

ROUNDNESS/CYLINDRICITY MEASUREMENT ROUNDTTEST RA-2200 SERIES

OFFERING THE HIGHEST PRECISION LEVEL IN ITS CLASS, EXCEPTIONAL
EASE-OF-USE, AND MULTIFUNCTION ANALYSIS CAPABILITY



ROUNDTTEST RA-2200AS/DS/AH/DH

All models are equipped with a highly accurate turntable that enables simple and accurate centering and leveling of the workpiece, which account for the majority of the essential setup work for measuring roundness/cylindricity.

Wide variety of models available to suit any application

- RA-2200AS/AH models are supplied as standard with an automatic centering and leveling turntable*1, freeing the operator from the centering and leveling task.
- RA-2200DS/DH models are supplied as standard with a navigation function*1 that quickly and simply guides the operator through the centering and leveling task, as though the task were being performed by an expert.
- RA-2200AS/DS models have a column drive height of 11.8" (300mm), and are available with a column drive height of 19.7" (500mm) (RA-2200AH/DH) for handling taller workpieces.
- All models can be combined with the basic, side-table system vibration-damping platform or the monitor-arm system vibration-damping platform*3.



The photo shows RA-2200AS+vibration isolator with monitor arm.*3



The photo shows RA-2200AS+vibration isolator with side table.

Space-saving design

Integrating the system vibration-damping platform has reduced the installation space by approximately 20-40% compared to Mitutoyo's earlier installation platforms. Additionally, a design with increased layout freedom greatly improves the measurement room utilization rate and measurement efficiency.

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: 4.4"(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*2.

Safety mechanism provided as a standard feature



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.

*1: See page 3 for details about the turntable.

*2: See page 3 for details about the continuous ID and OD measuring function.

*3: Isolation Table, Monitor Arm and Printer Table are optional accessories.

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

The table provides high rotational accuracy (radial $0.02+3.5H/10000 \mu\text{m}$; axial $0.02+3.5X/10000 \mu\text{m}$), enabling the system to measure flatness and other characteristics, in addition to roundness/cylindricity, at a level that suits any application.

For centering and leveling support, you can select either the A.A.T. (Automatic Adjustment Table) or D.A.T. (Digimatic Adjustment Table).

A.A.T. (Automatic Adjustment Table)

Incorporating an Automatic Adjustment Table (A.A.T.), the top-of-the-line RA-2200AS/AH models relieve the operator of workpiece centering and leveling.

Centering range: $\pm 3 \text{ mm}$
Leveling range: $\pm 1^\circ$

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

Centering/leveling complete
Preliminary measurement is followed by automatic centering and leveling.

D.A.T. (Digimatic Adjustment Table)

A guidance system (D.A.T.) is incorporated into the turntables Patent registered in Japan & USA (Patent pending in Germany). on the RA-2200DS/DH models to help the operator perform manual centering and leveling smoothly and simply.

Centering range: $\pm 5 \text{ mm}$
Leveling range of inclination: $\pm 1^\circ$

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

Display of misalignments

Simple adjustment
Feed the digital micrometer head of the turntable by the deviation displayed.

Centering/leveling complete

High accuracy even at high positioning speeds

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

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

Highly accurate repeat measurements

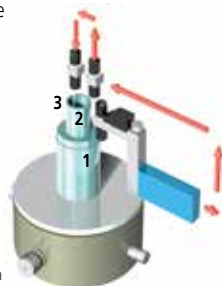
Mitutoyo's linear scales are incorporated into the X-axis positioning sensor, directly sensing the displacement of the drive unit to achieve highly accurate positioning, which is essential for repeat measurements.

Continuous OD/ID measurement function

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

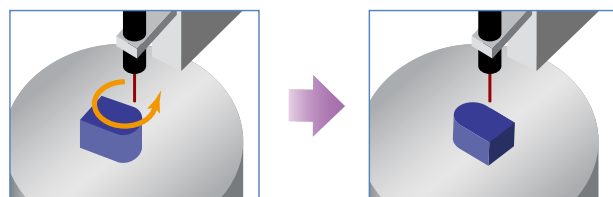
Continuous internal/external diameter measurement is possible without changing the detector position.

