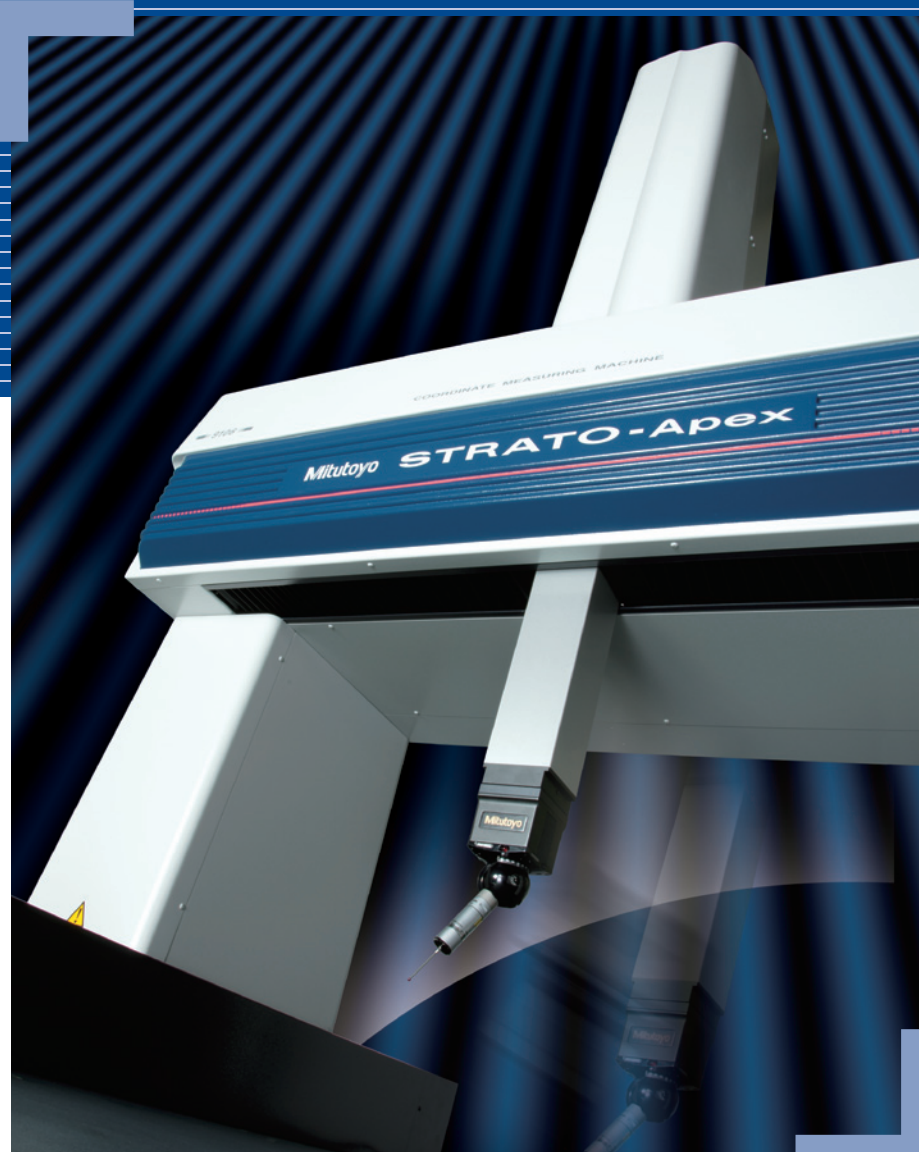


High Accuracy CNC Coordinate Measuring Machine **STRATO-Apex Series**

Bulletin No. 2028



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 long-awaited, state-of-the-art CNC accuracy 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 probe error: $MPE_{THP} = 1.8 \mu\text{m}$ (derived from scanning master ball during setup)
Maximum permissible scanning time $MPT_{\pm HP} = 45 \text{ sec}$ (to achieve $1.8 \mu\text{m}$ error)
(cf. Existing FALCIO Series: $MPE_{THP} = 2.2 \mu\text{m}$)
 $MPT_{\pm HP} = 110 \text{ sec.}$

*Probe used: SP25M



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Coordinate Measuring Machine that achieves high

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

Internal heat generation minimized

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



Mitutoyo STRATO-Apex

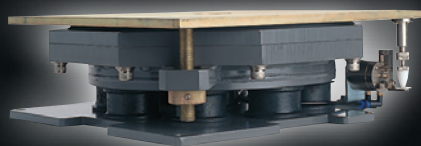
Ultra-high precision glass scales

- An ultra-high precision crystallized glass scale which has practically no thermal expansion (coefficient of linear expansion $0.01 \times 10^{-5}/^{\circ}\text{C}$) is combined with a high-performance reflective linear encoder with resolution of 0.00002mm 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.
- 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.

