# MEASURING TOOLS FORM MEASUREMENT

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# **Mitutoyo**

เครื่องวัดรูปทรง Surftest SJ-210 SERIES 178 — On-site Surface Roughness Tester



Compact type all-in-one surface roughness tester has evolved by meeting customer demands

- The color LCD can display not only calculation The book ESD data baskey into inty aductation results and measurement conditions, but also surface roughness waveforms. In addition, bigger character size contributes to visibility.
   Built-in rechargeable battery allows measurement without a mains power supply connection.



Contracer เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** แผ่นเทียบผิวงาน



1000	101409								
Model No.		Standard drive unit		Retractable drive unit		Transverse tracing drive unit			
		<b>SJ-210</b> (0.75mN type)			<b>SJ-210</b> (0.75mN type)	<b>SJ-210</b> (4mN type)			
Order No. mm inch/mm		178-560-01	178-560-02	178-562-01	178-562-02	178-564-01	178-564-02		
		178-561-01	178-561-02	178-563-01	178-563-02	178-565-01	178-565-02		
Measuring	X axis		16.0 mm			5.6 mm			
range	Detector	Range			360 μm (-200 μ	360 μm (-200 μm to +160 μm)			
rungo	Bottootoi	Range/Resolution	360 μm / 0.02 μm, 100 μm / 0.006 μm, 25 μm / 0.002 μm						
Measuring force/Stylus tip shape  Depends on the Code No.: 0.75mN/60°, 2µmR (when the Code No. ends with "-01")  4mN/90°, 5 mR (when the Code No. ends with "-02")									
Applicable sta	andards		JIS1982/ JIS1994/ JIS2001/ ISO1997/ ANSI/ VDA						
Assessed pro	ofile			Primary profi	ile, Roughness profile,	DF profile, Roughness	motif profile		

# เครื่องวัดรูปทรง Surftest SJ-310 SERIES 178 — On-site Surface Roughness Tester





# Advanced handheld tester that is easy to operate and meets a variety of needs

- Equipped with a large, touch-screen color graphic LCD for intuitive operation and excellent ease of use.
- or use.

  + High-speed thermal printer (whose printing speed is approx. 1.5 times that of conventional models) is provided as standard. Allows landscape mode printing to match the display on the LCD.

			Standard drive unit		Retractable drive unit		Transverse tracing drive unit		
Model No.		<b>SJ-310</b> (0.75mN type)			<b>SJ-310</b> (0.75mN type)	<b>SJ-310</b> (4mN type)			
Order No. mm inch/mm		mm	178-570-01	178-570-02	178-572-01	178-572-02	178-574-01	178-574-02	
		inch/mm	178-571-01	178-571-02	178-573-01	178-573-02	178-575-01	178-575-02	
X axis		16.0 mm			5.6 mm				
range	Measuring Range		360 μm (-200 μm to +160 μm)						
Range/Resolution		Range/Resolution	360 μm / 0.02 μm, 100 μm / 0.006 μm, 25μm / 0.002 μm						
Measuring force/Stylus tip shape			Depends on the Order No.: $0.75$ mN / $60^\circ$ , $2~\mu$ mR (when the Order No. ends with "- <b>01</b> ") $4~\text{mN}$ / $90^\circ$ , $5~\text{mR}$ (when the Order No. ends with "- <b>02</b> ")						
Applicable sta	andards		JIS1982/ JIS1994/ JIS2001/ ISO1997/ ANSI/ VDA						
Assessed pro	ofile		Primary profile, Roughness profile, DF profile, Roughness motif profile, Waviness motif profile				le		

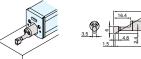
Extra small hole detectors

# **Mituto**yo

# อุปกรณ์เสริมสำหรับเครื่องวัดรูปทรง SJ-210/310 Optional Accessories for Surftest SJ-210/310

#### **Detector**

#### Standard detectors



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16.4 Stylus	
3.5	ĺ
1.5	
	•

Order No.	Measuring force	Stylus profiles*	Remarks
178-296	0.75mN	2µmR/60°	Dedicated to the
178-390	4mN	5μmR/90°	standard/retractable drive unit
178-387	0.75mN	2μmR/60°	Dedicated to the
178-386	4mN	5μmR/90°	transverse tracing drive unit
178-391	4mN	10µmR/90°	Dedicated to the standard/ retractable drive unit

#### Small hole detectors

0.75mN

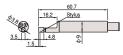
4mN



178-383

178-392

\*Tip radius / Tip angles



3.5.1	.5 4.8	60
ylus	Bon	a a rika

Remarks	С
	1
e hole diameter:	1



0.75mN

2μmR/60°

5µmR/90°

Minimum

ø2.8mm

measurable hole diameter

der No.

78-384

# Surftest

Contracer เครื่องวัดรูปทรง

Formtracer

เครื่องวัดรูปทรง

Roundtest เครื่องวัดรูปทรง

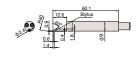
**Surface Roufhness** 

แผ่นเทียบผิวงาน



#### Gear-tooth surface detectors





Order No.	Measuring force	Stylus profiles*
178-388	0.75mN	2μmR/60°
178-398	4mN	5μmR/60°

<sup>\*</sup>Tip radius / Tip angles

#### • Deep groove detectors





Order No.	Measur- ing force	Stylus profiles*	Remarks
178-385	0.75mN		Not available for the transverse tracing
178-392	4mN		drive unit

2μmR/60° Minimum

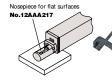
5μmR/90°

neasurabl

ø4.5mm

#### **Optional Accessories for Drive Units**

#### Nosepiece for flat surfaces



# No.12AAA217

Standard accessory for the standard/retractable drive unit of the SJ-310 series Not available for the

transverse tracing drive

#### Nosepiece for cylindrical surfaces



Point-contact adapter

No.12AAE643

No.12AAA218 drive unit of the SJ-310

Not available for the transverse tracing drive

#### Magnetic stand adapter

No.12AAA221 mounting section

No.12A A A 220 (Shaft diameter of the mounting section:



#### V-type adapter

• Extension rod (50mm) (Note: Only one rod can be used.)

\*Not applicable to up

No.12AAA210

#### No.12AAE644

No.12AAA210

transverse tracing

Transverse tracing type standard accessory. \* Dedicated to the transverse tracing drive





## • Extension cable (1m) (Note: Only one rod can be used.)

## Height gage adapter









# No.12BAA303

\* For the connection between the calculation display unit and drive unit



#### No.12AAA216 Standard accessory for the standard/retractable

Detector side

drive unit of the SJ-310 series \* Not available for the transverse tracing drive unit

\* Adjustment range is 28mm from bottom face.

<sup>\*</sup>Tip radius / Tip angles

**Mitutoyo** 

เครื่องวัดรูปทรง Surftest SJ-410

SERIES 178 — Compact Surface Roughness Tester

**MeasurLink®** ENABLED Data Management Software by Mitutoyo



Contracer เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** แผ่นเทียบผิวงาน





## Dramatic improvement on compact type surface roughness testers

- Equipped with a large, touch-screen color graphic LCD to achieve both intuitive operation and high operability
   Skidded and skidless measurement are switchable
- to perform optimum evaluation according to the
- measurement setup.

   Achieves the performance of a desktop type surface roughness tester in combination with the simplified stand and associated optional accessories.

Model No.		SJ-	411	SJ-412			
Ouden Ne	mm	178-580-01	178-580-02	178-582-01	178-582-02		
Order No.	inch/mm	178-581-01	178-581-02	178-583-01	178-583-02		
. X axis		25	mm	50 mm			
Measuring Z-axis (detector)		800 $\mu$ m, 80 $\mu$ m, 8 $\mu$ m Up to 2,400 $\mu$ m when using an optional stylus.					
	Resolution	$0.01 \mu m$ (800 $\mu m$ range), $0.001 \mu m$ (80 $\mu m$ range), $0.0001 \mu m$ (8 $\mu m$ range)					
	Stylus tip shape (Angle/Radius)	60°/2 μm	90°/5µm	60°/2µm	90°/5 μm		
Detector	Measuring force	0.75 mN	4 mN	0.75 mN	4 mN		
	Radius of skid curvature	40 mm					
	Measuring methods	Skidless / Skidded (switchable)					
Applicable standards JIS1982 / JIS1994 / JIS2001 / ISO1997 / ANSI / VDA							

## เครื่องวัดรูปทรง

**Surftest SJ-500/SV-2100** 

SERIES 178 — Dedicated Control Unit Type Surface Roughness Tester







High precision and high performance type surface roughness tester with a dedicated control unit, offering a userfriendly display and simple operation.

