

Form Measuring Machines



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 manually 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

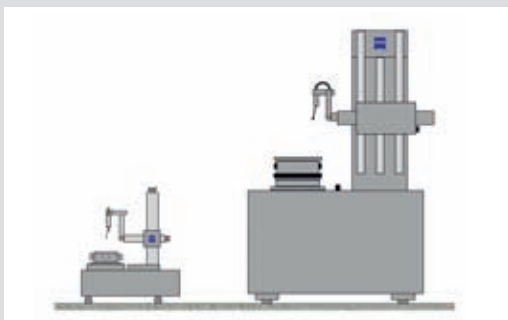


The right system for every requirement

- **Rondcom 31/41:** The compact form measuring stations with manual, software-supported alignment of the workpiece.
- **Rondcom 44/54:** The highly accurate systems with a broad range of applications. Easily upgrade to a full CNC form measuring station.
- **Rondcom 47/55:** The highly accurate form measuring systems with manual or complete CNC-controlled rotary table for large workpieces.
- **Rondcom 60:** The reference form measuring machine for maximum accuracy through design quality.
- **Rondcom 72/76:** The highly accurate spindle form testers for large parts



Measuring range



The Rondcom form measuring line from Carl Zeiss allows you to properly meet the requirements of the various measuring areas. The Rondcom 41, 44 and 54 table instruments for highly accurate workpieces are ideal up to a maximum measuring height of 500 mm.

The Rondcom 47, 55 and 60 systems can accommodate workpieces up to 1000 mm and 60 kg (100 kg optional).

The Rondcom 72 and 76 spindle form testers from Carl Zeiss are designed for particularly large and heavy workpieces. Cylinder heads, crankshafts and engine blocks are just a few of the typical applications.

Flexibility

The entire line of ZEISS form measuring systems features a modular design: Carl Zeiss form measuring machines can be equipped with a manual or fully CNC-capable rotary table. A special feature: the manual Rondcom 44 can also be easily upgraded on-site to a form tester with fully automatic CNC alignment.

Furthermore, the Rondcom 54, 55 and 60 can be equipped with a CNC detector and stylus system to enable complete CNC runs for volume measurement.

Depending on the application, the machines can be delivered with varying column heights or increased table load to properly meet your varying requirements.



Operation

The basic design of ZEISS form measuring machines consists of a base, Z column, R axis and detector and stylus system.

Moreover, the systems are equipped with a controller and modern, Windows-based computer workstations. The system is easily operated via the control panel or directly using the software.

Customized system furniture, also with an optional anti-vibration table, can be integrated with the respective instrument to create a modern workstation that incorporates ergonomic aspects.



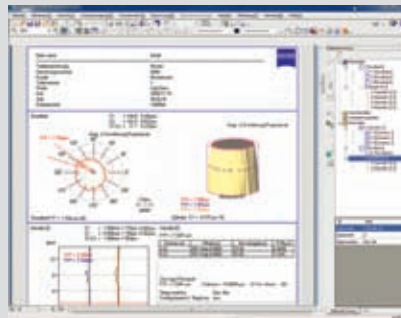
Software

ACCTee PRO – All in the Document

ACCTee PRO, the next generation of an 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

The design quality of ZEISS form measuring systems makes it possible to achieve maximum accuracy.

The key element in each form tester is the rotary table which is the deciding factor for precision. The rotary tables for the ZEISS Rondcom line are equipped with air bearings and achieve radial accuracies of up to 0.02 μm .

