



Mitutoyo

Mitutoyo Quality

Roundness / Cylindricity Measurement ROUNDTTEST RA-2200 Series

FORM MEASUREMENT



ROUNDTEST RA-2200



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



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

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.

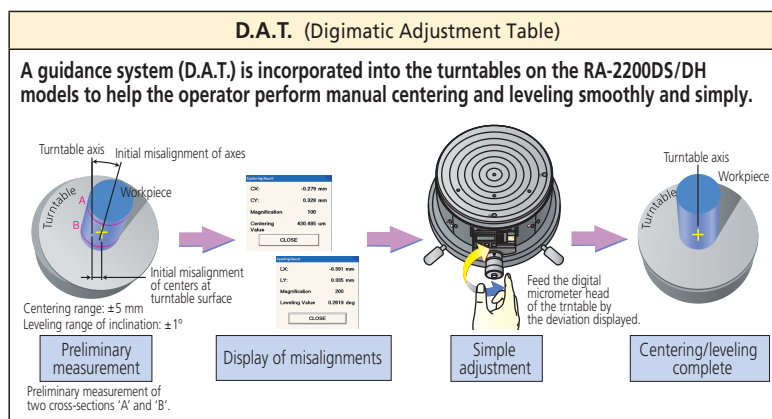
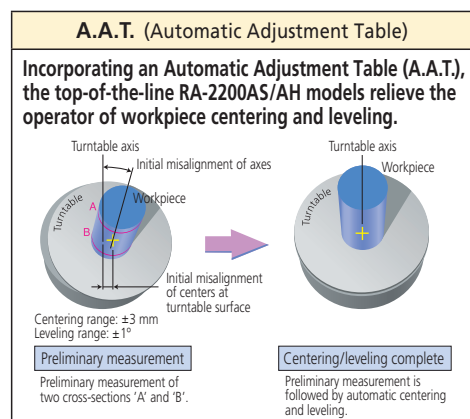
RA-2200AS/AH models are supplied as standard with an automatic centering and leveling turntable, freeing the operator from the centering and leveling task.

RA-2200DS/DH models are supplied as standard with a navigation function that quickly and simply guides the operator through the centering and leveling task, as though the task were being performed by an expert.

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).



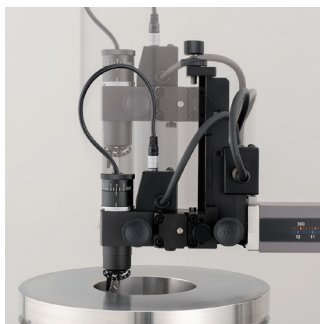
Centering and leveling using an A.A.T. or D.A.T.* can be integrated in the measurement procedure (part program). This can prevent mistakes such as forgetting to center and level during measurement and is intended to standardize measuring work through part-program measurement.

*Models equipped with a D.A.T. require manual adjustment of centering and leveling misalignments.



Sliding detector-unit holder provided as a standard feature

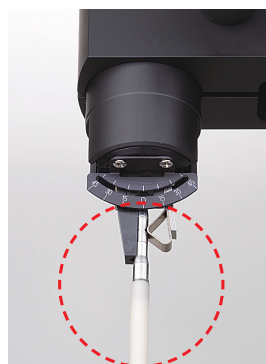
The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm.



Sliding distance: 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.

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.

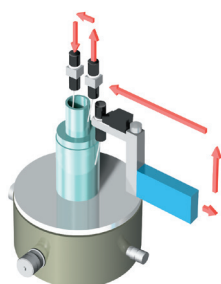
High accuracy even at high positioning speeds

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

Continuous OD/ID measurement function

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

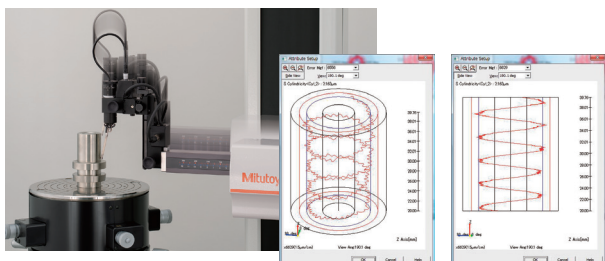


Highly accurate repeat measurements

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.

