Roundtest RA-1400/1500

Bulletin No. 1731

New Compact
High-Precision Roundness Measuring System

Mitutoyo

NEW COMPACT ROUNDTEST RA-1400/1500

Realization of space saving and lower cost by focusing on measurement of small parts

- Maximum probing diameter: ø3.94" (100mm)
- Vertical travel: 5.91" (150mm)

Outstanding accuracy!

- Rotational accuracy (radial): (0.02 + 0.0006H)μm
- Rotational accuracy (axial): (0.02 + 0.0006R)μm

Useful functions save time!

- Easy preparation: Easy and reliable centering and leveling adjustments with the DAT (Digital Adjustment Table) function.
- Improved measurement efficiency: Automatic measurement via a part program is standard.

RA-1400

High-performance roundness measurement instruments with analytical capabilities and small parts measurement know-how from top-of-the-line models

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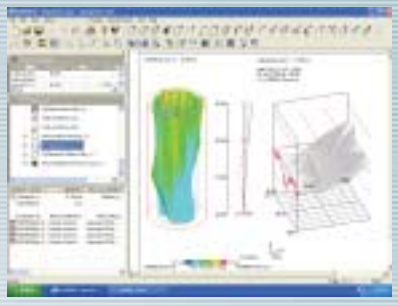
Powerful data analysis software ROUNDPAK V5

- Popular simplified measurement mode now even easier to use
- Simulation of part program possible
- Graphical display of both CAD and measurement data



ROUNDPAK Ver.5
The latest roundness/cylindrical form analysis program

High-precision rotary table achieves compact size and high stability through use of air bearings featuring new mechanism. The D.A.T. (Digital Adjustment Table) function is equipped.

RA-1500

High-precision column making evaluation of cylindricity and straightness possible

- Straightness of column: 0.01µin/1.97" (0.15µm/50mm)
- Parallelism of column: 0.01µin/5.91" (0.3µm/150mm)

ROUNDPAK Ver.5

Roundness and cylindricity measurement/analysis program

ROUNDPAK Ver.5 offers simple operation through icon and mouse operation. It allows various geometric variation analyses by providing a large assortment of calculation functions, such as simultaneous analysis of multiple items, and for data that has already been measured once, changing the filter cutoff value, deleting unneeded parts, and using this data for different analyses.

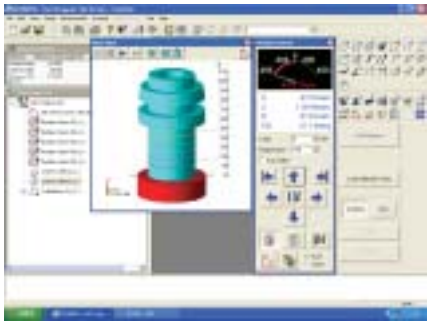
Two measurement modes

Simplified measurement mode allowing easy measurement of single items

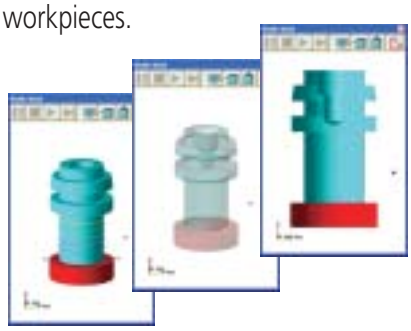
Part program mode allowing automatic measurement and analysis of multiple items

Part program

Easy editing and creation of part programs

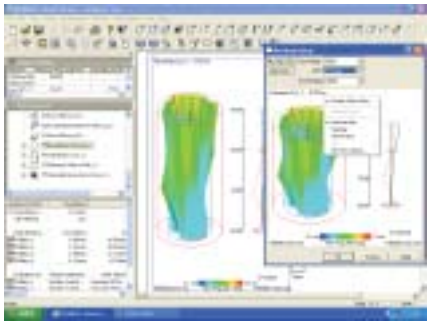


Part programs can be simulated offline using the CAD data of measured workpieces.



