



The Leica Absolute Tracker ATS600

CERN, October 2019

INTRODUCING THE LEICA ABSOLUTE TRACKER

AT500

ATS600 – technology Background



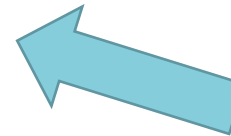
MS50

Next Generation WaveFormDigitizer (WFD) as Absolute Distance Meter Measures Uncooperative Targets



AT960/930

Iconic Design
Responsive Axes



AT403

Faster Automated
Target Recognition
(ATR) for Retro-
Reflectors

ATS600 – Tracker or Scanner? Both! Two modes of operation!

Reflector Targets

- Tracking
- Powerlock

Reflectors



RRR 0.5in



RRR 1.5in



RRR 0.875in



Custom Reflector

Scan Targets

- Selective Scanning
- Spheres
- Single Surface Points

Scan Targets



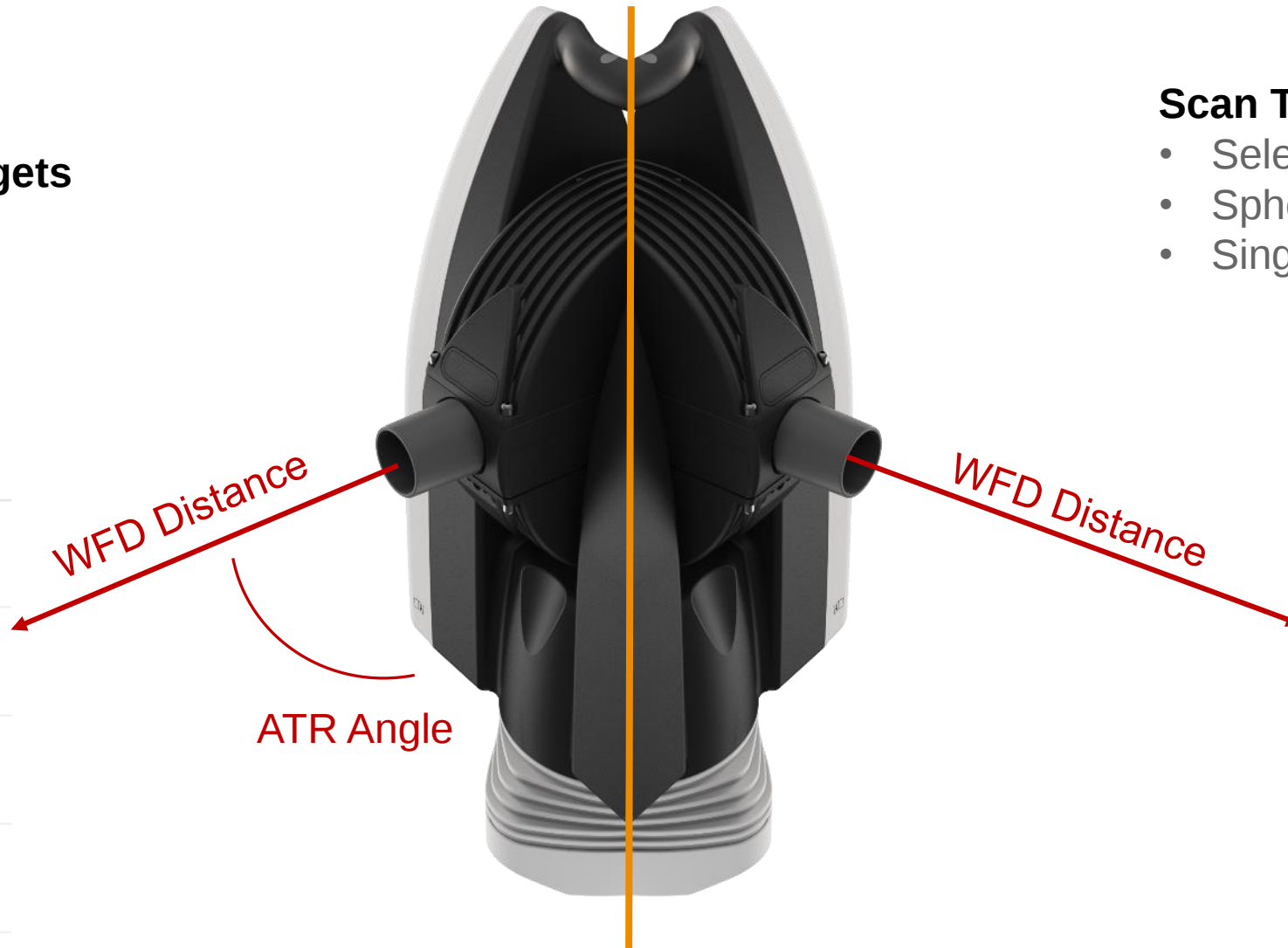
Custom Sphere



Reference Sphere

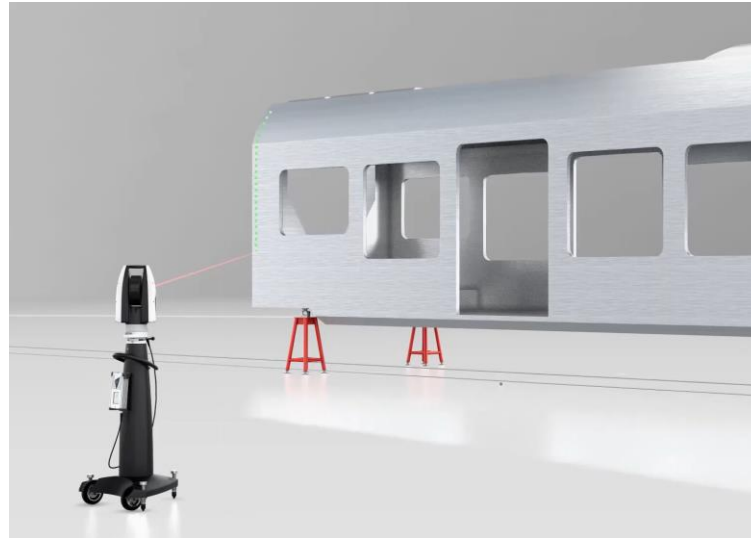


Surface



Worlds First Scanning Laser Tracker

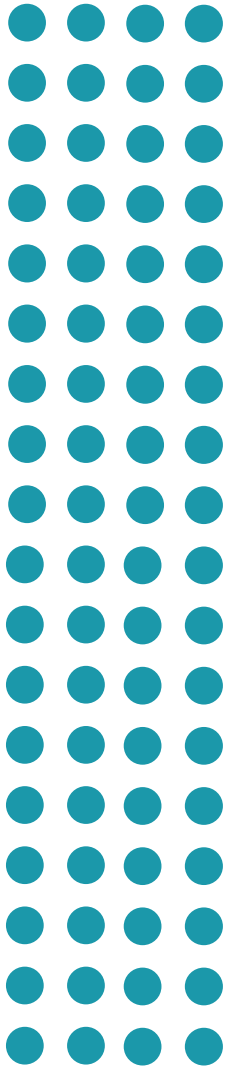
