

Dimensional Measuring Technology

Product catalog



T&S Gesellschaft für Längenprüftechnik mbH

Our main goal is achieving your satisfaction and appreciation while working together. A big part of that process is using your feedback to create new solutions, or adapt existing ones, as those needs change. The more we can help you find the right solutions and contribute to your goals, the more successful we are.



Robert Schmidt
CEO

Our work is guided by the following principles:

- 1. Quality and reliability**
Our solutions are used where quality and precision can make or break your product. We take this responsibility very seriously.
- 2. Trust is the keystone of our operation**
You get to know us the way we are: competent, reliable, friendly and respectful.
- 3. Social responsibility**
ConturoMatic – "Made in Germany": We make a conscious effort, within the company, to use components and services from local partners within the region where possible.
- 4. Lasting involvement**
We help and support people. Not just with words, but with deeds also.
- 5. Continuity and growth**
Consistent and continuous development improves the quality of our systems, thereby securing the future success of our clients and the future of T&S.
- 6. You can count on us**
We stand for quality, service, innovation and fair prices; today and in the future, and we are proud of that.

Robert Schmidt
CEO



The other solution

Contour management – away from classic paths:

The connection between the X- and Z-measuring axes in a drive unit always leads to narrow tolerances. Our solution: separation of X and Z. The feed axis assumes the function of tool receptacle while the Z-axis performs the scanning movement. Since both axes are motor controlled, this leads to enormous benefits.

Independent of the contour incline, both axes are controlled to keep the measurement speed constant. Classic combined drive units only move at constant speeds along X, which invariably leads to increased measuring point distances along steep contour sections. This irregularity in data point equality always leads to mathematical problems that can only be solved with interpolation (algorithmically generating interim values). Our solution automatically leads to more consistent data point distances. Calculation of results therefore always takes place using real, physically recorded, measured values. Furthermore, the Z-movement of a straight line is guided. There is no limitation of the measuring path anymore, as is caused by the circular motion of the tracing arm of conventional drive units. Our tracing arm is almost always set horizontally. The probe tip can follow the contour dynamically throughout the measuring range of up to 280 x 350 mm, and the scanning conditions are uniquely defined within the entire measuring range. Since the probe tip position is precisely defined and repeatable within a fraction of a millimeter, secure and automatic measurement is possible even in the smallest of bores. Additionally, guide deviations of the Z-axis, which commonly result in measuring errors due to the lever effect of the tracing arm length, are automatically compensated for by our concept.

The easy way to measure contours

It was an ambitious aim and great responsibility to develop a series of outstanding measuring devices that can be used in a production environment and in the lab as a result of their extreme flexibility and high performance. Development always focused on you, the user and technician, in measurement technology.

The result is a new generation of contour measuring systems: the *ConturoMatic* series.

This kind of development always brings together many people. It is all the better when all parties involved can be proud of the end result. It is part of our philosophy to let you, as our customer, contribute to this success. Your competence and suggestions help us to continually develop and optimize *T&S* systems further.

All *ConturoMatic* systems are built using the same software base. Therefore, any expansions or innovations are automatically usable on all systems. Simple operation and high flexibility at a fair price are our top priorities.

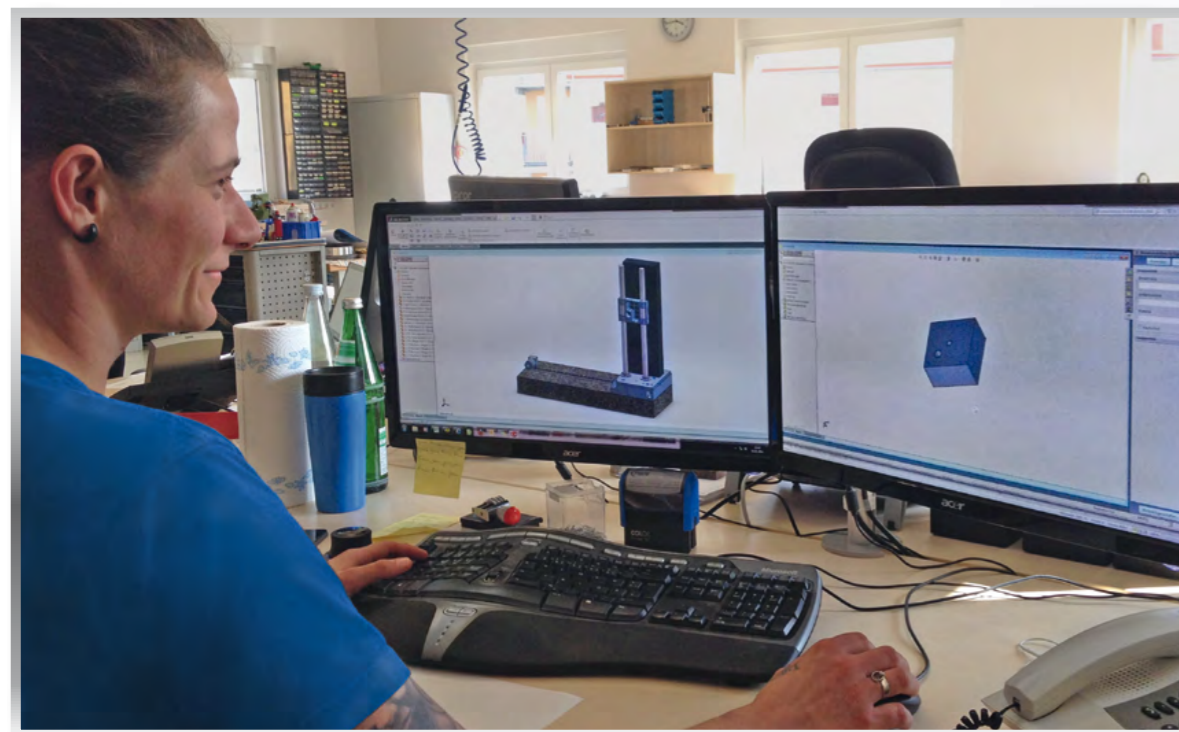
We are able to offer optimized systems to measure nearly all ranges of contour and roughness. The application range of our *ConturoMatic* systems comprises both, classic models with drive units and motorized columns and a group of high-end devices with aerostatic guide units and high accuracy.



Tracing arm assembly



CV120/CV250 control unit



The result

More than the total sum of ideas:

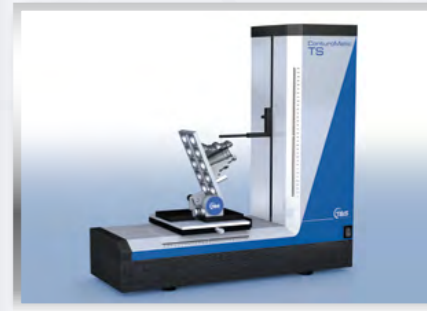
The concept behind all of the *ConturoMatic TS* systems mainly comprises two motor-controlled measuring axes. The X-axis carries the sample and the Z-axis scans the contours. Both measured value recording and control are strictly based on state-of-the-art digital technology. The base is high quality granite.

