

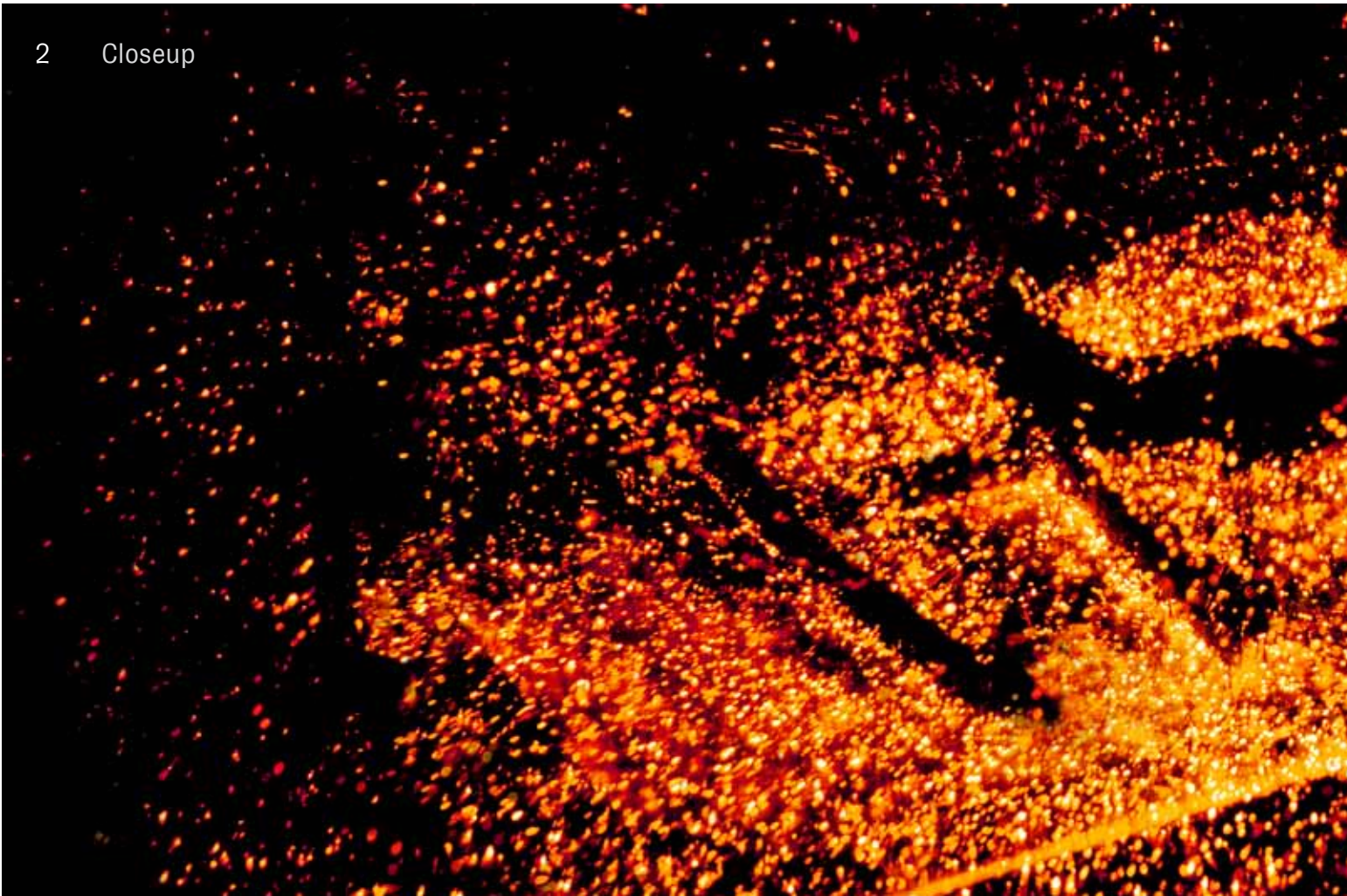
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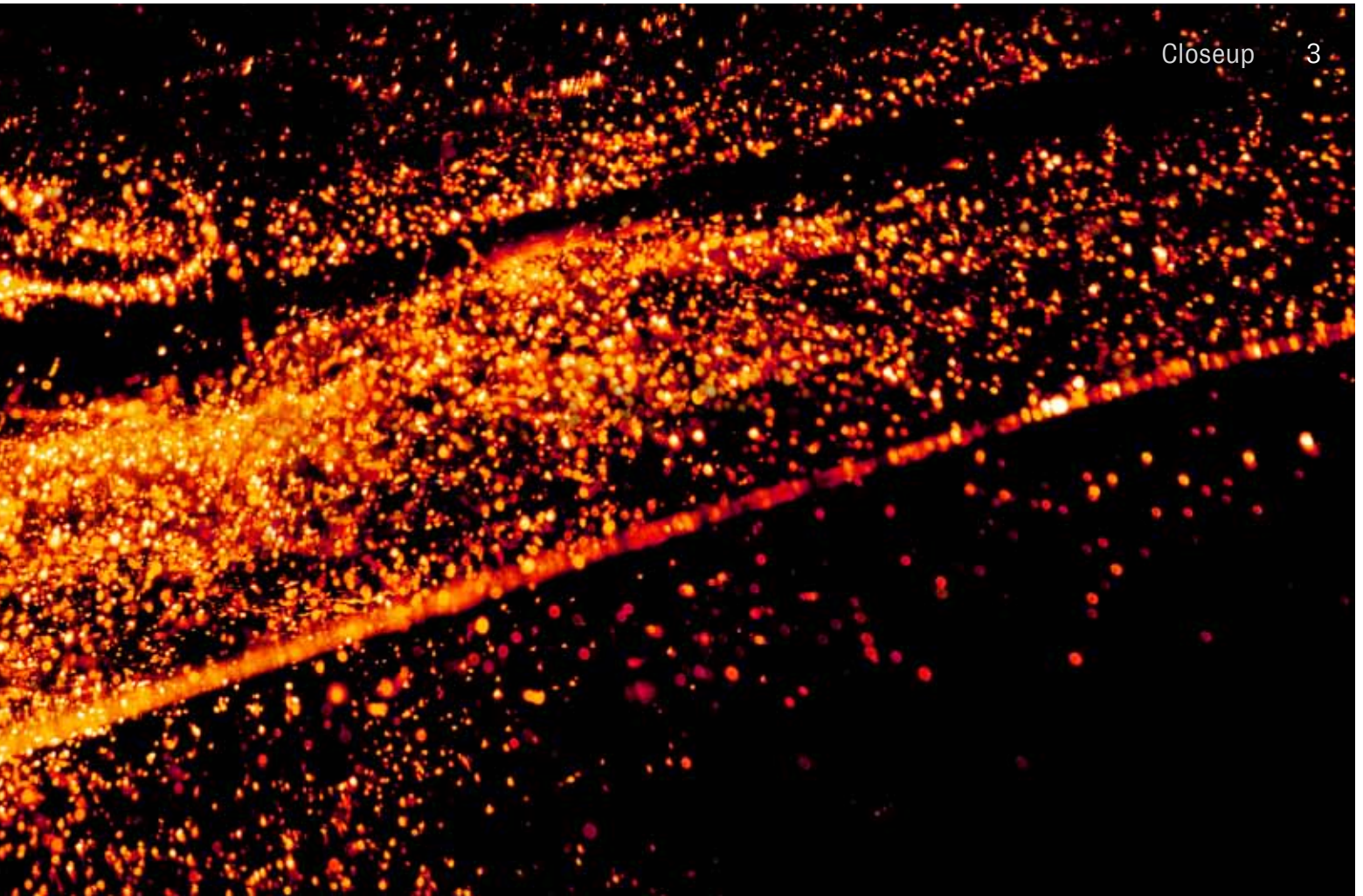
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10 000 single parts.
1 metrology partner.

page 16

 **HEXAGON**
METROLOGY





10 000 single parts. 1 metrology partner.

