High Precision Roundness/Cylindricity Measuring System

ROUNDTEST RA-H5200 SERIES

Bulletin No. 2023

Roundness/Cylindricity Measuring System combines world-class accuracy with superior maneuverability/ analytical capability

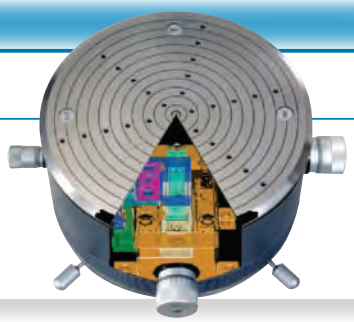
Mitutoyo

World-Class Accuracy with Superior Maneuverability
ROUNDTEST RA-H5200 SERIES

World-Class Accuracy

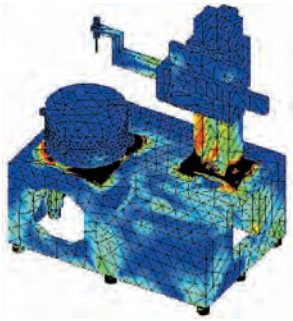
High-accuracy, automatic centering/leveling turntable

A highly accurate, highly rigid turntable has been achieved through exceptional manufacturing accuracy of the critical components, in addition to a high-accuracy air-bearing that provides superior rigidity. The resulting rotational accuracy, the heart of the roundness/cylindricity measuring system, is world-class at (0.02+3.5H/10000)µm.



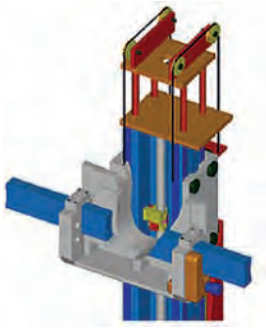
High-rigidity base

For a measurement system to be able to achieve high accuracy, the base, which forms the foundation of the system, must be completely rigid. Therefore, we utilized FEM structural analysis simulation to thoroughly analyze the base and its application. The result is the development of a high-rigidity base.



High-accuracy Z-axis column

Attaining the ultimate level of improvement in the manufacturing accuracy of the column guide surface, which is critical for achieving perfect straightness, and adopting Mitutoyo's proprietary system and mechanisms have led to the achievement of the ultra-high column straightness of 0.05µm/100mm (in narrow range).



High-accuracy positioning sensors

Mitutoyo's linear encoders have been incorporated into the positioning sensors in the X- and Z-axis drive units to directly sense the displacement. The drive units, thereby achieving the highly accurate positioning essential for repeat measurements.

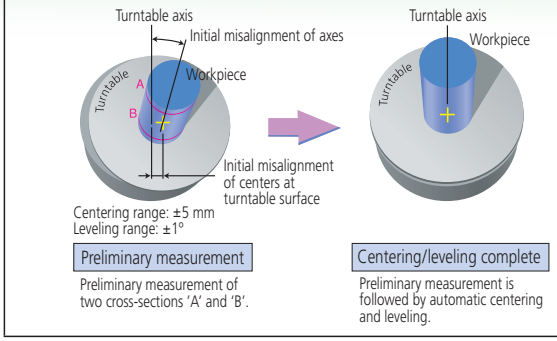
High-performance vibration isolator as a standard feature

The measurement accuracy of a roundness/cylindricity measuring system is greatly affected by external disturbances such as vibration. Therefore, the RA-H5200 Series is supplied as standard with a high-performance vibration isolator that possesses excellent vibration attenuation.

High-speed automatic centering/leveling

The system is supplied as standard with the Automatic Adjustment Table (A.A.T.) positioning and leveling function, freeing the operator from the task of centering and leveling the workpiece. High-precision glass encoders are used to reduce positioning errors and achieve high-speed automatic centering/leveling, which contributes greatly to reducing the total measurement time from workpiece setting to workpiece measurement.

