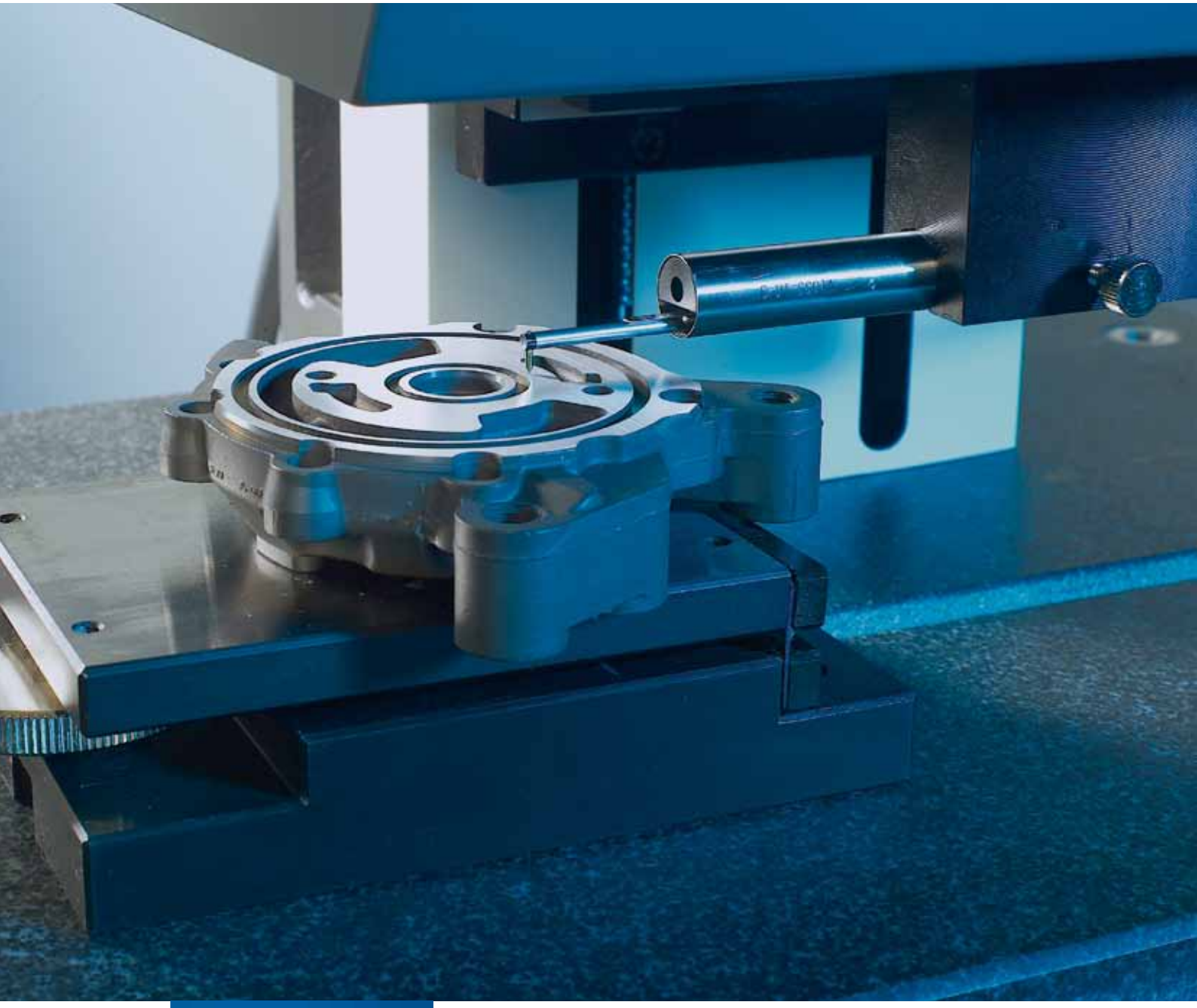
Contour and Surface Measuring Machines



ZEISS

We make it visible.

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.

