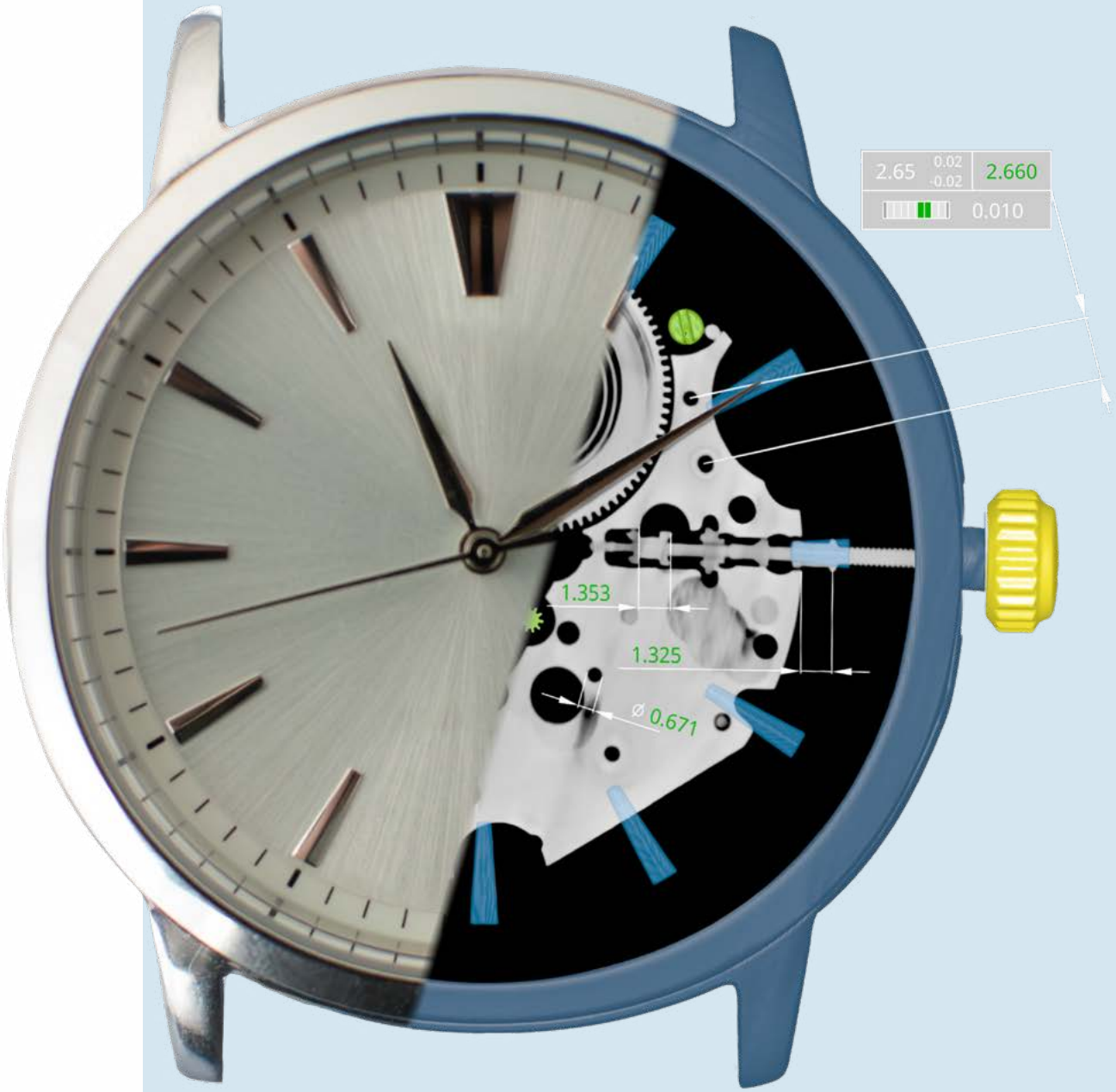
Multisensor

Innovative Metrology for your Quality Products



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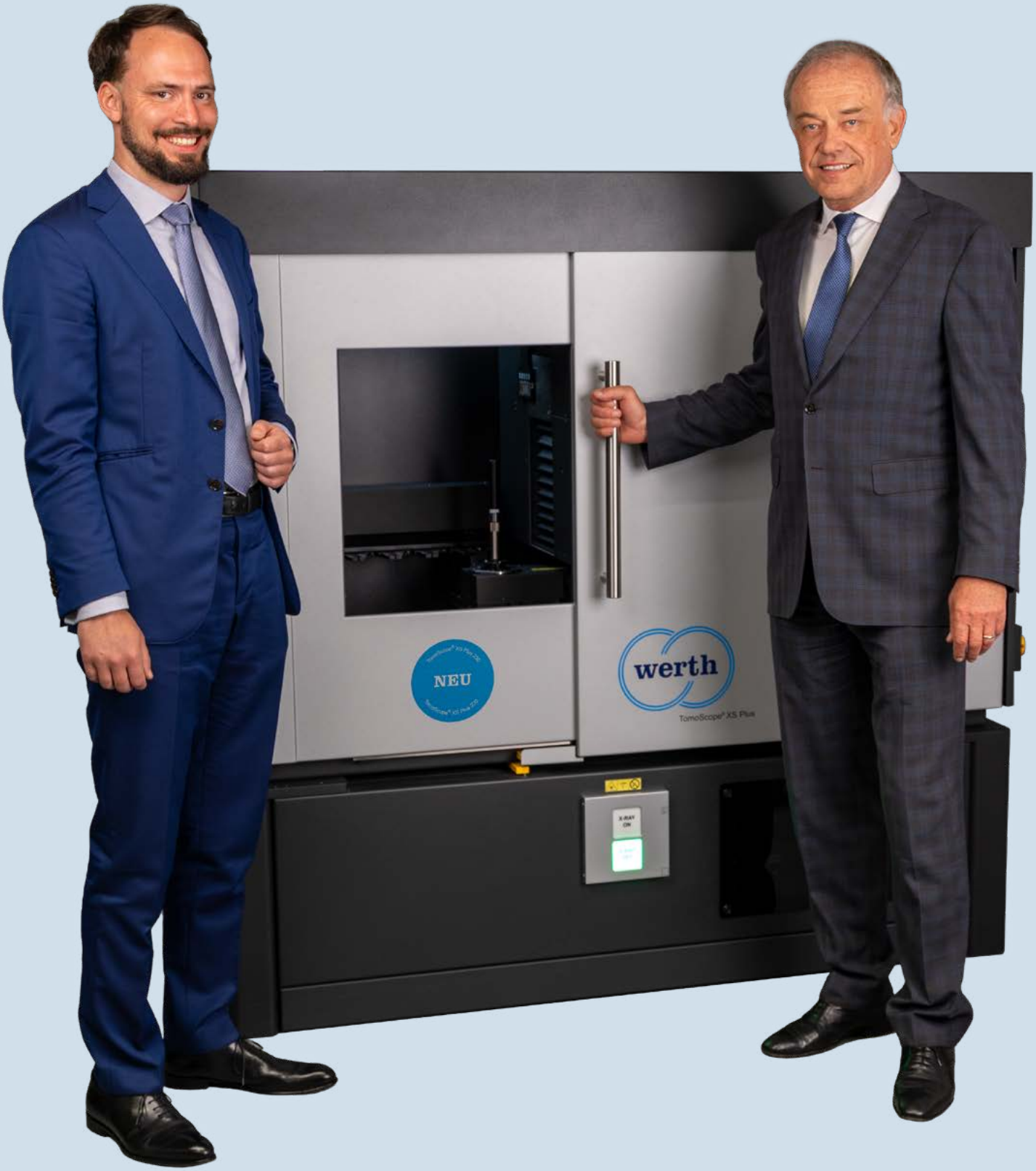
Issue 2025