A.A.T. (Automatic Adjustment Table)



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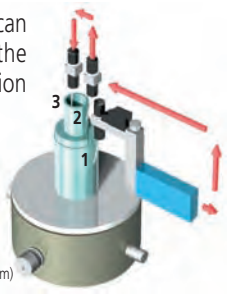
RA-H5200AS/AH SERIES

A RA-H5200 measuring system was developed to combine world-class accuracy with high maneuverability/analytical capability. This system can perform many other functions as well, such as tracking measurements and automatic OD/ID measurement.
Available with the standard column specification (Z-axis traverse of 13.8"(350mm)) or an extended specification (Z-axis traverse of 21.7"(550mm)) for handling taller workpieces.

Continuous OD/ID measurement function

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

Both the OD and ID of a workpiece can be measured in succession without the need for changing the traverse direction of the stylus.



1), 2) : External diameter measurement
3) : Internal diameter measurement
➡ : Displacement
3) = inner diameter: Up to ø2"(50mm)

Sliding detector-unit holder provided as a standard feature

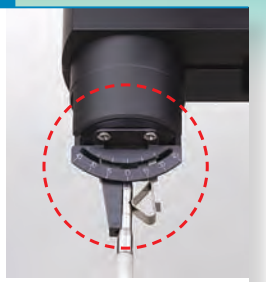
The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm.

Sliding distance: 4.41"(112mm)

Safety mechanism provided as a standard feature

Patent pending in Japan

A safety mechanism is incorporated into the detector unit area. 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 unit 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.



Spiral Measurement/Analysis

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

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 sensor, and X-axis motion is necessary to maintain contact with the workpiece surface.

EXTREME RA-H5200 CNC SERIES

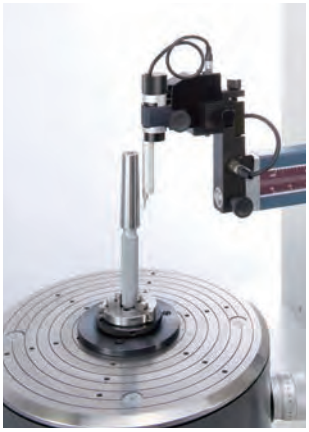
A CNC system combines high accuracy with automatic CNC measurements to greatly improve productivity and efficiency. Automatic orientation control of the detector unit enables this system to automatically execute high-speed, operator-free measurements. Available with the standard column specification (Z-axis traverse of 13.8"(350mm)) or an extended specification (Z-axis traverse of 21.7"(550mm)) for handling taller workpieces.

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 full-featured offline teaching function simplifies the creation of part programs.

Surface-roughness measuring function (optional)

The system is a multi-sensor type, compatible both with a standard probe that meets the specifications of the roundness measuring system and a surface roughness detector unit.
Incorporating the optional roughness detector unit into the system enables roughness measurement in the circumferential direction around the θ-axis, as well as in the direct-drive directions along the X- and Z-axes with the table stopped. (Surface roughness and geometric tolerances, such as roundness and cylindricity, can be validated using a single system.)



RA-H5200AS/AH SERIES

RA-H5200CNC SERIES

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RA-H5200 SERIES Specifications/Options