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.

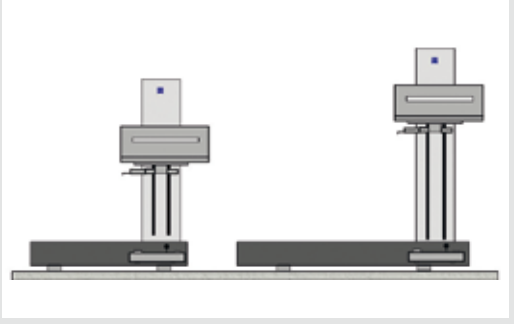
Furthermore, Carl Zeiss also delivers first class service. We help you get ahead – quickly and without red tape – be it a metrology question or maintenance and repair. Thanks to our network of local offices, you receive the expert help you need within a short time.

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

Modularity

The entire line of ZEISS contour and surface measuring machines feature a modular design:

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

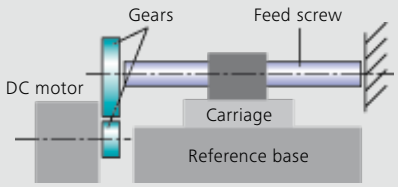
The systems can be equipped with a contour or roughness stylus-and-arm system, or upgraded later, depending on the measuring task. Furthermore, Y tables, Y driver units or CNC tables can be mounted for fully automatic contour and surface measurements, enable the systems to better meet customer needs.

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

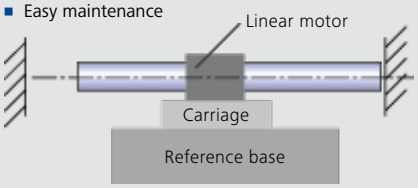
Disadvantages of traditional systems

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

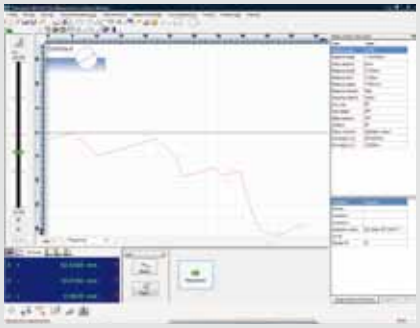


Software

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.



