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Roundness/Cylindricity Measuring System
ROUNDTEST RA-1600

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Powerful Analysis-Performance in a Compact Form:
ROUNDTEST RA-1600

Measure a wide variety of workpieces

Offers a wide measuring range in a compact form, allowing you to measure a diverse range of workpieces effectively.

- Max. probing diameter: 280 mm
- Vertical travel: 300 mm
- Max. table loading: 25 kg

High accuracy

Despite its compact size, the Roundtest RA-1600 maintains top-end precision for accurate measurements.

- Rotational accuracy (Radial): $(0.02+6H/10000)$ µm
- Rotational accuracy (Axial): $(0.02+6X/10000)$ µm
- Accuracy assurance for Z axis (Straightness, Parallelism) and X axis (Straightness, Squareness).

Multi-functional analysis system

This system incorporates the flexible data analysis software ROUNDPAK, providing you with a comprehensive set of features.

- Measurement results are displayed in a graphics window for easy interpretation.
- The simplified measurement mode ensures user-friendly operation.
- It can simulate a part program, allowing you to evaluate and optimize your measurement processes.

High functionality

The Roundtest RA-1600 offers various additional features to enhance its functionality.

- Includes a detector to prevent damaging collisions in the Z axis.
- The high-precision power column unit enables the evaluation of straightness as well as cylindricity.
- Equipped with the D.A.T. mechanism to boost measurement efficiency.
- The remote control box makes operation easy and convenient.

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High-level functions promote greater efficiency

Equipped with a highly accurate turntable for simple and accurate workpiece centering and leveling

The table provides exceptional rotational accuracy:
Radial: (0.02+6H/10000) µm
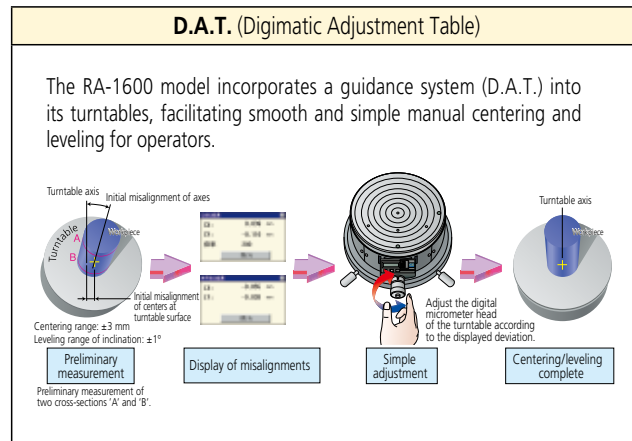Axial: (0.02+6X/10000) µm
This exceptional precision allows the system to measure not only roundness and cylindricity but also flatness and other characteristics, ensuring versatility across various applications.

The RA-1600 inherits the renowned D.A.T. mechanism from our top-end devices, simplifying workpiece centering and leveling. Operators can effortlessly match the adjustment values displayed on the monitor by manipulating the digital micrometer heads of the turntable. Even notched workpieces can be measured accurately with ease.

Centering and leveling operations performed using the D.A.T. can seamlessly integrate into the measurement procedure or part program. This integration minimizes human errors during centering and leveling, while standardizing measurement operations executed by the part program.

*Please note that centering and leveling is a manual process guided by the display.

D.A.T. (Digimatic Adjustment Table)

The RA-1600 model incorporates a guidance system (D.A.T.) into its turntables, facilitating smooth and simple manual centering and leveling for operators.

Turntable axis
Initial misalignment of axes
Turntable
Workpiece
A
B
Initial misalignment of centers at turntable surface
Centering range: ±3 mm
Leveling range of inclination: ±1°
Turntable axis
Workpiece
Adjust the digital micrometer head of the turntable according to the displayed deviation.

| Preliminary measurement | Display of misalignments | Simple adjustment | Centering/leveling complete |

Preliminary measurement of two cross-sections 'A' and 'B'.

