CATALOG No. US4198-211

Mitutoyo

Roundtest RA-2000

High-precision Roundness Measuring System

High-Precision
Roundness Measuring System

ROUNDTEST RA-2000 SERIES

The Roundtest RA-2000 Series has been developed by Mitutoyo to quest a high accuracy, high speed and high performance in roundness measurement. The fully-automatic or a DAT (Digital Adjustment Table) function aided manual workpiece centering and leveling turns what used to be a difficult and finicky task into one that is simple enough for even untrained users to perform. This facilitates substantial reductions in overall measurement time. The Roundtest system comes complete with a powerful data analysis software ROUNDPAK® V4.0 which requires only simple manipulation using a mouse and icon, achieving the enhanced functionality and ease of operation.

Achieving High-accuracy Measurement

■ ***Turntable***

Rotational accuracy:
(0.02+6H/10000)μm

■ ***Vertical column (Z-axis)***

Straightness: 0.25μm/100mm†
(0.8μm/280mm)

Parallelism with rotating axis:
1.0μm/280mm

†In narrow range

■ ***Horizontal arm (R-axis)***

Straightness: 1.0μm/150mm

Squareness against rotating axis:
1.0μm/150mm

Roundtest RA-2000AS/AH

Automatic workpiece centering and leveling

Roundtest RA-2000DS/DH

DAT (Digital Adjustment Table) function aided manual workpiece centering and leveling

Photo: RA-2000AS and optional accessories

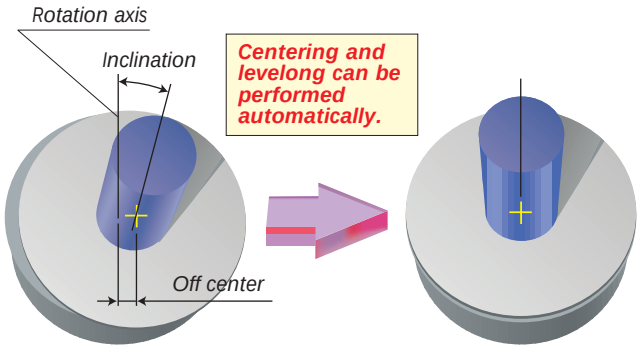
RA-2000 Series Features

Highly accurate table rotation due to the high-performance air bearing

The RA-2000 Series incorporates a turntable suspended by a high-precision air bearing, which has highly accurate rotation and is free from performance deterioration due to wear. The capacity for load mass of the turntable is given up to 30kg so that the RA-2000 Series is suitable to measure medium-sized workpieces as well as precision small parts.

High-speed automatic centering and leveling (RA-2000AS/2000AH)

All adjustment axes of the turntable incorporate Mitutoyo's high-accuracy linear scales, which minimizes positioning error during table adjustment and contributes to high-speed automatic centering and leveling of the workpiece. This facilitates substantial reductions in overall measurement time, starting from the setting of the workpiece and ending with the display of results. This automatic system even operates when measuring a notched workpiece.

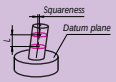
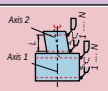
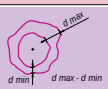
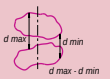
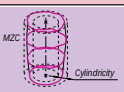
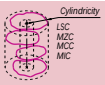
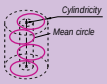
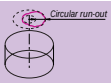
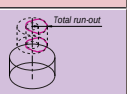
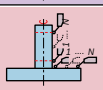
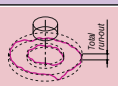


Automatic centering range: ±3mm
Automatic leveling range: ±1°

The DAT (Digital Adjustment Table) function aided manual centering and leveling (RA-2000DS/2000DH)

The turntable digitally displays the centering and leveling adjustments, turning what used to be a difficult and finickly task into one that is simple enough for even untrained operators to perform. The deviation, which is digitally displayed on the CRT, is adjusted by micrometer heads. A preliminary measurement for centering/leveling the workpiece can be performed within a wide deviation range of ±5mm/±1°. This DAT function is even available when measuring a notched workpiece.

A VARIETY OF MEASUREMENT/ANALYSIS FEATURES!

Mode	Analysis item	Procedure	Result
ROTATIONAL MEASUREMENT	ROUNDNESS (LSC/MZC/MIC/ MCC)		
	FLATNESS (SINGLE-CIRCUMFERENCE)		
	FLATNESS (MULTIPLE-CIRCUMFERENCE)		
	SQUARENESS (AGAINST AXIS)		
	SQUARENESS (AGAINST PLANE)		
	CONCENTRICITY		
	COAXIALITY (OF SECTION)		
	COAXIALITY (OF AXIS)		
	PARALLELISM (SINGLE-RADIUS)		
	PARALLELISM (MULTIPLE-RADIUS)		
	THICKNESS DEVIATION (RADIAL)		
	THICKNESS DEVIATION (AXIAL)		
	CYLINDRICITY		
	SIMPLIFIED CYLINDRICITY		
	MEAN CYLINDRICITY		
	RADIUS VARIATION		
	CIRCULAR RUN-OUT (RADIAL)		
	CIRCULAR RUN-OUT (AXIAL)		
	TOTAL RUN-OUT (RADIAL)		
	TOTAL RUN-OUT (AXIAL)		
	DIAMETER MEASUREMENT		

Mode	Analysis item	Procedure	Result
RECTILINEAR MEASUREMENT	STRAIGHTNESS (VERTICAL)		
	STRAIGHTNESS (HORIZONTAL)		
	TAPER RATIO (VERTICAL)		
	TAPER RATIO (HORIZONTAL)		
	SLOPE (VERTICAL)		
	SLOPE (HORIZONTAL)		
	CYLINDRICITY		
	SQUARENESS		
	COAXIALITY		
	PARALLELISM (VERTICAL)		
	PARALLELISM (HORIZONTAL)		
SPIRAL MEASUREMENT	CYLINDRICITY		
	FLATNESS		
	COAXIALITY		
	SQUARENESS (AGAINST AXIS)		
	SQUARENESS (AGAINST PLANE)		
	TOTAL RUN-OUT (RADIAL)		
	TOTAL RUN-OUT (AXIAL)		

LOCATION OF THE WORKPIECE CENTER ON TURNTABLE

ECCENTRICITY COORDINATE	
ECCENTRICITY ANGLE	

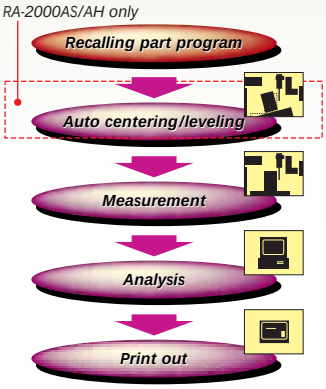
RA-2000 Series Features

Easy control via joystick operation

The vertical and horizontal movements of the probe can be easily controlled by the joystick.

