

# SCANNING SOLUTIONS

PORTABLE LASER SCANNING

WITH THE LEICA ABSOLUTE TRACKER AT960





LEICA ABSOLUTE SCANNER

# IMAGINE 3D IMAGING DONE BETTER

The unique six degrees of freedom (6DoF) measurement capabilities of the Leica Absolute Tracker AT960 open up a new world of possibilities for high-speed three-dimensional non-contact data acquisition.

Hexagon Manufacturing Intelligence offers a range of ultra-portable laser scanning solutions that mean more data, collected faster and at incredible levels of accuracy. These advanced tools offer a path to detailed data collection on virtually any surface type with zero physical disturbance of the part and minimal influence from varying environmental conditions.

Easy-to-use, endlessly versatile, instantly interchangeable and delivering usable results from the very first scan, Hexagon laser scanner systems are the ideal solution for an ever-broadening range of measurement applications.

“ To keep up with the constant demand to manufacture more efficiently, highly-flexible and portable measuring solutions with absolute accuracy are truly valuable. The Leica T-Scan 5 is a measuring device that supports our work and the key objective to maximise precision.”

**Dieter Hildesheim,**  
Volkswagen Sachsen, Germany


# INTRO TO 3D LASER SCANNING

Laser scanners work in conjunction with a global referencing system such as a laser tracker or portable measuring arm to create a three-dimensional model of a surface or entire part. Due to their high data-density – often consisting of millions of individual data points – these models are typically called “point clouds”.

Laser scanners operate by projecting a laser beam onto a surface, and then detecting and analysing properties of that beam as it is reflected back to the scanner. This allows for the determination of a precise location of every surface point from which the beam was reflected. This operation is repeated millions of times as the beam is moved over the surface in order to produce the data points that make up the point-cloud.

That point cloud will represent the geometry of the scanned surface. Once this data has been collected, it can then be processed to produce first a polygon-based model, then a full CAD digitisation, of the surface or part.

## LASER SCANNING TECHNOLOGY – KEY FACTS

- A laser scanner's overall speed of data acquisition is defined by its data-points-per-second capability, scanning path width and the density of points per scan line.
  - Complex surfaces with lots of curvature, features or textures benefit from scanning with a higher data-point density that can record finer-grained details, but may take longer.
  - For larger, more uniform surfaces with fewer fine details, a scanner with a wider scan line and therefore faster measurement process speed may be a better fit.
  - Technologies such as optical filters can allow scanners to overcome the effects of ambient light by ignoring wavelengths of light except those near the laser being used.
  - Technologies such as automatic exposure control allow laser intensity to be automatically adjusted in real time to account for changes in material colour and reflectivity that would otherwise make a surface difficult to digitise.
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# KEY APPLICATIONS OF 3D LASER SCANNING TECHNOLOGY

Laser scanning in an industrial metrology context can be used for several distinct purposes, which fall within two broad categories.

## Inspection and Validation

The 3D point cloud created by a laser scanning system can be used for dimensional inspection or geometric dimensioning and tolerancing, and the results compared against nominal CAD values. With cloud-to-CAD comparison, large point clouds can be overlaid on a CAD model for fast visual inspection of deviations. Laser scanning can also be used for traditional (non-CAD) inspection using feature construction and dimensioning.

## Reverse Engineering

It can be useful to take an existing physical part, measure it to determine its characteristics and then process the data to create a CAD model. This method is often used in cases where the product design process has significant manual operation, such as in automotive design. Some applications in this field can even be performed directly from the point cloud scan data or the mesh model without the need to create a full CAD model.



# LEICA ABSOLUTE SCANNER LAS ABSOLUTE SIMPLICITY

Lightweight, ergonomic and designed for complete usability in harsh shop-floor environments, the Leica Absolute Scanner LAS brings user-friendly high-end laser scanning to the metrology toolset.

Based on the 'flying-dot' operating concept, the LAS offers excellent performance for freeform surface inspection. By automatically adjusting laser intensity without user intervention, the best possible readings are achievable with a single pass of the scanner.

The LAS is automatically recognised by the laser tracker for seamless changes between reflector, probe and scanner measurements, while users can also select pre-set scanning modes from the main button to apply the right setup for each section of the part. The unit features a guide light, three line-of-sight indicators and haptic feedback in addition to the LED and audio indicators, giving even the most inexperienced operators complete confidence in their handling. IP50 rated and with a battery power option, the LAS is the handheld scanning solution that can go anywhere.





## AT A GLANCE

### **Complete Portability**

With optional battery power, the LAS requires just a single network cable connection to the laser tracker for truly portable high-end 3D digitisation.

### **High-End Accuracy**

The LAS can define data points to within an uncertainty of just 50 microns, representing class-leading accuracy for non-contact portable metrology.