Continuous OD/ID measurement function

Enable continuous internal/external measurement without changing the detector position.
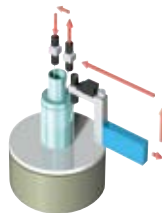
Partial circle measurement function

Measure segments of the circumference even when a workpiece cannot be physically rotated by a full turn due to obstructions (projections).
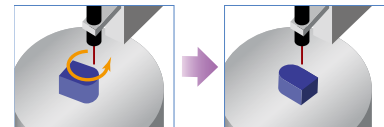
Spiral measurement/analysis

The spiral-mode measurement function combines table rotation and rectilinear action, enabling the loading of cylindricity, coaxiality, and other measurement data as a continuous data set.

Spiral-mode cylinder measurement

Measurement through X-axis tracking

Enable measurement while tracing through a built-in linear scale in the X-axis. This type of measurement is useful when displacement caused by form variation exceeds the detector's measuring range, requiring X-axis motion to maintain contact with the workpiece surface.

Standard Safety Mechanism

The detector unit (in the vertical orientation) is equipped with a collision-sensing function to prevent collisions in the Z-axis direction. Additionally, an accidental collision prevention function has been added, automatically stopping the system when the detector displacement exceeds its range. The dedicated analysis software (ROUNDPAK) detects any accidental touch and initiates an automatic system stop.

Sliding detector-unit holder (Option)

The optional sliding mechanism in the detector-unit holder allows for one-touch measurement of workpieces with deep holes and thick walls, which was previously challenging with the standard arm.

Sliding distance: 112 mm

The detector-unit holder can be positioned higher than the workpiece along the Z-axis, allowing for easy lowering and precise measurements. Additionally, the continuous internal/external measurement function* facilitates effortless measurement of internal and external features.

*Please refer to the corresponding page for detailed information on the continuous ID and OD measuring function.

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Roundness/Cylindricity Measurement/Analysis Software
ROUNDPAK

ROUNDPAK features an intuitive interface that allows for easy operation using a mouse and intuitive icons.

Effortless operations with comprehensive parameters and analysis functions

The ROUNDPAK software offers a wide range of standard parameters, including roundness, cylindricity, flatness, and parallelism. These parameters can be conveniently selected using intuitive icons, ensuring simplicity even with a full set of parameters. Additionally, ROUNDPAK provides specialized functions such as the design value best-fit analysis, harmonic analysis, and recording of peak or trough points on a circumference. It also offers the flexibility to easily re-calculate or delete previously collected data.

Recalculation
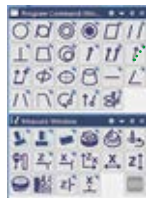
Data deletion

Icon View
Machine Control View
Operation Coodinates View
Workpiece View
Part Program List
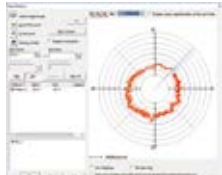

### Flexible Graphics & Data Layout Options

Enjoy the freedom to customize report layouts according to your preferences. With ROUNDPAK, you can specify how the analysis results and graphics are displayed, including their sizes and positions. The analysis result window can be used directly as a layout window, enabling seamless customization. Furthermore, the measurement procedure, along with the layout information, is saved, allowing for automated execution of the entire process, from measurement start and calculation to result saving and printing.
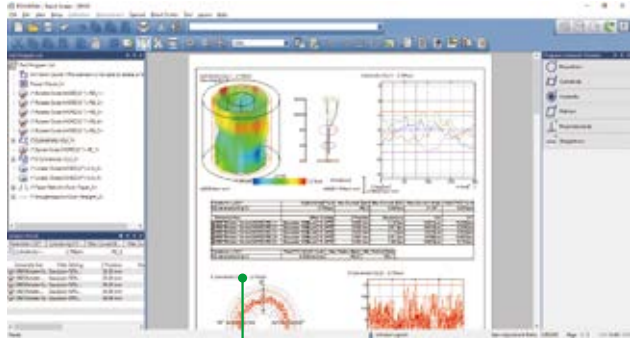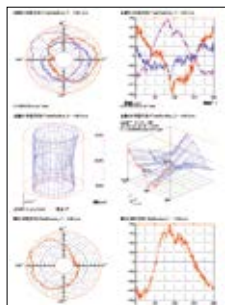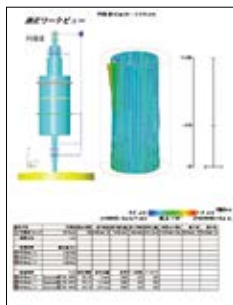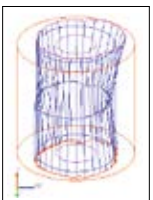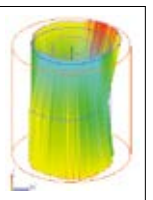