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.



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.

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.



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.



Retrofit kits can be used with models equipped with motorized detector-unit holders

Retrofit kits are available for the RA-2200AS and RA-2200AH to add the automatic measurement functionality found in their PLUS counterparts.

*See page 4 for details.

ROUNDTEST RA-2200 PLUS



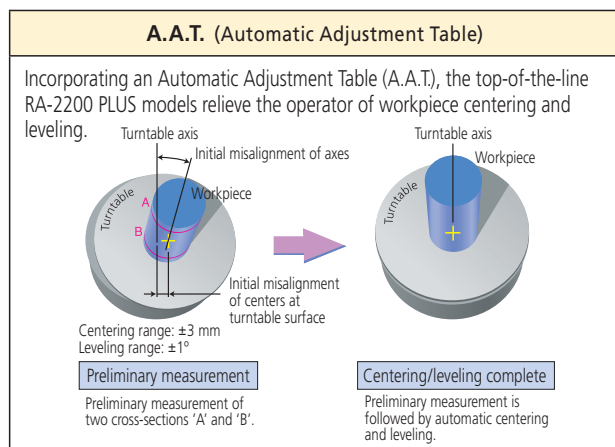
The photo shows
RA-2200 PLUS+ vibration isolator with monitor arm. *
* Printer table is a special Accessory.



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

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.



High accuracy even at high positioning speeds

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

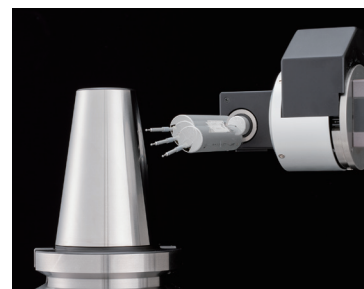
- Vertical direction (Z-axis column): Max. 50 mm/s
- Radial direction: Max. 30 mm/s

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.

Detector unit orientation programmable for CNC measurement

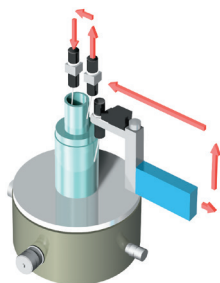
This function controls the orientation of the arm holding the detector unit (between vertical and horizontal) and the detector unit rotation mechanism (between 0 and 270 degrees in 1-degree increments), making it possible to continuously and automatically measure internal/external diameters as well as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





Continuous OD/ID measurement function

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



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.

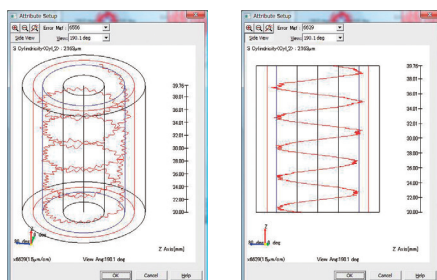
Roughness detector unit support

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.



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.



Highly accurate turntable

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

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.

Detector unit II (option)

This highly adjustable detector unit is for installation on motorized detector-unit holders.

Features of this detector unit include the ability to use alternative styli for the RA-2200* and freely change the angle of the stylus.

*See page 7 for alternative styli.



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.



