The MultiSensor
The Newsletter of Werth Messtechnik GmbH
August 2007

Building Blocks of Success: Quality, Innovation, Flexibility

Technological Advance for Our Customers' Success

In times of globalization, competitiveness is a challenge, to which every company must rise. A significant contributor in this pursuit is the multisensor coordinate measuring machine – now with computer tomography. *By Dr. Ralf Christoph*

The stated goal of Werth Messtechnik GmbH is to always be a step ahead. Traditionally, our first priority has been innovative product development, together with high quality. Werth made this demand of its measuring machines back in the '50s. At that time, the Record® profile projector was created. Profile projectors of that type, with image distortion of less than 0.1 per thousand, are still nowhere to be found among other suppliers.

The basis for the cutting-edge role of Werth Messtechnik in the area of multisensor coordinate measuring technology was created in the early '90s with the introduction of image processing coordinate measuring machines for production control and for metrology laboratories. In these days the VideoCheck® machine series was born. With PC technology, Windows operating system and precise mechanics, these systems allowed our customers to automate vision inspection tasks for the first time. Prior to this, these tasks required manual and visual measurements. The improved cost effectiveness of the measurement process itself, and the reliable, objective results, enabled the overall processes to be optimized.

Werth VideoCheck® UA

The modern successors to these devices are used on the production floor and in measurement rooms, and define the peak of performance in the industry today. The increase in accuracy of measuring machines is still the focus of work at Werth today. Our new VideoCheck® UA measuring machine recently set a new standard. The one nanometer resolution scales, along with a permissible error of a few tenths of micrometers, are new milestones in the history of coordinate measuring technology. This technology can be practically applied only in combination with appropriate sensors. In addition to high-precision image processing, the Werth Fiber Probe, the world's smallest microprobe, is optimally suited for this task. The minimum sphere diameter currently available is only 20 µm, which allows measurement of the smallest features.

Dr. Ralf Christoph, President

In addition to technical information on Werth products, you can find general metrology related information, user reports and an overview of our After-Sales Service on the following pages. We hope everyone will find it exciting.

CONTENT

Werth is forging new paths with the integration of X-Ray Computer Tomograpy in coordinate measuring technology as well. At Control 2005 exhibition, Werth showed its technical competence by displaying the first coordinate measuring machines with integrated CT-Sensor.

Werth TomoScope®

The perfect integration of multiple sensors made it possible for the first time, for tomography measurement results to be directly calibrated on the measured object (Patent Pending). Precision values of a few micrometers, which were previously unobtainable with computer tomography, were achieved. This technology is also now available for large and dense parts with our new TomoScope® HV. First article inspections of complex parts, in particular, can have their measurement times drastically reduced from days to hours. Werth customers improve their competitiveness with faster product cycles in this way.

new

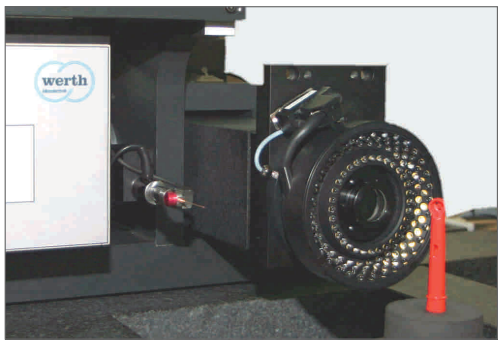
TomoCheck®: Measuring at µm Precision

First Article Inspection in Record Time

The demand for increased accuracy in tomography measurements lead us to develop a multisensor coordinate measuring machine with CT sensor on the basis of the VideoCheck® V HA, with air bearings.

This device, known already as the reference machine in the field of high-accuracy tool measurement, was the foundation to which a computer tomography sensor was added. It can also be equipped with image processing, fiber probes, lasers and tactile sensors.

