Compact Roundness Measurement

ROUNDTEST RA-120/120P

Compact roundness tester equipped with a wide range of analysis features and capable of accommodating a variety of workpieces

Mitutoyo
Roundtest RA-120

- Fine adjustment on both X- and Z-axes
- Multiple analyses through simple operation
- D.A.T. function *except for 211-621
- Scaled Z-axis
- Continuous ID and OD measurement
- High-precision air bearing
- Wide-range detector
- Store and implement measuring conditions and results

Simple, interactive display screen

The large LCD screen with backlight shows easy-to-understand measurement results and graphs. Forms can be checked and notch processing can be set while observing the displayed graphs.

Measurement screen
- Set the position of the detector and measurement conditions here
- During measurement, graphs are displayed in real time

Measurement results
- Filter, display magnification, etc., can be altered
- Besides circles, development views can also be displayed
Assuming on-the-job use, this compact roundness measuring machine is provided with numerous user-friendly features aimed at prioritizing usability, such as a wider range for the detector, an easy-to-understand operation panel with large LCD, a DAT function that powerfully supports centering and leveling adjustments, and so on.

**Operating panel that is read at a glance**

**Supports 10 languages**
- Japanese, English, German
- French, Italian, Spanish
- Portuguese, Chinese (Traditional characters)
- Korean, Chinese (Simplified characters)

**Analysis type**
Selection buttons provide access to a wide variety of analysis types

**Switching screen modes**
Switch the display at the touch of a button, providing access to the [Calibration], [Centering and Leveling], [Measurement], and [Result] screens.

**Zero-setting button**
No fine adjustment necessary for setting the measurement position

**Notch processing**
Unwanted data, such as that produced by notches or scratches, can be excluded from the analysis if desired. Select between [Automatic setting] and [Arbitrary setting].

**High-grade thermal printer**
Print measurement conditions, computation results, result graphs, comments, etc., to the thermal printer. Change development graphs and output items as desired.

**File save**
Save and access [Measurement files] and [Result files] in USB memory. Data can also be totaled using the data output function with commercial tabulation software.
Roundtest RA-120P

- Fine adjustment on both X- and Z-axes
- Multiple analyses through simple operation
- D.A.T. function *except for 211-625
- Scaled Z-axis
- Continuous ID and OD measurement
- Display function for diverse graphs
- High-precision air bearing
- Wide-range detector

Windows graphical interface

By using a mouse and buttons, identified by corresponding icons, to control the machine, the Roundtest RA-120P’s interface provides excellent usability. Functions such as recalculation and graph reading are handled swiftly with easy-to-understand operations.

Main screen

Measurement setup screen

Result screen

Measurement in progress screen
This entry-level desktop tester incorporates the ROUNDPAK multi-analysis evaluation program, which provides it with analytical power close to that of more elaborate models. This is, therefore, a highly functional multi-analysis roundness measuring machine that is suitable for use not only in measurement rooms, but also in research and development sections.

**Measurement screen makes ample use of graphs**

**Multi-analysis function**

Complete with a wide range of functions including partial enlargement, auxiliary line setup, color-change, displacement/ angular difference of data between two points, and so on. Also equipped with notch processing and graph reading functions, which make the machine useful in research departments. Recalculation can also be performed when the filter and evaluation method is changed.

**Simplified layout function**

Computation results for multiple items can be laid out in multiple forms on a single sheet and printed. This function also supports output to a color printer (optional). Printer cable (optional, 2m long):
D.A.T. function (patented)  *except for 211-621 and 211-625

This instrument uses the DAT (Digital Adjustment Table) function available on higher-end models, and this provides powerful support for centering and leveling operations. To perform such operations, the operator need only adjust the digital micrometer heads attached to the rotary table by the amounts indicated by the display. This function also supports notched workpieces.

Continuous ID and OD measuring function (patented)

This function comes in very handy when outside diameter and inside diameter surfaces need to be measured repeatedly, for example, with respect to coaxiality, deviation in wall thickness, etc. The inner surface can be measured and calculated with the detector, maintaining the same measuring position for the outside diameter without changing its orientation, as illustrated on the right. Inside diameters down to 50mm can be measured.