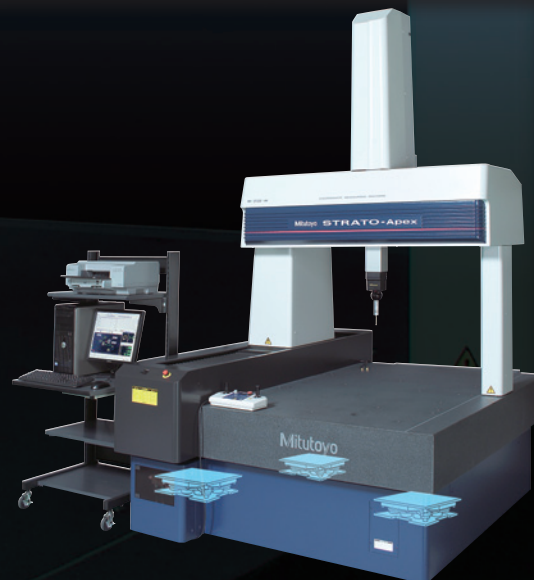


Vibration-dampening unit included as a standard accessory

- Vibration of the floor where the unit is installed shows up as measurement value variations. The STRATO-Apex Series comes equipped with a vibration-dampening unit that uses auto-leveling air springs. The vibration-dampening 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-dampening unit with auto-leveling air springs



▲Vibration-dampening unit positioning

Providing the Highest Speed and Accuracy in Moving-Integration of Key Measurement Technologies



STRATO-Apex 776



STRATO-Apex 9106

unit: Inch (mm)

Specifications

Item		STRATO-Apex 776	STRATO-Apex 7106	STRATO-Apex 9106	STRATO-Apex 9166
Measuring range	X	28" (705mm)		36" (905mm)	
	Y	28" (705mm)	39" (1005mm)		63" (1605mm)
	Z	24" (605mm)			
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)			
		unit: μm Measuring Speed 1 – 3mm/s			
	I/S mode	Drive Speed 0 – 80mm/s Measuring Speed 0 – 3mm/s Fine-positioning Speed 0.05mm/s			
Drive acceleration		1,500 mm/s ² for each axis (maximum combined acceleration: 2,598mm/s ²)			
Measuring method		Linear encoder			
Resolution		0.00002mm			
Work table	Material	Granite			
	Size (table surface)	35 x 56" (880 x 1420mm)	35 x 68" (880 x 1720mm)	42 x 68" (1080 x 1720mm)	42 x 91" (1080 x 2320mm)
	Tapped inserts	.31 x .049" (M8 x 1.25mm)			
Workpiece	Maximum height	30" (770mm)			
	Maximum mass	1760lb(800kg)	2200lb(1000kg)	2640lb(1200kg)	3300lb(1500kg)
Machine mass (includes the vibration-dampening platform and controller, but not workpiece)		4169lb(1895kg)	4796lb(2180kg)	5302lb(2410kg)	6787lb(3085kg)
Power supply specifications (including the probe option interface)		Power supply voltage: AC100-120/200-240 V \pm 10%; power supply capacity: 700 VA (of which 170 VA 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 K		
		Per 24 hours	2.0 K		
Temperature gradient	vertical/horizontal	1.0 K/m			

Maximum permissible error

unit: μm

	Probe used	Maximum permissible error
ISO 10360-2: 2001 (JIS B 7440-2: 2003)	SP25M/MPP-310Q	$MPE_E=0.9+2.5 L/1000$
	TP200	$MPE_E=1.4+2.5 L/1000$ (for model 776/7106) $MPE_E=1.5+2.5 L/1000$ (for model 9106/9166)

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.