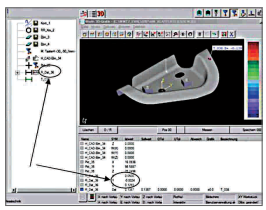
The measured point cloud can be "calibrated" by the other machine sensors to measure in a traceable



and highly accurate manner, using "Werth AutoCorrection" (Patent pending). The machine is specified for a maximum permissible error (MPE) of E3: 1.5 + L/300) (in accordance with ISO 10360). It is operated, as are all Werth machines, by WinWerth® software. Comparisons to CAD data are especially easy. Deviations are shown in color. Dimensions are measured using patch selection on the actual points in the WinWerth® 3D-CAD module (Click & Measure). Only a few seconds to a few minutes are required to program each dimension. Using TomoCheck®, it is possible to measure features in the sub-millimeter range and tolerances of a few micrometers. The first TomoCheck® machine was delivered to the Horst Scholz GmbH & Co. KG company in Germany, a leading manufacturer of extremely precise plastic components.

The return on investment (ROI) of the measuring machine was further enhanced with an automatic parts loader with component holders. The new type of system allows automatic loading and "unmanned" measurement of components overnight. Programming and evaluation are done at offline workstations, away from the machine.

First article inspection and revalidation are now possible in a few hours, even for workpieces with many dimensions and tight tolerances.



Parameters are shown as icons in the feature tree

Software-Update WinWerth 7.30

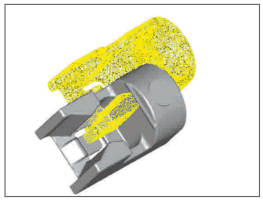
Optimized for CAD Online Measurement and Large Point Clouds.

The new WinWerth® version is ideal for the requirements of employees with little training, who measure only occasionally. Specialists who want to use all available options to solve complex measurement tasks will find many new, practical functions.

Emphasis was placed on the 3D-CAD module. This series includes measurement of free-form surfaces and regular geometries, using a point or line laser, Werth Fiber Probe, tactile sensors and the TomoScope®. With the motto of CLICK & MEASURE, evaluation of point clouds and regular geometries has been greatly simplified.

The results of an actual to nominal comparison are automatically displayed in color.

Available options: 3D-BestFit®, 3D-CAD-Online® and 3D-CAD-Offline®.



Automatic rough alignment of the point cloud to the CAD model

Top of the world

The TomoScope® HV by Werth

Werth presents the new multisensor coordinate measuring machine with computer tomography, the TomoScope® HV 500. The proven TomoScope® philosophy is available for the first time with a measurement area of 350 mm x 350 mm x 500 mm. The X-ray tubes, with a 225 kilovolt maximum acceleration voltage, allow large plastic parts with high fiberglass content, as well as metal and ceramic components, to be penetrated by X-rays.

Even the tiny spray holes in diesel fuel injector nozzles can be captured completely with this measurement technology.

The design of the new machine is similar to that of the TomoScope® 200. The base is a granite block over 3 meters long on which x ray tubes and sensors are mounted. This guarantees a construction that is stable over the long term. The maximum workpiece weight has been increased to 75 kg. Of course, the machine can be adapted to individual customer requirements.

A look at the sensors, not yet "hidden" behind thick lead plates, on the new Werth TomoScope® HV 500

The basic TomoScope® version, without any additional sensors to the CT, is like a precise CT coordinate measuring machine.

Optionally, the measurement area can be expanded to 500 mm length by using raster tomography. With the "multisensor" option, the additional sensors ensure the traceable measurement accuracy of the TomoScope® in the range of a few micrometers.

US-Market

Programmed for Growth

For market observers, it's not surprising: Werth Messtechnik is on course for success in the United States. With forward-looking innovations, and "Quality made in Germany", fiscal year 2006 was so successful that direct sales activities are expanding. A new sales employee will primarily handle the Midwest territory which includes the greater Detroit area, the traditional center of North American automobile production.

A view of the building of our US subsidiary, Werth Inc., in Old Saybrook, CT

France / French Switzerland

On the right path

The fiscal year is not over yet, but it could once again be the best year since the company was founded in 1995. The Werth France team now consists of seven employees. The Werth France service department was expanded. Sales in the French Alps region and French-speaking Switzerland was taken over by Jean-Pierre Triques. In a short time, Werth France has been able to become the preferred supplier for one of the largest producers of luxury watches.

