

# Roundness/Cylindricity Measurement

## ROUNDTEST RA-1600

Bulletin No. 2026



A new PC-Compliant Roundness and Cylindrical-Form Measuring Instrument with extensive analysis features to enable measurement of a wide variety of workpieces

# Mitutoyo

# Powerful Analysis Performance in a Compact Form

## ROUNDTTEST RA-1600

Can measure a wide variety of workpieces

Utilizes a wide measuring range in a compact form

- Max. probing diameter: 11.03"(280mm)
- Vertical travel: 11.82"(300mm)
- Max. table loading: 55lb(25kg)

Multi-functional analysis system

Incorporates flexible data analysis software ROUNDPAK

- Graphical measurement results displayed
- Easy to operate thanks to a simplified measurement mode
- Part Program Simulation

High accuracy

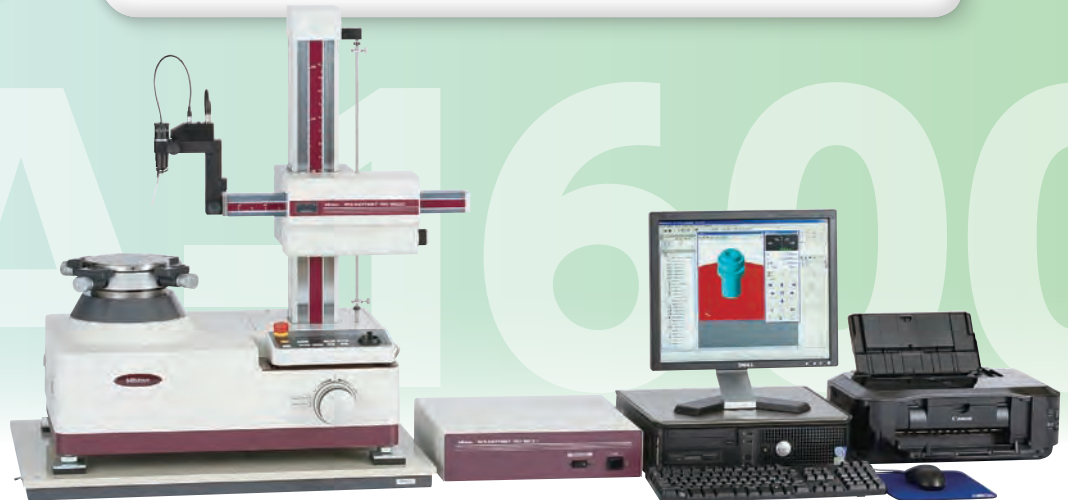
Compact, but with top-end precision

- Rotational accuracy (Radial):  $(0.02+6H/10000) \mu\text{m}$
- Rotational accuracy (Axial):  $(0.02+6X/10000) \mu\text{m}$
- Accuracy assurance: Z axis (Straightness, Parallelism), X axis (Straightness, Squareness)

High functionality

- Detector features safety switch to prevent damaging collisions in the z-axis
- High-precision powered column unit can evaluate straightness as well as cylindricity
- Equipped with D.A.T. mechanism to boost measurement efficiency
- Includes a remote control box for easy operation

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# High-level functions promote greater efficiency

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

The table provides high rotational accuracy (radial  $0.02+6H / 10000 \mu\text{m}$ ; axial  $0.02+6X/10000 \mu\text{m}$ ), enabling the system to measure flatness and other characteristics, in addition to roundness/cylindricity, at a level that suits 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 leveling 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.

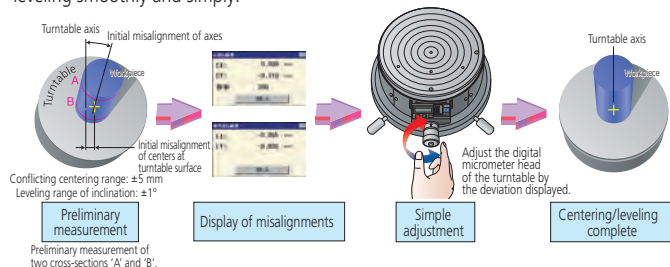
Centering and leveling operations carried out by using the D.A.T.\* can also be incorporated into the measurement procedure (part program). This prevents human errors when performing centering and leveling, and helps standardize measurement operations executed by the part program.

