Finding the Center of Rotation on a 4-Axis Head-Based Milling Machine

www.bobcad.com
877.262.2231 | 727.442.3554

In the BobCAD-CAM system when using the multi-axis features your machine must be properly defined. The calculations that must be performed for proper G-Code creation depends on an accurate definition of your machine's kinematics. This document covers how to find the center of rotation for a Head-Based 4-axis machine so the BobCAD machine parameters can be correctly defined.

There is a simple test you can use to find the necessary values and we will walk you through this process here in this document.

Step 1 – Locate the Z axis position with the spindle vertical

As shown in the following image. Setup an indicator on your machine's table. Touch the end of the indicator with the face of the spindle, and then Zero the reading on the indicator.
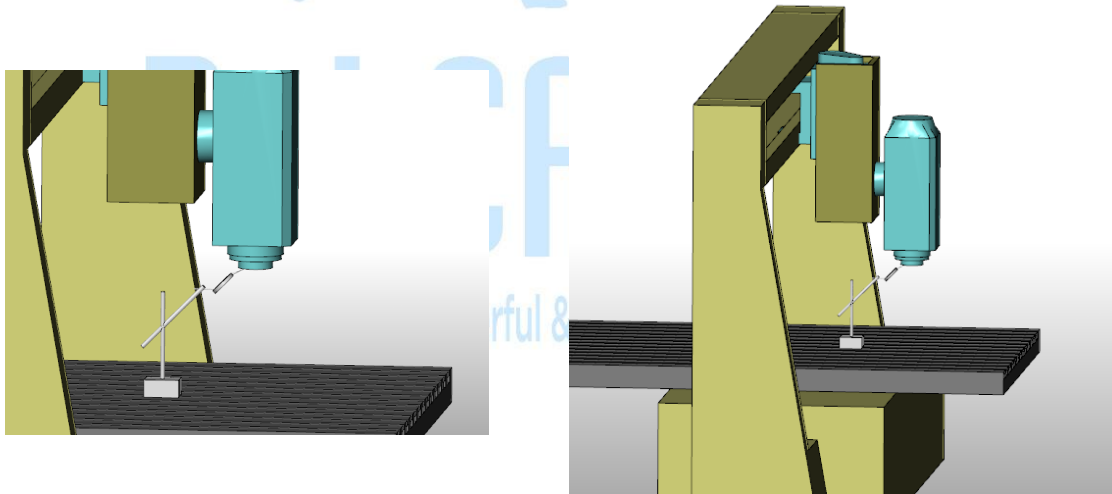

Note the Z axis position read on the machine controller for this location.

Z_1 = _____

Important Note: Do not move the indicator setup as we need this exact position for later measurements.

Step 2 – Measure the Diameter of the Spindle Ring

The spindle ring is the ground outer portion of the spindle that protrudes out of the spindle assembly. We need to know the accurate diameter of this as this value is used in the next step. The following image shows the spindle ring for this example machine.
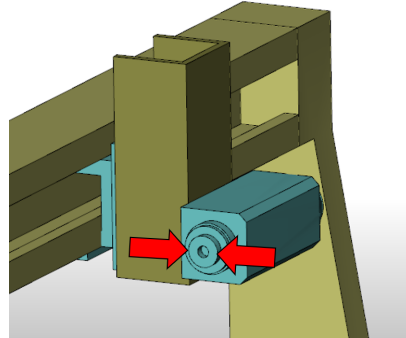

Spindle Diameter Measurement (SDM) = _____

Note: We will be using the Radius of the spindle in the next step

Step 3 – Read the Z axis position with spindle rotated Up 90 Degrees

For the next reading you need to rotate the spindle axis 90 degrees so that it is facing horizontal. Take a reading from the lowest portion of the outside diameter of the ground spindle ring.   Once you have this value add the Radius of the spindle to get the final Z axis reading.
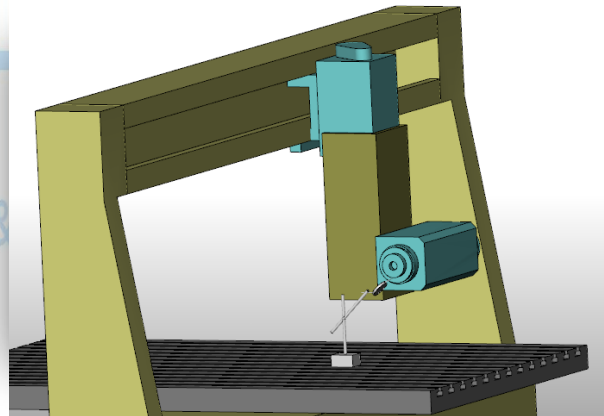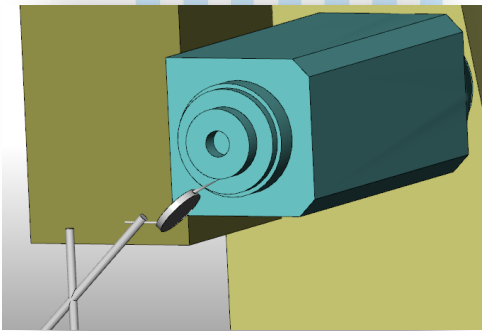
The Z_2 value is the reading from the machine's control to the location shown and takes your indicator back to zero.   The Z_3 value is the adjusted Z value to let us know where the center of the spindle axis is in this position. To get the Z_3 value just subtract the Spindle Radius from the Z_2 value.

Z_2 = _____

$Z_3 = Z_2 - (SDM/2)$ = _____

Step 4 – the Z-Component of the Center of Rotation (Z_P)

 To calculate Z_P, you simply subtract Z_3 from Z_1. This tells us the difference in Z for the two points. Z_P value will be used in your machine setup to determine the center of rotation for your spindle axis.

$Z_P = Z_1 - Z_3 =$ _____