Cover image: Tomography scan of a watch mechanism with a structural resolution of a few micrometers



TomoScope® XS Plus 230 – innovative X-ray technology in a compact design

20 years of computed tomography in coordinate metrology

As a pioneer in the integration of X-ray computed tomography (CT) into coordinate metrology, we introduced the TomoScope® in 2005, the first CT machine developed for this application. Today, we offer four machine series. On the occasion of the 20th anniversary, we are introducing the TomoScope® XS Plus 230, the fifth model in the successful XS machine series. 230 kV acceleration voltage enable even more demanding measurement tasks to be solved. The innovative Werth technology allows measurements to be performed five times faster than conventional CT with the same resolution and, in most cases, at a measuring speed many times higher than conventional metrology with tactile or optical sensors.

Dimensional metrology plays an important role in industry, not only for the reliable functioning of products and the elimination of scrap, but also for efficient manufacturing processes. The demand for turnkey measurement solutions integrated into the manufacturing process is growing. A continuing trend in coordinate metrology is therefore the increase in measuring speed for measurements close to production with high point density. Examples include computed tomography with the complete measurement of 100 plastic gears in three minutes or the use of high-precision optical metrology in the semiconductor industry. With the patented Werth Raster Scanning HD, one million micro-holes can be measured in high-resolution 20,000-megapixel images in just a few minutes.

The new EasyScope® series offers Werth multi-sensor technology with an optimal price-performance ratio. The entry-level class combines optical and tactile sensors in a compact design and, like all 3D CNC coordinate measuring machines from Werth, features complete correction of the machine geometry. Unlike many competing systems, this enables a complete, practical 3D specification of the maximum permissible length measurement and probing errors of the machines for all sensors. The new version 10.47/11.47 of our WinWerth® software offers numerous innovations for computed tomography and multi-sensor systems under Windows 10 and 11.

Fully automated measuring cells enable the monitoring and control of the manufacturing process. Werth offers sophisticated solutions for this purpose using both multi-sensor systems and computed tomography. When implementing such projects, a Werth team of highly competent engineers accompanies the user from the planning stage to the turnkey handover of the complete system.

On the occasion of their 25th and 15th anniversaries, we would like to thank our partners in Taiwan, Korea, and Thailand and the teams at our subsidiaries in China and Hungary for the extremely pleasant and successful cooperation.

This year, we are once again looking forward to many interesting discussions with users of our technology at Control and other tradeshows, and we also kindly invite you to attend our Werth Technology Days in your home region.

Dr. Ralf Christoph

Dr. Raoul Christoph

Multisensor 2025

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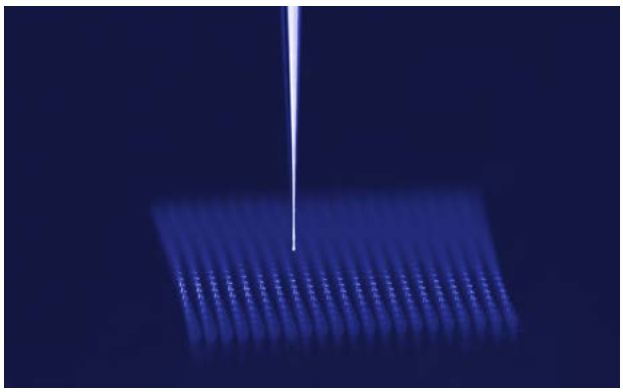
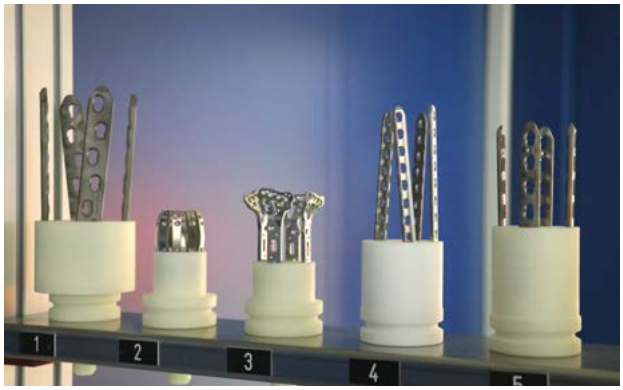




News about WinWerth®

News about X-ray Computed Tomography

News about the Werth Group

Multi-sensor coordinate metrology at an entry-level price

The EasyScope® machine series is now available in three versions offering optimum value for money.

Traceable measurement

Like almost all 3D CNC coordinate measuring machines from Werth, these receive a complete correction of the 3D geometry. On this basis, a bidirectional 3D specification of the length measurement and probing errors for all sensors is carried out in accordance with practical requirements.

Process-stable image processing

Werth contour image processing is based on almost 40 years of experience and features many sophisticated functions. Automatic image processing ensures high process stability even for difficult measuring tasks and operator-independent measurement results. All EasyScope® machines are equipped with low-distortion telecentric zoom optics, so that the specification applies throughout the entire field of view.

Machine configurations for every application

EasyScope® IP Manual

- Manual operation with automatic image processing
- EasyScope® SolidState Zoom
- Measuring range 200 mm × 100 mm × 200 mm
- Measurement sequence creation without programming thanks to user guidance with MeasureGuide
- Traceable, documented and reproducible results even for individual measurement tasks

EasyScope® IP Automatic

- 3D CNC coordinate measuring machine with automatic image processing
- EasyScope® SolidState Zoom Plus
- Measuring range 200 mm × 200 mm × 200 mm
- Automatic batch measurement
- Measurement sequence creation with a graphic user interface or CAD-supported
- Automatic measurement with image processing at the highest level

EasyScope® MultiSensor

- Genuine multi-sensor systems with image processing, laser distance sensor and scanning probe
- EasyScope® MultiSensor Zoom with integrated Werth Laser Probe
- Measuring range 400 mm × 200 mm × 200 mm
- Full measuring range for combined optical measurements using MultiSensor
- Measurement with all sensors in one software package
- Automatic batch measurement
- Measurement sequence creation with a graphic user interface or CAD-supported
- Sophisticated multi-sensor coordinate metrology

EasyScope® MultiSensor

Werth user report

Efficiency meets quality

Fully automatic cutting insert production at Schwanog

Schwanog relies on state-of-the-art automation combining cost-effectiveness and top quality in the production of cutting inserts. Thanks to the close interlinking of automation and grinding technology from Adelbert Haas GmbH with robust and accurate measuring machines from Werth Messtechnik GmbH in an automated production cell, the company has succeeded in making its production processes more economical and more reliable – around the clock.

