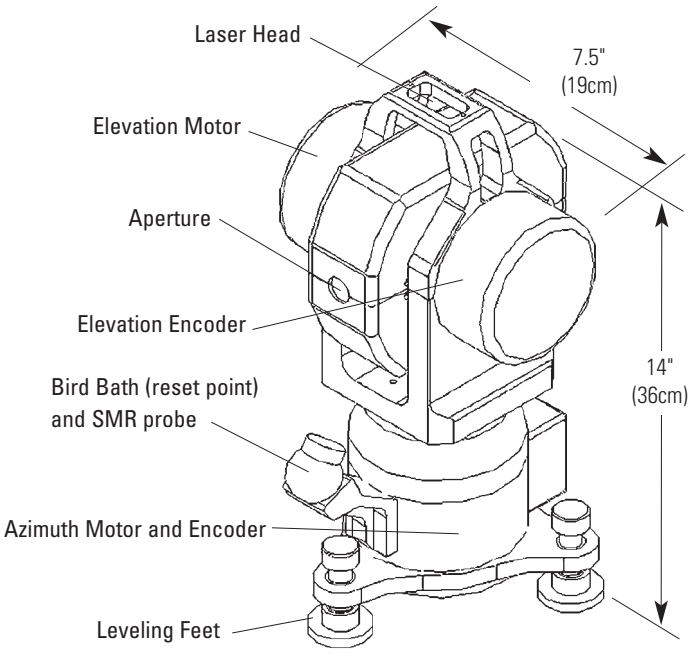
Laser Tracker II PLUS!™

The Laser Tracker II PLUS! offers unmatched performance for your precision measurement tasks. To arrange a demonstration at your facility or to obtain more information on the Laser Tracker II PLUS!, contact one of API's Sales Offices listed below or visit our website at **www.apisensor.com**.



Specifications

Laser Tracker II PLUS!

Maximum lateral target speed	> 3.0 meters/sec (120"/sec)
Maximum acceleration in all directions	> 2 g
Range of Measurements	
Horizontal:	± 300° (600° end-to-end)
Vertical:	+ 80°
	– 60°
Distance:	greater than 40 meters
Angle Resolution	0.14 arc second

Interferometer Mode

Distance Resolution	± 1µm
Repeatability	± 2.5 ppm (2 sigma)
Absolute Accuracy in 3D Spatial Measurement	
Static:	± 5 ppm (2 sigma)
	0.001" (25µm) at 16 feet (5 meters)
Dynamic:	± 10 ppm (2 sigma)
	0.002" (50µm) at 16 feet (5 meters)

ADM Mode

Distance Resolution	± 1µm
Repeatability	± 25µm
Accuracy	(± 25µm to + 2.5ppm)
Weight of Tracker Head	8.5 kg (18.5 lbs)
Weight of Controller	3.2 kg (7 lbs)
Total Package Weight	23 kg (50 lbs)*

*(includes carrying case, tracker, controller, tools, cable, accessories)

SmartTRAK 6D Sensor

Pitch	± 55°
Yaw	± 155°
Roll	± 30°
Angular resolution	± 3 arc-second
Weight	1.4 kg (3.1 lbs)

Communication: TCP/IP and Serial interfaces are available for remote monitoring and synchronized data collection.

All above stated accuracy and repeatability are in compliance with ASME-B89 Dimensional Measuring Standards.