Z-axis scale

This scale is useful when the measuring height position needs to be entered, such as when measuring coaxiality, etc. The machine uses an ABS Digimatic scale unit to provide an effective means for repetitive measurement and position setting.
IN/OUT switchable wide-range detector

The range of this detector has been extended from that of a conventional lever head by as much as four times, and is now wider than ever before. The detector can provide sufficient margin for centering and leveling jobs, or when measuring large differences. Moreover, the measuring direction can be switched between inside and outside diameters with a single touch of a button.

Types of Analysis

<table>
<thead>
<tr>
<th>Type of Analysis</th>
<th>Measurement mode</th>
<th>Evaluation diagram</th>
<th>RA-120</th>
<th>RA-120P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundness</td>
<td>![Roundness Diagram]</td>
<td>![Roundness Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flatness</td>
<td>![Flatness Diagram]</td>
<td>![Flatness Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Squaresness</td>
<td>![Squaresness Diagram]</td>
<td>![Squaresness Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Concentricity</td>
<td>![Concentricity Diagram]</td>
<td>![Concentricity Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Coarseness</td>
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<td>![Coarseness Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

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<th>Measurement mode</th>
<th>Evaluation diagram</th>
<th>RA-120</th>
<th>RA-120P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallelism</td>
<td>![Parallelism Diagram]</td>
<td>![Parallelism Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Radial variation</td>
<td>![Radial Variation Diagram]</td>
<td>![Radial Variation Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Axial variation</td>
<td>![Axial Variation Diagram]</td>
<td>![Axial Variation Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Circular run-out</td>
<td>![Circular Run-out Diagram]</td>
<td>![Circular Run-out Diagram]</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
### Optional Accessories

#### Interchangeable Styli

<table>
<thead>
<tr>
<th>Styli Code</th>
<th>Description</th>
<th>Dia.</th>
<th>Depth</th>
<th>Shank Type</th>
<th>Unit: inch/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AA8681</td>
<td>Standard stylus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8682</td>
<td>Stylus for notched workpieces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8683</td>
<td>Stylus for grooves</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8684</td>
<td>Stylus for corners</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8687</td>
<td>Stylus for extra small holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8694</td>
<td>Disk stylus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8696</td>
<td>Cranked stylus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8674</td>
<td>Stylus for small and deep holes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8676</td>
<td>M2 tapped shank for CMM styli</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8656</td>
<td>Stylus for flat surface</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12AA8658</td>
<td>Stylus for filtering asperities (machining marks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- *Standard accessory (stylus tip: ø.06" [1.6] carbide ball)
- Stylus for notched workpieces (stylus tip: ø.12" [3] carbide ball)
- Stylus for grooves (stylus tip: R0.01" [0.25] sapphire)
- Stylus for corners (stylus tip: R0.01" [0.25] sapphire)
- Stylus for extra small holes (stylus tip: ø.02" [0.5] carbide ball)
- Stylus for small holes (stylus tip: ø.03" [0.8] carbide ball)
- Stylus for small and deep holes (stylus tip: ø.06" [1.6] carbide ball)
- Stylus for small and deep holes (stylus tip: ø.06" [1.6] carbide ball)
- Stylus for small holes (stylus tip: ø.04" [1] carbide ball)
- Stylus for small holes (stylus tip: ø.04" [1] carbide ball)
- Disk stylus
- M2 tapped shank for CMM styli
- M2 tapped shank for CMM styli

- Pix portion shows stylus except for the cranked stylus and stylus for flat surface.
- *Dimension shows a distance from the tip end of stylus or the center of tip ball to the connecting surface of detector.
- Customized special interchangeable styli are available on request. Please contact any Mitutoyo office for more information.
Centering chuck (knurled ring operated)
Provides good operability when measuring a small-diameter workpiece. The knurled ring allows the workpiece to be clamped easily.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>211-032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding range</td>
<td>OD with internal jaws 11–36 mm ID with internal jaws 16–69 mm OD with internal jaws 25–79 mm</td>
</tr>
<tr>
<td>External size (D x H)</td>
<td>ø 4.65&quot; x 1.6&quot; (118 x 41 mm)</td>
</tr>
<tr>
<td>Mass</td>
<td>2.6 lbs (1.2 kg)</td>
</tr>
</tbody>
</table>

Collet chuck
Provides high clamping repeatability due to the use of optional precision collets. (See table at right.)