Leica Absolute Tracker ATS600 is a Metrology grade large volume scanner, combining scanning with tactile measurements seamlessly



Scanning Range
1 to 60 meter



Reflector Range
1 to 80 meter



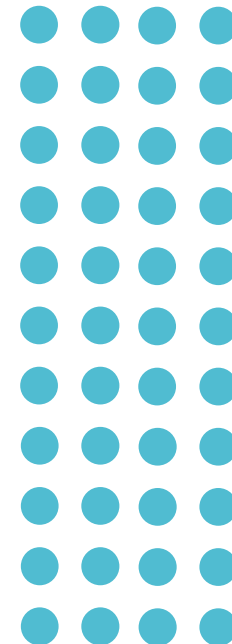
Selective Scanning



Leica Absolute Tracker ATS600 offers selective scanning capabilities, «only scan data that you really need»

Scanning rate up to 1 kHz

Scanning speed up to 10 sec/m² in Fast mode @ 5 m with 50 mm point-to-point and line-to-line spacing



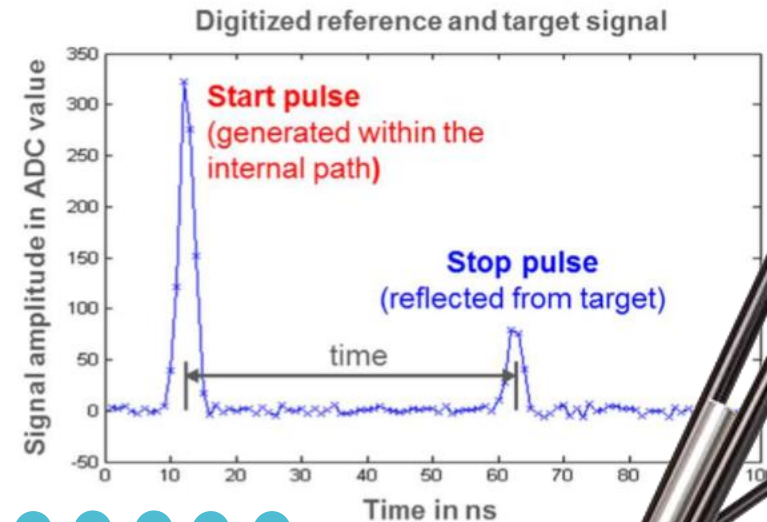
Scanning Absolute Distance Meter (ADM)

Our new Scanning ADM is based on the well established «Wave Form Digitizing» technology, which is used in many other Leica Geosystems instruments

The WFD combines the principles of time-of-flight and phase-shift measurement technologies, where the distance is calculated based on the time between a start and stop pulse, that is digitized out of the the received signal