The effect:

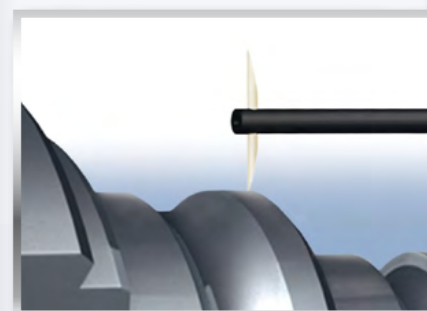
Due to the use of precision parts within our systems, there is no need for expensive and overly complicated error correction. Stability and longevity are basic elements of our *ConturoMatic* products. New, different, innovative and technically revolutionary.

Technical TS highlights

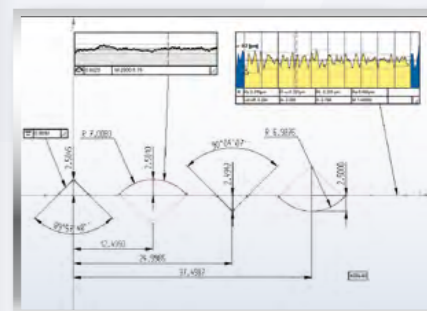
- Robust mechanical base
- Wide measuring range 250 x 320 (TS), 280 x 350 (TS-X)
- Guiding elements from granite for the highest degree of levelness
- Integrated Y-adjustment table
- Motor-controlled measuring axes
- Permanent dynamic speed control
- Constant data point distance, independent of the profile declination
- Non-contact incremental linear scales. Our scales are like steel when it comes to thermal behavior. Therefore, temperature, compensation or extensive climate control are not necessary in most cases
- Integrated control electronics
- Data recording and control via standard interfaces warrant future use and independence, regardless of changing computer hardware
- No relevant radial movement of the tracing arm
- Unique horizontal position of the tracing arm allowing easy and safe access to inspect the piece at any time
- Accuracy: $\pm (0.9 + L/100) \mu\text{m}$ [L = measurement displacement in mm] (ConturoMatic TS)
- Accuracy: $\pm (0.85 + L/100) \mu\text{m}$ [L = measurement displacement in mm] (ConturoMatic TS-X)



ConturoMatic TS



Two-way tracing arm



Visualization of results

Are your needs growing? ConturoMatic TS grows with you.

The modular concept allows cost-effective entry to the *TS class* with the option to retrofit additional functions at any time. With no mechanical intervention in the existing system; simply by software activation. The extension packages, which are available on an optional basis, contain all the necessary components, such as tracing arms for up/down scanning or roughness sensor with diamond tip.

The technical innovations that make our new *TS system* the best device in its class include the integrated, maintenance-free electro-mechanical system for tracing force adjustment. Using this function, the tracing force can be adjusted for the contour and roughness operation of each tracing arm. These settings are individually determined for each tracing arm, managed by the software and automatically adjusted according to the required measurement function. To calibrate the tracing arm and the offset between the upper and lower probe tip, only the ball standard, which is included in the scope of supply, is required.

Due to the geometrically precise horizontal position of the tracing arm, it is possible to check contours and bores with a diameter of less than 2 mm to more than 300 mm. Breakage of the probe tip is minimized by the integrated safety shutdown of the Z-axis movement. The roughness analysis option, which is realized through the integrated measuring force setting, can be used in combination with the contour analysis. In many cases this makes further measuring superfluous. Contour and roughness results can effectively be determined in a single step. Other tasks that can be performed by our *ConturoMatic-TS* include the analysis of bores, distances from inner to outer contours, taper angle and parallelism, profile defects and the measurement of discontinuous surfaces, with no loss of reference measurement.

Extensions of the ConturoMatic TS

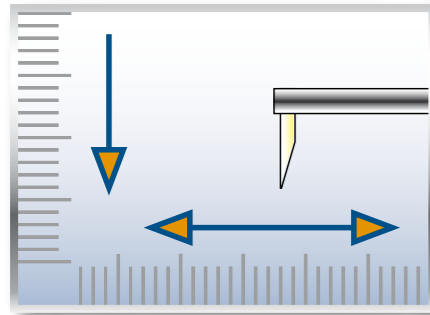
Option UD (Up/Down):

Allows switching of the scanning direction with no loss of reference measurement, e.g. to define bores or reference measurements from outer to inner contours. This function is also available in combination with roughness analysis and can be integrated into automated measurement sequences.

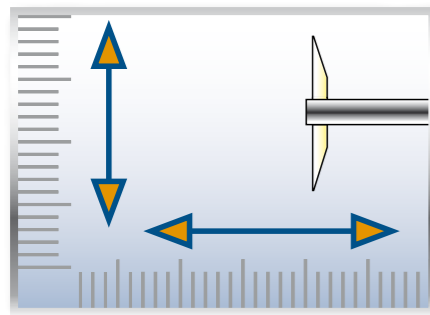
Option R (Roughness):

Measurement of surface roughness by means of reference surface measurement. Contour + roughness measurements can be combined under "multi-contour". This function is also available in combination with the option UD described above and can be integrated into automated measurement sequences too.

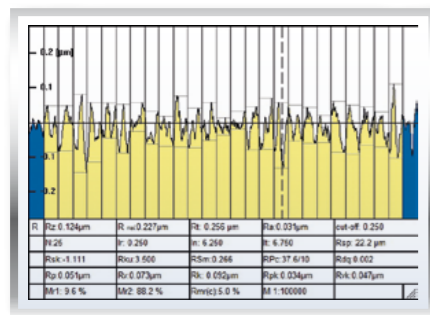
All options can be combined as desired.



Scanning direction ConturoMatic TS



Scanning direction ConturoMatic TS-UD



Roughness analysis

Contour & roughness measurement in one step

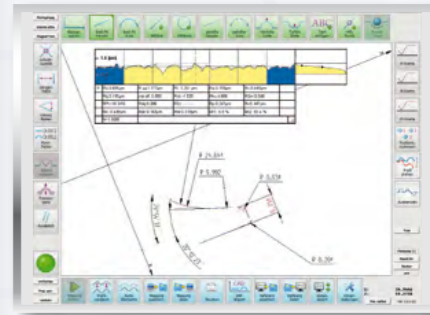
State-of-the-art contour measuring systems increasingly permit data acquisition and calculation of roughness parameters too. Roughness measuring of inclined contours brings more and more of the previous scanning procedures and assessment methods to their limits.

To solve this problem, our calculation algorithms have, from the start, been based on orthogonal regression. This method, in connection with dynamic speed control, which ensures even data point distance, leads to perfectly precise results – even on tilted surfaces. In contrast, conventional solutions for achieving constant measuring point distances require generating theoretical points, that haven't actually been measured, via interpolation.

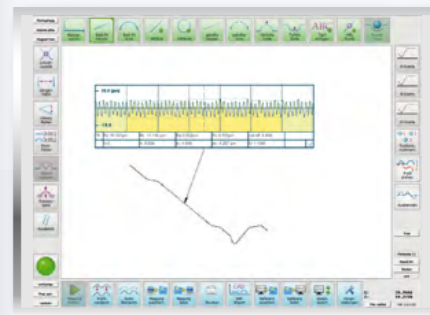
With our optional surface roughness software update for the *ConturoMatic TS*, your contour measuring system turns into a particularly high-performance system for surface & contour measurement. All common parameters can automatically be measured and evaluated. The software is seamlessly integrated into the standard software and can be operated intuitively. It is also possible to update every *T1*, *T2* and *TS system* delivered to date. The update comprises software for surface roughness, a roughness tracing arm with 2 µm tip radius and 60° angle, as well as comprehensive operating instructions. The roughness option is standard for the *ConturoMatic TS-X*.