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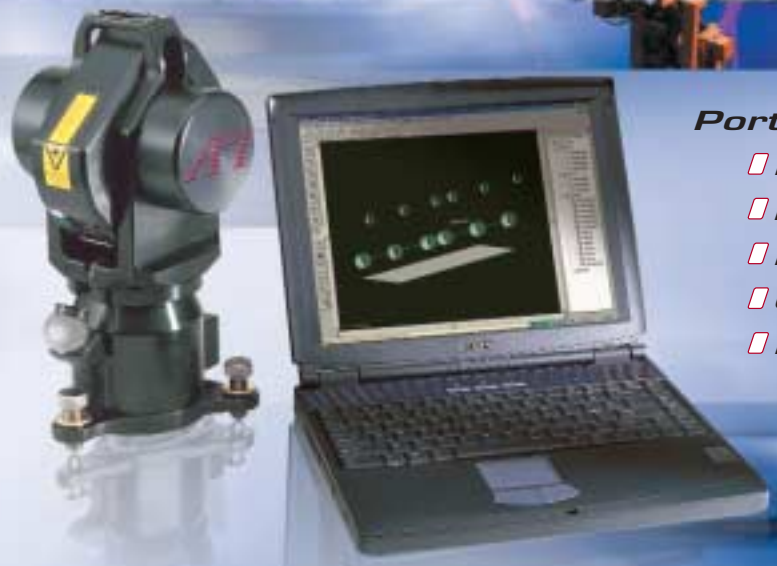
Laser Tracker II PLUS!TM

Laser Tracking System



Portable Coordinate Measurement

- High Precision
- Ease-of-Use
- Rapid Set-up
- Compact Size
- Intuitive Software

Automated Precision, Inc.

Founded by Dr. Kam Lau in 1987, API has pioneered progressively higher standards of accuracy for coordinate measurement and machine tool operation. As a world leader in advanced laser metrology solutions, API has consistently developed new products to meet the needs of today's rapidly evolving manufacturing processes. API's products are used by the world's leading automotive, aerospace, heavy industry, machine tool, and CMM manufacturers. API's leading edge metrology instrumentation has enabled industry leaders to achieve new levels of productivity, quality and accuracy.

As an active technology partner in many federal and industry sponsored research and development programs for the advancement of manufacturing technologies, API's work in measurement and error correction instrumentation continues to support industry's quest for ever higher levels of quality and productivity.

Industry Recognition

API's technical expertise and product innovation has been long recognized within industry.

A few of the prestigious awards include:

- **Photonics Circle of Excellence**
- **Research & Development IR 100**
- **Laser Focus World Advanced Production Technology**

Visionary Technology

API's pursuit of innovative solutions has enabled us to develop and patent the world's leading measurement instruments.

These patents include:

- **SmartTRAK 6D Sensor** *(patent pending)*
- **3D Laser Tracker**
- **5/6D Laser Measurement System**
- **Coordinate Measurement Probe**

Service Excellence

API's commitment to excellence extends beyond technology and underlies our dedication to quality in product, technical support, service and customer satisfaction. The company offers turn-key solutions to assist customers in solving precision measurement and sensing challenges encountered in the modern manufacturing environment.

- **Hardware**
- **Software**
- **Certification**
- **Training**
- **Service**

API the true measure of excellence

API's world headquarters is located near the National Institute of Standards & Technology (NIST) in the heart of Maryland's Technology Corridor. The new 45,000 square-foot building houses modern data, voice, and video communication. The API facility includes state-of-the-art measurement laboratories, modernized manufacturing facilities, and advanced optical manufacturing production centers bringing you the most accurate and reliable instrumentation in the world.

API's world headquarters

At API our dedication to continuously improving customer support is backed by our highly responsive application, engineering, and technical personnel.

API's five US offices, its Asian office in Beijing, China and its extensive network of partnerships with recognized industry representatives throughout the world insure that all customers have quality local support.

Distinguished Customers

API's core value is commitment to our customers. This commitment, coupled with our expertise in metrology and laser technology, enables API to serve the world's leading manufacturing firms and research institutions.

"We've had good success with the Laser Tracker II$^{PLUS!}$. The customer support has been excellent. The API tracker is the most portable tracker available and it's accuracy is on par with the larger trackers."

– Major Aerospace Manufacturer

"API has done an outstanding job developing software for the Laser Tracker II$^{PLUS!}$ that meets our exact press alignment needs. The way the Tracker II$^{PLUS!}$ and API software works in the field is awesome."

– Major Service Provider

When Accuracy and Portability are Critical...

Laser Tracker II$^{PLUS!TM}$

API is the innovator in laser tracking technology. The Laser Tracker II$^{PLUS!}$ surpasses the performance, portability, and accuracy of API's Laser Tracker II$^{PLUS!}$, establishing a new standard for laser tracker systems.

