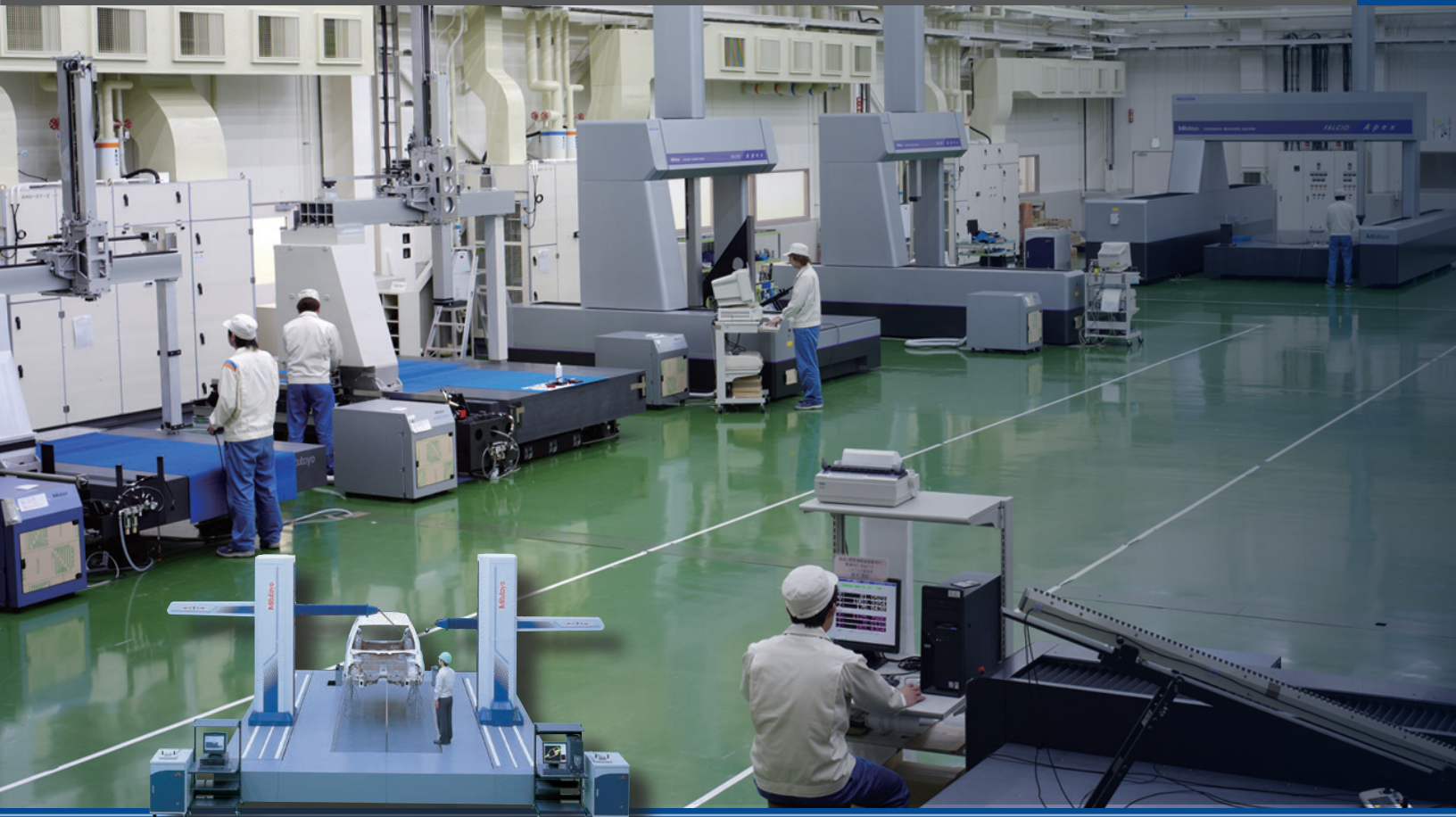


## CNC Coordinate Measuring Machines CUSTOM SPECIFICATIONS

COORDINATE  
MEASURING MACHINES



# INTRODUCTION

Based on our well-received standard coordinate measuring machine technology, we have developed, designed and manufactured coordinate measuring machines using various custom specifications in response to customer demands.