Free layout of measured forms and results

Measured forms and results can be graphically processed for 3D display, exploded display, etc., to allow easy evaluation.



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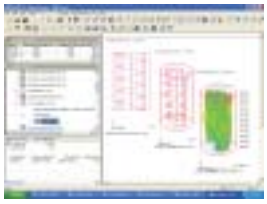
RA-1500/1400 + ROUNDPAK® Features

D.A.T. Function
(Digital Adjustment Table)

Available with the RA-1500 only

Spiral measurement/Analysis

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.

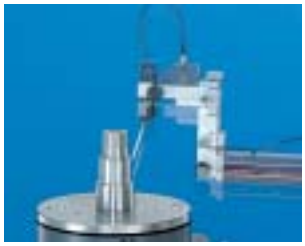


Spiral cylinder measurement

Available with the RA-1500 only

Positioning function of rotary table

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



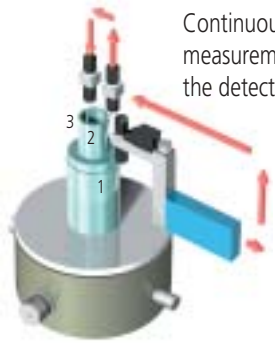
Roundness measurement column rectilinear action

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: ±0.20")

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

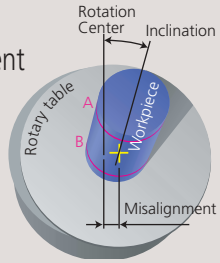
3) = inner diameter: Up to ø1.97" (50 mm)

Centering/leveling function D.A.T.

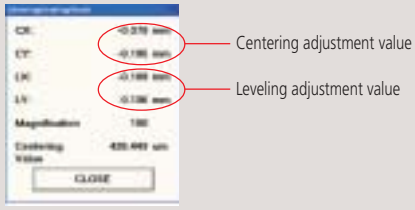
Troublesome centering and leveling are a cinch! Now anybody can perform measurements like an experienced pro!

D.A.T. (Digital Adjustment Table): Centering and leveling are facilitated by digimatic micrometerheads

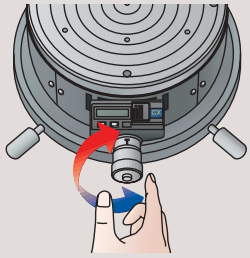
1. Preliminary measurement of two cross sections "A" and " B"



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.

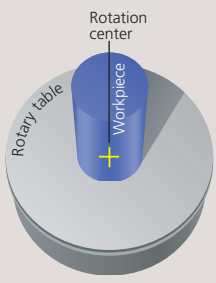


Manual adjustment

Micrometer head: [CX] [CY]: for centering
Micrometer head: [LX] [LY]: for leveling

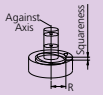
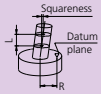
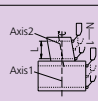
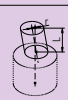
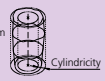
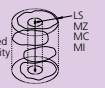
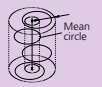
4. Centering and leveling are complete

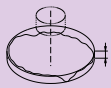
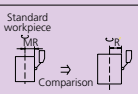
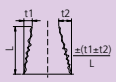
Centering range: ±.12" (3mm)
Leveling (inclination) range: ±1°



Measurement/Analysis Features

Analysis items

	Analysis mode		Measurement capacity	Evaluation diagram	RA-1400	RA-1500
Rotational measurement	Roundness				○	○
	Flatness	Single-circumference			○	○
	Squareness	Against Axis			○	○
		Against Plane			○	○
	Concentricity				○	○
	Coaxiality	Of section			○	○
		Of axis				○
	Parallelism	Dual-radius			○	○
	Thickness deviation	Radial			○	○
		Axial			○	○
	Cylindricity	Minimum cylindricity				○
		Simplified cylindricity				○
		Mean cylindricity				○
	Radius variation					○

