ROUNDTEST RA-1600

A new PC-compliant Roundness and Cylindricity form measuring instrument with extensive analysis features to enable measurement of a wide variety of workpieces.

Mitutoyo

Powerful analysis performance in a compact package

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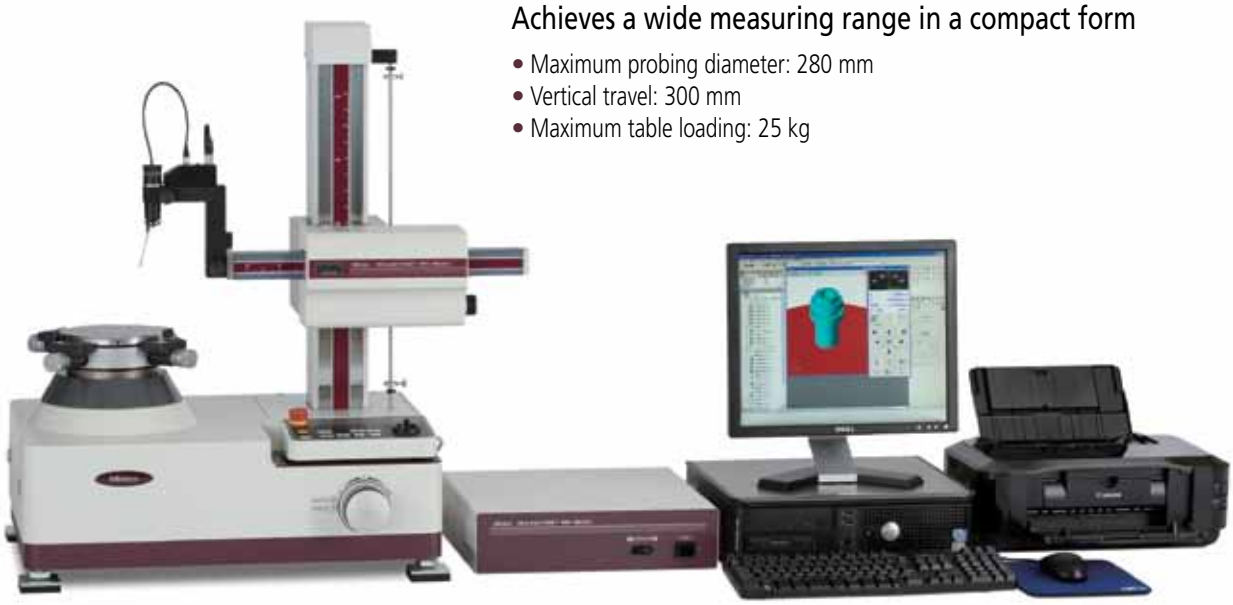
RA-1600

Can measure a wide variety of workpieces

Achieves a wide measuring range in a compact form

- Maximum probing diameter: 280 mm
- Vertical travel: 300 mm
- Maximum table loading: 25 kg



High functionality

Includes a detector to prevent damaging collisions in the Z-axis direction

- High-precision power column unit can evaluate straightness as well as cylindricity
- Equipped with D.A.T. turntable to boost measurement efficiency
- Includes a remote control box for easy operation