Imagine that you are on a journey around the globe. You will find: Metrology is with you everywhere. For example, when you are in a taxi nosing its way through one of the megacities of this world. Or when you step on a plane to hop from one continent to the next. And when you are relaxing on the beach and your gaze falls briefly on to an offshore

wind farm. Metrology recognises no borders, neither national nor industrial. In this edition of measureup, we would like to give you an insight into three of our most important industries: Find out more on pages 16 to 26 and learn how industries such as automotive, aerospace and energy deal with the demands of quality assurance with Hexagon Metrology

products. Feel like expanding more horizons? Then visit us in Las Vegas from 4th to 7th June 2012. For metrology is never out of place, even in the desert city. More about this on pages 14 to 15.

Enjoy your reading!
Your measureup editorial team



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The portable measurement secrets to maintaining pole position

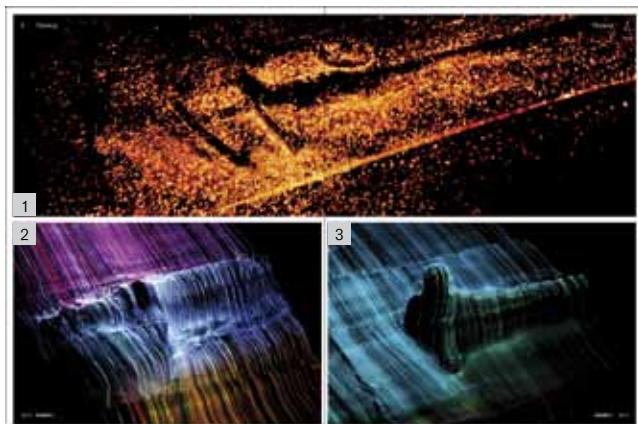
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Testing the accuracy of engine components for one of the largest engine plants in the world

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Close-up



1 *Caliper IP67*



2 *Micromaster*



3 *Imicro*



Metrology seen from a rather unusual perspective: The "Closeup" of this measureup issue reflects the 3D-scanned shapes of TESA high quality Swiss made hand tools. Learn more about this technology brand that unites tradition and innovation on page 12.

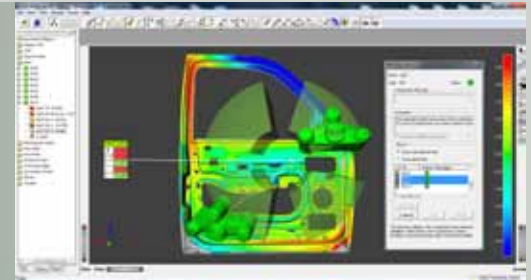
Hexagon Metrology Czech Republic in new location

The Hexagon Metrology commercial operation based in Czech Republic opened recently new premises in the Prosek suburb on the north side of Prague. The new premises serve as the official Leica Geosystems service and calibration centre for Central and Eastern Europe. It is not only a greatly improved facility for presenting and supporting customers but also a comfortable, spacious working environment for the employees with the ability to accommodate further expansion in the coming years.



Cognitens WLS400A and WLS400M voted products of the year

The readers of the US magazine "Photonic Tech Briefs" (PTB) have chosen Cognitens white light measurement systems as one of three products of the year 2011. This award goes to the most significant new introductions to the photonics engineering community. The manual Cognitens WLS400M and the automated Cognitens WLS400A, Hexagon Metrology's white light measurement systems, use digital stereo vision technology to generate 3D data. Customers can choose between a portable configuration and an automated system, which can be operated with all common industrial robots. The Cognitens WLS400M is the only high-performance 3D white light scanner that can be used in handy mode. The products include LED technology, which enables a broad variety of surface finishes to be measured or reverse engineered.



Hexagon Metrology accelerates robotic white light measurement programming

CoreView 6.0, Hexagon Metrology's latest software for Cognitens white light systems, now features CoreView Teach Pro. This new offline programming module simplifies preparation of measurement routines for white light robotic cells. CoreView Teach Pro offers users of Cognitens WLS400A systems significant savings in time and effort for programming measurement routines. Thanks to the new module, measurements with the Cognitens WLS400A can be programmed from any computer without direct connection to the robot. Find out more about the new features in CoreView 6.0 on page 10.



New production hall in Wetzlar under construction

The number of machines made at the Wetzlar manufacturing plant has doubled over the last two years. To keep up with the increasing demand, the company decided to expand its existing production area by 1500 square metres. The new production hall also has 600 m² of offices across two floors. "High-precision metrology can only be produced in a protected environment and requires a permanently constant temperature," says Holger Fritze, Managing Director of Hexagon Metrology GmbH. For this reason, the third floor contains an air-conditioning plant. This keeps the temperature in the hall at a constant 20°C ±0.1°C. As well as temperature stability, the new building needs to be free of vibration. The 130 concrete piles supporting the floor slab are designed to ensure this. They have a diameter of 75 centimetres and are based up to ten metres deep in the ground. Leitz coordinate measuring machines will be among products manufactured by Hexagon Metrology in the new hall. These measuring machines can be up to ten metres high and are specially designed for large parts such as gears for the wind turbine industry. The new production hall will be opened in a public ceremony following its completion, which is scheduled for the second half of 2012.



New calibration and service centre for Portable Measuring Arms in Cracow

To provide outstanding service to Hexagon Metrology customers in Central and Eastern Europe, the ROMER calibration and service centre has been opened in Cracow, Poland. All arms that have been produced under the ROMER and CIMCORE brand can be calibrated and serviced there under direct supervision of Hexagon Metrology factory specialists. The opening ceremony took place at the beginning of April gathering customers from both Poland and other countries across Eastern Europe.

Beyond the purchase

One of the Hexagon core values states "we are customer focused", a value which holds true right across our business, but nowhere more so than in our aftersales departments. Naturally, the advice we provide does not end with the purchase of a system. Years after acquisition Hexagon Metrology customers profit from comprehensive service programs that are available with every installed device. And should the going really get tough, your Hexagon Metrology service engineer always has the right answer.

Service is never far away; we have a worldwide network of regional precision centres and partners on hand to service a device at any time, upgrade a system to the latest version and train your measurement technicians to the highest standards. Here we highlight just some of the services on offer:

Skills Training

Optimising the productivity of your metrology equipment means having the right people trained to the highest standards. Alongside standard product training, Hexagon Metrology offers many other courses including basic engineering fundamentals of measurement through to GD&T (Geometric Dimensioning & Tolerancing).

