Absolute AT901

Leica Absolute Tracker™All-New Groundbreaking Laser Tracker Systems

We have built up a rock-solid reputation for designing and manufacturing absolutely reliable, robust laser trackers that find application in the most demanding environments, from factory shop floors to metrology labs. At first there was the SMART series, then the LTD500 generation, followed by the LTD700/800, and in 2005 we gave you the LTD640/706/709/840 family. In 2008, we are welcoming the Leica Absolute Tracker™.

At about 22 kg [48 lbs] and 62 cm [2 ft], the Leica Absolute Tracker™ enables easy one-person operation. A quick release mechanism securely locks the sensor onto the sturdy, heavy-duty tripod. You get the no-compromise stability that’s paramount for accurate measurements. Better still, the entire setup can be transported in the trunk of an average station wagon.

The Leica Absolute Tracker™, just like its earlier Leica Geosystems brethren, relies on a technically sophisticated yet surprisingly maintenance-free internal design that allows it to run hour after hour, day after day, month after month without the need for any compensation whatsoever.

Why Leica Absolute Tracker™?

Thermal stability and robustness second to none

Despite being an extremely sophisticated piece of equipment, a laser tracker is not intended just for controlled laboratory settings in which the temperature, humidity and the like are kept in check. In the real world, a laser tracker is subjected to punishing atmospheric conditions. Accounting for how they affect the refraction index of the emitting laser light is easy. The Leica Geosystems engineers have designed each and every component with the eye on the big picture, never losing sight of how different parts will mechanically and thermally interact with one another. The result: an extremely homogenous internal design and a laser tracker that refuses to drift out of spec. The Leica Absolute Tracker’s stunning looks are merely an extension of its inner beauty: a judicious, clean-cut design that leaves nothing to

chance.With the Leica Absolute Tracker™, intermediate adjustments typically required to “reset” the entire apparatus to avoid going out of spec are rendered superfluous.

Absolute Interferometer

In the ideal world, a laser tracker would combine the ability to instantly re-establish a broken laser beam and immediately start tracking a target. At the same time, it would measure absolute distances with the highest precision and would be arbitrarily fast. Keeping the integration time (the time required to perform the mathematical operations to determine the target’s position) down to a minimum is paramount when tracking moving targets. Historically, most laser trackers have used either absolute distance meters (ADM) or interferometers (IFM) to get the job done. Each system has its strengths.

The IFM can determine relative distances (i.e. the change in distance from point to point) with accuracies on the nanometer level, with an instantaneous update rate that is limited only by the speed at which the reflector is moved. It has been an industry standard for over 30 years and remains the most accurate system for measuring large distances available. However, an IFM can only measure relative distances, and is unable to determine an absolute position in 3D space without having a known starting point.

The ADM measures absolute distances (i.e. distances to a known point in a 3D coordinate system) with extreme precision but even the fastest ADM could never achieve IFM accuracies or speed for dynamic measurements. However, the ADM’s accuracy has a constant value throughout the entire measurement volume, even at the outer edge of the measurement volume.

Leica Geosystems combines the strengths of both of these measurement principles, creating a fool-proof system with multiple built-in redundancies that guarantees superb accuracies throughout the measurement volume. We call this forward-looking technology the Absolute Interferometer (patent pending). Its speed and accuracy establish the new metrology standard for industrial applications, featuring an insusceptible, technologically mature design with a negligible thermal footprint.

6 Degrees of Freedom

The Leica T-Cam, part of every Leica Geosystems Portable Coordinate Measurement System (PCMM) or as an add-on option for existing Leica Geosystems Laser Trackers migrating from reflector measurements to other target devices, is a CMOS digital camera system operating with visible light and near infrared (IR) radiation, with an optical vario zoom and a motor for vertical, angular movement. Mounted onto the Leica Geosystems Laser Tracker, the Leica T-Cam continuously follows the target device and captures the images of the IR LEDs located on them. The T-Cam’s incremental angle encoder is used to provide the vertical, angular movement of the T-Cam based on tracker guidance angles.

A reflector integrated in a target device, together with a set of ten IR LEDs embedded on the surface of the target device, represent the measurement targets of the system. Six measurement parameters describe the target device in relation to the laser tracking system completely. These are 3 position parameters (x, y and z) and 3 orientation parameters (pitch, yaw and roll). Together, they comprise the Six Degrees of Freedom (6DOF) principle. These parameters are determined by the Leica Geosystems Laser Tracker (position) and the Leica T-Cam (orientation).