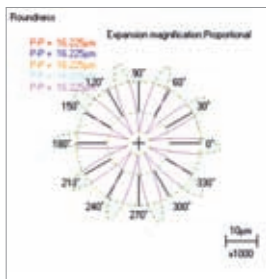
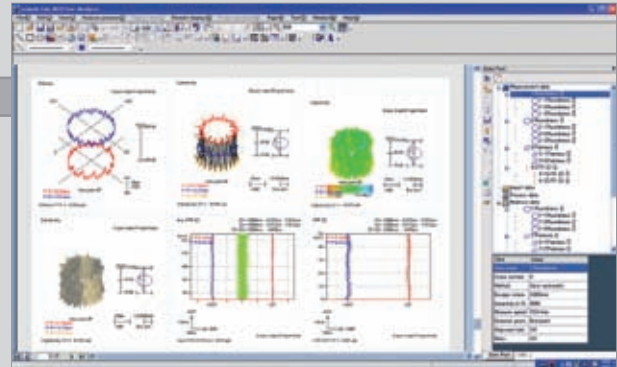
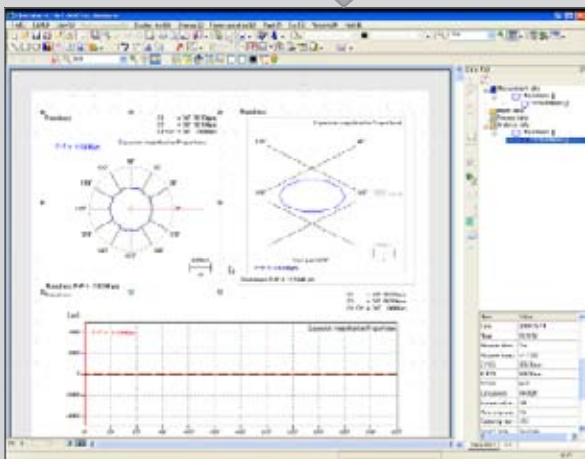
The combination of a rotary table and the precise guideway axes is ideal for the highest demands on accuracy in form metrology.



ACCTee PRO All in the document.



Easy Mode



Analysis preview window

Each analysis is shown in a preview window (centering method, filter, nicks). Analysis conditions can be easily edited.



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

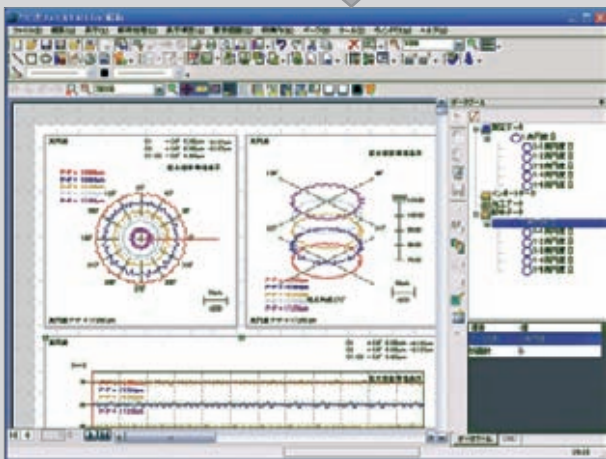
terms or based on key words in the index.



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.

Expert Mode



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.

Operating modes

Two different modes are available for the measurement and analysis. Easy Mode for manual systems and beginners: user guidance via a wizard. Expert mode for CNC machines and experts: allows CNC programming without moving the axes.

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.

Rondcom 31/41

The compact form measuring station with manual, software-supported alignment of the workpiece.



Rondcom 31



Rondcom 41



Accuracy through mechanical precision

- Designed for fast, easy and precise completion of form measuring tasks
- Measure polar and linear parameters, e.g. cylinders, straightness and concentricity, etc.
- High-quality axes with rotary table on air bearings, optional 500 mm Z column (from Rondcom 41)
- Variable measuring range and probing force
- Ease of use
- Semi-automatic processes
- CNC analysis with printout
- ACCTee PRO with help functions for manual centering and leveling
- Workpieces up to 25 kg
- Extensive accessories permit flexible use

Menu-guided, fast tilting and centering

For perfect cooperation with the user when preparing the measurement



Rondcom 44/54

**The highly accurate system with a broad range of applications.
Easy upgrade to a full CNC form measuring station.**



Rondcom 44

- Maximum accuracy and high flexibility through newly developed detector and stylus system
- New: easy on-site upgrade to full CNC capable form measuring system
- High productivity through reduced alignment times: rough alignment – maximum measuring accuracy
- Compact table form measuring station
- Highly accurate rotary table with air bearings for wear-free radial runout
- Additional linear scale in the R axis on the R44 and R54 standard systems
- ACCTee PRO with help function for manual centering and leveling
- Rondcom 44 with manual rotary table (upgradeable), Rondcom 54 with fully automatic workpiece alignment
- Different variations with the manual or CNC detector and stylus systems, Z=300 mm or 500 mm