Contract Inspection and Programming

It's not always feasible to have the required skill levels or equipment to hand for a particular part you need inspecting. Hexagon Metrology offers a professional solution to production overload or unique measuring applications. You can use the systems and expertise of Hexagon Metrology engineers to extend your dimensional inspection resources. Whether you require the highest accuracy or the largest of measurement volumes, someone in the aftermarket team is at your disposal.

Software Maintenance

The work horse of every measurement system is the software, which is constantly evolving to offer new and improved features. A cost effective way to keep up to date with the latest software innovations is to hold a Software Maintenance Agreement (SMA). Benefits of a SMA include updates to the latest versions, update training sessions, applications engineer support and periodic discounts on other services and events.

Certification and Calibration

Regular certification and calibration of your measurement systems will guarantee the highest levels of system accuracy and repeatability. Depending on the product, this service can either be

carried out at your site or at one of our local precision centres. For certain products we even offer the option to have a loan system whilst yours is out of service, ensuring minimum downtime.

System Upgrades and Rebuilds

Just because a system is old, it doesn't mean that replacement is always necessary. It is possible to breathe new life into certain systems by combining the latest hardware and software with the existing equipment. This service also applies to metrology systems not originally provided by Hexagon Metrology.

Service and Repair

We understand that you require the maximum possible uptime from your measurement equipment. Regular servicing by qualified engineers using factory certified parts means that your systems are kept running in peak condition.

Good service: Guaranteed

We want you to get the most from your measurement devices; good service generates more business, which in turn guarantees the longevity of the support we can offer you. You can always rely on Hexagon Metrology to look after you, long after the salesman has left the building.





"Customer relationship plays a big part; our traditional use of instruments from Hexagon Metrology over a few decades and having an open relationship are very important to us and give us great confidence."

Robert Elsey, Managing Director, PES (UK) Ltd.



"People put themselves out at strange times of the day and at weekends; that service to me is something we have to have. Portable engineers from Hexagon Metrology are setting the standards for customer service."

Chris Charnley, Quality Manager, Red Bull Technology.



"When we first introduced the laser tracker, we received a lot of support from Hexagon Metrology. Our training was really good and helped us to develop the right measurement strategies."

Nahia Arrese, Technician, Lakber.

How to accelerate robotic white light measurement





CoreView 6.0, Hexagon Metrology's latest software for Cognitens white light systems, now features CoreView Teach Pro. This new offline programming module simplifies preparation of measurement routines for white light robotic cells.

CoreView Teach Pro offers users of Cognitens WLS400A systems significant savings in time and effort for programming measurement routines. Thanks to the new module, measurements with the Cognitens WLS400A can be programmed from any computer without direct connection to the robot.

Using offline tools, 3D visualization and algorithms that help the user to define the ideal measurement process, the time for programming can be cut by up to 50%. CoreView Teach Pro optimizes the measurement order and ensures an efficient robot path.

It suggests the ideal number of tiles to be measured. Users benefit from a fully automated workflow determination or influence the program manually.

The new offline programming capabilities can also be used to optimize existing measurement routines. CoreView Teach Pro is available for all new systems, existing Cognitens WLS400A installations can be upgraded.



TESA or the alliance between SWISS MADE and innovation

Superior quality and very high precision have always been the hallmarks of TESA and the company's current investments reflect this frame of mind perfectly.



Manufacturing very high quality precision measuring instruments is one of the main missions TESA has set itself for more than 70 years. In order to meet an increasingly competitive market, the company is always seeking to improve both its production techniques and the excellence of its products. Top quality materials, guaranteed precision over the entire measuring range, novel technologies, monitoring and certification on each component, in addition to major reliability, are the top five points of the company's knowledge based in the outskirts of Lausanne, in Switzerland.

The level of quality and exceptional safety of the products is globally recognised and they fully meet the especially stringent requirements of the ISO 9001 Standards. Most products are, furthermore, SWISS MADE certified. Their design includes the use of high quality and precision components equipped with sophisticated electronics. These characteristics are found at all production stages based on the knowledge of qualified personnel who are also passionate about their work.

Regular investments in accordance with R&D enable the entire organisation to monitor the market's movements and competitiveness. For this reason the company announced significant investments for 2012.

December 2011 – Inauguration of the clean room

An initial stage was attained in December 2011, with the creation of a clean room; an area in which particles are concentrated so as to minimise the introduction and generation of dust. The assembly of certain components such as sensors for TESASTAR 3D measuring machines is indeed sensitive to dust and other flying particles and should be performed in a setting where environmental contamination is reduced to a minimum. In order to always comply with the key values of quality and precision, TESA produces part of its measuring systems in this sterilised class ISO 7 environment.

TESA sensors and LEAN assembly – Continuous performance and improvements

TESASTAR sensors and measuring heads are used on 3D measuring machines to verify complex components, especially in the automobile or aerospace industries, machine-tools, heavy equipment or components required to produce clean energies. Designed to meet the most demanding industrial applications and operate equally well in the laboratory and workshop, TESASTAR sensors combine tested and innovative technologies to attain quick and precise three-dimensional measurements combining reliability, flexibility and modularity. By means of investing in the assembly of these components, TESA aims to attain maximum precision and quality during the creation of its measuring instruments.

For more than four decades, TESA has created and also manufactured single direction inductive sensors, aimed at continuous dimension monitoring for series components. Fresh from this experience, the company is today able to offer a large variety of sensors designed to resist the highest number of requests. In order to stay loyal to these high standards, the production of TESASTAR sensors, in addition to single direction inductive sensors, has moved to LEAN production management.

Since November 2011, thanks to linearised operations and determined manufacturing processes movements, TESA is still able to optimise its performances on productivity, quality, deadlines and costs so as to continually improve the system. This kind of methodology gives the company the means to tackle the market's variation and competitiveness, in addition to the most complex requirements of its customers.

In 2012, and for the next few years, the company plans, with LEAN management, to increase its production capacity for certain categories (up to three times the volume of components manufactured compared to 2011 in some cases), without the obligation to proportionally increase its equipment or workforce.

THINK *INSPIRATION*

Join Hexagon Metrology in Las Vegas, NV, 4-7 June, for targeted sessions and workshops, visionary keynote presentations, interactive technology demonstrations, unlimited networking and much more!

Think forward with Hexagon and learn how you can begin solving tomorrow's problems today.



Hexagon 2012: **THINK FORWARD**

Hexagon 2012 is an international conference with the purpose of bringing together the users of Hexagon 3D measurement & visualisation technologies. Attendees will learn how to use Hexagon technologies to use actionable information that will help your business make smarter decisions. This year the conference takes place at the MGM Grand in Las Vegas, USA.

So why should you attend Hexagon 2012?