- Equipped with a 7.5-inch, color TFT LCD, large color icons and touch panel controls, the display unit is easy to read and simple to operate.
   A built-in joystick on the control unit allows quick and easy positioning. The manual adjustment knob allows fine positioning of a small stylus for magazing appell holes.
- measuring small holes.

  In addition to the roughness parameters compliant with ISO/JIS/ANSI/VDA surface roughness standards, contour analysis is also available.

Model No.		SJ-500	SV-2100M4	SV-2100S4	SV-2100H4	SV-2100W4
Stand type		(Optional)	Manual stand	nual stand Motorized stand		
Measuring	Z1-axis (detector)	800 µm, 80 µm, 8 µm				
range	X-axis	50 mm 100 mm				
	X-axis	0.05 m				
Resolution	Z1-axis (detector)		0.01 $\mu$ m (800 $\mu$	μm), 0.001 μm (80 μm), 0.0	001 μm (8μm)	
	Z2-axis (column)	1 m				
Assessed prof	ile	Primary profile, Roughness profile, Waviness profile, DF profile, Roughness motif profile, Waviness motif profile				s motif profile

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon. Note: Stand for SJ-500 is optional.

**MeasurLink®** ENABLED

Data Management Software by Mitutoyo

Surftest

Contracer

เครื่องวัดรูปทรง

Formtracer

เครื่องวัดรูปทรง

Roundtest

เครื่องวัดรูปทรง **Surface Roufhness** 

แผ่นเทียบผิวงาน

# เครื่องวัดรูปทรง

#### Surftest SJ-500P/SV-2100M4 **Data Processing Unit (PC) Surface Roughness Testers**



Highly precise, high-performance surface roughness testers that use the advantages of sophisticated analysis software.
The SJ-500P is a stand-alone instrument whereas the SV-2100M4 is a benchtop machine incorporating a precision column with manual drive.

Simple setup for surface roughness measuring

conditions. A simple input function is used to calculate A simple injut unicon is used to calculate according to ISO/JIS roughness standard drawing instruction symbols. Complicated measuring settings can easily be entered by selecting a drawing instruction symbol from the surface roughness menu.



# FORMTRACEPAK: Best-selling Surface Roughness Analysis Program Best-selling dedicated software for surface roughness measurement and analysis.

Features a flexible printer format and creation of an original inspection certificate.

Type of data pr	rocessing unit	PC	PC type				
Model No.		SJ-500P SV-2100M4					
Elevating shaft	mechanism of stand	*1	Manual operation only				
Measuring	X axis	50mm	100mm				
range	Z1 axis (detector)	800µm/80	Dμm / 8μm				
Z2-axis (colum	n) moving range	— 350mm					
	X axis	0.05μm					
Resolution	Z1 axis (detector)	0.01 $\mu$ m(800 $\mu$ m), 0.001 $\mu$ n	n(80µm), 0.0001µm(8µm)				
	Z2 axis (column)	_	_				
Drive speed	X axis	0 to 20mm/s or manual operation	0 to 40mm/s or manual operation				
Z2 axis (column)		_	Manual operation only				
Applicable star	ndards	JIS1982/ JIS1994/ JIS2001/ ISO1997/ ANSI/ VDA					
Assessed profi	Primary profile, Roughness profile, Waviness profile, Filtered waviness profile, Rolling circle wav						

\*1: The simplified stand or manual column stand is available as an optional accessory.

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

## เครื่องวัดรูปทรง Surftest SV-3200 SERIES 178 — Desktop Surface Roughness Tester





Equipped to measure a variety of parameters.
A precision surface roughness tester supported by a wide range of optional accessories for a versatile benchtop surface-analysis solution.

- The analysis unit is equipped with the FORMTRACEPAK Surface Roughness / Contour
- analysis program.

  Detectors with standard or low measuring force, 4 mN or 0.75 mN, are selectable whether the instrument is equipped with the inclinable drive
- unit or not.
   The 700 mm Z2-axis (column) range models are new to the lineup.



Model No.		SV-3200S4	SV-3200H4	SV-3200W4	SV-3200L4	SV-3200S8	SV-3200H8	SV-3200W8	SV-3200L8
Measuring range	Z1 axis	800μm/0.01μm, 80μm/0.001μm, 8μm/0.0001μm							
Resolution	Travel range of the X axis	100mm 200mm				mm			
	X-axis straightness	(0.05	(0.05+0.001L)µm (L: Measuring length (mm))			(0.1+0.002L)µm (L: Measuring length (mm))			
Drive unit	Measuring speed			0.02, 0	.05, 0.1, 0.2, 0.5,	1.0, 2.0, 5.0, 10, 20mm/s			
	Z2 axis (column)	300mm (motorized)*1	500mm (m	otorized)*1	700mm (motorized)*1	300mm (motorized)*1	500mm (m	otorized)*1	700mm (motorized)*1
Assessed profile								profile, Rolling cir viness motif profile	

\*1: Manual operation is also available.

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

Surftest

Contracer เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

Roundtest

เครื่องวัดรูปทรง

Scale แผ่นเทียบผิวงาน

**Surface Roufhness** 

# **FORM MEASUREMENT**

้เครื่องวัดรูปทรง

# **Mitutoyo**

## เครื่องวัดรูปทรง

#### Surftest Extreme SV-3000CNC/SV-M3000CNC SERIES 178 — CNC Surface Roughness Testers





• The X1-, Y and Z2-axes have a maximum drive speed of 200 mm/s.

This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile / multiple-workpiece measurement tasks.

• Capable of inclined plane measurement through 2 axis simultaneous control in X and Y.

• For models equipped with the \( \alpha \) axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-litting the drive unit.

• It is possible to expand the measuring range for multiple workpieces through positioning in Y.

• All connecting cables are incorporated into the measuring instrument to eliminate any inconvenience from loose cables during measurement.

inconvenience from loose cables during measurement.

Since the Z1-axis detector incorporates an anti-collision safety device, the machine will automatically stop if the detector touches a workpiece or jig.

Surftest Extreme SV-M300CNC (CNC Surface Roughness Tester with the movable Y-axis table) that handles measurement of large/heavy workpieces, such as engine blocks or crankshafts, is also available.

Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.



(Surface Roughness Tester with movable Y-axis column unit.) (The photo represents a special specification model.)

Gabbro

SV-3000CNC (Inclinable drive unit + Y-axis table)

Order No.			SV-3000CNC		
	Measuring ran	ge	200mm		
	Resolution		0.05 <i>µ</i> m		
	Scale type		Reflective-type linear encoder		
X1-axis (drive unit)	Duiter	CNC mode	Max. 200mm/s		
AT axis (drive unit)	Drive speed	Joystick mode	0 to 60mm/s		
	Measuring spe	ed	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 mm/s		
	Measuring dire	ection	Backward		
	Straightness		0.5μm/200mm		
	Measuring ran	ge	200 mm		
	Resolution		0.05 μm		
Y-axis (table)	Drive speed	CNC mode	Max. 200 mm/s		
		Joystick mode	0 to 50 mm/s		
	Maximum table	e loading	20 kg		
	Travel renge	Z2 axis (column, type S)	300mm		
	Travel range	Z2 axis (column, type H)	500mm		
70 avia (aaluma)	Resolution		0.05 <i>µ</i> m		
Z2 axis (column)	Scale type		Reflective-type linear encoder		
	Daine annual	CNC mode	Max. 200mm/s		
	Drive speed	Joystick mode	0 to 60mm/s		
Raco unit	Base size (wid	th x depth)	750x600mm		

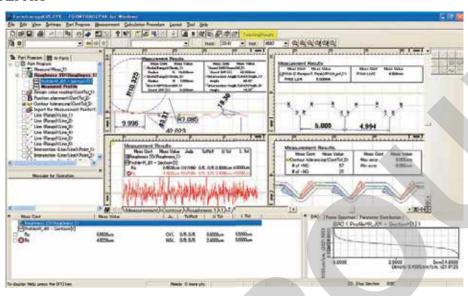
Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

