



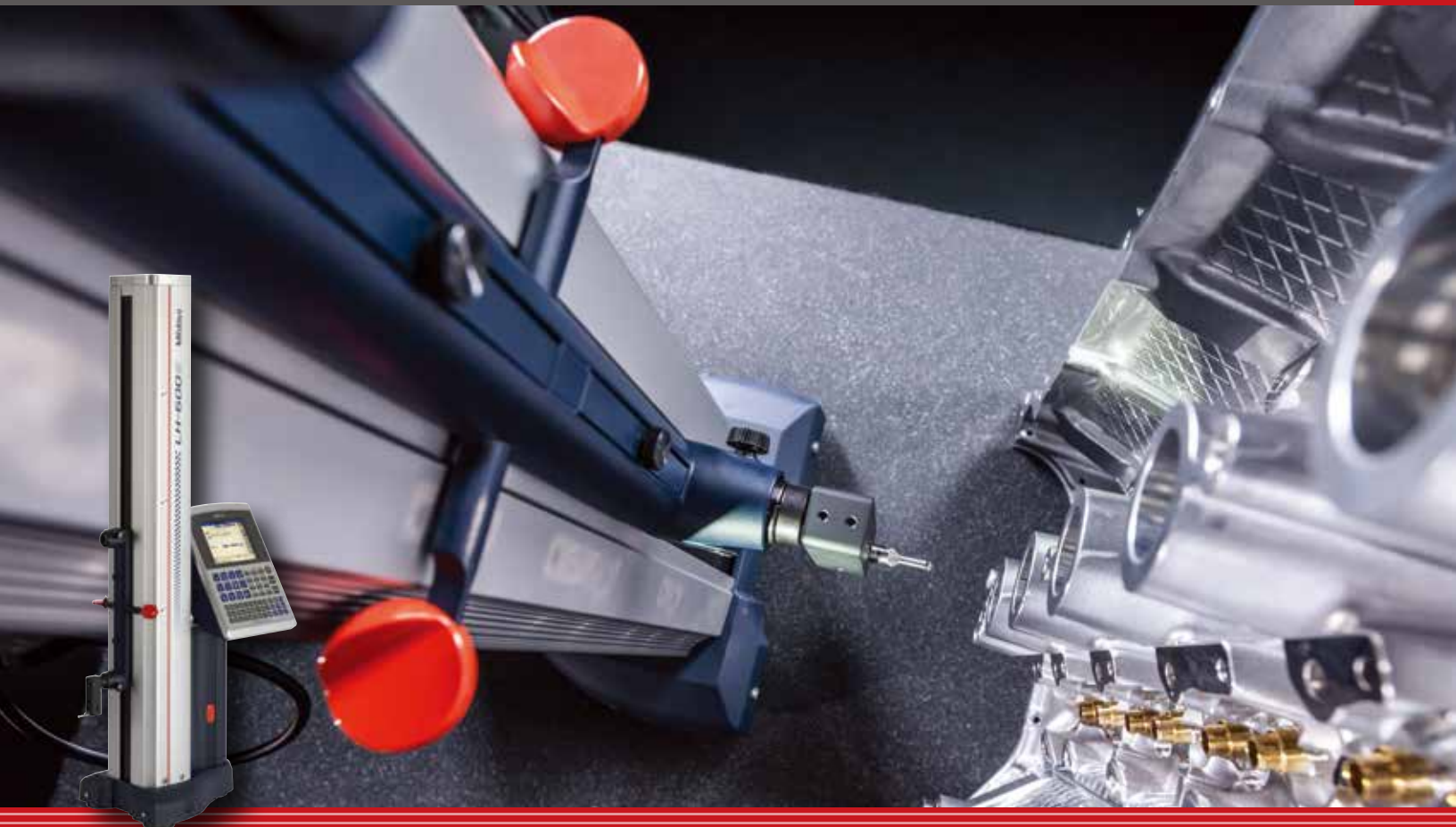
World's best-in-class accuracy 2D measurement system
A sophisticated height gage offering exceptional accuracy of $(1.1+0.6L/600)\mu\text{m}^*$
(* L = measured height in mm)



LH600E LINEAR HEIGHT

High Performance 2D Measurement System

SMALL TOOL INSTRUMENTS
AND DATA MANAGEMENT



World Leading Accuracy High Performance 2D Height Series LH-600E/EG

feature

1

World-Class Accuracy

- **Achieved accuracy: $(1.1 + 0.6L/600) \mu\text{m}$**

Best-in-class accuracy is achieved by using a high-accuracy scale unit and high-accuracy guiding mechanism manufactured in our dedicated scale plant.

Displacement accuracy when measuring a height of 600mm: $1.7 \mu\text{m}$

feature

2

Superior Ease of Operation

- **Easy operation with a single touch of a key**

Each frequently used measurement type is initiated by one dedicated icon type command key.

Even a novice can immediately start measurement without instruction.

- **Color TFT LCD**

This improves legibility and operability.

- **Unlimited USB memory**

Compatible models support more than 2 GB of USB memory.

- **High-accuracy air suspension assists measuring**

The Linear Height can move without friction over a surface plate using an air bearing incorporated in the base powered by the small built-in compressor.

A semi-floating mode is also provided that allows measurement with the gage barely floating with no influence on the measuring accuracy.

This mode is effective in operations such as scanning measurements of a hole or shaft on a large workpiece and displacement measurements performed while moving the gage.

Additionally, the power grip model (518-352A-21 LH600EG) improves handling operability.

feature

3

Numerous Functions and Options

- **Powerful measurement/calculation functions**

(See page 4 for details.)

Numerous types of measurement such as displacement/straightness/squareness are possible in addition to basic measurement functions including height and circle measurement.

This gage is also equipped with the 2D measurement function, tolerance judgment function, and others.

- **Standardization of measuring procedures**

Teaching the gage a series of measuring operations for a workpiece is possible (Repeat function). This function is very effective when measuring large batches of workpieces. Upon execution of the Repeat function, the probe automatically moves to the next measurement position (height). If an operation procedure manual is available, measurement can be standardized.

- **Supporting quality control with statistical processing functions**

GO/NG judgment is performed in real time on measured data. Up to 60,000 pieces of data can be stored in the database which can be used to perform various statistical calculations such as average, standard deviation and process capability. Quality control is also supported by graphic display of histograms.

- **Highly capable data processing unit**

The high-performance CPU supports future software upgrading.

Measurement results are output in CSV format, thus allowing users to reuse those results with their own software.

- **Versatile external interfaces**

A printer interface is provided which is installed in the main unit to connect a thermal printer or letter-size printer.

The USB interface allows a USB memory to back up and restore part programs and measured data that are stored.

Moreover, the RS-232C interface can output measurement results to an external device such as a PLC.

- **Numerous optional probes**

This gage is provided with various types of probes and interchangeable styli flexibly compatible with complicated workpiece profiles and various measurement features.

Mitutoyo's lineup of options offers various interchangeable styli for $\phi 5$ ball probes, depth probes, dial indicator holders, etc.

The optional probes extend their flexibility with an M2/M3 threaded shank that allows various CMM styli to be attached.

Measurement System



Reflective-type linear encoder & guide achieve world-class accuracy

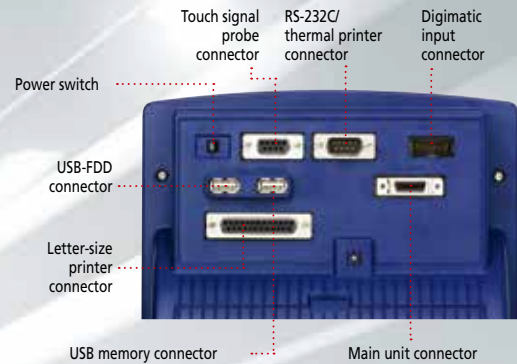
Numerous accessories compatible with many types of workpiece and measurement features provided in addition to standard ø5mm ball probes

High-accuracy air bearing can be operated in semi-floating mode while making highly accurate measurements and fully floating mode for frictionless travel over a surface plate

Diverse Interfaces

- Printer
- USB
- RS-232C
- Digimatic input

[Rear Panel (Connectors)]



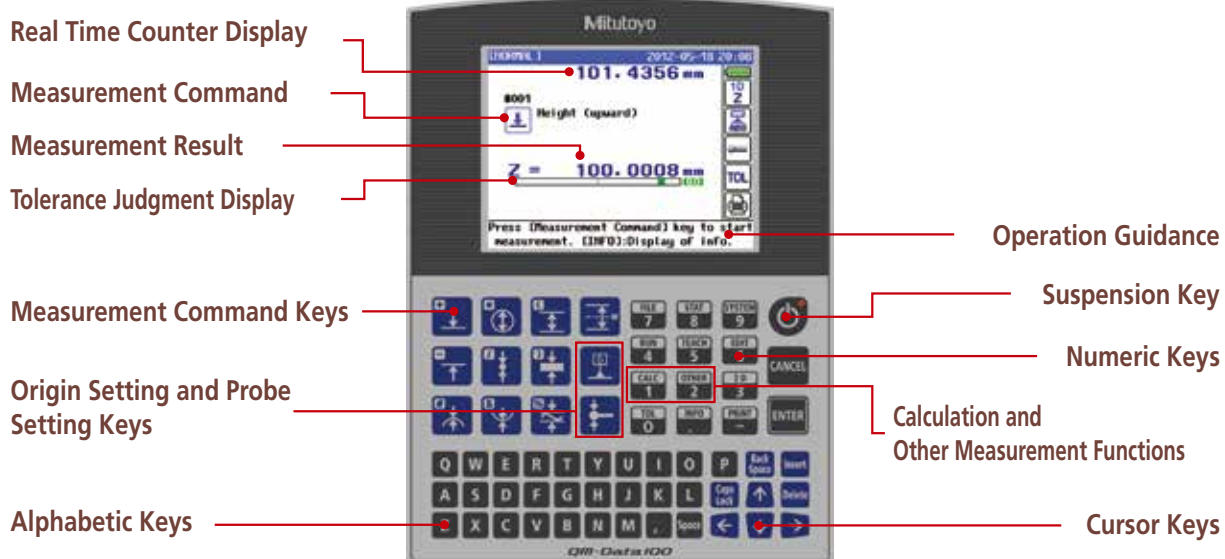
5.7 Inch color TFT LCD display

Icon-type command keys provide simple one-touch operation to drive powerful functionality
















A complete cordless system with a built-in compressor and battery allowing frictionless movement on a surface plate

Functions

The touch of a single key automatically runs the instrument until the last result is displayed. This eliminates the need to execute key operations at each step in the measurement process allowing you to concentrate 100% on workpiece inspection.



