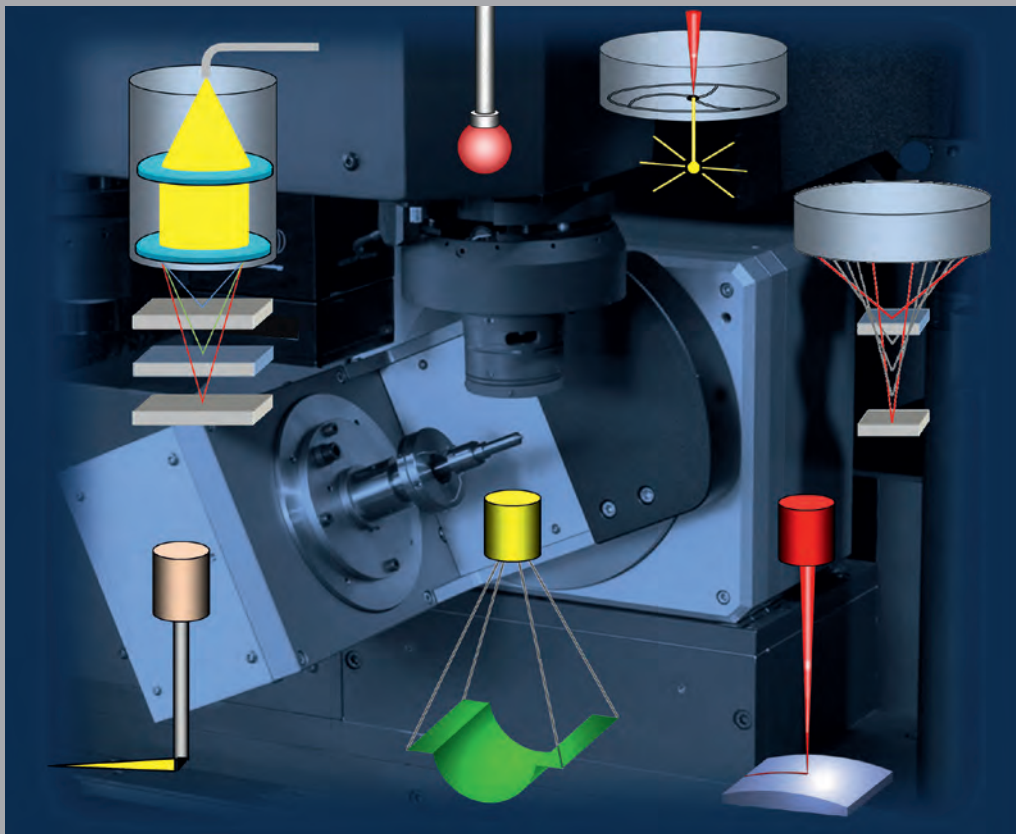




Always a Step Ahead with Quality



Multisensor Coordinate Measuring Machines

Optical Coordinate Measuring Machines

Coordinate Measuring Machines with Computed Tomography

Measuring and Profile Projectors

Specialized Measuring Equipment

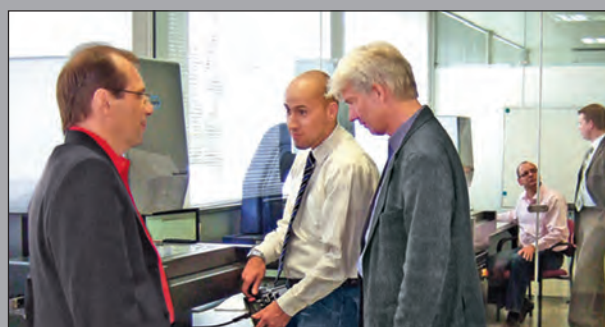
# The Company

Since 1951, the name Werth stands for the highest quality and precision in the field of dimensional metrology. The company's headquarters are located in Giessen, in a region with a long industrial tradition in fine mechanics and optics. With over 10,000 measuring machines installed worldwide, in the aerospace, automotive, electronics, energy, extrusion, jewelry, tooling, medical, defense and plastics industries, Werth has become a leading measurement technology company. Due to numerous global innovations and patents in the area of precision mechanics, image processing and software, Werth Messtechnik GmbH is currently a leading company in coordinate measuring technology with optical and multisensor systems. Since the introduction of the TomoScope®, the first X-ray computed tomography machine developed for coordinate metrology (with optional multisensor configuration) in 2005, Werth has also led the way to apply this powerful sensor technology. Innovative developments, excellent product quality, user satisfaction, and international orientation define the objectives of the company.



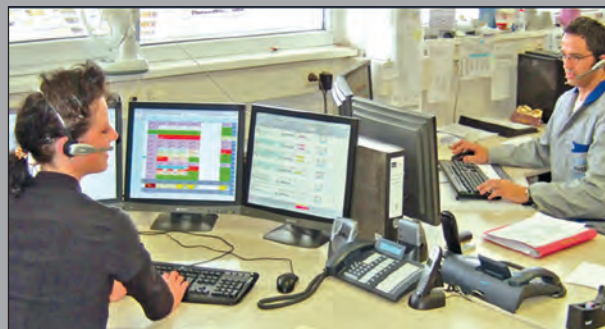
## Quality

With active participation in standardization committees, Werth supports product specifications and quality standards that promote competition. Consistent quality assurance and acceptance tests comparable to VDI/VDE 2617 and ISO 10360 guarantee the reliability and precision of the machines. The quality management system at Werth Messtechnik is ISO 9001 certified. In the ISO IEC 17025 accredited Werth DAkkS lab, the calibrations of the coordinate measuring machines with optical, tactile, and X-ray tomography sensors, are performed according to VDI 2617 and ISO 10360.



## Applications and Training

High quality and innovative technologies require the technical knowledge and expert support available from Werth. Years of experience in the area of coordinate measuring technology enables Werth to provide customer specific solutions and training for specific measurement tasks, which allows productive and efficient application of the coordinate measuring machine.



## Service and Technical Support

Werth has a large team of qualified service engineers and technicians in order to guarantee full customer satisfaction with on-time installation and fast reaction times when help is needed. Service contracts for maintenance and calibration ensure flawless performance of the measuring machines. Effective communication is a basic prerequisite for good service. Our main office and international service centers are perfectly positioned to provide this.



