

# Compact Roundness Measurement **ROUNDTTEST RA-220**

Catalog No. E4336-211



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

**Mitutoyo**

# Powerful Analysis Performance in a Compact Body

## Roundtest RA-220

Compact manual machine for measuring roundness and cylindrical form including cylindricity measurement

- Multiple analyses through simple operation
- Fine adjustment on both X- and Z-axes
- Scaled Z-axis\*
- Continuous ID and OD measurement\*
- D.A.T function\*
- Wide-range detector\*
- High accuracy offered in a compact body (features high-accuracy air bearing)

\* See page 4 for details.



### Various types of Analysis

Type of Analysis	Measurement mode	Evaluation diagram	Type of Analysis	Measurement mode	Evaluation diagram
Roundness			Parallelism		
Flatness			Thickness variation	Radial	
Squareness	Relative to Plane	Against Axis	Thickness variation	Axial	
	Relative to Plane	Datum plane		Radial	
Concentricity			Circular run-out	Radial	
Coaxiality	Of section		Cylindricity	Axial	
	Of axis				

### File save

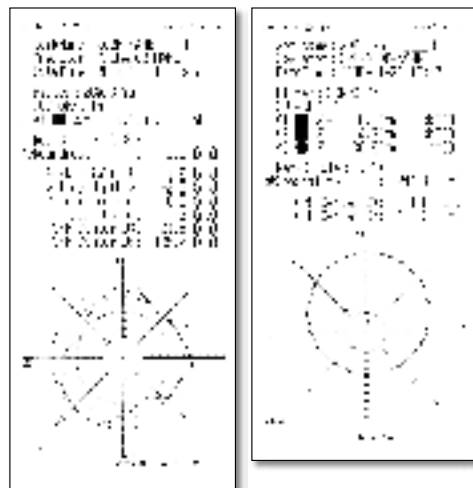
Save and access [Measurement files] and [Result files] in USB memory. Data can also be totaled using the data output function with commercial tabulation software.

### 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.



### Sample prints



### Call up by one touch of a button

Four measurement files can be independently assigned to buttons.

One-touch recall ⇒ Simple operation ⇒ Prevention of operational errors



# Easy-to-understand operation panel with large LCD

## Operating panel that is read at a glance

### Operating panel

Operating panel that is read at a glance

### 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



### Black and white LCD screen

Easy-to-read screen displays essential information

### Simple setup

Apply the current measurement setup in one go  
Simple operation helps prevent operational errors

### Jog dial

Make incremental changes to setup and other operations

## 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 screen

▲ Measurement in progress screen



### Measurement results

- Filter, display magnification, etc., can be altered
- Besides circles, developed views can also be displayed



Result screen ▲

# High-level functions promote greater efficiency

## D.A.T function

Patent registered (in Japan)

This instrument uses the D.A.T (Digital Adjustment Table) function available on more sophisticated models, and this provides powerful support for centering and leveling operations. To perform such operations, the user 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.



### Mode selection



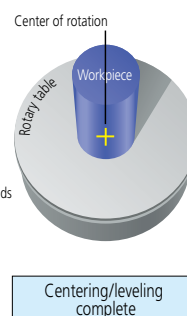
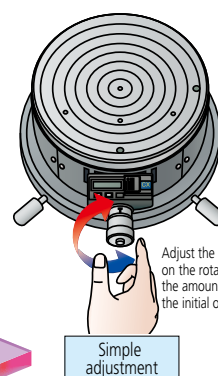
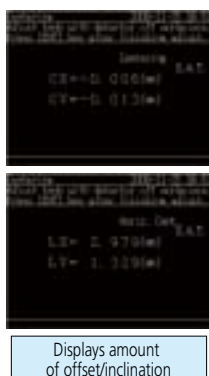
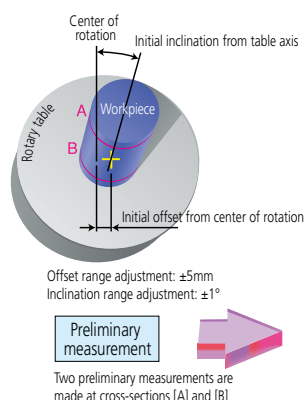
### Preliminary setup



### Centering

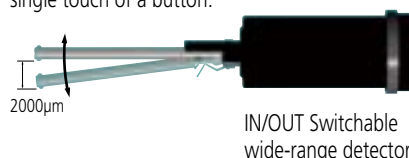


### Leveling



## 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 now provides a wide  $2000\mu\text{m}$  stroke. 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.