**Measure long,  
large workpieces**



**Efficient measurement of large  
cylindrical workpieces**



**Accurate measurement of large workpieces**



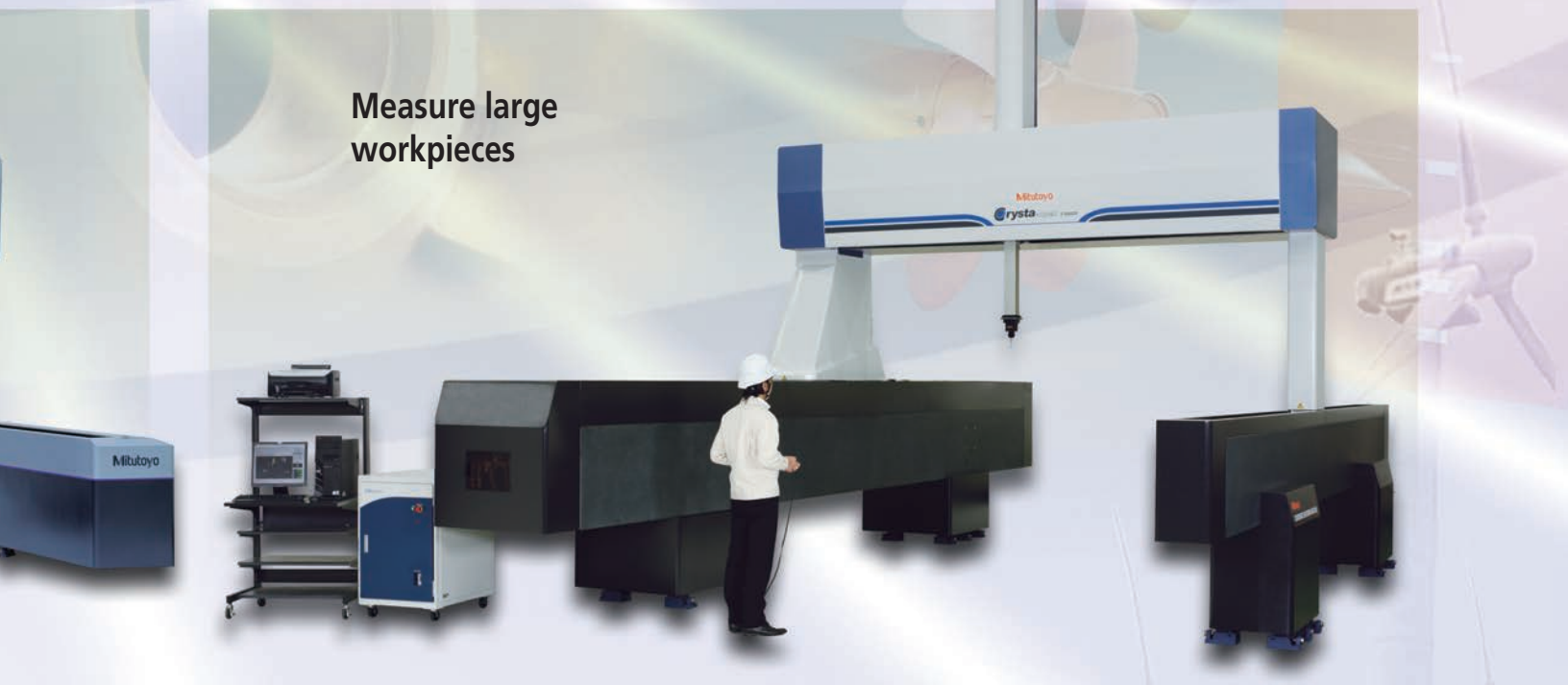


**Best seller  
Crysta-Apex C Series:  
standard large machines**

78.9" (2005mm) x 197.0" (5005mm)  
x 63.1" (1605mm) measuring range



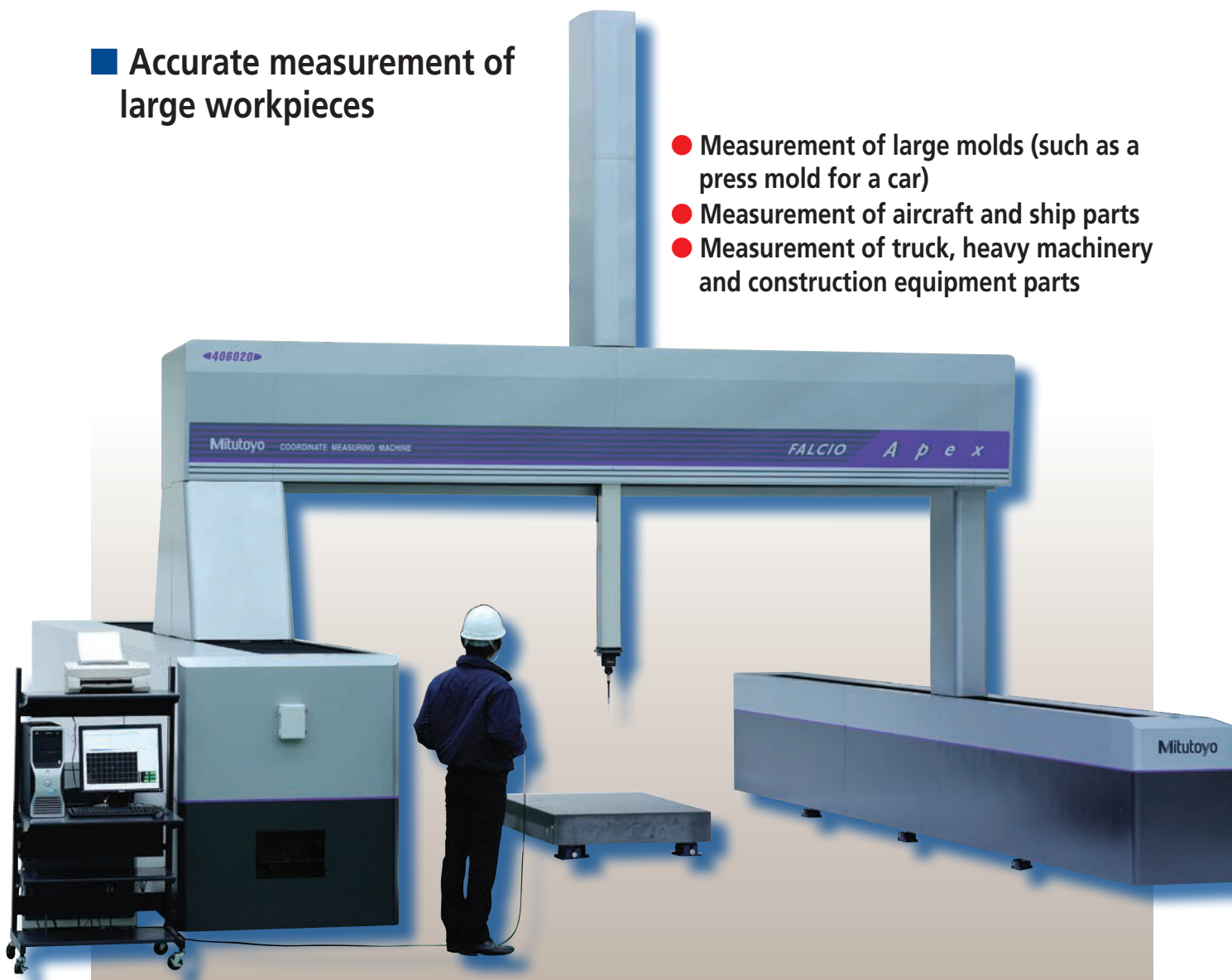
**Measure large  
workpieces**



# Large Separate Guide FALCIO Apex Series

■ Accurate measurement of large workpieces

- Measurement of large molds (such as a press mold for a car)
- Measurement of aircraft and ship parts
- Measurement of truck, heavy machinery and construction equipment parts



## \*pecifications

Model No.	FALCIO Apex						
	203015G	203020G	204015G	303012G	305015G	305020G	406020G
Measuring range (mm)	78.9" (2005mm)			118.3" (3005mm)			157.6" (4005mm)
	118.3" (3005mm)		157.6" (4005mm)	118.3" (3005mm)	197.0" (5005mm)		236.4" (6005mm)
	59.2" (1505mm)	78.9" (2005mm)	59.2" (1505mm)	47.4" (1205mm)	59.2" (1505mm)	78.9" (2005mm)	78.9" (2005mm)
Measuring error MPE <sub>z</sub> (μm)	[TP200] (4.8+5L/1000)	[TP200] (9+7L/1000) [SP25M] (7+7L/1000)	[TP200] (4.8+5L/1000)	[TP200] (4.9+5L/1000)	[TP200] (5.5+5L/1000)	[TP200] (9.5+10L/1000) [SP80] (6+8L/1000)	[TP200] (10+10L/1000) [SP25M] (8+8L/1000)
L: measuring length (mm)							
Max. workpiece weight (kg)	Depends on the basic specifications	Depends on the basic specifications	Depends on the basic specifications	Depends on the basic specifications	Depends on the basic specifications	Depends on the basic specifications	Depends on the basic specifications

# Large Separate Guide FALCIO Apex 30303G

## ■ Measure large, thin workpieces



Worktable (with a backlight)

## ● Measuring a large sheet for an LCD



### Specifications

Model No.	FALCIO Apex 30303G	
Measuring range (mm)	X	118.3" (3005mm)
	Y	118.3" (3005mm)
	Z	12" (305mm)
*Measuring error MPE <sub>E</sub> (μm)		[TP200]
L: measuring length (mm)		(5.5+5L/1000)
Max. workpiece weight		110 lbs.(50kg)**

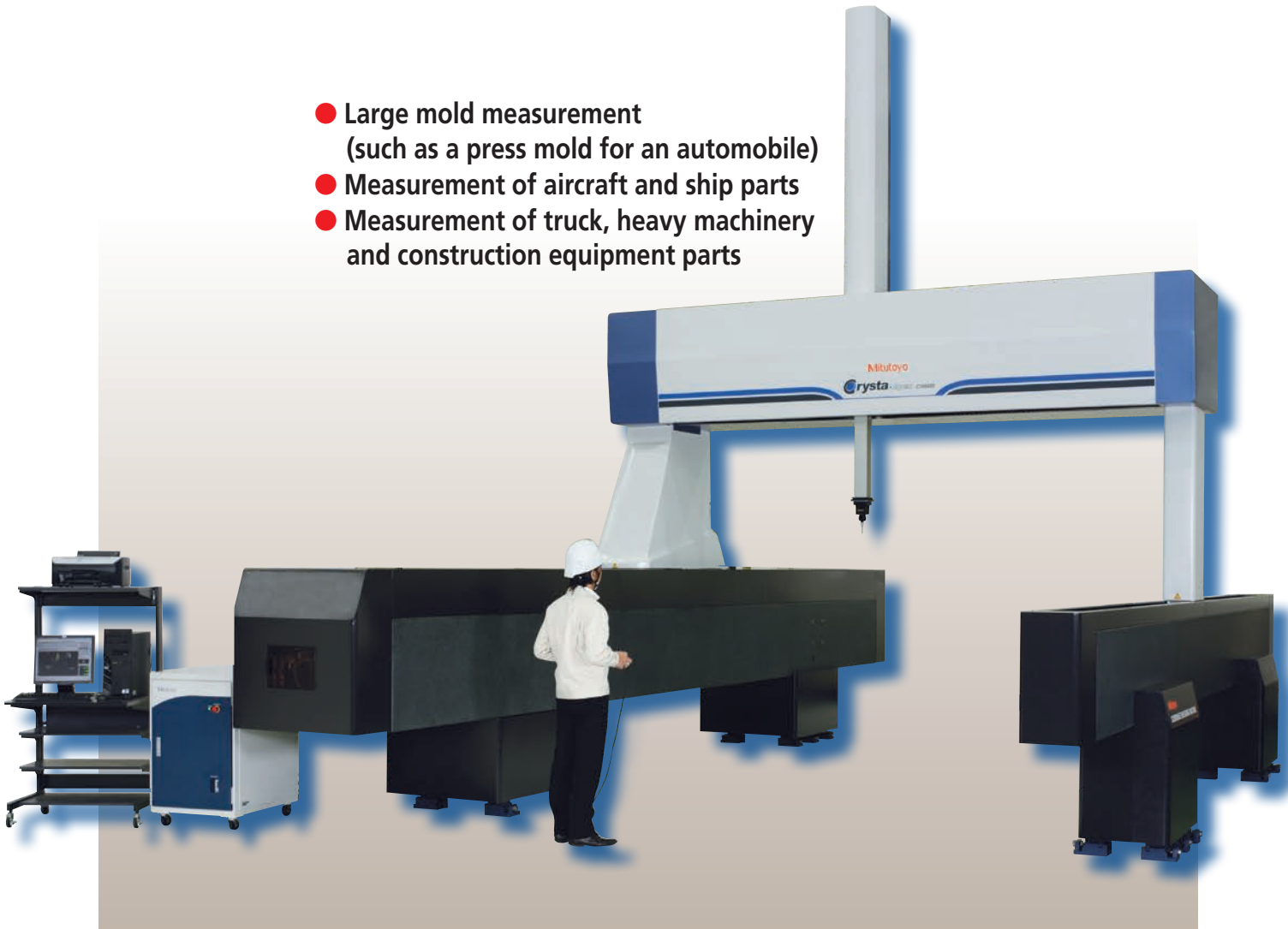
\* For the accuracy when using the QVP, the error is 4 μm or less per meter when using the standard lens (x 3 magnification).

