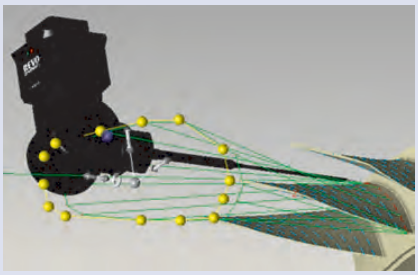
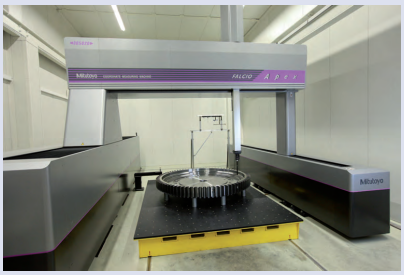
Coordinate Measuring Machines



CMM Software
Page 606

Mobile 3D Systems and Manual CMMs
Page 609

Small- and Medium Size CMMs
Page 611



Large Size CMMs
Page 615

In-Line and Shopfloor CMMs
Page 620

Measuring Heads, Probes and Styli
Page 623

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CMM Software

MCOSMOS - The Modular Software for all Kinds of Measurent

- Organize your measurement programs on the network
- Add comands and instructions to guide the operator
- Create individual reports meeting your customer's needs
- Archieve your results in formats like PDF, XLS, HTML and many other
- SPC with MeasurLink or export data to CAQ systems
- Export detected geometrical elements to CAD systems
- Revision Management for authorised usage of validated partprograms **as standard**
- Meet the requirements of FDA Title 21 CFR Part 11 without extra costs

The following packages are also available for Offline programming.
The so called "**Virtual MCOSMOS**" packages allow you to create part programs whilst the CMM is proofing your product quality.

Software package	MCOSMOS-1 Basic package	MCOSMOS Manual	MCOSMOS-2 CAD package	MCOSMOS-3 Full package
Part Manager				
• System configuration	●	●	●	●
• Part program handling				
• Data management				
• Create report templates				
GEOPAK				
• On/Off-line	●	●	●	●
• For prismatic elements				
• Operator guidance				
• Parametric programs				
CAT1000P				
• CAD programming			●	●
• For prismatic elements				
• Collision control				
• Incl. simulation				
CAT1000S				
• CAD programming			●	●
• Free-form inspection				
• Surface + edge points				
• Grahical Reports				
SCANPAK				
• For 2D contours				●
• Evaluate + manipulate				
• Graphical Reports				
• Data exchange to CAD + NC				

Additional software packages meeting your needs:

MeasurLink:
SPC software with certified AQDEF interface. Allows you to collect data from different vendors and devices. Its database offers collecting and analyzing data from all over the world, analyse your process and create individual reports.

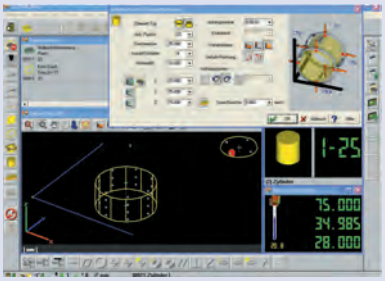
Correct-Plus:
Software for automatic feedback of correction data. It connects NC machining centers with any kind of measurement device like CMM, Small Tools, transducers or analogue probes.

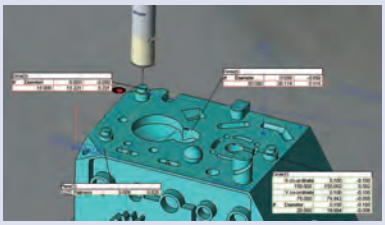
GEARPAK:
Turn your CMM into a gear measurement device! Extend your capabilities, measure gears, worm gears, helical gears. Just input the gear paramters - the rest will be done by GEARPAK: measurement strategy, path generation, probe changes, and of course the measurement report of your gear.

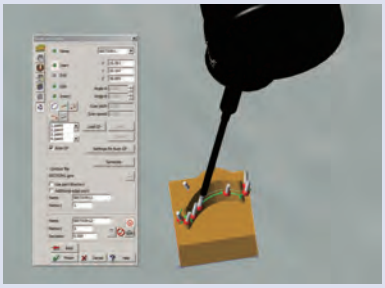
ROUNDPAK-CMM
Special evaluation tool for scanning measurements typically known from form measurement instruments. Topographic views and evaluation of form and position deviations.

GEO_EDM:
Capture the offset data of your EDM tools and workpieces. GEO_EDM is the solution for measuring the typical geometries in the EDM field, determining offset values and transferring this data to EDM centers. Lots of vendor formats like Charmilles®, Mitsubishi®, Ingersoll or System 3R® are supported.

PartManager


GEOPAK


CAT1000P


CAT1000S

For details, please ask for the MCOSMOS brochure.


Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

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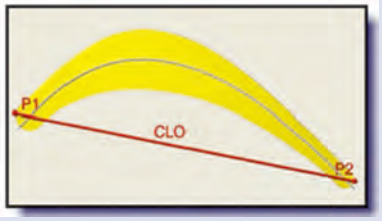
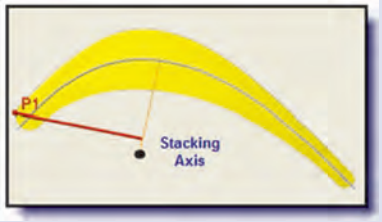
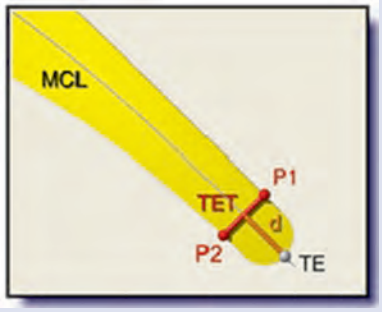
CMM Software



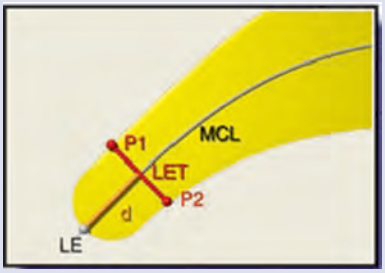
Overall Chord Length



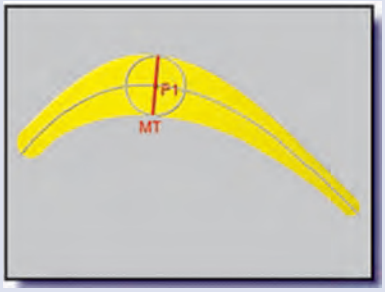
Stacking Axis



Trailing Edge – thickness on specific distance



Leading Edge – thickness on specific distance



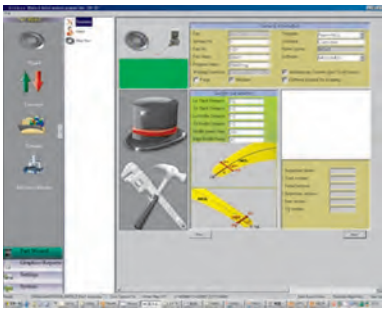
Maximum thickness

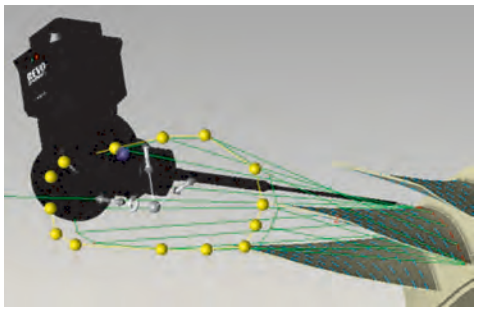
Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