## Standard accessories that enhance measurement efficiency

### Z-axis scale

This scale is useful when the measuring height position needs to be entered, such as when measuring coaxiality, etc.

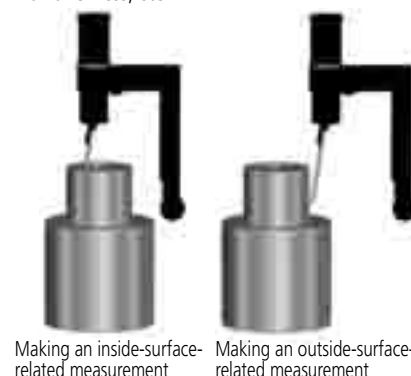
### X-axis stop

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



## Continuous ID and OD measuring function

Patent registered (in Japan, USA, Germany, UK, France)  
This function comes in very handy when outside and inside surfaces need to be measured repeatedly, for example, with respect to coaxiality, deviation in wall thickness, etc.



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# Specifications

## ■ Main unit

Model		RA-220	
Order No.		211-642	
Turntable unit	Rotational accuracy: Radial	(0.04+6H/10000)μm H: Measuring height (mm) JIS B7451-1997	
	Rotational accuracy: Axial	(0.04+6X/10000)μm X: Distance from the rotation center (mm)	
	Rotation speed	6 rpm	
	Effective table diameter	ø 150mm	
	Maximum turntable loading	25kg	
	Maximum probing diameter *1	ø 280mm (ø 380mm: when detector holder is installed in reverse; in the vertical posture only; maximum measuring height is up to 50 mm from the table top)	
	Maximum workpiece diameter	ø 470mm	
Vertical drive unit (Z-axis)	Parallelism to rotation center	0.5 μm/100mm	
	Straightness	Narrow range: 0.2 μm/20mm Wide range: 0.5 μm/100mm	
	Horizontal travel	280mm from the turntable top	
	Maximum probing height *1	280mm from the turntable top	
	Maximum probing depth	100mm (minimum ID: 30mm)	
Radial drive unit (X-axis)	Horizontal travel	-25mm ~ 140mm	
Detector *2	Measuring force	70 ~ 100mN (±30%)	
	Standard stylus	Carbide ball, ø 1.6mm	
	Measuring range	±1000μm	
	Measuring direction	IN/OUT switchable	
Electronic unit	Measuring range	±1000, ±100, ±10 μm (3 steps)	
	Recording magnification	×5, ×10, ×20, ×50, ×100, ×200, ×500, ×1K, ×2K, ×5K, ×10K, ×20K, ×50K, ×100K, ×200K (15 steps)	
	Filter type	With phase-correction: 2CRPC75, 2CRPC50 Without phase-correction: 2CR75, 2CR50 Gaussian, Filter OFF	
	Cutoff value	Low pass: 15 upr, 50 upr, 150 upr, 500 upr Band pass: 15-150 upr, 15-500 upr, 50-500 upr	
	Number of measuring cross sections	① 1 to 5 cross sections : Roundness, Coaxiality, Flatness ② 1 to 3 cross sections : Radial runout, Squareness (axis reference) ③ 2 cross sections: Concentricity, Thickness deviation, Parallelism ④ 3 cross sections: Squareness (plane reference) ⑤ 3 to 5 cross sections : Cylindricity	
	Reference circle for roundness evaluation	Least square circle method (LSC), Minimum zone circle method (MZC), Maximum inscribed circle method (MIC), Maximum circumscribed circle method (MCC)	
	Date analysis items	Roundness, Coaxiality, Concentricity, Flatness, Circular run-out (radial), Circular run-out (axial), Squareness (relative to axis), Squareness (relative to plane), Thickness deviation, Parallelism, Cylindricity	
	Data output	USB, RS-232C, SPC	
	Printer	Thermal line printer, External printer (option)	
Others	Power supply	AC100 ~ 240V	
	Power consumption	33W	
	Specified air pressure	0.39MPa	
	Air consumption	30 L/min or over (Standard state)	
	Mass	Main unit: 151kg Air filter: 2kg	

\*1: Use an auxiliary workpiece stand (option) when measuring a workpiece whose diameter is 20mm or less and whose height is 20mm or less from the top surface of the alignment table.

\*2: The detector supports standard-length styli only. Long styli cannot be used.