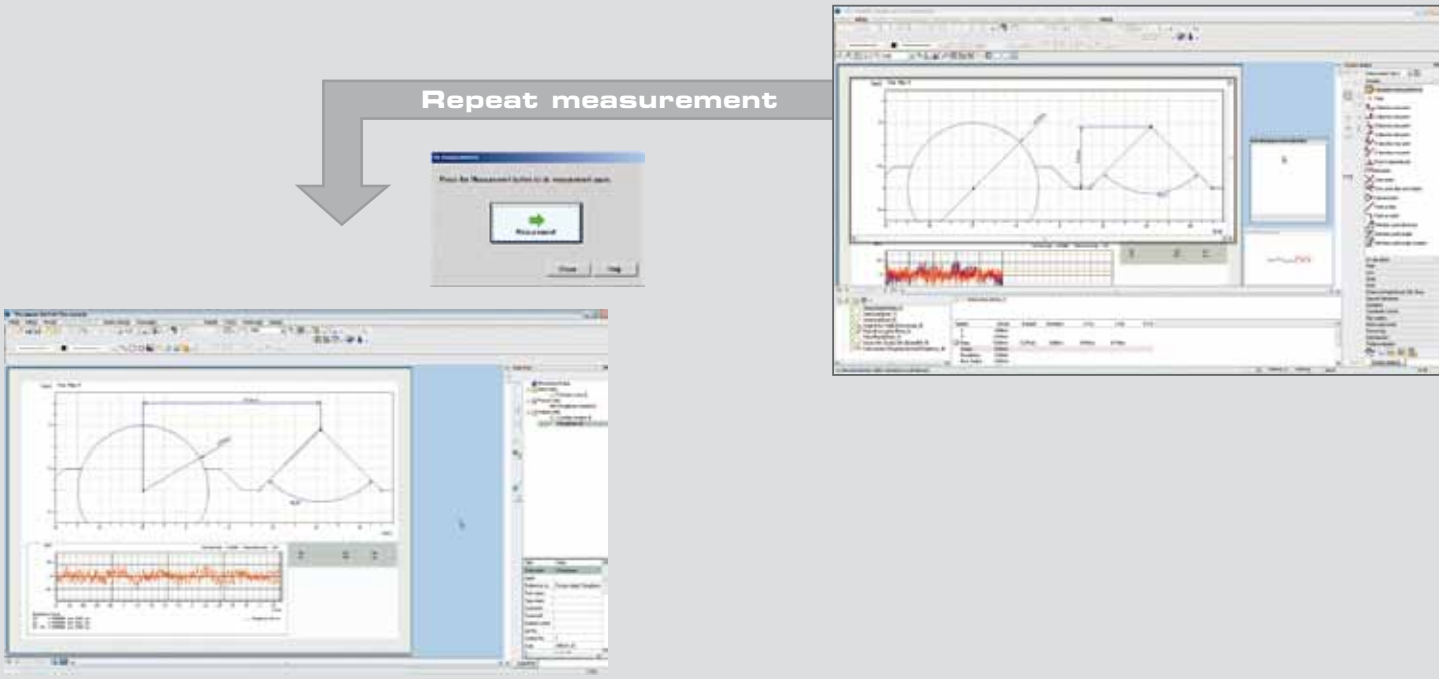
Precision

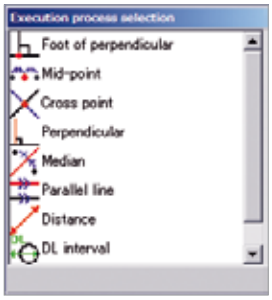
Highly precise, calibrated reference standards from Carl Zeiss for acceptance testing and monitoring

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

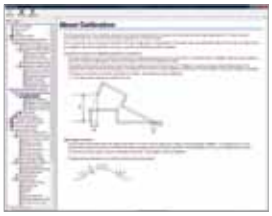
A sphere is the standard reference for acceptance testing of contour measuring machines. The Contour Check contour standard is optionally available.

ACCTee PRO
All in the document



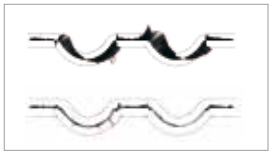


Feature calculation with icon support
When a new calculation is made, all possibilities for feature calculation are shown in a selection window with icons. The type of calculation between features can be intuitively selected.



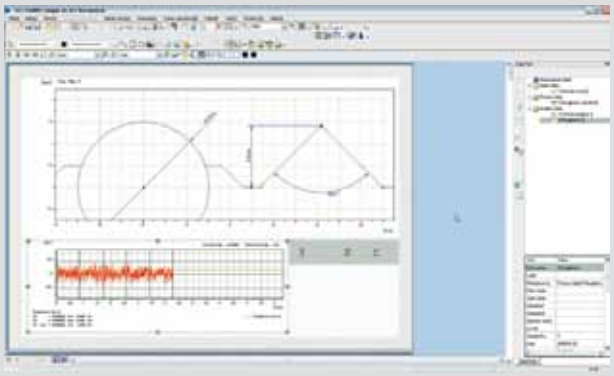
ACCTee PRO Help
Users can access the help pages at any time. Help information can be shown based on the work flow. Help topics can also be searched using search terms or based on key words in the index.

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.



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.

