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Loyal Articulated Arm User For More Than 15 Years
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Dear reader,

you are looking at the fifth issue of measureup. This issue marks the first publication of our Portable CMM newsletter in five languages. Following the overwhelmingly good resonance to the first four issues, we have been confronted with numerous requests to add Spanish to our other four standard languages, which include English, French, German and Italian. With the addition of Spanish to our standard language palette, we are now able to reach not only the customers on the Iberian peninsula but also vast readerships across South America and beyond.

In the upcoming issues, we will actively pursue editorial opportunities from the Spanish market and will also profile some of the sales personnel from the region, allowing them to voice the concerns and peculiarities specific to the Portable CMM market in Spain. As with our other language versions, measureup España too will be archived at the www.portable-cmm.com website.

If you are a customer from the regions served by Hexagon Metrology S.A., we would like to hear from about the experience you’ve had with our equipment. Really interesting applications of metrology equipment might even be featured in a future case study offered for your perusal on these pages.

Best regards,

Your measureup Editorial Team
World’s Largest Car Manufacturer Incorporates Leica T-Scan Into Production

Following extensive in-house testing, the world’s largest car manufacturer has committed to purchasing a total of 9 Leica T-Scan systems to be used for die and mold applications. The Japanese company will rely on contactless scanning to verify the dimensional integrity of dies and molds used for manufacturing vehicles that are already in serial production. Leica T-Scan’s high accuracy in the entire measurement volume and its ability to cope with immense amounts of point cloud data without causing software bottlenecks were the primary factors in winning this important customer.

CimCore Releases Latest Version of DOCS Tube Inspection Software

DOCS v2.2 tube inspection software features Tube Shop Manager (TSM), a fully integrated utility that enables communication between DOCS and CNC Tube Benders. TSM eliminates costly transcription errors when manually programming a bender of inputting corrections to the bend program at the bender. In addition, DOCS v2.2 measures springback and elongation factors in tubes, enabling manufacturers to bend a tube correctly in the first go. Older “trial-and-error” methods of developing a program to bend a tube to print could easily waste five or more parts to account for spring back and elongation.

Cessna Aircraft Company Adds 8 Leica Geosystems PCMM Systems to its Arsenal

Cessna Aircraft Company (Wichita, Kansas), the world’s largest manufacturer of general aviation airplanes, has signed a sales contract for eight portable Leica Geosystems CMM systems used for industrial measurement and inspection. The acquisition consists of four Leica LTD840 Laser Trackers and four Leica LTD640 Laser Trackers. Cessna will add mobile, large-volume measurement capabilities to its production floor. Leica Geosystems Laser Trackers will provide an overall quality solution for dimensional verification applications across Cessna’s product lines.

VW Halves Fit-and-Finish Inspection Times Utilizing Two Leica T-Probe Systems

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Impressions from CONTROL 2007

Focus on Technology

Special Romer Sales Action

Precision Centers in Europe

Newsticker
employees and its product lines, Dassault Aviation offers its customers in-depth know-how, ranging from design to operations, based on strong entrepreneurial values.

Dassault Aviation is at the cutting edge of technological innovation and airborne system expertise. The Group aims to provide its customers with innovative and cost-efficient solutions. Through technological development, the concept of the aircraft tends to embody the more realistic idea of complex airborne systems in both civil and military markets.

Few companies in the world are now capable of manufacturing these systems that require essential expertise from the design to the production and support stage in terms of coordination, the accounting management of integrated systems and integration. The systems integrator must possess a wide range of skills to take account of all the system’s technical and financial components, while at the same time knowing how to assess the risks involved in its integration.

Dassault’s computer-aided design and manufacturing department, located at the facility at the Bordeaux airport in Merignac, designs and inspects tooling conception, tooling control and retrofitting. This department, under the guidance of Jacky Blasquez, is part of the production department, and is crucially involved in all Dassault’s projects. Blasquez started as a workshop tool and die maker 32 years ago and has worked his way up as a technical illustrator, consequently heading several departments before assuming the leadership of the design and manufacturing department.