Jean-Pierre Triques

German-speaking Switzerland

An Optimal Decision

The realignment in German-speaking Switzerland led to the best sales ever achieved in Switzerland. The enthusiasm of our Swiss partner, Optische Messtechnik Stein, and the experience of Werth sales engineer Peter Bartel, are positively accepted by our customers.

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The Library of Technology

Expanded New Edition

It is a tradition: this year, again, the public was presented with the technical reference for multisensor coordinate measuring technology during Control – just as in 2003. In order to show the fundamentals of computer tomography, the new edition (available in german and english) was expanded by 12 pages. Now with well over 100 pages, the book is the most extensive publication in the history of the "Library of Technology" from the Verlag Moderne Industrie publishing house in Germany.

Since it first appeared, the book has been a fundamental reference for all those who need to inspect geometries of manufactured parts. For the areas of production and measurement rooms, potential applications and limitations of multisensor coordinate measuring machines have been detailed.

Austria

Own Sales Structures Established

The best possible coverage for Werth customers also applies in Austria. For the past several months, Robert Winkler, supported by the Gruber company from Vienna, exclusively serves the Austrian market.

Robert Winkler
robert.winkler@werthmesstechnik.de
+43 (0)6765 - 877 666

Brazil and South America

New Sales Partner

In the past year, Werth sales activities in South America were also restructured. Nelson Rigon, who serves our customers in the region, has already booked the first few successful sales. For example, a machine was delivered to Hanna, a company from Brazil. The sale was supported by the company Panambra. Werth Messtechnik and its products are moving forward around the world.

Russia and India

New Commercial Agencies

There are now exclusive sales partners in Russia and India as well. Close cooperation between a Werth area manager on site and an enthusiastic sales partner provide optimal conditions for a successful future.

Premiere: GOST Certificate for the Werth FlatScope® in Russia.

Time is Money

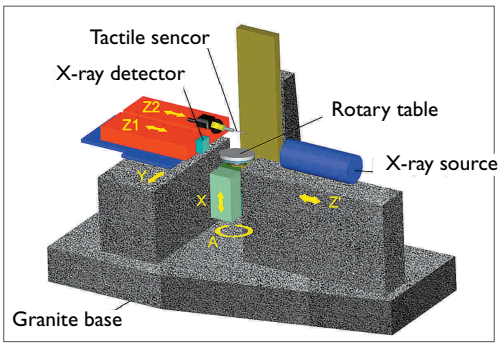
Traceability Secures Jobs

Production processes are constantly analyzed for cost purposes, or sometimes moved overseas. Long first article inspection times and time-consuming 100% inspections drive up costs. The Werth Company has addressed this point. *By Gerd Stach*

World First at Control 2005 – The Werth TomoScope®
Up to this time, industrial computer tomography was used only for inspection, that is, purely visual checking of parts. Insufficient mechanical precision and long-term stability, as well as inherent measurement deviations in tomography, prevented sufficiently accurate length calibration of the measurement results.

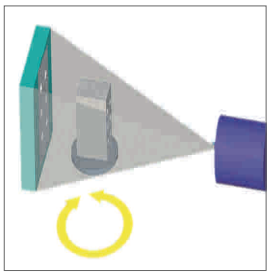
Based on Werth's more than 50 years of experience in coordinate measuring technology, a granite base was used in the TomoScope® to provide the required long-term stability. High-precision mechanical bearings (even air bearings on the TomoCheck®) ensure the precision needed to generate highly accurate point clouds.

Traceability and Multisensors
Even the most stable mechanical base cannot prevent one effect in tomography, known as creating artifacts. This is a physical phenomenon that generates structures in the measurement results that are not actually present on the real part. This effect depends heavily on the material and geometry of the workpiece, as well as the X-ray parameters, and cannot currently be completely compensated mathematically.



