Industrial Metrology in Focus

General overview
Technical highlights spanning more than 160 years

1846 Carl Zeiss opens a workshop for precision mechanics and optics in Jena
1866 The 1000th microscope leaves the workshop
1902 Revolutionary new camera lens: Tessar® – the “eagle eye”
1912 Punktal® – the first axially symmetric eyeglass lenses with point-focal imagery
1923 The first planetarium projector, Mark I – the “Munich Instrument” – shows the northern night sky in exactly the way we see it in nature with our own eyes
1936 First prototype of a phase contrast microscope based on Zernike’s original design
1953 Advent of microsurgery on even the finest tissue with surgical microscopes from Carl Zeiss
1957 Xenon photocoagulator – predecessor of the laser for eye surgery
1962 Camera lenses from Carl Zeiss are used on the Mercury 8 mission and on all other manned US space flights in the following years
1973 UMM 500, the world’s first numerically controlled 3D coordinate measuring machine; measuring accuracy: 0.5 µm
1999 UHT screening systems, jointly developed with Hoffmann-La Roche, increase the speed of drug discovery through the automated search for new agents
2000 Using innovative electron beam technology, structures can also be imaged with high resolution at low vacuum or low voltage
2001 The CenterMax® bridge-type measuring machine allows measurement directly in the production area with a level of accuracy normally only attained in air-conditioned measuring rooms
2003 The ApoTome® imaging system permits optical sections of fluorescence-labeled biological specimens to be produced with very high quality and at an economy price
2009 Industrial Metrology celebrates its 90 anniversary
The six business groups of Carl Zeiss are each responsible for their own operations within the Group.

**Semiconductor Technology**
As the market leader in lithography systems, Carl Zeiss lays the foundation for the leading-edge technology of tomorrow: the company produces optics for the manufacture of increasingly smaller and more powerful microchips. Carl Zeiss is also the leader in electron and ion-beam microscopes that visualize even the smallest structures.

**Medical Systems**
Products from the Medical Systems Group are used in ophthalmology, ENT and neurosurgery as well as in doctor’s offices. The product offering extends from surgical microscopes to visualization and documentation systems up to diagnostic and therapeutic instruments.

**Microscopy**
As the leading provider of innovative microscopy systems, Carl Zeiss delivers total solutions for customers in biomedical research, healthcare and industry. Systems for industrial materials analyses and process analytics round off the product line.

**Industrial Metrology**
The product line of technology leader Carl Zeiss Industrielle Messtechnik GmbH includes bridge-type and horizontal-arm measuring machines, as well as measuring machines to capture form, contour and surfaces. Carl Zeiss continually sets new benchmarks for the use of measuring machines on the shopfloor.

**Consumer Optics/Optronics**
The ZEISS brand delivers what it promises – imaging excellence without compromises: with binoculars and spotting scopes, digital and analog still, video and movie cameras, optronic systems and in planetarium technology.

**Carl Zeiss Vision**
*(Joint venture)*
The international business group Carl Zeiss Vision is number two in the eyeglass lens market. The range of products also includes systems for the fitting of eyeglass lenses and frames.
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Carl Zeiss IMT: 
Measuring technology from the leader

Reliable, high-quality measuring technology consists primarily of the coordinate measuring machine, well-engineered software and customer service and support. At Carl Zeiss, these elements interact in perfect harmony. Carl Zeiss IMT is your one-stop provider of metrology solutions.
The affordable CONTURA G2® is ideal for small and mid-sized companies wanting the benefits of high-speed scanning. VAST® scanning technology enables form inspections at maximum speed with high-quality measuring results. Process changes are detected at an early stage, high production quality is ensured and rejected parts are reduced.

Key features

Robust machine design

• Ceramic guideways in X and Z provide rigidity and protection against production-related environmental influences
• Air bearings on all axes for high stability at high travel speeds

Machine technology

• CONTURA G2 direkt: entry-level scanning technology from Carl Zeiss; equipped with the VAST XXT scanning sensor that can measure a variety of workpieces
• CONTURA G2 RDS: scanning of features in all angular positions with VAST XXT on the flexible ZEISS RDS articulating probe
• CONTURA G2 aktiv: self-centering probing, multi-point measurement of deeper features and reliable measurement of displaced features with size, form and position results also with high throughput thanks to the flexible VAST XT

Options

• Integrated sensor changer rack for maximum reproducibility without recalibration
• HTG version for the same accuracy over a larger temperature range
• Expansion of the Z measuring range by 200 mm with the U-shaped granite table option
CONTURA G2: affordable high-end measuring technology in a small size.

### Dimensions

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>X x Y x Z [mm]</td>
<td></td>
</tr>
<tr>
<td>700 x 700 (1000) x 600</td>
<td>1.8 + L/300</td>
</tr>
<tr>
<td>1000 x 1200 – 2100 x 600</td>
<td>1.9 + L/300</td>
</tr>
<tr>
<td>1000 x 1200 – 2100 x 600 (U-shaped granite table)</td>
<td>1.9 + L/300</td>
</tr>
</tbody>
</table>

L = measuring length in mm

### Sensor system
The platform concept of the new ACCURA® allows you to tailor your measuring machine to your requirements and budget. What do you need, performance or precision? We offer configuration packages that fit your requirements. Furthermore, the modular design provides you with security in your investment: the new ACCURA can be modified to meet changing requirements on the configuration, sensors and software.

**Key features**

**Lower weight for more speed**
The steel and aluminum bridge of the new ACCURA is extremely rigid and slim. The special CARAT coating on the aluminum parts ensures their temperature stability and long service life. The reduced weight of the moving parts improves the dynamics.