Variable detector orientation for a wide range of measuring jobs



Rondcom 54 with integrated furniture strategy

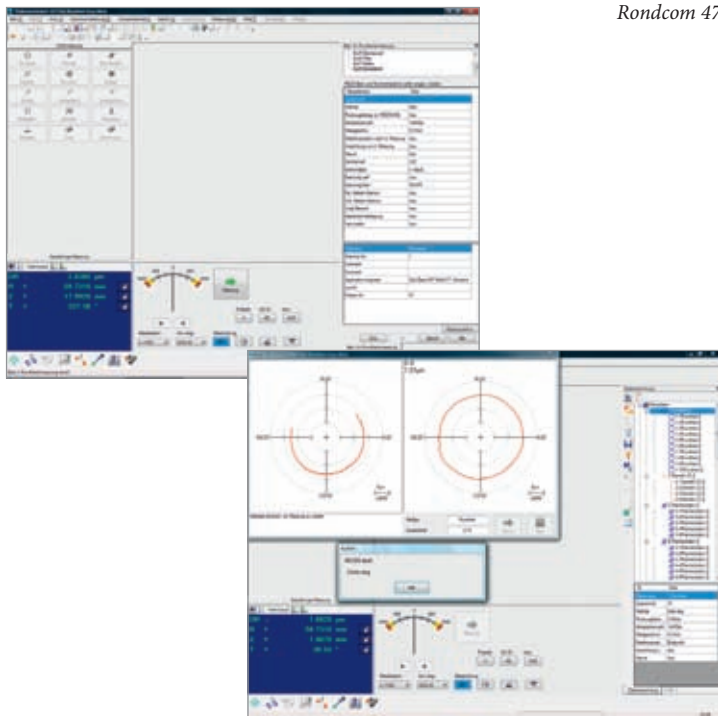
Rondcom 47/55

The highly accurate form measuring systems with manual or complete CNC-controlled rotary table for large workpieces.



- Fast, easy and precise completion of form measuring tasks
- Very high accuracies resulting from guideways on air bearings
- ACCTee PRO with help functions for centering and leveling with Rondcom 47
- Automated fast tilting and centering of the workpiece with Rondcom 55
- CNC programming from measurement to evaluation to printout, easy with teach-in
- Optional manual or CNC-controlled detector and stylus system
- Optional with incremental glass scale also in the R axis
- Standard machine with Z=350 mm (optional Z= 500 mm) and max. 60 kg load
- Variable measuring range and probing force
- Numerous possible variations

Rondcom 47



Rondcom 55 with fully automatic rotary table



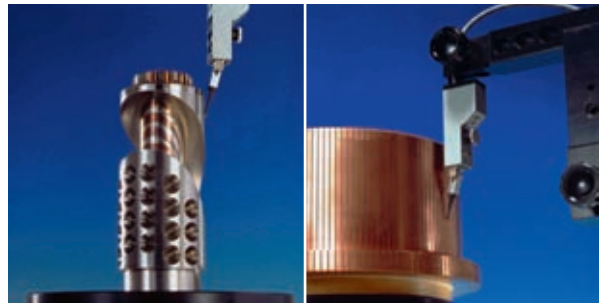
Rondcom 60

The reference form measuring machine for maximum accuracy through design quality.



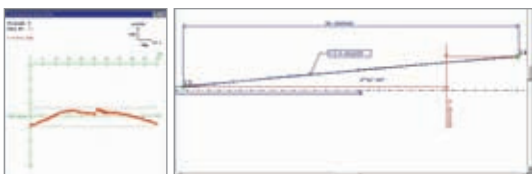
Rondcom 60

- High-end CNC form measuring machine for highest precision completion of form measuring tasks
- Most accurate form measuring station in its class
- Design quality resulting from distortion-free granite base and air bearings in all axes
- Automated fast tilting and centering of the workpiece with CNC measurements
- Programming from measurement to evaluation to printout, easy with teach-in
- Optional manual or CNC-controlled detector and stylus system
- Incremental glass scale also in the R axis
- Standard instrument with Z = 500 mm and maximum load of 60 kg (optional Z = 800 or 1000 mm and 100 kg)
- Variable measuring range and probing force
- Numerous possible variations



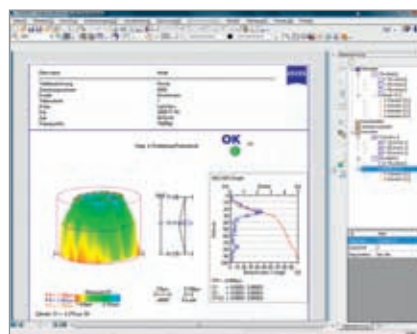
Data transmission for contour

The profiles can be optionally transmitted to the contour evaluation module for processing, e.g. to analyze angles and gaps.