\*\* Stage material is glass.

# Large Separate Guide Crysta-Apex C Series

## ■ Measure large workpieces

- Large mold measurement  
(such as a press mold for an automobile)
- Measurement of aircraft and ship parts
- Measurement of truck, heavy machinery  
and construction equipment parts



### Specifications

Model No.	Crysta-Apex C	
	203016G	306020G
Measuring range (mm)	X 78.9" (2005mm)	118.3" (3005mm)
	Y 118.3" (3005mm)	236.4" (6005mm)
	Z 63.1" (1605mm)	78.9" (2005mm)
Measuring error MPE <sub>e</sub> (μm)	[TP200] (9+8L/1000)	[TP200] (11+9L/1000)
L: measuring length (mm)	[SP25M] (6+8L/1000)	[SP25M] (8+9L/1000)
Max. workpiece weight (kg)	Depends on the basic specifications	Depends on the basic specifications

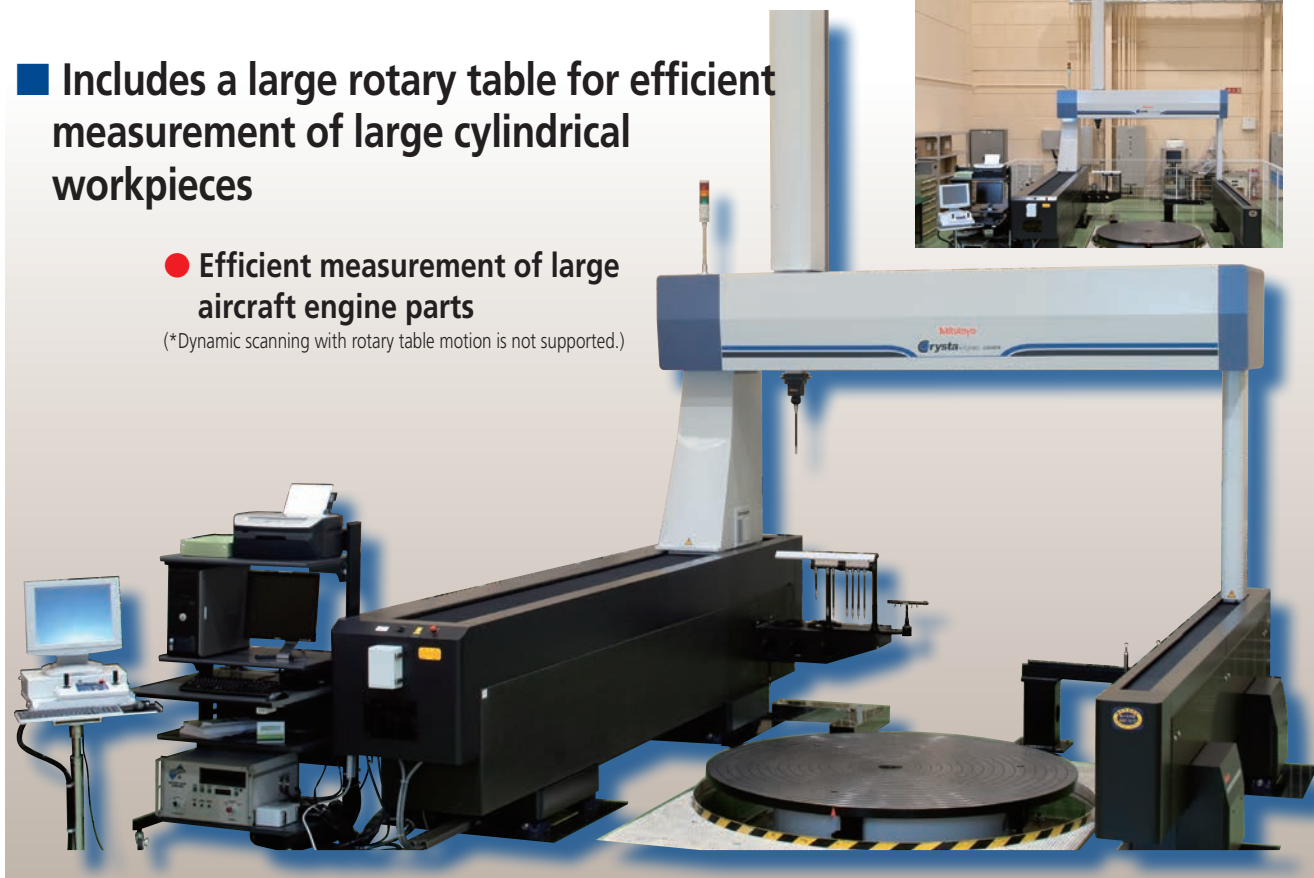
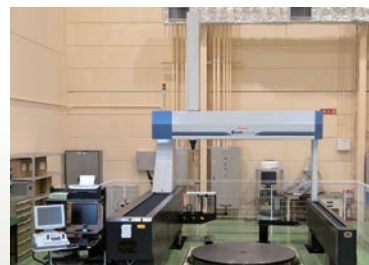


# Large Separate Guide with Large Rotary Table

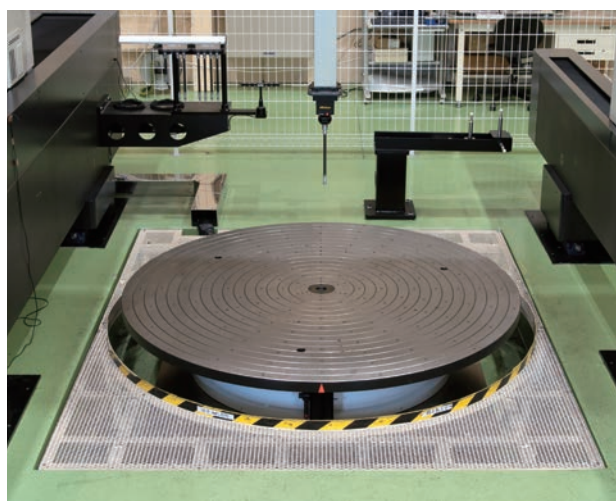
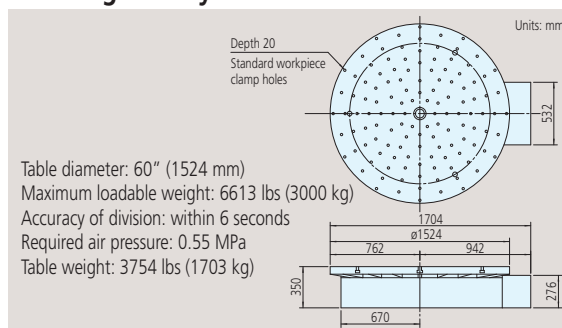
■ Includes a large rotary table for efficient measurement of large cylindrical workpieces

● Efficient measurement of large aircraft engine parts

(\*Dynamic scanning with rotary table motion is not supported.)