Schwanog was founded in 1946, with headquarters in Villingen-Schwenningen. Today, with knowhow in design of profile tools and tool changing systems, the company is one of the leading international manufacturers in this market segment. Application-specific tools are also produced in small batch sizes at several production sites around the world.

Grinding process of a profile plate

Fully automated process – from order to shipment

In industrial tool manufacturing, it is not only precision that counts, but also the reliable quality of each individual workpiece. At the same time, many companies are faced with the challenge of making their production efficient and economical despite a shortage of skilled workers – classic shift models are increasingly reaching their limits. Schwanog has met these challenges with fully automated production cells. Within a cell, the entire production and testing process runs from order to shipment without any human intervention – a “factory within a factory.”

View of the measuring cell with ScopeCheck® S and robot

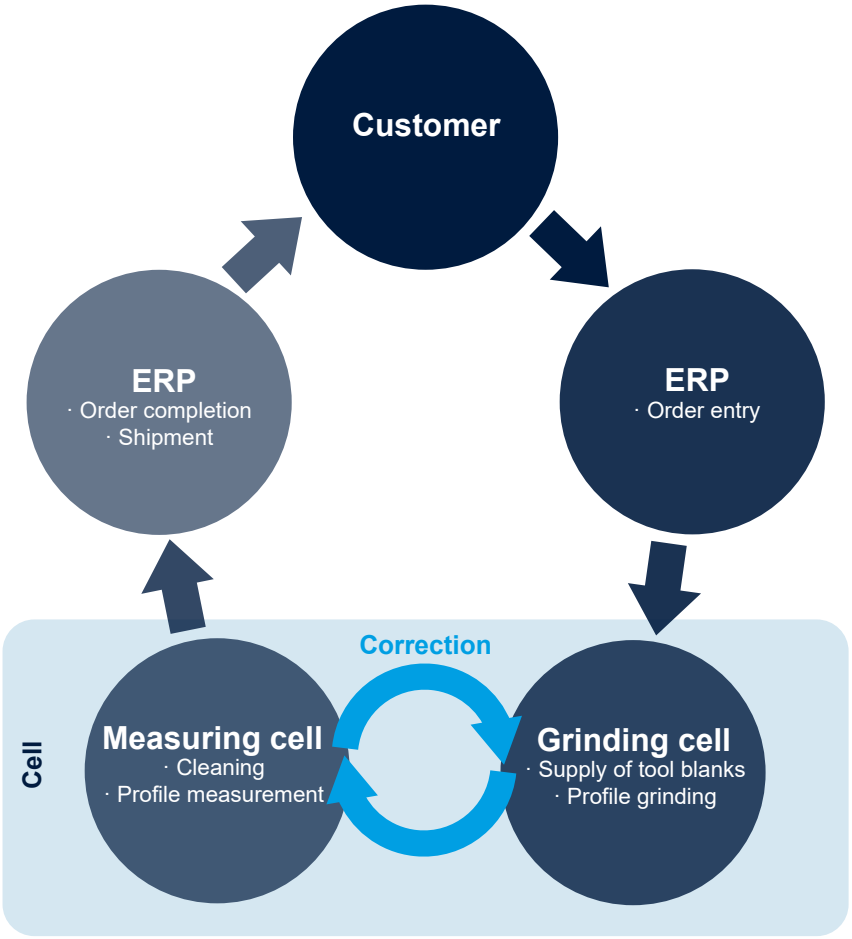
In the production cell, a robot feeds the grinding machine with tool blanks, in effect like a warehouse with a large number of parts, thus allowing a wide variety of products to be manufactured without changeover. After grinding, the first insert is cleaned and measured. If the profile is within the required toleran-

ces, series production begins. If not, the grinding process is corrected fully automatically – usually a single iteration is sufficient to grind a perfect profile. This closed-loop process ensures maximum accuracy and cost-effectiveness even for batch sizes of one. The tested inserts are then automatically packaged and shipped. At the same time, the system documents all relevant data, including a measurement report for each insert for the customer. “Thanks to the closed-loop process, we ensure consistently high manufacturing quality – completely autonomously,” says Clemens Güntert, Managing Director of Schwanog Siegfried Güntert GmbH. “Fully automated production enables us to make optimum use of our resources and significantly increase productivity.”

Even during series production, the measurement of each insert on the Werth ScopeCheck® S ensures consistent quality control. Each part is tested without interrupting the production flow. In addition to short cycle times of just a few seconds, the particular challenge lies in the required measurement accuracy. According to the golden rule of metrology, the measurement uncertainty must be 10 times lower than the tolerance in order to be able to use the tolerance band for production and avoid unnecessary scrap. For the profile shape, the measurement errors must therefore not exceed a few micrometers, combined with submicron reproducibility. This is possible thanks to Werth contour image processing in combination with the patented Rasterscanning HD method; the entire cutting edge is captured precisely and in high resolution in just a few seconds and the profile stability is evaluated. The rigid hard stone base of the ScopeCheck® S and workpiece temperature compensation assure the necessary technical conditions.