Manual or automatic – ease of use is guaranteed

Different 3D profile displays with choice of viewing angle via tilting and rotating.



Rondcom 72/76

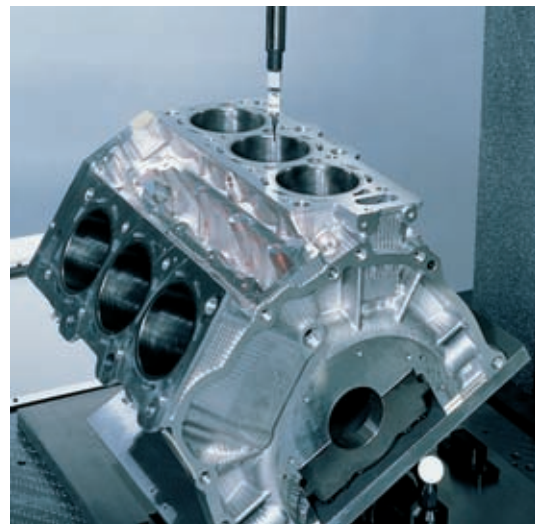
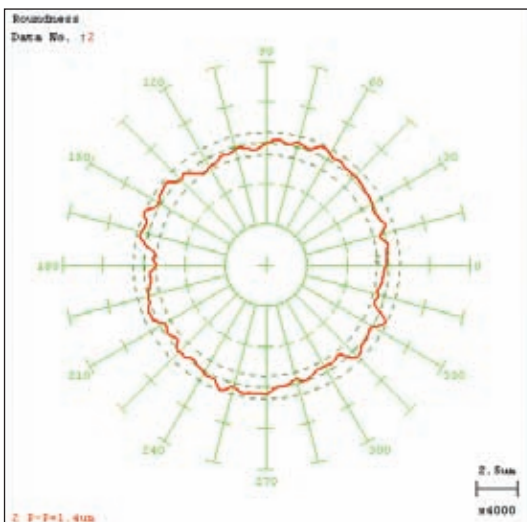
The highly accurate spindle form testers for oversized workpieces in the automotive industry.



Rondcom 72

Rondcom 72:

- Maximum accuracy form measurements on over-sized workpieces
- Typical applications: cylinder heads, engine blocks, crank shafts
- Rondcom 72 manually or CNC controlled
- Extensive accessories permit versatile use
- Windows-based software with teach-in programming

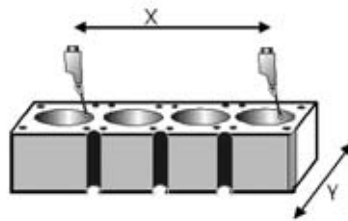




Rondcom 76

Rondcom 76:

- Highly accurate rotational axis, concentricity of $0.04 + 3H/10.000 \mu\text{m}$
- Guideways on the X, Y and Z axes with precision air bearings
- Fully automatic control of all 7 axes
- CNC alignment in Tx/Ty/Cx/Cy
- Measurement of diameters
- Measurement of parallelism through highly accurate X/Y axes
- Multi-flatness in the R axis
- Integrated anti-vibration table
- Teach-in programming



Typical applications for Rondcom 72/76: measurement of cylinder heads, engine blocks and crankshafts