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

### D.A.T. (Digimatic Adjustment Table)

A guidance system (D.A.T.) is incorporated into the turntables on the RA-1600 models to help the operator perform manual centering and leveling smoothly and simply.

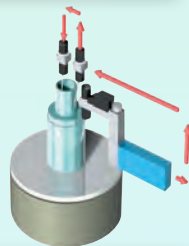
Patent registered in Japan, USA  
Patent pending in Germany



## Continuous OD/ID measurement function

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

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

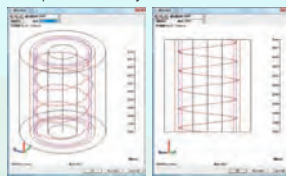


## Spiral Measurement/Analysis

The spiral-mode measurement function combines table rotation and rectilinear action allowing cylindricity, coaxiality, and other measurement data to be loaded as a continuous data set.



Spiral-mode cylinder measurement



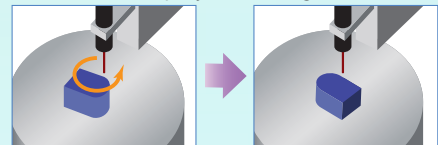
## Safety mechanism provided as a standard feature



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

## Partial circle measurement function

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.



## 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.



## Optional Sliding detector-unit holder available

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.

Sliding distance: 4.41" (112mm)



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 this page for details about the continuous ID and OD measuring function.

