



INNOVATION MAGAZINE



ZEISS Industrial Quality Solutions



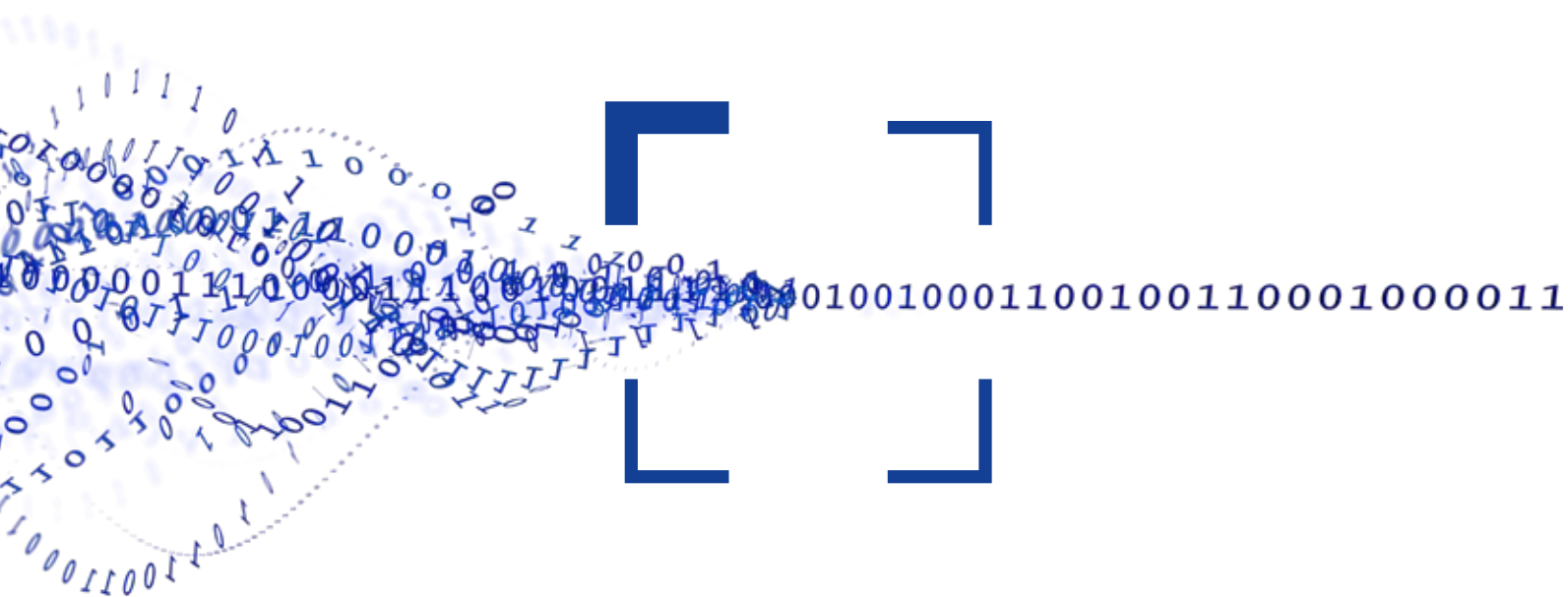
zeiss.com/metrology

EN Version

Seeing beyond

ZEISS Innovation Rocks

Connect to Productivity with flexible & future-proof solutions



Intro

Dear Quality Assurance Enthusiasts,

2020 was a very unique year. It was a year of change. We faced challenges beyond what anyone could have imagined. The status quo was confronted and many of our standards were tested. But there's always a silver lining to every situation. Overcoming adversity requires people and companies to rise up to be their very best. We observed this with many of our customers, suppliers and business partners. At ZEISS Industrial Quality Solutions, we also reinvented many of our business practices. We had to find new ways to increase productivity. We came together through new and different channels, and ultimately, we began 2021 as a team, stronger than ever before. Looking toward the future, there are plenty of reasons to be optimistic. The world is adapting quickly. It will continue evolving, and it will thrive, with technology driving the change. This progress requires new approaches to drive productivity and assure quality in industrial manufacturing. Always beyond standards. At ZEISS we strive to enable our customers to stay ahead of the pace, and thus we will continue providing innovative industrial quality solutions for automotive, eMobility, electronics, medical, aerospace, machinery, amongst other industry segments and applications.

Change is a constant factor in manufacturing today: geographic shifts, the ongoing transformation in the automotive industry towards digitalization and electrification, new technologies emerging towards in-line applications, and many others. Therefore, in 2021 we will introduce innovative solutions that enable flexibility to handle these changes, and that endure the test of time to enable our customers to stay ahead in their respective industries. These additions to our portfolio include: a new level of CT scanning simplicity for easy but thorough inspection of industrial applications, new ways to turn hidden manufacturing process efficiencies into real productivity gains, a new program to help suppliers in the medical industry achieve the highest quality standards, the newest easy-to-use 3D scanning solution designed for the makers, new upgrade packages to get your CMMs ready for the future, a more convenient software subscription model, and a breakthrough in CT-scanning for high-density parts, amongst others.

We at ZEISS are ready for the change and we invite you, our customers, to connect to productivity in manufacturing, and discover our new flexible and future-proof solutions.

Marc Wawerla on behalf of the ZEISS Industrial Quality Leadership Team.



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From energy to eMotion ZEISS eMobility Solutions

ZEISS eMobility Solutions Delivers Quality Solutions

The automotive industry is rapidly accelerating development and release of new electric vehicles. And since the construction of electric powertrains differs significantly from those of combustion engine vehicles, companies are being forced to adapt the production and assembly of critical electric vehicle components as well. A major challenge in quality assurance today is the need to meet the increased demand for precision.

Achieving more power, less weight and longer range are important targets in the design and construction of electric vehicles. At the same time, manufacturers are faced with the question of how to manufacture electric powertrains efficiently. While mechanical processes

such as milling, rotating and grinding prevail in the manufacture of combustion engines, the predominant methods used in the production of electric motor stators are punching, bending, welding and impregnation. This has implications on the quality assurance process.

Flexible quality solutions

Production requirements are bringing about changes to the traditional dimensional measurement of components of the electric motor. While tolerance margins are in fact widening in some cases, production is also complicated by limited accessibility and a high number of properties. New critical requirements

for weld seams, such as the need for seams to be free of defects, and even the thickness characteristics of impregnation coatings are likewise important contributors to the difficulty of manufacturing electric engines. This demands quality assurance solutions that are significantly more flexible and diverse, not only in sensor systems, but in software and analysis as

well. Evaluating weld seam inspections requires coordinate measuring machines with tactile and optical sensors, as well as computed tomography scanning. Ground weld seams also need to be analyzed under the microscope. ZEISS eMobility Solutions offers a wide range of solutions for this, paired with the ability to link results through ZEISS PiWeb, thus providing manufacturers with more efficient control over their production.





The battery tray challenge

Alongside the powertrain, the chassis of the electric vehicle is also undergoing significant production changes - as can already be seen in the manufacture of battery trays. In battery electric vehicles (BEVs), the battery tray consists mostly of a complex welded aluminum profile. Plug-hybrids (PHEVs) frequently use smaller cast constructions.

These various system requirements are translated into quality requirements in the form of geometric properties, such as the position, form and location of



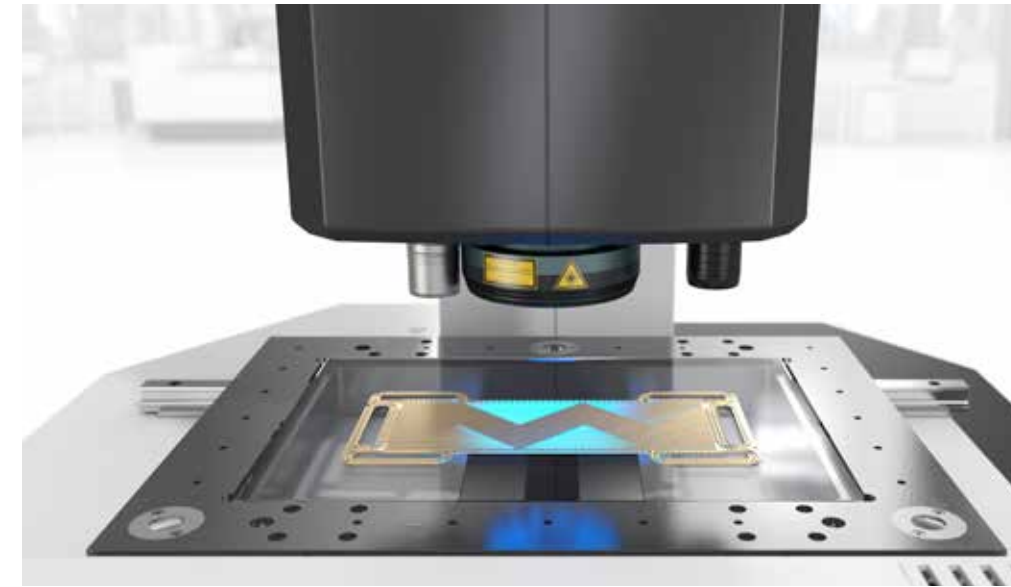
Tactile Measurement of Battery Tray on ZEISS Horizontal Arm CMM

individual component properties. The size of the battery tray in particular, and hence the large number of properties such as positive fitting, poses a challenge for measurement cycles. And since this is a safety-critical component, a 100% inspection is required in most cases.

ZEISS has a wealth of experience in inspecting battery trays. ZEISS PRO T horizontal-arm machine (HAM) with ZEISS EagleEye laser scanner is often used for this purpose. The ability to automatically switch between tactile and optical sensors within a single inspection plan makes it possible to access the most diverse points of measurement and to perform reliable and reproducible measurements. Once the various component characteristics are measured, the analysis results can be illustrated visually in the application software and in ZEISS PiWeb. The GOM ATOS ScanBox is also well-suited for measuring battery trays thanks to its high level of automatability and its use of structured-light 3D scanning.



Optical Laser Triangulation Measurement of Battery Tray with ZEISS EagleEye

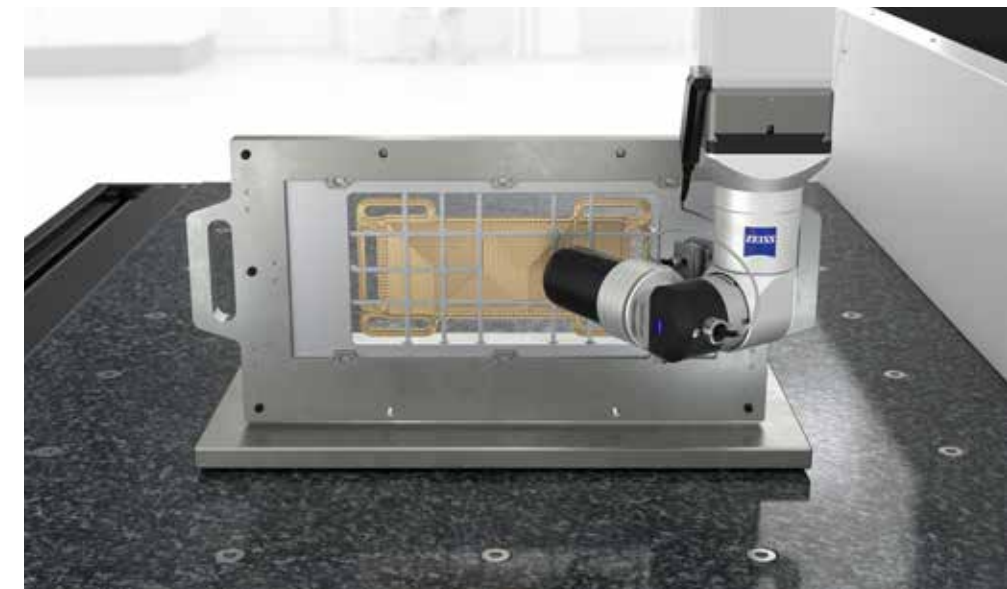


MEA Inspection on ZEISS Multisensor CMM ZEISS O-INSPECT

Quality assurance for fuel cell vehicles

At the heart of every fuel cell vehicle (FCEV) is a stack of individual low-temperature fuel cells with polymer membranes (PEMFC), which generate electric energy from hydrogen. Each cell is comprised of two bipolar plates and a membrane electrode assembly (MEA). Fuel cells are connected in series, which means that the quality of each cell is responsible for the performance of the overall system. The requirements placed on bipolar plates and MEAs can be met by means of dimensional metrology, as well as by inspecting coatings and surface defects, including contaminations and weld seams.

Operators therefore use a variety of measuring machines and imaging processes to cover the full range of quality requirements within the fuel cell manufacturing process. ZEISS solutions such as the the multi-sensor coordinate measuring machine O-INSPECT, the computed tomograph METROTOM, and Axiomager light microscope make it possible to achieve this level of quality



Bipolar plate measurement on CMM with confocal white light sensor ZEISS DotScan and ZEISS fixture system

assurance. The comprehensive ZEISS PiWeb software and uniform software design of each ZEISS solution ensure that manufacturers can track and record measurement results by generating individual reports for each component.

eMobility: Measuring technology from ZEISS provides the key for series production

ZEISS and VW have been working together to develop a new measuring solution for hairpin stators

The Volkswagen plant in Salzgitter manufactures important components for the new APP 310 electric drive destined for the VW ID.3 – including an innovative hairpin stator. To assure the quality of this sophisticated engine design, ZEISS worked collaboratively with VW to develop a convincing measuring solution.

The VW ID.3 is the first ever vehicle to be designed purely as an electric car. This compact model goes into production this year, with up to 500,000 units expected to roll off the factory floor in Germany. And plans are already in place to set up more production plants in other countries. The essential components of the electric drive are produced at the Volkswagen components plant in Salzgitter. For the stator, VW has opted for an innovative design using hairpin technology. "This approach enables high-volume series production, and it also means the engine has more power, while being significantly lighter," explains Philip Kurz, who is responsible for engine planning and testing at VW. However, there remains the challenge of quality

assurance – because the physical properties of the hairpins push the boundaries of the measuring methods traditionally used in engine construction. This is why over the past year ZEISS has been working with VW to develop a measuring solution which enables the automaker to manufacture electric cars in large-scale series production.

The challenge

The hairpins in the stator of the new electric drive, made from coated copper, replace the traditional copper wire coil. Pascal Schmidt, who is part of the quality assurance team, explains why this is too much for traditional measuring technology to cope with: "Copper is easily deformed, which is why we can't use tactile methods. Also, it

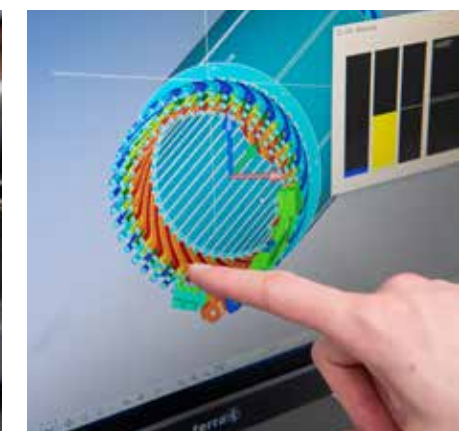
is shiny and semi-transparent, which makes it difficult for optical sensors to detect." On top of that, the form of the finished hairpins does not match the form of the installation position. And, with over 100 integrated hairpins, the winding head needs to be fully scanned by the sensors in order to ensure that the hairpins aren't touching the engine housing. VW also needed to develop an efficient measuring strategy which meets all of the safety and quality requirements for the electric drive.

The breakthrough

At the start of 2019, ZEISS and VW began a collaborative project with the aim of finding solutions to these challenges. Kurz explains: "Once we had defined our sensor requirements in-house, it became clear that the ZEISS PRISMO multisensor coordinate measuring machine was the ideal solution." In the chosen configuration, the coordinate measuring machine comes fitted with the ZEISS VAST XXT tactile scanning measuring head, the ZEISS LineScan optical form sensor and the ZEISS DotScan chromatic white light sensor, as well as a rotating swivel unit. Where possible VW prefers to use the tactile procedure for measuring the bundle of laminations on the stator, as



ZEISS LineScan digitizes the entire winding head for comparison of the point cloud with the CAD model.



The deviation from the CAD model is clearly visualized by a false-color display.

this is the most precise method. ZEISS LineScan is used to check the winding head, as this generates digital data in the form of a point cloud to enable calibration with the CAD model. The hairpins are measured using ZEISS DotScan. To check the individual hairpins prior to installation in the stator, ZEISS developed a fixture system in which the hairpins can be inserted for measurement in a configuration that matches how they will ultimately be installed in the stator. Also, for the lamination bundle, ZEISS developed a clamping device which enables the bundle to be secured for reproducible tactile measurement.

A comprehensive measuring solution

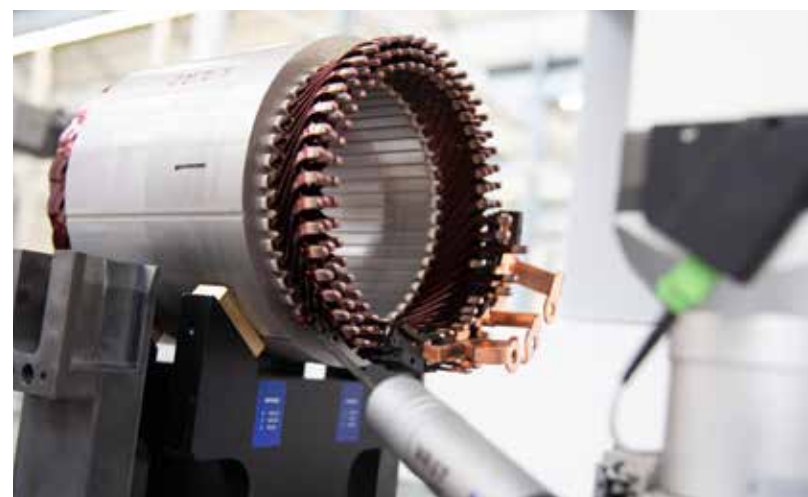
As it is not the measuring engineers themselves but the production workers who will conduct random checks, user-friendliness was also an important factor. And in Pascal Schmidt's opinion, the best conditions are in place to meet this requirement: "With CALYPSO, ZEISS

offers a clear interface with images and text which allows the operator to select what he wants to do. The operator inserts the part that is to be measured, enters which machine the part is from, selects the measurement program, and then the rest runs automatically. There's virtually nothing that can go wrong." And ZEISS PiWeb is also convincing with its ability to generate meaningful measurement reports quickly and easily, and to clearly visualize the measurement data – including with CAD views,

form plots, false color displays and histograms. Philip Kurz is delighted with the solution package: "In our planning at VW, we're never just looking for a specific measurement device, but always for a comprehensive measuring solution. ZEISS understands our products and our measuring needs, and is able to develop within its portfolio the ideal solution that best matches our requirements."

Once we had defined our sensor requirements in-house, it became clear that the ZEISS PRISMO multisensor coordinate measuring machine was the ideal solution.

