Measuring Machines from Carl Zeiss

For your benefit

Carl Zeiss offers a complete product line for industrial metrology. From the small “handy surf” for surface measurements to the systems required to measure large parts – whatever your needs, Carl Zeiss has the right measuring machine. Our product line also provides you with highly accurate measuring machines for form, contour and surface measurements.

Furthermore, Carl Zeiss also delivers first class service. We help you get ahead – quickly and without red tape – be it a metrology question or maintenance and repair. Thanks to our network of local offices, you receive the expert help you need within a short time.

Maximum quality – from production to service
Specialists finish vital machine components. Quality inspection of our products adheres to the most stringent internal testing procedures which are often significantly stricter than the specified standards.

Key features

The right system for every measuring task
- **Surfcom 1500**
  The comfortable measuring station for surface measurements
- **Contourecord 1700/2700**
  The flexible measuring station for contour measurements
- **Surfcom 1900/2900**
  The combined 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

Measuring range

Sufficient range for the measuring task
The base plate – columns – tracer driver combination can be adjusted as needed

- **Surfcom 1500/1900/2000 and Contourecord 1700/2700**
  Granite base plate 600 mm x 320 mm or 1000 mm x 450 mm
  Optional column height 250 mm, 450 mm, 650 mm
  Tracer driver 100 mm or 200 mm

- **Surfcom 5000**
  Fully enclosed DX version with granite base plate
  1000 mm x 450 mm, column height 500 mm, tracer driver 200 mm
The entire line of ZEISS contour and surface measuring machines feature a modular design:

The machines are comprised of a base plate – column – feeder.

The systems can be equipped with a contour or roughness stylus-and-arm system, or upgraded later, depending on the measuring task. Furthermore, Y tables, Y driver units or CNC tables can be mounted for fully automatic contour and surface measurements, enabling the systems to better meet customer needs.

The systems are based on a software platform which can be adjusted depending on the modular hardware system.

**Linear motor technology for the detector feed**

**Disadvantages of traditional systems**

At high measuring speeds, the vibrations generated by the motor, gears and drive spindle influence the measuring data.

**Benefits of a linear system**

- Non-contact and zero backlash
- Higher accuracy
- Higher measuring and travel speed
- Low vibration
- Easy maintenance

**Software**

**ACCTee PRO – All in the Document**

The ACCTee PRO integrated software strategy enables the simple analysis of surface quality, form and geometry.

The „All in the Document“ strategy ensures a seamless transition from the measurement to the analysis to the log design. The document contains all the information required, including measuring conditions, analysis conditions, measured data, log and CNC program. The visualization and intuitive operation enables even easier and more efficient analysis of the measured data and evaluation of the results.

**Precision**

**Highly precise, calibrated reference standards from Carl Zeiss for acceptance testing and monitoring**

These surface measuring machines are inspected and accepted using reverse engineered grooved reference standards.

A sphere is the standard reference for acceptance testing of contour measuring machines. The Contour Check contour standard is optionally available.
ACCTee PRO
All in the document

Feature calculation with icon support
When a new calculation is made, all possibilities for feature calculation are shown in a selection window with icons. The type of calculation between features can be intuitively selected.

Self diagnosis
When an error occurs, the self-diagnosis function immediately shows the operator an image of the cause, thus helping them find a solution to the problem.

ACCTee PRO Help
Users can access the help pages at any time. Help information can be shown based on the workflow. Help topics can also be searched using search terms or based on keywords in the index.

Plan/actual comparison and best fit
Faster comparison of measured data with nominal profiles (IGES, DXF). The best-fit function facilitates optimal alignment of the actual data to the nominal data for the comparison. The asphere analysis function is also available.
Stylus calibration wizard

The calibration wizard uses visual aids to guide the operator through stylus qualification. It leads users through the input of the calibration conditions, the positioning of the calibration standard, setting the starting point of the measurement and the calibration itself.

All in the document

A document is generated automatically during the first measurement. ACCTee PRO saves all information in this document, including measured data, measurement conditions, analysis conditions, measuring program (CNC) and log layout. This enables users to easily edit data, access analyses and conduct repeat measurements. ACCTee PRO can be used to manage roughness and contour data in one log or file.

CNC function

Jobs can be automatically processed from the start of the measurement until the results are displayed.

Analysis display

ACCTee Pro can perform a tolerance analysis for individually selectable parameters. The results are shown as an OK/Not OK symbol in the log.