Order No.			SV-M30	DOOCNC	
	Measuring ran	nge	200	)mm	
	Resolution		0.0	5 <i>μ</i> m	
	Scale type		Reflective-type	e linear encoder	
X1-axis (drive unit)	Drive speed	CNC mode	Max. 200mm/s		
AT-AXIS (UTIVE UTIL)	Drive speeu	Joystick mode	0 to 5	0mm/s	
	Measuring sp	eed	0.02, 0.05, 0.1, 0.2	2, 0.5, 1.0, 2.0mm/s	
	Straightness	When using a standard detector	0.5µm	/200mm	
	Measuring rar	nge	500	)mm	
	Resolution		0.05 $\mu$ m		
Z2 axis (column)	Scale type		Reflective-type	linear encoder	
	Drive speed	CNC mode	Max. 2	00mm/s	
	Joystick mode		0 to 50mm/s		
	Measuring rar	nge	800 mm		
	Resolution		0.05 μm		
	Scale type		Reflective-type linear encoder		
/-axis	Dubus sussed	CNC mode	Max. 20	00 mm/s	
r-axis	Drive speed	Joystick mode	0 to 5	0 mm/s	
	Measuring sp	eed	0.02 to	2 mm/s	
	Carolebanoso	When their a standard datastar halder	Narrow range	0.5 μm/50 mm	
	Straightness	When using a standard detector holder	Wide range	2μm/800 mm	
	Base size (wid	dth depth)	600x1	500mm	
Base unit	Base material		Steel		
	Maximum tab	le loading	30	0kg	



#### โปรแกรม

#### **Surface Roughness/Contour Analysis Program FORMTRACEPAK**



# Surftest

Contracer เครื่องวัดรูปทรง

Formtracer

เครื่องวัดรูปทรง

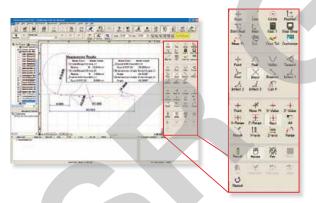
Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** Scale แผ่นเทียบผิวงาน

#### **Contour measurement**

#### Contour analysis

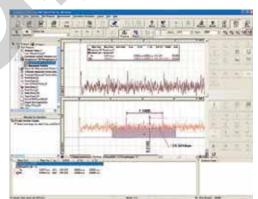
A wide variety of commands, which form the basic elements for analysis, are provided, including those for points (10 types), lines (6 types) and circles (6 types). A rich set of commands that combine these elements to calculate angles, pitches and distances as well as performing contour tolerancing and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



- Contour-tolerancing as a standard feature
- Design value generation
- **Data combination**
- Simple pitch calculation

#### **Surface roughness measurement**

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



- Micro contour analysis
- Simple input using drawing symbols
- Multiple-point measurement
   Analysis using multiple-point measurements
- Reference length dialog box
   Analysis condition modification with preview
- R-surface automatic measurement

้เครื่องวัดรูปทรง

# **Mitutoyo**

เครื่องวัดรูปทรง Contracer CV-2100 SERIES 218 — Contour Measuring Instruments





Contracer เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

Roundtest เครื่องวัดรูปทรง

Surface Roufhness Scale แผ่นเทียบผิวงาน

Z2 X-

เครื่องวัดรูปทรง

Contracer CV-3200

CV-3200S4





lodel No.		CV-2100M4	CV-2100N4			
Measuring	X axis	100	mm			
ange	Z1 axis (detector unit)	50mm				
2-axis (column	) moving range	350mm				
-axis inclinatio	n angle	±45				
ccuracy	X-axis	±(2.5+0.02L) μm L = Me	easurement Length (mm)			
20°C)	Z1-axis	$\pm$ (2.5+ 0.1H ) $\mu$ m H = Measurementt heigh	ght from horizontal position within ±25mm			

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

SERIES 218 — Contour Measuring Instruments

\* For the **CV-2100N4**, a manual column stand is required (optionally available.)



# Contour Measuring System enabling measurement that is fast, accurate, and easy. • The operation flow is significantly shortened

by arranging the controls for stylus position change, measurement start/ stop and return on the front of the drive unit.



Fine and coarse X-axis positioning can be performed easily by using the jog shuttle that covers the whole measuring range.



to swiftly and easily move the drive unit to and from the measurement height without having to push or pull (only for CV-2100M4).





. The quick-vertical-motion stand allo

Data Management Software by Mitutoyo



## Dramatically Improved High-Precision Contour Measuring Instruments.

Contour Measuring Instruments.

- CV-3200 series are contour measuring instruments equipped with a high-precision are scale and newly designed arm on the Z1-axis (detector). The high-precision arc scale can directly read the arc track of the stylus tip to achieve high accuracy and resolution. The new arm has extended the Z1-axis measuring range by 10 mm while reducing the chance of interference with workpieces compared to conventional models. The arm mount can be attached/detached with a single touch on the magnet joint for improved ease of operation.





Z1-axis measuring range has been extended by 10mm

 The 700 mm Z2-axis (column) range models are new to the lineur.

Model No.			CV-3200\$4	CV-3200H4	CV-3200W4	CV-3200L4	CV-3200\$8	CV-3200H8	CV-3200W8	CV-3200L8
Measuring X axis			100mm			200mm				
range	Z1 axis (detector)			60mm (±30mm from the horizontal)						
Z2-axis (col	Z2-axis (column) moving range			300mm 500mm 700mm		300mm	500mm		700mm	
Accuracy (2	X axis Accuracy (20°C)			$ \begin{array}{lll} \pm (0.8 + 0.01 L) \mu \text{m L} = \text{traverse length (mm)} & \pm (0.8 + 0.02 L) \mu \text{m L} = \text{traverse length (mm)} \\ \text{Wide range: } 1.8 \mu \text{m}/100 \text{mm} & \text{Wide range: } 4.8 \mu \text{m}/200 \text{mm} \\ \text{Narrow range: } 1.05 \mu \text{m}/25 \text{mm} & \text{Narrow range: } 1.3 \mu \text{m}/25 \text{mm} \\ \end{array} $					mm)	
		Z2 axis (column)		$\pm (1.4+ 2H /100)\mu m H = probing$				horizontal (mm)		

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

Surftest เครื่องวัดรูปทรง

Contracer

Formtracer เครื่องวัดรูปทรง

Roundtest

เครื่องวัดรูปทรง

Scale แผ่นเทียบผิวงาน

**Surface Roufhness** 

# **Mituto**yo

#### **MeasurLink®** ENABLED Data Management Software by Mitutoyo

## เครื่องวัดรูปทรง **Contracer CV-4500 SERIES 218 — Contour Measuring Instruments**



## **Dramatically Improved High-Precision Contour Measuring Instruments.**

· CV-4500 series are contour measuring instruments • Ov-4sou series are contour measuring instruments equipped with a high-precision are scale and newly designed arm on the Z1 axis (detector). The high-precision are scale can directly read the arc track of the stylus tip to achieve high accuracy and resolution. The new arm has extended the Z1-axis measuring range by 10 mm while reducing the chance of interferance with workinges compared to of interference with workpieces compared to conventional models. The arm mount can be attached/ detached with a single touch on the magnet joint for improved ease of operation.



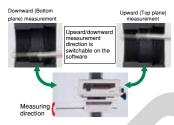


Z1-axis measuring range has been extended by 10mm.

- The following two features have been added exclusively for the CV-4500 series.

  (1) Continuous measurement in the vertical direction (up/down) is available in combination with a double-sided conical stylus. Up/down continuous measurement data facilitates the analysis of the effective diagnets of consultraces, which has he effective diameter of screw threads, which has been
- emective diameter of screw threads, which has been difficult to measure in the past.

  (2) The measuring force can be set in the FORMTRACEPAK software. Weight replacement and position adjustment are not required to adjust the measuring force.