Part program generation function

A series of process, ranging from measurement of the workpiece to evaluating and printing out the result, are stored as a part program, which can be executed at any time. This function is especially convenient for repeatedly measuring identical workpiece forms.

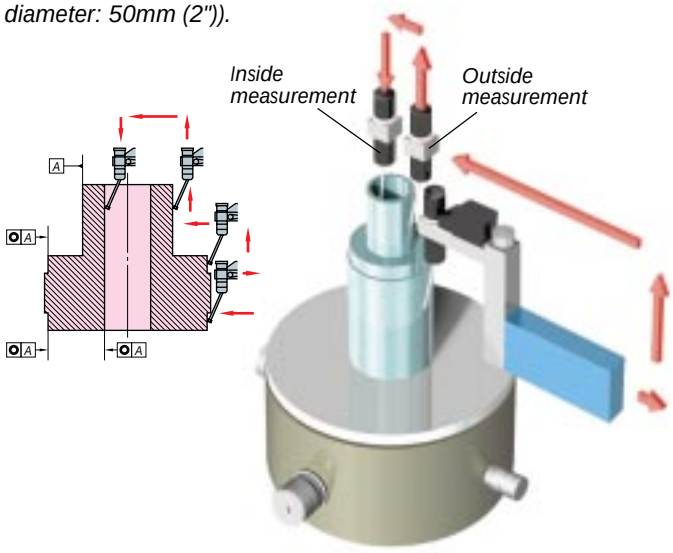


Wide measuring range due to automatic horizontal R-axis arm displacement

Incorporated with a precision linear scale, the horizontal arm automatically moves during rotating workpiece measurement so that the probe stylus can keep tracking the surface of a workpiece. Otherwise, the displacement in roundness/ cylindricity or the amount of taper that measurable through a vertical motion would result in a measurement over range (maximum R-axis following range: ±5mm (±.2")).

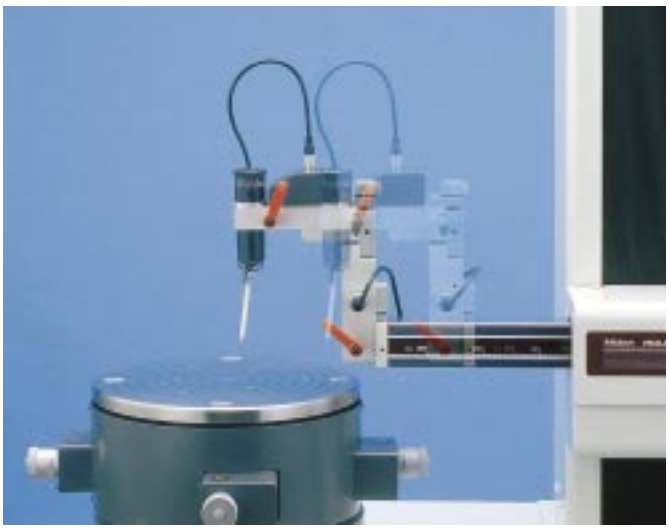
Continuous internal/external diameter measurement

The horizontal R-axis arm can traverse 25mm past the table rotation center, permitting continuous measurements on both internal and external features without manually changing the measuring direction of the probe (maximum measurable hole diameter: 50mm (2")).



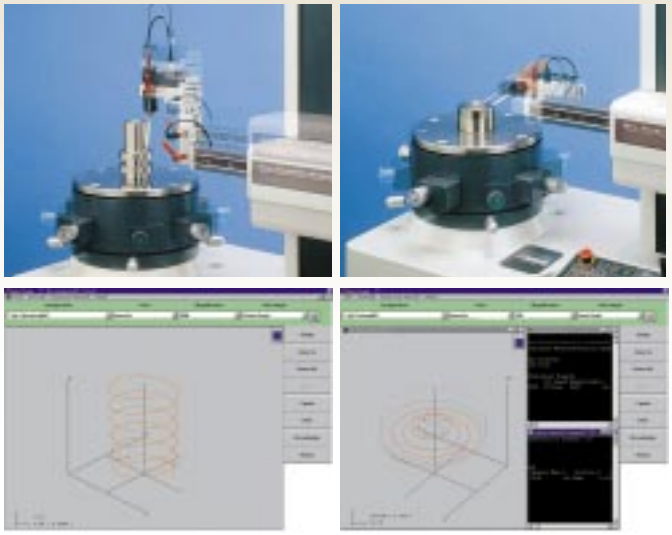
High-precision horizontal (R-axis) arm

The Mitutoyo arm has been designed to ensure the highest possible rigidity through FEM structural analysis and the simulation of locus at the stylus tip of a driven arm. The use of ceramic material and new technologies have achieved a horizontal arm straightness of 1.0μm/150mm in the RA-2000 Series.