“At the beginning, most work was done by hand, later migrating to CADAM and CATIA software for surfacing and tubing drawing. The metrology equipment was rather basic then: theodolites, plummets and rulers. For 3D measurements we had to rely on an external partner. Toward the late eighties our Argenteuil subsidiary had already purchased their first Romer articulated arm, and we used to borrow it from them on a per-need basis. Finally, in 1992 we took delivery of our first Romer articulated arm. It was incorporated directly into the tube bending process, and has been in daily use ever

A large, financially secure private international group, with a presence in more than 70 countries across 5 continents, Dassault Aviation has been profitable ever since its creation in 1936. Structured to adapt its production to market cycles, Dassault Aviation cooperates with a rich industrial network of high-tech companies in France, Europe, the US and other countries worldwide.

Through its engineering design departments, production facilities, the skills of its

Relying on articulated arms for more than 15 years

Case Study
since – for more than 15 years. The second Romer articulated arm was delivered to the department in 2004, quickly becoming our most critical measurement instrument.”

The articulated arm is in frequent use at Dassault. The staff is particularly keen on the G-Scan scanner, which can collect thousands of points per second with extremely high accuracies. The same applies to the G-tube software with its accessories for tube measurement. “Romer covers 100 percent of our metrology needs,” explains Blasquez, continuing: “The service department also deserves high praise because the personnel are knowledgeable and there is always someone to take our call and answer our questions.” Dassault has constructed a custom-made cart for transporting the arm to various physical locations within the premises, including aircraft interiors and exteriors. In addition, the company has constructed its own arm extension which allows them to conduct aircraft interior inspections in one step. Yet another arm elevation system is in the works, which will let them get the elongated arm above the aircraft to reach even more points in one go. To get the measurements of the aircraft underside, the articulated arm has to be mounted upside down, but the quality of the collected data is unaffected.

One example of the various challenging tasks at hand is an engine housing enclosure belonging to a Falcon series jet engine, delivered from the Canadian Dassault subsidiary. The part is very shiny in appearance, making it easy to notice any physical imperfections even with the naked eye. A quick scan will quickly let them pinpoint where the imperfections lie so they can implement the necessary modifications in the tooling.

Such part inspections occur daily within the department. With the production start of the Rafale and the 7FX version of the Falcon aircraft, new production challenges arose. Dassault has launched a new integrated digitalized network to tackle those two operations. Falcon F7X has established a new standard in terms of product life cycle management standards. The digitized data is frequently exchanged within the production facility, assigning the inspection process with the Romer arm tremendous importance, both for tooling and part inspection. The finished aircraft needs to comply with the CAD values. Assembly issues are quickly resolved with the articulated arm because the inspection can be done right there on the shop floor, simplifying the correction process. The results are very indicative and leave no room for false interpretation. For example, in the past it was fairly difficult to inspect the correct position of interior paneling alignment. Nowadays, reference points are inspected, a data report is created, and it is immediately clear where the errors lie. This new process allows Dassault to drastically cut inspection times, increasing productivity.

Romer articulated arms are also essential in all type of tube manufacturing process. The CAD conception and fabrication department under the guidance of Mr. Blasquez digitalizes the tubes and creates their 3D models. With newer tube types, finding errors is easy because 3D data exists to facilitate comparison with the tubes coming out of the actual production run. For older tube types, a 3D model first needs to be created by reverse-engineering a reference tube model.
Especially designed for more efficient and easier measurements: A complete range of intelligent tools is available to give the operator optimum performance.

1. **Standard contact probes**
   - Ball probes with different diameters
   - Point probe made of carbide
   - Automatic probe identification
   - Repeatable probe positioning system

2. **Touch trigger probe** for flexible surface measurement.

3. **Magnetic base**
   - 3 magnets with ± 15° orientation
   - Size: 77 x 52 x 56mm

4. **Specific probes** to suit many applications and even for difficult to reach areas

5. **Mobile steel stand** equipped with 2 wheels and a secured movable system:
   - Height 750mm
   - Weight 80kg for complete stability
   - Footprint size: triangle with 750mm sides
   - 120° repeatable puck included
   - Compatible with ROMER height extensions.

6. **Non-contact probes** for tube bending inspection
   - Laser or infrared technology
   - Tube diameter measurement from 2mm to 180mm
   - Laser visual help
   - Single or double precision measurement
   - No need to recalibrate when changing on the fly.