Philip Kurz

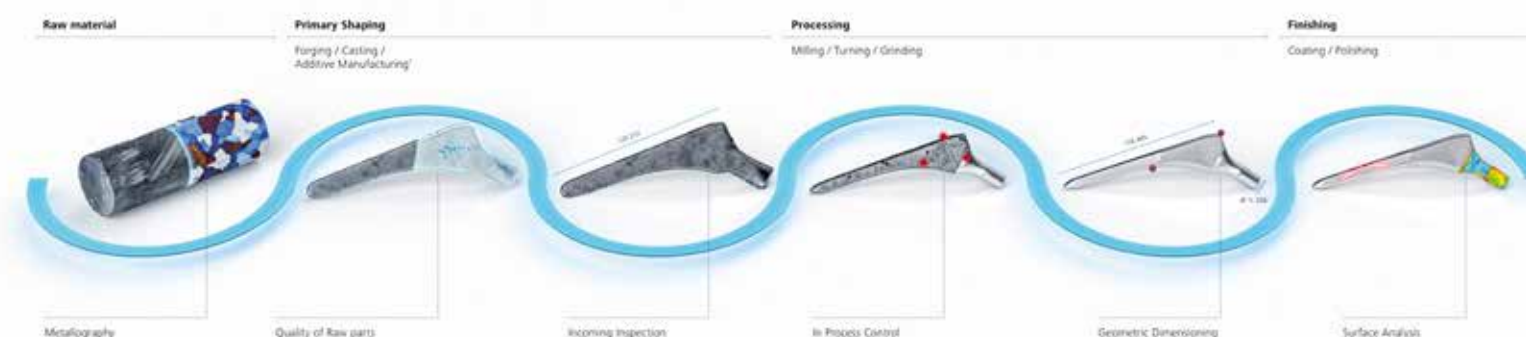
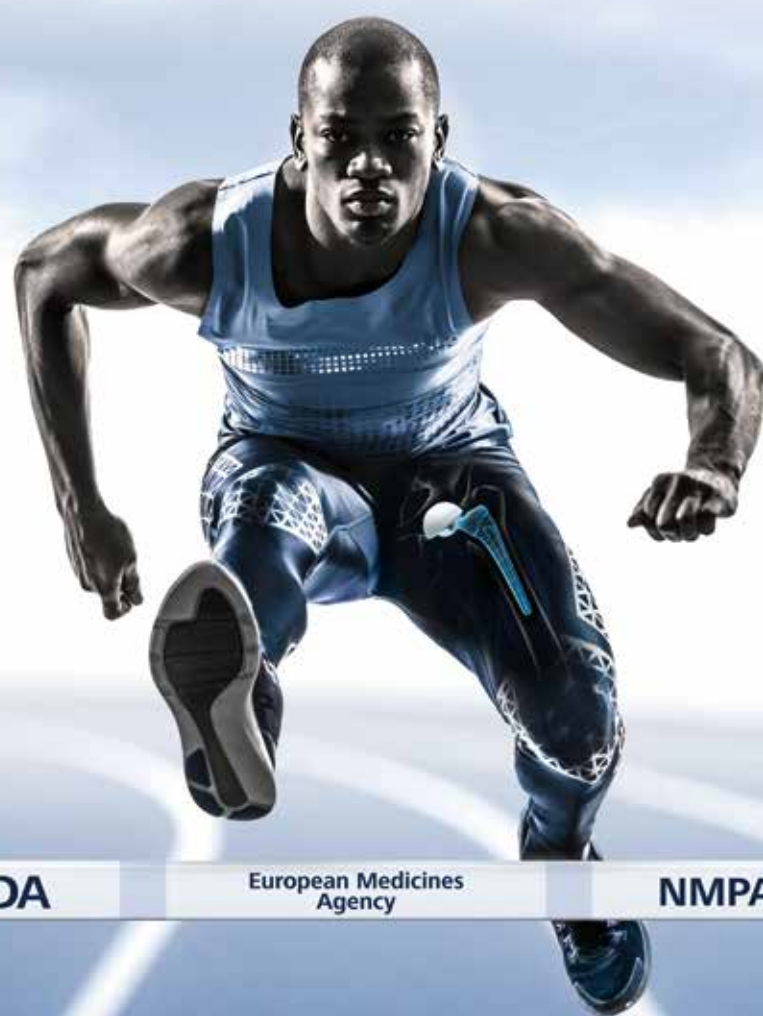


The fully assembled stator is reproducibly fixed on a ZEISS device.



Quality Assurance for the highest medical standards.

Every company in the field of medical technology has to meet extremely high demands with regard to quality and procedures. Quality-assurance processes must therefore be designed correctly, and companies must document and certify that those processes are being followed at all times. ZEISS Medical Industry Solutions helps manufacturers to meet these challenges through its comprehensive and connected portfolio of hardware and software solutions that can be configured exactly to each customer's needs. The solutions not only fulfill relevant industry standards, but also simplify all validation and verification processes, thereby contributing to higher productivity.



The regulatory requirements are therefore high – and rightly so. Proving compliance with regulations concerning quality assurance, quality management and data management must be seamless and traceable at all times. Ensuring that manufacturing and quality processes are correct is extremely complex and time-consuming. This makes it that much more important to have hardware and software solutions that can efficiently support these regulatory demands. Thanks to its extensive portfolio, ZEISS can support the medical industry in an effective way. ZEISS not only relies on its more than 100 years of experience in medical technology and quality assurance; as an international company, ZEISS knows the local guidelines and the associated requirements that manufacturers of medical technology must comply with in different countries.

Connected quality solutions for end-to-end traceability

ZEISS's comprehensive portfolio of hardware solutions range from tactile and optical coordinate measurement machines and 3D scanners to microscopes and CT- and -Xray solutions. Users benefit from industry-leading resolution, accuracy, measuring speed and powerful automation functions. That said, the most important factor that enables a company to fulfill its legal requirements is the software. ZEISS software matches perfectly with the respective hardware. This helps manufacturers comply with the required step-by-step processes. The microscopes operate with ZEISS ZEN core software, which can be used on many devices, as well as with the optional GxP module. For all other devices, the

ZEISS GUARDUS MES (Manufacturing Execution System) is available. Other powerful software packages include the ZEISS CALYPSO measurement software, ZEISS FACS automation software, ZEISS PiWeb reporting and statistical analysis software, and GOM Volume Inspect, which analyzes volume data. Equipped with such software, manufacturers can track and trace their processes at each step of production – from the raw materials to the end product. ZEISS software solutions allow companies to comply with DIN EN ISO 13485 and FDA 21 CFR Part 11. The software solutions offer a secure user administration, integrated audit trails and release management, detailed authentication concepts (including electronic signatures), and version management of documents in order to protect against other people making changes. With these capabilities, users can automatically create certificates and test certificates from the manufacturer, monitor processes on a continuous basis, and get online access to all company-wide performance key figures and KPIs.

Certainty about all types of implants and their entire value chain

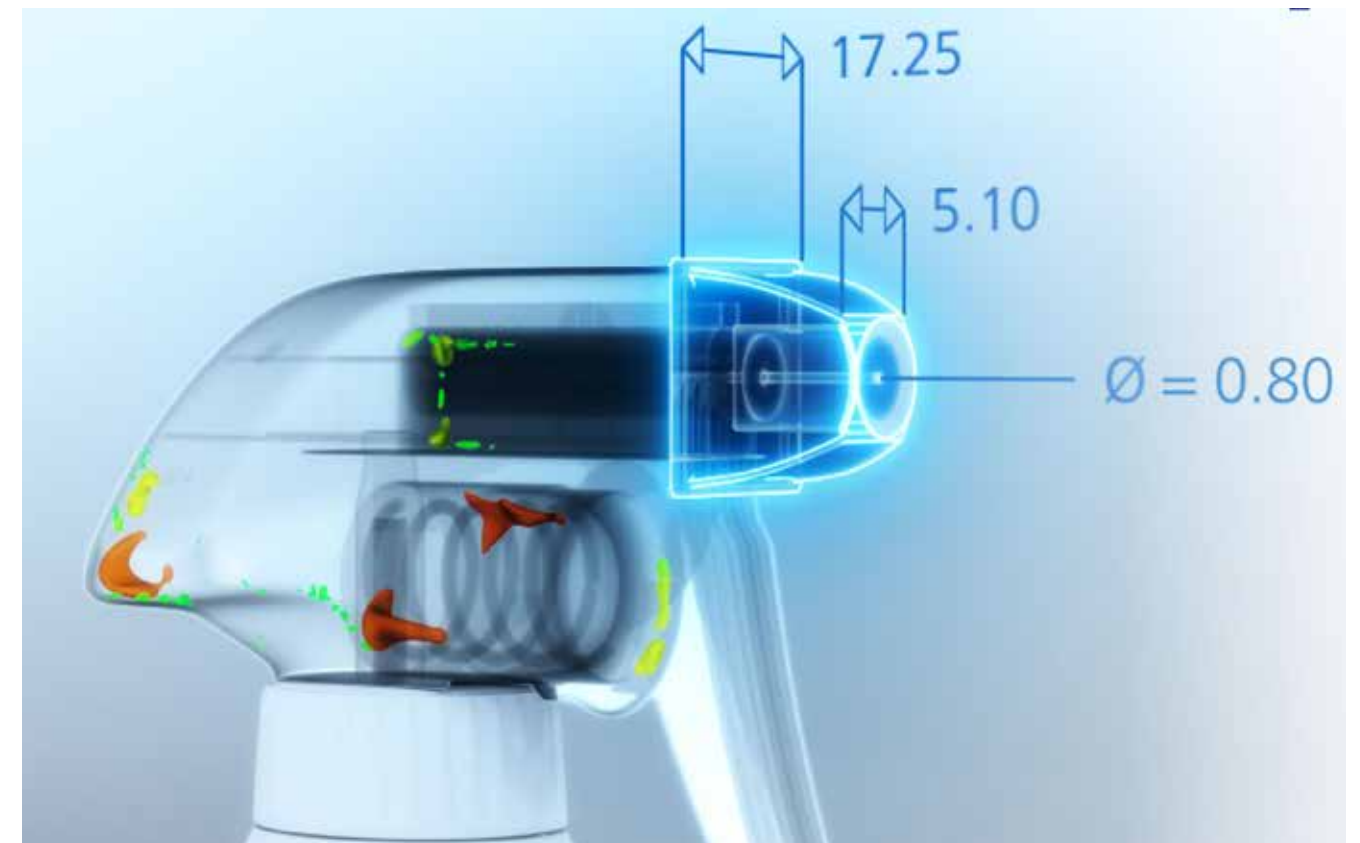
The enormous advantages of such an extensive portfolio are especially apparent in the field of manufacturing implants. There is a large number of implants and a wide diversity of materials used, from plastic (polyethylene, PEEK, UHMWPE, etc.) to different metal alloys (stainless steel, titanium alloys, etc.). For all the individual segments, whether the manufacturing processes utilize metal or plastic, ZEISS can offer the right quality solution – from

metallography or granulate analysis to controlling incoming goods, inspecting raw materials, testing measurements, forms and positions, as well as surface analysis during the processing and finishing. All individual solutions complement each other optimally, and because they're connected and intertwined, they seamlessly cover all the quality gates along the entire production chain. As a result, ZEISS Medical Industry Solutions delivers certainty about the accuracy of your production processes and the quality of your products. Parts that are contaminated or have defects can be taken out of production in a targeted way. The source of an error can be precisely localized and the standard of quality continuously improved over the long term. The continuous product and process inspections will lead to cost savings. For example, the fast inspection of incoming goods will help you avoid expensive errors during later manufacturing steps, as well as help you document erroneous inventories that would otherwise lead to legal claims. The amount of costly scrap can be reduced (which increases efficiency) and recourse claims caused by bad parts can be prevented. In short, 100% compliance and productivity do not have to be a contradiction – and that's true everywhere. Because with its global network of application and service technicians, ZEISS is a global partner that can support manufacturers in every region of the world in meeting their quality-assurance challenges and keeping their traceability and quality at a consistently high level.

The new Simplicity of Computed Tomography

Entering CT technology with ZEISS METROTOM 1 and GOM Volume Inspect

Computed tomography (CT), often perceived as complex, is significantly simplified with the latest additions to the ZEISS X-ray portfolio: ZEISS METROTOM 1 with the powerful GOM Volume Inspect software. The compact dimensions and convincing price/performance ratio of the ZEISS METROTOM 1, as well as the ease-of-use of the GOM Volume Inspect software – with a continuous workflow from data acquisition to inspection – make it easy to enter the world of industrial computed tomography.



What can customers expect from ZEISS METROTOM 1?

Dr. Dominik Stahl: CT technology has not always been affordable, especially for medium-sized companies until now. Our goal was to develop an innovative product that makes it easy to get started with CT technology. It was meant to be a measuring system, easy to use and flexible in terms of the parts and materials to be inspected. This is why the new system is a perfect complement for the ZEISS X-Ray Series.

Dr. Petra Schmidt: Innovative ideas have created a unique product with the potential to shake up and change the market. This system makes it much easier for customers to get started with the rather complex CT technology. With little experience, they can operate the CT and benefit from the advantages of X-ray technology. For example, they can detect internal defects or measure internal structures and wall thicknesses.

What other advantages does the new ZEISS METROTOM 1 offer?

Dr. Petra Schmidt: In addition to its ease of use, ZEISS METROTOM 1 is also characterized by its compact dimensions

and low maintenance requirements. This means that even smaller companies can integrate the CT system into their measuring room without any problems. The low maintenance requirements also help to keep operating costs as low as possible, making the overall price/performance ratio of ZEISS METROTOM 1 convincing.

Dr. Dominik Stahl: With GOM Volume Inspect the new ZEISS METROTOM 1 benefits from a software which is perfectly aligned with the hardware. This well-established, consistent solution for the acquisition of measuring data to the evaluation guarantees an easy operation.

What is so appealing about GOM Volume Inspect?

Dr. Dominik Stahl: GOM Volume Inspect becomes even more versatile. In the latest version, the software will be equipped with significantly more volume functions. This will allow many customer requirements to be met. An additional software for more detailed data analysis will no longer be necessary for metrological evaluations. This saves costs for the customer.

Dr. Petra Schmidt: When it comes to metrological evaluation, GOM Volume Inspect is a very established software. Customers appreciate its powerful features and it has a good, modern user-interface. Even today, some customers who own a CT from ZEISS use GOM Volume Inspect for evaluation. In the future, we will be able to offer all this from one source, including training and service.

About

Dr. Petra Schmidt is head of the X-ray Field of Business at ZEISS Industrial Quality Solutions.

Dr. Dominik Stahl is in charge of CT development at GOM, headquartered in Braunschweig

ZEISS X-Ray Series

Dare to see inside with ZEISS X-Ray Series

Making the invisible visible – with X-ray solutions of the ZEISS X-Ray Series, this becomes reality and opens up completely new possibilities in quality assurance. For example, internal defects can be detected, wall thicknesses can be measured or structural analyses can be performed. X-ray technology also offers many other advantages. Do you know them?



X-ray technology provides insights into the inside of parts without destroying them. As a result, not only hidden defects become visible, but internal structures can also be measured. With only one scan, you can obtain a multitude of information regarding defects, dimensional accuracy and material

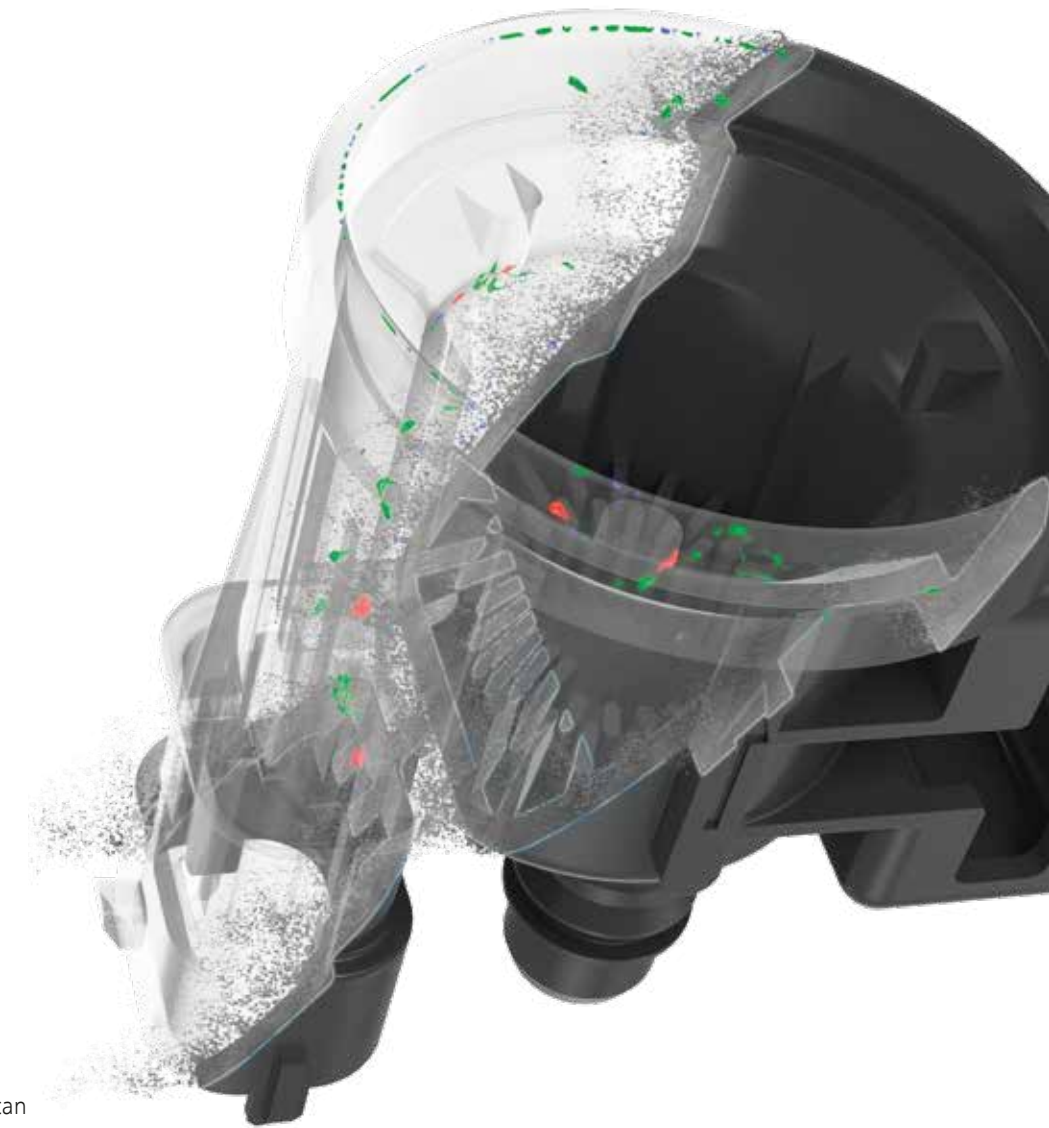
properties, and thus the possibility to fully assess the quality. This eliminates the need for time-consuming and cost-intensive tests with several other inspection and measuring methods. In addition, thanks to 3D computed tomography (CT) technology, components can be reproduced, even if the CAD is not available.

Complete solutions from ZEISS enable entry into X-ray technology

Would you also like to benefit from the advantages of X-ray technology? Nothing easier than that with the ZEISS X-Ray Series. Depending on your demands, such as precise measurements of small plastic parts, fast defect analyses of aluminum castings or high-resolution material analyses of 3D manufactured parts, we can offer you a complete solution from a single source. Customers benefit from an extremely broad hardware portfolio, ranging from easy-to-use systems for every customer need, high-precision computed tomography (CT) systems, robust, automated systems for production, to high-resolution X-ray microscopes. The software and accessory solutions as well as extensive services complete the picture. In this way, the customer receives an individual overall solution from one source. And with the new CT ZEISS METROTOM 1, your entry to the world of X-ray technology is particularly easy. Without much previous knowledge, you can evaluate all parts with regard to defects or dimensional deviations and benefit from the advantages of the technology.

A new benchmark for accuracy

In addition to the metrologically specified ZEISS METROTOM product family, ZEISS is the only supplier that can cover high-resolution analysis applications with 3D X-ray microscopes – and recently even metrological applications. The metrology option for ZEISS Xradia Versa systems is specified to a measuring accuracy (MPE) of $(1.9 + L/100) \mu\text{m}$ in terms of probing deviation – one of the lowest currently available on the market for CT metrology. This allows high-resolution metrological evaluations to be carried out in a field of view of 5 mm. This is important, for example, for the qualification of the smallest electronic components or parts that require extremely low tolerances. In order to make this possible, ZEISS has developed METROTOM-Check Nano, a new length measurement standard in accordance with the relevant VDI/VDE 2617-13 and 2630-1.3 guidelines – a calibration standard that is so precise that it can only be traceably measured at two locations in the world. This is an ideal solution for users who are used to high accuracy from their tactile measuring devices and expect the same from CTs.



Reliable inspection in the cycle of production

X-ray solutions are used not only in the measuring room, but also directly in production. The robust X-ray solutions of the BOSELLO product families allow very fast 2D inspection in production. If the dimensional accuracy of parts has to be carried out automatically or the exact dimensions and location of defects have to be determined, 3D computed tomography systems of the ZEISS VoluMax family are the right choice. Parts are automatically inspected and evaluated for defects and, if necessary, sorted out before high costs for processing of the defective part accumulate.