## Specifications and external dimensions of the large rotary table

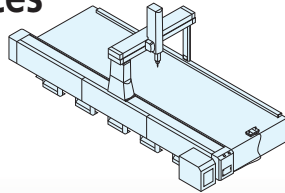


## Specifications

Model No.	Crysta-Apex C203016G	
	Includes a rotary table ø60" (ø1524mm)	
	X	78.9" (2005mm)
Measuring range (mm)	Y	118.3" (3005mm)
	Z	63.1" (1605mm)
*Measuring error MPE <sub>E</sub> (μm)	[TP200]	
L: measuring length (mm)	(9+8L/1000)	
Max. workpiece weight	6613 lbs (3000kg) (depends on the rotary table specifications)	

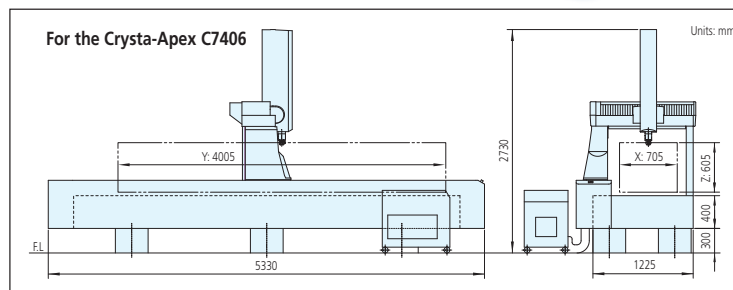
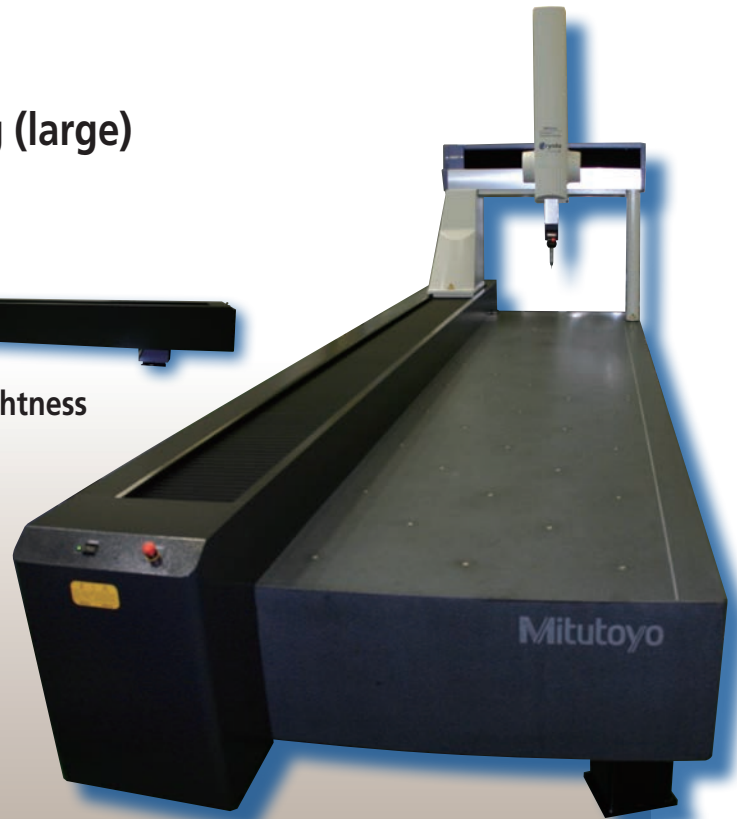
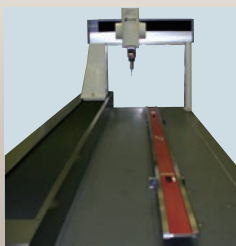
# Crysta-Apex C700/900 Series Custom Sizes

## ■ Custom sizes for measuring long (large) workpieces



### ● Application: accurate evaluation of straightness using inversion

By measuring a straightness master in advance and then calculating the straightness error in three-dimensional space, you can perform a high-accuracy straightness evaluation.



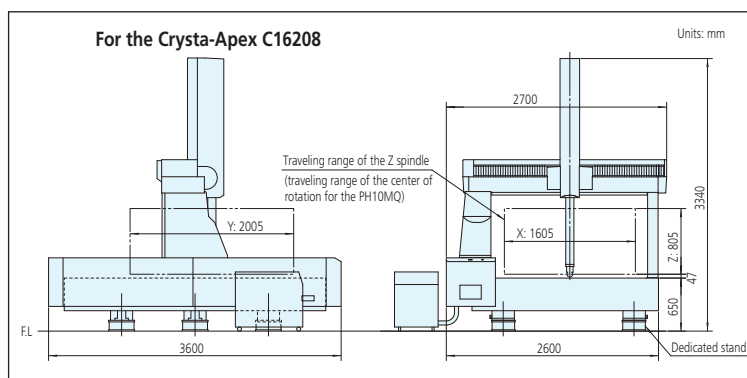
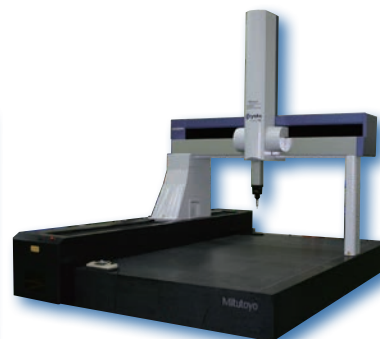
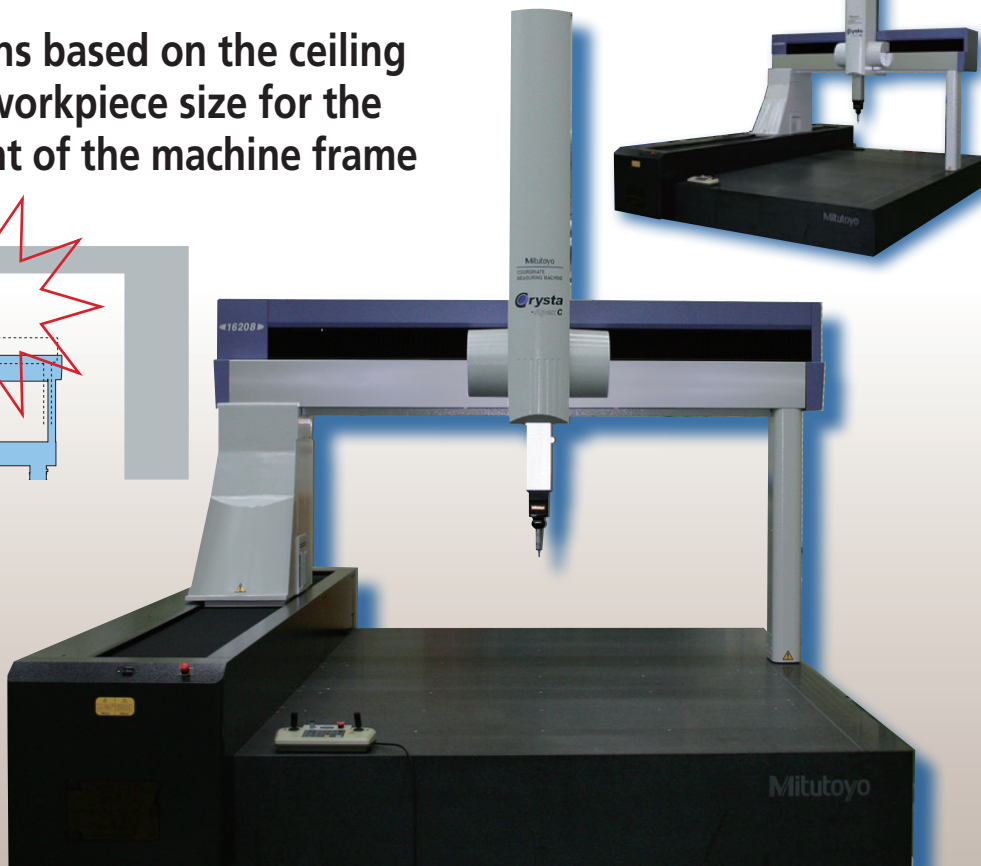
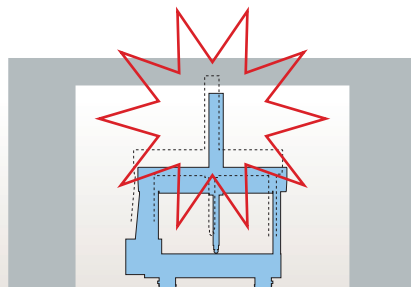
## Specifications

Model No.	Crysta-Apex C							
	774	7256	7306	7406	7406ST	7506	976	9104
Measuring range (mm)	X	27.7" (705mm)	27.7" (705mm)	27.7" (705mm)	27.7" (705mm)	27.7" (705mm)	35.6" (905mm)	35.6" (905mm)
	Y	27.7" (705mm)	98.6" (2505mm)	118.3" (3005mm)	157.6" (4005mm)	157.6" (4005mm)	197.0" (5005mm)	39.5" (1005mm)
	Z	15.9" (405mm)	23.8" (605mm)	23.8" (605mm)	23.8" (605mm)	23.8" (605mm)	23.8" (605mm)	15.9" (405mm)
Measuring error MPEx (μm)	Same as standard machine 776		[SP25M]	[TP200]	[SP25M]	[TP200]	Same as standard machine 9106	
L: measuring length (mm)			(1.9+4L/1000)	(1.9+4L/1000)	(3.0+3L/1000)	(1.9+4L/1000)		
Special straightness (μm)	—		Y axis straightness (in the direction of the X axis) 1.0μm/2500mm	Y axis straightness (in the direction of the X axis) 1.0μm/3000mm	—	Y axis straightness (in the direction of the X axis) 1.4μm/4000mm	—	
Max. workpiece weight	1,764 lbs (800kg)	Guaranteed accuracy: 2,204 lbs (1000kg) Permissible load: 5,511 lbs (2500kg)		2,204 lbs (1000kg)	Guaranteed accuracy: 2,204 lbs (1000kg) Permissible load: 5,511 lbs (2500kg)	2,204 lbs (1000kg)	2,204 lbs (1000kg)	2,645 lbs (1200kg)
Machine weight	3,747 lbs (1700kg)	12,235 lbs (5550kg)	13,007 lbs (5900kg)	14,000 lbs (6350kg)	15,440 lbs (6550kg)	17,306 lbs (7850kg)	4,232 lbs (1920kg)	4,850 lbs (2200kg)
Remark		Various conditions must be satisfied for guaranteed straightness.			Various conditions must be satisfied for guaranteed straightness.			