7. **Scanning probe** for reverse engineering (R-Scan)
   - Fast and powerful accessory for rapid scanning
   - Dedicated probe for reverse engineering
   - Compatible with all ROMER 6 axes measuring arms

8. **WBP (Wireless Battery Pack)**
   - Allows using the arm without cables.
   - Autonomy during measurement: 5 hours
   - Wireless technology: WiFi norm 802.11b
   - Battery specifications: Output 12V DC, Li-Ion battery (removable)
   - Quick installation (No tools required)
   - Weight (without battery): 300g

9. **Reference magnetic spheres and cones** to move the arm easily in a large volume.
Leica T-Probe Compensation Kit
For on-site compensation of Leica T-Probe. It comes with a Leica T-Probe reference frame, wedge tool, tripod screw and light duty magnetic holder for 0.5" Red Ring Reflectors. Requires additional 0.5" Red Ring Reflector (corner cube) for compensation process. The Leica T-Probe compensation kit fits into the Leica T-Cam compensation kit shipping container.

Stylus extensions for Leica T-Probe
Available in lengths from 20mm to 600mm

Leica T-Cam compensation kit
For on-site compensation of Leica T-Cam to Leica Geosystems Laser Tracker. Requires additional 0.5" Red-Ring Reflector (corner cube) for compensation process. It is recommended to have at least one compensation kit per factory. It comes with transportation case.

Overview Camera for Laser Tracker
The Optional black/white overview camera mounts on top of the Laser Tracker. It enables save and convenient reflector lock via video image. The camera functionality is supported during the various measuring modes of Leica LTD840, LTD706, LTD709, LTD640 Laser Tracker, which has the absolute distance meter built in.

Measurement Cart
Rack mounting for a fix installation of controllers,UPS and high speed computer. This cart can be used like the regular measuring cart and in addition it can be reconfigured to shuttle cart. L=1.20m, W=0.70m, H=1.10m

Reflectors
The widest range of offering for most various applications. Red-Ring Reflector (RRR) 1.5", ball with hardened steel surface. Corner cube reflector with removable ring, protection cover for optic and certificate, in wooden box.
• Radius 0.75" (19.05mm) ±0.0025mm
• Centring of optics ±0.006mm
• Shape ball ±0.0015mm
• Acceptance angle ±30°
• Weight 170g
• Applied for
  - Standard applications
  - Dynamic and static measurements
How do you decide what equipment is right for a particular customer?

Jörg Illemann: No two customers are the same, and measurement requirements vary substantially from customer to customer, from industry to industry, even from region to region.

The factors that determine what equipment is the most appropriate for a customer have to do with the measurement volume, accuracy requirements, data acquisition rate, mobility requirements and so on. Budgetary considerations also play a role. Anyone can sell measurement equipment. At Hexagon Metrology, we sell measurement solutions.

For repetitive measurements that need to be done with great speed, stationary CMMs are the obvious choice, especially because part handling can be automated, reducing human labor to a minimum.
For measurement tasks performed on larger objects or objects that cannot be readily transported, a portable CMM system is usually the way to go. Such systems may consist of articulated arms with probes or scanners, laser trackers used with reflectors, wireless probes or hand-held scanners. In industries in which the measurement volume spans hundreds of meters, we may suggest a theodolite or a total station.

On the other end of the size spectrum we have customers who need microscopic measurement instruments.

As Hexagon Metrology, we are able to cover all of these vastly different types of customers, and often times we have “repeat” customers who come back to us time and again because they value the personal relationship they have with us and to them being able to trust their supplier is very important.

measureup You've been on this job for more than 10 years. What are some of the peculiarities of the German market?

**Jörg Illemann:** Germany is one of the larger European countries, and it is Europe's most populous country. Add to that that some industrial regions are extremely densely populated, with industry clusters forming around major areas that have historic ties to specific industries, and you have a very challenging situation to cover as a sales person. That's why we at Hexagon Metrology have divided Germany among our personnel not based on application type but according to geographic regions.

This division into geographic regions has several advantages. We are able to form synergies between various industrial fields. Contrary to what most people intuitively think, there are quite a few parallels between shipbuilding, aerospace and general industrial applications. Concentrating on specific geographic regions allows us to focus more clearly on particular area, and the customers benefit from that because we are able to tie in the competencies of both support and sales engineers, increasing the quality of the know-how we bring to the customer.

measureup Is there a project in recent memory that was particularly interesting or challenging?