Mechanical construction of the Werth TomoScope®

The residual deviations from the correct dimension are in the range of 10 µm, sometimes as much as 20 µm. Werth has developed a method (Werth Auto-Correction) and applied for a patent. It captures and corrects for these deviations directly on the workpiece itself. Using a second sensor (probe, laser, image processing), the areas of interest are captured again mechanically, and correction values are derived. This only needs to be done on the first part, since the artifacts do not change for all further parts of the same type if the same technology parameters are used.



The measured object is rotated 360° for complete X-ray capture

Background:

How Tomography Works

*X-ray source emits a cone-shaped bundle of rays which penetrates the measured object and generates a 2-D grey image on a detector. These multiple 2D grey images are converted into a 3D volume by a reconstruction software. The point clouds are then derived from these voxels (**Vo**lume Pi**xels**), which are used for the measurement. The entire shape of the measured object is captured: inside and outside, including enclosed voids and cracks.*

The Advantage of the

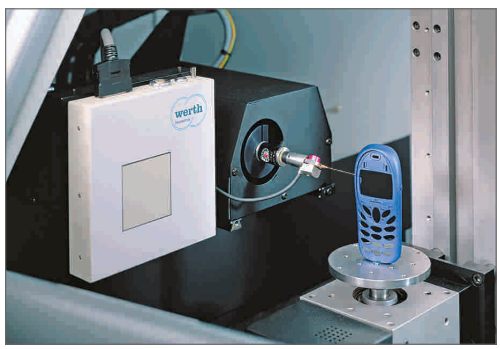
Double Z-Axis

For collision-free multisensor operation of the TomoScope®, as in other Werth machines, an additional Z-axis is used. This second Z-axis is used for collecting the correction matrix, while the X-ray detector is in its safe position.

The use of AutoCorrection allows, for the first time, a maximum permissible error (MPE) to be specified in accordance with ISO 10360 for coordinate measuring machines with CT sensors. For a machine in the TomoScope® series, for example, an E3 of (4.5 + L/75) µm has been achieved. With the use of precision mechanics in the TomoCheck®, this value can be further reduced to (1.5 + L/300) µm.

Measuring within Millionths: The 3D-CAD Module
WinWerth® software, proven over the years, has been optimized in the area of 3D free-form surface comparison and measurement of dimensions in 3D point clouds.

The point clouds generated with the TomoScope® are loaded into the 3D module and matched up with the CAD model using 3D BestFit®. The deviations of the measured points from the CAD model can be displayed in color. In order to measure dimensions from the point clouds, the appropriate areas are selected using Patch Selection and then calculated



Precise and Fast with Tomography – Thanks to Werth Multisensors

as regular geometries. These then appear in the feature tree in the WinWerth® Software and can then be linked to calculate dimensions and tolerances. Special attention was paid here to the ability to perform both programming and evaluation offline. This means that the point clouds that are measured and corrected by the TomoScope® can be evaluated at another workstation, or that the programs can be created in advance, meaning that the results are available immediately once the tomography is completed.

New Guidelines for

Multisensor Coordinate Measuring Machines

The VDI/VDE Guideline 2617, Part 6.1, for lateral sensors (image processing), and Part 6.2 for distance sensors (such as lasers), which are important to the use of optical sensors in coordinate measuring machines, were fundamentally revised with the active support of Werth, and adapted to the current ISO 10360 standards. In the VDI/VDE Guideline 2617, Part 6.3, for the first time, a guideline has been developed that allows specification of coordinate measuring machines using multiple sensors. The parts indicated are available from Beuth-Verlag Berlin, Germany.

Awards for TomoScope®

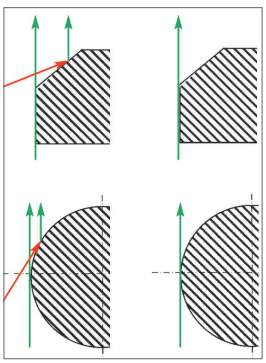
Gold in Brno (Czech Republic), Innovation Award in Germany and Euromold-Exhibition-Award in Gold

Innovation that anyone can see: first article inspection can be done in the shortest time, thanks to computed tomography. The TomoScope® provides an advantage over the competition that cannot be overcome even by moving production to low-wage countries. While others "just X-ray", the Werth TomoScope® truly measures.