**Machine technology**

Tailored to your requirements:
- **ACCURA Kompakt** with the RDS-C articulating probe holder the XDT and VAST XXT sensors.
- **ACCURA Aktiv** with sensors for contact measurement offers a choice of the DT, VAST XT, VAST XT gold and VAST gold active measuring sensors. It can be upgraded to MASS technology.
- **ACCURA with MASS** provides the entire line of ZEISS sensor technology, including the ViScan and LineScan optical sensors on the RDS-D.
- Navigator technology for increased productivity and high measuring performance.

**Options**

- DT, VAST XDT, VAST XXT, VAST XT gold and VAST gold for single-point measuring and scanning
- ViSCAN, DTS, LineScan; non-contact measurement
- Modular magazine technology combined with an automatic stylus rack
- Navigator
- Performance
The new ACCURA is part of the mass concept – the all-in-one strategy of measuring technology from Carl Zeiss that incorporates the increasing need for multifunctional machines. Today, measuring machines must be able to measure using optical scanning and contact sensors. The solution is ACCURA which combines both disciplines.

### Dimensions

<table>
<thead>
<tr>
<th>Measuring range X x Y x Z [mm]</th>
<th>Length measuring error [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCURA 8 900 x 1400 – 1800 x 800</td>
<td>1.6 + L/333</td>
</tr>
<tr>
<td>ACCURA 10 1200 x 1800 – 4200 x 1000</td>
<td>X = 1200 2.2 + L/300</td>
</tr>
</tbody>
</table>

**“mass” sensor system**
PRISMO® is number one in the world for high-speed scanning in production. Accuracy, speed and outstanding resistance to ambient conditions are the trademarks of this measuring machine. The VAST® universal probe for multi-point or single-point measuring is used on PRISMO navigator and adjusts to each measuring task and quickly determines size, form and position in a single measuring run.

Key features

The precise result as fast as possible
- All components support maximum precision during high-speed scanning
- Also suitable for use on the shopfloor
- ISC control provides high reliability and optimal controller action
- With VAST navigator, measuring times are reduced to an absolute minimum

Machine technology

- Extremely rigid, laterally driven light bridge
- Table covers as well as fully enclosed X axis and Y drive axis
- Glass ceramic scales
- Passive elastomer vibration damping
- S-CAA and D-CAA to compensate for static and dynamic bending effects

Options

- Integration of a rotary table as the 4th axis
- Use of palletizing and loading systems
- Accept® enclosure for inline use
PRISMO is also included in the mass concept that incorporates the increased need for multifunctional measuring machines. PRISMO thus enables both contact and optical measurements.

**Dimensions**

<table>
<thead>
<tr>
<th>Measuring range X x Y x Z [mm]</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 (7) 700 x 900 x 500 (650)</td>
<td>(5, 7) VAST Gold HTG 1.4 + L/333</td>
</tr>
<tr>
<td>900 x 1200 – 2400 x 650</td>
<td></td>
</tr>
<tr>
<td>10 1200 x 1200 – 4200 x 1000</td>
<td>(10) X = 1200 X = 1600</td>
</tr>
<tr>
<td>1600 x 2400 – 4200 x 1000</td>
<td>1.8 + L/300  2.9 + L/300</td>
</tr>
<tr>
<td>1600 x 2400 – 4200 x 1400</td>
<td>3.2 + L/300</td>
</tr>
</tbody>
</table>

L = measuring length in mm, single Y measuring ranges have different linear measuring tolerances, S-ACC version with linear measuring tolerance of up to 0.9 + L/300 available. Specifications for 15 – 30°C available.
With an extremely low measuring uncertainty, the UPMC ultra is particularly well-suited for maximum precision measurements in research, development and quality assurance, as well as for the calibration of gages and test pieces. Additionally, the UPMC ultra bridge-type measuring machine is ideal for precision measurements throughout 3D metrology, for measuring prototypes and volume parts, planes and spatial curves.

**Key features**

**Measurements in extreme ranges**
- CNC-controlled, high-precision measuring machine with bridge-type central drive for acceleration-free measuring and constant precision throughout the measuring range
- Thermally insensitive scales in the CARAT® version
- Servo drives for electronic monitoring of the drives and shearing force limitation in all axes

**Foundation for maximum precision**
- Fine CAA and S-CAA for guideway error correction and position-dependent bending correction of the machine rigidity
- Table plate bending compensation

**Machine technology**
- Active scanning to capture very large quantities of data
- Automatic decision-making aids, graphic user guidance and efficient interfaces between the operator and measuring machine
- Simultaneous determination of size, form and position
- Function-oriented inspection with a ring gage or mandrel

**Options**
- Attached rotary table as 4th axis
UPMC ultra meets the highest demands on precision.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Sensor system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td></td>
</tr>
<tr>
<td>X x Y x Z [mm]</td>
<td>Linear measuring tolerance [µm]</td>
</tr>
<tr>
<td>UPMC ultra</td>
<td>850 x 1150 x 600</td>
</tr>
<tr>
<td></td>
<td>0.3 + L/1000</td>
</tr>
</tbody>
</table>

L = measuring length in mm
CenterMax® navigator fits smoothly into any production line and withstands all production environments: neither extreme temperature fluctuations nor typical floor vibrations affect its precision. Even large workpieces are no problem for CenterMax – it can accept weights up to 1000 kg. The open design permits three-sided loading.

**Key features**
- Production measuring center with third generation high-speed scanning technology for high data density and reliable measuring results
- Computer-aided error correction of the axes of motion increases precision
- Sturdy construction as a result of the machine base consisting of cast mineral technology
- Ideal for use directly in a production environment as a result of extreme resistance to temperature fluctuations

**Machine technology**
- Temperature-resistant frame technology combines insulating and damping cast mineral with invar elements to ensure insensitivity to temperature fluctuations.
- Fully enclosed measuring axes on air bearings for maximum precision and resistance to dirt
- Active vibration damping eliminates the negative effects of floor vibrations on the measuring result

**Options**
- Ultra configuration enables added accuracy for applications in the measuring lab
- Granite or universal table permits adjustment to changed production conditions
The CenterMax navigator universal coordinate measuring machine is ideal for economical measuring both on the shopfloor and in the measuring lab.