Low calibration needs

Automatic monitoring of the calibration data reminds the user of the required recalibration based on freely definable intervals or on system status. This ensures an error-free, stable measuring process.

Stylus calibration wizard

The calibration wizard uses visual aids to guide the operator through stylus qualification. It leads users through the input of the calibration conditions, the positioning of the calibration standard, setting the starting point of the measurement and the calibration itself.

AI Function

(Auto Feature Analysis)

The basic features – point, line, circle – are recognized. Based on the selected features, ACCTee PRORO displays a pre-selection of corresponding analysis functions.
Contourecord 1700/2700

The flexible measuring station for contour measurements
Ease of use for efficiency

- Fast, easy and precise completion of contour measuring tasks
- Patented linear motor technology
- High straightness accuracy and glass scale in the X axis
- Extensive accessories enable a large range of applications
- All axes CNC controlled
- Automated calibration function
- Software compensates for sensing arm and stylus tip geometries
- Upgradeable using modularly adaptable CNC tables
- Also expandable for 2D and 3D surface measuring tasks
- Fully enclosed DX version with integrated active vibration damping
- Contourecord 1700 with inductive displacement transducer (LVDT) in the probing system
- Contourecord 2700 with optical diffraction scale in the probing system (Z axis) for maximum demands on accuracy

Contourecord 1700

Option: T-stylus
Surfcom 1500

The comfortable measuring station for surface measurements
Maximum performance, minimal effort

- Fast, easy and precise completion of surface measuring tasks
- Patented linear motor technology
- Wide range of accessories
- All axes CNC controlled
- Upgradeable using modularly adaptable CNC tables
- Also expandable for contour measuring tasks
- Topography measurement for the analysis of 3D surface data with optional Y feed
- Fully enclosed DX version with integrated active vibration damping for the highest demands

Roughness measurement
Surfcom 1900/2900
The combined measuring station for surface and contour measurements Easy to use

- Fast, easy and precise completion of contour and surface measuring tasks
- Non-contact, patented linear motor technology
- High straightness accuracy and glass scale in the X axis
- Easy change of the probing system from contour to roughness on the same tracing driver
- Wide range of accessories
- Automated calibration function
- Software compensates for sensing arm and stylus tip geometries
- All axes CNC controlled
- Upgradeable using modularly adaptable CNC tables
- Also expandable for 2D and 3D surface measuring tasks
- Fully enclosed DX version with integrated active vibration damping
Surfcom 2000

Contour and surface measurements in one run
Short measuring times - high productivity

- Contour and roughness measurements in one run
- Roughness detector with 5 mm deflection, 10 mm with doubled stylus length
- Reduction of measuring times and easy operation of the system
  - No changing the probing system
  - High productivity
- Friction-free, patented linear motor technology
  - Very high measuring and travel speeds
  - High straightness accuracy
  - Low background noise
  - Low maintenance and wear-and-tear
- All axes CNC controlled
- Upgradeable using modularly adaptable CNC tables
- Topography measurement for the analysis of 3D surface data with optional Y feed
- Fully enclosed DX version with integrated active vibration damping

Example application: asphere measurement on a lens
Surfcom 5000

Combined contour and surface measurements for high-end applications Technology for the highest demands

- Highest class of accuracy
- Contour and surface measurements in one operation
- Laser interferometric stylus-and-arm system with a resolution of 0.31 nm
- DX version with integrated damping system and protective hood; SD version with passive damping without protective hood
- Friction-free, patented linear motor technology in the tracing driver
- High measuring and travel speeds (X = 60 mm/s, Z = 200 mm/s) reduce measuring times
- Cylindrical stylus-and-arm system permits high flexibility – even for complex applications
- Upgradeable using modularly adaptable CNC tables
- Topography measurement for the analysis of 3D surface data with optional Y table

Surfcom 5000 DX version – the high-end contour and surface measuring instrument

Surfcom 5000 probing system for a measuring range of 13 mm
±45° inclination of the feeder
CNC tables, styli and accessories

The modular system with different table modules for the automation of CNC measuring runs

The “building set” contains three modules: the positioning stage covers the Y direction; two additional rotary tables are used to position the workpiece in the XY and ZX plane. The main advantage is the combination of table modules, depending on the need, to achieve motorization of each axis to the alignment and positioning of the workpiece.

