MICROCORD
CARB Series

Non-contact/contact horizontal-arm type CNC Coordinate Measuring Machines for the car body industry
A Coordinate Measuring Machine (CMM) is required at many stages in the process of work piece development, such as for CAD data creation, mold building, jig making, prototype evaluation, welding, and inspection on a mass-production line. Furthermore, a high-precision CNC CMM is required for prototype inspection, analysis and mass production in manufacturing large work pieces for the automotive, aerospace, defense, heavy machinery, railway, and ship industries to name only a few. The automation of 3D coordinate measurement by introducing a CARB series system can allow simplification of conventional inspection/fixing jigs or even the elimination of inspection jigs, and can achieve major cost reductions in addition to improving accuracy in parts and assembly. The CARB series, with capacity up to 8 meters (26 feet), can cope with even large-sized workpieces such as large aircraft parts and spacecraft components, as well as car bodies. Since this series can operate while automatically interchanging contact and non-contact probes, tens of millions of measurement points can be collected in a short time. With the aid of an optional software program this series can be used not only for quality control purposes but also for reverse engineering, thus drastically reducing the time required for development and prototyping. The CARB series combines horizontal-type CMM with high accuracy and maximum flexibility.
High Speed, High Stability and Environmentally Robust

On car body production lines, managing the assembly accuracy of individual parts comprising a car body is paramount. With statistical quality control requirements for molded and pressed parts in the final finishing process may require inspection of subassembly parts on a 100-percent basis. A CMM to meet these needs must have the durability to withstand around-the-clock operation while still delivering high speed and high accuracy.

CARBstrato is the horizontal arm CMM that satisfies these requirements with its fully-covered main unit, automatic temperature compensation function and dual-arm operation. This CMM can perform high-speed quality evaluation not only on parts with contoured surface profiles, including car bodies and aircraft parts, but also those using many common geometric elements, allowing application to the measurement of large marine parts, and heavy equipment components.
Cast iron is used for the base to ensure high stability for all axes. The Z-axis slider is provided with high acceleration by the integration of an air-operated balancing mechanism, and aluminum alloy guide with a large cross-section in accordance with Mitutoyo’s unique design technology. Carbon fiber is used for the Y-axis arm(s) to minimize cross section and to prevent interference while still maintaining high stiffness. Each axis is provided with a temperature sensor near the scale to provide automatic compensation for the difference in linear thermal expansion coefficient of the different materials involved. This allows the CMM to be operated over a wide temperature range without loss of accuracy.

A backlash free, minimum-vibration mechanism has been adopted for the X-axis drive. Air bearings and a frictiondrive system on the Y- and Z-axes minimizes vibrations during movement. Stable measurement results are achieved with continuous scanning probes (contact or noncontact type).
In the CARBstrato series, a single-arm system with one main unit and a dual-arm system with two main units installed are available. A four-arm system can also be made as an option. If a single item part is to be measured at high speed, the single-arm machine is optimal. If a body shell or a large part is to be measured at high speed, the dual-arm specification is optimal. In the dual-arm machine, both arms can share one workpiece coordinate system while the software performs an automatic interference check to prevent one arm colliding with the other. A dual-arm machine can be separated so as to operate independently as two single-arm machines if required.

The top of the base that houses the X-axis is completely protected with diamond steel plating for operator safety and accessibility to the parts being measured. Foreign matter is prevented from reaching the axis guides by shielding all openings with belt-shaped covers. If the system is installed in a pit, so that the top of the base is level with the floor, the operator can freely walk around the measurement space, assuring high operability and safety.

A light-sensitive safety device installed in the Y-axis-arm bellows stops all axial movement immediately when the arm comes into contact with a workpiece, clamp or anything else during measurement. Movement also stops, in all axes, if an excessive twisting load is exerted on the rotary head. Predetermined operations, performed after safety verification, restore the system to an operational state. This safety device functions in the same manner when using a contact or non-contact probe and, particularly when measuring the inside of a car body or a component fixed with many clamps, greatly increases safety for the operator and machine.
3-point Support Method

CMM accuracy is degraded by settling of the concrete foundations, so a machine using the multi-point support method needs periodical leveling adjustment to maintain the installed accuracy specification. However, the 3-point support method can maintain measurement-space accuracy irrespective of such unavoidable deformation. This simplest of all support methods requires leveling adjustment only at 2 points and so makes for rapid, easy maintenance. (The 3-point support method is provided with up to 6m machine.)