The WFD system constantly evaluates, digitizes and accumulates the waveform of all reflected signals to precisely recognize and extract the start and stop pulses

The Scanning ADM is a class 2 laser (eye-safe)



ATS600 Tracking Accuracy

According to ISO10360-10:2016

Absolute Angular Performance¹

e_T

$\pm 15 \mu\text{m} + 6 \mu\text{m/m}$

(Same accuracy as the AT403 and AT960)

Length Measurement ²

$E_{\text{uni:0:LT,MPE}}$

$\pm 100 \mu\text{m}$

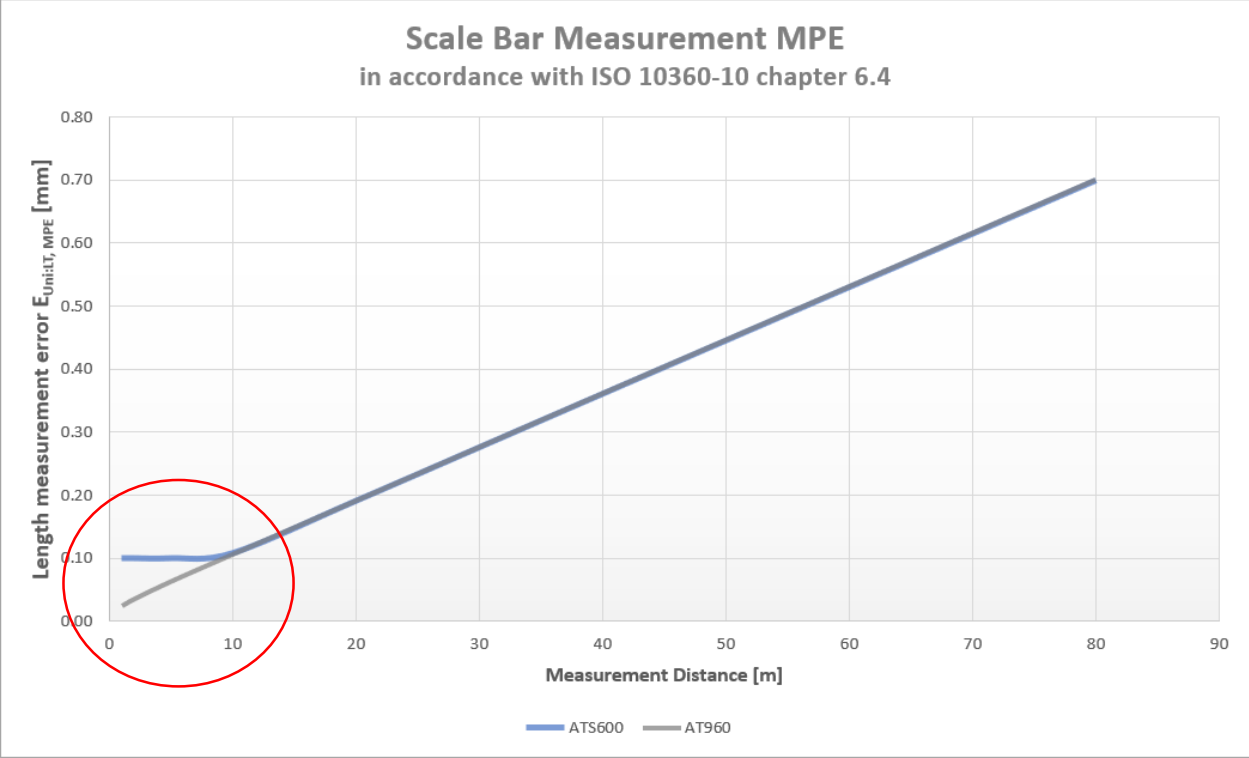
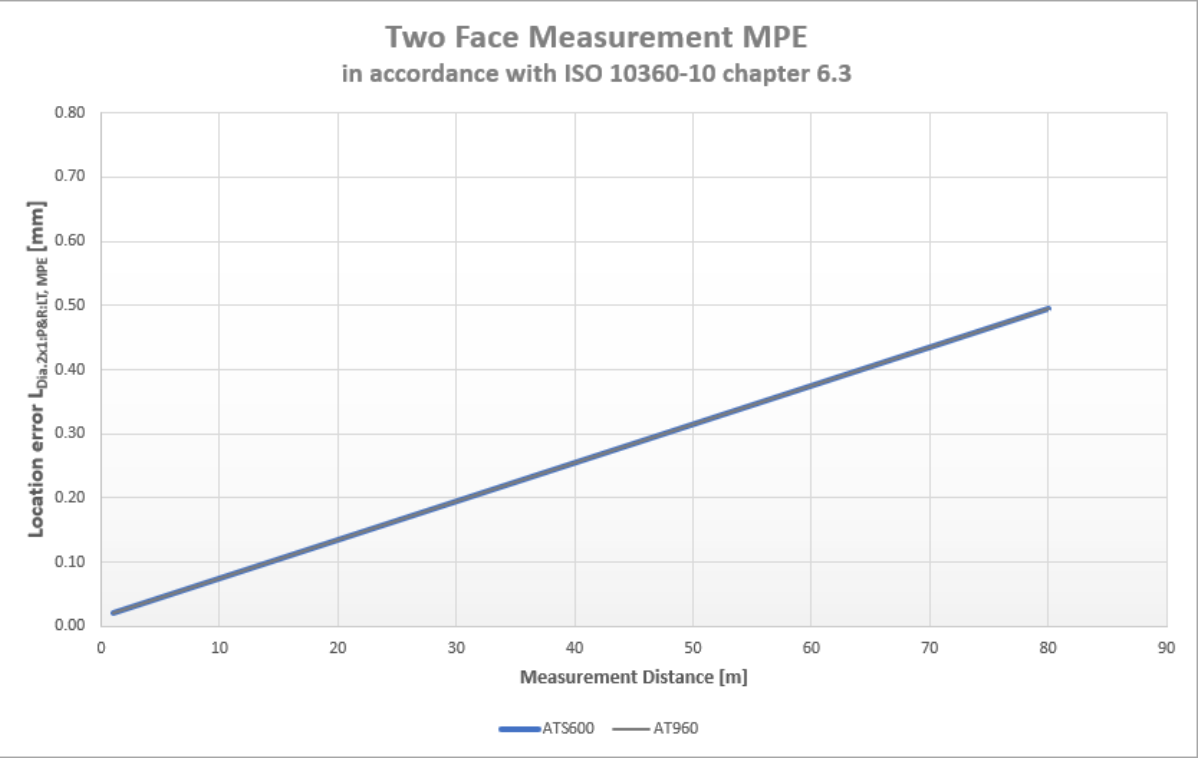
¹Angular Performance Transverse e_T according to ISO10360-10:2016, this respects to a MPE for the Location Error (**Dia.2x1:P&R:LT,MPE**) in accordance with chapter 6.3 of ISO 10360-10:2016 of $\pm 30 \mu\text{m} + 12 \mu\text{m/m}$