Probing error

unit: μm

	Probe used	Maximum permissible probing error
ISO 10360-2: 2001 (JIS B 7440-2: 2003)	SP25M	$MPE_P=0.9$
	MPP-310Q	$MPE_P=0.9$
	TP200	$MPE_P=1.8$

Scanning accuracy specification

(high-density scanning measurement using a preset route)

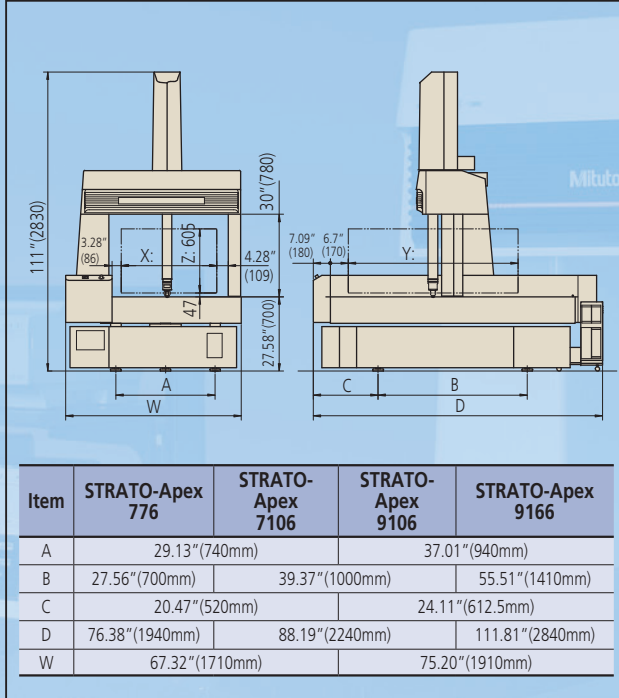
unit: μm

	Probe used	Maximum permissible scanning probe error (Maximum permissible scanning test time) [sec]
ISO 10360-4: 2001 (JIS B 7440-4: 2003)	SP25M	$MPE_{THP}=1.8 (MPT_{THP}=45)$
	MPP-310Q	$MPE_{THP}=2.0 (MPT_{THP}=70)$

Bridge Type Coordinate Measuring Machines

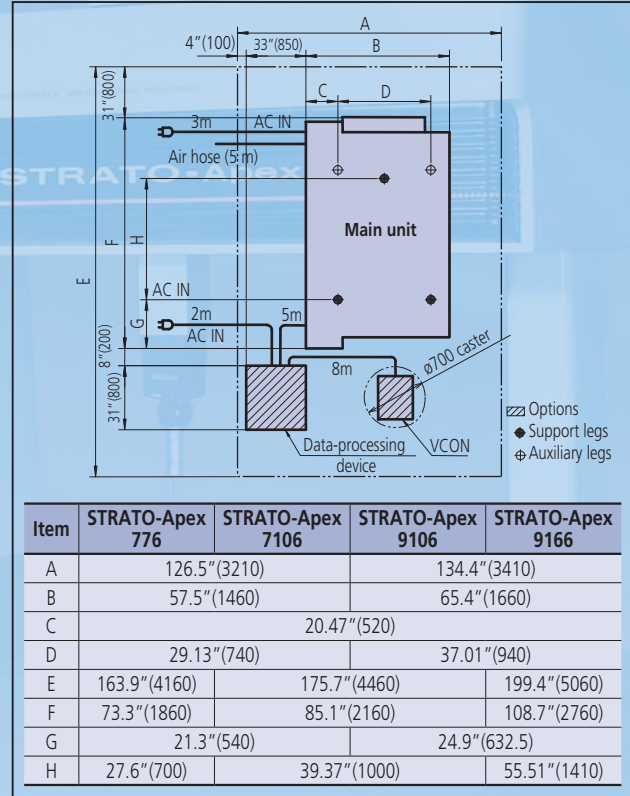
■ Dimensions

unit: Inch (mm)