Assessable indices

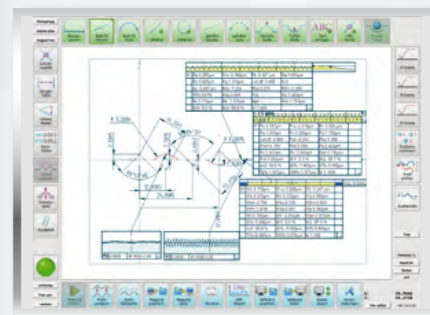
- Filtering by phase-corrected Gaussian filter DIN EN ISO 11562 (04/1998) and DIN EN ISO 13565-1 (04/1998)
- Index sizes
- Pt, Pz, Pa, Pc, Pq, Pp, Pv, Psk, Pku, PSm, Pdq, Pmr(c) purs. to DIN EN ISO 4287 (10/1998):
- Rt, Rz, Ra, Rc, Rq, Rp, Rv, Rsk, Rku, RSm, Rdq, Rmr(c) purs. to DIN EN ISO 4287 (10/1998):
- Wt, Wz, Wa, Wc, Wq, Wp, Wv, Wsk, Wku, WSm, Wdq, Wmr(c) purs. to DIN EN ISO 4287 (10/1998):
- Rk, Rpk, Rvk, Mr1, Mr2 purs. to DIN EN ISO 13565-2 (04/1998):
- Rmax as per. to VDA 2006 (07/2002):
- R3z as per to DB works standard 31007 (1983):
- RPC as per to steel-iron test sheet (SEP1940):



Contour and roughness analysis



Roughness analysis



Contour and roughness analysis

Measurement technology for highest demands

Our proven concept: "Contour and roughness measurements at the highest level" is what keeps us developing new systems. This philosophy has driven us to reanalyze every element of our *ConturoMatic TS* to reach new a level of system accuracy. Detailed fine-tuning of the guides, aerostatic air bearings, high-speed data transfer, fast reaction axis tracing, optimized tracing arm bearing, newly developed drive units and incremental scales of the highest quality are the results of a comprehensive, ever evolving, development process.

The result is the newest product from T&S:

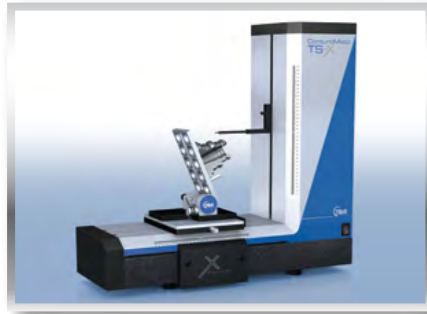
ConturoMatic TS-X – our high-performance measuring station.

Overview of the performance features of TS-X

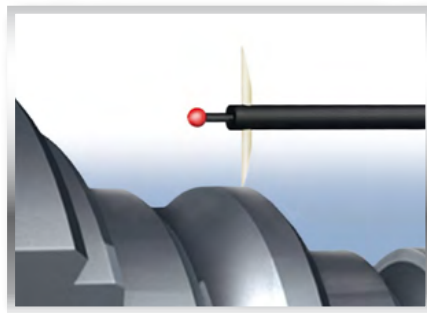
- Special frictionless aerostatic air bearings for the X- and Z-axes
- Enlarged measuring range (280 x 350 mm)
- Hybrid-ceramics tracing arm bearing
- Module roughness analysis in the standard scope of delivery
- Table load of up to 25 kg (optionally 50 kg)
- Non-contact incremental linear scales on steel base
- Measuring system resolution 0.1 nm
- Outstanding price-performance ratio
- Accuracy: $\pm (0.85 + L/100) \mu\text{m}$ [L = measuring length in mm] (no measuring direction change)
- **Combined contour and roughness measurements possible over the entire measuring range**

ConturoMatic TS-X surface roughness

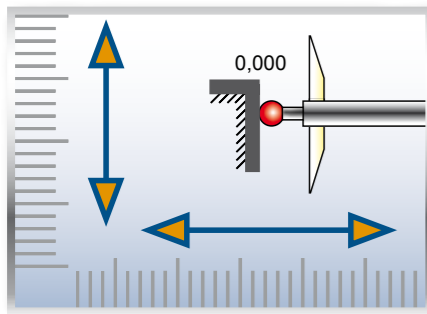
- Measurement of surface roughness possible by physically measuring a reference model
- Measuring range of roughness: 280 x 350 mm
- Effective resolution: 0.1 nm
- Measuring speed: 0.1 - 0.5 mm/s
- Measuring force: 7.5 mN
- Measuring point distance: approx. 0.5 μm
- Suitable for roughnesses: $R_z > 0.5 \mu\text{m}$, $R_a > 0.05 \mu\text{m}$
- Accuracy: 5%



ConturoMatic TS-X



Contour and X-scanning



Scanning direction ConturoMatic TS-X

Our little ones for the big tasks

Our concept: concentrate on what is essential. The *ConturoMatic CV* systems are classic contour measuring devices that boast smart functions and sensible automation. They offer everything a powerful and reliable contour measuring system needs.

Originally developed to control the quality of individual production processes, our *CV series* with its robust mechanics and high-performance software does a great job in the measuring lab too. Workpieces can be automatically measured within the entire measuring range. The entire calibration process of the traverse unit is fully automated. High measuring precision, detailed assessment, very simple operation and an outstanding price make the *ConturoMatic CV* systems particularly attractive.

"Do you need more?":

The completely digital *CV250digital* offers the largest measuring range of its device category at 70 x 250 mm.

Are you still using a contour measuring device with outdated technology?

Regardless of the manufacturer, we offer our "*ConturoMatic CV250 Retrofit*" as a retrofit system. You can continue to use all existing components that are still functional, such as X-Y adjustment table, stone slab and vice. We provide the necessary components to adapt our *CV250*, and you thereby gain a modern measuring device in accordance with the current state of the art.

Technical specifications

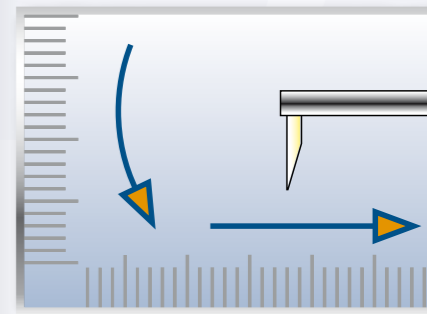
- Operating system: W7/64Bit
- External control unit connected to the PC by a standard interface
- Measuring range *CV120*: 30 x 120 mm
- Measuring range *CV250*: 50 x 250 mm
- Measuring range *CV250digital*: 70 x 250 mm
- Positioning range of the Z-column: 400 mm (optional 600 mm)
- Software-controlled tracing arm lifting function
- Automatic measuring via teach-in programming
- Even extremely large and heavy parts can be measured
- All axis movements can be automated
- Simple change of the tracing arm
- Calibration standard for dynamic X/Z-calibration in the scope of delivery



ConturoMatic CV120



ConturoMatic CV250



Scanning direction ConturoMatic CV

A view to what is essential

The user's needs have always been at the very top of our list of requirements. Our guiding principle has always been: contour measurement must be quick and easy. The trick is a combination of simple and intuitive operation of the system with unlimited diversity in performance.