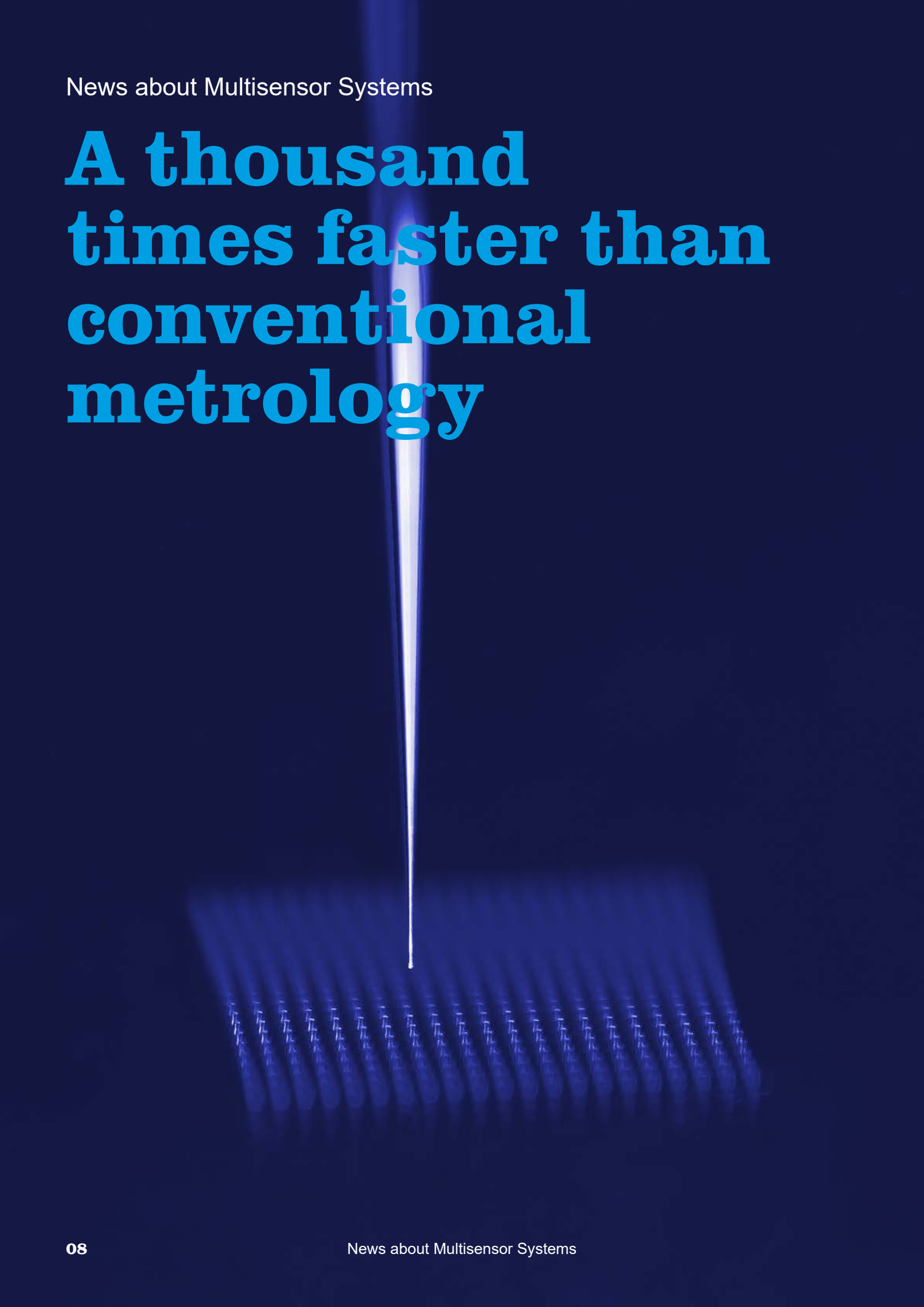
Interconnection as a factor for success

Close cooperation between Schwanog, Haas, and Werth ensures smooth processes and high productivity. Thanks to a fully automated process, workpieces can be produced around the clock without interruption. This not only reduces throughput times, but also lowers costs, especially for small quantities. At the same time, seamless quality control guarantees consistently high precision. This enables Schwanog to respond quickly and reliably to customer requests – a decisive benefit in a demanding market.



Process diagram – from order entry to final inspection with “closed loop”

A thousand times faster than conventional metrology



Glass plates with thousands of small bores (through glass vias – TGV) measuring just a few micrometers for advanced chip packaging place particularly high demands on metrology. In addition to diameters ranging from 10 µm to 80 µm, the position, form, and other properties of the bores must also be determined with a reproducibility of 0.1 µm. The required measurement of several hundred thousand bores per plate would take many hours with conventional technology. For economic reasons, however, only a few minutes are acceptable. In addition, it is often necessary to measure the form of the bores and the flatness of the glass plates.

Measurement of thousands of geometrical characteristics per second

Flexibility and process reliability are ensured by Werth contour image processing, which has been continuously developed for almost 40 years. The Raster Scanning HD image processing method developed and patented on this basis enables even large areas to be captured quickly with very high resolution in a short time. Currently limited by the hardware available at reasonable cost, overall images with a resolution of up to 20,000 megapixels can be measured and evaluated. By way of comparison, 2,400 4K monitors would be required to display such an image in full resolution. Special image processing algorithms evaluate more than a thousand geometrical characteristics (e.g., position, form, diameter of bores) per second.

High accuracy and ease of use

Maximum accuracy is achieved by using the world's most accurate multisensor coordinate measuring machines from the Werth VideoCheck® HA and UA series with specifications for MPE up to E_{uni} = (0.15 + L/2000) µm. The machines can be optionally adapted to the international safety standards of the SEMI industry association and are certified for this purpose by TÜV (Technical Inspection Agency in Germany).

WinWerth® allows fast parallel evaluation of randomly distributed geometric features and simple measurement sequence creation. For documentation and process monitoring, a clear display of the nominal/actual deviations of the geometrical characteristics in color-coded form (heat map) is possible for almost any number of features simultaneously. The raster images can be saved for subsequent evaluation. On request, a team of highly trained engineers supports the user in automation or integration into an automation solution.

By additionally using the patented Werth Fiber Probe® in the same machine, the 3D shape of the bores can also be captured by measurement. The measuring speed is of course considerably lower in this case. The Werth Chromatic Focus Probe enables fast measurement of the flatness and thickness of glass plates.

TGV measurement with multi-sensor coordinate metrology

- Patented Raster Scanning HD for measuring one million bores in just a few minutes
- Werth Fiber Probe® 3D (patented), the world's most successful micro-probe for high-precision 3D measurement of bore shapes
- Optical distance sensor Chromatic Focus Probe for fast and highly accurate measurement of flatness and glass thickness

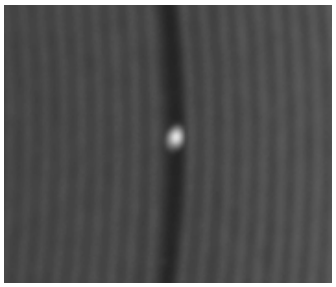
TGV measurement video

Werth multi-sensor systems with a wide range of sensors

Many small features make your everyday work easier

TomoScope®

Last year, the image acquisition speed of TomoScope® machines was increased to a few milliseconds per image, resulting in a total acquisition time of just a few seconds per volume. With atline and inline solutions, robot loading also takes only a few seconds, including switching the X-ray source on and off as well as opening and closing the doors.

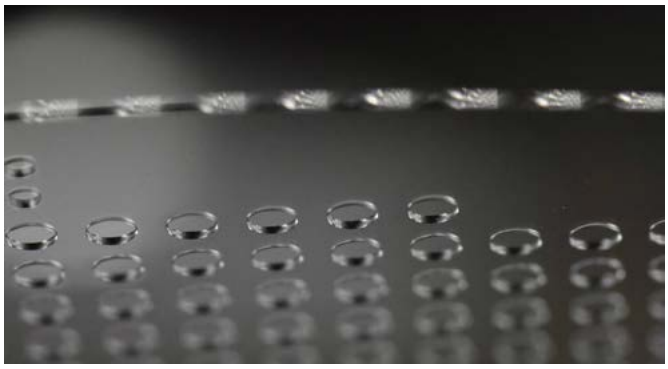


Thanks to almost 40 years of experience in coordinate metrology and image processing, the projection images are corrected and filtered in a matter of seconds to compensate for the effects of the detector, machine geometry and artifacts. The thick layer function in volume sectioning has been enhanced for automatic detection of small and low-contrast defects, such as particles in battery cells. New image filters are available and can be combined with each other so that defects are also visible in the original image.

