm for cranks
12AAL034	Stylus for flat surfaces
12AAL035	Stylus 2x-long standard type *1
12AAL036	Stylus 2X-long type for notches *1
12AAL037	Stylus 2X-long type for deep grooves *1
12AAL038	Stylus 2X-long type for corners *1
12AAL039	Stylus 2X-long type for cutter marks *1
12AAL040	Stylus 2X-long type ø1 mm for small holes *1
12AAL041	Stylus 3X-long standard type *1 *2
12AAL042	Stylus 3X-long type for deep grooves *1 *2
12AAL043	Stylus shank
12AAL044	Stylus shank for grooves
12AAL045	Stylus shank 2X-long type for grooves *1

*1 Not available for RA-10, RA-120, RA-120P

*2 Measuring is only possible in the vertical direction



Optional Styli for Roundtest

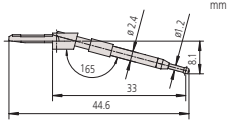
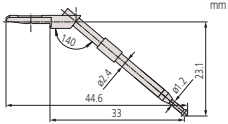
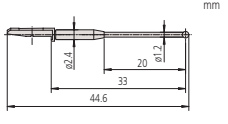
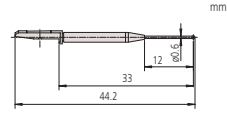
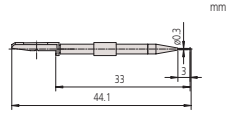
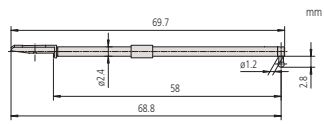
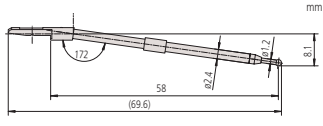
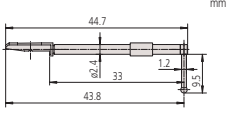
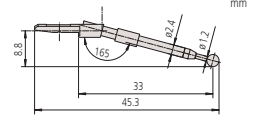
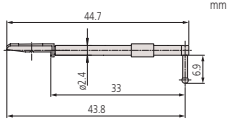
Interchangeable styli for RA-2200CNC, RA-H5200CNC

Standard accessories

No.	Description
12AAE301	Stylus standard type for CNC
12AAE302	Stylus for flat surfaces for CNC

Optional accessories

No.	Description
12AAE303	Stylus ball $\varnothing 1,6$ mm for CNC
12AAE304	Stylus ball $\varnothing 0,8$ mm for CNC
12AAE305	Stylus ball $\varnothing 0,5$ mm for CNC
12AAE306	Stylus for deep holes for CNC
12AAE307	Stylus for deep holes for CNC
12AAE308	Stylus for deep grooves for CNC
12AAE309	Stylus for notches for CNC
12AAE310	Stylus for grooves for CNC

 <p>12AAE301 - Standard $\varnothing 1,6$ mm tungsten carbide</p>	 <p>12AAE302 - Flat surface $\varnothing 1,6$ mm tungsten carbide</p>	 <p>12AAE303 - $\varnothing 1,6$ mm ball $\varnothing 1,6$ mm tungsten carbide</p>
 <p>12AAE304 - $\varnothing 0,8$ mm ball $\varnothing 0,8$ mm tungsten carbide</p>	 <p>12AAE305 - $\varnothing 0,5$ mm ball $\varnothing 0,5$ mm tungsten carbide</p>	 <p>12AAE306 - Deep hole $\varnothing 1,6$ mm tungsten carbide</p>
 <p>12AAE307 - Deep hole $\varnothing 1,6$ mm tungsten carbide</p>	 <p>12AAE308 - Deep groove $\varnothing 1,6$ mm tungsten carbide</p>	 <p>12AAE309 - Notch $\varnothing 3$ mm tungsten carbide</p>
 <p>12AAE310 - Groove $\varnothing 1,6$ mm tungsten carbide</p>		

Optional Accessories for Roundtest

Optional accessories for Roundtest and Roundtest Extreme

Auxiliary stage for a low-height workpiece

No.	Description
356038	Used for measuring a workpiece whose diameter is 40 mm or less and whose height is 20 mm or less

Chuck - Quick chuck

This Chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

No.	Holding capacity [mm]	External dimensions [mm]
211-032.	Internal jaw: ID = \varnothing 16 - 69 External jaw: OD = \varnothing 1 - 79	\varnothing 118 x 41
211-031.	Internal jaw: \varnothing 0,1 - 1,5	\varnothing 107 x 48,5

Chuck - Three jaw chuck (key operated)

No.	Holding capacity [mm]	External dimensions [mm]
211-014	Internal jaw: ID = \varnothing 25 - 68 Internal jaw: OD = \varnothing 2 - 35 External jaw: OD = \varnothing 35 - 78	\varnothing 157 x 70,6

Cylindric square

No.	Cylindricity [μ m]	Roundness [μ m]	Squareness [μ m]	Straightness [μ m]
350850	2	0,5	3	1

Gauge block set for calibration

No.	Description
997090	Standard accessory for RA-2200, RA-2200CNC Standard accessory for RA-H5200 and RA-H5200CNC

Magnification checking gauge

No.	Max. calibration range [μ m]	Graduation [μ m]
211-045	400	0,2

Origin point gauge

No.	Description
998382	Standard accessory for RA-1600, RA-2200 and RA-H5200

Vibrator isolator and accessories

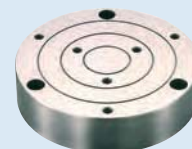
No.	Vibration isolation method	External dimensions [mm]	Description
178-025	Air suspension Diaphragm isolation system	(WxDxH) 750x550x59	For RA-2200 and RA-2200CNC
178-024			Stand for RA-2200 and RA-2200CNC
12AAL019		660 x 670 x 700	Side table
12AAK110		830 x 800 x 700	Vibration isolator
12AAK120			Monitor arm



12AAK110 + 12AAK120



12AAK110 + 12AAL019



356038



211-032



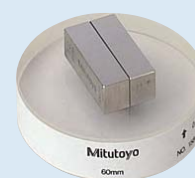
211-031



211-014



350850



997090



211-045



998382



178-025