Roundness/Cylindricity measurement/Analysis software

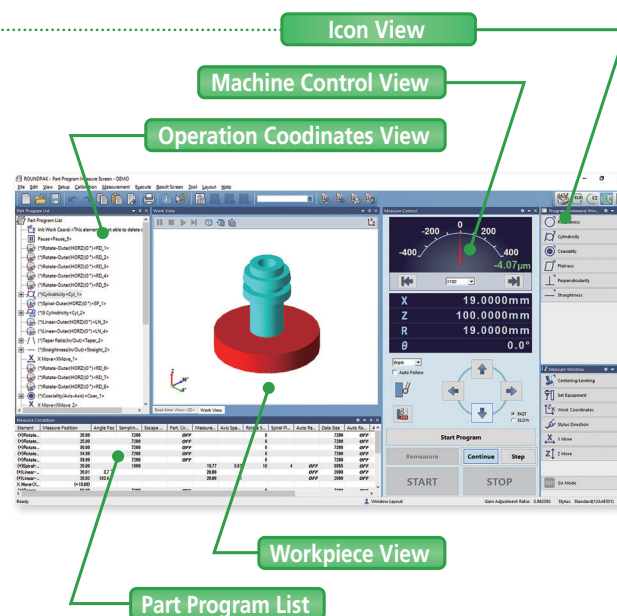
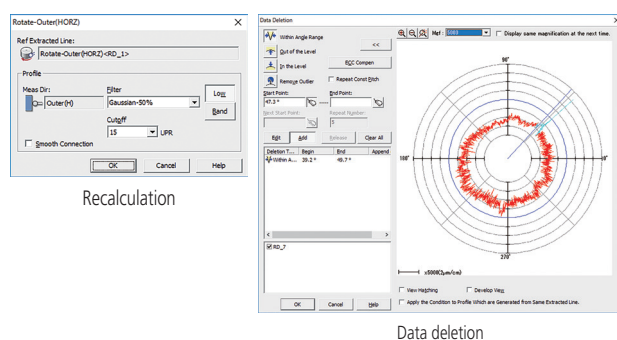
ROUNDPAK

ROUNDPAK provides simple manipulation using a mouse and icons

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

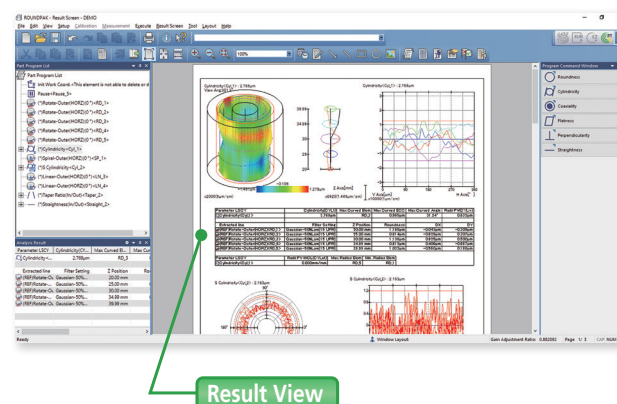
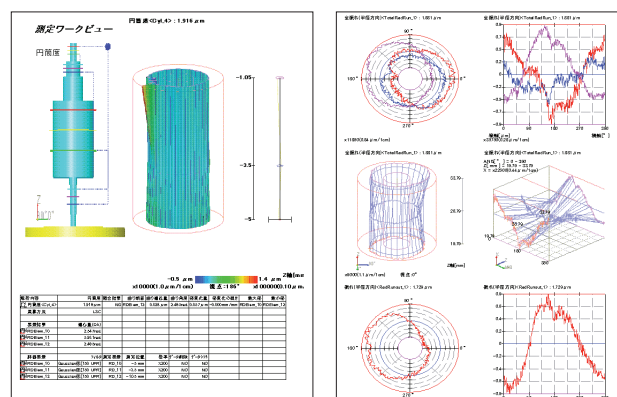
A wide variety of parameters including those for roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. You can visually select these parameters using icons.

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 recalculation, or deleted.



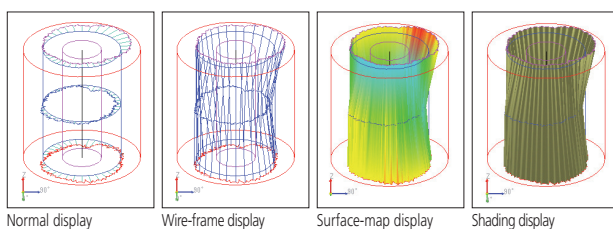
Freedom in laying out the graphics and data obtained from measurements

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.