• The 700mm Z2-axis (column) range models are new



		_	CV-	CV-	CV-	CV-	CV-	CV-	CV-	CV-	
Model No.			4500S4	4500H4	4500W4	4500L4	4500S8	4500H8	4500W8	4500L8	
Measuring	X axis		100mm 200mm								
range	Z1 axis (dete	ector)	60mm (±30mm from the horizontal)								
Z2-axis (column) moving range		g range	300mm	500	mm	700mm	300mm	500	mm	700mm	
	Scale type			Arc							
	Resolution			0.02μm							
	Stylus up/do	wn				Arc m	notion				
Z1 axis	Measuring d	irection				Forward /	backward				
(Detector)	Face of stylu	IS		Vertical di	rection (up/	down, availa	ble for cont	inuous mea	surement)		
	Measuring fo	orce		1	10, 20, 30, 4	0, 50mN (sv	vitching on t	the software	e)		
	Traceable ar	ngle	Ascent: 77 , descent: 83 (using the standard one-sided cut stylus*1 provided anddepending on the surface roughness)								
	Caala tuna	X axis			S	eparate typ	e linear scal	le			
	Scale type	Z2 axis (column)	ABS scale								
		X axis				0.05	μm				
	Resolution	Z2 axis (column)	1 μm								
Drive unit	Drive	X axis			0 to	30mm/s or n	nanual oper	ation			
	speed	Z2 axis (column)			0 to :	30mm/s or n	nanual oper	ation			
	Measuring speed	X axis		0	.02, 0.05, 0	1, 0.2, 0.5,	1.0, 2.0, 5.0	, 10, 20mm	/s		
	Straightness*2	X axis		0.8µm/	100mm			2μm/2	200mm		
	Inclination range	X axis	±45°								
Accuracy (	(20°C)	X axis	) w	'ide range: 1	traverse len 1.8µm/100m 1.05µm/25ı	m ,	) w	/ide range: 4	traverse len 4.8µm/200m : 1.3µm/25n	ım ,	
		Z2 axis (column)	$\pm (0.8+ 2H /100)\mu m$ H = probing height from the horizontal (mm)								
External di (WxDxH)	imensions	Main unit*3	756x482x 966mm	756x482x 1166mm	1156x482 x1176mm	1156x492 x1436mm	766x482 x966mm	766x482 x1166mm	1166x482 x1176mm	1156x492 x1436mm	
Mass		Main	140kg					270kg			

- \*1: SPH-71 (No. 354884)
- \*2: In X-axis horizontal position
  \*3: Base material of the main unit is Gabbro.

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

Surftest เครื่องวัดรูปทรง

Contracer

เครื่องวัดรูปทรง

Formtracer

Roundtest

เครื่องวัดรปทรง **Surface Roufhness** 

> Scale แผ่นเทียบผิวงาน

# **FORM MEASUREMENT**

เครื่องวัดรูปทรง

# **Mitutoyo**

เครื่องวัดรูปทรง

## Formtracer SV-C3200/4500

#### SERIES 525 — Surface Roughness and Contour Measuring Systems

**MeasurLink®** ENABLED Data Management Software by Mitutoyo



Contour measuring					SV-C	3200L4 (with op	tions)	
	SV-C3200S4	CV.	CV	CV.	CV	CV	CV	CV

	SV- C3200S4	SV- C3200H4	SV- C3200W4	SV- C3200L4	SV- C3200S8	SV- C3200H8	SV- C3200W8	SV- C3200L8
Model No.	SV- C4500S4	SV- C4500H4	SV- C4500W4	SV- C4500L4	SV- C4500S8	SV- C4500H8	SV- C4500W8	SV- C4500L8
Surface roughness meas	surement							
Measuring X axis (drive unit)		100	)mm			200	mm	
range Z1 axis (detector)		800μm/80μm/8μm						
Straightness	(0.05+L)	(0.05+L/1000) $\mu$ m L: traverse length (mm) (0.1+0.002L) $\mu$ m L: traverse length (mm)						th (mm)
Resolution Z1 axis (detector)	ector) 0.01 $\mu$ m (800				n (80µm), 0.	0001μm (8μ	m)	
Measuring force		0.75mN (when the Code No. of the main unit ends with "-1") / 4mN (when the Code No. of the main unit ends with "-2")						
Stylus tip shape	$60^{\circ}$ , $2\mu$ mR (when the Code No. of the main unit ends with "-1") / $90^{\circ}$ , $5\mu$ mR (when the Code No. of the main unit ends with "-2")							
Applicable standards			JIS1982/ JIS	S1994/ JIS20	01/ ISO1997	7/ ANSI/ VDA		
Parameter	Rt, Rc, Rs Wmr(C), RzDIN, Rs	Sm, RΔq, Rr Wmr, WΔc, 3y, R3z, S, H	nr (C), Rmr, I Rk, Rpk, Rvk ISC, Lo, Ir,Δa	R∆c, Wa, Wo k, Mr1, Mr2, A a,λa,λq, Vo,	q, Wsk, Wku A1, A2, Rx, A Htp, NR, NC	r, P c, Ra, R , Wp, Wv, Wz \R, R, Wx, A\ :RX, CPM, SI	z, Wt, Wc, W W, W, Wte, R R, SAR, NW,	Sm, WΔq, y, RyDIN, SW, SAW
Assessed profile	profile, Rollin	Primary profile, Roughness profile, Filtered waviness profile, Waviness profile, Rolling circle waviness profile, Folling circle waviness profile, Envelope residual profile, DF profile (DIN4776/ ISO13565-1), Roughness motif (Envelope waviness profile is displayed when evaluating the motif.)						
Analysis graph	Material ratio curve, Profile height amplitude distribution curve, Power spectrum chart, Auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, Slope distribution chart, Local peak distribution chart, Parameter distribution chart (Contour analysis function can analyze the area of abrasion amount and overlay.)					stribution		
Data compensation functions		ompensation,				sation, Parabo sation (auto or		
Filter		Gaussian fi	Iter, 2CRPC7	75, 2CRPC50	), 2CR75, 2C	R50, Robus	t spline filter	
Contour measurement								
Measuring X axis (drive unit)		100	)mm		200mm			
range Z1 axis (detector)			60mr	m (±30mm fr	om the horiz	ontal)		
Straightness		0.8µm/	/100mm			2µm/2	200mm	
X axis (drive unit)	±(0.8+0	).01L)µm L:	traverse leng	th (mm)	±(0.8+0	.02L)µm L =	traverse lenç	gth (mm)
Accuracy Z1 axis (detector)		SV-C3200 se		2H /100)µm, ng height fror		series: (0.84	⊦ 2H /100)µn	1
X axis (drive unit)				<del></del>	μm	, ,		
Resolution Z1 axis (detector)		S	V-C3200 ser		•	series: 0.02 <i>µ</i>	m	
Z2 axis (column)								
Measuring force	1 μm  SV-C3200 series: 30mN (adjustment using weights)							
	SV-C4500 series: 10, 20, 30, 40, 50mN (switching on the software)  SV-C3200 series: Vertical direction (up/down, single measurement)							
Face of stylus	SV-C4500 series: Vertical direction (up/down, single measurement) SV-C4500 series: Vertical direction (up/down, available for continuous measurement)				nent)			
Common specification								
Z2-axis (column) moving range	300mm	500	)mm	700mm	300mm	500	)mm	700mm
X axis Inclination range	±45°							
Drive X axis				80mm/s or n				
speed Z2 axis (column)			0 to	30mm/s or n	nanual opera	ation		

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

0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10, 20mm/s

- The combination of a surface roughness tester and
- The combination of a surface roughness tester and contour measuring instrument saves installation space.
   Surface roughness testing function
   Z1-axis detector provides highest resolution of 0.0001 µm (when the measuring range is 8µm) is provided as standard.
   High-accuracy glass scales, built-in on the X axis, directly read the drive unit movement. Greatly facilitates spacing parameter evaluation while achieving high-accuracy oscillations.
- high-accuracy positioning.

  Measuring force for the detector is selectable from 4mN or 0.75mN.

Contour measuring function

The 21 axis (detector) is equipped with a highprecision
arc scale and newly designed arm. The high-precision
arc scale and lirectly read the arc track of the stylus tip and scale can directly feat in early track of the sylvius up to achieve high accuracy and resolution. The new arm has extended the Z1-axis measuring range by 10 mm while reducing the chance of interference with workpleces compared to conventional models. The arm mount can be attached/detached with a single touch on the magnet joint for improved ease of





- Z1-axis measuring range has been extended by 10mm
- The following two features have been added exclusively for the SV-C-4500 series as functions dedicated to contour measuring systems.

  (1) Continuous measurement in the vertical direction
- Continuous measurement in the vertical direction (upridown) is available in combination with a doubletipped stylus. Up/down continuous measurement data facilitates the analysis of the effective diameter of screw threads, which has been difficult to measure in
- the past. (2) The measuring force can be set in the
- FORMTRACEPAK software. Weight replacement and position adjustment are not required to adjust the measuring force.

Downward (Bottom plane) measurement



• The 700mm Z2-axis (column) range models are new to the lineup.