The machine concept and the patent-pending method of Werth AutoCorrection have convinced users and judges.

2006 Gold in Brno for Technical Innovation

2005 Gold Euromold-Exhibition-Award



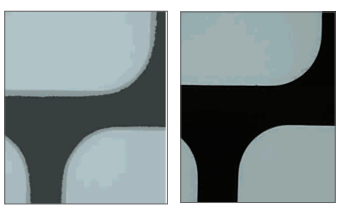
How it Works...

FlatLight

The Werth FlatLight is a special optical component that filters out all non-parallel beams in backlight. This ensures, for example, that cylindrical parts can be measured correctly. Without the FlatLight, "false light" would reach the camera chip, which then leads to systematic errors and diffuse images. For example diameters of cylindrical parts and material widths on chamfered prismatic parts will be measured as too small if no flathlight is installed (see figures).

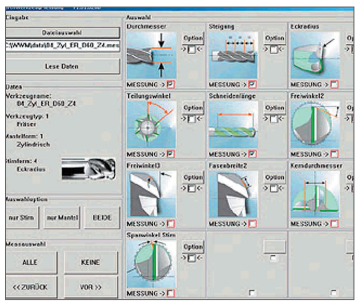
A positive side effect of the FlatLight is that the contours to be measured are sharper, even on "thick" objects and rounded edges.

The typical magnification errors from non telecentric optical systems are also eliminated. The Werth FlatLight can be used in all Werth multisensor coordinate measuring machines.



Tool Measurement

New Software Modules

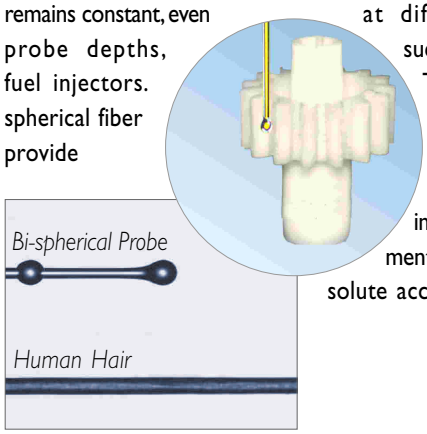


Using the parametic program for tool measurements, standard tools like step drills, milling cutters and grinding wheels can be measured quickly and easily. By accessing the tool database (e.g., Numroto), the measuring program is generated automatically and all selected parameters are measured using proven strategies.

WFP Werth Fiber Probe

Bi-spherical Probe

The new bi-spherical fiber inserts consist of a glass fiber shaft with two spheres spaced about 2 mm apart. The lower sphere contacts surfaces to be measured while the upper sphere is out in the open. Thanks to the bi-spherical variant, the lighting level remains constant, even at different probe depths, such as in fuel injectors. The bi-spherical fiber inserts provide considerable improvement in absolute accuracy.



UltraAccuracy UA Machines

Highly Accurate Measurement in Research and Industry

The Werth VideoCheck® UA sets a new standard. Achievable measured length deviations (MPE) below 0.15 µm have now convinced not only several universities, but also customers in industry, that it is a worthwhile investment. The users value this quantum leap in measurement accuracy.

DaimlerChrysler: Production-Integrated Measurement Stations

The Zero-Defect Target per Operation is Achievable

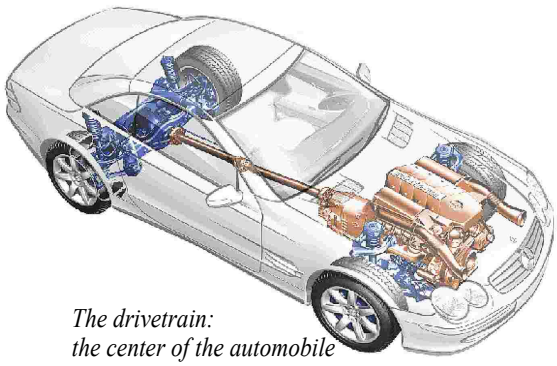
In the DaimlerChrysler AG plant in Untertürkheim (Germany), more than 3000 vehicle gear sets are produced each day. A significant improvement in quality assurance has been achieved in bevel gear manufacturing through the use of Werth CMM's. *By Friedrich Beutel and Detlef Ferger*

This gear set consists of a crown gear and a drive bevel gear. The manufacturing of these two components is now completely monitored using multisensor measurement technology at all stages of machining.