### Dimensions

<table>
<thead>
<tr>
<th></th>
<th>Measuring range X x Y x Z [mm]</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CenterMax navigator</td>
<td>1100 x 1200 x 900</td>
<td>20°C: 1.4 + L/300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22°C: 1.5 + L/290</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28°C: 1.8 + L/260</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40°C: 2.4 + L/200</td>
</tr>
<tr>
<td>CenterMax navigator ultra</td>
<td>900 x 1200 x 700</td>
<td>19 – 21°C: 0.6 + L/600</td>
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</table>

L = measuring length in mm
The GageMax® CNC production center replaces fixed gages in the innovative machining, and cutting and reshaping industry – and measures the entire range of parts in the process. In addition, it guarantees maximum precision in a production environment. The foundation for this is the computer-aided accuracy correction of the axes of motion and the insensitivity to dirt as a result of the fully enclosed machine axes.

**Key features**

**Measurements directly in production**
- Exceptionally sturdy and resistant to temperature changes
- Very high measuring accuracy and optimum productivity under production conditions

**Economical**
- Minimal space requirements
- No air-conditioned measuring lab required
- Replaces gages as well as measuring and testing equipment
- 30% lower life cycle costs

**Optimum flexibility**
- Can be easily moved when production conditions change

**Machine technology**

**Enclosed 3D box**
- Ideally designed to protect against environmental influences, easy to service
- Insensitive to temperature changes

**Sturdy design**
- Special linear guideways
- Highly dynamic drives with 520 mm/s travel speed and 3.5 mm/s² acceleration
- Insensitive to vibrations

**Options**

**Rotary table as integrated 4th axis**
- To measure rotational parts

**Integration into automation systems**
- Use of palletizing and loading systems

**More flexible operation and use**
- Control panel accessories and features
- Extensive computer and system equipment options
- Various software options
Sleek, compact and maximum flexibility – GageMax is the ideal coordinate measuring machine for a wide range of workpieces.

### Dimensions

<table>
<thead>
<tr>
<th>Measuring range X x Y x Z [mm]</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
</table>
| GageMax navigator 750 x 500 x 500 | 20°C: 2.2 + L/300  
28°C: 2.6 + L/260  
32°C: 2.8 + L/240  
40°C: 3.2 + L/200 |
| GageMax RDS 750 x 500 x 500 | |

L = measuring length in mm
DuraMax.
The right measuring equipment for the shopfloor

The ability to measure quickly and accurately and the flexibility to react to changes are essential in the machining and tooling industry. Fixed gages and inspection equipment are no longer economical. DuraMax is your answer.

Key features

Made for production
• Complete CNC coordinate measuring machine; replaces many gages
• Measure with temperature stability up to +30°C
• Minimal space requirements; easy setup

Well-equipped standard configuration
• Configured with scanning

Made to measure
• Easy to use; can be loaded from three sides
• Practical stylus rack
• Low space requirements; more room to work

Machine technology

Reliable drive technology
• Completely covered guideways
• Integrated damping system
• Compensation of guideway errors (CAA corrected)

Technology from Carl Zeiss, the market leader
• C99 controller technology
• VAST XXT scanning sensor
• CALYPSO measuring software
• Fast startup
• No special installation or power requirements

Sensor systems

• VAST XXT scanning sensor from the technology leader
• Probe for single-point measuring and scanning
• Stylus receptacle for CNC-guided stylus change
• Adapter plate with 25 mm diameter for optimal reproducibility
DuraMax.
Upgrade from manual measuring equipment to a CNC machine.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Measuring range X x Y x Z [mm]</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuraMax</td>
<td>500 x 500 x 500</td>
<td>18 – 22°C: 2.4 + L/300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 – 26°C: 2.7 + L/250</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 – 30°C: 2.9 + L/200</td>
</tr>
</tbody>
</table>

L = measuring length in mm
Because ScanMax® was designed for use in production, harsh conditions do not influence measurement quality. Whether a design model, standard geometries or a statistical evaluation – ScanMax always measures highly precisely and reliably. And: ScanMax is only available with scanning. Above all: the more points that are captured, the more precise the measurement and the more reliable the measured values.

**Key features**

- Intelligent gage for the shopfloor and pre-production
- Permits manual scanning directly next to the machine tool for the complete capture of complex workpiece surfaces
- High measuring accuracy at ambient temperatures of 15 – 30°C
- Patented correction processes ensure absolute precision directly in production
- Low space requirements with added flexibility

**Machine technology**

- Fully enclosed measuring systems ensure insensitivity to rough environmental conditions
- More resistance to bending and better temperature stability through the use of carbon-fiber reinforced plastic for the articulated arm
- Highly dynamic servo drive enables electronic monitoring of the drives and shearing force limitation

**Options**

- Optional rotary tilting table allows you to move and rotate the coordinate system for unlimited 3D measurements
- Equipped with wheels for easy transport
- Inherently stable base for additional vibration damping
ScanMax guarantees precision with ambient temperatures typical of production environments.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Measuring range</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ScanMax</td>
<td>850 x 400 x 450</td>
<td>5.0 + L/50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.9 + L/50 (HG Version)</td>
</tr>
</tbody>
</table>

L = measuring length in mm
With the F25 coordinate measuring machine, Carl Zeiss offers a system that meets the extreme demands of quality assurance for size, form and position of microsystem parts. Microsystem components are used in automotive and medical parts. They are essential for highly accurate control processes. Their reliability is determined by the precision with which quality assurance ensures the function of these tiny parts.

