ROUNDTEST RA-2200

Roundness / Cylindricity measuring system offering highest precision in its class, exceptional ease-of-use, and multifunction analysis capability.

Mitutoyo

Roundtest RA-2200AS/DS/AH/DH

All models are equipped with a highly accurate turntable that enables simple and accurate centering/levelling of the workpiece. This operation accounts for the majority of the essential setup work needed prior to measuring.

Models available to suit almost any application

RA-2200AS/AH
Supplied with an automatic centering/levelling turntable that frees the operator from this essential alignment operation.

RA-2200DS/DH
Supplied with a navigation function that quickly and simply guides the operator through a manual centering/levelling process, as though the task were being performed by an expert.

Both of the above types are available with column drive heights of 300 mm (type S), or 500 mm (type H, for handling taller workpieces). All models can be combined with a vibration-damping cabinet of the side-table or monitor-arm types.

Space-saving design

The improved vibration-damping cabinet design (see page 5) has reduced the installation space by approximately 20-40% compared to earlier vibration-damping platforms, allowing greater freedom in positioning within the typical quality control room or calibration laboratory.

Sliding detector-unit holder is standard

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 page 2 for details).

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.

Highest drive speed in class

Continual development has resulted in the highest drive speed within its class.

- Vertical direction (Z-axis column): 50 mm/s
- Radial direction: 30 mm/s

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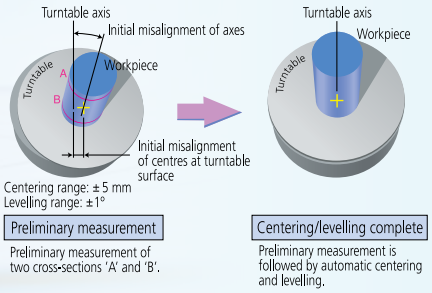
RA-2200AS/DS/AH/DH

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

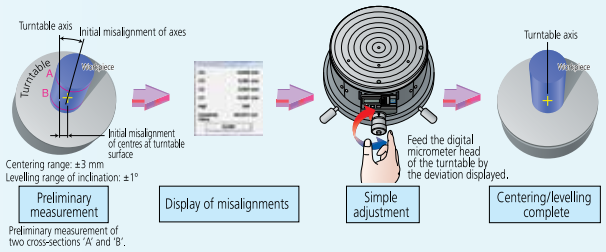
The turntable provides very high rotational accuracy, enabling the system to measure flatness and other roundform characteristics, in addition to roundness/cylindricity, at an accuracy level that suits almost any application. The critical centering/levelling process is supported by the A.A.T. (Automatic Adjustment Table) or D.A.T. (Digimatic Adjustment Table), according to the model selected.

A.A.T. (Automatic Adjustment Table)
RA-2200AS/AH



D.A.T. (Digimatic Adjustment Table)
RA-2200DS/DH

Patent registered in Japan, USA.
Patent pending in Germany

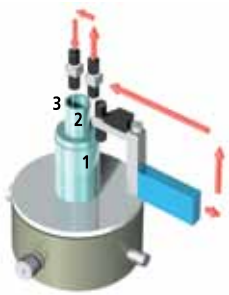


Continuous OD / ID measurement*

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

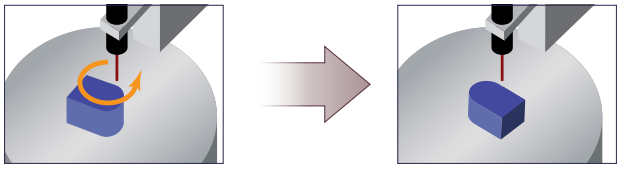


Highly repeatable measurement

Mitutoyo's linear scales are incorporated into the X-axis positioning sensor, directly sensing the displacement of the drive unit to achieve highly accurate positioning, and therefore high repeatability.

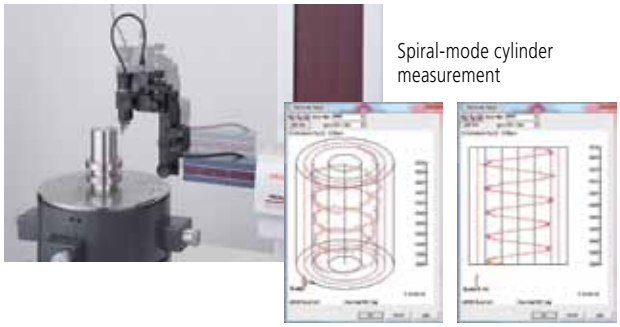
Partial circle measurement

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.



