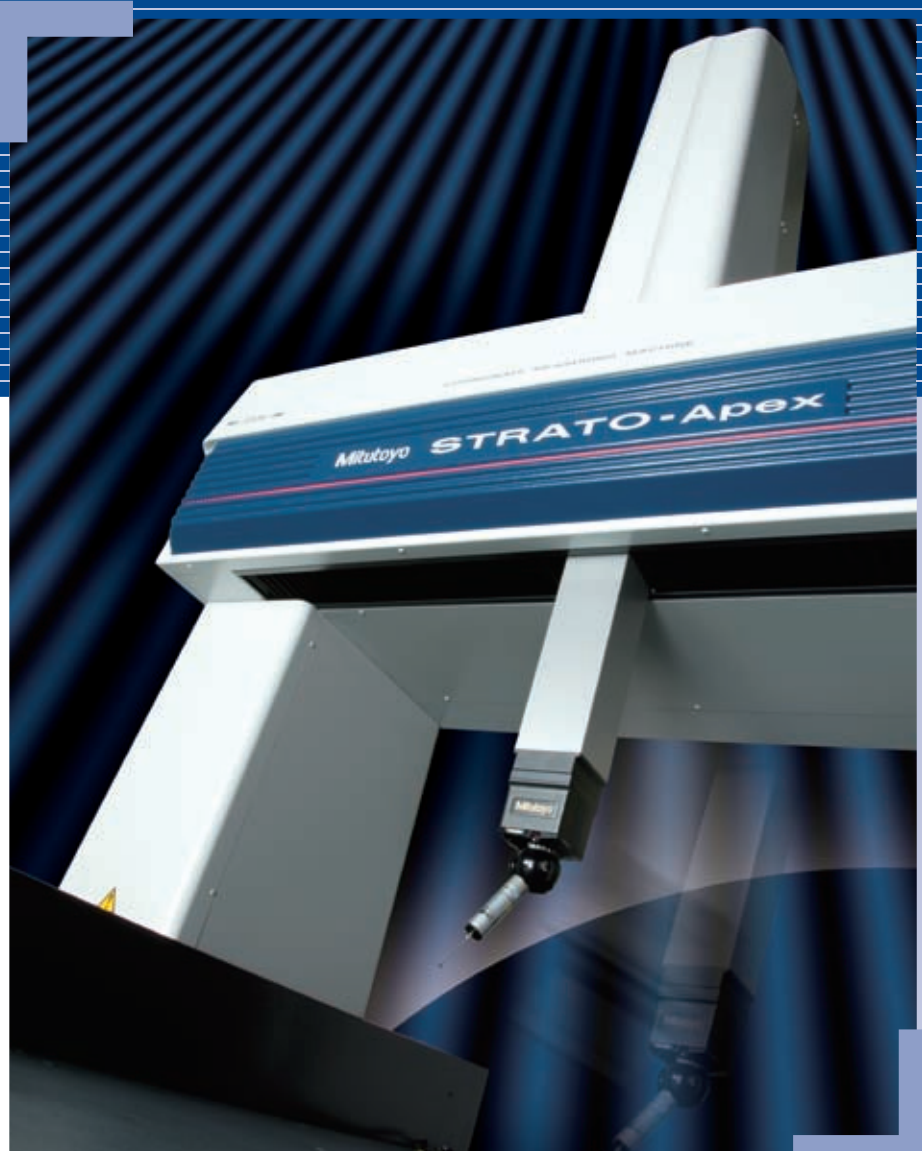


High Accuracy CNC Coordinate Measuring Machine MICROCORD STRATO-Apex Series

Catalog No. E16001(5)



A state-of-the-art CNC coordinate measuring machine that offers a rare blend of high-speed operation combined with highly accurate measurement

Mitutoyo

STRATO-Apex Series: A state-of-the-art CNC coordinate combined with high-speed operation

The high drive speed and acceleration guarantee top scanning performance

Improved machine rigidity

- High speed and accuracy in measurement is ensured by a redesign of the machine body that has improved rigidity of the structure, and by a remodeled guide mechanism

Newly developed, built-in, high-performance controller

- Uses a digital servo system that processes all control loops for position, speed, and current as digital signals.
- The digital servo system offers the following benefits:
 - (1) Little drift or deterioration with time
 - (2) Wide dynamic range
 - (3) Easy implementation of various types of control algorithm

Scanning measurement technology

- High-performance scanning measurement has been achieved through the improved structural rigidity and incorporation of a newly developed compensation technology
 - Maximum permissible scanning probing error: $MPE_{THP} = 1.3 \mu\text{m}$ (STRATO-Apex 574)
 - Maximum permissible scanning test time $MPT_{+HP} = 40 \text{ sec}$ (STRATO-Apex 574)
 - (cf. Existing FALCIO Series: $MPE_{THP} = 2.2 \mu\text{m}$)
 - $MPT_{+HP} = 110 \text{ sec.}$)

*Probe used: SP25M



Mitutoyo

measuring machine that achieves high accuracy

in a machine that also offers high-accuracy measuring in the 1 μm class

Internal heat generation minimized

- The controller is positioned outside the main unit, thereby eliminating the effect of the generated heat on the main unit.
- Compact layout has been achieved, resulting in a small footprint, even with the externally positioned controller.