	Rondcom 31/41		Rondcom 44/54
Measuring range			
Max. measurable diameter	250 mm		ID 300 mm/ED 360
Max. workpiece diameter	400 mm		580 mm
Max. load	25 kg		30 kg
Rotational axis (C axis)			
Faceplate diameter	–		220 mm
Radial runout (MZC, 50 W/U)	0.040 + 6H/10,000 µm		0.020 + 6H/10,000 µm
Axial runout	–		0.020 + 4R/10,000 µm
Measuring speed	6 u/min		2 –10 u/min
Centering range	±2 mm		±2 mm
Leveling range	±1°		±1°
Automatic alignment (CNC)	No		Rondcom 44 no/ Rondcom 54 yes
Automatic alignment speed	–		6/10/20 u/min
Resolution	0.1°		0.025°
Vertical axis (Z axis)			
Measuring height	ID 200 mm ED 400 mm	ID 300 mm ED 500 mm	300 mm (500 mm)
Straightness error	– –	0.5 µm/100 mm 1.5 µm/300 mm	0.12 µm/100 mm 0.2 µm/300 mm
Parallelism error C-Z	–	3 µm/300 mm	0.8 µm/300 mm
Measuring speed	5 mm/s	0.6–6 mm/s	0.5–6 mm/s
Travel speed	5 mm/s	max. 15 mm/s	max. 50 mm/s
Horizontal axis (R axis)			
Measuring path	125 mm		170 mm
Straightness error	–		0.8 µm/150 mm
Linear scale	No		Yes
Perpendicularity C-R	–		1 µm/150 mm
Measuring speed	–		0.5–6 mm/s
Travel speed	5 mm/s		max. 25 mm/s
Accuracy of the linear scale	–		±(2 + L/170) µm
Detector and stylus system			
Swiveling detector and stylus system	No		R54 optional
Measuring force	30–100 mN (adjustable)		30–100 mN (adjustable)
Collision protection	Mechanical/electronic		Mechanical/electronic
Measuring range	Max. ±1000 µm (adjustable)		Max. ±1000 µm (adjustable)
Resolution	max. 0.001 µm		max. 0.001 µm
Standard sensing arm	L = 54 mm; D = 1.6 mm, hard metal		L = 54 mm; D = 1.6 mm, hard metal
Other information			
Power supply	220 (110) V AC ±10%, 50/60 Hz		220 (110) V AC ±10%, 50/60 Hz
Power consumption	approx. 600 VA		approx. 600 VA
Compressed air supply	0.3–0.7 MPa 30 l/min		0.3–0.7 MPa
Total weight	Approx. 120 kg		Approx. 170 kg

Rondcom 47/55**Rondcom 60**

Measuring range		
Max. measurable diameter	350 mm	420 mm
Max. workpiece diameter	600 mm	680 mm
Max. load	60 kg	60 kg (optional 100 kg)

Rotational axis (C axis)

Faceplate diameter	290 mm	290 mm
Radial runout (MZC, 50 W/U)	0.020 + 6H/10.000 µm	0.020 + 6H/10.000 µm
Axial runout	–	0.020 + 4R/10.000 µm
Measuring speed	2 –10 u/min	2 –10 u/min
Centering range	±5 mm	±5 mm
Automatic alignment (CNC)	Rondcom 47 no/ Rondcom 55 yes	Yes
Automatic alignment speed	6/10/20 u/min	6/10/20 u/min
Leveling range	±1°	±1°
Resolution	0.1°	0.1°

Vertical axis (Z axis)

Measuring height	350 mm (500 mm)	500 mm (800, 1000 mm)
Straightness accuracy	0.15 µm/100 mm 0.3 µm/300 mm	0.10 µm/100 mm 0.25 µm/500 mm
Parallelism error C-Z	1.5 µm/350 mm	1.5 µm/500 mm
Measuring speed	0.6–6 mm/s	0.6–6 mm/s
Travel speed	max. 30 mm/s	max. 30 mm/s

Horizontal axis (R axis)

Measuring path	187 mm	220 mm
Straightness accuracy	1 µm/100 mm	0.5 µm/200 mm
Linear scale	R55 optional	Yes
Perpendicularity C-R	2 µm/100 mm	0.5 µm/200 mm
Measuring speed	0.6–6 mm/s	0.6–6 mm/s
Travel speed	max. 15 mm/s	max. 20 mm/s
Accuracy of the linear scale	±(2 + L/220) µm	±(2 + L/220) µm

Detector and stylus system

CNC swiveling detector and stylus system	R55 optional	optional
Measuring force	30–100 mN (adjustable)	30–100 mN (adjustable)
Collision protection	Mechanical/electronic	Mechanical/electronic
Measuring range	Max. ±1000 µm (adjustable)	Max. ±1000 µm (adjustable)
Resolution	max. 0.001 µm	max. 0.001 µm
Standard sensing arm	L = 54 mm; D = 1.6 mm, hard metal	L = 54 mm; D = 1.6 mm, hard metal