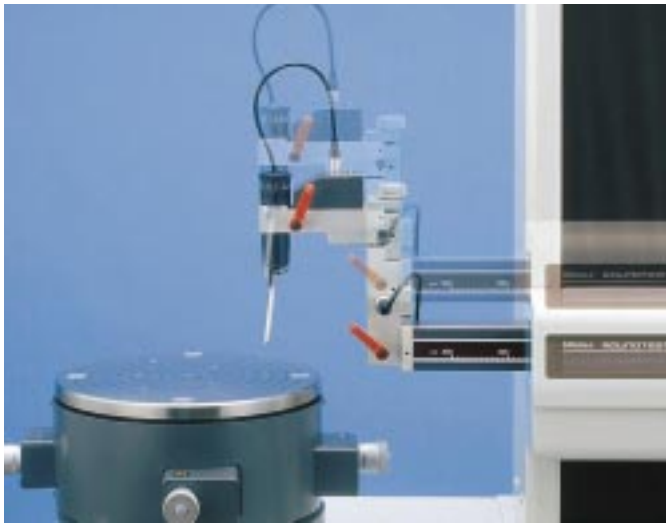
Spiral measurement

Cylindricity and flatness can be measured in a spiral motion, combining table rotation and the rectilinear motions of the vertical column and horizontal arm. One single measurement accomplishes intermittent measurements over multiple cross-sections, and the measurement data is saved continuously. Compared to the conventional measurement by sectioning, the measurement time is greatly reduced while permitting detection of flaws on the circumference.



High-precision vertical column for cylindricity/straightness measurement

The vertical slider is driven up and down by a precision ball screw along the column-guide surface, which is precision-finished. The RA-2000 Series models have the benefit of a high-accuracy column with a straightness of 0.25µm/100mm (within a narrow range) to enable the evaluation of cylindrical forms.

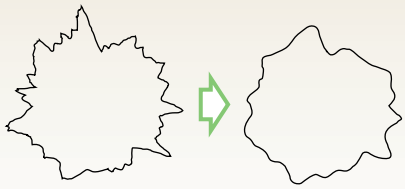


A variety of optional styli

Many optional styli are available for a variety of applications depending on workpiece shape and measuring purpose (see page 11).

Digital filter function

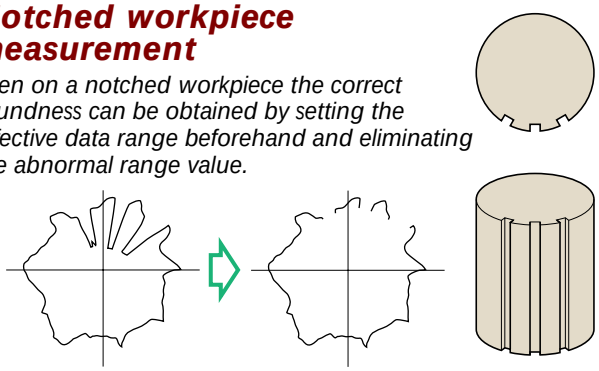
Roughness components of specific wavelengths on the workpiece surface can be removed from the recording profile with the digital filters, thereby yielding better analysis. This digital filter can be used with a phase compensation function to prevent the recorded profile from being warped.



The rate of roughness component elimination (= cut-off value) is usually expressed in "undulation per revolution". For example, a 15 upr low-pass filter will remove peak and valley components which appear more than 15 times per revolution from the recorded profile.

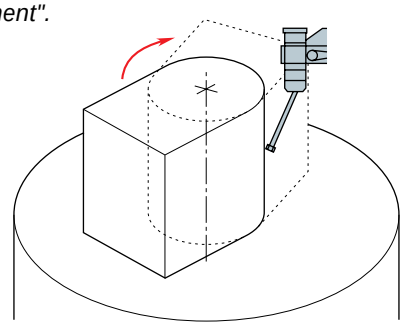
Notched workpiece measurement

Even on a notched workpiece the correct roundness can be obtained by setting the effective data range beforehand and eliminating the abnormal range value.



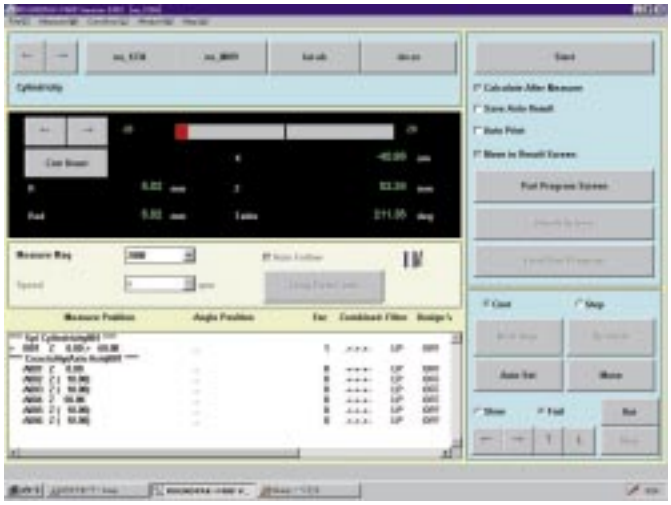
Partial circle measurement function

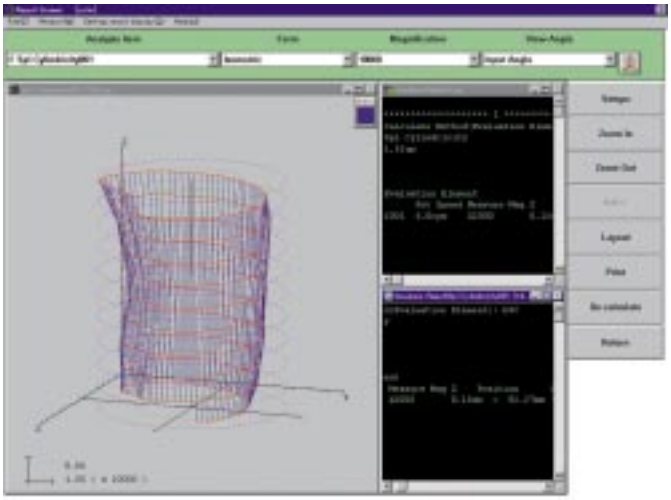
If a workpiece cannot be measured by physically rotating it by a full-turn due to some obstruction (projection), segments of the circumference can be measured in order to evaluate the cylindrical form. This measurement is called "partial circle measurement".