Result View

Diverse Graphics Functions

Explore a wide range of graphics functions that bring analysis results, such as cylindricity and coaxiality, to life in immersive 3D visuals.
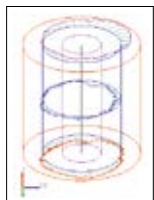
Normal display
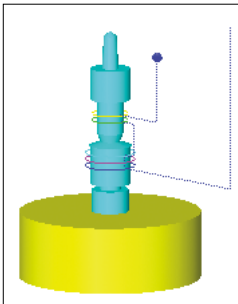

Wire-frame display

Surface-map display

Shading display

Off-line measurement procedure programming function

Take advantage of the offline teaching function, which allows you to create a part program (measurement procedure) without an actual measurement target. This function enables users to virtually execute the measurement operation in a 3D simulation window.

Patent registered in Japan, USA
Patent pending in Europe
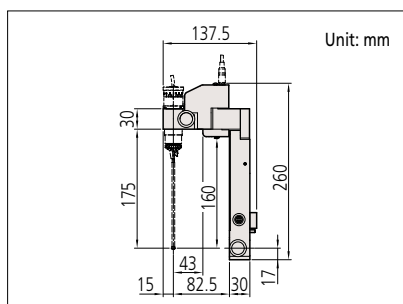
Optional Accessories

Interchangeable Styli*2

Type	Standard (Standard accessory)	Notch	Deep groove	Corner	Cutter mark
Order No.	**12AAL021**	**12AAL022**	**12AAL023**	**12AAL024**	**12AAL025**
Stylus tip	ø 1.6 mm tungsten carbide	ø 3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide
Dimensions (mm)					

Type	Small hole (ø 0.8)	Small hole (ø1.0)	Small hole (ø1.6)	Extra small hole (Depth 3 mm)	ø1.6 mm ball
Order No.	**12AAL026**	**12AAL027**	**12AAL028**	**12AAL029**	**12AAL030**
Stylus tip	ø 0.8 mm tungsten ca rbide	ø 1 mm tungsten carbide	ø 1.6 mm tungsten carbide	ø 0.5 mm tungsten carbide	ø 1.6 mm tungsten carbide
Dimensions (mm)					

Type	Disc	Crank (ø 0.5)	Crank (ø1.0)	Flat surface	2X-long type *1
Order No.	**12AAL031**	**12AAL032**	**12AAL033**	**12AAL034**	**12AAL035**
Stylus tip	ø 12 mm tungsten carbide	ø0.5 mm tungsten carbide (Depth 2.5 mm)	ø1 mm tungsten carbide (Depth 5.5 mm)	tungsten carbide	ø 1.6 mm tungsten carbide
Dimensions (mm)					

Type	2X-long type notch *1	2X-long type deep groove *1	2X-long type corner *1	2X-long type cutter mark *1	2X-long type small hole *1
Order No.	**12AAL036**	**12AAL037**	**12AAL038**	**12AAL039**	**12AAL040**
Stylus tip	ø 3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide	ø 1 mm tungsten carbide
Dimensions (mm)					