Our solution: *ConturoMatic S1 software*.

The operating concept of *ConturoMatic S1 software* is perfect, both for quality control in the production area and also for usage in the lab. All contour and roughness measuring devices are generally based on the profile method. Therefore, we have developed a consistent software basis as an interface to the user.

Higher efficiency via continuous development:

We maintain close communication with our users. Quick and targeted integration of our customers' suggestions makes continuous optimization of our software solution possible.

Benefits at a glance:

Simple measurement:

- All evaluation functions can be achieved by a single mouse click, without any elaborate menu bars and sub-functions
- Production control permits user-independence, meaning results and tolerance comparisons are conducted fully automatically and error-free
- Each measurement carried out generally contains everything needed to turn it into an automatic test process to include analysis. Teach-in in its purest form
- Three basic steps lead to automated inspection: measurement, assessment, saving

More accurate measurement:

- Parts that were difficult to measure before can now be dimensioned clearly and reproducibly
- The software is mainly form- and position-tolerant

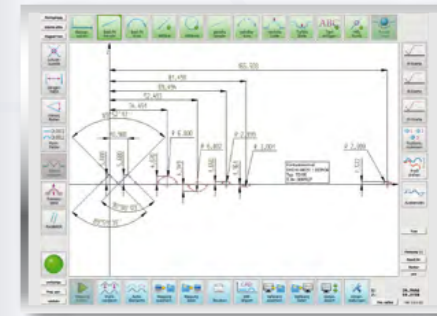
Ready for the future:

- Our *ConturoMatic software* is the basis of our *TS* and *CV systems* and continuously under development
- We provide our customers with free software updates and extensions

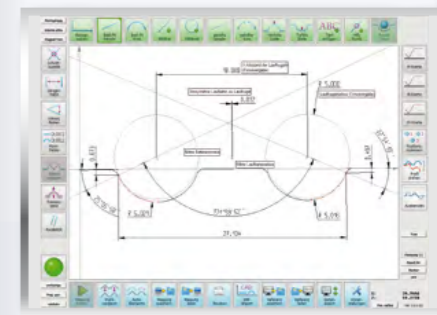


ConturoMatic S1 function excerpt

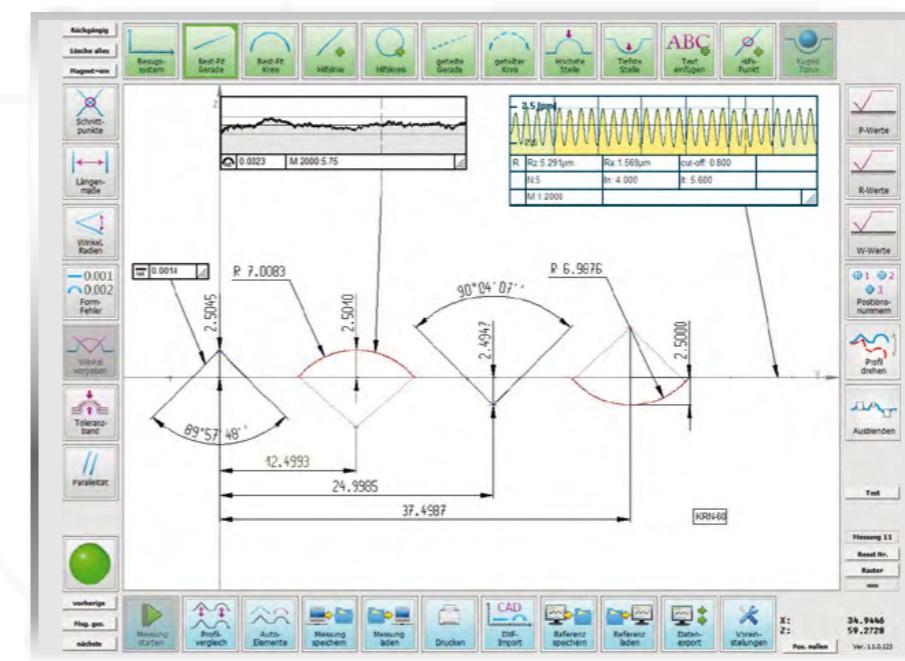
- Create basic coordinate system
- Regression line, single- and multi-part
- Regression circle, single- and multi-part
- Start and end angle fixing for regression circle
- Start and end fixing for regression line
- Calculation of radius, distance, angle, incline, ...
- Angle display in °/'", decimal, incline μ/mm
- Generation of auxiliary elements, circle, line, point, coordinate grid, parallel line, vertical line, angle bisector, angle line, ...
- "Fixed circle" fitting
- Intersection generation line/line
- Intersection generation auxiliary line/contour
- Intersection generation line/radius
- Generation of free reference points
- Determine highest point
- Determine lowest point
- Variable vanishing point generation mm or %
- Regression line through x points
- Regression radius through x points
- Ball adjustment
- Torus adjustment
- Form deviation, graphically scalable in X+Z
- Radius deviation, graphically scalable in X+Z
- Straightness
- Radius form error
- Parallelism
- Turn profile
- Hide segments
- Automatic dimensioning with tolerance assessment
- Integration of graphical information on the automatic test process
- Visual tolerance indicator
- DXF fitting
- Free text box
- Contour-bound text box
- Roughness measurement (optional for T1, standard for T1-R and T3)
- Comprehensive easy creation and use of print templates are easy to create and use
- Automatic printout function
- Automatic printout after automatic measurement
- Printout in portrait or landscape format
- Numbering of position valves
- Dynamic contour tracing
- Import of various data types
- Variable data export
- Automatic data export after measurement
- Export of results
- Export of raw data
- Export of DXF data
- Simple generation of autonomic measuring processes
- Smart tracing path optimization
- Grid lines can be displayed
- Dynamic axis scaling
- Individual color adjustment
- Software-assisted tracing arm calibration
- 12 selectable operating languages
- User administration
- Compatible with Windows XP and W7 (32/64Bit)



Contour analysis



Multi-contour analysis



The connection between the surface and measuring device

Often disregarded but still essential:

Slide friction, bending effects and tip shape are essential influences on the measured result.

Problems:

The slide friction between the probe tip and workpiece surface causes bending effects during measurement. This effect is mainly corrected by tracing arm calibration - but a residual error that cannot be corrected still remains. In addition, several workpiece materials will also cause deviating bends in the probe tip. These errors cannot be systematically corrected with reasonable effort. The only way out is by reducing friction.

Classic probe tip:

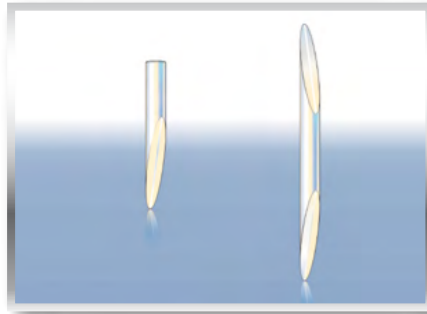
A classic probe tip weakness of contour measuring devices is the tip shape that is not uniquely defined. The transfer between various radiuses practically leads to only a single place of the tip radius corresponding to the requirements. The tip geometry is no longer defined outside of the axis.

