

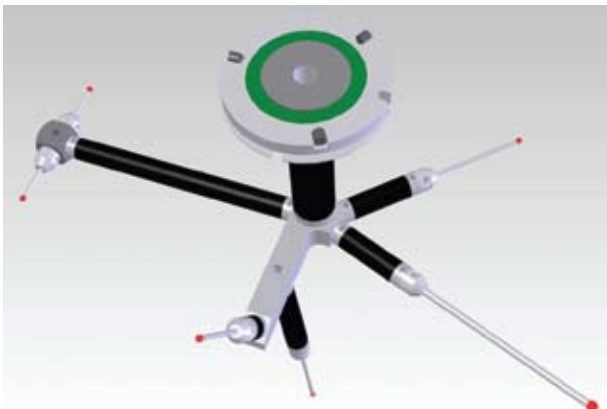
How to Develop High Efficiency CMM Probe Tooling

**By: Ken Bergler, President –
Advanced Consulting & Engineering, Inc.**

Non-articulating CMM heads and probe tooling are a common technology in today's high accuracy measurement systems. This type of equipment typically affords greater accuracy and repeatability in touch-trigger and scanning applications. Static tooling systems also allow greater flexibility in the type of products that can be measured due to their allowance of using longer and heavier probe configurations. These configurations are typically built-up using many standard components, which are screwed together to achieve the alignments needed to measure necessary features. There are, however, several tradeoffs to this off-the-shelf approach.

- Higher Cost – More styli and components are generally needed.
- Longer Cycle Time – Multiple probe changes are often needed.
- Difficult Assembly – aligning styli to proper angles, especially for compound angle holes, can be a time consuming and difficult challenge.
- Tough Maintainability – Components may rotate or loosen over time or after accidental collisions.

Custom designed and fabricated probe tooling is a simple solution that reduces or eliminates all of these



Advanced Consulting and Engineering designs static tooling systems to reduce costs and to improve cycle time and maintainability.



Laser welded intersections prevent movement and provide maximum rigidity.

drawbacks. Custom probe tooling consists of a rigid assembly, fabricated at the proper lengths and angles to measure all the needed features properly. These assemblies are constructed using high quality, temperature stable materials. Properly executed, this approach will provide:

- Lower Cost – One customized holder can cost less than purchasing multiple standard parts. Custom tooling usually consolidates multiple probe systems to reduce the total number of assemblies needed. This eliminates the need for additional head adapter plates, probe pockets, and the associated table space.
- Shorter Cycle Time – Fewer probe systems require fewer probe changes; shaving valuable time off of longer runs.
- Easy assembly and maintainability – Just screw the styli in, no squaring or aligning is needed. Broken or worn out styli are simply replaced.

My company, Advanced Consulting and Engineering, Inc. (ACE), Rochester Hills, Michigan, develops and supports turn-key probing systems for a wide spectrum of part types. Our contract services group (formally known as QualityTech, Inc.) offers a full range of 17025 accredited inspection services. Both of these groups use static probe tooling on a daily basis. As a result, we needed to develop an affordable, high-quality and robust solution

to meet our own, and our client's measurement requirements.

There are three vital pieces to the puzzle of creating this dedicated probe tooling: Design, materials and fabrication.

DESIGN:

By designing (or modeling existing) part holding fixtures and custom probe tooling in virtual 3D space, one can readily test the design for functionality and possible interferences. Proper CAD can prove that all the angles, lengths, and styli are correct for the given application; thus eliminating the need for expensive reworking of the custom manufactured parts.

MATERIALS:

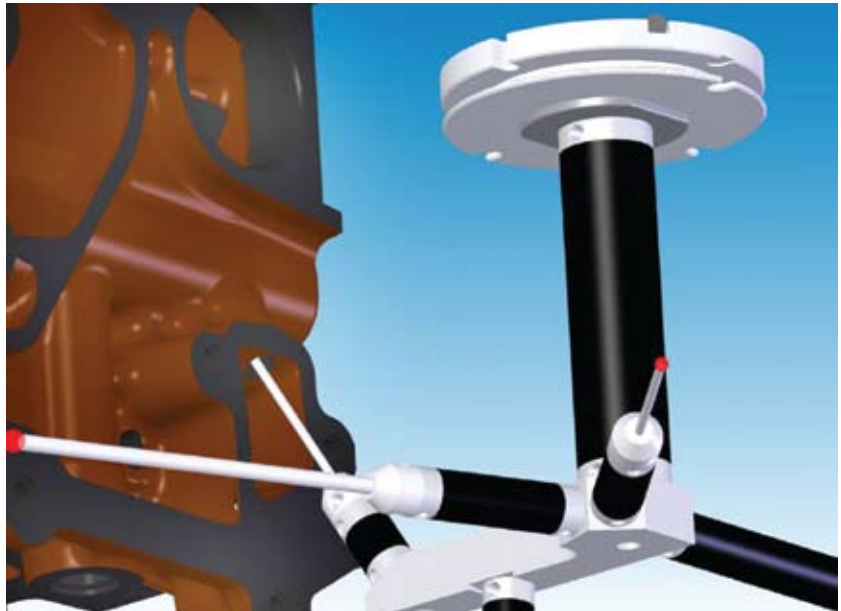
In most measurement environments, temperature is the largest source of measurement variation, making the use of temperature stable materials critical. Titanium is the material of choice for customized probe holders because of its low weight and thermal properties. ACE exclusively uses itpstyli's Temp-Comp™ thermally stable extensions, due to their high quality and exceptionally low cost. The unique double-wound carbon fiber and titanium construction provide a near-zero coefficient of expansion along with exceptional torsional rigidity that is not possible in typical carbon fiber.

MACHINING & FABRICATION

There is only so much room for variation from spec before a customized holder becomes unusable. Minor angular errors of a probe can cause probe shanking, leading to invalid measurements. ACE relies on itpstyli, LLC to provide the machined titanium holders because of their consistency in meeting tight tolerances and their accurately cut compound angles.

During fabrication, all assembled components, other than styli, are permanently affixed using epoxy or a laser weld to ensure the assembly always maintains its desired orientations.

Look over your current and future projects to see if using more efficient custom probe tooling is the right fit for you. Visit www.itpstyli.com or www.ace-cmm.com to learn more about High Efficiency CMM Probe Tooling.



ACE designs static tooling systems in 3D space to test the assemblies for functionality and possible interference.



itpstyli's titanium and Temp-Comp thermal-stable carbon fiber are ideal materials because of their low weights and thermal properties.