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Surftest



Formtracer



Contracer



Roundtest

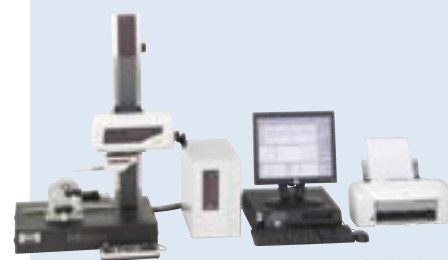
New Products



SV-M3000CNC



RA-H5100CNC



SV-3100



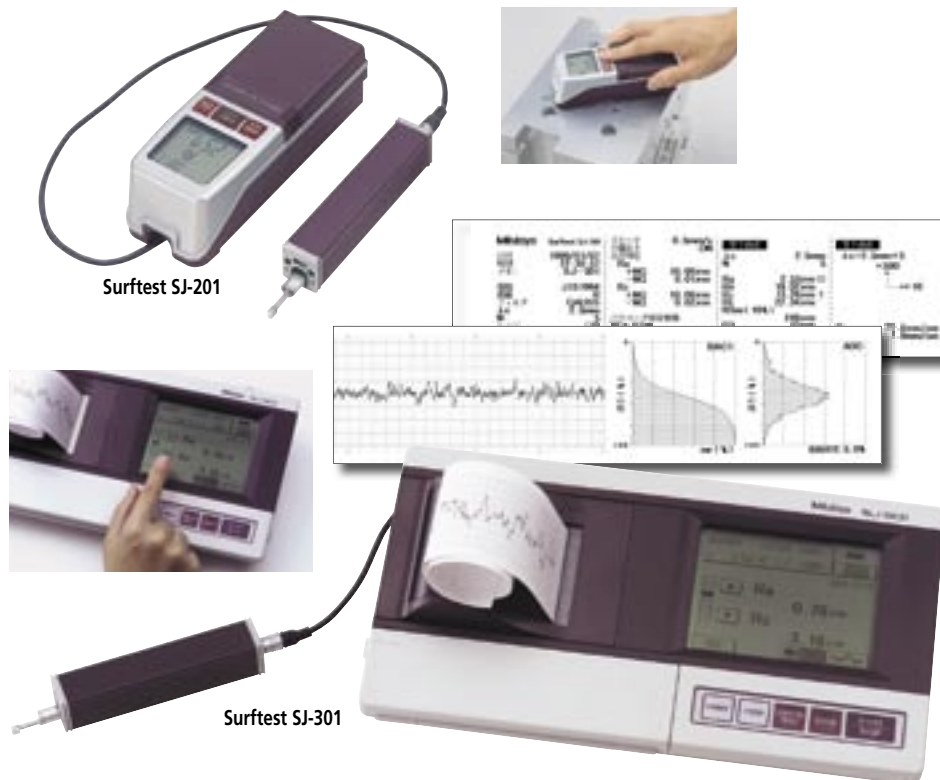
CV-3100



CS-3100

Surftest SJ-301 / SJ-201

SERIES 178 — Portable Surface Roughness Tester

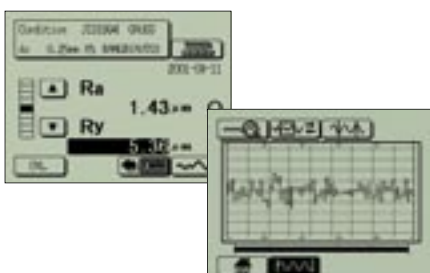


Surftest SJ-201

Surftest SJ-301

FEATURES: SJ-301

- Large characters are displayed on the large easy-to-view LCD.
- Simple operations performed with the large LCD touch-panel
- The Measure-Start button and others frequently used are hard wearing and resistant to workshop contaminants
- Equipped with a large capacity battery that, when fully charged, allows approximately 600 measurements to be made.
- A convenient carrying case is supplied as standard for protecting the instrument in the field.
- A high-resolution, high-speed printer is built in the main unit.
- Five sets of measurement set-ups can be saved in the measurement unit and the optional memory card (compact flash memory) allows saving of set-ups and measurements.
- Measurement data also can be saved in the memory card in CSV format and then loaded onto a personal computer for data handling with spreadsheet software.



FEATURES: SJ-201

- The display unit demonstrates IP53 protection level and is proof against dripping water and dust.
- The built-in battery, if fully charged, allows approximately 500 measurements to be taken even on a site with no access to mains power.
- A convenient carrying case is supplied as standard for protecting the instrument in the field.
- Up to 10 measurement results can be saved in the built-in memory.
- Measurement results appear in large characters on the large LCD screen. Results can be confirmed at a glance.
- Detailed set-ups, such as change of standards and cutoff lengths, can be made by pressing the relevant buttons after sliding back the top cover.
- The SPC connector for Digimatic output and the RS-232C output connector are provided on the rear panel of the display unit for data output to external devices.
- Printout of recorded profiles is also possible if the tester is connected to the dedicated hand-held, built-in battery operated compact SJ-printer (optional).



Technical Data

X-axis (drive unit)	
Measuring range:	12.5mm
Measuring speed:	0.25, 0.5mm/s (0.25mm/s: S-type)
Traversing direction:	Backward
Detector	
Range:	350µm (-200µm to +150µm)
Detecting method:	Skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5µmR (60°/2µmR: low force type)
Skid radius of curvature:	40mm
Skid force:	less than 400mN
Detecting method:	Differential inductance
Power supply:	Via AC adapter / rechargeable battery
Battery life:	Max. 600 measurements (w/o printing) Recharge time: 15 hours
Data output:	Via RS-232C interface / SPC output
Dimensions (WxDxH)	
Control unit:	307 x 165 x 94mm (SJ-301) 156.5 x 62 x 52mm (SJ-201)
Drive unit:	115 x 23 x 26mm
Mass	
Control unit:	Approx. 1.2kg (SJ-301) Approx. 0.3kg (SJ-201)
Drive unit:	0.2kg

Evaluation Capability: SJ-301

Applicable standard:	
JIS'82, JIS'94, JIS'01, DIN, ISO, ANSI	
Assessed profile:	
Primary profile (P), Roughness profile (R), DIN4776, MOTIF (R, W)	
Evaluation parameters:	
Ra, Ry, Rz, Rt, Rp, Rq, Rv, Sm, S, Pc, R3z, mr (c), Rpk, Rvk, δc, Rk, Mr1, Mr2, Lo, Ppi, R, AR, Rx, A1, A2, Vo, HSC, mr, SK, Ku, Δa, Δq, Wte, Wx, W, AW (can be customized)	
Analysis graphs:	
Bearing Area Curve (BAC1/ 2), Amplitude Distribution Curve (ADC)	
Digital filter	2CR, PC75, Gaussian
Cut-off length	λc: 0.08, 0.25, 0.8, 2.5, 8mm λs: 2.5, 8, 25mm
Number of sampling length:	X1, X3, X5, XL
Arbitrary length:	0.3 to 12.5mm, 0.1mm increments
Sampling length (L):	0.08, 0.25, 0.8, 2.5, 8mm
Printer	Thermal printer
Printing width	48mm (paper width: 58mm)
Recording magnification	
Vertical magnification: 10X to 100,000X, Auto	
Horizontal magnification: 1X to 1,000X, Auto	

Function

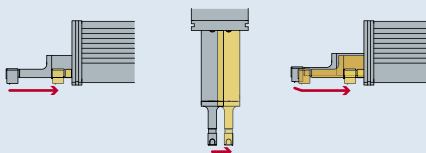
- Customization: Desired parameters can be selected for calculation and display.
- Statistical processing: Maximum value, minimum value, mean value, standard deviation, pass rate, frequency distribution chart of each parameter
- GO/NG judgment:
 - Upper/lower limits setting: 3 parameters
 - GO/NG judgment rule: mean value, 16% rule, maximum value rule
- Measurement conditions saving: Maximum 5 sets
- Data saving: Save/retrieval of measurement conditions (up to 20 sets), evaluation data, sampling data, and statistical data with a memory card (optional).
- Calibration: Auto-calibration with the entry of numerical value.
- Power saving function: If the auto-power-off function ON: Power turns off if not operated for 5 minutes

Detector + Drive unit + Display unit Combination

Detector: 0.75mN measuring force, 2 μ m stylus tip radius
4mN measuring force, 5 μ m stylus tip radius

Drive unit:

Standard-type Transverse tracing-type Retractable-type



Display unit:



Evaluation Capability: SJ-201

Applicable standard:

JIS'82, JIS'94, JIS'01, DIN, ISO, ANSI

Assessed profile:

Primary profile (P), Roughness profile (R), DIN4776

(Primary profile (P), Roughness profile (R), MOTIF (R):

M-type)

Evaluation parameters:

Ra, Ry, Rz, Rq, S, Sm, Pc, R3z, mr (c), Rt, Rp, Rk, Rpk, Rvk,

Mr1, Mr2, A1, A2, Vo (can be customized) (R, AR, Rx: M-type)

Digital filter

2CR, PC75, Gaussian

Cut-off length

λ_c : 0.25, 0.8, 2.5mm

λ_s : 2.5, 8mm

Number of sampling length: X1, X3, X5

Arbitrary length: 0.3 to 12.5mm, 0.1mm increments

Sampling length (L): 0.25, 0.8, 2.5mm

Function

Customization: Desired parameters can be selected for calculation and display.

GO/NG judgment:

Upper / lower limit setting: 2 parameters

Measurement conditions saving: Saves the conditions at the power OFF

Data saving: A maximum of 10 measurement results can be saved.

Calibration: Auto-calibration with the entry of numerical value

Power saving function: If the auto-power-off function is ON then power turns off if no operation for 30 seconds.



Refer to the Surftest SJ-400 leaflet (E4185) for more details.

SPECIFICATIONS

Model No.	SJ-201P		SJ-201R		SJ-201S		SJ-201M	
Order No. (mm)	178-920-2*	178-930-2*	178-985*	178-995*	178-889-2*	178-899-2*	178-920-2F*	178-930-2F*
Order No. (inch)	178-923-2*	178-933-2*	178-986*	178-996*	178-912-2*	178-913-2*	—	—
Drive unit	Standard type		Retractable type		Transverse tracing type		Standard type	
Detector	4mN type	0.75mN type	4mN type	0.75mN type	4mN type	0.75mN type	4mN type	0.75mN type

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **178-952-3A**):

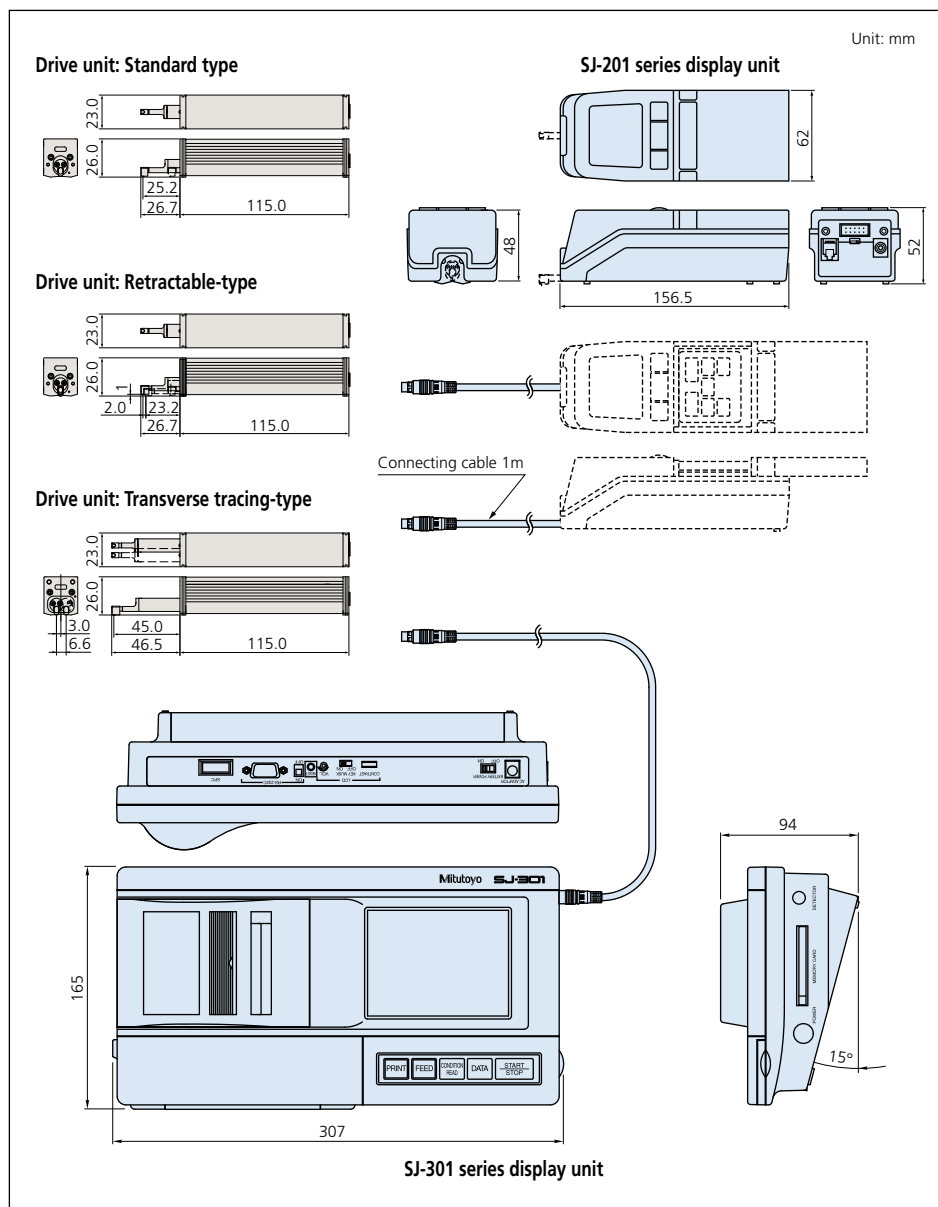
A for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Model No.	SJ-301		SJ-301R		SJ-301S	
Order No. (mm)	178-953-3*	178-952-3*	178-980*	178-990*	178-929-2*	178-939-2*
Order No. (inch)	178-954-3*	178-955-3*	178-987*	178-997*	178-901-2*	178-902-2*
Drive unit	Standard type		Retractable type		Transverse tracing type	
Detector	4mN type	0.75mN type	4mN type	0.75mN type	4mN type	0.75mN type

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **178-952-3A**):

A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Surftest SJ-301 / SJ-201

SERIES 178 — Optional Accessories

Drive unit, Display unit

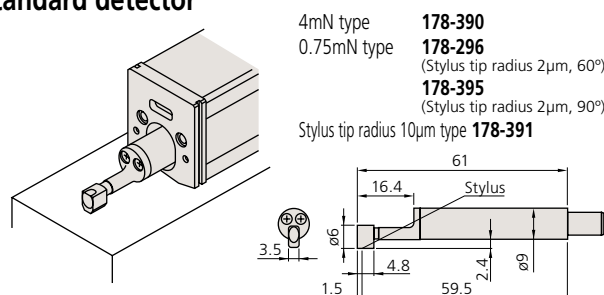
Drive unit	Display unit	Model No.
Standard drive unit Order No. 178-230-2	—	SJ-201M
Transverse tracing Order No. 178-233-2	Standard display unit Order No. 178-243-2* (mm), 178-248-2* (inch)	SJ-201P
Detector retracting type Order No. 178-235	Dedicated display unit for the detector retracting type Order No. 178-250* (mm), 178-251* (inch)	SJ-201R

Drive unit	Display unit	Model No.
Standard drive unit Order No. 178-230-2	Order No. 178-241-3*	SJ-301
Transverse tracing Order No. 178-233-2		SJ-301S
Detector retracting type Order No. 178-235		SJ-301R

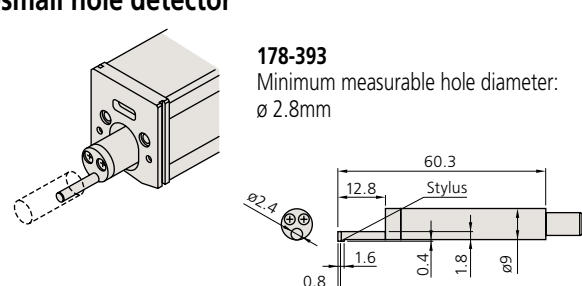
*To denote your AC line voltage add the following suffixes (e.g. **178-243-2A**). **A** for 120V, **C** for 110V (for Taiwan), **D** for 220V, **E** for 240V, **K** for 220V (for Korea), **DC** for 220V (for China)

Detector

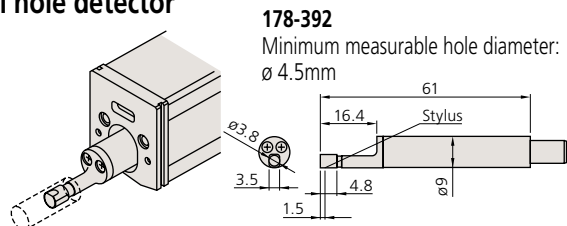
Standard detector



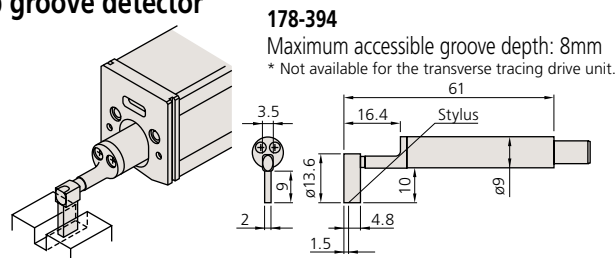
Extra-small hole detector



Small hole detector



Deep groove detector



SJ-Printer for SJ-201

Printout of recorded profiles is also possible if the tester is connected to the dedicated hand-held, built-in battery operated compact SJ-printer (optional).

- Can be operated with two-way power supply (AC adapter/battery pack)
- Printing items: Measurement conditions, calculation results, surface profiles, bearing area curve (BAC)
- Supplied with connection cable and 20 rolls of printer paper



178-420*

*To denote your AC line voltage add the following suffixes (e.g. **178-420A**). -A for 120V, D for 220V, E for 240V

Printer paper (20 rolls): **12AAC243**

DP-1VR

Powerful data management capabilities make it possible to process the Digimatic data output from the Surftest SJ series for measurement data printout, various statistical analyses for plotting a histogram and D-chart, and calculation of X-R control charts. Also, it is equipped with the RS-232C GO/NG judgment output for connection to a personal computer.



264-504*

*To denote your AC line voltage add the following suffixes (e.g. **264-504-5A**). -5A for 120V, -5D for 220V (for Europe), -5E for 240V (for UK), -1K for Korea without AC adapter, -5F for 240V (for Oceania)

Connecting cable: **936937** (1m)

Connecting cable: **965014** (2m)



Evaluation Capability: SURFPAK-SJ

Industrial standards met: ISO 4287:1997, ANSI / ASME B46.1-1995, JIS B0601 1994, etc.

Assessed profiles: P (primary profile), R (roughness profile), WC, WCA, WE WEA DIN4776 profile, E (envelope residual profile), R - motif (roughness/waviness motif)

Evaluation parameters: Ra, Rq, Rz, Rz (JIS), Ry, Ry (DIN), Rc, Rpi, Rp, Rpm, Rv, Rvmax, Rti, Rt, R3zi, R3z, R3y, S, Pc (Ppi), Sm, HSC, mr, δc , plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2, Δa , Δq , λa , λq , Sk, Ku, Lo, Lr, A1, A2, Rx, RAR, SR, SAR, NR, NCRX, CPM, Wte, Wx, W, AW, SW, SAW, NW

Analysis graphs: ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart

Digital filter: 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian -50% (phase corrected)

Cutoff length:

λc : 0.025, 0.08, 0.25, 0.8, 2.5, 8, 25mm or arbitrary value

f_l : 0.25, 0.8, 2.5, 8mm or arbitrary value

f_h : 0.25, 0.8, 2.5, 8mm or arbitrary value

Sampling length (L):

0.025, 0.08, 0.25, 0.8, 2.5, 8, 25mm or arbitrary value

Data compensation: Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, Conic automatic compensation, polynomial compensation, polynomial automatic compensation

Data deletion function

- Data deletion to avoid an over-range error
- Data deletion in a specific range to perform recalculation
- Automatic data deletion

Recording magnifications

Vertical: 100X - 500,000X, Horizontal: 1X - 10,000X

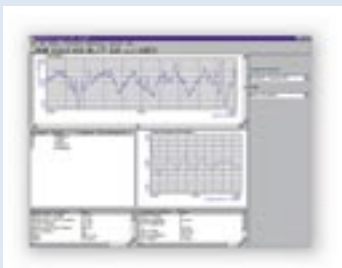
Special functions for report generation

- Bit-map image paste-up function
- Multiple data layout function

An RS-232C cable is required.

12AAA208: RS-232C cable for SJ-201 series

12AAA882: RS-232C cable for SJ-301 series

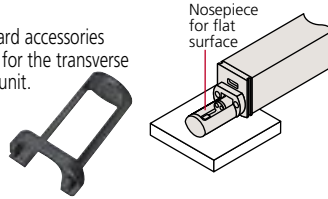


Drive unit, Display unit

Nosepiece for flat surfaces

12AAA217

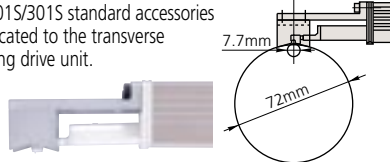
- SJ-301 standard accessories
- Not available for the transverse tracing drive unit.



V-type adapter

12AAE644

- SJ-201S/301S standard accessories
- Dedicated to the transverse tracing drive unit.

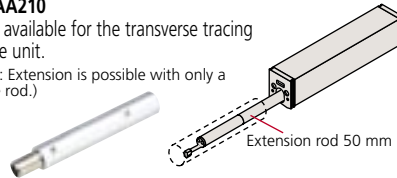


Extension rod (50mm)

12AAA210

- Not available for the transverse tracing drive unit.

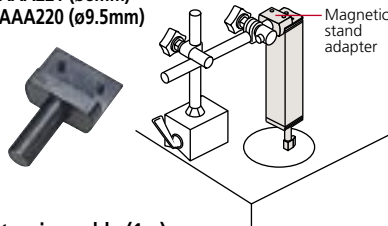
(Note: Extension is possible with only a single rod.)



Magnetic stand adapter

12AAA221 (ø8mm)

12AAA220 (ø9.5mm)



Extension cable (1m)

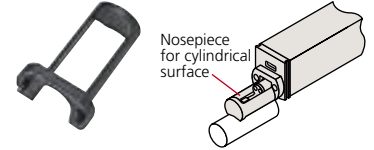
12BAA303

(Note: Extension is possible with only a single cable.)

Nosepiece for cylindrical surfaces

12AAA218

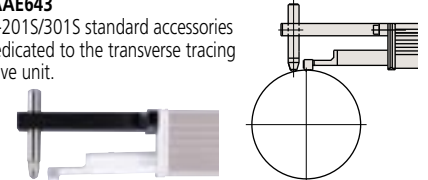
- SJ-301 standard accessories
- Not available for the transverse tracing drive unit.



Point-contact adapter

12AAE643

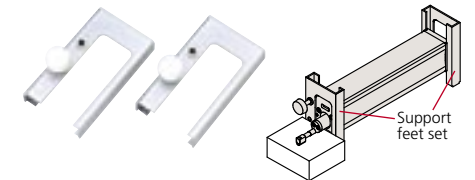
- SJ-201S/301S standard accessories
- Dedicated to the transverse tracing drive unit.



Support feet set

12AAA216

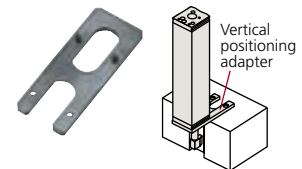
- SJ-301 standard accessory.
- Not available for the transverse tracing drive unit.



Vertical positioning adapter

12AAA219

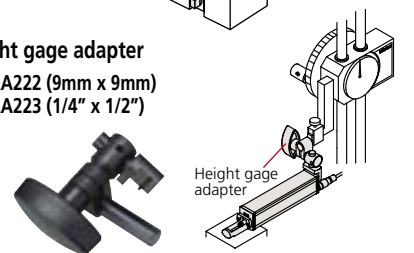
- Not available for the transverse tracing drive unit



Height gage adapter

12AAA222 (9mm x 9mm)

12AAA223 (1/4" x 1/2")



* Not available for the transverse tracing drive unit

Setting attachments

Enhances measurement efficiency by facilitating the measurement setup of multiple workpieces of the same type and of the hard-to-access sections of a workpiece.

Setting attachment: V type for measuring in the cylinder axis direction



178-033

The V-width is adjustable to the cylinder diameter facilitating axial measurement of a wide range of cylinder diameters.

- Adjustable range: $\phi 5 \sim 150\text{mm}$

Setting attachment: Magnetic slider type



178-034

The magnet attached to the frame bottom surface allows taking hands-free measurement on the wall.

Setting attachment: Inside diameter type



178-035

Greatly facilitates measurement of internal wall surfaces of, for example, a cylinder block.

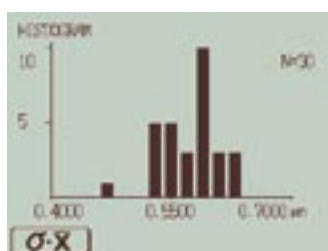
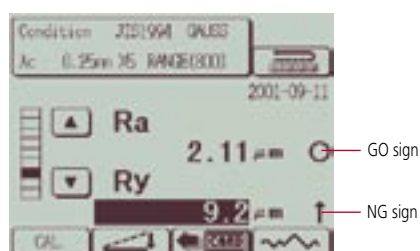
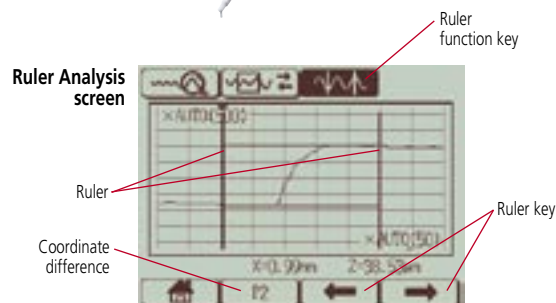
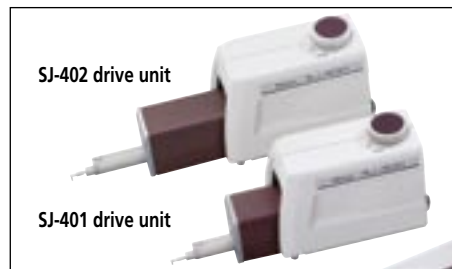
- Applicable diameter: $\phi 75 \sim \phi 95\text{mm}$
- Accessible depth: 30 ~ 135 mm

Surftest SJ-400

SERIES 178 — Portable Surface Roughness Tester

FEATURES

- Equipped with 36 kinds of roughness parameters that conform to the latest ISO, DIN, ANSI, and JIS standards.
- A wide-range, high-resolution detector and an straight drive unit provide superior high-accuracy measurement in its class.
- The skidless detector and the curved surface compensation function make it so efficient to evaluate cylinder surface roughness.
- Ultra-fine steps, straightness and waviness can be measured by using the skidless measurement function.
- Measured data can be output to an external PC by using an RS-232C cable (optional).
- With a roughness specimen.
- Digital filter function for non-distorted roughness profiles.
- GO/NG judgment function.
- Auto-calibration function.