ROUNDPAK® V4.0
Dedicated Data-processing Software for the Roundtest

ROUNDPAK® V4.0 is a Windows®-based software package for the analysis of roundness and cylindricity, requiring only simple manipulation using a mouse and icons. The great variety of items available for evaluation allows analysis along numerous geometric deviations.





Multiple displays of analysis results

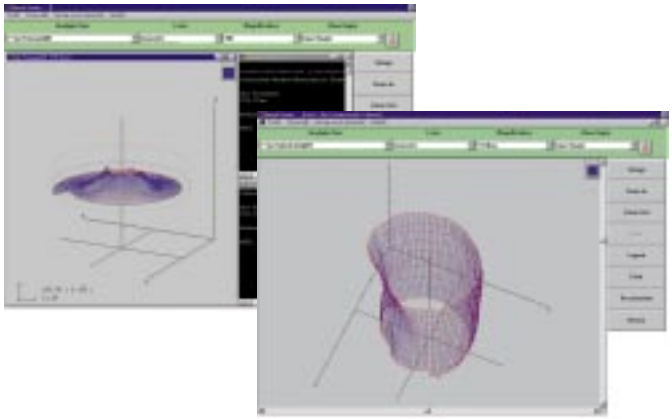
Graphics of multiple sections can be displayed on the monitor. The zoom function allows image expansion for easy viewing.

One key measurement analysis

In addition to the automatic multiple cross-section measurement function, the one key measurement analysis function is provided to allow easy manual measurement for a single cross-section.

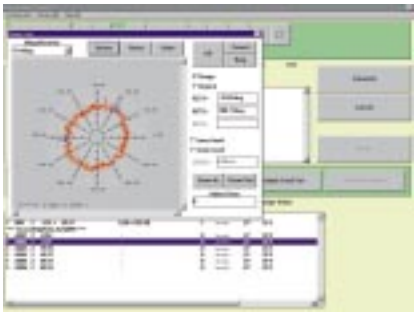
A variety of 3D displays

3D data displays are available from multiple view points.



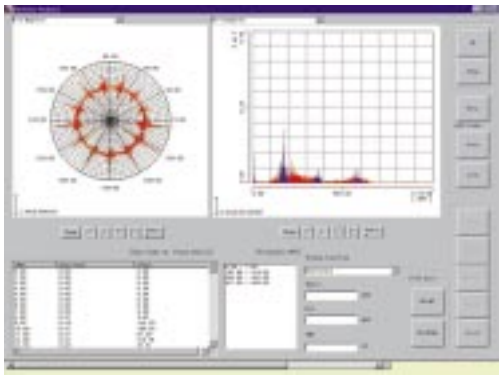
Multiple analysis/recalculation function

ROUNDPAK® V4.0 can also be used in the simultaneous analysis of multiple items, permitting changes in filter cutoff values, the deletion of unnecessary data, re-application of data for the analysis of different items, and other recalculation functions based on the data already collected.



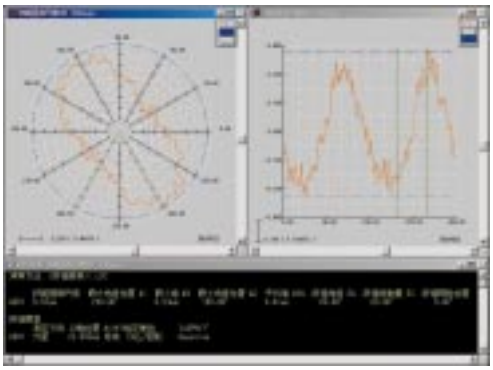
Harmonic-analysis function

The analysis of frequency components in measurement data facilitates the location of worn or damaged parts in a machine tool, workpiece deformation due to chucking, and other fabrication problems. Data deletion is possible at a desired frequency (= undulations per revolution) level.



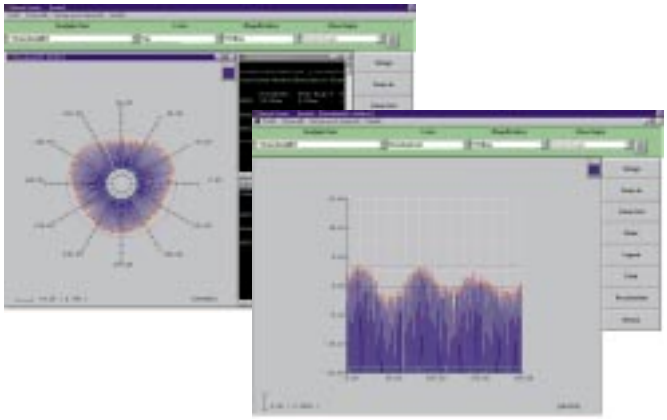
Narrow-range roundness analysis

This function provides for data extraction within a specified angular range from a set of measurements, thereby obtaining the maximum, minimum and average values in a roundness evaluation at a certain pitch.



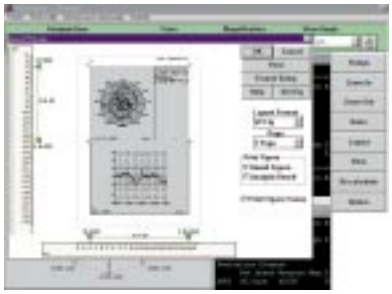
Gear-analysis function

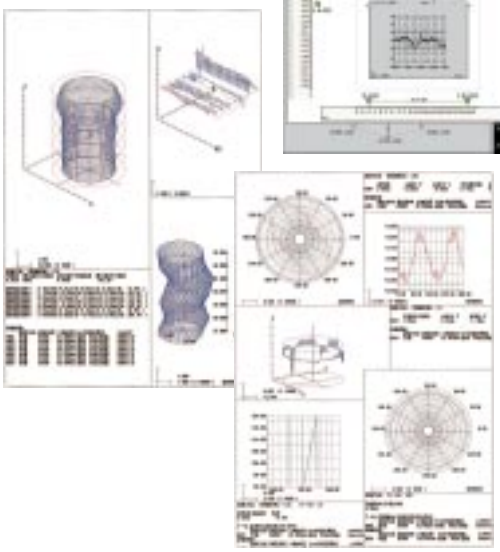
Gear analysis allows the evaluation of roundness by obtaining the peak or bottom points within a specific range of pitches.