New evaluation



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)

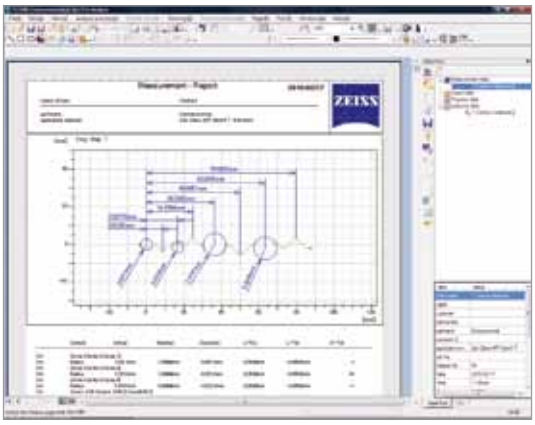
The basic features – point, line, circle – are recognized. Based on the selected features, ACCTee PRRO displays a pre-selection of corresponding analysis functions.

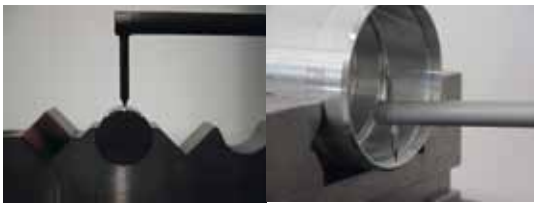
Contourecord 1700/2700

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

Contourecord 1700

- 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





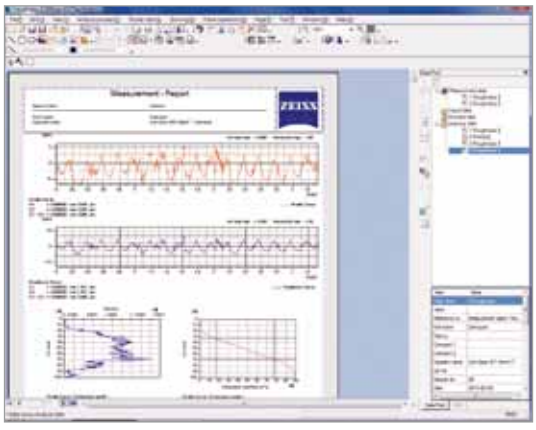
Option: T-stylus

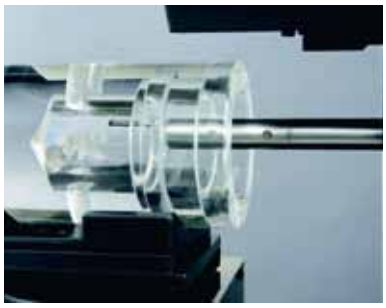
Surfcom 1500

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

Surfcom 1500

- 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

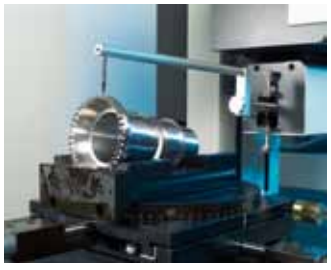
Surfcom 1900/2900

The combined measuring station for surface and contour measurements Easy to use

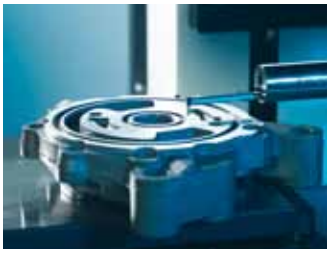
Surfcom 1900

- 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

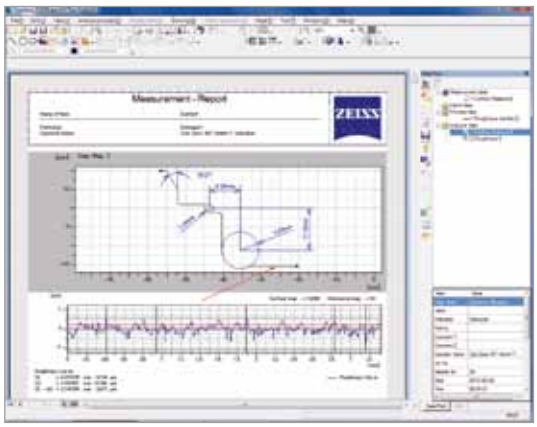
Surfcom 1500	Surfcom 1500
+ Contourecord 1700	+ Contourecord 2700
= Surfcom 1900	= Surfcom 2900