### **Immediate Results**

With very little post-processing required, the LAS delivers measurement data that's ready to use from the moment it's collected.

### **Multi-Surface Capable**

The established benefits of Hexagon's unique flying-dot scanning technology mean any surface is measurable, even with multiple materials and finishes falling under a single scan sweep.

### **Leading Usability**

With built-in guide light, line of sight indicators, visual, audio and haptic feedback, and scanning modes selectable on the scanner itself, the LAS is designed with ease-of-use firmly in mind.

### **Robust Operation**

The IP50-rated design of the LAS means resilience and durability in tough environmental conditions without compromising measurement performance.



# LEICA ABSOLUTE SCANNER LAS-XL

## ABSOLUTE SCALE

Bringing an entirely new sense of scale and efficiency to the world of non-contact measurement, the Leica Absolute Scanner LAS-XL bridges the chasm between high-accuracy metrology and terrestrial scanning systems.

The LAS-XL redefines what it means to be productive when it comes to ultra-large-volume surface scanning. A scan-line width of up to 600 millimetres and standoff at up to 1000 millimetres make this a scanner built for magnitude and speed. Just let the scanner do the work, with minimal station changes and accuracy to within 150 microns.

Working on the flying dot scanning principle, multi-surface scanning is effortlessly handled. Dealing with deep recesses and hidden areas is no longer a chore. For the first time, the Leica Absolute Scanner LAS-XL brings extra-large scale and super-fast 3D digitisation into the world of high-accuracy metrology.





## AT A GLANCE

### **Stand Off and Scan**

A scan-line width of up to 600 millimetres and a measurement standoff of up to 1000 millimetres are the keys to the productivity of the LAS-XL.

### **Higher Productivity**

The LAS-XL allows for long, sweeping passes over measurement objects, picking up scan data in far less time than traditional metrology scanners.

### **Accurate as Needed**

With accuracy to within 150 microns, the LAS-XL retains the metrology capability to make measurement worth doing.

### **Hidden-Area Measurement**

With such a large measurement standoff, even deep hidden-area measurement is no longer the obstacle it often is for traditional metrology and terrestrial scanners.

### **Multi-Surface Capable**

The established benefits of Hexagon's unique flying-dot scanning technology mean any surface is measurable, even with multiple materials and finishes falling under a single scan sweep.



# LEICA T-SCAN 5

## ABSOLUTE DYNAMICS

With unrivalled high-speed dynamics and a fast point acquisition rate, the Leica T-Scan 5 is the ultimate scanning solution for either automated inspection operations or expert manual users looking for advanced functionality in a laser scanner.

Reliably using laser line technology to deliver hundreds of millions of accurate points on virtually any surface, the Leica T-Scan 5 offers the best option for any application where feature location and small detail analysis is a priority. User aids including acoustic and visual feedback and a guide light to find the optimum scanning position make the scanner easy to train on and operate, while a range of customisable measurement profiles and options available through the operating software make it the tool of choice for experienced laser tracker operators.

The Leica T-Scan 5 makes full use of the Leica Absolute Tracker AT960's dynamic tracking performance to provide results quickly, making it ideal for automated installations with today's improving robotic speeds.





## AT A GLANCE

### **Dynamic Range**

Fine-grained features are detected and digitised with ease with the ultra-high dynamic range at the core of Leica T-Scan 5 technology.

### **High-Density Data**

Collecting up to 210,000 points per second, the T-Scan 5 delivers the measurement speed and quality for feature-rich measurement.

### **In-Built Flexibility**

Easily selected custom measurement profiles and automatic recognition make the Leica T-Scan 5 the perfect part of a full metrology toolkit covering a wide range of applications.

### **Automation for the People**

Optimised for fully automated robot-mounted high-speed measurement, the Leica T-Scan 5 is a defining tool of Industry 4.0.





Leica

Swiss Technology  
by Leica Geosystems



The Leica Absolute Tracker AT960 from Hexagon Manufacturing Intelligence offers us improved portability and faster measurements. As a result, the services we provide are even more efficient.”

**Laure Corneille Royer,**  
Airbus Helicopters, France



# LEICA ABSOLUTE TRACKER AT960

## THE FOUNDATION OF FIRST-CLASS LASER SCANNING

The first fully portable six degrees of freedom (6DoF) laser measurement system, the Leica Absolute Tracker AT960 delivers the technology necessary to serve as the global referencing system for a high-end 3D laser scanner.

The high-speed dynamic measurement functionality of the AT960 can accurately locate a Hexagon laser scanner up to 30 metres away with a maximum distance uncertainty of just 10 microns.

The unmatched speed, accuracy and portability of the Leica Absolute Tracker AT960 is based on a foundation of innovative technologies that make it the pinnacle of high-performance metrology on the move.