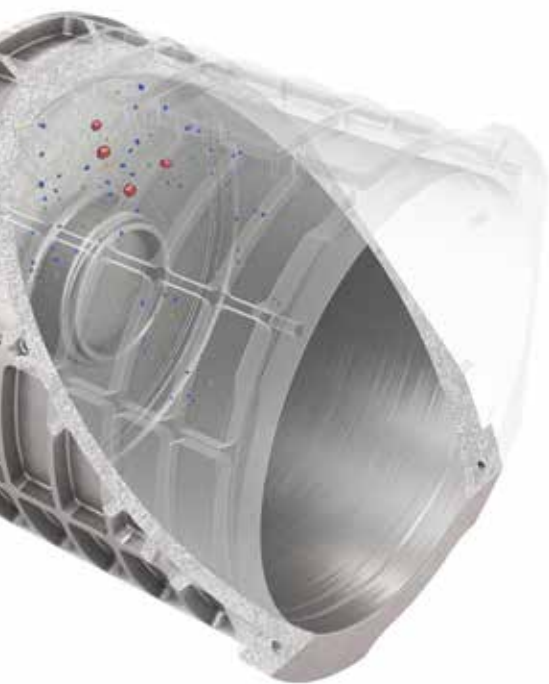
Powerful software and excellent service

For reliable quality assurance, ZEISS has high-performance software in its portfolio, such as ZEISS CALYPSO and

ZEISS Automated Defect Detection. Additionally, with GOM Volume Inspect you benefit from a proven software solution for metrological evaluation. This gives you everything you need for your inspection and measurement tasks from a single source. In this way, we provide you with the best overall solution for your application, rather than a single product. Another benefit for you is the global ZEISS service network, which ensures that your X-ray solutions always work, with a uniform international service standard. This also includes training and education to ensure consistent quality in handling inspection and measurement tasks at all customer locations. In this way, you may concentrate fully on production with the reassuring security that comes with the total insight of a ZEISS X-ray solution.

Making the invisible visible early on

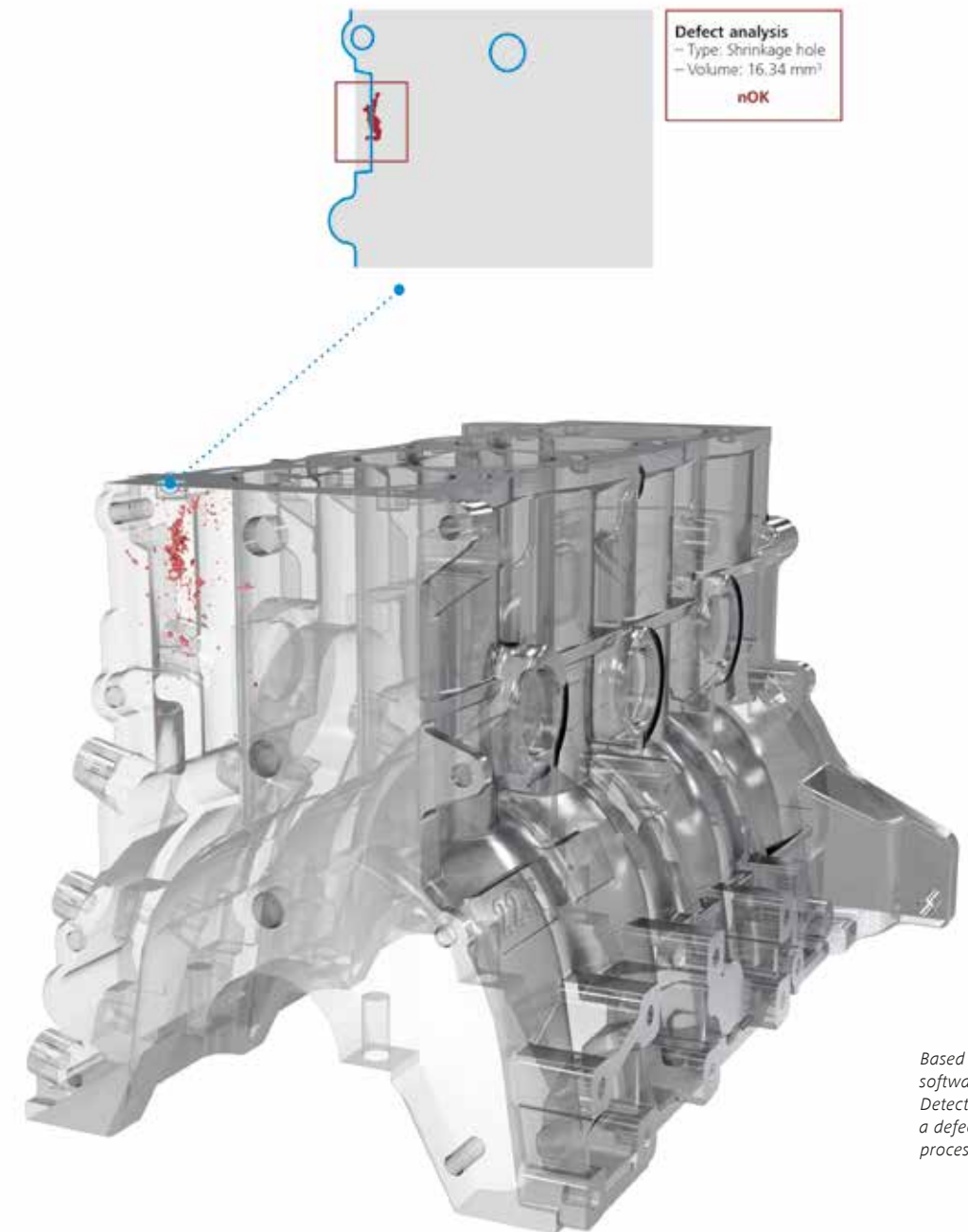
Light metal is being used more and more in industry, especially in the automotive sector. One of the reasons for this is to meet specifications for climate protection initiatives and lighter car bodies are an important factor. But lightweight construction means greater fragility and lower tolerances in casting and processing. Manufacturers have to master these challenges in production and also in quality assurance. For the latter, non-destructive inspection and measurement methods like X-ray technology are the best option.



The casting process of light metal is complex, and the risk of producing defective parts is high. Often the defects are located inside the castings and not visible on the surface. Whether pores, inclusions or shrinkage holes, for example, all defects can severely impair the stability and functionality of a part. If they remain undetected, the affected parts can lead to considerable problems and high costs later on in the production process. This is because the costs per part increase with each step. It is, therefore, essential to detect defects and critical errors reliably and early in the production process. If manufacturers want to “play it safe” with their parts, they should rely on sophisticated inspection and measuring technology at an early stage. In the best-case scenario, this means detecting defects and deformations non-destructively with X-rays – even in the production line.

Possibilities of X-ray technology

The industrial X-ray systems in the ZEISS BOSELLO family are specially designed for use in harsh production environments. Internal defects make the 2D inspection solutions visible quickly and automatically with just one scan. However, for manufacturers who produce particularly thin-walled and, therefore, fragile parts – for example to comply with the Euro 6 standard for vehicles – the pure detection and determination of defects is not enough. It is important to know their exact position and dimensions. This can be achieved by 3D X-ray technology. ZEISS computed tomography solutions can do even more: They evaluate defects with a view to subsequent processing steps. And in case castings have to be inspected for geometric deviations, the ZEISS METROTOM family offers precise measurements with highly accurate scans.



Based on the CAD model, the software ZEISS Automated Defect Detection can evaluate whether a defect leads to problems after processing.

Fastest inspection in the cycle of production

The challenge here is the short time available for inspection. The cycle of the production line, which is sometimes less than one minute, determines the maximum time frame for the inspection. The ZEISS VoluMax Series fulfils exactly this requirement and brings further advantages for production: Even large castings are no obstacle to maximum throughput. As part of a pilot project, a detector was specially designed for ZEISS VoluMax 9 flash that allows fast scans of large, denser castings. Another novelty on the market is ZEISS VoluMax F1500 thunder, which is equipped with an automatic feeder that sends the

parts directly through the system, thus ensuring maximum efficiency. With only eight seconds per part for loading and unloading, downtimes are reduced to a minimum. The ZEISS Automated Defect Detection (ZADD) evaluation software is particularly valuable for the user when parts need to be evaluated automatically and reliably. The software not only detects defects such as shrinkage holes, cracks or pores, but also classifies and localizes them. The greatest advantage for the user is the evaluation function: it shows whether a detected defect will cause problems in later processing steps. This allows manufacturers to sort out defective parts reliably and specifically.

If the data management software ZEISS PiWeb detects an accumulation of individual defects, it is possible to intervene in the casting process at an earlier stage to avoid increased scrap.

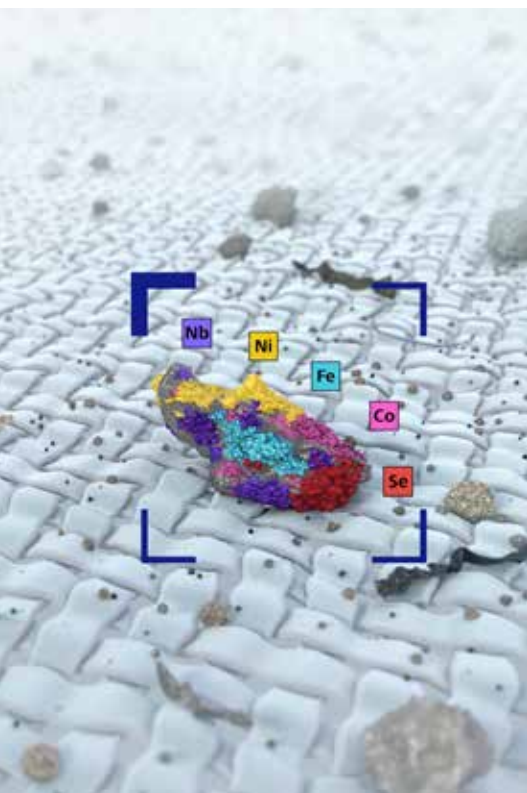
Coherent package

In addition to robust ZEISS X-ray systems and unique software solutions, users can rely on reliable service. If problems do arise, ZEISS service is available worldwide – with technicians guiding users through the system remotely or directly on site. With all spare parts in stock, production can be rapidly ramped up again.

Identify the root cause. Make the right decision faster.

ZEISS integrates data from HYDAC devices into reporting

From the automotive industry to medical technology and on to optics, technical cleanliness of functionally relevant components has long been a quality criterion. Nowadays users track down contamination sources on critical components even faster and more reliably. This is possible because ZEISS is incorporating the machine data from HYDAC devices for particle extraction of components into the microscopic reports of the analysis filters investigation- a first for the industry.



„Technical cleanliness is no longer an option, it is an obligation“ stated Werner Renz, Solution Manager Technical Cleanliness, ZEISS Industrial Quality Solutions. And as contamination leads to machine down-time and reduces the working life of systems, the tolerance of solid particle contamination also reduces at an increased rate - not just in the automotive industry. Checks for particulate cleanliness in accordance with VDI part 19.1 or the international standard ISO 16232, has therefore become a fixed component of quality management.

From particulate extraction to analysis

Technical cleanliness is tested indirectly. Contamination is generally extracted from the interior of cases, pumps, valves or pipes. After the extraction of particles from the sample, the complete extraction medium is filtered and the particles deposited on an analysis filter.

The filter is examined under a light microscope to quantify the particle contamination. If a critical level of particles is found, analysis under an electron microscope often follows to define the elemental composition as a way of pinpointing the root cause of the contamination.

Cleaning parameters ensure comparability

However, before the particles can be counted and classified, they must be removed from the component. HYDAC offers a number of different extraction devices for this task. Based on the requirements of the standard VDA Volume 19.1, as well as the company's own specifications, regulations for the analysis of the components are stored in the devices. For example, the volume flow of the test medium as well as the diameter and type of the nozzle with which the liquid is applied to the component are specified.



Correlated analysis across light and Electron microscopy in a seamless integrated workflow

HYDAC extraction machines lead the user step by step through the entire process with software support. A process with which „We achieve the greatest possible amount of particle removal without attacking the material from which the component is made“ explained Thomas Schitteck, Global Coordinator Technical Cleanliness at HYDAC International GmbH. This also ensures that the results are comparable across different operators.

Solutions for the detection of contamination sources

ZEISS offers a number of customized solutions which can be seamlessly combined depending on the requirements. Reflective and non-reflective particles up to a size of 20 micrometers can be counted and classified with the ZEISS SteREO Discovery.V8 which is also capable of identifying fibers. The solution includes a microscope with a digital color camera and image analysis software customized to suit the requirements of the cleanliness testing.

If the particles measure up to five micrometers, ZEISS offers the Axio Zoom.V16. And if particle definition has to extend beyond length and width to include height, according to Renz, the right choice is the ZEISS Axio Imager 2. With the ZEISS solutions users receive reliable, reproducible results regardless of the user who performs the analysis. Correlative particle analyses are also possible and easy with ZEISS. It takes no more than the push of a button to transfer the images of the particles detected with the light microscope to an electron microscope where they are analyzed. „Only with ZEISS instruments is this so easy“ stated Renz. The determination of the material of which the particles are composed is added to information such as number, size distribution, morphology and color gained with the light microscope. Thanks to this in-depth information, more than the cleanliness of the components can be defined. Possible contamination sources, for instance, can be identified and therefore eliminated.

One report for the entire workflow

„With our software we are able to transfer these extraction parameters from the HYDAC systems automatically into the record of the microscopic analysis of the filters“ explained Renz. This will save not only time for the users as they will no longer have to collect information from different systems. In particular, the operating errors of the analysis process will now be apparent earlier, „thus the security for the users is significantly increased,“ according to Schitteck. The collaboration between HYDAC and ZEISS was presented to the public for the first time in October 2019 at parts2clean, the leading international trade fair for industrial parts and surface cleaning. Both Schitteck and Renz remember that reactions were completely favorable. They agree that „customers can be more efficient in their work if they are able to monitor their entire workflow.“ And the two of them are also certain that at present only ZEISS and HYDAC can provide this.

Connected microscopy. Accelerate decision-making.

The ZEISS name has been synonymous with high-quality microscopes for the last 170 years. This experience has generated a unique range of high-performance microscopes that significantly increases the productivity of companies through workflow focus and connected software solutions. Dr. Robert Zarnetta, Head of the Industrial Microscopy Solutions and Roger Landolt who is responsible for software in this area explain the added value in detail.



NEW: ZEISS Industrial Microscopy Series presents digital microscope with extended depth of field in real time.

With ZEISS Visioner 1, ZEISS is launching an innovative digital microscope that for the first time enables all-in-one focus in real time thanks to its Micro-mirror Array Lens System (MALSTM). With its extended depth of field, users in their quality control and quality assurance applications in manufacturing can for the first time see the sample completely in focus without having to combine different focus planes from a series of images or post-process them. This not only simplifies the imaging and documentation process, but also allows for faster inspection and therefore higher throughput.

What relevance does microscopy have in industrial applications?

Dr. Robert Zarnetta: the basic requirements of our customers are image, analyze and connect – in other words acquiring, and analyzing images and then consolidating and using the results. The biggest areas of application for the technology are failure analysis, optical inspection and metrology, but there are also other important areas such as technical cleanliness and metallography as well as the characterization of roughness and topography of surfaces.

What challenges do they bring with them?

Roger Landolt: in industry the image created by the microscope is never an end in itself. The analysis of the image must generate quantitative statements which the development, quality assurance or production areas of a company use for specific purposes. This sometimes can cost a lot of time, particularly if these tasks have to be done by hand. Reproducibility is another important aspect - different users should not have any influence on image acquisition, analysis or measurement results.

What does the ZEISS microscope portfolio offer?

Dr. Robert Zarnetta: our portfolio is unique in that it covers all microscope technologies. The range starts with light microscopy and includes

stereo-microscopy, inverted light microscopy and confocal microscopy. It extends further to include electron microscopy for the nano-meter range. And we are the only company to additionally offer X-ray microscopes with ZEISS Xradia Versa. This enables our customers to inspect and analyze components with high resolution and non-destructively. Finally, our software platform ensures the future-proof connection of all microscope technologies.

What objectives is ZEISS pursuing with connected microscopy?

Dr. Robert Zarnetta: with the unique combination of our broad portfolio and our software platform, we can provide every customer with their ideal tool. This means, for example, that with solutions such as ZEISS ZEN Connect, areas which we identify with a light microscope can be immediately relocated with a high-resolution scanning electron microscope. That may sound trivial but it really isn't. The same component looks significantly different depending on the imaging method. Long searches across different types of microscopes are now superfluous with our correlative microscope solution.

Roger Landolt: and with ZEISS ZEN core, our software and database solution, customers can use a uniform software platform for all industrial microscope solutions. Thus they can operate all their microscopes in the same way, store their data centrally,

process images from everywhere and share the results with people anywhere in the world. With the new release which we are launching at Control, the international trade fair for quality assurance, our customers also obtain a uniform software interface for all ZEISS solutions.

What benefits do customers gain from workflow-oriented solutions?

Dr. Robert Zarnetta: to put it in a nutshell, fast, reproducible and user-independent results. Thanks to our integrated hardware and software solutions our customers can plan their microscope tasks as workflows and allow them to operate automatically with motorized systems. This accelerates the quality process and increases productivity considerably. For standardized microscopy tasks such as technical cleanliness or detecting non-metallic inclusions we offer our customers standard-compliant workflows and equipment as a comprehensive solution.

Roger Landolt: In addition, the connectivity means that users can continue to work on any other computer after the image has been acquired without further strain on the microscope. This increases microscope availability and efficiency. It is possible to save individual workflows as „jobs“ and send them to other staff members even across different locations. This is how to establish a uniform global quality standard.

ZEISS Metrology Portal

Your digital access to all metrological services

All ZEISS services at a glance, with just one access point – that is the ZEISS Metrology Portal. The customer portal offers free access to a wide range of services*, which are constantly being developed and expanded. Register directly at www.portal.zeiss.com and benefit from faster processes, more transparency and simple handling.

www.portal.zeiss.com



Download Center

In the Download Center you can easily download software full versions and updates. Subscribe to the release information to be always up to date. In the documents area you will find operating instructions, installation instructions and more for your ZEISS measuring systems.



License Manager

Activate software licenses online with just a few clicks. With a valid software maintenance agreement, you can request the license information to update your software.



My Systems

All systems at a glance: Retrieve and manage your system and software-related information with the free entry-level solution. Additional functions are available for customers with a software maintenance contract.



Academy Metrology

Further training made easy. Simply book training or eLearnings online or benefit from our free video tutorials.



Services Requests

Create a service ticket directly online. This guarantees an uncomplicated and quick solution to your service request.



Community

Become part of the ZEISS #measuring-hero community and exchange experiences and questions with other experts.



Metrology Shop

Just grab it online. ZEISS styli, metrology accessories & trainings at a click. Find and order more than 6,000 products in the ZEISS Metrology Shop.



Center Finder

Find the nearest ZEISS Quality Excellence Center, find out about measurement services and receive direct support for your measurement tasks.



My Voice

Do you have ideas how we can improve our software? Share your ideas, discuss with other users and vote for the best suggestions.



PiWeb Cloud

With PiWeb Cloud, you can store your measurement data easily and securely and analyze them from anywhere. Configure and manage your PiWeb Cloud subscription online - 90 days free trial.

Establish quality standards with standardized knowledge across the globe

Festo relies globally on training from and with ZEISS in measuring and testing technology

In Esslingen, Baden-Württemberg, Festo SE & Co KG develops automation technology that is in demand worldwide. However, Festo's technology is not the only technology used by manufacturing companies around the globe. Festo knows how to communicate skills in the best way and sets high standards in the development and further training of its own employees. Festo and ZEISS have been jointly developing global training standards for uniform measurement technology know-how for more than three decades. These are incorporated into the training portfolio of the ZEISS Academy.

With the basic knowledge, I can much better understand the requirements of measurement technology and the daily challenges of my colleagues from the operative area.

Juliane Westermann



Experience shows that learning success is 30 to 50 percent higher if people can learn in their own language.