## The right technology for every application

Werth offers a large product range, innovative sensor technology and customized software solutions. With expert consultation based on decades of experience, Werth can provide customer-specific solutions to optimally adapt to the measurement task at hand. The product spectrum extends from 2D machines for rapid scanning of flat workpieces, to machines with up to 6 axes for the measurement of tools and shafts. Task specific measurement uncertainties can be reduced to the sub-micron range.

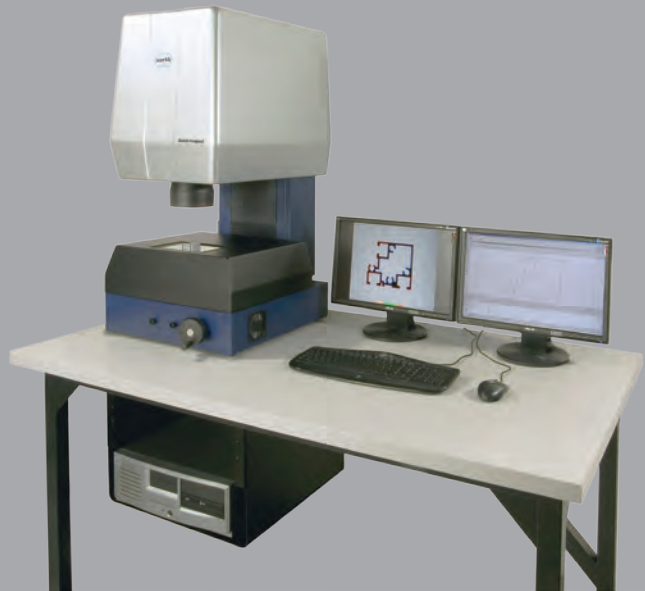
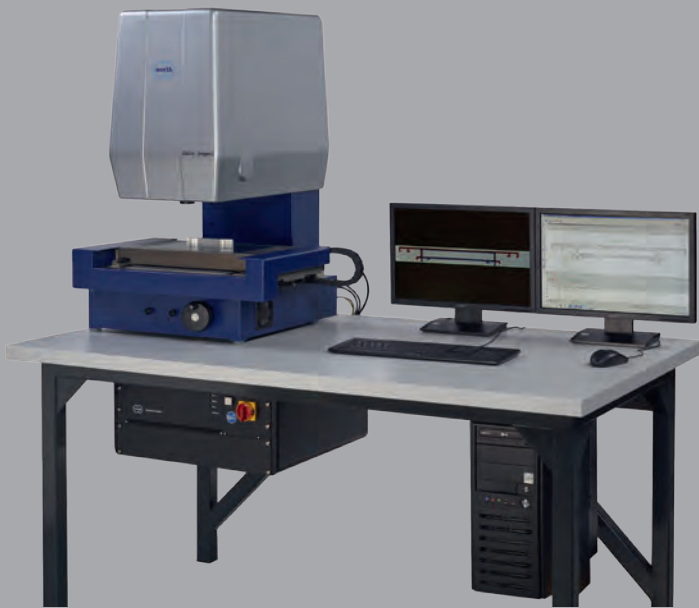


# QuickInspect and FlatScope – Modern Successors to the Profile Projector

The 2D machines allow rapid measurement “at a glance” on the production floor and in the measurement lab.

## QuickInspect

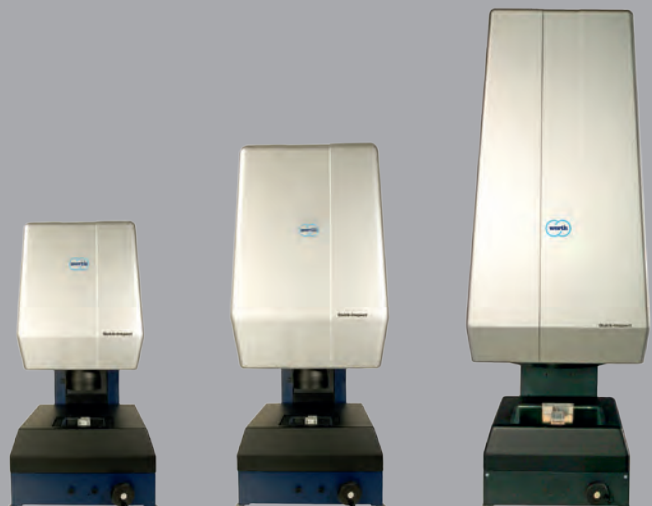
Capturing an entire workpiece “in the image” ensures easy operation and short measurement times. Similar to a classical profile projector, the measuring machine uses the field of view of the lens as the measurement range, without mechanical axes. The workpiece is placed on the table and automatically recognized and measured by the corresponding measurement program.



## QuickInspect MT

For higher demands on measurement range, resolution, and measurement uncertainty, the same ease of operation as the conventional QuickInspect is offered in the new QuickInspect MT. The machine raster scans the workpieces in seconds “OnTheFly” at the push of a button, producing a high-resolution image with nearly any desired resolution and high precision (patent). Even small or high-precision features on larger workpieces (standard 250 mm) can be measured very well. Here again, the workpiece is recognized fully automatically after raster scanning, and the matching measurement program is started automatically.

To ensure comparability to conventional coordinate measuring machines, the QuickInspect machines are specified comparable to ISO 10360 and VDI/VDE 2617 and traceable to the German National Metrology Institute (PTB – Physikalisch-Technische Bundesanstalt). Depending on the magnification of the optics, measurement uncertainties of fractions of a micron or a few microns can be achieved. For most versions of the machine (0.037 x to about 1 x magnification), it is not necessary to precisely adjust the focus due to the telecentric optics. For high magnification, setting the focus is simple with an easy-to-use focus function in the WinWerth® software.