Order No.			211-531A	211-532A	211-533A	211-534A
Model No.			RA-H5200AS	RA-H5200AH	RA-H5200 CNC	
Z-axis			Standard column	High column	Standard column	High column
Turntable unit	Rotational accuracy	Radial direction	(0.02+3.5H/10000) µm (H: probing height (mm))			
		Axial direction	(0.02+3.5X/10000) µm (X: distance from rotational center (mm))			
	Rotating speed		2,4,6,10 rpm (Auto centering: 20rpm)			
	Table effective diameter		ø11.8"(300mm)			
	Centering/leveling adjustment		A.A.T.			
	Centering adjustment range		.20"(±5mm)			
	Leveling adjustment range		±1°			
	Max. loading weight		176lb(80kg) (Auto centering: 143lb(65kg))			
	Max. probing diameter		ø16"(400mm)		ø14.03"(356mm)	
	Max. loading diameter		ø26.8"(680mm)			
Vertical drive unit (Z-axis)	Straightness accuracy (λc2.5mm)		0.05µm/100mm 0.14µm/350mm	0.05µm/100mm 0.2µm/550mm	0.05µm/100mm 0.14µm/350mm	0.05µm/100mm 0.2µm/550mm
	Parallelism to rotation center (Referential generattix line)		0.2µm/350mm	0.32µm/550mm	0.2µm/350mm	0.32µm/550mm
	Traverse speed		Max. 60mm/s (Measurement: 0.5/1.0/2.0/5.0mm/s)			
	Vertical Travel amount		13.8"(350mm)	21.7"(550mm)	13.8"(350mm)	21.7"(550mm)
	Max. probing height	ID/OD	13.8"(350mm)	21.7"(550mm)	13.8"(350mm)	21.7"(550mm)
	Max. probing depth (with standard stylus)		85mm for ø32mm or more 50mm for ø7mm or more		104mm for ø32mm or more 26mm for ø12.7mm or more	
Radial drive unit (X-axis)	Straightness accuracy		0.4µm/200mm (λc2.5mm)			
	Horizontal to rotation center		0.5µm/200mm (Reterential generattix line)			
	Travel amount		225mm (Including -25mm travel from rotational center)			
	Travel speed		Max. 50mm/s (Measurement: 0.5/1.0/2.0/5.0 mm/s)			
Detector	Measuring force		approx 10~50mN (switching 5 levels)		approx 40mN	
	Stylus design, material		ø1.6mm tungsten carbide ball		ø1.6mm tungsten carbide ball	
	Measuring range	Standard	±400µm / ±40µm / ±4µm		±400µm / ±40µm / ±4µm	
		Follow	±5mm		±5mm	
	Other		2 direction one-touch switching type Collision detection function for Z-axis direction Stylus angle scale markings (±45°)		Accidental touch function Measuring direction: 1	
Other	Power supply		100V~240V			
	Air pressure		0.39MPa			
	Air consumption		45L/min (Standard state)			
	Weight (measurement main unit)		1430lb (650kg)	1474lb (670kg)	1430lb (650kg)	1474lb (670kg)
	Weight (vibration isolator)		374lb (170kg)			

Options common to the RA-H5200 SERIES

•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" (ø157x70.6mm)
- 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" (ø118x48.5mm)
- 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) x185x70mm)
- Mass: 8.8lb (4kg)

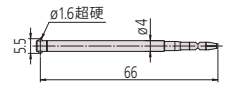
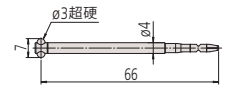
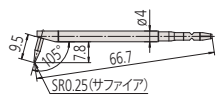
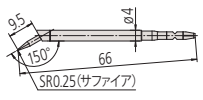
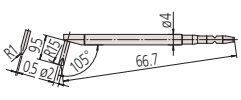
•Cylindrical square

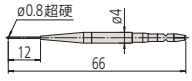
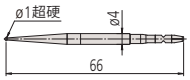
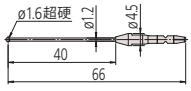
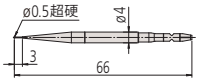
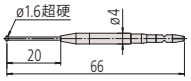
350850

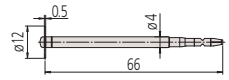
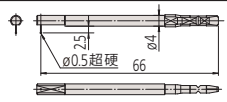
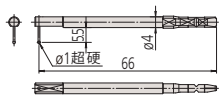
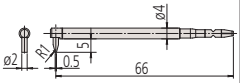
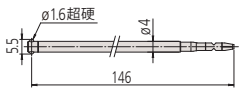
- Straightness: 0.5µm
- Cylindricity: 2µm
- External dimensions: 2.76" x 9.85" (ø70x250mm)
- Mass: 16.5lb (7.5kg)

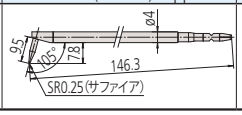
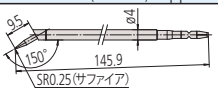
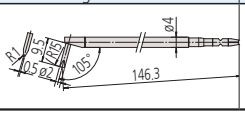
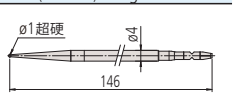
Options

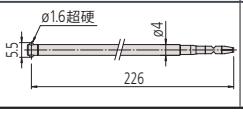
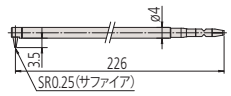
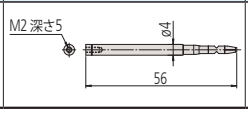
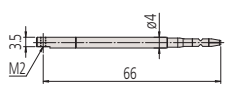
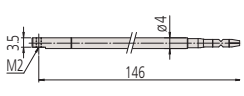
•Styli for RA-H5200AS/AH (Option)

