The Complete Guide to 3D Measurement for Machining

Capture the data you need without leaving the shop floor

www.faro.com

FARO®

Table of Contents

There's No Faster Way to Lose Business than by Machining Too Many Parts That Don't Meet Specifications.

You need accurate tools that allow your team to deliver high-quality parts without slowing down production. With 3D measurement technology, you can minimize escaped defects and tedious rework while increasing throughput.

This guide contains everything you need to know about 3D measurement for machining applications, including...

- How 3D measurement solutions can make your job easier – plus interviews with professionals who have implemented them
- A step-by-step breakdown of how 3D measurement solutions and software improve efficiency
- A detailed look at the type of hardware and software best suited for machining applications

How Can 3D Measurement Solutions Make Your Job Easier?

Capture Complex Parts Faster

Capture measurement detail on complicated parts and objects for complete quality assurance in less time.

Ensure Consistency and Repeatability

With more accurate data at your team's fingertips, you can make more informed decisions and stay ahead of any problems.

Increase Throughput and Revenue

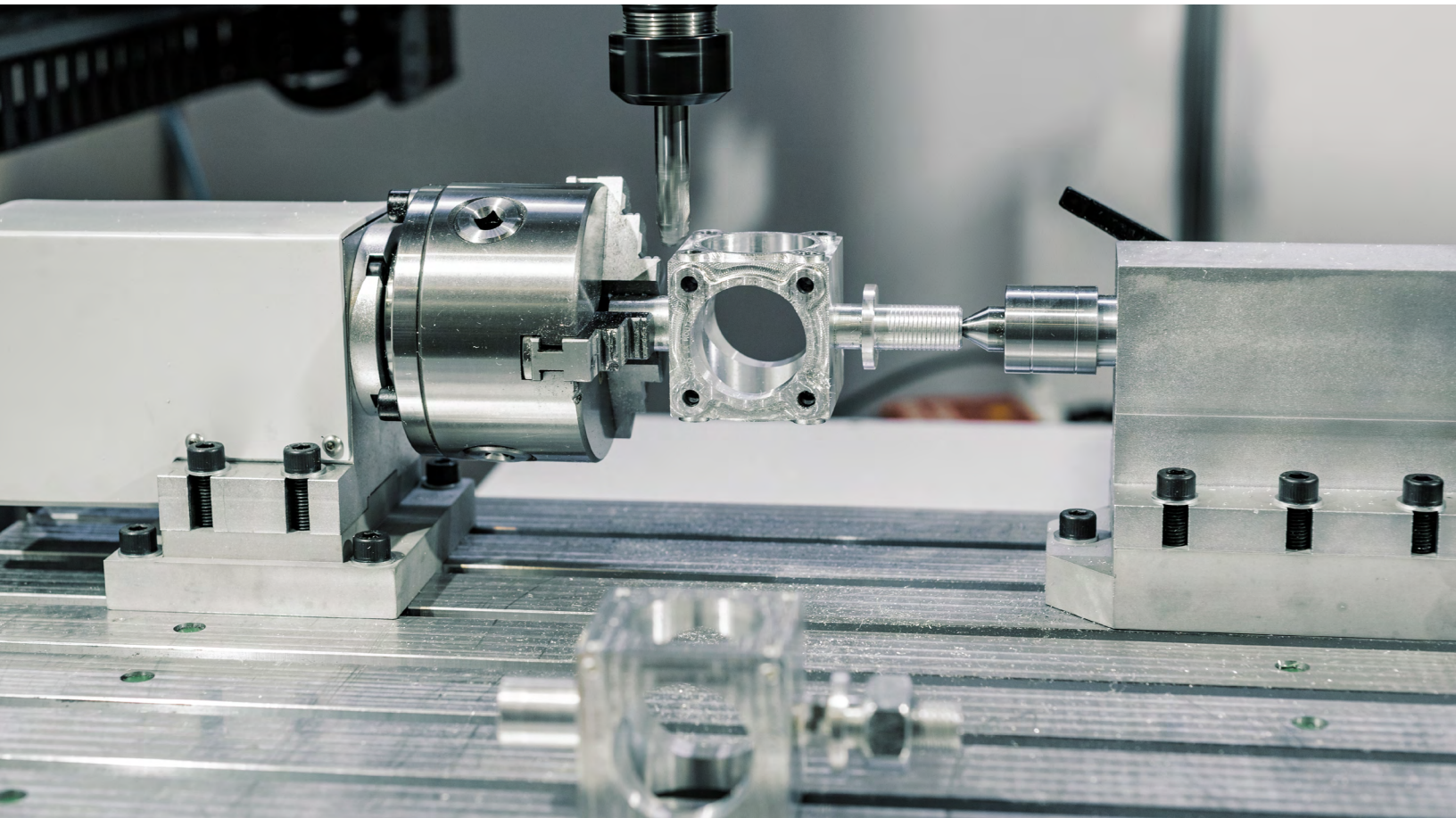
Reduce verification time, rework and inspection bottlenecks allow you to achieve greater throughput and bring more products to the market faster.

