CALYPSO Tip: Stylus Qualification Methods

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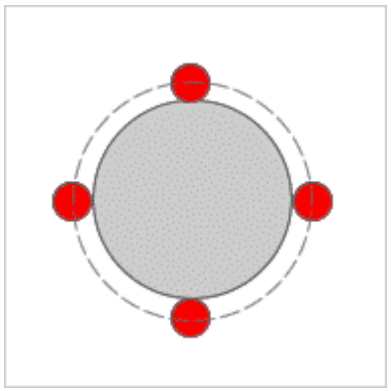
What is qualification?

Qualification, at the very least involves two basic concepts. It defines the location of the stylus relative to a common source—the position of the qualification sphere, It also defines the stylus size— relative to the known diameter of the qualification sphere.

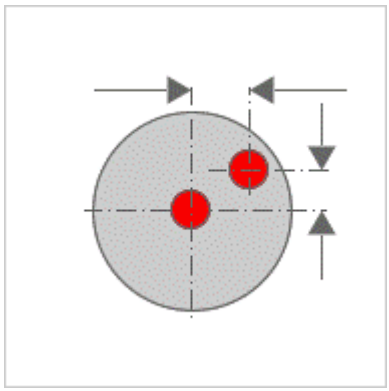
Why is it necessary? After the early years, measuring machines became more than simple readout driven devices. Users needed to be able to change the orientation of their stylus to access features. Qualification was initially introduced as a method of tying the relative positions of the styli to a common source, the Qualification Sphere. The Qualification Sphere, has a known physical size and a fixed location in the CMM envelope. The process of qualification relates the size and location of a stylus to the Qualification Sphere.

How does it work?

The first part in a qualification is to calculate the actual diameter of the stylus. The measurement of the sphere is with ball center data. The “Effective” diameter of the stylus is: (ball center data) – (the known reference sphere diameter) The second part of the qualification is to calculate the offset of the center of this measured sphere relative to the one measured with the Master probe. This “offset” is automatically added to any data taken with this stylus.



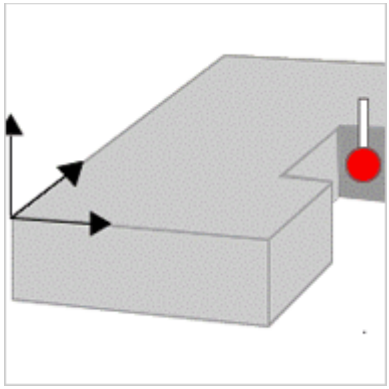
Effective Diameter



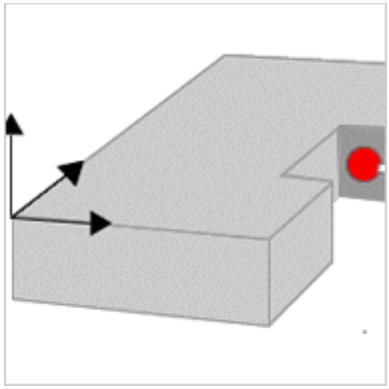
Calculating the Offset

What happens next?

Once the qualification has been done, subsequent points, taken with qualified styli will return accurate results. Any stylus that has been properly qualified will return accurate results, regardless of its orientation.



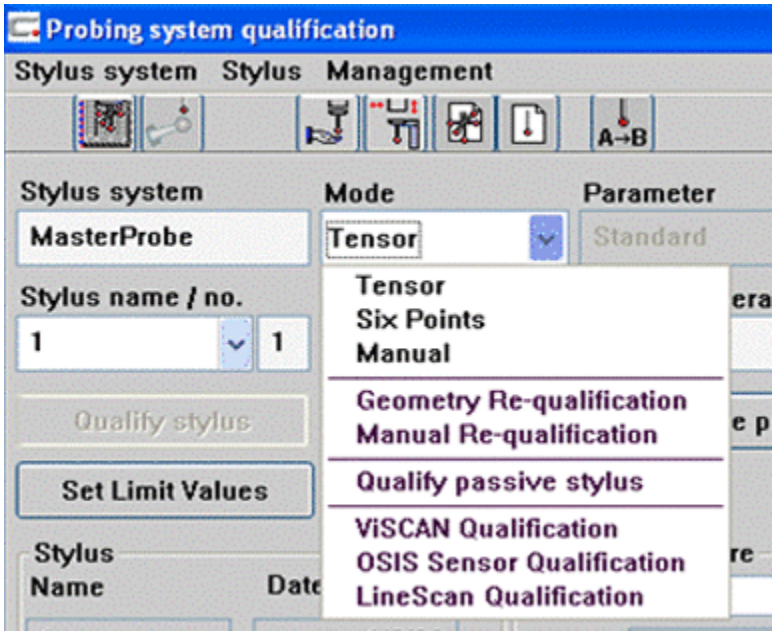
Stylus Orientation 1



Stylus Orientation 2

Overview

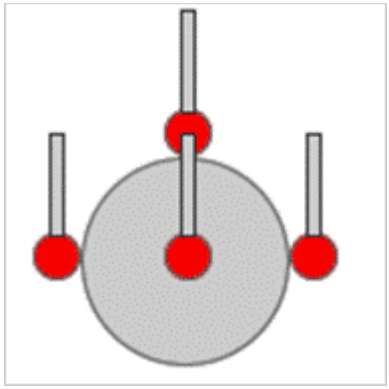
As CMMs have developed, available probing technologies have changed as well. CMMs have modified their structures to enhance their accuracy, but probing has also been improved to offer more accuracy and repeatability. Today, various compensations have been created which improve the accuracy of the stylus system. In CALYPSO, these methods are found in the “Mode” section of the “Stylus System” dialog box. Let's look at the contact methods where the stylus physically touches the part.



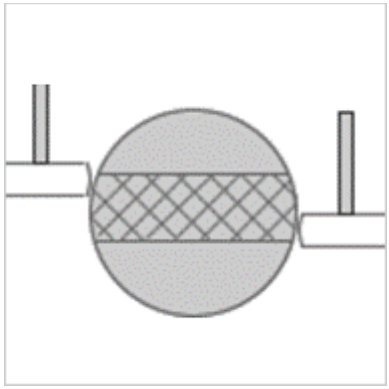
CALYPSO Stylus System Dialog Box

Six Point Mode

Six point mode mode is the traditional qualification mode standard mode. After the first point is taken to define the approach direction, the remaining points are taken around the periphery of the sphere.



Six Points



Manual Mode with Disc Styli

Tensor Mode

Tensor mode applies to scanning probe heads such as the VAST series and the High Speed Scanning heads. To increase the measuring accuracy, the measured data is modified to compensate for the bending parameter of the shaft. Thirty discrete measurements are taken around the sphere at different orientations and at different pressures, from this data a corrective table is defined which compensates for any inaccuracy.

Manual Mode

Manual mode is where the operator manually takes the points using the joystick. This method is recommended for styli such as discs or cylinders.