Type	Standard (Standard accessory)	Notch	Deep groove	Corner	Cutter mark
Order No.	**12AAL021**	**12AAL022**	**12AAL023**	**12AAL024**	**12AAL025**
Stylus tip	.063"(ø1.6mm) tungsten carbide	.12"(ø3mm) tungsten carbide	SR0 .009"(.25mm) sapphire	SR0 .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.	**12AAL026**	**12AAL027**	**12AAL028**	**12AAL029**	**12AAL030**
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)					

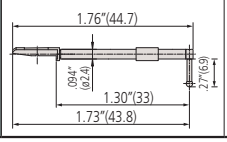
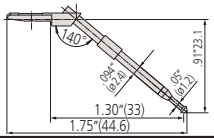
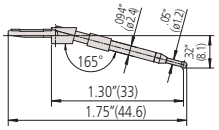
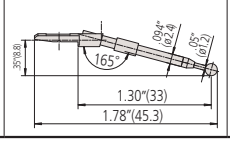
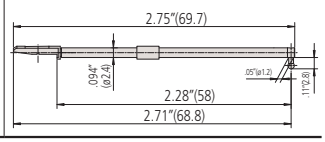
Type	Disk	Crank (ø0.5)	Crank (ø1.0)	Flat surface	2X-long type *1
Order No.	**12AAL031**	**12AAL032**	**12AAL033**	**12AAL034**	**12AAL035**
Stylus tip	.47"(ø12mm) tungsten carbide	.019"(ø0.5mm) tungsten carbide (Depth 2.5mm)	.039"(ø1mm) tungsten carbide (Depth 5.5mm)	tungsten carbide	.063"(ø1.6mm) tungsten carbide
Dimensions Inch(mm)					

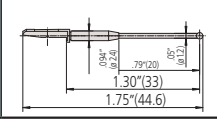
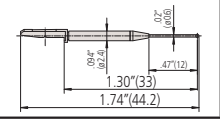
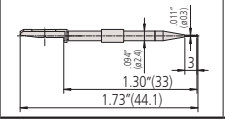
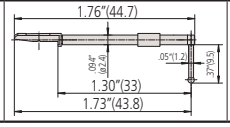
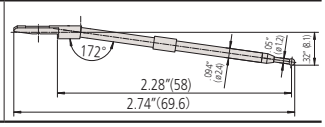
Type	2X-long type notch *1	2X-long type deep groove *1	2X-long type corner *1	2X-long type cutter mark *1	2X-long type Small hole *1
Order No.	**12AAL036**	**12AAL037**	**12AAL038**	**12AAL039**	**12AAL040**
Stylus tip	.12"(ø3mm) tungsten carbide	SR0 .009"(.25mm) sapphire	SR0 .009"(.25mm) sapphire	tungsten 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.	**12AAL041**	**12AAL042**	**12AAL043**	**12AAL044**	**12AAL045**
Stylus tip	.063"(ø1.6mm) tungsten carbide	SR0 .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.

•Styli for RA-H5200CNC (Option)

Type	Deep groove	Flat surface	Standard	Notch	Deep hole A
Order No.	**12AAE310**	**12AAE302**	**12AAE301**	**12AAE309**	**12AAE306**
Stylus tip	.063"(ø1.6mm) tungsten carbide	.063"(ø1.6mm) tungsten carbide	.063"(ø1.6mm) tungsten carbide	.12"(ø3mm) tungsten carbide	.063"(ø1.6mm) 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	.063"(ø1.6mm) tungsten carbide	.031"(ø0.8mm) tungsten carbide	.019"(ø0.5mm) tungsten carbide	.063"(ø1.6mm) tungsten carbide	.063"(ø1.6mm) tungsten carbide
Dimensions (mm)					

Mitutoyo

Roundness/Cylindricity measurement/Analysis software

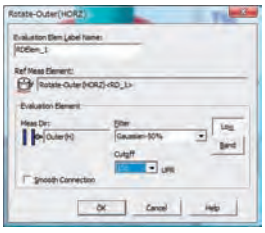
ROUNDPAK

ROUNDPAK provides simple manipulation using a mouse and icons

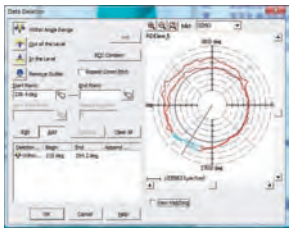
Simple operations even with a full set of parameters and analysis functions

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.

