# METROLOGY WORLD 2019

## THE WENZEL JOURNAL

WENZEL®


## TOP THEMES

### NEW SF SERIES
OUR SOLUTIONS FOR THE SHOP FLOOR

### PARTNERSHIPS
NEW SOLUTIONS FOR OUR PORTFOLIO

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## HERE YOU FIND ALL TOPICS

# INNOVATIVE MEASUREMENT SOLUTIONS
## WITH WENZEL YOU SAVE TIME & MONEY

Do you invest in the future even in uncertain times? With WENZEL you can because we know that our new products and services are valuable for our customers. We develop solutions so that our customers can perform their measurement tasks to the highest quality level. Verification of dimensional accuracy is becoming increasingly important due to the vertical and horizontal integration of production - ever faster and ever more digital.

With innovative solutions from WENZEL our customers save time and money. This is our motivation and it's the right answer to the current situation in the economy. Just being innovative is not enough. Our customers should be able to directly see and calculate what our new solution will bring them. The selection of content for this year's Metrology World is based on this. We present new or further developed solutions, which should bring you direct benefit. Measurement technology is becoming increasingly important in the course of the introduction of industry 4.0 solutions. For us it means that we leave the familiar conditions of the measuring room and move closer to production. In addition to the award-winning SF 87, we have significantly expanded our portfolio over the past 12 months. With the SF 55 we have made our smallest machine, already successfully used in many production environments, fit for the shop floor area. Small, robust and very economical - this is what distinguishes our SF 55.

Customers need sufficiently good measurements faster and faster. A comparison with a master part or a quick scan is often sufficient for process control in production. To this point, we have strengthened our position this year with partner solutions. Together with Renishaw we have integrated their equator into our WENZEL world and together with KREON, we have developed a WENZEL measuring arm which can also be operated directly with our software.

Faster and faster, WENZEL still has two more answers, which we are pushing forcefully, convinced of the added value they bring. With our highly dynamic, compact measuring system CORE, which was especially developed for the measurement of turbine blades and similar parts with polished, reflective surfaces and sharp edges in the production environment, or with a REVO from Renishaw on a WENZEL machine, you can shorten the cycle times enormously and thus manage significantly higher throughput from your measuring machines.

Measurements are becoming more and more digital due to the increased use of optical sensors and CT solutions. In this issue we present our new line sensor and first customer reports of our award-winning CT-U. Digitization should also create added value; this is where our WM | SYS Analyzer comes in, the latest version of which will also be presented.

WENZEL is and remains a family business. We are proud of this and therefore celebrated our anniversary in full last year. What is also special from our point of view, however, is that we have had partners at our side for many decades with whom we have more in common than just a business relationship. Klostermann and GGW Gruber are also family businesses and share our values and ideas. Read our double interview!

The only stable thing is change. This applies to the world, our customers and therefore also to us at WENZEL. We work on similar tasks in the same buildings and yet a lot is changing in measurement technology. Industry 4.0 and the digital transformation have outgrown the marketing slogans and become visible in the first solutions that also bring tangible added value and productivity increases. We at WENZEL believe that we will find the right answers for you, our customers. We look forward to your feedback and discussion.

Yours

**Dr. Heike Wenzel**
**&**
**Prof. Dr. Heiko Wenzel-Schinzer**


# TRENDS IN METROLOGY
## OPTICS, INLINE, AUTOMATION, FEEDBACK, SW

**We at WENZEL analyze technical possibilities and innovations especially with regard to the benefit they offer our customers: Which measuring task can I solve better or faster with new technology? What new areas of application are possible for our products that did not exist before? From the many buzzwords we have concentrated on the following.**

**OPTICS** - The importance of optical sensors in coordinate metrology has been increasing for several years. We at WENZEL have developed various solutions for this purpose, which are increasingly in demand from our customers. Our CORE solution - high-speed scanning with white spot sensor - and our CT product family are unique and successful. With the Shapetracer - in future known as WM | LS120 - we have had a competitive product on the market for years with which enables an optical sensor to be used on a CMM but many customers have missed being able to use it in the same software. Therefore we have integrated the CORE as well as the different optical sensors into our WM | Quartis. We at WENZEL always want to offer our customers the best solution, therefore we have extended our sensor family together with KREON. Optical sensors are not only used stationary, but also often mobile on measuring arms. Here, too, we at WENZEL have created a new solution!

**INLINE** - The trend is clear, what is the answer from WENZEL? There's not one, there's different ones. Since integrated production at our customers looks very different, we also have flexibly differentiated solutions for this. Our developers have invested a lot in the special CMMs - SF55 and SF87 - in order to reduce the dependence of the measurement results on temperature, dirt, etc. The CORE and the CT-U are also designed in such a way that they can excel when used on the shop floor. Technology is one

thing, operability the other. Complex software solutions do not work well in the fast cycle of production. Therefore, we invest a lot in new operating concepts and interfaces.

**AUTOMATION** - When introducing an automation system, the question of occupational safety immediately arises in addition to integration into a production cell. With the WENZEL Automation Interface (WAI) we have created a very good basis for solving these issues. More and more customers expect an automation solution from us - fast, flexible but standardized. Therefore we at WENZEL unify all approaches to the different scenarios under a new software family.

**FEEDBACK** - At WENZEL we address two types of feedback. By closed loop we mean the opportunity for direct communication between measured value analysis and setting the parameters of the processing machine. The faster we can pass on the results of the measurement to the processing machine, the lower the amount of rejects produced. On the other hand, the INLINE trend increases the demand for machine reliability. Together with our service department, we work on predictive maintenance scenarios that identify weak points before failures occur.

**SOFTWARE** - There is currently no development in measurement technology that does not present a major challenge to software. We at WENZEL have developed many innovations here, our WM | SYS Analyzer, our new solution for measuring gears on a classic CMM - WM | Gear and WM | Gear Analyzer, as well as the modules WM | Blade Analyzer and the first vision of our automatic measuring program generator WM | Generator.

These trends challenge us at WENZEL every day. Innovation means costs and risks, but it also offers us development opportunities. Important for us at WENZEL also is our tradition as a mechanical engineer. For us, the production of a high-precision coordinate measuring machine begins with a passion for good craftsmanship. The selection of the materials used must be made carefully and on the basis of the desired quality, not on the best possible deal from the supplier. This is our tradition and we are certain that there are no better quality machines on the market.

Innovation meets tradition. At WENZEL you can feel and see this every day. Be curious and have a look at ....

# A REVIEW OF THE JUBILEE YEAR
## 50 YEARS WENZEL

**2018 was a decisive year for the WENZEL Group GmbH & Co KG from Wiesthal, the largest family-run manufacturer of innovative measurement solutions. The Wiesthaler company could proudly look back on its 50th company anniversary and at the same time, there were serious changes to be made in order to set the course for a further successful future. In spite of the great challenges and the numerous tasks that had to be mastered, the management and the staff did not want to miss the opportunity to celebrate "50 years of WENZEL" with customers and partners.**

The managing directors of the WENZEL Group receive the award from Mentor Ranga Yogeshwar.

The year began with a highlight. Based on the latest analysis of industrial computed tomography, Frost & Sullivan awarded WENZEL the Global Customer Value Leadership Award 2017 in January. The then newly introduced, latest generation exaCT U system convinced the market researchers with its simplified, cost-effective and fully automated workflow for the entire CT analysis process.

### Expansion of the product portfolio & changes in the management board


WENZEL Group exhibition stand at Control 2018

At that time, it was already becoming apparent that changes in the management were imminent. At the end of June it was official: Dr. Heike Wenzel became the sole managing partner of the WENZEL Group GmbH & Co. KG. Frank Wenzel left the company. The entire company group remained almost completely intact, only the WENZEL DesignTec GmbH and a small location in Karlsruhe separated from the WENZEL Group.

With the departure of Frank Wenzel, Prof. Dr. Heiko Wenzel-Schinzer joined the management board. Since then he has been responsible, among other things, for the Group's digitization strategy. Already since 2015 he supported the WENZEL Group in the realignment of software development and digital transformation. Moreover, he is the husband of Dr. Heike Wenzel and thus the tradition of the family business was also preserved in the management


Cheerful atmosphere at the WENZEL Sales Conference 2018

Within the scope of the annual international sales conference, the 50th anniversary was celebrated in June with the "WENZEL 1968's PARTY" with all subsidiaries and sales partners from all over the world. On 14 June, the gates were opened to the public as part of an open day. Afterwards the anniversary celebration started for all WENZEL employees and their families. The music of the "THE JETS Revival Band" was celebrated until late in the evening.

## Innovation elite & change of name

In July WENZEL was chosen as one of the most innovative mid-size German companies in the TOP 100 competition. For the second time since 2016, WENZEL has made the leap into this innovation elite. In an independent selection process, the company was particularly convincing with its innovation processes.

WENZEL celebrated its official 50th anniversary ceremony in October with long-time friends and companions of the company from politics and the economy. In numerous speeches and honours it was remembered how the small handicraft business of 1968 has over the years become a globally active company. Between the individual speakers, recorded greetings messages from world-wide were heard. The acclaim came from all corners of the world and once again underlined the internationality of the WENZEL Group. As a consequence of the growth of the company in the last 50 years, the increasing globalization and the orientation towards a broader product range in measuring technology, the largest subsidiary of the WENZEL Group, the WENZEL Präzision GmbH, commenced trading under a new name at the turn of the year: WENZEL Metrology GmbH

With the name change WENZEL set the course for the future at the end of the anniversary year. "Metrology" in the company name guarantees a high recognition value at home and abroad and reflects the core competence and passion of WENZEL.

Kommerzialrat Karl Wiefler and wife Judit Wiefler

Volker Klostermann and wife Erika Klostermann

INTERVIEW WITH KOMMERZIALRAT KARL WIEFLER & VOLKER KLOSTERMANN

# **SUCCESSFUL INTO THE FUTURE**
# PARTNER FOR DECADES

**Since when have you been a partner of WENZEL and why did you become one?**

**Wiefler**: Since 1973/1974, unfortunately I can't trace it back exactly. At that time, the traditional grey cast iron/steel base plates, but also other aids such as measuring beams, flatness and angle standards were replaced by natural hard stone for corrosion resistance and temperature stability, mainly in the measuring rooms and later also in the production area.

**Klostermann**: Klostermann GmbH already had a name in the coordinate measuring technology market at the beginning of the 90s. Partner at the time was an American manufacturer who was very soon integrated into a metrology group. From then on, the instruments went differently, not as I had imagined for a continuous success. At that time I met Werner Wenzel and we both quickly realized that there were many common ideas and values to realize. After about six months of getting to know each other better and five measuring machines sold, we signed a distribution agreement on 01.02.1993.

**When did you sell your first WENZEL CMM and what became of it?**

**Wiefler**: The first 3D measuring and marking machine of the type RS (lateral roller bearing) was ordered by Dr. Weinberger, at that time QS manager at Steyr Daimler Puch, 1978/79, after a joint visit to WENZEL. As far as I know, the machine was later moved to another factory of Steyr Daimler Puch. At the same time, a similar machine (also in orange) had been manufactured for Opel Rüsselsheim. This or the Steyr Daimler Puch machine returned many years later to WENZEL for overhaul.

**Klostermann**: The first coordinate measuring machine, an LH 108, was sold to Grunewald GmbH in Bocholt in 1992. It has been in service for many years, has been modernized again and again in the meantime and was replaced last year by a larger WENZEL bridge measuring machine.

**What advantages do you see in the cooperation between a manufacturer and an independent house like yours?**

**Wiefler**: First and foremost, we see our advantage in our flexibility, as we can quickly respond to all customer requirements on site, both in the pre-sales and after-sales phases. Secondly, our geographical proximity to

our customers enables us to intervene more quickly when problems arise. We offer all services, preventive measures, software updates and much more, some of which are free of charge. We offer training courses and operating instructions at several locations, also in the customer's language on request.

**Klostermann**: As a rule, we get to know our customers at an early stage of the project. You approach us with a measurement task and look for optimal solutions, which we work out together. From the large product range and with our experience, also as a provider of metrological contract services, a machine is selected with which the solutions developed can be implemented. In close cooperation between WENZEL and our company market developments of the customers are analyzed and brought into the distribution process with suitable products. So the advantage for both parties is obvious. WENZEL can take care of its core tasks, the production of high-quality measuring instruments. And we are the partner for both the customer and the manufacturer.

### How do you perceive the relationship between WENZEL and your house?

**Wiefler**: The relationship between WENZEL and Gruber has been characterized for almost four decades by a personal and very deep friendship, which is now also cross-generational, and is therefore absolutely friction-free, cordial and familiar.

**Klostermann**: It is an outstanding feature to look back on almost three decades of successful cooperation. Partnership behavior, quick decisions and short distances are essential elements of our cooperation, which are practiced at all levels of the company. And the most important point in all these years was the unrestricted trust in each other!

### Which event do you particularly like to remember when you think of Haus WENZEL and the founders Werner and Helga Wenzel?

**Wiefler**: At WENZEL always great celebrations were organized with many partners and personal friends e.g. Prof. Braun, at that time director of the Neu-Technikum Buchs,. We were also allowed to be there more often with our little daughter Claudia. Mr. Bebié, the founder of the software house Metromec, completed his studies in the New Technology Center. Mr. Braun ordered a WENZEL LH machine with Metromec software for the new pilot plant. Mr. Wenzel always issued generous invitations at all trade fairs, no matter whether it was Miccrotechnik in Zurich, Control later in Sinsheim and Stuttgart or EMO in Paris.

**Klostermann**: I like to remember events that my wife and I could celebrate together with Helga and Werner Wenzel. They were birthdays, company anniversaries and the inauguration of new buildings again and again. Personal sympathies and the will to achieve common success have united us. Also a cosy get-together with dinner and wine tasting in the Villa Marburg on the occasion of the sale of our 200th measuring machine in 2003 is a nice memory for us.

Partners since decades

> "The relationship between WENZEL and GGW Gruber has been marked for almost four decades by a very deep personal friendship, now also across generations."
>
> *Karl Wiefler, founder of GGW Gruber & Co. GmbH*

**In your opinion, what were the biggest challenges in the partnership?**

**Wiefler**: Unfortunately, after the death of Werner Wenzel in 2006, there were internal tensions, which I tried to smooth in vain during many of my visits to Wiesthal. Only after about six months did calm return and since then the focus has shifted back to work, which has been clearly reflected in the recent performance.