### FlatScope

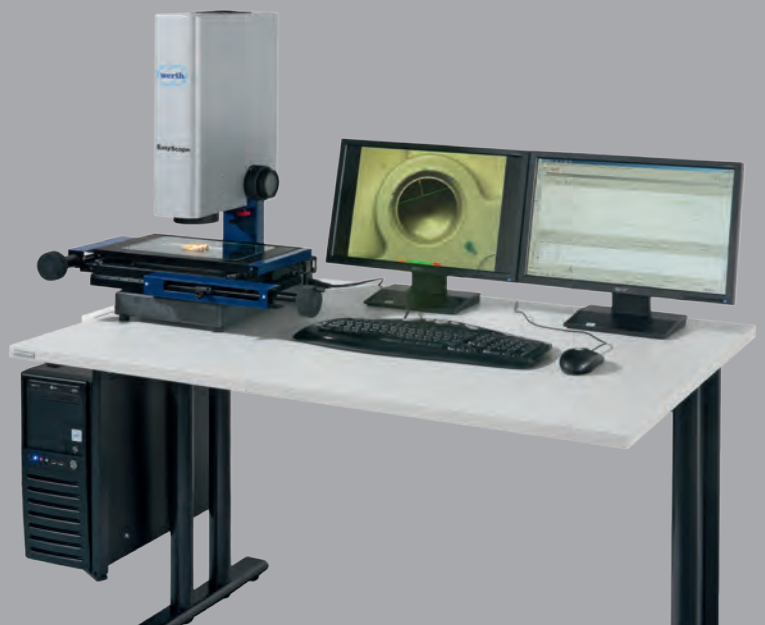
The chief area of application is the measurement of larger 2D profiles (e.g., rubber, plastic, and aluminum profiles), as well as films, circuit boards, laser-cut and stamped parts. The design of the FlatScope, with the image processing sensor under the glass plate, eliminates time-consuming focusing as the workpiece is always in the correct distance to the optics. In raster scanning mode (patented), this machine also quickly captures the selected measurement range completely. All geometric features are then evaluated automatically "in the image." Typical measurement ranges are 400 mm x 200 mm and 650 mm x 600 mm. Special sizes are available upon request.



## EasyScope® – 3D manual measuring microscope with automatic image processing

### EasyScope® 3D manual

The EasyScope® is a manually operated machine with automatic image processing, optoelectronic zoom and autofocus function for measuring in the vertical axis. The measurement range is 200 mm in the X axis, 100 mm in the Y axis, and 200 mm in the Z axis. The workpieces are finely positioned by a hand wheel or rapidly by a quick release slide. Intelligent software functions, such as the Werth AutoElement for automatically recognizing measurement elements, or the Werth MeasureGuide for navigating to the measurement positions saved in the program, make it easy to measure with the EasyScope®.



# ScopeCheck® and Inspector® – Coordinate measuring machines for the production environment

The ScopeCheck® series with integrated temperature compensation was developed for use in production environments and offers good value.

## ScopeCheck® S

This compact coordinate measuring machine with a granite base has a measurement range of 300 mm or 400 mm in the X axis and 200 mm in the Y axis allowing multisensor configurations and palletized workpieces. All Werth ScopeCheck® machines include image processing. The integration of additional sensors and the Z measurement range of 200 mm provide flexible solutions for measuring small and medium-sized workpieces.

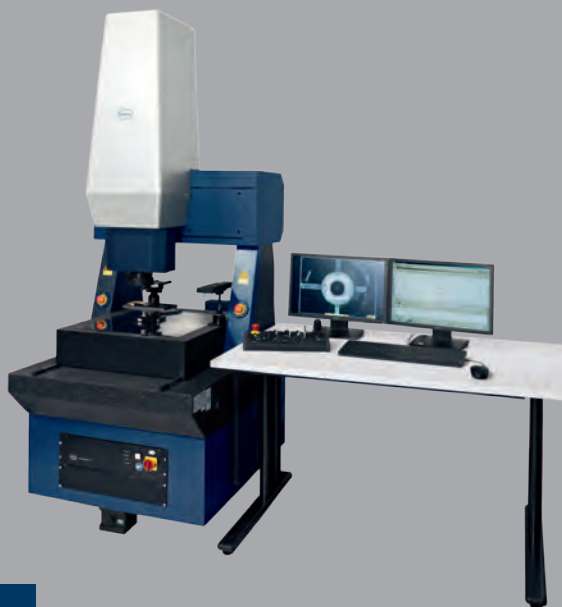


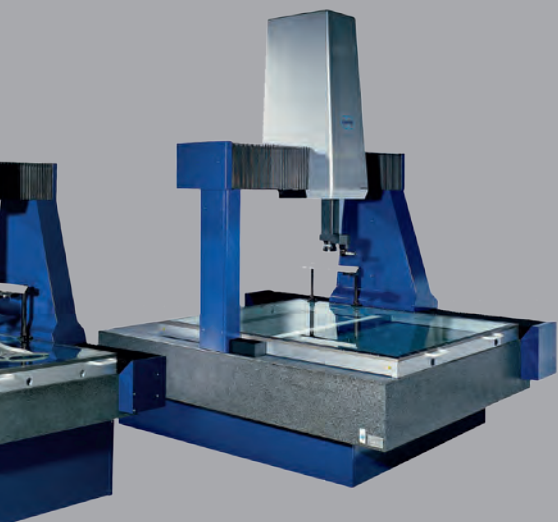
## ScopeCheck® MB

With the ScopeCheck® MB, Werth Messtechnik GmbH offers a multisensor coordinate measuring machine for measuring large workpieces in the measurement labs or in production environments. This machine can be equipped with the telecentric Werth Zoom and tactile probing systems. The rotating and tilting IP 40 T camera head is available for measuring larger workpieces from various directions. The Werth LLP Laser Line Sensor is used for rapid scanning of 3D workpieces with high point density. Standard measurement ranges are from 500 mm to 2000 mm in the X-axis, up to 3000 mm in Y, and up to 1500 mm in Z are available.

## ScopeCheck® FB

The ScopeCheck® FB machines also have a granite base and are suitable for use in production environments and measurement labs. Their solid construction with a fixed bridge guarantees low measurement uncertainty even with multiple sensors. Measurement ranges run from 400 mm to 1500 mm in the X axis, 400 mm to 1000 mm in Y, and up to 300 mm in Z.