No other tracker can match the accuracy and reliability of the Laser Tracker II$^{PLUS!}$. It is the most versatile laser tracker available for dimensioning, tool building, alignment, and reverse engineering applications.

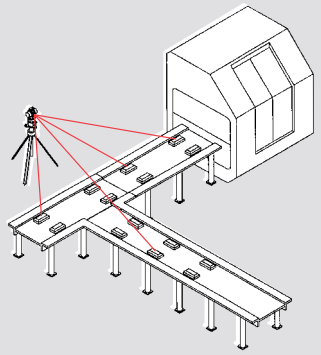
The Laser Tracker II$^{PLUS!}$ is designed to operate where the most benefit is realized...on the shop floor.

Applications

- Measure tooling, fixtures, and jigs
- Error map machine tools and robots
- Align machines, gear trains, rollers, and transfer lines
- Measure surface contours
- Reverse engineer parts
- Hidden point measurement

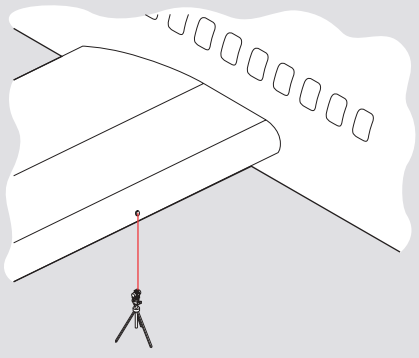
Layout Precisely

The Laser Tracker II$^{PLUS!}$'s superior accuracy makes it the ideal tool to precisely position and align transfer line elements. It performs complex alignment jobs quickly and easily.



Align Real-Time

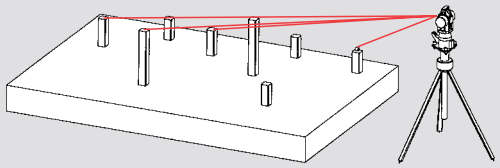
The enhanced versatility of The Laser Tracker II$^{PLUS!}$, with the Smart^{TRAK} 6D Sensor, enables it to quickly align large dimensional parts. This unique tool provides the operator with real-time position (x, y, z) and rotational orientation (pitch, yaw, roll) of the assembly to insure quality results.



...API has the solution for you

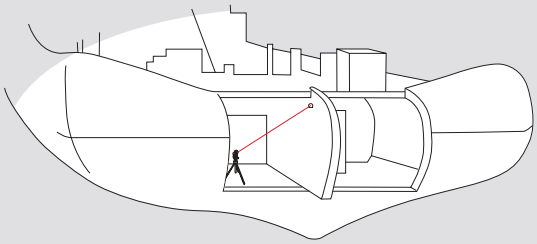
Build Large Fixtures and Jigs

The rapid set-up and ease-of-use of the Laser Tracker II$^{PLUS!}$ speeds fixture building and inspection.



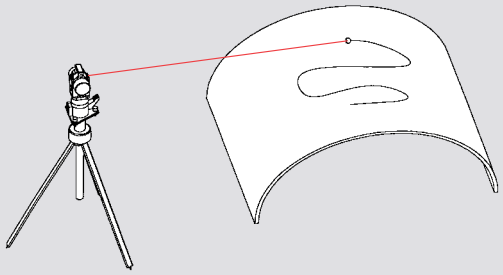
Align Large Assemblies

The unmatched portability of the Laser Tracker II$^{PLUS!}$ makes it easy to operate in tight work areas such as shipboard machinery spaces to make critical measurements and alignments.



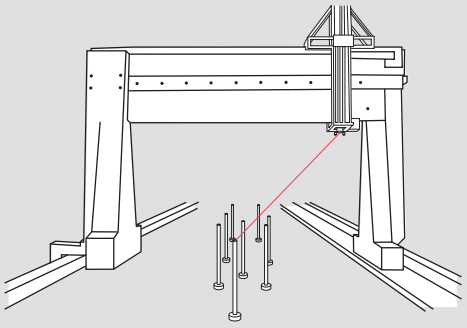
Reverse Engineer Parts

The superior accuracy of the Laser Tracker II$^{PLUS!}$ enables it to reverse engineer large dimensional parts such as engine cowlings and nose cones with precision.