**Mituto**//o

**MeasurLink**® ENABLED

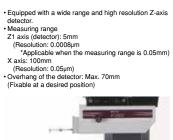
Data Management Software by Mitutoyo

# เครื่องวัดรูปทรง

# Formtracer CS-3200S4

## **SERIES 525 — Surface Roughness and Contour Measuring System**









		3	CS-3200S4
Model No.			CS-3200S4
	X axis		100mm/0.05μm
Measuring range	Z1 axis (detec	etor)	5mm/0.08μm
rango	Z2 axis (colun	nn)	0.5mm/0.008μm
Accuracy	X axis		0.05mm/0.0008μm
(20°C)	Z1 axis		300mm/1μm
Drive method	X axis		±(0.8+0.01L) μm L= measuring length(mm)
Billo motilog	Z1 axis (detec	etor)	$\pm$ (1.5+ 2H /100) µm H = probing height from the horizontal (mm)
Drive unit	Straightness	Under normal use	0.2μm/100mm
	(X axis)	When protruding to the maximum extent	0.4μm/100mm
	Measuring speed	Roughness measurement	0.02, 0.05, 0.1, 0.2mm/s (4-step)
		Contour measurement	0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0mm/s (7-step)
	Drive speed	X axis (horizontal direction)	0 to 80mm/s or manual operation
	Drive speed	Z2 axis (vertical direction)	0 to 20mm/s or manual operation
	Up/down mov	ement	300mm (motorized)
	Inclination ran	ge	±45°
Detector	Detection met	hod	Differential inductance
	easuring force		0.75mN
	Stylus	Standard stylus (for roughness/contour measurement)	Tip angle: 60° cone, Tip radius: 2μm, Diamond tip
		Cone stylus (for contourmeasurement)	Tip angle: 30° cone, Tip radius: 25µm, Sapphire
	Stylus up/dow	n e	Available (Stoppable at a mid-air position)

Note1: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon. Note2: High column and 200 mm X-axis drive-unit models are also available. Please consult your local Mitutoyo office for applicable specifications.

Surftest เครื่องวัดรูปทรง

> Contracer เครื่องวัดรูปทรง

Formtracer

Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** Scale แผ่นเทียบผิวงาน

เครื่องวัดรูปทรง

# **Mitutoyo**

เครื่องวัดรูปทรง

**MeasurLink®** ENABLED

Formtracer Extreme SV-C4500CNC/SV-C4500CNC HYBRID TYPE1 Data Management Software by Mitutoyo SERIES 525 — CNC Surface Roughness and Contour Measuring Systems



เครื่องวัดรูปทรง

Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** แผ่นเทียบผิวงาน



#### SV-C4500CNC Specifications\*

Order No.			SV-C4500CNC			
		Measuring range	200mm			
		Resolution	0.05 μm			
X1-axis		Scale type	Reflective-type linear encoder			
(Drive unit)	Contour	Straightness	2μm/200mm			
	Contour	Accuracy (20°C)	±(0.8+4L/200)µm L: Measuring length (mm)			
	Surface roughness	Straightness	0.5 μm/200mm			
		Measuring range	60mm (±30mm from the horizontal)			
		Resolution	0.02μm			
Z1 axis	Contour	Scale type	Arc			
(Detector)		Accuracy (20°C)	±(0.8+ 2H /100)µm  H: Measuring height from horizontal position (mm)			
	Surface	Measuring range	800µm/80µm/8µm			
	roughness	Resolution	0.01µm/0.001µm/0.0001µm			
Z2 axis		Drive range	Specification is selectable from 300mm or 500mm.			
(Column)		Resolution	0.05 μm			

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

#### SV-C4500CNC

- SV-C4500CNC

   High-accuracy stylus type CNC Surface Roughness
  / Contour Measuring System that allows measurement
  of surface roughness and form/ contour with one unit
  through detector replacement.
   For models with the -axis, it is possible to perform
  continuous measurement over horizontal and inclined
  surfaces by powertiliting the X1-axis. In addition,
  automatic measuring force adjustment function of
  Z1-axis detector for contour measurement enables
  automatic measurement with constant measuring force
  even with the X1-axis tilted.
   For models with the Y-axis table, it is possible to expand
  the measuring range for multiple workpieces through

- roundoes with re-taxis rate, it is possible to expand the measuring range for multiple workpieces through positioning in the Y-axis direction.

  Since the 21-axis detector incorporates an anti-collision safety device, the machine will automatically stop if the detector touches a workpiece or jig.

  Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.
- (programmable logic controller) is available.

#### SV-C4500CNC HYBRID TYPE1

- CNC Surface Roughness/Contour Measuring System equipped with a non-contact type detector as well as a contact type surface roughness contour measuring
- Equipped with the Y-axis table, it is possible to expand
- Equipped with the "Faxis table, it is possible to expand the measuring range for multiple workpieces through positioning in the Y-axis direction. Since the Z1-axis detector incorporates an anti-collision safety device, the machine will automatically stop if the detector touches a workpiece or jig. Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable lonic controller) is available.
- (programmable logic controller) is available.



# **M**itutoyo



#### SV-C4500CNC HVRRID TVDE1 Specification

Order No.			SV-C4500CNC					
		Measuring range	200mm					
		Resolution	0.05 μm					
		Scale type	Reflective-type linear encoder					
X1-axis		Straightness	2μm/200mm					
(Drive unit)	Contour	Accuracy (20°C)	±(0.8+4L/200)μm L: Measuring length (mm)					
	Surface roughness	Straightness	0.5 μm/200mm					
		Straightness	0.5 μm/200 mm					
	Non-contact type	Accuracy	±(0.8+4L/200)μm L: Measuring length (mm)					
		Measuring range	200 mm					
Y-axis	-axis Resolution		0.05 μm					
		Maximum table loading	20 kg					
		Measuring range	60mm (±30mm from the horizontal)					
		Resolution	0.02μm					
	Contour	Scale type	Arc					
		Accuracy (20°C)	±(0.8+ 2H /100)μm H: Measuring height from horizontal position (mm)					
Z1 axis (Detector)	Surface	Measuring range	800µm/80µm					
(Detector)	roughness	Resolution	0.01μm/0.001μm					
	Non-contact type	Measuring range	1.2 mm					
	detector CPS2525*1	Resolution	25 nm					
	Non-contact type	Measuring range	0.1 mm					
	detector CPS0517*1	Resolution	5 nm					
Z2 axis		Drive range	500 mm					
(Column)		Resolution	0.05 μm					

Note: While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.
\*1: Select either CPS2525 or CPS0517.



Surftest

Formtracer

Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** Scale แผ่นเทียบผิวงาน

Surftest เครื่องวัดรูปทรง

Contracer เครื่องวัดรูปทรง

Formtracer

Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** 

แผ่นเทียบผิวงาน

# **FORM MEASUREMENT**

้ เครื่องวัดรูปทรง

# **Mitutoy**o

## เครื่องวัดรูปทรง

#### **MeasurLink®** ENABLED Data Management Software by Mitutoyo

#### Formtracer Extreme CS-5000CNC/CS-H5000CNC SERIES 525 — CNC Surface Roughness and Contour Measuring Systems



Wide range detector employing active control technology



High-accuracy stylus type CNC Surface Measuring System that allows batch measurement of surface

System that allows batch measurement of surface roughness and form/contour.

• The X1- and Z2-axes have maximum drive speeds of 40 mm/s and 200 mm/s, respectively.

This permits high-speed positioning that can potentially result in a large increase in the throughput of multiple-profile / multipleworkpiece measurement tasks.

• A Mitutoyo Laser Holoscale is incorporated in the X1- and Z1-axes so that high resolution is achieved and batch measurement of form/ contour and surface roughness can be made.

roughness can be made.

The active control method is employed for the Z1-axis detector to implement a wide-range measurement capability wherein the variation in dynamic measuring force is restricted.

capability wherein the variation in dynamic measuring force is restricted.

Since the Z1-axis detector incorporates an anti-collision safety device, the machine will automatically stop if the detector touches a workpiece or jig.

For models with the -axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by powerthing the X1-axis.

(CS-500CNC only)

For models with the Vaxis table, it is possible to expand the measuring range for multiple workpieces through positioning in the Y-axis direction.

Optional external control function (Ext I/O) through bidirectional communication (RS-232C) with the PLC (programmable logic controller) is available.