### ScopeCheck® V

The ScopeCheck® V from Werth Messtechnik GmbH is the optical and multisensor coordinate measuring machine for precisely measuring round workpieces, such as tools, shafts and gear shafts in production environments. The special feature of these machines is the integrated vertical rotary axis for rapid measurement of diameters, planes, holes, and cutting and clearance angles with optical and tactile sensors. All industry standard tool holders and chuck systems are available on the rotary axis. Tools can be measured automatically using Numroto interfaces. The graphically supported tool measurement programs Micromills and Microform and the esco software for hobs, taps and form cutters, support simple operation with parametric programming. Standard measurement ranges are 200 mm length x 140 mm diameter, 500 mm x 250 mm, and 800 mm x 250 mm. Larger measurement ranges can be quoted on request.



### Inspector® FQ – Rapid Measurement in Production with Linear Drives

For applications that require both high speed and low measurement uncertainties, this coordinate measuring machine is equipped with linear drives. With a positioning speed of 1,000 mm/s and acceleration of 10 m/s<sup>2</sup>, the Inspector® FQ is the fastest multisensor coordinate measuring machine in the world. Various measurement ranges are offered for specific requirements.





# VideoCheck® – Coordinate Measuring Machines for the Toughest Requirements

The Werth VideoCheck® series offers the world's highest performance multisensor coordinate measuring machines, due to precision mechanics and modern control technology.



## VideoCheck® S

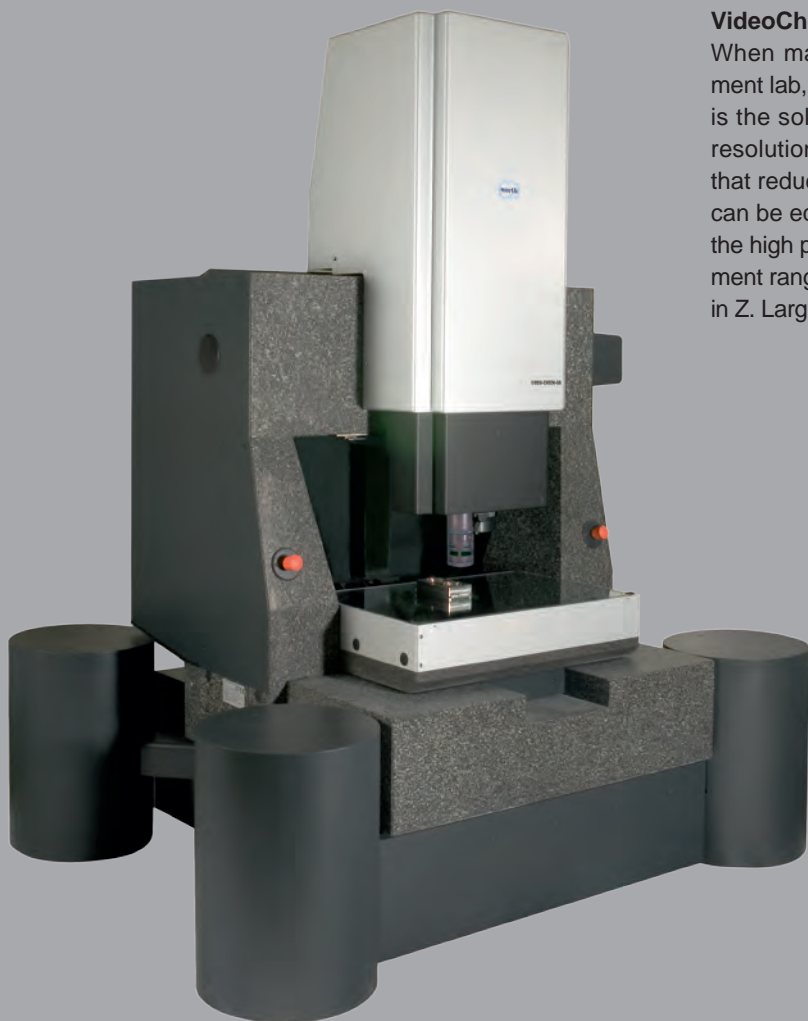
This series of machines is ideal for small measurement ranges that require high accuracy. The Werth constant-stress guideway principle of the X-Y stage ensures high precision and long-term stability. VideoCheck® S machines use the Werth image processing sensor with telecentric Werth Zoom and MultiRing. They can be equipped with a wide selection of additional optical and tactile sensors, including the patented Werth Fiber Probe. Measurement ranges are 400 mm x 200 mm and 250 mm x 125 mm in X and Y with 250 mm in Z.

## VideoCheck® FB, VideoCheck® DZ, and VideoCheck® HA

These machines, with a "fixed bridge" design and precision air bearings, provide a platform for solving the most challenging measurement tasks. The VideoCheck® can be equipped with a wide selection of sensors, as well as rotary and rotary/tilt axes. The VideoCheck® DZ, with dual Z rams, makes it easier to measure large workpieces using multiple sensors without collision. The VideoCheck® HA (High Accuracy) is available for high-precision measurements. Standard measurement ranges run from 400 mm to 3500 mm in the X axis, 400 mm to 1750 mm in Y, and up to 800 mm in Z.







### VideoCheck® UA

When maximum precision is required in the measurement lab, this ultraprecise coordinate measuring machine is the solution. The VideoCheck® UA features scale resolution in the nanometer range and a special design that reduces measurement errors. The VideoCheck® UA can be equipped with high-precision sensors including the high precision 3D Fiber Probe. The standard measurement range is 400 mm in the X and Y axes and 250 mm in Z. Larger measurement ranges are available on request.

### VideoCheck® V HA

With the Werth VideoCheck® V HA, Werth Messtechnik GmbH provides a tool and shaft measuring machine that achieves traceable measurement uncertainties in the range of tenths of microns. This multisensor coordinate measuring machine provides high-precision measurement of tools, such as drills, mills, step tools, reamers, taps, and grinding and dressing wheels. Measurements of cutting edge radii or flank relief are not a problem for this high-end measuring machine. The standard version allows measurement of workpieces with diameters up to 200 mm and lengths up to 300 mm. Larger measurement ranges are available on request.