Attending this conference will enable you to leverage your investment in the Hexagon Metrology technologies you currently use, and have a lasting impact on your businesses success. The conference will feature an impressive program with nearly 200 technical, educational and hands-on workshops and keynotes. Here's how you can benefit by joining us in Las Vegas:

- Hexagon 2012 presentations and activities will address solutions to current business and technology challenges facing your industry.
- This conference provides a unique opportunity to meet developers and subject matter experts, as well as Hexagon company partners, helping you to establish relationships that increase your opportunities for growth.
- You will receive first-hand information about future product roadmaps, which will help you plan ahead to achieve a competitive edge.
- You can participate in exclusive hands-on workshops.
- You will network with other users and industry leaders, learn from their successes and best practices and benefit from their expertise on how to solve problems similar to yours.

As the conference brings together all the companies within the Hexagon group, we split the event into several tracks in order for you to follow sessions aligned within your industry.

The Metrology Track for 2012 will cover several interest areas for you to choose from including Automotive, Aerospace, Medical and Energy amongst others. As a conference delegate, you are not restricted to just "Metrology" sessions, you can attend sessions from any track.

Visit the conference website for more information including a full conference agenda, special conference hotel rates and you can even download a special justification letter which will help you make your case for attending this unmissable event.

We look *FORWARD* to seeing you in Las Vegas

REGISTER NOW!

visit www.hexagonconference.com/met for more information

For the latest Hexagon 2012 updates, follow us on Facebook, Twitter, Google+ and LinkedIn.



A400M Automated Assembly with Leica Geosystems Laser Trackers



The Final Assembly Line at the Airbus Military facility in Seville, Spain, is the third largest aeronautical station in Europe after Toulouse and Hamburg and welcomes the final assembly and delivery of the A400M, the latest Airbus Military airplane. Designed to a recognised requirement for a new airlifter for European air forces, the A400M incorporates state-of-the-art materials and technology that are being continuously perfected in today's civil aircraft fleets.



The A400M or "grey giant" project is the biggest carbon fibre wings assembly project in the Airbus Group and is a major step for the future assembly project of the A350. Features such as electronic flight controls, carbon composite structures and an automated handling system will bring new standards of operability and safety to military aircrews. The 600 M Euros investment for the factory should see an annual production of 28 aircraft once the high output is achieved.

The assembly of the A400M military aircraft is divided in different stations. The first station is for the wings, putting together the central box produced in France and the outer wings provided from Broughton, UK. The second station is in charge of the fuselage, composed from a German made centre-rear part and a French "nose". The third and final station is for the complete assembly of the first two parts, along with the engine and tail plane, to complete the final aircraft. Whilst the three stations are in charge of assembling the different parts, they are also responsible for the installation of the fuel system, electrical system, hydraulic parts, air, etc. On completion of the assembly the A400M comes to a last testing station where more than 600 functional tests are carried out. The final control will result in a special station where 50 to 100 points will be measured before and after test flights.

The tender's objectives of EADS A400M assembly project was simple: to find a flexible, automated, simple and quick solution to measure the whole spatial geometry of the airplane. The benchmark only concerned two laser



Airbus Military rolled out its first completed A400M military transport aircraft from the Seville, Spain assembly line (26 June, 2008)

tracker suppliers. Salomon Benasuly, responsible of the measuring system for the fuselage assembly station remembers: "We did a lot of dual testing between the two brands, expecting to choose the best of them. Even if the first tracker was always within specification, the Leica Geosystems laser tracker reached much better accuracy – well within the ones they specify – and a better repeatability. Having also already a long and positive experience with the laser tracker and the services provided from Hexagon Metrology, the results confirmed our choice."

In fact, EADS already employs the combination of laser trackers with a NC positioner for the Falcon F7X at Airbus Military for the HTP (Horizontal Tail Plane) assembly. Next to this, Airbus Military has used Leica Geosystems laser trackers for tooling assembly & controlling different airplane parts and engineering. Almost all of the jigs are measured with Leica LTD. The Leica Geosystems trackers became an important part of the EADS' quality process.

EADS then started to use a big NC positioner for the fuselage, the wings and the assembly of the fuselage with the wings, working always with two Leica Geosystems laser trackers in order to have the best visibility. But the challenge of the automation and integration project was threefold because of the three different kinds of NC software used for each of the assembly stations. The emScon open architecture made the integrations very easy for the subcontractors.

On the fuselage assembly station, eight cameras are in charge of controlling the rivet positions as well as controlling the general security of the station. There is no operator controlling the two Leica Geosystems laser trackers. Salomon Benasuly explains: "the software is controlling everything. A trained operator makes a field check and a reflector check once in a while before the measurement process. That's all!" He goes on: "The trackers are feeding back to the control of the NC positioner, reading it with the laser tracker. The data goes back into the controller of the NC positioner and the controller calculates where it is and where it has to go. Once the correct position is achieved, the position is stored and used for the entire process. No more corrections are needed after this."

The Leica Geosystems laser trackers' open architecture and fully automated system allow measurement time in two minutes. "Such a measurement would be impossible to realise manually, unless having a few spare hours", adds Emma Barrio, Hexagon Metrology portable product sales engineer.

Even if the complete measurement activity represents an important work, it is often not considered as part of the production process. To be quick and precise helps in decreasing the global assembly time of the A400M. The last and final check will also need an automated process with a laser tracker or a laser station with manufactured dedicated tools to make the measurement as easy as possible.

Blue and white metrology under Bavaria's skies

Aircraft Philipp makes structural components in Übersee, Bavaria for every conceivable type of passenger and military aircraft. One such plane is the Airbus A320, the world's best-selling medium-range airliner. So that these silver birds climb safely into white and blue skies all over the world, quality assurance at Aircraft Philipp is firmly grounded on a coordinate measurement system from Hexagon Metrology.

Aircraft Philipp has been active in this industry for over 45 years. Structural and engine components leave the assembly lines in three locations in Germany for dispatch to almost all renowned aircraft manufacturers. The Übersee factory produces a wide range of machined aluminium or the more costly titanium structural components with dimensions up to 2 metres for incorporation into airframes. Small batches but enormous diversity of parts are the order of the day for the Bavarii.

Even after decades in the business, Toni Liedl, Quality Manager at Aircraft Philipp, is still fascinated by the engineering that makes aircraft construction possible. "I am still filled with enthusiasm when everything fits together at the end, just as it should. Especially when you consider the multitude of parts, with regular shapes, straight lines, various angles etc., which go into each plane."

True versatility: DEA GLOBAL and PC-DMIS

The company has made its mark in particular with its competence in numerical control (NC) programming. But it is not just milling and turning machines that are fed with CAD data from CATIA V5. The data is also essential for metrology. The metrology technicians use a DEA GLOBAL series coordinate measuring machine (CMM) with a measurement range of 1200 x 3000 x 1000 mm and PC-DMIS CAD++ CMM software. The software integrates CAD models simply and easily.

In addition to initial sample testing, coordinate measuring systems are used in the metrology laboratory for checking current series production – whether by 100% checks or random sampling – and for inspecting parts after modifications to machining programs. Metrology technician Andreas Laumer loads the part on the coordinate measuring machine and starts the measuring program. In normal circumstances Laumer can say within 30 to 60 minutes whether the component complies with the reference model.