The vario zoom in the Leica T-Cam keeps the size of the target device as seen by the CMOS sensor constant, thus resolving the biggest issue previously faced by photogrammetry systems: their inability to follow targets due to the camera-perceived changing size of the tracked object (i.e. the farther away the target device, the smaller it appears on the camera sensor).

Impervious to environmental light

Regardless of whether you are conducting your measurements in direct sunlight, with welding sparks flying around or with sharply changing environmental light, the Leica T-Cam functions flawlessly. The target devices emit pulsating infrared light of a known wavelength, and the CMOS camera utilizes a shutter that engages at the same frequency at which the target device pulsates. That way, it can effectively “tune out” all other light sources except for the target device itself. Simply put, the Leica T-Cam “only has eyes” for Leica Geosystems target devices.

Depending on your measuremet needs, there are three Leica Absolute Tracker™ types available.

Leica Absolute Tracker AT901-Basic

If your application requires positioning machines, fixtures or jigs, or if you are in the business of installing and aligning machine tools, roll mills, presses or gantry-based machines, AT901-Basic is your tracker. Operating solely with a reflector, it is optimized for inspections within a measurement volume of up to 80 m.

Leica Absolute Tracker AT901-Mid Range

Since the introduction of the Leica T-Probe in 2004 and the Leica T-Scan a few months later, practically all leading automobile manufacturers have joined the ranks of our customers. When a reflector simply won’t cut it because there is no clear line of sight to the part you are trying to inspect, the part is hiden or sunken deep beneath surrounding sheetmetal, or because you need to reverse-engineer a part right there on the spot, the AT901-MR is all you will need. When coupled to the Leica T-Probe and the Leica T-Scan, the AT901-MR gives you a measurement volume of up to 18 m (59 ft). Use it with the Leica T-Probe to measure recesses and cavities with an astonishing precision. Couple it to the Leica T-Scan, Leica’s high-speed contactless scanner, and small and large objects as well as complex surfaces can be quickly digitized with minimal preparation times and regardless of the surface material. Of course, it can also be used with a standard corner cube, in which case its measurement volume goes up to a full 50 m (163 ft).

Leica Absolute Tracker AT901-Long Range

False modesty aside, this laser tracker is the new benchmark for aerospace and other general industry precision (GIP) large-scale applications such as windmill blade inspection or heavy industrial machinery alignment. It gives you hand-held wireless probing or hand-held contactless scanning volume of up to 30 m (98 ft). Of course, it can also be used with a standard corner cube, in which case its measurement volume goes up to a full 80 m (262 ft). Its high-end specifications let you conduct demanding wireless inspections of very large parts with just one setup, with no need to reposition the laser tracker. With its unmatched robustness and reliability, repeatable accuracy and compact size that’s perfect for one-person operation, the AT901-LR is the ideal GIP workhorse for those applications in which taking second guesses is absolutely not an option.

Leica Absolute Tracker™ type	Absolute Interferometer	Max. measurement volume
AT901-B	yes	80 m
AT901-MR	yes	50 m
AT901-LR	yes	

80 m

Compatible with T-Products
no
yes
yes

Max. measurement volume with T-Products
n/a
18 m
30 m

5-Year Warranty Program as standard
yes
yes
yes

Feature
Benefit

Robust construction and superior thermal stability with homogenous internal design and non-heat emitting tracker sensor head

Continuous on-spec operation in tough industrial environments with no need for frequent compensation routines; a yearly calibration is all your Leica Absolute Tracker™ will ever need

Absolute Interferometer utilizing both an absolute distance meter (ADM) and an interferometer (IFM)
A simple, insusceptible, technologically mature design for high-accuracy measurements in all operating conditions; tremendous data redundancies achieved with combined ADM&IFM systems

6 Degrees of Freedom (6DOF) Portable CMM available as an option
The world’s only technologically mature PCMM system that can probe like a fixed CMM, scan like a laser scanner and track automated applications − all in one system

Lean construction and compact dimensions, weighing just about 22 kg and 62 cm in length
Easy one-person transportation and installation, in full compliance with labor department regulations; whole system fits in an average-sized station wagon