Keep Customers and End-Users Happy

Take advantage of 3D inspection and report capabilities to improve quality across the board, building loyalty and trust with customers and end-users.

> "We can now reduce first-off inspection time from up to 8 hours to less than 10 minutes, allowing machining time for an additional 26 cases per annum, per final operation machine."
>
> – Diesel Engine Manufacturer

> "Some of the products we manufacture are fairly large and expensive. When mistakes cannot afford to be made, we have used FARO, specifically the Laser Tracker, to ensure machine tool and part alignment prior to machining critical features."
>
> – Dan Hall, Quality Control Manager, Brilex.



Increase Throughput without Sacrificing Speed or Accuracy:

How 3D measurement solutions improve machining processes

Accelerate and Improve Alignment

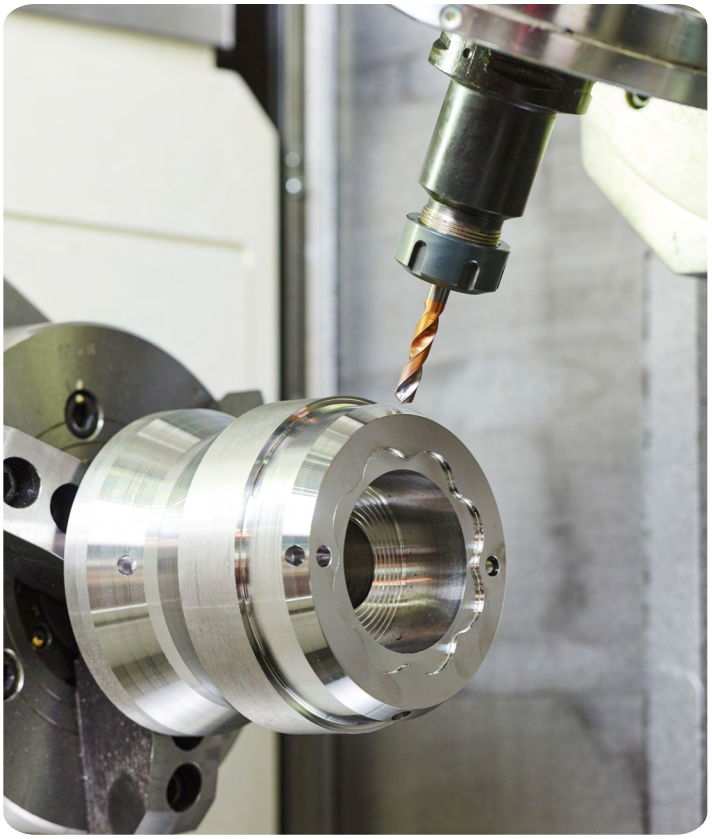
When you rely on manual measurement methods, it's often cumbersome and challenging to align the part to the machine axis.