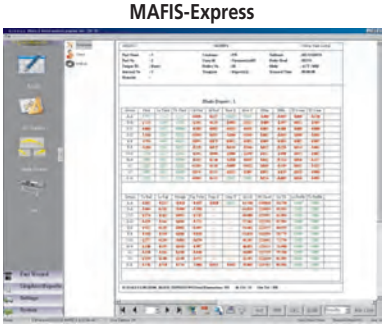
MAFIS-Express - Rapid Air Foil Inspection Software

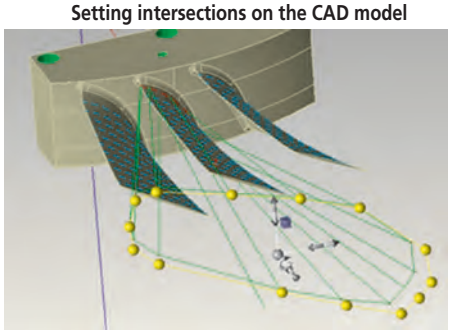
Mitutoyo introduces the fastest way for inspecting blades and blisks: MAFIS-Express.

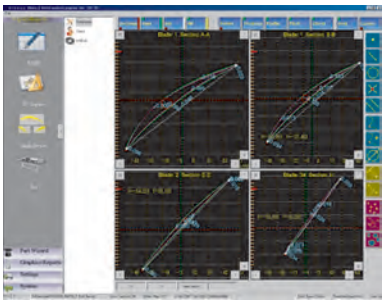
- Increases your throughput by time savings up to 90%
- Intuitive programming and easy handling
- For many kinds of airfoils like blades, blisks, gas turbines
- Easy Off-line programming on the CAD model
- Individual setting of the inspection routine: measure all or just some dedicated intersections
- Support of standards set by Rolls-Royce®, P&W, Siemens®, GE®, Honeywell®, SNECMA, Turbomeca® and others
- Ideal with the Revo® or SP25M probe heads


MAFIS-Express


Setting intersections on the CAD model


Numerical evaluation


Optimizing the probe path


Graphical evaluation

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CMM Software

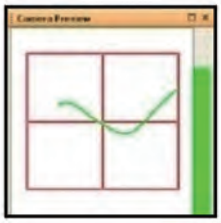
MSURF-S and MSURF-I

MSURF-S

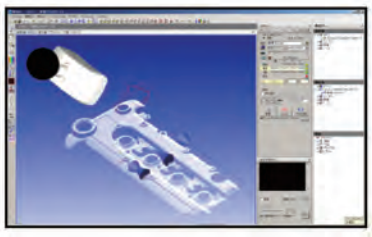
- Scanning paths can be created by simply defining three items : the scanning starting point, the scanning length, and the scanning width
- Scanning paths can be stored as measurement macros
- Point cloud data obtained from scanning can be exported in text or STL format
- MSURF-S can be started from MCOSMOS

MSURF-I

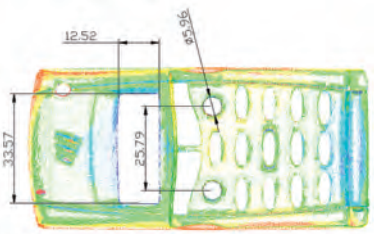
- Importing CAD data
- Feature-by-feature comparison
- Comparison of cross-sectional shapes



Screen sample from MSURF-S



Screen sample from MSURF-S

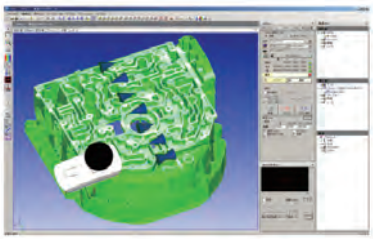


Screen sample from MSURF-I

MSURF-G

Off-line version for part program generation

- Semi-automatic function for creating measurement paths with optimum probe orientation
- Detection of collision between the probe and the workpiece model
- Generation of simulated data for the point cloud expected to be obtained through scanning
- Displaying measurement movements (scanner movements) in animation



Screen sample from MSURF-G

Screen sample from MSURF-G

Screen sample from MSURF-S/I

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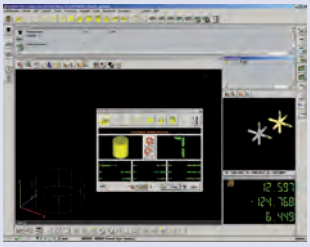
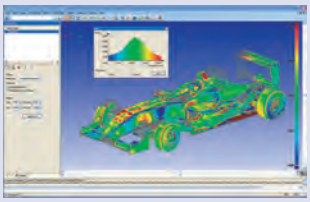
SpinArm-Apex S Series

SurfaceMeasure



MCOSMOS



MSURF-M

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

This product is not for use in the United States of America or for export into the United States of America.

Series 195 - Multi-axis Portable Coordinate Measuring System

This multi-axis portable coordination measuring system is designed to give you a portable solution. The SpinArm-Apex offers you the following benefits:

- Compact and lightweight so you can transport it easily.
- It has a brake function.
- It is counterbalanced, giving you easy, extended operation
- Wireless communication including a laser scanner for improved mobility.
- Thermal compensation.
- Automatic probe recognition

SpinArm

SpinArm-Apex S Models

No.	Model	Ø Measuring range [mm]	Repeatability	Point-to-point distance accuracy [1]	Number of axis
02AMA175	186	1,800	± 0.040 mm	± 0.055 mm	6
02AMA174	246	2,400	± 0.050 mm	± 0.065 mm	6
02AMA173	306	3,000	± 0.080 mm	± 0.100 mm	6
02AMA172	366	3,600	± 0.100 mm	± 0.135 mm	6
02AMA166	247	2,400	± 0.055 mm	± 0.080 mm	7
02AMA165	307	3,000	± 0.090 mm	± 0.135 mm	7
02AMA164	367	3,600	± 0.110 mm	± 0.165 mm	7

[1] Inspection method is conformed to Mitutoyo standard.

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CRYSTA-PLUS M Series

Series 196 - Manual CMM

This is a manual floating type coordinate measuring machine designed to give you very high accuracy in a wide range of applications, from simple dimensional to complex form measurement. The Crysta-Plus M offers you the following benefits:

- High-precision air bearings and lightweight moving members give you very smooth operation.
- Versatile for connection with powerful MCOSMOS software or simple QM-Data 300D calculator
- Continuous fine feed over the entire measuring range.
- You can also add an optional temperature compensation system.