- 1), 2) : External diameter measurement
- 3) : Internal diameter measurement
- : Displacement
- 3) = inner diameter. Up to $\phi 50 \text{ mm}$



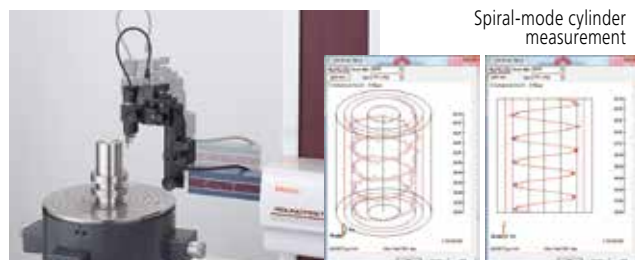
Partial circle measurement function

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.



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.



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.



Specifications

•RA-2200AS/DS/AH/DH

Model No.		RA-2200AS	RA-2200DS	RA-2200AH	RA-2200DH
Order No.		211-511A	211-514A	211-512A	211-516A
Turntable unit	Rotational accuracy	(0.02+3.5H/10000) μm H: probing height (mm) (0.02+3.5X/10000) μm X: distance from rotational center (mm)			
	Radial direction				
	Axial direction				
	Rotating speed	2, 4, 6, 10 rpm			
	Table effective diameter	ø 9.25" (235 mm)	ø 7.9" (200 mm)	ø 9.25" (235 mm)	ø 7.9" (200 mm)
	Centering/leveling adjustment	A.A.T	D.A.T	A.A.T	D.A.T
	Centering adjustment range	±0.12" (3 mm)	±0.2" (5 mm)	±0.12" (3 mm)	±0.2" (5 mm)
	Leveling adjustment range	±1°			
Vertical drive unit (Z-axis)	Max. loading weight	66lbs (30 kg)			
	Max. probing diameter	ø 11.8" (300 mm)			
	Max. loading diameter	ø 22.8" (580 mm)			
	Straightness accuracy	0.10 μm/100 mm (λc2.5)	0.15 μm/300 mm (λc2.5)	0.10 μm/100 mm (λc2.5)	0.25 μm/500 mm (λc2.5)
Radial drive unit (X-axis)	Parallelism to rotation center	0.7 μm/300 mm (Referential generatrix line)			
	Traverse speed	Max. 50 mm/s (Measurement: 0.5/1.0/2.0/5.0 mm/s)			
	Max. probing height	11.8" (300 mm)		19.7" (500 mm)	
	ID	11.8" (300 mm)		19.7" (500 mm)	
Detector	Max. probing depth	1.97" (50 mm) for ø.28" (7 mm) or more (with standard stylus) 3.35" (85 mm) for ø1.26" (32 mm) or more (with standard stylus)			
	Straightness accuracy	0.7 μm/150 mm (λc2.5)			
	Horizontal to rotation center	1.0 μm/150 mm (Referential generatrix line)			
	Travel amount	6.9" (175 mm) (from rotation center -25 mm~+150 mm)			
Other	Travel speed	Max. 30 mm/s (measurement: 0.5/1.0/2.0/5.0 mm/s)			
	Measuring force	10-50 mN (switching 5 levels) (ID/OD measurement style with standard stylus)			
	Stylus design, material	ø 1.6 mm tungsten carbide ball			
	Measuring range	Standard	±400 μm/±40 μm/±4 μm		
Other	Follow	±0.2" (5 mm)			
	Other	2 direction one-touch switching type, Stylus angle scale markings (±45°), Collision detection function for Z-axis direction, Sliding detector holder (3 position)			
	Power supply	100V-240V			
	Air pressure	0.39 MPa			
Other	Air consumption	30 L/min (standard state)			
	Weight (measurement main unit)	397 lbs (180 kg)		441 lbs (200 kg)	

•Styli for RA-2200AS/DS/AH/DH (Option)

Type	Standard (Standard accessory)	Notch	Deep groove	Corner	Cutter mark
Order No.	12AAL021	12AAL022	12AAL023	12AAL024	12AAL025
Stylus tip	ø 1.6 mm tungsten carbide	ø 3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide
Dimensions (mm)					
Type	Small hole (ø 0.8)	Small hole (ø 1.0)	Small hole (ø 1.6)	Extra small hole (Depth 3 mm)	ø 1.6 mm ball
Order No.	12AAL026	12AAL027	12AAL028	12AAL029	12AAL030
Stylus tip	ø 0.8 mm tungsten carbide	ø 1 mm tungsten carbide	ø 1.6 mm tungsten carbide	ø 0.5 mm tungsten carbide	ø 1.6 mm tungsten carbide
Dimensions (mm)					
Type	Disk	Crank (ø 0.5)	Crank (ø 1.0)	Flat surface	2X-long type*1
Order No.	12AAL031	12AAL032	12AAL033	12AAL034	12AAL035
Stylus tip	ø 1.2 mm tungsten carbide	ø 0.5 mm tungsten carbide (Depth 2.5 mm)	ø 1 mm tungsten carbide (Depth 5.5 mm)	tungsten carbide	ø 1.6 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 cutter mark*1	2X-long type Small hole*1
Order No.	12AAL036	12AAL037	12AAL038	12AAL039	12AAL040
Stylus tip	ø 3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide	ø 1 mm tungsten carbide
Dimensions (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	ø 1.6 mm tungsten carbide	SR0.25 mm sapphire	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)
Dimensions (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.