Horst Lang



"Festo is a company built on learning," emphasizes Horst Lang, Head of Global Operative Production Quality at Festo. "We can only maintain our high innovation speed with people who are curious and who enjoy learning new things all the time". In Mr. Lang's field of business worldwide standards for measuring and testing technology are developed, and a qualification matrix provides the framework for what employees should know and be able to do and what they still have to learn. The goal: a balanced level of knowledge with regard to measurement technology. "All over the world, our customers have the same expectations of the quality of our products," Mr. Lang knows. To ensure that this is right, measuring and testing technology must go hand in hand with production, as is the case at the plants in Germany, Hungary, China and the other global plants. However, it is not enough to have a perfect command of the measuring equipment and software. "My people must be able to communicate with the production employees of our plants at eye level. If there are discrepancies in knowledge here, it costs a lot of money."

Comprehensive training increases competence

Almost all ZEISS measuring solutions are in use at Festo: the future-proof computed tomography system ZEISS METROTOM 1500 or high-end machines like the ZEISS XENOS. Festo has relied on ZEISS for more than 30 years, both in terms of technology and training, worldwide. Like Festo, ZEISS is also internationally positioned - an important prerequisite for meeting Festo's training requirements. The topics of the measurement technology training courses are wide-ranging: from basics,

application and software updates to special topics such as geometric product specifications. This is also confirmed by András Kunt, Head of Quality & EHS+Facility at the Hungarian plant: "It is particularly effective that the training courses not only cover the programming of the machines, but also include all elements of measurement technology. I am not only proud that we work with the best systems in quality assurance, but also that we can benefit from a high and uniform training standard". Festo also attaches great importance to training in the respective national language. "Experience shows that learning success is 30 to 50 percent higher if people can learn in their own language," says Lang. "And to my knowledge, only ZEISS can reflect this diversity."

Individual learning paths to success

basics of coordinate measuring technology and also attend technology trainings from ZEISS. The employees follow an individual learning path, depending on their level of training and knowledge. The training courses, which last several days, take place at the nearest ZEISS Quality Excellence Center. ZEISS trainers, on the other hand, come to the Festo factories for the device- and software-specific training courses. Here, they practice directly on Festo components.

Employees have to look beyond the horizon

Horst Lang knows from decades of experience how important the role of measuring and testing technology is for production and process optimization - and how important their smooth interaction and communication is. This starts in his own department, which

consists of measurement technicians, programmers, engineers and data specialists. This is where many people with very different knowledge background and tasks come together. One of them is Juliane Westermann, a project engineer responsible for quality software and statistical calculations and analyses. "When I evaluate the results from measurement technology, I know where the problems lie in quality assurance," says Westermann. "In order to be able to discuss and solve them, it is important that I can communicate with the measurement engineers and programmers at eye level". The AUKOM training is therefore not only relevant for measurement technicians and quality managers. "With the basic knowledge, I can much better understand the requirements of measurement technology and the daily challenges of my colleagues from the operative area." This is exactly what Lang attaches great importance to: "Employees have to look beyond their own point of view in order to see the big picture and be able to do their part. The task of companies is to enable their employees to master challenges - technology alone cannot do this. ZEISS is an important partner for us in order to be able to meet this requirement."

Race of the future

Energy paired with emotion

Audi Sport ABT Schaeffler is again one of the title favorites in the ABB FIA Formula E Championship, now in its sixth season, perhaps in part thanks to the technology partnership with ZEISS. The first purely electric racing series in the world places completely new demands on measurement technology.



The automotive industry is undergoing radical shifts towards electric solutions. Emobility has found its way into motor racing. Formula E has become a crowd puller and a real competitor to Formula 1. Tight city circuits, unique interaction with the audience and sophisticated techniques with the attack mode - this is how motorsport can look like in the 21st century. The competition is more intense in the electric racing series with even more manufacturers than in classic motorsport. Right in the middle of it and team of the first hour: Audi Sport ABT Schaeffler. When the two drivers Lucas di Grassi and Daniel Abt go out onto the track, ZEISS accompanies them during the race. The racing team relies on ZEISS metrology expertise and know-how to meet the extreme quality and safety requirements.

To the top places with passion, stamina and team spirit

In addition to standard parts, the racing series also includes some in-house developments such as the drive train or various chassis parts. Alongside the driving style, it is precisely these parts - and their perfect quality - that ultimately make the decisive difference in the battle for tenths of a second. Before a car goes on the racetrack, the performance and safety-critical parts are tested at the ZEISS Quality Excellence Center in Neuburg an der Donau. ZEISS has been measuring parts for Audi's DTM cars since 2012. After Audi Motorsport took over sole responsibility for the Formula E racing team from the tuning company ABT in the 2017/18 season, more and more parts of the electric racing cars such as drive shafts, pressure plates and planet carriers are now also coming to the center.



"Sometimes we get a delivery on Friday afternoon with parts fresh from the test track, which must then be measured by Monday morning," says Carsten Gericke, Head of the ZEISS Quality Excellence Center. Both speed and precision are important in the race and in quality assurance. "The ZEISS team has a similar timing to our team," says Xaver Kraus. "Each individual brings a great deal of passion, stamina and team spirit to the race."

To the limits of what is possible

How extreme the quality requirements in Formula E are is shown by the example of the drive shaft. It carries the enormous torque of the electric motor from the gearbox to the wheel carrier. If the shaft is out of tolerance by only a few micrometers, high forces are generated which can tear the shaft apart. "That would be dramatic," warns Kraus, "because victory is not the only thing important to us. Our top priority is the safety of the driver." The drive shafts are among the parts that ZEISS intensively inspects during initial inspection, kilometer inspection or crash testing. The experts at ZEISS went to the limits of what is physically possible, praises Kraus. For Kraus, ZEISS is not just a service provider. "Technical development in motorsport is proceeding at a rapid pace, so we need

a trustworthy technology partner at eye level." The demands on the testing technology for Formula E will continue to increase. In the future, more and more technologies will be used, such as industrial computed tomography to detect blowholes in the casting or broken soldering that occur during vibrations. For example, there have been isolated failures of oil pressure sensors. The ZEISS METROTOM 1500 industrial computed tomography system made cavities and cracks in the materials visible, whereupon the supplier could repair the defects. "The experts at ZEISS bring a wealth of experience to the table and support us in interpreting the scans."

Lived technology partnership

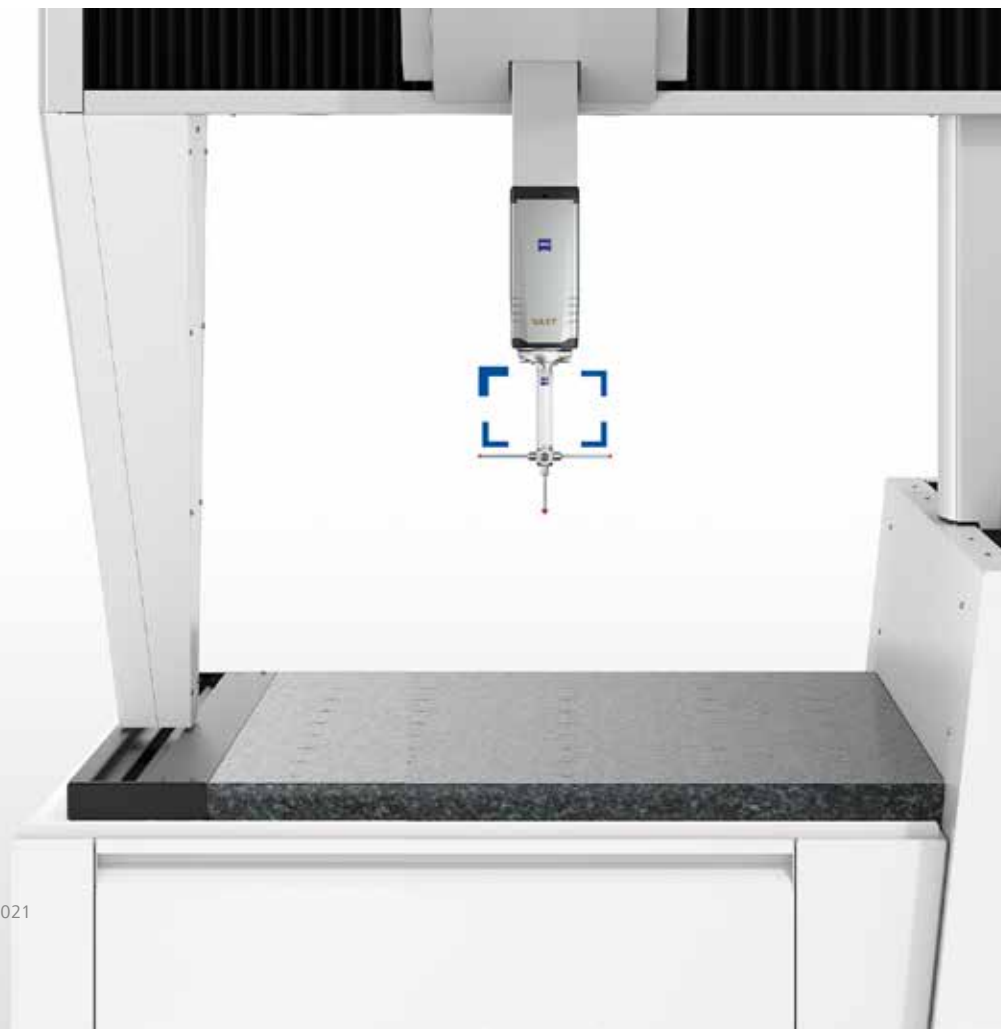
Carsten Gericke's team organizes an annual Technology Day especially for Audi Motorsport and invites experts from the headquarters to inform about the latest technologies. This year, the team is devoting itself to the key topic of electric mobility. The exchange between the motorsport team and the developers of production cars for the road has always been lively. "Technology is changing rapidly. Therefore, a strategic exchange with technology partners is of great importance".

Small Part. Big Accuracy Impact.

ZEISS REACH CFX carbon fiber extensions for every accuracy requirement

ZEISS has discontinued the sale of stylus extensions made of aluminum and titanium. This is because these can impair the accuracy of the measurement results. To ensure that customers can rely on the accuracy of their coordinate measuring machines without any worries, ZEISS now offers stylus extensions made of carbon fiber only with the ZEISS REACH CFX extension portfolio - precisely tailored to any accuracy requirement.

Almost 15 years ago, ZEISS was one of the first companies to recognize the opportunities offered by carbon fiber technology for metrology and launched ZEISS ThermoFit, the first carbon fiber stylus extension on the market. Although the advantages of such extensions are therefore generally known, "they are unfortunately not as present in everyday metrology as they should be," emphasizes Jörg Eßwein, Business Development Manager for the Field of Business Accessories of ZEISS Industrial Quality Solutions. And this has consequences. Valuable measuring time is wasted when using extensions made of aluminum. Because of the high weight of these extensions,



only simple probe systems can be used. With the lightweight carbon fiber extensions, on the other hand, more complex probe systems can be constructed without losing valuable time when measuring complex parts. And since metrology is also moving closer and closer to production, there is one more point in favor of carbon fiber extensions - they do not expand under the influence of heat. The clever material pairing of ZEISS extensions almost completely compensates for the heat influence on the measurement result. This means that regardless of whether users measure in the measuring lab or in production, with carbon you are always on the safe side.

For a reduced overall measurement uncertainty

In order to be able to meet the different performance requirements of its customers, ZEISS has now developed the new ZEISS REACH CFX portfolio, which offers two new carbon fiber extensions in addition to the existing ZEISS ThermoFit extensions. This means that users now have a total of three variants to choose from, which have been adapted to the individual accuracy classes of different coordinate measuring machines. The different accuracy levels of the individual solutions CFX 1, CFX 3 and CFX 5 is achieved by using a variety of carbon fibers. These have varying degrees of tensile strength, which influences the

stiffness of extensions. All extensions of the new portfolio are far superior to those made of aluminum and titanium in this respect. A great advantage for the user, because increased stiffness of the extension reduces the measurement uncertainty of the entire system.

The right extension for every requirement

The newly developed ZEISS REACH CFX 1 extensions offer a cost-efficient introduction to carbon fiber technology and a significant performance upgrade compared to aluminum and titanium extensions. It is approximately 40 percent stiffer than, for example, an extension made of titanium and thus offers significantly more stable measurement results.

Results are even more reliable - even at high scanning speeds - when the ZEISS REACH CFX 3 probe extension is used. The further 30 percent increase in stiffness compared to CFX 1 is particularly advantageous when high accuracy requirements are to be met by the measurement result. Many customers already know this version under the name ZEISS ThermoFit. "With the name change, we are now integrating ThermoFit into the new portfolio and making it clear to customers that we have the right carbon probe extension for every accuracy requirement". The third stylus extension in the



portfolio is ZEISS REACH CFX 5 - for extreme demands on the precision of measurement results. This precision is achieved by using a high-end carbon fiber that increases rigidity by a further 30% compared to CFX 3.

For Eßwein, the decision to remove aluminum and titanium extensions from the portfolio is only logical and absolutely in the interest of customers. Working with aluminum and titanium extensions therefore means that the potential of the coordinate measuring machine is not fully realized. In all relevant aspects, such as weight, temperature stability and stiffness, the extensions in the ZEISS REACH CFX portfolio are far superior to those made of aluminum and titanium, making them the best choice for ensuring the best possible measuring accuracy.



Gold for the Newcomers

A Chinese College is Training Future Engineers on ZEISS Machines

No one believed that Guangdong Machinery Technical College was capable of bringing home a gold medal in the WorldSkills Games, also known as the Skills Olympics, in CNC milling. But the future engineers beat out the competition during their very first attendance. Their training program was developed in part by ZEISS.

FENG Weiyun opens a display case containing medals. Four gold medals, one silver medal and one bronze – the results from two WorldSkills Games. The president of Guangdong Machinery Technical College smiles: “The first one! Yes, the first gold medal. That was a sensation.” He then tells a remarkable story. “The 43rd WorldSkills Games in 2015 in Sao Paulo, Brazil, was our first

time participating in the event. We came in first place in the challenging discipline of CNC milling. Gold on our first try, without any prior experience. We could hardly believe it.” The other teams could hardly believe it either. Guangdong Machinery Technical College’s results were called into question by the other participants, and an independent investigation was



requested. The organizing committee then had the parts sent to a London-based lab for testing. The verdict? Everything was correct. Gold for China. The training school is now the top WorldSkills team in China, having won more medals than any other participant. And this is in no small way thanks to ZEISS.

Promoting talent at the highest level

How could China, a newcomer to the event, beat out the world’s elite teams? To FENG, the answer to the question everyone was asking is simple: “We train our talent in a special program which was developed together with ZEISS, and we perform inspections using ZEISS measuring machines. Then we send our best students to WorldSkills.” The precision experts from Germany first attracted the attention of the college at an international trade show for tooling machines in 2013. Since the Chinese government is placing increasing emphasis on the training of highly skilled workers, schools and technical colleges have been expected to collaborate with leading companies. “With this goal in mind, we began looking for suitable partners. And we

found ZEISS.” Together, they founded the ZEISS Demonstration Education and Training Base for Industrial Measurement Application in 2015. The program is very popular with students because it combines theory and practice on high-tech machines, says FENG. ZEISS not only helped develop the training concept, but also provided the simulation software and measuring machines used every day for training.

Winning demands precision measurement

The members of the WorldSkills team always await the measurement results of their work with particular suspense. As the “top athletes” at the training school, they are competing for each and every micrometer. For the college, the particular value of the ZEISS CONTURA G2, ZEISS O-INSPECT and ZEISS DuraMax is that they can be easily programmed to accurately and reliably measure finely structured individual parts. Each week, around 300 student jobs are thoroughly analyzed, the results of which are then sent to the students. This gives them a clear picture of how they are performing and where they need to improve, to give them the passion to turn shortcomings into mastery.

With this goal in mind, we began looking for suitable partners. And we found ZEISS.

FENG Weiyun

Training inspired by Germany

China is changing. High-tech and highly skilled workers have become a point of interest for the government. “We are currently considering putting a German-style dual training model in place. We would like to combine the training program familiar to us in China with the talent training program developed for us by ZEISS. In this sense, we are looking forward to working more closely with ZEISS in the future to produce more highly skilled labor for China.” FENG says he certainly would not mind winning additional gold medals at the WorldSkills games either.



WorldSkills

WorldSkills is an organization comprised of 82 member organizations which seeks to change the lives of young people through the learning of vocational skills. The organization describes itself as a global hub for skills excellence and development. WorldSkills organizes conferences and, every two years, the WorldSkills Games, an Olympic Games-style competition in which young people pit their vocational skills against one another in a variety of disciplines.

More information: <https://worldskills.org/>

#HandsOnMetrology



This new platform is the go-to for 3D scanning novices

#HandsOnMetrology is our new 3D scanning network and the go-to for everything users always wanted to know about 3D scanning. The platform supports a global community of designers, tech geeks, engineers, scientists and specialists in improving their quality processes. From video instructions to advanced tutorials and expert hacks: HandsOnMetrology.com provides you with the necessary tools to deliver and use excellent 3D scans.



A hands-on approach to learning

The platform provides answers to typical questions from our users such as: "How do I set up and operate my system?" or "Which measurands can I cover?". Users will find step-by-step instructions, tips and tricks as well as video instructions for the GOM Inspect Suite inspection software.

Metrology inspiration and insight

From quality control of first articles and individual 3D-printed components through to reverse engineering for classic cars, the applications of optical 3D measurement technology know no bounds. Real makers talk about their passion in personal video clips. That's what #HandsOnMetrology is about: inspiration from makers for makers in all manufacturing fields.

Get your hands on the latest tech

#HandsOnMetrology focuses on new-to-the-market 3D scanners by GOM and ZEISS—naturally as "full package" with the GOM Inspect Suite software inside. It walks users through the entire workflow from 3D scanning to the evaluation and the inspection report.



GOM ATOS Q

The precise, flexible and yet compact 3D scanner offers whatever you might need for complex inspection tasks—plus the powerful GOM software. Equipped with interchangeable lenses and various resolutions, it is ideal to capture small to medium-sized parts.



ZEISS T-SCAN hawk

Designed to capture data wherever it is needed, the portable, hand-held 3D laser scanner is ready to start in no time. With its compact, lightweight design, it is particularly suitable for confined spaces and hard-to-reach areas.



ZEISS T-SCAN

The T-SCAN is another hand-held system that delivers a highly precise 3D metrology solution for intuitive 3D data acquisition. Its modular all-in-one concept offers maximum flexibility for a large variety of applications and surfaces.

The next small thing

New GOM Scan 1

GOM Scan 1 is here to open up new possibilities. Industrial standards such as GOM's fringe projection technology and Blue Light Technology deliver the foundation for detailed and accurate 3D meshes. Meanwhile, the integrated GOM Inspect Suite software helps you apply the mesh to any project you want: 3D printing, reverse engineering or part inspection. So, go ahead and start something big!

A small 3D scanner for precise meshes and big ideas

GOM Scan 1 is powerful, amazingly simple to operate and very accurate indeed. GOM Scan 1 features a compact shape filled with advanced technologies. From GOM's Blue Light Technology to the stereo camera principle, this sensor is built to deliver 3D data with high precision. The lightweight sensor is a specialist for simple and quick measurements of small parts – even in confined spaces. Meanwhile, the pre-installed GOM Inspect Suite software takes meshes to the next level, supporting you to get your 3D data easily and fast.

A precise fringe projection scanner with true benefits

GOM Scan 1 is an optical 3D fringe projection scanner with Blue Light Technology. It captures the complete surface of components with narrow-band blue light within a short measuring

time – recorded by two cameras that work based on GOM's stereo camera principle.

Prepare to print with intelligent mesh editing

The pre-installed GOM Inspect Suite enables you to smooth, thin and refine polygon meshes, fill holes or extract curvature lines, achieving very accurate meshes that can be saved in many common formats. The best part: our smart polygonization. It creates a mesh with highest detail while keeping the mesh size easy to handle.

Choose your measuring volume

Different applications have different requirements: GOM Scan 1 is available with three measuring volumes. Whether you decide on the 100, 200 or 400 mm field of view, you can always rely on high-precision measurements for small to medium-sized objects.

Capture and create your ideas

The new GOM Scan 1 sensor in combination with GOM Inspect Suite supports tasks such as 3D printing, 3D visualization and reverse engineering. It captures high-quality data in a short amount of time, while the powerful mesh editing functions make it easy to reproduce parts, create precise 3D models or develop new products. Whatever your idea may be, GOM Scan 1 meets the design and industrial standards to make it happen.