Key features

• The ultra-precise kinematics combined with the highly accurate measuring system enable measuring uncertainty of 250 nm at a resolution of 7.5 nm
• Time-tested CALYPSO measuring software used on other large coordinate measuring machines

Machine technology

• Flexible measuring with multi-sensor technology: contact and optical measuring with one system
• Contact, passive measuring scanning sensor based on silicon-chip technology with integrated Piezo-resistive elements
• ViSCAN camera sensor based on an objective lens used in ZEISS microscopy for 2D measurements
• An additional camera aids visualization during probing and simplifies learn programming

Options

• Sensitive 3D micro-stylus for stylus diameters of 50 – 500 µm and stylus tip diameters of 100 – 700 µm
Whether micro-motors, micro-switches or other tiny components – every micro-part can be highly accurately measured with the F25.

### Dimensions

<table>
<thead>
<tr>
<th>Measuring range $X \times Y \times Z$ [mm]</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 x 100 x 100</td>
<td>$0.250 + L/666$</td>
</tr>
</tbody>
</table>

$L = \text{measuring length in mm}$

### Sensor system

- 3D micro stylus
- ViSCAN F25
O-INSPECT combines the best from measuring technology with the best from optics: it is equipped with a contact and an optical sensor. O-INSPECT is the ideal solution for applications in the plastics industry, medicine and automotive technology and in precision mechanics – always when a large number of components have to be measured quickly with high accuracy.

**Key features**

**Proven design principle**
- Bridge-type measuring machine with rigid bridge and moveable table for high accuracy and optimum accessibility

**Premium basic configuration**
- Standard configuration with multi-sensor technology
- VAST® contact scanning and optical measuring in one machine

**Machine technology**

**Reliable drive technology**
- Precision roller bearings in all axes
- Highly dynamic drives and automatic drive monitoring
- Compensation of guideway errors (CAA corrected)

**Ideally equipped for inline measuring**
- Completely covered guideways
- Integrated damping

**Field-tested components**
- ZEISS VAST XXT scanning sensor for contact measuring
- ZEISS zoom lens for optical measuring
- In-house machine components relevant to precision

**Sensors**

**Discovery zoom lens from Carl Zeiss**
- Optical 2D camera sensor with image processing functionality
- Optical system with lenses from Carl Zeiss
- 12x zoom lens, image field (mm): 1 x 1 – 12 x 12
- Unique illumination with red and blue light, segmenting possible

**VAST XXT scanning sensor**
- Passive measuring probe for single-point probing and scanning
- Stylus receptacle for CNC-guided stylus change
- Lateral styli up to 40 mm, styli in three directions
Plugs no larger than a few millimeters, cellphone cases, implants – O-INSPECT is a true all-rounder and easily masters every measuring task.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Sensor system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range X x Y x Z [mm]</td>
<td>Linear measuring tolerance [µm]</td>
</tr>
<tr>
<td>400 x 400 x 200</td>
<td>1.9 + L/250</td>
</tr>
</tbody>
</table>

L = measuring length in mm
Metrotomography® is the fusion of metrology and tomography. It is now possible to measure highly precisely and non-destructively in areas where only destructive inspection was possible before or no quality assurance took place at all.

Metrotomography allows you to measure the interior of a workpiece: all recorded data can be applied to all areas of quality assurance and be evaluated. Non-destructive testing technology, such as assembly inspection, damage and porosity analysis, material inspection and defect checks is possible as well as traditional evaluation, reverse engineering applications or a comparison of geometries.

Key features

Well thought-out design
- 3D computed tomograph with micro-focus x-ray tubes and detectors
- Rotary table for clamping device and Mover from Carl Zeiss

Safe technology
- Radiation protective enclosure fulfills the requirements of a full-protection enclosure
- Meets radiation protection ordinance in accordance with DIN 54113 for full-protection devices (0.5 mR/h on external skin) of this type
- Ergonomically optimized design (special loading position)

Machine technology

Proven linear technology
- In-house manufactured, precision-relevant machine components
- Compensation of guideway errors (CAA corrected)
- Original Carl Zeiss rotary table with direct drive
- High-precision rotary table with very high resolution on air or mechanical bearings

Sensor

Micro-focus x-ray tubes
- METROTOM 1500: open x-ray technology with unlimited long service life
- METROTOM 800: maintenance-free closed x-ray technology

Detector
- Sensitive flatbed detector
- METROTOM 1500: 1 megapixel or optional 4 megapixel resolution
- METROTOM 800: 3 megapixel resolution
Metrotomography quickly and clearly shows defects in areas where previously either an inspection was not possible or very time-consuming, and costly cross sections were the only means of ascertaining the required results.

<table>
<thead>
<tr>
<th>METRO TOM 800</th>
<th>METRO TOM 1500</th>
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</thead>
<tbody>
<tr>
<td><strong>Performance features</strong></td>
<td><strong>Performance features</strong></td>
</tr>
<tr>
<td><strong>Tube</strong></td>
<td>Tube</td>
</tr>
<tr>
<td><strong>Detector</strong></td>
<td>130kV/39W</td>
</tr>
<tr>
<td><strong>Measuring range</strong></td>
<td>1900 x 1512 pixels</td>
</tr>
<tr>
<td><strong>Lifting table</strong></td>
<td>Ø125 x 150 mm</td>
</tr>
<tr>
<td><strong>adjustment range</strong></td>
<td>270 mm</td>
</tr>
<tr>
<td><strong>Source-detector distance</strong></td>
<td>800 mm</td>
</tr>
<tr>
<td><strong>Source-detector distance</strong></td>
<td>1500 mm</td>
</tr>
</tbody>
</table>