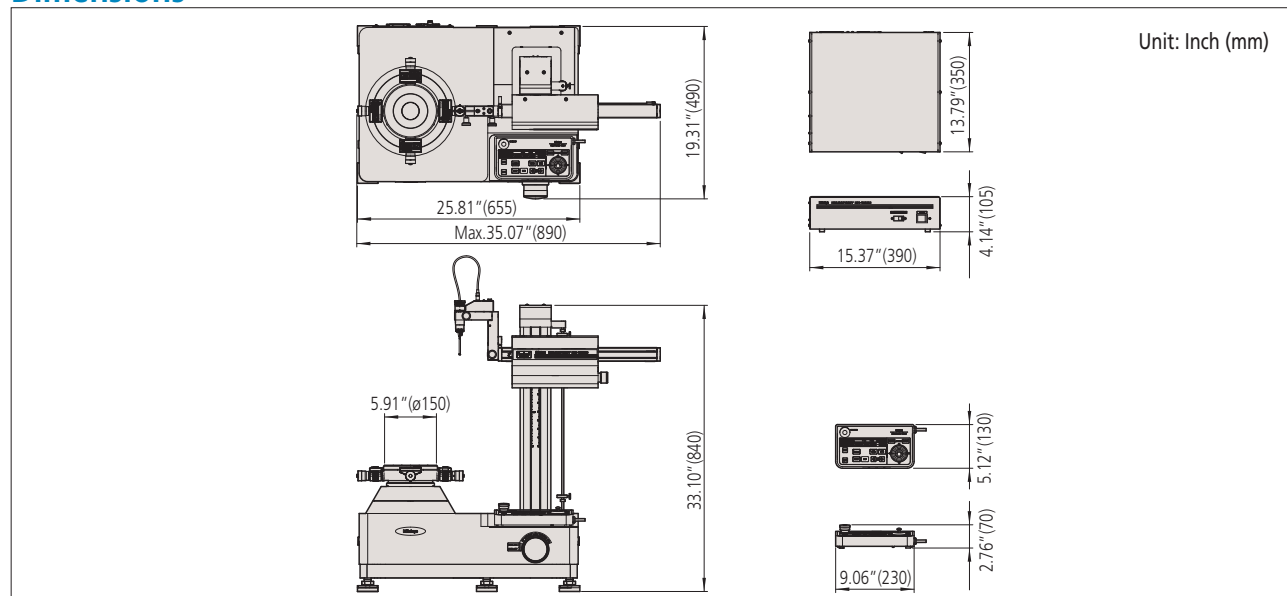
# Specifications

## Specifications

Model No.			RA-1600
Order No.			211-733A
Turntable unit	Rotational accuracy	Radial direction	(0.02+6H / 10000) $\mu$ m H: Measuring height with reference to turntable surface (mm) JIS B7451-1997
		Axial direction	(0.02+6X / 10000) $\mu$ m X: Radial distance with reference to turntable axis (mm)
	Rotational speed		4, 6, 10rpm
	Effective table diameter		5.91" ( $\phi$ 150mm)
	Centering / leveling adjustment		D.A.T.
	Centering adjustment range		.12" ( $\pm$ 3mm)
	Leveling adjustment range		$\pm$ 1°
	Maximum loading		25kg
	Maximum probing diameter		11.03" ( $\phi$ 280mm)
Vertical drive unit (Z-axis column unit)	Straightness of drive	Narrow range	0.20 $\mu$ m / 4" (100mm)
		Wide range	0.30 $\mu$ m / 11.8" (300mm)
	Parallelism with turntable axis		1.5 $\mu$ m / 11.8" (300mm)
	Traverse speed		Max. 15 mm/s (Measurement: 0.5, 1, 2, 5 mm/s)
	Maximum probing height (ID / OD)		11.8" (300mm)*1
	Maximum probing depth	over $\phi$ 32	3.59" (91mm) (with standard stylus)
Radial drive unit (X-axis arm unit)	Straightness of drive	over $\phi$ 7	2" (50mm) (with standard stylus)
			2.7 $\mu$ m / 5.51" (140mm)
	Perpendicularity to turntable axis		1.6 $\mu$ m / 5.51" (140mm)
	Traverse range amount		6.5" (165mm) (From table axis -25 mm ~ +140 mm)
Detector	Traverse speed		Max. 8 mm/s (measurement: 0.5, 1, 2, 5 mm/s)
	Measuring force		10 ~ 50mN (5 level switching) (ID/OD measuring position with standard stylus)
	Measuring range	Standard	$\pm$ 400 $\mu$ m / $\pm$ 4 $\mu$ m / $\pm$ 4 $\mu$ m
		Tracking	.20" ( $\pm$ 5mm)
Other	Tip shape, material		.063" ( $\phi$ 1.6 mm) tungsten carbide
	Other		IN/OUT one-touch switching, Stylus angle scale markings ( $\pm$ 45°), Z-axis collision detection function
	Power supply		100 V ~ 240 V
	Power consumption		80W
	Air pressure		0.39MPa
	Air consumption		22 L/min (standard state)
	Mass of main unit (NET)		374lb (170kg)

\*1: Use an optional auxiliary stage for measuring a workpiece whose height is .79" (20mm) or less.