Multi-functional analysis system

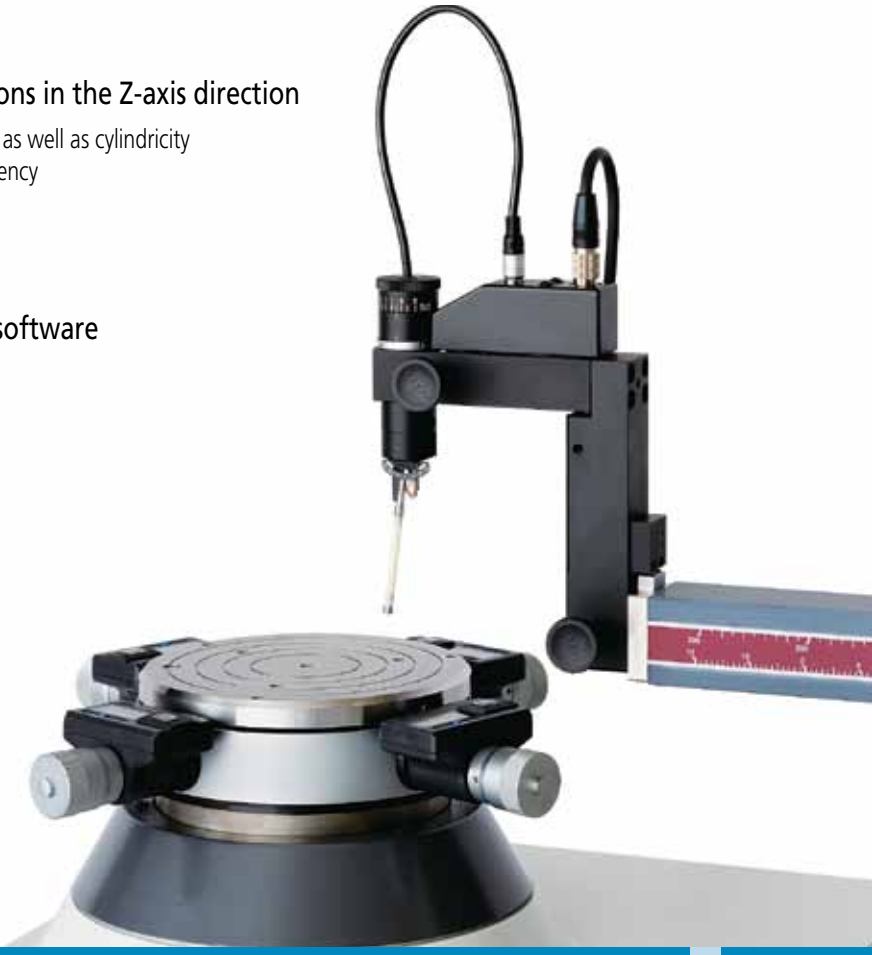
Incorporates ROUNDPAK flexible data analysis software

- Measurement results displayed in a graphics window
- Easy to operate thanks to a simplified measurement mode
- Simulation of part programs

High accuracy

Compact 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, perpendicularity)



High-level functions promote greater efficiency

Sliding detector-unit holder (optional)

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.

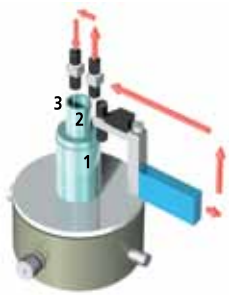
A sliding distance of 112 mm
The detector-unit holder can be stopped at a position sufficiently higher than the workpiece along the Z axis, and then lowered and positioned to make measurements. Furthermore, internal/external diameters can be easily measured with the continuous internal/external diameter measurement function (see below for details).

Continuous OD / ID measurement*

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

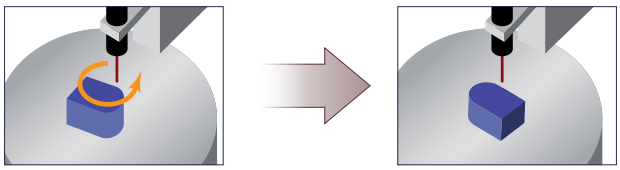
1), 2) : External diameter measurement
3) : Internal diameter measurement
➡ : Drive-speed traverse
(measurable internal diameter: 50 mm max.)

* Patent registered in Japan, USA, Germany, UK, France



Partial circle measurement

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.

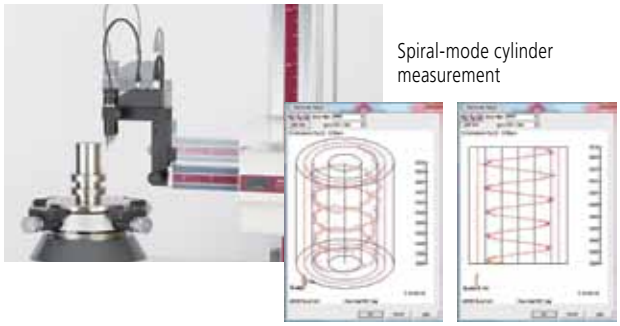


Safety mechanism provided as standard

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

Spiral measurement / analysis

The spiral-mode measurement function combines table rotation and rectilinear motion allowing cylindricity, coaxiality, and other form characteristics to be evaluated more accurately.