Single-Touch Basic Functions

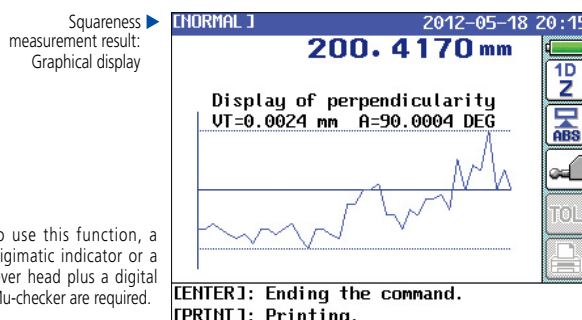
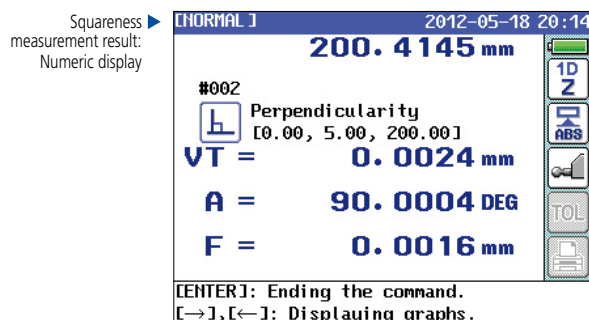
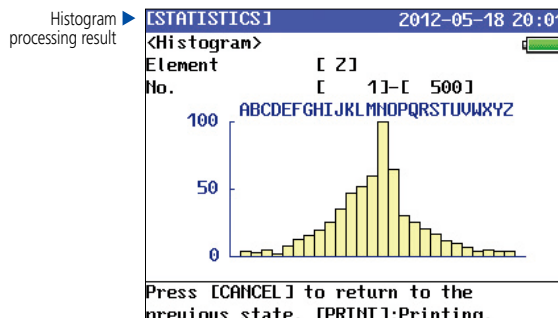
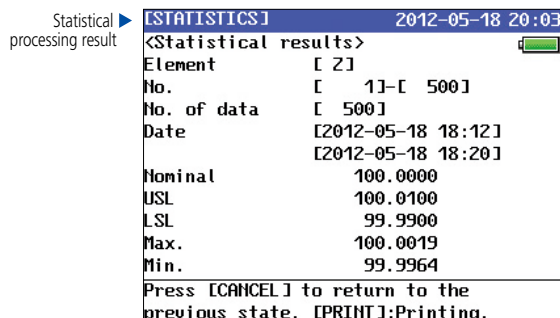
	Measures the height of an upward-facing surface.		Measures the diameter and center of a hole.		Measures the width and center of an inner diameter.		Measures the width and center position between two elements.
	Measures the height of a downward-facing surface.		Measures the diameter and center of a shaft.		Measures the width and center of an outer diameter.		Sets the ABS origin (absolute reference origin) or INC origin (incremental origin defined by the user), switches between ABS/INC origins and sets the offset ABS origin.
	Measures the maximum height of a downward or upward-facing surface.		Measures the minimum height of a downward or upward-facing surface.		Measures the difference between maximum height and minimum height of an upward or downward facing surface.		Sets the probe type, measures the probe diameter, inputs the probe diameter, saves the probe, loads the probe and shifts the probe position.
	Performs calculation, including angle.		Displays a comment when operations are paused, measures the position of a hole with a tapered probe, inputs measurement from a Digimatic measuring instrument and measures perpendicularity.		Suspends or resumes system operation.		

Other Functions

2D measurement	2D origin setting, X/Y axis setting, Element recall, Polar coordinate recall, Coordinate distance calculation, 2D distance calculation, 2 elements intersection-angle calculation, 3 elements intersection-angle calculation, Pitch-circle calculation
Tolerance judgment function	Tolerance/nominal value setting, Tolerance judgment result output, Warning functions
User-support functions	Switching resolution, Power saving function, Switchable measurement speed, Semi-floating measurement
Part-program functions	Creating/editing/executing a part program
Statistical processing functions	Basic statistical processing, Histogram
Accuracy-compensation functions	Temperature compensation, Scale factor

Screen Display Examples

The measurement operation is supported with graphics on the large LCD.

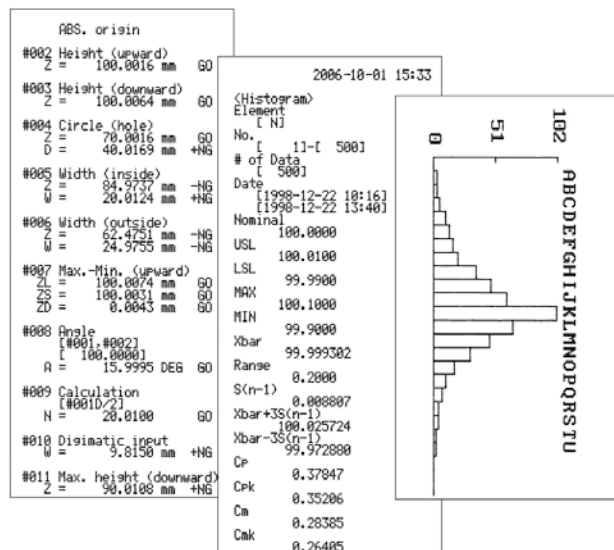


To use this function, a Digimatic indicator or a lever head plus a digital Mu-checker are required.

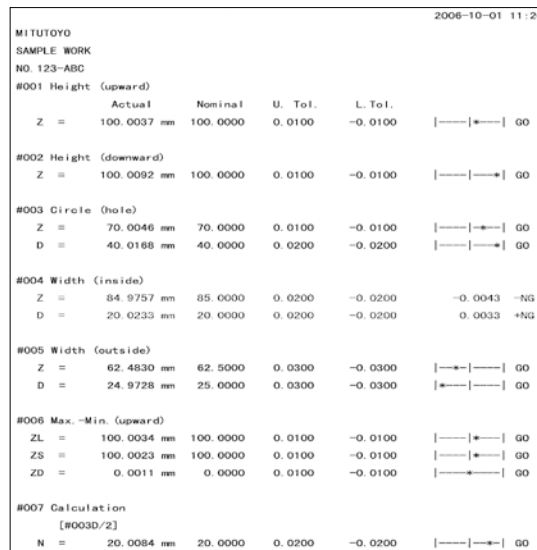
Printer Output Examples

An optional thermal printer that attaches to the Linear Height main unit is available. Result data can also be output to a commercial letter-size printer.