A system to support your entire workflow

GOM Scan 1 with GOM Inspect Suite supports you to get more accurate and comprehensive measurement results and makes 3D part inspection effortless. Import and align CAD and mesh files, create surface comparisons, dimensional inspections and generate reports – easily and efficiently.

The next small thing – GOM Scan 1

The new GOM Scan 1 sensor opens up new possibilities. The compact and mobile 3D scanner is an easy-to-use solution to digitally capture objects and achieve precise 3D meshes for applications such as 3D printing, reverse engineering and dimensional inspection. GOM Scan 1 features a compact shape filled with advanced technologies and is a specialist for simple and quick measurements of small parts – even in confined spaces. Meanwhile, the pre-installed GOM Inspect Suite supports you to capture your 3D data easily and fast. GOM Scan 1 is available with three different measuring volumes: 100, 200 and 400 mm field of view.

Versatile, precise, compact – ATOS Q

A powerful all-in-one package with high-performance software, precise optoelectronics and adaptable usage.

It's here: The portable system for complex measurement and inspection tasks: GOM's ATOS Q is a flexible, versatile, compact 3D scanner – an impressive system with easy operation and powerful GOM Inspect software.



Featuring precise optoelectronics, a robust sensor design and a powerful software, ATOS sensors are applied in nearly all industries. ATOS Q merges technology, performance and design into a versatile, robust and compact system with genuine ATOS DNA. With the GOM Inspect software inside, ATOS Q is an all-in-one solution that masters all jobs: It encompasses the entire workflow, from data acquisition and inspection to reporting. The system also meets high metrological demands and is portable due to its compact, lightweight design.

ATOS performance for product quality

ATOS Q captures in-depth product quality information at high speed and creates a data basis for tailored analyses. ATOS 3D sensors have been custom-built to meet the metrological requirements in industry and to deliver absolutely accurate and traceable measuring results — even under harsh conditions. Their full-field 3D scans visualize errors and defects on components and tools, thus allowing for thorough process and quality controls where users can remedy

defects and optimize processes at an early stage. Diverse industries use ATOS Q to measure small to medium-sized parts, e.g., in additive manufacturing and plastics processing and during casting and forging or metal forming. Users can choose between five precision lenses to cover varying measuring areas. The fixed camera position makes it very easy to switch from the smallest to the largest measuring volume.



Brilliant in every mode

The compact ATOS Q solves complex measurement and inspection tasks — be it in a manual, semiautomated or in a fully automated mode with the GOM ScanCobot or in the ATOS ScanBox 4105. All options are reliable and comfortable because the software walks users safely through the entire workflow.

Manual mode: The lightweight and compact ATOS Q is just 4 kg and can be easily maneuvered. It can be set up on a tripod in the measuring room or directly on the shop floor.

Semiautomated mode: The ATOS Q also works in a semiautomated mode. Simply place it on a tripod or desk stand and combine it with a GOM ROT 350 rotation table or a Motorization Kit.

Automated mode: GOM's ScanCobot delivers high-precision, automated measurements and speeds up development for small and medium-sized parts. ATOS Q inside the ATOS ScanBox 4105 ensures quality control with high throughputs in series production — a powerful duo for more efficiency.

The Superlative in Measuring Technology

Swiss Manufacturer of Water Fittings Improves Quality with ZEISS T-SCAN

The faucets from Franke Water Systems KWC meet the standards of discerning customers. The quality team headed by Agim Emini ensures top quality with the ZEISS T-SCAN handheld laser scanner, which also accelerates processes, reduces costs and simplifies the documentation of measurement results.



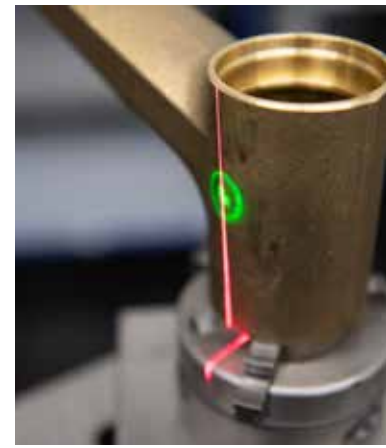
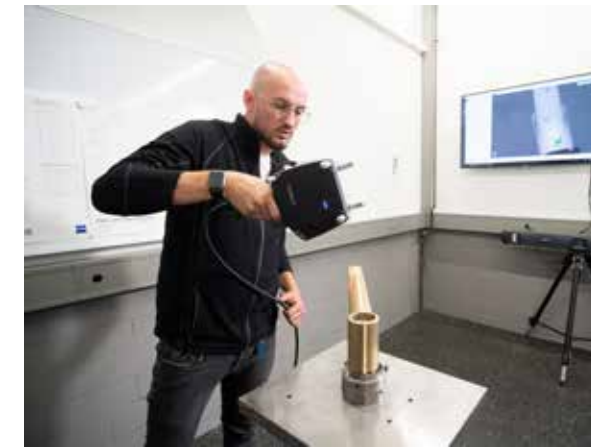
The massive metal jaws close and lower themselves over a hissing blue flame. Shortly thereafter, smoke rises: brass heated to 1000 °C shoots into the cavity of the mold and solidifies. Seconds later, the tool opens and releases a rough piece of metal with a golden shimmer that falls smoldering into a basket. Extensive knowledge of all the processing steps is required to ensure

that the metamorphosis from brass ingots to premium faucets proceeds smoothly and with precision. And one more thing is needed as well: ZEISS T-SCAN.

One system for every measuring task

In the measuring lab, Agim Emini shows how the flexible, handheld laser scanner

makes his work easier. The head of quality at KWC walks around the cast blank of a faucet and aims the laser beam of the ZEISS T-SCAN at it. "The measurement takes only a quarter of the time compared to inspection on a coordinate measuring machine," enthuses Emini. The 32-year-old and his six-member team inspect the raw castings with



particular care, "as defects in casting cause exponentially higher costs with every step in the value creation chain." After each series of 200 to 2000 cast parts, the inspection of a part with the ZEISS T-SCAN is obligatory for the top-selling cast parts. Samples are taken as well. For a more detailed analysis, the operator imports the generated measurement data into the ZEISS CALYPSO software, which checks the dimensional, form and positional tolerances. Reporting and statistical data analysis are then completed in ZEISS PiWeb.

Costs for scrap and rework in the foundry down by 20%

The objective was to reduce rework costs by 20 percent with ZEISS T-SCAN. This goal was achieved with reliable measurements and continuous, easily understandable reporting. But Emini wants to lower the scrap rate and rework costs still further. The team reviews the scrap statistics every two weeks, discussing what can be done to optimize the defects in the corresponding areas. ZEISS T-SCAN provides the reliable base data and



documents success based on the geometry and form of the parts.

Intuitive inspection and analysis

Emini demonstrates just how intuitive the measurements are on an already ground and polished cast part. With just a few clicks, the ZEISS colin3D software is ready to work. When the start button is pushed, ZEISS T-SCAN reads in the three-dimensional position of millions of surface points despite reflections on the difficult surface texture. A false-color comparison immediately shows whether the cast part is within tolerance and whether the part is over or undersized. With just a few mouse clicks, he generates a report for the coordination with the surface processing department. "It doesn't get any more intuitive than that," comments Emini.

Data for the final grinding

It was precisely this intuitive reporting which proved extremely useful in the introduction of an automated grinding and polishing machine, which removes the need for manual grinding and polishing. Now, the parts are clamped to robots which automatically work them down to the correct dimensions on rapidly rotating grinding belts. Thanks to continuous measurement with ZEISS T-SCAN and constant adjustment of the grinding parameters, the robots now work both precisely and very quickly. Because the company's own capacity still doesn't always suffice, part of the grinding work is outsourced to smaller firms. Then ZEISS T-SCAN is used for quality assurance during the incoming goods inspection.

ZEISS T-SCAN was only the beginning

The quality team recently purchased the ZEISS Smartzoom digital microscope. "We use the microscope to look for defects in the metal structure that are not visible or difficult to see with the naked eye," explains Michael Wage, Head of Surfaces at KWC, who is satisfied – if not downright impressed – by the microscope's performance. Reto Wirth, Head of ZEISS Industrial Quality Solutions in Switzerland, will presumably not have to wait long for the next order from Agim Emini, who is already planning to get rid of two older coordinate measuring machines and replace them with a ZEISS CONTURA. For Emini there is no alternative: "For me ZEISS is the absolute superlative in measuring technology."



When vision meets Decision

Visual Inspection – Inline Defect Detection

For many parts in industrial production, a surface is created by many process steps: casting or forming, machining, grinding, polishing, painting, finishing, and coating of different materials. Each step requires feedback and quality control.

Thousands of components and products made for automotive, aerospace, medical, and consumer electronics have specific demands on proper surface quality, both for cosmetic and functional purposes. From a cosmetic perspective, how something appears or feels to a customer affects its value and its overall quality. This impacts the way a customer looks at your brand, reputation and quality. Many components also rely functionally on the quality of the surface. Defects can affect part performance and reliability.

ZEISS SurfMax offers a reliable high-speed inline solution for visual inspection of all types of surfaces. Material finishes and coatings from matte to high polish and from opaque to transparent may be evaluated.

The SurfMax images surfaces in multiple channels: greyscale, gloss, and slope, which allow minute defects to be identified and differentiated. The SurfMax software not only identifies and categorizes these anomalies, but has the ability to determine the severity of the defect by means of production defined sensitivity settings. This allows SurfMax to distinguish the difference between real defects and acceptable surface

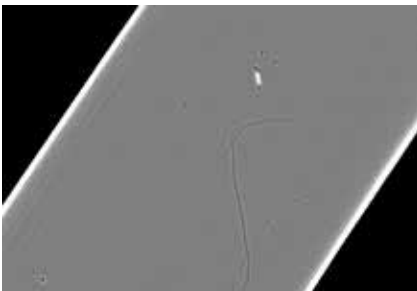
anomalies to eliminate overkill and escapes. Through tailored algorithms and machine learning, SurfMax has changed visual inspection from a subjective art into a predictable science.



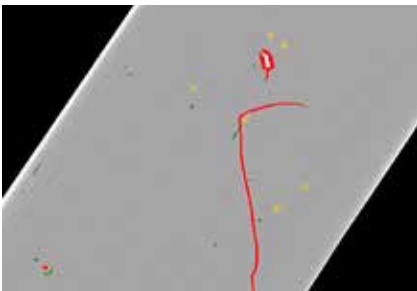
Grayscale: It provides information related to changes in white light reflectivity and highlights defects such as discoloration and dot imperfections, as well as part contours.



Gloss: It provides detailed information on the level of gloss and highlights defects such as scratch, texture nonuniformity, residue and even fingerprints, based on how much light scattering is observed.



Slope: It provides consistent evaluation of surface topography and form at localized regions and highlights defects including dents, deep scratches, orange peel and other form- and shape-related errors.



Final Classification: detected surfaces and severity classification



Reporting and Statistical Analysis with ZEISS PiWeb
By creating a digital library of defects, SurfMax offers 100% traceability and the opportunity to identify trends in the manufacturing process. ZEISS PiWeb allows the user to plot and view defect images and classification on the CAD model.



Specific defects may be isolated during batch run analysis to detect and correct patterns in the production process.

High-Precision Work, One Layer at a Time

MBFZ toolcraft GmbH uses ZEISS 3D ManuFACT to ensure end-to-end quality assurance in additive manufacturing

MBFZ toolcraft GmbH, located in Georgensgmünd in Germany's Franconia region, has been manufacturing high-end precision parts for aerospace and other industries since 2011. One of the ways they do this is with 3D printing, an established yet young production technology which presents a number of challenges for quality assurance. toolcraft is meeting these challenges with the help of ZEISS 3D ManuFACT, the only solution available on the market capable of providing consistent quality assurance for additive manufacturing.

High temperatures, noise and the smell of oil go with industrial manufacturing like yin goes with yang. But in toolcraft's glass production hall, this is no longer the case. Upon presenting their employee IDs at the entrance and stepping into the facility, workers are met with the sound of – nothing. Through small windows on each of the twelve 3D printers, however, one can

observe laser beams fusing layer after layer of metal powder in a dazzling dance of light.

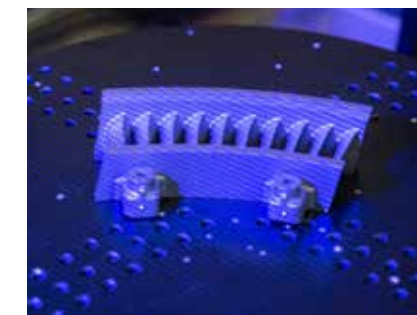
The uncharted territory of quality assurance

Whenever new technologies dominate markets, they bring many question marks with them. One of these question marks is quality assurance. Jens Heyder



points to a monitor showing two images captured with the ZEISS Axio Imager light microscope and enlarged to 50 times normal size. The image on the left shows a cut from a good component. The image on the right, however, contains cavities and weld defects.

"Under high levels of stress, this could result in cracks," warns Heyder, who has been working as a materials technician in toolcraft's materials lab for three years. The materials lab, however, is just one component of toolcraft's end-to-end quality assurance process.



Inspections are performed after each process step. And the machines used for this all bear the blue ZEISS logo: a ZEISS Axio Imager and a ZEISS Axio Zoom.V16 microscope; a ZEISS ACCURA, a ZEISS CONTURA and a ZEISS DuraMax coordinate measuring machine; and an optical 3D scanner.

Complete and consistent data

"ZEISS is the only company that provides metrological technology for the entire additive manufacturing process chain with complete and consistent data," explains Christoph Hauck, one of the company's three managing directors. The 42-year-old first came into contact with additive manufacturing at toolcraft in 2005. In those days, the technology was "still very much in need of improvement" and was suitable only for use in prototypes. Today things have changed. toolcraft's components meet

the strict requirements of the aerospace and medical technology industries, and they perform and hold up just as well as traditionally manufactured parts.

The manufacture and application of these components is also more efficient, as demonstrated by a 3D-printed stator guide vane which guides the flow of gas through a stationary gas turbine.

The curved shape of the blades are optimized using complex simulations and are barely manufacturable with reasonable amounts of traditional machining.

To scan complex blade geometries such as these, "we used the Blade software module from ZEISS," says Markus Miehling, head of quality assurance. With the 3D scanner Miehling is able to get a quick overview of the blade package.

Quality assurance in additive manufacturing is largely uncharted

territory. As such, toolcraft's materials experts have created their own method for determining the grain size distribution and structure of metal powder. The powder is mixed with an epoxy resin, and the hardened samples are then partially ground and put under a ZEISS Axio Zoom.V16 microscope for inspection.

Final tactile inspections

3D-printed parts also require special treatment when it comes to tactile measurements. Since the parts are too raw to be scanned when they come out of the printer, the probe is used to measure individual points instead of tactile scanning the entire component surface.

If the part is fine, it is sent to the machining specialists so that threads can be drilled in, radii can be optimized and the surfaces can be "finished" using traditional machining methods. Now, when the component is measured again on the ZEISS ACCURA, a scanning tactile probe can be used. This coordinate measuring machine is outfitted with ZEISS' mass technology, which enables the operator to quickly switch between different sensors, including an optical single-line sensor.

toolcraft already uses many devices in the ZEISS 3D ManuFACT portfolio, but their arsenal does not yet include a scanning electron microscope or a computed tomography scanner. They do not know what devices they will purchase in the future, says Christoph Hauck, but they are sure they will be from ZEISS. "Quality assurance is a major challenge in additive manufacturing, and it's good to know that we have an experienced partner like ZEISS on our side."



Intelligent software solutions increase efficiency

Data is the fuel of the modern world. In order to fully realize your potential in the pursuit of increased productivity and efficiency, three factors in particular are crucial: companies need to collect the right data and ensure a seamless transfer of information across the entire value creation chain so that ultimately this can be properly correlated and analyzed. Christoph Grieser, Head of BU Software & Quality Intelligence Industrial Quality Solutions, explains in this interview how ZEISS companies are supporting this endeavor.

Networking is the major challenge in manufacturing. What contribution can ZEISS make in this area?

Thanks to our experience with quality assurance, we are very familiar with the automotive, aerospace and medical technology industries. We know what companies need in order to operate efficiently – beyond metrology as well.

The “quality intelligence” solutions that we’ve developed are therefore easy to use, provide maximum benefits for users and are easy to find – e.g. via the ZEISS Metrology Portal. Long-term it’ll be the central touchpoint from which all important information can be retrieved. This gives the customer an overview of machines, software and history, and we’re able to respond faster as in an ideal situation, we can view all relevant data.



Our hardware systems and software solutions are configured to work together seamlessly so that our users can make the best use of their quality data and convert this information into productivity.

Christoph Grieser,
Head of BU Software & Quality Intelligence Industrial Quality Solutions



You’ve mentioned the term “quality intelligence”. What do you mean by this?

As experts in metrology and quality assurance, the first thing we see of course is measurement data. To prevent quality problems, however, the entire value chain must be considered. Our objective, therefore, is to link the quality data to all the relevant manufacturing data. “Quality intelligence” means allowing data to flow seamlessly and to be analyzed logically. The test plan dynamization example demonstrates the specific benefits that this entails. Here you can determine using statistical calculations which inspection characteristics are actually critical or relevant for a component and require closer monitoring than others. This knowledge allows us to dynamize the sample size and saves companies unnecessary measurement efforts going forward.

What solutions are part of the “quality intelligence” portfolio?

The central “quality intelligence” solutions are ZEISS PiWeb, ZEISS GUARDUS and the ZEISS Smart Services Suite. ZEISS PiWeb – I call it the “PowerPoint of Metrology” – visualizes quality in production clearly and concisely. Within the past year we’ve also launched the ZEISS PiWeb App so that users can check their measurement data at any time from their mobile device. New to the market is the ZEISS PiWeb cloud solution, the first

subscription-based solution in this field. It saves IT resources in the company and also enables supplier data to be fed into the system. In this way you know the quality of the delivery from the outset, which allows the customer to take countermeasures if necessary. The Manufacturing Execution System (MES) ZEISS GUARDUS brings all production data and systems together on one platform and creates the necessary transparency to identify critical factors in production, ideally before they have a chance to develop. And since service makes the difference, the ZEISS Smart Services Suite is also part of the Quality Intelligence portfolio. It is still in development at the moment, but customers have been making the most of our ZEISS Smart Services Starter Kit since last year. This allows data from connected measuring machines to be transferred and viewed on mobile devices, service tickets to be processed and/or remote service technicians to be requested 24/7. In addition to the CMM data, we also expect to be able to collect application data this year.

How do the various ZEISS systems connect to each other and how do you create a bridge to the other manufacturing systems?

Our hardware systems and software solutions are configured to work together seamlessly so that our users can make the best use of their quality data and convert this information into productivity. The measurement data therefore flows from the machine

via the application software ZEISS CALYPSO into ZEISS PiWeb. The reports generated not only provide individual values, they also shed light on the level of quality in the individual production lines. Measurement data is saved centrally in the cloud via ZEISS Smart Services’ connectivity solution, enabling targeted use in the event of maintenance work or disruptions. ZEISS GUARDUS meanwhile operates at a higher level. Here we bring the quality data into the context of the entire manufacturing process by correlating this information with data from each individual link in the value chain. Only then can companies make the right decisions in order to accelerate processes and reduce costs.

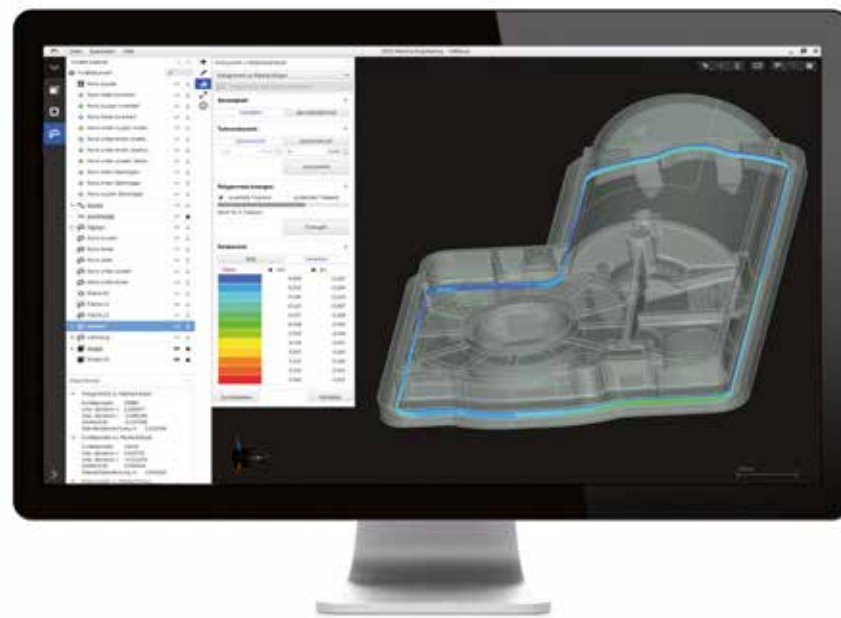
How do you further advance the topic of “quality intelligence”?