Strong argument: off-line programming

"We chose to invest in the Hexagon Metrology system because PC-DMIS is by far the best measuring software with respect to off-line programming," says Liedl. Since the introduction of off-line programming based on CAD data, the company's technicians have been able to create NC and measuring programs at the same time – without having the part physically in front of them and blocking the measuring machine. An enormous saving in time.

"During periods of high economic growth, we have to process 500 initial samples per year, which equates to between five and seven approval processes per day. The NC and measuring programs must be created in parallel so that we can manage this workload in the short time available," says Toni Liedl. "While we program with the off-line licence, other parts are being inspected on the CMM using previously created programs."



Precisely measured: Scanning comes into its own for complex features with tolerances of only a few microns. The measurement head measures a great many points per second.



Well prepared: Andreas Laumer brings an engine mounting component from a wing into position.

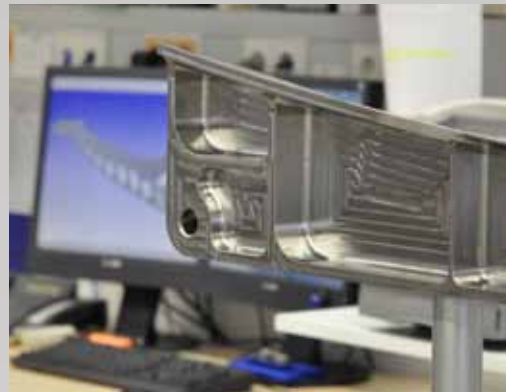


All-round acceleration: Thanks to the PC-DMIS off-line programming station, the metrology technicians can start their programming while the NC program is still being finished off in the nearby design office. At the same time as another part can be measured on the CMM.

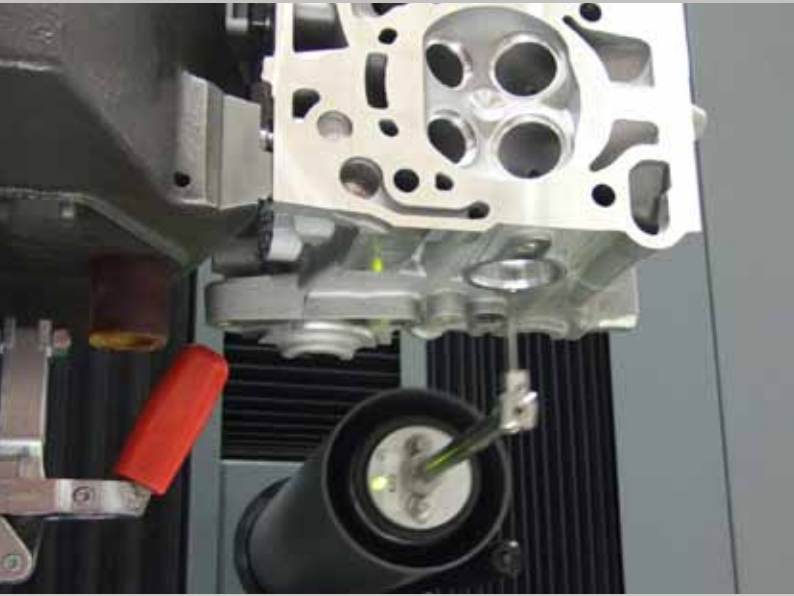
And this teamwork also works beyond the borders of Bavaria. All departments in the corporate group use PC-DMIS CAD++ CMM software. When the need arises at Karlsruhe, the engineers there simply send the CAD model and the necessary information about probes, fixturing systems and X-Y-Z axes to Übersee. On his off-line station Andreas Laumer creates the measuring program and makes it available to his colleagues in Karlsruhe.

Member of the PC-DMIS fan club

Andreas Laumer enthuses about the features of the measuring software: "I am a real PC-DMIS fan," he affirms. "The beauty of PC-DMIS is that there are different ways to achieve your goal when programming. Thus there are always alternative solutions. And the traceability of the evaluation is perfect. For example, if I had to examine a diameter and assess its circularity and for some reason the part was already with the customer, then I could still carry out the assessment in spite of this – using the previously measured values." Furthermore, he is able to do the programming very quickly, thanks to the shortcuts and the good graphical capabilities of the system. The excellent training from Hexagon Metrology is bound to have helped too. And the support from the Hexagon Metrology application engineers is worth its weight in gold, maintains Laumer.



Just as diverse as the palette of parts produced at Aircraft Philipp are the standards that the parts have to fulfil and the tolerances on their various features, which may be anything from a few microns to several hundredths of a millimetre. A universal measuring solution was therefore a must. Aircraft Philipp has backed a winner with the DEA GLOBAL coordinate measuring machine in combination with the flexible PC-DMIS CAD++ software.



Testing the accuracy of engine components for one of the largest engine plants in the world



Autobahn signs can already be seen some 1,5 hours Southeast of the Vienna city lines announcing the famous four interlinked rings. Immediately a vision pops into your mind: a sporty Audi racing through the spectacular landscape, hugging the passing curves of the hilly, serpentine and perfectly smooth asphalt. A part of this image your having is created by the subsidiary company AUDI HUNGARIA MOTOR Kft., which can be found in Hungarian Győr, close to the Austrian border. Over 1,9 million engines were produced here for various models of the Audi and VW Corporation in 2008. The quality assurance of the complex engines is amongst other things, measured on a total of 19 high-precision Leitz coordinate measuring machines.

Twelve Leitz SIRIOs, three Leitz References, three Leitz PMMs, one Leitz PMM-F – the list of the coordinate measuring machines that can be found in the measuring rooms of the Hungarian subsidiary company reads like an encyclopaedia article written on the Leitz brand. The youngest member of the Leitz machinery: a Leitz Reference with an integrated rotary table.

Innovative Engine Technique Meets...

A little less than 400 engine varieties are produced at Győr. Amongst these are for instance, the R4 engines, or the so called Global Engine, a 2 litre turbo FSI engine. However the biggest power packs of the corporation are also manufactured here: the V6, V8 and V10 engines, and now also quite recently, the V12 diesel engine – which is the heart of the Q7 model. All of the main engines are produced in Hungary. The spectrum spans from engine blocks and cylinder heads to piston rods and up to crankshafts and camshafts.

In the future, more engines will be equipped with the new camshaft generation, the Audi Valvelift System (AVS). This is a new challenge for Audi: between 2008 and 2009 as well as from 2009 to 2011, Audi will double the quantity of this new camshaft generation, not only because of the enormous amounts to be produced but also the fact that the new camshafts are very complicated parts to manufacture and require the full 100% commitment and performance of man and machine. Gearing, cams, mountings, axial control grooves are all found in one single unit. At the moment this feature of continuous testing in one sequence is only possible with coordinate measuring machines. Leitz measuring systems achieve these unusually high demands seven days a week, in three shift operations.

... Highly Modern Coordinate Metrology.