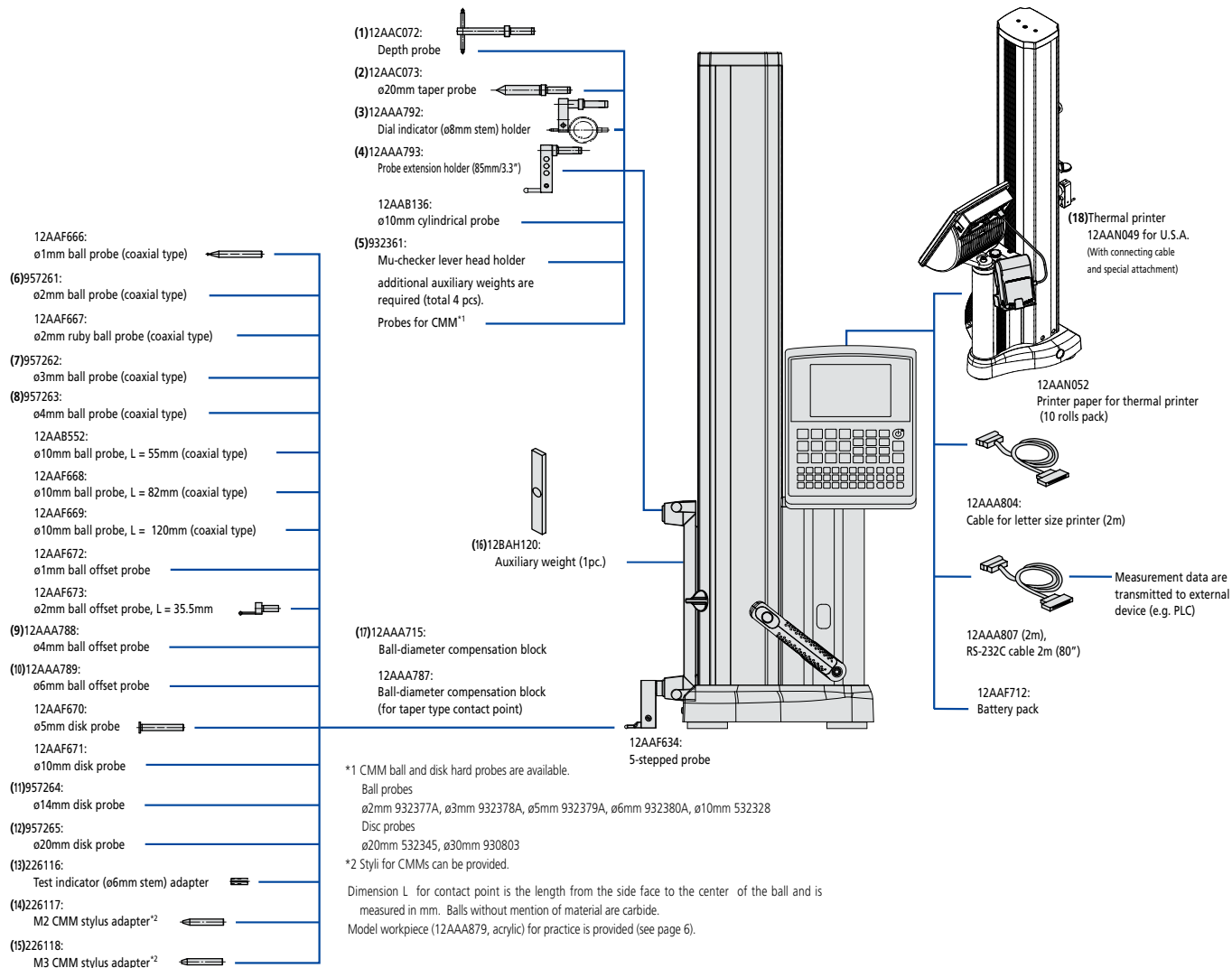
Thermal Printer Output



Letter Size Printer Output



Optional Accessories



Optional probes enable many types of measurement

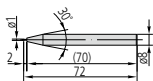


A choice of peripherals expand functionality

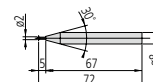


(18) Thermal printer

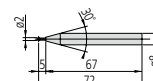
12AAF666
ø1 ball probe



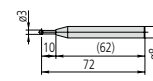
957261
ø2 ball probe



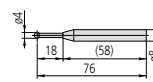
12AAF667
ø2 ruby ball probe



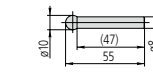
957262
ø3 ball probe



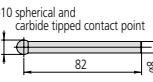
957263
ø4 ball probe



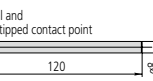
12AAB552
ø10 ball probe, L=55



12AAF668
ø10 ball probe, L=82



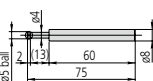
12AAF669
ø10 ball probe, L=120



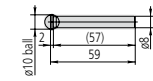
932361 Mu-checker lever head holder
CMM ball and disk hard probes
are available.

12AAA787 Block for calibrating probe diameter
(applicable to taper probe)

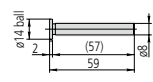
12AAF670
ø5 disk probe



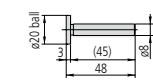
12AAF671
ø10 disk probe



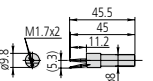
957264
ø14 disk probe



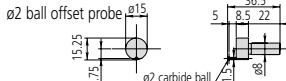
957265
ø20 disk probe



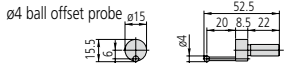
12AAF672
ø1 ball offset probe*
*test indicator stylus
(103017)



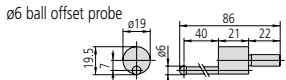
12AAF673



12AAA788



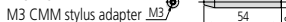
12AAA789



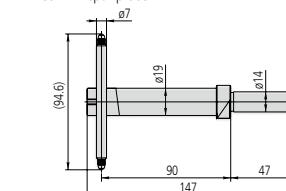
226117



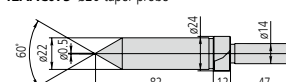
226118



12AAC072 Depth probe

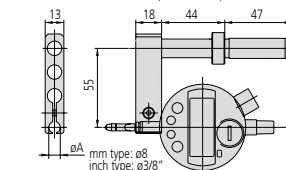


12AAC073 ø20 taper probe

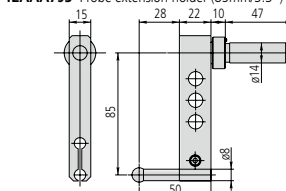


12AAA792 Dial indicator (ø8 stem) holder

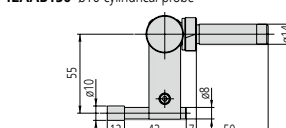
12AAA837 Dial indicator (ø3/8" stem) holder



12AAA793 Probe extension holder (85mm/3.3")



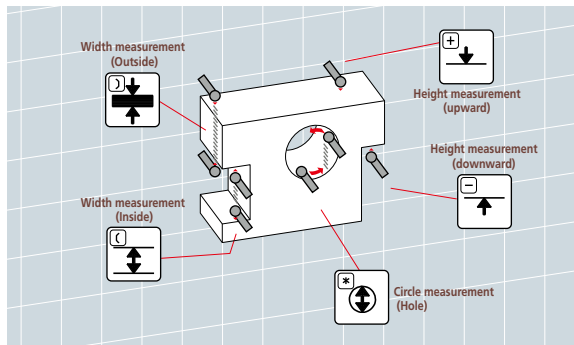
12AAB136 ø10 cylindrical probe



The Power Grip Type EG makes it easy to approach the workpiece.



Frequently Used Measurements



Linear Height Styli Kit M3



K650986

Contents	Description	ø S	L
1x Part No. K681867	Adapter block		
1x Part No. K651223	Pin wrench ø 1.2 mm		
1x Part No. K651157	Extension steel M3		20
1x Part No. K651156	Extension steel M3		10
1x Part No. K651172	Disk stylus steel M3	12.7	33
1x Part No. K651151	Stylus steel-ruby M3	4	31
1x Part No. K651148	Stylus steel-ruby M3	3	21
1x Part No. K651147	Stylus steel-ruby M3	2	21
1x Part No. K651146	Stylus steel-ruby M3	1	21

Specifications

Type		LH600E	LH600EG
Order No.		518-351A-21	518-352A-21
Measuring range (Stroke)		0 - 977mm (600mm) 0 to 38" (24")	
Resolution		0.0001/0.001/0.01/0.1mm (selectable) .00001/.00001/.0001/.001" (selectable)	
Accuracy (at 20°C)	Indication accuracy*1	(1.1 + 0.6L/600)µm, L = Measured length (mm)	
	Repeatability*1	Plane: 0.4µm (2σ), Hole: 0.9µm (2σ)	
	Perpendicularity (forward and backward)*2	5µm (after compensation)	
	Straightness (forward and backward)*2	4µm (mechanical accuracy)	
Guiding method		Roller bearing	
Driving method		Motor-driven (5,10,15,20,25,30,40mm/s: 7 steps)/Manual	
Scale unit		Reflective-type linear encoder	
Measuring force		1N (automatic constant-force function)	
Balancing method		Counter weight balance	
Main unit moving mode		Full-floating(moving) / Semi-floating(measuring) air bearing	
Air source		Built-in compressor	
Monitor		5.7 inch COLOR TFT LCD (320 x 240 dots, with LED backlight)	
Max. number of programs		50	
Max. number of measured data		60,000 (Max. number of data is 30,000 / one program)	
Power supply		AC adapter / Battery (Ni-MH)	
Battery endurance	Operating*3	Approx. 5 hours (compressor duty cycle 25% max.)	
	Standby*3	Approx. 10 hours	
Battery charging time		Approx. 3 hours (usable during charge)	
Dimensions (WxDxH)		237x448x1013mm	247x448x1013mm
Mass		24kg	24.5kg
Operating temperature range		5 - 40°C/ 20 - 80% RH (without condensation)	

*1 Guaranteed when using the standard eccentric $\phi 5$ probe.

*2 Guaranteed when using the Lever Head (MLH-521), Mu-Checker (M-511).

Perpendicularity for horizontal direction is not defined. If the workpiece is cylindrical, measurement error may be observed.

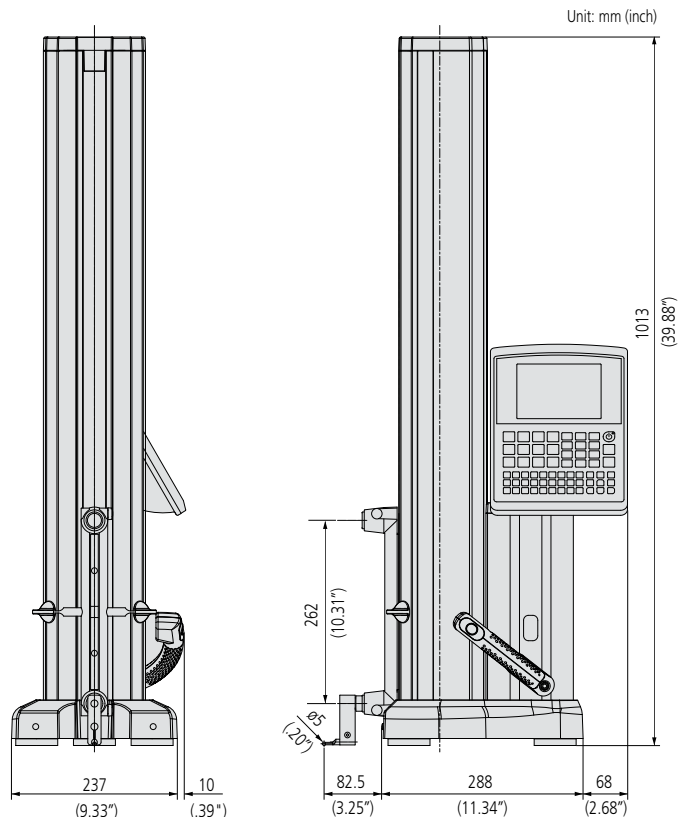
*3 Optional large-capacity battery pack (12AAF675) for longer battery-powered operation (8 hours when operated and 16 hours on standby).

*4 Mitutoyo does not guarantee the operation of all commercial USB memories except for the following. Mitutoyo recommends those USB memories made by SanDisk Corporation or IO DATA DEVICE, INC. and that meet the following requirements.

- Those that are not compliant with USB3.0
- Those that have no security function such as encryption and fingerprint authentication
- Those that have no write-protect switch function

• It is recommended to use the Linear Height on a surface plate of high flatness accuracy.

Dimensions



Standard Accessories

- Ø5mm probe
- Battery pack
- Clear cover
- Hex wrench
- Ball-diameter compensation block
- AC adapter
- Carrying handle
- Manual set
- Auxiliary weight (2pcs.)
- Power cable for AC adapter
- Cap
- Inspection certificate



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and our product catalog

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Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this printed matter as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. In addition, the latest applicable version of our General Trading Conditions will apply. Only quotations submitted by ourselves may be regarded as definitive. Specifications are subject to change without notice.