We already offer some sophisticated solutions. Nevertheless, we’ll continue to push innovation and aim to react flexibly to customer requirements, so that we can rapidly develop further high-performance solutions in the future, too. Because the customer and their success is central to everything we do, our future solutions will also be accessible, highly-customized and easy to integrate in accordance with customer needs.

A faster way to the perfect injection molding tool

ZEISS software halves the amount of iteration loops

In the plastics industry five to ten tool adjustments are still the rule rather than the exception on the way to the perfect injection molding tool. This represents time, expenditure and effort which companies can reduce by at least 50% with the ZEISS REVERSE ENGINEERING (ZRE) software. An advantage which reduces not only the development costs. It particularly opens up the possibility for companies to start production at a much earlier date.



Volume reduction caused by shrinkage occurs when plastics cool. These shrinkage dimensions must be considered during the development of injection dies in order to meet the increasingly tighter tolerances specified in the CAD model. In many companies

up to ten tool adjustments are therefore still customary. Each time the tool has to be reground a large number of work steps are involved, for example dismantling the tool, measurement of the components, interpretation of the results, redesign in the CAD

model, reprocessing and adjustment of the tool. In the experience of Marius Häusele, Product Manager of the ZEISS Metrology Application Software Business Unit, several months pass until the perfect tool is fitted into the machine.

Faster to market with ZEISS software

On the other hand, users' experiences with ZRE indicate a clear trend: instead of reducing the number of tool modifications from seven to six or five, these days they only have two or perhaps even only one iteration loop. Unsurprisingly, the companies enjoy a considerable reduction in costs: experience has shown that firms save at least 40,000 Euros per component by eliminating four tool correction loops per component, and savings even often amount to 60,000 Euros. "However, the financial savings are far from being the biggest advantage," explained Häusele. What gives companies an even greater and sustainable competitive advantage? "With ZRE, manufacturers can start production much earlier."

The plastics processing company Horst Scholz GmbH, for example, used ZRE when developing an injection molding tool for a medical product, achieving such speed and precision that they were able to begin production five months earlier than usual. "Not a unique case but the rule" emphasized Häusele. Another of his customers who needed an average of five iterations in spite of simulation software now achieves the perfect tool with two iterations. This customer is now able to start production three months earlier. But as far as Häusele is concerned it is not just the savings in time and money that represent the advantages of ZRE - "We have customers who are only able to achieve the specified tolerances with ZRE."

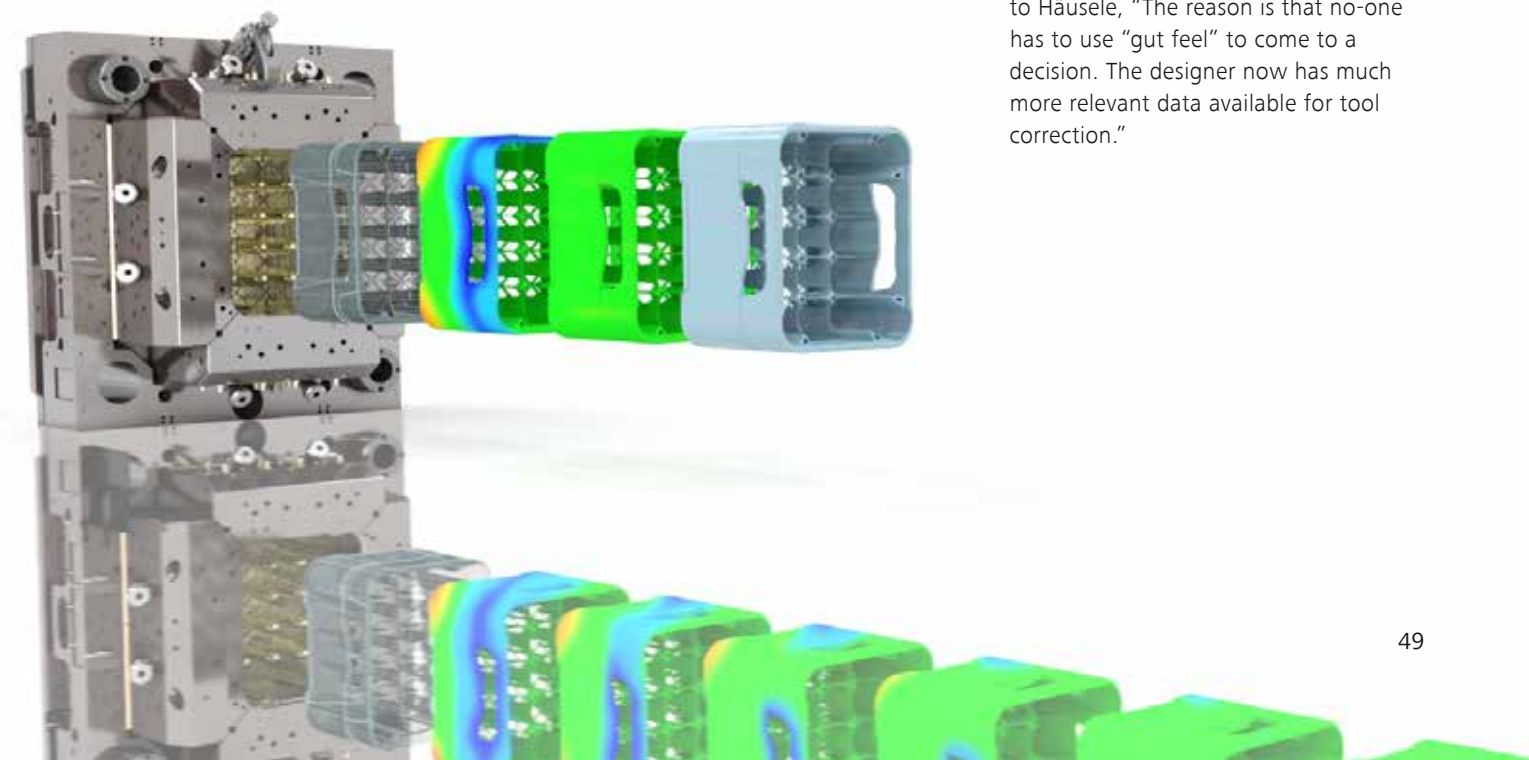
Slow progress towards the optimum

Designers become faster and more efficient in tool correction when using ZRE as many time-consuming work steps are no longer necessary,

for example defining a large number of contact points for subsequent coordinate measurement of the initial trial components. Without ZRE they would also have to manually enter the measured values in an Excel file and then compare these with the nominal data of the CAD model. After all this, they still have to spend a lot of time 'tweaking' the individual deviations into the CAD model. This process was quite prone to mistakes, especially since only a few error points are generally recorded and corrected. This explains why engineers have to undertake numerous correction loops with a lot of grinding on the way to the optimum result. On the other hand ZRE simplifies tool correction substantially: as a first step highly precise actual data is captured for the test components. In the ZEISS solution, it is immaterial whether the user generated the scan data with a computer tomograph, an optical sensor or a coordinate measuring machine (CMM).

Expertise still required

The point cloud or mesh is then imported to ZRE, as are the CAD models for the tool and the product. A nominal/actual analysis is then performed in defined areas. The software informs the operator how the error points are inverted and transferred to the CAD model for the tool. Finally, a new surface is matched with the corrected points using the Reverse Engineering function and refitted to the original CAD model. This eliminates the need for any time-consuming grading. Unlike in other solutions, in ZRE the user draws on their experience to decide which error values should be transferred to the tool and marks the corresponding surfaces in the CAD model. Ideally, the test part manufactured with the corrected tool should be immediately within the tolerance range specified. But even if the designer's expertise is still required, by using ZRE even those developers still without a comprehensive practical knowledge of materials can reach the end point faster. According to Häusele, "The reason is that no-one has to use 'gut feel' to come to a decision. The designer now has much more relevant data available for tool correction."



ZEISS CALYPSO

Threefold improvements: productivity, time saving and comfort

Anyone working with ZEISS portal measuring machines knows the ZEISS CALYPSO measuring software well. More than 20 years of experience in measurement technology have already flowed into ZEISS CALYPSO. It facilitates the daily work of metrologists around the globe. ZEISS is up to date with technological advances in terms of design, production and quality assurance. These factors are the motivation for constantly improving ZEISS CALYPSO to match the changing needs and requirements of users. The latest changes in the 2020 software version are all about productivity and thus ensure a better workflow.



High savings in programming and measuring time for parts with around 1,000 measuring elements, for example a printed circuit board, thanks to a newly developed method of pattern generation from CAD data.

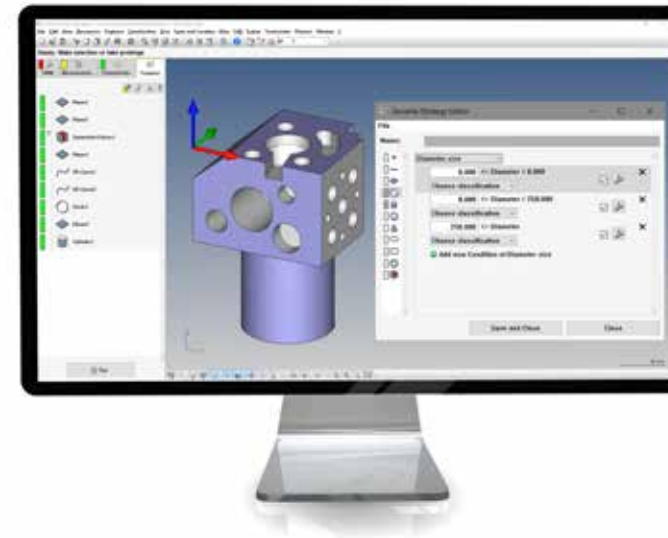
“The pressure for efficiency is increasing – especially due to digital transformation and global competition,” emphasizes Ana Carolina Mayr Adam, Product Management Metrology Application Software at ZEISS Industrial Quality Solutions. “Companies can increase their productivity above all through automation – ZEISS CALYPSO makes a significant contribution to this.” All new functions and further developments ensure a significant increase in measuring and testing performance, such as the following three innovations:

1. Six times faster thanks to optimized optical measurement:

On the ZEISS O-INSPECT multi-sensor measuring machine, the camera function “SnapPos” in combination with the new method for pattern generation from CAD data ensures time savings of up to 80 percent in terms of both programming and measuring time. For a workpiece with around 1,000 measuring elements, such as a printed circuit board, this means that twelve hours of programming are reduced to two hours and the measurement itself takes five minutes instead of 30.

2. Automation reduces time overhead:

For several years now, users have been able to create measurement plans in ZEISS CALYPSO using Product and Manufacturing Information (PMI) stored in the CAD model. The software is able to interpret the PMI and automatically generate characteristics and measuring elements. Furthermore, the principle of ZEISS Cookbooks was integrated into ZEISS CALYPSO using



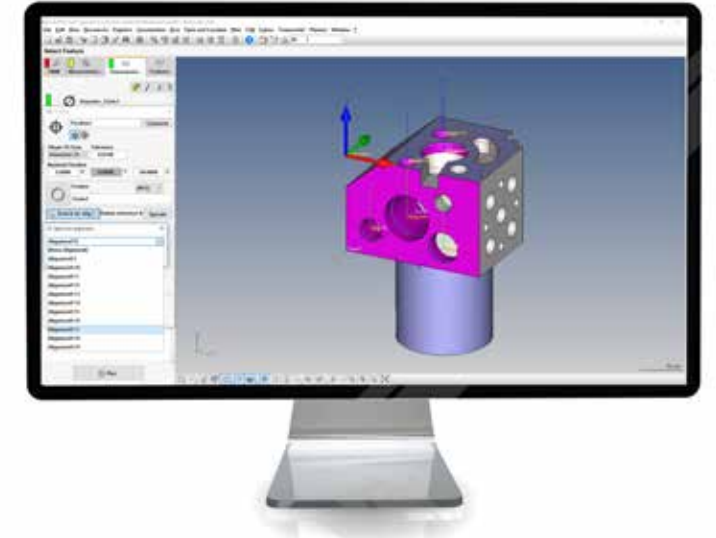
To improve overall efficiency, ZEISS CALYPSO now also allows measurement strategies to be defined centrally.

the Variable Strategy Editor. This enables measurement strategies to be defined centrally and then rolled out to various facilities, ensuring the comparability of measurement results and at the same time boosting overall efficiency.

3. Achieve your goal faster with a convenient search function:

The search function within the software has been both expanded and simplified – for less programming overhead. Input fields in several places on the ZEISS CALYPSO interface provide measuring technicians with uncomplicated access to the search function and allow them to find reference systems, test characteristics or measuring elements by name, for example, and use them easily when creating test plans. The software developers have also made improvements in CAD programming: measuring elements such as circles or contours can be extracted even more quickly than before directly from the CAD model with just a few clicks.

“Measuring technicians should and want to use their valuable working time for strategically important tasks – and ZEISS CALYPSO helps them do so,” says Product Manager Mayr Adam. Thanks to its continuous development, the software is “state of the art and ensures great performance.”



For less programming effort, ZEISS has extended the search function - Reference systems, inspection characteristics or measuring elements can now be found more easily when creating inspection plans.

Sneak Preview: ZEISS CALYPSO 2021

With the upcoming ZEISS CALYPSO 2021 software release, ZEISS is once again ensuring, with more than 60 new functions, a significant increase in performance in quality control for further time and cost savings in the inspection and analysis of components. We are pleased to give you a sneak preview and present the highlights of the ZEISS CALYPSO 2021 innovations:

- **New option ZEISS CALYPSO dynamic planning:** for dynamic adjustment of the inspection scope. Dynamization rules from MES and statistics software serve as a basis and ensure significant cost savings with targeted quality monitoring.
- **PMI optimizations:** Programming from PMI with STEP AP 242 becomes possible – available free of charge with the CAD interface from CALYPSO 2021.
- **Increased performance in the calculation of freeform and point sets:** Improved mathematical algorithm delivers results up to 20 times faster.

- **Performance enhancement for optical measurements with ZEISS O-INSPECT:** Path automation and optimization of pattern and algorithms as well as many other innovations enable measurement time optimization of up to 270 %.

- **Simplified programming:** through group with group comments and text element in the report with dynamic number of lines.

- **Enhanced change management for inspection plans:** Inspection plans become even easier to compare and a digital signature prevents unauthorized changes in the inspection plan.

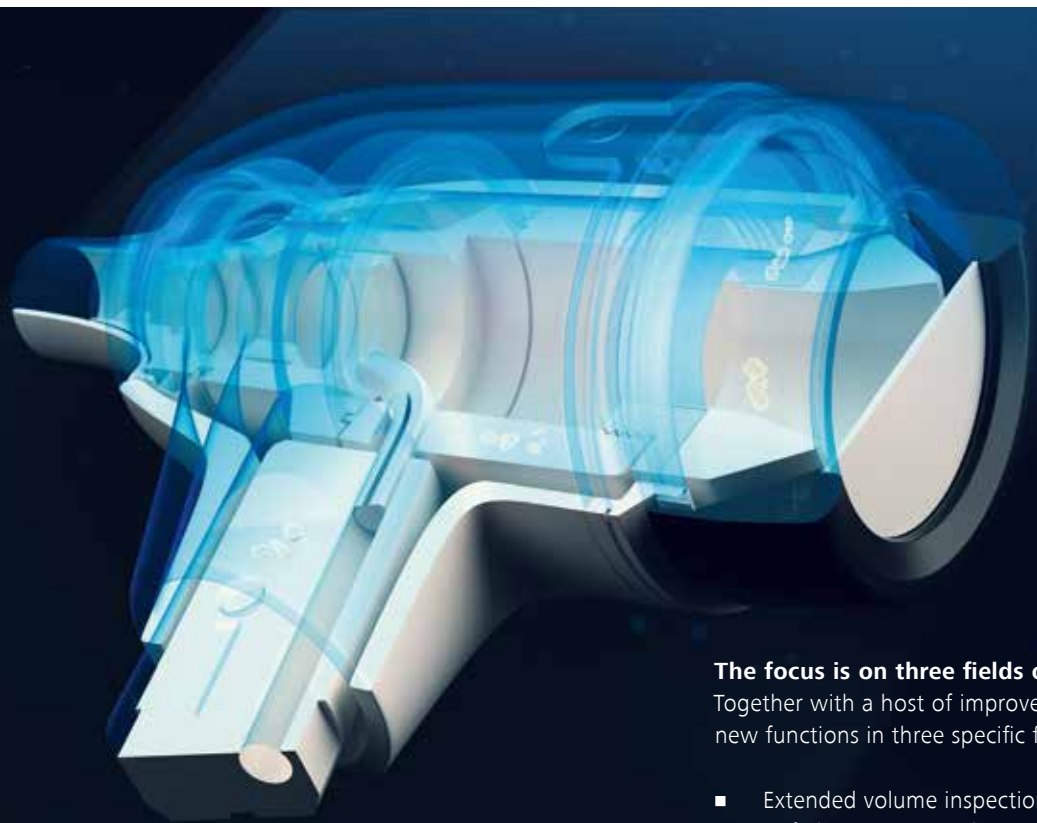
- **Acceleration of report generation with ZEISS PiWeb:** More than 50 new reporting functions are being developed for this, including: faster form plots, faster report displays or faster PDF creation.

ZEISS customers can rejoice! The new ZEISS metrology software version with above-mentioned and many other software innovations will be available from mid-May 2021. From then on, the update to ZEISS CALYPSO 2021 will be easily available via the ZEISS Metrology Portal for customers with a Software Maintenance Agreement.

One for all

GOM Software: Powerful stand-alone metrology solution and recognized industry standard

Engaging with customers on equal terms and developing software to solve their day-to-day challenges is the mission that has been driving GOM developers since day one. With its annual update cycles and an active user community, GOM Inspect has become a valued stand-alone software that handles the entire workflow from the first scan through to the final result report. The software offers a broad range of analysis functions that have been customized for various industries and are extended and enhanced on an ongoing basis. Customers can capture and analyze data in GOM Inspect, irrespective of the source of the data – a feature that is particularly interesting for ZEISS T-SCAN sensor users.



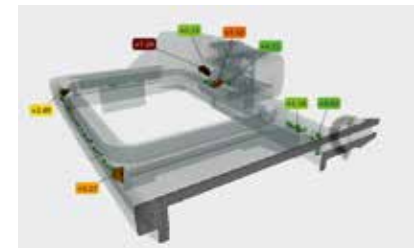
The focus is on three fields of application

Together with a host of improvements, the release 2021 provides new functions in three specific fields of application:

- Extended volume inspection of CT data
- Airfoil inspection with GOM Blade Inspect
- Simple handling of automated quality assurance

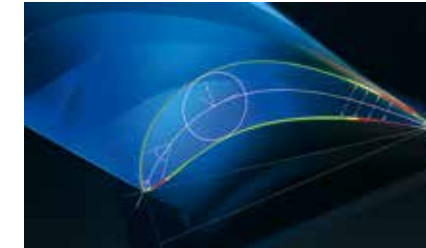


This software just does it



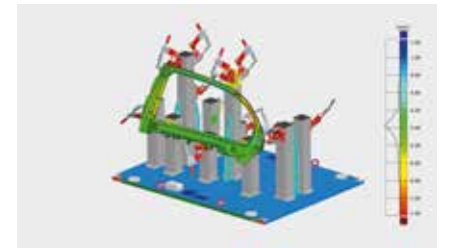
Extended volume inspection of CT data

Nondestructive measuring of parts and checking their inner surface for defects and material changes – these are the outstanding properties of industrial computed tomography. One of the new features in GOM Volume Inspect is an innovative volume renderer that excels at its ease of use and intuitive generation of sectional views. This allows for the visualization of the whole part and its internal structure as well as for the creation of sectional views for analysis. The volume inspection also comes with a porosity analysis based on Directive P203 (12/2019) of the Association of the German Foundry Industry (BDG).