Crysta-Plus M574

Crysta-Plus M7106

Crysta-Plus M Models:

No.	Model	Range [mm]	$E_{0,MPE}$ (1)	$P_{FTU,MPE}$ [µm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]	Temp.-Unit(2)
196-683	443	400 x 400 x 300	(3.0+0.40L/100) µm	4.0	180	480	410	
196-684D	443	400 x 400 x 300	(3.0+0.40L/100) µm	4.0	180	480	410	●
196-591	544	500 x 400 x 400	(3.5+0.45L/100) µm	4.0	180	595	495	
196-592	544	500 x 400 x 400	(3.5+0.45L/100) µm	4.0	180	595	495	●
196-596	574	500 x 700 x 400	(3.5+0.45L/100) µm	4.0	180	595	615	
196-597	574	500 x 700 x 400	(3.5+0.45L/100) µm	4.0	180	510	615	●
196-342	776	700 x 700 x 600	(4.5+0.45L/100) µm	5.0	500	800	1,560	
196-352	7106	700 x 1000 x 600	(4.5+0.45L/100) µm	5.0	800	800	1,800	

(1) According to ISO 10360-2:2010 when using probe TP20. L= measured length [mm].
(2)Temperature compensation unit for temperature range 15-30°C (see table in coloured area).

DATA PROCESSING OPTIONS:

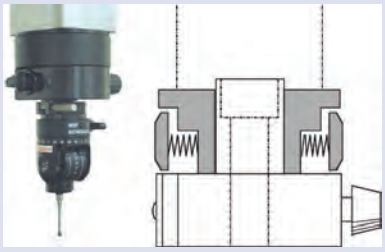
MCOSMOS

QM-DATA

Specifications

Guide system	Air bearing
Axis clamp	One-touch air clamp
Fine feed	Entire range
Digital step	0.5 µm

One-touch air clamp and fine feed for rapid and easy positioning



Ergonomically designed guide grip on Z-axis for reliable measurement (only for Crysta-Plus M776 and M7106)

Accuracy is specified for the following environmental conditions for the CMM

Temperature range		19°C - 21°C	**15°C - 30°C***
Temperature change	Per hour	-	**2.0 K**
	Per 24 hours	-	**5.0 K**
Temperature gradient	Vertical	0.5 K/m	**1.0 K/m**
	Horizontal	0.5 K/m	**1.0 K/m**

***The values shown in bold in the table above apply when using the temperature compensation system (optional):**

Crysta-Plus M brochure on request

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CRYSTA-APEX S Series

Series 191 - Standard CNC CMM

The CRYSTA-APEX S Series is a high performance, cost effective coordinate measuring machine, designed and constructed according to Mitutoyo's extensive experience in CNC CMM technology. It offers you the following benefits:

- Lightweight materials and an innovative machine structure deliver high motion stability, accuracy and affordability.
- The temperature compensation function (16°C to 26°C) allows you to take accurate measurements even on the shop floor.
- Compatible vision and scanning probe technologies give you flexible and effective measurement capabilities.

Specifications

Digital step	0.1 µm
$E_{0,MPE}$ [1]	(1.7+0.3L/100) µm [2] (1.7+0.4L/100) µm [3] L=measured length [mm]
$P_{FTU,MPE}$	1.7 µm
MPE_{THP}	2.3 µm
Drive speed	520 mm/s

[1] According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus Ø4x50mm.
[2] For temperature range 18°C - 22°C.
[3] For temperature range 16°C - 26°C.

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range		18°C - 22°C	16°C - 26°C
Temperature change	Per hour	1.0 K	1.0 K
	Per 24 hours	2.0 K	5.0 K
Temperature gradient	Vertical	1.0 K/m	1.0 K/m
	Horizontal	1.0 K/m	1.0 K/m

Joystick controller No. 06AAN641 (optional for CRT-AS 500 series)
Features:
-2 Levers
-Speed control
-Axis clamping
-Change operating position
-Store position

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

CRYSTA-Apex S9106

CRYSTA-Apex S Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]	Multi-Wire*
191-243	544	500 x 400 x 400	180	545	515	
191-247	574	500 x 700 x 400	180	545	625	
191-244	544	500 x 400 x 400	180	545	515	●
191-248	574	500 x 700 x 400	180	545	625	●
191-252	776	700 x 700 x 600	800	800	1,675	●
191-254	7106	700 x 1,000 x 600	1,000	800	1,951	●
191-292	9106	900 x 1,000 x 600	1,200	800	2,231	●
191-292H	9108	900 x 1,000 x 800	1,200	1,000	2,261	●
191-294	9166	900 x 1,600 x 600	1,500	800	2,868	●
191-294H	9168	900 x 1,600 x 800	1,500	1,000	2,898	●
191-296	9206	900 x 2,000 x 600	1,800	800	3,912	●
191-296H	9208	900 x 2,000 x 800	1,800	1,000	3,942	●

*Multi-Wire:CMM is ready for touch trigger probe, scanning probe, optical probe and laser scanning probe.

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Mitutoyo

CRYSTA-APEX S Series

Series 191 - Standard CNC CMM

The CRYSTA-APEX S Series is a high performance, cost effective coordinate measuring machine, designed and constructed according to Mitutoyo's extensive experience in CNC CMM technology. It offers you the following benefits:

- Lightweight materials and an innovative machine structure deliver high motion stability, accuracy and affordability.
- The temperature compensation function (16°C to 26°C) allows you to take accurate measurements even on the shop floor.
- Compatible vision and scanning probe technologies give you flexible and effective measurement capabilities.

CRYSTA-Apex S 122010

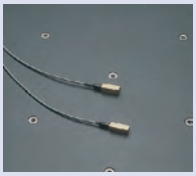
CRYSTA-Apex S Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-392	121210	1,200 x 1,200 x 1,000	2,000	1,200	4,050
191-394	122010	1,200 x 2,000 x 1,000	2,500	1,200	6,150
191-396	123010	1,200 x 3,000 x 1,000	3,000	1,200	9,110

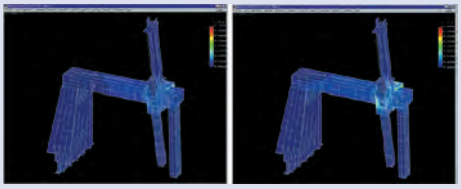
Specifications

Digital step	0.1 µm
$E_{0,MPE}$ (1)	(2.3+0.4L/100) µm (2) L = measured length [mm]
$P_{FTU,MPE}$	2.0 µm
MPE_{THP}	2.8 µm
Drive speed	520 mm/s

(1) According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus Ø4x50mm.
(2) For temperature range 16°C-26°C.



Temperature compensation system (temperature sensors)



The machine structure has been optimized using FEM (Finite-element Method) and modal analysis

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range		18°C - 22°C	16°C - 26°C
Temperature change	Per hour	1.0 K	1.0 K
	Per 24 hours	2.0 K	5.0 K
Temperature gradient	Vertical	1.0 K/m	1.0 K/m
	Horizontal	1.0 K/m	1.0 K/m

Refer to the CRYSTA-Apex S brochure

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STRATO-APEX Series

Series 355 - High accuracy CNC CMM

This a high accuracy CNC coordinate measuring machine that allows you to get accurate results at lightning speed.
The STRATO-APEX Series offers you the following benefits:

- High measurement accuracy and high-speed motion
- High-performance scanning.
- Ultra high precision scales on each axis.