	Analysis mode		Measurement capacity	Evaluation diagram	RA-1400	RA-1500
Rotational measurement	Circular run-out	Radial			○	○
		Axial			○	○
	Total run-out	Radial				○
	Diameter measurement				○	○
Rectilinear measurement	Straightness	Vertical				○
	Taper ratio	Vertical				○
	Slope	Vertical				○
	Cylindricity					○
	Squareness					○
	Coaxiality					○
	Parallelism	Vertical				○
Spiral measurement	Cylindricity					○
	Coaxiality					○
	Total run-out	Radial				○

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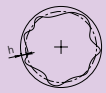
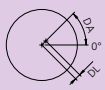
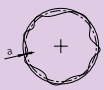
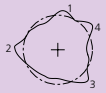
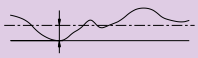
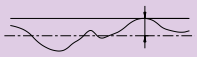
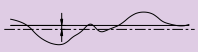
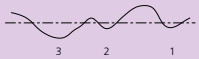
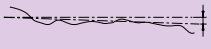
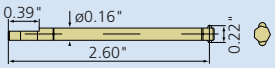
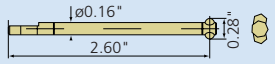
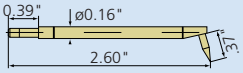
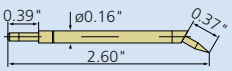
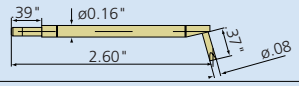
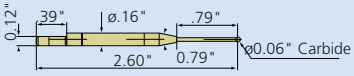
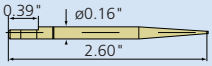
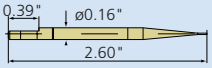
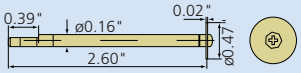
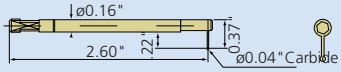
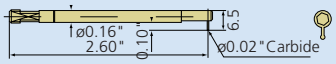
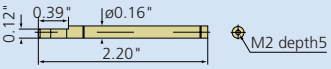
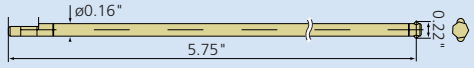
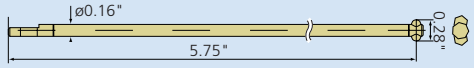
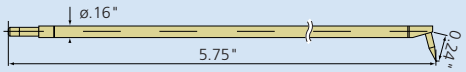
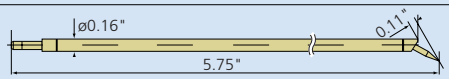
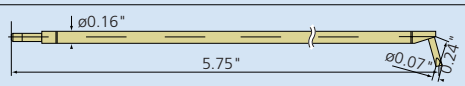
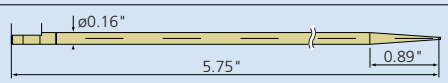
Quantitative analysis items

	Analysis mode	Measurement capacity	Evaluation diagram	RA-1400	RA-1500
Rotational measurement	Bulge height	Variation from mean circle to maximum value of form difference using method of least squares		○	○
	Depression depth	Variation from mean circle to minimum value of form difference using method of least squares		○	○
	Eccentricity amount 1	Amount of misalignment in X and Y axis directions at center of measured cross section in relation to rotation axis center		○	○
	Eccentricity amount 2	Variation and variation direction of center of cross section in relation to rotation axis center		○	○
	Average roundness	Average form variation in relation to mean circle using method of least square method		○	○
	Number of bulges	Number of bulges expressed as displacement in normal direction from mean circle using least square method		○	○
Rectilinear measurement	Bulge height	Variation between average line and maximum bulge height of measured cross section			○
	Depression depth	Variation between average line and maximum depression depth of measured cross section			○
	Average height	Average value of form variation in relation to average line of measured cross section			○
	Number of bulges	Number of bulges expressed as displacement in normal direction from average line of measured cross section			○
	Slope	Maximum value of variation of average line of measured cross section			○