**Klostermann**: The global economic crisis of 2009 left its mark on all of us. Sales collapsed. We put our heads together, developed strategies together, continued to work the market in order to be able to "harvest" again in better times. These joint efforts have led to the fact that all of us have emerged stronger from it.

**What were the greatest joint successes?**

**Wiefler**: The biggest individual successes were certainly the first LHF 30-60-25 sold to customer FACC, the first LH 22-30-12 to customer KBA, the first RAF 30-60-20 to customer ÖBB, the RAF with RUF to customer MAGNA and the first computer tomograph for our subsidiary WILD HI Precision. All, except the CT, are special machines and were adapted at that time still to the respective workpiece sizes of the customers.

**Klostermann**: The greatest common success was and is to maintain the existing partnership for 26 years. We look back with pride and joy on a large number of measuring machines sold together. For example, there is one customer who has bought 14 WENZEL measuring machines from us in recent years.

**At WENZEL and yours the 2nd generation is now "at the helm". How do such partnerships work over generations?**

**Wiefler**: Handing over the business to the (a) new generation or to a successor is associated with a longer-lasting process that demands respect, discipline and tolerance from all those involved. In addition to meticulous preparation that has been objectively evaluated from several sides, it seems important to me that the "previous generation" is integrated into the new company network and that this valuable know-how is not lost as a result. This is

Team of GGW Gruber


Team of Klostermann

the only way to ensure that the tradition that has made the company successful continues to exist and continuity is maintained, which is essential both for the customers, the suppliers and - and this is very important - for the employees of the company.

**Klostermann**: It fills me with special joy that the cooperation between the houses of WENZEL, GGW Gruber and Klostermann also functions excellently in the 2nd generation and is further developed and strengthened. From my point of view, the key answer is a common basis of values and an understanding of the other person. If one manages to transfer the values of the founders, who have proved successful since the first hour of cooperation, to the next generation, then a stable foundation is created.

### How do you see the future in measurement technology?

**Wiefler**: I see the future of measurement technology more positively than ever. Due to the constantly increasing demands on precision in the production area, together with the reduction of all production tolerances, the measuring systems must also be able to implement these accuracies measurably. At the same time, the desire on the part of customers to reduce measurement times is becoming louder and louder. In order to take greater account of this trend in the future, the path will increasingly lead to non-contact, optical measuring systems.

**Klostermann**: The ever shorter development cycles have led to a trend towards faster and more meaningful measurement results. The quality of the manufactured products is becoming ever higher, the tolerances ever smaller, whether in the automotive industry, medicine, space technology or in things that we use every day. I am sure that measurement technology will continue to develop in the areas of sensor technology, automation and accuracy and will continue to grow in importance.

### How will this affect the partnership?

**Wiefler**: The partnership between manufacturer, sales and service will continue to intensify and should lead to a win-win situation in which we see it as our task to pass on the customer's wishes to the system manufacturer. The close cooperation with our partner company WILD HI Precision on the one hand and the Technical University on the other hand can provide us with valuable information in the future, also in connection with Industry 4.0.

**Klostermann**: It will continue to be extremely important for us in the future to be very close to our customers. And to share the knowledge gained with the manufacturer of the measurement technology in order to find the right answer to the many questions promptly. Communication between each other will become "more frequent" in order to quickly adapt to emerging trends. The quick view on the current tasks, paired with a dynamic company WENZEL, which brings out suitable products on the street, will be from my point of view a guarantor for a successful advancement.


# INDUSTRIAL COMPUTED TOMOGRAPHY

## IN ADDITIVE MANUFACTURING

### Application potential of computed tomography in additive manufacturing

Additive Manufacturing (AM) has been through the typical course of a new technology: first praised exuberantly as a savior, then rejected as unfit for practical use and now on the way to be a real alternative in manufacturing. One of the main advantages of AM is that even complex and above all hybrid materials can be bonded simultaneously during the construction phase, due to the layered structure or melting. This poses new challenges in particular for part testing, both in terms of geometries and material consistency. Here, computed tomography (CT) measuring devices offer a unique opportunity to support quality assurance in the field of AM.

In general, all industrially manufactured components, including those manufactured with AM, must be subjected to a dimensional accuracy test. Relatively little is (yet) known about the achievable accuracies of the products manufactured with AM. Here CT can be a very useful solution. In CT, a body is x-rayed. To make a CT scan, the body is rotated in the beam path. A few hundred to a few thousand X-ray images are digitally recorded by a detector at various angles.

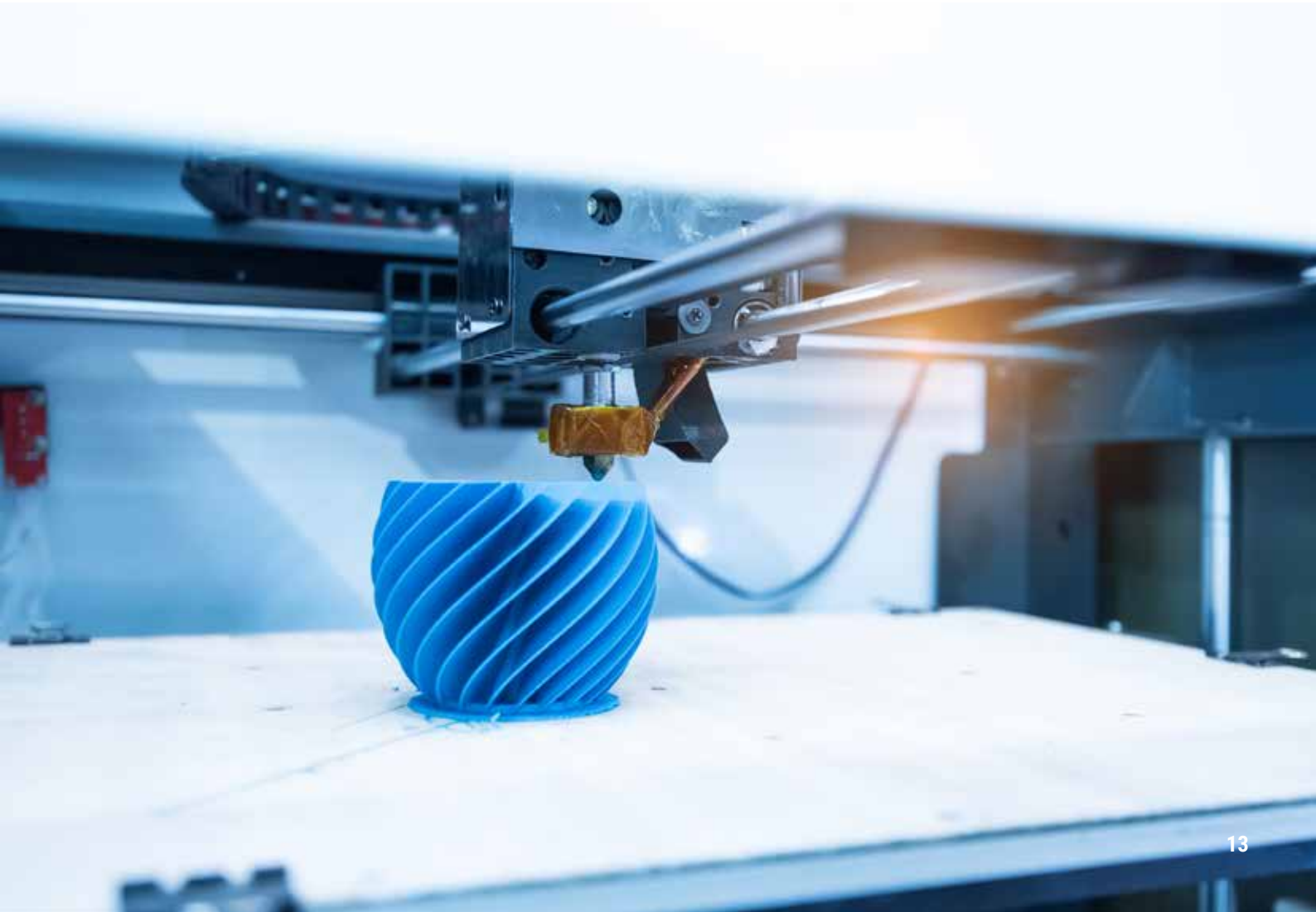
At the end of the scanning process, the result, the 3D

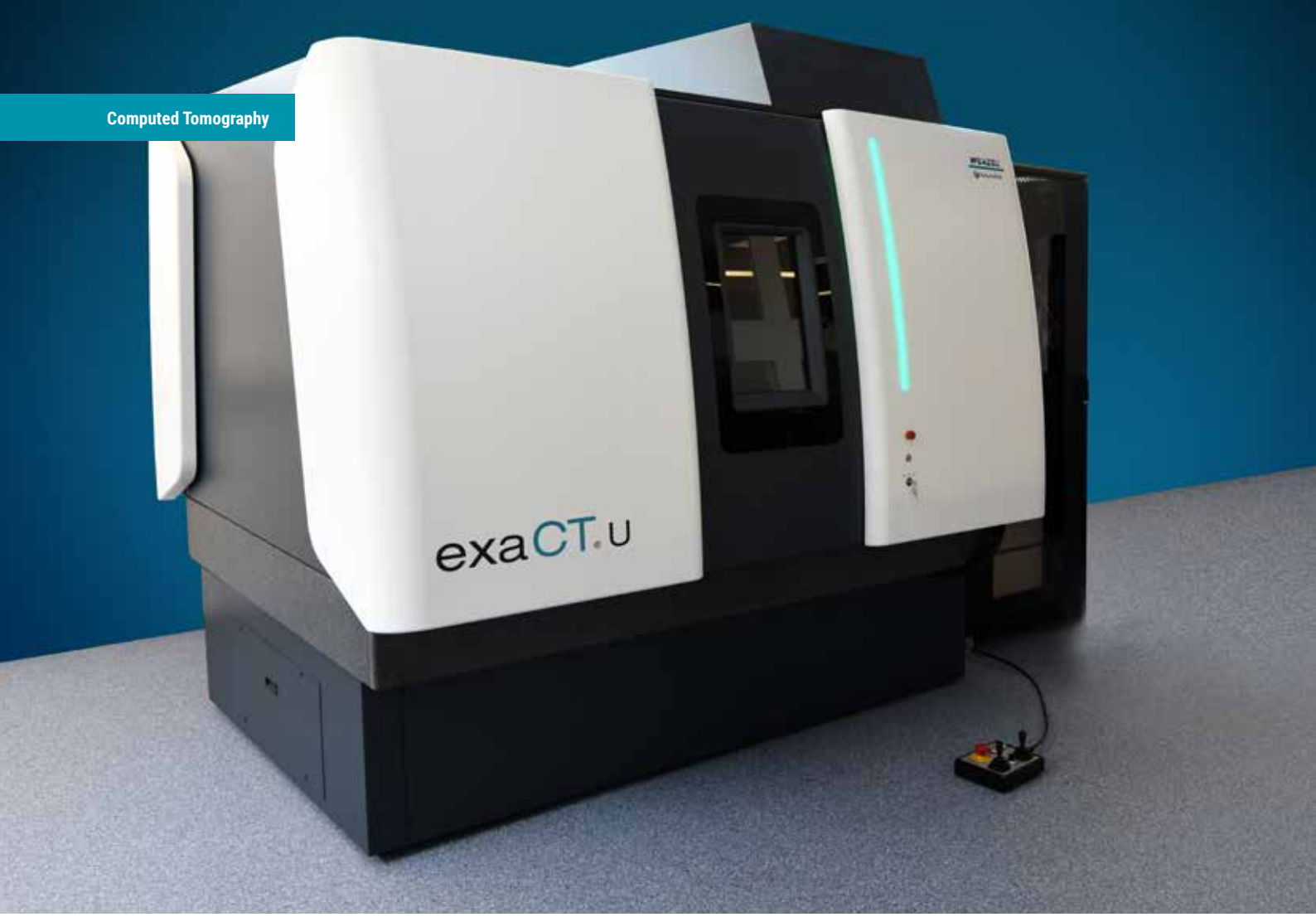
material distribution, is digitally stored in the computer's memory. By means of CT, material distributions can be differentiated from each other with regard to their density or elements. In principle, all bodies could be digitized with this method, but the method has physical limits. It is therefore very important to find the right CT solution for the respective application. With the exaCT S, WENZEL offers, for example, a device with a power of 130 KV and a weight of approx. 450 kg for small plastic and composite parts. For larger parts, also made of metal, WENZEL offers the powerful exaCT U with 300 KV. The exaCT-U, however, has to be shielded much better due to its higher power and therefore weighs 8 tons.

The first useful application of a CT lies in the field of non-destructive testing. Structural defects can be easily identified by the possibility of displaying the inner structure of materials in high-resolution images. This is a great advantage, especially during the current introduction of AM into industrial use, as this test creates confidence for this technology between producer and customer.

Another application of CT is assembly testing. Verifying the functions of a component non-destructively in an already assembled state is usually a challenge. Here, too, the material-resolving imaging of the CT allows the function to be assessed without disassembling the components. When used as a coordinate measuring machine, a CT offers the possibility of capturing almost any geometry quickly and accurately. Especially for hybrid components, a CT has a unique capability to validate the part in comparison to the CAD data set. Therefore, if the component can be X-rayed because of its density and size, the complexity of the geometry plays a subordinate role for the accuracy of the CT measurement method.

CT and AM - these are two comparatively young technologies that combine excellently with each other. While AM permits new structures, the quality assurance of these new constructions and productions is carried out by a CT. Based on these results, correction methods for design data will be generated in the future, which can significantly improve both the dimensional accuracy and the mechanical stability of 3D-printed parts.