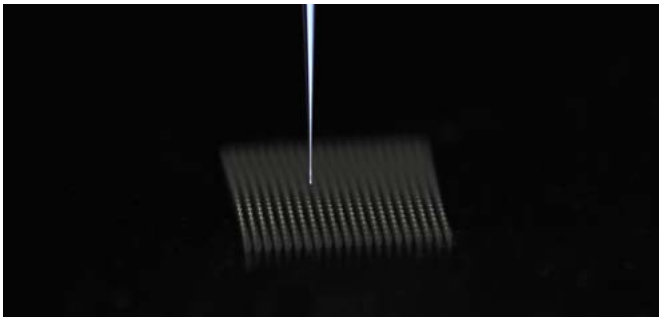
Another feature allows to cut out only the relevant gray values in CT volumes. This often reduces the file size by a factor of 10. Integrated into workpiece separation, the technique enables volume-based evaluations in a loop. This means that when measuring several work-pieces together, porosity analyses, for example, can be performed automatically one after the other on the same or different workpieces.

EasyScope®, ScopeCheck® und VideoCheck®

In addition to Werth image processing, also with integrated Werth Laser Probe for 3D measurements, and conventional probes, the patented Werth Fiber Probe® micro-probe and flexible chromatic point, line and multi-sensors (patent) are the most popular sensors in our product range. Various new features are available for this in WinWerth® 11.47.



The new high-speed image processing enables the measurement of several hundred thousand geometric elements in just a few minutes. With WinWerth® contour loops, over a thousand geometric properties per second are automatically evaluated on geometric elements.



The Werth Fiber Probe® now features automatic light control for measurements in deep bores with high aspect ratios. The intensity is automatically adjusted according to the probing depth, enabling reliable

measurements even in deep, small bores with diameters of just a few tens of micrometers.

The stepless rotary/tilt head for the Werth Rotary Tilt WRT Chromatic Focus Point sensor is now also available for the conventional SP25 probe and is multi-sensor capable.

EasyScope® IP Automatic

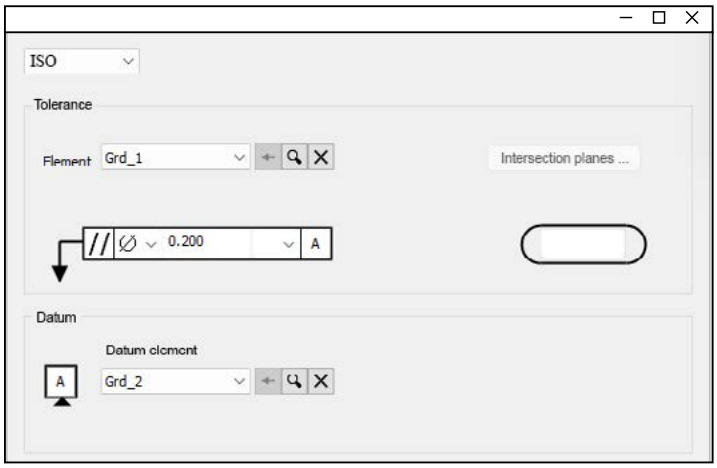
ScopeCheck® FB

VideoCheck® S

WinWerth® version 11.47

The surface profile shape according to DIN ISO and ASME can be evaluated in accordance with the standards using ToleranceFit® 3D. The maximum 3D nominal/actual deviation is minimized and the result is displayed in color-coded form next to the measured value in the measurement report.

For the new “S-shape” geometry element, the centers, radii, and shape of the two associated circle segments as well as the overall shape are output.



The user-friendliness of the new WinWerth® Version 11.47 is improved with many small smart functions. For example, complex geometrical deviations with multiple datum features are automatically calculated by WinWerth® in accordance with standards by entering the drawing entry, significantly reducing the time required to create the measurement sequence. The 3D graphic can now also be rotated conveniently with the right mouse button. If the insertion mark is to be moved, a preview shows between which features it will appear. CT volumes can now also be exported as DICOM files. The DICOM format is an international standard for medical image data, for example from MRI, CT, or ultrasound examinations, and is supported by several widely used viewers.

Computed tomography can now be used for most measuring tasks

As a pioneer in the integration of computed tomography into coordinate metrology, Werth revolutionized the industry in 2005 with the TomoScope®, the first CT machine developed for coordinate metrology. The most important benefit was initially the complete capture of the workpiece using X-ray technology. It soon became apparent that the new measuring systems enabled accurate, fast, and economical measurements.

Over the years, Werth developed several new machine concepts and components. By its 20th anniversary, four TomoScope® machine series had already established themselves around the world in quality assurance. With the evolution of CT technology, the use of computed tomography is now an economical solution for a wide range of measuring tasks. Werth initially responded to the request of many users for the TomoScope® XS benefits to be available for larger workpieces with the TomoScope® XS Plus. In 2023, the TomoScope® S Plus was introduced with a particularly large measuring range in a compact format. In order to meet the requirements for measuring workpieces made of denser materials or with greater radiographic lengths in compact machines, Werth is presenting another new model in the successful TomoScope® XS machine series in 2025.

Economical coordinate metrology with computed tomography

The TomoScope® XS series is characterized by exceptional cost-effectiveness in use. With innovative X-ray technology, TomoScope® XS machines enable measurements to be taken five times faster than with conventional CT measurement systems, while offering high availability and low costs. Despite their compact design, the machines have a large measuring range. Measurements with a structural resolution of just a few micrometers are possible. Standard-compliant calibration, optionally with DAkkS certificate, guarantees the performance of the machines. Calibrated calibration standards are used to ensure the traceability of all measurement results.

Increased performance for the TomoScope® XS machine series

The new TomoScope® XS Plus 230 has the most powerful transmission source on the market with up to 140 W. This enables even shorter measurement times compared to transmission sources with 80 W, for example. One application example is the measurement of prismatic battery cells from the automotive or e-bike industry. The high voltage of up to 230 kV also enables the penetration of workpieces with higher density, such as steel implants for shoulders or jaws. The compact machine size, which corresponds to the TomoScope® XS Plus 200, is ideal for installation in production. As with the other TomoScope® XS machines, the Werth long-life transmission sources ensure lower maintenance costs compared to conventional sources. With XY axes and raster tomography, the TomoScope® XS Plus machines offer a large measuring range.

Measure larger workpieces with the TomoScope® S Plus 230

The new 230 kV transmission source can also be integrated into the new TomoScope® S Plus. The low-maintenance operation familiar from the XS machines is therefore also available for this machine class. The standard-compliant specifications for length measurement error MPE for E = (4 + L/75) µm and distance

error MPE for SD = (2.5 + L/100) µm demonstrate the highest accuracy in this machine class. In addition, the machines have a particularly large measuring volume (up to D = 500 mm and L = 650 mm) in comparison to their compact external dimensions. With a high power output of up to 140 watts, car headlights, for example, can now be measured completely even faster.

The TomoScope® XS and S machine series are now available with the most powerful transmission source on the market.

TomoScope® XS Plus 230

100 percent measurements on implants thanks to automation

Quality assurance of bone implants

In order to be able to produce titanium bone implant systems cost-effectively in Switzerland, the manufacturer Genostis relies on automation. An important feature of the process chain is a CT machine from Werth, which automatically measures all implants.