Spiral measurement / analysis

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



Spiral-mode cylinder measurement

Measurement through X-axis tracking

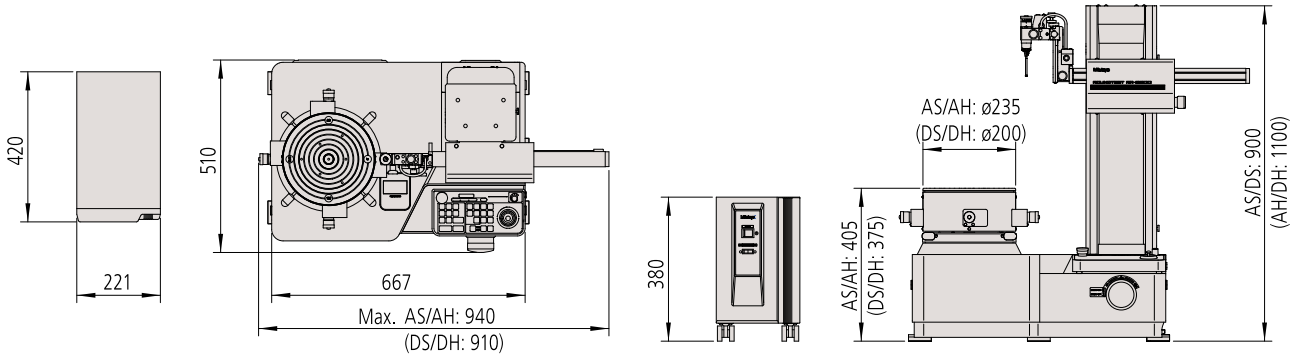
Measurement while tracing is possible through a built-in linear scale in the X axis. This type of measurement is useful when displacement due to form variation exceeds the measuring range of the detector, and X-axis motion is necessary to maintain contact with the workpiece surface.

Specifications RA-2200AS/DS/AH/DH

Model			RA-2200AS	RA-2200DS	RA-2200AH	RA-2200DH
Order No.		mm	**211-511**	**211-513**	**211-512**	**211-515**
		inch	—	**211-514**	—	**211-516**
Turntable	Rotational accuracy	Radial	(0.02 + 3.5 H/10000) µm, H: probing height (mm)			
		Axial	(0.02 + 3.5 X/10000) µm, X: distance from rotational centre (mm)			
	Rotational speed		2, 4, 6, 10 rpm			
	Effective diameter		235 mm	200 mm	235 mm	200 mm
	Centering/levelling adjustment		A.A.T	D.A.T	A.A.T	D.A.T
	Centering adjustment range		±3 mm	±5 mm	±3 mm	±5 mm
	Levelling adjustment range		±1°			
	Maximum loading		30 kg			
	Maximum probing diameter		300 mm			
	Maximum loading diameter		580 mm			
Vertical drive (Z-axis column unit)	Straightness of drive	Narrow range	0.10 µm/100 mm (λc 2.5)			
		Wide range	0.15 µm/300 mm (λc 2.5)		0.25 µm/500 mm (λc 2.5)	
	Parallelism with turntable axis		0.7 µm / 300 mm		1.2 µm / 500 mm	
	Maximum traverse speed		50 mm/s (measurement: 0.5/1.0/2.0/5.0 mm/s)			
	Maximum probing height with standard stylus	OD	300 mm		500 mm	
		ID	300 mm		500 mm	
	Maximum probing depth		85 mm for ø32 mm or more (with standard stylus)			
Radial drive (X-axis arm unit)	Straightness of drive		0.7 µm/150 mm (λc 2.5)			
	Perpendicularity to turntable axis		1.0 µm/150 mm			
	Traverse range		175 mm (from table axis -25 mm to 150 mm)			
	Maximum traverse speed		30 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, sliding detector holder (3 position)			
Other	Power supply		100 ~ 240 VAC			
	Air pressure		0.39 MPa			
	Air consumption		30 L/min (standard state)			
	Mass of main unit		180 kg		200 kg	