<table>
<thead>
<tr>
<th>Order No.</th>
<th>211-051</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part holding range</td>
<td>ø0.5–10 mm **</td>
</tr>
<tr>
<td>Centering error</td>
<td>Within 50 µm **</td>
</tr>
<tr>
<td>Mass</td>
<td>3 lbs (1.4 kg)</td>
</tr>
</tbody>
</table>

* Collets to match the workpiece size range are required for use with this chuck.
* When measured with ø5 mm pin gauge at measuring height of 30 mm.

SD scale for Z axis*
Scale unit for accurate positioning of the slider in the Z-axis direction (ABS scale system).

<table>
<thead>
<tr>
<th>Order No.</th>
<th>12AAH433</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>99 lbs (450g)</td>
</tr>
</tbody>
</table>

* Stripped out attached to the RA-10 machine, or will be installed on site by Mitsubishi service personnel.

X-axis stop
Allows the user to return the detector rapidly and easily to a fixed position in the X axis.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>12AAH320</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>14 lbs (65 g)</td>
</tr>
</tbody>
</table>

Three-jaw chuck (key operated)
Useful where it is necessary to apply a higher clamping force to the workpiece than can be applied with the centering chuck.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>211-014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holding range</td>
<td>OD with internal jaws 12–26 mm ID with internal jaws 25–68 mm OD with internal jaws 35–78 mm</td>
</tr>
<tr>
<td>External size (D x H)</td>
<td>ø 6.18&quot; x 2.78&quot; (157 x 70.6 mm)</td>
</tr>
<tr>
<td>Mass</td>
<td>8.4 lbs (3.8 kg)</td>
</tr>
</tbody>
</table>

Individual collets**
These collets are for use with the collet chuck shown at left and are acquired to match the workpiece diameter range required.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>12AAH402</th>
<th>12AAH403</th>
<th>12AAH404</th>
<th>12AAH405</th>
<th>12AAH406</th>
<th>12AAH407</th>
<th>12AAH408</th>
<th>12AAH409</th>
<th>12AAH410</th>
<th>12AAH411</th>
<th>12AAH412</th>
<th>12AAH413</th>
<th>12AAH414</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part holding range</td>
<td>ø0.02&quot;–0.04&quot; (0.5–1.0 mm)</td>
<td>ø0.04&quot;–0.06&quot; (1.0–1.5 mm)</td>
<td>ø0.06&quot;–0.08&quot; (1.5–2.0 mm)</td>
<td>ø0.08&quot;–0.1&quot; (2.0–2.5 mm)</td>
<td>ø0.1&quot;–0.12&quot; (2.5–3.0 mm)</td>
<td>ø0.12&quot;–0.138&quot; (3.0–3.5 mm)</td>
<td>ø0.138&quot;–0.157&quot; (3.5–4.0 mm)</td>
<td>ø0.157&quot;–0.197&quot; (4.0–5.0 mm)</td>
<td>ø0.197&quot;–0.236&quot; (5.0–6.0 mm)</td>
<td>ø0.236&quot;–0.275&quot; (6.0–7.0 mm)</td>
<td>ø0.275&quot;–0.315&quot; (7.0–8.0 mm)</td>
<td>ø0.315&quot;–0.354&quot; (8.0–9.0 mm)</td>
<td>ø0.354&quot;–0.394&quot; (9.0–10.0 mm)</td>
</tr>
</tbody>
</table>

* A collet cannot be mounted on the rotary table without a collet chuck.
*4: UCCTO-** Class AA, made by Yukise Seiko Inc. or its equivalent.