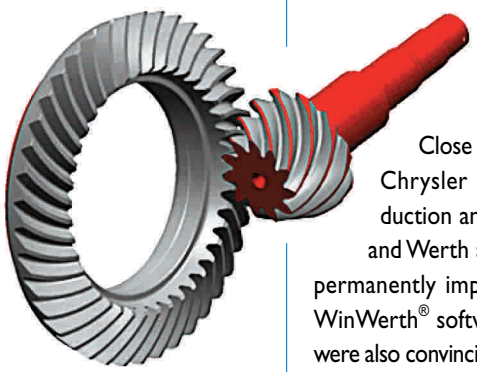
The manufacturing of drive bevel gears and crown gears takes place in relatively long process chains. After the raw components are delivered, the manufacturing process starts with turning and tooth-forming. The workpiece is then hardened. Next comes the turning of the hardened material and the grinding of the tooth faces of the bevel gear teeth.

Quality monitoring was introduced many years ago as a simple stand-alone gage solution and never further developed until recently. Traceable measurement results were not possible. Only purely static measurements, with sometimes subjective measurement results, were all that was available. The entire inspection chain was thus no longer suitable for the requirements for a controllable and verifiable production process.

A detailed analysis of the manufacturing processes revealed that a new quality management system, with contemporary measurement technology was needed in order to be competitive in the future. Clearly delimited process chains were defined. Since data exchange has been converted to CAD, all required dimensions are now simply derived in this production step from the previous process steps. They also serve in parallel as identical nominal dimensions for NC programming. The measurement concepts were then developed. From the aspect of "feasibility in the daily work environment", it soon became clear that the best solution, from a measurement technology and cost effectiveness standpoint, could be achieved with measuring machines from Werth Messtechnik.



The drivetrain: the center of the automobile



The heart of the rear differential is the wheel set.

Background:

Manufacturing takes on responsibility for quality

With measurement stations integrated in production, each production step in the Mettingen plant today has responsibility for production monitoring. This has created a new quality awareness. All measuring machines are calibrated regularly. All workpiece characteristics are fed into the QS-STAT software. Evaluation management allows each user to call up all important information across the board.

Vehicle models with rear differentials from Untertürkheim

E-Class

S-Class

Chrysler 300C

Depending on the specific task, the appropriate measuring machines were selected, with tactile, image processing, or laser sensors.

Close cooperation between the DaimlerChrysler Manufacturing Engineering, Production and Quality Assurance departments and Werth allowed the quality standard to be permanently improved. The simple operation of WinWerth® software and the non-contact sensors were also convincing. The bonus is: rapid measurement with high measurement point density, without collision problems and a cost effective machine solution that is adapted to the individual production tolerances.

A measurement station was integrated in the production line in each processing area with a multisensor coordinate measuring machine configured for the measurement tasks.

The responsible employees are now able, with measurement tools that are optimally configured for the measurement task, to monitor and take actions to maintain the required quality.

The new quality management system that was introduced at the DaimlerChrysler Untertürkheim plant has created transparent processes. Using new, innovative measurement technology with user-friendly WinWerth® measurement software, the "zero-defect target" is in tangible reach. The significant increase in the quality awareness of entire departments is now a firmly planned part of each production step.

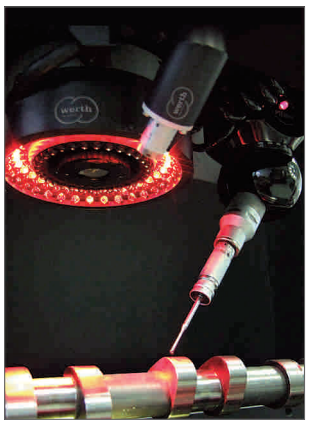
Thanks to the new DaimlerChrysler manufacturing philosophy and the flexible measurement technology from Werth that is adapted to it, the global player is well positioned for future challenges.