Dimensions

Unit: mm



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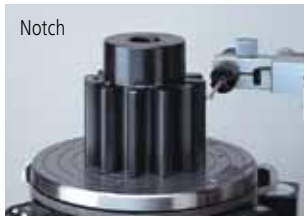
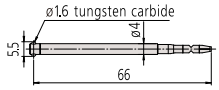
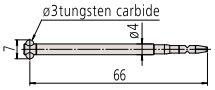
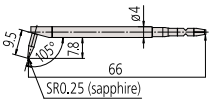
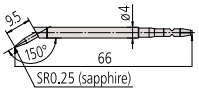
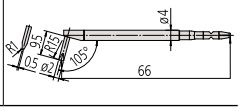
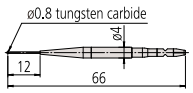
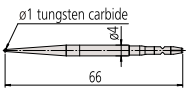
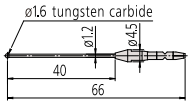
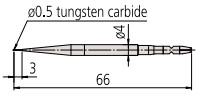
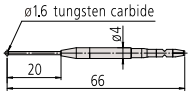
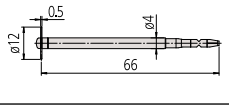
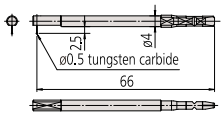
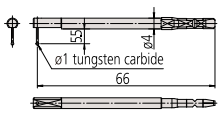
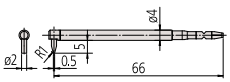
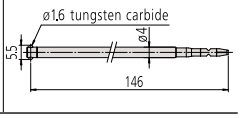
Optional accessories

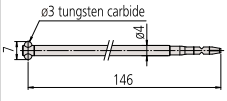
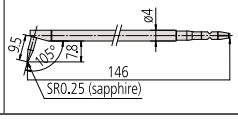
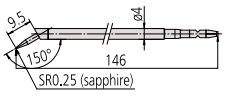
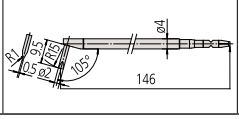
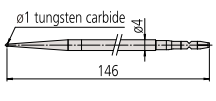
Styli

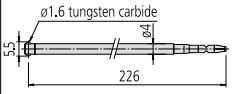
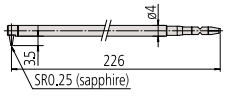
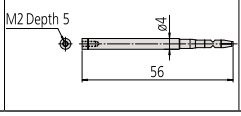
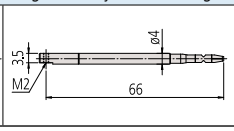
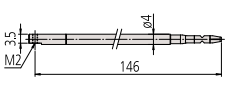


Type	Standard (Standard accessory)	Notch *2	Deep groove *2	Corner	Chisel
Order No.	**12AAL021**	**12AAL022**	**12AAL023**	**12AAL024**	**12AAL025**
Stylus tip	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide	SR 0.25 mm sapphire	SR 0.25 mm sapphire	tungsten carbide
Dimensions (mm)					

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.

See page 8 for optional accessories common to the RA-2200AS/DS/AH/DH and RA-2200CNC

Roundtest Extreme RA-2200CNC

RA-2200CNC with vibration isolator and side table

Highly accurate turntable

The turntable provides very high rotational accuracy, enabling the system to measure flatness and other roundform characteristics, in addition to roundness/cylindricity, at an accuracy level that suits almost any application.

Space-saving design

Integrating the system vibration-damping platform has signifi cantly reduced the installation space requirements. The availability of a matching PC table provides layout flexibility.

Highly accurate positioning sensor

A Mitutoyo linear scale is incorporated into the X-axis positioning sensor, directly sensing the displacement of the drive unit to achieve the highly accurate positioning essential for repeatable measurement. Furthermore, continual development has resulted in the highest drive speed within the class while achieving high accuracy even at high drive speeds.

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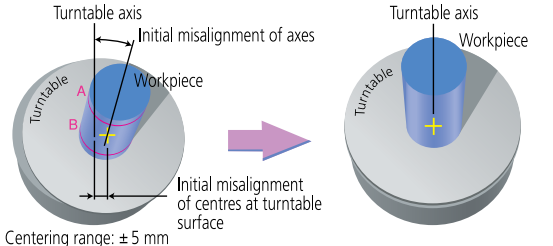
Extreme RA-2200CNC

Detector unit orientation programmable for CNC measurement

This function controls the orientation of the arm holding the detector unit (between vertical and horizontal) and the detector unit rotation mechanism (between 0 and 270 degrees in 1-degree increments), making it possible to continuously and automatically measure internal/external diameters as well as top/bottom surfaces. Additionally, a fully featured offline teaching function simplifies the creation of part programs.