# Crysta-Apex C1600/2000 Series Custom Sizes

- Specifications based on the ceiling height and workpiece size for the overall height of the machine frame



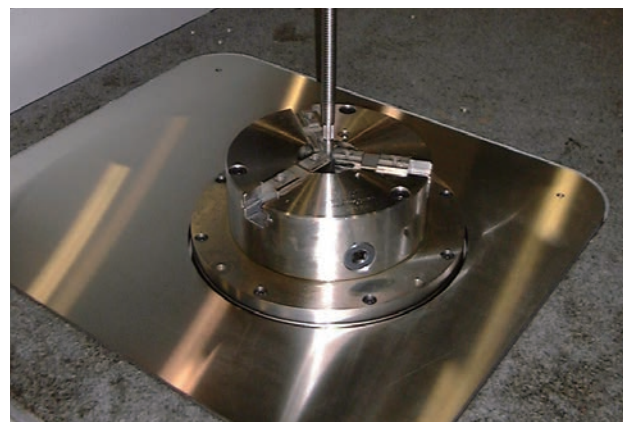
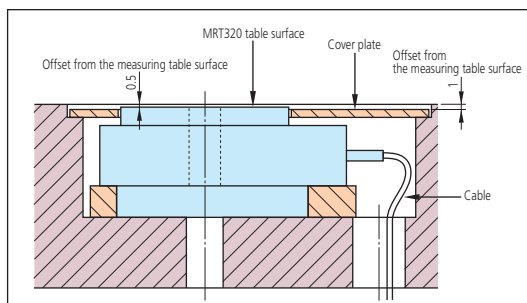
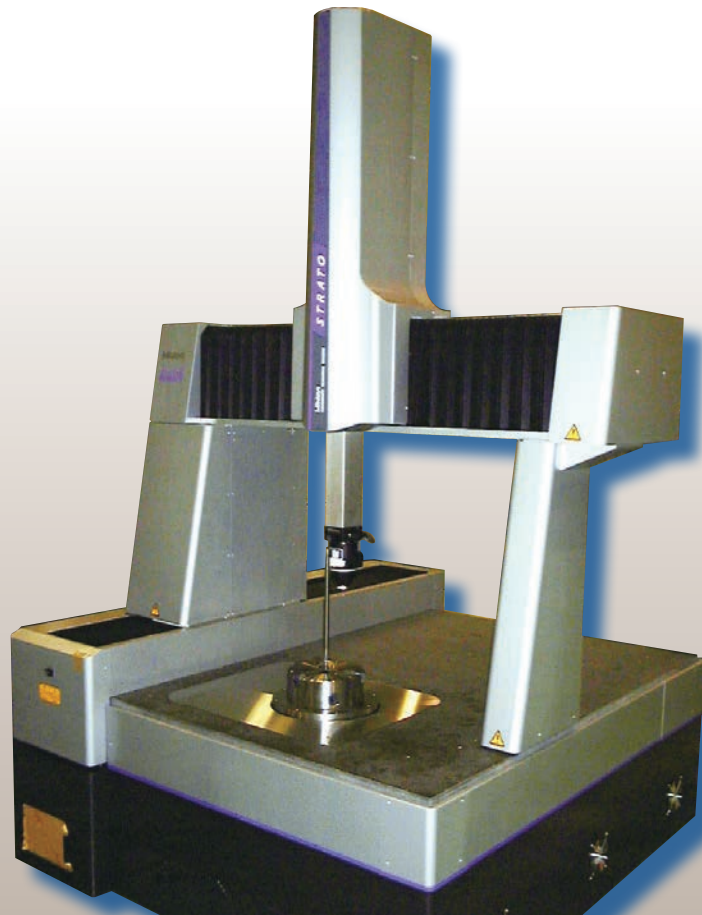
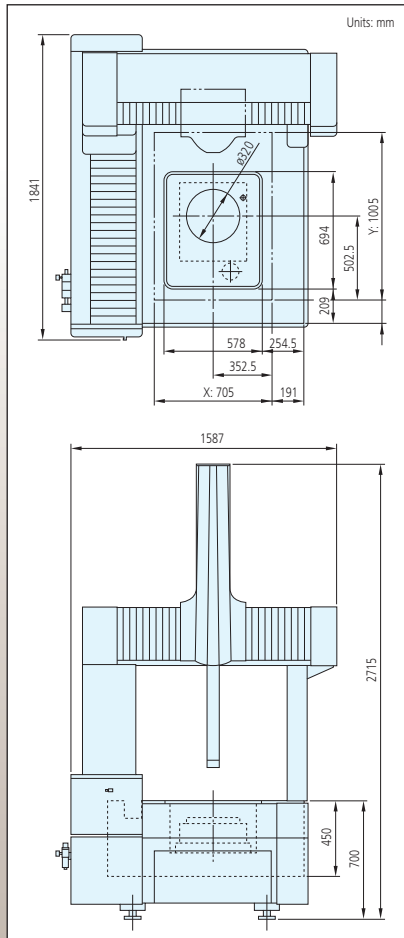
## Specifications

Model No.	Crysta-Apex C				
	16208	162012	163014	16528	20408
Measuring range (mm)	X	63.1" (1605mm)			78.9" (2005mm)
	Y	78.9" (2005mm)		118.3" (3005mm)	157.6" (4005mm)
	Z	31.6" (805mm)	47.4" (1205mm)	15.9" (405mm)	31.6" (805mm)
Measuring error MPE <sub>E</sub> (μm) L: measuring length (mm)	Same as standard machine 163012	Same as standard machine 163012	[SP25M] (4+5L/1000)	[TP200] (18+18L/1000)	[TP200] (7+6L/1000) [SP25M] (4.5+6L/1000)
Max. workpiece weight	7,716 lbs (3500kg) (same as the standard machine)	7,716 lbs (3500kg) (same as the standard machine)	7,716 lbs (3500kg) (same as the standard machine)	4,409 lbs (2000kg) (same as the standard machine)	11,023 lbs (5000kg) (same as the standard machine)

# FALCIO Apex Series with Embedded Rotary Table

- Specifications for a standard size machine with a MRT320 rotary table embedded in the measuring table so the measuring range is not sacrificed

- Specifications include an embedded MRT320 rotary table and a  $\phi 2.36"$  ( $\phi 60\text{mm}$ ) hole



# Crysta-Apex C Series Custom Specifications

## High-accuracy custom specifications

### Specifications

Model No.	High-accuracy Crysta-Apex C	
	122010	123010
Measuring range (mm)	X 47.4" (1205mm)	47.4" (1205mm)
	Y 78.9" (2005mm)	118.3" (3005mm)
	Z 39.5" (1005mm)	39.5" (1005mm)
Measuring error MPE <sub>E</sub> (μm)	[SP25M] (1.9+3L/1000)	[SP25M] (1.9+3L/1000)
L: measuring length (mm)	Standard accuracy: (2.3+3L/1000)	Standard accuracy: (2.3+3L/1000)
Remark	Temperature environment: 18 to 22°C	Temperature environment: 18 to 22°C