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Mitutoyo

Mitutoyo America Corporation

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Los Angeles, California

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Seattle, Washington

Houston, Texas

Mitutoyo

Mitutoyo Quality

CRYSTA-APEX S SERIES

High-performance, low-price CNC coordinate measuring machine meets global standards.

COORDINATE
MEASURING MACHINES



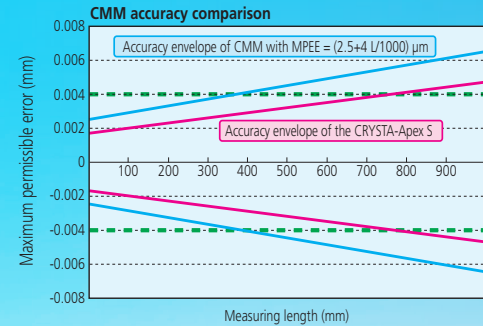
Bulletin No. 2202(3)

CNC Coordinate Measuring Machine CR

High accuracy in the 1.7 μm class

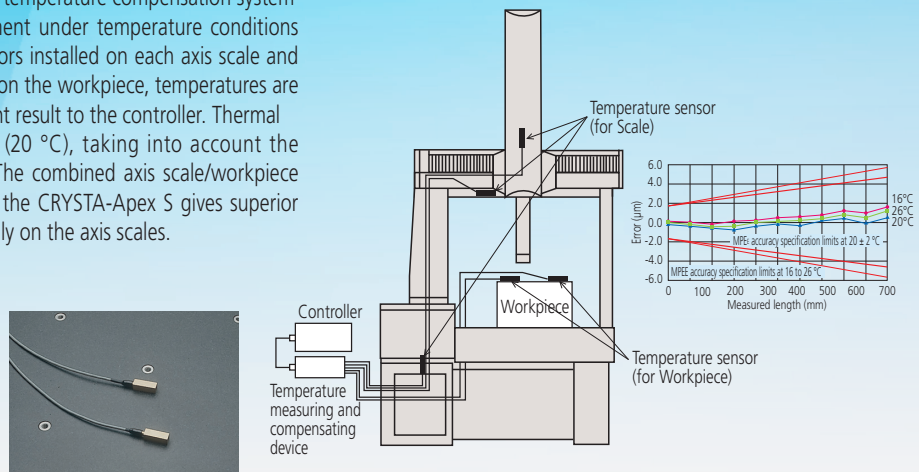
The CRYSTA-Apex S is a high-accuracy CNC coordinate measuring machine that guarantees a maximum permissible error of $*E_{0,MPE} = (1.7+3L/1000)\mu\text{m}$ [500/700/900 Series]. Let's compare the CRYSTA-Apex S with CMMs offering $*E_{0,MPE}$ of approximately $(2.5+4L/1000)\mu\text{m}$. If, for example, the required tolerance on a dimension is $\pm 0.02\text{ mm}$, then the measuring machine uncertainty should be no more than one-fifth (ideally one-tenth) of that, i.e. $4\mu\text{m}$. This means that with a general-purpose CMM, when the measured length exceeds 14.8" (375mm), machine uncertainty exceeds one-fifth of the dimension tolerance in this case. In contrast, as shown in the figure on the right, with the CRYSTA-Apex S the measurement uncertainty remains within one-fifth of the dimension tolerance up to 30.2" (766mm). The higher accuracy specification of the CRYSTA-Apex S, therefore, gives it more than double the effective measuring range in terms of accuracy-guarantee capability in this case.

*ISO 10360-2:2009



Temperature compensation system

The CRYSTA-Apex S comes equipped with a temperature compensation system that guarantees the accuracy of measurement under temperature conditions of 60.8 to 78.8 °F (16 to 26 °C). From sensors installed on each axis scale and working in conjunction with sensors placed on the workpiece, temperatures are obtained before outputting the measurement result to the controller. Thermal compensation is applied based on 68 °F (20 °C), taking into account the workpiece material expansion coefficient. The combined axis scale/workpiece temperature compensation design used on the CRYSTA-Apex S gives superior results compared to systems with sensors only on the axis scales.



500 Series



CRYSTA-Apex S544

700 Series



CRYSTA-Apex S776

900 Series



CRYSTA-Apex S9106

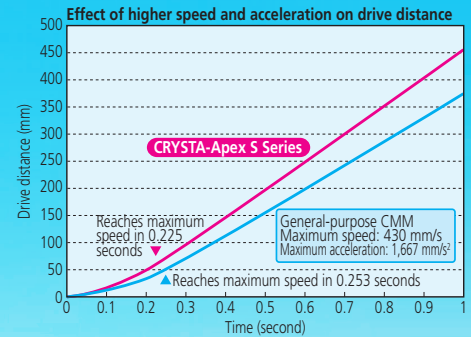
Mitutoyo

CRYSTA-Apex S Series

High-speed, high-acceleration drive

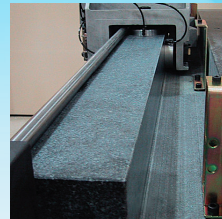
The CRYSTA-Apex S Series offers a maximum drive speed of 693mm/s (27.2"/s) [1600/2000 Series], and a maximum acceleration of 2,309mm/s² (7.57"/s²) [500/700/900 Series], resulting in an increase of almost 270mm in drive distance in one second, when compared with general-purpose CNC coordinate measuring machines (with a maximum speed of 430mm/s (16.9"/s) and a maximum acceleration of 1,667mm/s² (5.46"/s²).

Furthermore, with a maximum measuring speed (i.e., the speed with which the stylus traces over the workpiece) of 8mm/s (0.31"/s), the CRYSTA-Apex S produces measurements more quickly than ordinary CMMs (with a maximum measuring speed of 5mm/s (0.19"/s)). Combining high speed and high acceleration, the CRYSTA-Apex S reduces measuring time. As the number of measuring points increases, measuring costs per point are further reduced.

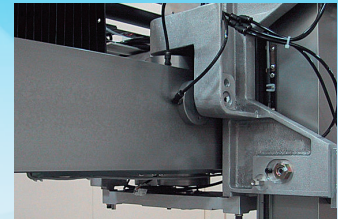


Designed for high rigidity

As is the case with Mitutoyo's conventional CMMs, various structures are employed in the CRYSTA-Apex S in order to give the body higher rigidity. The Y-axis guide rail, which is integrated to one side of the granite surface plate, shows little deterioration with use and, therefore, maintains the stated accuracy much longer. The air bearings located on the bottom face, in addition to those at the front, rear, and upper surfaces of the slider unit of the X-axis, minimize vibration even during high-speed, high-acceleration movement, thus ensuring stable linear motion.



Integrated Y-Axis in Granite Table



1200 Series



CRYSTA-Apex S122010

1600/2000 Series



Crysta-Apex S163016

NOTE: PC and workstation differ from those shown.

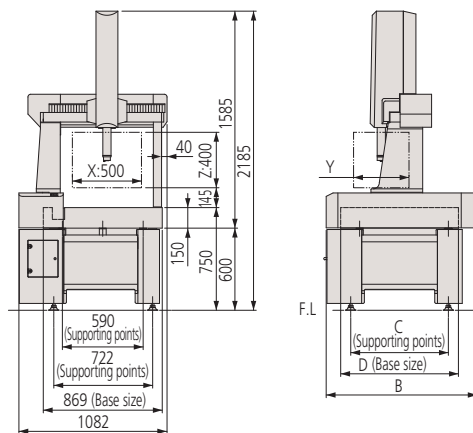
CRYSTA-Apex S 500 Series



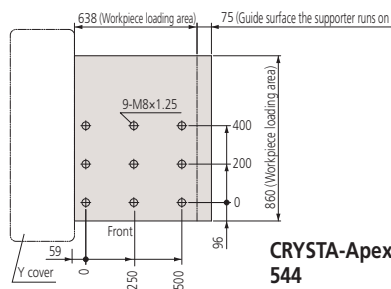
NOTE: PC and workstation differ from those shown.

Note: This machine incorporates a main unit startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. After initial installation, be sure to contact your nearest Mitutoyo sales office prior to relocation.

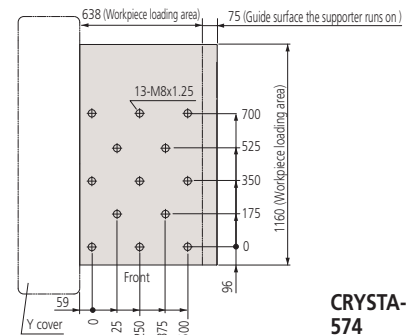
CRYSTA-Apex S500 Series Dimensions unit: inch (mm)



Measuring Table (Tapped Insert) Dimensions unit: mm



CRYSTA-Apex S
544



CRYSTA-Apex S
574

Model No.		CRYSTA-Apex S544	CRYSTA-Apex S574
Measuring range	X axis	19.68" (500mm)	
	Y axis	15.74" (400mm)	27.55" (700mm)
	Z axis	15.75" (400mm)	
Resolution		0.000004" (0.0001mm)	
Guide method		Air bearings on each axis	
Drive speed	CNC mode (Key selector: AUTO)	Max. moving speed = 519mm/s (20.4"/s) (3D) Max. measuring speed = 8mm/s	
	CNC mode (Key selector: MANUAL)	Max. moving speed = 239mm/s (9.4"/s) (3D) Max. measuring speed = 8mm/s	
Max. drive acceleration		2,309 mm/s ² (3D)	
Workpiece	Maximum height	21.45" (545mm)	
	Maximum mass	396.8lbs. (180kg)	
Mass (including the control device and installation platform)		1,135lbs. (515kg)	1,377lbs. (625kg)
Air supply	Pressure	58 PSI (0.4MPa)	
	Consumption	1.76CFM (50L/min) under normal conditions	
	Air source	3.53CFM (100L/min)	

CRYSTA-Apex S500 Series Accuracy

unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error (P _{FTU,MPE}) ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	1.7+3 L/1000 (temperature environment 1) 1.7+4 L/1000 (temperature environment 2)	1.7
TP200 (Stylus: ø4 X 10mm)	1.9+3 L/1000 (temperature environment 1) 1.9+4 L/1000 (temperature environment 2)	1.9
TP20 (Stylus: ø4 X 10mm)	2.2+3 L/1000 (temperature environment 1) 2.2+4 L/1000 (temperature environment 2)	2.2

* L = Selected measuring length (in mm).