Simple and accurate centering and levelling of the workpiece

The RA-2200CNC is equipped as standard with the A.A.T. (Automatic Adjustment Table) positioning and levelling system that frees the operator from the sometimes tedious task of centering and levelling the workpiece by manual adjustment.



Centering range: ±5 mm
Levelling range: ±1°

Preliminary measurement

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

Centering/levelling complete

Preliminary measurement is followed by automatic centering and levelling.

Roughness detector unit support

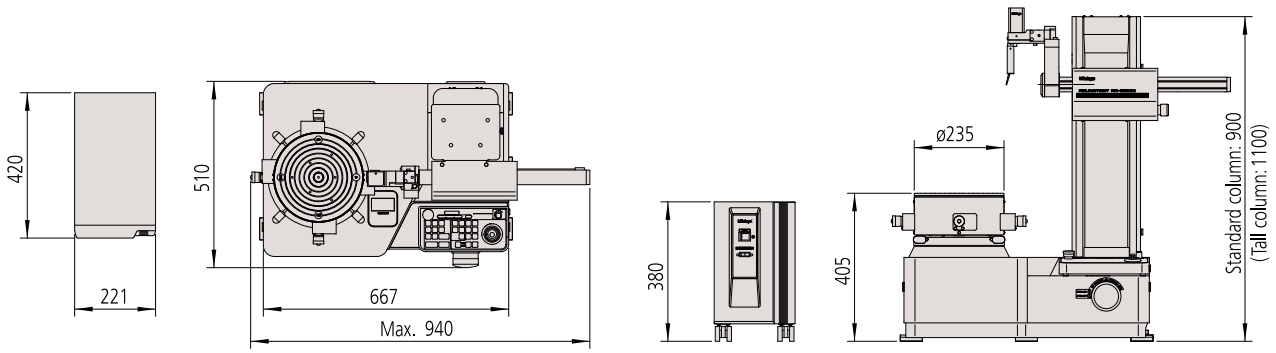
When an optional roughness detector unit is incorporated into the system it can measure workpiece surface roughness in the circumferential direction around the axis of rotation, as well as roughness in the direct-drive directions along the X- and Z-axes with the table stopped.

Specifications RA-2200CNC

Model No.			RA-2200CNC	
Z axis			Standard column	Tall column
Turntable	Rotational accuracy	Radial	(0.02 + 3.5 H / 10000) µm, H: probing height (mm)	
		Axial	(0.02 + 3.5 X / 10000) µm, X: distance from rotational centre (mm)	
	Rotational speed		2, 4, 6, 10 rpm	
	Effective diameter		235 mm	
	Centering / levelling adjustment		A.A.T.	
	Centering adjustment range		±3 mm	
	Levelling adjustment range		±1°	
	Maximum loading		30 kg	
	Maximum probing diameter		256 mm	
	Maximum loading diameter		580 mm	
Vertical drive (Z-axis column unit)	Straightness of drive	Narrow range	0.10 µm / 100 mm (λc 2.5)	
		Wide range	0.15 µm / 300 mm (λc 2.5)	0.25 µm / 500 mm (λc 2.5)
	Parallelism with turntable axis		0.7 µm / 300 mm	1.2 µm / 500 mm
	Maximum traverse speed		50 mm/s (measurement: 0.5 / 1.0 / 2.0 / 5.0 mm/s)	
	Maximum probing height with standard stylus	OD	300 mm	500 mm
		ID	300 mm	500 mm
	Maximum probing depth		26 mm for ø12.7 mm or more, 104 mm for ø32 mm or more (with standard stylus)	
Radial drive (X-axis arm unit)	Straightness of drive		0.7 µm / 150 mm (λc 2.5)	
	Perpendicularity to turntable axis		1.0 µm / 150 mm	
	Traverse range		175 mm (from table axis -25 mm to 150 mm)	
	Maximum traverse speed		30 mm/s (measurement: 0.5 / 1.0 / 2.0 / 5.0 mm/s)	
Detector	Measuring force		40 mN	
	Stylus design, material		ø1.6 mm tungsten carbide ball	
	Measuring range	Static	±400 µm / ±40 µm / ±4 µm	
		Tracking	±5 mm	
	Other		Rotating mechanism (within the range 0° to 270°, in increments of 1°)	
Other	Power supply		100 ~ 240 VAC	
	Air pressure		0.39 MPa	
	Air consumption		30 L/min (standard state)	
	Mass of main unit		180 kg	200 kg

