CRYSTA-APEX S SERIES

High-performance, low-price CNC coordinate measuring machine that meets global standards
The CRYSTA-Apex S is a high-accuracy CNC coordinate measuring machine that guarantees a maximum permissible error of $E_{\text{MPE}} = (1.7+3L/1000)\mu\text{m}$ [500/700/900 Series]. Let’s compare the CRYSTA-Apex S with CMMs offering $E_{\text{MPE}}$ of approximately $(2.5+4L/1000)\mu\text{m}$. If, for example, the required tolerance on a dimension is $\pm 0.02\text{ mm}$, then the measuring machine uncertainty should be no more than one-fifth (ideally one-tenth) of that, i.e., $4\mu\text{m}$. This means that with a general-purpose CMM, when the measured length exceeds $14.8\times(375\text{mm})$, machine uncertainty exceeds one-fifth of the dimension tolerance in this case.

In contrast, as shown in the figure on the right, with the CRYSTA-Apex S the measurement uncertainty remains within one-fifth of the dimension tolerance up to $30.2''$ (766mm). The higher accuracy specification of the CRYSTA-Apex S therefore gives it more than double the effective measuring range in terms of accuracy-guarantee capability in this case.

*ISO 10360-2:2009

The CRYSTA-Apex S comes equipped with a temperature compensation system that guarantees the accuracy of measurement under temperature conditions of 60.8 to 78.8 °F (16 to 26 °C). This system, based on permanently installed temperature sensors on each scale working together with sensors placed on the workpiece, monitors scale and workpiece temperatures and, monitors the temperature and, before outputting the measurement result to the controller, corrects it to the value that would be measured at 68 °F (20 °C), taking into account the workpiece material expansion coefficient as well as the CMM’s characteristics. The combined scale/workpiece temperature compensation scheme used on the CRYSTA-Apex S gives markedly superior results compared to systems that only compensate for scale temperature.
The CRYSTA-Apex S Series offers a maximum drive speed of 519 mm/s (20.4") and a maximum acceleration of 2,309 mm/s² (7.57")² [500/700/900 Series], resulting in an increase of almost 100 mm in drive distance in one second, when compared with general-purpose CNC coordinate measuring machines (with a maximum speed of 430 mm/s (16.9") and a maximum acceleration of 1,667 mm/s² (5.46")²).

Furthermore, with a maximum measuring speed (i.e., the speed with which the stylus traces over the workpiece) of 8 mm/s (0.31"), the CRYSTA-Apex S produces measurements much more quickly than ordinary CMMs (with a maximum measuring speed of 5 mm/s (0.19"'}). Combining high speed and high acceleration, the CRYSTA-Apex S dramatically reduces measuring time, with the difference between the CRYSTA-Apex S and ordinary CMMs only increasing as the number of measuring points increases, resulting in a significant reduction in measuring cost.

As is the case with Mitutoyo’s conventional CMMs, various structures are employed in the CRYSTA-Apex S in order to give the body higher rigidity. The Y-axis guide rail, which is attached to one side of the granite surface plate, shows very little deterioration with use, and thus promises to maintain high accuracy for a long time. The air bearings located on the bottom face, in addition to those at the front, rear, and upper surfaces of the slider unit of the X-axis, minimize vibration even during high-speed, high-acceleration movement, thus ensuring stable linear motion.
CRUSTA-Apex S 500 Series

CRUSTA-Apex S 500 Series Accuracy

**Model No.**
- **CRYSTA-Apex S 544**
- **CRYSTA-Apex S 574**

**Accuracy**

<table>
<thead>
<tr>
<th>Probe used</th>
<th>Maximum permissible error (E_{0.001})</th>
<th>Maximum permissible probing error (P_{THP})</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP25M</td>
<td>1.7+4 L/1000 (temperature environment 1)</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>1.7+4 L/1000 (temperature environment 2)</td>
<td></td>
</tr>
<tr>
<td>TP20</td>
<td>1.9+4 L/1000 (temperature environment 1)</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>1.9+4 L/1000 (temperature environment 2)</td>
<td></td>
</tr>
<tr>
<td>TP25</td>
<td>2.2+4 L/1000 (temperature environment 1)</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>2.2+4 L/1000 (temperature environment 2)</td>
<td></td>
</tr>
</tbody>
</table>