CS-H5000CNC (with Y-axis table)

Model No.			CS-5000CNC	CS-H5000CNC			
	Measuring rang	е	200	mm			
	Resolution		0.00625 μm				
	Scale type		Laser Ho	oloscale			
	Drive aread	CNC mode	Max. 4	0mm/s			
(1 avia	Drive speed Joystick mode		0 to 40	0mm/s			
1 axis	Measuring spec	ed	0.02, 0.05, 0.1, 0.2mm/s (surface roughness), 0.0	2, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0mm/s (form/contour)			
	Measuring direc	etion	Forward /	backward			
	Straightness	(with standard stylus)	(0.1+0.0015L) µm L: traverse length (mm)	(0.05+0.0003L) µm L: traverse length (mm)			
011	Straighthess	(with 2X-long stylus)	(0.2+0.0015L) µm L: traverse length (mm)	(0.1+0.0015L) µm L: traverse length (mm)			
	Accuracy (20°C	)	(0.3+0.002L) µm L: traverse length (mm)	±(0.16+0.001L) μm L: traverse length (mm)			
γ-axis	Inclination range	e	-45°(CCW), +10 (CW)	_			
	Measuring	(with standard stylus)	12mm				
	range	(with 2X-long stylus)	24mm				
	Decolution	(with standard stylus)	0.0008 μm				
	Resolution	(with 2X-long stylus)	0.0016	6 μm			
	Vertical movem	ent of the stylus	Arc m	otion			
	Scale type		Transmission-typ	e linear encoder			
	Accuracy (20°C	)	±(0.3+ 0.02H ) μm H: probing height (mm)	±(0.07+ 0.02H ) µm H: probing height (mm)			
1 axis	Measuring	(with standard stylus)	4mN (Fixed)				
Detector)	force	(with 2X-long stylus)	0.75mN (Fixed)				
	Traceable angle		Ascent: 60°, Descent: 60°, (De	pends on the surface texture.)			
		Standard stylus	Tip angle: 40°, Tip radius: 5 μm, Diamond tip				
		Standard ball stylus	Tip ball radius: 0.25mm, Sapphire				
	Stylus tip shape	2X-long stylus	Tip angle: 40°, Tip radi	us: 5 µm, Diamond tip			
		2X-long stylus	_	Tip angle: 60°, Tip radius: 2 μm, Diamond tip			
		2X-long ball stylus	Tip ball radius: 0.	25mm, Sapphire			
	Face of stylus		Down	ward			
	Travel range	Z2 axis (column, type S)	300	mm			
	Travel range	Z2 axis (column, type H)	500mm	<del>-</del>			
	Resolution		0.05	μm			
2 axis	Scale type		Reflective-type linear encod				
Column)	Drive speed	CNC mode	Max. 200mm/s				
	Drive speed	Joystick mode	0 to 50mm/s				
	Base size (widtl	n x depth)	750 x 600mm				
	Base material		Gabbro				

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

Surftest เครื่องวัดรูปทรง

Contracer

เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

Roundtest

## เครื่องวัดรูปทรง **Roundtest RA-10** SERIES 211 — Roundness Measuring Instrument

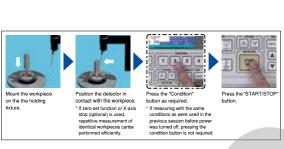




# It is a cost-effective compact machine that enables full-scale roundness evaluation. Offers easy operation for anyone.

- A large, simple key arrangement is used.
- User-friendly operation.

  Measurement results and recorded profiles are easy weasurement results and recorded profiles are easy to view with the large LCD, and can then be printed by the built-in thermal line printer. Furthermore, optional functions to improve usability can be offered.





A-10	
	Surface Roufhness
	Scale
	แผ่นเทียบผิวงาน

Order No.			RA-10
	Rotational accuracy	Radial direction	(0.04+6H/10000)µm H: Probing height (mm)
Turntable		Axial direction	(0.04+6X/10000)µm X: distance from the center of rotation (mm)
Turritable	Maximum probing diame		ø100mm
Maximum loading mass			10kg
Vertical movement	Vertical travel		117mm
X axis	Travel range		75mm (-25mm to 50mm from the rotation center)
Detector*1	Measuring range		±1000μm

<sup>\*</sup> Only the standard length stylus is applicable to this detector. The long type cannot be used.

#### เครื่องวัดรูปทรง Roundtest RA-120/120P **SERIES 211 — Roundness Measuring Instruments**

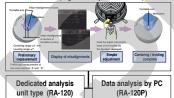
**MeasurLink**® ENABLED Data Management Software by Mitutoyo



# Easy operation, compact and outstanding cost/performance ratio, designed for use on the shop-floor right beside the production line. - D.A.T. (Digimatic Adjustment Table) function aids adjustments such as centering and leveling, and exhatoricity reduces the time outside for exclisionary.

substantially reduces the time required for preliminary setup operations

What is the D.A.T. (Digimatic Adjustment Table) function?



Compact, lightweight design from incorporating electronic components inside the main unit.

unit type (RA-120)

 BOUNDPAK, a data analysis program employs Windows OS and archived higher level of analysis.





Order No.			RA-120 RA-120P						
	Rotational accuracy	Radial direction	(0.04+6H/10000)µm	H: Probing height (mm)					
	(JIS B 7451-1997)	Axial direction	(0.04+6X/10000)μm X: distar	nce from the center of rotation (mm)					
Turntable	Maximum probing diameter*1		ø280mm (ø380mm: for the vertical position when detector holder is installed reversely, the maximum probing height is up to 50mm from the table top.)						
	Maximum loading mass		25kg						
Vertical movement	Vertical travel		280mm from	the table top					
X axis	Travel range		165mm (–25mm to 140mm from the rotation center)						
Detector*2	Measuring range		±10	00μm					

<sup>\*1:</sup> Auxiliary stage for a low-height workpiece (optional) is required for the measurement 20 mm or less in the radial direction from the center point of the table and 20 mm or less from the table top.
\*2: Only the standard length stylus is applicable to this detector. The long type cannot be used.

้เครื่องวัดรูปทรง

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เครื่องวัดรูปทรง





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Roundtest

**Surface Roufhness** แผ่นเทียบผิวงาน Roundtest RA-1600 SERIES 211 — Roundness/Cylindricity Measuring System

211-723 RA-1600

- Compact body and a wide measuring range assures precision that compares well with that of higher-grade models.
   D.A.T. (Digital Adjustment Table) function aids

- L.A.I. (Ugital Adjustment Table) function aids manual workpiece centering and leveling.
   Safety mechanism provided in the detection section as a standard feature.
   A sliding mechanism (optional sliding detector holder) can be installed in the detector holder. It enables one-touch measurement of a workpiece.





Order No.			RA-1600						
	Rotational accuracy	Radial direction	(0.02+6H/10000)µm H: Probing height (mm)						
Turntable	(JIS B 7451-1997)	Axial direction	(0.02+6X/10000)µm X: Distance from the center of rotation (mm)						
Turritable	Maximum loading ma	ss	25kg						
	Maximum probing dia	meter	ø280mm						
Vertical movement (Z-axis column unit)	Vertical travel		300mm						
X-axis	Travel range		165mm (–25mm to +140mm from the rotation center)						
Detector	Detection range	Standard	±400µm/±40µm/±4µm						
Detector	Detection range	Tracking	±5mm						

## เครื่องวัดรูปทรง

#### **Roundtest RA-2200**

#### SERIES 211 — Roundness/Cylindricity Measuring System



## **MeasurLink®** ENABLED

Data Management Software by Mitutoyo

# Pursued world's highest level accuracy. A high-performance automatic model equipped with a high-speed automatic centering/leveling function. - High-speed automatic centering/leveling function contributed to a significant reduction in the man-hours required for setups. - It is a full-automatic model which performs all the processing automatically from port program calling.

- processing automatically from part program calling, centering/leveling, measurement, calculation, to
- centering/leveling, measurement, calculation, to printing.

   Capable of continuous inside/outside diameter measurement without changing the detector orientation. (I.D. up to 650 mm)

   The automatic positioning function of the turntable enables automatic measurement in combination with table vication and slider/column programent.
- enables automatic measurement in combination with table rotation and slider/column movement.

   Advanced graphical analysis such as power spectrum chart is available.

   A sliding metchanism is incorporated in the detector holder part.