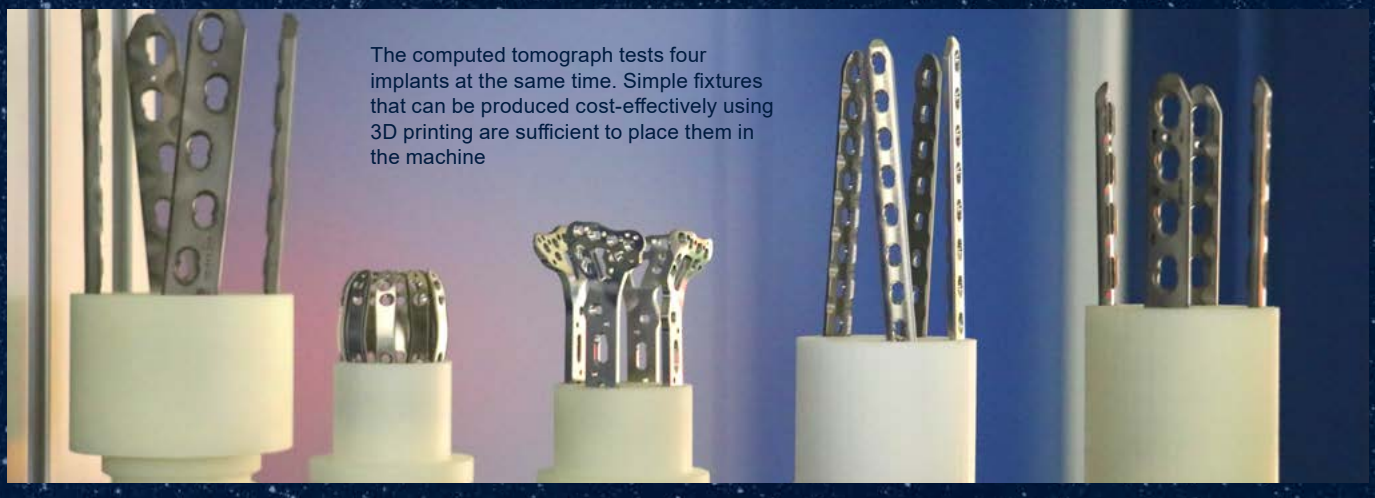
The Swiss company Genostis AG, based in Burgdorf in the canton of Berne, manufactures bone implants based on known and now patent-free designs. Thanks to the principle known as "generic", the costs for research and development are marginal. "Our plates and screws are based on designs that have been tried and tested over decades," explains Genostis CEO Lorenzo Zoccoletti. "In an in-house reengineering process, we optimize them in line with today's requirements for patient-friendly application and efficient production."

The prices for such implants are significantly lower than those of other well-known suppliers. According to Zoccoletti, 100% of the high-quality systems are produced in Switzerland. As the largest cost block is in production, those responsible there pay attention to very high efficiency. "We have very high labor costs here in Switzerland," says Carmelo Blandini, COO of Genostis. "That's why maximally automated production processes and the intelligent use of innovative production equipment are crucial to our success."

Automated metrology as the basis for MDR certification

A core element here is metrology. "All of our implants must meet the strict legal requirements for medical devices, including the applicable EU Medical Device Regulation MDR 2017/745," explains Zoccoletti. In order to use the CE mark to market an implant in the EU, various proofs must be provided and tested by a certification company.

In addition to validation measures, some measurement tasks are also unavoidable, such as initial sample testing of the individual products. In addition, measure-



The computed tomograph tests four implants at the same time. Simple fixtures that can be produced cost-effectively using 3D printing are sufficient to place them in the machine

ments close to production are required, which Genostis has integrated automatically into the production process.

"Computed tomography seemed to us to be the most suitable measurement technology for our concept," explains Genostis COO Blandini. He ruled out conventional tactile 3D coordinate metrology for various reasons: The time and costs involved for the required clamping devices and measurements were enormous, and the test specimens also had to be placed manually. An industrial CT machine offered better conditions for achieving the desired high level of automation.

The Genostis managers opted for the TomoScope® XS Plus 160 from Werth Messtechnik GmbH in Giessen. "We were familiar with Werth as a renowned metrology provider that has been offering coordinate measuring systems for industrial computed tomography for a long time," says Blandini. The selected TomoScope® XS Plus 160 enables the scanning of small and medium-sized workpieces up to around 300 mm in diameter and 450 mm in length. A core element is the transmission tube in monoblock design, which enables a small focal spot even with high tube power, so that fast measurements with high resolution can be carried out.

The maximum voltage of the machine is 160 kV. This means that workpieces with longer radiographic lengths, as well as denser materials, can also be measured. "As we need to capture the geometries of plates and screws made of titanium, this was an important decision criterion," explains Blandini. However, he also points out that the short cycle time required for production control was a challenge. "We had to invest some time until we had built up the necessary experience with the CT sensor."

Genostis wanted to scan the titanium workpieces in multiple clamping, for example. "As the measuring objects influence each other during the measurement and this can result in image errors, so-called artifacts, we ran many tests regarding the number of parts and their positioning in relation to each other in order to get good results," explains Dusan Mirkovic, Head of Production and Automation. "The CT specialists from Werth actively supported us with their expertise, so that we were able to develop a great deal of know-how and ultimately measurement strategies that fit our products perfectly."

As a result, Genostis has succeeded in reducing scanning times from an average of around 20 minutes to 2 to 5 minutes per titanium workpiece. "These values depend on the products, their size, the required resolution and the sizes to be captured," explains the production manager. On average, ten to twelve critical geometrical characteristics have to be captured during a measurement. The TomoScope® XS Plus 160 provides the complete three-dimensional workpiece volume as a measurement result. The user can set the resolution to almost any value up to 60 billion voxels.

