Multi-axis Portable Coordinate Measuring System

SpinArm-Apex Series

Multi-axis Design Provides a Large Measuring Volume Combined with Compact Portability
Multi-axis Portable Coordinate Measuring System

SpinArm-Apex

NEW-STYLE
Coordinate Measuring Machines

Mitutoyo
The high performance obtained with the SpinArm-Apex series makes it suitable for many manufacturing processes.

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The ultra-compact body provides excellent portability. Combined with the software created with Mitutoyo-unique technologies, SpinArm-Apex achieves superior operability.

Multi-axis Portable Coordinate Measuring System

SpinArm-Apex

**High Environmental Resistance**
Carbon fiber tube with optimized length-ratios design, allows for wide operating temperature range. The system can be used in any environment due to the temperature compensation function.

**Automatic Probe Recognition**
This function prevents a measurement error due to users selecting the wrong probe. The system automatically knows the type and parameters of each probe once connected.

**Counterbalancing System**
Nimble operation is achieved with symmetrical balance springs.

**Screw Mounting**
Mounting plate design enables quick setup thereby minimizing downtime.

**Optional Functions**
Many options such as wireless (WiFi) communication of measurement data and main unit batteries are provided for improvement in user-friendliness.
FEATURES

Standard accessories

- **Tool box**
  This is used to store various accessories.

- **Fixture (Magnet)**
  Main unit securing plate
  Magnetic stand (3 units)

Carbon fiber tubes

Counterbalancing system

Automatic probe recognition

Automatic brake

Temperature compensation function
## Specifications

### 6-axis model

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Measuring envelope*1</td>
<td>1800 mm</td>
<td>2400 mm</td>
<td>3000 mm</td>
<td>3600 mm</td>
</tr>
<tr>
<td>Repeatability*2, *3</td>
<td>± 0.040 mm</td>
<td>± 0.050 mm</td>
<td>± 0.080 mm</td>
<td>± 0.100 mm</td>
</tr>
<tr>
<td>Accuracy (Arm type)*2, *3</td>
<td>± 0.055 mm</td>
<td>± 0.065 mm</td>
<td>± 0.100 mm</td>
<td>± 0.135 mm</td>
</tr>
<tr>
<td>Mass (main unit)</td>
<td>15.6 kg</td>
<td>15.8 kg</td>
<td>16.3 kg</td>
<td>16.7 kg</td>
</tr>
</tbody>
</table>

### 7-axis model

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring envelope*1</td>
<td>2400 mm</td>
<td>3000 mm</td>
<td>3600 mm</td>
</tr>
<tr>
<td>Repeatability*2, *3</td>
<td>± 0.055 mm</td>
<td>± 0.090 mm</td>
<td>± 0.110 mm</td>
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<tr>
<td>Accuracy (Arm type)*2, *3</td>
<td>± 0.080 mm</td>
<td>± 0.135 mm</td>
<td>± 0.165 mm</td>
</tr>
<tr>
<td>Mass (main unit)</td>
<td>16.2 kg</td>
<td>16.7 kg</td>
<td>17.1 kg</td>
</tr>
</tbody>
</table>

*1 Measurement range is expressed as a diameter value at the maximum reach using software with the Sø10 mm standard probe mounted.

*2 According to Mitutoyo’s acceptance procedure. The accuracy guaranteed value above is determined when MSS-5R11G probe is mounted.

*3 Guaranteed accuracy temperature range: 16°C - 24°C (Temperature gradient: 1.5K per hour)

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### Carrying Case

With casters
- External dimensions of 1800mm/2400mm model: 620x1217x365mm
- External dimensions of 3000/3600mm models: 590x1517x365mm

### Connection Cables

### Counterbalancing system

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### Counterbalancing system

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### Carrying Case

With casters
- External dimensions of 1800mm/2400mm model: 620x1217x365mm
- External dimensions of 3000/3600mm models: 590x1517x365mm
General Dimension/Coordinate Measurement Software Applicable to Vehicle Bodies and Frames, Aircraft Parts, Processing Machine Bases, and Tools, etc.

Advanced Dimension Measurement/Coordinate System Setup Function

This is a dimension measurement software program provided with the part program function, the graphical display function, and so on.

Memory Call Function

The element data of any point, line, plane, circle, ellipse, sphere, cylinder or cone currently displayed in icon form will be automatically stored in the memory. The stored element data can be called at any time for repeat calculations of angle, distance and tolerance zone, etc.