Other information

Power supply	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz
Power consumption	approx. 800 VA	approx. 800 VA
Compressed air supply	Supply pressure 0.5 – 0.7 MPa	Supply pressure 0.5 – 0.7 MPa
Total weight	Approx. 480 kg	Approx. 600 kg

	Rondcom 72	Rondcom 76
Measuring range		
Max. measurable diameter	2-450 mm	2-500 mm
Max. workpiece size	X = 600 mm/Y = 550 mm/Z = 760 mm	X = 800 mm/Y = 680 mm/Z = 760 mm
Max. load	200 kg	200 kg (1000 kg)
X measuring range	600 mm	700 mm (1200 mm)
Y measuring range	50 mm	200 mm
Z measuring range	1000 mm	1000 mm (1500, 2000 mm)

Accuracy tolerances		
Radial tolerance	0.03 µm standard detector and stylus system L = 235 mm	0.04 + 3H/10.000 µm
	0.3 µm detector and stylus system L = 620 mm	
Axial tolerance	0.1 µm/R 50 mm standard detector and stylus system L = 235 mm	0.1 + 8R/10.000 µm
	0.2 µm/R 50 mm detector and stylus system L = 620 mm	
Z axis straightness tolerance	2 µm/200 mm standard detector and stylus system L = 235 mm	[(0.2 + 8L/10.000) x (1 + 5/1000)] µm
	5 µm/600 mm detector and stylus system L = 620 mm	
Parallelism tolerance	2 µm/100 mm	0.8 µm/200 mm
Positioning accuracy	±50 µm	±50 µm

Speed		
Rotation speed	2 u/min (measuring)	2 u/min (measuring)
	10 u/min (centering)	10 u/min (centering)
Linear measuring speed Travel speed	Z = 0.6 mm/s–6 mm/s (measuring)	max. 10 mm/s (measuring)
	X = 30 mm/s, Y = 15 mm/s, Z = 30 mm/s	max. 100 mm/s (traveling)

Detector and stylus system		
Stylus tip	D = 1.6 mm hard metal	Standard D = 0.5 mm sapphire
Stylus length	Standard L = 24 mm (1:1)	Type A L = 76 mm (1:1) Type B L = 201 mm (2:1)
Measuring force	70 mN standard	Type A 130 mN Type B 65 mN
Power supply	220 (110) V AC ±10%, 50/60 Hz	220 (110) V AC ±10%, 50/60 Hz
Power consumption	3000 VA	1000 VA
Air pressure	0.5 – 0.7 MPa	0.5 – 0.7 MPa
Total weight	Approx. 3000 kg	Approx. 6700 kg
Accuracy	20 ±2°C <0.5 K/h 20 ±2°C <0.5 K/h	20 ±2°C < 0.5 K/h
Operating temperature	10 – 30°C	10 – 30°C
Relative humidity	40 – 80%	40 – 80%

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

ID = Internal diameter
ED = External diameter
R = Radius in mm
H = measuring height in mm

Software

Data processing

Roundness evaluation	LSC Gaussian compensating circle (Least Square Circle Method) MZC (Minimum Zone Circle Method) MIC (Maximum Inscribed Circle Method) MCC (Minimum Circumscribed Circle Method), NC (No Correction)
Features	Roundness, flatness, concentricity, parallelism, coaxiality, polar Cylindricity (from Rondcom 41), perpendicularity, total runout Radial runout, axial runout, diameter and height error linear Straightness, tapering (cylindricity), perpendicularity, parallelism
Display unit	Color monitor
Printer	Color inkjet printer
Displayable values	Measuring conditions, measuring parameters, graphic display, Fourier analysis, Abbott curve, ADC
Measuring units	µm, inch (selectable)
Filter type	Gaussian, 2 RC (Digital)
Filter setting	Low-pass filter 15, 50, 150, 500 /revolutions, or without limitation
For roundness and straightness	High-pass filter 15-150, 15-500/revolutions, 50-500/revolutions Cutoff wavelength 0.25, 0.8, 2.5, 8 mm
Magnification	50, 100, 200, 500, 1,000, 2,000, 5,000, 10,000, 20,000, 50,000, 100,000x, Auto
Interrupted surface	Angular range 0.1°– 8° (in 1° increments) Limit value Each value in 0.1 mm increments

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