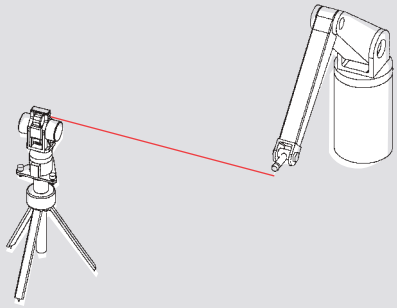
Error Map with Tracker II$^{PLUS!}$

Use the 3D-6D Laser Tracker II$^{PLUS!}$ to precisely error map large machine tools. The proven reliability of its gimbal mounted laser head insures superior measurement accuracy in harsh industrial environments.



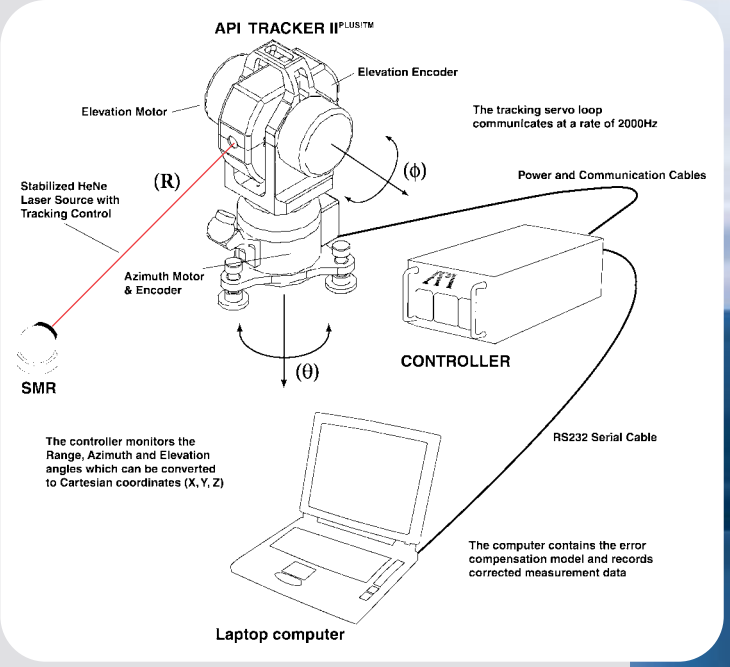
Calibrate Robots

The 6D Laser Tracker II$^{PLUS!}$ with it's large volumetric measurement capacity offers enhanced versatility for robot calibration.



Tracker Fundamentals

Designed for large scale measurement applications requiring high precision and accuracy, the Laser Tracker II$^{PLUS!}$ enables you to make precise measurements. Hold job measurement accuracies to better than 25µm (0.001") over a 10m (32') work envelope.



The Laser Tracker II$^{PLUS!}$ combines the linear distance of the interferometer or ADM with a position angle of the elevation and azimuth axes to derive a target's 3D coordinate position. Measurement data can be displayed in spherical, cylindrical or cartesian coordinates.The operator simply moves the target, a Spherical Mounted Retroreflector (SMR), to the location to be measured.

As the target is moved, the tracker's sensor system measures the target's position 2000 times per second providing feedback to the controller. The controller commands the elevation and azimuth servo-motors to track the target anywhere within the instrument's measurement envelope.

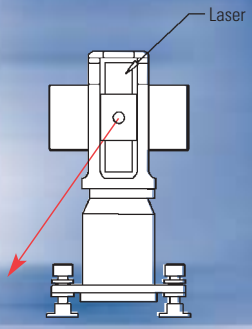
Once the target is at the measurement point, data recording is triggered via wireless remote control, voice recognition or keyboard entry. Measurement data is presented in clear and concise reports or exported to CAD or spreadsheet programs for further data analysis.