Combating Foundation Deformation

• The secular deformation of foundation concrete after construction cannot be avoided. A periodical leveling adjustment of supports is required because of the effect on accuracy due to this deformation.
• The adoption of the 3-point support method maintains long-term accuracy independently of foundation deformation.

Combating Differential Expansion

If the cast-iron base were rigidly fixed to the concrete foundations then any difference in temperature between the two would allow differential thermal expansion, an unavoidable effect, to generate forces which would distort the base and degrade accuracy. To overcome the consequences of this effect the adopted method is to fix the base to the foundations at one support point only. One of the other support points is then allowed to slide in a straight line away from the fixed point and the remaining point is free to slide in any direction in the horizontal plane. Therefore the base and the foundations can expand and contract independently without any distorting force arising between them.
The bellows shown in the photo are optional.

Some large work piece manufacturing does not require the CMM to possess the high speed and ruggedness that is needed on a production line. For example, the design, preproduction and subcontract sections all fall into this category. Also, activities such as sampling inspection or reverse engineering do not require a high-speed machine. For these groups and applications the CARBapex is offered as a lower-cost version of CARBstrato to provide the same versatility at a lower operating speed and with less environmental protections, but still with the automatic temperature compensation function and dual-arm operation of CARBstrato.

The operator control (joystick box), software and operating procedures of CARBapex are 100% identical to those of CARBstrato and part programs are also compatible. Owing to the open, horizontal-type design of this cost-effective CMM it is highly suitable for quality improvement measurement applications for products across a wide range of fields including plastic parts, glass parts, reinforcing parts, drive-train parts, clay models, inspection jigs as well as car bodies and pressed parts. Higher environmental protections can be achieved if required the addition of main unit optional bellow covers.

The CARBapex system can be equipped with a light-sensitive safety device but only if the optional bellows are fitted. The safety device operates by detecting interference between the bellows on the Y-axis arm and any obstruction to immediately stop the machine. It is recommended that bellows be fitted when operating in a dust-laden environment. However, note that bellows reduce the stroke of the Y and Z axes.
Cast iron is used for the CARBapex base structure to give rigidity and stability, and ball-circulation type high-rigidity linear guides form the X-axis. The Z- and Y-axis arms are manufactured from extruded aluminum alloy to minimize overall mass and to utilize air bearings for frictionless movement. Owing to the use of air bearings, abrasions do not occur on any part of the Y-axis arm, therefore maintaining high accuracy. In addition, all connecting cables are contained in a caterpillar-type cable guide, cables cannot interfere with objects placed on the site floor. The top of the base that houses the X-axis is completely protected with diamond steel plating, the same as CARBstrato, for operator safety and accessibility to the parts being measured.

The use of air bearings for the Y-axis arm distinguishes it from the typical layout machine and this is an extremely important factor for maintaining the straightness of the arm between annual verification tests. Also, the large square cross-section of the Z-axis column minimizes deformation due to expansion/contraction of the arm. Moreover, Mitutoyo’s unique friction drive system on all axes minimizes vibration during travel, unlike the conventional rack and pinion arrangement. A drive system that generates no vibration is especially important because it has the effect of causing no noise in the measurement results of a scanning probe.

The X-axis base of CARBapex is designed to the minimum for a horizontal-type coordinate measuring machine. Therefore, if this system is installed on the floor the top of the base is low and provides the operator with safer operation. Also, if this system is installed under the floor, the cost of the foundations can be reduced because of the shallower excavation required. Since the Y-axis spindle is located at the lower end of the Z-axis slider, the spindle can be lowered close to a measuring plane. This allows the height of fixtures to be lower so that the operator can work safely even when measuring the top of a large part.
Non-contact Line Laser Measuring Systems

The combination of form and function in current large work piece designs increasingly requires complicated combinations of contoured surfaces. The ideal tool for inspecting these complex surfaces is the non-contact line laser probe. This powerful probe system can acquire a huge amount of measurement data at high speed enabling detailed 3D analysis.