Optional Accessories

Stylus

Description	Parts No.	Stylus tip	Dimensions
Standard stylus (Standard accessory)	**12AAB681**	ø0.06"(1.6mm) carbide ball	
Stylus for notched workpiece	**12AAB682**	ø0.12"(3mm) carbide ball	
Stylus for groove	**12AAB683**	0.01"(0.25mm) radius sapphire	
Stylus for corner	**12AAB684**	0.01"(0.25mm) radius sapphire	
Stylus for removing asperity (cutter mark)	**12AAB685**	0.59"(15mm) radius carbide blade	
ø1.6 ball stylus	**12AAB674**	ø0.06"(1.6mm) carbide ball	
Stylus for small hole	**12AAB686**	ø0.04"(1mm) carbide ball	
Stylus for extra small hole	**12AAB687**	ø0.02"(0.5mm) carbide ball	
Disk stylus	**12AAB694**	ø0.47"(12mm) carbide disk	
Crank stylus (ø1)	**12AAB695**	ø0.04"(1mm) carbide ball	
Crank stylus (ø0.5)	**12AAB696**	ø0.02"(0.5mm) carbide ball	
M2 tapped shank for CMM stylus	**12AAB676**	ø0.02"(0.5) to ø0.31"(8.0) ruby ball styli are available	
2X-long type stylus	**12AAB688**	ø0.06"(1.6mm) carbide ball	
2X-long type stylus for notched workpiece	**12AAB689**	ø0.12"(3mm) carbide ball	
2X-long type stylus for groove	**12AAB690**	0.01"(0.25mm) radius sapphire	
2X-long type stylus for corner	**12AAB691**	0.01"(0.25mm) radius sapphire	
2X-long type stylus for removing asperity(cutter mark)	**12AAB692**	0.60"(15mm) radius carbide blade	
2X-long type stylus for small hole	**12AAB693**	ø0.04"(1mm) carbide ball	

- The 2X-long type styluses are used only in the horizontal position only.
- The crank styluses cannot be used for inner/outer diameter measurement.
- Mitutoyo accepts orders for the manufacture of special replacement stylus. For details, please contact your nearest Mitutoyo Sales Office.

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Gages, Chucks, Arm/Holder Extension

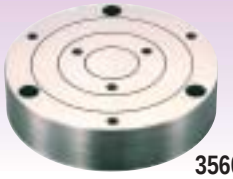
Cylindrical square

- Used for checking and aligning table rotation axis parallel to the Z-axis column.
- Squareness: 0.12µin (3µm)
- Straightness: 0.04µin (1µm)
- Cylindricity: 0.08µin (2µm)
- Roundness: 0.02µin (0.5µm)
- Mass: 16.5 lbs.(7.5kg)

350850

Auxiliary workpiece stand

- Used for measuring a workpiece whose diameter is 0.8" (20mm) or shorter and whose height is0.8" (20mm) or lower.



356038

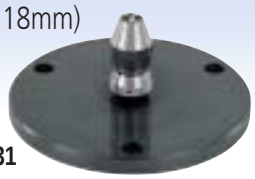
Magnification checking gage

- Used for checking and adjusting the probe sensitivity.
- Range: 15.75µin (400µm)
- Micrometer reading: 0.08µin (2µm)
- Mass: 8.8 lbs. (4kg)

211-045

Micro chuck

- Used for clamping extra-small diameter workpieces such as pins or wires.
- External range: Up to 0.06" (1.5mm)
- Mounting flange: ø4.65" (118mm)
- Height: 1.91" (48.5mm)
- Mass: 1.36 lbs. (620g)