Order No.			RA-2200AS	RA-2200DS	RA-2200AH	RA-2200DH						
	Rotational accuracy	Radial direction	(0.02+3.5H/10000)μm H: Probing height (mm)									
Turntable	(JIS B 7451-1997)	Axial direction	(0.02+3.5X/10000)µm X: distance from the center of rotation (mm)									
Turritable	Maximum loading mass			3	0kg							
	Maximum probing diameter	er	ø 300mm									
Vertical movement (Z-axis column unit)	Maximum probing height		300 mm 500 mm									
X-axis	Travel range			175mm (-25mm to +150r	nm from the rotation center)							
Detector	Detection range	Standard	±400μm/±40μm/±4μm									
Detector	Detection range	Tracking	5mm									

<sup>\*1:</sup> Auxiliary stage for a low-height workpiece is required for the measurement 20 mm or less from the table top.

# เครื่องวัดรูปทรง Roundtest RA-H5200



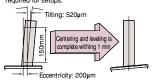
**MeasurLink®** ENABLED

Data Management Software by Mitutoyo

**Mituto**yo



# A high-performance automatic model equipped with a high-speed automatic centering/leveling function achieves the world's highest-level of accuracy. - High-speed automatic centering/leveling function contributes to a signific cant reduction in the man-hours required for setups.



- It is a full-automatic model which performs processing automatically from part program calling, centering/ leveling, measurement, calculation, all the way through to printing.
- Capable of continuous inside/outside diameter measurement without changing the detector position.
- measurement winout changing me detector position. (up to ID a50 mm)

  \*The automatic positioning function of the turntable enables automatic measurement in combination with table rotation and slider / column movement.

  \*Advanced graphical analysis such as a power position with table to state the such as a power position with table to such the such as a power position with table to such the such as a power position.
- spectrum chart is available.
   A sliding mechanism is incorporated in the detector



Order No.				RA-H5200AS		RA-H5200AH				
	Rotational accuracy	Radial direction		(0.02+3.5H/10	000)µm	H: Probing height (mm)				
Turntable	(JIS B 7451-1997)	Axial direction	(0.02	(0.02+3.5X/10000)µm X: distance from the center of rotation						
Turritable	Maximum loading			80kg (	On auto	-centering: 65kg)				
	Maximum probing dia	meter	ø400mm							
Vertical movement (Z-axis column unit)	Maximum probing hei	ght	350mm 550mm							
X-axis	Travel range			225mm (-25mm to +200mm from the rotation center)						
Detector	Detection range	Standard	±400μm/±40μm/±4μm							
Detector	Detection range	Tracking		imm						

## เครื่องวัดรปทรง

#### **Roundtest Extreme RA-2200 CNC** SERIES 211 — CNC Roundness/Cylindricity Measuring System

Highly accurate and easy-to-use turntable. The turntable with automatic centering and leveling function is equipped as standard, which frees operators from manual centering and leveling

operators from manual centering and leveling operations.

• A function to change the detector posture enables CNC automatic measurement. Automatic control of holder arm posture (vertical/horizontal) and the rotation feature of the detector (rotates in 1° increments in the range of 0 to 270°) enables continuous measurement of various feature combinations, such as OD/ID and/or top/bottom plane measurements.

 A positioning sensor to achieve CNC highaccuracy automatic measurement.

A Mitutoyo linear scale is used in the X-axis drive unit to directly detect the position of the drive unit. It guarantees the highly precise positioning vital for

automatic measurement.

• A roughness detector is supported.









Order No.			RA-2200 CNC							
Z-axis column unit	,		Standard column specification (Vertical travel: 300mm)	High column specification (Vertical travel: 500mm)						
	Rotational accuracy	Radial direction	(0.02+3.5H/10	000)μm H: Probing height (mm)						
Turntable	(JIS B 7451-1997)	Axial direction	(0.02+3.5X/10000)μm	X: distance from the center of rotation (mm)						
Turritable	Maximum loading mass		30kg							
	Maximum probing diamete	r	ø 256mm							
Vertical movement (Z-axis column unit)	Travel range		300mm	500mm						
X-axis	Travel range		175mm (–25mm to +150mm from the rotation center)							
Detector	Detection range	Standard	±400μm/±40μm/±4μm							
Detector	Detection range Tracking		±5mm							

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> Contracer เครื่องวัดรูปทรง

Formtracer

Roundtest

เครื่องวัดรูปทรง **Surface Roufhness** 

แผ่นเทียบผิวงาน

เครื่องวัดรูปทรง

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## เครื่องวัดรูปทรง

#### **Roundtest Extreme RA-H5200 CNC** SERIES 211 — CNC Roundness/Cylindricity Measuring System





Surftest

เครื่องวัดรูปทรง

Contracer

เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

Roundtest

เครื่องวัดรูปทรง **Surface Roufhness** 

Scale แผ่นเทียบผิวงาน



- Top productivity and performance from a CNC machine with highestlevel accuracy.

   The turntable with automatic centening and leveling function is equipped as standard, which frees operators from manual centering and leveling operations.

   Automatic control of holder arm posture (vertical/horizontal) and the rotation feature of the detector (rotates in 1° increments in the range of 0 to 270°) enables continuous measurement of various feature combinations, such as OD/ID and/or top/bottom plane measurements.

   A Mitutoyo linear scale is used in the X-axis drive unit to directly detect the position of the drive unit. It guarantees the highly precise positioning vital for automatic measurement.

   A roughness detector is supported.

Order No.			RA-H5200 CNC							
Z-axis column unit			Standard column specification (Vertical travel: 350mm)							
	Rotational accuracy	Radial direction	(0.02+3.5H/10000)μm F	H: Probing height (mm)						
Turntable	(JIS B 7451-1997) (JIS B 7451-1997)	Axial direction	(0.02+3.5X/10000)μm X: distance from the center of rotation (mm)							
	Maximum loading mass		80kg (On auto-centering: 65kg)							
	Maximum probing diameter		ø356mm							
Vertical movement (Z-axis column unit)	Travel range		350mm	550mm						
X-axis	Travel range		225mm (-25mm to +200mm	from the rotation center)						
Detector	Detection range	Standard	±400µm/±40µm/±4µm							
Detector	Detection range	Tracking	±5m	m						

## เครื่องวัดรูปทรง

#### **Roundtest Extreme RA-6000 CNC** SERIES 211 — CNC Roundness/Cylindricity Measuring System





Data Management Software by Mitutoyo

## The best accuracy achieved in the class of

- The best accuracy achieved in the class of large cylindricity measuring machine.

  Loading capacity is 350 kg, and the highest rotational accuracy in the class is achieved. Besides roundness and cylindricity, the flatness can be measured in high accuracy. The workpiece that requires high accuracy measurement such as large and heavy cylindrical parts can be measurement. parts can be measurement.

  For the ID measurement of a deep hole, such as a
- main shaft of machine tool, a deep hole measuring unit (specially made, without CNC functions) is available.
- available.

  Mitutoyo linear scale is used in the X-axis drive unit to directly detect the traveling amount of the drive unit. It guarantees high precision positioning vital for automatic measurement.

Order No.			RA-H5200 CNC					
	Rotational accuracy*1*2	Radial direction	(0.05+6H/10000)μm H: Probing height (mm)					
Turntable	(JIS B 7451-1997)	Axial direction	(0.05+6X/10000)μm X: distance from the center of rotation (mm)					
Turritable	Maximum loading mass		350kg					
	Maximum probing diameter		ø880mm					
Vertical movement (Z-axis column unit)	Travel range	1050mm						
X-axis	Travel range		465 mm					
Detector	Detection range	Standard	±400μm/±40μm/±4μm					
Detector	Detection range	Tracking	±5mm					

<sup>\*1:</sup> The temperature at which the accuracy can be guaranteed is 20 °C.
\*2: The rotational accuracy has been obtained when load is applied to the rotation center.