Spiral-mode cylinder measurement

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.

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Performance

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

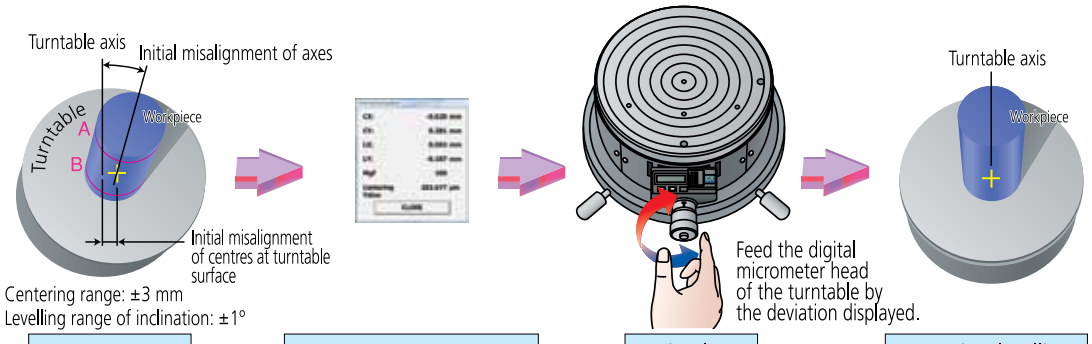
This highly accurate turntable enables the system to measure flatness and other roundform characteristics, in addition to roundness/cylindricity, at an accuracy level that suits almost any application. The RA-1600 has also inherited the D.A.T. (Digital Adjustment Table) mechanism used in top-end devices to make workpiece centering and levelling 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 levelling operations carried out by using the D.A.T.* can also be incorporated into the measurement procedure (part program). This prevents operator error when performing centering and levelling operations, and helps standardize measurement operations executed by the part program.

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

D.A.T. (Digimatic Adjustment Table)

Patent registered in Japan, USA.
Patent pending in Germany.



Preliminary measurement

Preliminary measurement of two cross-sections 'A' and 'B'.