Technical Data

X-axis (drive unit)	
Measuring range:	25mm (SJ-401), 50mm (SJ-402)
Measuring speed:	0.05, 0.1, 0.5, 1.0mm/s
Return speed:	0.5, 1.0, 2.0mm/s
Traversing direction:	Backward
Traverse linearity:	0.3μm/25mm (SJ-401), 0.5μm/50mm (SJ-402)
Positioning:	±1.5° (tilting), 10mm (up/down)
Detector	
Range / resolution:	800μm / 0.01μm, 80μm / 0.001μm, 8μm / 0.0001μm (up to 2400μm with an optional stylus)
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5μmR (60°/2μmR: low force type)
Skid radius of curvature:	40mm
Detecting method:	Differential inductance
Power supply:	Via AC adapter / rechargeable battery
Battery life:	Max. 600 measurements (w/o printing)
	Recharge time: 15 hours
Data output:	Via RS-232C interface / SPC output
Dimensions (WxDxH)	
Control unit:	307 x 165 x 94mm
Height-tilt adjustment unit:	131 x 63 x 99mm
Drive unit:	128 x 36 x 47mm (SJ-401), 155 x 36 x 47mm (SJ-402)
Mass	
Control unit:	Approx. 1.2kg
Height-tilt adjustment unit:	Approx. 0.4kg
Drive unit:	0.6kg (SJ-401), 0.7kg (SJ-402)

Evaluation Capability

Assessed profile:
Primary profile (P), Roughness profile (R), Filtered waviness profile (W), DIN4776, MOTIF (R, W)

Evaluation parameters:
Ra, Ry, Rz, Rq, Pc, R3z, mr, Rt, Rp, Rv, Sm, S, δc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Lo, Ppi, R, AR, Rx, Da, Dq, Ku, HSC, mrd, Sk, W, AW, Wte, Wx, Vo

Analysis graphs:
Bearing Area Curve (BAC1/ 2), Amplitude Distribution Curve (ADC)

Digital filter: 2CR, PC75, Gaussian

Cut-off length: 0.08, 0.25, 0.8, 2.5, 8mm

Number of sampling length: X1, X3, X5, XL

Arbitrary length (XL): 0.1 to 25mm (0.1 to 50mm: SJ-402), 0.1mm increments

Sampling length (L): 0.08, 0.25, 0.8, 2.5, 8mm

Printer: Thermal printer

Printing width: 48mm (paper width: 58mm)

Recording magnification:
Vertical magnification: 20X to 100,000X, Auto
Horizontal magnification: 1X to 1,000X, Auto

Function
Customize: Selection of display/evaluation parameter
Data compensation: R-surface, Tilt compensation
Ruler function:
Displays the coordinate difference of any two points
D.A.T. function:
Helps to adjust leveling during skidless measurement
Displacement detection mode
Enables the stylus displacement to be input while the drive unit is stopped.
Statistical processing: Max. value, Min. value, Mean value, Standard deviation (s), Pass ratio, Histogram
Tolerance judgment: Upper and lower limit values for three parameters can be specified.
Measuring condition storage: Five sets of measuring conditions (control unit)

Optional Accessory

- 178-611:** Reference step specimen (mm)
178-612: Reference step specimen (inch)
178-610: Step gage (step: 1µm, 2µm, 5µm, 10µm)
178-009: Manual column stand (vertical travel: 200mm)
178-039: Manual column stand (granite base)
 (vertical travel: 250mm)
12AAB358: Cylinder attachment (workpiece dia.: 15 - 60mm)
178-016: Leveling table (tilting: ±1.5°, max. loading: 15kg)
178-048: Leveling table with D.A.T function (mm)
 (tilting: ±1.5°, max. loading: 15kg)
178-058: Leveling table with D.A.T function (inch)
 (tilting: ±1.5°, max. loading: 15kg)
178-043-1: XY leveling table (25 x 25mm)
 (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-053-1: XY leveling table (1" x 1")
 (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-042-1: Digital XY leveling table (25 x 25mm)
 (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-052-1: Digital XY leveling table (1" x 1")
 (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
178-049: Digital XY leveling table (25 x 25mm)
 (tilting: ±1.5°, max. loading: 15kg)
178-059: Digimatic XY leveling table (1" x 1")
 (tilting: ±1.5°, max. loading: 15kg)
178-019: Precision vise for XY leveling table
 (jaw opening: 36mm)
181-902: V-block set with clamp (workpiece dia.: max. 25mm)
181-901: V-block set with clamp (workpiece dia.: max. 1")
998291: Precision V-block for XY leveling table
 (workpiece dia.: 1 - 160mm)
12BAA781: Carrying case
12AAA841: Memory card (8MB)
12AAA882: PC connecting cable (RS-232C cable)
965014: SPC cable (2m)
264-012-10: Input tool (USB type)
264-504*: DP-1VR
 *Suffix: **A** for 120V, **C** for 110V, **D** for 220V, **E** for 240V or non for 100V
 —: Detectors, Styli, and nosepieces (See page 426.)

Consumable Parts

- 12AAA896:** LCD protective sheet (10 sheets/set)
270732: Standard printer paper (25m, 5 rolls/set)
12AAA876: Durable printer paper (25m, 5 rolls/set)



Evaluation Capability: SURFPAK-SJ

Industrial standards met: ISO 4287:1997, ANSI / ASME B46.1-1995, JIS B0601 1994, etc.

Assessed profiles: P (primary profile), R (roughness profile), WC, WCA, WE WEA DIN4776 profile, E (envelope residual profile), R - motif (roughness/waviness motif)

Evaluation parameters: Ra, Rq, Rz, Rz (JIS), Ry, Ry (DIN), Rc, Rpi, Rp, Rpmx Rvi, Rv, Rvmax, Rti, Rt, R3zi, R3z, R3y, S, Pc (Ppi), Sm, HSC, mr, δc, plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2, Δa, Δq, λa, λq, Sk, Ku, Lo, Lr, A1, A2, RAR, SAR, NR, NCRX, CPM, Wte, Wx, W, AW, SW, SAW, NW

Analysis graphs: ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart

Digital filter: 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian -50% (phase corrected)

Cutoff length:

λc: 0.025, 0.08, 0.25, 0.8, 2.5, 8, 25mm or arbitrary value
 fl: 0.25, 0.8, 2.5, 8mm or arbitrary value
 fh: 0.25, 0.8, 2.5, 8mm or arbitrary value

Sampling length (L):

0.025, 0.08, 0.25, 0.8, 2.5, 8, 25mm or arbitrary value

Data compensation: Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, Conic automatic compensation, polynomial compensation, polynomial automatic compensation

Data deletion function

- Data deletion to avoid an over-range error
- Data deletion in a specific range to perform recalculation
- Automatic data deletion

Recording magnifications Vertical: 100X - 500,000X, Horizontal: 1X - 10,000X

Special functions for report generation

- Bit-map image paste-up function
- Multiple data layout function

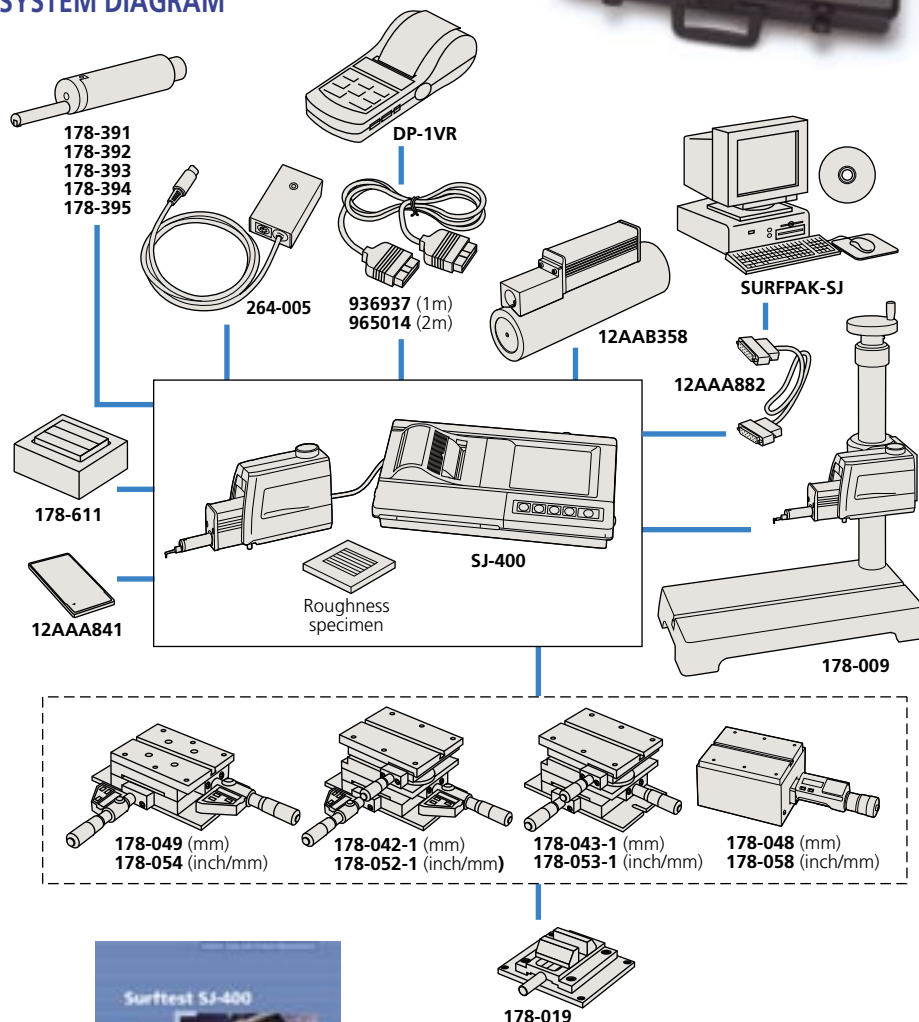
SPECIFICATIONS

Model No.	SJ-401	SJ-401	SJ-402	SJ-402
Order No. (mm)	178-956-3*	178-946-3*	178-958-3*	178-940-3*
Order No. (inch)	178-957-3*	178-947-3*	178-959-3*	178-945-3*
Measuring range	0.75mN	4mN	0.75mN	4mN
Evaluation range	25mm	25mm	50mm	50mm

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **178-956-3A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Carrying case is a standard accessory

SYSTEM DIAGRAM



Mitutoyo

Refer to the SurfTest SJ-400 leaflet (E4185) for more details.

Surftest SV-3000 / SV-2000

SERIES 178 — Surface Roughness Testers



SV-2000N2 with TCON



SV-2000S2 with TCON



SV-3000M4
with personal computer system and software
(SURFPAK-SV)

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metrology software
FORM

Technical Data

X-axis (drive unit)

Measuring range: 50mm or 100mm
Resolution: 0.05μm
Measurement method: Linear encoder
Drive speed: 0.5, 5.0mm/s
Measuring speed: 0.1, 0.2, 0.5, 1.0, 2.0mm/s
Traversing direction: Backward
Traverse linearity: (0.05+1.5L/1000)μm*
(0.5μm/200mm: 200mm range model)

Z-axis (column)

Vertical travel: 300mm
Base size (W x H): 613 x 450mm (SV-2000S4)
760 x 450mm (SV-3000M4)

Base material: Granite

Detector

Range / resolution: 800μm / 0.01μm, 80μm / 0.001μm,
8μm / 0.0001μm (up to 2400μm with
an optional stylus)

Detecting method: Skidless / skid measurement
Measuring force: 4mN or 0.75mN (low force type)
Stylus tip: Diamond, 90°/5μmR
(60°/2μmR: low force type)

Skid radius of curvature: 40mm

Detecting method: Differential inductance

Dimension (W x D x H): 613 x 450 x 905mm (SV-2000S2)
263 x 82 x 140mm (SV-2000N2)
760 x 450 x 711mm (SV-3000M4)

Mass: 130kg (SV-2000S2)

2.8kg (SV-2000N2)

140kg (SV-3000M4)

*L = Measured length (mm)

Evaluation Capability: SURFPAK-SV & TCON

Assessed profiles

P (primary profile), R (roughness profile), WC, WCA, WE,
WEA, DIN4776 profile, envelope residual profile, roughness
motif, waviness motif

Evaluation parameters

Ra, Rq, Rz, Ry, Rz(JIS), Ry(DIN), Rc, Rp, Rpmax, Rpi, Rv,
Rvmax, Rvi, Rt, Rti, R3z, R3zi, R3y, S, Pc (Ppi), Sm, HSC, mr,
δc, plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2, Δa, Δq, λa,
λq, Sk, Ku, Lo, Lr, A1, A2

Roughness motif parameters: Rx, R, AR, SR, SAR, NR,
NCRX, CPM

Waviness motif parameters: Wte, Wx, W, AW SW, SAW,
NW

Analysis graphs

ADC, BAC1, BAC2, power spectrum chart, auto-correlation
chart, Walsh power spectrum chart, Walsh auto-correlation
chart, slope distribution chart, local peak distribution chart,
parameter distribution chart

Digital filter 2CR-75%, 2CR-50%, 2CR-75% (phase
corrected), 2CR-50% (phase corrected), Gaussian-50%

Cutoff length*

λc: 0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm

fl: 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm

fh: 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm

Sampling length (L)*

0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm

Data compensation functions

Tilt compensation, R-plane (curved surface) compensation,
ellipse compensation, parabola compensation, hyperbola
compensation, quadric curve automatic compensation,
polynomial compensation, polynomial automatic
compensation

*Arbitrary length can be specified in the range from 0.025mm to
the maximum traverse length.

Optional Accessory

- 178-611:** Reference step specimen (mm)
- 178-612:** Reference step specimen (inch)
- 178-610:** Step gage (step: 1μm, 2μm, 5μm, 10μm)
- 997843:** Cylinder attachment for SV-2000N2
- 178-006:** Granite column stand for SV-2000N2
(vertical travel: 330mm)
- 178-008:** Column stand for SV-2000N2
(workpiece dia.: 50 - 625mm)
- 178-016:** Leveling table
(tilting: ±1.5°, max. loading: 15kg)
- 178-048:** Leveling table with D.A.T function (mm)
(tilting: ±1.5°, max. loading: 15kg)
- 178-058:** Leveling table with D.A.T function (inch)
(tilting: ±1.5°, max. loading: 15kg)
- 178-043-1:** XY leveling table (25 x 25mm)
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-053-1:** XY leveling table (1" x 1")
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-042-1:** Digital XY leveling table (25 x 25mm)
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-052-1:** Digital XY leveling table (1" x 1")
(tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-049:** Digital XY leveling table (25 x 25mm)
(tilting: ±1.5°, max. loading: 15kg)
- 178-059:** Digimatic XY leveling table (1" x 1")
(tilting: ±1.5°, max. loading: 15kg)
- 178-047:** Three-axis adjustment table
(including **998291** precision V-block)
- 178-019:** Precision vise for XY leveling table
(jaw opening: 36mm)
- 181-902:** V-block set with clamp
(workpiece dia.: max. 25mm)
- 181-901:** V-block set with clamp
(workpiece dia.: max. 1")
- 998291:** V-block for XY leveling table
(workpiece dia.: 1 - 160mm)
- 178-023:** Vibration isolator
- 178-024:** Stand for vibration isolator
- 178-027:** Auto-leveling Table
(table size: 130 x 100mm)
- 178-028:** Auto-leveling Table
(table size: 280 x 250mm)
- 178-044:** Y-axis Traverse Table
(traverse range: 160mm)
- 178-054:** Y-axis Traverse Table
(traverse range: 6.3")
- 178-036:** Rolling Unit
- 998054:** Extension unit*
- 998055:** Add-on Unit**
- : Detectors, Styli, and nosepieces

(See page 426.)

*The Extension unit is required to connect up to two kinds of motor-driven options, such as the Auto-leveling Table, Y-axis Traverse Table, and Rolling Unit.

**The Add-on Unit is required to connect two more kinds of motor-driven options.

SPECIFICATIONS

Model No.	SV-2000N2	SV-2000N2	SV-2000S2	SV-2000HS2	SV-3000M4	SV-3000M4
Order No. (mm)	178-660*	178-640*	178-661*	178-641*	178-662*	178-642*
Order No. (inch)	178-670*	178-650*	178-671*	178-651*	178-672*	178-652*
Measuring force of detector	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN
Traverse range	50mm		50mm		100mm	
Vertical travel	—		300mm Power column		300mm Manual column	
Granite base size (WxD)	—		613 x 450mm		760 x 450mm	
Dimensions (main unit, WxDxH)	263 x 82 x 40mm		613 x 450 x 905mm		760 x 450 x 711mm	
Mass (main unit)	2.8kg		130kg		140kg	

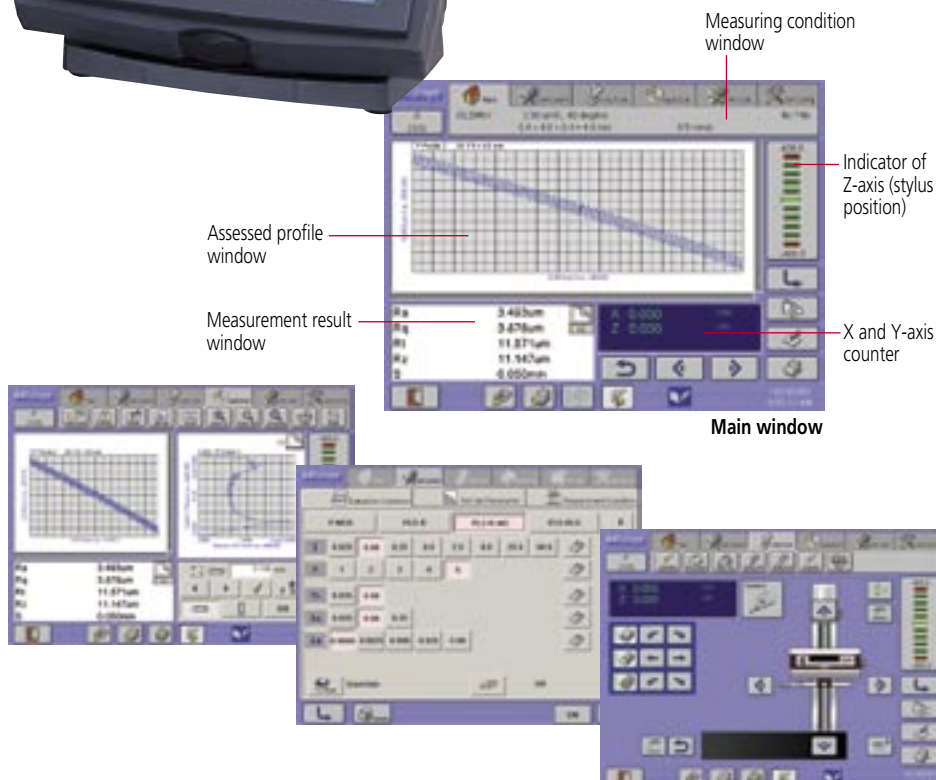
*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **178-660A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Touch-Panel Controller

TCON



- Easy & speedy operation with a touch panel
- Employing a 12-inch color LCD
- Large sized and easy-to-understand icons allow high-level analysis as well as SURFPAK-SV with facility.



Surftest SV-3100

SERIES 178 — Surface Roughness Testers



SV-3100H4 with personal computer system

The Surftest SV-3100 Series provide high-accuracy, high-level analysis, and multi-functionality in measurement of surface roughness.

FEATURES

- Mitutoyo's Surftest SV-3100 Series provide high-accuracy, high-level analysis, and multi-functionality in three dimensional analysis and measurement of fine contour, as well as the conventional type surface roughness measurement.
- Peripheral devices such as the auto-leveling table are available to enhance operability and to enable automatic measurement.
- SURFPAK-SV, a dedicated data-analyzing software is installed. This software allows data management in a consistent format, from the work site to the laboratory.
- Ceramic, which is known for its superb anti-abrasive property, is used as the X-axis drive unit guide. No lubrication of the guide is required.
- High-accuracy glass scales are built-in on X-axis (resolution: $0.05\mu\text{m}$) and Z2-axis (column, resolution: $1\mu\text{m}$) to insure high-accuracy positioning. The SV-3100 series manifest high-reliability especially in the horizontal roughness parameters (S , S_m), that require high-accuracy of the X-axis travel.
- Equipped with high-accuracy detector stylus.
- Equipped with various functions such as: the "straightness compensation" function, which improves the linear accuracy of the X-axis; the "circular compensation" function for the vertical movement of the stylus; and the "stylus-tip diameter compensation" function.
- The stylus and the skid can be replaced easily. Optional styli and skids are available for a wide variety of roughness measurement applications, such as measurement of small holes, deep holes, etc.
- An easy-to-operate Control Box is provided. The Control Box independent of the main unit allows positioning, measurement start/stop, retracting, and other operations to be performed remotely. The Drive Unit up/down position and the X-axis traverse can be fine controlled manually.

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Technical Data

X-axis	
Measuring range:	100mm or 200mm
Resolution:	$0.05\mu\text{m}$
Measurement method:	Linear encoder
Drive speed:	0 - 80mm/s
Measuring speed:	0.02 - 5mm/s
Traversing direction:	Backward
Traverse linearity:	$(0.05+1L/1000)\mu\text{m}^*$ ($0.5\mu\text{m}/200\text{mm}$: 200mm range model)
Inclining range:	$\pm 45^\circ$
Z2-axis (column)	
Vertical travel:	300mm or 500mm, power drive
Resolution:	$1\mu\text{m}$
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 20mm/s
Detector	
Range / resolution:	$800\mu\text{m} / 0.01\mu\text{m}$, $80\mu\text{m} / 0.001\mu\text{m}$, $8\mu\text{m} / 0.0001\mu\text{m}$ (up to $2400\mu\text{m}$ with an optional stylus)
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, $90^\circ/5\mu\text{mR}$ ($60^\circ/2\mu\text{mR}$: low force type)
Skid radius of curvature:	40mm
Detecting method:	Differential inductance
Base size (W x H):	600 x 450mm or 1000 x 450mm
Base material:	Granite
Dimension (W x D x H):	756 x 482 x 966mm (S4-type) 756 x 482 x 1166mm (H4-type) 1156 x 482 x 1176mm (W4-type) 766 x 482 x 966mm (S8-type) 766 x 482 x 1166mm (H8-type) 1166 x 482 x 1176mm (W8-type)
Mass	
	140kg (S4-type, S8-type) 150kg (H4-type, H8-type) 220kg (W4-type, W8-type)

*L = Measured length (mm)

Evaluation Capability: SURFPAK-SV

Assessed profiles

P (primary profile), R (roughness profile), WC, WCA, WE, WEA, DIN4776 profile, envelope residual profile, roughness motif, waviness motif

Evaluation parameters

Ra, Rq, Rz, Ry, Rz(JIS), Ry(DIN), Rc, Rp, Rpmax, Rpi, Rv, Rvmax, Rvi, Rt, Rti, R3z, R3zi, R3y, S, Pc (Ppi), Sm, HSC, mr, δc , plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2, Δa , Δq , λa , λq , Sk, Ku, Lo, Lr, A1, A2

Roughness motif parameters: Rx, R, AR, SR, SAR, NR, NCRX, CPM

Waviness motif parameters: Wte, Wx, W, AW SW, SAW, NW

Analysis graphs

ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart

Digital filter 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian-50%

Cutoff length*

λc : 0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm
fl: 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm
fh: 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm

Sampling length (L)*

0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm

Data compensation functions

Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, quadric curve automatic compensation, polynomial compensation, polynomial automatic compensation

*Arbitrary length can be specified in the range from 0.025mm to the maximum traverse length.

Optional Accessory

- 178-611:** Step gage (2μm, 10μm)
178-612: Step gage (2μm, 10μm, 79μm, 394μm)
178-610: Metric 4-step gage (1μm, 2μm, 5μm, 10μm)
178-047: Three-axis adjustment table (998291 is included.)
178-016: Leveling table
178-042-1: Digimatic XY leveling table (25 x 25mm)
178-052-1: Digimatic XY leveling table (1" x 1")
178-043-1: XY leveling table (25 x 25mm)
178-053-1: XY leveling table (1" x 1")
178-019: Precision vise*
998291: Precision V-block*
181-902: V-block set with clamp (Max. workpiece dia.: 25mm)
181-901: V-block set with clamp (Max. workpiece dia.: 1")
178-023: Vibration isolator
178-024: Stand for vibration isolator
218-007: Workbench
166-215: Workbench (with drawers)
218-010: Auxiliary desk
218-008: Auxiliary desk
 (See page 426.) Detectors, styli, and nosepieces
 *Use with an XY leveling table

Simplified CNC Function

With the support for a wide range of optional peripherals designed for use with the CNC models enables automatic measurement.



Using Y-axis Table

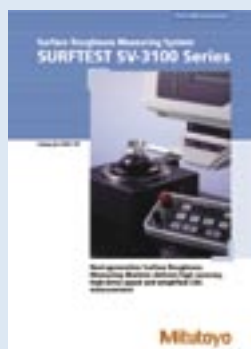


Using Rotary Table θ1



Using Rotary Table θ2

(See page 424 for more details.)



Refer to the Surtest SV-3100 Series leaflet (E4301) for more details.