# WORKING MEASUREMENT WITH THE exaCT U
## START UP WITH WENZEL

**t-exact GmbH, based in Schmalkalden, Thuringia, is a provider of 3D measurement and analysis services. Since 2017 the company has offered analysis by means of computer tomography (CT) with the exaCT U computer tomograph from WENZEL, especially for applications from the plastics industry, e.g. for the contract measurement of components made of materials which are difficult to sample with conventional measurement technology (e.g. rubber or silicones).**
**The company refers here to its extensive experience, since this technology has already been used since 2012.**

### The customers quickly recognized the advantages of computed tomography

"We were aware of the importance of this technology to our customers, but it would have been foolhardy to buy such a costly device as early as 2012. That's why we first purchased the point clouds and then analyzed them in-house with the appropriate software," says Torsten Herrmann, managing partner of t-exact GmbH.

### Strict selection process

The young start-up company chose WENZEL as its future partner in the field of computed tomography and coordinate measuring technology after a strict selection process. With the powerful exaCT U from WENZEL, the company is able to offer professional 3D measurement and analysis services using computer tomography. The possibility of non-destructive testing offers its customers enormous time savings compared to other analysis and measurement methods. With the exaCT U, plastic, structural, hybrid and cast components or organic and mineral materials can be measured and tested without contact. This also applies to the measurement of elastic, transparent and soft components. "In the meantime, an increasing number of our customers have committed to carry out the


re-qualification required by IATF 16949 using CT comparison measurement between the approved initial sample part and the component currently being produced. This approach puts the practical feasibility of the standard requirement into the realm of the economically possible," explains Torsten Herrmann. In addition to the possibilities of CT analysis, t-exact also offers the service of tactile measurement. "Tomography does not make sense everywhere, this method cannot be used everywhere, which is why we also offer the possibilities of traditional measuring techniques," explains Tommy Hehnke.

## KEY DATA OF THE PROJECT

### Customer:

**t-exact GmbH is a provider of 3D measurement and analysis services by means of computed tomography and profile measurements in Thuringian Schmalkalden.**

### Requirements:

High-precision, non-destructive complete acquisition of external and internal structures.

### Fields of application:

Contract measurement of components made of materials which can be difficult to measure conventionally such as rubber or silicones.

FOR USE IN THE WORKSHOP

# THE NEW WENZEL SHOPFLOOR SERIES
## CMMs FOR USE IN THE WORKSHOP

**WENZEL's workshop-suited CMMs are universally applicable. The WENZEL SF 55 and SF 87 coordinate measuring machines can be used to measure both series and individual individual parts in the direct production environment, in incoming goods and in classical quality assurance. The intelligent and compact design is suitable for a wide range of applications in the production environment, especially in the cutting and forming industry.**


### WENZEL SF 87

The new SF 87 coordinate measuring machine is the universal measuring machine for the production environment. The SF 87 requires little floor space and offers an optimized measuring volume of 800x700 x 00 mm. This makes it ideal for a large part of the metal cutting and forming industry. The machine concept offers a very good price-performance ratio with low space requirements. High traversing speeds and accelerations ensure high productivity. The combination of powerful probes and optical sensors leads to a considerable increase in efficiency in your measuring and testing process.

### WENZEL SF 55

The SF 55 is a CNC bridge measuring device for use in a production environment and can be equipped with both tactile and optical sensors. The corrosion-free guides of the machine are made of granite and hand lapped with high precision. The guide ways are completely covered and protected against contamination. The controller and PC are integrated into the machine for a minimum foo print. The space requirement is low with excellent price-performance ratio. The SF 55 has passive vibration damping and can optionally be equipped with active vibration isolation.


"WENZEL has built a strong presence and credibility among customers in various end-user markets, such as automotive, aerospace, plastics, powertrain, and medical devices, and is expected to increase its presence in additive manufacturing as well. WENZEL has actively rebranded its corporate identity and strengthened its thought leadership in the current digital transformation trend."

*Prem Shanmugam, Senior Berater und Program Manager, Frost & Sullivan*

### Multisensor capable and ready for automation

SF 87's bionic structure and unique low center of gravity design make it efficient, ergonomic, productive, and insensitive to shop floor vibrations. SF87 is flexible when it comes to sensors. SF87 is multi-sensor capable and supports both optical and Renishaw tactile sensors including the PH10MQ PLUS that can be equipped with extensions and SP25M analogue scanning probes. SF 87 can be configured with a tool-change rack to switch probes and extensions automatically, without need for time consuming requalification. The new coordinate measuring machine is a directly usable production line and automation solution and can be integrated through the optional WENZEL Automation Interface (WAI) for material handling, without losing any footprint. The accessibility of the measuring volume from three sides is optimal for automated assembly by robots and can be flexibly adapted for more complex tasks with customer-specific substructures.

In addition, SF 87 uses an active damping system and does not use air bearing
technology, which helps customers avoid using expensive clean air and operate with only
a 230V power supply, all achieved without compromising measurement accuracy. WENZEL complements its strong product range with an optional service package which includes all services such as preventive maintenance, calibrations and repairs.

INNOVATION IN METROLOGY

# WENZEL SHOPFLOOR SOLUTIONS

Robust, fast, accurate, compact


## WENZEL SF 87
AWARD WINNING SHOP FLOOR SOLUTION

FROST & SULLIVAN

2018 BEST PRACTICES AWARD

GLOBAL
COORDINATE MEASUREMENT MACHINE
NEW PRODUCT INNOVATION AWARD

We are thrilled to be winners of *The Frost & Sullivan Best Practice Award*. And you should be thrilled, too! Because with the WENZEL SF 87 we are now offering you more measuring volume, smaller footprint, larger operating temperature range, and seamless integration with material handling solutions. SF 87 successfully tackles key industry challenges in shop floor inspections.

**www.wenzel-group.com**

BEST PRACTICE AWARD 2018

# **WENZEL SF 87**
# AWARD WINNING SHOP FLOOR SOLUTION

**London – Based on its recent analysis of the global coordinate measurement machine (CMM) market, Frost & Sullivan recognizes the WENZEL Group with the "Best Practices Award" for its groundbreaking SF 87 shop floor CMM. The SF 87 successfully tackles key challenges in shop floor inspections by offering more measuring volume, a smaller footprint, a wider operating temperature range, and seamless integration with material handling solutions.**


Picture (from left to right): WENZEL Management Prof. Dr. Heiko Wenzel-Schinzer, Dr. Heike Wenzel and Jan E. Kristiansen, Senior Partner of Frost & Sullivan

Each year, Frost & Sullivan presents this award to the company that has developed an innovative element in a product by leveraging leading-edge technologies. The award recognizes the value-added features and benefits of the product and the increased return on investment (ROI) it gives customers, which, in turn, raises customer acquisition and overall market penetration potential. Frost & Sullivan's Best Practices Award recognizes companies in a variety of regional and global markets for excellence in areas such as leadership, technological innovation, customer service and strategic product development. Industry analysts compare market participants and measure performance through in-depth interviews, analysis and extensive secondary research to identify industry best practices. The award ceremony took place on March 20th, 2019 in London. Dr. Heike Wenzel and Prof. Dr. Heiko Wenzel-Schinzer accepted the award from Jan E. Kristiansen.

**Best Practices Award 2018 geht an WENZEL**

""The SF 87 has a measuring volume of 800 x 700 x 700 millimeters (mm), which is three times the measuring volume for the given footprint of competing products. Further efficiency gains can be achieved by using more powerful probes and optical sensors."

*Prem Shanmugam, Senior Consultant and Program Manager, Frost & Sullivan*

FOR USE IN THE WORKSHOP

# IN PRODUCTION WORKFLOW
## FERRATEC INVESTIERT IN MEHR PRODUKTIVITÄT

**Since 1989, FERRATEC GmbH has stood for quality and reliability in the fields of tool and mould making and plastics technology. The Hösbacher company offers complete solutions from a single source - from the conception and development of tools to sample parts and series production readiness through to the assembly of the finished components. The range of activities includes mould construction for the company's own plastic injection moulding shop as well as tool construction for special machines, jigs and fixtures, cutting tools, series production, assembly and contract manufacturing.**

**In order to guarantee the highest quality standards, FERRATEC constantly invests in new technologies, including naturally in the area of quality control. The latest acquisition is the SF 87 coordinate measuring machine from WENZEL for workshop use. With a large measuring volume, a small footprint and a wide operating temperature range, the SF 87 meets all the requirements for successful measurements in the direct production environment.**

### Convincing quality of product and service

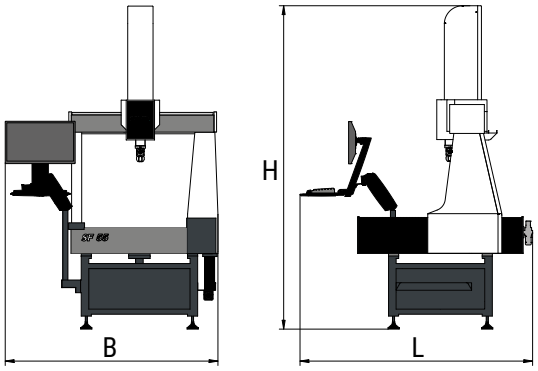
"The SF 87 has a measuring volume of 800 x 700 x 700 mm. This is three times the measurement volume of competing products with comparable footprints," says René Kunkel, Product Manager CMM at WENZEL.

"Further increases in efficiency can be achieved by using more powerful probes and optical sensors," he continues. The WENZEL SF 87 can also be operated at temperatures of up to 30 degrees Celsius. In contrast, conventional CMMs require about 20 degrees Celsius. This makes them unsuitable for use in production halls.

At FERRATEC, the SF 87 is primarily used for the evaluation of dimensional accuracy and shape and position tolerances of plastic parts from a wide variety of areas.

> "In order to be able to guarantee our customers top-quality products, we manufacture almost all tools ourselves. It doesn't matter whether you want single pieces or small series. The measurement solutions from WENZEL contribute to a maximum of product quality, productivity and satisfied customers."
>
> *Gerhard Rosenberger, Head of Quality Assurance at FERRATEC*

The decision for this measuring solution from WENZEL was easy. "We have been working successfully for many years with a WENZEL bridge measuring device of the LH series", explains Gerhard Rosenberger, head of QS at FERRATEC. The high quality of the WENZEL products especially as well as the fast and good service convinced him. "In order to be able to guarantee our customers top-quality products, we manufacture almost all tools ourselves. It doesn't matter whether you want single pieces or small series. The measurement solutions from WENZEL contribute to a maximum of product quality, productivity and satisfied customers", says Rosenberger.




## MACHINE PROFILE

| | |
|---|---|
| **Space Requirements** (L x B x H) | **2130 x 1560 x 2890 mm** |
| **Machine weight** | **1850 kg** |
| **Max. Workpiece weight** | **300 kg** |
| **Measuring ranges** | **800 x 700 x 700 mm*** |

* with touch probe PH10M PLUS

### Integration in automation solutions

While the LH is available in the measuring room for highly precise measurements, the SF 87 is integrated into the machine tool workflow. "The SF 87 stands in a typical shop floor environment with direct sunlight, for which it was designed," reports Kunkel. In the next step, automated assembly and an initial visual check by optical sensors are planned.

The SF 87 is already prepared for use in production lines and automation solutions and can be easily integrated via the optionally available WENZEL Automation Interface (WAI).

The accessibility of the measuring volume from three sides is optimal for automated assembly by robots and can be flexibly adapted for more complex tasks," explains Kunkel. The ability to seamlessly integrate into automation solutions was also a key factor in Frost & Sullivan awarding the SF 87 its Best Practices Award 2018 in March of this year.

# WENZEL CORE
## WHY CORE?

**Hollywood, for example, used it for the film "The Core". In sports, "core training" means the training of the central body part, in physics "core" is the most important part of a nuclear reactor in which the chain reaction takes place. No matter what we have looked at so far, they all have one thing in common: it is about the innermost, the central part.**

In addition to measurements in the measuring room, it is now important to move metrology into the production area close to the processing machines in order to be able to react quickly to deviations. With this in mind, WENZEL's CORE product range was developed for the central part of a production plant - the quality of the products. No matter whether the measurement is carried out directly after production or during post-processing within the maintenance cycle at a later point in time, the CORE is the appropriate coordinate measuring machine for this. The measuring machine can be used directly in the production area and measure the relevant characteristics. It is possible to measure on almost all surfaces, whether shot peened, lacquered, polished or matt. Due to the unique optical sensors of the CORE product line it is possible to measure all these surfaces.

Some may now think that optical sensors cannot measure everything. That's right, every technology has its limits. For this reason, WENZEL has developed a hybrid sensor that combines the characteristics of optics and tactile sensors and is outstanding in this regard, but not only are the sensors to be emphasized here, also the machine itself impresses with its small space requirement in comparison to similar measuring machines. The CORE product range is also characterized by its incredible flexibility. Depending on the model, the CORE can be equipped with 6 axes and a measuring turntable. This combination allows almost unrestricted access to the components in order to measure as many features as possible in a single operation without re-clamping. This measurement is not done in hours, days or weeks, no, the development of the CORE product line has been designed to measure within

the cycle time of production. Fast measurements can be achieved as a result of high acceleration of the individual axes. yet the accuracy is not overlooked, resulting in the best possible relationship between measurement time and accuracy. In addition, the CORE product range can also be integrated into a fully automated production line. Whether using a robot or an automatic feeding system - with the CORE, WENZEL can make real almost any automation.

What would a measuring machine be today without the right software? It would probably only function in a limited way. For this reason the CORE is now available with the well-known WM | Quartis software from WENZEL.

The areas of application for CORE are wide. For example, turbine blades from the aerospace industry or industrial gas turbines can be inspected. In medical technology, joints and prostheses can also be measured, as can components from other diverse markets. Small, medium and large components with a length of more than 2m can be measured with the CORE product range. No matter whether you want to check the quality of your products directly after manufacture or at a later point in time, CORE will not let you down. Do not leave the quality of your products to chance, but entrust this important central part of the CORE to WENZEL.