STRATO-Apex 700/900 Series

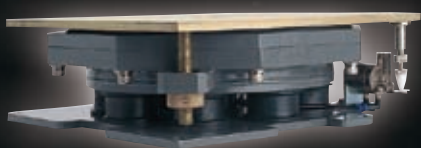
Ultra-high precision glass scales

- An ultra-high precision crystallized glass scale which has practically no thermal expansion (coefficient of linear expansion $0.01 \times 10^{-6}/^{\circ}\text{C}$) is combined with a high-performance reflective linear encoder with resolution of $2/100 \mu\text{m}$ to create the ultra-high accuracy measurement unit installed on each axis of STRATO-Apex. This is basically the same unit as used in the LEGEX Series of ultra-high accuracy CNC coordinate measuring machines. (Applies to STRATO-Apex 700/900 Series).
- A unique securing method used for the scales minimizes the hysteresis error that can result from the difference in the coefficients of linear expansion between the installation plane and scale.

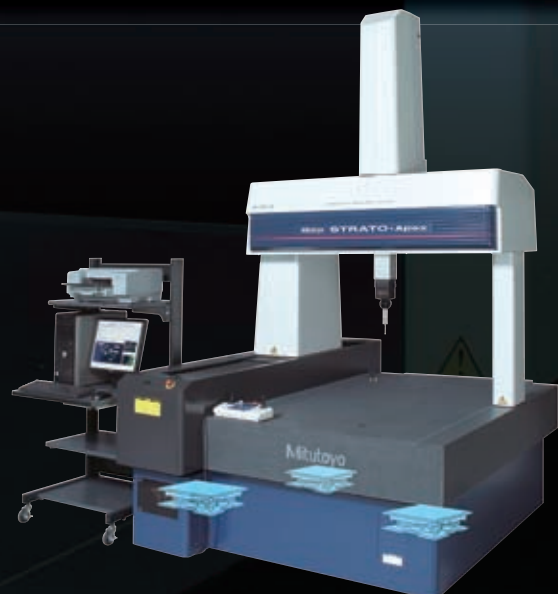


Vibration-damping unit included as a standard accessory

- Vibration of the floor where the unit is installed shows up as measurement value variations. The STRATO-Apex Series comes equipped with a vibration-damping unit that uses auto-leveling air springs. The vibration-damping unit not only prevents floor vibrations from reaching the main unit, but also has a function that uses a sensor to detect load changes caused by movements of the individual axes and placement of a workpiece and quickly restores the main unit to horizontal orientation.



▲Vibration-damping unit with auto-leveling air springs



▲Vibration-damping unit positioning

STRATO-Apex 574



STRATO-Apex 574

Specifications

Item		STRATO-Apex 574	
Measuring range	X	500 mm	
	Y	700 mm	
	Z	400 mm	
Guide method		Air bearings on all axes (static pressure air bearings)	
Drive speed	CNC mode	Drive speed: From 8 to 300 mm/s for each axis (maximum combined speed: 519 mm/s)	
		Measuring Speed 1 – 3 mm/s	
	J/S mode	Drive Speed 0 – 80 mm/s	
		Measuring Speed 0 – 3 mm/s	
		Fine-positioning Speed 0.05 mm/s	
Drive acceleration		1,330 mm/s ² for each axis (maximum combined acceleration: 2,310 mm/s ²)	
Measuring method		Linear encoder	
Resolution		0.00005 mm	
Work table	Material	Granite	
	Size (table surface)	676 × 1420 mm	
	Tapped inserts	M8 × 1.25 mm	
Workpiece	Maximum height	560 mm	
	Maximum mass	180 kg	
Machine mass (includes the vibration-damping platform and controller, but not workpiece)		1530 kg	
Power supply specifications (including the probe option interface)		Power supply voltage: AC100-120/200-240 V ± 10%; power supply capacity: 700 W (of which 170 W is used for the probe option interface)	
Air supply	Pressure	0.4 MPa	
	Consumption	60 L/min under normal conditions (air source: At least 120 L/min)	
Guaranteed accuracy temperature environment	Temperature range		18 – 22 °C
	Temperature change	Per hour	1.0 °C
		Per 24 hours	2.0 °C
Temperature gradient	vertical/horizontal	1.0 °C/m	

* While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

Length measurement error unit: μm

Standard	Probe used	Max. permissible length measurement error
ISO 10360-2: 2009	SP25M	$E_{0, MPE} = 0.7 + 2.5L/1000$
		$E_{150, MPE} = 0.7 + 2.5L/1000$

Repeatability unit: μm

Standard	Probe used	Repeatability range of E_0
ISO 10360-2: 2009	SP25M	$R_0, MPL = 0.7$

Single stylus form error unit: μm

Standard	Probe used	Max. permissible single stylus form error
ISO 10360-5: 2010	SP25M	$P_{FTU, MPE} = 0.7$