ROUNDTTEST EXTREME RA-2200CNC

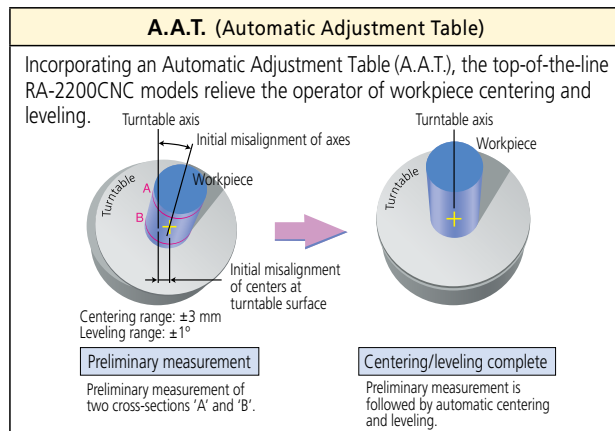
Detector unit orientation programmable for CNC measurement

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 290 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.



Simple and accurate centering and leveling of the workpiece

The system comes standard with the A.A.T. (Automatic Adjustment Table) positioning and leveling function, freeing the operator from the task of centering and leveling the workpiece.



Highly accurate turntable

The table provides high rotational accuracy (radial $0.02+3.5H/10000 \mu\text{m}$; axial $0.02+3.5X/10000 \mu\text{m}$), enabling the system to measure flatness and other characteristics, in addition to roundness/cylindricity, at a level that suits any application.

Space-saving design

Integrating the system vibration-damping platform has significantly reduced the installation space requirements. Additionally, any layout can be achieved by combining the system with a PC table.

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 highly accurate positioning, which is essential for repeat measurements. Furthermore, continual development has resulted in the highest drive speed within the class while achieving high accuracy even at high positioning speeds.

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 θ -axis, as well as roughness in the direct-drive directions along the X- and Z-axes with the table stopped.



The photo shows RA-2200CNC+vibration isolator with side table.

Specifications

•RA-2200CNC

Model No.		RA-2200S CNC		RA-2200H CNC		
Order No.		211-517A		211-518A		
Z-axis		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				
	Table effective diameter	ø 9.25" (235 mm)				
	Centering/leveling adjustment	A.A.T				
	Centering adjustment range	±0.12" (3 mm)				
	Leveling adjustment range	±1°				
	Max. loading weight	66lbs (30 kg)				
	Max. probing diameter	ø 10.1" (256 mm)				
	Max. loading diameter	ø 22.8" (580 mm)				
Vertical drive unit (Z-axis)	Straightness accuracy		0.10 μm/100 mm(2.5) 0.15 μm/300 mm(2.5)		0.10 μm/100 mm(2.5) 0.25 μm/500 mm(2.5)	
	Parallelism to rotation center		0.7 μm/300 mm (Referential generatrix line)		1.2 μm/500 mm (Referential generatrix line)	
	Traverse speed		Max. 50 mm/s (Measurement 0.5/1.0/2.0/5.0 mm/s)			
	Max. probing height	OD	11.8" (300 mm)		19.7" (500 mm)	
		ID	11.8" (300 mm)		19.7" (500 mm)	
Max. probing depth		1.02" (26 mm) for ø0.5" (12.7 mm) or more, 4.1" (104 mm) for ø1.26" (32 mm) or more (with standard stylus)				
Radial drive unit (X-axis)	Straightness accuracy		0.7 μm/150 mm(2.5)			
	Horizontal to rotation center		1.0 μm/150 mm (Referential generatrix line)			
	Travel amount		6.9" (175 mm) (from rotation center -25 mm~+150 mm)			
	Travel speed		Max. 30 mm/s (measurement: 0.5/1.0/2.0/5.0 mm/s)			
Detector	Measuring force		40 mN			
	Stylus design, material		ø 1.6 mm tungsten carbide			
	Measuring range	Standard	±400 μm / ±40 μm / ±4 μm			
		Follow	±5 mm			
Other		Rotating mechanism (within the range 0° to 290°, in increments of 1°)				
Other	Power supply		100V 240V			
	Air pressure		0.39 MPa			
	Air consumption		30L/min (standard state)			
	Weight (measurement main unit)		397lbs (180 kg)		441lbs (200 kg)	