SPECIFICATIONS

Model No.	SV-3100S4	SV-3100S4	SV-3100H4	SV-3100H4	SV-3100W4	SV-3100W4
Order No. (mm)	178-471-1*	178-471-2*	178-472-1*	178-472-2*	178-473-1*	178-473-2*
Order No. (inch)	178-481-1*	178-481-2*	178-482-1*	178-482-2*	178-483-1*	178-483-2*
Order No. (mm)	178-451-1*	178-451-2*	178-452-1*	178-452-2*	178-453-1*	178-453-2*
Order No. (inch)	178-461-1*	178-461-2*	178-462-1*	178-462-2*	178-463-1*	178-463-2*
Measuring force of detector	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN
X-axis measuring range	100mm		100mm		100mm	
Vertical travel	300mm power column		500mm power column		500mm manual column	
Granite base size (WxD)	600 x 450mm		600 x 450mm		1000 x 450mm	
Dimensions (main unit, WxDxH)	756 x 782 x 966mm		756 x 482 x 1166mm		1156 x 482 x 1176mm	
Mass (main unit)	140kg		150kg		220kg	

Model No.	SV-3100S8	SV-3100S8	SV-3100H8	SV-3100H8	SV-3100W8	SV-3100W8
Order No. (mm)	178-476-1*	178-476-2*	178-477-1*	178-477-2*	178-478-1*	178-478-2*
Order No. (inch)	178-486-1*	178-486-2*	178-487-1*	178-487-2*	178-488-1*	178-488-2*
Order No. (mm)	178-456-1*	178-456-2*	178-457-1*	178-457-2*	178-458-1*	178-458-2*
Order No. (inch)	178-466-1*	178-466-2*	178-467-1*	178-467-2*	178-468-1*	178-468-2*
Measuring force of detector	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN
X-axis measuring range	200mm		200mm		200mm	
Vertical travel	300mm power column		500mm power column		500mm manual column	
Granite base size (WxD)	600 x 450mm		600 x 450mm		1000 x 450mm	
Dimensions (main unit, WxDxH)	766 x 482 x 966mm		766 x 482 x 1166mm		1166 x 482 x 1176mm	
Mass (main unit)	140kg		150kg		220kg	

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **178-663A**):

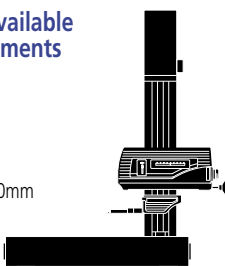
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Models without X-axis inclination function

A variety of models available for measuring requirements

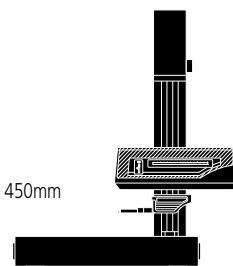
SV-3100S4

Traverse range: 100mm
 Vertical travel: 300mm
 Base size (W x D): 600 x 450mm
 Base material: Granite



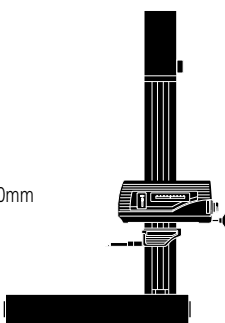
SV-3100S8

Traverse range: 200mm
 Vertical travel: 300mm
 Base size (W x D): 600 x 450mm
 Base material: Granite



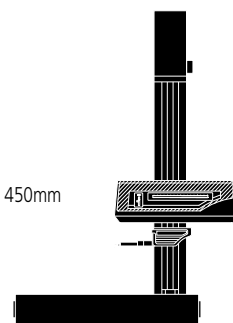
SV-3100H4

Traverse range: 100mm
 Vertical travel: 500mm
 Base size (W x D): 600 x 450mm
 Base material: Granite



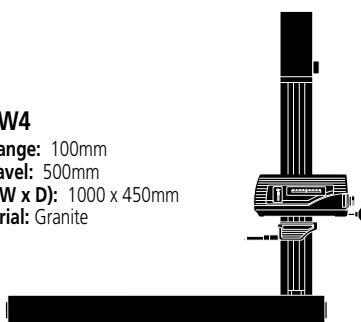
SV-3100H8

Traverse range: 200mm
 Vertical travel: 500mm
 Base size (W x D): 600 x 450mm
 Base material: Granite



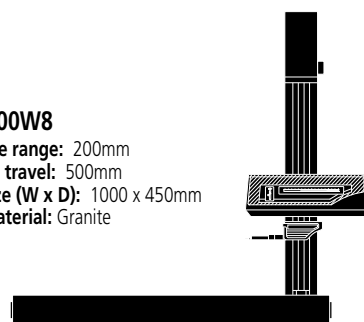
SV-3100W4

Traverse range: 100mm
 Vertical travel: 500mm
 Base size (W x D): 1000 x 450mm
 Base material: Granite



SV-3100W8

Traverse range: 200mm
 Vertical travel: 500mm
 Base size (W x D): 1000 x 450mm
 Base material: Granite



Surftest Extreme SV-3000CNC / SV-M3000CNC

SERIES 178 — CNC Surface Measuring Instruments

FEATURES

- High-accuracy CNC Surface Roughness Measuring Instrument that allows both measurement of surface roughness.
- Each axes has the maximum drive speed of 200 mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- For models with the α axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the drive unit.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- With the support for optional rotary table $\theta 1$ and $\theta 2$ designed for use with the CNC models enables to expand the CNC measurement application range.
- Enables inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- Since the detector unit incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or jig.
- Supplied with an easy-to-operate Remote Box, on which the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Communication with the Data Processing/Analysis section is via USB.



SV-3000CNC with personal computer system and software

SPECIFICATIONS

Model No.	SV-3000CNC		SV-3000CNC		SV-3000CNC		SV-3000CNC	
Order No. (100V - 120V)	178-521-1	178-541-1	178-522-1	178-542-1	178-523-1	178-543-1	178-524-1	178-544-1
Order No. (200V - 240V)	178-521-2	178-541-2	178-522-2	178-542-2	178-523-2	178-543-2	178-524-2	178-544-2
X1-axis measuring range	200mm	200mm	200mm	200mm	200mm	200mm	200mm	200mm
Z2-axis vertical travel	300mm	500mm	300mm	500mm	300mm	500mm	300mm	500mm
Y-axis table unit	—	—	—	—	Installed	Installed	Installed	Installed
α -axis unit	—	—	Installed	Installed	—	—	Installed	Installed

Technical Data: SV-C3000CNC

X1-axis	
Measuring range:	200mm
Resolution:	0.05 μ m
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (CNC, max.) 0 - 60mm/s (joystick)
Measuring speed:	0.02 - 2mm/s
Traversing direction:	Backward
Traverse linearity:	0.5 μ m/200mm
α -axis	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	300mm (500mm)*
Resolution:	0.05 μ m
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 60mm/s (joystick)
Base size (W x H):	750 x 600mm
Base material:	Granite
Detector	
Range / resolution:	800 μ m / 0.01 μ m, 80 μ m / 0.001 μ m, 8 μ m / 0.0001 μ m
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5 μ mR (60°/2 μ mR: low force type)
Dimension (W x D x H):	800 x 620 x 1000mm (800 x 620 x 1200mm)*
Mass:	240kg (250kg)*
*High column model	

Optional Accessory

Vibration insulating stand	
Vibration insulating mechanism: Diaphragm air spring	
Natural frequency :	2.5 - 3.5Hz
Damping mechanism:	Orifice
Leveling mechanism:	Automatic control with mechanical valves
Air supply pressure:	0.4MPa
Allowable loading capacity:	350kg
Dimensions (W x D x H):	1000 x 895 x 715mm
Mass:	280kg
Y-axis table unit	
Measuring range:	200mm
Minimum reading :	0.05 μ m
Scale unit:	Reflective-type Linear Encoder
Drive speed:	200mm/s (max., CNC) 0 - 60mm/s (joystick)
Maximum loading capacity: 20 kg	
Traverse linearity	0.5 μ m/200mm
Linear displacement accuracy (at 20°C):	$\pm (2+2L/100) \mu$ m, L: Dimension between two measured points (mm)
Table size:	200 x 200mm
Dimensions (W x D x H):	320 x 646 x 105mm
Mass:	35kg



Refer to the CNC Form Measuring Instrument Series leaflet (E4284) for more details.

Technical Data: SV-MC3000CNC

X1-axis	
Measuring range:	200mm
Resolution:	0.05µm
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 50mm/s (joystick)
Measuring speed:	0.02 - 2mm/s
Traverse linearity:	0.5µm/200mm 0.7µm/200mm (long-type detector) 0.5µm/200mm (rotary-type detector, up/down direction) 0.7µm/200mm (long-type detector, forward/backward direction)
α-axis	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	500mm
Resolution:	0.05µm
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (CNC, max.) 0 - 50mm/s (joystick)
Y-axis	
Measuring range:	810mm
Resolution:	0.05µm
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 50mm/s (joystick)
Measuring speed:	0.02 - 2mm/s
Traverse linearity:	0.5µm/50mm, 2µm/800mm 0.7µm/50mm, 3µm/800mm (long-type detector) 0.7µm/50mm, 3µm/800mm (rotary-type detector, up/down direction)
Base unit	
Size (W x H):	600 x 1500mm
Material:	Steel
Loading capacity:	300kg
Detector	
Range / resolution:	800µm / 0.01µm, 80µm / 0.001µm, 8µm / 0.0001µm (up to 2400µm with an optional stylus)
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5µmR (60°/2µmR: low force type)
Skid radius of curvature:	40mm
Detecting method:	Differential inductance
Dimension (W x D x H):	1085 x 1695 x 1922mm
Mass	1600Kg (including vibration isolating unit)

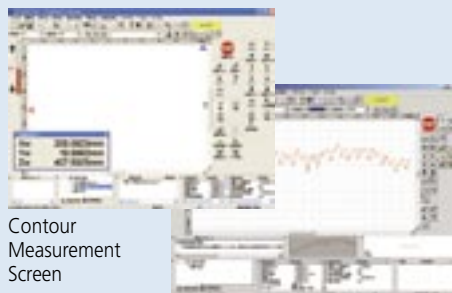
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the standard in world
metrology software
FORM

Optional Software

FORMTRACEPAK

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, you can create an original inspection certificate by setting the print format to suit your particular requirements.



Contour
Measurement
Screen

Surface Roughness Measurement Screen



SV-M3000CNC with personal
computer system and software

FEATURES

- CNC Surface Roughness Tester that covers measurement of large/heavy workpieces such as engine blocks, crankshafts, etc.
- In combination with the surface roughness detector rotating unit, S-3000AR (optional), covers continuous measurement over the bottom, top and side surfaces of a workpiece.
- Compatible with the optional large table for supporting a load of 100 kg or a large Ø2 table. Enables continuous automatic measurement of large-size workpiece
- Suitable for automatic surface roughness measurement on large and heavy workpieces.
- Employs the column-moving type configuration that is not restricted by workpiece size. This is advantageous for measuring heavy workpieces such as engine blocks, crankshafts, etc.
- Provides 800 mm of Y-axis stroke. This makes it possible to measure multiple profiles on large workpieces.
- Load table has a self-contained structure to ensure that various size workpieces, jigs, auto-feed devices, etc., are easily accommodated and can be specified, if required, by special order.

SPECIFICATIONS

Model No.	SV-M3000CNC
Order No. (100V - 120V)	178-549-1
Order No. (200V - 240V)	178-549-2
X1-axis measuring range	200mm
Z2-axis column travel range	500mm
Y-axis travel range	800mm
α-axis inclination angle	-45° (CCW), ±10° (CW)

Formtracer SV-C3100 / SV-C4100

SERIES 525 — Surface Roughness / Contour Measuring System



SV-C3100S4 with personal computer system and software

FEATURES

- Dramatically increased drive speed (X axis: 80 mm/s, Z2 axis column: 20 mm/s) further reduces total measurement time.
- In order to maintain the traverse linearity specification for an extended period of time, Mitutoyo has adopted highly rigid ceramic guides that combine the characteristics of smallest secular change and remarkable resistance to abrasion.
- The drive unit (X-axis) and column (Z2-axis) are equipped with a high-accuracy linear encoders (ABS type on Z2-axis). This improves reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurement of parts which are difficult to position.

Automatic Measurement

- With the support for a wide range of optional peripherals designed for use with the CNC models enables automatic measurement.



Using Y-axis Table

Using Rotary Table 01



Using Rotary Table 02

(See page 424 for more details.)

Surface Roughness Measurement



- Traverse linearity: $\pm(0.05+0.001L) \mu\text{m}^*$
Designed to handle workpieces calling for high accuracy.
*S4, H4, W4 types, L = Drive length (mm)
- Compliant with JIS '82/'94/'01, ISO, ANSI, DIN, VDA, and other international surface roughness standards.
- Equipped as standard with a high accuracy detector (0.75mN / 4mN measuring force) providing a resolution down to 0.0001 μm .

Contour Drive Measurement



- X axis accuracy: $\pm(0.8+0.01L) \mu\text{m}^*$
Z1-axis accuracy: $\pm(0.8+10.5H/25) \mu\text{m}^*$
Designed to handle workpieces calling for high accuracy.
*SV-C4100S4, H4, W4 types, L = Drive length, H = Measurement height (mm)
- The contour drive unit of SV-C4100 series is equipped with a Laser Hologage detector giving excellent narrow/wide range accuracy and resolution in the Z axis (vertical).

Technical Data: Common

Base size (W x H):	750 x 600mm or 1000 x 450mm
Base material:	Granite or cast iron
Mass	
Main unit:	140kg (S4), 150kg (H4), 220kg (W4)
Controller Unit:	14kg
Remote Control Box:	0.9kg
Power supply:	100 – 240VAC $\pm 10\%$, 50/60Hz
Power consumption:	400W (main unit only)

Technical Data: Contour Measurement

X-axis	
Measuring range:	100mm or 200mm
Resolution:	0.05 μm
Measurement method:	Reflective-type linear encoder
Drive speed:	80mm/s and manual
Measuring speed:	0.02 – 5mm/s
Measuring direction:	Forward/backward
Traverse linearity:	0.8 $\mu\text{m}/100\text{mm}$, 2 $\mu\text{m}/200\text{mm}$ <small>*with the X axis in horizontal orientation</small>
Linear displacement accuracy (at 20°C)	$\pm(1+0.01L) \mu\text{m}$ (SV-C3100S4, H4, W4) $\pm(0.8+0.01L) \mu\text{m}$ (SV-C4100S4, H4, W4) $\pm(1+0.02L) \mu\text{m}$ (SV-C3100S8, H8, W8) $\pm(0.8+0.02L) \mu\text{m}$ (SV-C4100S8, H8, W8) <small>*L = Drive length (mm)</small>
Inclining range:	$\pm 45^\circ$
Z2-axis (column)	
Vertical travel:	300mm or 500mm
Resolution:	1 μm
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 – 20mm/s and manual
Z1-axis (detector unit)	
Measuring range:	$\pm 25\text{mm}$
Resolution:	0.2 μm (SV-C3100 series), 0.05 μm (SV-C4100 series)
Measurement method:	Linear encoder (SV-C3100 series), laser hologage (SV-C4100 series)
Linear displacement accuracy (at 20°C)	$\pm(2+14H/100) \mu\text{m}$ (SV-C3100 series) $\pm(0.8+10.5H/25) \mu\text{m}$ (SV-C4100 series) <small>*H: Measurement height from the horizontal position (mm)</small>
Stylus up/down operation:	Arc movement
Face of stylus:	Upward/downward
Measuring force:	30mN
Traceable angle:	Ascent: 77°, descent: 87° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 25 μm , carbide tip

Technical Data: Surface Roughness Measurement

X1-axis	
Measuring range:	100mm or 200mm
Resolution:	0.05 μm
Measurement method:	Linear encoder
Drive speed:	80mm/s
Traversing direction:	Backward
Traverse linearity:	(0.05+1.5L/1000) μm (S4, H4, W4 types) 0.5 $\mu\text{m}/200\text{mm}$ (S8, H8, W8 types)
Z2-axis (column)	
Vertical travel:	300mm or 500mm
Resolution:	1 μm
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 – 20mm/s and manual
Detector	
Range / resolution:	800 μm / 0.01 μm , 80 μm / 0.001 μm , 8 μm / 0.0001 μm (up to 2400 μm with an optional stylus)
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5 μm R (60°/2 μm R: low force type)
Skid radius of curvature:	40mm
Detecting method:	Differential inductance

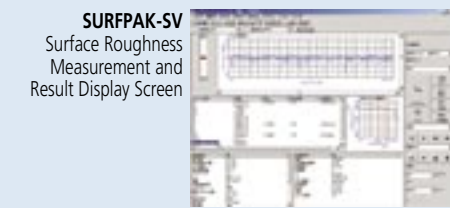
Optional Software

DUAL TRACEPAK

The type of measuring unit is automatically recognized so that when the surface roughness drive unit is mounted the surface roughness analysis program SURFPAK-SV starts automatically. Conversely, when the contour drive unit is mounted, the form analysis program FORMPAK-1000 is initiated. For offline analysis the program required can be selected for execution on the menu screen even when the Formtracer is turned off.



FORMPAK-1000
Contour Analysis Screen



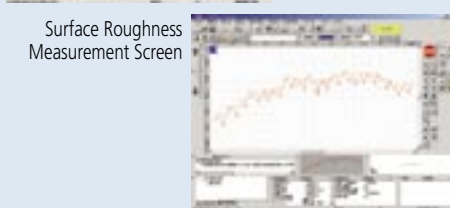
SURFPAK-SV
Surface Roughness
Measurement and
Result Display Screen

FORMTRACEPAK

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, you can create an original inspection certificate by setting the print format to suit your particular requirements.



Contour Measurement
Screen



Surface Roughness
Measurement Screen



Refer to the Formtracer SV-C3100 / 4100 Series leaflet (E4304) for more details.

SPECIFICATIONS

Model No.	SV-C3100S4	SV-C3100S4	SV-C3100H4	SV-C3100H4	SV-C3100W4	SV-C3100W4
Order No. (mm)	525-421-1*	525-421-2*	525-422-1*	525-422-2*	525-423-1*	525-423-2*
Order No. (inch)	525-431-1*	525-431-2*	525-432-1*	525-432-2*	525-433-1*	525-433-2*
Model No.	SV-C4100S4	SV-C4100S4	SV-C4100H4	SV-C4100H4	SV-C4100W4	SV-C4100W4
Order No. (mm)	525-461-1*	525-461-2*	525-462-1*	525-462-2*	525-463-1*	525-463-2*
Order No. (inch)	525-471-1*	525-471-2*	525-472-1*	525-472-2*	525-473-1*	525-473-2*
X1-axis measuring range	100mm	100mm	100mm	100mm	100mm	100mm
Measuring force of detector	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN
Vertical travel	300mm power column		500mm power column		500mm power column	
Granite base size (WxD)	610 x 450mm		610 x 450mm		1000 x 450mm	
Dimensions (main unit, WxDxH)	996 x 575 x 966mm		996 x 575 x 1176mm		1396 x 575 x 1176mm	
Mass (main unit)	140kg		150kg		220kg	

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **525-421-1A**):
A for UL/CSA, D for CEE, E for BS, DC for China, K for EK, No suffix is required for JIS/100V

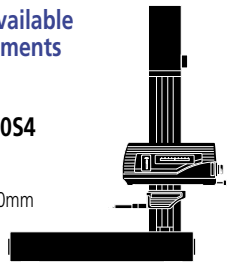
Model No.	SV-C3100S8	SV-C3100S8	SV-C3100H8	SV-C3100H8	SV-C3100W8	SV-C3100W8
Order No. (mm)	525-426-1*	525-426-2*	525-427-1*	525-427-2*	525-428-1*	525-428-2*
Order No. (inch)	525-436-1*	525-436-2*	525-437-1*	525-437-2*	525-438-1*	525-438-2*
Model No.	SV-C3100S8	SV-C3100S8	SV-C3100H8	SV-C3100H8	SV-C3100W8	SV-C3100W8
Order No. (mm)	525-466-1*	525-466-2*	525-467-1*	525-467-2*	525-468-1*	525-468-2*
Order No. (inch)	525-476-1*	525-476-2*	525-477-1*	525-477-2*	525-478-1*	525-478-2*
X1-axis measuring range	200mm	200mm	200mm	200mm	200mm	200mm
Measuring force of detector	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN
Vertical travel	300mm power column		500mm power column		500mm power column	
Granite base size (WxD)	610 x 450mm		610 x 450mm		1000 x 450mm	
Dimensions (main unit, WxDxH)	1005 x 575 x 966mm		1005 x 575 x 1176mm		1408 x 575 x 1176mm	
Mass (main unit)	140kg		150kg		220kg	

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **525-426-1A**):
A for UL/CSA, D for CEE, E for BS, DC for China, K for EK, No suffix is required for JIS/100V

A variety of models available for measuring requirements

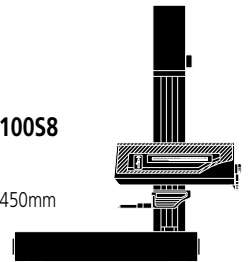
SV-C3100S4 / SV-C4100S4

Traverse range: 100mm
Vertical travel: 300mm
Base size (W x D): 600 x 450mm
Base material: Granite



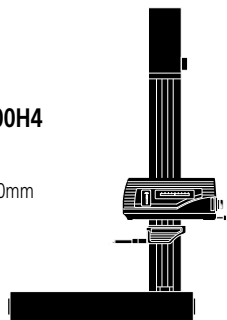
SV-C3100S8 / SV-C4100S8

Traverse range: 200mm
Vertical travel: 300mm
Base size (W x D): 600 x 450mm
Base material: Granite



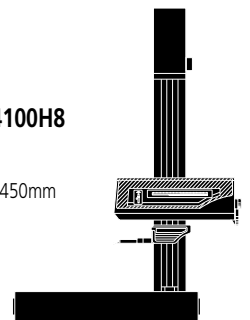
SV-C3100H4 / SV-C4100H4

Traverse range: 100mm
Vertical travel: 500mm
Base size (W x D): 600 x 450mm
Base material: Granite



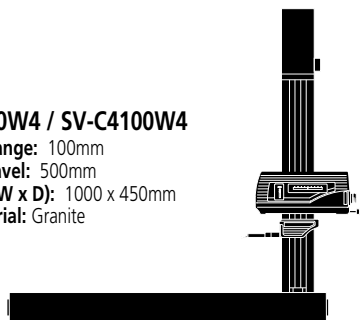
SV-C3100H8 / SV-C4100H8

Traverse range: 200mm
Vertical travel: 500mm
Base size (W x D): 600 x 450mm
Base material: Granite



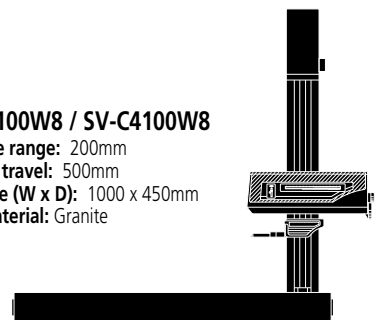
SV-C3100W4 / SV-C4100W4

Traverse range: 100mm
Vertical travel: 500mm
Base size (W x D): 1000 x 450mm
Base material: Granite



SV-C3100W8 / SV-C4100W8

Traverse range: 200mm
Vertical travel: 500mm
Base size (W x D): 1000 x 450mm
Base material: Granite



Formtracer Extreme SV-C3000CNC / SV-C4000CNC

SERIES 525 — Surface Roughness/Form Measuring Instrument



SV-3000CNC with personal computer system and software

Surface roughness drive unit

Contour drive unit

FEATURES

- High-accuracy CNC Surface Roughness/Form Measuring Instrument that allows both measurement of surface roughness and form/contour with one unit.
- Each axes has the maximum drive speed of 200 mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- For models with the α axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the detector unit.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- The contour drive unit of SV-C4000CNC series is equipped with a Laser Hologage detector giving excellent narrow/wide range accuracy and resolution in the Z axis (vertical).
- Enables inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- When the detector for form/contour measurement is replaced with that for surface roughness measurement, or vice versa, it is a simple, one-touch replacement without re-routing of the connecting cables.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or jig
- Supplied with an easy-to-operate Remote Box, on which the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Communication with the Data Processing/Analysis section is via USB.

Technical Data: Common

Base size (W x H):	750 x 600mm
Base material:	Granite
Mass:	240kg, 250kg (high column type)
Power supply:	100 – 240VAC $\pm 10\%$, 50/60Hz
Power consumption:	500W (main unit only)

Technical Data: Contour Measurement

X1-axis	
Measuring range:	200mm
Resolution:	0.05 μ m
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 60mm/s (joystick)
Measuring speed:	0.02 - 2mm/s
Measuring direction:	Forward/backward
Traverse linearity:	2 μ m/200mm *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C): $\pm(1+0.02L)\mu$ m, * L = Drive length (mm)	
α-axis	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	300mm or 500mm
Resolution:	0.05 μ m
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 60mm/s (joystick)
Z1-axis (detector unit)	
Measuring range:	± 25 mm
Resolution:	0.2 μ m (SV-C3100CNC), 0.05 μ m (SV-C4100CNC)
Measurement method:	Linear encoder (SV-C3100CNC), laser hologage (SV-C4100CNC)
Linear displacement:	$\pm(3+12H/25)\mu$ m (SV-C3100CNC)
accuracy (at 20°C)	$\pm(0.8+10.5H/25)\mu$ m (SV-C4100CNC) *H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Downward
Measuring force:	30mN
Traceable angle:	Ascent: 70°, descent: 70° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 25 μ m, carbide tip

Technical Data: Surface Roughness Measurement

X1-axis	
Measuring range:	200mm
Resolution:	0.05 μ m
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 60mm/s (joystick)
Measuring speed:	0.02 - 2mm/s
Traversing direction:	Backward
Traverse linearity:	0.5 μ m/200mm
α-axis	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	300mm or 500mm
Resolution:	0.05 μ m
Measurement method:	Reflective-type linear encoder
Drive speed:	200mm/s (max., CNC) 0 - 60mm/s (joystick)
Detector (optional)	
Range / resolution:	800 μ m / 0.01 μ m, 80 μ m / 0.001 μ m, 8 μ m / 0.0001 μ m (up to 2400 μ m with an optional stylus)
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5 μ mR (60°/2 μ mR: low force type)
Skid radius of curvature:	40mm
Detecting method:	Differential inductance

Optional Accessory

Vibration insulating stand

Vibration insulating mechanism: Diaphragm air spring
 Natural frequency : 2.5 - 3.5Hz
 Damping mechanism: Orifice
 Leveling mechanism: Automatic control with mechanical valves
 Air supply pressure: 0.4Mpa
 Allowable loading capacity: 350kg
 Dimensions (W x D x H): 1000 x 895 x 715mm
 Mass: 280kg

Y-axis table unit

Measuring range: 200mm
 Minimum reading : 0.05μm
 Scale unit: Reflective-type Linear Encoder
 Drive speed: 200mm/s (max., CNC)
 0 - 60mm/s (joystick)
 Maximum loading capacity: 20 kg
 Traverse linearity 0.5μm/200mm
 Linear displacement accuracy (at 20°C):
 ± (2+2L/100) μm, contour mode
 L: Dimension between two measured points (mm)
 Table size: 200 x 200mm
 Dimensions (W x D x H): 320 x 646 x 105mm
 Mass: 35kg



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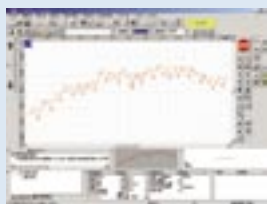
Optional Software FORMTRACEPAK

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, you can create an original inspection certificate by setting the print format to suit your particular requirements.



Contour Measurement Screen

Surface Roughness Measurement Screen



Refer to the CNC Form Measuring Instrument Series leaflet (E4284) for more details.

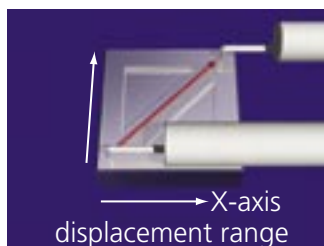
SPECIFICATIONS

Model No.	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC
Order No. (100V - 120V)	525-521-1	525-522-1	525-523-1	525-524-1
Order No. (200V - 240V)	525-521-2	525-522-2	525-523-2	525-524-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	300mm	300mm	300mm	300mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm
Mass (main unit)	240kg	240kg	240kg	240kg

Model No.	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC
Order No. (100V - 120V)	525-541-1	525-542-1	525-543-1	525-544-1
Order No. (200V - 240V)	525-541-2	525-542-2	525-543-2	525-544-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	500mm	500mm	500mm	500mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm
Mass (main unit)	250kg	250kg	250kg	250kg

Model No.	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC
Order No. (100V - 120V)	525-621-1	525-622-1	525-623-1	525-624-1
Order No. (200V - 240V)	525-621-2	525-622-2	525-623-2	525-624-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	300mm	300mm	300mm	300mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm
Mass (main unit)	240kg	240kg	240kg	240kg

Model No.	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC
Order No. (100V - 120V)	525-641-1	525-642-1	525-643-1	525-644-1
Order No. (200V - 240V)	525-641-2	525-642-2	525-643-2	525-644-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	500mm	500mm	500mm	500mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm
Mass (main unit)	250kg	250kg	250kg	250kg



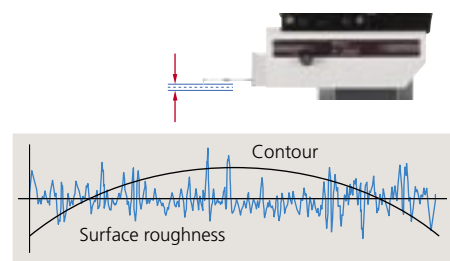
Formtracer CS-3100

SERIES 525 — Form Measuring Instruments



FEATURES

- Highest measurement accuracy in its class.
X axis: $\pm(1+0.01L)\mu\text{m}$
Z1 axis: $\pm(2+14H/100)\mu\text{m}$
- To detect surface roughness and contour in a single measurement the Z1-axis detector unit of CS-3100 has a wide measuring range and high resolution of 5mm / 0.08 μm to 0.05mm / 0.0008 μm .