Contour measurement

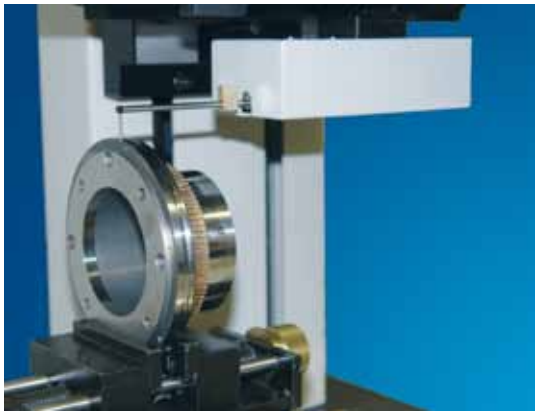


Roughness measurement



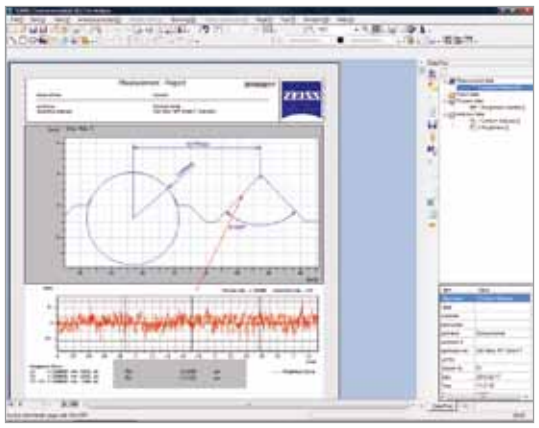
Surfcom 2000

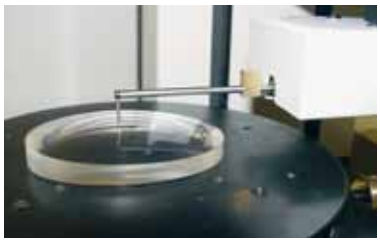
Contour and surface measurements in one run
Short measuring times – high productivity



Surfcom 2000

- 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





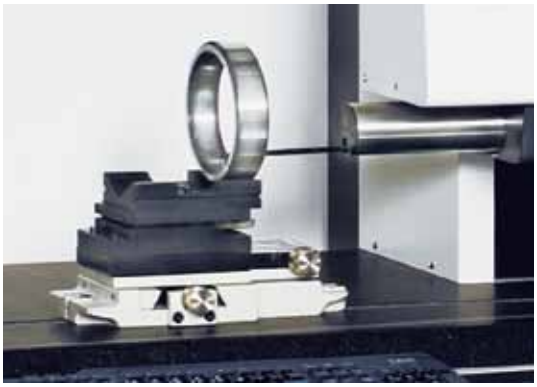
Example application: asphere measurement on a lens

Surfcom 5000

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

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

- 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 probing system for a measuring range of 13 mm

±45° inclination of the feeder

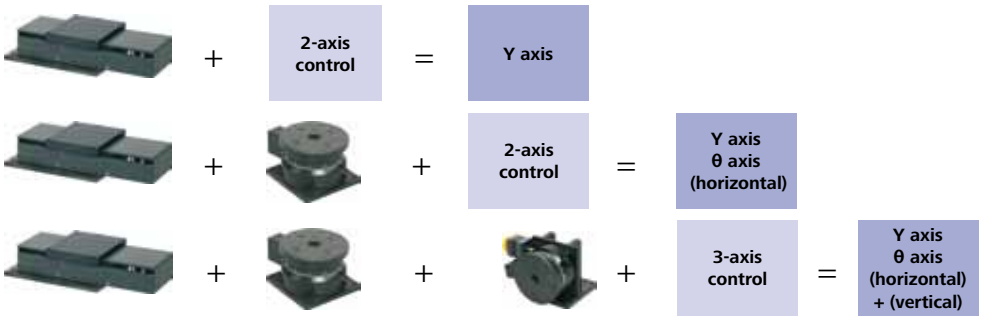
CNC tables, styli and accessories

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

Combination example

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



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

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

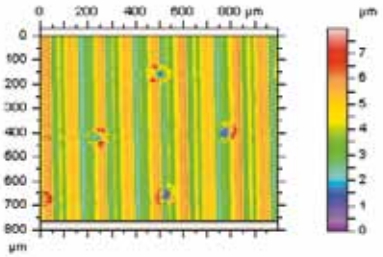
Y table as external tracing driver for the acquisition of 3D surface data

