A PC-compliant roundness and cylindrical-form measuring instrument with extensive analysis features to enable measurement of a wide variety of workpieces.
Powerful Analysis Performance in a Compact Form
ROUNDTEST RA-1600

Can measure a wide variety of workpieces
Realizes a wide measuring range in a compact form
• Max. probing diameter: 280 mm
• Vertical travel: 300 mm
• Max. table loading: 25 kg

Multi-functional analysis system
Incorporates flexible data analysis software ROUNDPAK
• Measurement results displayed in a graphics window
• Easy to operate thanks to a simplified measurement mode
• Can simulate a part program

High accuracy
Compact, but with top-end precision
• Rotational accuracy (Radial): \((0.02 + 6H/10000) \, \mu m\)
• Rotational accuracy (Axial): \((0.02 + 6X/10000) \, \mu m\)
• Accuracy assurance: Z axis (Straightness, Parallelism), X axis (Straightness, Squareness)

High Functionality
• Includes a detector to prevent damaging collisions in the z axis
• High-precision power column unit can evaluate straightness as well as cylindricity
• Equipped with D.A.T. mechanism to boost measurement efficiency
• Includes a remote control box for easy operation
The table provides high rotational accuracy (radial 0.02+6H / 10000 μm; axial 0.02+6X/10000 μm), enabling the system to measure flatness and other characteristics, in addition to roundness/cylindricity, at a level that suits any application. The RA-1600 has also inherited the D.A.T. (Digital Adjustment Table) mechanism used in top-end devices to make workpiece centering and leveling quick and easy. The operator simply has to manipulate the digital micrometer heads of the turntable to match the adjustment values displayed on the monitor. Even notched workpieces can be measured accurately.

Centering and leveling operations carried out by using the D.A.T.* can also be incorporated into the measurement procedure (part program). This prevents human errors when performing centering and leveling, and helps standardize measurement operations executed by the part program.

*Centering and leveling is a manual process guided by the display.

Continuous OD/ID measurement function

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

Spiral Measurement/Analysis

The spiral-mode measurement function combines table rotation and rectilinear action allowing cylindricity, coaxiality, and other measurement data to be loaded as a continuous data set.

Safety mechanism provided as a standard feature

A collision-sensing function has been added to the detector unit (when it is in the vertical orientation) to prevent collision in the Z-axis direction. Additionally, an accidental collision prevention function, which stops the system when the detector displacement exceeds its range, has been added. When an accidental touch is detected, the dedicated analysis software (ROUNDPAK) senses the error and automatically stops the system.

D.A.T. (Digimatic Adjustment Table)

A guidance system (D.A.T.) is incorporated into the turntables on the RA-2200DS/ DH models to help the operator perform manual centering and leveling smoothly and simply.

Partial circle measurement function

Even if a workpiece cannot be measured by physically rotating it by a full turn due to some obstruction (projection), segments of the circumference can be measured.

Measurement through X-axis tracking

Measurement while tracing is possible through a built-in linear scale in the X-axis. This type of measurement is useful when displacement due to form variation exceeds the measuring range of the detector, and X-axis motion is necessary to maintain contact with the workpiece surface.

Sliding detector-unit holder provided as a standard feature (Option)

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

*See this page for details about the continuous ID and OD measuring function.
## Specifications

### Turntable unit

<table>
<thead>
<tr>
<th>Model No.</th>
<th>RA-1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>211-723</td>
</tr>
</tbody>
</table>

**Rotational accuracy**
- Radial direction: \((0.02+8H/10000) \mu m\) \(H\): Measuring height with reference to turntable surface (mm) \(\text{JIS B7451-1997}\)
- Axial direction: \((0.02+8X/10000) \mu m\) \(X\): Radial distance with reference to turntable axis (mm)

**Rotational speed**
- 4, 6, 10 rpm

**Effective 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**
- ø180 mm

**Maximum workpiece diameter**
- ø800 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**
- Max. 15 mm/h (Measurement: 0.5, 1, 2, 5 mm/s)

**Maximum probing height (ID / OD)**
- over ø32: 91 mm (with standard stylus)
- over ø7: 50 mm (with standard stylus)

**Traverse speed**
- Max. 15 mm/s (Measurement: 0.5, 1, 2, 5 mm/s)

**Maximum probing depth**
- 300 mm

### 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 μm

**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: Use an optional auxiliary stage for measuring a workpiece whose height is 20 mm or less.