CS42 ceramics probe tips:

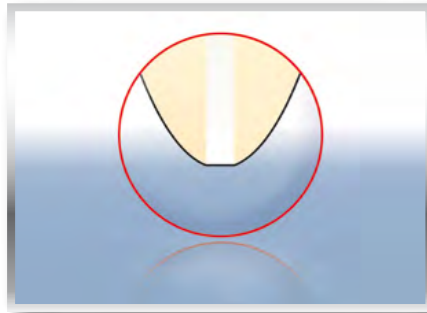
The problems stemming from sliding friction, bend and tip shape are reduced first and foremost by our patented *CS42 probe tips*. The friction coefficient of our probe tips made of high-performance ceramic is far below that of carbide. Defined tip geometry prevents defective measured values caused by small positioning errors. The result of our improvement measures leads to a clear reduction in measurement uncertainty.

Benefits at a glance:

- Optimized patented tip geometry
- Much less time is required for precise placement at the test piece
- Reduced friction as compared to carbide
- Electrically non-conductive
- Not magnetizable
- Resistant against attachment cutting
- The scanning element follows the test piece surface much more securely in the threshold area
- Form-retaining probe tip geometry
- Consistently high product quality
- High-tech material
- Grain size reduced by 50% as compared to conventional carbide
- Extraordinarily high-wear resistance and hardness
- Reduced susceptibility to breaks
- Lower costs



CS42 ceramic tips



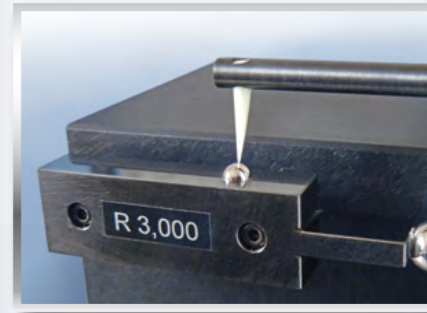
Patented probe tip geometry

ConturoMatic tracing arms

A small excerpt from our comprehensive range:		
One-way contour tracing arm – short version – for ConturoMatic T1/T2/T3/TS/TS-X		
150/20.5	↓	Item no.: 6829-02/2 Tracing arm total length 150 mm, probe tip length 20.5 mm
150/6	↓	Item no.: 6829-01/2 Tracing arm total length 150 mm, probe tip length 6 mm
One-way contour tracing arm – long version – for ConturoMatic T1/T2/T3/TS/TS-X/CV250/CV250D		
260/6	↓	Item no.: 6829-04/2 Tracing arm total length 260 mm, probe tip length 6 mm
260/33	↓	Item no.: 6829-05/2 Tracing arm total length 260 mm, probe tip length 33 mm
260/59.5	↓	Item no.: 6829-06/2 Tracing arm total length 260 mm, probe tip length 59.5 mm
Two-way contour tracing arm – short version – for ConturoMatic T1/T3/TS/TS-X		
150/2x5	↓ ↑	Item no.: 6829-08/2 Tracing arm total length 150 mm, probe tip length 2 x 5 mm
150/2x9	↓ ↑	Item no.: 6829-21/2 Tracing arm total length 150 mm, probe tip length 2 x 9 mm
150/2x16.5	↓ ↑	Item no.: 6829-33/2 Tracing arm total length 150 mm, probe tip length 2 x 16.5 mm
190/2x1.25 Disc	↓ ↑	Item no.: 6829-24 Tracing arm total length 190 mm, probe tip length 2 x 1.25 mm
Two-way contour tracing arm – short version – for ConturoMatic T3/TS/TS-X		
150/2x9x1.5 ruby	↓ ↑	Item no.: 6829-87/2 Tracing arm total length 150 mm, probe tip length 2 x 9 mm and ruby ball Ø1.5 mm
Two-way contour tracing arm – long version – for ConturoMatic T1/T3/TS/TS-X		
260/2x10x1.0 ruby	↓ ↑	Item no.: 6829-47 Tracing arm total length 260 mm, probe tip length 2 x 10 mm and ruby ball Ø1.0 mm
260/2x16.5	↓ ↑	Item no.: 6829-10/2 Tracing arm total length 260 mm, probe tip length 2 x 16.5 mm
One- or two-way – Roughness tracing arm – for ConturoMatic T1/T3/TS/TS-X		
190/6	↓	Item no.: 6829-29/65 Tracing arm total length 190 mm, probe tip length 6 mm diamond 60° 2 µm
190/2x5	↓ ↑	Item no.: 6829-89 Tracing arm total length 190 mm, probe tip length 2 x 5 mm diamond 60° 2 µm
Examples for special tracing arms T1/T3/TS/TS-X		
200/90°/20.5	↓	Item no.: 6829-11 Tracing arm total length 200 mm, 90° angled Probe tip length 20.5 mm
200/2x33 HG	↓ ↑	Item no.: 6829-146 Tracing arm total length 200 mm, Probe tip length 2 x 33 mm 20° inclined tips – forward
On request, we will also offer other special tracing arms.		



Tracing arm ConturoMatic TS-X



Tracing arm ConturoMatic TS

ConturoMatic – Standard probe tips

One-way contour CS42 ceramics probe tips				
Probe tips total length	Probe tip Ø	Probe tip angle	Probe tip radius	Item no.:
6 mm	1.0 mm	19°	25 µm	7181-04-CS42
9 mm	1.5 mm	14°	25 µm	7181-07-CS42
12 mm	1.0 mm	19°	25 µm	7181-081625
20.5 mm	3.5 mm	12°	25 µm	7181-03-CS42
33 mm	3.5 mm	12°	25 µm	7181-02-CS42
59.5 mm	3.5 mm	12°	25 µm	7181-01-CS42
One-way contour HM carbide probe tip, conical				
6 mm	1.0 mm	24°	25 µm	5730-08k
20.5 mm	3.5 mm	24°	25 µm	5730-07k
33 mm	3.5 mm	24°	25 µm	5730-02k
Two-way contour CS42 ceramics probe tip				
2 x 5 mm	1.0 mm	19°	25 µm	7182-03-CS42
2 x 9 mm	1.5 mm	14°	25 µm	7182-02-CS42
2 x 16.5 mm	2.5 mm	12°	25 µm	7182-01-CS42
Two-way contour HM carbide tip				
2 x 5 mm	1.0 mm	24°	100 µm	6810-02
Diamond probe tip (roughness)				
1.5 mm	0.5 mm	60°	2 µm	7796
6 mm	1.2 mm	60°	2 µm	7636
10 mm	1.2 mm	60°	2 µm	7636-10
20 mm	1.2 mm	60°	2 µm	7636-20
Two-way diamond probe tip (roughness)				
2 x 5 mm	1.0 mm	60°	2 µm	7825
One-way contour probe tip – ruby ball				
Probe tips total length	Connection thread	Shaft Ø	Ruby ball Ø	Item no.:
21.5 mm	M3	1	1.5 mm	7124
Two-way contour probe tip – ruby ball T-shape				
Probe tips total length	Receptacle shaft Ø	Shaft Ø	Ruby ball Ø	Item no.:
2 x 5 mm	3.0 mm	1.0 mm	1.0 mm	7487-01
2 x 5 mm	3.0 mm	1.0 mm	1.5 mm	7487
2 x 10 mm	3.0 mm	1.0 mm	1.0 mm	6810-05
Two-way contour probe tip – T-shape				
Disc Ø	Receptacle shaft Ø	Disc angle	Disc radius	Item no.:
2.5 mm	1.0 mm	15°	100 µm	7184-101-L40
5 mm	1.5 mm	15°	100 µm	7184-102-L40