Airfoil inspection with GOM Blade Inspect

The new software solution GOM Blade Inspect offers industry-specific 2D and 3D evaluations for airfoil quality assurance processes that meet high and diverse industrial inspection requirements. It also features an enhanced blisk evaluation and basically offers boundless options. With GOM Blade Inspect, users can unite their proprietary scripts and evaluation standards into one platform concept and integrate it directly into the inspection process.



Simple handling of automated quality assurance

By introducing the new GOM software, GOM has further simplified the automated measurement process. Thanks to the new Smart Scanning function in the Virtual Measuring Room (VMR), users can teach, execute and enhance measurements with just a single click. This function is based on the nominal data and dovetails all necessary steps into a single process. For instance, operating the ATOS ScanBox will be even easier and more productive.

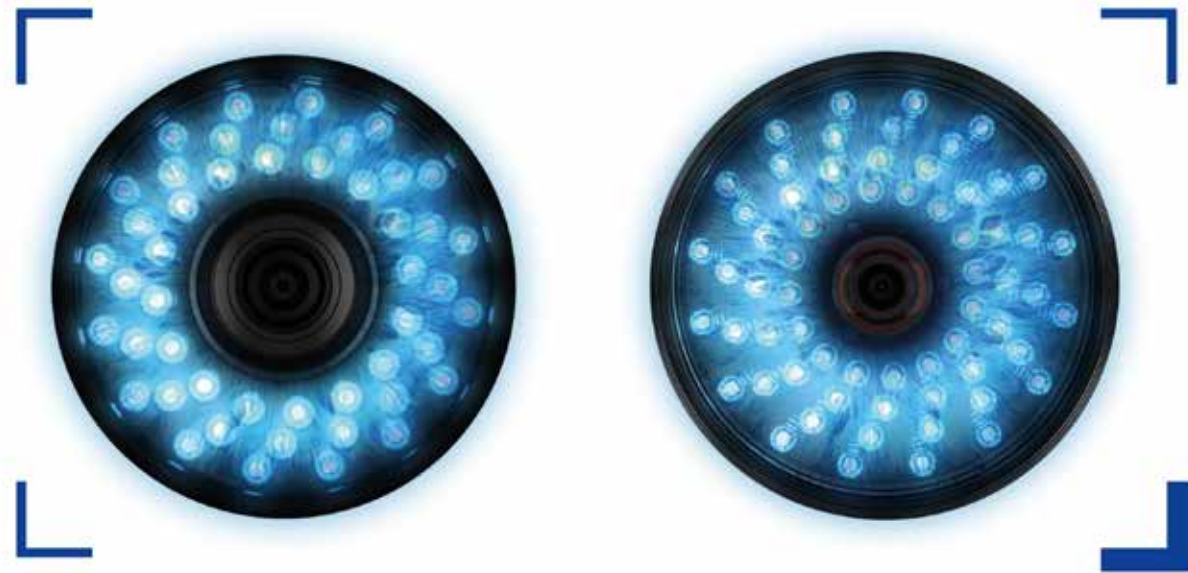
Get to know the GOM software

At GOM's website, users will find a free download and unlimited use of the basic software. Users interested in trying out more features can download a free 30-day trial version of the GOM Software Pro.

GOM Suite – the control center for all GOM products

The GOM Suite offers an ideal overview of all software products as well as other services and information relating to GOM. It is the central interface from where users can operate GOM Inspect, GOM Correlate, GOM Volume Inspect and GOM Blade Inspect and have easy access to the GOM Training Center, the GOM Forum or the FAQ. Also, the GOM Suite start page displays the latest news and events revolving around 3D metrology. Learn more at [gom.com](https://www.gom.com/de-de/produkte/gom-inspect-suite).





Capture the world from a different point of view ZEISS Optical Series

The advantages of optical metrology are obvious. If components are particularly small, complex in shape, easily distorted or scratched, what they need most of all is contact-free quality assurance.

ZEISS has accepted the technical challenges resulting from these requirements and has taken advantage of its many years of development work, its in-depth discussions with customers and the permanently increasing quality requirements to offer a new generation of optical measuring machines.

ZEISS Optical Series consists of models tailored to meet customers' requirements, each version of which is equipped with variable illumination, a high-resolution camera and sophisticated software; each machine is capable of delivering rapid and accurate measurement readings. The range of models

extends from purely optical machines through to multi-sensor solutions in which components can be measured both optically and by tactile techniques in one and the same machine.



Discover ZEISS O-DETECT

Entry into the world of modern optical metrology was never so simple. Thanks to a clear-cut design and an intuitive user interface, operation of the newly developed ZEISS O-DETECT is child's play after a short period of training even for newcomers to the machine. The purely optical measuring machine provides contact-free measurement and delivers rapid and precise data in next to no time.

The high-performance, high-resolution optical system and digital zoom, an overview camera for easy navigation and an adjustable ring light are amongst the equipment responsible for the precise measurement readings. ZEISS software also guarantees not only a precise analysis of the optically collected data but also an optimal user experience.



Focus on the user

The purely optical ZEISS O-DETECT coordinate measuring machine proves just how simple the operation of a highly-technical machine can be made for the user. Thanks to the intuitive, easily grasped user interface, after only two days' training, even staff new to ZEISS O-DETECT can reliably operate this machine which has been optimized and automated for simple use. Users achieve accurate measurement readings right from the start.

Camera

The high-quality camera is a vital part of ZEISS O-DETECT. The complete lack of optical distortion of any kind creates the technical foundation needed for precise measurements. Thanks to sophisticated software and the new auto-focus function, the photographic data recorded by the camera is transformed into precise measurement results at the touch of a button.

Exchangeable ring lights

When accurate measurement results are at stake, first-class illumination plays a pivotal role. The two versatile ring lights which are easily replaceable by hand meet this need. The white and the blue ring lights operate both automatically as well as in line with user-defined settings. The customer himself can easily install updates and upgrades without the need to call in a service team.

Overview camera

For the first time, an overview camera with an integral 5 megapixel camera sensor also forms a further standard component. As a result of this equipment, the component due for measurement can be located faster and an image created.

This gives the user an easier overview of all the scanned parts. As with other applications, this technical component excels with its particularly simple and fast control system.



Experience ZEISS O-INSPECT

ZEISS O-INSPECT gives the user the best of both worlds in just a single machine - the optical measuring machine with a tactile sensor provides the opportunity for the precision measurement of the broadest possible variety of components both optically and using tactile technology without the need for recalibration when changing the sensor technology, as both technologies are integrated into a single machine. When dealing with complex components, this machine saves not only time and money

but also reduces the risk of inaccurate measurements caused by the use of different machines. Thanks to the continuous development of multi-sensor technology - for example ranging from high optical resolution created by alternative sensor units which make the error-free measurement of extremely small structures possible, through to a particularly sensitive tactile scan-sensor - ZEISS O-INSPECT never fails to generate accurate 3D measurement results in compliance with ISO-10360.

Faster than ever before

Thanks to an updated software solution, measurements up to 6x faster than before are possible. Faster programming is possible for the user and several features of the component can be measured precisely at the same time. The updated software used in ZEISS O-INSPECT is therefore not only extremely user-friendly but above all it also saves additional costs for the customer.



ZEISS O-INSPECT - benefits and features at a glance

- Tactile and optical measurement of components in a single machine
- 3D measurement results in compliance with ISO-10360
- Updated, 6x faster 3D software
- Wide range of illumination options
- Higher resolution through alternative sensor units
- Cost savings from faster programming and measurements as well as the simultaneous measurement of several components

Accreditations

Since May 2015, the Measurement and Calibration Center of Carl Zeiss Industriellen Messtechnik GmbH with its locations in Essingen and Oberkochen, Germany, has been accredited for the calibration of length standards for optical metrology. The measuring method is based on the use of the ViScan 2D image processing sensor on bridge-type measuring instruments from ZEISS and enables calibration in a 2D measuring range of 1200 mm x 1980 mm with an uncertainty of $0.7 \mu\text{m} + 2 \times 10^{-6} \times L$. By using a ZEISS O-INSPECT measuring device, it was possible to successfully extend accreditation in the high-precision range. Since February 2019, chromium masks can now also be calibrated in the nanometer range. The smallest uncertainties for unidirectional distances are $0.09 \mu\text{m} + 0.14 \times 10^{-6} \times L$, for diameters $0.25 \mu\text{m}$ and roundness deviations $0.3 \mu\text{m}$.

René Friedel also proudly points out the unrivalled capabilities of the ZEISS Measuring and Calibration Center: "We are currently the only laboratory in all of Germany that can offer calibration of length, diameter, form deviation and the thermal expansion coefficient on optical standards from a single source - from microstructures with smallest diameters of 0.06 mm to a large-volume 2D measuring range".

In May 2020, the accreditation for on-site calibration of coordinate measuring machines with optical 2D image processing sensor will be extended. "This gives us the authority to verify the measuring accuracy of machines according to the DIN EN ISO 10360-7 standard and to certify it by means of DAkkS calibration".

The following figures underline how important accreditations for equipment in the field of metrology have become in the meantime. While 10 years ago there were only 25 accredited on-site calibrations of measuring instruments, the number has already risen to the four-digit range in 2019. Especially in the automotive industry, the demand is constantly increasing. The ZEISS team is ideally equipped for this: "In dimensional metrology, we are currently one of the most accurate calibration laboratories in the world. This not only benefits our own development work, but it also benefits all customers who want to have their optical standards and machines calibrated and checked by us."



Maximizing versatility and speed

When Brenk Brothers Inc. was looking to increase the speed of its measurements and quality assurance to keep up with customer demand, the ZEISS CONTURA CMMs and ZEISS O-INSPECT 8/6/3 multi-sensor CMM were their first choices.



The company has been AS91000-certified since 2011, meaning its quality management systems fulfill the strict criteria to produce safety-critical parts for the aerospace industry. Brenk Brothers produces, assembles and manages flight-critical components for 20 major aircraft programs. Its main product for the industry is hydraulic actuation manifolds. These are the mechanical nerve centers that move such things as the flaps, elevator, rudder and flight-critical steering on an aircraft.

A tradition of quality

The current owners are part of long family tradition dedicated to quality. After serving behind the front lines in Europe during World War II, Victor Brenk, father of the current owners,

returned home and started his career at a local tool and engineering company near Minneapolis. Several years later, he co-founded a precision machine shop that made parts for the Apollo 11 moon landing. It was here where his sons got their first hands-on experience in machining. After Victor retired, three brothers formed Brenk Brothers. Today, it is run by Jeff and Mike Brenk. Jeff's son Mike, today a Sales Engineer/Program Manager with Brenk Brothers Inc., was exposed early to the family business.

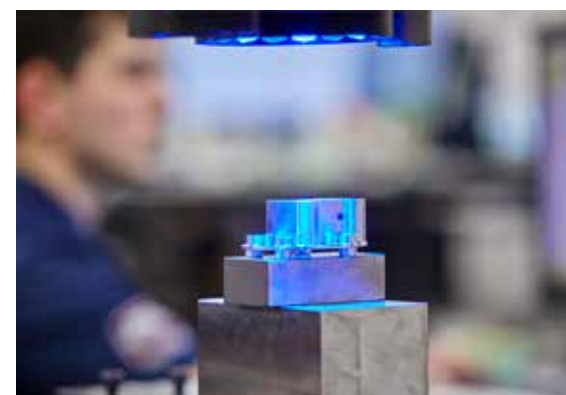
Demand for more data

As the number of flights globally grows unabatedly, orders from aviation and aerospace customers are rising fast. This was one of the reasons why Brenk



"The machines from ZEISS are sophisticated; they're the most accurate machines in the world," says CEO Jeff Brenk.

Brenk Brothers Inc. is a US precision machining company near Minneapolis that specializes in high-complexity machining applications. Its core capabilities are in CNC milling, including fourth- and fifth-axis machining, Swiss turning and wire EDM. With 150 employees, including 15 who work exclusively with ZEISS CMMs, Brenk Brothers serves customers from the aerospace, defense, computing, medical technology and pump industries.



Brothers expanded its facility by 40,000 square feet (4,000 m²) last year, after already doubling space 15 years earlier. In addition to higher production volumes, aerospace OEMs have also raised the bar for quality assurance. They not only expect more data on a part, but more detailed data on a part than they did a few years ago. And they want it faster than ever.

"The demand for information has increased exponentially," explains CEO Jeff Brenk. "Customers want us to catalog as many data points as possible that they can keep on hand forever, and they expect us to do that in a very short amount of time. It's happening on a mass scale. It's a major challenge to keep up."

At the same time, many aerospace OEMs have outsourced the inspection process to suppliers like Brenk Brothers. "Customers have shifted the burden of proof to us, and they want us to be able to show them that we can inspect well," explains Mike Brenk. "This has led to a constant betterment of our own processes to ensure we don't even make a bad part in the first place."

Accuracy and speed

Brenk Brothers already has 10 ZEISS CONTURA CMMs, with two more on their way. Jeff: "Of the 2,000 features that might need to be checked on a part, several hundred can have tolerances of ± 0.0005 of an inch. That's the complexity that we have to deal with every day." The CONTURAs have the precision and speed to measure such tight tolerances, and the reliability to run all night when needed.

A key benefit of the ZEISS CONTURA is the seamless interface between the ZEISS CALYPSO software and CAD files. This makes it much easier to electronically manage each part. Another advantage is that the CALYPSO software can be used on any CMM that happens to be free.

Close tolerances

Three years ago, the company added a ZEISS O-INSPECT 8/6/3 multi-sensor CMM to gain more flexibility during inspection. The O-INSPECT unites optical and contact measuring technology in a single system, which combines the best of both worlds on certain parts.

"The O-INSPECT gives us more options to inspect a part optically," says Mike. "Some customers want to record x amount of data per run, and a vision system like the O-INSPECT system is very good at accumulating and aggregating data quickly."

The two men also value the ability of the O-INSPECT to deliver accuracy for areas with very tight tolerances. "We have parts coming in with many different compound angles," adds Mike.

"Some parts have deep cavities of 9 or 10 inches (22.86-25.4 cm), with internal features as well. These parts are difficult enough to machine, and we need to be able to reach those areas with our CMMs." For some complex aero parts, the O-INSPECT has reduced the inspection time from 45 minutes to 10 minutes.

Tight feedback loop

Meeting the twin demands of short response times and high-accuracy data

is the key to remaining competitive for the aero industry.

"The only way to keep up with the speed expected by our aerospace customers is to make the feedback loop as tight as possible to the process," states Mike. "So when a product comes off the machine, we can make minute adjustments right away and inspect parts as close to real time as possible. And that is the critical nature of our ZEISS partnership: we trust the brand and the information that the CMMs are giving us."

Confidence

The customers of Brenk Brothers trust ZEISS too. Mike: "Someone from Boeing was just here today and when he walked into the quality control lab and saw all the ZEISS CMMs, he said, 'Wow, I've never seen a room like this.' When customers come in for quality audits and see the ZEISS badge at the top of our printouts, they stop, check the box, and move on. They have confidence. This really helps in our efforts to become a top-tier supplier."

Substantiating Quality with ZEISS CONTURA

Karl Reim Werkzeugbau GmbH is well known for the exceptional quality of its mechanical components. Now the company's two managing directors want proof of this in order to turn their reduced reject rates into faster delivery times and to bring production steps back under the company's own control. The proposal from ZEISS to be a pilot customer for the newly developed ZEISS CONTURA coordinate measuring machine could not have come at a better time.



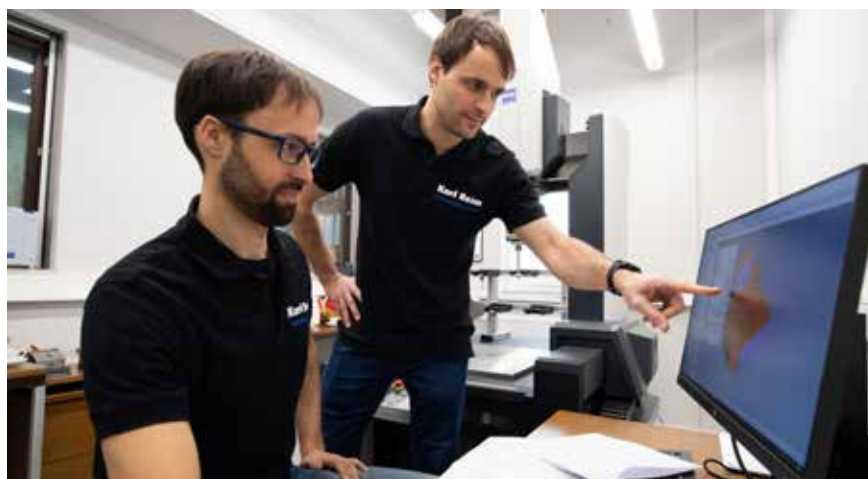
Metrological challenge: The presetting adapter for optical measurement of tools must be exactly rectangular.

At Karl Reim Werkzeugbau GmbH, located in Kirchheim unter Teck at the foot of the Swabian Jura, things were getting tight. The facility's available space was occupied entirely by metalworking benches and machines. "Every time we purchased a new machine, we had to take an old one out of service to make room for it," says Stefan Reim, who, together with his brother Andreas and his father Dieter, is the third generation to run the company. In 2019 the company completed a facility expansion which provided additional floor space not only for production, but also for a metrology room.

Proven quality

Karl Reim Werkzeugbau GmbH's components have always been of exceptional quality. "But we were unable to substantiate this with data," says Andreas Reim. With ZEISS CONTURA this is no longer an issue: the coordinate measuring machine clearly shows how large workpiece measurement deviations really are, and whether or not they lie within specified tolerances. For some of Reim's individual parts and small-series production components, the tolerances are extremely narrow. This is the case with preset adapters, used by tooling

machine operators to visually gauge their tools, which must be inspected in terms of their perpendicularity down to just a few arc seconds. Performing measurements with the CMM helps to further reduce the already very low rejection rate. And since the quality inspection is integrated early on in the manufacturing process, delivery times can be reduced by several days. The plan to purchase a CMM first entered the minds of the company's two managing directors two years ago. A customer had informed them that ZEISS was looking for pilot users to work closely with them to test the



Andreas (left) and Stefan Reim evaluating a measurement: "Our customers' trust in ZEISS is enormous."



Andreas Reim about ZEISS CONTURA: "Now we can take back work that we previously outsourced and carry it out ourselves."



Andreas Reim measures a presetting adapter on ZEISS CONTURA.

latest ZEISS CONTURA, to provide initial feedback and to help develop the newly constructed machine into an optimal solution. The collaboration proved beneficial for both parties: Andreas and Stefan Reim provided ZEISS with valuable feedback about the device, and ZEISS in turn ensured that Reim received exceptional levels of support in the months following commissioning of the machine.

Small space requirements paired with a large measuring volume

The fifth generation of ZEISS CONTURA machines was made for operations like Reim Werkzeugbau. The machine was redesigned from the ground up and is now so compact that it provides a 30 percent larger measurement volume when installed in an area of the same size and with a noticeably reduced device height. The managing directors at Reim were given an introduction to the new machine over the course of three days. "This device offers so many possibilities — for first-time users this is astonishing at first," says Andreas Reim. But thanks to the on-site training provided by ZEISS, the two CMM newcomers were able to quickly learn how to operate the device. Now the two company heads want to expand their machining services and acquire new customers. To do this, no new machines are required. The facility's existing machines have machining accuracy to spare, but until now workers were unable to tap into it because it could not be measured. "Now certain machining tasks which

were previously outsourced can be reclaimed and performed in-house," says Andreas Reim. In the long term, Reim Werkzeugbau plans to introduce new machining technologies such as the coordinate grinding of inner bores.