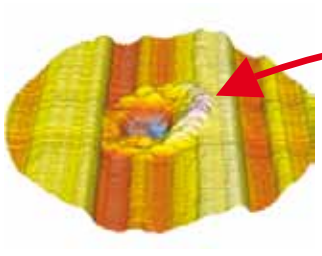
Y feed directly on tracing driver for the acquisition of 3D surface data from over-sized workpieces (only S1500/ S2000)

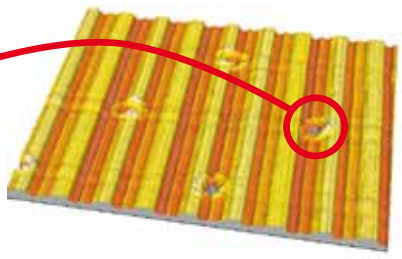
- High measuring and travel speeds resulting from patented linear motor technology
- Data acquisition by means of an external **Y table** or with **Y feed** directly on the tracing driver

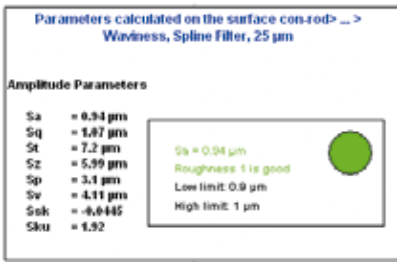
Software Surfcom Map:

- 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









	Y table for 3D surface topography	Y feed for 3D surface topography
Traversing stroke	50 mm (100 mm)	13 mm
Length of the measured distance	0.001 mm-10 mm	
Number of single measured distances:	2–2000	
Number of measuring points	max. 64 million	
Straightness accuracy	(0.05 + 3L/1000) µm	0.5 µm
Table size	80 mm x 120 mm	
Max. load	5 kg	
Systems	50 mm: all except S5000 100 mm: S5000	S1500/ S2000

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

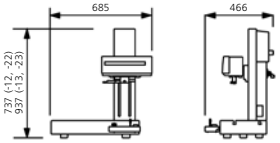
- Integrated, fully enclosed design requires little space
- Integrated anti-vibration table
- Simple location change without additional service expenses
- Modularly expandable
- Maximum performance
- Ergonomically correct design
- On all Contourecord and Surfcom systems