- Can be modified and retrofitted later
- No special instruments required
- Can be combined with all Contourecord and Surfcom systems
- Programmable using Teach-in and system software

<table>
<thead>
<tr>
<th>CNC table modules</th>
<th>Y table</th>
<th>Horizontal rotary table</th>
<th>Vertical rotary table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traversing stroke</td>
<td>100 mm (200 mm)</td>
<td>360°</td>
<td>360°</td>
</tr>
<tr>
<td>Travel speed</td>
<td>50 mm/s</td>
<td>2°/s</td>
<td>2°/s</td>
</tr>
<tr>
<td>Position accuracy</td>
<td>20 µm</td>
<td>0.03°</td>
<td>0.03°</td>
</tr>
<tr>
<td>Max. load</td>
<td>30 kg</td>
<td>15 kg</td>
<td>5 kg</td>
</tr>
<tr>
<td>Weight approx.</td>
<td>19 kg (22 kg)</td>
<td>2.5 kg</td>
<td>3.2 kg</td>
</tr>
</tbody>
</table>

Online shop for styli and accessories

www.probes.zeiss.com
3D topography

3D topography software with a variety of evaluation possibilities for the visualization of specific surface features

**Y table** as external tracing driver for the acquisition of 3D surface data

**Y feed** directly on tracing driver for the acquisition of 3D surface data from over-sized workpieces (only S1500/ S2000)

- High measuring and travel speeds resulting from patented linear motor technology
- Data acquisition by means of an external **Y table** or with **Y feed** directly on the tracing driver

**Software Surfcom Map:**
- 3D display and analysis of topographical measuring data
- Numerous evaluation possibilities: different alignment functions, ISO-based standards, 3D roughness parameters, volume calculations, form filter, 3D Fourier analysis, profile intersections, photo simulation, step height analysis
- Distance and angle measurements from freely selectable profile points
- Fast and easy generation of measurement logs
- Tolerance input with automatic inspection of the measuring results
- Various means of data output (SPC, Excel, etc.)
- Password protection
- Extensive help menu

<table>
<thead>
<tr>
<th>Parameters calculated on the surface &lt;br&gt; Amplitude Parameter:</th>
<th>S5: 0.04 µm</th>
<th>Rms (Root Mean Square) 0.5 µm</th>
<th>Low limit: 0.5 µm</th>
<th>High limit: 1 µm</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Y table for 3D surface topography</th>
<th>Y feed for 3D surface topography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traversing stroke</td>
<td>50 mm (100 mm)</td>
</tr>
<tr>
<td>Length of the measured distance</td>
<td>0.001 mm-10 mm</td>
</tr>
<tr>
<td>Number of single measured distances:</td>
<td>2-2000</td>
</tr>
<tr>
<td>Number of measuring points</td>
<td>max. 64 million</td>
</tr>
<tr>
<td>Straightness accuracy</td>
<td>(0.05 + 3L/1000) µm</td>
</tr>
<tr>
<td>Table size</td>
<td>80 mm x 120 mm</td>
</tr>
<tr>
<td>Max. load</td>
<td>5 kg</td>
</tr>
<tr>
<td>Systems</td>
<td>50 mm: all except 55000</td>
</tr>
<tr>
<td></td>
<td>100 mm: 55000</td>
</tr>
<tr>
<td></td>
<td>100 mm: 52000</td>
</tr>
</tbody>
</table>
Furniture design

Different system furniture for different demands
The right strategy for each customer requirement

Integrated furniture strategy for SD version
- Flexible configuration thanks to modern design
- Integratable, active anti-vibration elements
- Ergonomic design
- Perfect design
- On all Contourecord and Surfcom systems

DX version fully enclosed
- Integrated, fully enclosed design requires little space
- Integrated anti-vibration table
- Simple location change without additional service expenses
- Modularly expandable
- Maximum performance
- Ergonomically correct design
- On all Contourecord and Surfcom systems
### Technical data

#### Probing system

<table>
<thead>
<tr>
<th>Contourrecord 1700</th>
<th>Contourrecord 2700</th>
<th>Surfcom 1500</th>
<th>Contour 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>50 mm</td>
<td>50 mm</td>
<td>1000 µm sensing arm</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Electro-mechanical measuring system</td>
<td>Diffraction scale</td>
<td>LVDT</td>
</tr>
<tr>
<td>Measuring error</td>
<td>±(1 + 2H)/100 µm</td>
<td>±(1 + 2H)/100 µm</td>
<td>± 2% bei 20 µm groove</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 µm/5 mm range</td>
<td>0.025 µm/50 mm range</td>
<td>0.1 µm/ 4 µm range</td>
</tr>
<tr>
<td></td>
<td>0.4 µm/20 mm range</td>
<td>Contour 2900 similar</td>
<td>20 mm/1000 µm range</td>
</tr>
<tr>
<td></td>
<td>1 µm/50 mm range</td>
<td></td>
<td>1 µm/50 mm range</td>
</tr>
</tbody>
</table>