## TYPICAL FIELDS OF APPLICATION

Knee and hip prostheses

Blades

Pumps


# REVOLUTIONS CHANGE THE WORLD
## LH WITH REVO CHANGES THE WORLD OF TACTILE METROLOGY

**Like no other touch probe, the REVO changes the world of tactile coordinate metrology. The name REVO stands for Revolve and Revolution in the sense of radical change, and not by chance. Two stepless rotary axes with very high rotation speed and a completely new measuring technology in connection with the powerful LH measuring machine provide a revolutionary increase in the measuring performance and possibilities with simultaneous simplification of the probe configurations.**

A completely new feature is the Active-Head function, in which the sensor records the measurement data on the component during the rotation of the two axes of the head. In combination with the three axes of the machine, which can be moved simultaneously depending on the measuring task, this results in a true 5-axis measuring system. Another new feature is that the deflection of the stylus during the measurement is recorded in real time and included in the calculation. Using this technology, the LH achieves scanning speeds up to a factor of 10 higher than the usual values for stylus lengths up to 500 mm and beyond. Due to the high precision of the LH, measurements with an accuracy in the range of one micrometer are also possible with these extreme values. Since the REVO can reach any infinitely variable angle, a wide variety of measuring tasks can be performed with just a few probes, which reduces the number and thus the costs and the effort needed for complex probe configurations in changing systems and keeping their calibration to a minimum. The simple configuration, high performance and variety of possibilities offered by the LH with this system make the machine easier to operate, faster and more accurate, saving time and money.
In addition to the tasks of classical coordinate technology, the LH with REVO with the roughness sensor also takes over the surface analysis automatically in a single oper-


ation. The REVO with its various sensors as well as the roughness sensor is fully integrated into the user-friendly WM | QUARTIS measuring software so that the LH is just as easy to operate with this powerful system as any other measuring machine from WENZEL. Whether small components in smaller machines or ship diesel engines in large machines, the LH with REVO excels in series monitoring with speed and in analysis and initial sampling with flexibility and unique potential. We are certain that with REVO, LH will also revolutionize quality assurance.

ÖKONOMISCHE & LEISTUNGSSTARKE 3D KMGs

# µ-ACCURATE MEASUREMENT OF BIG PARTS

**What used to be the exception has become increasingly the norm over the last five or six years in the measurement of manufactured parts. The trend is clearly towards 100% control. The company Tool-Tec from Pischelsdorf is well prepared for these "high customer demands". The company recently invested in another gantry-type coordinate measuring machine. The WENZEL LH 2015 was ordered from GGW Gruber, Tool-Tec's trusted partner for high-precision, quality-assurance testing.**

## KEY DATA ON THE PROJECT

### Customer:

Specialist in the machining of large parts - turning, milling and welding of components with a unit weight of up to 15 tons.

### Requirements:

Tailor-made complete solutions from a single source.
- Machine base frame including painting.
- Welding of railway vehicles and parts.

### Fields of application:

Zero defect policy with quality assurance according to ISO 9001 and ISO 14001.
- Just-in-time delivery and with test report
- Process control and optimization

Tool-Tec was actually founded in 1993 as a toolmaker, but the market gave the Styrians a different direction. Meanwhile the Pischelsdorfer are regarded as the go-to people when large parts have to be turned, milled and/or welded. "We offer our customers tailor-made complete solutions from a single source, whereby a few years ago we specialized in the machining of large parts," reveals Harald Wolf, founder and managing director of Tool-Tec Werkzeugbau GmbH. Among the Steirer's regular customers are many well-known mechanical engineers and industrial companies. Typical products ordered from Harald Wolf and his team of 85 employees are, for example, machine base frames including painting. An average annual quantity of 400 means that two such machine components are produced almost daily.

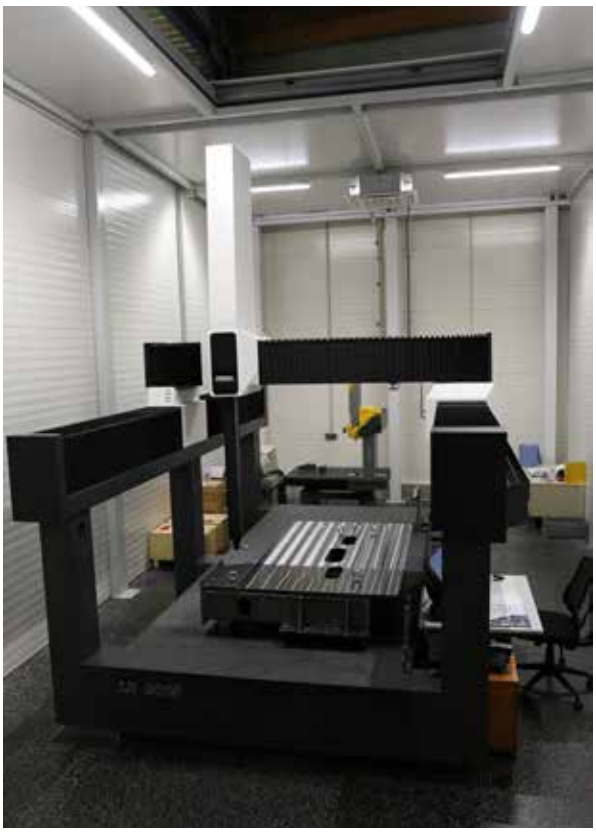
"We can weld, process and measure parts with a unit weight of up to 15 tons", emphasizes the Tool-Tec boss. "When welding, we meet the requirements of DIN EN 15085 CL1/CL4-2, DIN EN ISO 3834-2 and EN 1090," he adds. The approval for the welding of rail vehicles and rail vehicle parts is therefore also given by the Pischelsdorfers.

### Quality assurance is the trump card

The company Tool-Tec's machinery is impressive. A total of 20 CNC milling machining centers, three lathes, two grinding machines, five welding machines, one painting booth and two measuring machines distributed over two locations are available for mainly series production. Usually the ordered lot sizes range between 5 and 50 pieces. "We strive for lasting customer relationships and impeccable references. To this end, we pursue a zero-defect policy with quality assurance in accordance with ISO 9001 and ISO 14001," explains Harald Wolf. The demands of our customers are constantly increasing. According to the Tool-Tec managing director, this fact can be seen, among other things, in the fact that just-in-time delivery with test reports is becoming increasingly necessary. "What used to be the exception is now explicitly included in almost every order: most customers want to have their documents documented in black and white and

**Perfect teamwork:** Walter Artinger (right), workshop manager at Tool-Tec, knows that he can always contact Roland Widrich (left) and his colleagues at GGW Gruber if he has any problems or questions.

proof that the quality of the manufactured parts fits 100%," confirms Harald Wolf. That was one of the reasons why he recently invested in another WENZEL LH Gantry. The LH 1210, which has been available for a long time, has already been performing reliable "measuring services" at the Pischelsdorf company for several years. "This coordinate measuring machine has already pointed out errors to us several times. It serves not only as a quality assurance tool but also as a quality-enhancing instrument, because we can now optimize much more specifically," says one who prefers to act proactively. After all, as a future-oriented company interested in long-term success, it has to stay on the ball permanently in order to succeed in the face of increasingly global competition.



**Upstairs there is room for the overhead travelling crane:** Without a crane nothing is possible with the parts weighing up to 15 tons that are measured in this WENZEL system.

# µ-ACCURATE MEASUREMENT OF BIG PARTS

## LH 2015 as unique selling point

It only moved into Tool-Tec in February 2018, but many potential customers knew about it within a very short time: "Things like this get around quickly," smiles Harald Wolf. He remembers several phone calls that started in the last months with the words "I heard you have a new measuring machine...". No wonder, because such a 3D coordinate measuring machine of gantry construction, with which one can measure up to 2 m wide, 4 m long and 1.5 m high parts µ-precisely, is already a certain unique selling point. Not everyone has that.

The LH Gantry is a CNC coordinate measuring machine with air bearings in all axes. It offers all the advantages and applications of the LH series and has been specially designed for the inspection of large-volume and heavy workpieces. "Thanks to the granite construction the LH Gantry scores with a very high basic accuracy. It is extremely long term and temperature stable. Thermal environmental influences acting on the workpiece and the CMM are corrected by automatic temperature compensation. Another optionally available special feature that has actually been integrated into the Tool-Tec solution is the active pneumatic vibration damping, which provides optimum protection against vibration," describes Roland Widrich, Sales Manager Austria at GGW Gruber.

## Scanning rotary/tilt switch

For Harald Wolf, it was actually clear from the very beginning that the new measuring machine would again be "a WENZEL": "On the one hand, the LH 1210, which has been available for a long time, has been working perfectly for years, and on the other hand, we received consistently positive feedback when we asked other users about their experiences with this CMM. Last but not least, the support provided by GGW Gruber is also excellent: "Whenever there is a measuring problem, it is solved professionally within the shortest possible time," he praises.

"I often turn to Mr. Widrich and his colleagues for detailed programming questions," says Walter Artinger, workshop manager at Tool-Tec. The Styrian is extremely pleased that quality assurance and thus the LH 2015, among other things, are now also part of his area of responsibility: "I actually come from milling and working with this CNC coordinate measuring machine represents a new challenge for me. It's like a little Mercedes," he compares. "I haven't found any weaknesses with this machine yet and the service from GGW Gruber is also perfect," he adds.

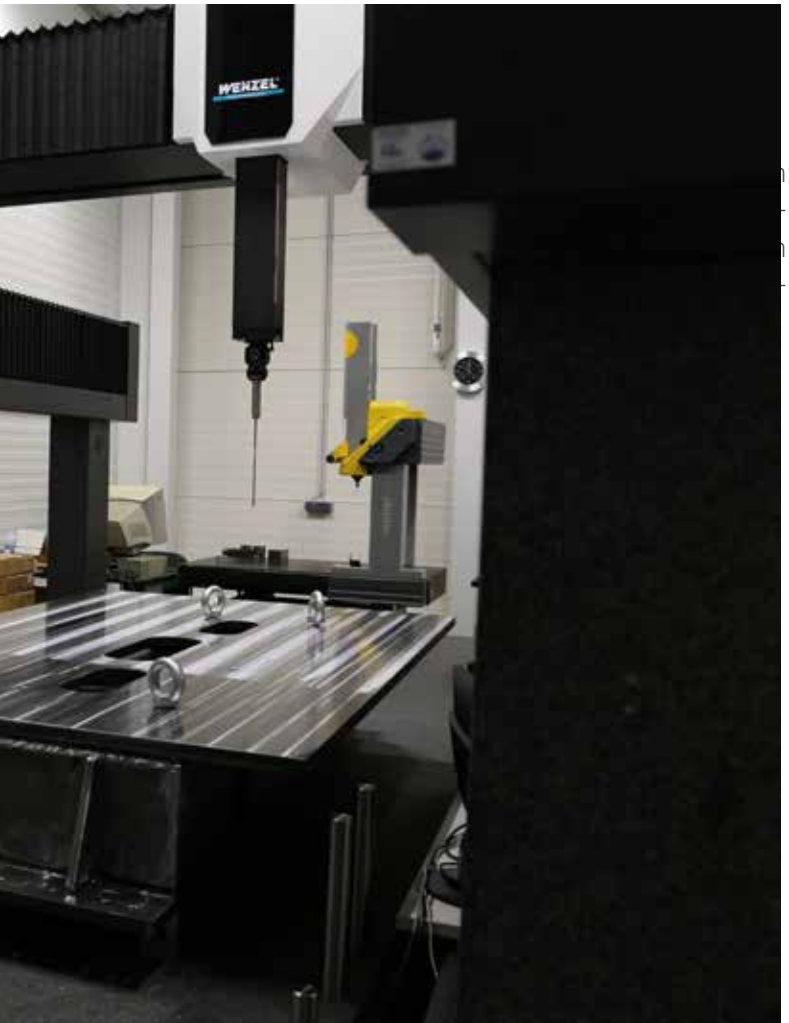
**One probe for all positions -** that means flexibility. Within a very short period of time, tens of mea

“The LH 2015 is like a small Mercedes. I haven’t found any weaknesses with this machine yet and the service from GGW Gruber fits perfectly, too.”

*Walter Artinger, Workshop Manager at Tool-Tec*

Fun to learn how to place the workpieces to be measured in the LH Gantry to get the scanning probe to the desired location. Because one thing is “law” at Tool-Tec: no product leaves the company without having been carefully examined in an LH gantry. During this quality check, not only the most varied dimensions, distances and tolerances are checked, but also fits, position positions and much more. An average measurement log shows between 50 and 100 positions, the complete geometry of each individual component is precisely measured at 2 µ. A scanning rotary/tilt switch that can be tilted from 0 to 360 ° and from 0 to 105 ° in 720 positions makes this possible. “One button for all positions - that means flexibility. Throughout the scanning, this not only works very accurately, but also very quickly. Within the shortest time, dozens of measuring points are recorded and captured”, Roland Widrich finally emphasizes the efficiency of the WENZEL 3D gantry measuring device solution used at Tool-Tec.

asuring points are picked up and recorded by a scanning rotary/tilt probe.




## CUSTOMER PORTRAIT

**Founded in 1993, Tool-Tec Werkzeugbau GmbH developed over the years from a two-man business to a company with 85 employees. Whereby the Pischelsdorfer have finally specialized in the processing of large parts. Among the Steirer’s regular customers are many well-known mechanical engineers and industrial companies.**

**Tool-Tec Werkzeugbau GmbH, Pischelsdorf 411, A-8212 Pischelsdorf am Kulm, Tel. +43 3113/3488-0, www.tool-tec.at**

KREON PARTNERSHIP EXPANDS THE WENZEL PORTFOLIO

# **PRODUCT INNOVATION WM | MMA**
# PORTABLE 7-AXIS MEASURING ARM

**The world of coordinate metrology is subject to constant change. We at WENZEL are therefore always on the lookout for innovative partners who can help us to offer you the best possible solution on the market. The step therefore to enter into a partnership with KREON in the field of mobile applications was only logical for us. After intensive discussions between the management of both companies, it was decided to include products like the KREON measuring arm in the product portfolio of WENZEL - in WENZEL's own design. The objectives of this strategic partnership are to increase product reach and to offer a comprehensive product portfolio.**

## Location-independent fast and easy measurement increases flexibility

The mobile measuring arm from WENZEL is characterized by a high degree of flexibility. It can be used flexibly in production and quality assurance processes. This is supported among other things by the integrated battery as well as WiFi. The combination of the portable 7-axis measuring arm with high-resolution line scanners, which capture every detail contact-free, makes the measuring arms a good supplement to classical coordinate measuring systems. The use of the latest materials makes the measuring arm a lightweight unit that delivers accurate and reproducible measurement results in mobile applications. The measuring arm can be used directly - both optically and tactilely - without warm-up time or the sticking of markers on your component or device. Depending on your requirements, you can choose from a wide portfolio of measuring arms and sensors. Arm lengths from 2m to 4.5m and line sensors in various designs are available. Certain sensors can be used both on the measuring arm and on the CMM, which not only gives you flexibility but also reduces costs. You can display and evaluate the measurement results obtained with familiar software as the measuring arm is integrated into the company's own WM | Quartis software. This guarantees you all the advantages of user-friendliness.