Specifications

Digital step	0.02 µm
$E_{0,MPE}$[1]	(0.9+0.25L/100) µm L=measured lenght [mm]
$P_{FTU,MPE}$	0.9 µm
MPE_{THP}	1.8 µm
Drive speed	519 mm/s
3D Acceleration	2,598 mm/s²

[1] According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus ø4x50 mm.

Accuracy is specified for the following enviromental conditions for the CMM*:

Temperature range		19°C - 21°C
Temperature change	Per hour	1.0 K
	Per 24 hours	2.0 K
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

STRATO-Apex 9106

STRATO-Apex Models:

No.	Model	Range [mm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
355-502	776	700 x 700 x 600	500	770	1,895
355-507	7106	700 x 1,000 x 600	800	770	2,180
355-512	9106	900 x 1,000 x 600	800	770	2,410
355-517	9166	900 x 1,600 x 600	1,200	770	3,085

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LEGEX Series

Series 356 - Ultra-High Precision Premium CNC CMM

This LEGEX Series is the most accurate CNC coordinate measuring machine that gives you the ultimate accuracy.
The LEGEX Series offers you the following benefits:

- Rigorous analysis of all possible error-producing factors, and elimination or minimisation of their effects, delivers unsurpassed accuracy of 0.35µm.
- Ultra-high accuracy crystallised-glass scale with the ultra-low expansion coefficient of 0.01×10^{-6}/K is used on each axis.
- The fixed bridge structure and precision air bearings, running on highly rigid guideways, give you superior motion stability and ultra-high geometrical accuracy.
- You can use many different types of optional probe systems, including touch-trigger probes, laser scanning probes, and a vision measuring probe.

LEGEX 774

LEGEX Models:

No.	Model	Range [mm]	$E_{0,MPE}$(1)	$P_{FTU,MPE}$ [µm]	MPE_{THP} [µm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
356-373-5	574	510 x 710 x 455	0.35+0.1L/100	0.45	1.4	200	706	3,900
356-353	774	710 x 710 x 455	0.35+0.1L/100	0.45	1.4	500	696	5,000
356-357	776	710 x 710 x 605	0.35+0.1L/100	0.45	1.4	500	862	5,100
356-363	9106	910 x 1010 x 605	0.35+0.1L/100	0.45	1.4	800	856	6,500
356-343	12128	1210 x 1210 x 810	0.6+0.15L/100	0.6	1.8	1,000	1,056	10,500

(1) According to ISO 10360-2:2010 when using MPP-310Q probe system.
L=measured length [mm]

Specifications

Drive speed	200 mm/s
3D Acceleration	981 mm/s²
Digital step	0.01 µm

Accuracy is specified for the following environmental conditions for the CMM*

Temperature range		20±2°C
Temperature change	Per hour	0.5 K
	Per 24 hours	1.0 K/m
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m

CMM calibration using a virtually zero thermal expansion glass gauge

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

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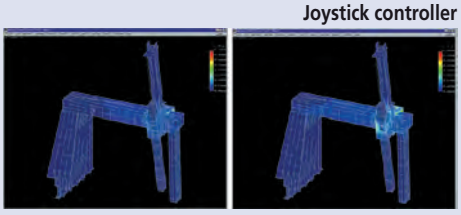
CRYSTA-APEX C Series

Specifications

Digital step	0.1 µm
Drive speed	520 mm/s

Joystick controller



The machine structure has been optimized using FEM (Finite-Element Method) and modal analysis

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

Series 191 - Standard CNC CMM

Large size and high performance CNC CMM, designed to provide high accuracy in various environment, ready for touch trigger probe, scanning probe, optical probe and laser scanner probe.

- Proven bridge type construction
- High rigidity air-bearing guiding on every axis
- High accuracy
- High speed and acceleration
- Temperature compensation from 16° to 24°C
- Glass scale with high resolution 0.1 µm
- Granite working table with M8 threads
- Multi-Function Joystick Box including two levers and speed adjustment

CRYSTA-Apex C 205016

CRYSTA-Apex C Models:

No.	Model	Range [mm]	$E_{0,MPE}$[1]	$P_{FTU,MPE}$ [µm]	MPE_{THP} [µm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
191-262-2	163012	1,600 x 3,000 x 1,200	3.3+0.55L/100	5.0	6.0	3,500	1400	10,600
191-272-2	164012	1,600 x 4,000 x 1,200	3.3+0.55L/100	5.0	6.0	4,500	1,400	14,800
191-282-2	165012	1,600 x 5,000 x 1,200	3.3+0.55L/100	5.0	6.0	5,000	1,400	19,500
191-262H-2	163016	1,600 x 3,000 x 1,600	4.5+0.55L/100	6.0	7.0	3,500	1,800	10,650
191-272H-2	164016	1,600 x 4,000 x 1,600	4.5+0.55L/100	6.0	7.0	4,500	1,800	14,850
191-282H-2	165016	1,600 x 5,000 x 1,600	4.5+0.55L/100	6.0	7.0	5,000	1,800	19,550
191-362-2	203016	2,000 x 3,000 x 1,600	4.5+0.9L/100	6.0	6.0	4,000	1,800	14,100
191-372-2	204016	2,000 x 4,000 x 1,600	4.5+0.9L/100	6.0	6.0	5,000	1,800	19,400
191-382-2	205016	2,000 x 5,000 x 1,600	4.5+0.9L/100	6.0	6.0	6,000	1,800	28,000
191-362H-2	203020	2,000 x 3,000 x 2,000	6.0+1.0L/100	7.5	7.5	4,000	2,200	14,150
191-372H-2	204020	2,000 x 4,000 x 2,000	6.0+1.0L/100	7.5	7.5	5,000	2,200	19,450
191-382H-2	205020	2,000 x 5,000 x 2,000	6.0+1.0L/100	7.5	7.5	6,000	2,200	28,050

[1]According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus Ø4x50mm.
L= measuring length [mm]

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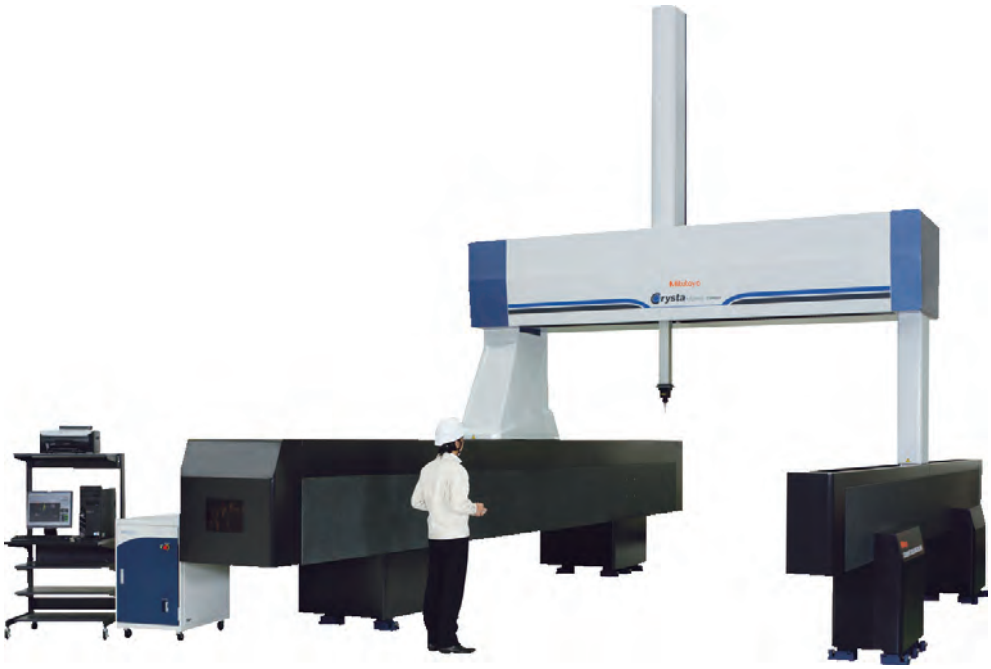
CRYSTA-APEX C Gantry Series

Series 191 - Standard Large CNC CMM

High precision gantry type CNC CMM, designed to provide top scanning performance for your largest workpieces, ready for touch trigger probe, scanning probe, optical probe, laser scanner probe.