Scanning probing error unit: μm

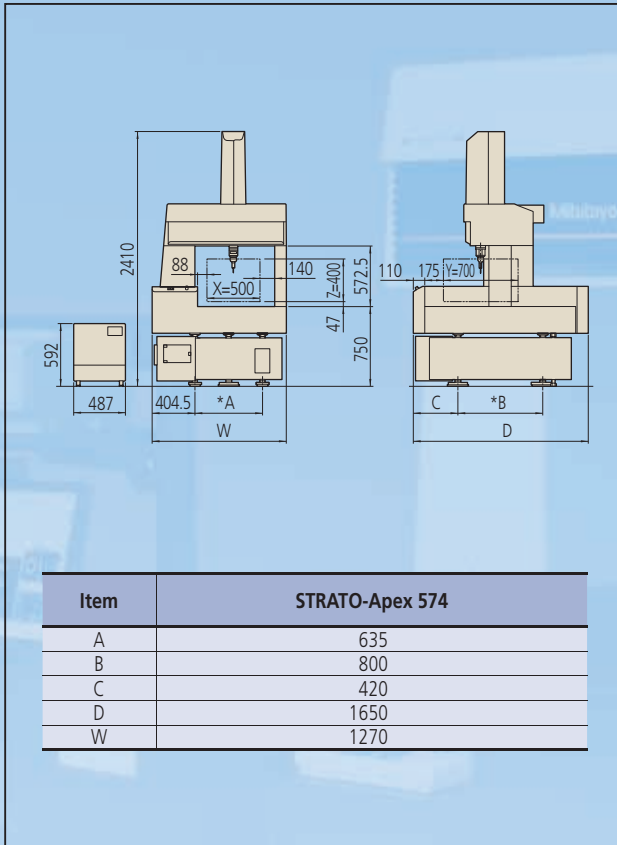
Standard	Probe used	Maximum permissible scanning probing error (Maximum permissible scanning test time) [sec]
ISO 10360-4: 2000	SP25M	$MPE_{THP} = 1.3$ ($MPT_{THP} = 40$)

Note: This machine incorporates a main unit Startup system (relocation detection system), which disable operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.

Length measurement error of $E_0, MPE=0.7+2.5L/1000$ (μm)