211-031

Three jaw chuck

- Reversible jaws for external and internal chucking.
- Used for centering and clamping a small diameter workpiece such as clank shafts or pins.
- Heavy-duty type
- With a clamping wrench.
- External range: 0.04" to 3.34" (1 to 85mm)
- Internal range: 1.3" to 3.34" (33 to 85mm)
- Mounting flange: ø6.18" (157mm)
- Height: 2.99" (76mm)
- Mass: 8.36 lbs. (3.8kg)

211-014

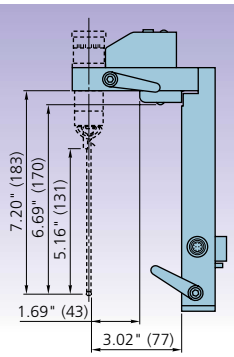
Quick chuck

- Reversible jaws for external and internal chucking.
- Used for centering and clamping a small diameter workpiece.
- Easy clamping with a knurled clamp ring.
- External range: 0.04" to 2.95" (1 to 75mm)
- Internal range: 0.55" to 2.75" (14 to 70mm)
- Mounting fange: ø4.65" (118mm)
- Height: 1.34" (34mm)
- Mass: 2.64 lbs. (1.2kg)

211-032

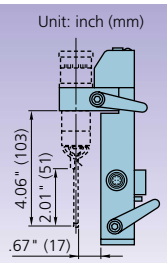
Extension probe holder (2X higher)

- 2X-longer type stylus is possible.
- Mass: 2.42 lbs. (1.1kg)



12AAB569

Unit: inch (mm)



12AAB597

Auxiriary probe holder for a large diameter workpiece

- Allows to measure a workpece which has an outside diameter from 2.76" (70mm) up to 8.66" (220mm).
- Mass: 1.98 lbs. (0.9kg)

Specifications

Model		RA-1500	RA-1400
Type		inch/mm	inch/mm
Order No.		**211-732A**	**211-731A**
Turntable	Rotational accuracy (radial)	(0.8 +0.6H)μ inch [(0.02 + 6H / 10000)μm] H: Probing height (inch [mm])	
	Rotational accuracy (axial)	(0.8 + 0.6R)μ inch [(0.02 + 6R / 10000)μm] R: Probing radius (inch [mm])	
	Rotating speed	4rpm, 6rpm, 10rpm	
	Working diameter	ø5.91" (150mm)	
	Centering range	±0.12" (3mm)	
	Leveling range	±1°	
	Maximum probing diameter	ø3.94" (100mm)	
	Maximum workpiece diameter*1, *2	ø15.75" (400mm)	
	Maximum workpiece weight	22.03lbs. (10kg)	
Vertical Column (Z-axis)	Straightness (in narrow range)	6μ inch / 1.96" (0.15μm / 50mm)	
	Straightness (in entire range)	12μ inch / 5.9" (0.3μm / 150mm)	
	Parallelism with rotating axis	12μ inch / 5.9" (0.3μm / 150mm)	
	Vertical travel	5.9" (150mm)	
	Positioning speed	Max. 0.59"/s (15mm/s) with joystick operation (Manual feed available)	
	Measuring speed	0.02", 0.04", 0.20"/s (0.5, 1, 2, 5mm/s)	
	Maximum probing height (OD)	5.9" (150mm)	
	Maximum probing height (ID)	5.9" (150mm)	
	Maximum probing depth	3.54"(90mm)	
Horizontal arm (X-axis)	Horizontal travel	2.95"/75mm (Including a protrusion of 0.98" [25mm]the turntable rotation center)	
	Positioning speed	Max. 0.31"/s (8mm/s) with joystick operation (Manual feed available)	
Air supply	Air pressure	390kpa (4kgf/cm^2)	
	Air consumption	30L/min.	
Probe and stylus	Measuring range	±15.75μin (400μm)	
	Measuring force	7 to 10mN	
	Standard stylus (**12AAB681**)	Carbide ball, ø0.06" (1.6mm)	
	Measuring direction	Two directional	
	Stylus angle adjustment	±45° (with graduations)	
Electronic unit	Data sampling dots	Max. 14400dots/rotation	
	Measuring modes and functions	Rotational measurement, rotational measurement with X-axis displacement, Z-axis rectilinear measurement	
	Power supply	100V AC – 240V AC, 50/60Hz	
Dimensions (W x D x H)		24" x 16.93" x 24.41"/635mm x 430mm x 620mm	
Mass		209.25lbs. (95kg)	
Standard accessories		Optical flat and gauge block set (**997090**), standard stylus (**12AAB681**), reference hemisphere (**211-016**), origin point gage (**998382**), machine cover, lubricant (**352637**), connecting cables, user's manual, screw drivers, key wrenches, power cord, grounding lead wire	