²In accordance to ISO10360-10:2016 chapter 6.4, table 4 positions 1-35

SPECIFICATIONS	
Accuracy	
• Reflector Measurement	
Absolute Angular Performance ¹	$\pm 15 \mu\text{m} + 6 \mu\text{m/m}$
Length Measurement ($E_{\text{uni:0:LT,MPE}}$) ²	$\pm 100 \mu\text{m}$
All accuracies specified as Maximum Permissible Error (MPE). Typical values are half of MPE.	
• Non-Contact Measurement	
Range Noise ³	$< 80 \mu\text{m}$
Absolute Accuracy ⁴	$< \pm 300 \mu\text{m}$
¹Angular Performance Transverse e_T according to ISO 10360-10:2016, this respects to a MPE for the Location Error ($E_{\text{Loc:2x1:P&R:LT,MPE}}$) in accordance with chapter 6.3 of ISO 10360-10:2016 of $\pm 30 \mu\text{m} + 12 \mu\text{m/m}$.	
²In accordance with ISO 10360-10:2016 chapter 6.4, table 4, positions 1 - 35.	
³Standard deviation (1σ) of a best-fit plane (78% albedo), distance 1 - 30 meter, standard measurement mode, target aligned	
⁴Maximum Deviation (MPE) of the absolute position of a plane (78% Albedo), 1 to 30 meter, 0 to $\pm 45^\circ$ incidence angle	