Dimensions

Unit: mm



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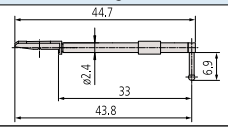
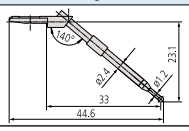
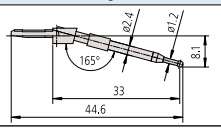
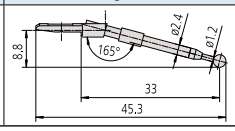
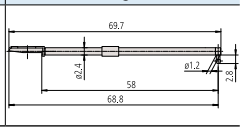
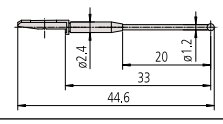
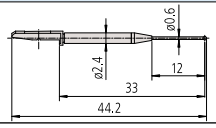
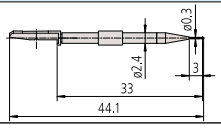
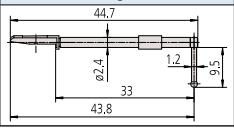
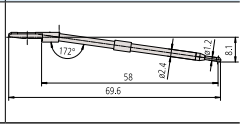
Optional accessories

Styli

Type	Deep groove	Flat surface	Standard	Notch	Deep hole A
Order No.	**12AAE310**	**12AAE302**	**12AAE301**	**12AAE309**	**12AAE306**
Stylus tip	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)					

Type	ø1.6 mm ball	ø0.8 mm ball	ø0.5 mm ball	Deep groove	Deep hole B
Order No.	**12AAE303**	**12AAE304**	**12AAE305**	**12AAE308**	**12AAE307**
Stylus tip	ø1.6 mm tungsten carbide	ø0.8 mm tungsten carbide	ø0.5 mm tungsten carbide	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)					

Options common to the RA-2200AS/DS/AH/DH and RA-2200CNC

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

Vibration isolation cabinet & monitor arm*

12AAK110

Vibration Isolation cabinet with built-in isolator.

12AAK120

Optional arm for mounting a monitor.

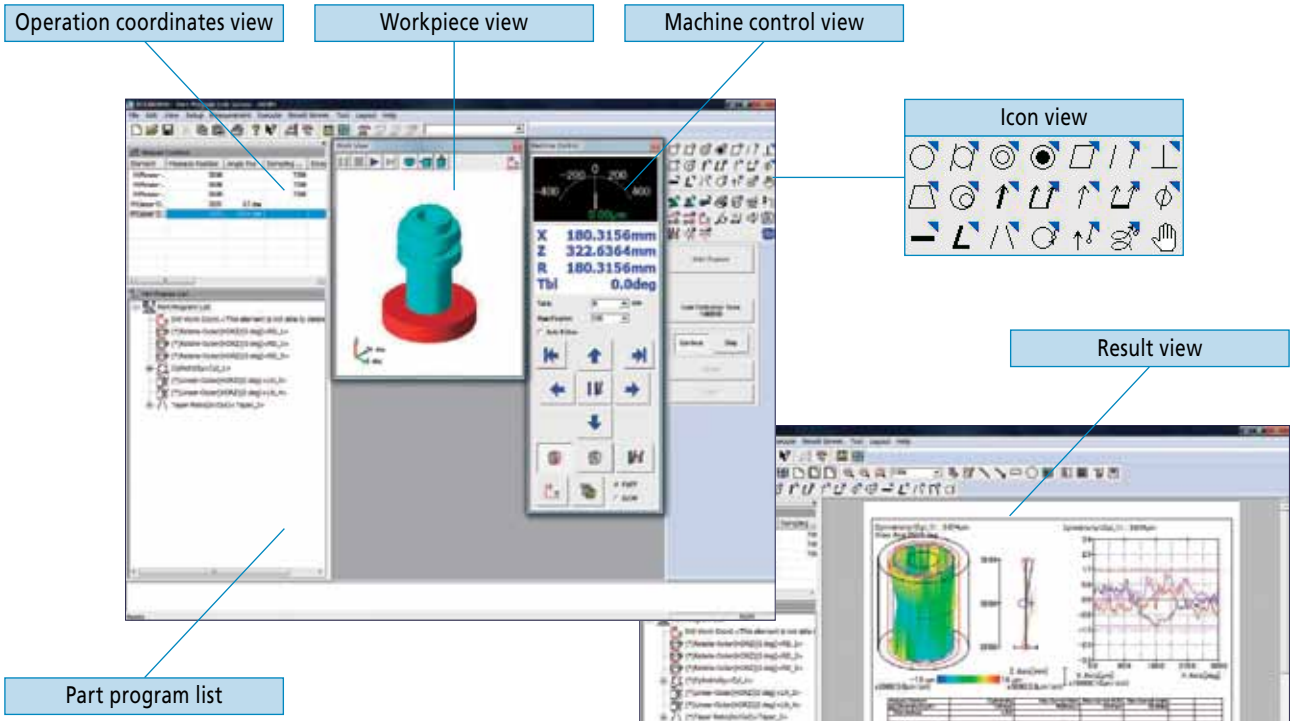
* Vibration isolators do not include measuring units, controllers or analysis systems shown.