""Goethe already recognized that one should not think in terms of problems but in terms of solutions. By the combination of the new products and the well-known software WENZEL offers now new solutions for the coordinate measuring technology to the customers."

*Edwin Thiel, Product Manager of the WENZEL Group*

# YOUR ADVANTAGES AT A GLANCE

- **High flexibility**
  7 axes for freedom of movement | Can be used with tactile and optical sensors | Axis limit detection
- **Mobile use**
  Suitable for industrial use | portable light weight | integrated battery
- **High process efficiency**
  No marker sticking | No warm-up time | Automatic button recognition
- **Accurate and reproducible measurement results**
  Temperature compensation | Stable rest position | Internal weight compensation with damping element
- **Data evaluation and security**
  integrated WiFi interface | evaluation with QM | Quartis

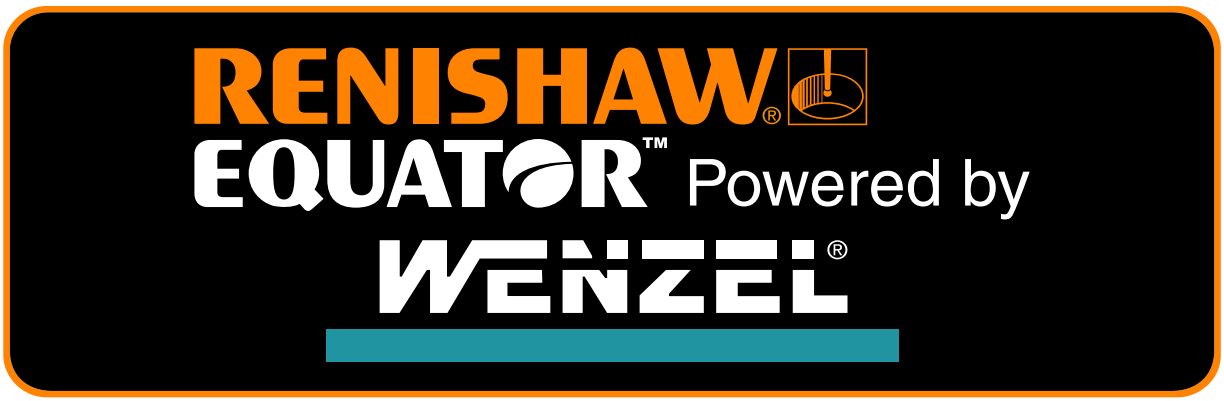
WENZEL EXPANDS ITS PARTNERSHIP WITH RENISHAW

# WORK TOGETHER, GROW TOGETHER
## ACHIEVE COMMON GOALS

**A strategic partnership has been linking Renishaw and WENZEL for several years, no, decades. What once began with a probe for coordinate measuring machines has now grown considerably. A DIN A4 page is no longer sufficient to present the complete product portfolio offered by Renishaw through WENZEL. Over the years, both sides have learned from each other and have grown through intensive cooperation. Since this cooperation was and still is successful, both sides have decided to sell further products together.**

For this reason, the Renishaw Equator is now available from WENZEL. WENZEL sees the Equator as a cost-effective addition to the product portfolio for comparison measurements. The Equator can be used wherever gauges, tolerance rings, etc. have been used so far. In the first step, the "master part" is measured on a coordinate measuring machine, which serves as a reference for the comparison measurement in the later process. In production, the components can then be tested by means of a comparative measurement. This happens directly in the line in the cycle of the series production whereby normally no loss of time occurs. WENZEL offers the customer the WM | Quartis software for the Equator, which is included in the package in the execution mode. This ensures a smooth interaction of WENZEL coordinate measuring machines - for the calibration of the master parts - and the Equator - for the comparison measurement in production.

The customer is free to choose whether to use the WM | Quartis version supplied or whether to upgrade to the WM | Quartis full version. In both cases the customer has the same interface and does not need an extra program to convert the files. The files can be transferred directly from the coordinate measuring machine to the equator via a corresponding system. WENZEL as well as Renishaw see great potential in the combination of Equator and WM | Quartis to carry out almost a 100% comparison




measurement against a master part during series production. WENZEL supports all 4 sizes of the equator with the WM | Quartis software. Furthermore, it is also possible to automate the equator according to requirements.
This in turn means a benefit for the customer. Due to the long-standing cooperation between Renishaw and WENZEL, both sides know that the combination of the Equator and the WENZEL software will also be a success story. True to the motto "work together, grow together, achieve goals together", the partners look to the future with optimism and look forward to the challenges they will encounter in the market in the future.

## YOUR ADVANTAGES AT A GLANCE

- **Independent test system**
- **Simple operation**
- **Low inspection costs with 100% inspection**
- **Constant accuracy in production**
- **Can be automated**
- **Can be combined with a WENZEL CMM**
- **Easy integration**
- **Process monitoring**
- **Temperature range 5°C - 50°C**
- **Software WM | Quartis**

SIMPLE AND INDIVIDUAL EVALUATION OF TURBINE BLADE MEASUREMENTS

# NEW PRODUCT
# WM | BLADE ANALYZER

Defined elements can be freely placed on the measurement report

**With the program WM | Blade Analyzer WENZEL introduces a new tool for the evaluation of turbine blade measurements.**

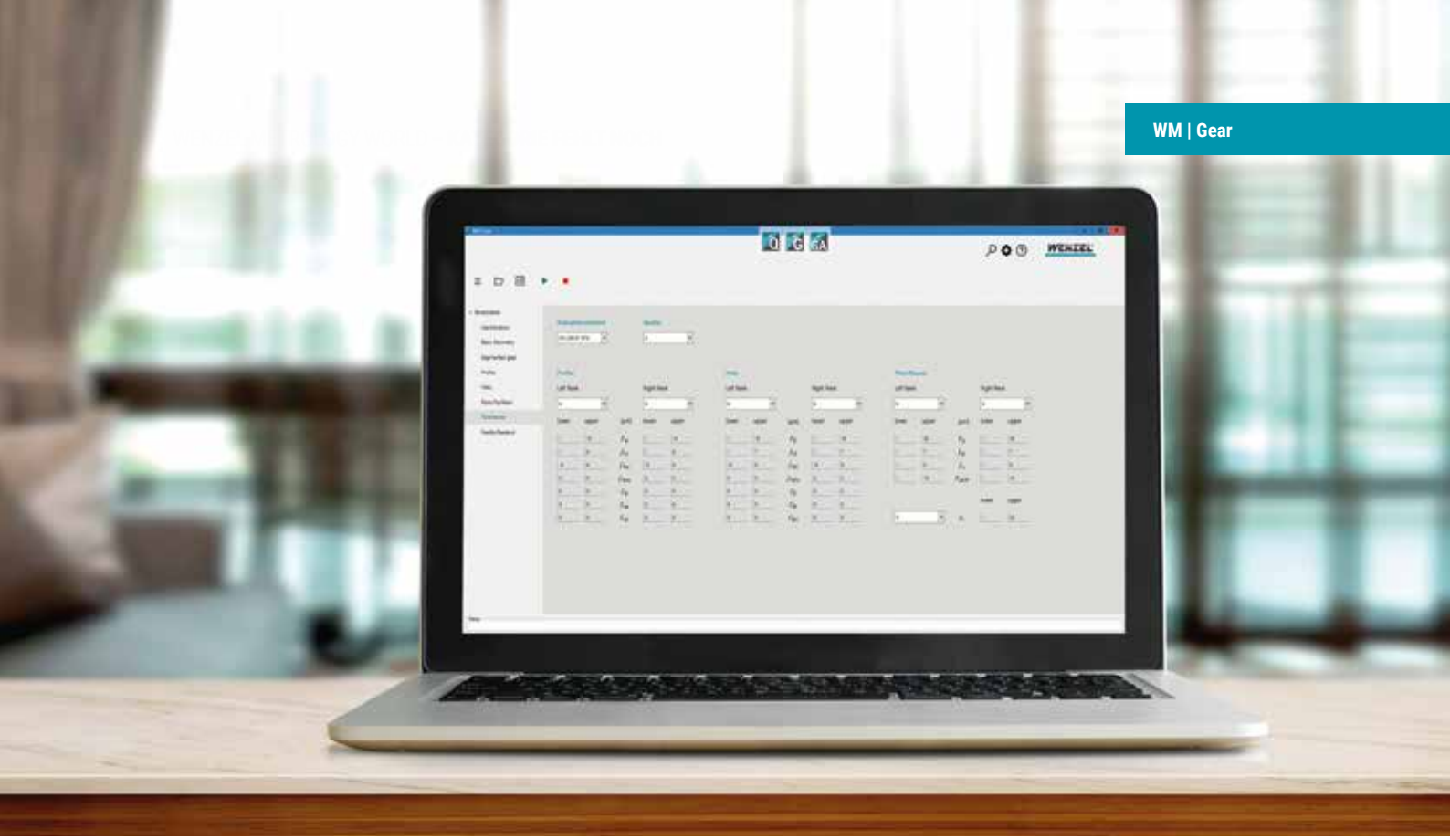
## New benchmark in blade measurement

the software supports standard parameters such as

- maximum thickness
- entry and exit edge radius
- edge thickness
- blade length
- blade angle

Analyses according to various manufacturer standards (GE, Safran, Royce Rolls, Pratt & Whitney). Different Best Fit algorithms for determining the blade position are just as much a part of the scope of services as the evaluation of tip and root dimensions.
A defined workflow makes it easier for the user to create the measurement report. A generated report can be saved as a template and used for all further measurements. The measurement data is transferred in file format. Different formats like vda, iges, csv and xml are supported. In addition to manual use by an operator, the software can also be automated by command line parameters. The data can be stored in various formats for statistical recording of the results.

Different views can be defined in the designer



Input page "Quality classes and tolerances".

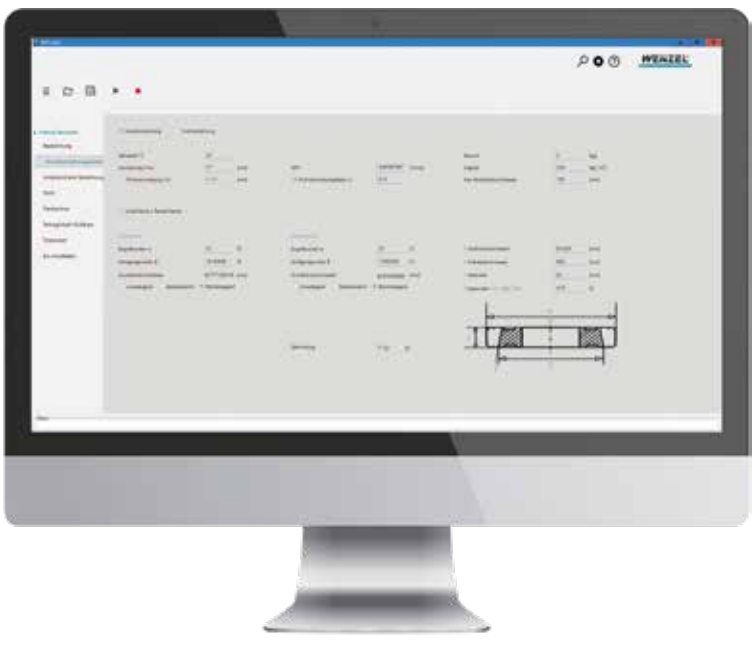
GEAR MEASUREMENT ON WENZEL COORDINATE MEASURING MACHINES

# NEW PRODUCT
# WM | GEAR

### Specialist meets Swiss Army Knife

WM | Gear is a completely new software package for data acquisition and measurement of involute cylindrical gears on WENZEL coordinate measuring machines. Together with the WM | Gear Analyzer for evaluation and presentation of the measurement results, a complete package for quality determination of involute gears is available. Without additional training, the operator can use the usual WM | Quartis capabilities to determine workpiece alignment, probe management and calibration. The WM | Gear software solution enables the determination of the usual gearing characteristics, determined according to the most common evaluation standards.

Input page "Basic gearing data"

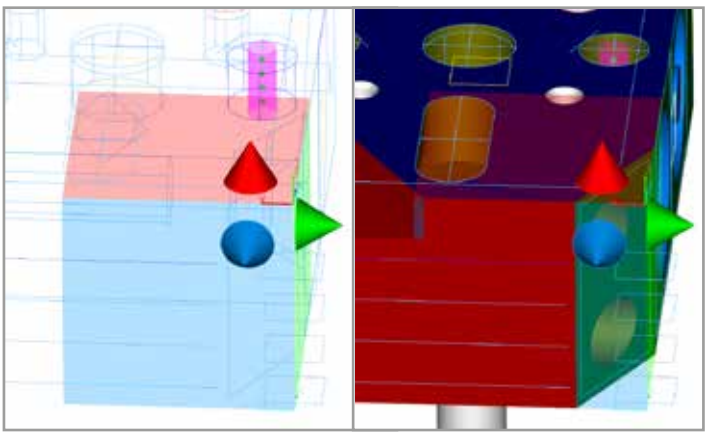


# WHAT'S NEW IN WM | QUARTIS
R2019-2

**In the following, we present innovations that are based on specific customer requirements and directly help our users to process their measurement tasks more efficiently. In addition, fundamental adjustments were made in the course of further development.**

## Position tolerance completely renewed

The standards on which our daily work is based are constantly changing. The WM | Quartis is also continuously being adapted to this landscape of standards. Position tolerance is completely renewed.
Evaluating the position tolerance is one of the more demanding metrological tasks. The implementation of the new position tolerance in the menu band was already presented in earlier releases. New with R2019-1 is the preview for ISO reference systems, with the help of which the user can immediately see how the reference system defined by him works and where its origin is. Together with further improvements in the graphical representation of the tolerance zone and the calculated compensation element or touch points, this allows an easy evaluation - directly in the CAD model!