### Dimensions

![Diagram of the machine showing dimensions](image-url)
## Optional Accessories

### Styli for RA-1600 (Option)

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard (Standard accessory)</th>
<th>Notch</th>
<th>Deep groove</th>
<th>Corner</th>
<th>Cutter mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>12AAL021</td>
<td>12AAL022</td>
<td>12AAL023</td>
<td>12AAL024</td>
<td>12AAL025</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø 1.6 mm tungsten carbide</td>
<td>ø 3 mm tungsten carbide</td>
<td>SR0.25 mm sapphire</td>
<td>SR0.25 mm sapphire</td>
<td>tungsten carbide</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Small hole (ø 0.8)</th>
<th>Small hole (ø 1.0)</th>
<th>Small hole (ø 1.6)</th>
<th>Extra small hole (Depth 3 mm)</th>
<th>ø1.6 mm ball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>12AAL026</td>
<td>12AAL027</td>
<td>12AAL028</td>
<td>12AAL029</td>
<td>12AAL030</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø 0.8 mm tungsten carbide</td>
<td>ø 1 mm tungsten carbide</td>
<td>ø 1.6 mm tungsten carbide</td>
<td>ø 0.5 mm tungsten carbide</td>
<td>ø 1.6 mm tungsten carbide</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Disk</th>
<th>Crank (ø 0.5)</th>
<th>Crank (ø 1.0)</th>
<th>Flat surface</th>
<th>2X-long type *1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>12AAL031</td>
<td>12AAL032</td>
<td>12AAL033</td>
<td>12AAL034</td>
<td>12AAL035</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø 1.2 mm tungsten carbide</td>
<td>ø 0.5 mm tungsten carbide (Depth 2.5 mm)</td>
<td>ø 1 mm tungsten carbide (Depth 5.5 mm)</td>
<td>tungsten carbide</td>
<td>ø 1.6 mm tungsten carbide</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>Type</th>
<th>2X-long type notch *1</th>
<th>2X-long type deep groove *1</th>
<th>2X-long type corner *1</th>
<th>2X-long type cutter mark *1</th>
<th>2X-long type Small hole *1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>12AAL036</td>
<td>12AAL037</td>
<td>12AAL038</td>
<td>12AAL039</td>
<td>12AAL040</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø 3 mm tungsten carbide</td>
<td>SR0.25 mm sapphire</td>
<td>SR0.25 mm sapphire</td>
<td>tungsten carbide</td>
<td>ø 1 mm tungsten carbide</td>
</tr>
</tbody>
</table>

**Dimensions (mm)**

<table>
<thead>
<tr>
<th>Type</th>
<th>3X-long type *1</th>
<th>3X-long type deep groove *1</th>
<th>Stylus shank</th>
<th>Stylus shank (Standard groove)</th>
<th>Stylus shank (2X-long groove) *1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No.</td>
<td>12AAL041</td>
<td>12AAL042</td>
<td>12AAL043</td>
<td>12AAL044</td>
<td>12AAL045</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø 1.6 mm tungsten carbide</td>
<td>SR0.25 mm sapphire</td>
<td>For mounting CMM stylus (mounting thread M2)</td>
<td>For mounting CMM stylus (mounting thread M2)</td>
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</tr>
</tbody>
</table>

**Dimensions (mm)**

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*1: Measuring is only possible in the vertical direction.

*2: Customized special interchangeable styls are available on request. Please contact any Mitutoyo office for more information.

### Detector holders

- **2X extension holder:** 12AAF203
- **Auxiliary holder for a large-diameter workpiece:** 12AAF204
- **Sliding detector holder:** 12AAL090
Optional Accessories

**Centering 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

**Centering 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*

**Auxiliary stage**
356038

**Vibration isolator**

When using roundness and cylinder form measuring instruments, the measurement results can be significantly affected by environmental disturbances such as vibration. To prevent this, we invite you to choose from our selection of vibration isolators, which includes a table-type vibration isolator with an optional stand and two deluxe isolators (a monitor arm type and a side table type).

**Desktop type**

- Vibration isolator with monitor arm
- Vibration isolator with side table

*The vibration isolator does not include the measuring unit, controller, or analysis system.

**Order No.**
178-025

**Vibration damping system**
Diaphragm type air spring

**External size**
765 x 365 x 51 mm

**Stand for 178-025**

*The vibration isolator does not include the measuring unit, controller, or analysis system.*
A wide variety of parameters including those for roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. You can visually select these parameters using icons. ROUNDPAK also comes with specialized functions, such as the design value best-fit analysis function, the harmonic analysis function, and a function for recording the peak or trough points on a circumference. Data that has already been collected can be easily used for re-calculation, or deleted.

Freedom in laying out the graphics and data obtained from measurements

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

A wide variety of graphics functions

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

Off-line measurement procedure programming function

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