# TomoScope® – Coordinate Measuring Technology with X-Ray Tomography

Since Werth combined for the first time X-ray computed tomography with proven coordinate measuring technology the machines in the Werth TomoScope® series allow workpieces to be measured completely, precisely and non-destructively. These machines can also be equipped with multisensor systems as an option. With this technology, product development costs are reduced by minimizing time for first article inspection and process validation.



## 3D comparison

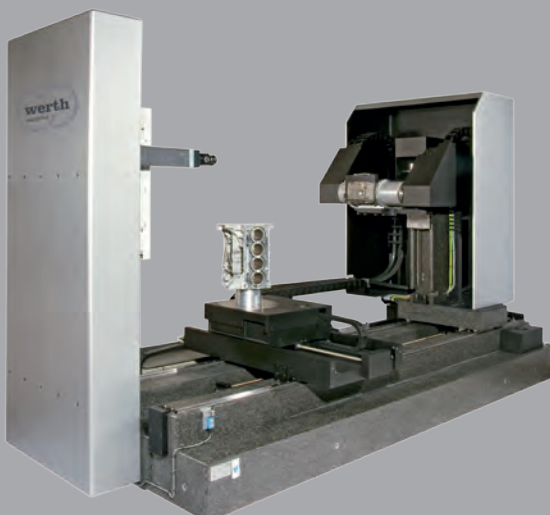
Once X-ray images of the workpiece in numerous rotational positions have been captured, a complete, high-resolution 3D point cloud is computed. This point cloud can be compared directly with the 3D CAD model imported in IGES or STEP format. Each point is automatically associated with the corresponding patch in the CAD model. The deviation of each measurement point from the CAD nominal is displayed in a color-coded deviation plot.

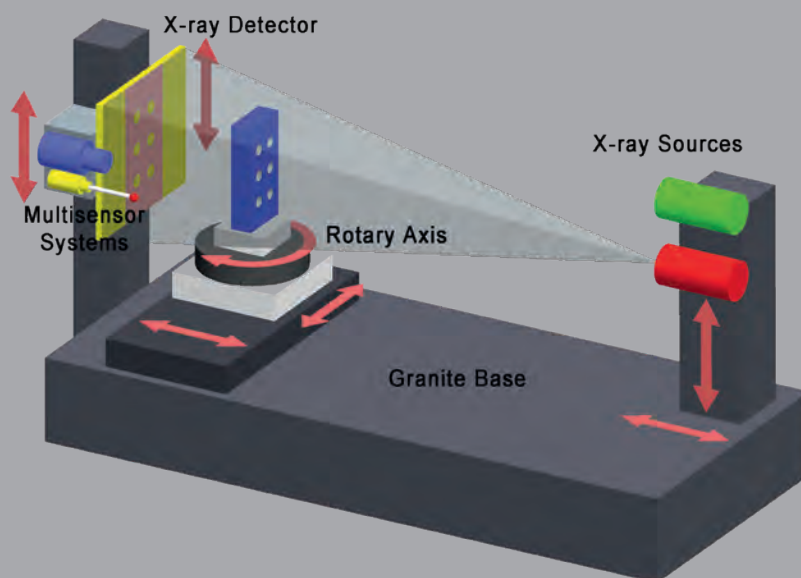
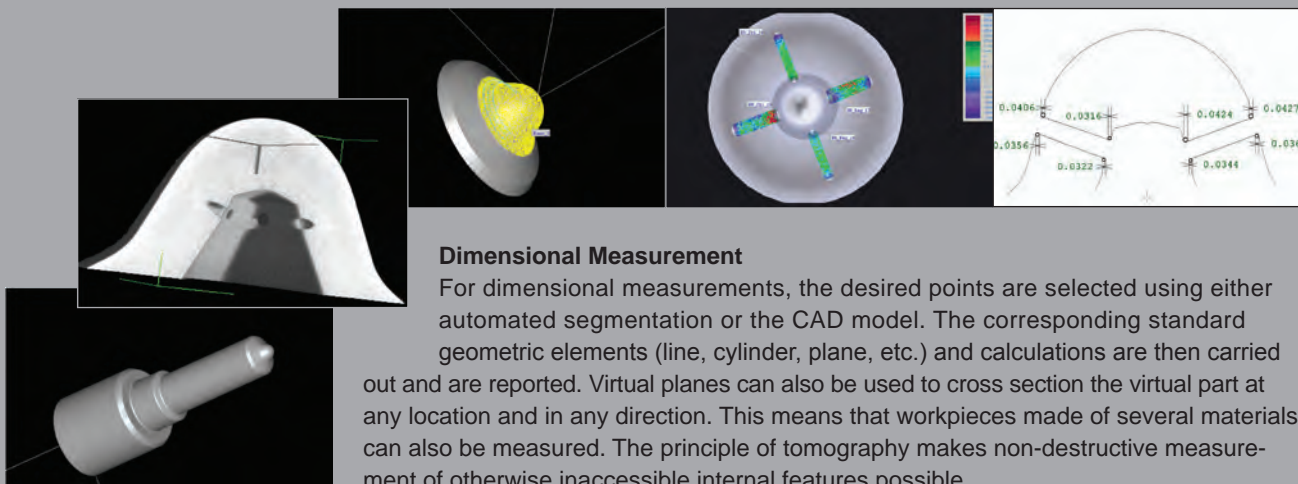
## Machine design

The design of the tomographic measuring machines is based on proven components from Werth coordinate measuring machines to ensure stability and precision. All TomoScope® and TomoCheck® systems are engineered as fully protected machines according to X-ray regulations.

## Precision in the Micron Range

The CT measurements are traceable to the internationally recognized length standard of the German National Metrology Institute (PTB – Physikalisch-Technische Bundesanstalt) using calibrated standards in accordance with VDI 2617 or VDI 2630. A DAkkS calibration certificate is available on request. For example CT measurements on plastics can be performed with a precision of a few microns. When workpieces that are difficult to penetrate require measurement uncertainties in the submicron range, the multisensor approach reduces the systematic measurement deviations due to artifacts, by using the patented Werth Autocorrection process. The deviations of the tomographic scan are determined on a workpiece using a reference sensor – of course, only for the dimensions that have such a precise tolerance – and the systematic error is compensated fully automatically by the software for all subsequent parts.