* Table below describes temperature environments 1 and 2.

CRYSTA-Apex S500 Series Accuracy ISO 10360-4

unit: μm

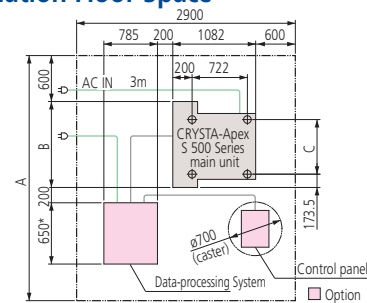
Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.3μm (50s)

CRYSTA-Apex S500 Series Installation Temperature

		Temperature environment 1	Temperature environment 2
Limits within which accuracy is guaranteed	Temperature Range	20±2 °C (64.4-71.6 °F)	16 - 26 °C (60.8-78.8 °F)
	Rate of change	2 °C per hour or less 2 °C in 24 hours or less	2 °C per hour or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter	1 °C or less per meter

Installation Floor Space

unit: inch (mm)



* When a mouse table is used: 850 mm
When a 2-monitor dedicated rack is used: 1,000 mm

Model No.	A	B	C	D	Y
CRYSTA-Apex S544	126" (3200)	46.8" (1191)	28.1" (713)	33.9" (860)	16.1" (405)
CRYSTA-Apex S574	138" (3500)	60.9" (1548)	39.9" (1013)	45.7" (1160)	27.8" (705)

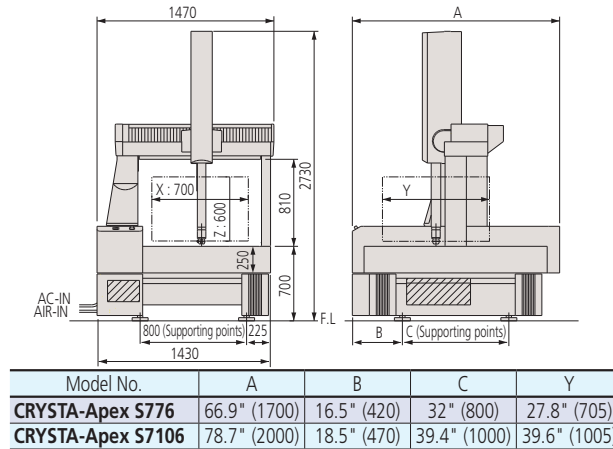
CRYSTA-Apex S 700 Series



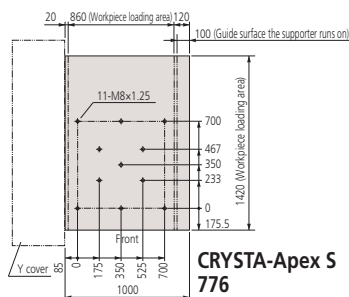
NOTE: PC and workstation differ from those shown.

Note: This machine incorporates a main unit startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. After initial installation, be sure to contact your nearest Mitutoyo sales office prior to relocation.

CRYSTA-Apex S700 Series Dimensions unit: inch (mm)



Measuring Table (Tapped Insert) Dimensions unit: mm



Model No.		CRYSTA-Apex S776	CRYSTA-Apex S7106
Measuring range	X axis	27.6" (700mm)	
	Y axis	27.55" (700mm)	39.36" (1000mm)
	Z axis	23.62" (600mm)	
Resolution		0.000004" (0.0001mm)	
Guide method		Air bearings on each axis	
Drive speed	CNC mode (Key selector: AUTO)	Max. moving speed = 519mm/s (20.4"/s) (3D) Max. measuring speed = 8mm/s	
	CNC mode (Key selector: MANUAL)	Max. moving speed = 239mm/s (9.4"/s) (3D) Max. measuring speed = 8mm/s	
Max. drive acceleration		2,309 mm/s ² (3D)	
Workpiece	Maximum height	31.49" (800mm)	
	Maximum mass	1,763lbs. (800kg)	2,204lbs. (1000kg)
Mass (including the control device and installation platform)		3,692lbs. (1675kg)	4,301lbs. (1951kg)
Air supply	Pressure	58 PSI (0.4MPa)	
	Consumption	1.76CFM (50L/min) under normal conditions	
	Air source	3.53CFM (100L/min)	

CRYSTA-Apex S700 Series Accuracy ISO 10360-2 unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error P _{FTU,MPE} ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	1.7+3 L/1000 (temperature environment 1) 1.7+4 L/1000 (temperature environment 2)	1.7
TP200 (Stylus: ø4 X 10mm)	1.9+3 L/1000 (temperature environment 1) 1.9+4 L/1000 (temperature environment 2)	1.9
TP20 (Stylus: ø4 X 10mm)	2.2+3 L/1000 (temperature environment 1) 2.2+4 L/1000 (temperature environment 2)	2.2

* L = Selected measuring length (in mm).

* Table below describes temperature environments 1 and 2.

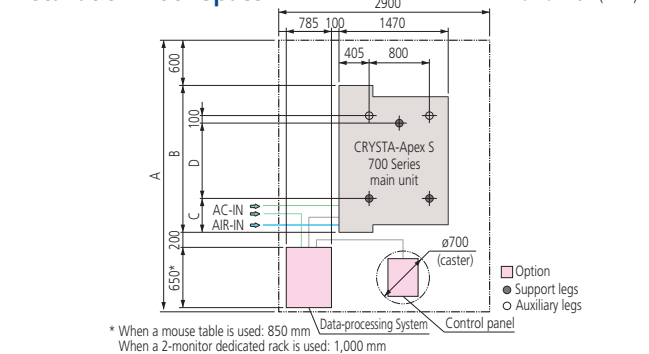
CRYSTA-Apex S700 Series Accuracy ISO 10360-4 unit: μm

Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.3μm (50s)

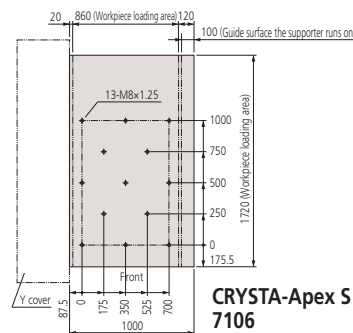
CRYSTA-Apex S 700 Series Installation Temperature

Limits within which accuracy is guaranteed	Temperature Range	Temperature environment 1	Temperature environment 2
	Rate of change	20±2 °C (64.4-71.6 °F)	16 - 26 °C (60.8-78.8 °F)
	Rate of change	2 °C per hour or less 2 °C in 24 hours or less	2 °C per hour or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter	1 °C or less per meter

Installation Floor Space



Model No.	A	B	C	D
CRYSTA-Apex S776	130" (3300)	65" (1650)	16.5" (420)	32" (800)
CRYSTA-Apex S7106	142" (3600)	76.8" (1950)	18.5" (470)	39.4" (1000)



Mitutoyo

Note: This machine incorporates a main unit startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. After initial installation, be sure to contact your nearest Mitutoyo sales office prior to relocation.

Technical drawings of the machine structure showing side and front views with dimensions.

Side View Dimensions:

- Overall width: 1670
- Overall height: A
- Height from base to center of rotation: B
- Height from base to center of rotation (lower section): 700
- Distance from base to center of rotation (lower section): 82
- Distance from base to center of rotation (lower section): 47
- Distance from base to center of rotation (lower section): C
- Distance from base to center of rotation (lower section): 1000 (Supporting points)
- Distance from base to center of rotation (lower section): 1275
- Overall width (lower section): 1630
- Angle: $\alpha : 900$

Front View Dimensions:

- Distance from base to center of rotation: E
- Distance from base to center of rotation: F (Supporting points)
- Overall width: D
- Distance from base to center of rotation: Y

Other Labels:

- F.L.

Model No.		CRYSTA-Apex S 9106 / [9108]	CRYSTA-Apex S 9166 / [9168]	CRYSTA-Apex S 9206 / [9208]
Measuring range	X axis	35.43" (900mm)		
	Y axis	39.36" (1000mm)	62.99" (1600mm)	78.3" (2000mm)
	Z axis	23.62" (600mm) / [31.49" (800mm)]		
Resolution		0.000004" (0.0001mm)		
Guide method		Air bearings on each axis		
Drive speed	CNC mode (Key selector: AUTO)	Max. moving speed = 519mm/s (20.4"/s) (3D) Max. measuring speed = 8mm/s		
	CNC mode (Key selector: MANUAL)	Max. moving speed = 239mm/s (9.4"/s) (3D) Max. measuring speed = 8mm/s		
Max. drive acceleration		2309mm/s ² [1732mm/s ²] (3D)		
Workpiece	Maximum height	31.49" (800mm) / [39.36" (1000mm)]		
	Maximum mass	2,645lbs. (1200kg)	3,306lbs. (1500kg)	3,968lbs. (1800kg)
Mass (including the control device and installation platform)		4,919lbs. (2231kg) [4,985lbs. (2261kg)]	6,322lbs. (2868kg) [6,389lbs. (2898kg)]	8,625lbs. (3912kg) [8,691lbs. (3942kg)]
Air supply	Pressure	58 PSI (0.4MPa)		
	Consumption	2.11CFM (60L/min) under normal conditions		
	Air source	4.23CFM (120L/min)		

Probe used	Maximum permissible error ($E_{0,MPE}$) ISO 10360-2:2009	Maximum permissible probing error ($P_{PTU,MPE}$) ISO 10360-5:2010
SP25M (Stylus: $\varnothing 4 \times 50\text{mm}$)	1.7+3 L/1000 (temperature environment 1) 1.7+4 L/1000 (temperature environment 2)	1.7
TP200 (Stylus: $\varnothing 4 \times 10\text{mm}$)	1.9+3 L/1000 (temperature environment 1) 1.9+4 L/1000 (temperature environment 2)	1.9
TP20 (Stylus: $\varnothing 4 \times 10\text{mm}$)	2.2+3 L/1000 (temperature environment 1) 2.2+4 L/1000 (temperature environment 2)	2.2

Probe used	Max. permissible scanning error (MPE _{HP})
SP25M (Stylus: ø4 X 50 mm)	2.3µm (50s) / [2.3µm (60s)]

		Temperature environment 1	Temperature environment 2
Limits within which accuracy is guaranteed	Temperature Range	20±2 °C (64.4-71.6 °F)	16 - 26 °C (60.8-78.8 °F)
	Rate of change	2 °C per hour or less 2 °C in 24 hours or less	2 °C per hour or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter	1 °C or less per meter

Technical drawing of the CRYSTA-Apex S 900 Series main unit, showing dimensions and optional features.