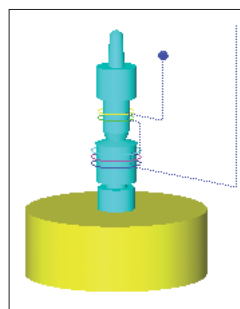


A wide variety of graphics functions

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



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-2200 PLUS** only.

StatusMonitor

Remote machine monitoring

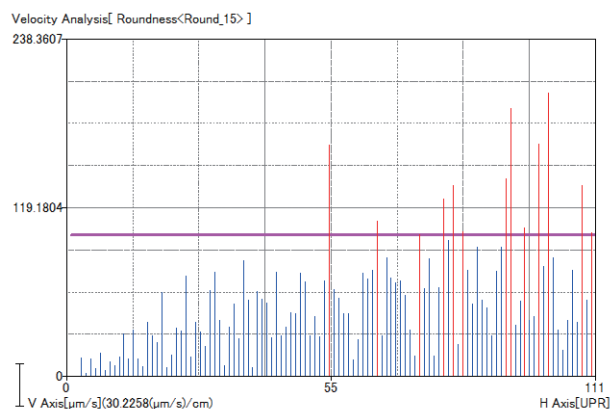
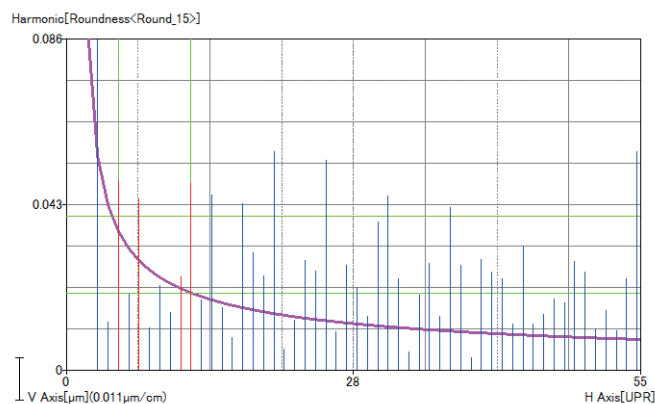


MitutoyoLauncher support

Quick Launcher is provided as a standard feature. This enables simple and intuitive operation, so part programs can be run easily. Part programs can also be run by scanning barcodes or QR codes.

Harmonic tolerance verification / Velocity analysis

Analysis of bearing sliding surfaces is provided as a standard feature.



Optional Accessories

■ Styli for RA-2200 (Option)

Type	Standard (Standard accessory)	Notch	Deep groove	Corner	Cutter mark
Order No.	12AAL021	12AAL022	12AAL023	12AAL024	12AAL025
Stylus tip	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide
Dimensions (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	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	Disk	Crank (ø0.5)	Crank (ø1.0)	Flat surface	2X-long type *1
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 cutter mark *1	2X-long type Small hole *1
Order No.	12AAL036	12AAL037	12AAL038	12AAL039	12AAL040
Stylus tip	ø3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide	ø1 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	ø1.6 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.

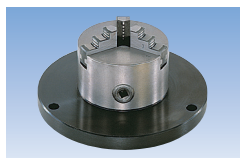


Styli for RA-2200 PLUS

Type	Groove	Flat surface	Standard	Notch	Deep hole A
Order No.	12AAE310	12AAE302	12AAE301	12AAE309	12AAE306
Stylus tip	ø 1.6 mm tungsten carbide	ø 1.6 mm tungsten carbide	ø 1.6 mm tungsten carbide	ø 3 mm tungsten carbide	ø 1.6 mm 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 1.6 mm tungsten carbide	ø 0.8 mm tungsten carbide	ø 0.5 mm tungsten carbide	ø 1.6 mm tungsten carbide	ø 1.6 mm tungsten carbide
Dimensions (mm)					

Options common to the RA-2200 and RA-2200 PLUS



Centering chuck (key operated)