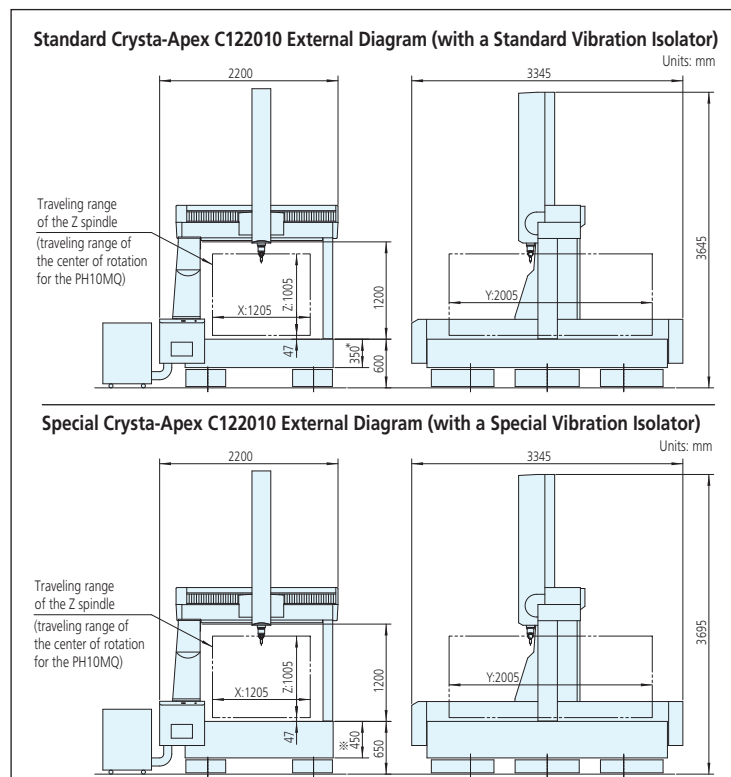
## Crysta-Apex C122010 for Measuring 5-Ton Workpieces (Vibration Isolator Specifications)

- For workpieces too heavy to measure using a standard machine, we offer a base with increased rigidity and a vibration isolator.

- Mold measurements for car parts

### Specifications

Model No.	Crysta-Apex C122010	
Measuring range (mm)	X	47.4" (1205mm)
	Y	78.9" (2005mm)
	Z	39.5" (1005mm)
Measuring error MPE <sub>E</sub> (μm)	Same as the standard machine	
Max. workpiece weight	11,023 lbs (5000kg)	
Machine weight	17,196 lbs (7800kg)	
Remark	Vibration isolator specifications Required air pressure for the vibration isolator: 0.45 MPa (Air pressure source: At least 0.55 MPa)	





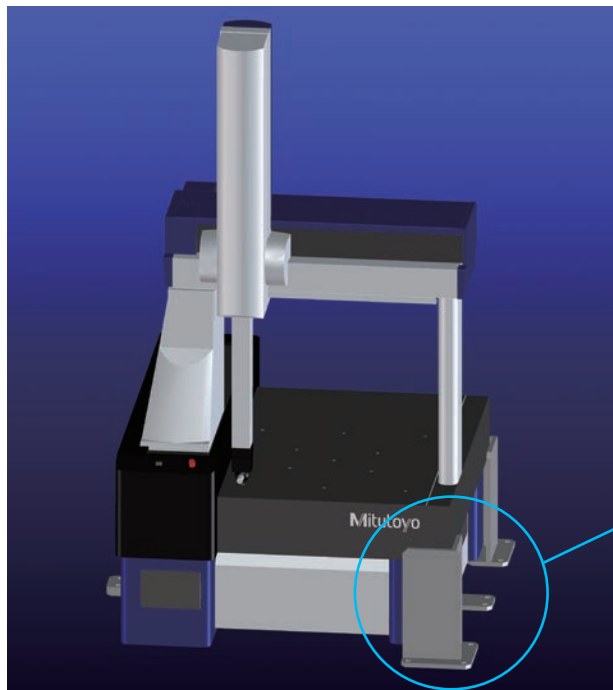
# Other Custom Specifications

## ■ Simplified dust-proof rack



## ■ Anti-earthquake retrofit

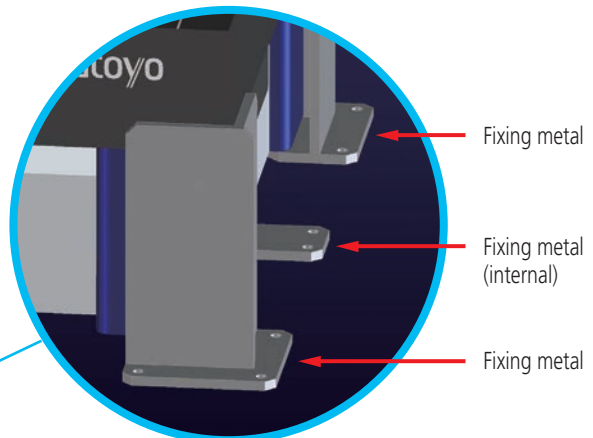
- In the event of an earthquake, this retrofit prevents slippage between the machine stand and measuring table, as well as prevents the machine stand from moving. The retrofit also reduces the damage caused by man-made disasters.



### Models

Crysta-Apex C500/700/900/1200 Series

Crysta-Plus M700 Series



\*1: If the retrofit cannot be constructed due to the installation conditions of the coordinate measuring machine main unit, or a retrofit for another model is desired, please contact us.

\*2: Constructing the retrofit might be difficult depending on the floor finish. For details, please contact us in advance.

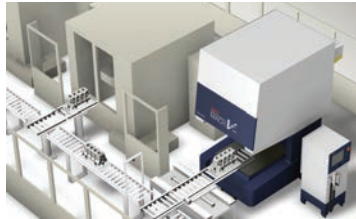
### Caution

Because an earthquake is a natural disaster and the effects of such an event cannot be perfectly anticipated, we cannot guarantee that the retrofit will prevent the machine from tipping over or ensure your safety. Also note that the retrofit is not intended to maintain the accuracy of a coordinate measuring machine.

# Other Custom Specifications

## In-line measurement

The MACH-3A and MACH-V maximize machining operations by performing in-line or near-line high-speed coordinate measuring in conjunction with your CNC machine tools. These high-throughput machines can be incorporated right into the manufacturing line and provide pre/post machining feedback to adjust the machine tool.



MACH-V9106

Inline CNC CMM (horizontal type) incorporates the CMM controller and host computer in the main unit for a compact, space-saving footprint on the shop floor. This series is designed for stable, 24-hour operation.



MACH-3A 653



MACH-Ko-ga-me

The MACH Ko-ga-me is a compact, 3D CNC measuring system that can be configured to almost any process. Use for stand-alone applications or integrate into cells. If required, the system can measure workpiece features that exceed the Ko-ga-me's X stroke by mounting the workpiece, or the Ko-ga-me, on an auxiliary X axis. Ideal for inspection of large or small workpieces and offers a wide choice of measuring probes including touch-trigger, optical and scanning types. (Note: Probe choice is dependent on the application.)

## Other Custom Specifications

### ■ Ball screw evaluation system (V-groove rotary scanning measurement system)

- This system, which includes a coordinate measuring machine, rotary table and scanning probe, enables the use of a rotary table for synchronized scanning by contacting two surfaces of a workpiece for scanning (V-groove scanning) in order to measure objects, such as the shafts of ball screws.

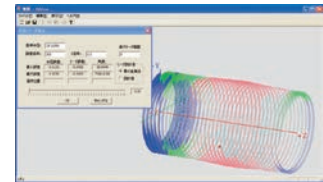
Coordinate measuring machine: LEGEX9106

Scanning probe: MPP300Q

Rotary table: MRT320

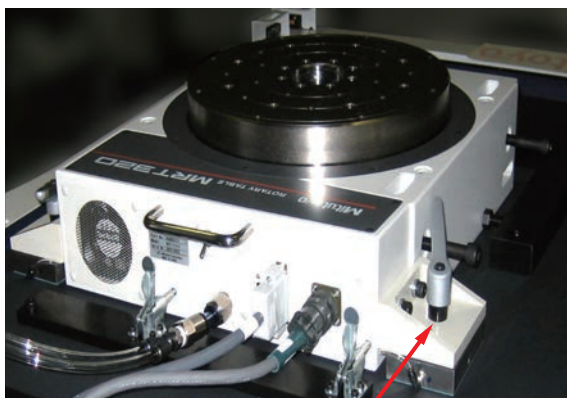


Example: single lead error, cumulative lead error, lead variation, PCD variation



### ■ Float-type rotary table: MRT320

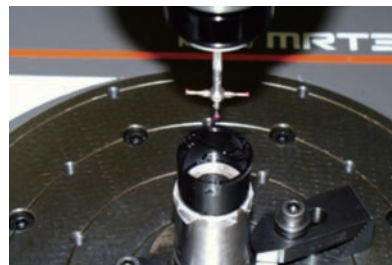
- This rotary table slides while moving.



Sliding mechanism  
(uses three air bearings)

\* The specifications for the rotary table accuracy are the same as those for the standard MRT320.