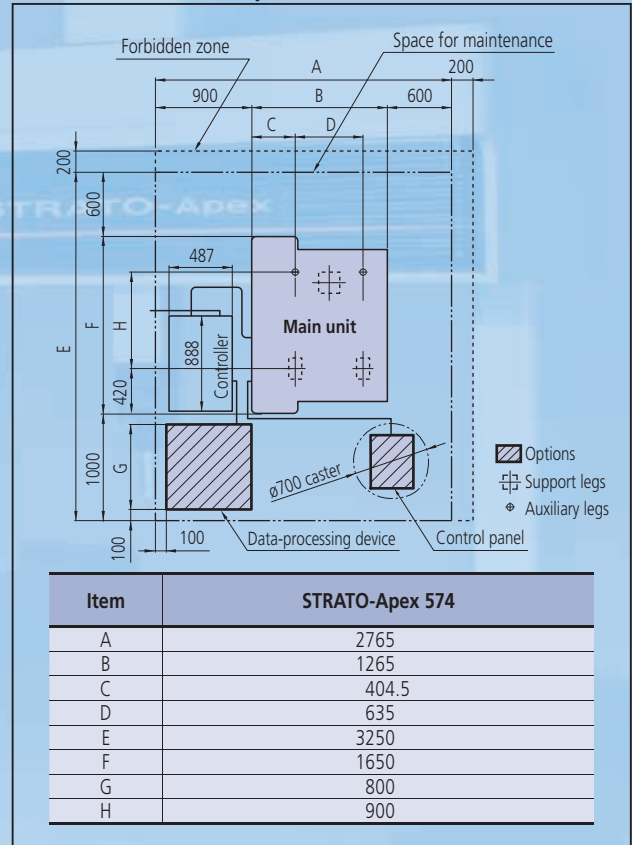
■ Dimensions

unit: mm



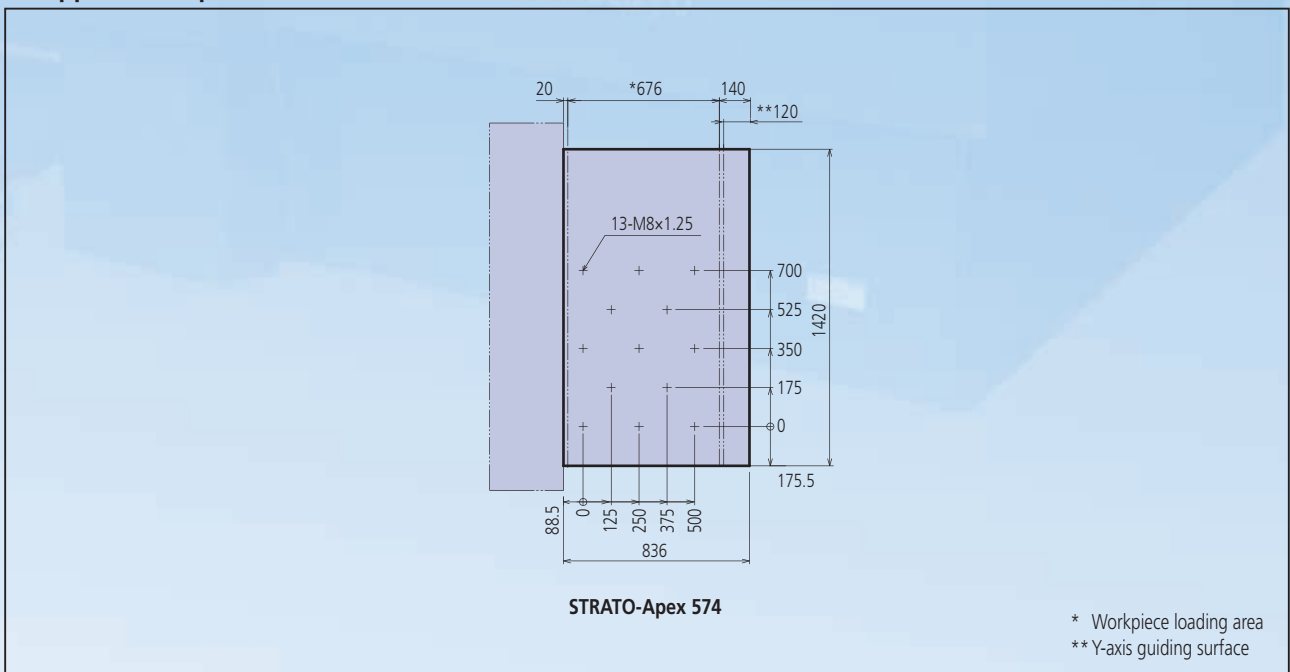
■ Installation floor space

unit: mm



■ Tapped insert positions in the table surface

unit: mm



STRATO-Apex 700/900 Series



STRATO-Apex 776



STRATO-Apex 9106

Specifications

Item		STRATO-Apex 776	STRATO-Apex 7106	STRATO-Apex 9106	STRATO-Apex 9166
Measuring range	X	700 mm		900 mm	
	Y	700 mm	1000 mm		1600 mm
	Z	600 mm			
Guide method		Air bearings on all axes (static pressure air bearings)			
Drive speed	CNC mode	Drive speed: From 8 to 300 mm/s for each axis (maximum combined speed: 519 mm/s)			
		Measuring Speed 1 – 3 mm/s			
	J/S mode	Drive Speed 0 – 80 mm/s			
		Measuring Speed 0 – 3 mm/s			
		Fine-positioning Speed 0.05 mm/s			
Drive acceleration		1,500 mm/s ² for each axis (maximum combined acceleration: 2,598 mm/s ²)			
Measuring method		Linear encoder			
Resolution		0.00002 mm			
Work table	Material	Granite			
	Size (table surface)	862 x 1420 mm	862 x 1720 mm	1062 x 1720 mm	1062 x 2320 mm
	Tapped inserts	M8 x 1.25 mm			
Workpiece	Maximum height	770 mm			
	Maximum mass	500 kg	800 kg	800 kg	1200 kg
Machine mass (includes the vibration-damping platform and controller, but not workpiece)		1895 kg	2180 kg	2410 kg	3085 kg
Power supply specifications (including the probe option interface)		Power supply voltage: AC100-120/200-240 V ± 10%; power supply capacity: 700 W (of which 170 W is used for the probe option interface)			
Air supply	Pressure	0.4 MPa			
	Consumption	60 L/min under normal conditions (air source: At least 120 L/min)			
Guaranteed accuracy temperature environment	Temperature range	19 – 21 °C			
	Temperature change	Per hour	1.0 °C		
		Per 24 hours	2.0 °C		
	Temperature gradient	vertical/horizontal	1.0 °C/m		

* While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

Length measurement error			unit: μm
Standard	Probe used	Max. permissible length measurement error	
ISO 10360-2: 2009	SP25M	$E_{0, MPE} = 0.9 + 2.5L/1000$	
		$E_{150, MPE} = 0.9 + 2.5L/1000$	

Repeatability			unit: μm
Standard	Probe used	Repeatability range of E_0	
ISO 10360-2: 2009	SP25M	$R_0, MPL = 0.8$	

Single stylus form error			unit: μm
Standard	Probe used	Max. permissible single stylus form error	
ISO 10360-5: 2010	SP25M	$P_{FTU, MPE} = 0.9$	

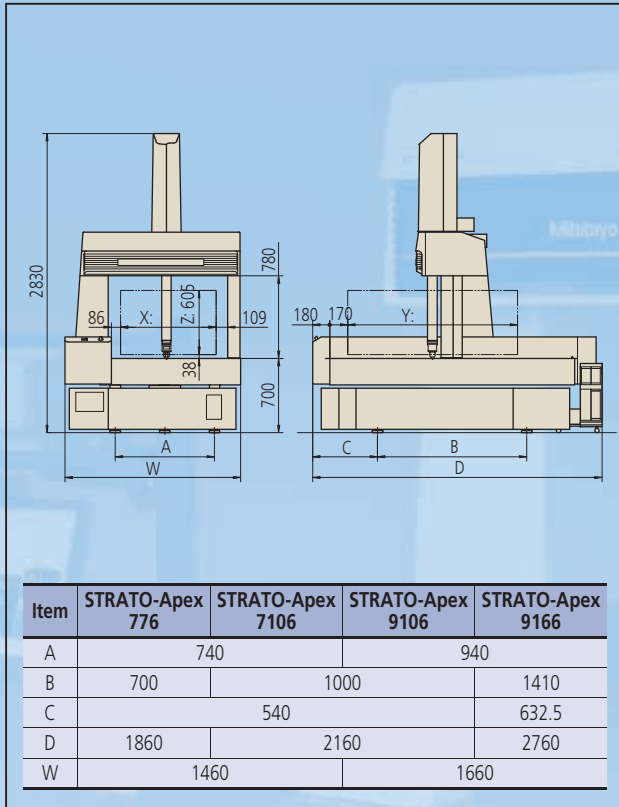
Scanning probing error			unit: μm
Standard	Probe used	Maximum permissible scanning probing error (Maximum permissible scanning test time) [sec]	
ISO 10360-4: 2000	SP25M	$MPE_{THP} = 1.8$ ($MPT_{THP} = 45$)	

Note: This machine incorporates a main unit Startup system (relocation detection system), which disable operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.