- **Line Laser Probes Appropriate for Large Work Piece Measurement**

<table>
<thead>
<tr>
<th>Item ' Model</th>
<th>SurfaceMeasure 606</th>
<th>SurfaceMeasure 610</th>
<th>SurfaceMeasure 1010</th>
<th>SurfaceMeasure 606T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. scan width</td>
<td>60mm</td>
<td>60mm</td>
<td>100mm</td>
<td>3x65mm</td>
</tr>
<tr>
<td>Max. scan depth</td>
<td>60mm</td>
<td>100mm</td>
<td>100mm</td>
<td>65mm</td>
</tr>
<tr>
<td>Working distance</td>
<td>93mm</td>
<td>115mm</td>
<td>115mm</td>
<td>174mm</td>
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<tr>
<td>Scanning error *</td>
<td>12μm</td>
<td>15μm</td>
<td>18μm</td>
<td>17μm</td>
</tr>
<tr>
<td>Acquisition rate</td>
<td>75,000 points/sec</td>
<td>3x25,000/sec</td>
<td>3x25,000/sec</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>430g</td>
<td>400g</td>
<td>400g</td>
<td>480g</td>
</tr>
<tr>
<td>Laser type</td>
<td>Red semiconductor</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Line Laser Wavelength</td>
<td>660nm</td>
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<td></td>
<td></td>
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<tr>
<td>Output</td>
<td>4mW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Point Laser Wavelength</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>1mW</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Accuracy inspection environment: Temperature: 20°C±1°C / Humidity: 50%±10%

* Target workpiece: Specified master ball for inspection (Diameter 30mm)

* Inspection method: According to Mitutoyo’s acceptance procedure. (σ/ sphere measurement, probe alone)
CAT1000 3D Teaching Programs

- CAT1000P implements a 3D measurement point search function and an edge measuring function essential for complex curved surface measurement as a 3D-CAD model standard. CAT1000P can create a high-quality part program either offline or online, dramatically improving the availability of a measuring system.

- Offline Teaching
  This teaching program can create a CNC part program even without a real workpiece and thus provide tuition in advance of receiving the workpiece.

- Online Teaching
  With CAT1000P active on the CNC CMM, the CMM main unit moves according to the instructions issued by the CAT1000P. This teaching program can teach the measurement of fine parts and specify of measuring directions more easily than operating the joystick.

- CAT1000S is a curved surface profile evaluation program that can graphically display a toleranced result while making comparisons between a free-form surface profile (3D CAD model) and a measurement point group. CAT1000S easily performs Pass/Fail judgment on the measured/analyzed comparison results with user defined color tolerance parameters.

- Real-time reporting GEOPAK
  This evaluation program allows measurement in conjunction with GEOPAK under the condition of ‘GEOPAK setup coordinate system = CAD model coordinate system’.