Preview when evaluating the position tolerance

## WM | LS Line scanner

With the integration of the 3D line scanner WM | LS in WM | Quartis R2019-2, further automated multi-sensor measurement sequences are possible. The component can be precisely aligned with a tactile probe system such as TP20, TP200 or SP25. The same sensors can be used to measure internal geometries and features with tight tolerances. The optical sensor can then be loaded and a scan made of the external geometry to evaluate the required surface shape tolerance and generate graphical reports with color-coded representation of component deviations.

## Mobile measuring arm WM | MMA

The mobile measuring arm WM | MMA can be configured in WM | Quartis R2019-2 and then operated like other measuring arms. All geometry and free-form elements supported in WM | Quartis can be captured and evaluated tactilely.

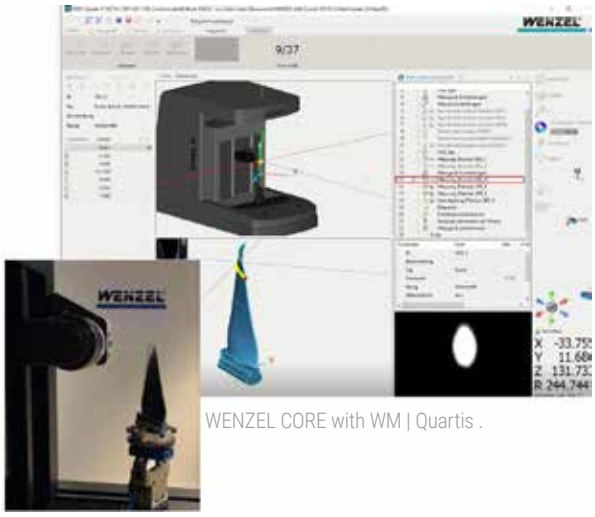
## Renishaw Equator Tester

WM | Quartis R2019-2 can be used to operate the Renishaw Equator tester. The main difference between the equator and a coordinate measuring machine is that the equator compares components against a reference part.

RENISHAW EQUATOR™ Powered by WENZEL®

### WENZEL CORE Measuring Instruments

With the new version of WM | Quartis it is possible to configure the WENZEL CORE measuring instruments and to operate them with their tactile sensors as well as with optical double-eye sensors. Almost all WM | Quartis functionalities for measuring, as well as the various options for evaluating, reporting and exporting are available.




WENZEL CORE with WM | Quartis .

### REVO 5-axis measuring system application extended

When measuring with Renishaw REVO RSP2 scanning probes, the 5-axis movements offer great advantages in many applications. In addition to improvements to increase accuracy and user-friendliness, the following functions have been implemented:

- New sweep scan measurement: efficient acquisition of surfaces with manual distribution on the CAD model. The component surface is "dodged" with the RSP2 scanning probe, while the probe head moves with continuous speed in one direction over the workpiece.
- New setting "Head orientation off": the A/B head angles of the REVO set before starting the measurement sequence remain fixed, i.e. the rotation axes do not move and the RSP2 scanning probe remains in the same position during the complete measurement. This allows certain measurement tasks to be solved without having to change to a REVO RSP3 3D scanning probe.

## MORE NEW FEATURES OF WM | QUARTIS R2019-2 AT A GLANCE

- Measure points: safety plane can be selected independently of the reference
- Evaluate the individual touch points of a curve or surface as position dAB
- Report: New Functions for Aligning Data Boxes
- Probe management: Configuration, change system and group transfer
- Use expression editor in other input fields of characteristics
- Automation: direct remote program start
- DMIS programs: Extension of the supported language range

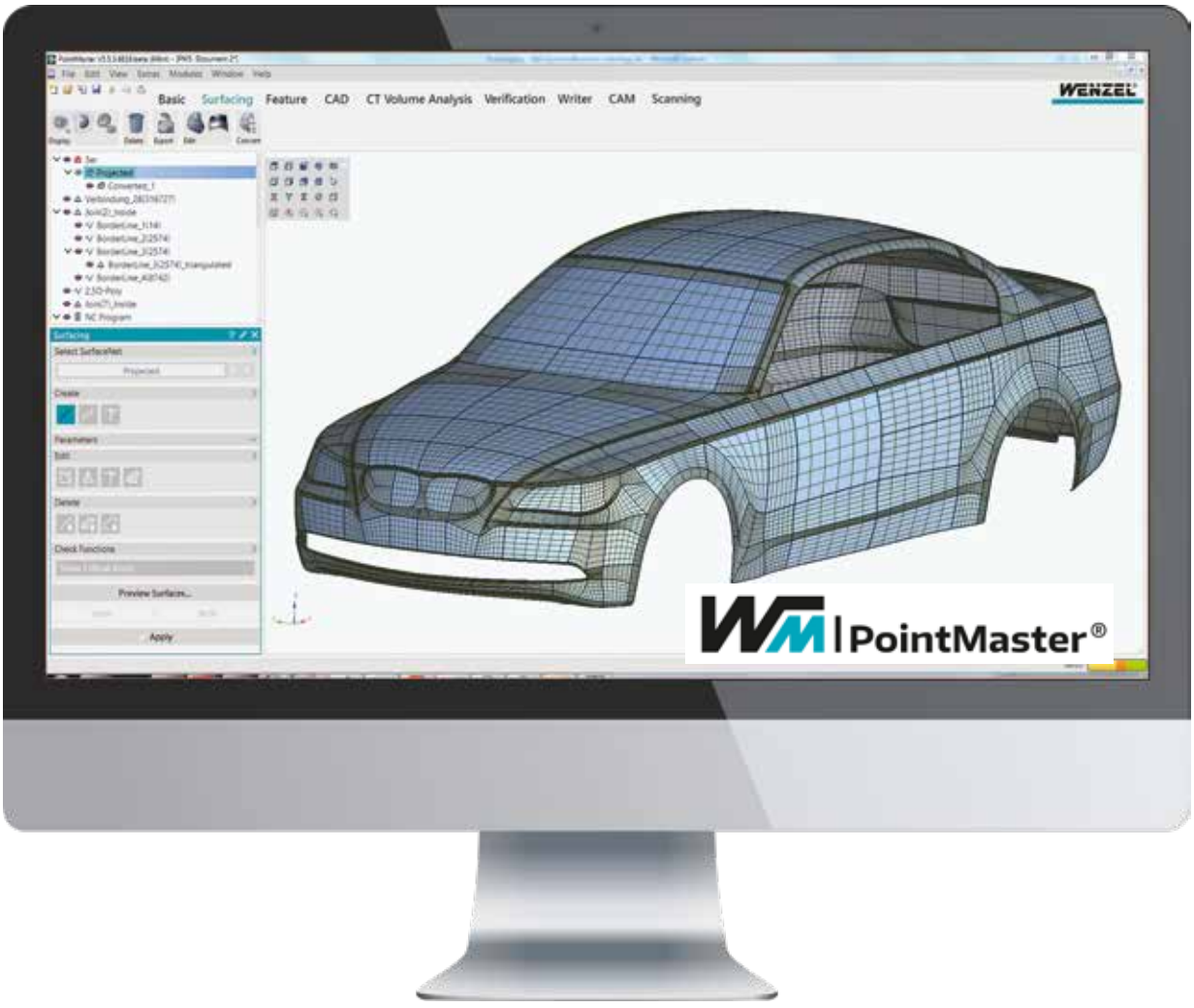
# WM | POINTMASTER
# EXTENDED FUNCTIONS WITH NEW RELEASE

## NEW COMPENSATE MODULE

The processing of optically and tactile measured data is an indispensable and efficient element in the development and manufacturing process in many industrial sectors and applications, such as tool and mould making and quality control. The processing of large amounts of data from point clouds, polymer meshes and voxels and a high application flexibility have always characterized our WM | PointMaster. The multifunctional surface concept offers a compendium of modules that enable the user to process point clouds, model polymer meshes, reverse engineer surfaces and model CAD models. The innovative processes and process chains are based on the WM | PointMaster geometry kernel and ensure excellent data quality and outstanding machining processes.

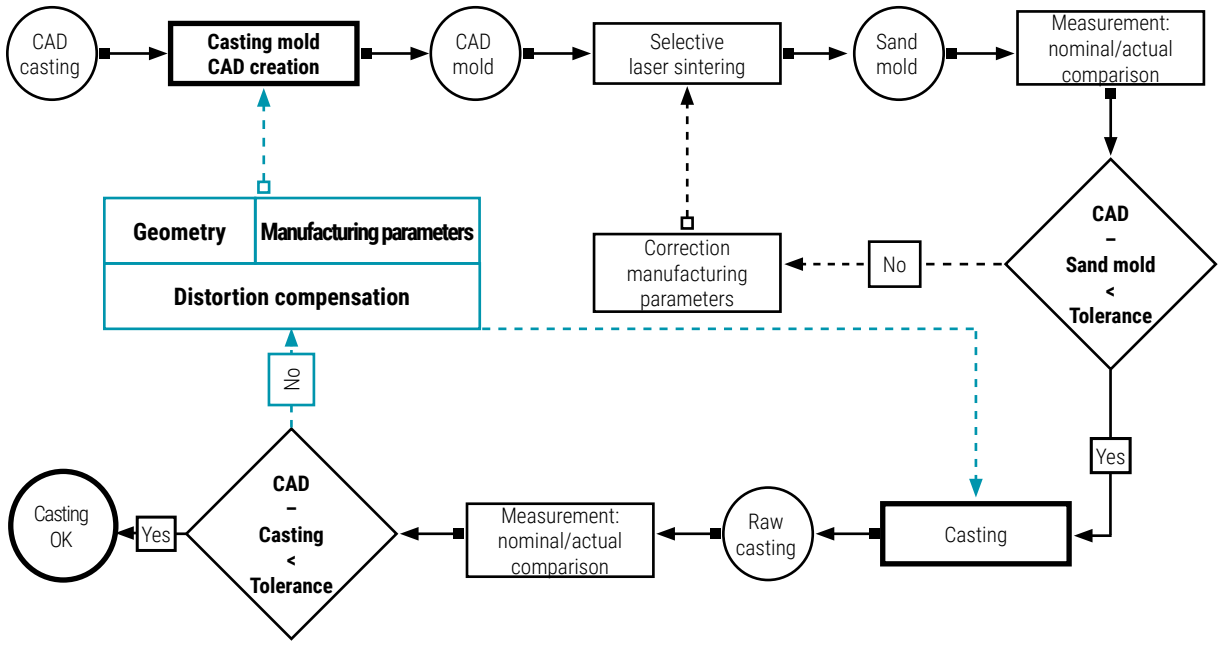
### Fully automatic calculation of deformation results

After the de-moulding of plastic parts, a deformation occurs due to shrinkage and distortion of the plastic component. This deformation is usually compensated in the injection mould by shaping, so that the plastic part is first formed into a "wrong" shape. After the plastic has cooled down, the part is deformed back into the desired shape due to shrinkage and distortion, in order to correspond as closely as possible to the nominal shape.
The traditional compensation of the tool geometry is carried out by iterative reworking (milling, grinding or eroding) of a new or existing tool shape. This post-processing is associated with immense effort and ultimately leads to the fact that the mould insert can often no longer



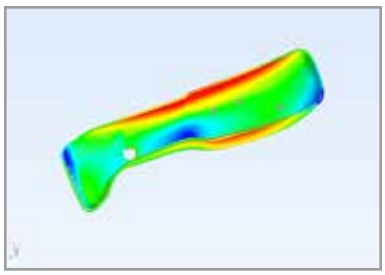
be used. In virtual deformation, on the other hand, the deformation rules are derived from simulation systems or measurement results of actually scanned components. This enables WM | PointMaster to calculate the deformation result fully automatically. Factors such as local volumes, shrinkage and the experience of toolmakers are taken into account. The fully automatically calculated distortion-compensated geometry is then converted into CAD surface models using the powerful reverse engineering functionality of WM | PointMaster and entered into the existing tool data.

Fully automatic calculation of an error-compensated new tool geometry taking into account a nominal geometry, the shrinkage factor of materials as well as the original tool geometry (represented in the process diagram for the compensation of shrinkage and warpage for tool and mould making).