## Dimensions





# Optional Accessories

## Styli for RA-1600 (Option)

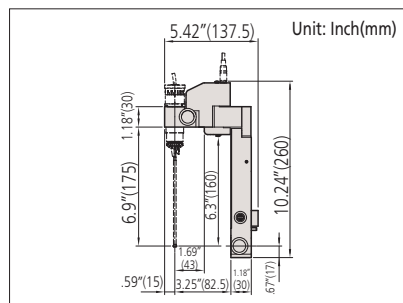
Type	Standard (Standard accessory)	Notch	Deep groove	Corner	Cutter mark
Order No.	<b>12AAL021</b>	<b>12AAL022</b>	<b>12AAL023</b>	<b>12AAL024</b>	<b>12AAL025</b>
Stylus tip	.063" (ø1.6mm) tungsten carbide	.12" (ø3mm) tungsten carbide	SRO .009" (.25mm) sapphire	SRO .009" (.25mm) sapphire	tungsten carbide
Dimensions Inch(mm)					
Type	Small hole (ø0.8)	Small hole (ø1.0)	Small hole (ø1.6)	Extra small hole (Depth 3 mm)	ø1.6 mm ball
Order No.	<b>12AAL026</b>	<b>12AAL027</b>	<b>12AAL028</b>	<b>12AAL029</b>	<b>12AAL030</b>
Stylus tip	.032" (ø0.8mm) tungsten carbide	.04" (ø1mm) tungsten carbide	.063" (ø1.6mm) tungsten carbide	.019" (ø0.5mm) tungsten carbide	.063" (ø1.6mm) tungsten carbide
Dimensions Inch(mm)					
Type	Disk	Crank (ø0.5)	Crank (ø1.0)	Flat surface	2X-long type *1
Order No.	<b>12AAL031</b>	<b>12AAL032</b>	<b>12AAL033</b>	<b>12AAL034</b>	<b>12AAL035</b>
Stylus tip	.47" (ø12mm) tungsten carbide	.019" (ø0.5mm) tungsten carbide (Depth 2.5 mm)	.039" (ø1mm) tungsten carbide (Depth 5.5 mm)	tungsten carbide	.063" (ø1.6mm) tungsten carbide
Dimensions Inch(mm)					
Type	2X-long type notch *1	2X-long type deep groove *1	2X-long type corner *1	2X-long type cutter mark *1	2X-long type Small hole *1
Order No.	<b>12AAL036</b>	<b>12AAL037</b>	<b>12AAL038</b>	<b>12AAL039</b>	<b>12AAL040</b>
Stylus tip	.12" (ø3mm) tungsten carbide	SRO .009" (.25mm) sapphire	SRO .009" (.25mm) sapphire	tungsten carbide	.039" (ø1mm) tungsten carbide
Dimensions Inch(mm)					
Type	3X-long type *1	3X-long type deep groove *1	Stylus shank	Stylus shank (standard groove)	Stylus shank (2X-long groove) *1
Order No.	<b>12AAL041</b>	<b>12AAL042</b>	<b>12AAL043</b>	<b>12AAL044</b>	<b>12AAL045</b>
Stylus tip	.063" (ø1.6mm) tungsten carbide	SRO .009" (.25mm) sapphire	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)
Dimensions Inch(mm)					

\*1: Measuring is only possible in the vertical direction.

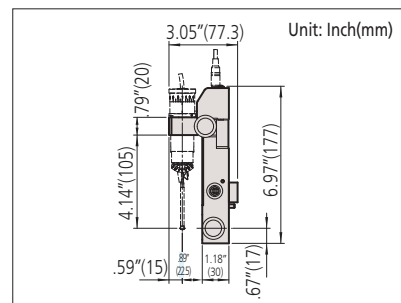
\*2: Customized special interchangeable styli are available on request. Please contact any Mitutoyo office for more information.

## Detector holders

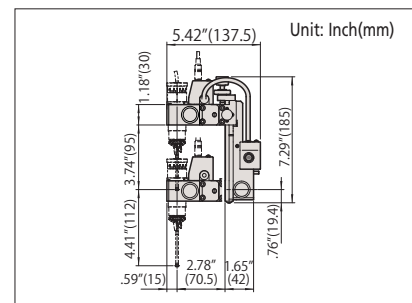
### 2X extension holder: 12AAF203



### Auxiliary holder for a large-diameter workpiece: 12AAF204



### Sliding detector holder: 12AAL090



# Optional Accessories

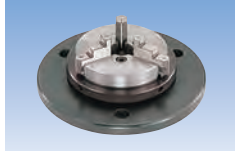


## •Centering chuck (key operated)

**211-014**

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

- Holding capacity:  
Internal jaws: OD = .08-1.38" (ø2-ø35mm),  
ID = 1-2.68" (ø25-ø68mm)  
External jaws:  
OD = 1.38 x 3.07" (ø35-ø78mm)  
•External dimensions: 6.18 x 2.78"  
(ø157 x 70.6mm)  
•Mass: 8.4lb (3.8kg)



## •Centering chuck (ring operated)

**211-032**

Suitable for holding small parts with easy-to-operate knurled-ring clamping.