The TomoScope® XS Plus 160 scans four titanium implants in around ten minutes

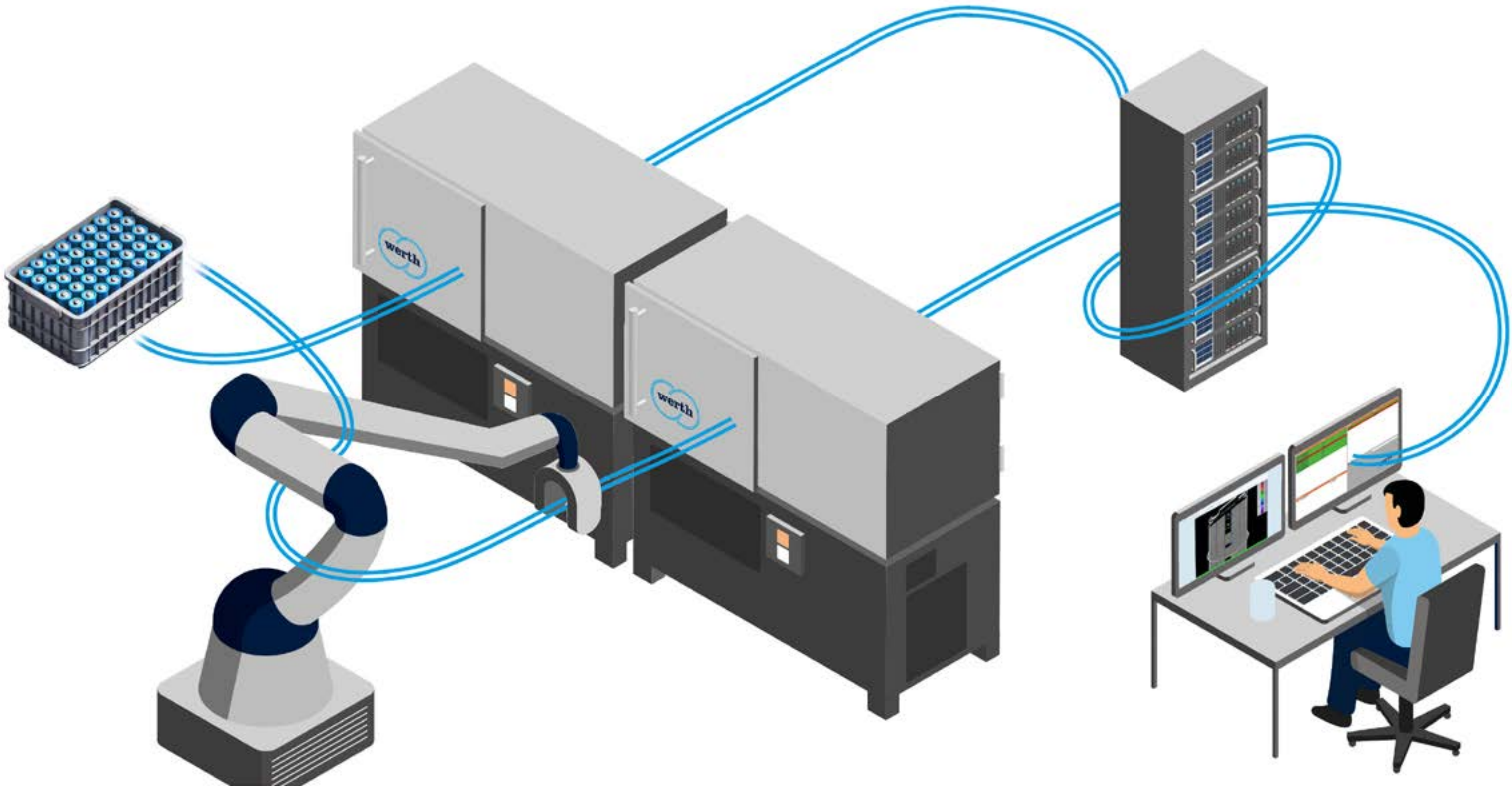
"The 3D nominal-to-part variation analysis is very good," praises Mirkovic. "We read in the 3D CAD model and compare it with the measured point cloud in STL format." The color-coded deviation plot quickly shows whether the workpiece is within tolerance. "If we then determine a few critical geometrical characteristics, the values of which are also automatically stored in the measurement log, we can release the medical device for use within seconds."

All measurement results are reliable and traceable

Manual measurements are completely eliminated. And: the manufacturer has 100% documentation of the measurement results. Mirkovic adds: "It is important for our use in medical technology that the measurement results are reliable and traceable. Werth Messtechnik guarantees this through standard-compliant calibration, including with a DAkkS certificate." Programming, control and evaluation of the entire measuring process take place in the WinWerth® measurement software. Genostis uses it not only on the TomoScope® itself, but also on two additional workstations that are used for programming and evaluation. "This way, we never block the measuring machine with other tasks," says Mirkovic. The TomoScope® XS Plus is very easy to automate. Genostis, for example, installed a measuring cell with a robot and a racking system with 135 places.

At the moment, Genostis mainly measures plates and screws. After further expansion of production, the TomoScope® XS Plus 160 will also increasingly be used for validation and initial sample inspection. Blandini sums up: "As things stand today, we are very satisfied with our CT coordinate measuring system."

Complete battery cell testing in seconds



Battery cells are among the most important core components for the performance and safety of battery-powered vehicles. In the worst case, defects can lead to a vehicle fire. This risk can be almost completely eliminated with 100 percent testing. When performing quality assurance on millions of cells, the measurement of each individual battery cell must take only a few seconds. The aim is therefore to test all cells reliably, quickly and automatically – without destroying them.

How modern computed tomography is making electric mobility safer

In industrial X-ray computed tomography (CT), the workpiece is rotated in the X-ray beam. The WinWerth® measurement software reconstructs a digital twin from the radiographic images taken, which provides a non-destructive view of the inside of the workpiece. Complete capture in three dimensions enables both the exact position of defects to be determined and the dimensional evaluation of all geometries. The TomoScope® XS Plus 200 sets standards in terms of speed, availability, machine size, and cost efficiency.

Fully automated inspection process

For this purpose, the machines are loaded and unloaded with several robots in a matter of seconds. The tomography scan of the cell with Werth ClearCT results in an almost artifact-free digital workpiece volume, which enables measurements with high accuracy. In order to maintain the short cycle times, several volumes are reconstructed in parallel using a multi-PC network. The WinWerth® measurement software also distributes the tasks to the next available high-speed computer. There, the cell is automatically evaluated, for example with regard to the anode overhangs or the geometry of the “jelly roll.” The cells are also sorted into “good” and “bad” without any human intervention.

Key technology for electric mobility

With a TomoScope® XS Plus 200, fully automatic testing of 120 battery cells per hour is possible. Thanks to its compact size, several machines can be arranged in the test cell in a small space. This allows up to 450 cells per hour to be measured with up to four TomoScope® machines. This also allows for redundancy in the event of maintenance, as the measurements can be continued by the available machines. The innovative TomoScope® XS machine series with continuous improvements to hardware and software enables ever shorter measurement times. With less than 10 milliseconds for image acquisition, the measurement time for the tomography scan of the entire battery cell is less than 15 seconds.

Innovative technology

- Powerful and low-maintenance Werth long-life transmission source
- Application-specific machine geometry for short measurement times
- New type of detector for faster image acquisition
- Everything from a single source: WinWerth® measurement software guarantees traceability
- Fast data transfer between high-speed computers
- Parallel reconstruction and evaluation on multiple computers
- Long-term archiving of very large amounts of data

Increased cost-effectiveness

- 100 percent testing reduces scrap
- Increased safety for electric mobility
- Measurements many times faster
- Cost reduction for the manufacturing process

CT applications from electric mobility, the electronics industry, and medical technology in video

Multi-material artifact correction – precision for the next generation

The continuous reduction of systematic errors in computed tomography (CT) – known as artifacts – is one of the main areas of development for the WinWerth® measurement software. Even back in 2005, correction methods were integrated into the reconstruction of the digital workpiece volume in the TomoScope® 200, the world's first machine with X-ray CT developed specifically for coordinate metrology.