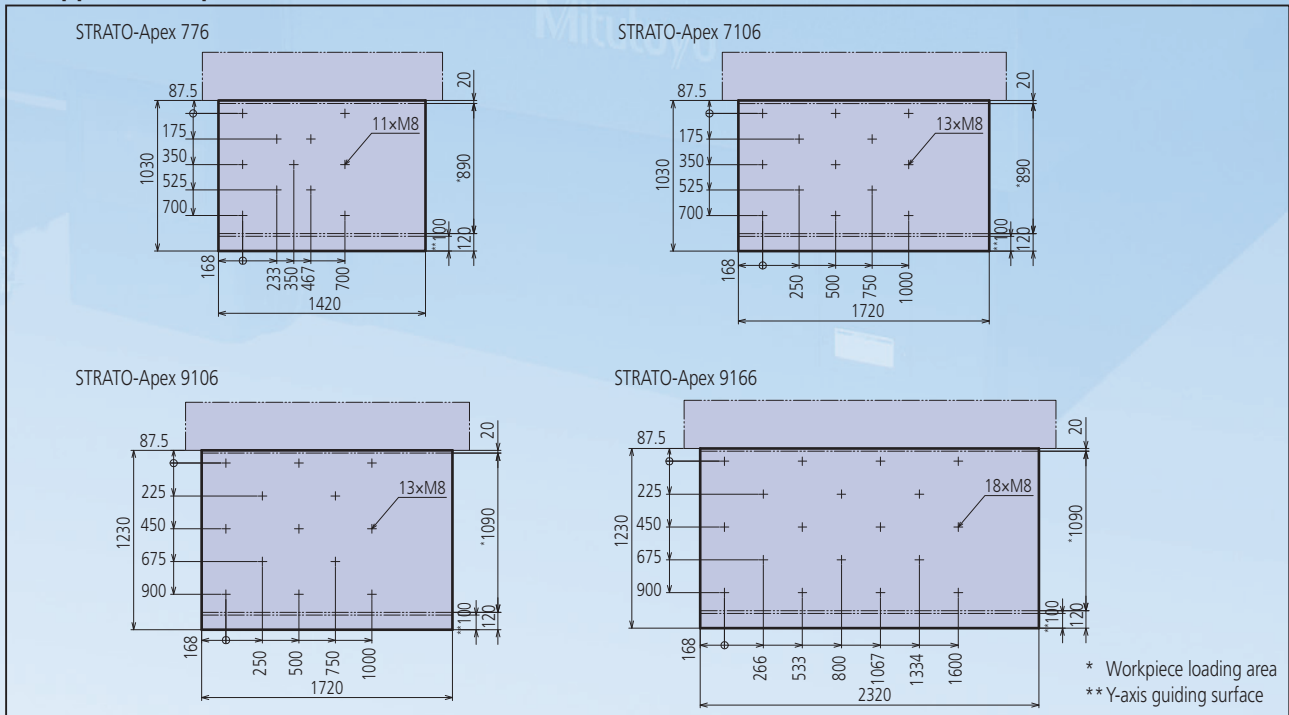
■ Installation floor space

unit: Inch (mm)

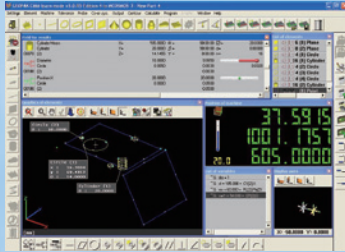


■ Tapped insert positions in the table surface

unit: mm

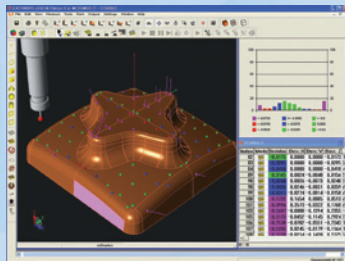


Software options handle all kinds of measurement



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 real-time graphic display of measurement results and a function for direct call-up of elements from results graphics.



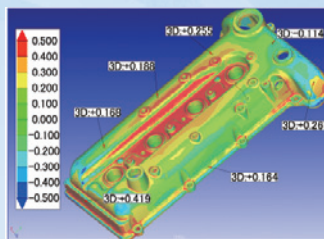
CAT1000S (Freeform Surface Evaluation Program)

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.



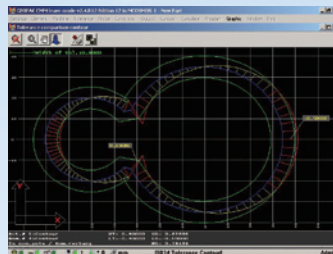
SurfaceMeasure606 (Non-Contact Laser Probe)

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



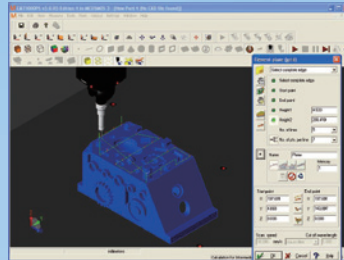
MSURF (Non-ncontact Laser Measurement and Evaluation Program)

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.