### X-ray CT Reduces First Article Inspection Time

The measurement time of a few days for first article inspection using classical metrology is reduced to a few minutes with CT. The total process time can thereby be significantly reduced. With extensive and precise information about the workpiece, tool corrections can be implemented in a fraction of the time.





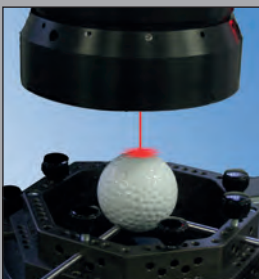
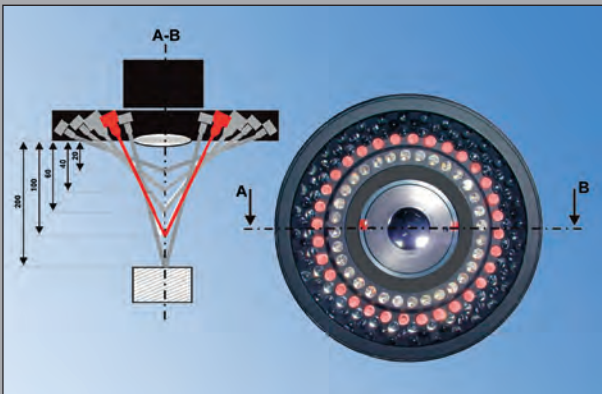
# Multisensor Systems – Optical and Tactile Sensors for Any Task

Werth multisensor coordinate measuring machines can be equipped with a large selection of sensors to provide the right machine configuration for specific applications.

## Optical Sensors

### Werth Zoom

The unique Werth Zoom optics, with variable working distance, and the patented MultiRing with adjustable lighting angles provide advanced capabilities for automatic measurement even for workpieces with minimal contrast.

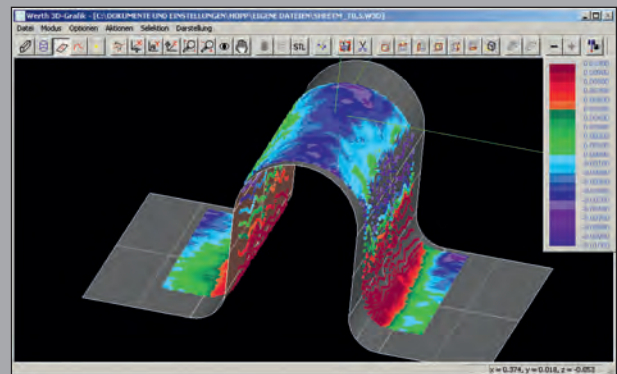


### Werth Laser Probe WLP

The unique Foucault principle of the Werth Laser Probe can be used in applications that go far beyond the limits of typical through the lens lasers (TTL).

### Werth 3D-Patch

With focus variation methods, surface topographies can be captured simply and quickly in three dimensions. High dynamic range (HDR) principle allows this technology to work even on heterogeneous surfaces with severe variations in brightness.



### Laser Line Probe LLP

Large, free-form surfaces with tolerances in the middle precision range can be measured quickly with large data sets and high point densities.

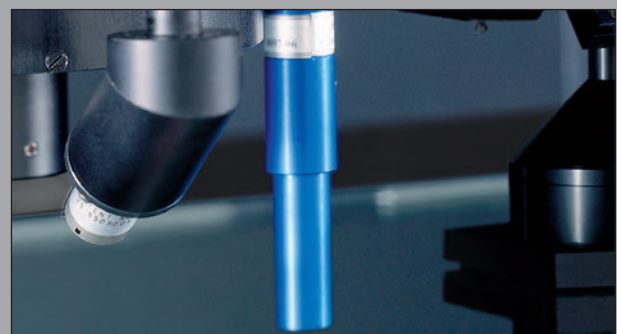
### Werth Nano Focus Probe NFP

The NFP measures topography and roughness of surfaces with the principle of confocal microscopy. Even cutting edge radii on tools or layer thicknesses can be measured.



### Werth Chromatic Focus Probe CFP

The operating principle of the Werth Chromatic Focus Probe (CFP) provides scanning capability on highly reflective and transparent surfaces. Different sensor heads for different applications can be selected.



### Werth Interferometer Probe WIP

The WIP is a non-contacting fiber optic distance sensor for high-precision measurement of geometry, form and roughness. Features are measured using a very thin glass fiber probe with an interferometric analysis of the distance between probe and workpiece.



### Optical Measuring Heads – Werth IP 40 T and Werth IP 110 T

The rotating and tilting IP 40 T and IP 110 T sensors make flexible measurement with image processing possible at any angle. Large workpieces and difficult to access features can be measured. The Werth Fiber Probe can also be used with this versatile optical sensor.

## Tactile Sensors

### Tactile probing systems

Renishaw probing systems, such as TP200, SP25, SP600 and SP80, are fully integrated in Werth coordinate measuring machines. A wide selection of parking stations, as well as rotary and rotary/tilt heads, increase the flexibility and allow the machines to be configured to match the application.

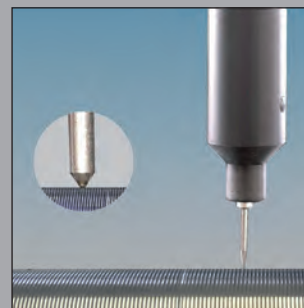


### Werth Fiber Probe WFP

The patented Werth Fiber Probe (WFP) with probe sphere radii down to 10 µm allows 2D and 3D measurements of extremely small geometries with previously unobtainable precision. Contact forces in the micro newton range allow even sensitive features to be measured without deformation and surface damage. The fiber probe is available in many variations to fit each application.

### Werth Contour Probe WCP

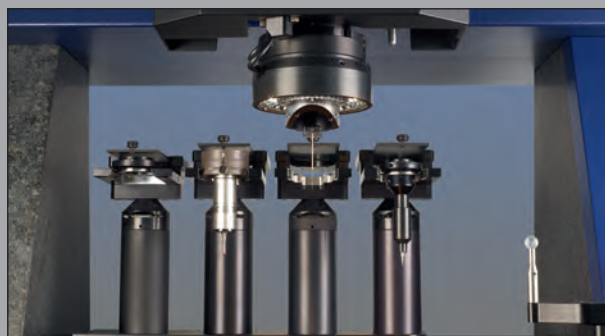
Applications that previously used a stylus or contour tracer can be done during the CMM operation using the patented Werth Contour Probe. This tactile probe allows surface finish or form to be measured in defined workpiece coordinates. Measurements in additional orientations are not necessary.