- Boundary Evaluation with Changed Evaluation Method
  In addition to curved surface evaluations, CAT1000S can also determine the difference between side face measurement data projected on a curved surface model and the edge of a workpiece. This program is effective at evaluating the circumference of a comparatively thin workpiece such as sheet metal.
# CARBstrato Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Single Arm System</th>
<th>Dual Arm System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guide method</td>
<td>X: Linear guide, Y, Z: Air bearings</td>
<td></td>
</tr>
<tr>
<td>Drive speed</td>
<td>CNC mode</td>
<td>Moving speed of each axis 8 to 500mm/s (0.31 to 19.7&quot;/s) (Maximum speed 866mm/s (34.1&quot;/s))</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measuring speed: 1 to 10mm/s (0.04 to 0.4&quot;/s)</td>
</tr>
<tr>
<td></td>
<td>J/S mode</td>
<td>Moving speed: 0 to 80mm/s (0 to 3.15&quot;/s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measuring speed: 0 to 3mm/s (0 to 0.12&quot;/s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feed speed: 0.05mm/s (0.002&quot;/s)</td>
</tr>
<tr>
<td>Driving acceleration</td>
<td></td>
<td>1176mm/s² (46.3&quot;/s²) for each axis (Maximum composite acceleration 2037mm/s² (80.2&quot;/s²))</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.0001mm (0.000004&quot;)</td>
<td></td>
</tr>
<tr>
<td>Measuring system</td>
<td>Linear encoder</td>
<td></td>
</tr>
<tr>
<td>Temperature conditions within which accuracy is guaranteed</td>
<td>Range</td>
<td>16°C to 26°C</td>
</tr>
<tr>
<td></td>
<td>Rate of change</td>
<td>1.0 K/hour</td>
</tr>
<tr>
<td></td>
<td>Gradient</td>
<td>Vertical 1.0 K/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Horizontal 1.0 K/min</td>
</tr>
<tr>
<td>Temperature range within which operation is guaranteed</td>
<td></td>
<td>10°C to 35°C</td>
</tr>
<tr>
<td>Recommended humidity</td>
<td></td>
<td>55% to 65%</td>
</tr>
<tr>
<td>Vibration</td>
<td>Rated voltage</td>
<td>Single phase: 100/115/220/240 V ±10% (50/60 Hz)</td>
</tr>
<tr>
<td></td>
<td>Max. current</td>
<td>15A (100 V) 2 x 15A (100 V)</td>
</tr>
<tr>
<td>Power supply</td>
<td>Pressure</td>
<td>0.5 Mpa</td>
</tr>
<tr>
<td>Machine air requirements</td>
<td>Consumption</td>
<td>During Z-axis motion: Up to 500 l/min When Z axis is stopped: 70 l/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>During Z-axis motion: Up to 1000 l/min When Z axis is stopped: 140 l/min</td>
</tr>
<tr>
<td>Air supply capability</td>
<td>Pressure</td>
<td>0.6 MPa or more</td>
</tr>
<tr>
<td></td>
<td>Flow rate</td>
<td>At least 500 l/min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At least 1000 l/min</td>
</tr>
</tbody>
</table>

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.
Accuracy of Main Unit

The accuracy of the CARBstrato Series with specified probes is shown below.

Displacement accuracy ISO10360-2 (JIS B 7440-2)

CARBstrato Single Arm

<table>
<thead>
<tr>
<th>Model</th>
<th>TP2/20</th>
<th>SP25M</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARBstrato 401420</td>
<td>MPE: 18+20L/1000≤70</td>
<td>MPE: 15+20L/1000≤70</td>
</tr>
<tr>
<td>CARBstrato 401424</td>
<td>MPE: 18+20L/1000≤70</td>
<td>MPE: 15+20L/1000≤70</td>
</tr>
<tr>
<td>CARBstrato 401620</td>
<td>MPE: 18+20L/1000≤70</td>
<td>MPE: 15+20L/1000≤70</td>
</tr>
<tr>
<td>CARBstrato 401624</td>
<td>MPE: 18+20L/1000≤70</td>
<td>MPE: 15+20L/1000≤70</td>
</tr>
<tr>
<td>CARBstrato 601620</td>
<td>MPE: 18+20L/1000≤70</td>
<td>MPE: 15+20L/1000≤70</td>
</tr>
<tr>
<td>CARBstrato 601624</td>
<td>MPE: 18+20L/1000≤70</td>
<td>MPE: 15+20L/1000≤70</td>
</tr>
<tr>
<td>CARBstrato 601626</td>
<td>MPE: 20+20L/1000≤110</td>
<td>MPE: 18+20L/1000≤110</td>
</tr>
<tr>
<td>CARBstrato 601620D</td>
<td>MPE: 38+30L/1000≤90</td>
<td>MPE: 35+30L/1000≤90</td>
</tr>
<tr>
<td>CARBstrato 601624D</td>
<td>MPE: 38+30L/1000≤90</td>
<td>MPE: 35+30L/1000≤90</td>
</tr>
<tr>
<td>CARBstrato 601626D</td>
<td>MPE: 40+30L/1000≤110</td>
<td>MPE: 38+30L/1000≤110</td>
</tr>
<tr>
<td>CARBstrato 601630D</td>
<td>MPE: 40+30L/1000≤110</td>
<td>MPE: 38+30L/1000≤110</td>
</tr>
<tr>
<td>CARBstrato 801620D</td>
<td>MPE: 38+30L/1000≤90</td>
<td>MPE: 35+30L/1000≤90</td>
</tr>
<tr>
<td>CARBstrato 801624D</td>
<td>MPE: 38+30L/1000≤90</td>
<td>MPE: 35+30L/1000≤90</td>
</tr>
<tr>
<td>CARBstrato 801626D</td>
<td>MPE: 40+30L/1000≤130</td>
<td>MPE: 38+30L/1000≤130</td>
</tr>
<tr>
<td>CARBstrato 801630D</td>
<td>MPE: 40+30L/1000≤130</td>
<td>MPE: 38+30L/1000≤130</td>
</tr>
</tbody>
</table>