- In order to maintain the traverse linearity specification for an extended period of time, Mitutoyo has adopted highly rigid ceramic guides that combine the characteristics of smallest secular change and remarkable resistance to abrasion.
- Drastically increased drive speed further reduces total measurement time.
X axis: 80mm/s, Z2 axis: 20mm/s
- To enhance safety during fast traverse, the Z-axis detector unit incorporates a safety device (Automatic Stop-On-Collision Mechanism).

- The detector unit can be protruded to avoid interference between the drive unit and workpiece. The measuring range is shifted to the left by 70mm.



- Incorporation of an ABS scale in the Z2 axis eliminates the need for wearisome origin point re-setting conventionally required for every step of repeated measurements over stepped or multiple sections.
- Small holes and inclined planes can be efficiently measured using the inclined X-axis drive unit and fine-feed handles on the X and Z2 axes.
- All detector and drive unit cables are housed inside the main unit to eliminate any risk of abrasion and guarantee trouble free, high-speed operation.
- Orientation of the drive unit can be inclined by $\pm 45^\circ$. This allows CS-3100 to measure a surface speedily inclined.

ABSOLUTE®
Absolute System Patented by MITUTOYO

(Refer to the page 9 for details.)

Technical Data: Contour Measurement

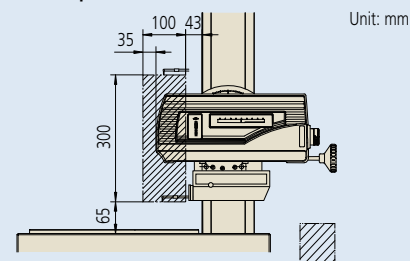
X1-axis	
Measuring range:	100mm
Resolution:	0.05 μm
Measurement method:	Reflective-type linear encoder
Drive speed:	0 - 80mm/s and manual
Measuring speed:	0.02 - 0.2mm/s (surface roughness) 0.02 - 2mm/s (contour)
Measuring direction:	Forward/backward
Traverse linearity:	0.2 $\mu\text{m}/100\text{mm}$ (0.4 $\mu\text{m}/100\text{mm}$) () : at the protruded detector position *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C):	$\pm(1+0.01L)\mu\text{m}$, * L = Drive length (mm)
Inclining range:	$\pm 45^\circ$
Z2-axis (column)	
Vertical travel:	300mm
Resolution:	1 μm
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 20mm/s and manual

Z1-axis (detector unit)

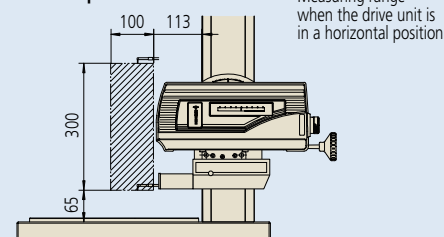
Measuring range / resolution:	5mm / 0.08 μm , 0.5mm / 0.008 μm , 0.05mm / 0.0008 μm
Measurement method:	Differential inductance method
Linear displacement:	$\pm(2+14H/100)\mu\text{m}$
accuracy (at 20°C)	*H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Downward
Measuring force:	0.75mN
Traceable angle:	Ascent: 65°, descent: 65° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 2 μm , diamond
Base size (W x H):	600 x 450mm
Base material:	Granite
Mass:	140kg (main unit)
Power supply:	100 - 240VAC $\pm 10\%$, 50/60Hz
Power consumption:	400W (main unit only)

Protrusion of Detector Position

Standard position



Protruded position

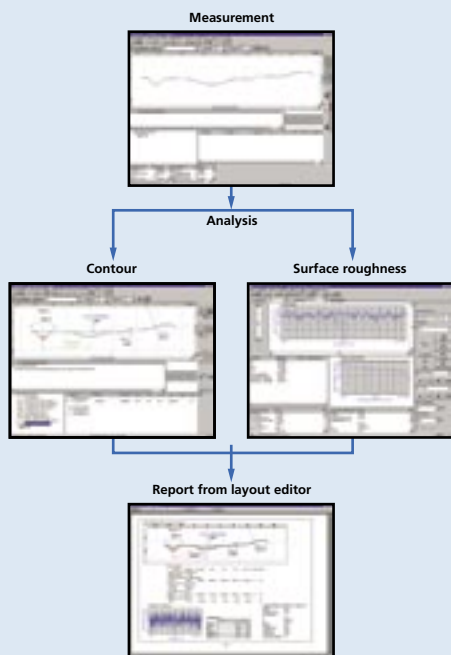


Traverse linearity is guaranteed at either of two positions.

Optional Software

FORMTRACEPAK

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, you can create an original inspection certificate by setting the print format to suit your particular requirements.



Refer to the Formtracer CS-3100 Series leaflet (E4243) for more details.

SPECIFICATIONS

Model No.	SC-3100
Order No. (mm)	525-381-1*
Order No. (inch)	525-391-1*
X1-axis measuring range	100mm
Z2-axis vertical travel	300mm

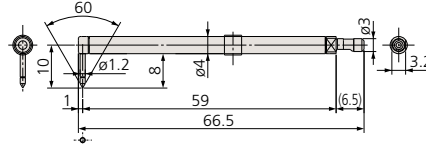
*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **525-381A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No** suffix is required for JIS/100V

Stylus

(Unit: mm)

Standard stylus: No. 12AAD554

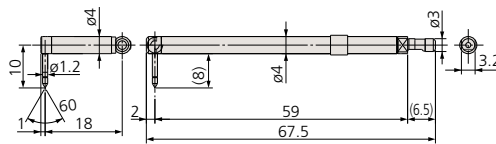
Radius of tip curvature: 2 μ m
tip form: 60° cone
Tip material: Diamond



For contour/surface roughness measurement
Measurable depth: 7 mm max.

Standard stylus: No. 12AAD558

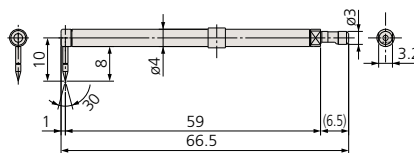
Radius of tip curvature: 2 μ m
tip form: 60° cone
Tip material: Diamond



For contour/surface roughness measurement
Offset from center line: 18 mm

Cone stylus: No. 12AAD552

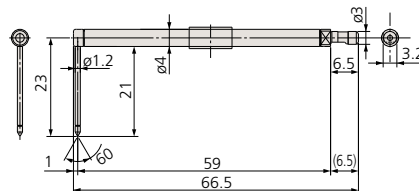
Radius of tip curvature: 25 μ m
tip form: 30° cone
Tip material: Sapphire



For contour measurement
Measurable depth: 7 mm max.

Standard stylus: No. 12AAD560

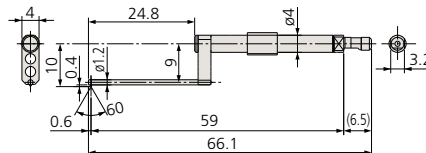
Radius of tip curvature: 2 μ m
tip form: 60° cone
Tip material: Diamond



For contour/surface roughness measurement
Measurable depth: 15 mm max.

Small hole stylus: No. 12AAD556

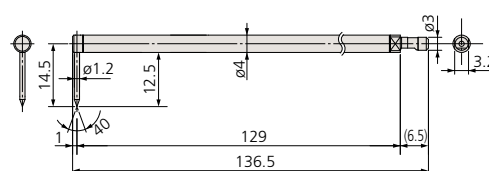
Radius of tip curvature: 2 μ m
tip form: 60° cone
Tip material: Diamond



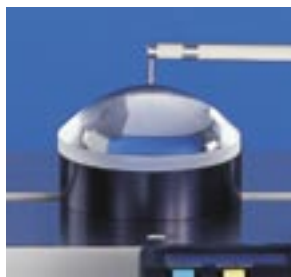
For contour/surface roughness measurement
Applicable hole: ϕ 2 mm min.

2x-long stylus: No. 12AAD562

Radius of tip curvature: 5 μ m
tip form: 40° cone
Tip material: Diamond



For contour/surface roughness measurement
Measurable depth: 10 mm max.



Measuring lens



Measuring ball screw



Measuring bearing ring

Formtracer Extreme CS-5000CNC / CS-H5000CNC

SERIES 525 — CNC Form Measuring Instruments



CS-5000CNC with personal computer system and software

Remote box



Wide range detector employing active control technology



FEATURES

- High-accuracy stylus type CNC Surface Measuring Instrument that allows simultaneous measurement of surface roughness and form/contour.
- The X1 axis has a maximum drive speed of 40 mm/s, and Z2 axes have a maximum drive speed of 200 mm/s, respectively. This permits high-speed positioning that may result in a large increase in the throughput of multiple-profile / multiple-workpiece measurement tasks.
- A Mitutoyo Laser Holescale is incorporated in the X1 axis and Z1 axis so that high resolution (X1 axis: 6.25nm, Z1 axis: 4nm/8nm) is achieved and batch measurement of form / contour and surface roughness can be made.
- The active control method is employed for the Z1-axis detector to implement a wide-range measurement capability wherein the variation in dynamic measuring force is restricted.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or jig.
- For models with the a axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X1 axis.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- Supplied with the easy-to-operate Remote Box, on which the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Uses USB for communicating with the Data Processing / Analysis Unit (optional).

Technical Data:

X1 axis	
Measuring range:	200mm
Resolution:	0.00625μm
Measurement method:	Laser Holescale
Drive speed:	Max. 40mm/s (in CNC mode) 0 - 40mm/s (in joystick control mode)
Measuring speed:	0.02 - 0.2mm/s (surface roughness) 0.02 - 2mm/s (form/contour)
Measuring direction:	Forward / backward direction
Traverse linearity:	(0.1+0.0015L)μm with standard stylus (0.2+0.0015L)μm with 2X-long stylus
Traverse linearity:	(0.05+0.0003L)μm with standard stylus (0.2+0.0015L)μm with 2X-long stylus
Linear displacement accuracy (20°C):	±(0.3+0.002L)μm
Linear displacement accuracy (20°C):	±(0.16+0.001L)μm L = Measured length (mm)
Z1 axis	
Measuring range:	12mm (with standard stylus) 24mm (with 2X-long stylus)
Resolution:	0.004μm (with standard stylus) 0.008μm (with 2X-long stylus)
Stylus up/down:	Arc movement
Measurement method:	Laser Holescale
Linear displacement accuracy (20°C):	±(0.3+0.02H)μm
Linear displacement accuracy (20°C):	±(0.07+0.02H)μm H = Measured height (mm)
Measuring force:	4mN (with standard stylus) 0.75mN (with 2X-long stylus)
Traceable angle:	60° for ascent, 60° for descent (Depending on the workpiece surface condition)
Stylus tip:	Radius: 5μm, angle: 40°, diamond (ball stylus) (Radius: 0.25mm, sapphire)
Face of stylus:	Downward
Z2 axis (column unit)	
Measuring range:	300mm (500mm: high column type)
Resolution:	0.05μm
Measurement method:	Reflective-type linear encoder
Drive speed:	Max. 200mm/s (in CNC mode) 0 - 50mm/s (in joystick control mode)
Base size (W x D):	750 x 600mm
Base material:	Granite
Dimension (W x D x H):	800 x 620 x 1000mm (800 x 620 x 1200mm: high column type)
Mass:	240kg (250kg: high column type)

*CS-H5000CNC



Refer to the CNC Form Measuring Instrument Series leaflet (E4284) for more details.

Optional Software

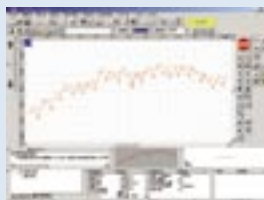
FORMTRACEPAK

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, you can create an original inspection certificate by setting the print format to suit your particular requirements.



Contour Measurement Screen

Surface Roughness Measurement Screen



ASPHERICALPAK

Aspherical lens analysis program



Formtracer CS-5000 Formtracer CS-5000L Joystick Operation Models



SPECIFICATIONS

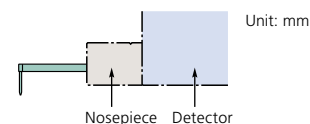
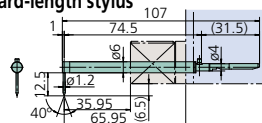
Model No.	CS-5000CNC	CS-5000CNC	CS-5000CNC	CS-5000CNC
Order No. (100V - 120V)	525-721-1	525-722-1	525-723-1	525-724-1
Order No. (200V - 240V)	525-721-2	525-722-2	525-723-2	525-724-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	300mm	300mm	300mm	300mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed

Model No.	CS-5000CNC	CS-5000CNC	CS-5000CNC	CS-5000CNC
Order No. (100V - 120V)	525-741-1	525-742-1*	525-743-1	525-744-1
Order No. (200V - 240V)	525-741-2	525-742-2	525-743-2	525-744-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	500mm	500mm	500mm	500mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed

Model No.	CS-H5000CNC	CS-H5000CNC
Order No. (100V - 120V)	525-761-1	525-763-1
Order No. (200V - 240V)	525-761-2	525-763-2
X1-axis measuring range	200mm	200mm
Z2-axis vertical travel	300mm	300mm
Y-axis table unit	—	Installed
α-axis unit	—	—

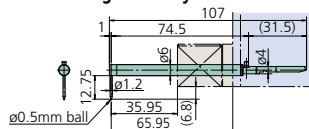
Stylus

12AAD543: Standard-length stylus

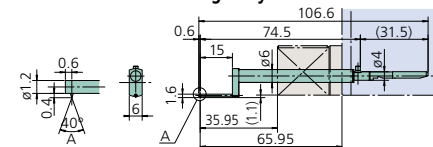


Unit: mm

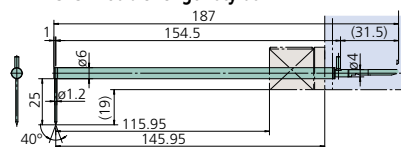
12AAD544: Standard-length ball stylus



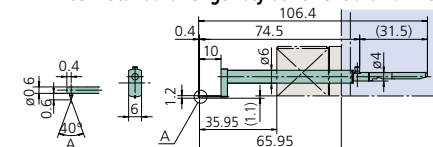
12AAD651: Standard-length stylus for small hole



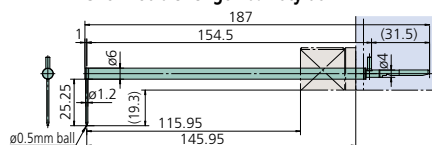
12AAD545: Double-length stylus



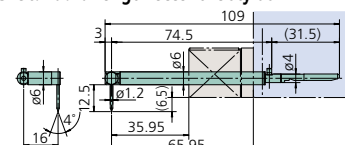
12AAD652: Standard-length stylus for extra-small hole



12AAD546: Double-length ball stylus



12AAD653: Standard-length eccentric stylus

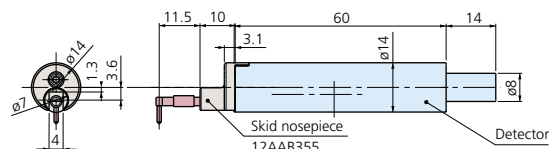


SPECIFICATIONS

Model No.	CS-5000	CS-5000L
Order No. (mm)	525-886*	525-905*
Order No. (inch)	525-896*	525-915*
X1-axis measuring range / resolution	200mm / 6.25nm	200mm / 6.25nm
Z1-axis measuring range / resolution	Standard stylus 6mm / 2nm 2X-long stylus 12mm / 4nm	12mm / 4nm 24mm / 8nm
Z2-axis vertical travel	250mm	250mm
X1-axis Traverse linearity L = Measured length (mm)	Standard stylus (0.05+0.5L/1000)μm 2X-long stylus (0.1+0.5L/1000)μm	(0.1+1.5L/1000)μm (0.2+1.5L/1000)μm
Linear displacement accuracy (20°C) L = Measured length (mm), H = Measured height (mm)	X1-axis ±(0.2+L/1000)μm Z1-axis ±(0.2+1H/100) μm	±(0.2+L/1000)μm ±(0.3+12H/100) μm

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **525-886A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Compatible with SJ-400, SV-2000, SV-3000, SV-3100, SV-3000CNC, SV-M3000CNC, SV-C3100, SV-C4100, SV-C3100CNC, SV-C4100CNC



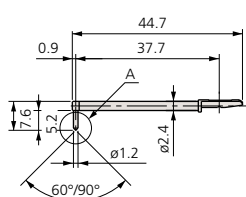
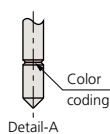
Detector (0.75mN): **178-396-2**
 Detector (4mN): **178-397-2**



Extension rods
(12AAG202: 50mm, 12AAG203: 100mm)

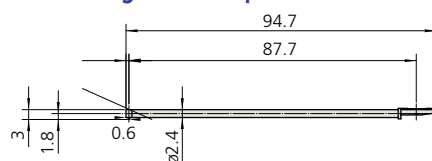
Styli

Standard stylus



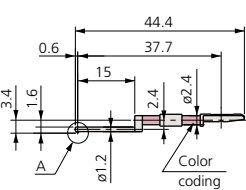
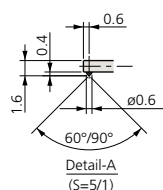
12AAE882 (1 μ m)*
12AAE924 (1 μ m)**
12AAC731 (2 μ m)*
12AAB403 (5 μ m)**
12AAB415 (10 μ m)**
12AAE883 (250 μ m)
(): Tip radius
*Tip angle: 60° **Tip angle: 90°

Double-length for deep hole



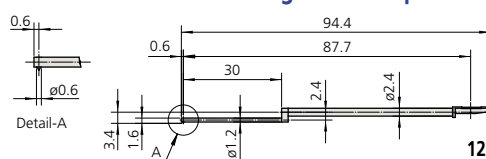
12AAE898 (2μm)*
12AAE914 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For small hole



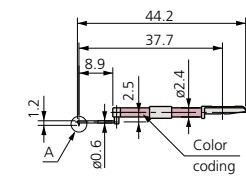
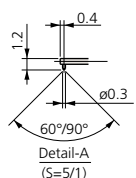
12AAC732 (2μm)*
12AAB404 (5μm)**
12AAB416 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For small hole/Double-length for deep hole



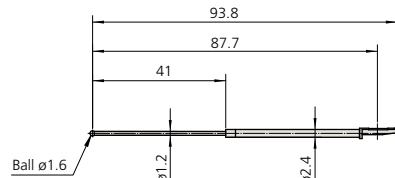
12AAE892 (2μm)*
12AAE908 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For extra small hole



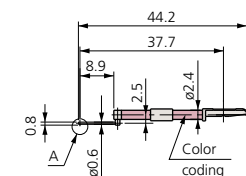
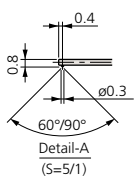
12AAC733 (2 μ m)*
12AAB405 (5 μ m)**
12AAB417 (10 μ m)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For small hole



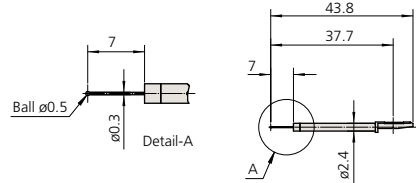
12AAE884 (0.8mm)
(): Tip radius

For extra minute hole



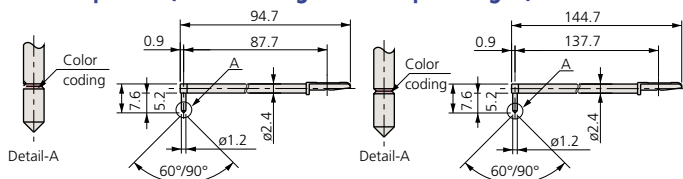
12AAC734 (2 μ m)*
12AAB406 (5 μ m)**
12AAB418 (10 μ m)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For ultra small hole



12AAE885 (0.25mm)
(): Tip radius

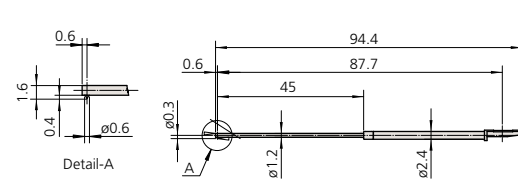
For deep hole (double-length and triple-length)



2X stylus
12AAC740 (2μm)*
12AAB413 (5μm)**
12AAB425 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

3X stylus
12AAC741 (2μm)*
12AAB414 (5μm)**
12AAB426 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For small slotted hole

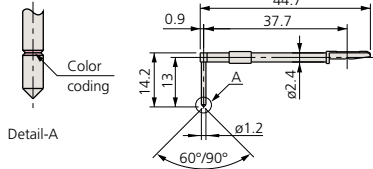


12AAE938 (2μm)*
12AAE940 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

Styli

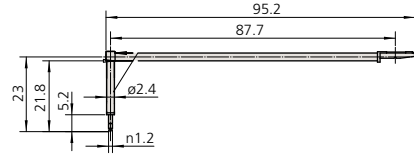
Unit: mm

For deep groove (10mm)



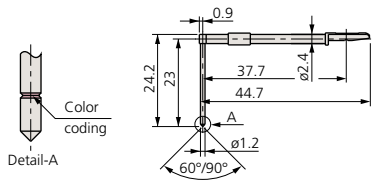
12AAC735 (2μm)*
12AAB409 (5μm)**
12AAB421 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For deep groove (20mm)/Double-length for deep hole



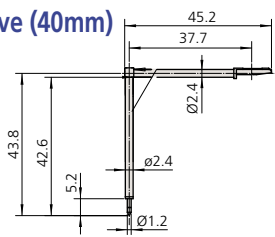
12AAE893 (2μm)*
12AAE909 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For deep groove (20mm)



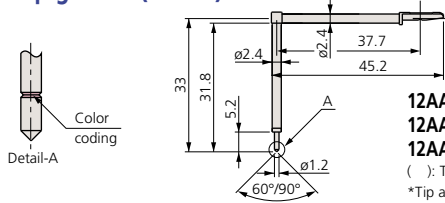
12AAC736 (2μm)*
12AAB408 (5μm)**
12AAB420 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For deep groove (40mm)



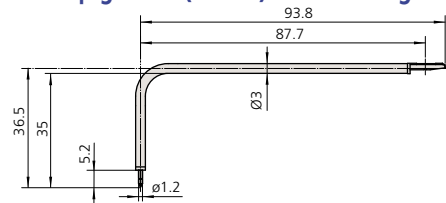
12AAE895 (2μm)*
12AAE911 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For deep groove (30mm)



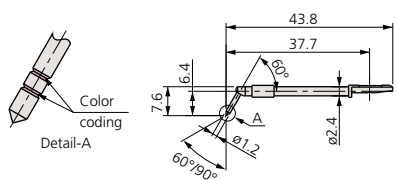
12AAC737 (2μm)*
12AAB407 (5μm)**
12AAB419 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

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



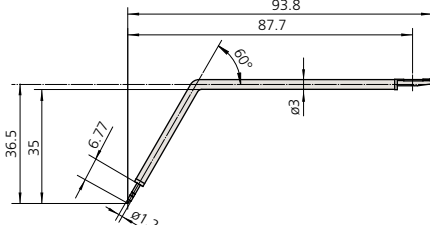
12AAE894 (2μm)*
12AAE910 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For gear tooth



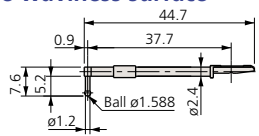
12AAB339 (2μm)*
12AAB410 (5μm)**
12AAB422 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For gear tooth/Double-length for deep hole



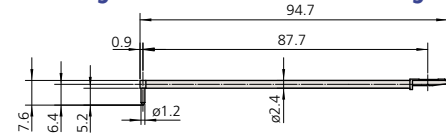
12AAE896 (2μm)*
12AAE912 (5μm)**
 (): Tip radius

For rolling circle waviness surface



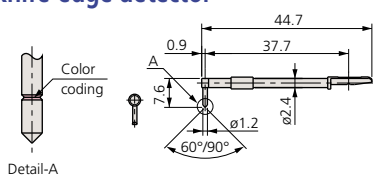
12AAB338 (0.8mm)
 (): Tip radius

For rolling circle waviness/Double-length for deep hole



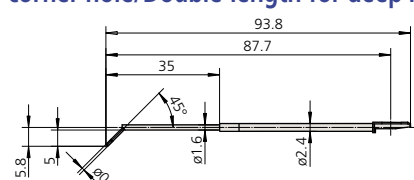
12AAE886 (0.25mm)
 (): Tip radius

For knife-edge detector



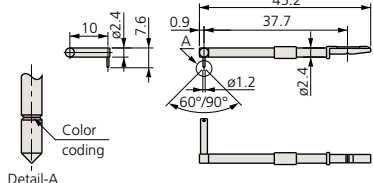
12AAC738 (2μm)*
12AAB411 (5μm)**
12AAB423 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For corner hole/Double-length for deep hole



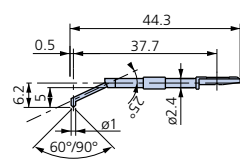
12AAE897 (2μm)*
12AAE913 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For eccentric arm



12AAC739 (2μm)*
12AAB412 (5μm)**
12AAB424 (10μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

For bottom surface



12AAE899 (2μm)*
12AAE915 (5μm)**
 (): Tip radius
 *Tip angle: 60° **Tip angle: 90°

Optional Accessory for Automatic Measurement

Compatible with SV-3100, SV-C3100, SV-C4100, CS-3100 and CNC Models

Y-axis table*: 178-097

Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single measurement surface.

* available as a factory set accessory for CNC model.



Travel range	200mm
Resolution	0.05μm
Positioning accuracy	±3μm
Drive speed	Max. 80mm/s
Maximum load	50kg
Mass	28kg

θ2-axis table: 178-078*

You can measure multiple points on a cylindrical workpiece and automate front/rear-side measurement.

* θ2-axis mounting plate (12AAE718) is required when directly installing on the base of the SV-3100.



Inclination adjustment angle	±2°
Maximum load	7kg
Table dimensions	130 x 100mm
Mass	3.5kg

Quick chuck: 211-032

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

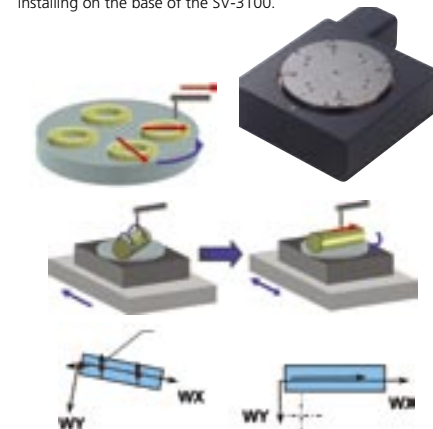


Retention range	Inner latch	OD: ø1 - ø36mm
	Inner latch	ID: ø14 - ø70mm
	Outer latch	OD: ø1 - ø75mm
Dimensions		ø118 x 41mm
Mass		1.2kg

θ1-axis table: 12AAD975*

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.