## Multisensor Probe

### Werth WMS Magnetic Interface

The universal Werth magnetic interface can be used to swap out various sensors fully automatically with a suitable parking station. This makes it possible to measure using the Werth Zoom, 3D-Patch, Werth Laser Probe, mechanical probe systems, WFP, angular optics, and the WCP in one measurement sequence, not only on one single machine, but even at the same sensor position without any loss of measurement range.

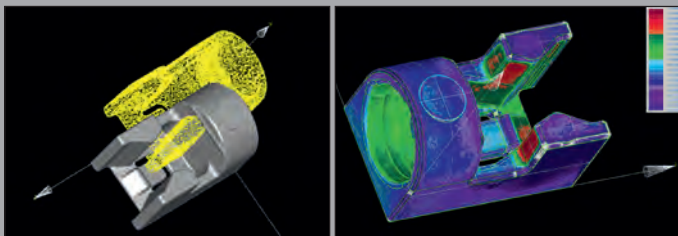


# WinWerth® Software

The WinWerth® 3D measurement software provides efficient and intuitive operation for both simple and complex 5 and 6-axis applications. It enables easy manual measurements and powerful programming in the TeachEdit mode or by using the CAD model.

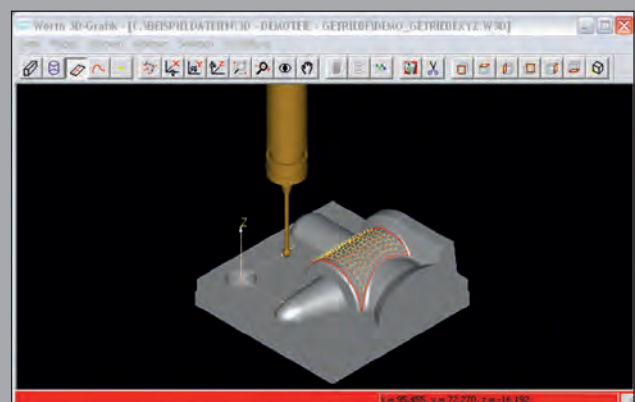
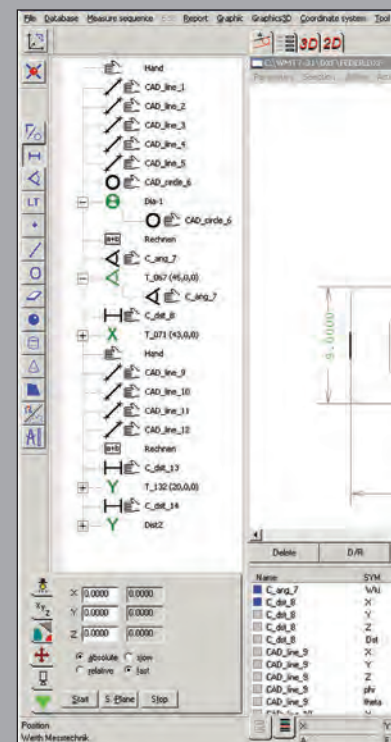
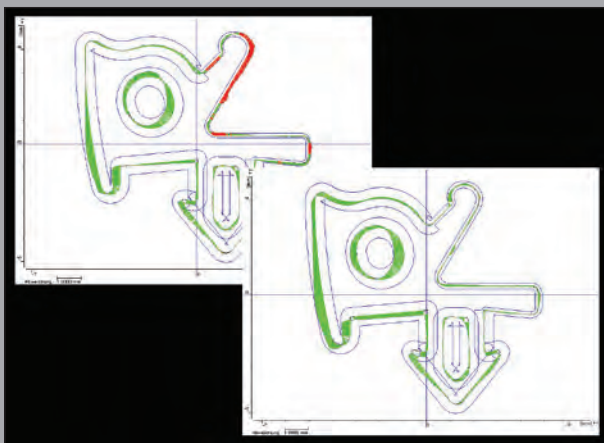
## TeachEdit Mode

The desired features are measured on the first workpiece by selecting the sensor and the geometric element (point, line, cylinder, plane, etc.) and positioning the sensor. The software stores these steps and creates the DMIS program in the background for series measurement. Convenient graphic interactive functions for testing and editing measurement programs make it easy to adapt to current requirements, such as for measuring selected features.



## BestFit and ToleranceFit®

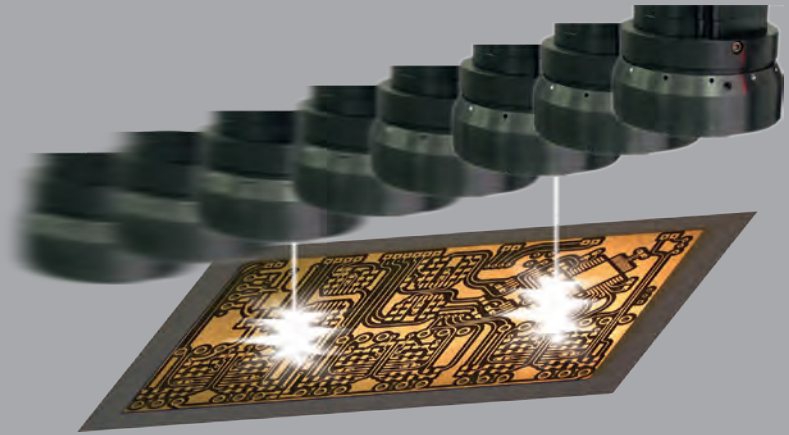
Profiles and point clouds captured with any sensors are compared to 2D and 3D CAD models. Additionally, a correct functional inspection of features with a tolerance band adjustment (patent) and limitations of degrees of freedom is possible. The software displays the regions on the part that are within or out of tolerance using color-coded deviation plots.