Data over paper

ZEISS CONTURA is also the catalyst for digitalization at Reim Werkzeugbau. Since nearly all of Reim's customers use ZEISS CMMs, the company naturally wants to be able to send measurement reports digitally in the future, instead of sending them on paper as they have in the past. This will enable their customers to do away with quality inspections when goods arrive, since these will have already been performed by Reim Werkzeugbau, and the uniform, digital reports will be able to demonstrate this. "We have immense trust in ZEISS," says Stefan Reim. "We would have purchased a ZEISS machine even if we had not been selected as a pilot customer. Our trust has grown not only because of the outstanding quality of their systems, but also because of the excellent service we've been provided."



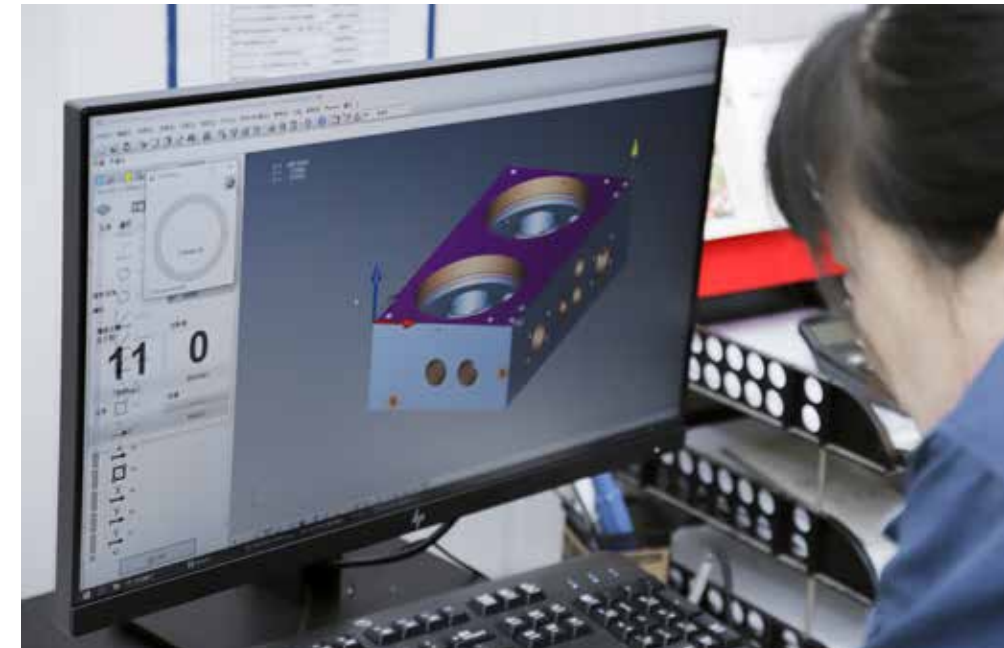
We have immense trust in ZEISS

Stefan Reim

“ZEISS”, the Choice by a Hidden Champion of Hydraulic Valve Block Industry

An interview with Chen Zhengwei, general manager of Wuxi Maytag Machinery Co. Ltd

Wuxi, as one of the central cities in China’s Yangtze River Delta, the core city of China’s manufacturing industry, as well as the leading area of advanced manufacturing industry, has experienced rapid development in recent years, witnessing the explosion of emerging superior manufacturing enterprises and quite a few specialized and well-organized hidden champions.



“The company enjoys annual sales revenue of 30 million RMB and 1 million RMB per capita output and sustains the unique leadership in processing technology and quality assurance of hydraulic valve block parts. We follow the Amoeba management model while promoting the implementation of intelligent manufacturing to actual production process, with the reputation as an innovative technology enterprise and a private sci-tech company with Grade II intelligence maturity...” introduced by Chen Zhengwei, General Manager of Wuxi Maytag Machinery Co. Ltd. He attributed these data and honors to highly advanced production capacity manifested by potent software and hardware, high level of interconnection and intelligence of workshops. All these advantages have consolidated Maytag, the company he founded, as a leading manufacturer in Wuxi. However, the company also encountered some difficulties in production, namely, how to better convince their users of product quality, how to organize the machining workshop with a more scientific flow, and how to integrate digital management into the internal system effectively...

“Good” Product Worthy Higher Prices

Since the founding of company, Maytag has supplied the market with large size

and high-quality hydraulic cartridge valve blocks. Chen Zhengwei noted that “Our company has accumulated many years of experience in the processing of cartridge valve and deep oil passage hole of hydraulic valve block, and are equipped with various kinds of cartridge valve cutters. All of our valve blocks are manufactured in the machining center, which not only ensures the product quality, but also ensures the high efficiency of processing and the consistency of batch products.” When walking into the seemingly compact production area of Maytag, we found a total of 17 machining centers in the three production lines are carrying out their respective processing tasks in an orderly manner, involving the processing of small valve blocks (below 30 kg), large valve blocks (above 30 kg), as well as precision parts. “Our workshop operates for 24 hours a day. In general, equipment debugging and product switching are performed during day-shift, while each staff is responsible for a production line at night-shift.” As manager Chen commented, this schedule is much more economical than previous one in which each staff is assigned to one machine. “Increasing staff also indicates higher management costs.”

As is known, Maytag is mainly specialized in the field of wind power generation, devoting itself to the processing of supporting valve block

parts. “Currently in China we are at a leading position in this field, in which the market share of valve blocks is also the highest.” When manager Chen thinks about how to improve the automation, overall efficiency and quality of processing, he also followed “one piece flow” method advocated by lean production, with the purpose of minimizing the semi-finished products in the production process, thereby obtaining precise process steps and clearer procedures. Many holes can be seen in valve block parts. Several peer enterprises adopt a combination of radial drills and vertical machining centers for production, which is much more likely to result in fewer parts and missing parts during the production process. What’s more, it takes at least half a month to produce from raw materials to finished products. “However, we can perform the whole process with only one machining center, and each program-controlled step will undoubtedly prevent the above-mentioned problems. Meanwhile, we also take the obvious advantage of time-the parts are clamped to the machining center in the morning and can be processed as finished products in the afternoon. “ The overall improvement of measure methods is essential to realizing such modern production. In the past, the measurement of valve block parts in Maytag was mainly performed by



*Our workshop
operates for
24 hours a day*

Chen Zhengwei,
General Manager of Wuxi Maytag

inspectors and domestic measurement equipment, concerning the measurement s of depth, position, and dimensional precision. „It usually takes at least one day for the inspectors to carry out the one-by-one measurement of a product with 1000 sizes, in addition, the measurement duration will be much longer in case of some unfavorable factors during the process. In this situation, the machine tool is also required to keep the standby mode for one day or more days to perform further processing until the completion of size confirmation. „

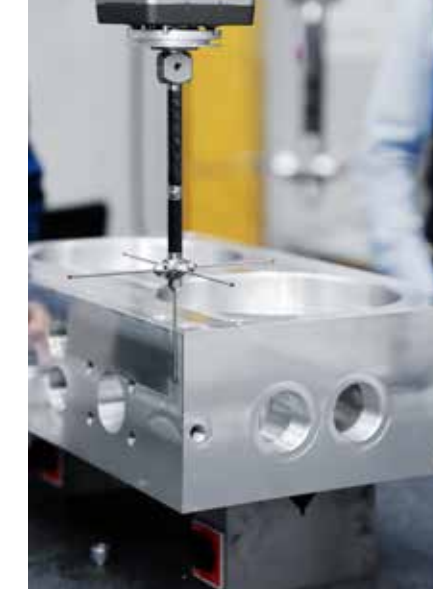
Therefore, while planning the layout of the intelligent workshop, manager Chen also takes a proactive step in looking for advanced measurement machine. Finally, ZEISS CONTURA 776 was initiated in the factory in 2018. The rotating probe, equipped with user-friendly software, is easy for inspectors to operate. „The good products are worthy higher prices, which should be easy to use.“ Talking about the reasons for choosing ZEISS, manager Chen presented with a smile, „There are only two types of coordinate measurement machine on the market, namely ZEISS and other brands, so we

chose ZEISS.“ As manager Chen states, the relatively expensive ZEISS machine is a treasure. „As far as I’m concerned, the cheap price is not a point I will focus on while purchasing something, as cheapness will also bring about costs and expenses.“ Before purchasing ZEISS machine, manager Chen also consulted several inspectors, „They all agreed that ZEISS is definitely the best, therefore ZEISS is the best and most correct choice for our company.“ He insisted on minimizing the cost of „trial and error“ upon choosing, „the cost of trial and error is often the highest.“

Development in Wind Energy Requires High Product Quality

At the same time, ZEISS machine has also brought about many potential orders to Maytag, a small and micro enterprise. “When many people know that we are using ZEISS machine for measurement, they will think that we are not only competitive, but also value quality. With the first impression on emphasis of quality, they are willing to deal with their orders with our company.” Manager Chen presented to us.

In particularly, while producing samples for customers, we must ensure that the measurement data of parts is accurate, to ensure the reliability of finished parts delivered to customers. „If there are problems with the measurement



data in our company, how can we assure the quality of parts? Therefore, after purchasing the ZEISS coordinate measuring machine, more customers are willing to put their new products in our factory for producing samples. „ In 2020, many enterprises were affected by the COVID-19, with shrinkage of orders and stagnancy of business. However, the wind power industry has benefited from the development of clean energy, thus achieving contrarian growth. Manager Chen commented that, traditional energy sources have their respective weaknesses, such as nuclear power (negative effects to the ecological environment), thermal power (high pollution to the environment), and hydroelectric power (negative effects to the ecological environment), so they are no longer suitable for large-scale application. It’s generally acknowledged that one of the cleanest energy sources is solar energy and the other is wind energy.

Since wind energy equipment is installed at a relatively high altitude, once the parts arise some problems, both danger and expensive maintenance cost will come out. „Therefore, the product quality is of particular significance in this field.“ At present, 70% of Maytag’s business comes from wind power. Manger Chen adopts a clear strategy that the enterprise shall focus on a certain subdivision with the goal of becoming larger and stronger. „With the increase of orders this year, it’s evident that the measurement capability is required to be further improved, so we have purchased an additional ZEISS CONTURA 10126 without hesitation. We hope that

more equipment can bring about more production capacity to make good reserves for future development.“ Manager Chen commented with a smile that waiting in line was necessary for previous measurement s, while parallel measurements can be realized at present. ZEISS CONTURA 776 can achieve multi-angle measurement with the rotating probe, while CONTURA 10126 can also perform automatic replacement of multiple probes to achieve various measurements with larger strokes. With the measurement precision of 1.7 μm, it’s sufficient for Maytag to deal with various measurement requirements easily. „Actually, the ZEISS machines are easy to use. Firstly, the software generates convenience and improves speed; secondly, some functions are more convenient with faster operation compared with other similar measuring equipment.“ The inspection engineer of Maytag still remembered that programming can only be initiated until the parts were sent to the measurement rooms, which took much time and energy to perform measurements while waiting for parts. Currently, by importing the 3D model of parts to create the program in advance, the parts can be directly used for computer operating after being sent to the measurement room, which is free of manual work and improves efficiency. In addition, ZEISS supporting software enjoys full-featured functions, compared with our previous measurement equipment, which consists of a series of single incoherent operation, for example, each hole had to be collected one by one, while using ZEISS CALYPSO

to collect one hole, hole arrays can be realized, with 10 or 20 holes becoming available. Whether it is a circular array, or a 1D array or a 2D array, horizontal or vertical, ZEISS’s measurement machines are applicable. Furthermore, it should be noted that ZEISS also takes meticulous consideration into operational ease. For example, the function of format painter is very easy to use.

Another very important point is that, „In the past, when domestic measurement machines were applied, users sometimes made arguments with us about the accuracy of measurement data. Now we use ZEISS machines, such problems no longer appear. As evidenced by this situation, ZEISS is highly recognized in terms of quality within the industry.“ Manager Chen added.



Staying Competitive with Inline Quality Assurance

ZEISS Integration Series helps Schabmüller Automobiltechnik stand out against the competition

Schabmüller manufactures large quantities of cylinder head covers in Ingolstadt for a southern German automotive group. In the face of global competition, the company seeks to set itself apart with quality and is doing so by means of an inline quality assurance solution from ZEISS. The fully automated system reduces manufacturing costs and enables higher rates of production. Since the introduction of the system, the company has not received a single complaint.

Quality assurance is often a source of pain for decision-makers in manufacturing companies – a necessary evil that generates high costs without helping to improve the speed of production. This was an issue that Helmut Häckl, managing director of Schabmüller Automobiltechnik, was all too familiar with. Häckl's company machines the cylinder head covers for all V6 gasoline engine vehicles worldwide of a southern German automotive group. And they compete with suppliers in low-wage countries. Under such conditions, how does a manufacturer ensure high levels of quality in a manner which is also cost-effective? For Schabmüller, the answer came in the form of an automated measuring solution which, in close collaboration with ZEISS, was integrated directly into their production line.



"We haven't had a single complaint since we started doing quality assurance with the ZEISS inline measuring technology," reports Helmut Häckl, managing director of Schabmüller Automobiltechnik.

Each day, Schabmüller inspects, cuts, measures and prepares for delivery roughly 2,600 components after arrival. "This is easily our largest production project, and a very challenging one as well," says Häckl. "Global competition among automotive suppliers is fierce, and cost efficiency is an important factor." At the same time, the components are subject to stringent quality requirements. To meet this challenge, Schabmüller uses two ZEISS production measuring machines which, together with a automated loading table from the ZEISS Integration Series, inspect the quality of the manufactured parts. Their setup, in operation since 2017, is special: the measuring machines were integrated directly into the automated production line in collaboration with ZEISS.

The investment paid off quickly. "We haven't had a single complaint since we started doing quality assurance with the ZEISS inline measuring technology," reports Häckl.



The ZEISS in-line inspection performs routine inspections independently. This frees up lots of time for more complex measurement tasks, says metrologist Emre Baysal.

An automated production line with integrated quality assurance

The required efficiency in machining is ensured by a nearly fully automated production line: the incoming blanks are loaded manually into the first station, and the rest of the machining process is then performed almost entirely automatically across a total of 96 processing stations. The key process is that of cutting the blanks to make high-precision fitting drill holes and sealing surfaces. Robotic arms grab the blanks from the assembly line and place them in the clamping machines. What comes out at the end is a cleanly machined part. Normally,

To reliably detect exceptions to this rule, a station is placed halfway down the production line with two integrated ZEISS GageMax machines, each equipped with a fully-automatic loading system. The station hence works as a fully-automated part of the production line: a robotic arm grabs the incoming cylinder head cover and holds it up to

a blower which removes any residual metal chips. The arm then clamps the cover in a ZEISS custom-made clamping device on the sliding table. The probes in the ZEISS ProMax-G lateral probe rack then scan the relevant characteristics of the component in accordance with a defined program. In this way, the station is able to quickly scan and analyze 35 highly critical characteristics. A coding system tells the robot at that measuring station whether to select a workpiece for inspection or to send it to the next processing station. This system ensures that inspections are always evenly distributed across workpieces at all 96 stations, making it possible at all times to trace errors to specific production machines and processing stations.

High measurement speed and durability

Facility operator Frederic Kern is extremely satisfied with the solution: "It's important to me to know with confidence that my facility is running smoothly and is delivering high levels of quality. This solution gives me instant certainty." Each of the 96 processing stations within the facility are a potential source of error. A single tool swap can result in deviations which fall outside of the very narrow tolerances. "If this happens, I need to know about it right away," says Kern, "otherwise we'll end up producing lots of rejects, which is expensive." The automated integration from ZEISS can inspect the products of all processing stations within 16 hours. This is only possible thanks to the two production measuring machines, which are able to load and measure components quickly. "Of course, there are



Metrologist Emre Baysal performs in-depth complete measurements, including roughness and contours, on selected components twice a week in the metrology lab.



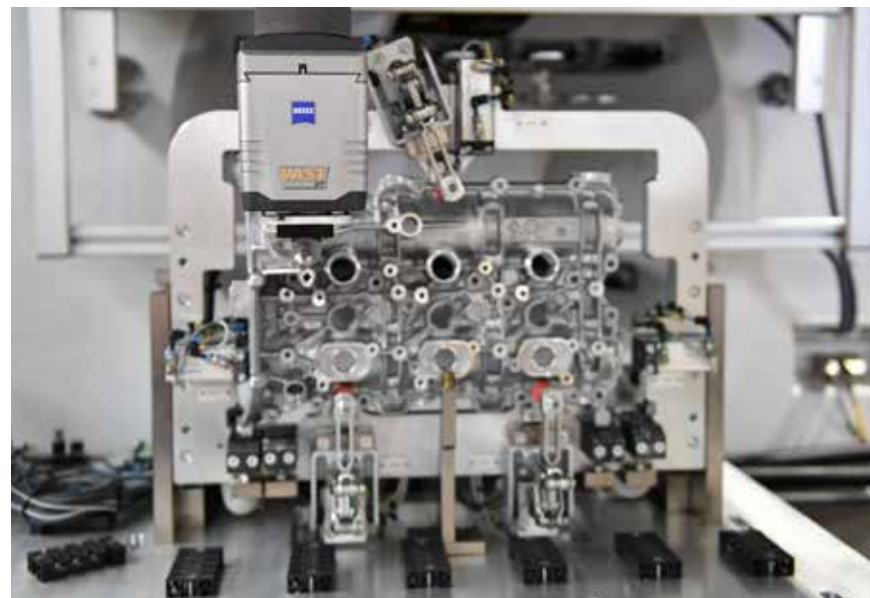
The ZEISS inline measuring station is completely automated: a robotic arm grabs the incoming cylinder head cover, holds it up to a blower to remove any residual metal chips, and clamps the cover on the loading table.

harsh conditions in production – there’s dust, dirt and vibrations, and it’s cold in the winter and hot in the summer,” says Kern. “But the ZEISS devices stand up to these conditions just fine.” Helmut Häckl can attest to this. In 2017 he oversaw the project to introduce the inline coordinate measuring machine. “It was clear to me from the start that we needed an inline solution,” emphasizes Häckl. “And the ZEISS inline solution provides the durability we need in an environment such as this.”

More time available for the metrology lab

Before the inline solution was introduced, quality assurance was performed by means of performing serial measurements in the measurement lab – a very time-consuming process. Now, metrologist Emre Baysal and his colleagues have enough time to perform in-depth complete measurements, including roughness and contours, on selected components twice a week. “It’s great that the ZEISS solution is able to continuously perform routine inspections in production without the involvement of any workers,” says Baysal. “This saves us a great deal of time and allows us to focus on those tasks which actually need to be performed by a trained metrologist.” Baysal is also a big fan of the ZEISS CALYPSO software, which Schabmüller uses to manage multiple devices. The company also uses ZEISS PiWeb to visualize quality data. “This is an enormous advantage,” says Baysal, “because it allows us to directly compare measurement results from all devices, and it gives us conclusive information which we can store in our database.”

The data stored with ZEISS PiWeb is compressed and displayed in an easy-to-understand manner, with relevant data being visualized for different groups of workers (e.g. machine operators, metrologists, management). This ensures transparency and leads to fast and easy decision-making, allowing production trends to be identified in a timely manner and making defective workpieces a thing of the past. And since the facility’s workers were already familiar with the software environment, there was no need for additional training when the ZEISS inline solution was introduced.



The probes of the ZEISS production measuring machine scan the relevant characteristics of the component in accordance with a defined program. The station can automatically scan and analyze 35 highly critical characteristics within minutes.

For Herman Häckl, quality assurance has gone from being a source of discomfort to a true competitive edge: “We’re able to ensure quality in our largest production line without having to hire additional personnel,” says Häckl. “This saves costs and enables us to use quality to set ourselves apart from competitors from abroad.” Even the planning and introduction of the system was easy, says Häckl: “Something like this is only possible with close cooperation between skilled partners. ZEISS understands what our needs are, and has the expertise and experience necessary to integrate measuring machines in an automated production line.”

#measuringhero

A smooth manufacturing operation is vital for every successful business. Production lines are the arteries of the company. They are becoming increasingly sophisticated, and requiring higher precision every day. Thus, quality assurance is more important than ever; however, it is usually taken for granted, and it takes a prominent role only when there is an issue. The smallest quality incident can generate costly losses, and even impact the reputation of the company. Therefore, the people working in quality assurance are unsung heroes with the big responsibility to quietly assure a smooth operation, day after day. We, as a provider of quality assurance solutions, stand behind you all the way, and will support you with a state-of-the-art range of solutions, products and services, so that you can always have positive results with your colleagues and company. You are our #measuringhero!

www.zeiss.com/measuringhero



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