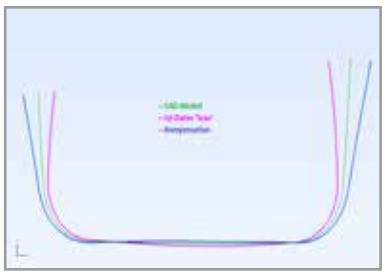

Align actual component to nominal component

Analysis of the actual component by



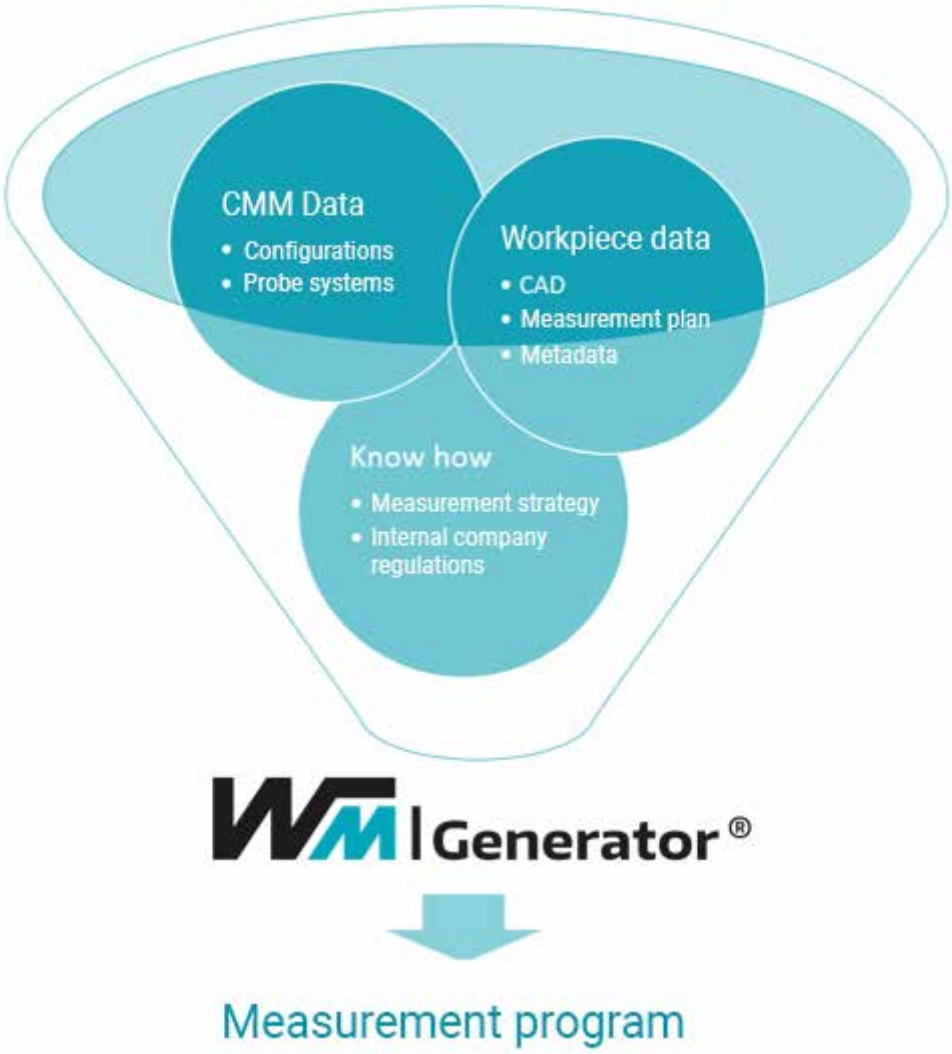
nominal/actual comparison

Strategy of compensation



represented by sections

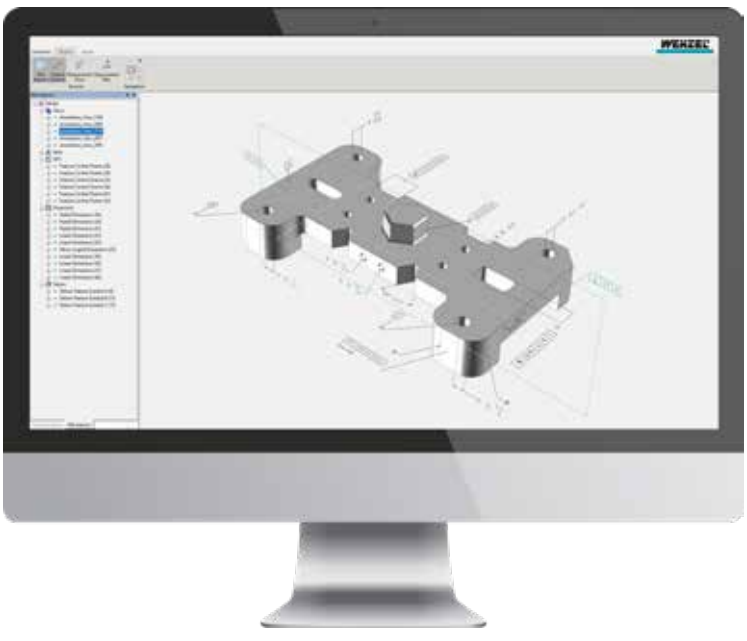
Green cut = Nominal geometry
Red cut = Actual geometry (scan)
Blue cut = Compensated geometry




# WM | GENERATOR – AUTOMATIC CREATION OF MEASURING PROGRAMS

**WENZEL has recognized the trend that measuring programs will no longer have to be generated individually in the future, but will be generated automatically on the basis of the information in the CAD model. The "Proof of Concept" has been successfully launched and at Control 2019 initial approaches can already be shown to receive valuable feedback from specialists in the field, even from those with ulterior motives in mind.**

When importing the CAD model, not only the CAD data but also the semantic PMI are converted.



The measurement plan is automatically generated from the PMI - the basis for the measurement sequence.


## WENZEL goes ahead

The WM | Generator is still a very visionary product in the early stages of development. It will still take years until the CAD-models contain the corresponding information all over the country, but WENZEL is on the topic. The WM | Generator is being developed for customers who want to reduce the effort of generating measuring programs. Initially, the focus is on tactile, touch trigger probe systems with PH10 in combination with CAD models that contain measurement plans in the form of semantic PMIs. Other technologies - and other measurement plan formats - will also be supported later.

**Our vision: To take a look at the part and get a complete measurement program!**

+
Based on a measurement plan and the CAD model, time-optimized part measurement programs are to be generated with as little user intervention as possible.

**Avoid transmission errors through automated data exchange**

+
Interfaces reduce typos
+
Electronic data validation provides tools for plausibility checking
+
The result is always as good as the data basis

**Creating time for the essential by automating processes that can be automated.**

+
Collision avoidance
+
Automatic selection of the touch probe
+
Determining the sequence of the measurement

**Optimize Resource Utilization**

+
Time-optimized calculation of the measuring sequence --> reduced running times of the measuring program

# WQP – WENZEL QUALIFICATION PROGRAM
# **WENZEL IGNITES THE NEXT STAGE**

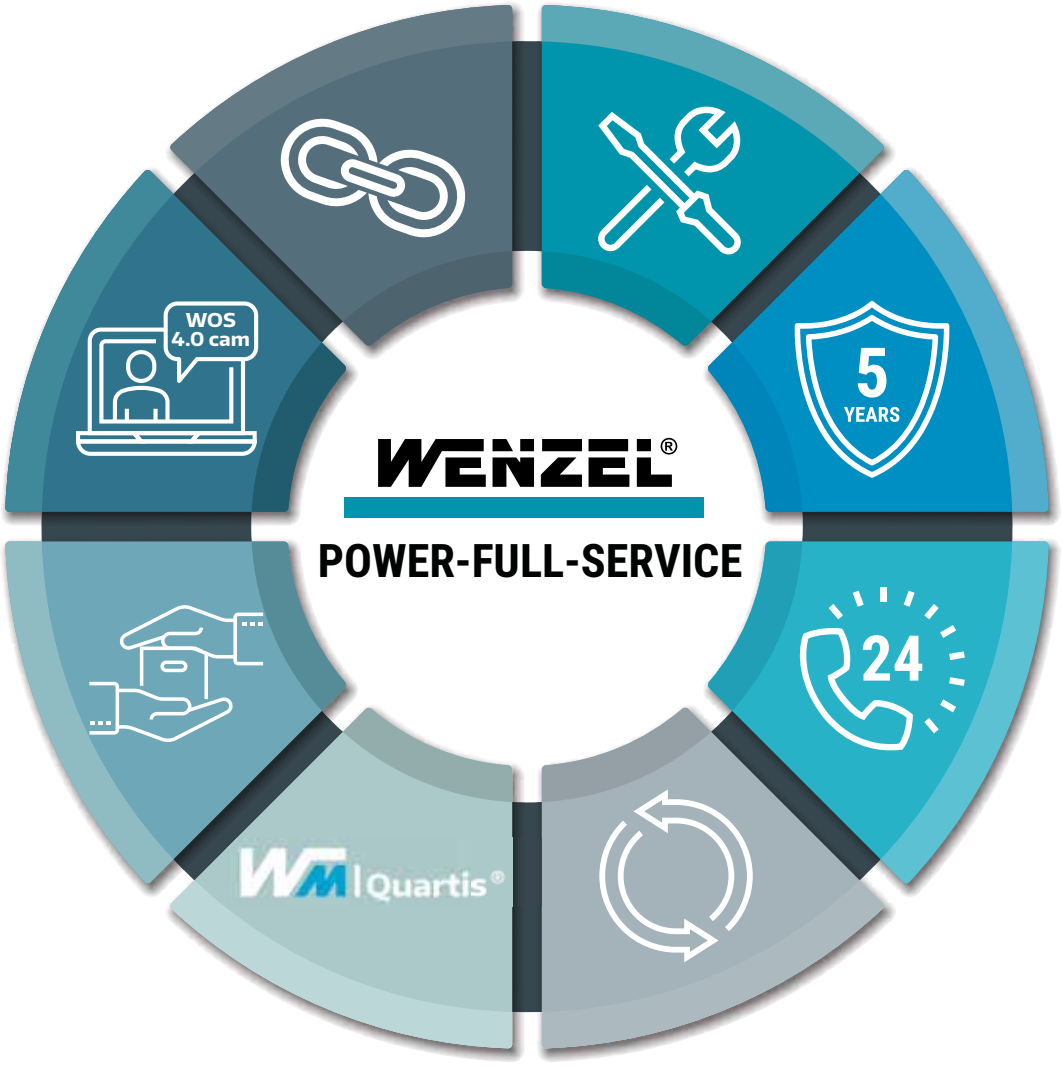
**After the introduction of a qualification program in 2016, the existing program will be expanded to include the area of application technology and given a new name. With the WENZEL Qualification Program (WQP) WENZEL implements a worldwide qualification program. This is in line with rising customer expectations for application technology and after-sales service. With the WQP, WENZEL guarantees a worldwide uniform standard at the highest level. WENZEL thus ensures that training courses and technical application support as well as the execution of work, repairs and corrections of your measuring machines are carried out by trained and qualified personnel.**

In a strict examination process WENZEL partners certify themselves for the duration of 36 months for the WQP. For each WENZEL product line, a certificate will need to be acquired. This applies to portal, horizontal arm, optical high-speed scanning systems and computer tomographs. The evaluation covers a whole range of different criteria such as the qualification of service and application technicians, tools and information technologies used, and business processes. For each criterion, 5 to 20 subheadings are evaluated. In addition, the options for training courses and demonstrations of WENZEL products are evaluated and included in the evaluation. "The focus of the WQP is on qualified employees", explains Karl Nagel, Head of the Service & Application Center at WENZEL. "The acquisition of certification is a continuous expansion of the WENZEL network and thus an investment in the future". The participants of the qualification program have appropriate demo machines as well as hardware and software tools to ensure the regional support of the machines.

# ALL-ROUND CAREFREE SERVICE PACKAGES FOR CMMs
# WENZEL SERVICE CONTRACTS & SERVICE 4.0

**Wiesthal - WENZEL Group GmbH & Co KG offers as a manufacturer of measuring machines with its portfolio of different service contracts a variety of options from which customers can choose the best solution for them.**

In addition to traditional maintenance and software maintenance contracts, customers are offered further contract models tailored to their needs. The aim is to offer the most attractive service package possible, which exactly matches the requirements profile of each customer. For this there are different models among other things for the extension of the manufacturer warranty of the machine, as well as the Premium product; the WENZEL Full Service 4.0. Full service, the outstanding performance promise, includes all services such as preventive maintenance, calibrations and repairs. The Full Service 100% manufacturer warranty includes original spare and wear parts, the controller, the measuring computer, the control panel as well as the measuring system. Only pushbuttons are excluded. In addition, the delivery of the latest release of the WM |




MAINTENANCE / CALIBRATION
GUARANTEE EXPANSION / FULL-SERVICE
WENZEL HOTLINE
EXCHANGE SERVICE
SOFTWARE SUPPORT
WENZEL TOP INSURANCE
WENZEL ONLINE SERVICE (WOS 4.0)
WM | SYS ANALYZER®

QUARTIS measurement software is included, if desired. The Full Service Package has a duration of 3 to 7 years and offers an extended range of services with guaranteed response time, extended on-call service and the WENZEL Online Service.

### Maximum availability at an attractive price

"With the individually coordinated Full Service WENZEL takes over the cost risk and the maintenance planning", explains Karl Nagel, head of the Service & Application Center at WENZEL. In addition to absolute cost transparency and easy budgeting over the entire life of the machine, maximum machine availability is guaranteed and preventive maintenance can be easily planned. "Our customers can concentrate fully on their core business and transfer the responsibility for the operational readiness of their measuring machine to WENZEL", Nagel adds. In addition to the full service contract WENZEL offers flexible leasing models and thus a whole bundle of supplementary services, which represent a clear added value for the customer. Leasing secures liquidity and financial independence and, as an off-balance-sheet instrument, can increase the scope for financing. This creates planning security and competitive advantages.
The customer has full investment security and costs that are manageable and calculable in the long term. "Our quotations are calculated in such a way that the customer spends significantly less compared to individual orders. He can even save a lot compared to our service contract models", Karl Nagel is sure.
The WENZEL Full Service 4.0 is offered in Germany for tactile and scanning WENZEL portal measuring machines of the series XO and LH up to size 1210 (X=1200 mm, Y=1000 mm). The SF 55 and SF 87 machines, for production-related applications, are a particular focus here, as customers are particularly dependent on these machines due to their direct connection to production output.

"With the individually coordinated Full Service WENZEL takes over the cost risk and the maintenance planning."

*Karl Nagel, Head of Service & Application Center WENZEL*

# WENZEL SOLUTION CENTER EVEN CLOSER TO REALITY

**WENZEL invests massively in the expansion of its Solution Center and presents a completely new presentation concept that is unique in measurement technology. Within the scope of the annual worldwide Sales Conference with international participants in February this year, the extension of the Solution Center was officially opened by Dr. Heike Wenzel during a ceremony.**

In addition to the previously available presentation areas, the identical floor space was once again set up for demonstrations and training purposes. This area was named "Shopfloor World". It was specially designed for machines that enable the production-related measurement of components. There are 3 computer tomographs on display. In addition to the largest device, the CT-U with 300 KV, two table-top devices are also on display and are actively used for customer demonstrations. In the area of coordinate measuring machines, the SF 55 and SF 87 machines specially designed for production-related applications will be exhibited. As an option for very large components, a horizontal measuring machine of the RS series with a large base plate can be used to hold the components. In addition to all tactile measuring systems, this machine can also demonstrate the optical sensors offered by WENZEL. Another highlight of the "shop floor world" is the CORE D, which demonstrates a combination of high measuring speed and high accuracy with optical high-speed scanning. In addition, various robot and placement systems will be shown which demonstrate the integration of

# YOU INTERESTED?

**Get in contact with your WENZEL employee or contact our Solution Center Team. A visit is always worthwhile!**

**WENZEL Solution Center in Wiesthal, Germany**
**Email: awt_admin@wenzel-metrology.de**
**Tel.: +49 6020 201 8402**

the machines in production lines and the corresponding part flow. In addition, the "Shopfloor World" offers the possibility for presentations and events, even for large groups of participants, and can be equipped accordingly. The previous demonstration area of WENZEL was christened "Laboratory World" and reflects the classical world of measuring rooms. The current bridge measuring machines of the LH series are presented here in various sizes and with all conceivable combinations of measuring systems. Tactile, scanning, optical and REVO 5-axis technology as well as rotary table applications for portal measuring machines can be viewed and extensively tested. In the WENZEL Solution Center the two areas "Shopfloor World" and "Laboratory World" present the complete WENZEL product range and of the associated environmental conditions.