Rich Tolerance Zone Measurement Functions

A variety of measurement functions cover form tolerance zones such as straightness, flatness, roundness, etc., and other tolerance zones such as concentricity, coaxiality, positional deviation, etc.

Graphical Display

Measurement results will be presented as a real-time graphic display in the Element Drawing Window. A variety of processing functions including Change View Angle, Zoom-In, Zoom-Out, etc., provide extensive support for user inspections.

Customization of Layout

Users can optionally customize the layout of each window (Element Drawing, Measurement Result, Measurement Display, Counter Value, etc.). The size and position of each window can also be modified, stored and restored at any time.

Image/Sound Input

Image data (.bmp) and sound data (.wav) can be added during part programming. This greatly helps the user to improve the operating efficiency of repeat measurement by following the image or sound guidance inserted beforehand.

Edit Part Program Function

Existing part programs can be edited. This function features a user-friendly interface to support the editing process with iconized menus.

Output Function

Measurement results can be output in text file format or to the printer. Print-out of the current Element Drawing Window is also possible.
Free-form Surface Evaluation

IGES-, VDAFS-formatted CAD data import is possible. This software is used to load the surface data of a workpiece and evaluate any error (deviation) relative to the CAD data.

Best-fit Function

This function enables optimum alignment by rotating the coordinate system or shifting the origin position in order to minimize differences between measurement data and the corresponding CAD data.

A Variety of Graphical Displays

For the measurement data, the user can choose whether the error line, error values (deviation values) or the measurement number, etc., is displayed on the screen. Furthermore, the user can view the error situation intuitively, since the error distribution can be represented in histogram form.

Output Format

(1) .txt data output: Outputs in a form readable by a text editor such as MS Notepad.
(2) DMIS output: Outputs in a DMIS-compatible format.
(3) VDA-FS output: Saves the data into a file using the VDAFS-format.
(4) IGES output: Saves the data into a file using the IGES106 format.

Loading CAD Data

<table>
<thead>
<tr>
<th>Format</th>
<th>Extension</th>
<th>Supported version</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGES</td>
<td>.igs/.iges/.iges</td>
<td>V4.0/V5.2/V5.3</td>
</tr>
<tr>
<td>SAT</td>
<td>.sat</td>
<td>Up to V16.0</td>
</tr>
<tr>
<td>VDAFS</td>
<td>.vda/.vdafs</td>
<td>V1.0/V2.0</td>
</tr>
<tr>
<td>STEP</td>
<td>.stp/.step</td>
<td>AP203/AP214</td>
</tr>
<tr>
<td>CATIA V4</td>
<td>.exp</td>
<td>V4.1.x – V4.2.4</td>
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<tr>
<td>CATIA V5</td>
<td>.CATPart/.CATProduct</td>
<td>R2 – R16</td>
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<tr>
<td>PRO/E</td>
<td>.prt/.prt</td>
<td>V16 – Wildfire2, Wildfire3</td>
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<tr>
<td>Parasolid Part</td>
<td>.x_t/.xmt/.x_b</td>
<td>10.0 – 18</td>
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<tr>
<td>Unigraphics</td>
<td>.prt</td>
<td>11 – 18/NX1/NX2/NX3/NX4</td>
</tr>
<tr>
<td>SolidWorks</td>
<td>.sldprt/.prt</td>
<td>98 – 2006</td>
</tr>
</tbody>
</table>

Note: Some CAD Data above are options. Please contact us for details.
Tolerance zone measurement and best-fit of any profile data obtained can be performed. This covers workpieces such as cams or shafts that have geometrical features hard to evaluate normally.

Contour Tolerance Zone Measurement

This function performs tolerancing by comparing measured values with the corresponding design values.

[Contour Tolerance Zone Measurement Setup Window]

1. Tolerance limit
   Sets the upper and lower limit tolerances of a feature and specifies the width of the magnified error zone.

2. Contour data specification
   Specifies design data and measurement data. Design data can be provided with point sequence (X, Y, Z) data on a contour.

3. Tolerancing pitch
   This field specifies a tolerancing point pitch and direction.

4. Tolerancing direction
   This toolbar specifies whether to perform tolerancing in the axial or the normal direction.

5. Best-fit
   This toolbar optimizes the correlation between the reference coordinates of measurement data and design data to minimize the amount of error.
Perform 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.