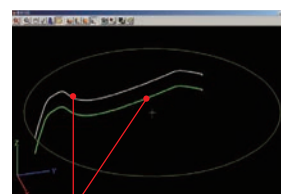
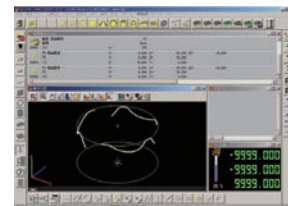
### ■ Measurement of a cylindrical cam using the MRT320 rotary table



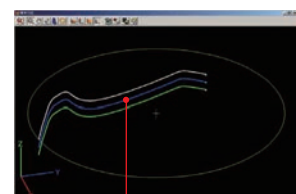
Rotary table: MRT320



Cylindrical cam



Calculation of the central contour from two contours

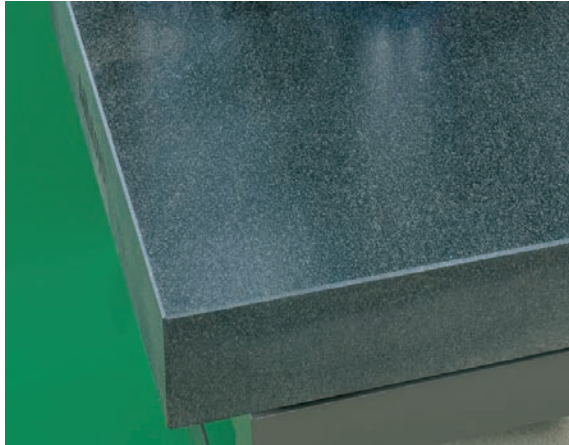


The calculated central contour



# Precision Granite Surface Plate Introduction

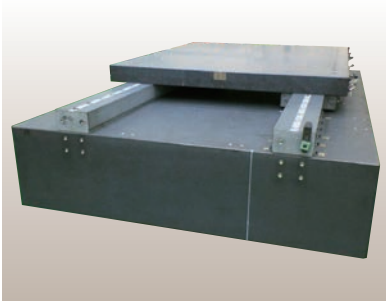
## ■ Can be used as a structural element



- Suction base for an LCD slit coater
- Suction base for an LCD spin coater
- Suction base for an LCD inspection device
- One-axis air slider stage for an exposure device
- Base for an LCD inspection device
- Various other special machining processes

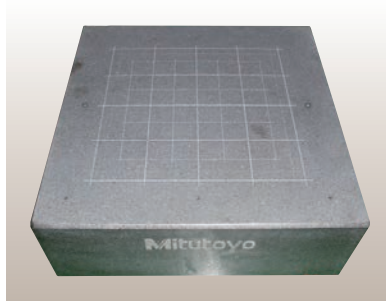
## Examples

### One-axis air slider



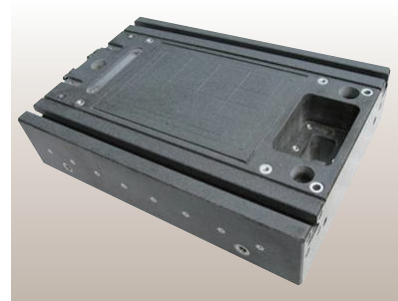
One-axis air slider

### Suction plate



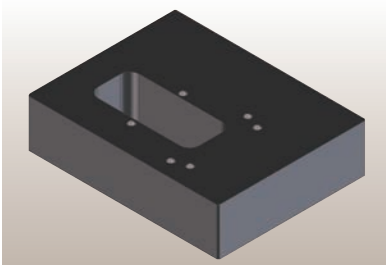
Small grooves, small hole machining

### Suction plate



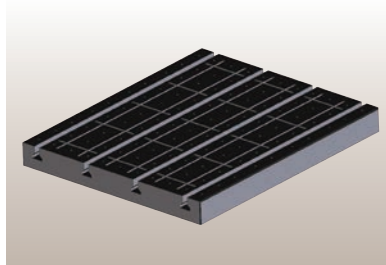
Drilling, T-groove machining, small holes for bushing screws, small-groove machining

### Hard disk measuring machine base



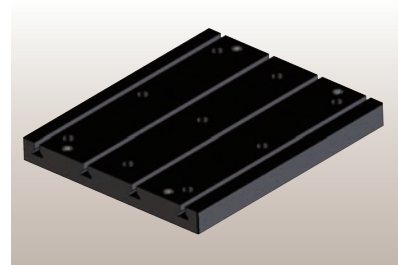
Cut holes, bushing screw machining

### Semiconductor inspection device base



Small holes, narrow grooves, T-groove machining

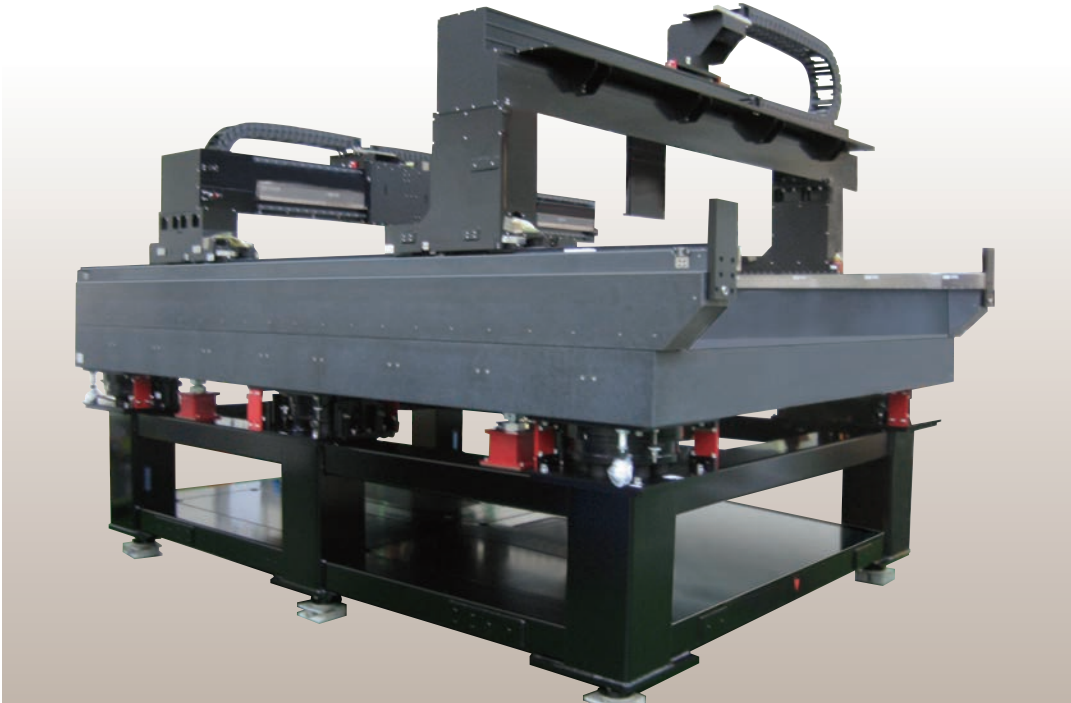
### Electrical discharge machine base



T-grooves, bushing screw machining

# Gantry Stage

## ■ Stage for highly accurate two-dimensional positioning



### ▲ Gantry stage

Gantry stage uses stone structural elements for the base and aluminum structural elements for the moving parts.