The new shop-floor world shows the machines in a realistic production environment.

# WENZEL AND KLOSTERMANN
## A PRECISE DEFINITION OF FRIENDSHIP

**Bill Clinton replaces George W. Bush Senior as US President. The German postcodes suddenly have five digits. And the European Union (EU) will also become an economic reality with the entry into force of the Maastricht Treaty. It ultimately brings together 27 countries in a confederation of states. For others, this special year 1993 also marks the starting signal for a great common future: for WENZEL Metrology and Klostermann GmbH from Remscheid.**

It is the year in which two entrepreneurs, Werner Wenzel and Volker Klostermann, seal a connection that has far-reaching consequences in the best sense of the word: the contract for sales cooperation in North Rhine-Westphalia and later also in southern parts of Lower Saxony. Both are united by the exemplary attitude of medium-sized family entrepreneurs. This successful balance of emotional cooperation and clear analysis, visionary power and practical intelligence - supported by clear values and an extremely strong sense of reliability and fairness. Towards business partners, customers and employees. Today, 26 years later, and one generation of entrepreneurs at a time, it is clear how consistent and future-proof the solidarity of the two companies should be: Klostermann GmbH and WENZEL are currently one of the most successful teams in the market for 3D coordinate measuring technology.

### 600 machines in 26 years

Klostermann has so far placed more than 600 new WENZEL measuring instruments of all sizes in the market flanked by a complete range of services, from consulting, installation and training to service and contract measurement technology.

As a WENZEL representative Klostermann is authorized to carry out repairs as well as calibrations and accuracy inspections. The excellently trained service team has at its disposal high-quality equipment such as gauge blocks and laser interferometers. At Klostermann, 26 employees are committed to the topic of 3D metrology with passion and performance every day. With their commitment and qualification, they have developed the Remscheid-based company - in addition to sales - into an exemplarily experienced service provider for contract measuring technology.

## Contract measurement technology as an added value factor

Contract measurement technology as an added value factor In the measuring laboratories and rooms at the Remscheid location there are currently ten WENZEL measuring machines: From the new SF 55 up to the LH 1512 scanning machine in full equipment. None of them are older than two years and the machines are regularly replaced by new systems. Klostermann offers its customers contract metrology in the four core technologies tactile, optical, 3D scanning and computed tomography. Other marginal technologies have also established themselves, such as reverse engineering, shape testing technology and roughness measurements.
The complete range of services also includes the writing of measurement programs and the provision of measurement technicians in the event of personnel bottlenecks. The combination of factory representatives and contract measuring service providers in the training sector bears particular fruit. Here, the clear guidelines of the WENZEL manufacturer's specifications are combined with the expertise from the real day-to-day measurement routine to create a didactic density that is second to none. The knowledge is imparted in Klostermann training courses exclusively in practice-related individual lessons.

## Where knowledge sets a precedent

The measurement tasks of the participating company serve as concrete examples and are integrated into the training content from the very beginning. Many users complete the courses annually in the Klostermann training center in Remscheid, which was expanded again in 2019. As basic training for newcomers, advanced training for advanced users or company-specific individual training. Cooperation is the program for WENZEL and Klostermann in the literal sense of the word when it comes to software. This is where the development competence of WENZEL and the practical relevance of Klostermann come together in an extremely successful combination. On the one hand by Klostermann impulses for new solutions - on the other hand by knowledge advantage as beta tester for innovative WENZEL software novelties. Whether software development, measuring machine sales, service or training - in all areas trust and partnership characterize the cooperation of WENZEL and Klostermann. What was born in 1993 from the spontaneous sympathy of two entrepreneurial personalities has grown into a partnership that has proven its worth for decades. As a precise definition of friendship. As a benchmark for cooperation in the innovative German SME sector. Together on behalf of quality.


# WENZEL AMERICA
## AFTER 10 YEARS

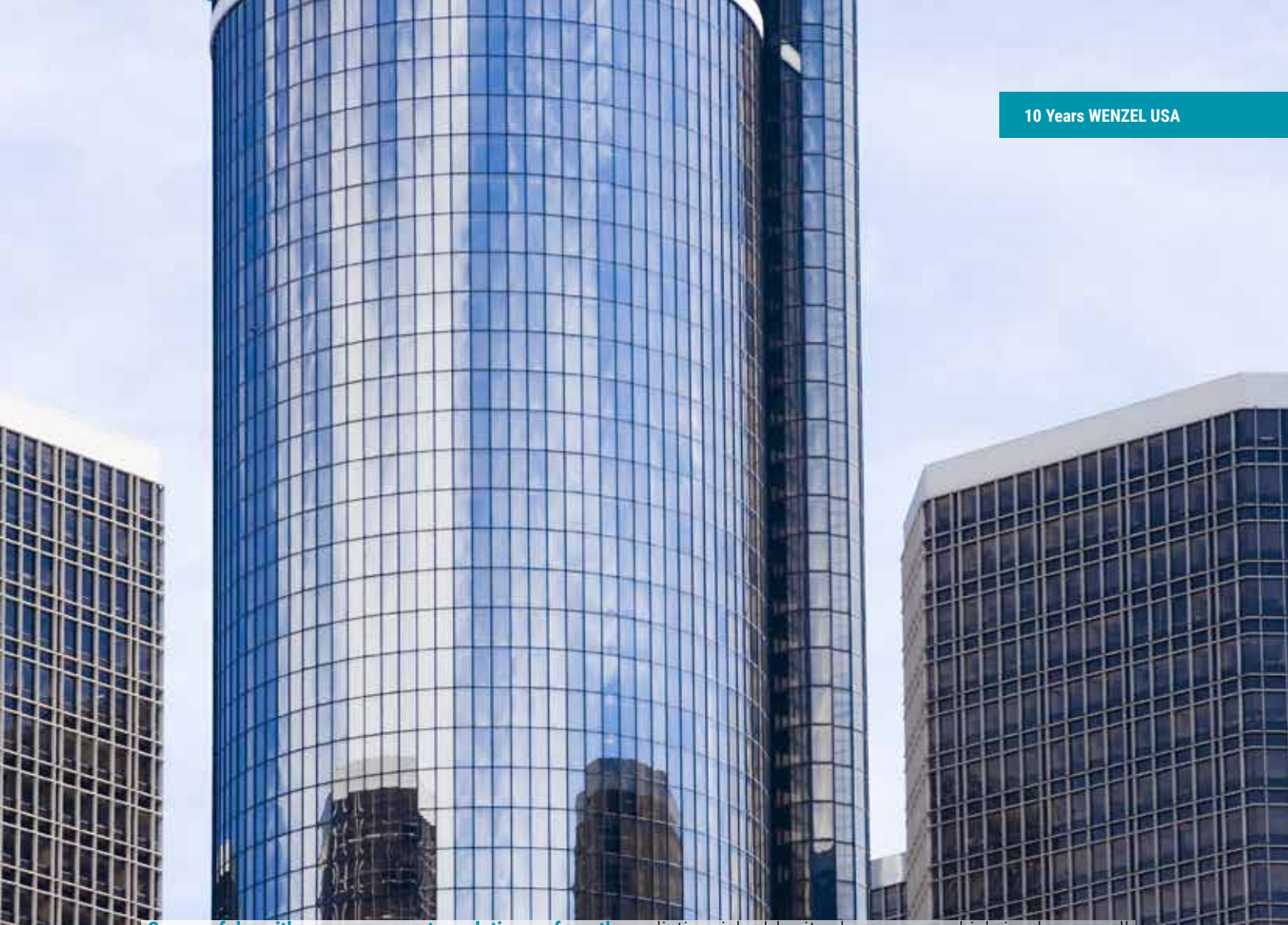
**WENZEL America is one of the top performing WENZEL Group subsidiaries and it celebrates its 10th Anniversary in 2019.**

**Based in Wixom Michigan, "America's Great Lakes State" WENZEL America is also located at the traditional center of manufacturing the United States.**

**WENZEL America serves not just the USA but also Canada and Mexico. Many of the customers it serves have design and manufacturing facilities in two or all three countries and WENZEL America is able to serve them with an equally high standard of service through its service and sales departments working in conjunction with local partners, an arrangement that works well.**

Many of the WENZEL America team have been with the company for its whole 10 years including the President Bryn Edwards. Edwards attributes the company's success to having a consistent supply of high quality and high reliability CMMs being increasingly applied in shop floor Flexible Manufacturing Systems. "Newer products like laser scanners and computer tomography systems have also enabled us to provide solutions for new technologies like 3D printing" he adds.

There is strength in depth too in Wenzel's North American service and support operation with several of the staff having been with the company for the whole 10 years including the service Manager Manfred Hock who was factory trained and worked at Wenzel in Germany before moving to the USA. Similarly, the customer support coordinator Mark Guest has been with the company since its inception as has Technical specialist Tom Lundgren and Applications Engineer Jonah Delongchamp.



## Successful with measurement solutions for the aerospace industry

One of Wenzel America's strongest sectors is the Aerospace industry where WENZEL's products are particularly successful. Much of this can be attributed to the emphasis WENZEL America has had on 5 Axis measurement using the Renishaw REVO 5 Axis scanning probe which is particularly suited to mounting on the stable and smooth operating WENZEL LH CMM. More CORE D and CORE M machines have been sold in North America than by any other subsidiary. Giles Gaskell, now Marketing Manager started with WENZEL America as the CORE product specialist in 2010 and believes that the success with CORE was as a result of having a deliberate product focus on high speed optical scanning along with the CORE being particularly suited to measuring turbine blades at a time when demand for aircraft engine and power generation gas turbine blades was rising. "in addition to the demand for blades another factor in the success of CORE has been the way WENZEL America has dedicated applications staff to specialize in high speed optical scanning" said Gaskell.

WENZEL America's imposing headquarter building is distinguished by its demo room which is always well equipped with the full range of WENZEL products including the CORE M, the CORE D and exaCT CT machines as well as a Large LH CMM with REVO and other LH and XO CMMs with different probing systems including the 5 Axis PH20.

With a strong economy and growing manufacturing sector WENZEL America is optimistic as it enters its second decade.

# WENZEL SOLUTION FINDER
## THE RIGHT SOLUTION FOR EVERY TASK

**1. Installation location:** Here we differentiate whether the machine is fundamentally designed for the measuring room or for production, i.e. without any special precautions.

**2. Component size:** Here we roughly distinguish between small, medium and large components.

**3. Accuracy:** Here we differentiate roughly into very accurate, accurate or less accurate.

**4. Application:** Here we make a rough distinction between geometry, free-form surfaces, non-destructive testing and defect detection.

**5. Mobility:** The main issue here is the amount of work required for the measuring instrument to be able to work at a different location.

**6. Speed:** The higher the speed, the lower the achievable cycle times.

**7. Financials:** In addition to the acquisition costs, this also includes maintenance and service costs as well as operating costs (e.g. simple operation). Of course, all our solutions have a very good price/performance ratio, but require investments in different amounts. We differentiate between lower, medium and higher investment.

| | | TACTILE | OPTICAL | TACTILE | OPTICAL | TACTILE | OPTICAL | TACTILE | OPTICAL | TACTILE | OPT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| INSTALLATION LOCATION | Measuring room | ● | ● | ● | ● | | | ● | ● | ● | |
| | Production | | | | | ● | ● | | | | |
| COMPONENT SIZE | Small | ● | ● | ● | ● | 55 ● | ● | | | | |
| | Medium | | | | | 87 ● | ● | ● | ● | ● | |
| | Large | | | | | | | | | | |
| ACCURACY | Very High | ● | | ● | | ● | | ● | | ● | |
| | High | | | | | | | | | | |
| | Medium | | ● | | ● | | ● | | ● | | |
| APPLICATION | Geometry | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| | Free-form surfaces | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| | NDT + Defect | | | | | | | | | | |
| MOBILITY | Easy | | | | | 55 ● | ● | | | | |
| | Medium | ● | ● | ● | ● | 87 ● | ● | ● | ● | ● | |
| | Complicated | | | | | | | | | | |
| SPEED | Very High | | ● | | ● | | ● | | ● | | |
| | High | | | | | | | | | REVO ● | |
| | Medium | ● | | ● | | ● | | ● | | ● | |
| FINANCIALS | Acquisition | +++ | ++ | +++ | ++ | +++ | ++ | +++ | ++ | +++ | |
| | Maintenance | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | +++ | |
| | Simplicity | +++ | ++ | +++ | ++ | +++ | ++ | +++ | ++ | +++ | |
| | | XO 5-5/8-7 | | LH 6-5/8-7 | | SF 5-5/8-7 | | XO 10-7/12-10 | | LH 10-8/12- | |

*depending on the material of the component

**WENZEL offers you the appropriate solutions for your different requirements. But which one suits you? On this double page we want to give you a qualified overview. Of course, we would also be happy to advise you on a detailed analysis and examination.**

| TACTILE | OPTICAL | TACTILE | OPTICAL | TACTILE | OPTICAL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LH 15-12/20-15 | | LHF | | R-Serie | | CORE | exaCT S/M | exaCT U | WM \| MMA |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | | | | ● | ● | ● | | ● | ● |
| | | | | | | ● | ● | ● | |
| ● | ● | | | | | ● | | ● | ● |
| | ● | ● | ● | ● | ● | | | ● | |
| | | | | | | | ● | | |
| | ● | ● | | ● | | ● | ● | ● | |
| ● | | ● | | | ● | | | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| ● | ● | ● | ● | | ● | ● | ● | ● | ● |
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| ● | | ● | | | ● | ● | ●* | ●* | ● |
| | REVO ● | | REVO ● | | | | ●* | ●* | |
| | ● | | ● | ● | | | | ●* | |
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# IMPRESSIONS
FROM LAST YEAR








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