| **Tube**                          | 225kV/225W                   |
| **Detector**                      | 1024 x 1024 pixels           |
| **Measuring range**               | Ø300 x 350 mm                |
| **Lifting table**                 | 150 mm                       |
| **adjustment range**              | 808 x 808 pixels             |
| **Source-detector distance**      | 1500 mm                      |
Carl Zeiss offers a device that is of particular interest to medium-sized companies, suppliers and manufacturers in the automotive industry: CARMET, the horizontal-arm measuring machine. Precision, long-term stability and investment security have been systematically incorporated into this new development. CARMET II meets all of the demands on a fully automated coordinate measuring machine for the dimensional control of reshaped and originally shaped components. CARMET carries on the traditions of its successful predecessor: easy to use, solid technology with a good price-performance ratio and low lifecycle costs.

Key features

CARMET has been optimized to ensure that the maximum measuring range is available for the specified machine dimensions. Integrating the controller into the measuring machine not only decreased the number of interfaces, but also simplifies installation and reduces system footprint. The unique trapezoidal structure of the Z column with a bionic design is based on nature, thus enabling a stable and simultaneously effective design solution.

Machine technology

All axes are equipped with proven linear guide-ways featuring ball chains for an optimal service life, accuracy and rigidity. The panels on the column can be removed in only a few steps. The components relevant to maintenance are easily accessible and replaceable, thus reducing maintenance times and increasing availability.

Sensors

CARMET II comes standard with the RDS-C stepping articulating probe holder featuring CAA. In conjunction with the CAA computer-aided correction system, RDS is a real calibration wonder. RDS-CAA calibrates automatically by mathematical calculation. It calibrates 8-12 angular positions and uses the stylus in all 20,736 positions. You simply cannot measure any more flexibly. RDS-CAA makes it possible to change a stylus manually or automatically with a high degree of precision and without recalibrating the stylus. You can move all styli into any angular position without delay.
Dimensions

<table>
<thead>
<tr>
<th>Measuring range X x Y x Z [mm]</th>
<th>Length measuring error [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000 – 7000 x 1600 – 3000 x 2500</td>
<td>16-24 °C: 35+L/50 ≤ 80</td>
</tr>
</tbody>
</table>

L = measuring length in mm

Sensor system

CARMET.
More room to measure.
PRO and PRO T are universal measuring machines for the automotive and supplier industries. They are ideal for the initial batch of parts up to analysis – from the first sheet to the first tool, from the cubing model to a complete car body. The machine design of the PRO line is based on a completely new platform strategy with a modular design. The most important features: very high speeds without a loss of measuring accuracy and error-free adjustment to changed production requirements.

**Key features**

**Bionic design construction**
- Unique trapezoidal design of the Y and Z axes for unparalleled rigidity
- Separation of the basic mechanical structure and guideways for more efficient and economical maintenance

**PRO Platform**
- Modular design for optimum adaptation to the range of tasks and investment levels
- RDS-CAA articulating probe holder

**Machine technology**

**Linear guideway in all three axes**
- For high accuracy, speed and long-term stability
- Permits travel speeds up to 866 mm/s and acceleration up to 1500 mm/s²

**PRO**: measuring beam with large cross section and three-point bearing  
**PRO T**: (floor version) lateral guideway on own rigid measuring plate

**Options**

**Easy-to-use, precise software**
- Possible to operate with CMM-OS or DME® control software
- Connection to non-ZEISS software possible
- Teleservice for onboard diagnostics, software upgrades and user support

**Optimized sensors**
- Adaptation of different stylus systems possible depending on the PRO or PRO T version
- High-end option for PRO/PRO T premium: Eagle Eye Navigator laser-line triangulation stylus
Maximum output and minimum costs for the entire product line are the result of the modular design of PRO and PRO T.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Sensor system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range X x Y x Z [mm]</td>
<td>TP 6</td>
</tr>
<tr>
<td>compact 5000 – 10000 x 1600 x 2100 – 3000</td>
<td></td>
</tr>
<tr>
<td>select 5000 – 10000 x 1600 x 2100 – 3000</td>
<td></td>
</tr>
<tr>
<td>premium 5000 – 10000 x 1600 x 2100 – 3000</td>
<td></td>
</tr>
<tr>
<td>Optional high accuracy PRO T</td>
<td>TP 20</td>
</tr>
<tr>
<td></td>
<td>PH10M</td>
</tr>
<tr>
<td></td>
<td>MIH</td>
</tr>
<tr>
<td>Linear measuring tolerance [μm]</td>
<td>L = measuring length in mm</td>
</tr>
<tr>
<td>compact 30 + L/70 ≤ 80</td>
<td></td>
</tr>
<tr>
<td>select 25 + L/100 ≤ 60</td>
<td></td>
</tr>
<tr>
<td>premium 18 + L/125 ≤ 50</td>
<td></td>
</tr>
</tbody>
</table>
Large machines

MMZ G, MMZ T.
Outstanding measuring performance

There is room for precision even where heat and dirt cannot be avoided: with the MMZ G and MMZ T machine measuring centers. They are tailored for precise, economical measuring of large parts directly in the production environment. Furthermore, because these measuring centers can be loaded from three sides with a crane or floor conveyors, they are ideal for the conditions in production.