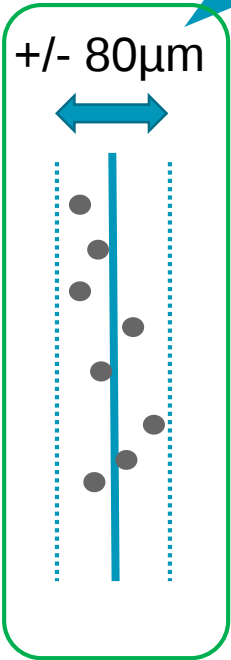
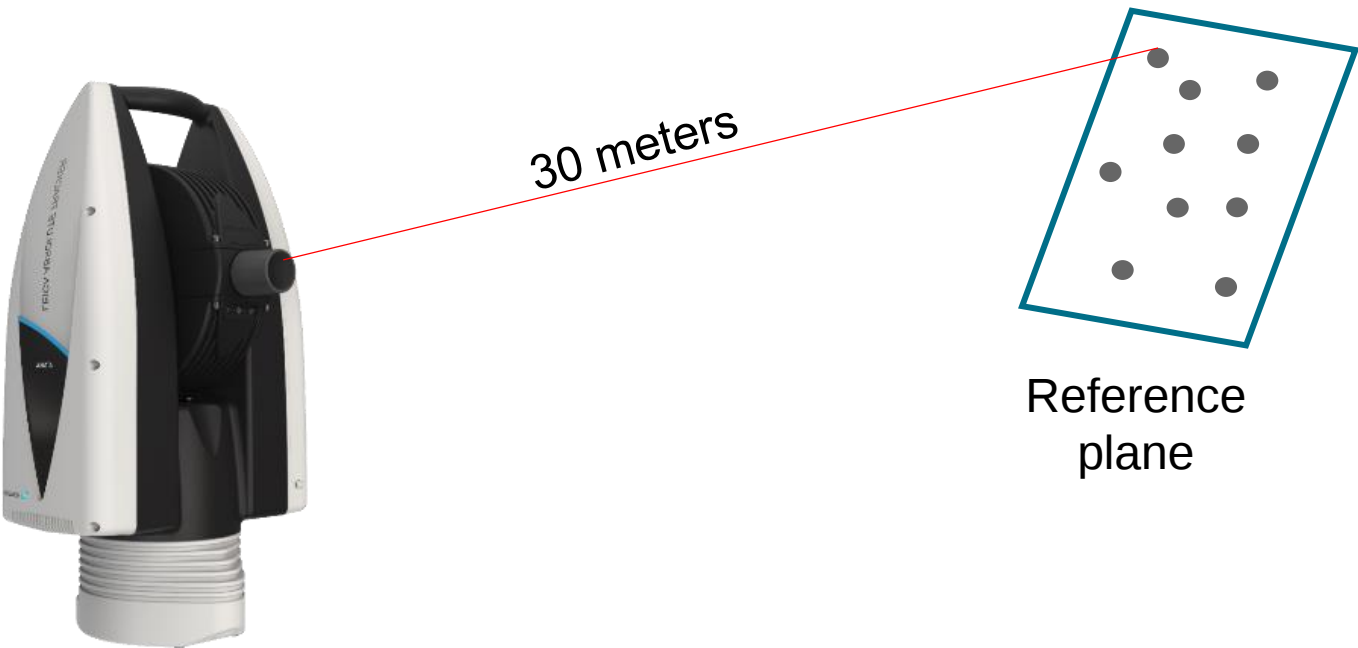


ATS600 Laser Tracker Accuracy ctd.



Model	Two Face Measurement $L_{Dia.2x1:P\&R:LT,MPE}$	Scale Bar Measurement $E_{Uni:LT,MPE}$
ATS600	$\pm 15\ \mu m + 6\ \mu m/m$	$\pm 100\ \mu m (< 10\ m)$ $\pm 18\ \mu m + 8.5\ \mu m/m (> 10\ m)$
AT930/AT960 AT403	$\pm 15\ \mu m + 6\ \mu m/m$	$\pm 18\ \mu m + 8.5\ \mu m/m$