### Defining features

- All-in-one compact and highly portable single flight case design
- Unmatched speed and accuracy based on Absolute Interferometer technology
- Automatic target acquisition and reconnection with PowerLock
- IP54-certified environmental ingress protection
- Integrated mini variozoom for reliable 360° field of view under any light conditions
- High-resolution colour overview camera for fast and accurate targeting
- Built-in smart WiFi connectivity for single-user operation and remote control functionality
- Levelling and alignment made easy with Orient-to-Gravity function
- Independent hot-swappable battery power
- MeteoStation environmental monitoring
- 6DoF measurement volume up to 60 metres in diameter
- Additional Real-Time Feature Pack delivers 1000kHz 7DoF capability for automated solutions

# SPECIFICATIONS



## System Comparison

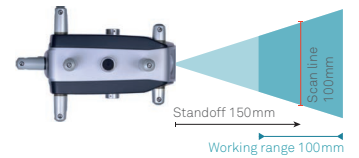
	Leica Absolute Scanner LAS	Leica Absolute Scanner LAS-XL	Leica T-Scan 5
Scanner Size / Weight	300 x 201 x 140 mm / 0.94 kg	300 x 201 x 140 mm / 0.96 kg	380 x 210 x 138 mm / 1.1 kg
Controller Size / Weight	226 x 146 x 91 mm / 1.9 kg	226 x 146 x 91 mm / 1.9 kg	316 x 235 x 142 mm / 6 kg
Standoff	180 mm	700 mm	150 mm
Working Range	± 40 mm	± 300 mm	± 50 mm
Maximum Scan Width (at standoff)	220 mm	468 mm	100 mm
Maximum Sampling Rate	150 000 pts/sec*	143 000 pts/sec*	210 000 pts/sec*
Maximum Line Frequency	100 Hz*	100 Hz*	330 Hz*
Minimum Point Density (at standoff)	0.013 mm*	0.045 mm*	0.075 mm
Scanner / Controller IP Code	IP50 (IEC 60529) / IP30 (IEC 60529)	IP50 (IEC 60529) / IP30 (IEC 60529)	IP40 (IEC 60529) / IP40 (IEC 60529)

\*Depending on measurement mode

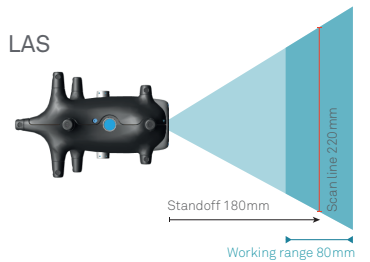
## System Accuracies

	Leica Absolute Scanner LAS and Leica T-Scan 5	Leica Absolute Scanner LAS-XL
Measurement uncertainty of spatial length (2 sigma)	$U_L = \pm 60 \mu\text{m}$ if under 8.5 m $U_L = \pm 26 \mu\text{m} + 4 \mu\text{m/m}$ if greater than 8.5 m	$U_L = \pm 150 \mu\text{m}$
Measurement uncertainty of sphere radius (2 sigma)	$U_R = \pm 50 \mu\text{m}$ if under 8.5 m $U_R = \pm 16 \mu\text{m} + 4 \mu\text{m/m}$ if greater than 8.5 m	$U_R = \pm 200 \mu\text{m}$
Measurement uncertainty of plane surface (2 sigma)	$U_p = \pm 80 \mu\text{m} + 3 \mu\text{m/m}$	$U_p = \pm 450 \mu\text{m}$