•Styli for RA-2200CNC (Option)

Type	Deep groove	Flat surface	Standard	Notch	Deep hole A
Order No.	12AAE310	12AAE302	12AAE301	12AAE309	12AAE306
Stylus tip	ø 1.6mm tungsten carbide	ø 1.6mm tungsten carbide	ø 1.6mm tungsten carbide	ø 3mm tungsten carbide	ø 1.6mm tungsten carbide
Dimensions (mm)					
Type	ø 1.6 mm ball	ø 0.8 mm ball	ø 0.5 mm ball	Deep groove	Deep hole B
Order No.	12AAE303	12AAE304	12AAE305	12AAE308	12AAE307
Stylus tip	ø 1.6mm tungsten carbide	ø 0.8mm tungsten carbide	ø 0.5mm tungsten carbide	ø 1.6mm tungsten carbide	ø 1.6mm tungsten carbide
Dimensions (mm)					

•Options common to the RA-2200AS/DS/AH/DH, 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 = ø2 - ø35mm,
ID = ø25 - ø68mm
External jaws: OD = ø35 - ø78mm
- External dimensions: ø157 x 70.6mm
- Mass: 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 = ø1 - ø36mm,
ID = ø16 - ø69mm
External jaws: OD = ø25 - ø79mm
- External dimensions: ø118 x 41mm
- Mass: 1.2kg

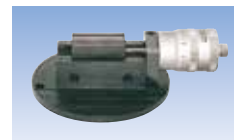


•Micro-chuck

211-031

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

- Holding capacity: ø0.1-ø1.5mm
- External dimensions: ø118x48.5mm
- Mass: 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: 400 μm
- Graduation: 0.2 μm
- External dimensions: 235 (max) x 185 x 70mm
- Mass: 4kg

•Cylindrical square

350850

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

•Vibration isolator

12AAK110

•Monitor arm

12AAK120

•Side table

12AAL019

•Surface Roughness Detector Holder for non-CNC

12AAF353

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

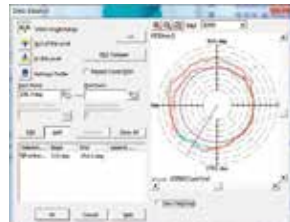
A wide variety of parameters including those for roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. You can visually select these parameters using icons.



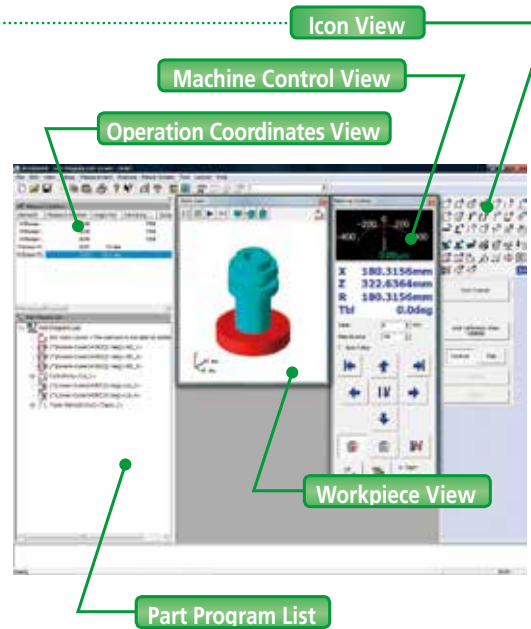
ROUNDPAK also comes with specialized functions, such as the design value best-fit analysis function, the harmonic analysis function, and a function for recording the peak or trough points on a circumference. Data that has already been collected can be easily used for re-calculation, or deleted.