This is a convenient software program for creating user-original inspection tables by exporting the data obtained with MCOSMOS1 MANUAL and CAT-1000S MANUAL in a statistical processing format, which has been defined in advance.
SurfaceMeasure M series can automatically adjust its performance as it scans an object. This line laser probe can effectively measure the following objects, in contrast to conventional laser probes or white-light system scanner:

- Glossy objects or objects with different reflectance parts
- Objects painted in multiple colors
- Objects exposed to direct sunlight
- Objects with an acute reflection angle

**Specifications**

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>1010M</th>
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</thead>
<tbody>
<tr>
<td>Max. line width [A]</td>
<td></td>
<td>100mm</td>
</tr>
<tr>
<td>Measurement range [B]</td>
<td></td>
<td>100mm</td>
</tr>
<tr>
<td>Working distance [C]</td>
<td></td>
<td>93mm</td>
</tr>
<tr>
<td>Accuracy [1σ]<strong>1</strong></td>
<td></td>
<td>15µm</td>
</tr>
<tr>
<td>Scanning speed</td>
<td></td>
<td>81,920 points/sec</td>
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<tr>
<td>Resolution</td>
<td></td>
<td>0.050mm or more</td>
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<tr>
<td>Laser Class</td>
<td>EN / IEC</td>
<td>Class 2 [EN/IEC60825-1 (2007)]</td>
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<tr>
<td></td>
<td>JIS</td>
<td>Class 2M [JIS C 6802-2005]</td>
</tr>
<tr>
<td>Laser type</td>
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<td>Semiconductor</td>
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<tr>
<td>Wavelength</td>
<td>Point</td>
<td>660nm [Visible]</td>
</tr>
<tr>
<td>Laser type</td>
<td>Laser</td>
<td>Semiconductor</td>
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<tr>
<td>Wavelength</td>
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<td>635nm [Visible]</td>
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<tr>
<td>Mass</td>
<td></td>
<td>430g</td>
</tr>
<tr>
<td>Operational</td>
<td>Temperature</td>
<td>0°C - 30°C</td>
</tr>
<tr>
<td>environment</td>
<td>Humidity</td>
<td>20%RH - 80%RH without condensation</td>
</tr>
</tbody>
</table>

**Note: Safety precautions regarding laser beam**

A low-power visible laser is used in this line laser scanning probe. The CLASS 2 warning/description label as shown at right is attached to the measuring unit.
MSURF-M was designed for the purpose of acquiring the highest-accuracy data from SurfaceMeasure-M. This is a software package that consists of multiple modules integrated seamlessly.

**Scanning Function**

A dedicated graphical user-interface enables this software to run with minimum intervention via the PC mouse and keyboard. Large icons help make arm mouse/button operation easy.

**Real-time Tolerance Zone Measurement**

This module facilitates real-time comparative evaluation against a design value by setting a part coordinate system with the contact probe after reading the design value data. This allows the operator to quickly obtain the inspection result for a workpiece.

**Polygon Editing Function**

MSURF-M is provided with the polygon editing function. If any missing part exists in the data, this function can compensate for the deficiency, allowing quick data export to the software for reverse engineering, etc.

**Comparative Evaluation of a Cross-section**

This module enables comparative evaluation of an arbitrary cross-section by extracting it from the measurement data.

**Various Dimensional Analyses**

This module allows various features such as a circle, plane, or point to be created from the measurement data, and various dimensional analyses such as width measurement to be executed.

**CAD Import**

- IGES (standard)
- STEP (option)
- CATIA V4 (option)
- CATIA V5 (option)
- UGNX (option)
- VDA (option)
- PRO-E (option)

**GAP&FLUSH**

This module allows analysis of GAP&FLUSH for performing sheet-metal gap management. This analysis can be made seamlessly from the data measured with SurfaceMeasure-M.
## System Configuration

**Main Unit**
- SpinArm-Apex Series
- Notebook PC/Desktop PC

**Software**
- For position measurement: MCOSMOS-1 MANUAL, SpinArm-Utility
- For line laser probe control: Software for evaluation of pointclouds, MSURF-M
- For acquisition/evaluation of 2D profile data: SCANPAK MANUAL
- For the statistical processing of measurement data: STATMeasure PLUS
- For evaluation of free-form surfaces: CAT1000S MANUAL
- Inspection Table Generation Software MeasureReport®

**Optional accessories**
- Line laser probe: SurfaceMeasure M Series
- Hard probe body
- Touch probe (LP2 probe)
- WiFi kit
- Various stylus
- Stand
- Portable stand

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**Mitutoyo Corporation**
20-1, Sakado 1-Chome,
Takatsu-ku, Kawasaki-shi,
Kanagawa 213-8533, Japan
T +81 (0) 44 813-8230
F +81 (0) 44 813-8231
http://www.mitutoyo.co.jp

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