### Leica T-Scan 5



### LAS



### LAS-XL



Standoff 700mm

Working range 600mm



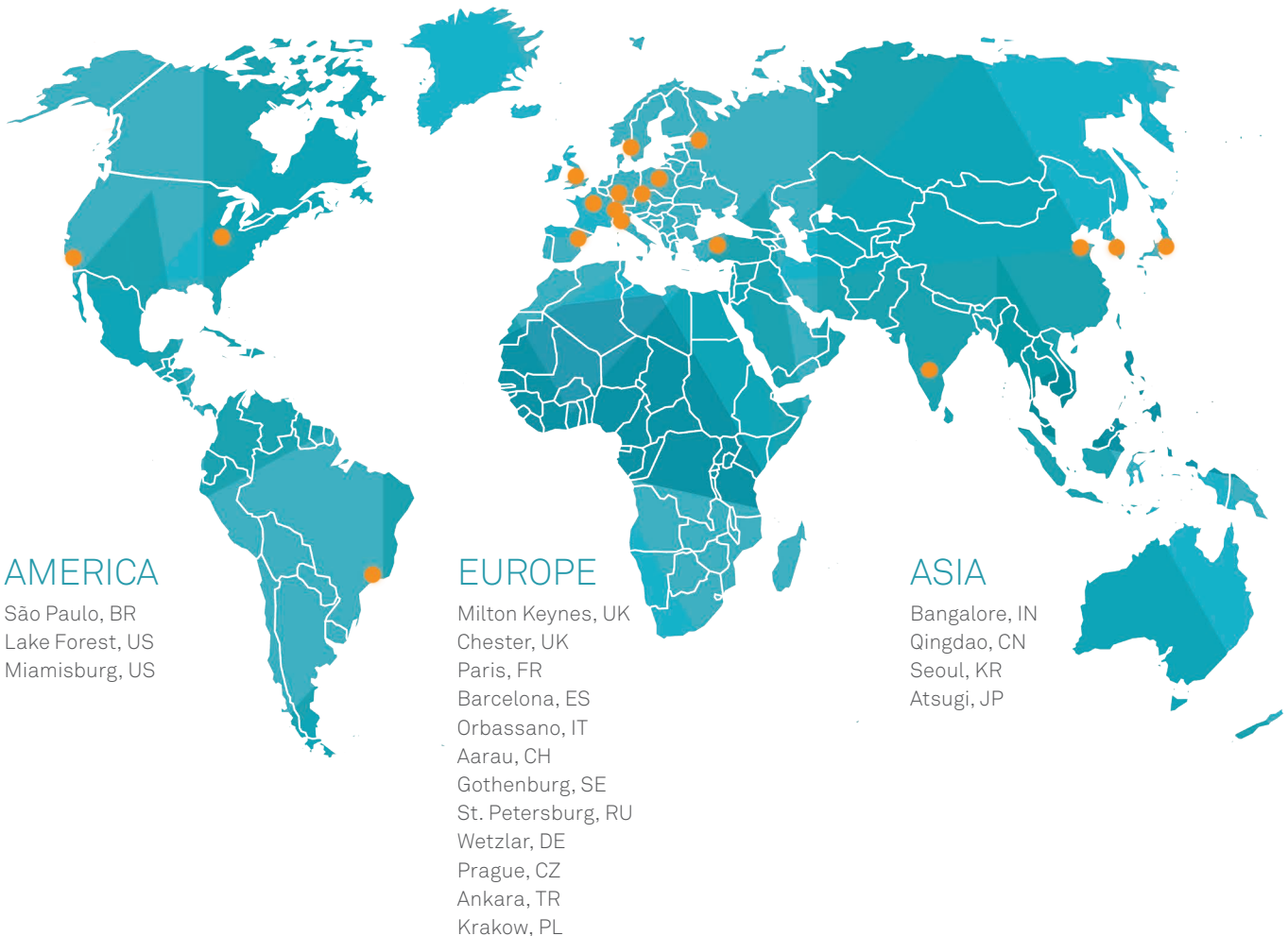
# QUALITY ACROSS THE GLOBE

## LEADING TOOLS WITH LEADING SUPPORT

Drawing on over 25 years of research and development, laser tracker and scanning technology from Hexagon Manufacturing Intelligence is built on a long history of outperforming technological innovation. Deriving quality from experience to drive productivity is what keeps Hexagon in front and able to deliver first-class solutions for industries around the world.

The international presence of Hexagon guarantees comprehensive aftersales support and services across the globe. With the largest dedicated service team of any metrology equipment manufacturer and an emphasis on locally delivered solutions, Hexagon is unmatched from service, repair, certification and calibration through operator training and software maintenance and upgrades.

Along with the assurance of ten years of serviceability, Hexagon laser scanner owners will benefit from a full 12-month factory warranty – our guarantee that our technology will always meet the needs of our users.







Hexagon Manufacturing Intelligence helps industrial manufacturers develop the disruptive technologies of today and the life-changing products of tomorrow. As a leading metrology and manufacturing solution specialist, our expertise in sensing, thinking and acting – the collection, analysis and active use of measurement data – gives our customers the confidence to increase production speed and accelerate productivity while enhancing product quality.

Through a network of local service centres, production facilities and commercial operations across five continents, we are shaping smart change in manufacturing to build a world where quality drives productivity. For more information, visit [HexagonMI.com](http://HexagonMI.com).

Hexagon Manufacturing Intelligence is part of Hexagon (Nasdaq Stockholm: HEXA B; [hexagon.com](http://hexagon.com)), a leading global provider of information technologies that drive quality and productivity across geospatial and industrial enterprise applications.

-  COORDINATE MEASURING MACHINES
-  3D LASER SCANNING
-  SENSORS
-  PORTABLE MEASURING ARMS
-  SERVICES
-  LASER TRACKERS & STATIONS
-  MULTISENSOR & OPTICAL SYSTEMS
-  WHITE LIGHT SCANNERS
-  METROLOGY SOFTWARE SOLUTIONS
-  CAD / CAM
-  STATISTICAL PROCESS CONTROL
-  AUTOMATED APPLICATIONS
-  MICROMETERS, CALIPERS AND GAUGES
-  DESIGN AND COSTING SOFTWARE