Type	3X-long type *1	3X-long type deep groove *1	Stylus shank	Stylus shank(standard groove)	Stylus shank(2X-long groove)*1
Order No.	**12AAL041**	**12AAL042**	**12AAL043**	**12AAL044**	**12AAL045**
Stylus tip	ø 1.6 mm tungsten carbide	SR0.25 mm sapphire	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)
Dimensions (mm)					

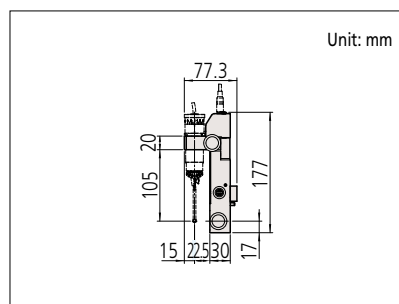*1: Please note that measuring is limited to the vertical direction.
*2: Customized special interchangeable styli are available upon request. For more information, please contact your local Mitutoyo office.
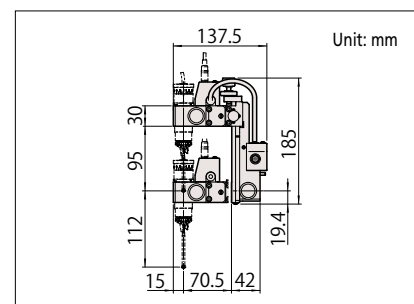
Optional detector holders

Double length detector holder: 12AAF203

Large diameter detector holder: 12AAF204

Sliding detector holder: 12AAL090

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Optional Accessories

Enhance the versatility of your measurement setup with our range of optional accessories, carefully designed to accommodate a wide variety of workpieces, from longer parts to smaller ones, and those requiring a powerful clamp.

Three-jaw chuck
(key operated)

211-014
Suitable for holding longer parts and those requiring a relatively powerful clamp.
- Holding capacity:
  Internal jaws:
  OD = ø2 - ø35 mm,
  ID = ø25 - ø68 mm
  External jaws:
  OD = ø35 - ø78 mm
- External dimensions (DxH):
  ø157 x 70.6 mm
- Mass: 3.8 kg

Quick chuck
(ring operated)

211-032
Suitable for holding small parts with easy-to-operate knurled-ring clamping.
- Holding capacity:
  Internal jaws:
  OD = ø1 - ø36 mm,
  ID = ø16 - ø69 mm
  External jaws:
  OD = ø25 - ø79 mm
- External dimensions (DxH):
  ø118 x 41 mm
- Mass: 1.2 kg

Micro chuck

211-031
Used for clamping a workpiece (less than ø1 mm dia.) that the centering chuck cannot handle.
- Holding capacity:
  ø0.2 - ø1.5 mm
- External dimensions (DxH):
  ø107 x 48.5 mm
- Mass: 0.6 kg

Magnification calibration gage

211-045
Used for normalizing detector magnification by calibrating detector travel against displacement of a micrometer spindle.
- Maximum calibration range: 400 µm
- Graduation: 0.2 µm
- External dimensions (WxDxH): 235 (max) x 185 x 70 mm
- Mass: 4 kg

Cylindrical square

350850
- Straightness: 1 µm
- Cylindricity: 2 µm
- External dimensions (DxH):
  ø70 x 250 mm
- Mass: 7.5 kg

Optical flat and gage block set
997090

Reference hemisphere
211-016*

* Standard accessory for **RA-1600**

Auxiliary stage
356038

Vibration isolator

Achieve accurate roundness and cylindricity measurements by mitigating the impact of environmental disturbances, such as vibrations. Our optional vibration isolator provides a solution to minimize these effects. Choose between a desktop-type or desk-type vibration isolator, which can be used in combination with a monitor arm and a side table to create a stable measurement environment.

Desk type

- Vibration isolator (integrated stand and air suspension system) **178-188**
- Monitor arm **12AAK120***[1]
- Side table **178-181***[1]

Desktop type*
178-025

*Measuring unit and controller not included.