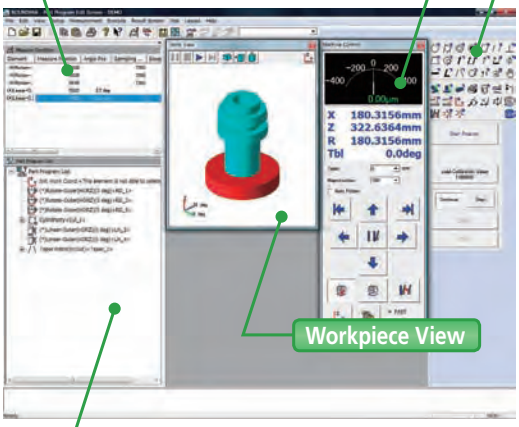
ROUNDPAK also comes with specialized functions, such as the design value best-fit analysis function, the harmonic analysis function, and a function for recording the peak or through points on a circumference. Data that has already been collected can be easily used for re-calculation or deleted.



Recalculation

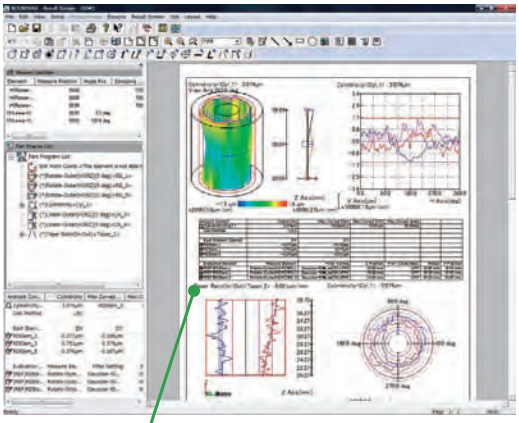


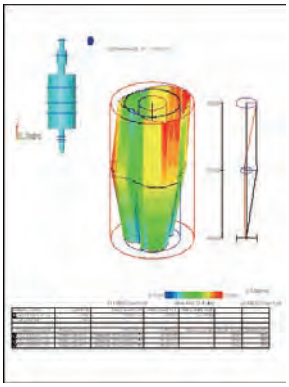
Data deletion

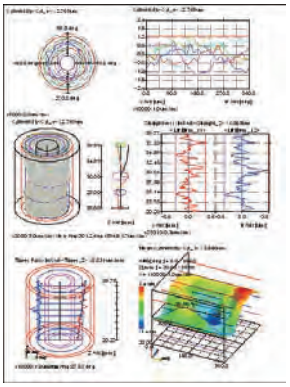


Freedom in laying out the graphics and data obtained from measurements

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 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.

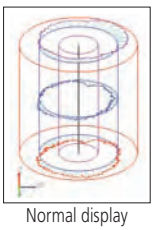




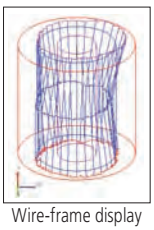


A wide variety of graphics functions

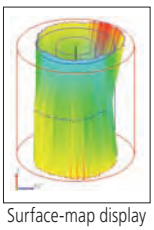
Analysis results such as cylindricity and coaxiality can be visually expressed in 3D graphics.