In contrast, Laser Trackers speed up the alignment process and make it much easier. You can measure the coordinate system of the machine and align the part to the machine axis, which also improves the precision of the alignment and quality of machine operations.

Minimize Rework and Scrap

Machine processes can be long. If you aren't able to inspect the part while it's on the machine, you can't identify any errors until the entire process is complete. Especially for more complex parts, that can add up to hours of wasted work. You have to perform extensive, time-consuming rework or even scrap the part completely, which puts the entire operation behind.

3D measurement tools allow you to spot those errors much sooner in the process. Simply pause and measure the part to determine if it needs to be adjusted, so you aren't wasting hours of critical machine time on a part that will have to be reworked or scrapped.



Inspect Parts without Leaving the Shop Floor

It's not a simple task to move a large part to the CMM lab, and it usually involves several team members. Then, if there are any errors or issues, you have to remove the part from the CMM and transport it back to the production floor to perform the necessary rework.

With portable 3D measurement technology, you can inspect the part right there on the production floor and complete the rework immediately, without team members having to go back and forth.

Improve Accuracy for Future Projects

With 3D measurement tools, you can drastically improve the quality of the machine alignment. Machines often experience changes in their axis over time, which results in parts that are not within tolerance. A traditional CMM isn't able to measure those changes, so you would have to rely on outside resources to come in and measure and adjust the machine, adding extra time and expenses.

With laser trackers and measurement arm technology, you can measure the actual machine position versus the intended position, so you can recalibrate it and achieve better accuracy for future projects.

FARO Vantage
Laser Trackers

Portable FARO Vantage Laser Trackers perform fast, accurate measurements for large-scale applications, reducing inspection cycle times by up to 75%. Laser trackers measure 3D coordinates by tracking a target that the user moves from one point to another on the object being measured, which can then be compared against nominal CAD data for complete quality assurance.

- Achieve higher production rates and reduced verification downtime, and by extension, increased throughput
- Bring products to market faster and increase revenue generation
- Sturdy design that can withstand shock, vibration, temperature cycle and humidity
- Use RemoteControls™ to control the laser tracker from any mobile device
- Use the handheld 6Probe with interchangeable styli for 6DoF measurement to measure hidden areas that are not in the direct line of sight
- Keep customers happy with higher quality products – catch defects sooner and ensure high accuracy machinery alignment
- Versatile mounting and a flexible design that is easy to set up anywhere

FARO Quantum Max:
The Next Generation ScanArm

FARO Quantum Max ScanArms combine the measurement capabilities of a Quantum Max FaroArm® portable CMM with the non-contact functionality of a laser line probe.

- Select from three different LLPs to achieve the results you need for specific projects
- Bring the ScanArm to the part and set it up anywhere with the Universal Quick Mount
- Easily adjust and change probes without recalibrating
- Designed to ensure maximum performance in all kinds of temperatures and environments
- Use working volumes of 2.0m, 2.5m, 3m, 3.5m and 4m for any application
- The 8-Axis integration allows you to measure all sides of a part without repositioning it
- Effectively scan dark, reflective and translucent surfaces with Continuous Light Rectification (CLR) technology
- Meets ISO 10360-12 performance standards

FARO 8-Axis Max

The 8-Axis Max is a rotary worktable that seamlessly integrates with the ScanArm, eliminating the need to relocate or reposition the device so inspections can be completed in a fraction of the time. Parts can be rotated in real-time relative to the Arm — meaning no reaching around the object and no need to move the Arm to different locations during the measurement process.

This results in improved measuring speed, reach and user-friendliness, offering an easy-to use solution that allows users to focus on the actual measurement and not on the measurement processes.

FAROBlu Laser Line Probe Family

Flexibility is key for achieving the level of precision and resolution your applications require. The Quantum Max comes with three purpose-built LLPs you can switch out depending on the task at hand. All three LLPs use the exclusive FARO Continuous Light Rectification (CLR) scanning technology to capture even the most challenging surfaces, like dark, translucent or reflective parts.