- Improve structural rigidity gantry type construction with compensation technology
- High accuracy
- High speed and acceleration
- Temperature compensation from 18° to 22°C
- High precision glass scale with resolution 0.1 µm
- Multi-Function Joystick Box including two levers and a speed adjustment
- Available in many differen sizes from 2,000 x 3,000 x 1,500 mm to 3,000 x 5,000 x 2,000 mm.



CRYSTA-Apex C 203016 G

No.	Range [mm]	$E_{0,MPE}$ (1)	$P_{FTU,MPE}$ [µm]	MPE_{THP} [µm]
Crysta-Apex C 203016 G	2,000 x 3,000 x 1,600	(6.0+0.6L/100) µm	6.0	6.5
Crysta-Apex C 306020 G	3,000 x 6,000 x 2,000	(8.0+0.7L/100) µm	8.0	8.5

(1) According to ISO 10360-2:2010 when using probe SP25M, module SH25-1, stylus ø4x50 mm.
L= measured length [mm].

Specifications

Digital step	0.1 µm
Drive speed	500 mm/s

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range		18°C - 22°C	16°C - 26°C
Temperature change	Per hour	1.0 K	1.0 K
	Per 24 hours	2.0 K	5.0 K
Temperature gradient	Vertical	1.0 K/m	1.0 K/m
	Horizontal	1.0 K/m	1.0 K/m

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Foundation
This type series always requires a special foundation. Please contact your local Mitutoyo partner for further details.

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

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FALCIO-APEX Series

Specifications

Digital step	0.1 µm
Drive speed	500 mm/s

Accuracy is specified for the following environmental conditions for the CMM:*

Temperature range		18°C - 22°C
Temperature change	Per hour	1.0 K
	Per 24 hours	2.0 K
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

Series 355 - High accuracy CNC CMM

High precision large size bridge type CNC CMM, designed to provide top scanning performance with high accuracy, ready for touch trigger probe, scanning probe, optical probe, laser scanner probe.

- Improve structural rigidity bridge type construction with compensation technology
- High accuracy
- High speed and acceleration
- Temperature compensation from 18° to 22°C
- High precision glass scale with resolution 0.1 µm
- Integrated vibration-damping units with auto-levelling air springs
- Granite working table with M8 threads
- Multi-Function Joystick Box including two levers and a speed adjustment

FALCIO-Apex 163012

FALCIO-Apex Models:

No.	Model	Range [mm]	$E_{0,MPE}$ (1)	$P_{FTU,MPE}$ [µm]	MPE_{THP} [µm]	Loading Weight [kg]	Loading Height [mm]	Mass [kg]
355-592-1	162012	1,600 x 2,000 x 1,200	(2.8+0.40L/100) µm	2.8	2.8	3,500	1,350	9,500
355-594-1	162015	1,600 x 2,000 x 1,500	(3.3+0.45L/100) µm	3.3	3.5	3,500	1,650	9,600
355-597-1	163012	1,600 x 3,000 x 1,200	(2.8+0.40L/100) µm	2.8	2.8	4,000	1,350	14,000
355-599-1	163015	1,600 x 3,000 x 1,500	(3.3+0.40L/100) µm	3.3	3.5	4,000	1,650	14,050
355-602-1	164012	1,600 x 4,000 x 1,200	(2.8+0.40L/100) µm	2.8	2.8	4,500	1,350	25,000
355-604-1	164015	1,600 x 4,000 x 1,500	(3.3+0.45L/100) µm	3.3	3.5	4,500	1,650	25,050

(1) According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus ø4x50 mm.
L= measured length [mm].

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Mitutoyo

FALCIO-APEX Gantry Series

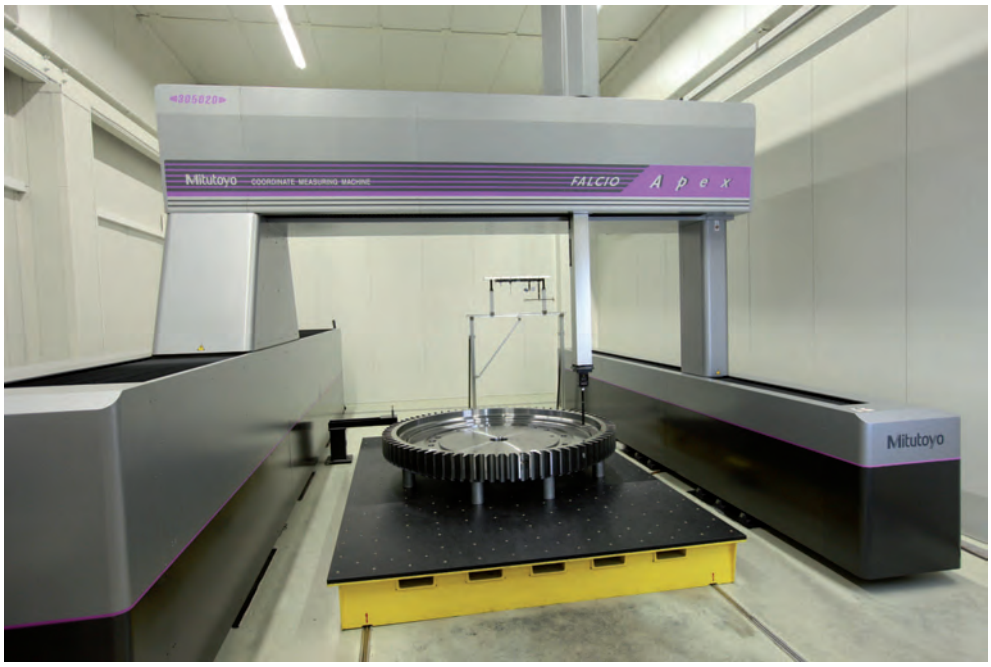
Series 355 - High accuracy Large CNC CMM

High precision gantry type CNC CMM, designed to provide top scanning performance for your largest workpieces, ready for touch trigger probe, scanning probe, optical probe, laser scanner probe.

- Improve structural rigidity gantry type construction with compensation technology
- High accuracy
- High speed and acceleration
- Temperature compensation from 18° to 22°C
- High precision glass scale with resolution 0.1 µm
- Multi-Function Joystick Box including two levers and a speed adjustment
- Available in many differen sizes from 2,000 x 3,000 x 1,500 mm to 3,000 x 5,000 x 2,000 mm.