Monitor arm*[1]
12AAK120

Vibration isolator (Desk type) **178-188**

Side table*[1] **178-181**

Example combination*[2]:
with a monitor arm but no side table*[3]

Example combination*[2]:
with a side table but no monitor arm

*1: Please note that this accessory should be used together with the vibration isolator (178-188).
*2: Measuring unit, controller and analysis system not included.
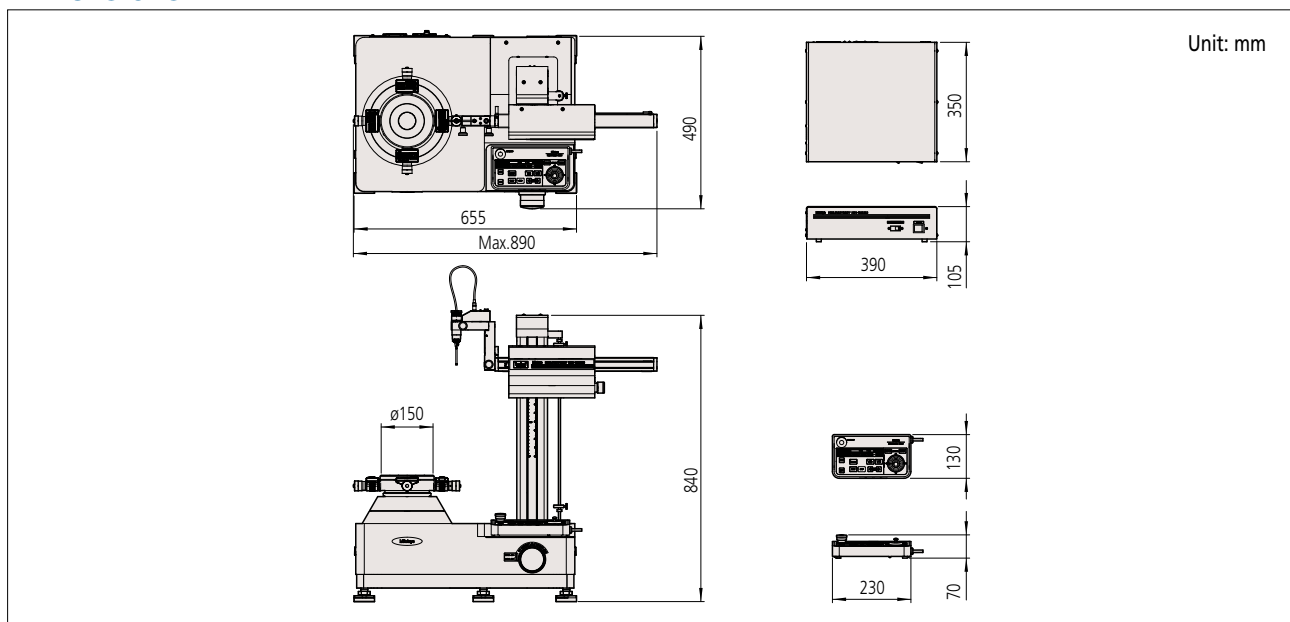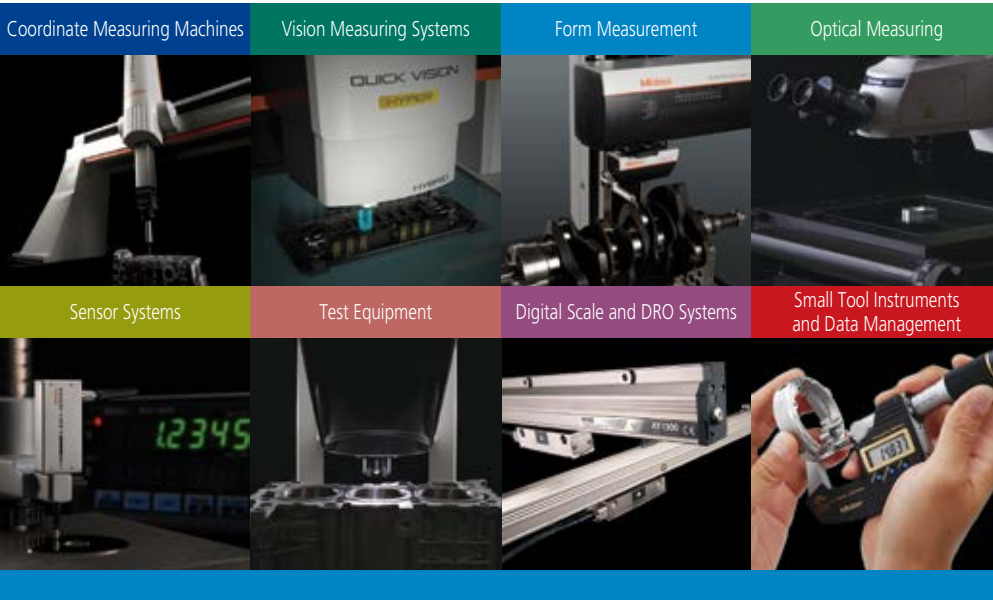*3: User to provide a printer rack.