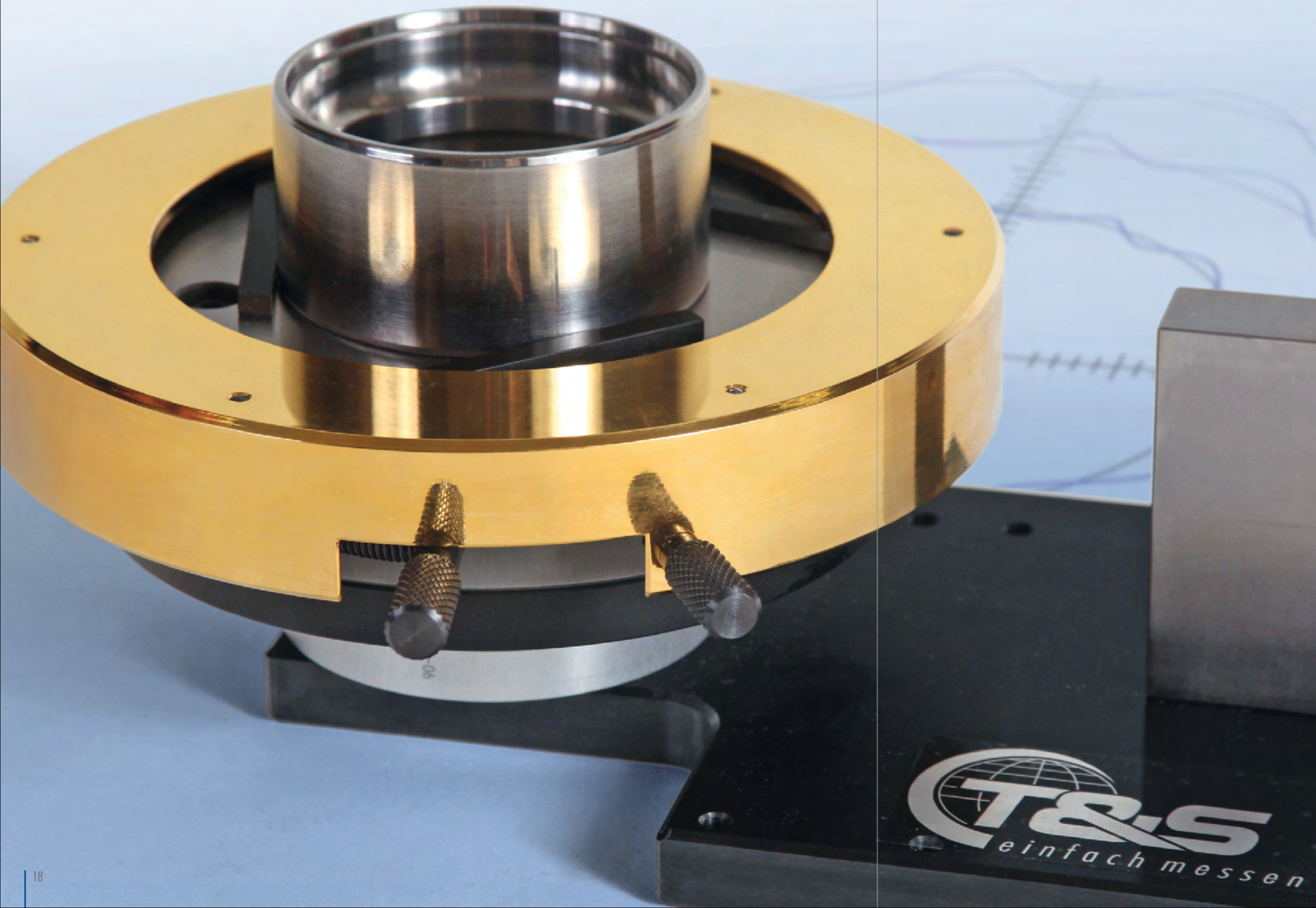
Information without warranty as of 01.03.2014

ConturoMatic – Technical Data

ConturoMatic	TS	TS-X	CV120	CV250	CV250digital	Comment
ConturoMatic system data						
Measuring range-X ←→	250 mm	280 mm	120 mm	250 mm		
Measuring range-Z ↑↓	320 mm	350 mm	30 mm	50 mm	70 mm	
Scanning from below ↓	✓	✓	✓	✓	✓	
Scanning from above ↑	✓	✓	–	–	–	
Measuring direction ←→	✓	✓	–	–	–	
X-scanning ←→	–	✓	–	–	–	
Measuring speed	0.1-3.0 mm/s		0.03-1.75 mm/s			
Auto speed optimization	✓	✓	–	–	–	
Positioning speed	up to 25 mm/s		up to 25 mm/s			
Measuring system(s)	visually incremental		digital	analogue	digital	
Measuring data processing	digital					
Measuring system resolution	0.033 µm	0.0001 µm	0.1 µm	0.1 µm	0.033 µm	
Guide elements	mechanic	aerostatic	mechanic	mechanic	mechanic	
Table load max.	35 kg	25 kg (50 kg TS-X HD)				centrically load
System inaccuracy *						
Total error	+/- (0.9+L/100) µm	+/- (0.85+L/100) µm				per scanning direction L = measuring path in mm
X-axis	+/- (0.75+Lx/100) µm	+/- (0.5+Lx/100) µm	+/- (1.2+2Lx/25) µm	+/- (1.2+2Lx/25) µm	+/- (1.0+2Lx/25) µm	Lx = X - measuring paths in mm
Z-axis	+/- (0.75+Lz/100) µm	+/- (0.5+Lz/100) µm	+/- (1.8+2Lz/25) µm	+/- (1.8+2Lz/25) µm	+/- (1.5+2Lz/25) µm	Lz = X - measuring paths in mm
Guide accuracy No guide correction	(0.15+L/100) µm	(0.08+L/100) µm	(1.5+L/25) µm	(1.5+L/25) µm	(1.2+L/25) µm	L = measuring paths in mm
Measuring point distance in X	0.5 - 25 µm	0.5 - 10 µm	0.5 - 17 µm			
Radius measurement	± 0.005 % of the NW at R12.5 mm		± 0.05 % of the NW at R12.5 mm			NW = nominal value
Distance measurement	+/- (1.2+L/100) µm		+/- (1.8+L/25) µm			
Angle measurement	≤ 30°	≤ 20°	≤ 2°	≤ 2°	≤ 2°	
ConturoMatic Software						
Contour	✓	✓	✓	✓	✓	
Diameter	•	✓	–	–	–	
NC-Automatic measurement	✓	✓	✓	✓	✓	
NC-Automatic assessment	✓	✓	✓	✓	✓	
Roughness						
Availability	•	✓	–	–	–	
Measuring range Z/X	1.0/250 mm	350/280 mm	–	–	–	
Application ranges Ra	Ra ≥ 0.1 µm	Ra ≥ 0.05 µm	–	–	–	
Application ranges Rz	Rz ≥ 1.0 µm	Rz ≥ 0.5 µm	–	–	–	
Measuring point distance	approx. 0.5 µm	approx. 0.5 µm	–	–	–	
Accuracy	5% MW	5% MW	–	–	–	MW = Measured value
Measuring speed	0.1 mm/s	0.1 - 0.5 mm/s	–	–	–	
Measuring force	7.5 mN	7.5 mN	–	–	–	

* Conditions according to T&S specification • = Option – = not available

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“How to place the workpiece into the measuring device”

Precise clamping and alignment of the test pieces in measuring devices is very time-consuming work. It is hardly surprising that a high amount of measurement uncertainties in this area are due to such inaccuracies. Time is money, in particular in the production industry. But take care: defective test pieces that are not recognized because of imprecise measurements have a negative effect on product quality. In the worst case, this may endanger the company's existence.