Display of misalignments

Simple adjustment

Centering/levelling complete

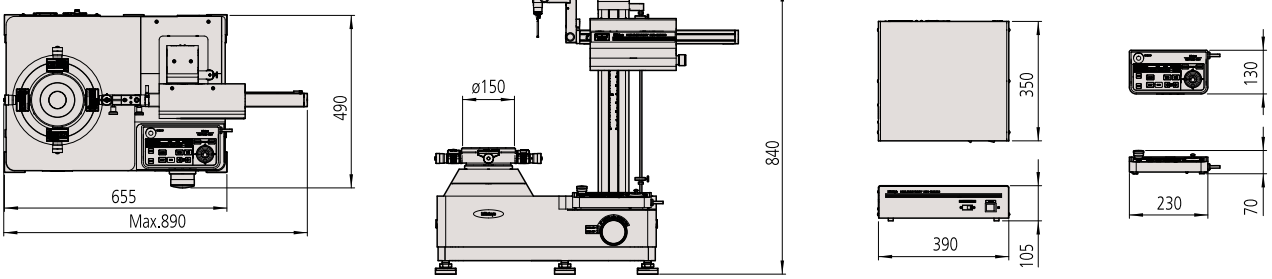
Specifications

Model No.			RA-1600
Order No.			**211-723**
Turntable	Rotational accuracy	Radial	(0.02 + 6H / 10000) µm, H: probing height (mm)
		Axial	(0.02 + 6X / 10000) µm, X: distance from rotational centre (mm)
	Rotational speed		4, 6, 10 rpm
	Effective diameter		150 mm
	Centering/levelling adjustment		D.A.T.
	Centering adjustment range		±3 mm
	Levelling adjustment range		±1°
	Maximum loading		25 kg
	Maximum probing diameter		280 mm
	Maximum loading diameter		560 mm
Vertical drive (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		1.5 µm / 300 mm
	Maximum traverse speed		15 mm/s (measurement: 0.5 / 1.0 / 2.0 / 5.0 mm/s)
	Maximum probing height (ID / OD)		300 mm*
	Maximum probing depth with standard stylus	over ø32 mm	91 mm
		over ø7 mm	50 mm
Radial drive (X-axis arm unit)	Straightness of drive		2.7 µm / 140 mm
	Perpendicularity to turntable axis		1.6 µm / 140 mm
	Traverse range		165 mm (from table axis -25 mm to 140 mm)
	Maximum traverse speed		8 mm/s (measurement: 0.5 / 1.0 / 2.0 / 5.0 mm/s)
Detector	Measuring force		10 ~ 50 mN, 5-level switchable (ID / OD measuring position with standard stylus)
	Stylus design, material		ø1.6 mm tungsten carbide ball
	Measuring range	Static	±400 µm / ±40 µm / ±4 µm
		Tracking	±5 mm
	Other		2 direction one-touch switching type, stylus angle scale markings (±45°), collision detection function in Z-axis direction
Other	Power supply		100 ~ 240 VAC / 80 W
	Air pressure		0.39 MPa
	Air consumption		22 L/min (standard state)
	Mass of main unit		170 kg

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

Dimensions

Unit: mm



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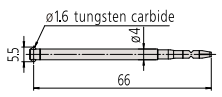
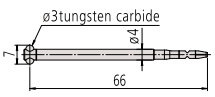
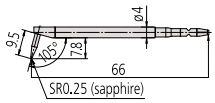
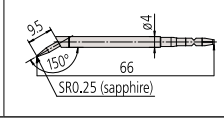
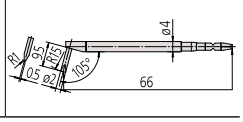
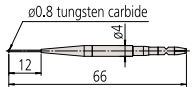
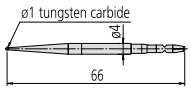
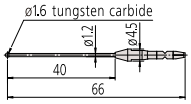
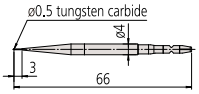
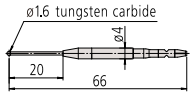
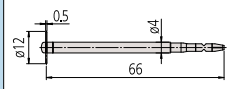
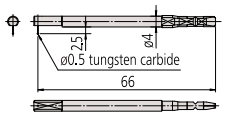
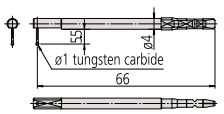
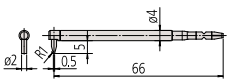
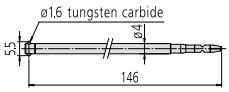
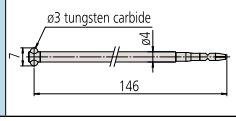
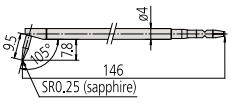
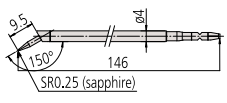
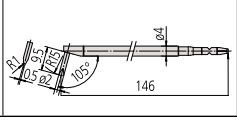
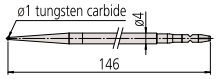
Optional accessories

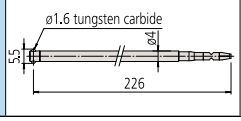
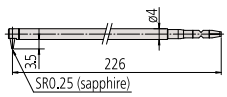
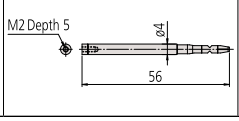
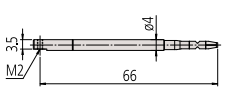
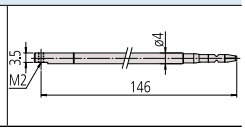
Styli

Type	Standard (Standard accessory)	Notch *2	Deep groove *2	Corner	Chisel
Order No.	**12AAL021**	**12AAL022**	**12AAL023**	**12AAL024**	**12AAL025**
Stylus tip	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide	SR 0.25 mm sapphire	SR 0.25 mm sapphire	tungsten carbide
Dimensions (mm)					

Type	Small hole (ø0.8)	Small hole (ø1.0) *2	Small hole (ø1.6)	Extra small hole (depth 3 mm)	ø1.6 mm ball *2
Order No.	**12AAL026**	**12AAL027**	**12AAL028**	**12AAL029**	**12AAL030**
Stylus tip	ø0.8 mm tungsten carbide	ø1 mm tungsten carbide	ø1.6 mm tungsten carbide	ø0.5 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)					