* θ1-axis mounting plate (12AAE630) is required when directly installing on the base of the SV-3100.



Displacement	360°
Resolution	0.004°
Maximum load	12kg
Rotational speed	Max. 10°/s
Mass	7kg

Auto-leveling table: 178-087

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.



Displacement	360°
Resolution	0.0072°
Maximum load (loading moment)	4kg (343 N•cm or less)
Rotational speed	Max. 18°/s
Mass	5kg

Micro-chuck: 211-031

This chuck is suitable for clamping extra-small diameter workpieces (ø1mm or less), which cannot be retained with the centering chuck.



Retention range	OD: ø0 - ø1.5mm
Dimensions	ø118 x 48.5mm
Mass	0.6kg

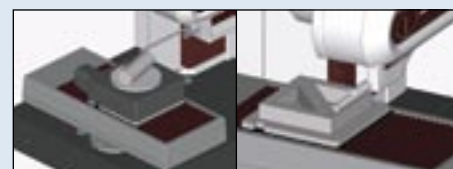
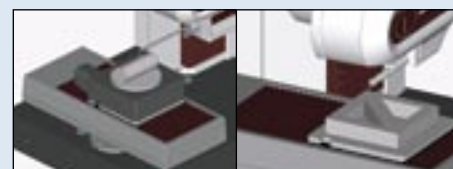
Examples of optimal combinations of accessories for CNC models

Optional accessory	Y-axis Table	θ1 Table	θ2 Table
Function			
Automatic leveling	—	—	—
Automatic alignment (Patent registered: Japan)	●	●	—
Multiple workpiece batch measurement	▲	—	—
Measurement in the Y-axis direction	●	—	—
Oblique measurement of XY plane **	●	—	—
Outside 3D surface roughness measurement/evaluation **	●	—	—
Multiple-piece measurement in the Y-axis direction (Positioning in the Y-axis direction)	●	—	—
Multiple-piece measurement in the radius direction (Positioning in the rotating direction of XY plane)	▲	●	—
Tracking measurement in the Z-axis direction *	—	—	—
Inclined surface measurement in the X-axis direction	▲	—	—
Inclined hole inside measurement in the X-axis direction	▲	—	—
Multiple cylinder generatrix line measurement	▲	—	●
Measurement of both top and bottom surfaces	▲	—	●
Rotary positioning of large workpiece ***	—	—	—
Upward/downward and frontward/backward measurement of large workpiece ***	—	—	—

* : Applicable only to form/contour measurement

** : Applicable only to surface roughness measurement

*** : Applicable only for SV-M3000CNC

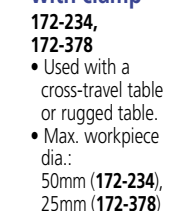


Compatible with Desktop Models of Surftest and Formtracer

This table helps 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 Digimatic micrometers are adjusted accordingly. A flat-surfaced workpiece can also be leveled with this table.



●: Essential ▲: Better to provide with
—: Not necessary



Contracer CV-1000 / CV-2000

SERIES 218 — Contour Measuring Instruments

FEATURES

- The digital arc scale is equipped in the Z-axis detecting unit. This gives you a wider range of measurement with higher resolution. No more reliance on measurement magnifications.
- A data analysis system (personal computer system and software of Formpak-1000) and an XY plotter are available.



The CV-1000 is portable and can be carried to the machine-shop for measurement of large workpieces. Even at a site where a power source may not be nearby, the CV-1000 can work with the optional display unit (built-in rechargeable battery).

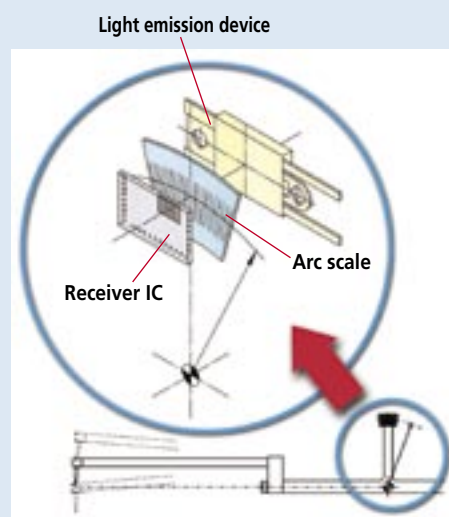


Technical Data

X1-axis	
Measuring range:	50mm (CV-1000) or 100mm (CV-2000)
Resolution:	0.2μm
Measurement method:	Reflective-type linear encoder
Drive speed:	0.2, 1mm/s and manual
Measuring speed:	0.2, 0.5mm/s
Measuring direction:	Backward
Traverse linearity:	3.5μm/50mm (CV-1000), 3.5μm/100mm (CV-2000) *with the X axis in horizontal orientation
Linear displacement:	±(3.5+2L/100)μm * L = Drive length (mm)
Inclining range:	±45° (CV-2000)
Z2-axis (column, CV-2000 only)	
Column type:	Power drive (S4 type) or Manual (M4 type)
Vertical travel:	250mm (S4 type), 320mm (M4 type)
Resolution:	0.2μm (S4 type)
Measurement method:	ABSOLUTE linear encoder (S4 type)
Drive speed:	0 - 5mm/s and manual

Z1-axis (detector unit)	
Measuring range:	25mm (CV-1000) or 40mm (CV-2000)
Resolution:	0.4μm (CV-1000) or 0.5μm (CV-2000)
Measurement method:	Arc encoder
Linear displacement:	±(3.5+14H/25)μm accuracy (at 20°C) *H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Downward
Measuring force:	10 - 30mN
Traceable angle:	Ascent: 77°, descent: 87° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 25μm, carbide tip
Base size (W x H):	750 x 600mm (CV-2000)
Base material:	Granite (CV-2000)
Mass:	5kg (CV-1000N2), 115.8kg (CV-2000M4), 124kg (CV-2000S4)
Power supply:	100 - 240VAC ±10%, 50/60Hz
Power consumption:	150W (main unit only)

Arc scale on the Z-axis



Optional Accessory

- 12AAA841:** RAM card
218-341*: Display unit
218-024: Column stand for CV-1000
 (vertical travel: 250mm, inclination: $\pm 45^\circ$)
218-001: Cross-travel table (XY range: 100 x 50mm)
218-011: Cross-travel table (XY range: 4" x 2")
218-041: Cross-travel table (XY range: 50 x 25mm)
218-051: Cross-travel table (XY range: 2" x 1")
218-002: Rugged table
176-107: Holder with clamp
218-003: Rotary vise (heavy-duty type)
172-144: Rotary vise
172-234: V-block with clamp
 (Max. workpiece dia.: 50mm)
172-378: V-block with clamp
 (Max. workpiece dia.: 25mm)
172-197: Swivel center support
172-142: Center support
172-143: Center support riser
178-023: Vibration isolator
178-024: Vibration isolator stand
998862: Pin gage unit for calibration (mm)
998861: Pin gage unit for calibration (inch)
 _____: Arms and styli (See page 410.)

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **218-341A**):
A for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

Display Unit and XY Plotter



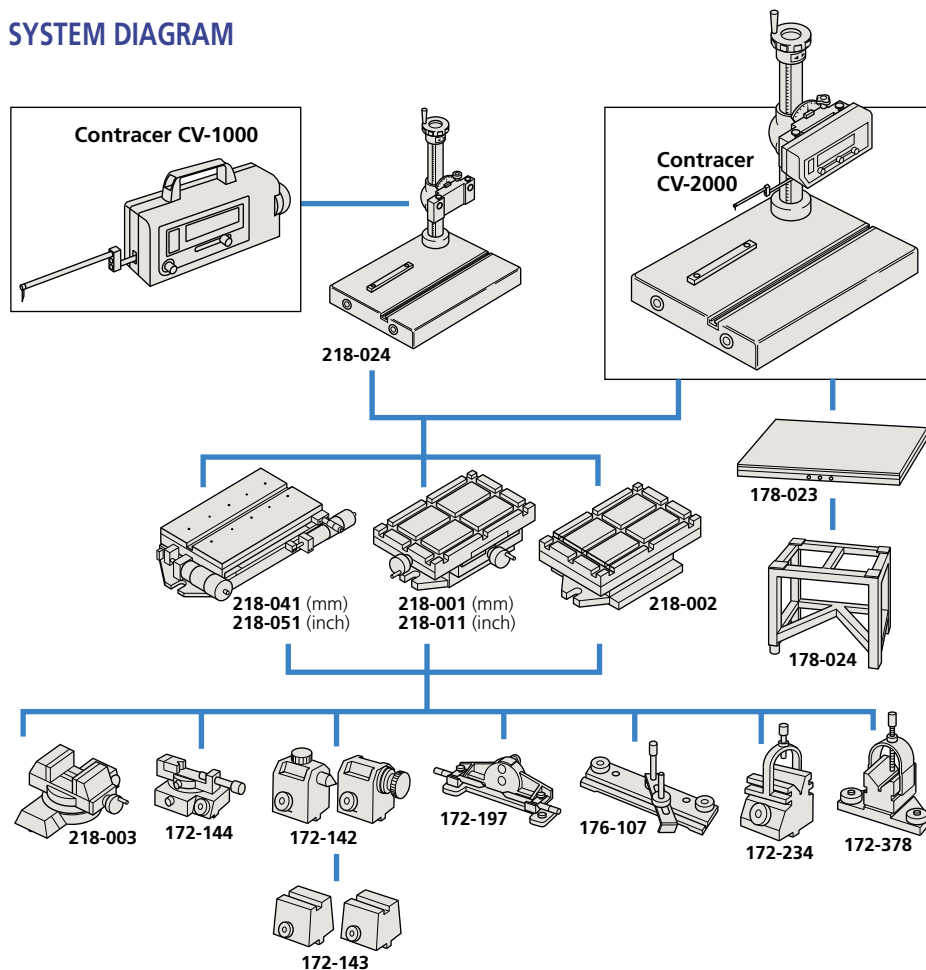
Icons and graphics on the LCD and touch panel make it easy for anyone — even a novice — to perform key analysis operations. The contour profile can be confirmed with the display unit prior to output to an XY plotter. Contour measurement data can be stored on optional RAM cards and read into the personal computer.

SPECIFICATIONS

Model No.	CV-1000N2	CV-2000M4	CV-2000S4
Order No. (mm)	218-611*	218-631*	525-724-1*
Order No. (inch)	218-621*	218-641*	525-724-2*
X1-axis measuring range	50mm	100mm	100mm
Z1-axis measuring range	25mm	40mm	40mm
Z2-axis vertical travel	—	250mm	320mm

*To denote your AC line voltage add the following suffixes to the order No. (e.g.: **218-611A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

SYSTEM DIAGRAM



Contracer CV-3100 / CV-4100

SERIES 218 — Contour Measuring Instruments



CV-3100S4 with personal computer system and software

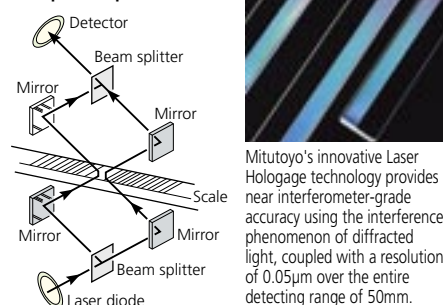
FEATURES

- Dramatically increased drive speed (X axis: 80 mm/s, Z2 axis: 20 mm/s) further reduces total measurement time.
- In order to maintain the traverse linearity specification for an extended period of time, Mitutoyo has adopted highly rigid ceramic guides that combine the characteristics of smallest secular change and remarkable resistance to abrasion.
- With the support for a wide range of optional peripherals designed for use with the CNC models enables simplified CNC measurement.
- The drive unit (X-axis) and column (Z2-axis) are equipped with a high-accuracy linear encoders (ABS type on Z2-axis). This improves reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurement of parts which are difficult to position.
- X axis accuracy: $\pm(0.8+0.01L)\mu\text{m}$
Z1 axis accuracy: $\pm(0.8+10.5H/25)\mu\text{m}^*$
Designed to handle workpieces calling for high accuracy.

*CV-4100S4, H4, W4 types,
L = Drive length, H = Measurement height (mm)

- The drive unit of CV-4100 series is equipped with a Laser Hologage detector giving excellent narrow/wide range accuracy and resolution in the Z axis (vertical).

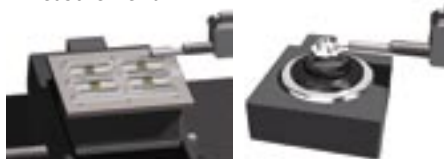
Principle of Operation



Mitutoyo's innovative Laser Hologage technology provides near interferometer-grade accuracy using the interference phenomenon of diffracted light, coupled with a resolution of 0.05μm over the entire detecting range of 50mm.

Automatic Measuring Function

- With the support for a wide range of optional peripherals designed for use with the CNC models enables automatic measurement.



Using Y-axis Table

Using Rotary Table θ1



Using Rotary Table θ2

Technical Data

X-axis	
Measuring range:	100mm or 200mm
Resolution:	0.05μm
Measurement method:	Reflective-type linear encoder
Drive speed:	80mm/s and manual
Measuring speed:	0.02 - 5mm/s
Measuring direction:	Forward/backward
Traverse linearity:	0.8μm/100mm, 2μm/200mm *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C)	$\pm(1+0.01L)\mu\text{m}$ (CV-3100S4, H4, W4) $\pm(0.8+0.01L)\mu\text{m}$ (CV-4100S4, H4, W4) $\pm(1+0.02L)\mu\text{m}$ (CV-3100S8, H8, W8) $\pm(0.8+0.02L)\mu\text{m}$ (CV-4100S8, H8, W8) * L = Drive length (mm)
Inclining range:	$\pm 45^\circ$

Z2-axis (column)	
Vertical travel:	300mm or 500mm
Resolution:	1μm
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 20mm/s and manual
Z1-axis (detector unit)	
Measuring range:	$\pm 25\text{mm}$
Resolution:	0.2μm (CV-3100 series), 0.05μm (CV-4100 series)
Measurement method:	Linear encoder (CV-3100 series), laser hologage (CV-4100 series)
Linear displacement accuracy (at 20°C)	$\pm(3+18H/100)\mu\text{m}$ (CV-3100 series) $\pm(0.8+12H/100)\mu\text{m}$ (CV-4100 series) *H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Upward/downward
Measuring force:	30mN
Traceable angle:	Ascent: 77°, descent: 87° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	
Base size (W x H):	Radius: 25μm, carbide tip
Base material:	750 x 600mm or 1000 x 450mm Granite or cast iron
Mass	
Main unit:	140kg (S4), 150kg (H4), 155kg (W4) 145kg (S8), 155kg (H8), 160kg (W8)
Controller Unit:	14kg
Remote Control Box:	0.9kg
Power supply:	100 - 240VAC $\pm 10\%$, 50/60Hz
Power consumption:	400W (main unit only)

Collective Calibration Function

- A dedicated calibration gage enables the user to calibrate the instrument for Z-axis gain, symmetry, stylus-tip radius, etc, in a single procedure.



MICAT

Mitutoyo Intelligent Computer Aided Technology

the standard in world
metrology software
FORM

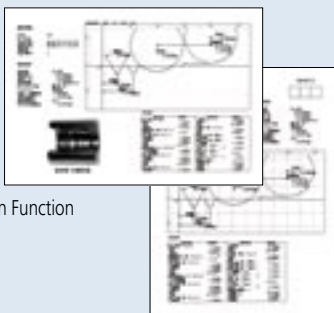
Optional Software FORMPAK-1000



Measurement
Control Screen



Profile Analysis
Screen

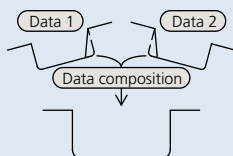


Report Creation Function

Automatic Circle/Line Application Function



Data Composition Function



Refer to the Contracer CV-3100 / 4100 Series
leaflet (E4293) for more details.

SPECIFICATIONS

Model No.	CV-3100S4	CV-3100H4	CV-3100W4
Order No. (mm)	218-421*	218-422*	218-423*
Order No. (inch)	218-431*	218-432*	218-433*
Model No.	CV-4100S4	CV-4100H4	CV-4100W4
Order No. (mm)	218-461*	218-462*	218-463*
Order No. (inch)	218-471*	218-472*	218-473*
X1-axis measuring range	100mm	100mm	100mm
Vertical travel	300mm power column	500mm power column	500mm power column
Granite base size (WxD)	600 x 450mm	600 x 450mm	1000 x 450mm
Dimensions (main unit, WxDxH)	741 x 450 x 905mm	741 x 450 x 1105mm	1118 x 450 x 1111mm
Mass (main unit)	140kg	150kg	155kg

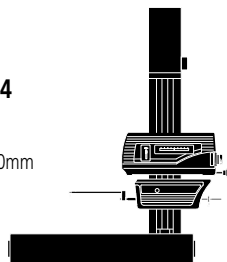
Model No.	CV-3100S8	CV-3100H8	CV-3100W8
Order No. (mm)	218-426-1*	218-427-1*	218-428-1*
Order No. (inch)	218-436-1*	218-437-1*	218-438-1*
Model No.	CV-4100S8	CV-4100H8	CV-4100W8
Order No. (mm)	218-466-1*	218-467-1*	218-468-1*
Order No. (inch)	218-476-1*	218-477-1*	218-478-1*
X1-axis measuring range	200mm	200mm	200mm
Vertical travel	300mm power column	500mm power column	500mm power column
Granite base size (WxD)	600 x 450mm	600 x 450mm	1000 x 450mm
Dimensions (main unit, WxDxH)	741 x 450 x 905mm	767 x 450 x 1105mm	1144 x 450 x 1111mm
Mass (main unit)	145kg	155kg	160kg

* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **218-421A**):
A for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

A variety of models available for measuring requirements

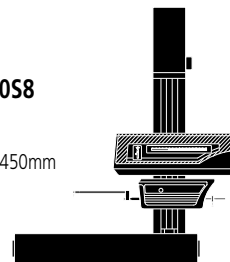
CV-3100S4 / CV-4100S4

Traverse range: 100mm
Vertical travel: 300mm
Base size (W x D): 600 x 450mm
Base material: Granite



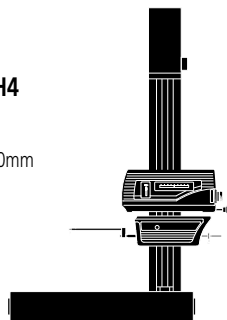
CV-3100S8 / CV-4100S8

Traverse range: 200mm
Vertical travel: 300mm
Base size (W x D): 600 x 450mm
Base material: Granite



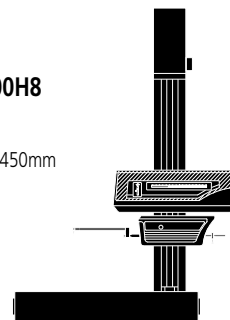
CV-3100H4 / CV-4100H4

Traverse range: 100mm
Vertical travel: 500mm
Base size (W x D): 600 x 450mm
Base material: Granite



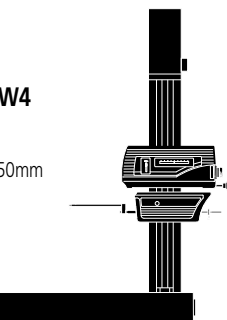
CV-3100H8 / CV-4100H8

Traverse range: 200mm
Vertical travel: 500mm
Base size (W x D): 600 x 450mm
Base material: Granite



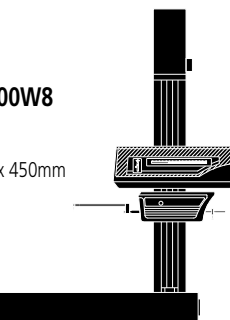
CV-3100W4 / CV-4100W4

Traverse range: 100mm
Vertical travel: 500mm
Base size (W x D): 1000 x 450mm
Base material: Granite



CV-3100W8 / CV-4100W8

Traverse range: 200mm
Vertical travel: 500mm
Base size (W x D): 1000 x 450mm
Base material: Granite



Contracer Extreme CV-3000CNC / CV-4000CNC

SERIES 218 — CNC Contour Measuring Instruments

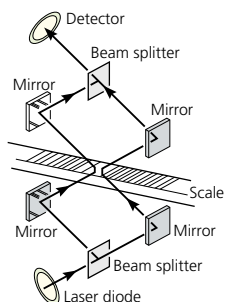


CV-3000CNC with personal computer system and software

FEATURES

- High-accuracy CNC contour / form measuring instrument.
- X1, (Y), and Z2 axes have a maximum drive speed of 200 mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile / multiple-workpiece measurement tasks.
- For models with the α axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X1 axis.
- The drive unit of CV-4000CNC series is equipped with a Laser Hologage detector giving excellent narrow/wide range accuracy and resolution in the Z axis (vertical).
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- Enables inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or jig.
- Supplied with an easy-to-operate Remote Box, on which the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Communication with the Data Processing / Analysis section is via USB.

Principle of Operation



Mitutoyo's innovative Laser Hologage technology provides near interferometer-grade accuracy using the interference phenomenon of diffracted light, coupled with a resolution of $0.05\mu\text{m}$ over the entire detecting range of 50mm.

Technical Data

X1-axis	
Measuring range:	200mm
Resolution:	$0.05\mu\text{m}$
Measurement method:	Reflective-type linear encoder
Drive speed:	Max. 200mm/s (CNC) 0 - 50mm/s (joystick)
Measuring speed:	0.02 - 2mm/s
Measuring direction:	Forward/backward
Traverse linearity:	$2\mu\text{m}/200\text{mm}$ *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C):	$\pm(1+4L/200)\mu\text{m}$, * L = Drive length (mm)
α-axis	
Inclination angle:	-45° to $+10^\circ$
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	300mm or 500mm
Resolution:	$0.05\mu\text{m}$
Measurement method:	Reflective-type linear encoder
Drive speed:	Max. 200mm/s (CNC) 0 - 50mm/s (joystick)
Z1-axis (detector unit)	
Measuring range:	$\pm 25\text{mm}$
Resolution:	$0.2\mu\text{m}$ (CV-3000CNC), $0.05\mu\text{m}$ (CV-4000CNC)
Measurement method:	Linear encoder (CV-3000CNC), laser hologage (CV-40100CNC)
Linear displacement accuracy (at 20°C):	$\pm(3+12H/25)\mu\text{m}$ (CV-3000CNC) $\pm(0.8+10.5H/25)\mu\text{m}$ (CV-4000CNC) *H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Upward/downward
Measuring force:	30mN
Traceable angle:	Ascent: 70° , descent: 70° (using the standard stylus provided and depending on the surface roughness)
Stylus tip:	Radius: $25\mu\text{m}$, carbide tip
Base size (W x H):	750 x 600mm
Base material:	Granite
Mass:	240kg, 250kg (high column type)
Power supply:	100 - 240VAC $\pm 10\%$, 50/60Hz
Power consumption:	400W (main unit only)

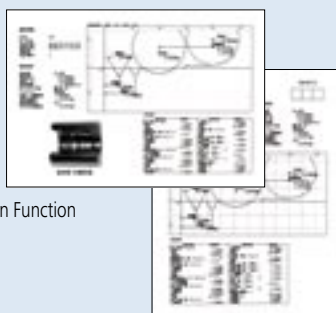
Optional Software FORMPAK-1000



Measurement
Control Screen



Profile Analysis
Screen

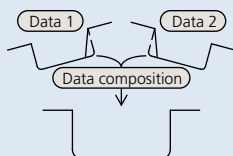


Report Creation Function

Automatic Circle/Line Application Function



Data Composition Function



Refer to the CNC Form Measuring Instrument Series leaflet (E4284) for more details.