#### X tracing driver

<table>
<thead>
<tr>
<th></th>
<th>100 mm (200 mm)</th>
<th>100 mm (200 mm)</th>
<th>100 mm (200 mm)</th>
<th>100 mm (200 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traversing stroke</td>
<td>100 mm (200 mm)</td>
<td>100 mm (200 mm)</td>
<td>100 mm (200 mm)</td>
<td>100 mm (200 mm)</td>
</tr>
<tr>
<td>Straightness error</td>
<td>1 µm/100 mm</td>
<td>1 µm/100 mm</td>
<td>0.05 ± (1/100) µm</td>
<td>1 µm/100 mm</td>
</tr>
<tr>
<td>Measuring speed</td>
<td>0.03–20 mm/s</td>
<td>0.03–20 mm/s</td>
<td>0.03–3 mm/s roughness</td>
<td>0.03–20 mm/s</td>
</tr>
<tr>
<td>Travel speed</td>
<td>0.03–60 mm/s</td>
<td>0.03–60 mm/s</td>
<td>0.03–60 mm/s</td>
<td>0.03–60 mm/s</td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Linear motor with glass scale</td>
<td>Linear motor with glass scale</td>
<td>Linear motor with glass scale</td>
<td>Linear motor with glass scale</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±(1 + 2 L/100) µm</td>
<td>±(1 + 2 L/100) µm</td>
<td>–</td>
<td>±(1 + 2 L/100) µm</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.016 µm</td>
<td>0.016 µm</td>
<td>0.016 µm</td>
<td>0.1 µm</td>
</tr>
<tr>
<td>Max. number of measuring points</td>
<td>100,000 (max. 10 profiles)</td>
<td>100,000 (max. 10 profiles)</td>
<td>32,000 (without Xs filter)</td>
<td>100,000 (max. 10 profiles)</td>
</tr>
</tbody>
</table>

#### Sensing arm

<table>
<thead>
<tr>
<th></th>
<th>Max. 30 mN</th>
<th>Max. 30 mN</th>
<th>0.75 mN</th>
<th>Max. 30 mN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring force</td>
<td>Max. 30 mN</td>
<td>Max. 30 mN</td>
<td>0.75 mN</td>
<td>Max. 30 mN</td>
</tr>
<tr>
<td>Stylus tip radius</td>
<td>25 µm (250 µm, 500 µm)</td>
<td>25 µm (250 µm, 500 µm)</td>
<td>Standard 2 µm/60°</td>
<td>25 µm (250 µm, 500 µm)</td>
</tr>
<tr>
<td>Stylus tip material</td>
<td>Hard metal (ruby)</td>
<td>Hard metal (ruby)</td>
<td>Diamond</td>
<td>Hard metal (ruby)</td>
</tr>
<tr>
<td>Follow-up angle</td>
<td>77° upwards/downwards</td>
<td>77° upwards/downwards</td>
<td>–</td>
<td>77° upwards/downwards</td>
</tr>
<tr>
<td>Lifting of the sensing arm</td>
<td>Automatic</td>
<td>Automatic</td>
<td>–</td>
<td>Automatic</td>
</tr>
</tbody>
</table>

#### Z column

<table>
<thead>
<tr>
<th></th>
<th>450 mm (250 mm, 650 mm)</th>
<th>450 mm (250 mm, 650 mm)</th>
<th>450 mm (250 mm, 650 mm)</th>
<th>450 mm (250 mm, 650 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z column height</td>
<td>450 mm (250 mm, 650 mm)</td>
<td>450 mm (250 mm, 650 mm)</td>
<td>450 mm (250 mm, 650 mm)</td>
<td>450 mm (250 mm, 650 mm)</td>
</tr>
<tr>
<td>Travel speed</td>
<td>max. 10 mm/s</td>
<td>max. 10 mm/s</td>
<td>max. 10 mm/s</td>
<td>max. 10 mm/s</td>
</tr>
</tbody>
</table>