Type	Disc	Crank (ø0.5)	Crank (ø1.0)	Flat surface	2X-long type *1 *2
Order No.	**12AAL031**	**12AAL032**	**12AAL033**	**12AAL034**	**12AAL035**
Stylus tip	ø12 mm tungsten carbide	ø0.5 mm tungsten carbide (depth 2.5 mm)	ø1 mm tungsten carbide (depth 5.5 mm)	Tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)					

Type	2X-long type notch *1	2X-long type deep groove *1	2X-long type corner *1	2X-long type chisel *1	2X-long type small hole *1
Order No.	**12AAL036**	**12AAL037**	**12AAL038**	**12AAL039**	**12AAL040**
Stylus tip	ø3 mm tungsten carbide	SR 0.25 mm sapphire	SR 0.25 mm sapphire	Tungsten carbide	ø1 mm tungsten carbide
Dimensions (mm)					

Type	3X-long type *3	3X-long type deep groove *3	Stylus shank	Stylus shank(standard groove)	Stylus shank(2X-long groove) *1
Order No.	**12AAL041**	**12AAL042**	**12AAL043**	**12AAL044**	**12AAL045**
Stylus tip	ø1.6 mm tungsten carbide	SR 0.25 mm sapphire	For mounting CMM stylus (mounting thread M2)		
Dimensions (mm)					

*1: For measuring in the horizontal direction with detector 12AAF203.

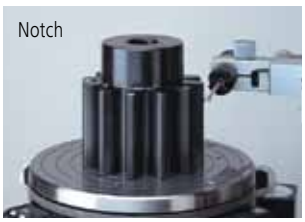
*2: Part of the 5-piece styli set 12AAL020.

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


Chisel

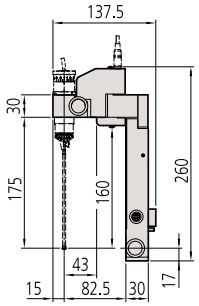

Corner


Small hole


Notch

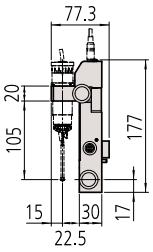
Optional accessories

Detector holders



2X extension holder

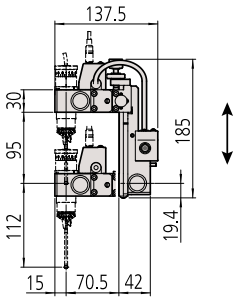
12AAF203



Auxiliary holder

12AAF204

For large-diameter workpieces.



Sliding detector holder

12AAL090

Vibration isolation

When using form measuring instruments, the measurement results can be significantly affected by environmental disturbances such as vibration. This can be prevented by standing the instrument on a vibration isolator, as shown below. The selection offered includes an isolator designed to mount on an existing table or desktop, or on an optional steel stand, and a deluxe cabinet featuring a built-in isolator. An optional monitor arm can be fitted to this cabinet for optimum viewing, and an optional side table is available for mounting peripheral equipment such as a PC, monitor, printer, etc.

Cabinet type*

12AAK110

Vibration Isolation cabinet with built-in isolator.

12AAK120

Optional arm for mounting a monitor.

12AAL019

Side table for mounting ancillaries.

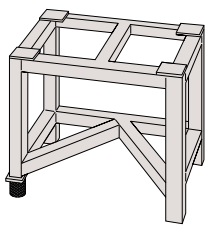
* Vibration isolators do not include measuring units, controllers or analysis systems shown.

Desktop type*

178-025

Vibration damping system: diaphragm type pneumatic spring system inflated by compressor.

- External dimensions: 765 x 565 x 51 mm



178-024

Stand for supporting the RA-1600 on a 178-025 vibration isolator as an alternative to table or desktop mounting.

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Accessories

Clamping and calibration

Centering chuck (key operated)

211-014

Suitable for holding longer parts and those requiring a relatively powerful clamp.