FAROBlu xR: Maximum Resolution and Accuracy

The FAROBlu xR is best suited for high-precision tasks. It's designed to scan small intricate parts and fine details with up to 30% better accuracy and resolution than the xP.

FAROBlu xP: Maximum Productivity

The FAROBlu xP offers a balance of xR accuracy/ resolution and xS speed to improve efficiency and throughput.

FAROBlu xS: Maximum Speed

FAROBlu xS is ideal for scanning large parts or expansive surface areas when data collection speed is top priority. The extra-wide laser stripe can cover twice as much in a single pass, collecting data over 65% faster than the xP.

FARO CAM2 Software

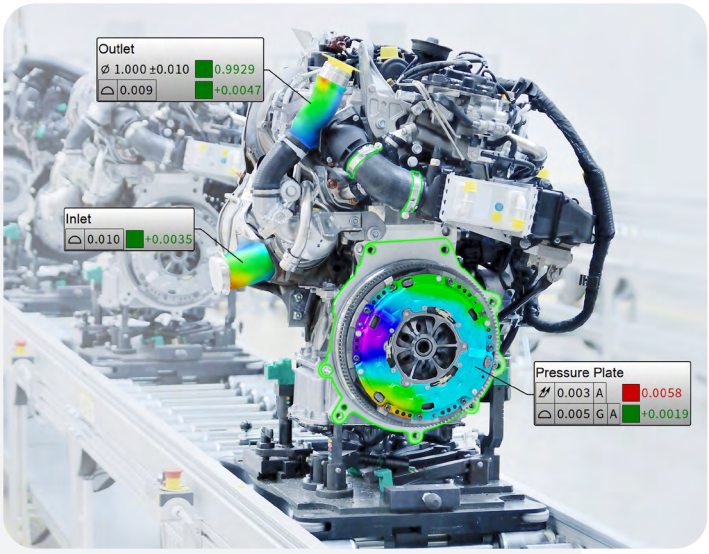
CAM2 Software is designed for use with any FARO portable CMM, enabling operators to capture accurate measurements. CAM2 is a powerful, intuitive and application-focused 3D measurement platform that allows you to achieve greater accuracy and speed.

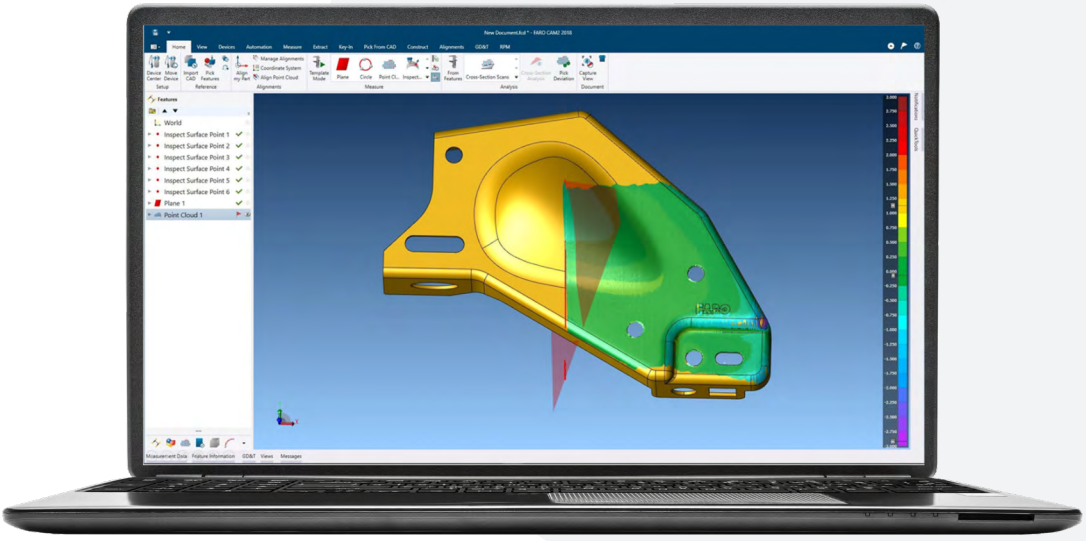
- Ensure consistency and simplify inline inspections with Repeat Part Management (RPM)
- Measure large components faster by using multiple measurement devices together simultaneously
- Utilize the built-in Universal CAD import and Align-My-Part Wizard
- Monitor actionable insights and trend analysis based on real-time information for SPC using the RPM Control Center
- Create metrology-grade STL files
- Easily display part inspection results with Geometric Dimensioning and Tolerancing (GD&T)
- Deviations are highlighted in color during scanning, making it easy to check part quality in real-time