Coordinate Measuring Technology Must be Flexible

Optics and Probe in One

Flexible coordinate measurement technology is the call of the hour. Ideally, various sensors complement one another – depending on the measurement task. They are divided into non-contact (optical) and contact (tactile) sencors. *By Bernd Weidemeyer*

The properties of the measured object must be considered when selecting sensors. These include sensitivity to touch, feature size, accessibility of the features to be measured, the number of measured points required and the tolerances of the features.



Due to the complexity of many measuring tasks the use of several sensors on the same sample is required offen.

The camera electronics in the **Image Processing Sensors** convert optical signals that enter through the lens into a digital image. The measurement uncertainty for telecentric lenses with a fixed magnification of 5 to 20 times is the lowest possible, and therefore ideal for tolerances of a few micrometers. A zoom lens with magnifications from 0.5 to 5 times, and working distances from 15 to 200 mm, is optimal for flexible measurement tasks. One advantage of the very large working distance is the ability to measure inside the bottoms of deep blind holes. An additional advantage of the flexible working distance arises from use in combination with the Werth MultiRing®, in which LEDs are arranged in individually switched rows around the optics. Depending on the working distance, the appropriate LED rows are used with the most suitable illumination angle. The scene is thus always shown with maximum contrast. This lighting is supplemented by brightfield lighting. Here, the light impacts the measured object, through the lens. The HiCam was developed especially for measuring dark objects. The captured image is amplified, so that optimal contrast is visible and measurable. The **Werth Foucault-Laser** (WLP) integrated into the beampath (TTL) allows measurements of surface profiles.

The fundamental principle of all **Tactile Sensors** is based on mechanical contact of the sensor with the measured object, in oposition to the image processing sensor, which measures edges and surfaces without contact. Using several probes, or a tilting / rotating head, features can be measured that cannot be "seen" by an image processing sensor, such as undercuts. Using a contact measurement system, three-dimensional contours and surfaces can be scanned. This also applies to cross sections and to predefined paths, with as many measurement points as desired.

Prerequisites for Successful Measurement

The Right Light

Optical measurement with image processing works only if the lighting conditions are optimal. The interaction of the lighting, measured object, and measurement beam path must be considered. Three light sources are available:

Transmitted light:
Ideal for flat objects measurements and profile measurements.

Brightfield incident light:
Projected onto the measured object parallel to the axis of the optical beam path (ideally: directly through the lens). Flat surfaces reflect the light and appear bright; angled surfaces reflect the light past the objective and appear dark.

Sensors measure the surface and contour separately.

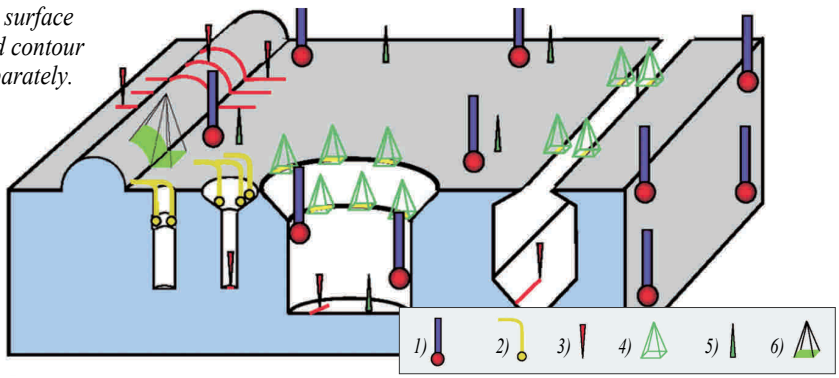
Darkfield Incident Light:
This is applied to the measured object at an angle to the lighting path (Werth MultiRing with widely variable angle). All three light sources are separately adjustable in modern coordinate measuring machines.