Data layout function

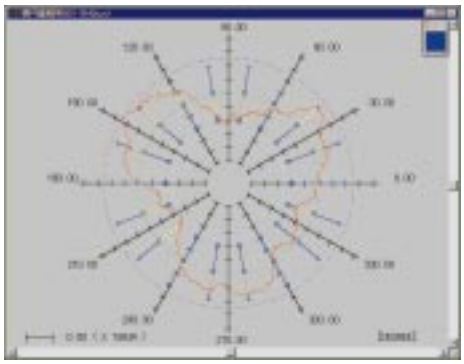
A simplified data layout function facilitates the quick preparation of easy-to-understand reports, which can be output on A3- or A4-size paper. (Several items and drawings can be printed on a single sheet.)





Tolerance-zone measurement function against design values

The tolerance-zone function allows the measurement of stored measurement data against design values, and measurement data on the workpiece before and after a test. Measurement data can be positioned to accommodate the design value, through the combination of rotation and movement in the X- and Y- directions of the center coordinates. Accordingly, tolerance-zone measurement can be made with no regard to whether the position of workpiece is off. The function may also be used to analyze the shape of a piston.



Data output via TEXT format

The analysis results and data can be stored and output via the TEXT format which is compatible with application PC software on the market.

OPTIONAL ACCESSORIES

Gages

Cylindrical square

- Used for checking and aligning table rotation axis parallel to the Z-axis column.
- Squareness: 3µm
- Straightness: 1µm
- Cylindricity: 2µm
- Roundness: 0.5µm
- Mass: 7.5kg (16.5 lbs.)

350850

Magnification checking gage

- Used for checking and adjusting the probe sensitivity.
- Range: 400µm
- Micrometer reading: 0.2µm
- Mass: 4kg (8.8 lbs.)

211-045

Auxiliary workpiece stand

- Used for measuring a workpiece whose diameter is 20mm (.8") or shorter and whose height is 20mm (.8") or lower.

356038

Dynamic calibration gage

- Allows to perform quick calibration of the probe sensitivity.
- Roundness: 20-30µm
- Mass: 0.5kg (1.1 lbs.)

12AAB596

Chucks

Quick chuck

- Reversible jaws for external and internal chucking.
- Used for centering and clamping a small diameter workpiece.
- Easy clamping with a knurled clamp ring.
- External range: 1 to 75mm (.04" to 2.95")
- Internal range: 14 to 70mm (.55" to 2.75")
- Mounting fange: Ø118mm (4.65")
- Height: 34mm (1.34")
- Mass: 1.2kg (2.64 lbs.)

211-032

Three jaw chuck

- Reversible jaws for external and internal chucking.
- Used for centering and clamping a small diameter workpiece such as clank shafts or pins.
- Heavy-duty type
- With a clamping wrench.
- External range: 1 to 85mm (.04" to 3.34")
- Internal range: 33 to 85mm (1.3" to 3.34")
- Mounting flange: Ø157mm (6.18")
- Height: 76mm (2.99")
- Mass: 3.8kg (8.36 lbs.)

211-014

Micro chuck

- Used for clamping extra-small diameter workpieces such as pins or wires.
- External range: Up to 1.5mm (.06")
- Mounting flange: Ø118mm (4.65")
- Height: 48.5mm (1.91")
- Mass: 620g (1.36 lbs.)

211-031

Vibration damping stand

Vibration damping stand

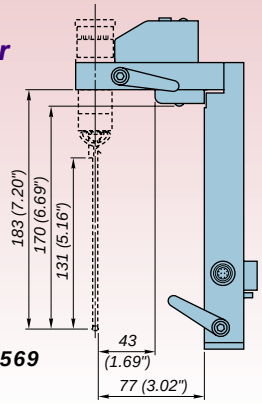
- Maximum loading weight: 200kg
- Damping method: Air spring
- Designed natural frequency: 2.0 to 3.0Hz
- Air pressure control: Orifice
- Leveling method: Mechanical valve
- Air supply: 490kPa (5kgf/cm²) or more
- With an air lock.

178-025

Arm/Holder Extension

Extension probe holder (2X higher)

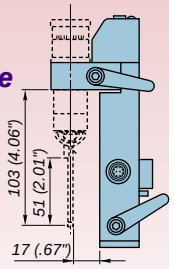
- 2X-longer type stylus is possible.
- Mass: 1.1kg



12AAB569

Auxiriary probe holder for a large diameter workpiece

- Allows to measure a workpece which has an outside diameter from 70mm (2.76") up to 520mm (20.47").
- Mass: 0.9kg



12AAB597

Unit: mm (inch)

Others

Air cover

- Used for keeping out the influence of air blow on accuracy during measurement.

12AAB949

External emergency box

- Allows to halt the performance of Roundtest apart from the instrument.