The *centering and clamping systems* from T&S, specifically developed for use on test machines, warrant precise measuring results. If our standard is not sufficient, we will find a customized solution together with you for your special needs.

Benefits of our clamping and centering systems

- Flexibility
- Simple, quick handling
- High precision that usually does not require re-centering
- Robustness for production-aligned use
- Adjustable clamping force for centering thin-walled parts

How to place the workpiece into the measuring device?

State-of-the-art production procedures now achieve qualities that reach the thresholds of measuring device accuracy in inspection. It is all the more important that the workpiece is received correctly; essentially, this determines measurement quality. If enormous time expenditure is required for precise clamping and alignment - if the test piece still is not placed precisely, correct measurement is not possible. It is understandable that practical applications lose a high share of measurement certainty possible by insufficient placement into the measuring device. To counteract this, we have developed a number of *centering* and *clamping systems* specifically for use on test machines. The main areas of application are contour-measuring systems, form-measuring machines, coordinate measuring devices and optical test devices.

Benefits at a glance:

- Flexibility
- Simple, quick handling
- High precision that usually does not require re-centering
- Robustness for production-aligned use
- Adjustable clamping force for centering thin-walled parts

Type WA

Angle-adjustable universal receptacles for contour measurement systems.

Series AZ

Outside centering system for form testers.

Series UZ

Universal, patented system for outer and inner centering.

"The guidance of the UZ-320 corresponds to a non-linear curve. Thus we achieve an outwardly increasing centering force. Larger workpieces, usually also heavier, are centred with a greater force than small, lightweight workpieces."

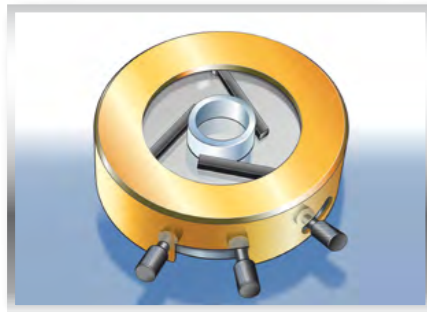
Series VZ

Battery-powered vacuum centering and receptacle system with integrated low-vibration special vacuum pump for rotary table systems. For test pieces that cannot be clamped by common methods (small or flat parts, balls or bolts) or for those that must be tested across their entire length (asymmetric parts, etc.).

Centrally load

Do you require a customized solution?

That's not a problem! From an auxiliary device to the test device with special software – we will find a suitable way with our special measurement technology.



AZ - 2



UZ - 320



Tool receptacle

The universal inspection system for electric motor rotors

Electric motors are an important part of today's technology. Specifically the commutator that converts the electrical polarity is a highly precise mass component with extreme requirements for accuracy. Lowest of the bars, precise roundness, lowest roughness and concentric properties of the entire rotor are required to warrant best wear and noise behavior.

In close cooperation with leading global motor manufacturers, we developed our *KommutatorMatic system* for the inspection of all relevant geometric parameters of electric motor rotors. The bandwidth of possible solutions ranges from simple, cost-efficient systems for manual process monitoring to 100% in-process control in production lines.

Again, the basic frame is universally usable operator-friendly software, a robust mechanical base and quick measurement data recording. Adding simple handling to this, *KommutatorMatic* becomes an effective all-round test system for electric motor rotors.

Performance at a glance:

Kommutator.info software

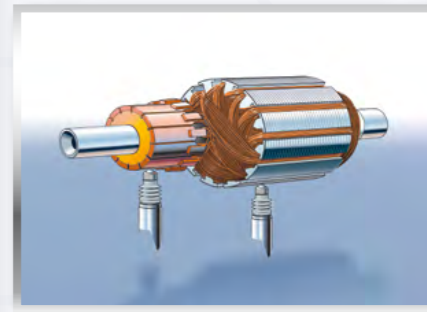
- Numeric and graphical visualization of results
- Graphical display of exceeded tolerances
- Linear, polar or combined presentation
- PLC assessment
- SPC data export
- Result presentation as a table
- User administration
- Status display of control inputs/outputs
- Communication with the SPS of production lines
- Quick data recording with up to 4000 samples/s
- 4- and 8-channel data recording
- Typical cycle times incl. assessment < 2s

Parameter assessment

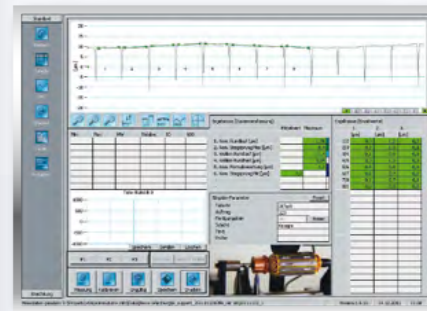
- Segment deviation
- Segment shape deviation
- Commutator concentricity
- Commutator roundness
- Commutator diameter
- Concentricity to shaft/worm
- Shaft roundedness
- Shaft diameter
- Angle offset to bar package
- Package concentricity
- Package diameter
- Angle offset to bar package

KommutatorMatic mechanics

- Robust mechanics
- Simply adjustable elements
- Unparalleled short re-equipment time
- Modular structure
- Simple adjustment to extended measuring tasks



Commutator inspection



Software



Measuring device

Get help when it matters most!

It's great when everything is running smoothly. However, if problems do arise, we offer customized solutions!

It's not enough for us to deliver technically outstanding products, our service know-how and customer support is first-class too.

Additionally, we place special importance on robustness and longevity when developing products. T&S is dedicated to the principle of technology "Made in Germany" and mainly cooperates with local partners and suppliers. This not only assures quality but in particular warrants short delivery and turnaround times.