Key features

Designed for measurements of highly precise machine parts
- Traditional bridge-type machine construction for high accuracy, measuring performance and resistance to ambient conditions
- Roller bearings increase resistance to rough environmental conditions without compromising the superb guideway characteristics
- CAA error correction of the axes of motion

Control and operation
- Highly integrated ISC control technology
- Variable speed control during CNC operation
- Prepared locking device with crane control to load workpieces

Machine technology
- Peak performance during active scanning with VAST® gold standard probe, even with large styli
- Software assistant to automatically determine the fastest possible scanning speed
- Complete collision protection of the quill

Options
- VAST navigator for high result quality with a short measuring time
- Optimization functions for probe movement
- Outstanding measuring flexibility with use of VAST and RDS
Reliable measurement of large parts over the long-term is easily possible with MMZ G and MMZ T.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Measuring range</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMZ G 2000</td>
<td>2000 x 3000 – 5000 x 2000</td>
<td>2.8 + L/40</td>
</tr>
<tr>
<td>MMZ G 2500</td>
<td>2500 x 3000 – 6000 x 2000</td>
<td>3.2 + L/400</td>
</tr>
<tr>
<td>MMZ G 3000</td>
<td>3000 x 4000 – 6000 x 2000</td>
<td>3.5 + L/400</td>
</tr>
<tr>
<td>MMZ T 12</td>
<td>1600 x 2400 (3000) x 1200</td>
<td>2.0 + L/300</td>
</tr>
<tr>
<td>MMZ T 16</td>
<td>1600 x 2400 (3000) x 1600</td>
<td>3.0 + L/300</td>
</tr>
<tr>
<td></td>
<td>2000 x 3000 x 1600</td>
<td>3.2 + L/300</td>
</tr>
</tbody>
</table>

L = measuring length in mm
How do you precisely measure large engineering, automotive and aerospace components, as well as communication and satellite equipment? This is best accomplished with the flexible MMZ B and MMZ E machine measuring centers. The open design of these measuring machines and the ability to measure on both sides of the Y axis enables you to quickly and easily measure large parts.

Key features

- Flexible line of gantry measuring machines with a large measuring range
- Accuracy, speed and reproducibility with optimum reliability even on the shopfloor
- Easy placement of the parts and unimpeded access to the measuring range
- Integration of loading systems
- Superior metrology and dynamic properties

Machine technology

Raised guideways

- Increases resistance to dirt
- Specially coated and ground for high repeatability of the movements
- Results in the lowest moving masses
- Enables high travel speeds with low drive power
- Guideways on air bearings for the realization of economical solutions with outstanding operating characteristics

Temperature resistant machine geometry

- Measuring systems of the X and Y axes systematically arranged in one plane to minimize the influence of spatial temperature differences

Sensors

- RDS with TP6, TP20 and TP200 for single-point probing; VAST XXT measuring stylus for scanning or single-point probing
- WBScan optical line scanner for surface measurement
- Only on MMZ B: VAST gold for scanning or single-point probing
The practical design of the MMZ B and MMZ E permits loading with a crane or forklift.

### Dimensions

<table>
<thead>
<tr>
<th>Measuring range X × Y × Z [mm]</th>
<th>Linear measuring tolerance [µm]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MMZ B 2000</strong></td>
<td>RDS/TP6 6.0 + L/166 (Z = 1500); 8.0 + L/125 (Z = 2000)</td>
</tr>
<tr>
<td></td>
<td>VAST gold 4.0 + L/200 (Z = 1500); 6.0 + L/150 (Z = 2000)</td>
</tr>
<tr>
<td><strong>MMZ B 2500</strong></td>
<td>RDS/TP6 6.0 + L/143 (Z = 1500); 8.0 + L/111 (Z = 2000)</td>
</tr>
<tr>
<td></td>
<td>VAST gold 4.0 + L/180 (Z = 1500); 6.0 + L/130 (Z = 2000)</td>
</tr>
<tr>
<td><strong>MMZ E 2000</strong></td>
<td>RDS/TP6 6.0 + L/167 (Z = 1000); 8.0 + L/125 (Z = 1500)</td>
</tr>
<tr>
<td><strong>MMZ E 2500</strong></td>
<td>RDS/TP6 9.0 + L/110 (Z = 1000); 10.0 + L/100 (Z = 1500)</td>
</tr>
</tbody>
</table>

The sensor system of these measuring machines corresponds to the range of sensors of the MMZ G and MMZ T (pages 30/31).
Carl Zeiss offers a variety of contact sensors, such as the RST-P and DT sensors for single-point measurement as well as the third generation scanning with the active VAST sensors from Carl Zeiss. They allow you to quickly, precisely and reproducibly inspect form elements such as roundness or straightness in a single measuring run.

**RST-P**

- Trigger sensor for fast, dynamic capture of measuring values through single-point probing
- Ideal for the automotive, engineering, tool making and mold making industries

**DT DynaTouch**

- Very robust, integrated dynamic system delivers high reproducibility with single point measuring
- DT has a self-centering feature and permits complex stylus configurations as a result of its automatic weight balancing
- Different styli can be used in one configuration

**VAST XXT**

- Passive sensor as a replacement for trigger sensors
- Increases operational safety and the accuracy of the measurements
- For light, short and symmetrical stylus configurations, e.g. star probe
- For the measurement of parts that require many angular positions of the stylus

**VAST XT gold, VAST XT**

- Active scanning technology from Carl Zeiss
- High-speed scanning for each measuring task
- Complex and heavy styli combinations without a loss of accuracy; for stylus lengths up to 500 mm and stylus weights up to 500 g
- For form and position measurements, curve and freeform measurements, and reverse engineering
- Can be combined with navigator technology

**VAST gold**

- Active scanning probe for contact scanning and single-point measurements
- Collision protection in all directions
- Higher dynamic through optimized moving masses
- Higher rigidity through optimized joints
- Scanning speeds up to 300 mm/s
- Easy use of stylus lengths up to 800 mm, stylus weights up to 600 g and asymmetrical stylus configurations
- VAST gold – primarily with Navigator technology – drastically increases the measuring performance and thus productivity
Measuring technology from Carl Zeiss is designed for use in production. This applies to single point measuring as well as scanning.
Optical sensors

ViSCAN, DTS, LineScan, Eagle Eye Navigator.