- Holding capacity
  Internal jaws: OD = 2-35 mm, ID = 25-68 mm
  External jaws: OD = 35-78 mm
- External dimensions: 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 = 1-36 mm, ID = 16-69 mm
  External jaws: OD = 25-79 mm
- External dimensions: ø118 x 41 mm
- Mass: 1.2 kg

Micro-chuck

211-031

Used for clamping a workpiece (less than ø1 mm) that the centering chuck cannot handle.

- Holding capacity: ø0.1-1.5 mm
- External dimensions: ø107 x 48.5 mm
- Mass: 0.6 kg

Magnification calibration gauge

211-045

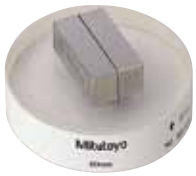
Used for normalizing detector magnification by calibrating detector travel against displacement of a micrometer spindle.

- Maximum calibration range: 400 µm
- Graduation: 0.2 µm
- External dimensions: 235 (max) x 185 x 70 mm
- Mass: 4 kg

Cylindrical square

350850

- Straightness: 0.5 µm
- Cylindricity: 2 µm
- External dimensions: ø70 x 250 mm
- Mass: 7.5 kg



Magnification checking kit

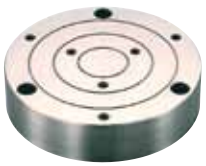
997090

- A combination of gauge blocks and an optical flat for checking the magnification factor of a detector/stylus combination

Reference hemisphere

211-016

- A calibration artefact used for testing the rotational accuracy of the turntable



Auxiliary stage

356038

- Enables a small workpiece to be positioned within reach of the stylus for full coverage of the surface
- Used for measuring a workpiece of diameter 40 mm or less and/or height 20 mm or less

Origin-point gauge

998382

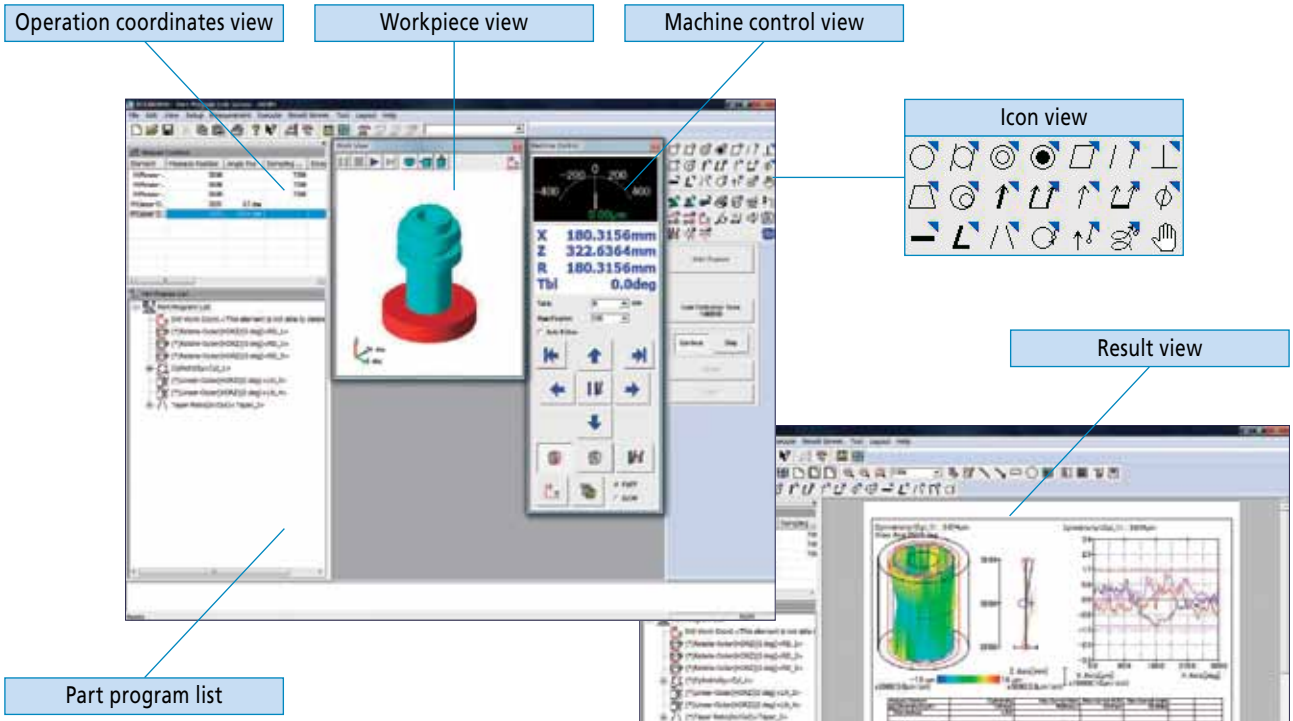
- A gauge for zero setting the X- and/or Z-axes