Specifications

Digital step	0.1 µm
Drive speed	520 mm/s



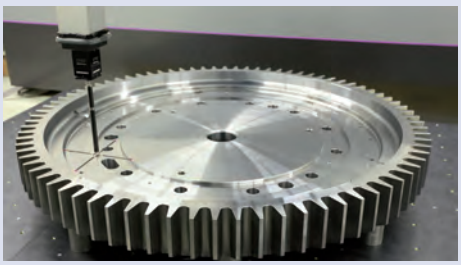
FALCIO-Apex 305020 G measuring a gear for a wind turbine engine

Accuracy is specified for the following environmental conditions for the CMM:*

Temperature range		18°C - 22°C
Temperature change	Per hour	1.0 K
	Per 24 hours	2.0 K
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m

No.	Range [mm]	$E_{0,MPE}$ (1)	$P_{FTU,MPE}$ [µm]	MPE_{THP} [µm]
FALCIO-Apex 203015 G	2,000 x 3,000 x 1,500	(3.5+0.45L/100) µm	3.5	3.8
FALCIO-Apex 305020 G	3,000 x 5,000 x 2,000	(4.4+0.45L/100) µm	4.0	4.2

(1) According to ISO 10360-2:2010 when using probe SP25M, moule SM25-1, stylus Ø4x50 mm. L=measured length [mm].



Scanning with probe SP80 and 100 mm styli.

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Foundation
This type series always requires a special foundation. Please contact your local Mitutoyo partner for further details.

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CARB-Strato Series / CARB-Apex Series

Series 360 - Car Body Measuring System

A large, horizontal-type arm CNC CMM for measuring car bodies or similar components. Single/ dual-head types are available ; the dual-head type measures by controlling two heads simultaneously, one from each side.

MAIN FEATURES CARBstrato : large, high precision, dual-head type.
MAIN FEATURES CARBapex : large, single-head type, affordable.

Specifications

Range X-axis	4,000-8,000 mm
Range - Y-axis	1,400-1,600 mm
Range - Z-axis	2,000-2,600 mm
Scale	High accuracy linear encoder
Guide system	X-axis : linear guide ; YZ-axis : air bearing
Drive speed	866 mm/sec (CARBstrato) 519 mm/sec (CARBapex) mm/s
3D Acceleration	0,2G (CARBstrato) 0,1G (CARBapex) mm/s²
Digital step	0.1 µm

Accuracy is specified for the following environmental conditions for the CMM*:

Temperature range		16°C - 26°C
Temperature change	per hour	1.0 K
	per 24 hours	5.0 K
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m

CARBstrato / CARBapex Series brochure on request

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

Foundation
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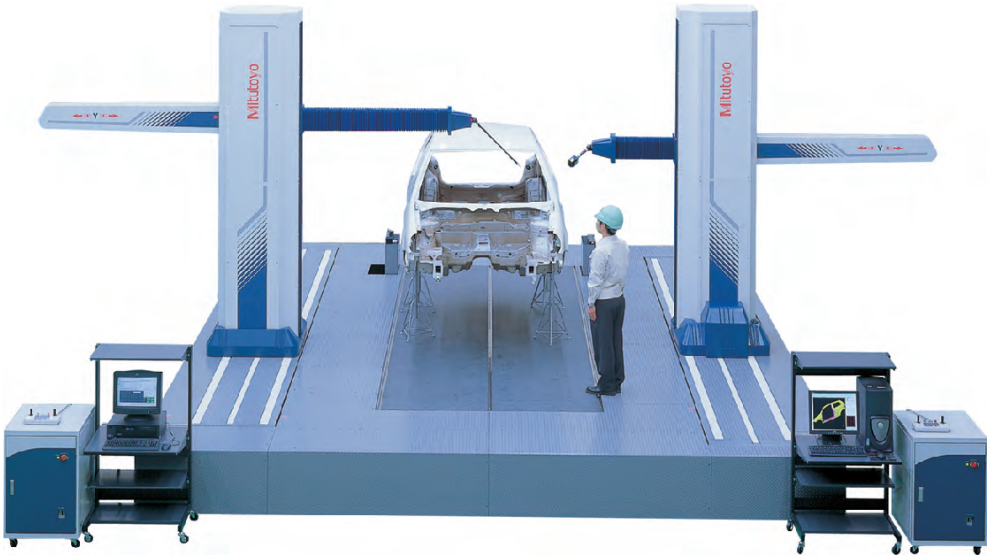

CARBstrato

No.	Accuracy[1] $E_{0,MPE}$
CARBstrato	(18+20L/1000)µm
CARBapex	(25+28L/1000)µm

[1] According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus ø 4x50 mm. L= measured length (mm).

CARBapex

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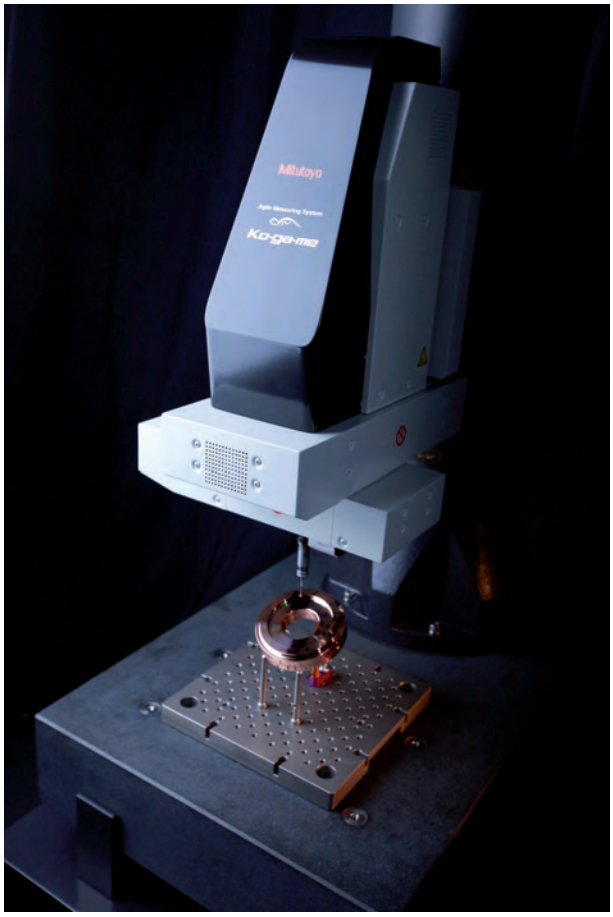
MACH-KO-GA-ME Series

Series 357 - Agile Measurement System

- Compact in-line system
- High-speed measurements
- For scanning and touch-trigger measurements
- Ideal for single feature inspection
- Extremely Small Footprint - perfect for automated cells
- Also as stand alone solution
- Designed for production environment 10°C-35°C