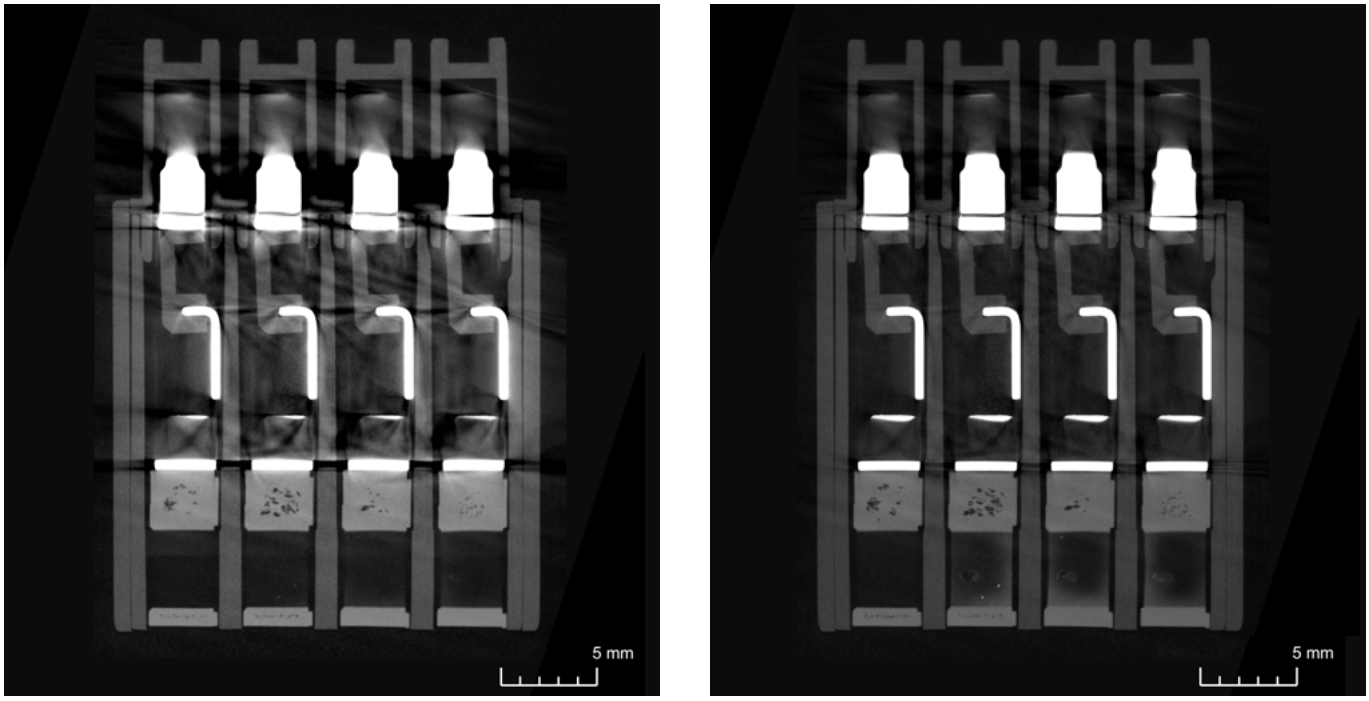
To expand the range of applications for the machines, it is not enough to measure plastic workpieces quickly and accurately. Complex assemblies with highly absorbent materials such as metals or ceramics and, for example, combinations of plastic and copper must also be analyzed and measured with high accuracy. However, tomography scans of such multi-material workpieces produce significantly stronger artifacts, for example due to beam hardening, which considerably impair measurement accuracy and even make inspection impossible in some cases.

Accuracy and efficiency go hand in hand

To meet these challenges, various correction methods have been integrated into WinWerth®. Empirical Artifact Correction (EAC), which has been tried and tested for decades, enables the correction of unknown artifacts on the basis of a single tomography scan, but has so far been limited to use with single-material workpieces. Alternatively, Multi-Spectra CT (MSP-CT) delivers very good results even with multi-material workpieces by taking two measurements with different X-ray spectra, but at the expense of measurement time. With the new MEAC (Multi-Material EAC), artifact-generating areas (e.g., metal contacts in connectors) are automatically recognized, the generated artifacts determined and removed. The result is a corrected volume with significantly reduced artifacts, which usually allows reliable measurement and analysis.

Multi-material empirical artifact correction (MEAC)

- Starting with WinWerth® version 11.47
- Only one tomography scan necessary
- High measuring speed
- For single- and multi-material workpieces
- High measuring accuracy
- Fast, reliable, and universally applicable



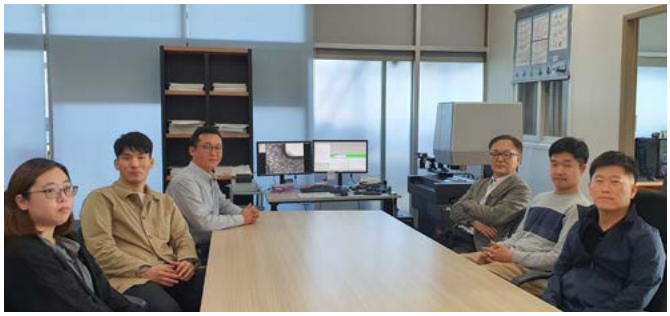
The volume section of a connecting clamp impressively shows the difference between the original CT with artifacts and the volume corrected with MEAC.

News in Brief

25 years of Werth in Asia

Werth established its first contacts with Asian sales representatives in the 1990s, and this market has been an essential source of our business success ever since.

In Thailand, Voravirat Paopongpaiboon founded Voravirat Measure Equipment Co. Ltd. in 1994, which sells Werth machines mainly to customers in the electronics and mold making industries.



JiMEAS Technology Corp., based in the Korean capital Seoul, was founded in 1997 by J. J. Ji (right rear with his son Gyoon Chul Ji).

In Taiwan, Werth is still successfully represented by Full Bright Industrial Supply Center, founded in 1974 by Mike Chen (right, with sales manager Danny Lee)

15 years of Suzhou Werth Metrology and Werth Magyarország

Due to increasing demand, a Werth representative office was opened in Shanghai in 2010 with Dr. Zhichao Li as managing director. In 2013, it was transferred to Werth Metrology (Shanghai) Co. Ltd. and has had its headquarters and a representative demonstration center in Suzhou since 2015. From the outset, the Chinese market was served jointly with Dantsin Technology Co. Ltd., which provides customer support via several locations in China, such as Beijing, Shenzhen, and Chengdu.

From 1992, Werth coordinate measuring machines were initially offered in Hungary by the calibration laboratory of Hungarian-German entrepreneur István Székessy. On the occasion of his retirement in 2010, Werth Messtechnik founded Werth Magyarország Kft. together with his long-time employee Tamás Csontos.

Promotion of science

Last year, the Dr.-Ing. Siegfried Werth Foundation awarded prizes to the dissertations of Dr. Thorsten Goebel, Dr. Anne-Sophie Munser, and Dr. Chen Zhang at various ceremonies and conferences. At the end of the year, the doctoral thesis of Dr. Julian Lich and the bachelor's thesis of Jie Zhang were honored at the annual Werth Technology Day at the company's headquarters in Giessen.

Further publications such as user reports and practical tips in English language can be found on the Werth website

(www.werth.de).

Coordinate Measuring Machines with Optics, Computed Tomography and Multisensor Systems

The “Multisensor” is the Company-Newspaper of the

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04/2025