12AAB599

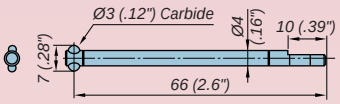


Unit: mm (inch)

Interchangeable Styli

Stylus for notched workpiece

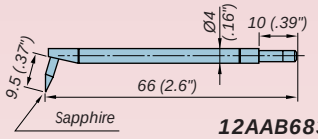
- Stylus tip: Ø3mm carbide ball
- Minimum hole diameter: 8mm (.32")
- Maximum hole depth: 50mm (1.96")



12AAB682

Stylus for groove

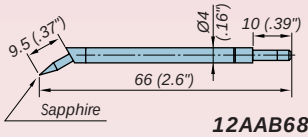
- Stylus tip: 0.25mm radius sapphire
- Minimum hole diameter: 13mm (.52")
- Maximum hole depth: 50mm (1.96")



12AAB683

Stylus for corner

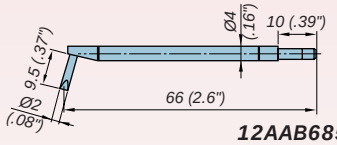
- Stylus tip: 0.25mm radius sapphire
- Minimum hole diameter: 9mm (.36")
- Maximum hole depth: 50mm (1.96")



12AAB684

Stylus for removing asperity (cutter mark)

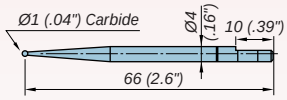
- Stylus tip: 15mm radius carbide blade
- Minimum hole diameter: 14mm (.56")
- Maximum hole depth: 50mm (1.96")



12AAB685

Stylus for small hole

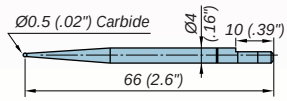
- Stylus tip: Ø1mm carbide ball
- Minimum hole diameter: 15mm (.59")
- Maximum hole depth: 50mm (1.96")



12AAB686

Stylus for extra small hole

- Stylus tip: Ø0.5mm carbide ball
- Minimum hole diameter: 1mm (.04") [or 15mm (.59")]
- Maximum hole depth: 2.5mm (.1") [or 50mm (1.96")]

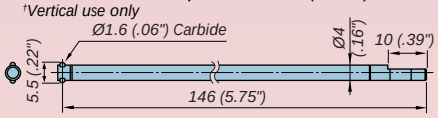


12AAB687

2X-long type stylus†

- Stylus tip: Ø1.6mm carbide ball
- Minimum hole diameter: 7mm (.28")
- Maximum hole depth: 130mm (5.11")

†Vertical use only

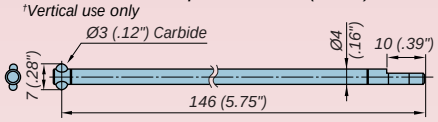


12AAB688

2X-long type stylus for notched workpiece†

- Stylus tip: Ø3mm carbide ball
- Minimum hole diameter: 8mm (.28")
- Maximum hole depth: 130mm (5.11")

†Vertical use only

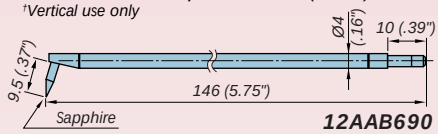


12AAB689

2X-long type stylus for groove†

- Stylus tip: 0.25mm radius sapphire
- Minimum hole diameter: 13mm (.52")
- Maximum hole depth: 130mm (5.11")

†Vertical use only

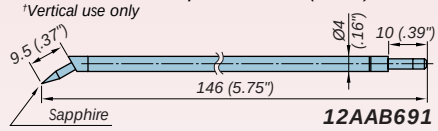


12AAB690

2X-long type stylus for corner†

- Stylus tip: 0.25mm radius sapphire
- Minimum hole diameter: 9mm (.36")
- Maximum hole depth: 130mm (5.11")

†Vertical use only

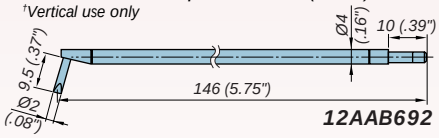


12AAB691

2X-long type stylus for removing asperity (cutter mark)†

- Stylus tip: 15mm radius carbide blade
- Minimum hole diameter: 14mm (.56")
- Maximum hole depth: 130mm (5.11")

†Vertical use only

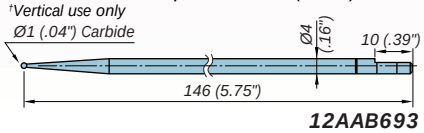


12AAB692

2X-long type stylus for small hole†

- Stylus tip: Ø1mm carbide ball
- Minimum hole diameter: 15mm (.59")
- Maximum hole depth: 130mm (5.11")

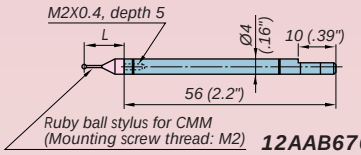
†Vertical use only



12AAB693

M2 tapped shank for CMM stylus

- Maximum hole depth: 50mm (1.96")

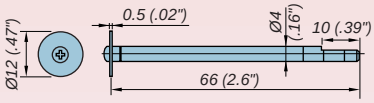


12AAB676

- Applicable ruby ball styli for CMM:
  - **153866** Ø0.5mm (.02"), L= 10mm (.39")
  - **160138** Ø1.0mm (.04"), L= 10mm (.39")
  - **153216** Ø2.0mm (.08"), L= 10mm (.39")
  - **163136** Ø3.0mm (.12"), L= 10mm (.39")
  - **160217** Ø4.0mm (.16"), L= 10mm (.39")
  - **160218** Ø5.0mm (.20"), L= 10mm (.39")
  - **160219** Ø6.0mm (.24"), L= 10mm (.39")
  - **160220** Ø8.0mm (.32"), L= 12mm (.47")
- The above ruby ball styli are optional.