The ViSCAN, DTS, LineScan and Eagle Eye Navigator optical sensors are capable of delivering precise measuring results for sensitive, soft, finely structured or 2D test pieces.

ViSCAN

- Optical 2D image sensor
- Measurements in all spatial directions; rechucking the workpiece is unnecessary
- Different lenses can be used, making it possible to capture deep-laying features
- Parts with very small or 2D geometries and/or soft materials can be measured in the image with the auto focus system as well as perpendicular to the camera plane
- Difficult measurements can be performed on low-contrast test pieces such as punched components or printed circuit boards using the optional, mobile transmitted light stages

DTS

- Optical diode stylus for single-point measuring
- Clamping of materials is unnecessary; deformations avoided
- Simple, fast and reliable probing
- Compact design, low weight, no mechanical wear parts
- For soft and sensitive materials such as plasticine, clay, wood, plastics, foam parts, material or lacquered surfaces

LineScan

- Optical sensor to capture the entire surface of forms using point clouds for a comparison with available nominal CAD data sets or for the creation of a new CAD model or milling data
- Complete with scanner, software, cables
- Ultra-fast line scanner for high-speed digitization; captures 250,000 points per second; short measuring times enable considerable increases in productivity
- For contact-sensitive or finely structured surfaces in the areas of car body, mold/tool making, model making and design

Eagle Eye Navigator

- Optical scanning for car body measurement based on laser triangulation
- Reduced measuring and reaction times, increased quality of the pressed parts
- Top-quality evaluations of the results with information on the diameter, position and form of the part feature down to the micrometer
The more points, the more information on the workpiece – optical scanning is unparalleled in this area.
CALYPSO enables you to complete all measuring tasks with one software at the click of a mouse – whether single-point or scanning, manual or CNC, on a coordinate measuring machine or offline. CALYPSO can be used for a variety of tasks.

For standard geometries or freeform surfaces, HOLOS NT is the program of choice. This software features a modular design that can be adapted to your needs.

**Concept**

- Software for all measuring strategies and tasks
- Integrated in production
- Can be combined with non-ZEISS measuring systems via DME interface
- Articulated-arm measuring machines, laser trackers and computed tomographs can be used
- Interfaces for all standard CAD formats

**Programming**

- Generate measurement programs by clicking on measurement and reference points on the displayed component
- Measurement of standard geometries and freeform surfaces in one process following upgrade

**Measurement and evaluation**

- Interactive guidance through CALYPSO during the measurement
- Filter function, special calibration procedures, optimum approach and travel paths, as well as measuring in one pass with VAST® navigator for highly precise measuring results
- Standardized protocol output in QDSA or DMIS
- Results can be transferred to SPC software

**Modules**

**HOLOS Geo**
- Measurement of standard geometric features
- Automatic user guidance

**HOLOS Light**
- Measurement of curved surfaces with a plan/actual comparison
- Complete graphic display of the measurement for reliable interpretation of the measured values

**HOLOS Extended**
- Quickly and very accurately measure complex freeform surfaces
- Complete automation of measurement runs
- Open data exchange
- Ideal for comparing models in a single step during cubing

**HOLOS Digitize**
- Digitization of curves and surfaces
- Direct conversion into CAD data for immediate checks
- Automatic calculation of defined scanning lines
While CALYPSO is ideal for a variety of different requirements, HOLOS NT has been specially designed to measure standard geometries and freeform surfaces.
With the Surfcom and Contourecord lines, Carl Zeiss meets the demands of surface and contour measurement. They are based on a modular machine design, enabling Carl Zeiss to always offer the ideal solution.

**Systems**

- Surfcom 1500: The comfortable measuring station for surface measurements
- Contourecord 1700/2700: The flexible measuring station for contour measurements
- Contourecord 1900/2900: The flexible measuring station for surface and contour measurements
- Surfcom 2000: The system for surface and contour measurements in one pass
- Surfcom 5000: Contour and surface technology for the highest demands

**Software**

TIMS – integrated software for form, contour and surface

- Facilitates the exchange of measurement data, e.g. from form or roughness analyses directly to contour analysis, in order to permit the evaluation of micro-contours according to specific requirements, for example
- Typical features of contour analyses such as the calculation of radii, angles and gaps can be quickly and easily evaluated

**Options**

- Modular system with various CNC table modules
- Combination of table modules: motorization of each axis to align and position the workpiece
- Programming of fully automatic CNC measuring runs via the TIMS software platform
Contourecord and Surfcom are the experts for surfaces and contours – in the workshop, in production or in the measuring lab.
The precise determination of form parameters such as roundness, concentricity and cylindricity is an essential element of the quality assurance process. Even manual form testers provide very good accuracy while also measuring quickly. CNC programs are generated with graphic support and ensure time savings, load relief and measuring uncertainty.

The Rondcom line from Carl Zeiss provides operators with optimum support for the inspection of forms. The excellent value for the money is another optimum feature of this measuring machine.

### Key features

**The right system for every requirement**
- Broad line of manual and CNC machines for form measurements on workpieces of varying size
- Manual or CNC capable rotary tables on air bearings with radial runout accuracies down to 0.02 µm on the reference point
- Rotary table and precise guideway axes ensure very high accuracy

### Software

**TIMS software strategy: flexible measurement and evaluation**
- Easy-to-use with a control panel or graphic software support, as well as a Windows-based computer workstation
- Correction software with Rondcom 44/54 delivers high measuring accuracy beginning with the rough alignment
- Exchange data, for example between form and roughness analyses for a contour analysis

### Options

- Fulfillment of various requirements through different sized columns and/or for increased load
- Rondcom 54, 55 and 60 can be equipped with a CNC stylus system for CNC volume measurements
- In TIMS, for example, enhancement modules for special analyses such as gear tooth tip and piston evaluations, statistics and Fourier analysis
When quality assurance demands precise form measurements, Rondcom is the right choice.
Lifecycle services.