Tracker Beam Path

Accuracy of a laser tracker depends upon the stability of the laser beam path. With conventional beam steering systems, a very small change in mirror position is greatly magnified at the point of measurement as instrument error. Change in mirror position can stem from instrument assembly error, structural instability or thermal distortion during use. API's Laser Tracker II$^{PLUS!}$ does not employ beam steering mirrors.

Heat Management

Heat and thermal expansion are major obstacles in precision coordinate measurement. With the Laser Tracker II$^{PLUS!}$ the largest instrument thermal source, servo-electronics, are completely removed from the tracker optical head. Consequently, the optical head is not disturbed by thermal gradients emitted by the instrument. Heat associated with the internal laser source is centered on the optical axis of the laser head, eliminating asymmetrical thermal distortions.



Straight line approach to tracker accuracy

The Laser Tracker II[PLUS!] offers a superior class of performance, portability, instrument ease-of-use, and reliability. Designed with the user in mind, the Laser Tracker II[PLUS!]'s advanced optical design translates to precise accuracy, and measurement reliability.

Advanced Optical Design

API's advanced design adopts an on-the-shaft mounting of the laser head. As a result of this design approach, the laser beam exits the tracker head without going through a single bending mirror.

Superior Accuracy

The heart of this advanced tracker is the unique laser head design. The complete laser interferometer, and the ADM position sensing devices, and optics are housed in one assembly. API's design minimizes thermal induced measurement errors, resulting in superior instrument stability and accuracy.

Large Measurement Volume

No other tracker offers the large measurement volume of the Laser Tracker II[PLUS!] with a vertical range of +80° to –60°; enabling the equipment to handle large jobs such as error mapping machine tools and CMMs.

Absolute Distance Measurement (ADM)

The Absolute Distance Measurement (ADM) option greatly expands the measurement capabilities of the Tracker II[PLUS!]. Use ADM to quickly measure inaccessible targets or automate repetitive measurement tasks. ADM can quickly measure remote points, in seconds, with its rapid target acquisition time. API's ADM technology is based upon new innovative repetitive time-of-flight (RTOF) technique (pat. pend.) offering fast response, superior stability and accuracy, in an industrial environment.

Unmatched Portability

The Laser Tracker II[PLUS!] sets the standard in tracker portability. Weighing only 8.2 kg (18 lbs), measuring 36 cm (14 in) in height, and 19 cm (7.5 in) in width, it is the most portable tracker available.

Enhanced Versatility

The Laser Tracker II[PLUS!] with Smart[TRAK] 6D Sensor (option) performs complex alignments of large parts and assemblies. No longer is it necessary to use three trackers to determine real-time part orientation. Measure position (x, y, z) and rotational orientation (pitch, yaw, roll). The 6D Sensor can be added to the Laser Tracker II[PLUS!] at any time.

Rapid Warm-up

Laser Tracker II[PLUS!]'s sealed optical head insures rapid warm-up in under 30 minutes even in cold environments. Rapid warm-up means more productive measurement time.

3D Metrology Software

MeasurePro

MeasurePro is an intuitive metrology software package from Automated Precision with a user-friendly graphical environment. The package offers a complete set of measurement, dimensioning, tolerance reporting, and reverse engineering tools. No other software offers these advanced features in such an easy-to-use package. MeasurePro offers many advanced features.

Powerful Measurement Tools

MeasurePro offers a complete library of measurement functions to make your inspection or measurement tasks easier. MeasurePro menus and screens are intuitive, reducing start up time and training requirements. The software supports many conventional CAD functions. Users can view measurement results and manipulate data in a graphical environment.

Reverse Engineering

Advanced dimensioning tools enable the operator to quickly dimension parts with ease. Measured parts can be exported in standard CAD file formats, such as IGES and DXF. Users can export MeasurePro data into their preferred CAD software for reverse engineering of parts.