L = Measured length (mm)

Probing error ISO 10360-2 (JIS B 7440-4)

<table>
<thead>
<tr>
<th>Probe Model</th>
<th>Maximum Permissible Probing Error (MPEp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP2/20</td>
<td>20μm</td>
</tr>
<tr>
<td>SP25M</td>
<td>15μm</td>
</tr>
</tbody>
</table>

• Accuracy determined with Standard Stylus
  ø3 x 10mm / ø0.12 x 0.39” for TP2/20
  ø4 x 50mm / ø0.16 x 1.97” for SP25M

• The accuracy values quoted above are guaranteed at any position within the measurement volume.

• Other accuracy information is described in the Mitutoyo inspection certificate
# CARBapex Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Single Arm System</th>
<th>Dual Arm System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guide method</td>
<td>X: Linear guide, Y, Z: Air bearings</td>
<td></td>
</tr>
<tr>
<td>Drive speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNC mode</td>
<td>Moving speed of each axis 8 to 300mm/s (0.31 to 11.8”/s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Maximum speed 519mm/s (20.43”/s))</td>
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<td></td>
<td>Measuring speed: 1 to 5mm/s (0.04 to 0.2”/s)</td>
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</tr>
<tr>
<td>J/S mode</td>
<td>Moving speed: 0 to 80mm/s (0 to 3.15”/s)</td>
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<tr>
<td></td>
<td>Measuring speed: 0 to 3mm/s (0 to 0.12”/s)</td>
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</tr>
<tr>
<td></td>
<td>Feed speed: 0.05mm/s (0.002”/s)</td>
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</tr>
<tr>
<td>Driving acceleration</td>
<td>588mm/s² (23.15”/s²) for each axis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Maximum composite acceleration 980mm/s² (38.58”/s²))</td>
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</tr>
<tr>
<td>Resolution</td>
<td>0.0001mm (0.000004”)</td>
<td></td>
</tr>
<tr>
<td>Measuring system</td>
<td>Linear encoder</td>
<td></td>
</tr>
<tr>
<td>Temperature conditions</td>
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<td></td>
</tr>
<tr>
<td>within which accuracy is</td>
<td>16°C to 26°C</td>
<td></td>
</tr>
<tr>
<td>guaranteed</td>
<td>1.0 K/hour</td>
<td></td>
</tr>
<tr>
<td>Rate of change</td>
<td>5.0 K/24 hours</td>
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<tr>
<td>Gradient</td>
<td>Vertical 1.0 K/min</td>
<td></td>
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<tr>
<td></td>
<td>Horizontal 1.0 K/min</td>
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</tr>
<tr>
<td>Temperature range within</td>
<td>10°C to 35°C</td>
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<tr>
<td>which operation is</td>
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</tr>
<tr>
<td>guaranteed</td>
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<tr>
<td>Recommended humidity</td>
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<tr>
<td>Vibration</td>
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<td></td>
<td>Amplitude of 2μm p-p or less</td>
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<tr>
<td></td>
<td>10 Hz to 50 Hz</td>
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<tr>
<td></td>
<td>Acceleration of 0.004m/s² or less</td>
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<tr>
<td>Power supply</td>
<td>Rated voltage</td>
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<td></td>
<td>Single phase: 100/115/220/240 V ±10% (50/60 Hz)</td>
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<td>Max. current</td>
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</tr>
<tr>
<td></td>
<td>15A (100 V)</td>
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</tr>
<tr>
<td></td>
<td>2 x 15A (100 V)</td>
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<tr>
<td>Machine air</td>
<td>Pressure</td>
<td></td>
</tr>
<tr>
<td>requirements</td>
<td>0.5 Mpa</td>
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</tr>
<tr>
<td></td>
<td>Consumption</td>
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<td>Maximum: 70 l/min</td>
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</tr>
<tr>
<td></td>
<td>Maximum: 140 l/min</td>
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<tr>
<td>Air supply capability</td>
<td>Pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.6 MPa or more</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flow rate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>At least 100 l/min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>At least 200 l/min</td>
<td></td>
</tr>
</tbody>
</table>