FARO BuildIT Metrology Software

BuildIT software is the industry's leading 3D metrology software program designed to simplify alignment, build and inspection processes.

- Use it with industry-standard CAD formats and assembly-level data, including Product Manufacturing Information (PMI)
- Enhance accuracy with flexible real-time deviation read-outs for alignment and positioning details
- Create or import, modify, define and evaluate GD&T information
- Generate repeatable, guided, automated workflows and communicate with external applications





FARO 3D Measurement Technology in Action

AM Hydraulics Achieved Greater Efficiency with FARO Quantum ScanArm

AM Hydraulics specializes in the Turning, Milling, Horizontal Boring and Cylindrical Grinding of small to large and heavy components. They needed a scanner that would be able to work with their large workpieces, so they decided to implement the FARO Quantum ScanArm with 2.5m capacity.

“As it is easily transportable and quick and simple to set-up, it helps that our operators can carry the Quantum ScanArm to all of our production areas and quickly put it to work carrying out detailed inspection work using its touch probe or its non-contact laser probe,” said Stuart Hill of AM Hydraulics.

“Although our staff are experienced in using precision equipment, given the nature of the production areas it is used in, it helps that the Quantum ScanArm is so tough.”

Janicki Industries Reduced Machining by 35%

Janicki Industries is a full-service engineering and manufacturing company specializing in the manufacturing of parts, prototypes and tools made of advanced composites and metals.

“Today’s tooling market is very competitive. Our suppliers are constantly asking for reduced pricing while still maintaining the same quality they’ve come to expect,” said James Diedesch, Senior Manufacturing Engineer.

One of the primary ways they can reduce costs is by limiting the amount of nonvalue-added cutting moves during the rough machining stages, which are more common when dealing with large metal tools, and can add up to hours of wasted time.

“We set up a reference system on the tool using SMRs—a target used with laser trackers—and value those targets using the FARO Vantage Laser Tracker. Once that is established we can tie into the tracker’s reference system through specialized metrology software’s device localization feature,” said Diedesch.

“So now, instead of locking into tooling points, you connect the FaroArm (which, for the TrackArm solution, has SMRs attached directly to the FaroArm) to the laser tracker and take a couple of thousand points to localize the arm to the tracker. Once that is established, you start scanning the tool with the integrated laser scanner on the FaroArm.”

Depending on the size of the tool, he estimates that the company saves up to 20 hours per tool. “The result of this solution is roughly a 35-percent reduction in machining,” said Diedesch.

How can 3D measurement tools transform your machining processes?

Talk to our experts to learn how to increase efficiency and production while reducing scrap and rework at your shop.

Consult With Our Experts

Local offices in over 25 countries around the world. Go to **www.faro.com** to learn more.

FARO Global Headquarters
250 Technology Park, Lake Mary, FL 32746, USA
US: 800 736 0234 MX: +52 81 4170 3542
BR: 11 3500 4600 / 0800 892 1192

FARO Europe Regional Headquarters
Lingwiesenstr. 11/2
70825 Korntal-Münchingen, Germany
00 800 3276 7253

FARO Asia Regional Headquarters
No. 3 Changi South Street 2, #01-01 Xilin Districentre Building B Singapore, 486548
+65 65111350

Revised: 19/01/2022