- *L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

**ISO 10360-4**

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

**Dimensions**

**Installation floor space**

- **Model No.**
  - **CRYSTA-Apex S 544**
  - **CRYSTA-Apex S 574**

**Measuring table (Tapped insert) Dimensions**

- **unit: mm**

Note: This machine incorporates a main unit Startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.
**CRYSTA-Apex S 700 Series**

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

### CRYSTA-Apex S 700 Series Dimensions

<table>
<thead>
<tr>
<th>Model No</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRYSTA-Apex S776</td>
<td>65&quot;(1650)</td>
<td>16.5&quot;(420)</td>
<td>32&quot;(800)</td>
<td>27.6&quot;(705)</td>
</tr>
<tr>
<td>CRYSTA-Apex S7106</td>
<td>76.8&quot;(1950)</td>
<td>18.5&quot;(470)</td>
<td>39.4&quot;(1000)</td>
<td>39.6&quot;(1005)</td>
</tr>
</tbody>
</table>

### Measuring table (Tapped insert) Dimensions (unit: mm)

- X: 23.62 (600mm)
- Y: 27.55 (700mm)
- Z: 27.6 (700mm)

### CRYSTA-Apex S 700 Series Accuracy

<table>
<thead>
<tr>
<th>Model No</th>
<th>CRYSTA-Apex S776</th>
<th>CRYSTA-Apex S7106</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe used</td>
<td>Maximum permissible error (Eu:mm)</td>
<td>Maximum permissible probing error (Pmm:mm)</td>
</tr>
<tr>
<td>SP25M (Stylus: ø4 X 50 mm)</td>
<td>1.7+3 L/1000 (temperature environment 1)</td>
<td>1.7</td>
</tr>
<tr>
<td>TP200 (Stylus: ø4 X 10mm)</td>
<td>1.9+3 L/1000 (temperature environment 1)</td>
<td>1.9</td>
</tr>
<tr>
<td>TP20 (Stylus: ø4 X 10mm)</td>
<td>2.2+3 L/1000 (temperature environment 1)</td>
<td>2.2</td>
</tr>
</tbody>
</table>

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

### CRYSTA-Apex S 700 Series Installation Temperature

<table>
<thead>
<tr>
<th>Limits within which accuracy is guaranteed</th>
<th>Temperature, environment 1</th>
<th>Temperature, environment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>20±2 °C (68.4-71.6 °F)</td>
<td>16 - 26 °C (60.8-78.8 °F)</td>
</tr>
<tr>
<td>Rate of change</td>
<td>2 °C per hour or less</td>
<td>2 °C per hour or less</td>
</tr>
<tr>
<td>Gradient</td>
<td>1 °C or less per meter</td>
<td>1 °C or less per meter</td>
</tr>
</tbody>
</table>

### Installation floor space

<table>
<thead>
<tr>
<th>Model No</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRYSTA-Apex S776</td>
<td>130&quot;(3300)</td>
<td>65&quot;(1650)</td>
<td>16.5&quot;(420)</td>
<td>32&quot;(800)</td>
</tr>
<tr>
<td>CRYSTA-Apex S7106</td>
<td>142&quot;(3600)</td>
<td>76.8&quot;(1950)</td>
<td>18.5&quot;(470)</td>
<td>39.4&quot;(1000)</td>
</tr>
</tbody>
</table>
CRUSTA-Apex S 900 Series

Measuring table (Tapped insert) Dimensions (unit: mm)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRUSTA-Apex S 9106/9108</td>
<td>142</td>
<td>250</td>
<td>175</td>
<td>100</td>
<td>120</td>
<td>90</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>CRUSTA-Apex S 9166/9168</td>
<td>169</td>
<td>250</td>
<td>175</td>
<td>100</td>
<td>120</td>
<td>90</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>CRUSTA-Apex S 9206/9208</td>
<td>185</td>
<td>250</td>
<td>175</td>
<td>100</td>
<td>120</td>
<td>90</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>

Conversion: 1 inch = 25.4 mm

Installation floor space (unit: mm)

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
</tr>
</tbody>
</table>

Model No.: CRUSTA-Apex S 9106/9108

- X axis: 35.43" (900mm)
- Y axis: 35.43" (900mm)
- Z axis: 23.8" (605mm)
- 23.8" (605mm)