Providing the Highest Speed and Accuracy in Moving-Bridge Type Coordinate Measuring Machines Integration of Key Measurement Technologies

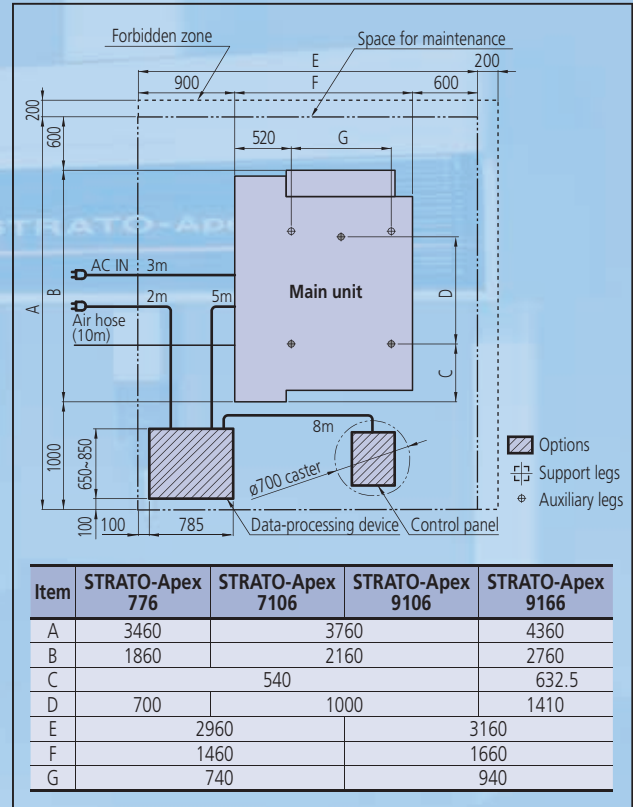
■ Dimensions

unit: mm



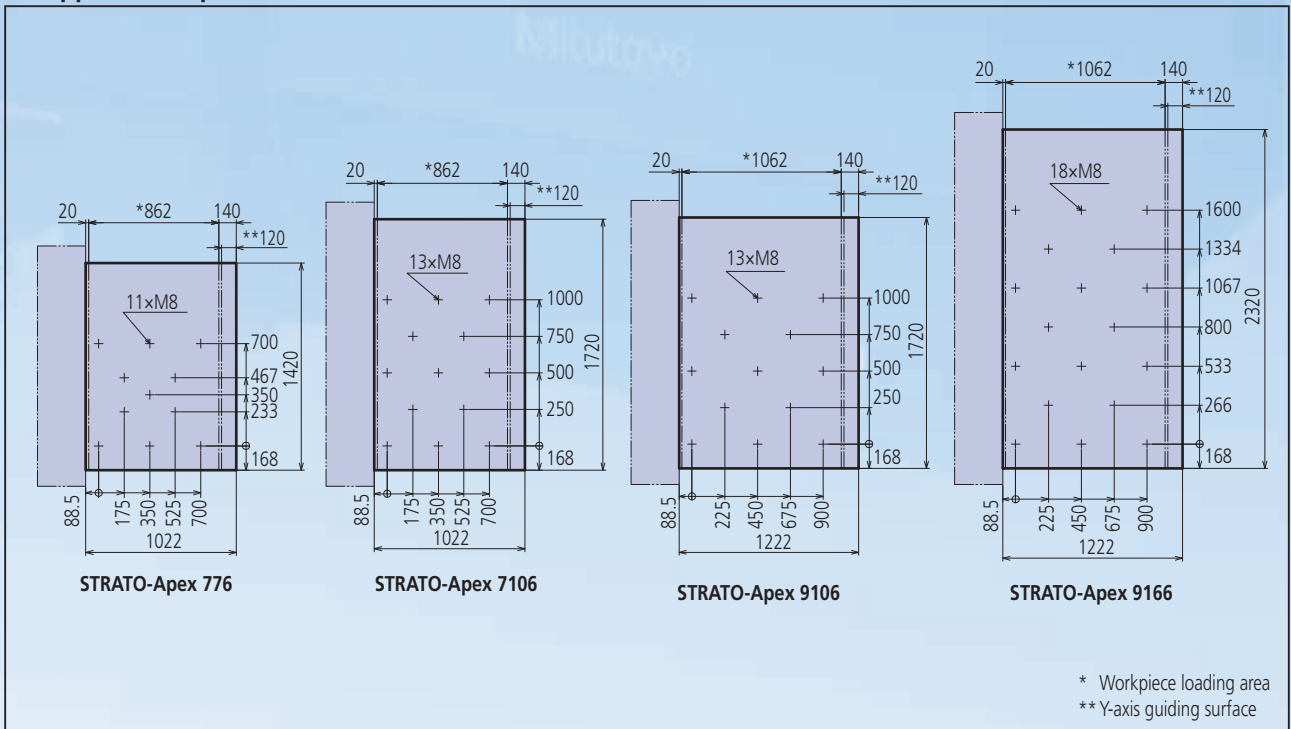
■ Installation floor space

unit: mm



■ Tapped insert positions in the table surface

unit: mm



STRATO-Apex 1600 Series



STRATO-Apex 163016

Specifications

Item		STRATO-Apex 162012	STRATO-Apex 162016	STRATO-Apex 163012	STRATO-Apex 163016
Measuring range	X	1600 mm			
	Y	2000 mm		3000 mm	
	Z	1200 mm	1600 mm	1200 mm	1600 mm
Guide method		Air bearings on all axes (static pressure air bearings)			
Drive speed	CNC mode	Drive speed: From 8 to 350 mm/s for each axis (maximum combined speed: 606 mm/s)			
		Measuring Speed 1 – 3 mm/s Drive Speed 0 – 80 mm/s			
	J/S mode	Measuring Speed 0 – 3 mm/s Fine-positioning Speed 0.05 mm/s			
		780 mm/s ² for each axis (maximum combined acceleration: 1,350 mm/s ²)			
Drive acceleration		780 mm/s ² for each axis (maximum combined acceleration: 1,350 mm/s ²)			
Measuring method		Linear encoder			
Resolution		0.00005 mm			
Work table	Material	Granite			
	Size (table surface)	1850 x 3280 mm		1850 x 4280 mm	
	Tapped inserts	M8 x 1.25			
Workpiece	Maximum height	1350 mm	1750 mm	1350 mm	1750 mm
	Maximum mass	3500 kg		4000 kg	
Machine mass (includes the vibration-damping platform and controller, but not workpiece)		11150 kg	11200 kg	15300 kg	15350 kg
Power supply specifications (including the probe option interface)		Power supply voltage: AC100-120/200-240 V ± 10%; power supply capacity: 1500 W (of which 170 W is used for the probe option interface)			
Air supply	Pressure	0.4 MPa			
	Consumption	100 L/min under normal conditions (air source: At least 250 L/min)			
Guaranteed accuracy environment	Temperature range		18 – 22 °C		
	Temperature change	Per hour	1.0 °C		
		Per 24 hours	2.0 °C		
Temperature gradient		vertical/horizontal 1.0 °C/m			