Two general purpose Leitz Reference CMMs are used for camshaft measuring, this means for basic shafts measurements and the measuring of cam units. Graduate Engineer Kohán Zoltán, employed at Audi's production planning explains: "On the basic shafts we measure, amongst other things, gearings. Parameters such as pitches, flank direction and profile form play a special role here. Aside from the gearings in this unit, there are also control geometries that are necessary to measure. Whereas with cam units, the cam shape is important but also the cam angle as well. In addition, we can also control free form surfaces and bearing diameters with the Leitz Reference and QUINDOS."

The latest Leitz Reference has come up with a special feature: the integrated rotary table. This feature makes this CMM an economic solution for Audi. It enables a complex inspection of the AVS camshaft components and has the potential to test parts with large measuring volumes. At the same time this solution enables greater stability and accuracy. The measurement range of 1500 x 900 x 700 mm is aligned to the measurement of the aggregate engines. The basic shaft is for example, measured horizontally as well as vertically. Varying fixtures also require a large measurement range. Fixtures on the rotary table are necessary, amongst others, to be able to measure the internal gears of the camshaft lobes. Special fixtures are required for the pump cam so that no deformations are generated.

Zohán Koltán explains why the decision for Leitz Reference was made: "In order to be able to support product quality through stable control processes, we trust the dependability and accuracy of Leitz coordinate measuring machines. The Leitz Reference convinced us because of its accuracy, its dynamics, its robustness and the QUINDOS measuring software, which has proven itself to us over the years. Our existing Leitz machines have reliably seen us through the manufacturing process so well that we have decided again for Leitz."

Safer Engine Performance Thanks to the Leitz PMM-F and the Leitz SIRIO

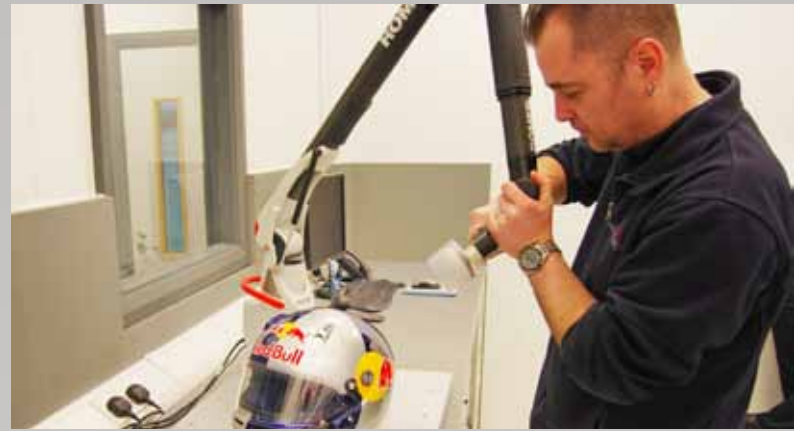
Other large CMMs from Hexagon Metrology are also to be found at Audi Hungary – such as the Leitz PMM-F and a whole fleet of Leitz SIRIO 688. With the PMM-F, measuring technicians can test components of the Global Engine. To do this you need for example, the series production analysis from cylinder bores. Form measurements of all kinds are possible thanks to high speed scanning, ISO compliant filter algorithms in QUINDOS and a low probing variation with the Leitz PMM-F.

Kohán Zoltán comments: "The cylinder bore analysis is a very complex measurement. Previously we conducted this measurement with special form measuring machines. A measurement took an hour to carry out. With QUINDOS and the excellent scanning features of the Leitz PMM-F, we can achieve production control appropriate results within a half hour – and within close distance to the factory floor. Previously the equipment we used required a climatic chamber for this and the chamber had to achieve three times as high climatic demands. The Leitz PMM-F is not as sensitised when compared to temperature influence and can also be set up in a measurement room close to production."

Numerous Measuring Machines – One Measurement Software

Another advantage of the measurement software from QUINDOS that Audi values: "Our company has different measuring machines from different manufacturers. Until now, each of the measuring machines used their own specific software. However that limited the versatility of the machines. The future solution is QUINDOS7 with its manufacturer independent support of the I++ interface. In this way we can use QUINDOS as an overlapping software on all different kinds of measuring machines. This raises the versatility of the measuring machines and of the operating personnel. Furthermore, we can compare the measurement results better and simplify the programming efforts and management of the measurement programmes," says Kohán Zoltán.

Due to the complex engine component construction and the interconnection of the components there's generally no route at Audi that passes by the stationary, high-precision coordinate metrology. Through the combination of Hexagon Metrology systems and well engineered quality processes, Audi achieves a high process stability that's based on speed and accuracy. And only in this way will the Audi cars glide smoothly through desert, winter and mountain landscapes.



The portable measurement secrets to maintaining pole position

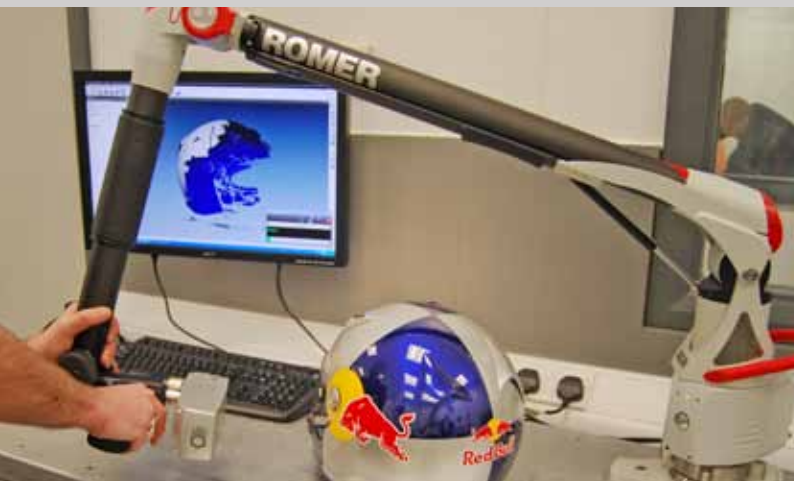
The variety of components that Red Bull Technology need to measure is vast. At their factory in Milton Keynes, UK, the workflow is governed by time management, this defines that the Inspection Department needs to be accurate, flexible and most importantly – fast! There are no second chances in an Formula 1 race hence Red Bull Technology are using ROMER Absolute Arms and CMS laser scanners from Hexagon Metrology to keep the Red Bull Racing cars in pole position.

Every small improvement made to the car has the potential to contribute to the speed and ultimately the gaining of championship points. Time constraints in the past had meant compromising which components were and were not measured, potentially leading to issues throughout the racing season. Now with three portable measuring arms amongst their arsenal of metrology equipment, Red Bull Technology has the time to concentrate on every last micron to ensure the car is kept ahead of the pack.