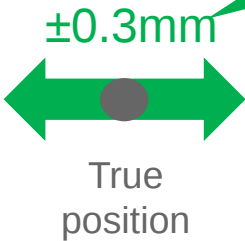
Accuracy - Reflectorless



This is the NOISE

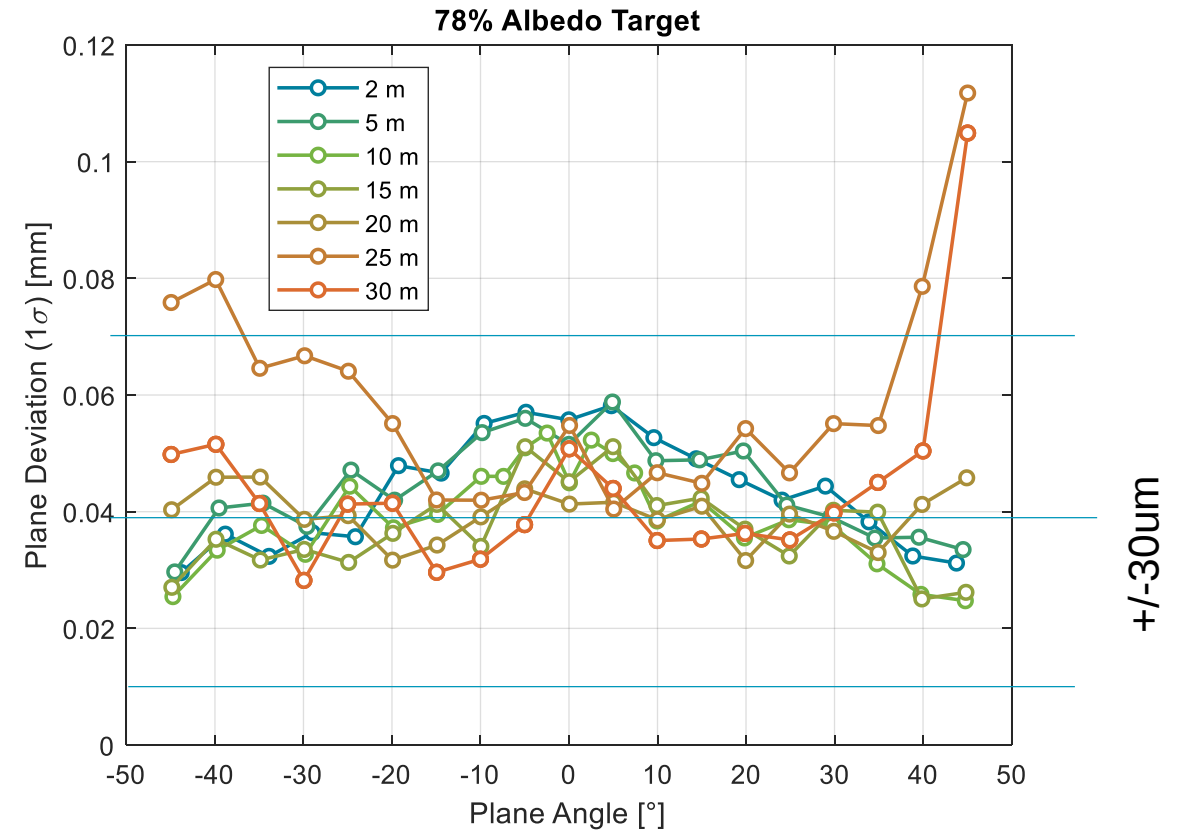
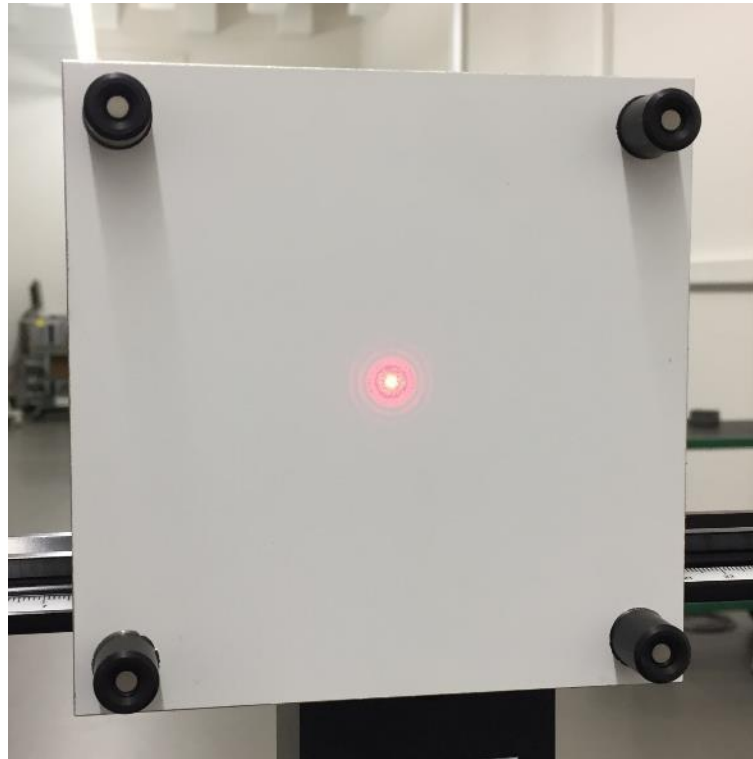
This is the LOCATION

Range Noise¹ < $\pm 80\mu\text{m}$
Absolute Accuracy² < $\pm 300\mu\text{m}$



Range Noise – Reference Plane

(specs +/-80 μm)



³ Standard deviation (1σ) of a best-fit plane (78% albedo), distance 1.5 to 30 metres, standard measurement mode, target aligned.

⁴ Maximum Deviation (MPE) of the absolute position of a plane (78% Albedo), 1.5 to 30 metres, 0 to $\pm 45^\circ$ incidence angle.

Typical performance. Hexagon does not guarantee values beyond specifications.

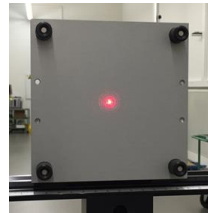
ATS600 A Benchmark in Scanning Accuracy

ATS600 Range Noise (1σ) significantly less than Terrestrial Laser Scanners (TLS), < 0.1 mm

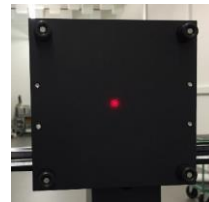
Absolute scanning accuracy of ATS600 to a variety of common materials better than ± 0.3 mm (best-fit plane 95%)

Very large incidence angle ($> 45^\circ$) on many materials with almost no decrease in accuracy