Auxiliary stage for a short workpiece
Order No. 356038

Reference hemisphere
Order No. 211-016

Magnification checking gage
Order No. 211-045

Vibration-damping stand

<table>
<thead>
<tr>
<th>Order No.</th>
<th>950-990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration damping system</td>
<td>Pneumatic type w/ self-leveling</td>
</tr>
<tr>
<td>External size</td>
<td>25&quot; x 20&quot; x 2&quot;</td>
</tr>
<tr>
<td>Max. loading mass</td>
<td>175 lbs (80 kg)</td>
</tr>
</tbody>
</table>

Gage block set for calibration
Order No. 997090
## Specifications

### Main unit

<table>
<thead>
<tr>
<th>Model</th>
<th>RA-120</th>
<th>RA-120P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Order No.</strong>*</td>
<td>211-621A</td>
<td>211-623A</td>
</tr>
</tbody>
</table>

**Turntable**

- **Rotational accuracy**
  - Radial: (0.04+6H/10000)μm
  - Axial: (0.04+6H/10000)μm
- **Rotation speed**: 6rpm
- **Effective table diameter**: ø6" (150mm)
- **Centering range adjustment**: ±118" (3mm)
- **Leveling range adjustment**: ±1"
- **Centering/leveling device** (micrometer head): Mechanical head
- **Digital head (inch/mm)**
- **Maximum probing diameter**: ±11" (280mm) ±15" (380mm) in a reverse and vertical detector position
- **Maximum workpiece diameter**: 17.32" (440mm)
- **Maximum turntable loading**: 55 lbs (25kg)

**Vertical column (Z-axis)**

- **Vertical travel**: 11.02" (280mm) from the turntable top
- **Maximum probing height**: 280mm from the turntable top (18.9" (480mm) in the reverse and vertical detector configuration)
- **Maximum probing depth**: 3.94" (100mm) (minimum ID: ø1.12" (30mm))

**Horizontal arm (X-axis)**

- **Horizontal travel**: 6.5" (165mm) (including a protrusion of 1" (25mm) from the turntable rotation center)

**Detector**

- **Measuring direction**: Two directional (IN/OUT switchable)
- **Measuring range**: ±1000μm
- **Measuring force**: 70 to 100mN ±30%
- **Standard stylus**: (12AA8681) Caribe ball ø1.6mm (.06")

**Electronic unit**

- **Measuring range**: ±1000 ±500 ±200 ±100 ±50 ±10 ±5μm (8 steps)
- **Magnification**: X5 to X200,000
- **Filter type**: Phase corrected: Gaussian, 2CRPC75, 2CRPC50 Not phase corrected: 2CR75, 2CR50 Filter OFF
- **Number of measuring sections**: Maximum 5 Maximum 100
- **Evaluation type**: Roundness, coaxiality, concentricity, flatness, circular run-out (radial/axial), squareness (relative to axis/Plane), thickness deviation, parallelism
- **Reference circle for evaluation**: LSC, M2C, MIC, MCC
- **Adjusting centering/leveling**: D.A.T function (circular/multi-point switchable)
- **Functions**: Notched measurement, re-calculation, limacon error correction, continuous ID and OD measurement, Notched measurement, re-calculation, limacon error correction, remarkable point analysis (gear), harmonic analysis, continuous ID and OD measurement
- **Printer**: Thermal line printer (external printer port available) Windows compatible ink-jet printer
- **Data output**: USB stick memory, Calculation result, measurement data, RS-232C, Calculation result, measurement data, SPC, Calculation result

**Others**

- **Power supply**: AC 100 ~ 240V
- **Power consumption**: 40W 30W (excluding PC system)
- **Air pressure**: 390kPa
- **Air consumption**: 30L/min (minimum)
- **Mass**: Main unit: 70.5 lbs (32kg) Air filter: 4.4 lbs (2kg)

Optional replacement elements for the air filter: 358592 (filter), 358593 (filter regulator)
Dimensions

■ External dimensions

■ Turntable top view

■ Installation floor plan
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