* While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can always be relied upon.

STRATO-Apex162012/163012

Length measurement error unit: μm

Standard	Probe used	Max. permissible length measurement error
ISO 10360-2: 2009	SP25M	$E_{0, MPE} = 2.5 + 4.0L/1000$
		$E_{150, MPE} = 2.5 + 4.0L/1000$

Repeatability unit: μm

Standard	Probe used	Repeatability range of E_0
ISO 10360-2: 2009	SP25M	$R_{0, MPL} = 2.5$

Single stylus form error unit: μm

Standard	Probe used	Max. permissible single stylus form error
ISO 10360-5: 2010	SP25M	$P_{FTU, MPE} = 2.3$

Scanning probing error unit: μm

Standard	Probe used	Maximum permissible scanning probing error (Maximum permissible scanning test time) [sec]
ISO 10360-4: 2000	SP25M	$MPE_{THP} = 2.5$ ($MPT_{THP} = 60$)

Note: This machine incorporates a main unit Startup system (relocation detection system), which disable operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.

High accuracy combined with wide measuring range Best suited for highly accurate measurement of large workpieces

STRATO-Apex162016/163016

Length measurement error unit: μm

Standard	Probe used	Max. permissible length measurement error
ISO 10360-2: 2009	SP25M	$E_{0, \text{MPE}}=3.0+4.0L/1000$
		$E_{150, \text{MPE}}=3.0+4.0L/1000$

Repeatability unit: μm

Standard	Probe used	Repeatability range of E_0
ISO 10360-2: 2009	SP25M	$R_{0, \text{MPE}}=2.5$

Single stylus form error unit: μm

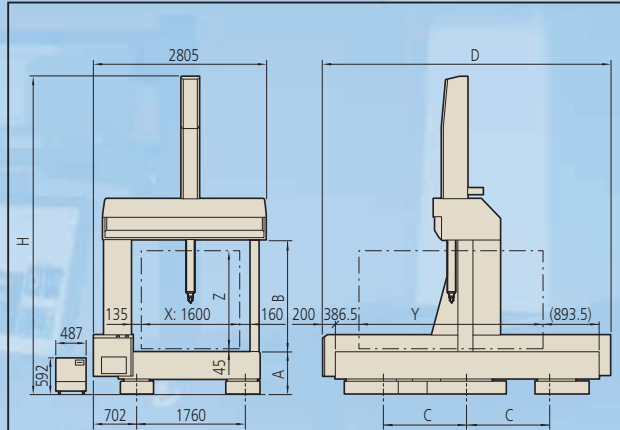
Standard	Probe used	Max. permissible single stylus form error
ISO 10360-5: 2010	SP25M	$P_{\text{FTU, MPE}}=2.8$

Scanning probing error unit: μm

Standard	Probe used	Maximum permissible scanning probing error (Maximum permissible scanning test time) [sec]
ISO 10360-4: 2000	SP25M	$\text{MPE}_{\text{THP}}=3.0$ ($\text{MPT}_{\text{THP}}=60$)

Dimensions

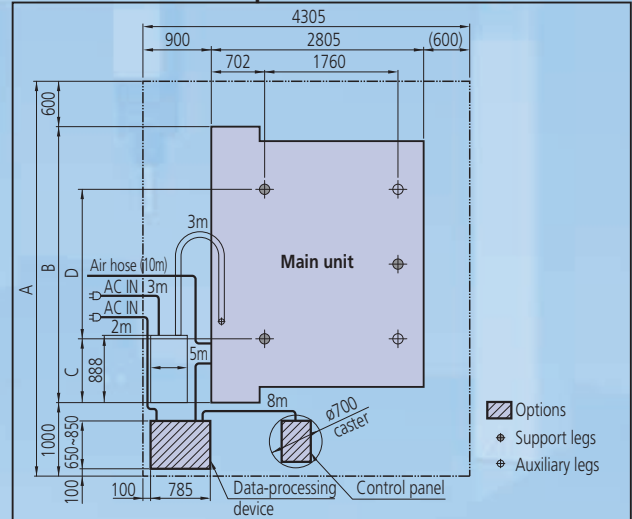
unit: mm



Item	STRATO-Apex 162012	STRATO-Apex 162016	STRATO-Apex 163012	STRATO-Apex 163016
A	650		700	
B	1415	1815	1415	1815
C	1000		1350	
D	3685		4685	
H	4340	5140	4390	5190