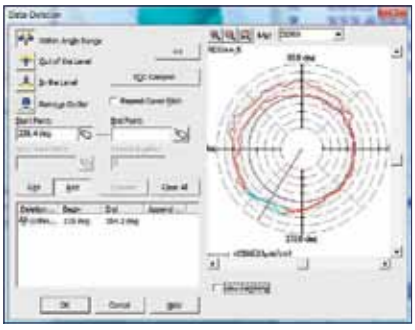
ROUNDPAK
Analysis software provides user-friendly operation

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.





Data deletion

Recalculation

Mitutoyo

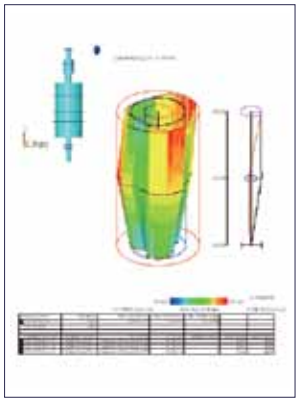
Software

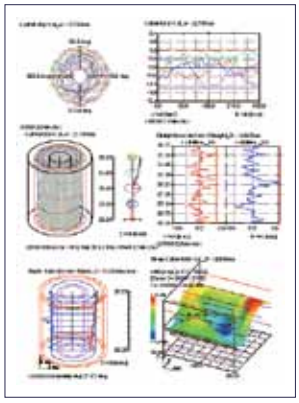
ROUNDPAK

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.

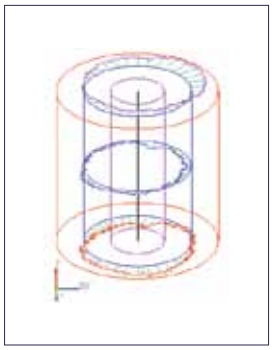
The analysis result window can be directly used as a layout window. Since the measurement procedure, including the layout information, is saved, the entire process, from measurement start, calculation, result saving, and finally to printing, can be automatically executed.



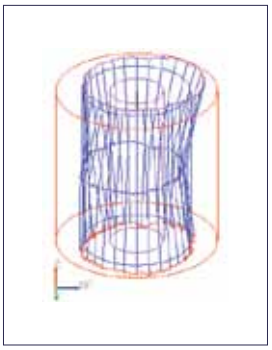


A wide variety of graphics functions

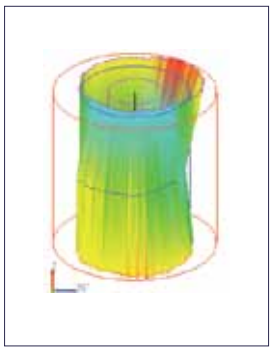
Analysis results such as cylindricity and coaxiality can be visually expressed in 3D graphics.



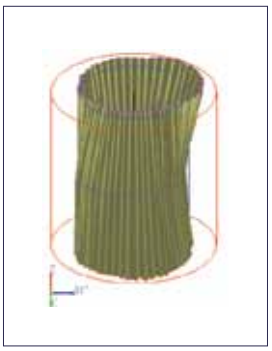
Normal display



Wire-frame display

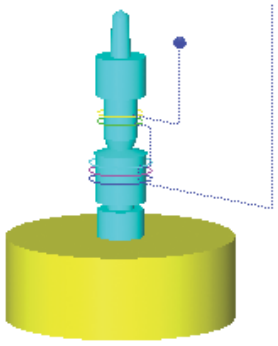


Surface-map display



Shaded 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.

UK-FOR-02-0103-1207

- Coordinate Measuring Machines
- Vision Measuring Systems
- Form Measurement
- Optical Measuring
- Sensor Systems
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- Small Tool Instruments and Data Management

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