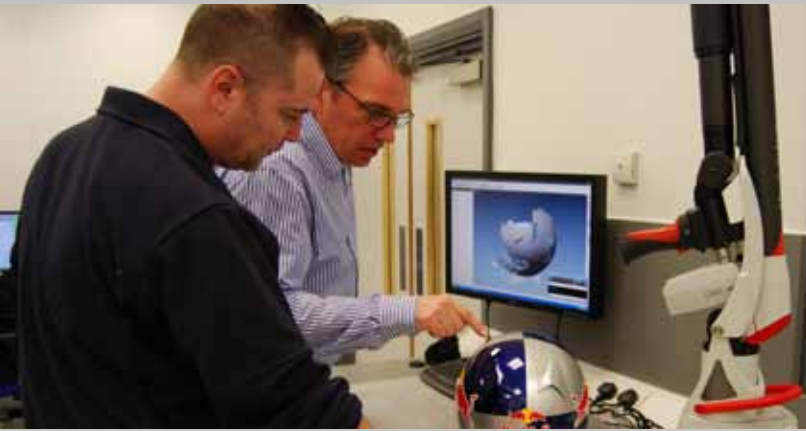
The ROMER Absolute Arms are used with two different types of software for 3D scanning and point-to-point measurement, the same software is used on the other metrology systems across the factory including Leica Laser Trackers. All the systems are 7 Axes arms with a TESA Kinematic Joint which allows the connection of a Hexagon Metrology CMS 108 laser scanner.

Measurement is part of the day to day production process inside the Red Bull Technology's plant; the arms are based within the composite production area and are continuously used to check mouldings and finished components. "The thing that we are trying to do is improve our production flow and make sure that we are checking components as accurately as possible". States Chris Charnley, Quality Manager, Red Bull Technology.

The portability of a ROMER arm lends itself to the vast manufacturing facility at Red Bull Technology, wherever a measurement may be needed, for example a chassis on a machining jig, the arm is easily moved to the location required, saving time in the process.



The right scanner for the job: The CMS 108 automatically adjusts sensitivity to the surface being scanned and does not deform flexible parts of the helmet like the visor and padding



Red Bull Technology engineers discuss the 3D measurement data required from a racing helmet



Rapid prototyping equals a faster car

The rapid development nature of F1 depends heavily on the ability to gather 3D point data quickly and effectively. To achieve this within the required time constraints Red Bull Technology are using a Hexagon Metrology CMS 108 laser line scanner which when coupled with any of their arms provides the latest in 3D scanning technology. The CMS 108 has automatic laser power control which automatically adapts laser sensitivity to match the surface conditions being scanned.

The company had been looking for a 3D scanner for a number of years, but it wasn't until they witnessed the capabilities of the new CMS 108 that a purchase was made. Chris describes why the CMS 108 was the right scanner for them, "The lack of need for operator intervention to keep changing settings in order to scan different surfaces means that varying colours and materials are scanned easily with only one setting. This contributes wholly to our time management needs".

"The arm has made a massive difference with requests from the design office for things that we would never have done before." Explains Mark Foden, Senior Mechanical Inspector. "The original reason for the procurement of the scanner was for measurement and inspection, but with the success of the CMS 108 laser scanner the majority of the work is now reverse engineering."

Additional benefits

Another benefit of 3D scanning over traditional point measurement is non-contact measurement, meaning that parts are not deformed during inspection. Additionally with the ROMER arms there is no time pressure related to creating inspection programs as with traditional CMMs, "this means that we put the part on the table and are measuring it within seconds" explains Charnley.

In addition to using the scanner for shape and form measurements all of the arms are used extensively with point-to-point touch probes for feature based inspection. Where required the Red Bull Technology engineers are combining scan and touch data to achieve higher levels of accuracy.

User Friendly

Prior to investing in the ROMER Absolute Arms Red Bull Technology had been using several other portable arm products including arms from Hexagon Metrology and other suppliers. Sam Harper, Composites Inspection Team Leader, gives his verdict on the new arms, "The arms are very good, we are finding errors on components now that we didn't know we had before, the handling of the arm is excellent compared to previous arms and the easy changing of probes makes the arms very user friendly."

Meeting service expectations

The level of customer service expected by the Formula 1 manufacturer is paramount, Chris talks of his experience with Hexagon Metrology service and applications teams: "People put themselves out at strange times of the day and at weekends; that service to me is something we have to have. Portable engineers from Hexagon Metrology are setting the standards for customer service."

A True Partnership

The Innovation Partnership means that aside from using production products from Hexagon Metrology, Red Bull Technology engineers are also involved with Hexagon Metrology R&D and testing, being at the forefront of automotive technology both companies benefit from this cooperation.

Steve Nevey, Business Development Manager explains the importance of the partnership, "We are very much pushing the boundaries of technology and it is important that we have partners that can push those boundaries with us. Whilst there are lots of things that we are the best at, we accept that there are things we are not the best at, one of those being metrology, and so we are leveraging the expertise from throughout Hexagon Metrology to get better at measurement, get the best out of the systems and ultimately win more championships."

Chris Charnley – "Hexagon Metrology is our metrology supplier; we don't have this partnership with any other measurement company".



Flexible laser tracker system facilitates the processing of large cast and steel components

At the DMR Produktionsgesellschaft mbH in Rostock there blows a fresh wind: previously, traditional measuring methods which were used had limitations; success is now guaranteed with the Leica Absolute Tracker AT901 and Leica T-Probe. Now when the component can't get to the CMM, the CMM will go to the component.



Wind energy changes politics and industry, and both are reacting to these changes differently. With funding being provided by governments, industry is looking at manufacturing possibilities. The sheer size of modern wind energy installations presents new challenges; manoeuvring steel and cast iron components weighing 80 tonnes takes time and is expensive - therefore, it pays to keep transport to a minimum.

At the DMR Produktionsgesellschaft mbH in Rostock extremely large components are an everyday occurrence. The company, which evolved from Dieselmotorenwerk Rostock, specialises in turnkey manufacturing, with special skills gained in manufacturing housings for wind turbines, industrial gearboxes, various components for gas and steam turbines and spare parts for two-stroke cross-head engines.

Easy to operate at lofty heights

Holger Radanke, Quality Manager at DMR Produktionsgesellschaft mbH, is responsible for identifying suitable measuring procedures. He is particularly concerned about the increasing size of components: "As we are only manufacturing to order, we are not able to focus solely on measuring instruments and methods. With very large components we have often asked ourselves in the past how we could save valuable time, both with measuring and marking. With large components, manual methods are very limited. And if you

also have to provide evidence of compliance with form and position tolerances, these methods are inadequate anyway."

DMR Produktionsgesellschaft mbH required a new method enabling measuring that was easy to operate, mobile and compatible with the software of an existing stationary coordinate measuring machine. The Leica Absolute Tracker AT901 in combination with the wireless Leica T-Probe tip turned out to be the ideal solution. Ralf Steinke, DMR specialist for metrology, says: "The Leica T-Probe makes measuring and marking much easier, especially when we are working with very large components and have to climb up to the measuring points. Furthermore, we can operate the Leica T-Probe with one hand, which is perfect."

Errors are not acceptable

The company use the Leica Absolute Tracker AT901 and the Leica T-Probe primarily for checking incoming goods, then during and after machining and finally during marking-up for technical control. Ralf Steinke: "When we notice that an error has occurred during casting, we have to react immediately to ensure that we can still produce the component in accordance with the drawing by adjusting the casting appropriately. We are extremely careful with our own work to ensure that we don't exceed the tolerances in either way. Any such error would mean an enormous financial loss to us. With machine supports for wind

turbines, a large part of the value is not just in the material but also in the machining. If the component is not fully within the specified tolerances, our customers will not accept it. This can easily mean losses running into several hundreds of thousands of Euros."