**Jörg Illemann:** Airbus, with their plants in Bremen, Hamburg, Nordenham, Stade and Varel, and the supporting supplier network, has over the years translated into the fact that we have more than 50 Leica Laser Trackers on jobs for or around Airbus.

The most interesting project in the last couple of years has been the A380 double-decker jet. The sheer dimensions of this aircraft have made a lot of customer visits extremely interesting. This project has also made it very transparent how international Airbus is, with their sites in France, Spain and the United Kingdom, where our equipment is also heavily used.

Over the years, we have been able to share a lot of information back and forth between different countries, helping us make sure the customer always gets the most optimal solution to his measurement problem.
The Transparent Factory in Dresden, as this futuristic plant enclosed almost entirely in glass is called, was built especially to manufacture Volkswagen’s premium-segment vehicle, the Phaeton, and opened its doors on December 11th, 2001. Employing a workforce of some 400 people, the plant is located centrally in the city, fitting beautifully within its urban landscape.

The core element of Volkswagen’s new manufacturing concept is the scaled assembly line. The only thing this operation actually has in common with conventional assembly lines is the phasing of individual assembly procedures, meaning that production is sectored into stages such as engine fitting and window fitting. The surface of each of the concentrically designed scaled assembly lines comprises 29 individual segments with wall-to-wall hardwood floors. It is on these segments that the vehicles to be assembled are placed by lifters which feature a large selection of setting options. Given the hardwood floors and the clearly structured assortment of assembly parts placed in baskets, the entire setup looks more like a high-tech trade workshop than an assembly-line operation.

This dedication to perfection manifests itself in many ways, for example in the attention paid to the width of the gap between individual sheetmetal segments, to the way headlamp elements seamlessly hug the fender or the “thump” a door makes when it shuts. All of these are subtle yet perceptive indicators of the car’s quality even to non-technical people, and even an untrained eye will immediately notice if something does not sit perfectly.

The Metrology Department at the Dresden plant, under the guidance of Frank Herold, is in charge of assuring the perfect fit. The department calibrates and sets the production tools and conduct the initial inspection of the subassembly and bodyshells. In addition, they perform analysis measurements to determine how various external parts fit to one another. In short, the Metrology Department keeps all these different processes stable and well within tolerances.

These measurements are extremely important in a vehicle in the premium class because the buyers expect nothing but absolute perfection and almost religious attention to detail. In the past, the department has relied on a large-scale measurement facility with conventional coordinate measurement machines. This facility was not located on the premises, which has meant transporting half-finished vehicles offsite and back to the Transparent Factory, which was a production interruption involving time loss and added costs.

When Frank Herold started looking for an alternative solution, he was fully aware that any replacement solution had to be fully cost-effective and had to bring substantial benefits. He explains: “We wanted to implement a versatile measurement system that would allow us to cut the time needed to inspect a finished vehicle. Of course, the...
system had to meet our strict accuracy, stability and quality requirements. Together with our partners in the planning department, we decided to shift the responsibility for calibrating and setting entirely to the assembly group, with the requirement to discontinue using setting masters normally used for such tasks and focus solely on laser trackers.

Herold continues: “Thanks to our migration to two Leica T-Probe systems, we were able to cut the time needed to inspect a vehicle by at least 4 to 5 hours. Plus, the entire time and effort normally invested in the maintenance and alignment of the setting masters as well as the whole storage space became history. What we have effectively done is cut the end inspection times in half. Having a fixed CMM installation on the premises was out of the question for us due to our spatial restrictions. Rather than bringing the finished car to the CMM, we are now bringing the CMM to the car instead.”

Like in most businesses, time is money, and Volkswagen chose to get two complete Leica T-Probe systems that both measure in the same coordinate system. One system inspects the front end and the left side of the car while the second system inspects the car’s read and the right-hand side. This combination produces optimal time saving results.

AICON 3D Systems from Braunschweig, Germany, which distributes the Leica Laser Tracker and implements installations and customer support in that geographical area, brought this idea to life. AICON’s Thomas Nickel explains: “We’ve created the first-ever laser tracker ‘Doublet.’ Because both systems are controlled by the Metrolog XG for Leica software and use the same coordinate system, data sets can be simply exchanged between the two. This way, the laser tracker duo can fully replace a mobile double-column CMM. This double laser tracker setup gives the operator easy access to all sides of the vehicle without the need to reposition the laser tracker, with the crucial difference that the system is mobile and that the inspection of hard-to-reach positions, such as the car underbody, is a breeze. This solution is one-of-a-kind.”