Conversion: 1 inch = 25.4 mm

CRUSTA-Apex S 900 Series Accuracy

ISO 10360-2 unit: µm

<table>
<thead>
<tr>
<th>Probe used</th>
<th>Maximum permissible error (E0,μm)</th>
<th>ISO 10360-2:2009</th>
<th>Maximum permissible probing error (Pr0,μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP25M (Stylus: ø4 X 50mm)</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>IF200 (Stylus: ø4 X 10mm)</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>IF200 (Stylus: ø4 X 10mm)</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
</tbody>
</table>

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

CRUSTA-Apex S 900 Series Installation Temperature

- Temperature range: 20 ± 2 °C (68.4°F - 71.6°F)
- Temperature environment 1: 16 ± 26 °C (60.8°F - 78.8°F)
- Rate of change: 2 °C per hour or less
- Gradient: 1 °C or less per meter

CRUSTA-Apex S 900 Series Installation Platform

- Consumption: 2.11CFM (60L/min) under normal conditions
- Air supply: 3.53CFM (100L/min) under normal conditions
- Mass: 2,645lbs. (1200kg) - 3,968lbs. (1800kg)
- Maximum mass: 2,645lbs. (1200kg) - 3,968lbs. (1800kg)
- Max. drive acceleration: 2309mm/s² (1732mm/s²) (3D)
- Max. drive acceleration: 2209mm/s² (1632mm/s²) (3D)

CRUSTA-Apex S 900 Series Dimensions (unit: inch (mm))

- X axis: 35.43" (900mm)
- Y axis: 35.43" (900mm)
- Z axis: 23.8" (605mm)
- 23.8" (605mm)

Conversion: 1 inch = 25.4 mm

CRUSTA-Apex S 900 Series Mounting Table

- Consumption: 2.11CFM (60L/min) under normal conditions
- Air supply: 2.11CFM (60L/min) under normal conditions
- Mass: 2,645lbs. (1200kg) - 3,968lbs. (1800kg)
- Maximum mass: 2,645lbs. (1200kg) - 3,968lbs. (1800kg)
- Max. drive acceleration: 2309mm/s² (1732mm/s²) (3D)
- Max. drive acceleration: 2209mm/s² (1632mm/s²) (3D)

CRUSTA-Apex S 900 Series Accuracy

ISO 10360-4 unit: µm

<table>
<thead>
<tr>
<th>Probe used</th>
<th>Maximum permissible error (E0,µm)</th>
<th>ISO 10360-4:2009</th>
<th>Maximum permissible probing error (Pr0,µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP25M (Stylus: ø4 X 50mm)</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>IF200 (Stylus: ø4 X 10mm)</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>IF200 (Stylus: ø4 X 10mm)</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
</tbody>
</table>

* L = Selected measuring length (in mm). Table on opposite page describes temperature environments 1 and 2.

CRUSTA-Apex S 900 Series Installation Temperature

- Temperature range: 20 ± 2 °C (68.4°F - 71.6°F)
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- Consumption: 2.11CFM (60L/min) under normal conditions
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- Max. drive acceleration: 2309mm/s² (1732mm/s²) (3D)
- Max. drive acceleration: 2209mm/s² (1632mm/s²) (3D)

CRUSTA-Apex S 900 Series Dimensions (unit: inch (mm))

- X axis: 35.43" (900mm)
- Y axis: 35.43" (900mm)
- Z axis: 23.8" (605mm)
- 23.8" (605mm)
CRYSTA-Apex S 1200 Series

CRYSTA-Apex S 1200 Series Dimensions  unit: inch (mm)

CRYSTA-Apex S 1200 Series Accuracy  ISO 10360-4  unit: µm

CRYSTA-Apex S 1200 Series Installation Temperature

Installation floor space  unit: inch (mm)

Measuring table (Tapped insert) Dimensions  unit: mm
Group of options that enable various kinds of measurements

**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.

**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.

**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.
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.

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., wearing or damaging of cutting tools) to be discovered early on. This program can also be linked to a higher-level network environment to build a central control system.

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.

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

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

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

SurfaceMeasure606
(non-contact laser probe)
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.
MPP-310Q (scanning probe)
Probe that collects coordinate values (point cloud data) at high accuracy by moving at speeds of up to 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.

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.

VISIONPAK (vision measurement program)
This program controls QVP and performs various computational analyses on captured images.

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 autofocusing.

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 in the world. The introduction of the auto probe changing system allows normal dimensional measurements as well as effective screw depth measurements to be made automatically.

Solid Model Developer
This program generates CAD data from data measured using MCOSMOS.
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 bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.