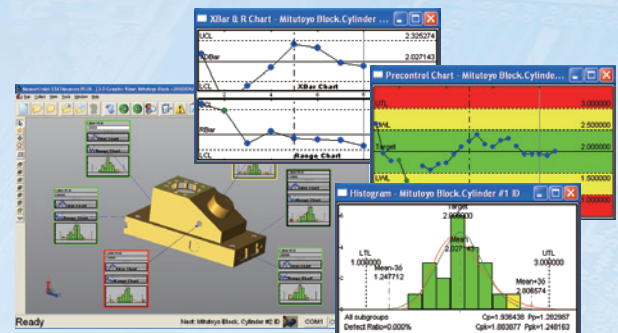
SCANPAK (Contour Measurement Program)

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.



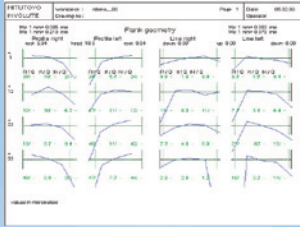
CAT1000P (Programming from a CAD Model)

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.



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.

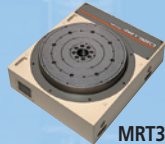


GEARPAK (Gear Evaluation Program)
For evaluating the most types of involute gears.



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.

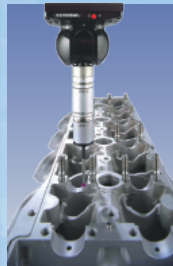


MRT320



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.



SP25M (Compact high-accuracy Scanning Probe)

This is a compact, high-accuracy, multi-function scanning probe with a 25mm 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 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 auto-focusing.



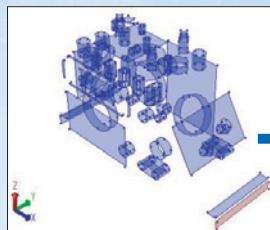
UMAP-CMM

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.



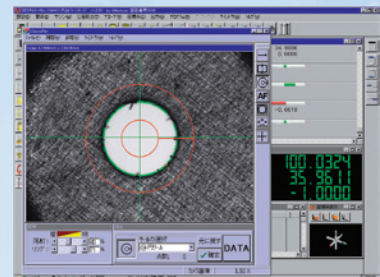
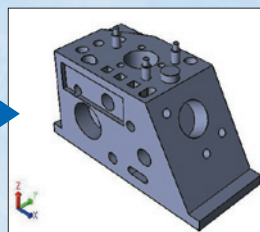
NC-Auto Measure

This program generates CAD data from NC data.



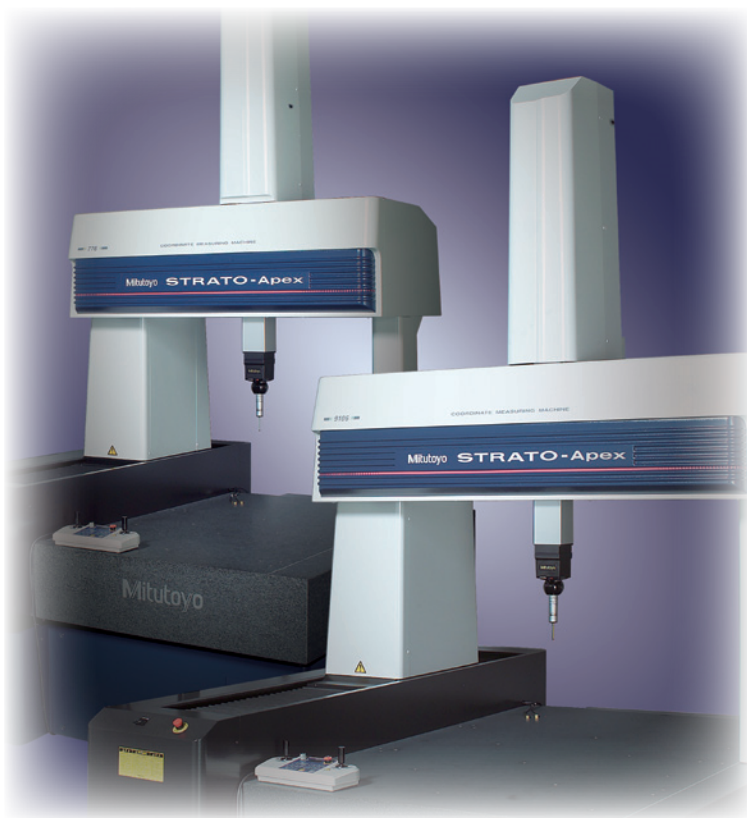
Solid Model Developer

This program generates CAD data from data measured using MCOSMOS.



VISIONPAK (Vision Measurement Program)

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



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

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