Dimensions:

- Overall width: 3200
- Overall height: 600
- Unit width: 1670
- Unit height: 405
- Distance from left wall to unit: 785
- Distance from unit to right wall: 1000
- Distance from top to unit top: 100
- Distance from unit top to ceiling: 100
- Distance from unit bottom to floor: 200
- Distance from floor to unit bottom: 650*

Unit Label: CRYSTA-Apex S 900 Series main unit

Optional Features:

- Option (pink box)
- Support legs (black dots)
- Auxiliary legs (white circles)

Connections:

- AC-IN
- AIR-IN

Labels:

- Data-processing System
- Control panel
- ø700 (caster)

Footnote:

* When a mouse table is used: 850 mm
When a 2-monitor dedicated rack is used: 1,000 mm

Topped Insert) Dimensions (un

Technical drawing of the CRISTA-Apex 9106/9108 topped insert. The drawing shows a rectangular plate with dimensions 1080 mm (width) by 1720 mm (height). The width is divided into a 20 mm section on the left, a 1080 mm section for the 'Workpiece loading area', and a 120 mm section on the right. The height is divided into a 100 mm section at the top for the 'Guide surface the supporter runs on', and a 1720 mm section for the 'Workpiece loading area'. The 1720 mm section is further divided into 750 mm, 500 mm, 250 mm, and 175 mm sections. A 13-M8x1.25 hole is located in the upper left quadrant. A 'Front' view is indicated at the bottom. A 'Y cover' is shown on the left side with a dimension of 87.5 mm. The drawing is labeled 'CRYSTA-Apex 9106/9108'.

20 1080 (Workpiece loading area) 120 100 (Guide surface the supporter runs on) 1000 750 500 250 175 1720 (Workpiece loading area) 13-M8x1.25 0 25 1200 675 900 Front Y cover 87.5

CRYSTA-Apex 9106/9108

CRYSTA-Ape
9166/9168

[illegible]

CRYSTA-Apex S
9206/9208

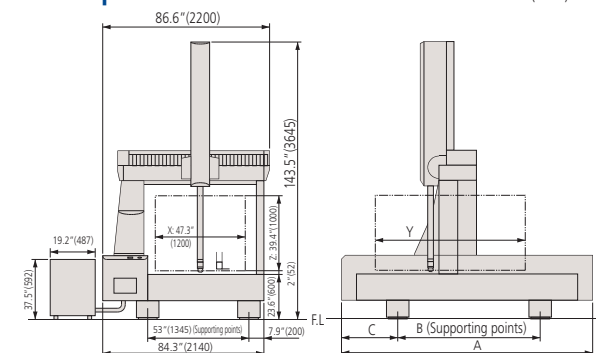
CRYSTA-Apex S 1200 Series



NOTE: PC and workstation differ from those shown.

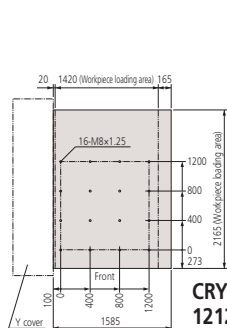
Note: This machine incorporates a main unit startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. After initial installation, be sure to contact your nearest Mitutoyo sales office prior to relocation.

CRYSTA-Apex S1200 Series Dimensions unit: inch (mm)

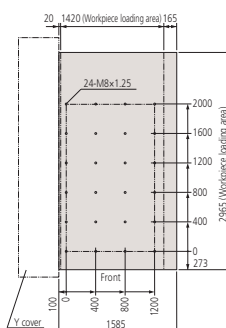


Model No.	A	B	C	Y
CRYSTA-Apex S121210	102.2" (2595)	67" (1700)	16.6" (420)	47.3" (1200)
CRYSTA-Apex S122010	133.7" (3395)	74.5" (1890)	28.6" (725)	78.8" (2000)
CRYSTA-Apex S123010	173.1" (4395)	98.5" (2500)	36.6" (920)	118.2" (3000)

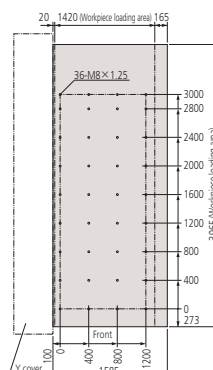
Measuring Table (Tapped Insert) Dimensions unit: mm



CRYSTA-Apex S
121210



CRYSTA-Apex S
122010



CRYSTA-Apex S
123010

Model No.		CRYSTA-Apex S 121210	CRYSTA-Apex S 122010	CRYSTA-Apex S 123010
Measuring range	X axis	47.24" (1200mm)		
	Y axis	47.24" (1200mm)	78.73" (2000mm)	118.10" (3000mm)
	Z axis	39.36" (1000mm)		
Resolution		0.000004" (0.0001mm)		
Guide method		Air bearings on each axis		
Drive speed	CNC mode (Key selector: AUTO)	Max. moving speed = 693mm/s (27.3"/s) (3D) Max. measuring speed = 8mm/s		
	CNC mode (Key selector: MANUAL)	Max. moving speed = 236mm/s (9.3"/s) (3D) Max. measuring speed = 8mm/s		
Max. drive acceleration		1,732 mm/s ² (3D)		
Workpiece	Maximum height	47.24" (1200mm)		
	Maximum mass	4,409lbs. (2000kg)	5,511lbs. (2500kg)	6,613lbs. (3000kg)
Mass (including the control device and installation platform)		8,928lbs. (4050kg)	13,558lbs. (6150kg)	20,084lbs. (9110kg)
Air supply	Pressure	58 PSI (0.4MPa)		
	Consumption	100 L/min under normal conditions		
	Air source	5.29CFM (150L/min)		

CRYSTA-Apex S1200 Series Accuracy ISO 10360-2

unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009	Maximum permissible probing error (P _{TU,MPE}) ISO 10360-5:2010
SP25M (Stylus: ø4 X 50mm)	2.3+3L/1000 (temperature environment 1) 2.3+4L/1000 (temperature environment 2)	2.0
TP200 (Stylus: ø4 X 10mm)	2.5+3L/1000 (temperature environment 1) 2.5+4L/1000 (temperature environment 2)	2.2
TP20 (Stylus: ø4 X 10mm)	2.8+3L/1000 (temperature environment 1) 2.8+4L/1000 (temperature environment 2)	2.6

* L = Selected measuring length (in mm).

* Table below describes temperature environments 1 and 2.

CRYSTA-Apex S 1200 Series Accuracy ISO 10360-4

unit: μm

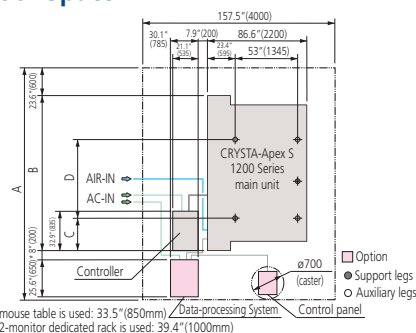
Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 X 50 mm)	2.8μm (50s)

CRYSTA-Apex S1200 Series Installation Temperature

		Temperature environment 1	Temperature environment 2
Limits within which accuracy is guaranteed	Temperature Range	20±2 °C	16 - 26 °C
	Rate of change	2 °C per hour or less 2 °C in 24 hours or less	2 °C per hour or less 5 °C in 24 hours or less
	Gradient	1 °C or less per meter	1 °C or less per meter

Installation Floor Space

unit: inch (mm)



* When a mouse table is used: 33.5" (850mm)
When a 2-monitor dedicated rack is used: 39.4" (1000mm)

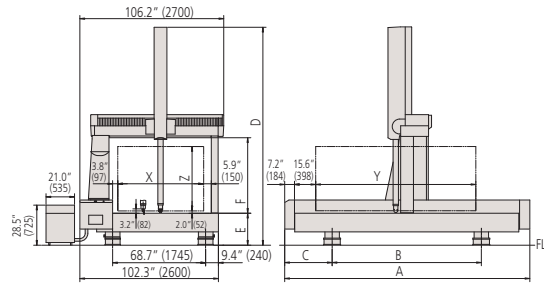
Model No.	A	B	C	D
CRYSTA-Apex S121210	163.2" (4145)	100.2" (2545)	16.6" (420)	67" (1700)
CRYSTA-Apex S122010	194.7" (4945)	131.7" (3345)	28.6" (725)	74.5" (1890)
CRYSTA-Apex S123010	234.1" (5945)	171.1" (4345)	36.3" (920)	98.5" (2500)

Crysta-Apex S 1600 Series



Note: This machine incorporates a main unit startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. After initial installation, be sure to contact your nearest Mitutoyo sales office prior to relocation.