## ■ Standard accessories

Order No.	Name of Parts	QTY	Remarks
211-016	Reference hemisphere	1	
350365	Calibration film	2	
12AAB681	Standard stylus	1	
938882	Battery pack	5	SR44: For Micrometerheads (D.A.T function), For ABS-SD scale (Z axis)
—	Printer paper (2), X-axis stop (1), Coupler(socket) (1), Hose band (1), Power cord (1), Philips screwdriver (1), Allen wrench(Nominal size:0.9mm) (1), Allen wrench(Nominal size:2mm) (2), Allen wrench(Nominal size:2.5mm) (1), Vinyl cover (1), Hanger bolt (4), User's manual (1)		

\*Number in ( ) shows quantity

## ■ Reference hemisphere

Order No. 211-016





# Optional Accessories

## Interchangeable Styli

Unit: mm

<b>12AAB681</b> Standard stylus (*Standard accessory) (stylus tip: $\phi 1.6\text{mm}$ carbide ball)	<b>12AAB682</b> Stylus for notched workpieces (stylus tip: $\phi 3\text{mm}$ carbide ball)	<b>12AAB683</b> Stylus for grooves (stylus tip: R0.25mm sapphire)	<b>12AAB684</b> Stylus for corners (stylus tip: R0.25mm sapphire)
<p>For standard applications</p> <p>In ID measurement Dia.: <math>\geq 7.5\text{mm}</math>, Depth: <math>\leq 50\text{mm}</math></p>	<p>Useful for notched workpieces</p>	<p>For stepped applications</p>	<p>For inside-corner applications</p>
<b>12AAB687</b> Stylus for extra small holes (stylus tip: $\phi 0.5\text{mm}$ carbide ball)	<b>12AAE859</b> Stylus for small holes (stylus tip: $\phi 0.5\text{mm}$ carbide ball)	<b>12AAB674</b> Stylus for small and deep holes (stylus tip: $\phi 1.6\text{mm}$ carbide ball)	<b>12AAE855</b> Stylus for small and deep holes (stylus tip: $\phi 1.6\text{mm}$ carbide ball)
<p>For extra small hole applications Dia.: <math>\geq 1\text{mm}</math>, Depth: <math>\leq 2.5\text{mm}</math></p>	<p>For small hole applications Dia.: <math>\geq 1.5\text{mm}</math>, Depth: <math>\leq 10\text{mm}</math></p>	<p>For small and deep hole applications Dia.: <math>\geq 3\text{mm}</math>, Depth: <math>\leq 18\text{mm}</math></p>	<p>For small and deep hole application Dia.: <math>\geq 3\text{mm}</math>, Depth: <math>\leq 38\text{mm}</math></p>
<b>12AAB686</b> Stylus for small holes (stylus tip: $\phi 1\text{mm}$ carbide ball)	<b>12AAB696</b> Cranked stylus (stylus tip: $\phi 0.5\text{mm}$ carbide ball)	<b>12AAB695</b> Cranked stylus (stylus tip: $\phi 1\text{mm}$ carbide ball)	<b>12AAE856</b> Stylus for flat surface
<p>For small hole applications</p>	<p>For upper/lower surface in a narrow groove</p> <p>Note: This stylus cannot be used for OD/ID measurement.</p>		
<b>12AAB685</b> Stylus for filtering asperities (cutter mark)	<b>12AAB694</b> Disk stylus	<b>12AAB676</b> M2 tapped shank for CMM styli	<b>12AAE857</b> M2 tapped shank for CMM styli
<p>Filtering out the effects of asperities by tracing with R15 tipped stylus</p>	<p>Example For narrow groove applications</p>	<p>Compatible with CMM styli with M2 threaded shank</p>	<p>Compatible with CMM styli with M2 threaded shank</p>

\* 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.



Order No.	211-032
Holding range	OD with internal jaws 11–36 mm ID with internal jaws 16–69 mm OD with internal jaws 25–79 mm
External size (D x H)	ø118 x 41 mm
Mass	1.2 kg

### ■ 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.



Order No.	211-014
Holding range	OD with internal jaws 12–26 mm ID with internal jaws 25–68 mm OD with internal jaws 35–78 mm
External size (D x H)	ø157 x 70.6 mm
Mass	3.8 kg

### ■ Microchuck

For clamping a small workpiece, 1 mm or less in diameter, that cannot be held in the centering chuck.