SPECIFICATIONS

Model No.	CV-3000CNC	CV-3000CNC	CV-3000CNC	CV-3000CNC
Order No. (100V - 120V)	218-521-1	218-522-1	218-523-1	218-524-1
Order No. (200V - 240V)	218-521-2	218-522-2	218-523-2	218-524-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	300mm	300mm	300mm	300mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm
Mass (main unit)	240kg	240kg	240kg	240kg

Model No.	CV-3000CNC	CV-3000CNC	CV-3000CNC	CV-3000CNC
Order No. (100V - 120V)	218-541-1	218-542-1	218-543-1	218-544-1
Order No. (200V - 240V)	218-541-2	218-542-2	218-543-2	218-544-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	500mm	500mm	500mm	500mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm
Mass (main unit)	250kg	250kg	250kg	250kg

Model No.	CV-4000CNC	CV-4000CNC	CV-4000CNC	CV-4000CNC
Order No. (100V - 120V)	218-561-1	218-562-1	218-563-1	218-564-1
Order No. (200V - 240V)	218-561-2	218-562-2	218-563-2	218-564-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	300mm	300mm	300mm	300mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm	800 x 620 x 1000mm
Mass (main unit)	240kg	240kg	240kg	240kg

Model No.	CV-4000CNC	CV-4000CNC	CV-4000CNC	CV-4000CNC
Order No. (100V - 120V)	218-581-1	218-582-1	218-583-1	218-584-1
Order No. (200V - 240V)	218-581-2	218-582-2	218-583-2	218-584-2
X1-axis measuring range	200mm	200mm	200mm	200mm
Z2-axis vertical travel	500mm	500mm	500mm	500mm
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	750 x 600mm	750 x 600mm	750 x 600mm	750 x 600mm
Dimensions (main unit, WxDxH)	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm	800 x 620 x 1200mm
Mass (main unit)	250kg	250kg	250kg	250kg

Optional Accessory

Vibration insulating stand

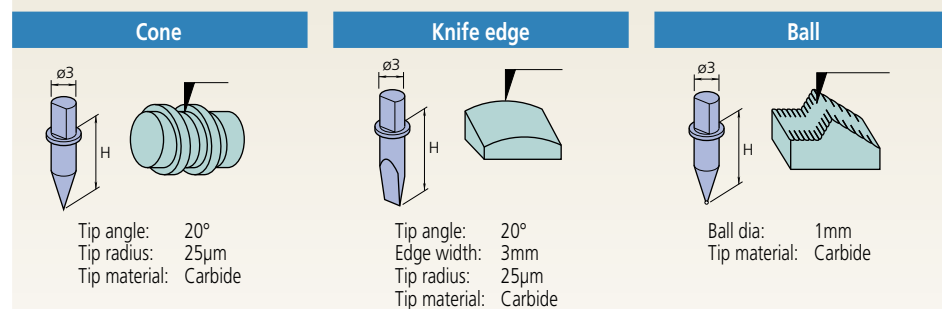
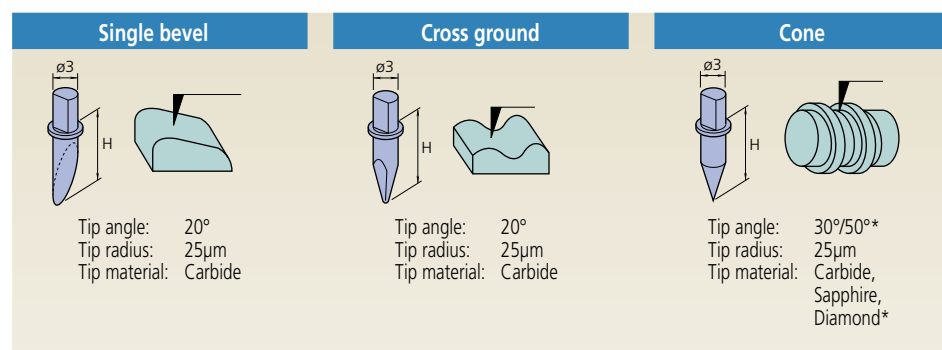
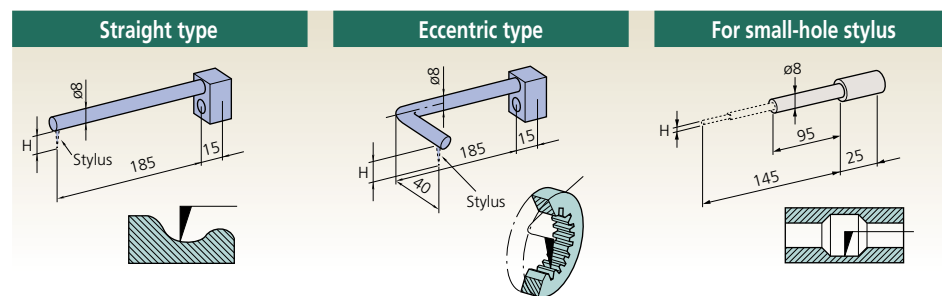
Vibration insulating mechanism: Diaphragm air spring
 Natural frequency : 2.5 - 3.5Hz
 Damping mechanism: Orifice
 Leveling mechanism: Automatic control with mechanical valves
 Air supply pressure: 390kPa
 Allowable loading capacity: 350kg
 Dimensions (W x D x H): 1000 x 895 x 715mm
 Mass: 280kg

Y-axis table unit

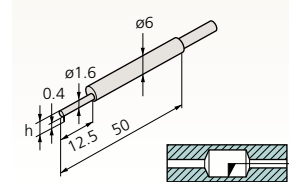
Measuring range: 200mm
 Minimum reading : 0.05μm
 Scale unit: Reflective-type Linear Encoder
 Drive speed: Max. 200mm/s (CNC)
 0 - 50mm/s (joystick)
 Maximum loading capacity: 20 kg
 Traverse linearity: 0.5μm/200mm (surface roughness)
 2μm/200mm (contour)
 Linear displacement accuracy (at 20°C):
 ± (2+2L/100) μm, contour mode
 L: Dimension between two measured points (mm)
 Table size: 200 x 200mm
 Dimensions (W x D x H): 320 x 646 x 105mm
 Mass: 35kg

Optional Arms and Styli for Contour Measurement

For CV-1000 and CV-2000

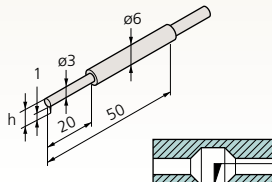


Small hole: 932693 / 12AAE873



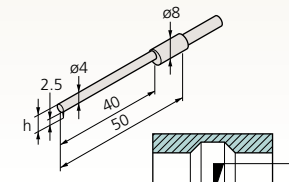
932693 **12AAE873**
 Tip shape: Single bevel Cone
 Tip angle: 20° 30°
 Tip radius: 25 μ m 25 μ m
 Tip material: Carbide Carbide

Small hole: 932694 / 12AAE874



932694 **12AAE874**
 Tip shape: Single bevel Cone
 Tip angle: 20° 30°
 Tip radius: 25 μ m 25 μ m
 Tip material: Carbide Carbide

Small hole: 932695 / 12AAE875



932695 **12AAE875**
 Tip shape: Single bevel Cone
 Tip angle: 20° 30°
 Tip radius: 25 μ m 25 μ m
 Tip material: Carbide Carbide

List of Applicable Arms

Arm name	Order No.	Compatible stylus height
Straight type	935111	H = 6mm
	935112	H = 12mm
	935113	H = 20mm
	935114	H = 30mm
	935115	H = 42mm
Eccentric type	935116	H = 6mm
	935117	H = 12mm
	935118	H = 20mm
	935119	H = 30mm
	935120	H = 42mm
Small hole	935110	H = 0.4, 1, 2.5mm

List of Applicable Styli

Stylus name	Order No.	Stylus height
Single-bevel stylus carbide-tipped	354882	H = 6mm
	354883	H = 12mm
	354884	H = 20mm
	354885	H = 30mm
	354886	H = 42mm
Cross-ground stylus carbide-tipped	354887	H = 6mm
	354888	H = 12mm
	354889	H = 20mm
	354890	H = 30mm
	354891	H = 42mm
Cone stylus carbide-tipped tip angle 20°	12AAE865	H = 6mm
	12AAE866	H = 12mm
	12AAE867	H = 20mm
	12AAE868	H = 30mm
	12AAE869	H = 42mm
Cone stylus sapphire tipped tip angle 30° *Diamond tipped *tip angle 50°	354892	H = 6mm
	354893	H = 12mm
	354894	H = 20mm
	355129*	H = 20mm
	354895	H = 30mm
Cone stylus carbide-tipped tip angle 30°	354896	H = 42mm
	12AAA566	H = 6mm
	12AAA567	H = 12mm
	12AAA568	H = 20mm
	12AAA569	H = 30mm
Knife-edge stylus carbide-tipped	12AAA570	H = 42mm
	354897	H = 6mm
	354898	H = 12mm
	354899	H = 20mm
	354900	H = 30mm
Ball stylus carbide-tipped	354901	H = 42mm
	354902	H = 6mm
	354903	H = 12mm
	354904	H = 20mm
	354905	H = 30mm
Small-hole stylus carbide-tipped one-sided cut	354906	H = 42mm
	932693	H = 2mm
	932694	H = 4mm
Small-hole stylus carbide-tipped cone	932695	H = 6.5mm
	12AAE873	H = 2mm
	12AAE874	H = 4mm
	12AAE875	H = 6.5mm

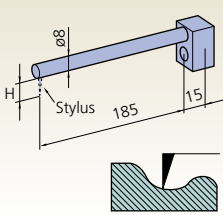
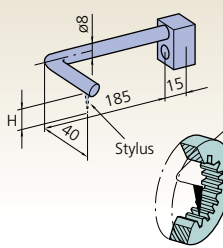
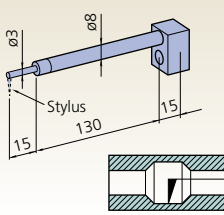
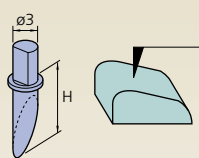
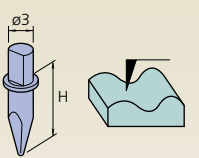
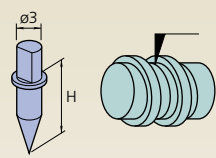
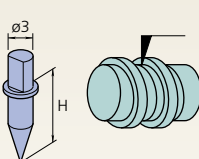
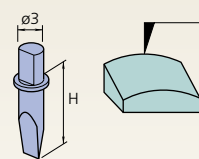
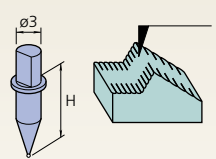
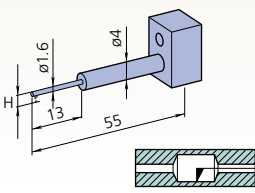
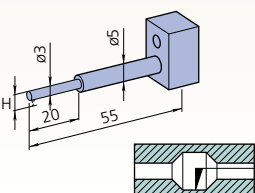
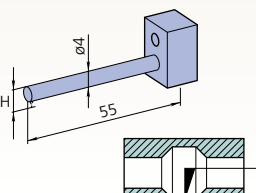
List of Applicable Arms

Arm name	Order No.	Compatible stylus height
Straight type	12AAE294	H = 6mm
	12AAE295	H = 12mm
	996506	H = 20mm
	996507	H = 30mm
	996508	H = 42mm
Eccentric type	996509	H = 6mm
	996510	H = 12mm
	996511	H = 20mm
	996512	H = 30mm
	996513	H = 42mm
Small hole	12AAE296	Small-hole stylus

List of Applicable Styli

Stylus name	Order No.	Stylus height
Single-bevel stylus carbide-tipped	354882	H = 6mm
	354883	H = 12mm
	354884	H = 20mm
	354885	H = 30mm
	354886	H = 42mm
Cross-ground stylus carbide-tipped	354887	H = 6mm
	354888	H = 12mm
	354889	H = 20mm
	354890	H = 30mm
	354891	H = 42mm
Cone stylus carbide-tipped tip angle 20°	12AAE865	H = 6mm
	12AAE866	H = 12mm
	12AAE867	H = 20mm
	12AAE868	H = 30mm
	12AAE869	H = 42mm
Cone stylus sapphire tipped tip angle 30° *Diamond tipped *tip angle 50°	354892	H = 6mm
	354893	H = 12mm
	354894	H = 20mm
	355129*	H = 20mm
	354895	H = 30mm
Cone stylus carbide-tipped tip angle 30°	354896	H = 42mm
	12AAA566	H = 6mm
	12AAA567	H = 12mm
	12AAA568	H = 20mm
	12AAA569	H = 30mm
Knife-edge stylus carbide-tipped	12AAA570	H = 42mm
	354897	H = 6mm
	354898	H = 12mm
	354899	H = 20mm
	354900	H = 30mm
Ball stylus carbide-tipped	354901	H = 42mm
	354902	H = 6mm
	354903	H = 12mm
	354904	H = 20mm
	354905	H = 30mm
Small-hole stylus carbide-tipped one-sided cut	354906	H = 42mm
	12AAE297	H = 2mm
	12AAE298	H = 4mm
	12AAE299	H = 6.5mm

For CV-3100, CV-4100, CV-3000CNC, CV-4000CNC, SV-C3100, SV-C4100, SV-C3000CNC and SV-C4000CNC

Straight type	Eccentric type	For small-hole stylus
		
Single bevel	Cross ground	Cone
 Tip angle: 20° Tip radius: 25µm Tip material: Carbide	 Tip angle: 20° Tip radius: 25µm Tip material: Carbide	 Tip angle: 30°/50°* Tip radius: 25µm Tip material: Carbide, Sapphire, Diamond*
Cone	Knife edge	Ball
 Tip angle: 20° Tip radius: 25µm Tip material: Carbide	 Tip angle: 20° Edge width: 3mm Tip radius: 25µm Tip material: Carbide	 Ball dia: 1mm Tip material: Carbide
Small hole: 12AAE297	Small hole: 12AAE298	Small hole: 12AAE299
 Tip shape: Single bevel Tip angle: 20° Tip radius: 25µm Tip material: Carbide	 Tip shape: Single bevel Tip angle: 20° Tip radius: 25µm Tip material: Carbide	 Tip shape: Single bevel Tip angle: 20° Tip radius: 25µm Tip material: Carbide

• Any specified arm and stylus other than above listed can be custom-made to special order.

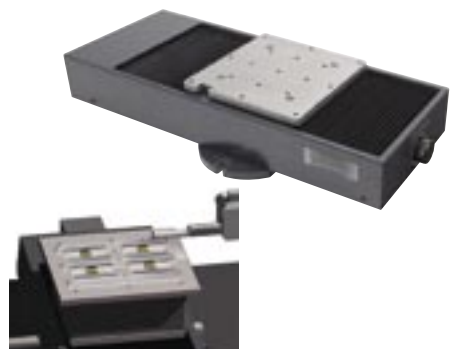
Optional Accessory for Automatic Measurement

Compatible with CV-3100, CV-4100 and CNC Models

Y-axis table*: 178-097

Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single measurement surface.

* available as a factory set accessory for CNC model.

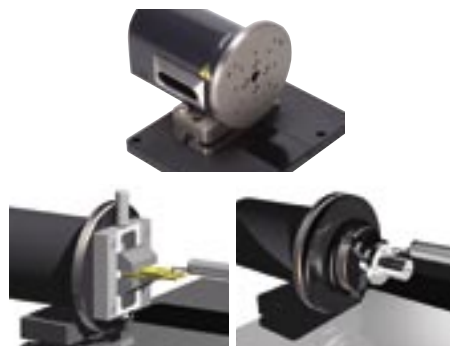


Travel range	200mm
Resolution	0.05μm
Positioning accuracy	±3μm
Drive speed	Max. 80mm/s
Maximum load	50kg
Mass	28kg

θ2-axis table: 178-078*

You can measure multiple points on a cylindrical workpiece and automate front/rear-side measurement.

*θ2-axis mounting plate (12AAE718) is required when directly installing on the base of the SV-3100.

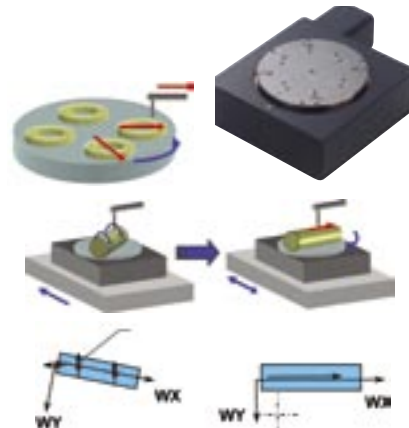


Inclination adjustment angle	±2°
Maximum load	7kg
Table dimensions	130 x 100mm
Mass	3.5kg

θ1-axis table: 12AAD975*

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.

*θ1-axis mounting plate (12AAE630) is required when directly installing on the base of the SV-3100.



Displacement	360°
Resolution	0.004°
Maximum load	12kg
Rotational speed	Max. 10°/s
Mass	7kg

Quick chuck: 211-032

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



Retention range	Inner latch	OD: ø1 - ø36mm
	Inner latch	ID: ø14 - ø70mm
	Outer latch	OD: ø1 - ø75mm
Dimensions	ø118 x 41mm	
Mass	1.2kg	

Micro-chuck: 211-031

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

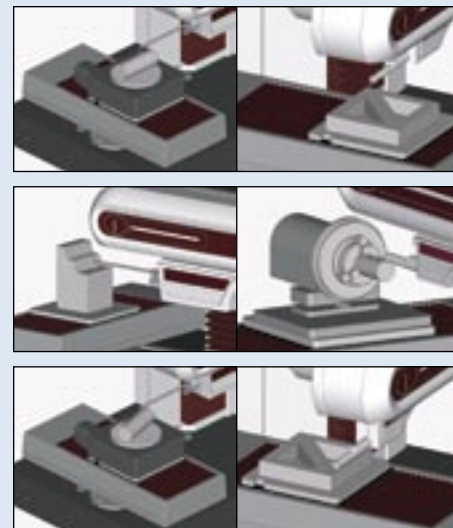


Retention range	OD: ø0 - ø1.5mm
Dimensions	ø118 x 48.5mm
Mass	0.6kg

Examples of optimal combinations of accessories for CNC models




Optional accessory	Y-axis Table	θ1 Table	θ2 Table
Function			
Automatic alignment (Patented : Japan)	●	●	—
Multiple workpiece batch measurement	▲	—	—
Multiple-piece measurement in the Y-axis direction (Positioning in the Y-axis direction)	●	—	—
Multiple-piece measurement in the radius direction (Positioning in the rotating direction of XY plane)	▲	●	—
Tracking measurement in the Z-axis direction *	—	—	—
Inclined surface measurement in the X-axis direction	▲	—	—
Inclined hole inside measurement in the X-axis direction	▲	—	—
Multiple cylinder generatrix line measurement	▲	—	●
Measurement of both top and bottom surfaces	▲	—	●
Rotary positioning of large workpiece **	—	—	—
Upward/downward and frontward/backward measurement of large workpiece **	—	—	—

* : Applicable only to form/contour measurement
** : Applicable only for SV-M3000CNC

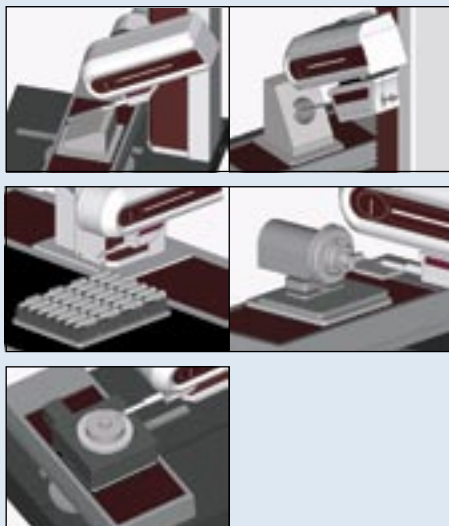


Optional Accessory for Contracer / Formtracer

Compatible with Desktop Models of Contracer and Formtracer

Drive unit tilting function (Patent pending: Japan)	Large θ Table	Rotary-type detector holder
		
▲	—	—
—	—	—
—	—	—
—	—	—
—	—	—
●	—	—
●	—	—
—	—	—
—	●	—
—	—	●

●: Essential ▲: Better to provide with
—: Not necessary



Cross-travel table

- Table top: 280 x 180mm
- XY travel: 100 x 50mm



218-001 (mm)
218-011 (inch)

- Table top: 280 x 152mm
- XY travel: 50 x 25mm



218-041 (mm)
218-051 (inch)

Rotary vise

- Two-slide jaw type.
- Max. workpiece size: $\phi 60$ mm
- Minimum reading: 1°



218-003

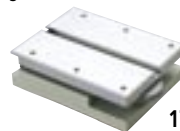
- One-slide jaw type.
- Max. workpiece size: $\phi 60$ mm
- Minimum reading: 5°



172-144

Leveling table

- Table top: 130 x 100mm
- Leveling range: $\pm 1.5^\circ$
- Height: 40mm



178-016

V-block with clamp

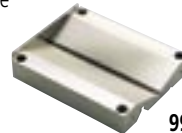
- Used with a cross-travel table or rugged table.
- Max. workpiece diameter: 50mm
- Max. workpiece diameter: 25mm



172-378

172-234

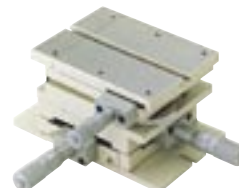
- Workpiece diameter: 1mm to 160mm
- Can be mounted on a leveling table



998291

Leveling table

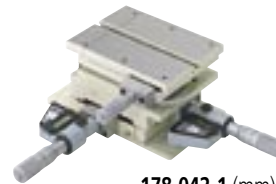
- Table top: 130 x 100mm
- Leveling range: $\pm 1.5^\circ$
- XY travel: ± 12.5 mm



178-043-1 (mm)
178-053-1 (inch)

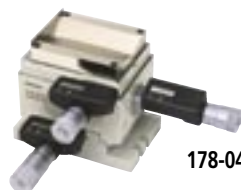
Digital Leveling table

- Table top: 130 x 100mm
- Leveling range: $\pm 1.5^\circ$
- XY travel: ± 12.5 mm



178-042-1 (mm)

Three-axis adjustment table



178-047

Precision vise

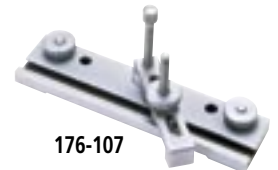
- Max. workpiece size: 36mm
- Can be mounted on a leveling table.



178-019

Holder with clamp

- Used with a cross-travel table or rugged table.
- Max. workpiece height: 35mm



176-107

Swivel center support

- Max. workpiece diameter: 80mm*
- *65mm when swiveled 10°
- Max. workpiece length: 140mm



172-197

Center support

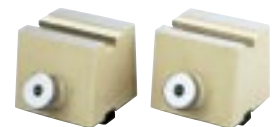
- Max. workpiece diameter: 120mm
- 60mm riser is optional (172-143)



172-142

Center support riser

- Used with a center support.
- Max. workpiece diameter: 240mm



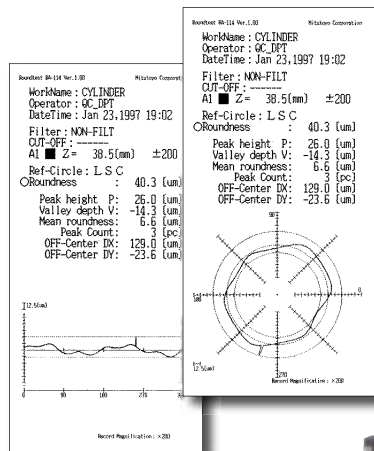
172-143

Roundtest RA-100

SERIES 211 — Roundness Measuring Instruments

The RA-100 Series Roundtest is a compact, affordable, and simple-to-use device for measuring part geometry on the shop floor. It also provides such superb data analysis capabilities as required with laboratory roundness measuring instruments and has a $\pm 1000\mu\text{m}$ wide range detector and precision turn table with excellent rotation accuracy.

The RA-114 / 114D is a dedicated processor based model which controls all operations via the control panel incorporated in the main unit.



RA-114D



RA-114
(without D.A.T. function)

The RA-116/116D is a PC based model which controls all operations via ROUNDPAK software.



RA-116D

Technical Data

Turntable

Rotational accuracy: $(0.07+6H/10000)\mu\text{m}$
H: Probing height (mm)

Rotating speed: 6rpm
Table top diameter: $\phi 150\text{mm}$
Centering range: $\pm 3\text{mm}$
Leveling range: $\pm 1^\circ$

Maximum probing diameter: $\phi 280\text{mm}$
Maximum workpiece diameter: $\phi 280\text{mm}$
Maximum workpiece weight: 20kg

Vertical column (Z-axis)

Vertical travel: 280mm
Feeding: 30mm/rev. (coarse), 1mm/rev. (fine)
Maximum probing height: 280mm (OD), 280mm (ID)
Maximum probing depth: 100mm

Horizontal arm (X-axis)

Horizontal travel: 165mm (Including a protrusion of 25mm the turntable rotation center)

Probe and stylus

Measuring range: $\pm 1000\mu\text{m}$
Measuring force: 7 to 10mN
Standard stylus: **12AAB681**, carbide ball, $\phi 1.6\text{mm}$
Measuring direction: Two directional
Stylus angle adjustment: $\pm 45^\circ$ (with graduations)

Data analysis unit:

Processing unit: Built-in (PC with Roundpak-100)*
Data sampling dots: Max. 1,800dots/rotation

Data analysis items:

Roundness, Concentricity, Coaxiality*, Circular run-out (radial), Circular run-out (axial), Squareness (against axis), Squareness (against plane), Thickness deviation, Flatness, Parallelism

Reference circles for roundness evaluation:

LSC, MZC, MIC, MCC

Variation of analysis views*:

Top view, Opened view, Side view, Inclined view, Overlooked view

Recording device:

Built-in thermal line printer (optional external printer)*

Recording magnification:

X5 to X50000, Auto (X100 to X200000, Auto)*

Roughness component reduction:

Low pass filter, band pass filter

Filter type:

2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian, filter OFF

Cutoff value:

15upr, 50upr, 150upr, 500upr, 15-150upr, 15-500upr, 50-500upr, Manual setting*

Functions

- Total analysis of multiple items
- Recalculation of datum/measured data
- Tolerancing (GO/NG judgment)
- Rotation of 3D display*
- Real-time display*
- Simplified layout (divided layout)*
- Hair line, auxiliary line, hidden line, fill line*
- Color setting of measured data*
- Offsetting of recorded profile generation*
- Zooming of recorded profile*
- Data deletion*
- Graph analysis (displacement/angle between measured points)*
- Power spectrum analysis*
- Gear tooth analysis*
- Harmonic analysis*
- Text data output (via CSV format)*

Air supply

Air pressure: 390kPa (4kgf/cm²)

Air consumption: 45L/min.

Power supply:

100V AC ~ 240V AC, 50/60Hz

Dimensions (W x D x H): 660 x 415 x 620mm

(610 x 380 x 620mm: RA-114 / 116)

Mass: 40kg

*RA-116 / 116D

Optional Accessory

- 211-032:** Quick chuck (OD: 1 - 75mm, ID: 14 - 70mm)
211-014: Chuck (OD: 1 - 85mm, ID: 33 - 85mm)
211-031: Micro-chuck (OD: 1.5mm max.)
356038*: Auxiliary stage for a low-height workpiece
211-045: Magnification checking gage
997090: Gauge block set for calibration
211-016*: Reference hemisphere
 —: Interchangeable styli (See page 461.)

*Standard accessory for RA-114D/116D



211-032



211-014



211-031



356038



211-045



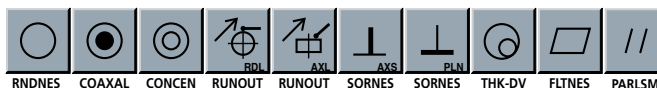
997090



211-016

CONSUMABLE PARTS

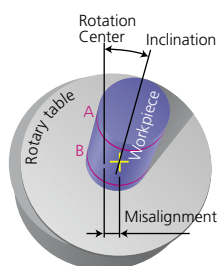
- 998698:** Printer paper (25m) 10 rolls/set
358592: Element for air filter 1 pc./set
358593: Element for air regulator 10 pcs./set



DAT (Digital Adjustment Table) function

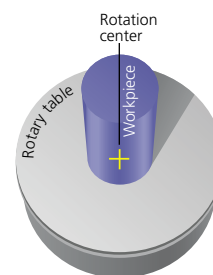
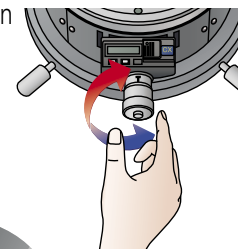
The turntable digitally displays the centering and leveling adjustments, turning what used to be a difficult and finicky task into one that is simple enough for even untrained operator to perform.

1. Preliminary measurement of two cross sections" A" and" B"



2. Following preliminary measurement, the centering and leveling adjustment values are displayed on the monitor.

3. Manipulate the digital micrometer heads of the rotary table so that the adjustment values displayed on the monitor are realized.



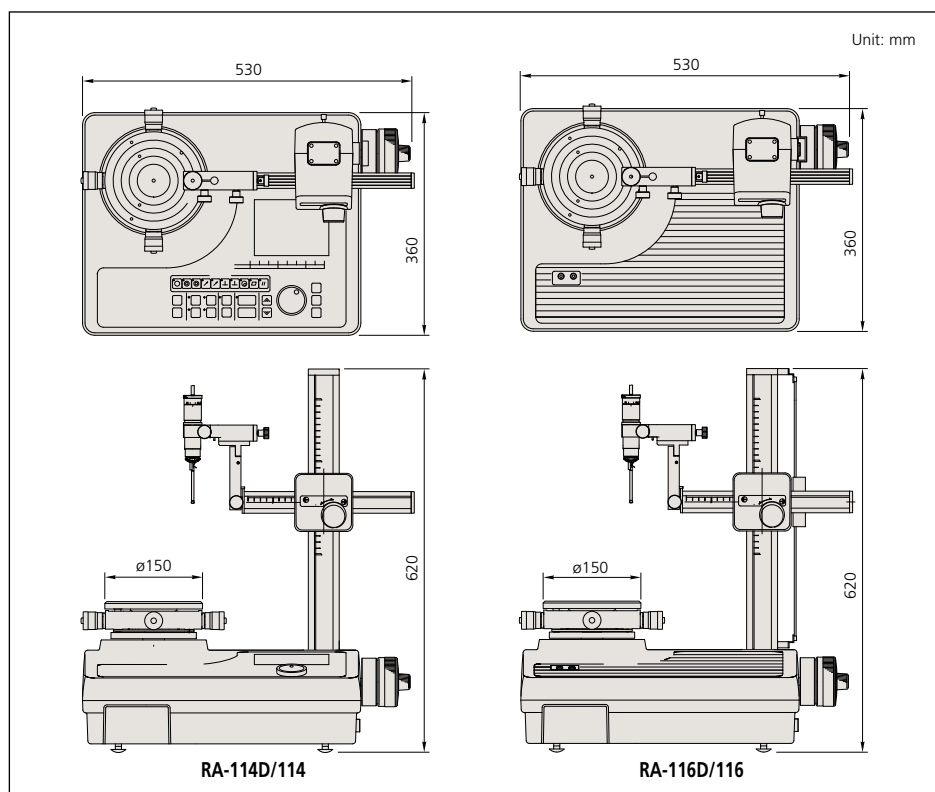
4. Centering and leveling are complete
 Centering range: $\pm 3\text{mm}$
 Leveling (inclination) range: $\pm 1^\circ$

SPECIFICATIONS

Model No.	RA-114	RA-114D	RA-116	RA-116D
Order No. (mm)	211-703*	211-704*	211-707*	211-708*
Order No. (inch)	211-713*	211-714*	211-717*	211-718*

*To denote your AC line voltage add the following suffixes to the order No.
 (e.g.: **211-703A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Roundtest RA-1400 / RA-1500

SERIES 211 — Roundness / Cylindricity Measuring System

The RA-1400 / 1500 Series Roundtest is a roundness measuring system equipped with state-of-the-art technologies including an



RA-1400
with personal computer system and software

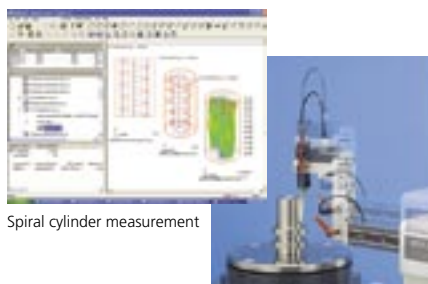
automatic measurement function, an arc measuring function, and a D.A.T. (Digital Adjustment Table) mechanism which makes workpiece centering and leveling simple and speedy.