Numerous applications

The portable CMM by Leica Geosystems has made the measuring processes used at DMR Produktionsgesellschaft mbH much simpler and has made certain applications possible that were not before. Now when inspecting incoming goods and marking components, the DMR team saves up to 40% of expensive man-hours when compared with their previous conventional methods. Holger Radanke summarises: "The Tracker system is exactly the right tool for us because we can save a lot by detecting deviations before machining starts compensating for errors by fitting the component into the shape of the casting. Thanks to our detailed and accurate measurement results, necessary deviations from the construction can now be requested from customers with a new level of quality. By determining deviations in form and position in large measurement volumes, it is possible to draw valuable conclusions for the production process. We can combine the Tracker system in combination with our in-house software which opens up numerous application options, so that the system has even exceeded our expectations."

Leica Absolute Tracker AT901 for inspection of large-volume wind energy components

In industry sectors where work pieces are large and heavy, mobility is everything for a measurement system. When accuracy and easy handling are the other functional requirements, there is no way around a portable CMM. Spanish machining company Lakber came to this conclusion and uses a high-end Leica Absolute Tracker AT901 and a Leica T-Probe.



Lakber provides perfection. By order of Sakana, a foundry specialized in large components for wind energy installations and ship's engines, Lakber delivers completely machined parts. Proximity is the idea on the manufacturing campus in Lakuntza, Northern Spain: Sakana and Lakber share premises. Almost no transport is necessary during the process that leads to the machined part.

Mobile and accurate metrology tool

Next to the milling machines is Lakber's inspection area. The Lakber technicians use a portable CMM from Leica Geosystems for part inspection. Directly on the shop floor, a Leica Absolute Tracker AT901 and a Leica T-Probe deliver highly accurate 3D measurement results. Time and cost consuming transport to a metrology lab is not necessary.

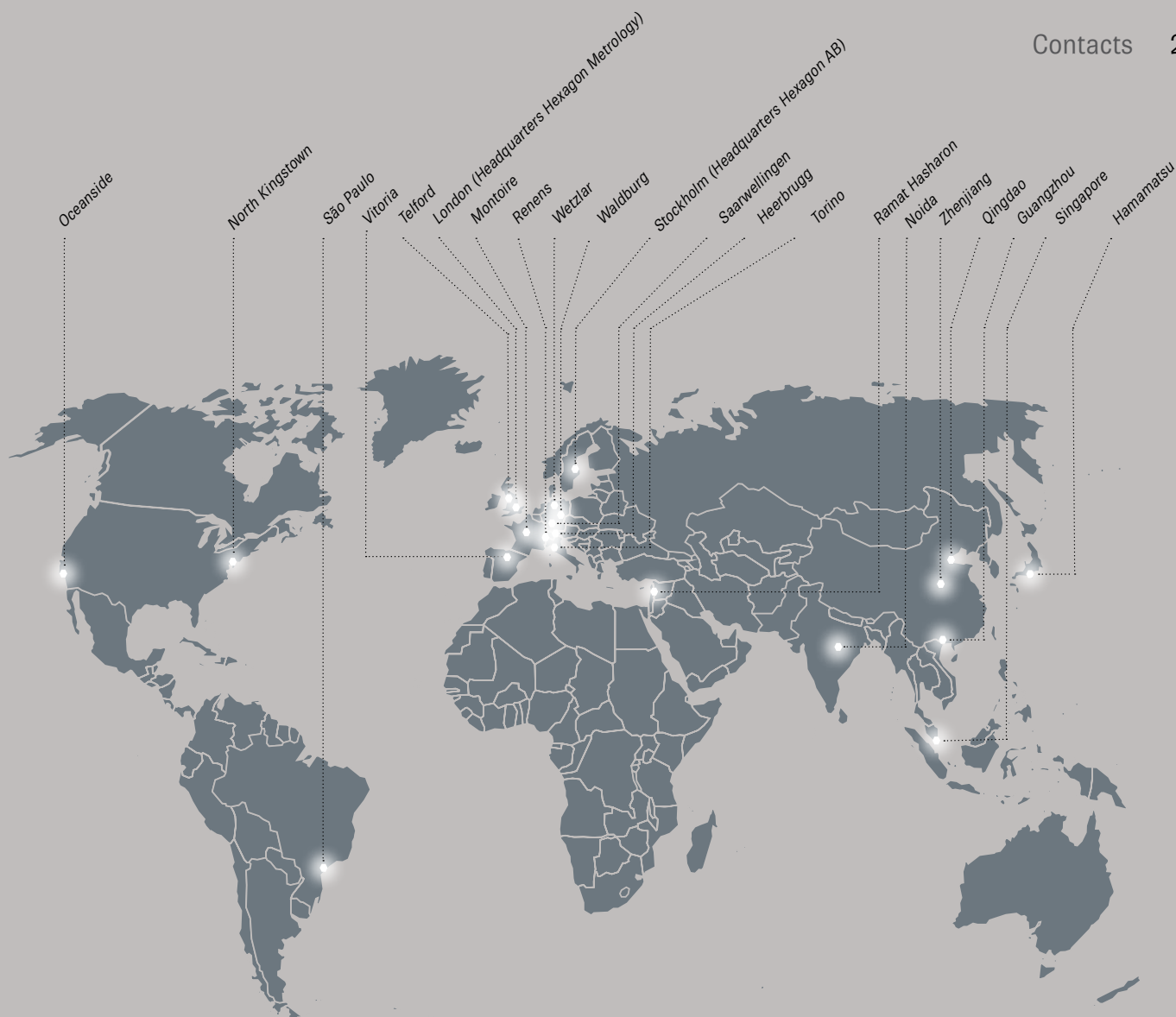
Leica T-Probe: Unique

Alejandro Martinez, General Manager of Lakber, explains why he decided to purchase a laser tracker system: "The volume of the components we produce requires a laser tracker – there is just no alternative that works so elegantly. We talked to other machining companies who already had experience with trackers, and they recommended it. The Leica T-Probe was the decisive factor after all. This device is unique."

Developing metrology know-how

Two Lakber technicians operate the laser tracker system. Nahia Arrese is one of them. She looks back: "When we first introduced the laser tracker, we received a lot of support from Hexagon Metrology Spain. Our training was really good and helped us to develop the right measurement strategies. The operation is really easy, thanks to PowerLock."

Alejandro Martinez adds: "We are very happy with the system, and it was the right decision to develop metrology knowledge of our own. The laser tracker and the support we received from Hexagon Metrology are a strong package."



Along with the manufacturing facilities highlighted, Hexagon Metrology has over 60 direct precision centres in more than 20 countries, plus a network of over 70 agents and distributors across the world. Wherever you are, Hexagon Metrology is never far away.

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	MACRO	MICRO	NANO
< 100 µm	Leica Geosystems		
100 µm		WYV TESA	
10 µm		Cognitens Leica Geosystems ROMER	
1 µm		PC Brown & Sharpe DEK Leitz ITI optiv	
0.3 µm			optiv

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