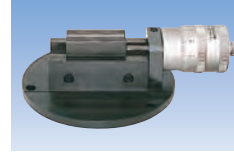
- Holding capacity:  
Internal jaws: OD = 0.4-1.4" (ø1-ø36mm),  
ID = .63-2.72" (ø16-ø69mm)  
External jaws: OD = 1-3.11" (ø25-ø79mm)  
•External dimensions: 4.65 x 1.62"  
(ø118 x 41mm)  
•Mass: 2.6lb (1.2kg)



## •Micro-chuck 211-031

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

- Holding capacity: .004-.05" (ø0.1-ø1.5mm)  
•External dimensions: 4.65 x 1.91"  
(ø118 x 48.5mm)  
•Mass: 1.3lb (0.6kg)



## •Magnification calibration gage

**211-045**

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

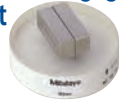
- Maximum calibration range: 400µm  
•Graduation: 0.2µm  
•External dimensions: 9.26 (max) x 7.3 x 2.76" (235 (max) x 185 x 70mm)  
•Mass: 8.8lb (4kg)

## •Cylindrical square 350850

- Straightness: 0.5µm  
•Cylindricity: 2µm  
•External dimensions: 2.76" x 9.85" (ø70 x 250mm)  
•Mass: 16.5lb (7.5kg)

## •Optical flat and gage block set

**997090**



## •Reference hemisphere

**211-016**



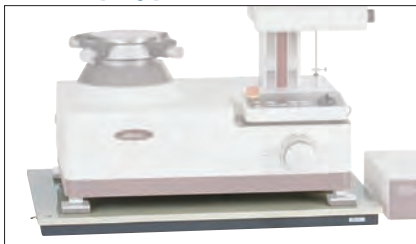
## •Auxiliary stage 356038



## Vibration isolator

When using roundness and cylinder form measuring instruments, the measurement results can be significantly affected by environmental disturbances such as vibration. To prevent this, we invite you to choose from our selection of vibration isolators, which include a desk-top vibration isolator with an optional stand and two deluxe isolators (a monitor arm type and a side table type).

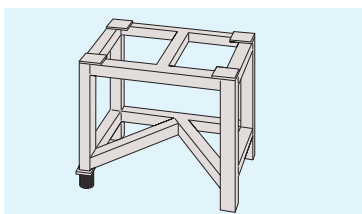
### Desktop type\*



\*The vibration isolator does not include the measuring unit, controller, or analysis system.

Order No.	<b>178-025</b>
Vibration dampening system	Diaphragm type air spring
External size	30.14x22.26x2.01" (765x565x51mm)

### Stand for desktop type: 178-024



### Deluxe type\*

Vibration isolator with monitor arm



Vibration isolator with side table



\*The vibration isolator does not include the measuring unit, controller, or analysis system.

# Roundness/Cylindricity data analysis software

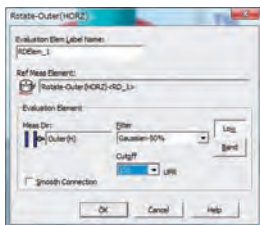
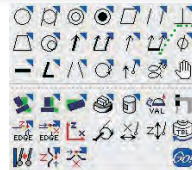
## ROUNDPAK

ROUNDPAK provides simple data manipulation using a mouse and icons

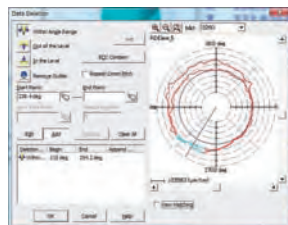
### Simple operations include a full set of parameter and analysis functions

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 graphical icons.

ROUNDPAK also comes with specialized features, such as the design value best-fit analysis, the harmonic analysis, and a function for recording the peak or through points on a circumference. Data that has already been collected can be easily used for re-calculation, or deleted.