From planning to equipment disposal.

Procurement phase

From the moment you start using your coordinate measuring machine, excellent service is key. Lay the foundation for a long service life – be it with a vibration analysis, startup support or warranty packages.

Operating phase

Maintenance of your coordinate measuring machine plays a major role during this phase. However, other services such as calibration and Teleservice also ensure the reliable performance of the machine during this stage.

Retrofitting

Everything is running smoothly. Everything is subject to constant change. This applies in particular to coordinate measuring technology. The technological advances we achieve with our hardware and software are passed on to you with our retrofit services.

New investment planning phase

Your measuring machine has been in use for years. The time has come for a new model. We take care of everything – dismantling, transport and disposal of old equipment.
Customized service packages from Carl Zeiss are focused on the current needs of the customer as well as the changed conditions of industrial production.

### Overview

**Procurement phase**
- Tour of the installation site, vibration analysis
- Startup support
- Turnkey solutions
- 12 and 24-month warranty packages
- Measuring and evaluation software
- Styli and accessories

**Operating phase**
- CMM monitoring
- Maintenance
- Parts supply
- Calibration
- Response time agreements and hotline
- Teleservice
- Software solutions for process optimization

**Retrofitting**
- Hardware and software

**New investment planning phase**
- Move, buy back, dismantling, disposal
Support services.
Consultation, training, maintenance.

Consultation, planning, security

Good measuring technology is simply not enough. You need more to deliver maximum quality: consultation, planning and solutions that ensure the security of data and information technology. Carl Zeiss is an expert in this field.

Academy

Retrofitting your measuring machine is one part. Expanding and refreshing your metrology knowledge make up the rest. We are here to assist you in this process. Training courses, workshops, software and the latest training materials help keep you up to date.

Measuring Services

Save valuable time and take advantage of our inspection services. Our range of services extends from contract programming and measuring to reverse engineering and calibration.
As the market leader in lithography systems, Carl Zeiss lays the foundation for the leading-edge technology of tomorrow: the company produces optics for the manufacture of increasingly smaller and more powerful microchips. Carl Zeiss is also the leader in electron and ion-beam microscopes that visualize even the smallest structures.

Products from the Medical Systems Group are used in ophthalmology, ENT and neurosurgery as well as in doctor's offices. The product offering extends from surgical microscopes to visualization and documentation systems up to diagnostic and therapeutic instruments.

As the leading provider of innovative microscopy systems, Carl Zeiss delivers total solutions for customers in biomedical research, healthcare and industry. Systems for industrial materials analyses and process analytics round off the product line.

The product line of technology leader Carl Zeiss Industrial Messtechnik GmbH includes bridge-type and horizontal-arm measuring machines, as well as measuring machines to capture form, contour and surfaces. Carl Zeiss continually sets new benchmarks for the use of measuring machines on the shopfloor.

The ZEISS brand delivers what it promises – imaging excellence without compromises: with binoculars and spotting scopes, digital and analog still, video and movie cameras, optronic systems and in planetarium technology.

The international business group Carl Zeiss Vision is number two in the eyeglass lens market. The range of products also includes systems for the fitting of eyeglass lenses and frames.

Consultation, planning, security
- Turn-key solutions
- Process chain consultation
- Process and measurement data processing
- Network integration and backup

Academy
- Basic training
- Measuring software training
- Teaching software and material

Measuring Services
- Contract programming
- Contract measurement
- Initial sampling
- Digitization/ reverse engineering
- Defect identification and assembly checks
- Calibration
- Determination of measuring uncertainty
- Controller data conversion

Overview
Consultation, planning, security

Academy

Measuring Services
Industrial Metrology in Focus

General overview

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Service: +49 7364 20-6337
Fax: +49 7364 20-3870
Email: imt@zeiss.de
Internet: www.zeiss.de/imt

Technical highlights spanning more than 160 years

1846
Carl Zeiss opens a workshop for precision mechanics and optics in Jena

1866
The 1000th microscope leaves the workshop

1902
Revolutionary new camera lens: Tessar® – the “eagle eye”

1912
Punktal® – the first axially symmetric eyeglass lenses with point-focal imagery

1923
The first planetarium projector, Mark I – the “Munich Instrument” – shows the northern night sky in exactly the way we see it in nature with our own eyes

1936
First prototype of a phase contrast microscope based on Zernike’s original design

1953
Advent of microsurgery on even the finest tissue with surgical microscopes from Carl Zeiss

1957
Xenon photocoagulator – predecessor of the laser for eye surgery

1962
Camera lenses from Carl Zeiss are used on the Mercury 8 mission and on all other manned US space flights in the following years

1973
UMM 500, the world’s first numerically controlled 3D coordinate measuring machine; measuring accuracy: 0.5 µm

1999
UHT screening systems, jointly developed with Hoffmann-La Roche, increase the speed of drug discovery through the automated search for new agents

2000
Using innovative electron beam technology, structures can also be imaged with high resolution at low vacuum or low voltage

2001
The CenterMax® bridge-type measuring machine allows measurement directly in the production area with a level of accuracy normally only attained in air-conditioned measuring rooms

2003
The ApoTome® imaging system permits optical sections of fluorescence-labeled biological specimens to be produced with very high quality and at an economy price

2009
Industrial Metrology celebrates its 90 anniversary