RA-1500
with personal computer system and software

Spiral Measurement/Analysis (RA-1500 only)

A spiral measurement function that combines table rotation and rectilinear action is provided, allowing cylindricity, coaxiality, and other data to be loaded as continuous data.



Spiral cylinder measurement

Especially the RA-1500 is provided with a high-precision power column unit, which has a guaranteed accuracy (straightness) of $0.3\mu\text{m}/150\text{mm}$, for cylindricity/straightness measurement.

Measurement through X-axis tracking

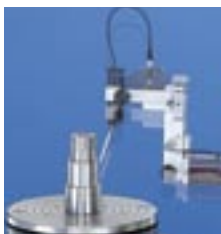
Measurement while tracing the surface form of the measured object through the X-axis with a built-in linear scale is possible. This type of measurement is useful, for example, when the roundness/cylindrical form displacement amount, and the taper obtained from rectilinear action are large, exceeding the measuring range of sensors.



Tracing measurement
range: $\pm 5\text{ mm}$

Positioning function of rotary table (RA-1500 only)

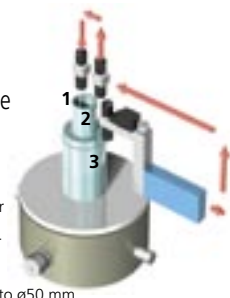
Automatic measurement that combines rectilinear action is possible at any position (angle) in relation to table rotation.



Roundness measurement
column rectilinear action

Continuous internal/external diameter measurement

Continuous internal/external diameter measurement is possible without changing the detector position.



- 1), 2) : External diameter measurement
- 3) : Internal diameter measurement
- ➡ : Displacement
- 3) = inner diameter: Up to $\phi 50\text{ mm}$

Technical Data

Turntable

Rotational accuracy (radial): $(0.02+6H/10000)\mu\text{m}$
 Rotational accuracy (axial): $(0.02+6R/10000)\mu\text{m}$
H: Probing height (mm), R: Probing radius (mm)
 Rotating speed: 4, 6, 10rpm
 Table top diameter: $\phi 150\text{mm}$
 Centering range: $\pm 3\text{mm}$ (w/ D.A.T. function)
 Leveling range: $\pm 1^\circ$ (w/ D.A.T. function)
 Maximum probing diameter: $\phi 100\text{mm}$
 Maximum workpiece diameter: $\phi 400\text{mm}^*$
 Maximum workpiece weight: 10kg

Vertical column (Z-axis)

Vertical travel: 150mm
 Straightness (in narrow range): $0.15\mu\text{m} / 50\text{mm}$
 Straightness (in entire range): $0.3\mu\text{m} / 150\text{mm}$
 Parallelism with rotating axis: $0.3\mu\text{m} / 150\text{mm}$
 Positioning speed: Max. 15mm/s with joystick operation (Manual feed available)
 Measuring speed: 0.5, 1, 2, 5mm/s
 Maximum probing height: 150mm (OD), 150mm (ID)
 Maximum probing depth: 90mm

Horizontal arm (X-axis)

Horizontal travel: 75mm (Including a protrusion of 25mm the turntable rotation center)
 Positioning speed: Max. 8mm/s with joystick operation (Manual feed available)

Probe and stylus

Measuring range: $\pm 400\mu\text{m}$
 Measuring force: 7 to 10mN
 Standard stylus: **12AAB681**, carbide ball, $\phi 1.6\text{mm}$
 Measuring direction: Two directional
 Stylus angle adjustment: $\pm 45^\circ$ (with graduations)

Data analysis system

Analysis software: Roundpak
 Filter type:
 2CRPC-75%, 2CRPC-50%, 2CR-75% (phase corrected),
 2CR-50% (phase corrected), Gaussian, filter OFF

Cutoff value;

15upr, 50upr, 150upr, 500upr, 1500upr,
 15-150upr, 15-500upr, 15-1500upr, 50-500upr,
 50-1500upr, 150-1500upr, Manual setting

Reference circles for roundness evaluation:

LSC, MZC, MIC, MCC

Air supply

Air pressure: 390kPa (4kgf/cm²)
 Air consumption: 30L/min.
 Power supply: 100V AC – 240V AC, 50/60Hz

Dimensions (W x D x H): 635 x 430 x 620mm

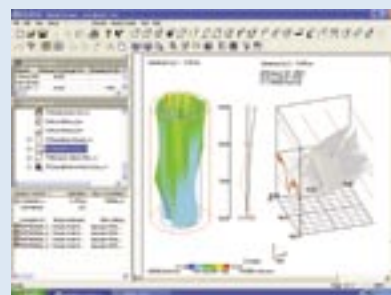
Mass: 95kg

* When using an optional auxiliary probe holder (**12AAB597**), the possible measuring range is between $\phi 70\text{mm}$ and $\phi 220\text{mm}$.

An optional auxiliary stage (**356038**) is required for measurements 20 mm or less in the radial direction from the table center and 20 mm or less from the table top.

ROUNDPAK

The latest roundness/cylindrical form analysis program



MiCAT
 Mitutoyo Intelligent Computer Aided Technology

the standard in world
 metrology software
FORM

Optional Accessory

- 350850:** Cylindrical square
356038: Auxiliary stage for a low-height workpiece
12AAB597: Extension probe holder (2X higher)
12AAB597: Auxiliary probe holder for a large diameter workpiece
211-045: Magnification checking gage
211-014: Chuck (OD: 1 - 85mm, ID: 33 - 85mm)
211-032: Quick chuck (OD: 1 - 75mm, ID: 14 - 70mm)
211-031: Micro-chuck (OD: 1.5mm max.)
178-023: Vibration isolator
178-024: Stand for vibration isolator
—: Interchangeable styli (See page 461.)



211-032



211-014



211-031



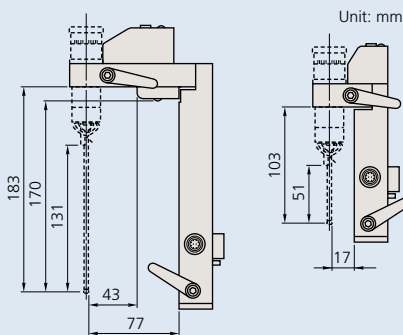
356038



211-045



350850



12AAB569

12AAB597

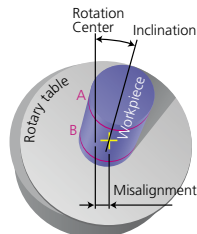


Refer to the RA-1400/1500 leaflet (E4258) for more details.

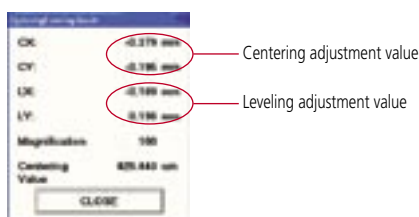
DAT (Digital Adjustment Table) function

The turntable digitally displays the centering and leveling adjustments, turning what used to be a difficult and finicky task into one that is simple enough for even untrained operator to perform.

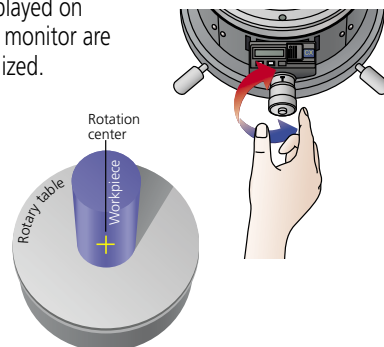
1. Preliminary measurement of two cross sections "A" and "B"



2. Following preliminary measurement, the centering and leveling adjustment values are displayed on the monitor.



3. Manipulate the digital micrometer heads of the rotary table so that the adjustment values displayed on the monitor are realized.



4. Centering and leveling are complete

Centering range: $\pm 3 \text{ mm}$

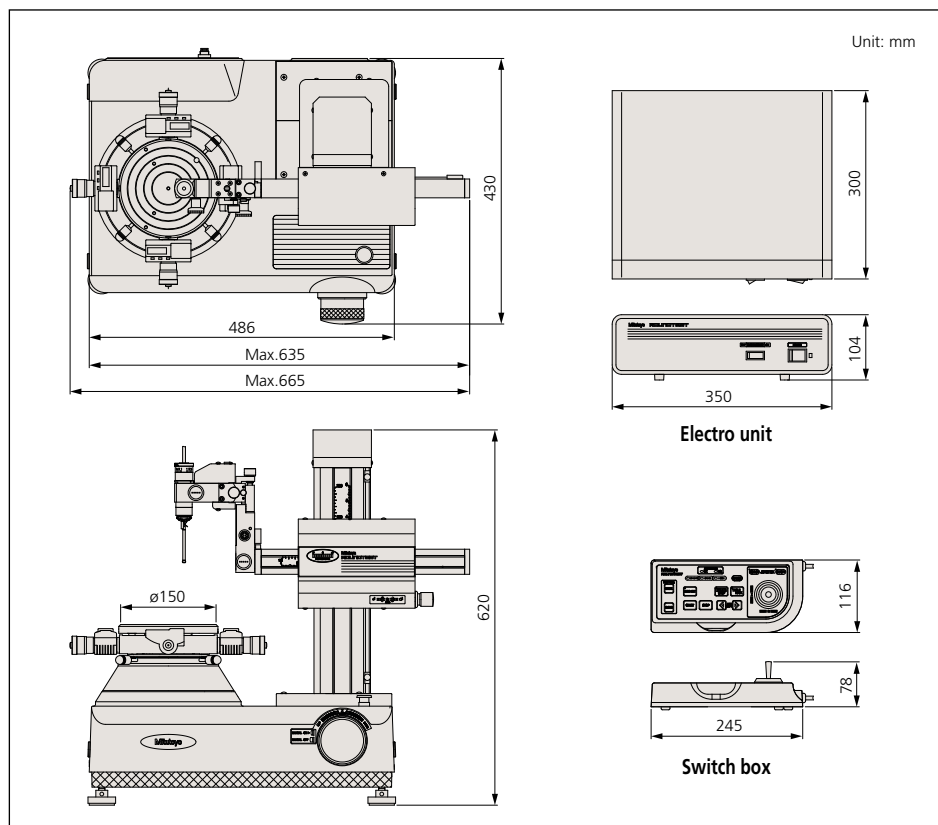
Leveling (inclination) range: $\pm 1^\circ$

SPECIFICATIONS

Model No.	RA-1400	RA-1500
Order No. (mm)	211-722*	211-721*
Order No. (inch)	211-732*	211-731*

*To denote your AC line voltage add the following suffixes to the order No.
 (e.g.: **211-722A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Roundtest RA-2100AS / DS / AH / DH

SERIES 211 — Roundness / Cylindricity Measuring System



RA-2100AS
with personal computer system and software

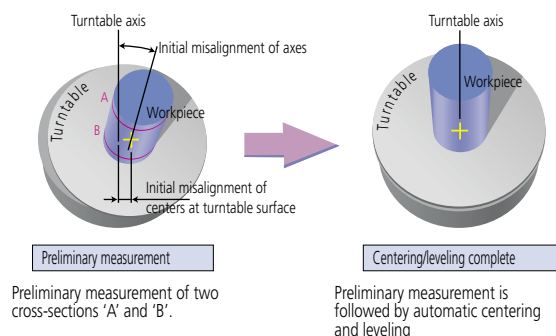
The RA-2100 provides a high accuracy, high speed and high performance in roundness measurement. The fully-automatic or a DAT (Digital Adjustment Table) function aided manual workpiece centering and leveling turns what used to be a difficult and finicky task into one that is simple enough for even untrained users to perform. This facilitates substantial reductions in overall measurement time. The RA-2100 system

comes complete with a powerful data analysis software ROUNDPAK which requires only simple manipulation using a mouse and icon, achieving the enhanced functionality and easy of operation.

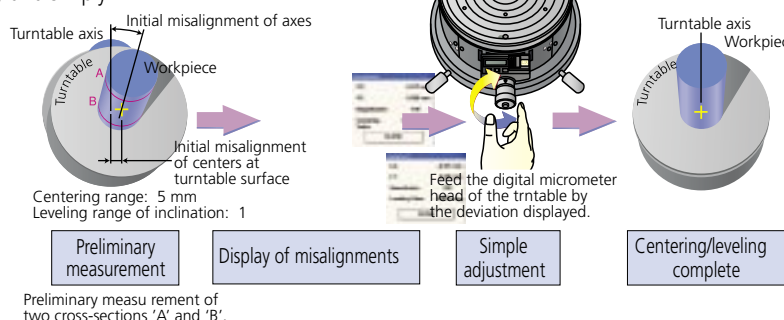
Highly accurate and easy-to-use turntable

With extremely high rotational accuracy, both in the radial and axial directions, the turntable allows high accuracy flatness testing to be performed in addition to roundness and cylindricity measurements.

Incorporating an automatic centering/leveling turntable (A.A.T.), the top-of-the-line RA-2100AS/AH models relieve the operator of the bothersome task of workpiece centering and leveling.



A guidance system (D.A.T.) is incorporated into the turntables on the RA-2100DS/DH models to help the operator perform manual centering and leveling smoothly and simply.



Technical Data

Turntable

Rotational accuracy (radial): $(0.02+3.8H/10000)\mu\text{m}$
 Rotational accuracy (axial): $(0.02+3.8R/10000)\mu\text{m}$
H: Probing height (mm), R: Probing radius (mm)
 Rotating speed: 2, 4, 6, 10rpm
 Table top diameter: $\varnothing 235\text{mm}$ ($\varnothing 200\text{mm}$: DS / DH models)
 Centering range: $\pm 3\text{mm}$ ($\pm 5\text{mm}$: DS / DH models)
 Leveling range: $\pm 1^\circ$
 Maximum probing diameter: $\varnothing 300\text{mm}$
 Maximum workpiece diameter: $\varnothing 580\text{mm}$
 Maximum workpiece weight: 30kg

Vertical column (Z-axis)

Vertical travel: 300mm (500mm: AH / DH models)
 Straightness ($\lambda c2.5$): $0.12\mu\text{m} / 100\text{mm}$, $0.18\mu\text{m} / 300\text{mm}^*$
 (* $0.3\mu\text{m} / 500\text{mm}$: AH / DH models)
 Parallelism with rotating axis: $0.7\mu\text{m} / 300\text{mm}$
 (1.2 $\mu\text{m} / 500\text{mm}$: AH / DH models)
 Positioning speed: Max. 35mm/s
 Measuring speed: 0.5, 1, 2, 5mm/s
 Maximum probing height: 300mm (OD), 300mm (ID)
 [500mm: AH / DH models]

Horizontal arm (X-axis)

Horizontal travel: 175mm (Including a protrusion of 25mm the turntable rotation center)
 Straightness ($\lambda c2.5$): $0.7\mu\text{m} / 150\text{mm}$
 Squareness with rotating axis: $1.0\mu\text{m} / 150\text{mm}$
 Positioning speed: Max. 20mm/s with joystick operation
 Measuring speed: 0.5, 1, 5mm/s

Probe and stylus

Measuring range: $\pm 400\mu\text{m}$ ($\pm 5\text{mm}$: tracking range)
 Measuring force: 7 to 10mN (in 5 steps)
 Standard stylus: **12AAB681**, carbide ball, $\varnothing 1.6\text{mm}$
 Measuring direction: Two directional
 Stylus angle adjustment: $\pm 45^\circ$ (with graduations)

Data analysis system

Analysis software: Roundpak

Filter type:

2CRPC-75%, 2CRPC-50%, 2CR-75% (phase corrected),
 2CR-50% (phase corrected), Gaussian, filter OFF

Cutoff value;

15 μm , 50 μm , 150 μm , 500 μm , 1500 μm ,
 15-150 μm , 15-500 μm , 15-1500 μm , 50-500 μm ,
 50-1500 μm , 150-1500 μm , Manual setting

Reference circles for roundness evaluation:

LSC, MZC, MIC, MCC

Air supply

Air pressure: 390kPa (4kgf/cm²)

Air consumption: 30L/min.

Power supply: 100V AC – 240V AC, 50/60Hz

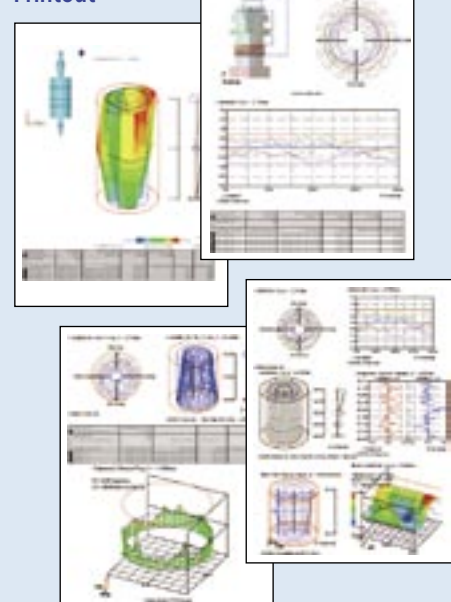
Dimensions (W x D x H): 667 x 475 x 900mm

(667 x 475 x 1100mm: AH / DH models)

Mass:

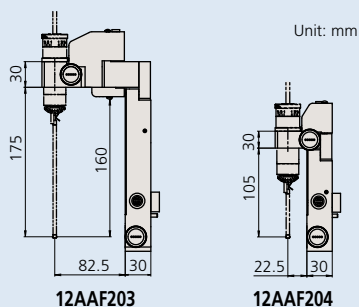
180kg (200kg: AH / DH models)

Printout



Optional Accessory

- 350850:** Cylindrical square
356038: Auxiliary stage for a low-height workpiece
12AAF203: Extension probe holder (2X higher)
12AAF204: Auxiliary probe holder for a large diameter workpiece
211-045: Magnification checking gage
211-014: Chuck (OD: 1 - 85mm, ID: 33 - 85mm)
211-032: Quick chuck (OD: 1 - 75mm, ID: 14 - 70mm)
211-031: Micro-chuck (OD: 1.5mm max.)
178-023: Vibration isolator
178-024: Stand for vibration isolator
12AAB949: Protective shield
 ———: Interchangeable styli (See page 461.)

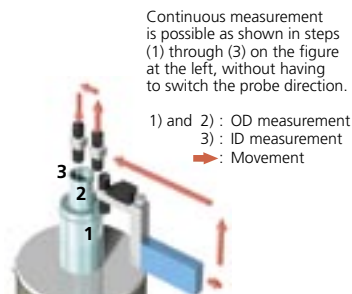


Refer to the RA-2100 series leaflet (E4278) for more details.

Greater productivity by continuous measurement

Both the OD and ID of a workpiece* can be measured in succession without the need for changing the traverse direction of the stylus.

*Inside diameter up to 50 mm.



Highly repeatable measurements with high-accuracy scales Mitutoyo linear scales are used in the X/Z drive unit to guarantee the high precision positioning so vital for repetitive measurement.

Unique design allows system upgrading

The system can be upgraded to CNC operation by replacing and adjusting the detector unit. (This task should be performed by a Mitutoyo technician.)

Surface roughness measurement function (Surface roughness unit: option)

A surface roughness detector, compliant with the relevant International Standards, can be mounted in place of the roundness measuring detector. This creates a multiple sensor system that can not only test the geometrical roundness/cylindricity of a surface but also the roughness of that surface as well.

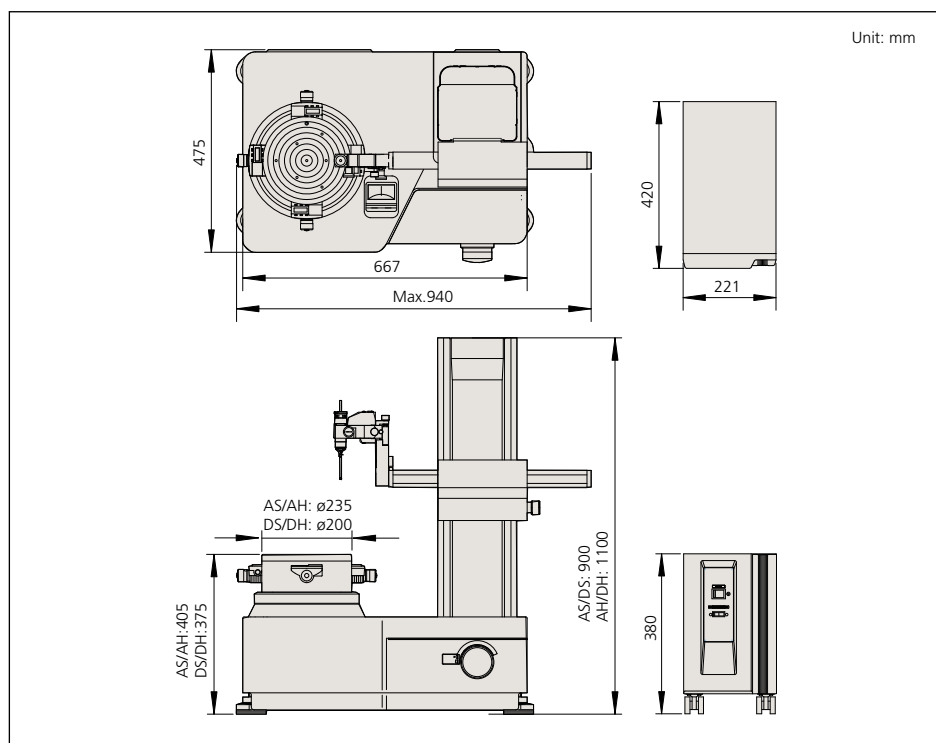


SPECIFICATIONS

Model No.	RA-2100AS	RA-2100DS	RA-2100AH	RA-2100DH
Order No.	211-843-1 (mm/inch)	211-863-1 (mm) 211-873-1 (inch)	211-844-1 (mm/inch)	211-864-1 (mm) 211-874-1 (inch)
Effective table diameter	235mm	200mm	235mm	200mm
Centering/leveling adjustment	A.A.T.	D.A.T.	A.A.T.	D.A.T.
Centering range	±3mm	±5mm	±3mm	±5mm
Column travel	300mm (standard column)		500mm (high column)	
Basic unit mass	180kg		200kg	

* To denote your AC line voltage add the following suffixes to the order No.
 (e.g.: **211-843-1A**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Roundtest RA-H5100AS / AH

SERIES 211 — Roundness / Cylindricity Measuring System

RA-H5100AS / AH, a roundness/cylindricity measuring system developed to combine world-class accuracy with maneuverability/high analysis capability.

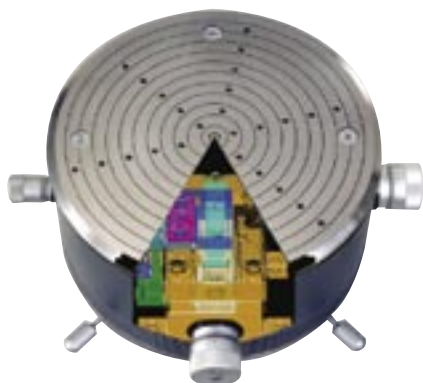
Enhanced measurement functions include tracking measurement and automatic OD/ID measurement capabilities. Also capable of roughness measurement (both in circumferential and axial directions).



RA-H5100AS
with personal computer system and software

High-accuracy automatic centering/leveling turntable

A highly accurate, highly rigid turntable has been achieved through exceptional manufacturing accuracy of the critical components, such as the rotor and stator, in addition to an air-bearing incorporating a complex aperture that provides superior rigidity and uniform pressure distribution. As a result, the rotational accuracy (radial), which is the heart of the roundness/cylindricity measuring system, is a world-class ($0.02 + 4H/10000$) μm .

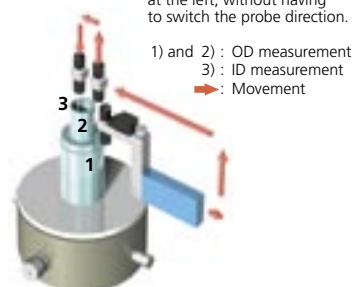


Automatic continuous OD/ID measurement

Automatic measurement can be performed continuously from external diameter to internal diameter without having to change the probe position. This not only reduces measurement time but eliminates the error factors otherwise involved in changing the probe position, greatly facilitating high-accuracy measurement.

The automatic centering/leveling mechanism incorporates a high-precision glass scale on each axis of the turntable. This allows feedback to be generated that prevents positioning errors from affecting centering/leveling adjustments. The high-speed, automatic, centering/leveling capability achieved greatly contributes to reducing the total measurement time from workpiece setting to workpiece measurement.

Continuous measurement is possible as shown in steps (1) through (3) on the figure at the left, without having to switch the probe direction.