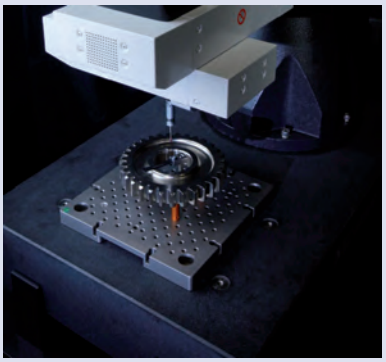
MACH-Ko-ga-me 884-3V with optional stand

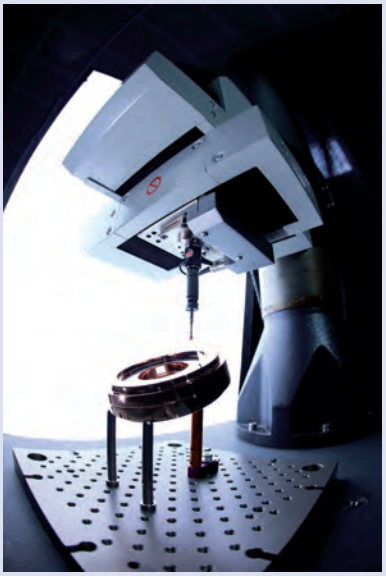
MACH Ko-ga-me Models:

No.	Model	Range [mm]	Mass [kg]
357-126	884-3V	80 x 80 x 40	26
357-127	888-3V	80 x 80 x 80	29
357-136	12124-3V	120 x 120 x 40	33
357-137	12128-3V	120 x 120 x 80	36

Specifications

Digital step	0.02 µm
$E_{0,MPE}$ [1]	(2+0.50L/100) µm (19-21°C) (3+0.72L/100) µm (10-35°C) L = measured length [mm]
$P_{FTU,MPE}$	2.0 µm
MPE_{THP}	2.5 µm
Drive speed	340 mm/s
3D Acceleration	6750 mm/s²





[1] According to ISO 10360-2:2010 when using probe SP25M, module SM25-1, stylus ø4x50mm.

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MACH-3A 653

Series 360 - High-Speed In-Line CMM

Super high speed and acceleration Production-line Coordinate Measuring Machine with horizontal spindle, designed for intensive use in hostile workshop environment.

- Super High speed and acceleration
- Drastic reduction of the measurement cycle compared with any conventional CMM
- All in One Compact design to minimize the foot print in the workshop and to improve the dust resistance
- Work piece handling and routing in the same posture as for other horizontal spindle machining centres
- Control unit and PC are installed in the dust-tight rack with heat exchanger.
- Ease-of-maintenance construction and air-free operation using high accuracy linear ball bearing
- Temperature compensation from 5°C to 40°C
- Glass scale with high resolution 0.1 µm
- Safety joystick box with deadman switch and speed adjustment
- Optional with index table for higher flexibility

Specifications

Digital step	0.1 µm
$E_{0,MPE}$[1]	(2.5+0.35L/100) µm[2] (3.9+0.65L/100) µm[3]
$P_{FTU,MPE}$	2.5 µm
Drive speed	1212 mm/s

(1)According to ISO 10360-2:2010 when using probe TP7M, stylus ø4x50 mm. L= measured length [mm].
(2)For temperature range 19°C-21°C.
(3)For temperature range 5°C-40°C.

Accuracy is specified for the following environmental conditions for the CMM

Temperature range		5°C - 40°C
Temperature change	per hour	2.0 K
	per 24 hours	10.0 K
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m

Safety System
For this type series, Mitutoyo offers a customized safety system. Depending on the local situation in your facility, Mitutoyo will propose a tailor-made solution meeting the requirements of the Machinery Directive.

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No.	Model	Range [mm]
360-412	MACH-3A 653	600 x 500 x 285 mm

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MACH-V 9106

Series 360 - In-line type CNC CMM

High speed and acceleration Production-line Coordinate Measuring Machine with vertical spindle, designed for intensive use in hostile workshop environment.

- Higher speed and accuracy with barycentric drive
- Improved dust resistance by installing all drive system and scale units in the dust-tight enclosure on the machine top
- Control unit and PC are installed in the dust-tight rack
- Space-saving design helps installation in a production line
- Flexible loading options due open access to the measuring area
- Ease-of-maintenance construction and air-free operation using high accuracy linear ball bearing
- Temperature compensation from 5° to 35°C
- Glass scale with high resolution 0.1 µm.

MACH-V 9106

No.	Model	Range [mm]
360-226A	MACH-V9106	900 x 1,000 x 600

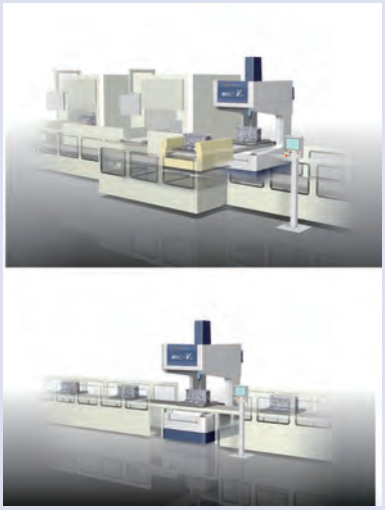
Specifications

Digital step	0.1 µm
$E_{0,MPE}$ [1]	(2.5+0.35L/100) µm [2] (3.6+0.58L/100) µm [3]
$P_{FTU,MPE}$	2.5 µm
Drive speed	866 mm/s

[1] According to ISO 10360-2:2010 when using probe TP7M, stylus ø4x50 mm. L=measured length [mm].
[2] For temperature range 19°C-21°C.
[3] For temperature range 5°C-35°C.

Accuracy is specified for the following environmental conditions for the CMM*

Temperature range		5°C - 35°C
Temperature change	per hour	2.0 K
	per 24 hours	10.0 K
Temperature gradient	Vertical	1.0 K/m
	Horizontal	1.0 K/m



Safety System
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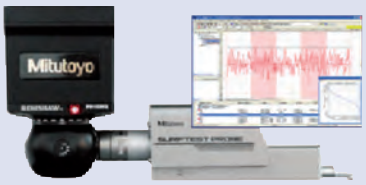
CMM Probes



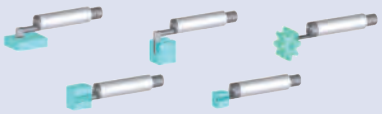
SURFTEST Probe

SURFTEST Probe

Surface Roughness Measurement directly on the CMM!

This latest Mitutoyo probe head closes the gap between typical dimensional CMM measurements and surface roughness inspection. Instead of having to take the workpiece to another measuring instrument or using additional portable systems, the SURFTEST Probe adds roughness measurement capability to your CMM and so avoids all the cost and inconvenience of additional systems. It brings the proven technology of the SJ-310 series to the CMM with all its highly capable range of detectors developed for handling specialist applications such as roughness measurement on gears, inside small holes or deep grooves, in addition to simple flat surface measuring tasks.

- Proven technology from Mitutoyo's SJ-310 Surftest
- Chose from five types of detector for variant applications
- High accuracy – no CMM movement during measurement
- One CNC measurement cycle produces all results
- Graphical and numerical output
- One Measurement report for all GD&T requirements



Optional detectors

SurfaceMeasure

SurfaceMeasure

Mitutoyo's Laser Line Scanning Probe

- Suitable for inspection by CAD comparison and reverse engineering purposes.
- Autojoint mounting compatible with PH10M/MQ and automatic probe change racks.
- Automatic laser intensity and camera sensitivity adjustment according to the surface texture.
- Powder-sprayless measurement even for glossy or multiple colors surfaces.
- High Speed Scanning by High Acquisition rate of 75.000 points/sec (1.000 points/line).
- Scanning uncertainty: 12 µm.
- Maximum scanning width: 60 mm.
- Working Distance: 93 mm.