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## CARBapex Accuracy of Main Unit

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**Displacement accuracy ISO10360-2 (JIS B 7440-2)**

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<th>SP25M</th>
</tr>
</thead>
<tbody>
<tr>
<td>CARBapex 401420/401218B</td>
<td>MPE&lt;sub&gt;e&lt;/sub&gt;: 25+28L/1000≤95</td>
<td>MPE&lt;sub&gt;e&lt;/sub&gt;: 20+28L/1000≤95</td>
</tr>
<tr>
<td>CARBapex 401424/401222B</td>
<td>MPE&lt;sub&gt;e&lt;/sub&gt;: 25+28L/1000≤95</td>
<td>MPE&lt;sub&gt;e&lt;/sub&gt;: 20+28L/1000≤95</td>
</tr>
<tr>
<td>CARBapex 401620/401418B</td>
<td>MPE&lt;sub&gt;e&lt;/sub&gt;: 25+28L/1000≤95</td>
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### CARBapex Dual Arm

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L = Measured length (mm)

Probing error ISO 10360-2 (JIS B 7440-4)

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<td>Z : 2600x3000mm 20μm</td>
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- Accuracy determined with Standard Stylus
  - ø3 x 10mm / ø0.12 x 0.39” for TP2/20
  - ø4 x 50mm / ø0.16 x 1.97” for SP25M
- The accuracy values quoted above are guaranteed at any position within the measurement volume.
- Other accuracy information is described in the Mitutoyo inspection certificate.
Single Arm System External Dimensions

CARBstrato

- If the ABS/Home position (origin return direction) or controller position is to be changed owing to the workpiece carry-in direction and the operational circumstances, optional works are required. For details, consult your local Mitutoyo Support Staff.

- Mitutoyo provides a Reference Foundation Drawing detailing the foundation structure necessary to maintain the accuracy of measuring machines. A construction contractor will be required to prepare a site-specific foundation drawing and execute the work required.

- Information on the base plate, welding work and anchor work for fixing a CARB machine to the base floor is described in the Reference Foundation Drawing. These works must be arranged by the customer.

- Ancillary works for the cast surface plate, pit cover, workpiece support stand, etc. must be executed by the customer.
### CARBstrato

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### CARBapex (When equipped with optional bellows cover)

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Dual Arm System External Dimensions

CARBstrato

- If the ABS/Home position (origin return direction) or controller position is to be changed owing to the workpiece carry-in direction and the operational circumstances, optional works are required. For details, consult your local Mitutoyo Support Staff.

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CARBapex

CARBapex (When equipped with optional bellows cover)
### CARBstrap-Dual Arm System External Dimensions

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### CARBapex (When equipped with optional bellows cover)

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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.

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