Technical data

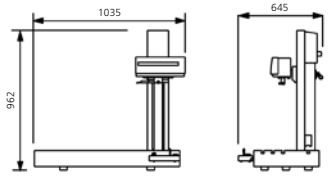
	Contour	Contour	Surface	Contour
Probing system	**Contourecord 1700**	**Contourecord 2700**	**Surfcom 1500**	**Surfcom 1900**
Measuring range	50 mm	50 mm	1000 µm sensing arm	50 mm
Measuring principle	Electro-mechanical measuring system	Diffraction scale	LVDT	Electro-mechanical measuring system
Measuring error	±(1.8 + (2H)/100) µm	±(0.8 + (2H)/100) µm	± 2% bei 20 µm groove	±(1.8 + (2H)/100) µm
Resolution	0.1 µm/ 5 mm range 0.4 µm/20 mm range 1 µm/50 mm range	0.025 µm/50 mm range Contour 2900 similar	0.1 nm/ 6.4 µm range 20 nm/1000 µm range	0.1 µm/ 5 mm range 0.4 µm/20 mm range 1 µm/50 mm range
X tracing driver				
Traversing stroke	100 mm (200 mm)	100 mm (200 mm)	100 mm (200 mm)	100 mm (200 mm)
Straightness error	1 µm/100 mm	1 µm/100 mm	0.05 + (L/1000) µm	1 µm/100 mm
Measuring speed	0.03-20 mm/s	0.03-20 mm/s	0.03–3 mm/s roughness 0.03–20 mm/s waviness	0.03-20 mm/s
Travel speed	0.03-60 mm/s	0.03-60 mm/s	0.03-60 mm/s	0.03-60 mm/s
Measuring principle	Linear motor with glass scale	Linear motor with glass scale	Linear motor with glass scale	Linear motor with glass scale
Accuracy	±(1 + 2 L/100) µm	±(1 + 2 L/100) µm	–	±(1 + 2 L/100) µm
Resolution	0.016 µm	0.016 µm	0.016 µm	0.1 µm
Max. number of measuring points	100,000 (max. 10 profiles)	100,000 (max. 10 profiles)	32.000 (without λs filter) 300.000 (with λs filter)	100,000 (max. 10 profiles)
Sensing arm				
Measuring force	Max. 30 mN	Max. 30 mN	0.75 mN	Max. 30 mN
Stylus tip radius	25 µm (250 µm, 500 µm)	25 µm (250 µm, 500 µm)	Standard 2 µm/60°	25 µm (250 µm, 500 µm)
Stylus tip material	Hard metal (ruby)	Hard metal (ruby)	Diamond	Hard metal (ruby)
Follow-up angle	77° upwards/downwards	77° upwards/downwards	–	77° upwards/downwards
Lifting of the sensing arm	Automatic	Automatic	–	Automatic
Z column				
Z column height	450 mm (250 mm, 650 mm)	450 mm (250 mm, 650 mm)	450 mm (250 mm, 650 mm)	450 mm (250 mm, 650 mm)
Travel speed	max. 10 mm/s	max. 10 mm/s	max. 10 mm/s	max. 10 mm/s
Other Information				
Dimensions of the standard base plate	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)
Material for standard base plate	Granite	Granite	Granite	Granite
Max. base plate load	50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)
Total weight	125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)
Power supply	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz
Air supply power consumption (DX version)	505 VA Air >0.4 MPa	505 VA Air >0.4 MPa	505 VA Air >0.4 MPa	505 VA Air >0.4 MPa
Accuracy	20°C ±2°C	20°C ±2°C	20°C ±2°C	20°C ±2°C
Operating temperature	10°C–30°C	10°C–30°C	10°C–30°C	10°C–30°C
Permissible relative humidity (without condensation)	40–80%	40–80%	40–80%	40–80%

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

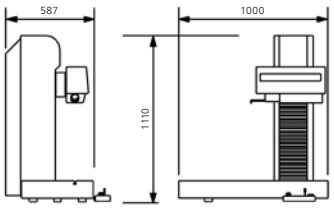
SD version exterior dimensions



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



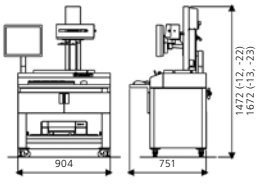
Z column height: 450 mm
Large table: 1000 x 450 mm
Standard: SD-14, -24



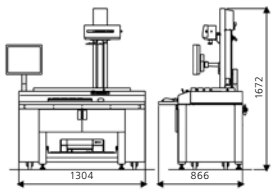
Surfcom 5000
Z column height: 500 mm
Table: 1000 x 480 mm