#### Other Information

<table>
<thead>
<tr>
<th>Dimensions of the standard base plate</th>
<th>600 mm x 320 mm (small table)</th>
<th>600 mm x 320 mm (small table)</th>
<th>600 mm x 320 mm (small table)</th>
<th>600 mm x 320 mm (small table)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. base plate load</td>
<td>100 kg (small table)</td>
<td>100 kg (small table)</td>
<td>100 kg (small table)</td>
<td>100 kg (small table)</td>
</tr>
<tr>
<td>Material for standard base plate</td>
<td>Granite</td>
<td>Granite</td>
<td>Granite</td>
<td>Granite</td>
</tr>
<tr>
<td>Total weight</td>
<td>125 kg (small table)</td>
<td>125 kg (small table)</td>
<td>125 kg (small table)</td>
<td>125 kg (small table)</td>
</tr>
<tr>
<td>Power supply</td>
<td>220 (110) V AC ±10%, 50/60 Hz</td>
<td>220 (110) V AC ±10%, 50/60 Hz</td>
<td>220 (110) V AC ±10%, 50/60 Hz</td>
<td>220 (110) V AC ±10%, 50/60 Hz</td>
</tr>
<tr>
<td>Air supply pressure consumption</td>
<td>505 VA</td>
<td>505 VA</td>
<td>505 VA</td>
<td>505 VA</td>
</tr>
<tr>
<td>(DX version)</td>
<td>Air &gt;0.4 MPa</td>
<td>Air &gt;0.4 MPa</td>
<td>Air &gt;0.4 MPa</td>
<td>Air &gt;0.4 MPa</td>
</tr>
<tr>
<td>Accuracy</td>
<td>20°C ±2°C</td>
<td>20°C ±2°C</td>
<td>20°C ±2°C</td>
<td>20°C ±2°C</td>
</tr>
<tr>
<td>Permissible relative humidity (without condensation)</td>
<td>40–80%</td>
<td>40–80%</td>
<td>40–80%</td>
<td>40–80%</td>
</tr>
</tbody>
</table>

**Subject to change as a result of technical modifications and required export licenses**

**LVDT = Linear Variable Differential Transformer (inductive displacement transducer)**

**L = measuring length in mm**

**H = measuring height in mm**

#### SD version exterior dimensions

**Z column height:**
- Small table: 250 mm (-12, -22) 450 mm (-13, -23)
- Standard: 600 x 320 mm

**Surfcom 5000**
- Z column height: 500 mm
- Table: 1000 x 480 mm
LVDT = Linear Variable Differential Transformer (inductive displacement transducer)

Permissible relative humidity (without condensation)

Operating temperature 20°C ±2°C

 Accuracy ±(1 + 2 L/100) µm

Air supply power consumption 505 VA

Power supply 50 kg (small table)

Total weight 125 kg (small table)

Material for standard base plate Granite

Dimensions of the standard base plate 1000 mm x 450 mm (large table)

Travel speed 0.03–60 mm/s

Z column height 450 mm

Lifting of the sensing arm Automatic

Stylus tip material Hard metal (ruby)

Stylus tip radius 25 μm (250 μm, 500 μm)

Measuring force Max. 30 mN

Sensing arm 1000 mm (200 mm) 100 mm (200 mm) 100 mm (200 mm) 100 mm (200 mm) 100 mm (200 mm)

Max. number of measuring points 100,000 (max. 10 profiles) 100,000 (max. 10 profiles) 32,000

Measuring range 0.016 μm 0.016 μm 0.016 μm 0.016 μm

Probing system Linear motor with glass scale

Contourrecord 1700 Contourrecord 2700 Surfcom 1500 Surfcom 1900

Resolution 0.4 μm/20 mm range

Measuring speed 1 μm/50 mm range

Straightness error 0.1 nm/6.4 μm range

Traversing stroke 0.025 μm 0.025 μm 0.025 μm 0.025 μm

X tracing driver Linear motor with glass scale

Linear motor with glass scale

– Automatic

– Automatic

– Automatic

– Automatic

– Automatic

– Automatic

DX version exterior dimensions

Z column height: 250 mm (-12, -22) 450 mm (-13, -23) 600 mm x 320 mm DX-12, -22, -13, -23

Small table: Standard:

Surfcom 5000 Z column height: 500 mm

Table: 1000 x 480 mm

Table: 1000 x 450 mm DX-14, -24

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