211-014

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

- Holding capacity:
Internal jaws: OD = ø2 - ø35 mm,
ID = ø25 - ø68 mm
External jaws: OD = ø35 - ø78 mm
- External dimensions (DxH):
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 = ø1 - ø36 mm,
ID = ø16 - ø69 mm
External jaws: OD = ø25 - ø79 mm
- External dimensions (DxH):
ø118 x 41 mm
- Mass: 1.2 kg

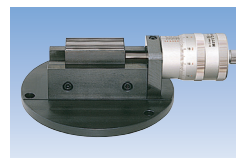


Micro-chuck

211-031

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

- Holding capacity: ø0.2 - ø1.5 mm
- External dimensions (DxH):
ø107 x 48.5 mm
- Mass: 0.6 kg



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 (WxDxH):
235 (max) x 185 x 70 mm
- Mass: 4 kg

Cylindrical square 350850

- Straightness: 1 µm
- Cylindricity: 2 µm
- External dimensions (DxH):
ø70 x 250 mm
- Mass: 7.5 kg

Specifications

RA-2200

Model No.			RA-2200AS	RA-2200DS	RA-2200AH	RA-2200DH
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 the center of rotation (mm)			
	Rotating speed		2, 4, 6, 10 rpm			
	Table effective size		ø235 mm	ø200 mm	ø235 mm	ø200 mm
	Centering/leveling adjustment		A.A.T	D.A.T	A.A.T	D.A.T
	Centering adjustment range		±3 mm	±5 mm	±3 mm	±5 mm
	Leveling adjustment range		±1 °			
	Max. loading mass		30 kg			
	Max. probing diameter		300 mm			
Max. loading diameter		580 mm				
Vertical drive unit (Z-axis)	Straightness accuracy		0.10 μm/100 mm (λ c2.5) 0.15 μm/300 mm (λ c2.5)		0.10 μm/100 mm (λ c2.5) 0.25 μm/500 mm (λ c2.5)	
	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 (during measurement: 0.5/1/2/5 mm/s)			
	Max. probing height	OD	300 mm		500 mm	
		ID	300 mm		500 mm	
Max. probing depth (with standard stylus)		85 mm for ø32 mm or more, 50 mm for ø7 mm				
Radial drive unit (X-axis)	Straightness accuracy		0.7 μm/150 mm (λ c2.5)			
	Horizontal to rotation center		1.0 μm/150 mm (Referential generatrix line)			
	Traverse range		175 mm (-25 mm to +150 mm from the rotation center)			
	Traverse speed		Max. 30 mm/s (during measurement: 0.5/1/2/5 mm/s)			
Detector	Measuring force		10 ~ 50 mN (switching 5-step)			
	Stylus design, material		ø1.6 mm tungsten carbide ball			
	Measuring range	Standard	±400 μm/±40 μm/±4 μm			
		Follow	±5 mm			
	Other		In/out switching feature, Measuring force switching feature (5-step), Stylus angle scale markings (±45 °), Collision detection function for Z-axis direction, Sliding detector holder (plus 3 rotational positions)			
Other	Power supply		100V ~ 240 V			
	Air pressure		0.39 MPa			
	Air consumption		30 L/min in standard state (80 L/min or more as air source)			
	Mass (main unit)		180 kg		200 kg	