## CAD-Online® and CAD-Offline®

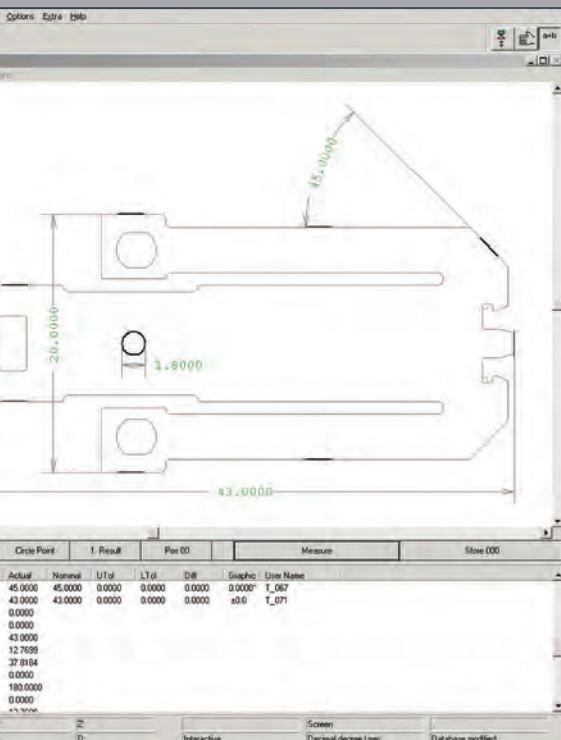
Measurement programs can be generated both online and offline using 2D or 3D CAD models. The CAD models are imported in either STEP, native CAD or IGES format. In offline mode a sensor is selected and a patch or combination of several patches is selected on the CAD model. The software computes the necessary actions for the sensor and automatically generates the corresponding segment of the program. The graphic shows the simulated measurement sequence. In online mode the procedure is similar to the offline mode, but the coordinate measuring machine immediately performs each operational step so it can be observed "live."





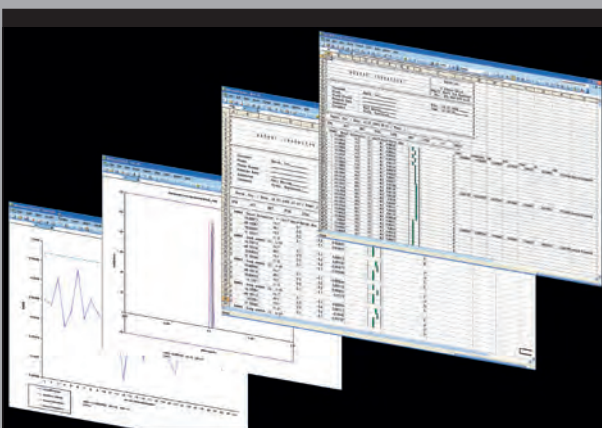
### Measuring with OnTheFly® (Patent)

For high-speed measurements for time-critical applications the features are measured while the measurement axes continue to move. This provides significant time savings, as the start-stop cycles that would otherwise be required are eliminated. With Rotary OnTheFly®, the image is captured while the rotary axis is in motion.



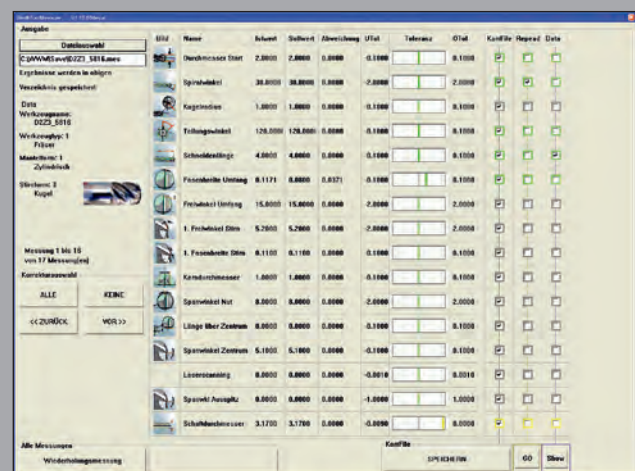
### Graphic Displays and Reports

WinWerth® displays all the measured elements along with their measured dimensions in the 2D or 3D graphics window. The report generator summarizes the various outputs in "Office style".



### Online statistics

All desired dimensions are collected during measurement, statistically analyzed in real time and evaluated using standard SPC functions.



Name	Actual	Setpoint	Deviation	UTol	LTol	Status
Übermessen Start	2.8000	2.8000	0.0000	-0.1000	0.1000	OK
Spindeltest	38.8000	38.8000	0.0000	-2.0000	2.0000	OK
Kugelmessung	1.8000	1.8000	0.0000	-0.1000	0.1000	OK
Tiefenmessung	126.0000	126.0000	0.0000	-0.1000	0.1000	OK
Schuldmessung	4.0000	4.0000	0.0000	-0.1000	0.1000	OK
Flankenmessung	8.1171	8.0000	0.0000	-0.1000	0.1000	OK
Flankenmessung	15.8000	15.8000	0.0000	-2.0000	2.0000	OK
1. Flankenmessung	5.7800	5.7800	0.0000	-2.0000	2.0000	OK
1. Flankenmessung	8.1100	8.1100	0.0000	-0.1000	0.1000	OK
Kantenmessung	1.8000	1.8000	0.0000	-0.1000	0.1000	OK
Spindeltest	8.0000	8.0000	0.0000	-2.0000	2.0000	OK
Länge über Zentrum	8.0000	8.0000	0.0000	-0.1000	0.1000	OK
Spindeltest	5.1000	5.1000	0.0000	-0.1000	0.1000	OK
Losmessen	8.0000	8.0000	0.0000	-0.0010	0.0010	OK
Spindeltest	8.0000	8.0000	0.0000	-1.0000	1.0000	OK
Schuldmessung	3.1700	3.1700	0.0000	-0.0000	0.0000	OK

### Werth Parameter Programs for Standard Applications

After entering the parameters for certain part types, the measurement sequence is generated automatically. To measure tools or fuel injectors, the type of part and the parameters such as overall length, number of flutes or spray holes, cutting and clearance angles, etc. are entered. Customer-specific user interfaces or complex parametric programs can also be created by Werth as turnkey solutions or by the end user himself in the powerful DMIS programming language.



Always a Step Ahead with Quality



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