GD&T Tolerance Reporting

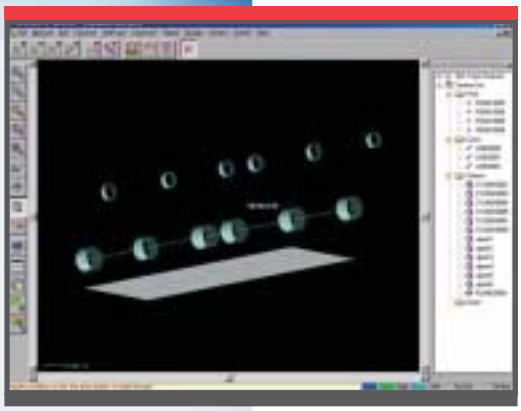
A complete GD&T tolerance reporting capability is supported by MeasurePro. This function displays tolerances, raw data, and deviation data for form tolerances such as straightness, flatness, circularity, and cylindricity. Tolerance results can be displayed and reported graphically, along with detailed deviation data.

Supported Software Platforms

API is pleased to offer several Metrology software packages for its tracker system with full turnkey customer support and product integration with the Laser Tracker II^{PLUS}!.

The Laser Tracker II$^{PLUS!}$ is supported by:

- Spatial Analyzer
- Verisurf
- Metrolog II
- Build!IT



Formfit

Formfit is a powerful best-fit analysis module for MeasurePro that enables the operator to compare measured points to a CAD model. Evaluate errors of parts having complex geometric shapes. This advanced option offers fast 2D and 3D best-fit capabilities to help you accurately align parts and CAD models.

SmartTRAK 6D Sensor™

PAT. PEND.

The SmartTRAK 6D Sensor for the Laser Tracker II PLUS! is a major breakthrough for large scale measurement and alignment applications.

This enabling measurement tool can be used to determine the position (x, y ,z) and rotational orientation (pitch, yaw, roll) with a single tracker.

The SmartTRAK 6D Sensor greatly simplifies instrument and software complexity to perform intricate alignment tasks. No longer is it necessary to use three trackers to determine real-time part orientation.

A motorized receiver within the SmartTRAK 6D Sensor tracks the laser beam providing object pitch and yaw information in real-time. A proprietary roll detection system provides object roll angle.

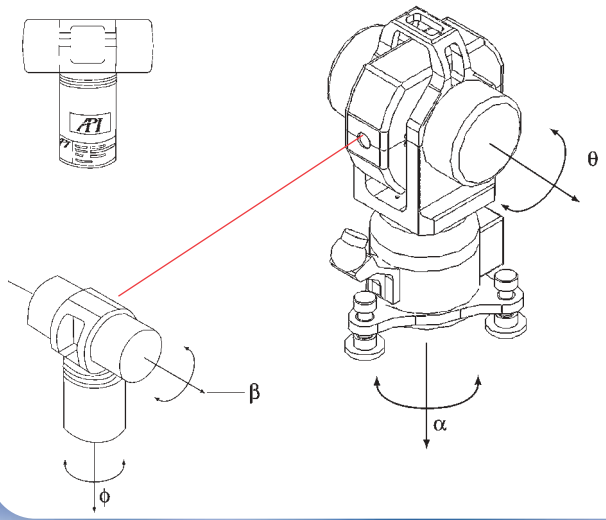
Weighing only 1.4 kg (3.1 lbs), the compact SmartTRAK 6D Sensor makes it ideal for direct mounting on alignment fixtures and end-effectors.

SmartTRAK 6D Sensor

SmartTRAK 6D Sensor Technology / Applications

Measure real-time position
(x, y, z) and rotational orientation
(pitch, yaw, roll)

- Compact unit — ideal for mounting on alignment fixtures and assemblies
- Angular resolution — better than 3 arc-seconds
- Hidden Point Measurement
- Machine Tool Calibration, 5-Axis
- Robotic Calibration and Error Map



Any Laser Tracker II PLUS! can be upgraded to a SmartTRAK 6D Laser Tracker

Accessories

...To Insure Quality

Tripod

Portable and light weight with a variable height 41" to 57"

SMR Rod Holder

Enables precision measurement of critical parts and assemblies when using ½" SMRs.