Installation floor space

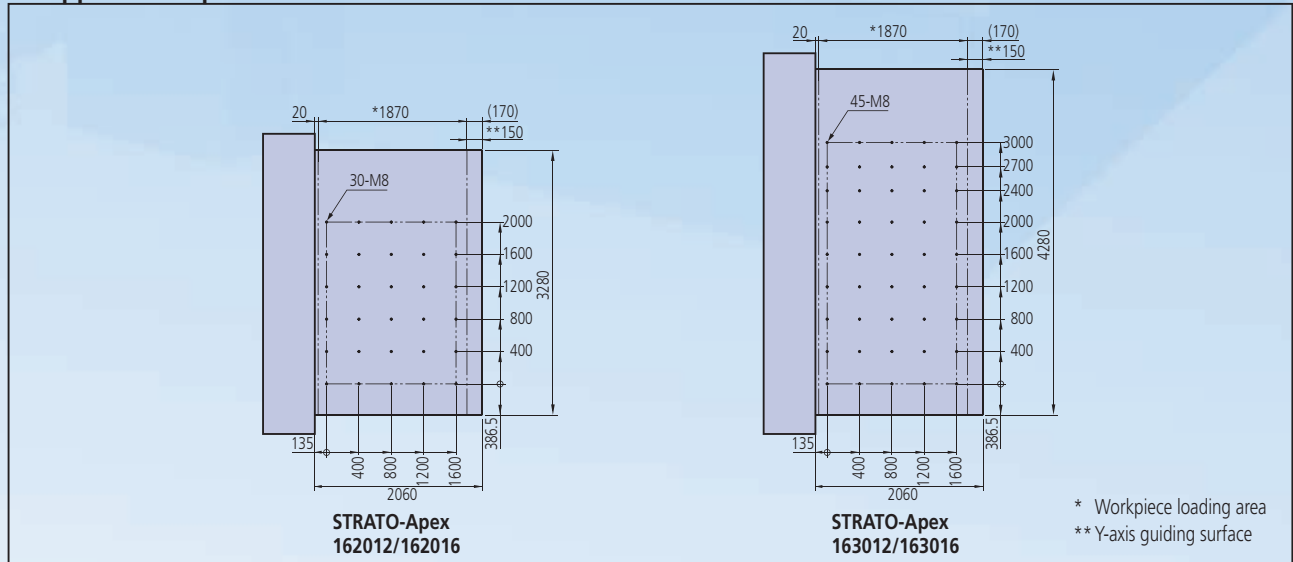
unit: mm



Item	STRATO-Apex162012/162016	STRATO-Apex163012/163016
A	5285	6285
B	3685	6285
C	840	990
D	2000	2700

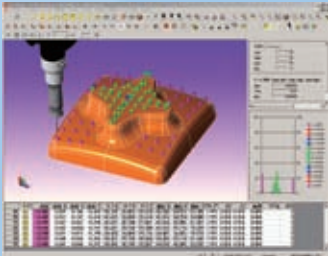
Tapped insert positions in the table surface

unit: mm



* Workpiece loading area
** Y-axis guiding surface

Software options handle all kinds of measurement



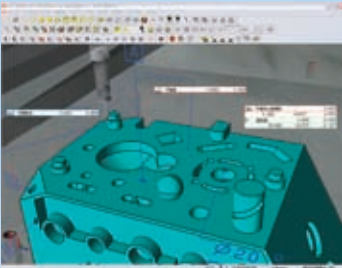
CAT1000S (freeform surface evaluation program)

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 to directly convert from/to various types of CAD data is available as an option.



GEOPAK (high-functionality general-purpose measurement program)

This 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, so even novices can promptly select desired functions. Its main features include easier viewing of measuring procedures and results such as realtime graphic display of measurement results and a function for direct call-up of elements from results graphics.



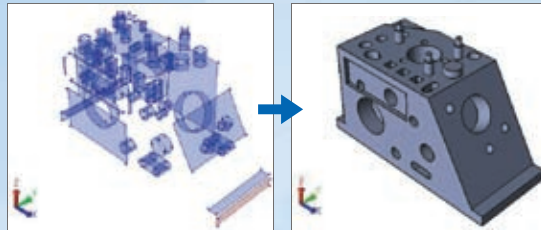
CAT1000P (off-line teaching program)

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



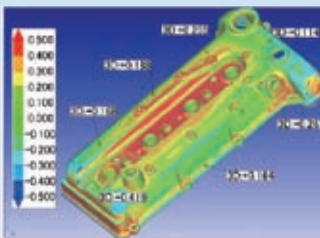
NC-Auto measure

This program generates CAD data from NC data.



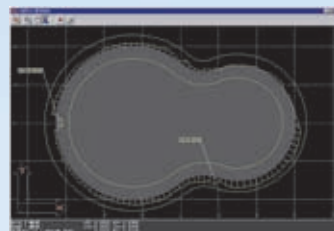
Solid Model Developer

This program generates CAD data from data measured using MCOsmOS.