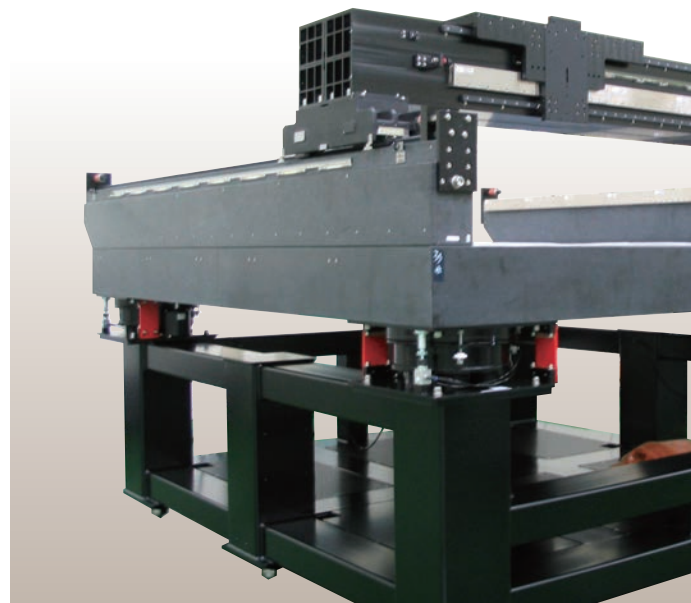
- Linear guide specifications
- Coreless linear motor specifications

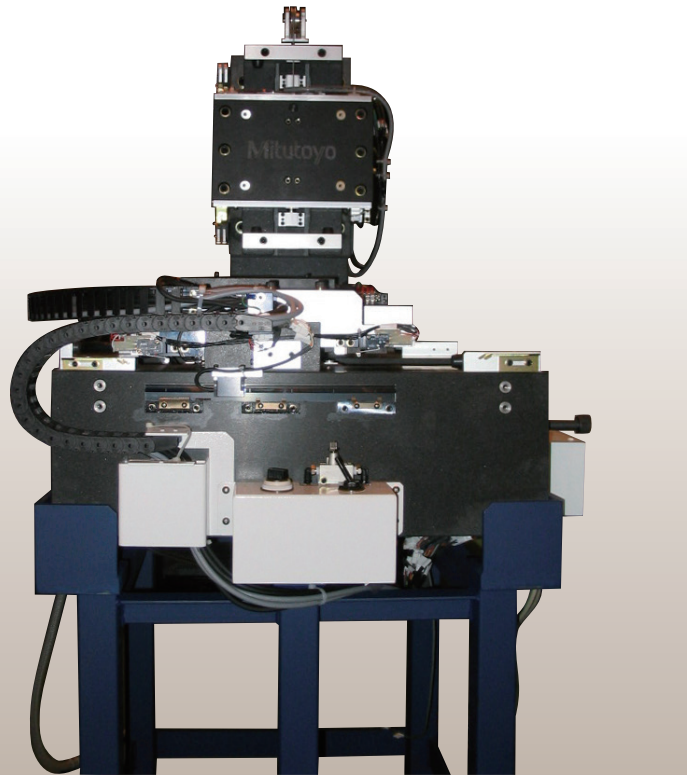
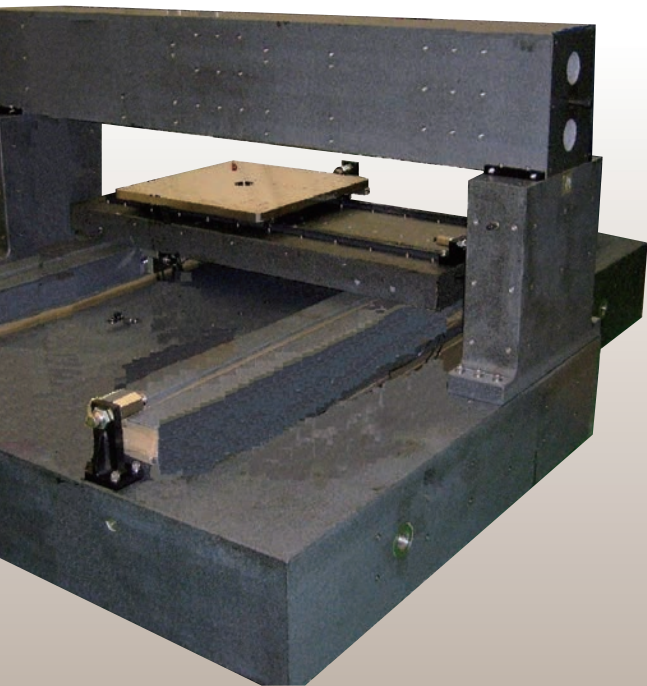
### Gantry stage ►

Can be used in a clean room.  
Because the gantry is mobile, a large panel is available.

Applications  
Repair device for an LCD panel  
Inspection device for an LCD panel

Size: 132.2" (3360mm) × 157.4" (4000mm)  
Stroke: X-axis: 119.2" (3030mm)  
Y-axis: 119.2" (3030mm)





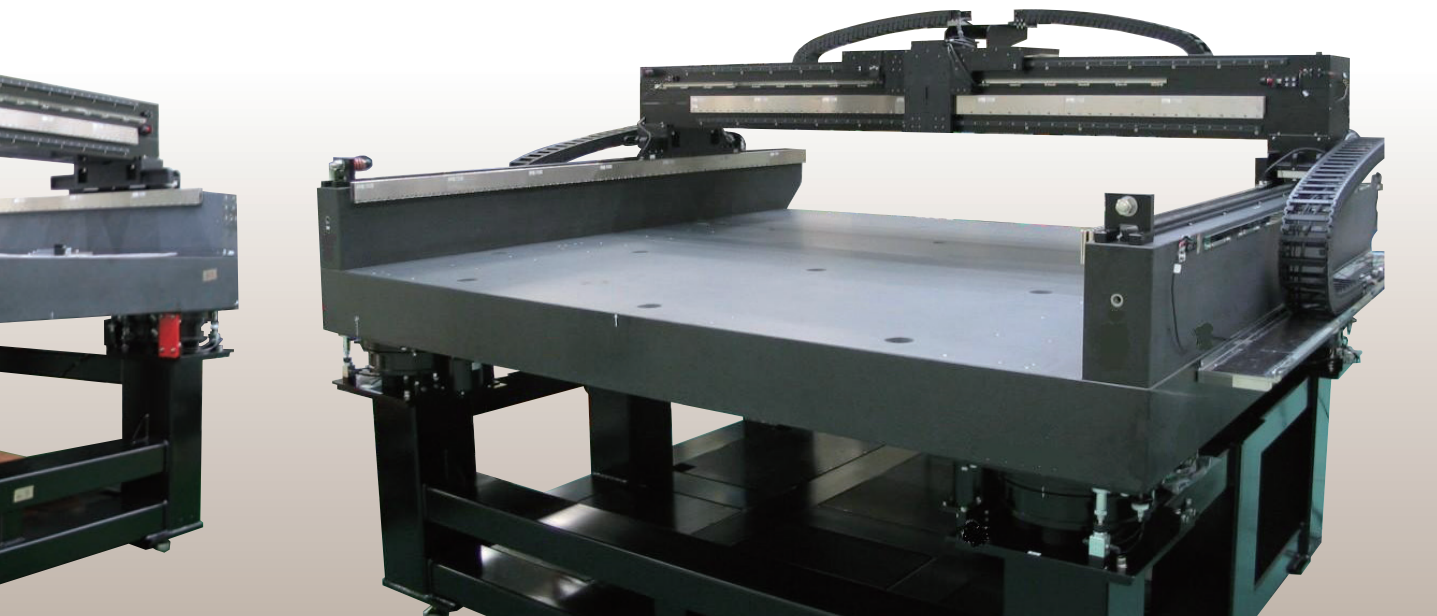
## ▲ Mobile table stage

Mobile table stage uses stone structural elements.

- Air bearing specifications
- Can be used in a clean room

Applications  
Inspection devices for LCD panels  
Machining lasers for LCD panels

Size: 78.7" (2000mm) x 98.4" (2500mm)  
Stroke: X-axis: 59.0" (1500mm)  
Y-axis: 23.6" (600mm)





# Large Measuring Machine Assembly Plant



## Overview:

- Manufactured models: large coordinate measuring machines, flat panel display-related equipment
- Environment, manufacturing facilities  
 Assembly environment:  $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$   
 Grade slab: 1 m  
 20-ton cranes: 3
- Number of manufactured units: 100 machines per month

## Main facilities

- Air-conditioning: Our fan system suppresses variation in the room temperature as much as possible.
- Lighting: We use highly efficient lights whose brightness is controlled using inverters to conserve energy. Our system suppresses the initial illuminance, gradually increases the supplied power, and maintains a constant illuminance of 650 to 700 lux.

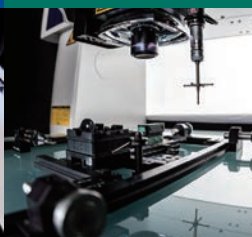




Coordinate Measuring Machines



Vision Measuring Systems



Form Measurement



Optical Measuring



Sensor Systems

Test Equipment  
and Seismometers

Digital Scale and DRO Systems

Small Tool Instruments  
and Date Management

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

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

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.



Find additional product literature  
and our product catalog

[www.mitutoyo.com](http://www.mitutoyo.com)

**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.

Mitutoyo products are subject to US Export Administration Regulations (EAR). Re-export or relocation of our products may require prior approval by an appropriate governing authority.

#### Trademarks and Registrations

Designations used by companies to distinguish their products are often claimed as trademarks. In all instances where Mitutoyo America Corporation is aware of a claim, the product names appear in initial capital or all capital letters. The appropriate companies should be contacted for more complete trademark and registration information.

# Mitutoyo

#### Mitutoyo America Corporation

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