Technical Data

Turntable

Rotational accuracy (radial): ($0.02 + 4H/10000$) μm
 Rotational accuracy (axial): ($0.02 + 6X/10000$) μm
H: Probing height (mm), X: Distance from the turntable axis (mm)
 Rotating speed: 2, 4, 6, 10rpm (20rpm: auto-centering)
 Table top diameter: $\varnothing 300\text{mm}$
 Centering range: $\pm 5\text{mm}$
 Leveling range: $\pm 1^\circ$
 Maximum probing diameter: $\varnothing 400\text{mm}$
 Maximum workpiece diameter: $\varnothing 680\text{mm}$
 Maximum workpiece weight: 80kg (65kg: auto-centering)

Vertical column (Z-axis)

Vertical travel: 350mm (550mm: AH model)
 Straightness ($\lambda c2.5$): $0.05\mu\text{m} / 100\text{mm}$, $0.14\mu\text{m} / 350\text{mm}^*$
 (* $0.2\mu\text{m} / 550\text{mm}$: AH model)
 Parallelism with rotating axis: $0.2\mu\text{m} / 350\text{mm}$
 ($0.32\mu\text{m} / 550\text{mm}$: AH model)
 Positioning speed: Max. 60mm/s
 Measuring speed: 0.5, 1, 2, 5mm/s
 Maximum probing height: 350mm (OD), 350mm (ID)
 [550mm (OD / ID): AH model]

Maximum probing depth: 100mm

Horizontal arm (X-axis)

Horizontal travel: 225mm
 Straightness ($\lambda c2.5$): $0.4\mu\text{m} / 200\text{mm}$
 Squareness with rotating axis: $0.5\mu\text{m} / 200\text{mm}$
 Positioning speed: Max. 50mm/s
 Measuring speed: 0.5, 1, 5mm/s

Probe and stylus

Measuring range: $\pm 400\mu\text{m}$ ($\pm 5\text{mm}$: tracking range)
 Measuring force: 7 to 10mN (in 5 steps)
 Standard stylus: **12AAB681**, carbide ball, $\varnothing 1.6\text{mm}$
 Measuring direction: Two directional
 Stylus angle adjustment: $\pm 45^\circ$ (with graduations)

Data analysis system

Analysis software: Roundpak

Filter type:

2CRPC-75%, 2CRPC-50%, 2CR-75% (phase corrected),
 2CR-50% (phase corrected), Gaussian, filter OFF

Cutoff value:

15upr, 50upr, 150upr, 500upr, 1500upr,
 15-150upr, 15-500upr, 15-1500upr, 50-500upr,
 50-1500upr, 150-1500upr, Manual setting

Reference circles for roundness evaluation:

LSC, MZC, MIC, MCC

Air supply

Air pressure: 390kPa (4kgf/cm²)

Air consumption: 45L/min.

Power supply: 100V AC – 240V AC, 50/60Hz

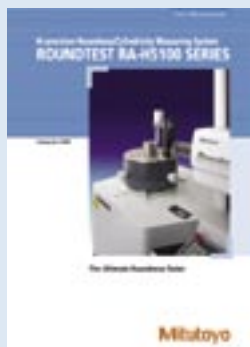
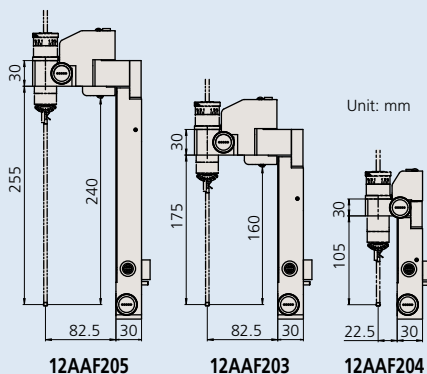
Dimensions (W x D x H): 1260 x 710 x 1700mm

(1260 x 710 x 1900mm: AH model)

Mass: 650kg (670kg: AH model)

Optional Accessory

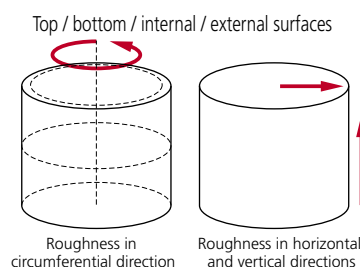
- 350850:** Cylindrical square
356038: Auxiliary stage for a low-height workpiece
12AAF203: Extension probe holder (2X higher)
12AAF205: Extension probe holder (3X higher)
12AAF204: Auxiliary probe holder for a large diameter workpiece
211-045: Magnification calibration gage
211-014: Chuck (OD: 1 - 85mm, ID: 33 - 85mm)
211-032: Quick chuck (OD: 1 - 75mm, ID: 14 - 70mm)
211-031: Micro-chuck (OD: 1.5mm max.)
12AAB949: Protective shield
 ———: Interchangeable styli (See page 461.)



Refer to the RA-2100 series leaflet (E4278) for more details.

X-axis tracking measurement

Because of the linear scale incorporated into the X-axis, measurement can be performed by tracking the workpiece surface (tracking range: $\pm 5\text{mm}$). This function is effective for measuring a workpiece with a displacement that exceeds the detection range of the probe in measuring roundness/cylindricity or a taper that is determined with slider/column movement.



Surface roughness measurement function (Surface roughness unit: option)

A surface roughness detector, compliant with the relevant International Standards, can be mounted in place of the roundness measuring detector. This creates a multiple sensor system that can not only test the geometrical roundness/cylindricity of a surface but also the roughness of that surface as well.

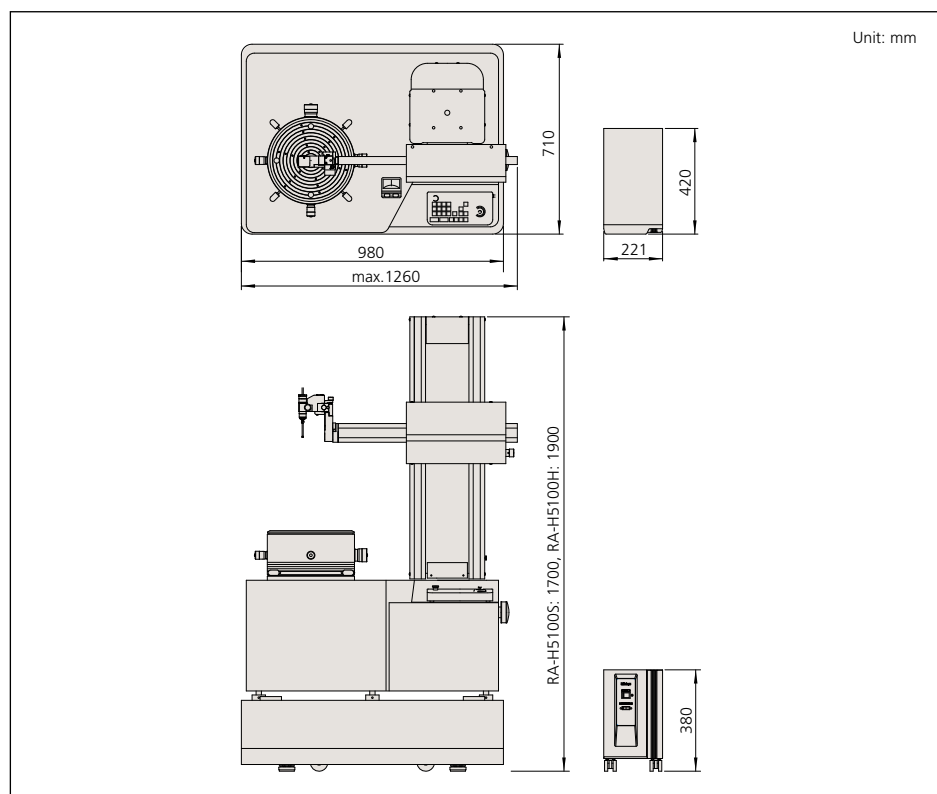


SPECIFICATIONS

Model No.	RA-H5100AS	RA-H5100AH
Order No.*	with machine stand	211-823
	with vibration isolating stand	211-823-2
Column travel	350mm (standard column)	550mm (high column)

*To denote your AC line voltage add the following suffixes to the order No.
(e.g.: **211-843A-2**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Roundtest Extreme RA-H5100CNC / 2100CNC

SERIES 211 — CNC Roundness / Cylindricity Measuring System

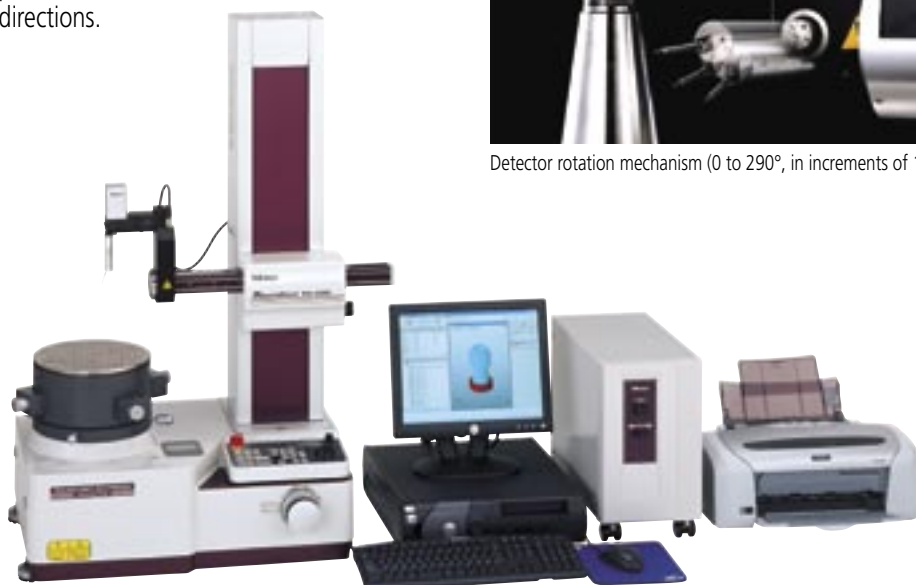
Mitutoyo offers innovative roundness/cylindricity measuring systems capable of automated measurement with independent/simultaneous multi-axis CNC control. In addition to high measuring accuracy and reliability, these CNC models provide excellent inspection productivity. Roundness and surface roughness measurements are both available from a single measuring system so workpiece resetting for roughness measurement is not required. Roughness measurement is possible in the axial and circumferential directions.



Holder-arm orientation switching (vertical position - horizontal position)



Detector rotation mechanism (0 to 290°, in increments of 1°)



RA-2100H CNC
with personal computer system and software



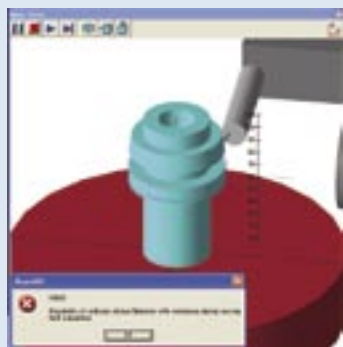
RA-H5100H CNC
with personal computer system and software

Technical Data: RA-2100CNC

Turntable	
Rotational accuracy (radial):	(0.02+3.8H/10000)μm
Rotational accuracy (axial):	(0.02+3.8X/10000)μm
H: Probing height (mm), X: Distance from the turntable axis (mm)	
Rotating speed:	2, 4, 6, 10rpm
Table top diameter:	ø235mm
Centering range:	±3mm
Leveling range:	±1°
Maximum probing diameter:	ø256mm
Maximum workpiece diameter:	ø580mm
Maximum workpiece weight:	30kg
Vertical column (Z-axis)	
Vertical travel:	300mm (500mm: 2100H model)
Straightness (λc2.5):	0.12μm / 100mm, 0.18μm / 300mm* (*0.3μm / 500mm: 2100H model)
Parallelism with rotating axis:	0.7μm / 300mm (1.2μm / 500mm: 2100H model)
Positioning speed:	Max. 35mm/s
Measuring speed:	0.5, 1, 2, 5mm/s
Maximum probing height:	300mm (OD), 300mm (ID) [500mm (OD / ID): 2100H model]
Maximum probing depth:	100mm
Horizontal arm (X-axis)	
Horizontal travel:	175mm (Including a protrusion of 25mm the turntable rotation center)
Straightness (λc2.5):	0.7μm / 150mm
Squareness with rotating axis:	1.0μm / 150mm
Positioning speed:	Max. 20mm/s
Measuring speed:	0.5, 1, 5mm/s
Probe and stylus	
Measuring range:	±400μm (±5mm: tracking range)
Measuring force:	7 to 10mN (in 5 steps)
Standard stylus:	12AAE301 , carbide ball, ø1.6mm
Measuring direction:	Two directional
Stylus angle adjustment:	±45° (with graduations)
Air supply	
Air pressure:	390kPa (4kgf/cm ²)
Air consumption:	30L/min.
Power supply:	100V AC ~ 240V AC, 50/60Hz
Dimensions (W x D x H):	667 x 475 x 900mm (667 x 475 x 1100mm: 2100H model)
Mass:	180kg (200kg: 2100H model)

Technical Data: RA-H5100CNC

Turntable	
Rotational accuracy (radial):	(0.02+4H/10000)μm
Rotational accuracy (axial):	(0.02+6X/10000)μm
H: Probing height (mm), X: Distance from the turntable axis (mm)	
Rotating speed:	2, 4, 6, 10rpm (20rpm: auto-centering)
Table top diameter:	ø300mm
Centering range:	±5mm
Leveling range:	±1°
Maximum probing diameter:	ø356mm
Maximum workpiece diameter:	ø680mm
Maximum workpiece weight:	80kg (65kg: auto-centering)
Vertical column (Z-axis)	
Vertical travel:	350mm (550mm: H5100H model)
Straightness (λc2.5):	0.05μm / 100mm, 0.14μm / 350mm* (*0.2μm / 550mm: H5100H model)
Parallelism with rotating axis:	0.2μm / 350mm (0.32μm / 550mm: H5100H model)
Positioning speed:	Max. 60mm/s
Measuring speed:	0.5, 1, 2, 5mm/s
Maximum probing height:	350mm (OD), 350mm (ID) [550mm (OD / ID): H5100H model]
Maximum probing depth:	ø12.7 x 26mm, ø32 x 79mm
Horizontal arm (X-axis)	
Horizontal travel:	225mm
Straightness (λc2.5):	0.4μm / 200mm
Squareness with rotating axis:	0.5μm / 200mm
Positioning speed:	Max. 50mm/s
Measuring speed:	0.5, 1, 5mm/s
Probe and stylus	
Measuring range:	±400μm (±5mm: tracking range)
Measuring force:	7 to 10mN (in 5 steps)
Standard stylus:	12AAE301 , carbide ball, ø1.6mm
Measuring direction:	Two directional
Stylus angle adjustment:	±45° (with graduations)
Air supply	
Air pressure:	390kPa (4kgf/cm ²)
Air consumption:	45L/min.
Power supply:	100V AC ~ 240V AC, 50/60Hz
Dimensions (W x D x H):	1260 x 710 x 1700mm (1260 x 710 x 1900mm: H5100H model)
Mass:	650kg (670kg: H5100H model)



Optional Accessory

- 350850:** Cylindrical square
- 356038:** Auxiliary stage for a low-height workpiece
- 12AAF203:** Extension probe holder (2X higher)
- 12AAF205:** Extension probe holder (3X higher)*
- 12AAF204:** Auxiliary probe holder for a large diameter workpiece
- 211-045:** Magnification calibration gage
- 211-014:** Chuck (OD: 1 - 85mm, ID: 33 - 85mm)
- 211-032:** Quick chuck (OD: 1 - 75mm, ID: 14 - 70mm)
- 211-031:** Micro-chuck (OD: 1.5mm max.)
- 178-023:** Vibration isolator**
- 178-024:** Stand for vibration isolator**
- 12AAB949:** Protective shield
- : Interchangeable styli (See page 461.)

*Only for RA-H5100S CNC and RA-H5100H CNC

**Only for RA-2100S CNC and RA-2100H CNC



Refer to the RA-2100 series leaflet (E4278) for more details.

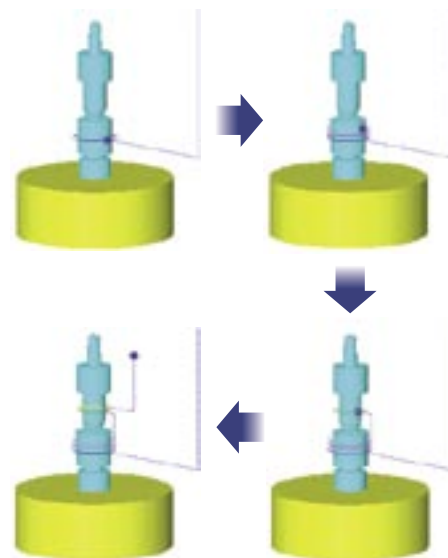
ROUNDPAK

Off-line measurement procedure programming function

On-screen virtual 3D simulation measurements can be performed with the incorporated off-line teaching function that allows a part program (measurement procedure) to be created without an objective workpiece. The probe and the holder unit of the Roundtest Extreme can be precisely represented and an alarm can be raised to indicate that there is a collision risk predicted by the simulation.



3D simulation screens (work-view windows) can be generated after entering CAD data (in IGES, DXF form) and text data.



SPECIFICATIONS

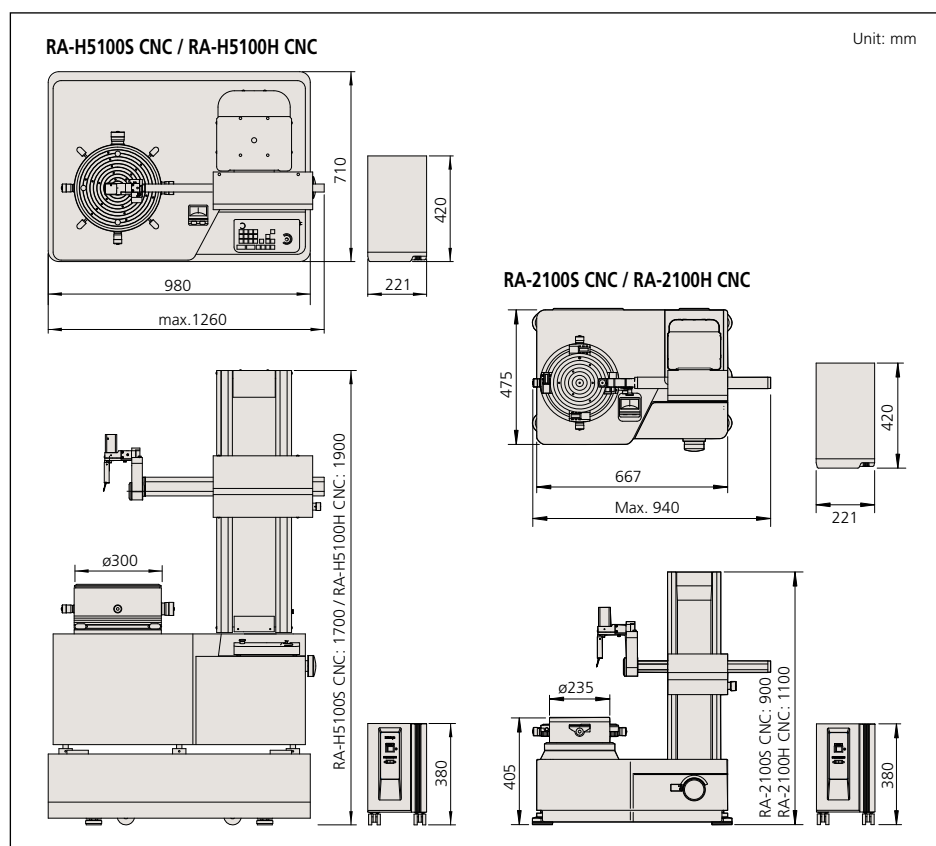
Model No.	EXTREME RA-2100S CNC	EXTREME RA-2100H CNC
Order No.*	211-847*-1	211-848*-1
Column travel	300mm (standard column)	500mm (high column)

Model No.	EXTREME RA-H5100S CNC	EXTREME RA-H5100H CNC
Order No.*	with machine stand 211-837*	with vibration isolating stand 211-838*
Column travel	350mm (standard column)	550mm (high column)

*To denote your AC line voltage add the following suffixes to the order No.

(e.g.: **211-847A-1**): **A** for UL/CSA, **D** for CEE, **E** for BS, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

DIMENSION



Optional Styli for Roundtest

Interchangeable Styli for RA-100, RA-1400 / 1500, RA-2100, RA-H5100

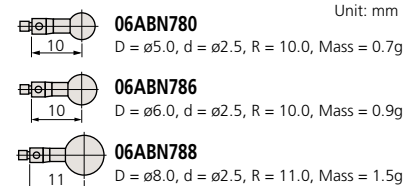
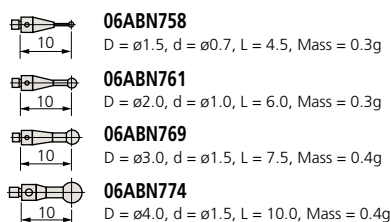
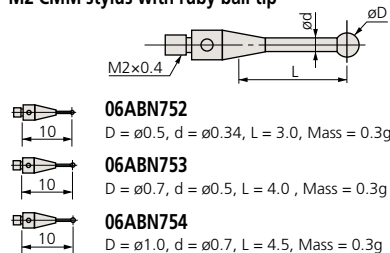
Application/Type	Standard type*	Notch	Deep groove	Corner
Order No.	12AAB681	12AAB682	12AAB683	12AAB684
Stylus tip	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide	0.25 mm radius sapphire	0.25 mm radius sapphire
Dimensions (mm)				
Application/Type	Cutter mark	Small hole (ø0.8)	Small hole	Small hole (ø1.6)
Order No.	12AAB685	12AAE859	12AAB686	12AAE855
Stylus tip	15 mm radius tungsten carbide	ø0.8 mm tungsten carbide	ø1 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)				
Application/Type	Extra small hole (Depth: 3mm)	ø1.6 mm ball	Disk	Crank (tip: ø0.5 mm)
Order No.	12AAB687	12AAB674	12AAB694	12AAB696
Stylus tip	ø0.5 mm tungsten carbide	ø1.6 mm tungsten carbide	ø12 mm	ø1.6 mm tungsten carbide Depth: 2.5 mm
Dimensions (mm)				
Application/Type	Crank (tip:ø1 mm)	Flat surface	2X-long type**	2X-long type notch**
Order No.	12AAB695	12AAE856	12AAB688	12AAB689
Stylus tip	ø1 mm tungsten carbide Depth: 5.5 mm	Tungsten carbide	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide
Dimensions (mm)				
Application/Type	2X-long type deep groove**	2X-long type corner**	2X-long type cutter mark**	2X-long type small hole**
Order No.	12AAB690	12AAE691	12AAB692	12AAB693
Stylus tip	0.25 mm radius sapphire	ø1 mm tungsten carbide Sapphire	15 mm radius tungsten carbide	ø1 mm tungsten carbide
Dimensions (mm)				
Application/Type	Stylus shank	Stylus shank (standard groove)	Stylus shank (2X-long groove)	
Order No.	12AAB676	12AAE857	12AAE858	
Stylus tip	For mounting CMM stylus (mounting thread M2)			
Dimensions (mm)				

* 12AAB681 is a standard accessory for all Roundtest models.

** Not available for RA-114 / 114D and RA-116 / 116D.

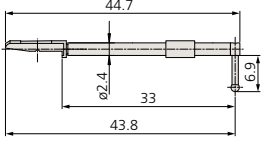
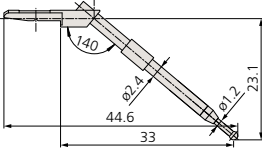
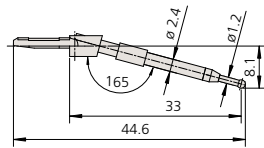
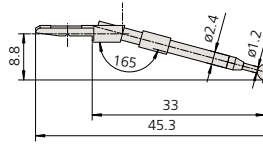
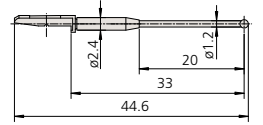
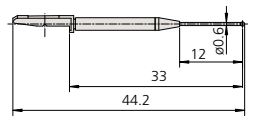
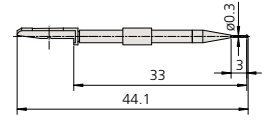
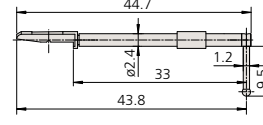
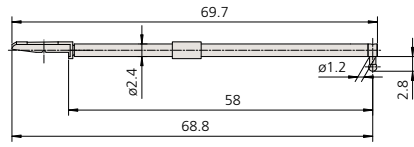
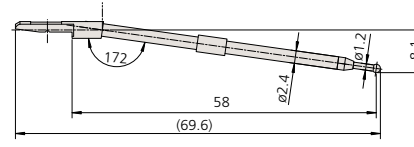
Measuring is only in the vertical direction. Measuring magnification of 20000X is available using the 2X-long stylus. Customized special interchangeable styli are available on request. Please contact any Mitutoyo office for more information.

M2 CMM stylus with ruby ball tip



Unit: mm

Interchangeable Styli for RA-2100 CNC, RA-H5100 CNC

Application/Type	Groove	Flat surface	General purpose	Notch
Order No.	12AAE310	12AAE302	12AAF150	12AAE309
Stylus tip	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)				
Application/Type	ø1.6 mm ball	ø0.8 mm ball	ø0.5 mm ball	Deep groove
Order No.	12AAE303	12AAE304	12AAE305	12AAE308
Stylus tip	ø1.6 mm tungsten carbide	ø0.8 mm tungsten carbide	ø0.5 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)				
Application/Type	Deep hole A		Deep hole B	
Order No.	12AAE306		12AAE307	
Stylus tip	ø1.6 mm tungsten carbide		ø1.6 mm tungsten carbide	
Dimensions (mm)				



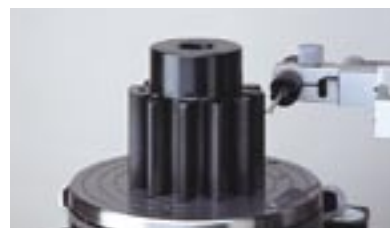
Cutter mark



Corner



Small hole



Notched workpiece measurement



Flatness measurement



ID measurement

Optional Accessory for Roundtest



Centering chuck (ring operated)

211-032

Suitable for holding small parts with easy-to-operate knurled-ring clamping.

- Holding capacity:
Internal jaws: OD = 1-36 mm, ID = 14-70 mm.
External jaws: OD = 1-75 mm.
- External dimensions: $\varnothing 118 \times 34$ mm
- Mass: 1.2kg



Micro-chuck

211-031

Used for clamping a workpiece (less than $\varnothing 1$ mm dia.) that the centering chuck cannot handle.

- Holding capacity: up to $\varnothing 1.5$ mm
- External dimensions: $\varnothing 118 \times 48.5$ mm
- Mass: 0.8kg



Centering chuck (key operated)

211-014

Suitable for holding longer parts and those requiring a relatively powerful clamp.

- Holding capacity:
Internal jaws: OD = 1 - 35mm, ID = 33 - 85mm
External jaws: OD = 30-80mm.
- External dimensions: $\varnothing 157 \times 76$ mm
- Mass: 3.8kg

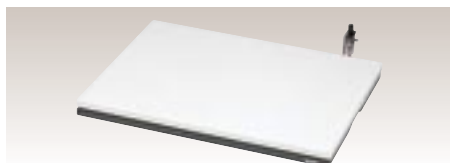


Magnification calibration gage

211-045

Used for normalizing detector magnification by calibrating detector travel against displacement of a micrometer spindle.

- Maximum calibration range: 400 μ m
- Graduation: 0.2 μ m
- Mass: 4kg



Vibration isolator*

178-025

- Vibration isolation method:
Air suspension, diaphragm isolation system.
- External dimensions (W x D x H): 750 x 550 x 57mm

Vibration isolator stand*

178-024

*for RA-2100 and RA-2100CNC



Auxiliary workpiece stand

356038

- Used for measuring a workpiece whose diameter is 20mm or shorter and whose height is 20mm or lower.



Cylindrical square

350850

- Used for checking and aligning table rotation axis parallel to the Z-axis column.
- Squareness: 3 μ m
- Straightness: 1 μ m
- Cylindricity: 2 μ m
- Roundness: 0.5 μ m
- Mass: 7.5kg



Magnification checking kit*

997090

- A combination of gauge blocks and an optical flat.

* Standard accessory for RA-H5100 and RA-H5100CNC



Origin-point gage*

998382

- A gage for zero setting of the R-axis and Z-axis.

* Standard accessory for RA-2100, RA-2100CNC, RA-H5100 and RA-H5100CNC