Order No.	211-031
Holding range	OD: up to 1.5 mm
External size (D x H)	ø118 x 48.5 mm
Mass	0.6 kg

### ■ Collet chuck

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



Order No.	211-051
Part holding range	ø0.5–10 mm* <sup>1</sup>
Centering error	Within 50 µm* <sup>2</sup>
Mass	1.4 kg

\*1: Collets to match the workpiece size range are required for use with this chuck.

\*2: When measured with ø5 mm pin gauge at measuring height of 30 mm.

### ■ Individual collets\*<sup>3</sup>

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

Order No.	Part Holding Range
12AAH402	ø0.5–1.0 mm
12AAH403	ø1.0–1.5 mm
12AAH404	ø1.5–2.0 mm
12AAH405	ø2.0–2.5 mm
12AAH406	ø2.5–3.0 mm
12AAH407	ø3.0–3.5 mm
12AAH408	ø3.5–4.0 mm
12AAH409	ø4.0–5.0 mm
12AAH410	ø5.0–6.0 mm
12AAH411	ø6.0–7.0 mm
12AAH412	ø7.0–8.0 mm
12AAH413	ø8.0–9.0 mm
12AAH414	ø9.0–10.0 mm

\*3: A collet cannot be mounted on the rotary table without a collet chuck.

\*3: YCC10-\*\* Class AA, made by Yukiwa Seiko Inc. or its equivalent.

### ■ Magnification checking gage

Order No. 211-045



### ■ Gage block set for calibration

Order No. 997090



### ■ Auxiliary stage for a short workpiece

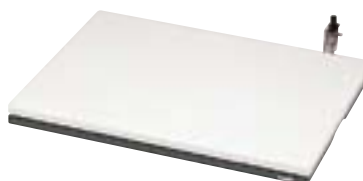
Order No. 356038



### ■ Printer paper set (10 pc)

Order No. 12AAH181

### ■ Vibration-damping stand



Order No.	211-013
Vibration damping system	Diaphragm type air spring
External size	615 x 515 x 51 mm
Max. loading	150 kg

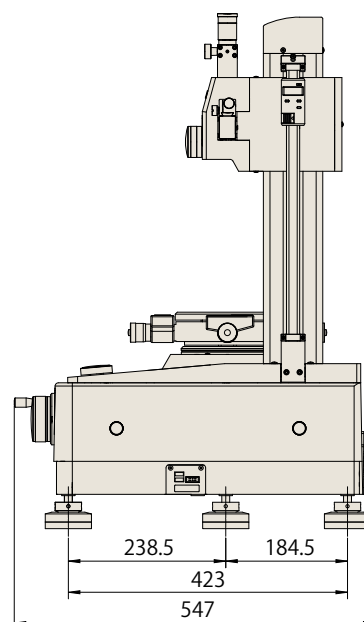
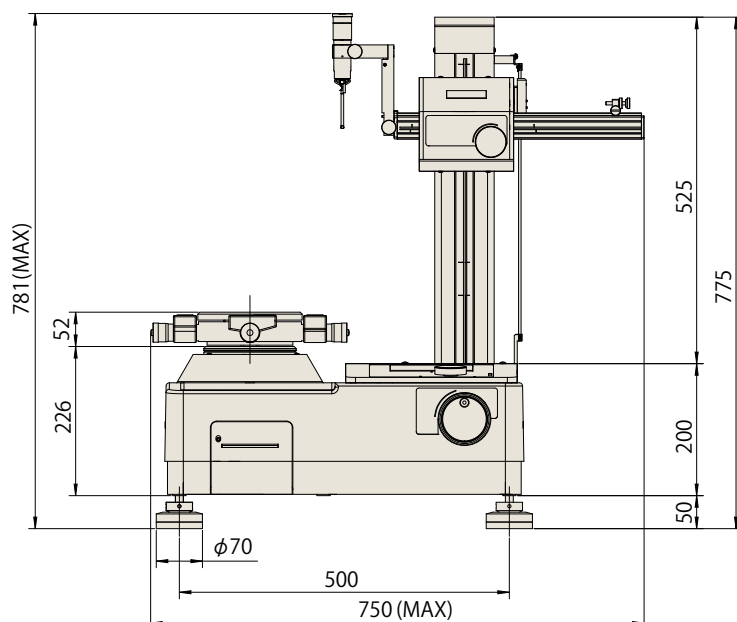
### ■ Cylindrical square

Order No.	350850
Straightness	0.5µm
Cylindricity	2µm
External size (D x H)	ø70 x 250mm
Mass	7.5kg

# Dimensions

## External dimensions

Unit: mm



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