QVP (Quick Vision Probe)

QVP

Mitutoyo's Vision Probe System for CMMs

- Fast optical measurements – the perfect choice for small features and soft materials
- Ideal in combination with tactile probes
- Prepared for automatic probe change
- Four objective lenses offer different optical magnification
- From 0.375 x to 3.75 x
- White LED ring light
- White LED coaxial light

Mitutoyo offers you over 600 styli plus highly specialised equipment for your measuring task - Refer to the small tool section of the catalogue for detailed information.

The prices listed are suggested retail prices (valid until 31st May 2014). All products to be sold to commercial customers. Therefore VAT is not included. Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon.

Mitutoyo

CMM Probes

MPP-310Q

Ultra-High Precision Scanning Probe

- High resolution of 0.01 µm
- Measuring range ±1 mm
- Extremely low measuring forces of 0.03 N
- Styli length up to 200 mm
- Air bearing for smooth measurements
- Axis clamping for scanning on slanted or arched surfaces

MPP-310Q

PH20

Rapid tactile measurements at any probe angle

- Head touch for improved repeatability
- Feature-based calibration for improved accuracy
- Probe change with TP20 moduls
- Allowing subsequent measurement at any head angle
- Full support in MCOSMOS

No.
PH20

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CMM Probes

Scanning probe systems

SP80

SP25M

SP600M

Touch-trigger probe systems

TP7M
High accuracy type

TP200
Compact and high accuracy (stylus change type)

SCR200
Rack

Micro Touch Probe
UMAP-CMM

TP20
Compact type

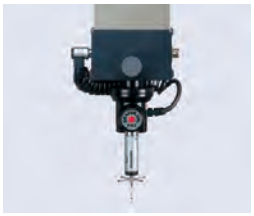
MCR20
Rack

MH20i / MH20
Manual Probes

Probe heads

PH10M
Motor drive index type

MIH
Manual index type



PH1
Simple manual type

TP8
Manual Indexable Probe

CMM Probes brochure on demand

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Quick Guide to Precision Measuring Instruments

Coordinate Measuring Machines

The procedure for assessing the performance of CMMs is defined in the international standard series EN ISO 10360. Mitutoyo is keen to always quote the most recent ISO standards. This page gives you an overview of the ISO parameters Mitutoyo shows in this catalogue.

Maximum Permissible Measuring Error (MPE) of length measurement $E_{0,MPE}$ [EN ISO 10360-2]

The test procedure under this standard is that a coordinate measuring machine (CMM) is made to perform a series of measurements on five different test lengths in each of seven directions, as shown in Figure 1, to produce a set of 35 measurements. This sequence is then repeated twice to produce 105 measurements in all. If these results, including allowances for the uncertainty of measurement, are equal to or less than the values specified by the manufacturer then the performance of the CMM has been proved to meet its specification.

The standard allows up to five measurements to exceed the specified value (two NG results among 3-time measurements in the same position are not allowed). If this is the case, additional 10-times measurements for the relevant position are performed. If all the 10 results, including the uncertainty allowance, are within the specified value, the CMM is assumed to pass the test. The uncertainties to be considered in determining the maximum permissible measuring error are those concerning calibration and alignment methods used with the particular material standards of length involved with the test. (The values obtained by adding an extended uncertainty combining the above two uncertainties to all test results must be less than the specified value.) The result of the test may be expressed in any of the following three forms (unit: µm).

$E_{0,MPE}=A+L/K\leq B$
$E_{0,MPE}=A+L/K$
$E_{0,MPE}=B$

A: Constant (µm) specified by the manufacturer
K: Dimensionless constant specified by the manufacturer
L: Measured length (mm)
B: Upper limit value (µm) specified by the manufacturer

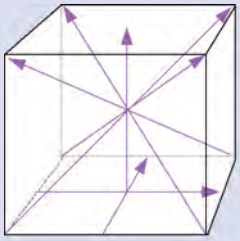

Figure 1 Typical test measurement directions within the CMM measuring volume

Maximum Permissible Scanning Probing Error MPE_{THP} [EN ISO 10360-4]

This is the accuracy standard for a CMM if equipped with a scanning probe. The test procedure is to perform a scanning measurement of 4 planes on the standard sphere and then, for the least squares sphere center calculated using all the measurement points, calculate the range (dimension 'A' in Figure 3) in which all measurement points exist. Based on the least squares sphere center calculated above, calculate the distance between the calibrated standard sphere radius and the maximum measurement point or minimum measurement point, and take the larger distance (dimension 'B' in Figure 3). Add an extended uncertainty that combines the uncertainty of the stylus tip shape and the uncertainty of the standard test sphere shape to each A and B dimension. If both calculated values are less than the specified values, this scanning probe test is passed.

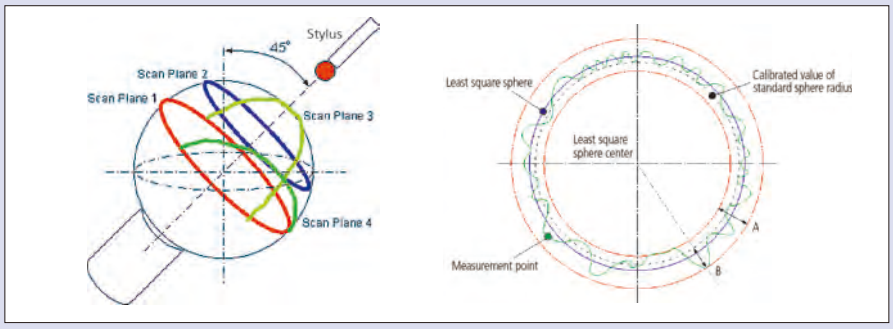

Figure 3 Target measurement planes for the maximum permissible scanning probing error and its evaluation concept

Maximum Permissible Single Stylus Form Error $P_{FTU,MPE}$ [EN ISO 10360-5]

The test procedure under this standard is that a probe is used to measure defined target points on a standard sphere (25 points, as in Figure 2) and the result used to calculate the position of the sphere center by a least squares method. Then the distance R from the sphere center for each of the 25 measurement points is calculated, and the radius difference Rmax - Rmin is computed. An extended uncertainty that combines the uncertainty of the stylus tip shape and that of the standard test sphere is added to the radius difference. If this final calculated value is equal to or less than the specified value, the probe has passed the test.

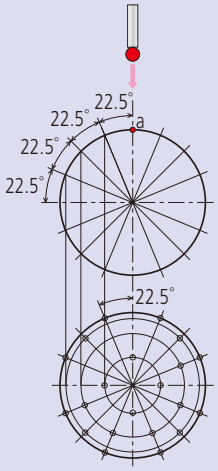

Figure 2 Target points on standard sphere for determining the Maximum Permissible Single Stylus Form Error

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