RA-2200 PLUS

Model No.			RA-2200 PLUS			
Z-axis			Standard column (Vertical travel: 300 mm)		High column (Vertical travel: 500 mm)	
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 the center of rotation (mm)			
	Rotating speed		2, 4, 6, 10 rpm			
	Table effective size		ø235 mm			
	Centering/leveling adjustment		A.A.T			
	Centering adjustment range		±3 mm			
	Leveling adjustment range		±1 °			
	Max. loading mass		30 kg			
	Max. probing diameter		256 mm (OD), 344 mm (ID)			
Max. loading diameter		580 mm				
Vertical drive unit (Z-axis)	Straightness accuracy		0.10 μm/100 mm (λ c2.5) 0.15 μm/300 mm (λ c2.5)		0.10 μm/100 mm (λ c2.5) 0.25 μm/500 mm (λ c2.5)	
	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 (during measurement: 0.5/1/2/5 mm/s)			
	Max. probing height	OD	300 mm		500 mm	
		ID	300 mm		500 mm	
Max. probing depth (with standard stylus)		26 mm for ø12.7 mm or more, 104 mm for ø32 mm				
Radial drive unit (X-axis)	Straightness accuracy		0.7 μm/150 mm (λ c2.5)			
	Horizontal to rotation center		1.0 μm/150 mm (Referential generatrix line)			
	Traverse range		175 mm (-25 mm to +150 mm from the rotation center)			
	Traverse speed		Max. 30 mm/s (during measurement: 0.5/1/2/5 mm/s)			
Detector	Measuring force		40 mN			
	Stylus design, material		ø1.6 mm tungsten carbide			
	Measuring range	Standard	±400 μm/±40 μm/±4 μm/			
		Follow	±5 mm			
	Other		Accidental touch function Measuring direction : one direction			
Other	Power supply		100 V ~ 240 V			
	Air pressure		0.39 MPa			
	Air consumption		30 L/min in standard state (80 L/min or more as air source)			
	Mass (main unit)		180 kg		200 kg	