Herold concludes: “In the future, we plan to introduce laser scanning of surfaces, which will make the measurement processes even more time-efficient, and the Leica T-Scan is the logical choice here because it would seamlessly integrate into our existing laser tracker-based portable CMM system and has the same large measurement volume of 30m. Thanks to our dual Leica T-Probe system, we have effectively halved inspection times on finished vehicles and have at the same time gained an unsurpassed level of versatility, being able to ‘loan out’ a complete system to other departments, completing two very different sets of tasks with just one solution: both end inspection of finished vehicles and tool inspection in the assembly line.”

Contacts

Full version of this case study available upon request using the feedback form in the back.

For further information, please contact your closest Hexagon Metrology Precision Center (see list on page 14)
www.portable-cmm.com
www.volkswagen.com
2007 Control Show Astounding Success for Hexagon Metrology

This year’s show in Sinsheim, Germany was our best showing to-date. Prominently placed in Hall 6, Hexagon Metrology featured a number of new products introduced by its fixed and portable CMM brands.

On almost 500m², we showcased the customer-oriented, international character of our organization, performing frequent product demonstrations to crowds of awed, curious laymen and professionals alike. This being only the second year since all the Hexagon Metrology brands are featured under one roof, it was a great tribute to the speed at which our “family” grew together, further stressing the point that we don’t merely provide products; having a vast array of available possible instruments with which solve our customers’ problems, we provide solutions instead.

On the Portable CMM side of the business, Romer added a Perceptron 3D scanning solution to its offerings in the articulated arm business. This new sensor easily retrofits onto existing articulated arms and comes with multiple software options. Leica Geosystems introduced the Leica T-Mac, a next-generation 6DoF tracking device for automated applications such as robot arms.

Over on the fixed CMM side, TESA showcased its TESASTAR-mp, a new touch trigger probe, featuring a magnetic stylus module, fast stylus changer, four different probing forces and a configurable changing rack. Leitz presented the Leitz LSP-X1, a new compact high-precision probe for single-point probing, with self-centering, continuous high-speed scanning and full compatibility with TESASTAR-m probe heads. From the house of Leitz also came the Leitz PMM-G, a new gantry CMM for accurate, very large component measurements. DEA BRAVO HP features both a single and a dual arm, an optimized dynamic/accuracy ratio, new guideways with recirculating ball bearing pads and superb cost-effectiveness.
Focus on Technology

How Leica T-Scan works

In the previous issues of measureup, you’ve had the opportunity to read different case studies in which the Leica T-Scan was used to digitize surfaces or to gather 3D information on actual parts, which was then compared to CAD models. But how does the Leica T-Scan work? Read on.

Leica T-Scan is a high-speed hand scanner that digitizes shiny and diffuse surfaces in one go under normal light conditions. It deploys the triangulation principle. A laser beam is projected onto the object surface using a rapidly rotating mirror. Depending on the distance of the laser to the object surface, the reflected beam hits the sensor at different positions.

Leica T-Scan projects its laser beam point by point, so that the visible line looks like a “flying dot.” Because the laser beam consists of individual dots, their intensity can be adjusted on the fly so surfaces of different reflective properties, from shiny to black, can be scanned in one step. A laser beam of a lower intensity is applied to lighter surfaces, while darker surfaces have a laser beam of higher intensity applied to them. All this happens automatically and is transparent to the user.

The Leica T-Scan incorporates a reflector on 4 of its sides, allowing the Leica Laser Tracker to calculate its absolute distance. But that’s only half of the story. The reference LEDs are used to establish the Leica T-Scan’s position in 6-dimensional space (pitch, yaw and roll). These LEDs allow the laser tracker to determine the Leica T-Scan position regardless of how the device is being held by the operator. Together, the reflectors and the LEDs form the foundation of tracking the Leica T-Scan in 6 Degrees of Freedom (6DoF). For a more detailed description of how 6DoF works, see page 13 of the 2/2006 issue of measureup, downloadable in the archive area of www.portable-cmm.com (use the scroll bar on the right to get to that issue).