CRYSTA-Apex S1600 Series Dimensions unit: inch (mm)

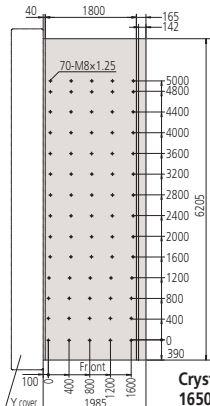


Model No.	A	B	C	D	E	F	X	Y	Z
CRYSTA-Apex S 162012/16	143.7" (3650)	70.8" (1800)	35.4" (900)	162.9" (4140)	23.6" (600)	55.1" (1400)	62.9" (1600)	78.7" (2000)	47.2" (1200)
CRYSTA-Apex S 163012/16	183.1" (4650)	103.9" (2640)	38.5" (980)	162.9" (4140)	23.6" (600)	55.1" (1400)	62.9" (1600)	118.1" (3000)	47.2" (1200)
CRYSTA-Apex S 164012/16	222.4" (5650)	134.6" (3420)	42.9" (1090)	164.9" (4190)	25.5" (650)	55.1" (1400)	62.9" (1600)	157.4" (4000)	47.2" (1200)

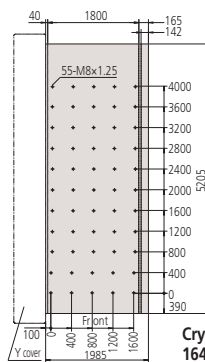
* () indicates Z: 1600 mm specification

Measuring Table (Tapped Insert) Dimension

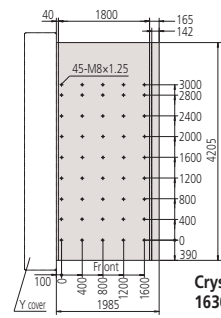
(unit: mm)



Crysta-Apex S
165012/165016



Crysta-Apex S
164012/164016



Crysta-Apex S
163012/163016

Model No.		CRYSTA-Apex S 162012/ [162016]	CRYSTA-Apex S 163012/ [163016]	CRYSTA-Apex S 164012/ [164016]
Measuring range	X axis	62.99" (1600mm)		
	Y axis	78.73" (2000mm)	118.10" (3000mm)	157.47" (4000mm)
	Z axis	47.24" (1200mm) / [62.99" (1600mm)]		
Resolution		0.00004" (0.0001mm)		
Guide method		Air bearings on each axis		
Drive speed	CNC mode (Key selector: AUTO)	Max. moving speed = 693mm/s (27.3"/s) (3D)		
		Max. measuring speed = 8mm/s		
	CNC mode (Key selector: MANUAL)	Max. moving speed = 236mm/s (9.3"/s) (3D)		
Max. drive acceleration		Max. measuring speed = 8mm/s		
		3D: 1.41G (1390mm/s ²)		
Workpiece	Maximum height	55.11" (1400mm) / [70.86" (1800mm)]		
	Maximum mass	6,613 lbs. (3000kg)	7,716 lbs. (3500kg)	9,920 lbs. (4500kg)
Mass (including the control device and installation platform)		20,502 lbs. (9300kg)	23,368 lbs. (10600kg)	32,628 lbs. (14800kg)
		[20,613 lbs. (9350kg)]	[23,479 lbs. (10650kg)]	[32,738 lbs. (14850kg)]
Air supply	Pressure	58 PSI (0.4MPa)		
	Consumption	5.29CFM (150L/min) under normal conditions		
	Air source	7.06CFM (200L/min)		

CRYSTA-Apex S1600 Series Accuracy ISO 10360-2

unit: μm

Probe used	Maximum permissible error (E _{0,MPE}) ISO 10360-2:2009		Maximum permissible probing error (E _{PTU,MPE}) ISO 10360-5:2010
	Temperature environment 1	Temperature environment 2	
SP25M (Stylus: ø4 × 50 mm)	3.3+4.5/L/1000 [4.5+5.5/L/1000]	3.3+5.5/L/1000 [4.5+6.5/L/1000]	5.0 [6.0]
TP200 (Stylus: ø4 × 10 mm)	6.0+4.5/L/1000 [7.0+5.5/L/1000]	6.0+5.5/L/1000 [7.0+6.5/L/1000]	6.5 [7.5]
TP20 (Stylus: ø4 × 10 mm)	7.0+4.5/L/1000 [8.0+5.5/L/1000]	7.0+5.5/L/1000 [8.0+6.5/L/1000]	7.5 [8.5]

* L = Selected measuring length (in mm).

* Table below describes temperature environments 1 and 2.

* [] Indicates Z: 1600mm specifications

CRYSTA-Apex S1600 Series Accuracy ISO 10360-4

unit: μm

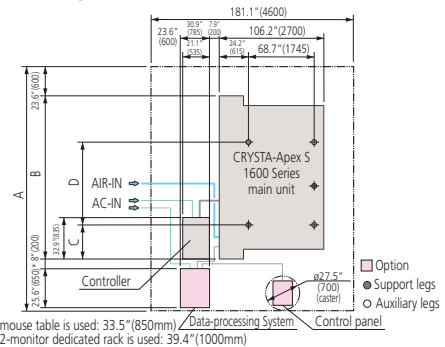
Probe used	Max. permissible scanning error (MPE _{THP})
SP25M (Stylus: ø4 × 50 mm)	5.0μm (60s)

CRYSTA-Apex S1600 Series Installation Temperature

Limits within which accuracy is guaranteed	Temperature environment 1	Temperature environment 2
	Temperature Range	20±2 °C (64.4-71.6 °F)
	Rate of change	1 °C per hour or less
	Gradient	2 °C in 24 hours or less

Installation Floor Space

unit: inch (mm)



* When a mouse table is used: 33.5" (850mm) / Data-processing System
When a 2-monitor dedicated rack is used: 39.4" (1000mm)

Model No.	A	B	C	D
Crysta-Apex S 162012/162016	244.0" [6200]	181.1" [4600]	38.5" [980]	103.9" [2640]
Crysta-Apex S 163012/163016	283.4" [7200]	220.4" [5600]	42.9" [1090]	134.6" [3420]
Crysta-Apex S 164012/164016	322.8" [8200]	259.8" [6600]	47.2" [1200]	165.3" [4200]

Crysta-Apex S 2000 Series



Note: This machine incorporates a main unit startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. After initial installation, be sure to contact your nearest Mitutoyo sales office prior to relocation.

Model No.		CRYSTA-Apex S203016	CRYSTA-Apex S204016
Measuring range	X axis	78.73" (2000mm)	
	Y axis	118.10" (3000mm)	157.47" (4000mm)
	Z axis	62.99" (1600mm)	
Resolution		0.000004" (0.0001mm)	
Guide method		Air bearings on each axis	
Drive speed	CNC mode (Key selector: AUTO)	Max. moving speed = 693mm/s (27.3"/s) (3D) Max. measuring speed = 8mm/s	
	CNC mode (Key selector: MANUAL)	Max. moving speed = 236mm/s (9.3"/s) (3D) Max. measuring speed = 8mm/s	
Max. drive acceleration		3D: 1.41G (1390mm/s ²)	
Workpiece	Maximum height	70.86" (1800mm)	
	Maximum mass	8,818 lbs. (4000kg)	11,023 lbs. (5000kg)
Mass (including the control device and installation platform)		31,085 lbs. (14100kg)	42,769 lbs. (19400kg)
Air supply	Pressure	58 PSI (0.4MPa)	
	Consumption	5.29CFM (150L/min) under normal conditions	
	Air source	7.06CFM (200L/min)	

CRYSTA-Apex S2000 Series Accuracy ISO 10360-2

unit: μ m

Probe used	Maximum permissible error ($E_{0,MPE}$) ISO 10360-2:2009		Maximum permissible probing error ($E_{FTU,MPE}$) ISO 10360-5:2010
	Temperature environment 1	Temperature environment 2	
SP25M (Stylus: $\phi 4 \times 50$ mm)	4.5+8L/1000	4.5+9L/1000	6.0
TP200 (Stylus: $\phi 4 \times 10$ mm)	9+8L/1000	9+9L/1000	9.5
TP20 (Stylus: $\phi 4 \times 10$ mm)	10+8L/1000	10+9L/1000	10.5

* L = Selected measuring length (in mm).

* Table below describes temperature environments 1 and 2.

CRYSTA-Apex S2000 Series Accuracy ISO 10360-4

unit: μ m

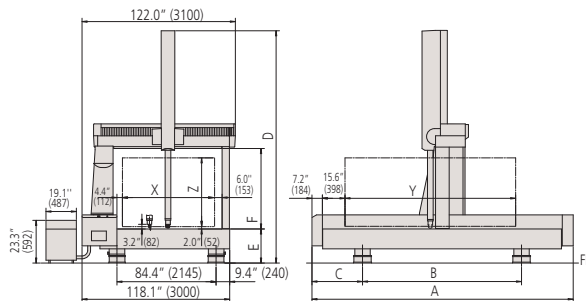
Probe used	Max. permissible scanning error (MPe_{THP})
SP25M (Stylus: $\phi 4 \times 50$ mm)	6.0 μ m (60s)

CRYSTA-Apex S2000 Series Installation Temperature

Limits within which accuracy is guaranteed	Temperature Range	Temperature environment 1	Temperature environment 2
	Rate of change	1 °C per hour or less	
	Gradient	2 °C in 24 hours or less	5 °C in 24 hours or less
		1 °C or less per meter	

CRYSTA-Apex S2000 Series Dimensions

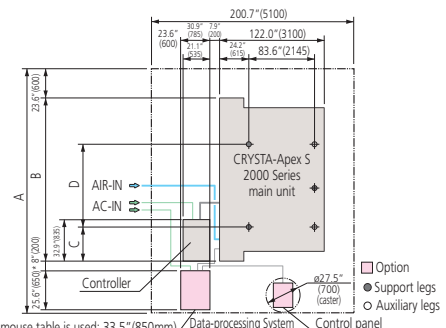
unit: inch (mm)



Model No.	A	B	C	D	E	F	X	Y	Z
Crysta-Apex S 203016	183.0" (4650)	103.9" (2640)	38.5" (980)	196.4" (4990)	25.5" (650)	70.8" (1800)	78.7" (2000)	118.1" (3000)	62.9" (1600)
Crysta-Apex S 204016	222.4" (5650)	134.6" (3420)	42.9" (1090)	198.4" (5040)	27.5" (700)	70.8" (1800)	78.7" (2000)	157.4" (4000)	62.9" (1600)