The **Werth Fiber Probe** (WFP) is a special contact measurement system in which the probe shaft is used simply to position the contact sphere. The actual measurement of the position of the sphere is done by an image processing sensor built into the system.

Since the deflection of the sensor is not included in the measurement result, extremely thin shafts and the smallest contact spheres can be used. The fiber is used simultaneously to conduct light into the contact sphere. Measurements can thus be made in self-illuminated mode. Transmitted light can also be used.

Due to the small geometry, only very small contact forces are generated by the fiber probe (up to a few µN). Features with very small dimensions and very touch-sensitive surfaces can thus be measured.

Due to its operating principle, the fiber probe is currently the most accurate sensor for coordinate measuring machines, next to the image processing sensor. Together with the Werth Zoom, probe lengths



Various sensors: 1) Probe 2) Fiber Probe 3) Laser 4) Image Processing 5) Autofocus 6) 3D-Patch

of up to 200 mm are possible, in order to measure in deep holes, for example.

In summary, it can be said that you can find a suitable sensor at Werth for every feature to be measured. If you need help in your selection, or just technical advice, we would be pleased to assist.

The Werth Strategy

Service is our Strength

Executive Vice President Detlef Ferger

It has been quite a while since the latest edition of our Werth newsletter. Our service department has been completely reorganized and restructured to serve our installed base of over 10,000 measuring machines in all the regions worldwide. Werth provides comprehensive service in which every employee feels responsible for our customers. Our highest goal is rapid help in case of emergency. We are convinced that cooperative partnerships with our customers are necessary in order to remain the world leader.
Take our word for it!

Our Worldwide Service and Sales Network

- Subsidiaries in France and the USA, with regional service and sales employees.
- Direct sales in Switzerland, Italy, Austria, England and Brazil, supported by local partners.
- More than 40 additional service and sales partners in Europe, Asia, South Africa, North and South America.
- Service headquarter, hotline, factory and technical support center in Giessen, Germany (near Frankfurt).
- Training and demonstration center at our main location in Germany with excellent travel connections for our international customers.

Service Contracts

Service contract customers are VIP customers and receive preferential treatment in the event of downtime. A service contract ensures the maximum in affordable service and security. Annual maintenance minimizes downtime and guarantees traceability of measurement results. In addition, our contract customers benefit from service rate discounts.

COMMENTARY

The Multisensor Speaks...

It's great that I've been able to lend my name to the "Werth Multisensor" newsletter, but there is a deeper purpose here, too, since as a sensor, one stretches out their feelers, observing market activity, standardization, and everything else going on in the wide field of coordinate measuring technology.

As a multisensor, no less! Don't miss a thing! The Werth Company has long since proven that. Here I've been able to really run rampant. I've almost never had to surrender to any task. One of my feelers has always been a match.

Others have seen this, too, of course, and take my name with pride. Anyone can do that.

But the people at Werth have always been the fastest, and published the first book about me.

Here again, in the new, expanded edition (available in English and German), computer tomography is described in detail. Even error influences are discussed! Which by no means everyone does.

Honesty and seriousness, after all, last the longest. Hoping everyone take this to heart.

The Multisensor

Applications Technology / Hotline

Our applications technicians develop optimal solutions for you prior to the sale. Of course, we are also available later as well, with a hotline for difficult measurement problems. We guarantee the shortest reaction times for any questions about our machines. We strive to meet your expectations for competence and professional support.

Installation / Machine Relocation

We take great care of the installation, start up and relocations at your site. You receive documentation of the calibration, and thus complete information on the status of your measuring machines.

Training

We provide initial and advanced training. Investment in knowledge and ability is the best way to optimize the use of your measuring machine.

Service and Repair

Rapid reaction in the event of downtime is our top concern. We react quickly to prevent unexpected loss of production with timely service.

Retrofitting and Upgrades

Ensure and increase the productivity and value of your measuring machine, whether with retrofits or modern controls, new sensors, or an update to the latest version of WinWerth®.

For more information on our worldwide service program contact your local dealer or our export service in Germany

Phone: +49 - 641 - 79 38 772 or email: service@werthmesstechnik.de

Imprint

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