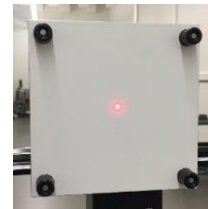
Tested Material Samples



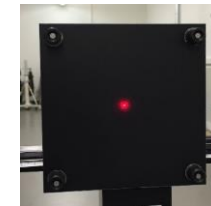
MELOX FBL



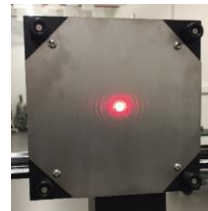
MELOX SW



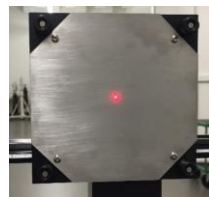
A1



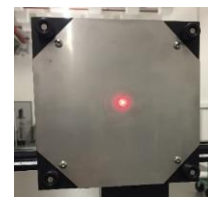
A4



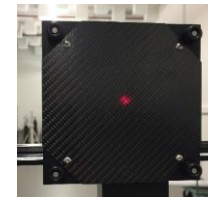
Steel brushed
vertical



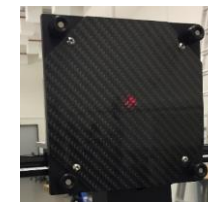
Steel brushed
horizontal



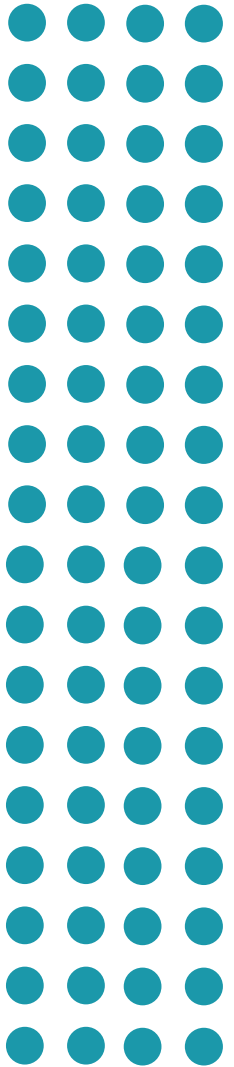
Steel bright
(polished)



Carbon rough
(texture)



Carbon
smooth
(polished)



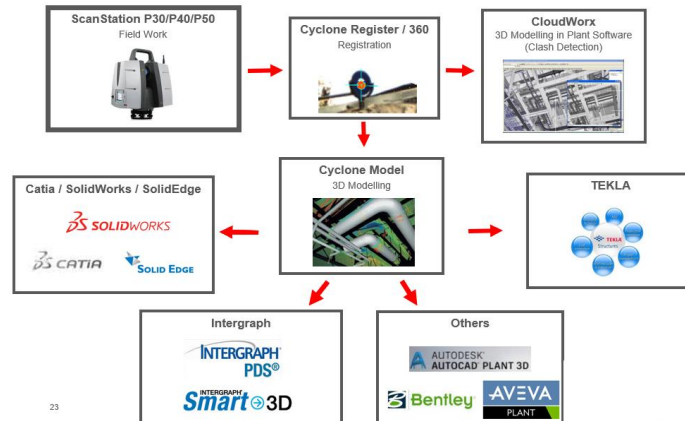
Application Software Workflow

The **ATS600** offers true Metrology workflows of integration of large scale scan data in metrology software

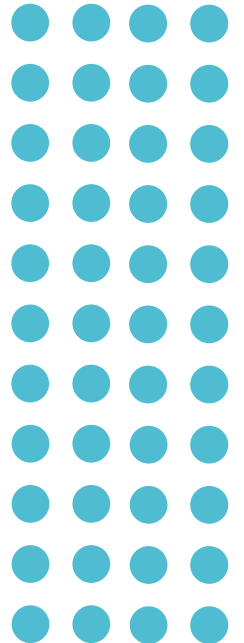
Point cloud data from ATS600 is directly available within the application software for immediate feedback, i.e. Build & Inspect

Terrestrial Laser Scanners are quite fast to take a full dome scan, but it takes a significant amount of time to import the point cloud into an application software package

Workflow TLS Scanners



Workflow ATS600



Application Software

- New interface (LMF v1.6) implemented,



<http://discoverinspire.com>



Metrolog^x4

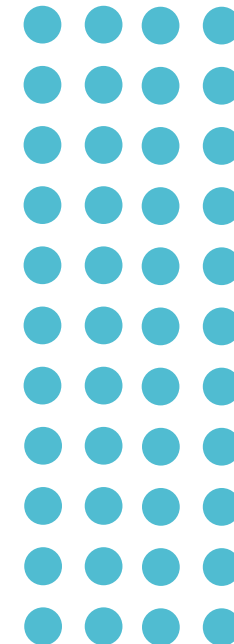
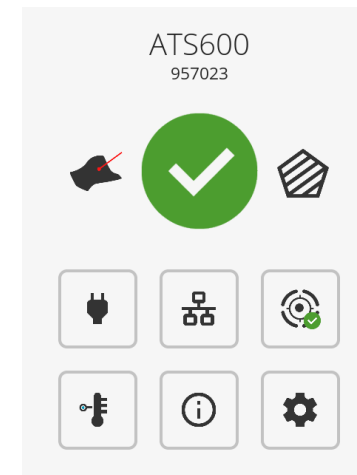
- Informed, working on interface