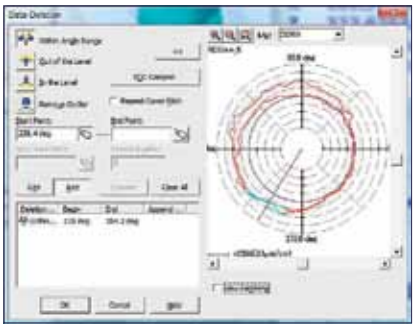
ROUNDPAK
Analysis software provides user-friendly operation

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

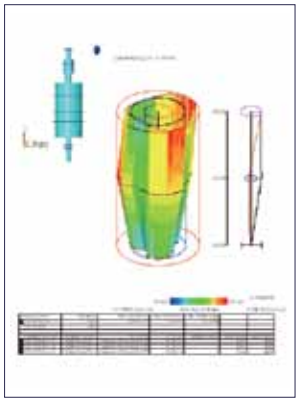
Software

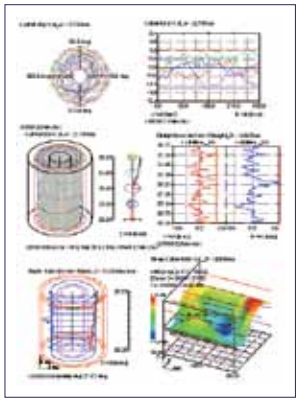
ROUNDPAK

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.

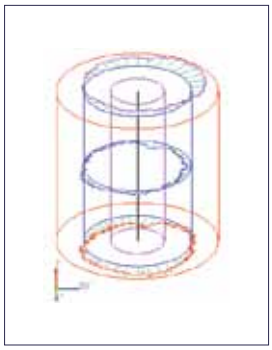
The analysis result window can be directly used as a layout window. Since the measurement procedure, including the layout information, is saved, the entire process, from measurement start, calculation, result saving, and finally to printing, can be automatically executed.



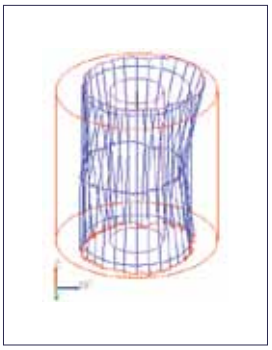


A wide variety of graphics functions

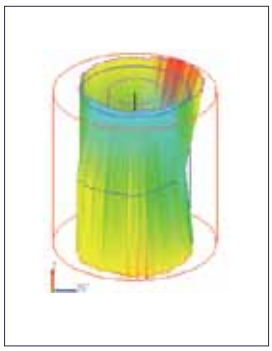
Analysis results such as cylindricity and coaxiality can be visually expressed in 3D graphics.



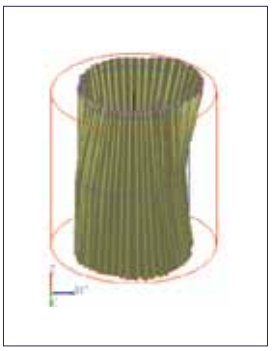
Normal display



Wire-frame display

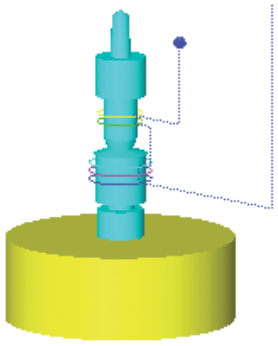


Surface-map display



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-02-0104-1207

- Coordinate Measuring Machines
- Vision Measuring Systems
- Form Measurement
- Optical Measuring
- Sensor Systems
- Test Equipment and Seismometers
- Digital Scale and DRO Systems
- Small Tool Instruments and Data Management

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