Recalculation

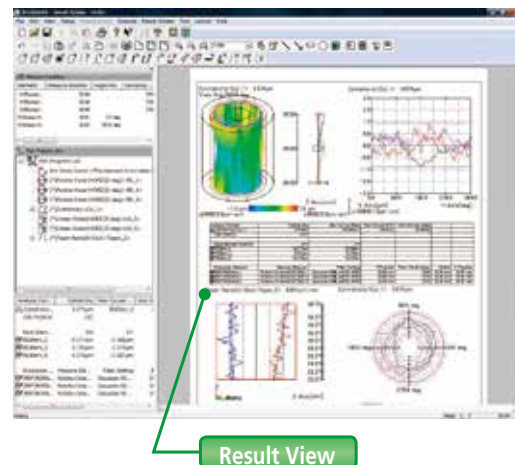
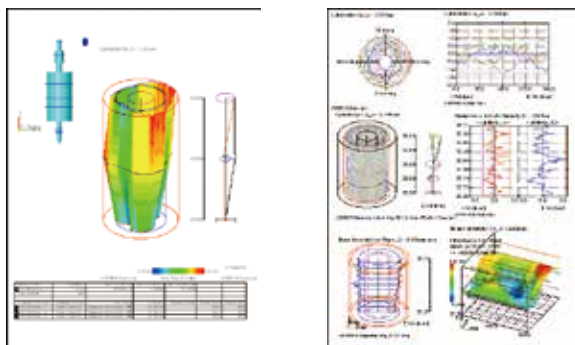


Data deletion



Freedom in laying out the graphics and data obtained from measurements

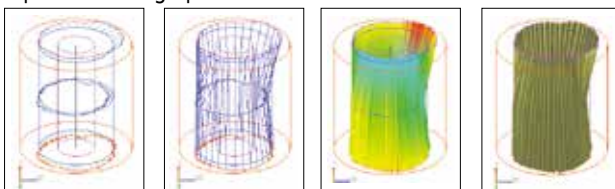
The customer can create reports in custom formats by specifying how the analysis results will be displayed, as well as the sizes and positions of graphics. The analysis result window can be directly utilized as a layout window. Since the measurement procedure, including the layout information, is saved, the entire process, from measurement start, calculation, result saving, and finally to printing, can be automatically executed.



Result View

A wide variety of graphics functions

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



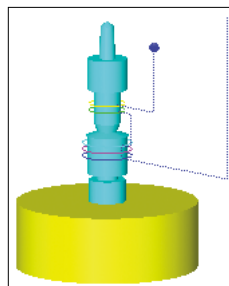
Normal display

Wire-frame display

Surface-map display

Shading display

Off-line measurement procedure programming function

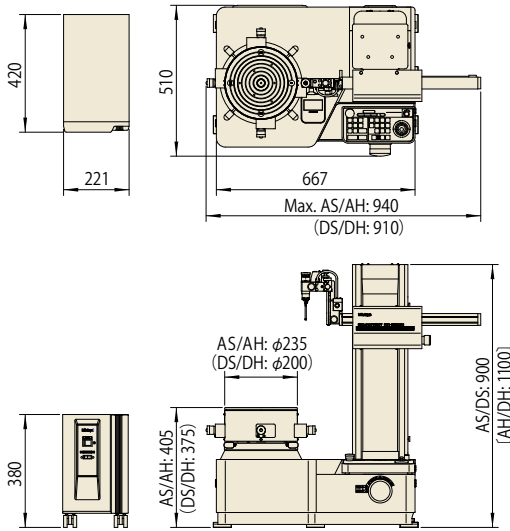


Patent registered in Japan, USA
Patent pending in Europe

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 on the simulation window.

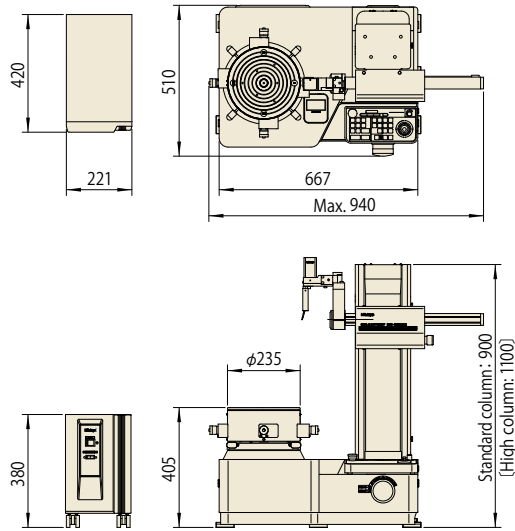
*This function is for RA-2200CNC only.

RA-2200AS/DS/AH/DH



RA-2200S/H CNC

Unit: mm



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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



**Whatever your challenges are,
Mitutoyo supports you from start to finish.**

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Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.



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