Installation Floor Space

unit: inch (mm)

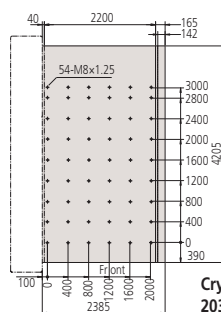


* When a mouse table is used: 33.5" (850mm) / Data-processing System
When a 2-monitor dedicated rack is used: 39.4" (1000mm)

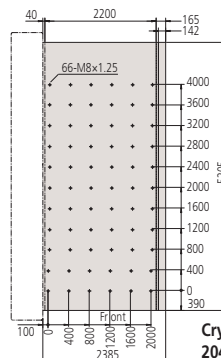
Model No.	A	B	C	D
Crysta-Apex S 203016	244.0" [6200]	181.1" [4600]	38.5" [980]	103.9" [2640]
Crysta-Apex S 204016	283.4" [7200]	220.4" [5600]	42.9" [1090]	134.6" [3420]

Measuring Table (Tapped Insert) Dimensions

(unit: mm)



Crysta-Apex S
203016

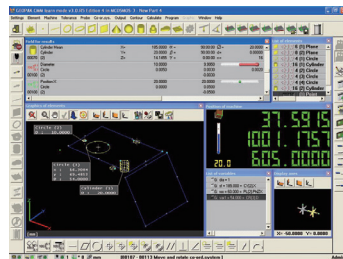


Crysta-Apex S
204016

Software and Probes

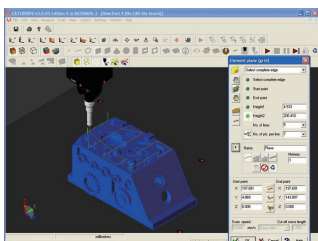
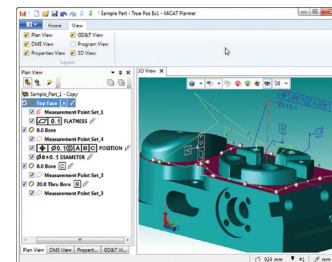
GEOPAK (general-purpose measurement program)

The GEOPAK module is the heart of the MCOSMOS software system and is used to measure and analyze geometric elements. All the functions are provided by icons or pull-down menus for ease of use. Main features include easier viewing of measuring procedures and results such as real-time graphic display of measurement results and a function for direct call-up of elements from results graphics.



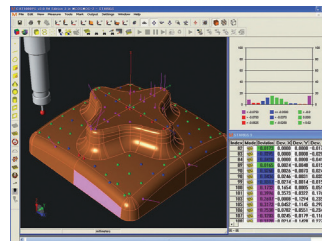
MiCAT Planner

Automatic measurement program generation software that uses 3D CAD with Product & Manufacturing Information (PMI) to enable one-click automated generation of measurement programs. With this program, a complex program that previously would have taken five hours to complete manually now can be completed in 15 minutes.



CAT1000P (CAD-based programming)

This module enables the user to use CAD data and on-screen simulation to create parts programs for making automated measurements. This module allows the user to begin creating a parts program as soon as the design data has been finalized, shortening the entire process.

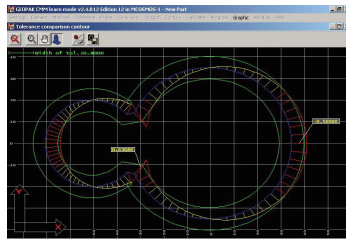


CAT1000S (freeform surface evaluation)

Checks and compares the workpiece with the CAD data containing freeform surfaces and directly outputs the results in the form of CAD data in various formats. Software that directly converts to/from various types of CAD data is available as an optional module.

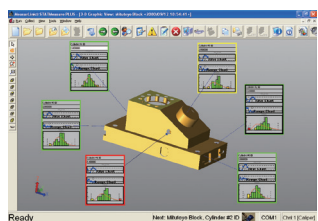
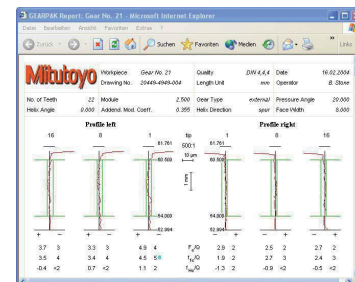
SCANPAK (contour measurement program)

Software for scanning and evaluating workpiece contours (2D). Evaluates contour tolerance between measurement data and design data, and performs various types of element and inter-element calculations based on a desired range of measurement data specified by the user.



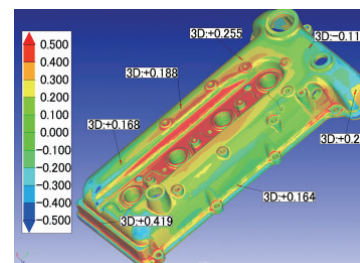
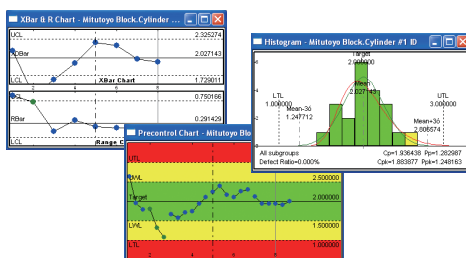
GEARPAK (gear evaluation)

For evaluating most types of involute, worm, and bevel/hypoid gears.



MeasurLink STATMeasure Plus (statistical control - SPC)

Performs various types of statistical computations using measurement results. In addition, by displaying a control diagram on a real-time basis, this program allows defects that may occur in the future (e.g., wearing or damaging of cutting tools) to be discovered early on. This program can also be linked to a higher-level network environment to build a central control system.



MSURF (non-contact laser measurement and evaluation)

MSURF-S is used to obtain measured point cloud data with the SurfaceMeasure (non-contact laser probe), while MSURF-I is used for comparing this data with the master model data, and for making dimensional measurements. Furthermore, MSURF-G for offline teaching allows the user to create a measurement macro even without the actual workpiece, improving the measuring machine's uptime.



SurfaceMeasure606T

SurfaceMeasure606T (non-contact laser probe)

Lightweight, high-performance, non-contact probe developed for CNC coordinate measuring machines. Spray-less powder measurement has been achieved through automatic setting of appropriate laser intensity and camera sensitivity according to environment or material, providing a simpler and more comfortable laser scanning environment.



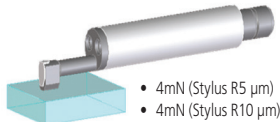
CMM Surftest Probe (surface roughness measuring)

Mitutoyo has a range of surface roughness analysis products from hand-held portable type up to CNC-type Surftest with broader functions and higher accuracy. Utilizing the technologies developed on our surface roughness measuring machines, our CMM's can perform surface roughness analysis by implementing a Surftest probe and the dedicated software. The Surftest probe requires PH10M or PH10MQ probe head.



Not available for
Crysta Apex S500 series

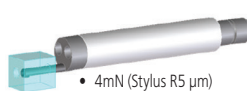
Standard-type detector



Small hole detector



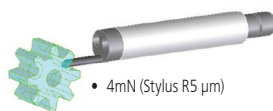
Extra-small hole detector



Deep groove detector

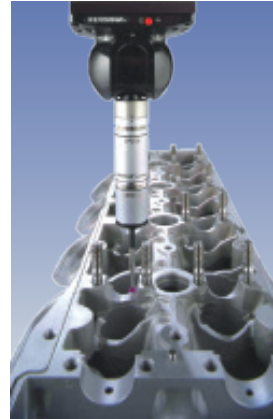
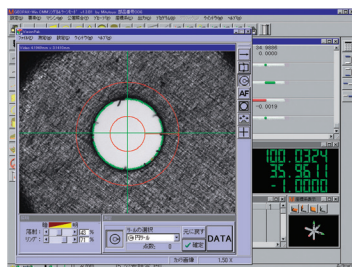


Gear-tooth surface detector



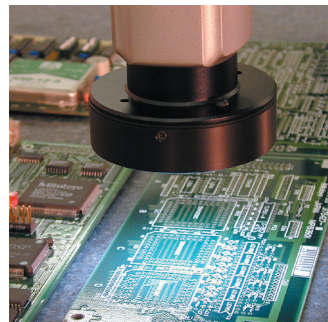
VISIONPAK (vision measurement program)

This program controls QVP and performs various computational analyses on captured images.



SP25M (compact high-accuracy scanning probe)

This is a compact, high-accuracy, multi-function scanning probe with a 25-mm outside diameter that makes scanning measurements, high-accuracy point measurements, and centripetal point measurements (optional function). The SP25M is used with the PH10MQ/10M auto probe head to provide a high degree of measurement freedom.



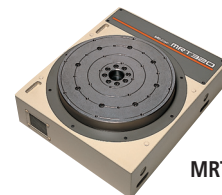
QVP (vision probe)

This probe automatically detects edges from image data of the workpiece magnified by a CCD camera. It is useful for measuring microfabricated products that cannot be measured using a contact-type probe and soft objects that cannot be subjected to any measurement force. The QVP can also be used for measuring height based on autofocus.



MPP-310Q (scanning probe)

Probe that collects coordinate values (point cloud data) at high accuracy by moving at speeds of up to of 120 mm/s while in contact with the workpiece. Because MPP-310Q can also be used with the rotary table (MRT320) for synchronous scanning, it is effective for measuring gears, blades, ball screws, cylindrical cams, etc.

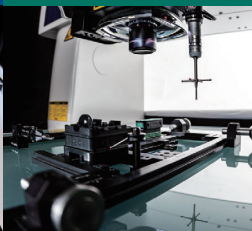


MRT320

Coordinate Measuring Machines



Vision Measuring Systems



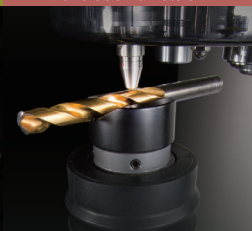
Form Measurement



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.

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 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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