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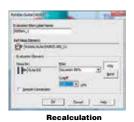
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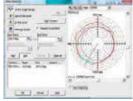
#### **ROUNDPAK**

#### Roundness/Cylindricity measurement/Analysis software

#### Simple operations even with a full set of parameters and analysis functions

· A wide variety of parameters includingthose for ನ್ಯಾಗಳಿಕೆ ಪ್ರಭಾಗಳಿಗಳ ಪ್ರಭಾಕ್ರಾಬರ roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. You can visually select these parameters using icons. ROUNDPAK also comes with specialized functions, such as the design value bestfit analysis function, the harmonic analysis function, and a function for recording the peak or trough points on a circumference. Data that has already been collected can be easily used for re-calculation,



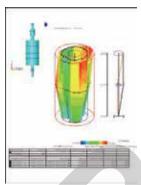


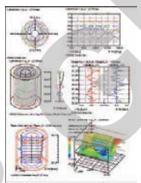
Data deletion

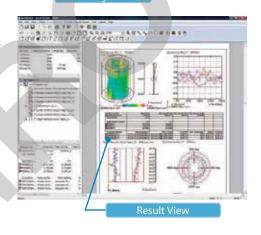


# Freedom in laying out the graphics and data **obtained from measurements**The customer can create reports in custom formats by specifying how the analysis

results will be displayed, as well as the sizes and positions of graphics. The analysis result window can be directly utilized as a layout window. Since the measurement procedure, including the layout information, is saved, the entire process, from measurement start, calculation, result saving, and finally to printing, can be automatically executed.





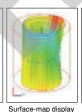


A wide variety of graphics functions

Analysis results such as cylindricity and coaxiality can be visually expressed in 3D graphics.









Shading display

#### Off-line measurement procedure programming function



Patent registered in Japan, USA Patent pending in Europe

An offline teaching function is provided to create a part program (measurement procedure) without an actual measurement target, enabling the user to virtually execute the measurement operation in a 3D simulation window.

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Roundtest เครื่องวัดรูปทรง

**Surface Roufhness** Scale แผ่นเทียบผิวงาน

# FORM MEASUREMENT เครื่องวัดรูปทรง

เครื่องวัดรูปทรง ROUNDTEST

**Mitutoyo** 

Surftest เครื่องวัดรูปทรง

Contracer เครื่องวัดรูปทรง

Formtracer เครื่องวัดรูปทรง

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**Surface Roufhness** Scale แผ่นเทียบผิวงาน

Model		Model	RA-2200/H5200 RA-2200CNC/	RA-1600	RA-120P	RA-120	RA-10
Analysis	type		H5200CNC/6000CNC				
Roundness		0	•	•	•	•	•
Cylindricity		<i>[</i> /	•	•	-	-	
Concentrici	ty	0	•	•	•	•	•
Coaxiality	Axis element Axis	•	•	•	•	•	•
Flatness			•	•	•		-
Parallelism		11	•	•	•	•	•
Perpendicu	larity	上	•	•	•	•	-
Radial devi	ation	$\Box$	•	•	•	•	-
Thickness of	deviation	0	•	•	-		-
Radial runo	ut	1	•	•	•	•	
Total runout	t	44	•	•	•	•	•
Diameter m	easurement	Φ	•	•	•	-	-
Straightnes	S	_	•	•	-	-	-
Inclination		L	•	•	-	-	-
Taper		/\	•	•	-	-	-
Diameter co tolerancing	ontour	Ф	•	•	-	-	-
Rectilinear tolerancing	contour	D	•	•	-	-	-
Width meas (only CNC)	surement		(only CNC)	-	-	-	-
Power spec	etrum	Шщ	•	•	-	-	-
Harmonic a	nalysis	<b>(</b>	•	•	•	-	-
Profile oper	ation	+	•	•	•	-	-
Tapered sur	rface analysis	8	•	•	-	-	-

SURFACE ROUGNBESS SCALE

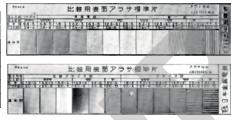
# NIPPON KINZOKU DENCHU

แผ่นเทียบผิวงาน

#### **SURFACE ROUGHNESS SCALE - A) Plane Surface**

#### Specification of surface roughness scale

SYMBOL	∇	$\nabla \nabla \nabla \nabla$						$\nabla \nabla$			∇		
STIVIBOL	Method S	0.2	0.4	0.8	1.6	3.2	6.3	12.5	18	25	35	50	100
	Paper (p)			0									
(A)	Ground			0	0	0	0	0		0			
Plane	Shaped							0		0		0	0
Surface	End Milled				0	0	0	0		0		0	
	Milled				0	0	0	0		0		0	



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**Surface Roufhness** 

เครื่องวัดรูปทรง

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#### SURFACE ROUGHNESS SCALE - B) Tubular outer surface

#### Specification of surface roughness scale

SYMBOL	∇	∇	$\nabla \nabla$	∇		$\nabla \nabla \nabla$	′		$\nabla$			∇	
STWIDOL	Method S	0.2	0.4	0.8	1.6	3.2	6.3	12.5	18	25	35	50	100
(B) Tubular outer	Ground			0	0	0							
Surface	Round Ground				0	0	0	0	0	0	0	0	0



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#### SURFACE ROUGHNESS SCALE - D) Precision Casting

#### Specification of surface roughness scale

SYMBOL	S	6.3	12.5	25	35	50	70	100	280	400
(D) Precision Casting		0	0	0	0	0	0	0	0	0

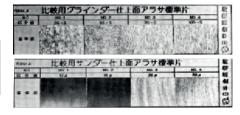


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#### SURFACE ROUGHNESS SCALE - E) Steel Plate Finished

#### Specification of surface roughness scale

	Grinding	25-S	35-S	70-S	100-S
(E) Steel Plate	Face	0	0	0	0
Finished	Sander	12µ	16µ	26μ	36µ
	Face	0	0	0	0



แผ่นเทียบผิวงาน

## SURFACE ROUGHNESS SCALE - F) For Traning Center

#### Specification of surface roughness scale

SYMBOL	∇	∇	<b>7 V V</b>	∇		$\nabla \nabla \nabla$	,		$\nabla$			∇	
STMBOL	Method S	0.2	0.4	0.8	1.6	3.2	6.3	12.5	18	25	35	50	100
	Paper (p)				0	0	0						
(F)	Ground			0	0	0							
For Traning Center	Shaped						0			0		0	
	File					0	0	0					

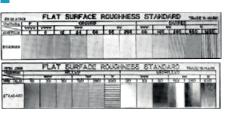


**Surface Roufhness** 

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แผ่นเทียบผิวงาน

#### SURFACE ROUGHNESS SCALE - G) USAS Plane Surface Rrms



#### Specification of surface roughness scale

	Р	5							
(G)	Ground	6	12	24	58	95	265		
USAS Plane Surface	Shaped				68	130	260	560	1200
Rrms	End Milled		20	35	80	135	260	540	
	Milled		16	35	65	130	260	530	

แผ่นเทียบผิวงาน

## SURFACE ROUGHNESS SCALE - H) USAS Tubular Outer Surface Rrms



#### Specification of surface roughness scale

(H) USAS Tubular	Ground	5	12	24								]
Outer surface Rrms	Turned		17	34	70	130	190	260	380	530	990	

แผ่นเทียบผิวงาน

#### SURFACE ROUGHNESS SCALE - I) For Gas Cutter Surface A, B



#### Specification of surface roughness scale

(I) For Gas Cutter Surface A	0.10 mm	0.12 mm	0.16 mm	0.25mm	0.60 mm	1
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#### Specification of surface roughness scale

(I) For Gas Cutter Surface	В	0.04 mm	0.05 mm	0.10 mm	0.12 mm	0.18 mm
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แผ่นเทียบผิวงาน

#### SURFACE ROUGHNESS SCALE - J) Gas welded surface



#### Specification of surface roughness scale

		Flati	ness			Molting	
	15mm ≤ Th	ick ≤ 25mm	Thick >	25 mm		Melting	
(J) Gas Welded	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	Class 3
Surface		Rounghness				Slug	
	Class 1 50-S	Class 2 100-S	Class 3 200-S	Class 1	Class 2	Class 3	Class 4
	0	0	0	0	0	0	0

แผ่นเทียบผิวงาน

#### **SURFACE ROUGHNESS SCALE - K) Hand Finished**



#### Specification of surface roughness scale

SYMBOL	∇	∇	<b>7</b> ∇ ∇	∇	,	$\nabla \nabla \nabla$	′		$\nabla$			∇	
STWIBOL	Method S		0.4	0.8	1.6	3.2	6.3	12.5	18	25	35	50	100
(K) Hand	Paper (P)		0	0	0	0	0						
Finished	File					0	0	0	0	0			

แผ่นเทียบผิวงาน

#### SURFACE ROUGHNESS SCALE - L) Lapping Finished



#### Specification of surface roughness scale

SYMBOL	∇	7 V V	∇
STWIDOL	0.2	0.4	0.8
(L) Lapping Finished	0	0	0