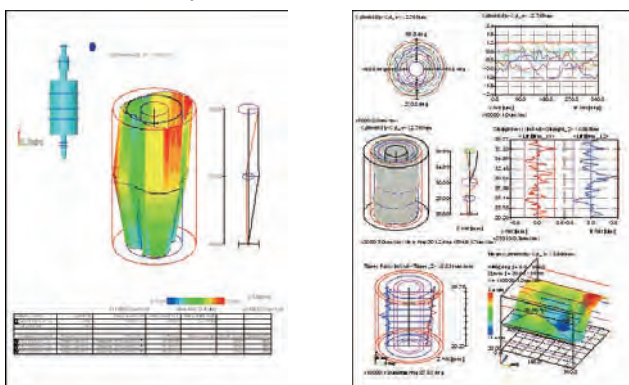
Recalculation



Data deletion

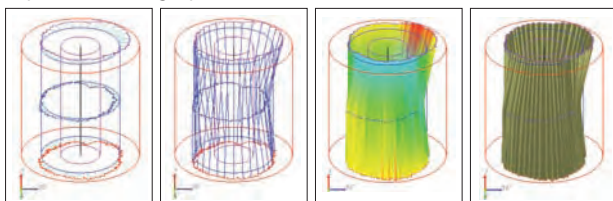
### Customizable layouts using graphics and data obtained from measurements

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 utilized 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.

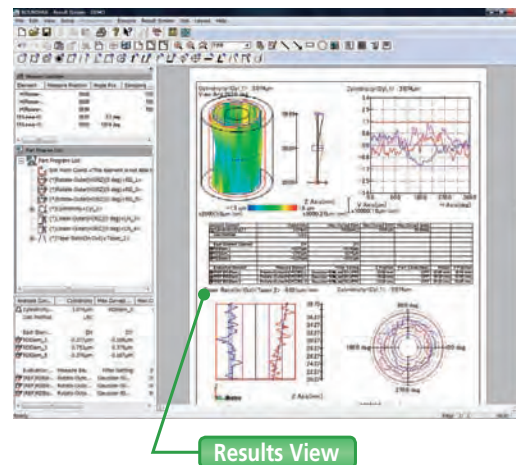
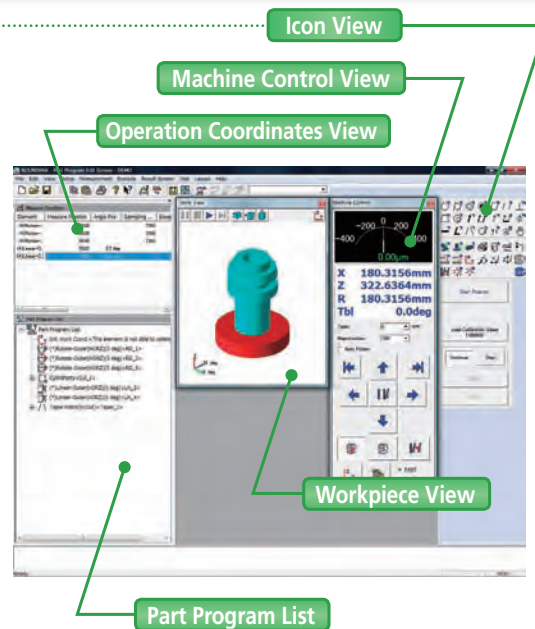


Normal display

Wire-frame display

Surface-map display

Shading display

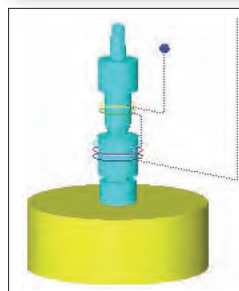


Results View

### Off-line measurement procedure programming function

Patent registered in Japan, USA  
Patent pending in Europe

An off-line 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.





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Coordinate Measuring Machines

Vision Measuring Systems

Form Measurement

Optical Measuring

Sensor Systems

Testing Equipment and  
Seismometer

Digital Scale and DRO Systems

Small Tool Instruments and  
Data Management

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# Mitutoyo

**Precision is our Profession**