Disk stylus

- Stylus tip: Ø12mm carbide disk
- Minimum hole diameter: 14mm (.55")
- Maximum hole depth: 50mm (1.96")

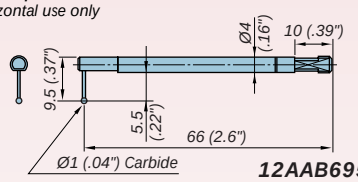


12AAB694

Crank stylus (Ø1)††

- Stylus tip: Ø1mm carbide ball

††Horizontal use only

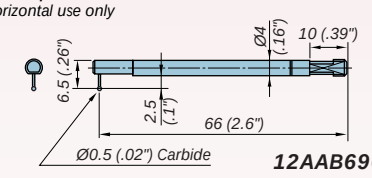


12AAB695

Crank stylus (Ø0.5)††

- Stylus tip: Ø0.5mm carbide ball

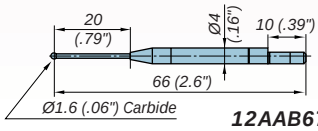
††Horizontal use only



12AAB696

Ø1.6 ball stylus

- Stylus tip: Ø1.6mm carbide ball
- Minimum hole diameter: 2mm (.08")
- Maximum hole depth: 18mm (.70")



12AAB674

RA-2000AS//DS/AH/DH MAIN UNIT SPECIFICATIONS

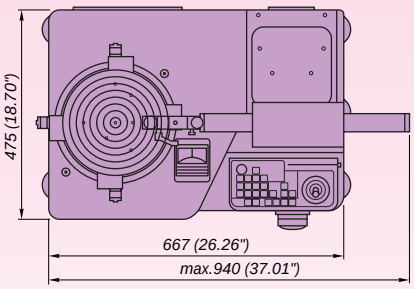
Model		RA-2000AS	RA-2000DS	RA-2000AH	RA-2000DH
Type		inch/mm	inch/mm	inch/mm	inch/mm
Order No.		211-851A	211-871A	211-852A	211-872A
Workpiece centering/leveling	Automatic	●		●	
	Manual (DAT function aided)		●		●
Turntable	Rotational accuracy (radial)*	(0.02+6H/10000)µm [(0.8+0.6H)µinch], H= Probing height (mm [inch])			
	Rotational accuracy (axial)*	(0.02+6R/10000)µm [(0.8+0.6R)µinch], R= Probing radius (mm [inch])			
	Rotating speed	2rpm, 4rpm, 6rpm, 10rpm			
	Working diameter	Ø235mm (9.25")	Ø200mm (7.87")	Ø235mm (9.25")	Ø200mm (7.87")
	Centering range	±3mm (±.1")	±5mm (±.19")	±3mm (±.1")	±5mm (±.19")
	Leveling range	±1°			
	Maximum probing diameter	Ø300mm (11.81")			
	Maximum workpiece diameter	Ø580mm (22.83")			
	Maximum workpiece weight	30kg (66 lbs.)			
Vertical column (Z-axis)	Straightness (in narrow range)**	0.25µm/100mm (9.9µinch/3.93")			
	Straightness (in entire range)**	0.8µm/280mm (32µinch/11.02")		1.2µm/480mm (47µinch/18.9")	
	Parallelism with rotating axis	1.0µm/280mm (39µinch/11.02")		1.7µm/480mm (67µinch/18.9")	
	Vertical travel	280mm (11.02")		480mm (18.9")	
	Positioning speed	Up to 12mm/s (.47"/s) with joystick operation (Manual feed available)			
	Measuring speed	0.5mm/s (.02"/s), 1mm/s (.04"/s), 2mm/s (.08"/s), 5mm/s (.2"/s)			
	Maximum probing height (OD)	280mm (11.02")		480mm (18.9")	
	Maximum probing height (ID)	280mm (11.02")		480mm (18.9")	
	Maximum probing depth	100mm (3.93") when using a standard stylus (**12AAB681**)			
Horizontal arm (R-axis)	Straightness**	1.0µm/150mm (39µinch/5.9")			
	Squareness against rotating axis	1.0µm/150mm (39µinch/5.9")			
	Horizontal travel	175mm (6.9")***			
	Positioning speed	Up to 8mm/s (.31"/s) with joystick operation (Manual feed available)			
	Measuring speed	1mm/s (.04"/s), 5mm/s (.2"/s)			
Air supply	Air pressure	390kPa (4kgf/cm^2)			
	Air consumption	30 liters per minute			
Probe and stylus	Measuring range	±300µm (±.012")			
	Measuring force	7 to 10mN (0.7 to 1gf)			
	Standard stylus (**12AAB681**)	Carbide ball, Ø1.6mm (.06")			
	Measuring direction	Two-directional			
	Stylus angle adjustment	±45° (with graduations)			
Electronic unit	Data sampling dots	7200 dots/rotation			
	Measuring modes and functions	Rotational measurement, rotational measurement with R-axis displacement, R-axis rectilinear measurement, Z-axis rectilinear measurement, partial circle measurement, automatic R-axis arm/Z-axis column motion control, automatic centering†, turntable position resetting† (†Equipped for **RA-2000AS/AH** only)			
	Power supply	120V AC, 50/60Hz			
	Power consumption	200VA max (without personal computer)			
	Dimensions (WxDxH)	480x325x180mm (18.90"x12.80"x7.09")			
	Mass	15kg (33 lbs.)			
Dimensions (WxDxH)		667x475x900mm (26.26"x18.7"x35.43")		667x475x1100mm (26.26"x18.7"x43.31")	
Mass		180kg (396 lbs.)		200kg (440 lbs.)	
Standard accessories		Optical flat and gauge block set (**997090**), standard stylus (**12AAB681**), reference hemisphere (**211-016**), origin point gage (**998382**), machine cover, training kit (**12BAB958**), air filter set, lubricant (**352637**), connecting cables, user's manual, screw drivers, key wrenches, power cord, grounding lead wire			

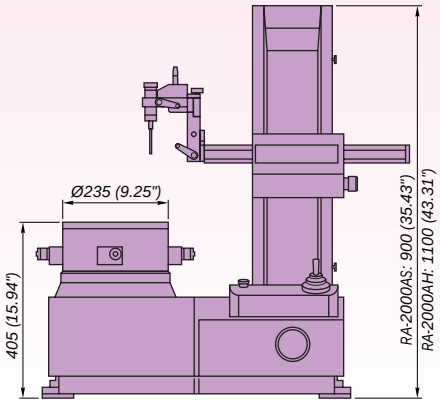
*According to JIS B7451-1997
**Roughness component cutoff value: 2.5mm
***Including a protrusion of 25mm (1") over the turntable rotation center.
Note: Use an optional auxiliary workpiece stand (**356038**) for measuring a workpiece whose diameter is 20mm (.8") or shorter and whose height is 20mm (.8") or lower.