*1: When using an auxiliary probe holder for a large diameter workpiece, the possible measuring range is between ø2.76" (70mm) and ø8.66" (220mm).

*2: An auxiliary workpiece stand (option) is required for measurements 0.79" (20mm) or less in the radial direction from the table center and 0.79" (20mm) or less from the table top.

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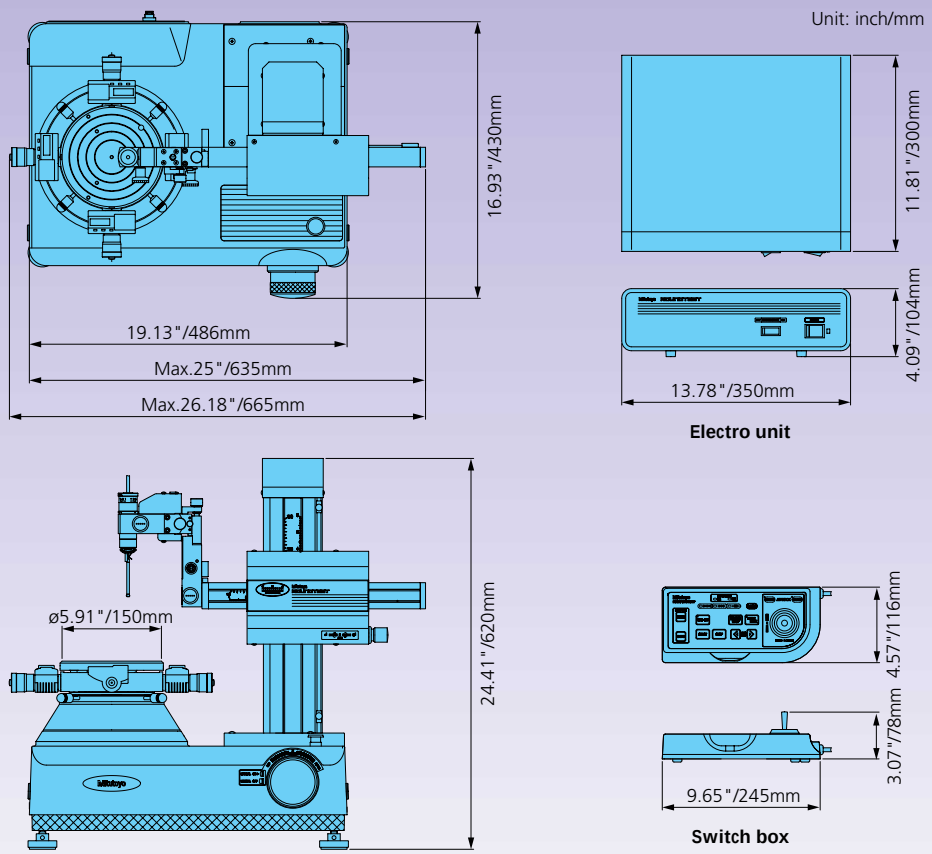
Dimensions



The RA-1400 measuring unit dimensions are the same as those of the RA-1500.

- Coordinate Measuring Machines
- Vision Measuring Systems
- Surface-, Form- and Contour Measurement
- Digital Scale and DRO Systems
- Optical Measuring
- Sensor Systems
- Hardness Measuring
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