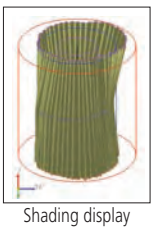
Normal display



Wire-frame display

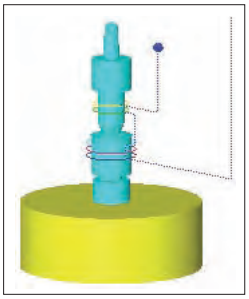


Surface-map display



Shading display

Off-line measurement procedure programming function



Patent registered in Japan, USA
Patent pending in Europe

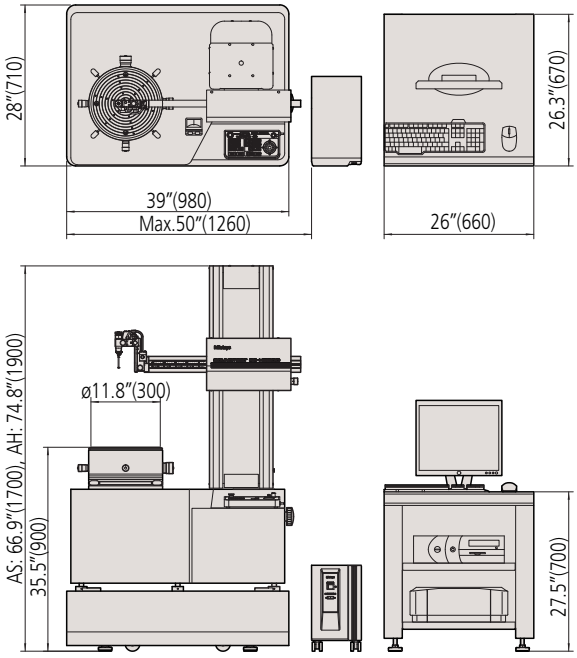
An offline teaching function is provided to create a part program (measurement procedure) without an actual measurement target, enabling the user to virtually execute the measurement operation in a 3D simulation window. You can also display warnings* about the risk of collision in the simulation window.

*This function is for RA-H5200CNC only.

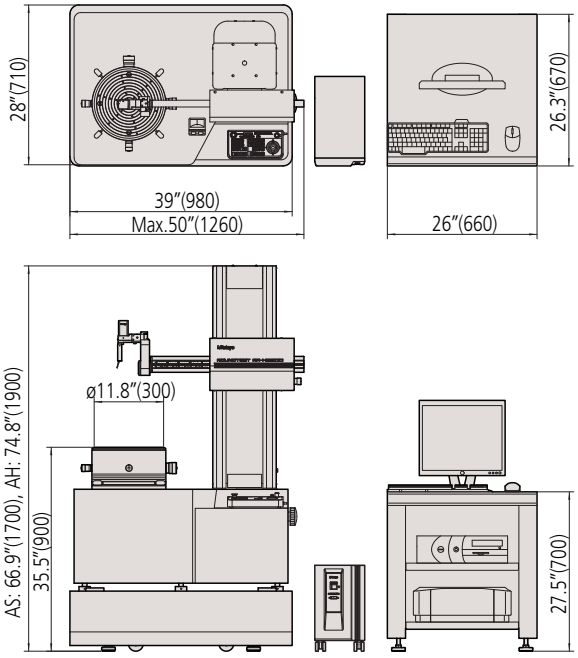
Dimensions

Unit: Inch (mm)

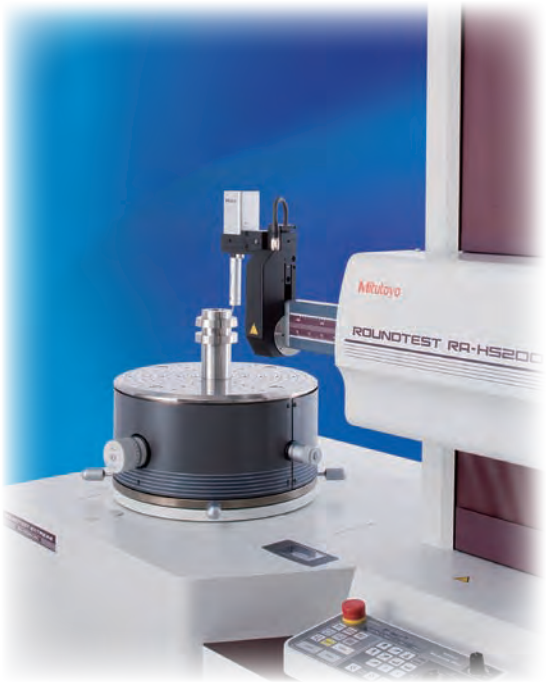
•RA-H5200AS/AH



•RA-H5200CNC



Note: Side table (PC table) is an option.



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