Specifications

Specifications

Model No.			RA-1600
Turntable unit	Rotational accuracy	Radial direction	(0.02+6H/10000) µm H: Probing height (mm) JIS B7451-1997
		Axial direction	(0.02+6X/10000) µm X: Distance from the center of rotation (mm)
	Rotational speed		4, 6, 10 rpm
	Table diameter		ø150 mm
	Centering / leveling adjustment		D.A.T.
	Centering adjustment range		±3 mm
	Leveling adjustment range		±1 °
	Maximum loading		25 kg
	Maximum probing diameter		ø280 mm
	Maximum workpiece diameter		ø560 mm
Vertical drive unit (Z-axis column unit)	Straightness of drive	Narrow range	0.20 µm / 100 mm
		Wide range	0.30 µm / 300 mm
	Parallelism with turntable axis		1.5 µm / 300 mm
	Traverse speed		Max. 15 mm/s (Measurement: 0.5, 1, 2, 5 mm/s)
	Maximum probing height (ID / OD)		300 mm[1]
	Maximum probing depth	over ø32	91 mm (with standard stylus)
		over ø7	50 mm (with standard stylus)
Radial drive unit (X-axis arm unit)	Straightness of drive		2.7 µm / 140 mm
	Perpendicularity to turntable axis		1.6 µm / 140 mm
	Traverse range amount		165 mm (From table axis -25 mm ~ +140 mm)
	Traverse speed		Max. 8 mm/s (measurement: 0.5, 1, 2, 5 mm/s)
Detector	Measuring force		10 ~ 50 mN (5 level switching) (ID/OD measuring position with standard stylus)
	Measuring range	Standard	±400 µm / ±40 µm / ±4 µm
		Tracking	±5 mm
	Tip shape, material		ø1.6 mm tungsten carbide
	Other		IN/OUT one-touch switching, Stylus angle scale markings (±45 °), Z-axis collision detection function
Other	Power supply		100 V ~ 240 V
	Power consumption		80 W
	Air pressure		0.39 MPa
	Air consumption		22 L/min (standard state)
	Mass of main unit (NET)		170 kg

*1: For measuring a workpiece with a height of 20 mm or less, it is recommended to use an optional auxiliary stage.

Dimensions

Unit: mm

490
655
Max.890
350
390
105
840
ø150
130
230
70

Coordinate Measuring Machines	Vision Measuring Systems	Form Measurement	Optical Measuring

| Sensor Systems	Test Equipment	Digital Scale and DRO Systems	Small Tool Instruments and Data Management

Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.
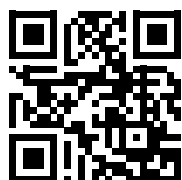
Find additional product literature and our complete catalog here.

www.mitutoyo.eu

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