Calibration Bar

Easy to use tool to verify laser tracker precision

Voice Control

Provides "hands-free" operation of the tracker's measurement functions. The battery operated belt pack module permits remote operation of the tracker software functions.

Advanced Tool Kit

Kit Contains:

- *Drift Nest (6)*
- *Pin Nest (4)*
- *Edge Tool (2)*
- *Construction Ball*
- *Hidden Point Bar 10"*
- *Hidden Point Bar 5"*
- *Hard Point*
- *Carrying Case*
- *Internal / External Circle Tools*

Hidden Point Bar

The hidden point bar is a precision tool to measure points not in direct line of sight with the tracker. The bar has a reach length of 15.5". Supplied with hard point and 0.25" spherical tips.

- *Extension lengths of 5", 10" and 20"*

LaserRAIL

The portable Laser$^{RAIL™}$ is a precision certification tool which can be used on the shop floor to certify your laser tracker's accuracy. A laser interferometer internal to the rail permits quick accuracy checks of the tracker in horizontal, vertical, inclined attitudes.

Automated Precision, Inc.

Visit our website @ www.apisensor.com

...And Improve Measurement Accuracy

Edge Tool

Measure outer edges with precision. Available in standard and large formats.

- *¼" Offset*

SMR Adapter ½" to 1 ½"

Enables the operator to locate a ½" SMR in the birdbath or remote home nest.

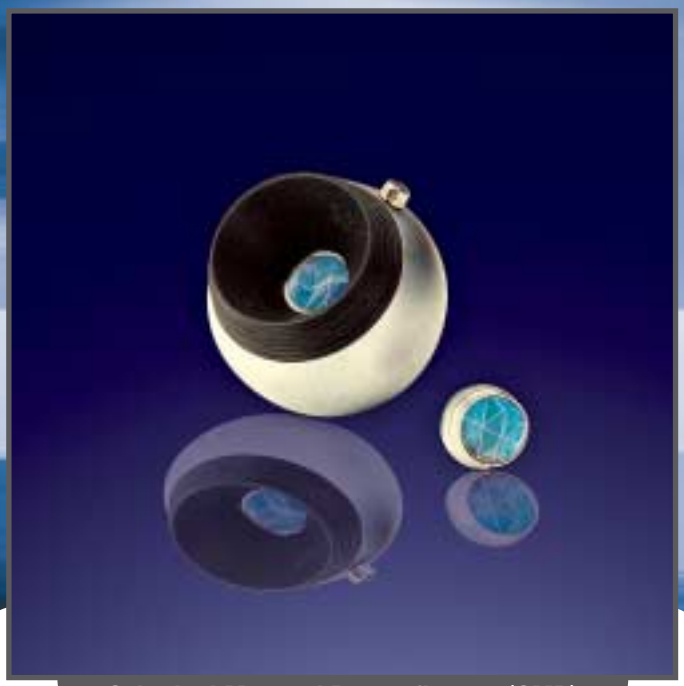
Construction Tooling Ball

Locate tooling control points quickly and accurately.

Wireless Remote Control

Control measurement data capture

- *One person operation*
- *RF communication link*



Spherical Mounted Retroreflectors (SMR)

Available in multiple sizes to measure different dimensional features.

Hollow Corner Cube

Available in 1 ½" and ½"

- *High Precision*

Accuracy better than 0.0005"

Solid Corner Cube

Available in 1 ½" and ½"

- *Accuracy better than 0.001"*
- *Rugged Construction*

Drift Nest

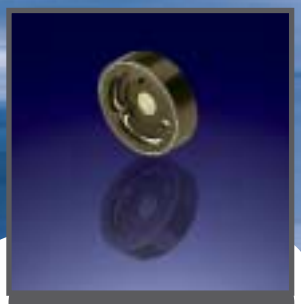
Establish temporary control points or remote home points. Utilize a constellation of drift nests to monitor instrument or part movement during measurements.

Pin Nest

Measure the location of control point or hole.

Pin Sizes: (Diameter)

- *¼", ⅜", ½"*
- *¼" Offset*



Surface Tool

Measure surfaces with greater precision.

- *¼" Offset*