Scan data is imported into the software as a collection of points called “point cloud.” A complex object is represented by millions of points. In the next phase the software automatically converts the point cloud into a multitude of triangles, also referred to as polygons. The resulting polygon model can be saved as a stereolithography, or STL, file, which can be sent to specialized machines for rapid prototyping or custom manufacturing. In the third step, the software transforms polygons into non-uniform rational B-splines, or NURBS, surfaces. This surfaced model, as it is called, can be used for inspection and engineering analysis, or passed on to a CAD system for design changes, tooling or manufacturing.
Best Romer Offer Yet!

Between now and the end of the year, Romer is making a plethora of one-time deals available to its current and future customers.

- Swap your existing Romer arm for a brand-new Romer SIGMA articulated arm.
- Buy any Romer FLEX arm with interchange-able arm lengths and pay the price of a single-length.

Get a special package on the Romer VPS. It’s the world’s first-ever electronic sensor grid with auto ID. It lets you measure large parts directly on the ground and is compatible with all Romer arms.

Contact your local Hexagon Metrology sales organization for specific details on different offers!

Precision Centers in Europe

FRANCE: Bron (Lyon): Tel. 04 72 37 90 60, Fax 04 72 37 90 61 — Courtaboeuf: Tel. 01 69 29 12 00, Fax 01 69 29 00 32 — Montoire: Tel. 02 54 86 40 40, Fax 02 54 86 40 59 —

GERMANY: Munich: Tel. 089 149810-0, Fax 089 149810-59 — Sarstedt: Tel. 050 6698 99-0, Fax 050 6698 99-21 — Wetzlar: Tel. 064 412 07 0, Fax 06441 207 122

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POLAND: Warsaw: Tel. 022 338 15 00, Fax 022 338 15 22

SPAIN: Cerdanyola del Vallès (Barcelona), Tel. 93 594 69 20, Fax 93 594 69 21

SWEDEN: Eskilstuna: Tel. 016 16 08 00, Fax 016 16 08 90 — Spånga: Tel. 016 16 08 80, Fax 016 16 08 90

SWITZERLAND: Crissier: Tel. 021 633 50 33, Fax 021 633 50 34 — Unterentfelden: Tel. 062 737 67 67, Fax 062 737 68 68

UK: Huntingdon: Tel. 0870 446 2667, Fax 0870 446 2668 — Milton Keynes: Tel. 0870 4462667, Fax 1539 737876 — Swindon: Tel. 0870 446 2667, Fax 0870 446 2667 — Telford: Tel. 0870 446 2667, Fax 0870 446 2668

www.hexagonmetrology.com
www.portable-cmm.com
contact@portable-cmm.com
Get measured up!

Please send me the marketing materials about the following products:

- Romer Articulated Arms for inspection
- Romer Articulated Arms for laser scanning
- Romer Articulated Arms for tube inspection
- Leica Geosystems Laser Trackers
- Leica Geosystems Portable CMM (Leica T-Probe, Leica T-Scan & Leica T-Mac)
- Leica Geosystems Industrial Theodolites & Total Stations
- Software
- Service & Support

Please check all that apply:
- I would like to order the case studies featured in measureup:
  - Leading Aircraft Manufacturer Loyal Articulated Arm User For More Than 15 years
  - VW Halves Fit-and-Finish Inspection Times
- I would like to receive personal invitations to trade shows at which Hexagon Metrology is exhibiting. I am interested in the following countries (please specify):

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Please sign up the following people to start receiving measureup FOR FREE.

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Please check all that apply:
- I would like to sign up the following people to start receiving measureup FOR FREE.
  - Leading Aircraft Manufacturer Loyal Articulated Arm User For More Than 15 years
  - VW Halves Fit-and-Finish Inspection Times

Please contact me to arrange a personal equipment demonstration. I am interested in the following products:

- Romer Articulated Arms for inspection
- Romer Articulated Arms for laser scanning
- Romer Articulated Arms for tube inspection
- Leica Geosystems Laser Trackers
- Leica Geosystems Portable CMM (Leica T-Probe, Leica T-Scan & Leica T-Mac)
- Leica Geosystems Industrial Theodolites & Total Stations
- Software
- Service & Support

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