Surface	Contour	Surface	Contour/surface	Contour/surface
Surfcom 1900	**Surfcom 2900**	**Surfcom 2900**	**Surfcom 2000**	**Surfcom 5000**
1000 µm standard sensing arm	50 mm	1000 µm standard sensing arm	5 mm standard sensing arm 10 mm doubled length	13 mm standard sensing arm 26 mm doubled length
Inductive	Diffraction scale	Inductive	Inductive	Laser interferometer
±2% with 20 µm groove	±(0.8 + (2H)/100) µm	±2% with 20 µm groove	±(2.5 + (2H)/100) µm	±(0.2 + H/1000) µm
0.1 nm/6.4 µm range 20 nm/1000 µm range	0.025 µm	0.1 nm/6.4 µm range 20 nm/1000 µm range	8 nm/0.05 mm range 80 nm/5 mm range	0.31 nm/13 mm range 0.62 nm/26 mm range
100 mm (200 mm)	100 mm (200 mm)	100 mm (200 mm)	100 mm (200 mm)	200 mm
0.05 + (L/1000) µm	1 µm/100 mm	0.05 + (L/1000) µm	0.05 + (L/1000) µm	0.05 + (3L/10,000) µm 0.11 µm/200 mm
0.03–3 mm/s roughness 0.03–20 mm/s waviness	0.03-20 mm/s	0.03–3 mm/s roughness 0.03–20 mm/s waviness	0.03–3 mm/s roughness 0.03–20 mm/s waviness + contour	0.03–3 mm/s roughness 0.03–20 mm/s waviness + contour
0.03-60 mm/s	0.03-60 mm/s	0.03-60 mm/s	0.03-60 mm/s	0.03-60 mm/s
Linear motor with glass scale	Linear motor with glass scale	Linear motor with glass scale	Linear motor with glass scale	Linear motor with glass scale
–	±(1 + 2 L/100) µm	–	±(1 + 2 L/100) µm	±(0.2 + L/1000) µm ±0.4 µm/200 mm
–	0.1 µm	–	0.016 µm	0.54 nm
32,000	100,000 (max. 10 profiles)	32,000	100,000 (max. 10 profiles)	150,000
0.75 mN	Max. 30 mN	0.75 mN	0.75 mN	0.75 mN
Standard 2 µm/60°	25 µm (250 µm, 500 µm)	Standard 2 µm/60°	Standard 2 µm/60°	Standard 2 µm/60°
Diamond	Hard metal (ruby)	Diamond	Diamond	Diamond
–	77° upwards/downwards	–	–	–
–	Automatic	–	Automatic	Automatic
450 mm (250 mm, 650 mm)	450 mm (250 mm, 650 mm)	450 mm (250 mm, 650 mm)	450 mm (250 mm, 650 mm)	500 mm
max. 10 mm/s	max. 10 mm/s	max. 10 mm/s	max. 10 mm/s	max. 100 mm/s
600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)	600 mm x 320 mm (small table) 1000 mm x 450 mm (large table)
Granite	Granite	Granite	Granite	Granite
50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)	50 kg (small table) 100 kg (large table)
125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)	125 kg (small table) 250 kg (large table)
100–240 V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz
505 VA Air >0.4 MPa	505 VA Air >0.4 MPa	505 VA Air >0.4 MPa	505 VA Air >0.4 MPa	505 VA Air >0.4 MPa
20°C ±2°C	20°C ±2°C	20°C ±2°C	20°C ±2°C	20°C ±0.5°C <0-5°C/h
10°C–30°C	10°C–30°C <0.1°C/measurement	10°C–30°C	10°C–30°C	10°C–30°C
40–80%	40–80%	40–80%	40–80%	40–80%

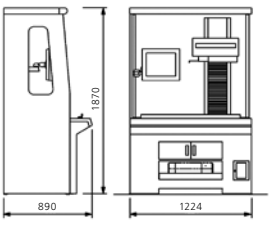
DX version exterior dimensions



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



Z column height: 450 mm
Large table: 1000 x 450 mm
Standard: DX-14, -24



Surfcom 5000
Z column height: 500 mm
Table: 1000 x 480 mm

EN_60_020_705I Printed in Germany CZ-VII/2010 Printed on chlorine-free bleached paper.

Carl Zeiss
Industrielle Messtechnik GmbH
73446 Oberkochen Germany
Sales: +49 7364 20-6336
Service: +49 7364 20-6337
Fax: +49 7364 20-3870
Email: imt@zeiss.de
Internet: www.zeiss.de/imt