After-sales service

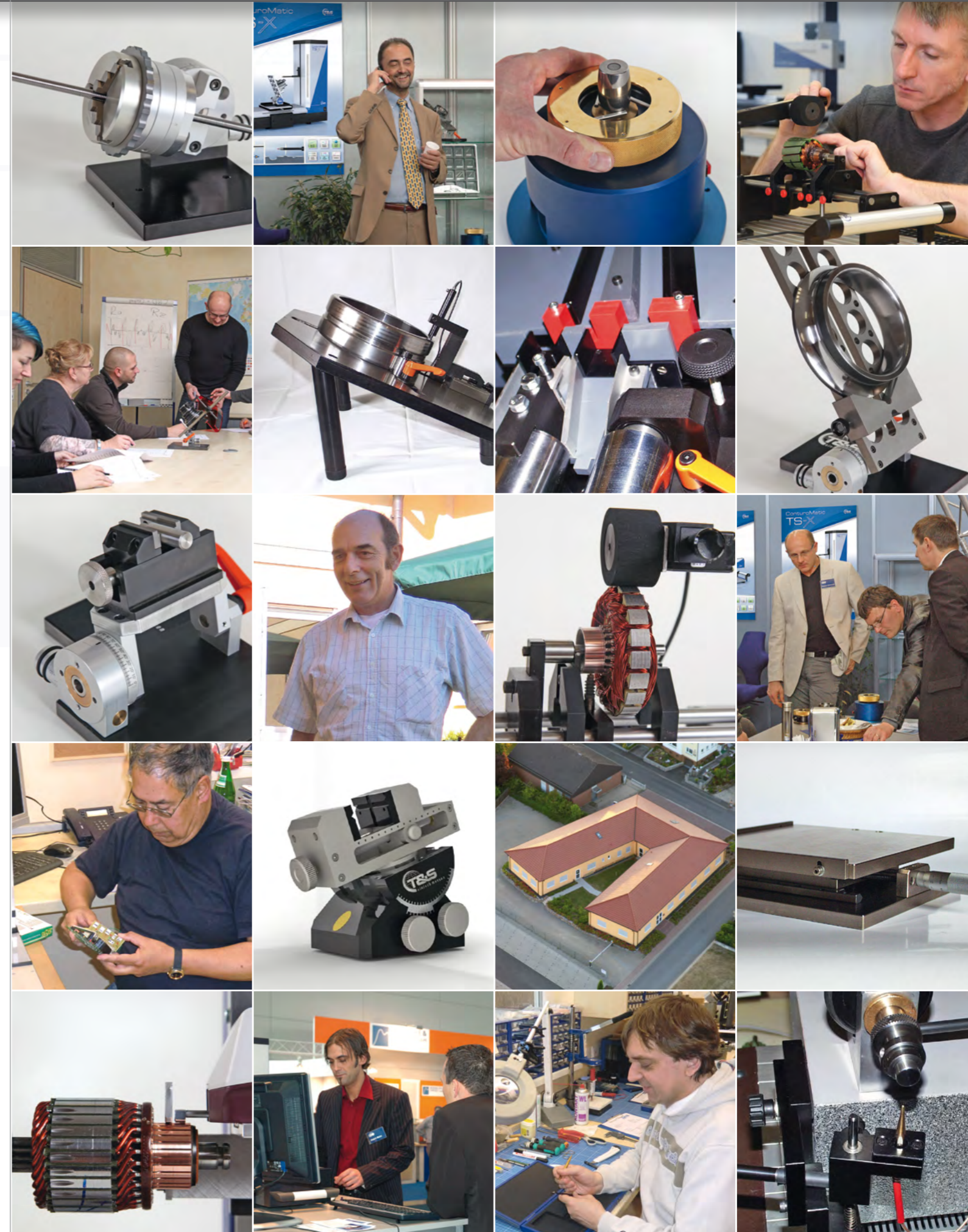
We are available for support and advice and will use our combined practical know-how gained from more than 20 years of experience and hundreds of delivered systems across the world. You can reach us by phone or email during our business hours. If required, our technicians will come to your site personally.

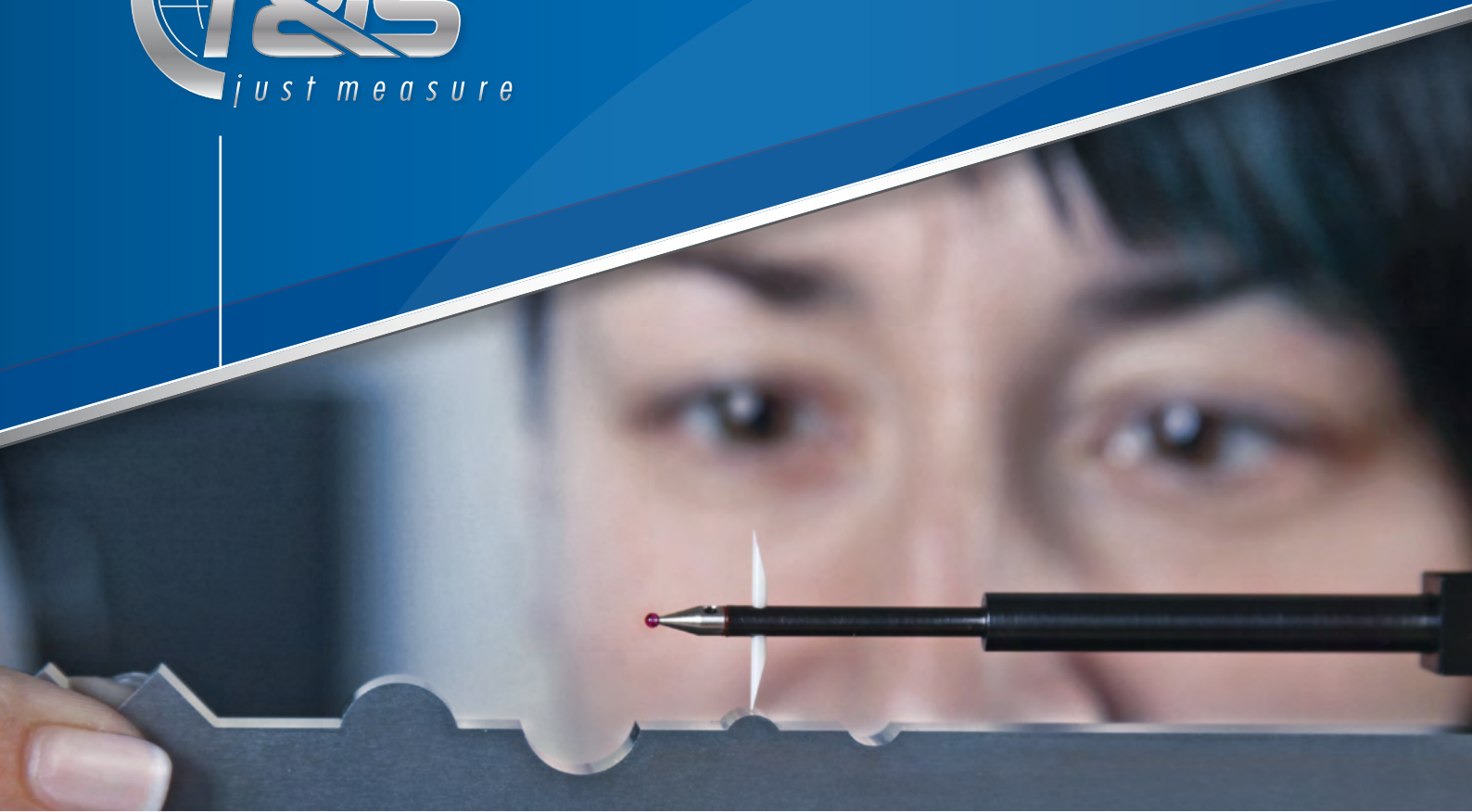
What you can expect from us

- A friendly, helpful and competent service team
- Project management by our technical sales
- T&S in-house repair service with transport organization
- Technical customer service for on-site repairs
- Maintenance contracts with schedule monitoring by us
- User and follow-up training at T&S or at your site
- Free-of-charge technical customer service over the phone and by email
- Loan equipment to cover repair times where possible
- Global customer service
- Tracing arm repair service
- Free software updates



ISO 9001:2008 certification
Certified by
TÜV Rheinland Cert GmbH





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