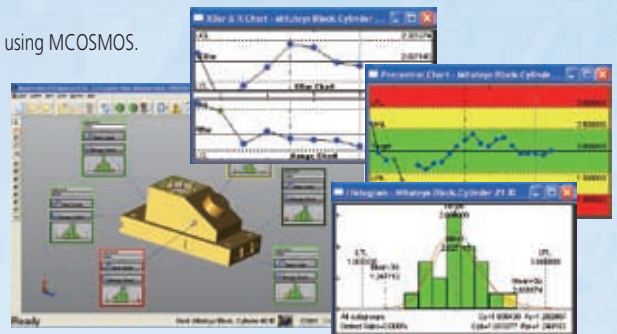
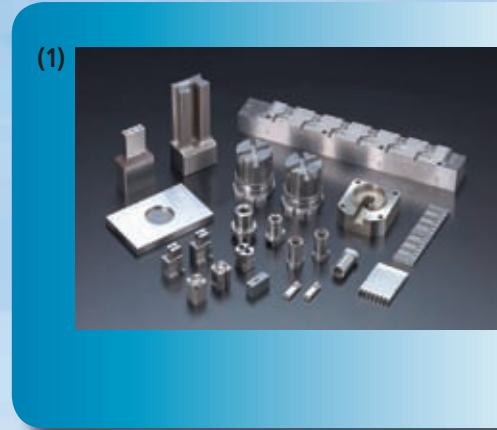
MSURF (non-contact laser measurement and evaluation program)

MSURF-S is used for obtaining 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.



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.



MeasurLink STATMeasure Plus (statistical-processing and process-controlling program)

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., wear or damage to 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.



GEARPAK (gear evaluation program)
For evaluating the most types of involute gears.



MPP-310Q (scanning probe)

A 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

MPP-10 (probe for effective screw depth measurement)

The probe that made it possible for a coordinate measuring machine to measure effective screw depth for the first time. The introduction of the auto probe changing system allows normal dimensional measurements as well as effective screw depth measurements to be made automatically.



(2)



Source of photographs

- (1) SHIN-NIHON TECH INC. URL <http://www.sntec.com>
- (2) TOYOTEC Co.,Ltd URL <http://www.toyotec.com>

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.



UMAP-CMM

This head makes it possible to use an ultra-small stylus (0.1- or 0.3-mm diameter). It can be installed on the PH10MQ to measure the shape and dimensions of microfabricated products from multiple directions.



QVP (vision probe)

This probe automatically detects edges from image data of the workpiece magnified by a CCD camera. It is extremely 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.

SURFTEST PROBE

The SURFTEST PROBE is a highly sensitive detector for measuring surface roughness using a CNC coordinate measuring machine. It is compatible with automatic probe-changing systems and therefore can be handled just as easily as the usual touch trigger or scanning probes. This new probe provides the ability to perform combined, automatic measurement of dimension, form and surface roughness on one machine at one setup. Mitutoyo will endeavor to meet requests for assistance with custom measurement applications by providing dedicated software making best use of its wide range of optional detectors.

SurfaceMeasure606/610/1010/606T (non-contact laser probe)

A lightweight, high-performance, non-contact probe developed for CNC coordinate measuring machines. Powder spray-less 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.

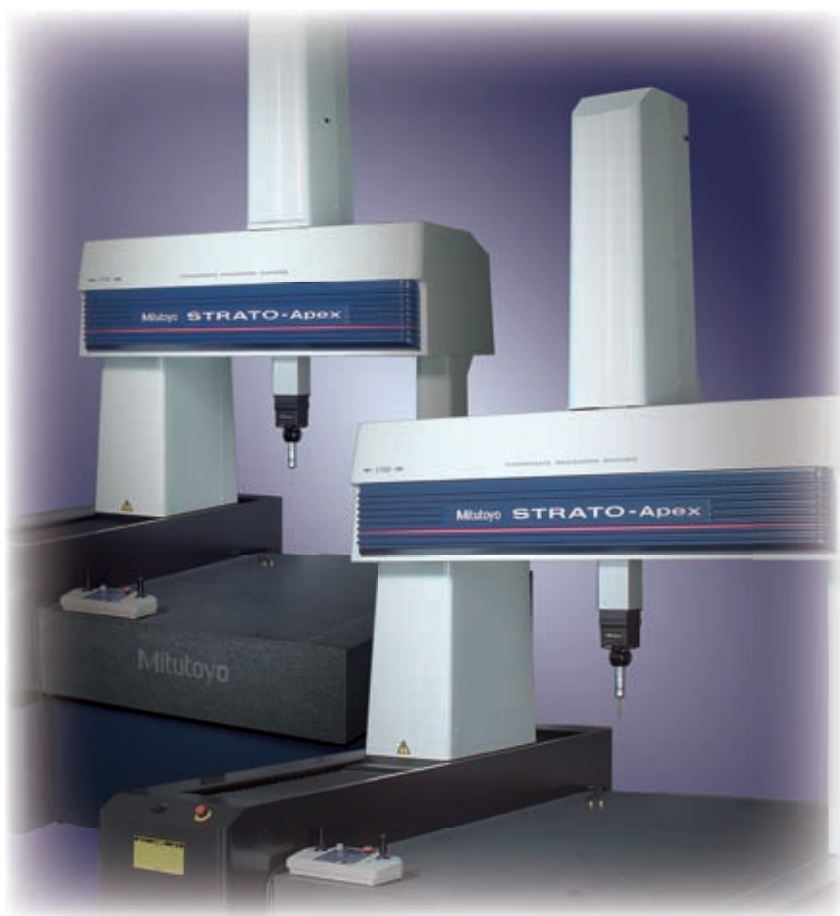


SurfaceMeasure 606/610/1010



SurfaceMeasure 606T





Specifications are subject to change without notice.

Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this pamphlet, 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, dimensions and weights. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. Only quotations submitted by ourselves may be regarded as definitive.

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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

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