Application Integration

Leica Absolute Tracker ATS600 is compatible with LMF software development kit (SDK), it is easy to integrate into Metrology software packages

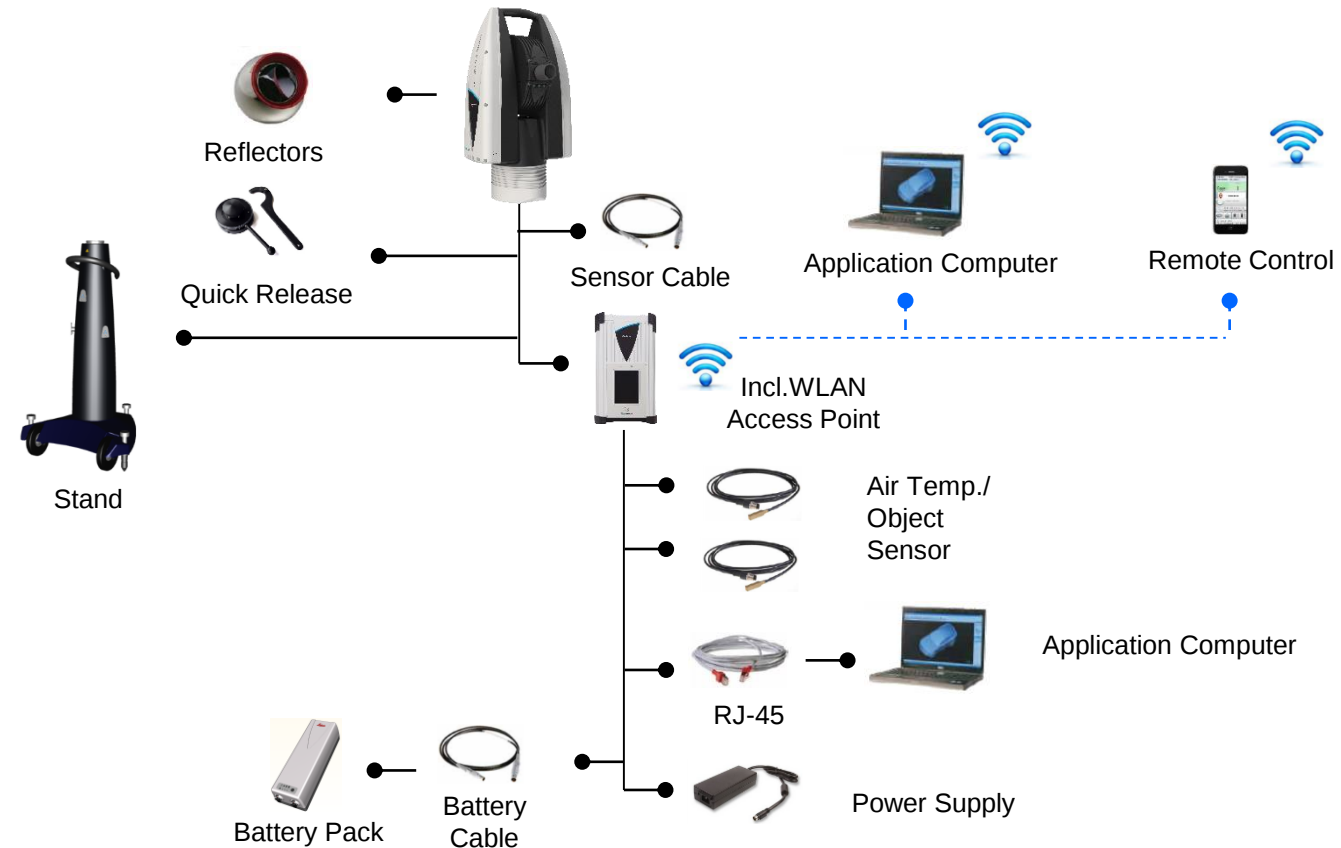
New design of Tracker Pilot and Controller screens, adapting Hexagon style guides



System Components

The **ATS600** has been developed on the basis of the successful AT9x0 platform

Many accessories are compatible between ATS600 and AT930/AT960



ATS600 – Key Features



All-in-one system design



Power Lock



Orient to Gravity



Smart Connectivity



Battery Power



Measurement Volume



1 kHz Data Output



Overview Camera



IP54

IP54 Certification



Built-in Meteo Station



24 month warranty

Good reasons to look closer to the ATS600

1. It is a laser tracker- can measure with reflectors in large volume @ Laser tracker accuracy
2. The workflow allows immediate results
3. It enables to measure reflectorless
4. It allows fast and precise selective scanning



THANK YOU!