Dimensions

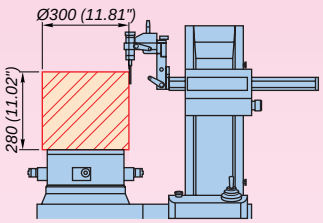
Unit: mm (inch)

RA-2000AS/AH

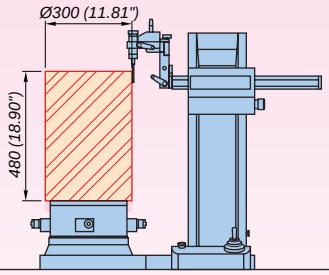




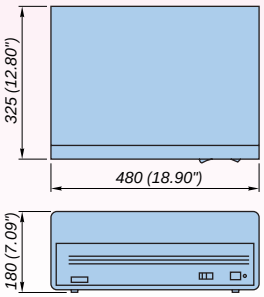
RA-2000AS/RA-2000DS



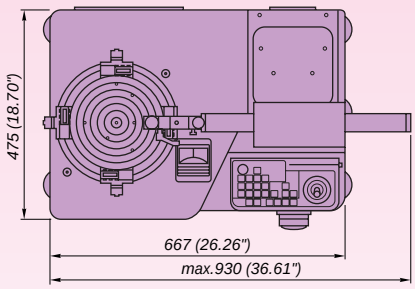
RA-2000AH/RA-2000DH

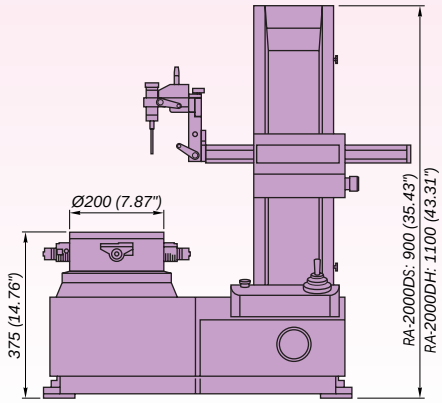


Electronic unit



RA-2000DS/DH

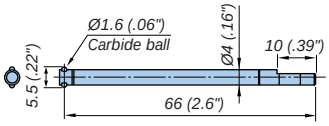




STANDARD ACCESSORIES

Standard stylus

- Stylus tip: Ø1.6mm carbide ball
- Minimum hole diameter: 7mm (.28")
- Maximum hole depth: 50mm (1.96")



12AAB681

Origin point gage

- Used for setting an origin point when performing absolute measurements in the R-axis and the Z-axis directions.

998382

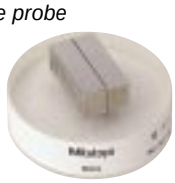
Reference hemisphere

- Used for checking accuracy.
- Comes with the error compensation data
- Roundness: 0.08µm
- Mass: 0.65kg (1.43 lbs.)

211-016

Optical flat and gauge block set

- Used for checking the probe sensitivity.
- Consists of 10.00mm and 10.02mm gauge blocks and an optical flat.



997090

Air filter set

- Used for revoming micro dusts from the air supplied.
- **Consumable parts:**
  Air filter element (**358592**)
  Air regulator element (**358593**)

ROUNDPAK® V4.0 SPECIFICATIONS

Data analysis items	Rotational measurement	Roundness, concentricity, coaxiality (of section), coaxiality (of axis), radius variation, cylindricity, simplified cylindricity, mean cylindricity, thickness deviation (radial), thickness deviation (axial), parallelism (single-radius), parallelism (multiple-radius), diameter measurement, squareness (against plane), squareness (against axis), flatness (single-circumference), flatness (multiple-circumference), circular run-out (radial), circular run-out (axial), total run-out (radial), total run-out (axial), power spectrum analysis
	Rectilinear measurement	Straightness (vertical), straightness (horizontal), slope (vertical), slope (horizontal), coaxiality, taper ratio, cylindricity, squareness, parallelism (vertical), parallelism (horizontal), power spectrum analysis
	Sprial measurement	Cylindricity, flatness, coaxiality, squareness, total run-out
Reference circles for roundness evaluation		LSC, MZC, MIC, MCC
Variation of analysis views		Top view, opened view, side view, inclined view, overlooked view
Recording device		External printer with the driver for Windows® OS (optional)
Recording magnification		100X to 100,000X auto (Desired magnification can be specified manually.)
Roughness component reduction		Low pass filter, band pass filter
Waviness component reduction		High pass filter
Filter type		2CR-75%, 2CR-50%, 2CR-75% (phase-corrected), 2CR-50% (phase-corrected), Gaussian, non-filter
Cutoff value	Rotational/spiral measurement	15upr, 50upr, 150upr, 500upr, 1500upr (Desired value can be specified manually.)
	Rectilinear measurement	0.25mm, 0.8mm, 2.5mm, 8mm, 25mm, .01", .03", .1", .3", 1" (Desired value can be specified manually.)
Functions		• Automatic calculation from measured data • Total analysis of multiple items • Recalculation of datum/measured data • Part program setting (from measurement to analysis) • Automatic concentricity measurement (without manual switching of the probe measuring direction) • Tolerancing (GO/NG judgment) • Rotation of 3D display • Real-time display • Simplified layout (divided layout) • Hair line, auxiliary line, hidden line, fill line • Color setting of measured data • Multi-color display of cross-sections • Offsetting of recorded profile generation • Zooming of recorded profile • Data detetion • Graph analysis (displacement/angle between measured points) • Harmonic analysis • Gear tooth analysis • Text data output (via CSV format) • Comparison to designed data • Narrow range roundness/flatness analysis
Hardware requirements		• Computer: IBM PC compatible • Processor: Intel Pentium II 300MHz or faster • Harddisk: 2GB or more • Memory: 64MB or more • OS: Windows®95/98/NT4.0 • Data I/O port: GP-IB board (Manufacturer: National Instruments) • Monitor: Color SVGA (800x600 dot or finer)

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