Roundness/Cylindricity Measuring System
ROUNDTEST RA-1600
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: 11.03” (280mm)
- Vertical travel: 11.82” (300mm)
- Max. table loading: 55lb (25kg)

Multi-functional analysis system
Incorporates flexible data analysis software ROUNDPAK
- Graphical measurement results displayed
- Easy to operate thanks to a simplified measurement mode
- Part Program Simulation

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

High Functionality
- Detector features safety switch to prevent damaging collisions in the z-axis
- High-precision powered 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
High-level functions promote greater efficiency

**Equipped with a highly accurate turntable that enables simple and accurate centering and leveling of the workpiece**

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 (ROUNDPAX) 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 (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.*
Roundness/Cylindricity measurement/Analysis software
ROUNDPAK

ROUNDPAK provides simple manipulation using a mouse and icons

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

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.

Recalculation
Data deletion

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

A wide variety of graphics functions
Analysis results such as cylindricity and coaxiality can be visually expressed in 3D graphics.

Normal display Wire-frame display Surface-map display Shading display

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.

Patent registered in Japan, USA
Patent pending in Europe
## 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>ø1.6 mm tungsten carbide</td>
<td>ø3 mm tungsten carbide</td>
<td>SR0.25 mm sapphire</td>
<td>SR0.25 mm sapphire</td>
<td>tungsten carbide</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>ø12 tungsten carbide</td>
<td>ø15.6</td>
<td>66</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø0.8 mm tungsten carbide</td>
<td>ø1.1 mm tungsten carbide</td>
<td>ø1.6 mm tungsten carbide</td>
<td>ø0.5 mm tungsten carbide</td>
<td>ø1.6 mm tungsten carbide</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>ø12.9 tungsten carbide</td>
<td>ø15.6</td>
<td>66</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Stylus tip</td>
<td>ø1.2 mm tungsten carbide</td>
<td>ø1.6 mm tungsten carbide</td>
<td>ø1.6 mm tungsten carbide</td>
<td>ø0.5 mm tungsten carbide</td>
<td>ø1.6 mm tungsten carbide</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>ø12.9 tungsten carbide</td>
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<td>66</td>
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<td>ø15.6</td>
<td>66</td>
<td>66</td>
<td>66</td>
</tr>
</tbody>
</table>

**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 carbide  ø1.0 mm tungsten carbide  ø1.6 mm tungsten carbide  ø0.5 mm tungsten carbide  ø1.6 mm tungsten carbide  
**Dimensions (mm)**: ø12.9 tungsten carbide | ø15.6 | 66           | ø15.6 | 66     | 66          |

*1: Measuring is only possible in the vertical direction.  
*2: Customized special interchangeable styli 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**

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Unit: mm  
25.4mm=1"
Optional Accessories

**Centering chuck**
- **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**
- **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 (DxH): 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**

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**Vibration isolator**

When measuring roundness and cylindricity, the measurement results can be significantly affected by environmental disturbances such as vibration. To prevent this, we invite you to choose either a desktop-type or desk-type vibration isolator which is to be used in combination with a monitor arm and a side table.

**Desktop type**
- **178-025**
  - Measuring unit and controller not included.

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

**Desk type**

**Example combination**
- **178-188**: with a monitor arm but no side table
- **178-181**: with a side table but no monitor arm

---

*1: Used together with vibration isolator (178-188)
*2: Measuring unit, controller and analysis system not included.
*3: User to provide a printer rack.

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# Specifications

<table>
<thead>
<tr>
<th>Turntable unit</th>
<th>RA-1600</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rotational accuracy</strong></td>
<td>Radial direction: (0.02+6H / 10000) μm, H: Probing height (mm)</td>
</tr>
<tr>
<td></td>
<td>Axial direction: (0.02+6X / 10000) μm, X: Distance from the center of rotation (mm)</td>
</tr>
<tr>
<td><strong>Rotational speed</strong></td>
<td>4, 6, 10 rpm</td>
</tr>
<tr>
<td><strong>Table diameter</strong></td>
<td>ø150 mm</td>
</tr>
<tr>
<td><strong>Centering / leveling adjustment range</strong></td>
<td>±1 mm</td>
</tr>
<tr>
<td><strong>Leveling adjustment range</strong></td>
<td>±1 °</td>
</tr>
<tr>
<td><strong>Maximum loading</strong></td>
<td>25 kg</td>
</tr>
<tr>
<td><strong>Maximum probing diameter</strong></td>
<td>ø280 mm</td>
</tr>
<tr>
<td><strong>Maximum workpiece diameter</strong></td>
<td>ø560 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vertical drive unit (Z-axis column unit)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Straightness of drive</strong></td>
<td>Narrow range: 0.20 μm / 100 mm</td>
</tr>
<tr>
<td></td>
<td>Wide range: 0.30 μm / 300 mm</td>
</tr>
<tr>
<td>Parallelism with turntable axis</td>
<td>1.5 μm / 300 mm</td>
</tr>
<tr>
<td><strong>Traverse speed</strong></td>
<td>Max. 15 mm/s (Measurement: 0.5, 1, 2, 5 mm/s)</td>
</tr>
<tr>
<td><strong>Maximum probing height (ID / OD)</strong></td>
<td>300 mm*1</td>
</tr>
<tr>
<td><strong>Maximum probing depth</strong></td>
<td>over ø32</td>
</tr>
<tr>
<td></td>
<td>over ø7</td>
</tr>
<tr>
<td><strong>Traverse range amount</strong></td>
<td>165 mm (From table axis -25 mm ~ +140 mm)</td>
</tr>
<tr>
<td><strong>Traverse speed</strong></td>
<td>Max. 8 mm/s (measurement: 0.5, 1, 2, 5 mm/s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Radial drive unit (X-axis arm unit)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Straightness of drive</strong></td>
<td>2.7 μm / 140 mm</td>
</tr>
<tr>
<td><strong>Perpendicularity to turntable axis</strong></td>
<td>1.6 μm / 140 mm</td>
</tr>
<tr>
<td><strong>Traverse range amount</strong></td>
<td>165 mm (From table axis -25 mm ~ +140 mm)</td>
</tr>
<tr>
<td><strong>Traverse speed</strong></td>
<td>Max. 8 mm/s (measurement: 0.5, 1, 2, 5 mm/s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Detector</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measuring force</strong></td>
<td>10 ~ 50 mN (5 level switching) (ID/OD measuring position with standard stylus)</td>
</tr>
<tr>
<td><strong>Measuring range</strong></td>
<td>Standard ±400 μm / ±40 μm / ±4 μm</td>
</tr>
<tr>
<td></td>
<td>Tracking ±5 mm</td>
</tr>
<tr>
<td><strong>Tip shape, material</strong></td>
<td>ø 1.6 mm tungsten carbide</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>IN/OUT one-touch switching, Stylus angle scale markings (±45 °), Z-axis collision detection function</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power supply</strong></td>
<td>100 V ~ 240 V</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>80 W</td>
</tr>
<tr>
<td><strong>Air pressure</strong></td>
<td>0.39 MPa</td>
</tr>
<tr>
<td><strong>Air consumption</strong></td>
<td>22 L/min (standard state)</td>
</tr>
<tr>
<td><strong>Mass of main unit (NET)</strong></td>
<td>170 kg</td>
</tr>
</tbody>
</table>

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

# Dimensions

![Diagram](image-url)
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 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.

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