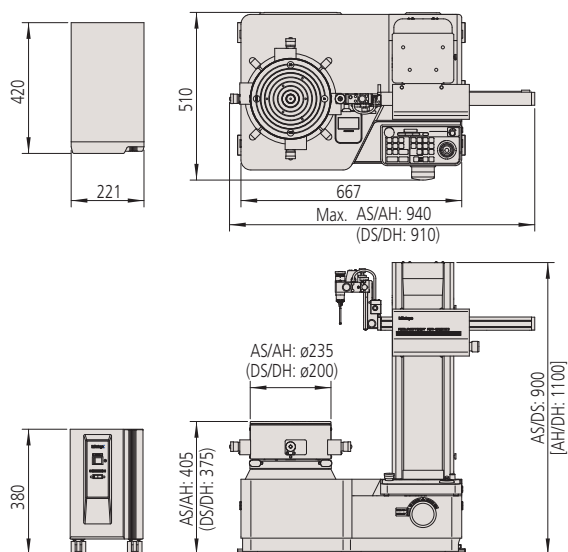


Dimensions

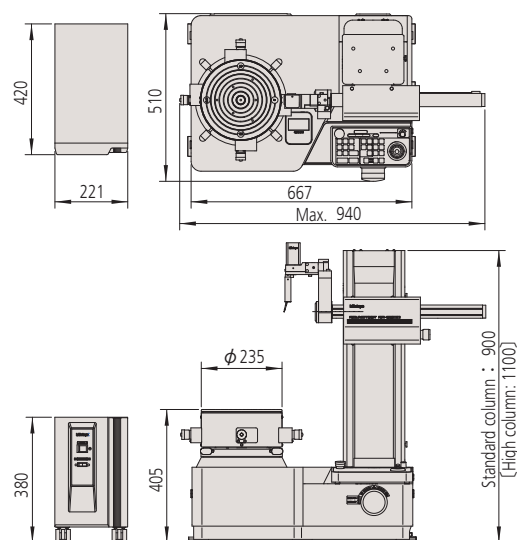
■ Dimensions

Unit: mm

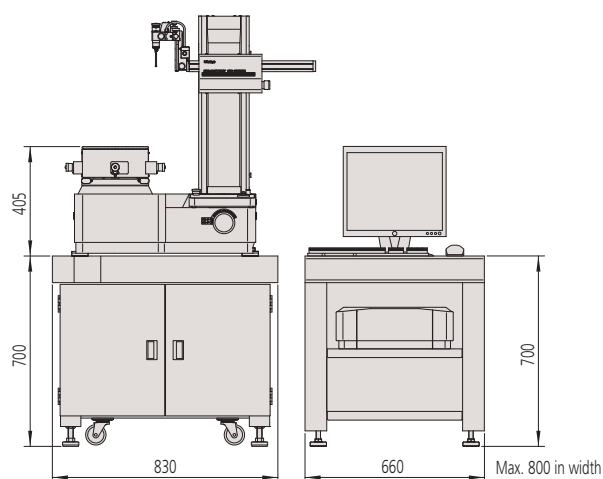
RA-2200



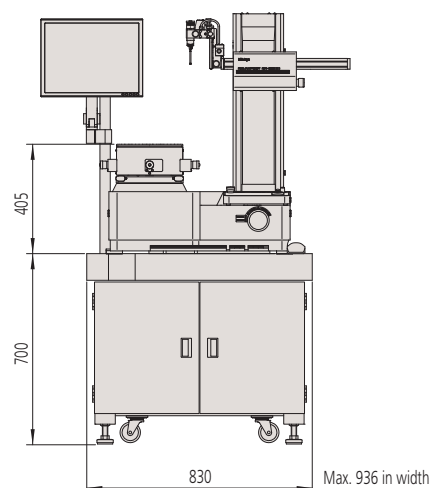
RA-2200 PLUS



with vibration isolator and side table



with monitor arm*



* Printer table is a special accessory.





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

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

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

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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Mitutoyo Asia Pacific Pte. Ltd.

Company Reg No. 197800892N

24 Kallang Avenue, Mitutoyo Building, Singapore 339415

Tel: (65) 6294 2211 Fax: (65) 6299 6666

E-mail: mapsg@mitutoyo.com.sg



www.mitutoyo.com.sg | www.mitutoyo.com.my
www.mitutoyo.co.th | www.mitutoyo.co.id
www.mitutoyo.com.vn | www.mitutoyo.com.ph

Mitutoyo (Malaysia) Sdn. Bhd.

Mah Sing Integrated Industrial Park,
4, Jalan Utarid U5/14, Section U5,
40150 Shah Alam, Selangor, Malaysia

Tel: (60) 3-7845 9318

Fax: (60) 3-7845 9346

E-mail: mmsb@mitutoyo.com.my

Penang Branch

Tel: (60) 4-641 1998

Fax: (60) 4-641 2998

Johor Branch

Tel: (60) 7-352 1626

Fax: (60) 7-352 1628

Mitutoyo (Thailand) Co., Ltd.

76/3-5, Chaengwattana Road, Kwaeng
Anusaawaree, Khet Bangkaen,
Bangkok 10220, Thailand

Tel: (66) 2080 3500

E-mail: office@mitutoyo.co.th

Chonburi Branch

Tel: (66) 2080 3563

ACC Branch

Tel: (66) 2080 3565

PT. Mitutoyo Indonesia

Jalan Sriwijaya No.26
Desa cibatu
Kec. Cikarang Selatan
Kab. Bekasi 17530, Indonesia

Tel: (62) 21-2962 8600

Fax: (62) 21-2962 8604

E-mail: ptmi@mitutoyo.co.id

Batam Branch

Tel: (62) 778-4888 000

Email: ptmi-batam@mitutoyo.co.id

Mitutoyo Vietnam Co., Ltd.

1st & 2nd Floor, MHDI Building,
No. 60 Hoang Quoc Viet Road,
Nghia Do Ward, Cau Giay District,
Hanoi, Vietnam

Tel: (84) 24-3768 8963

Fax: (84) 24-3768 8960

E-mail: mvc@mitutoyo.com.vn

Ho Chi Minh City Branch

Tel: (84) 28-3840 3489

Hai Phong Branch

Tel: (84) 22-5398 9909

Mitutoyo Philippines, Inc.

Unit 1B & 2B LTI,
Administration Building 1,
Annex 1, North Main Avenue,
Laguna Technopark, Biñan,
Laguna 4024, Philippines

Tel: (63) 49-544 0272

E-mail: mpi@mitutoyo.com.ph

MAP•1281(5)

