

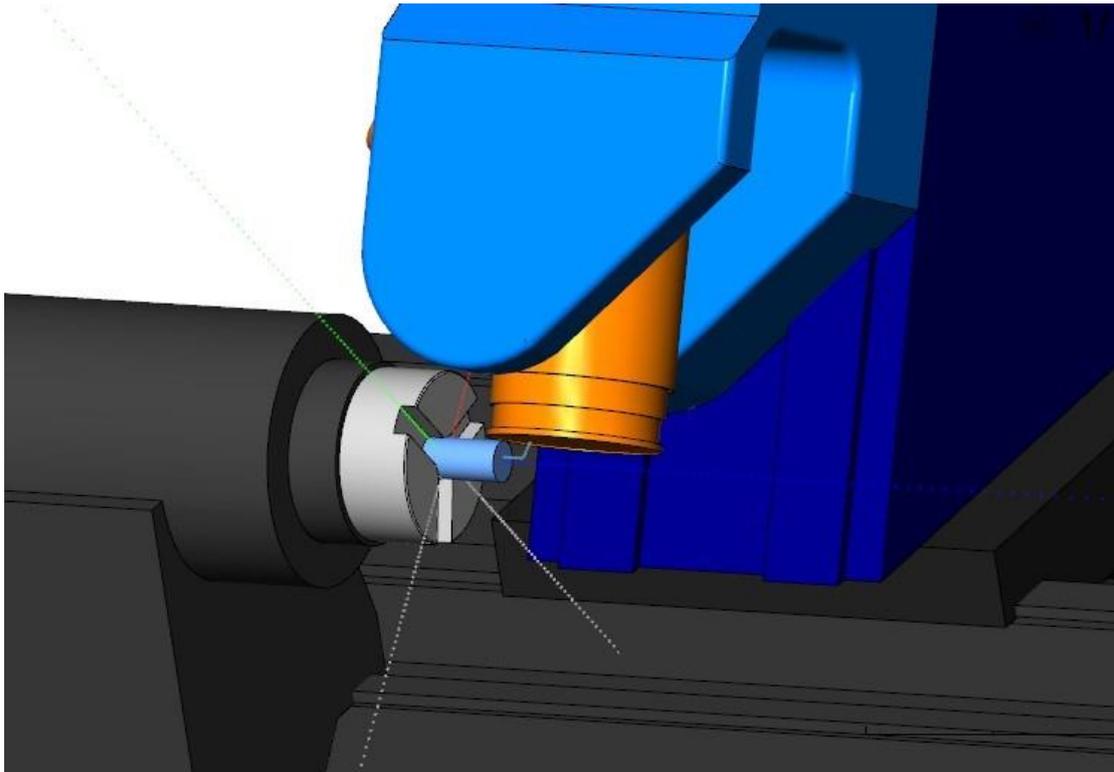
# Finding the Center of Rotation on a Mill-Turn Machine with an X-Axis Oriented Milling Head

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 mill-turn machine with a X-axis-oriented milling (spindle) head so the 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. Please make sure to keep the sign of the reading at each step and carry those signs to next steps.

## Step 1 - Locate the X-Axis Position with the Spindle at Zero Degrees ( $X_1$ )

Setup an indicator on the main spindle's chuck while the milling (spindle) head is at 0-degree orientation (it is oriented vertically). Touch the end of the indicator with the end face of the spindle, and zero the reading on the indicator.



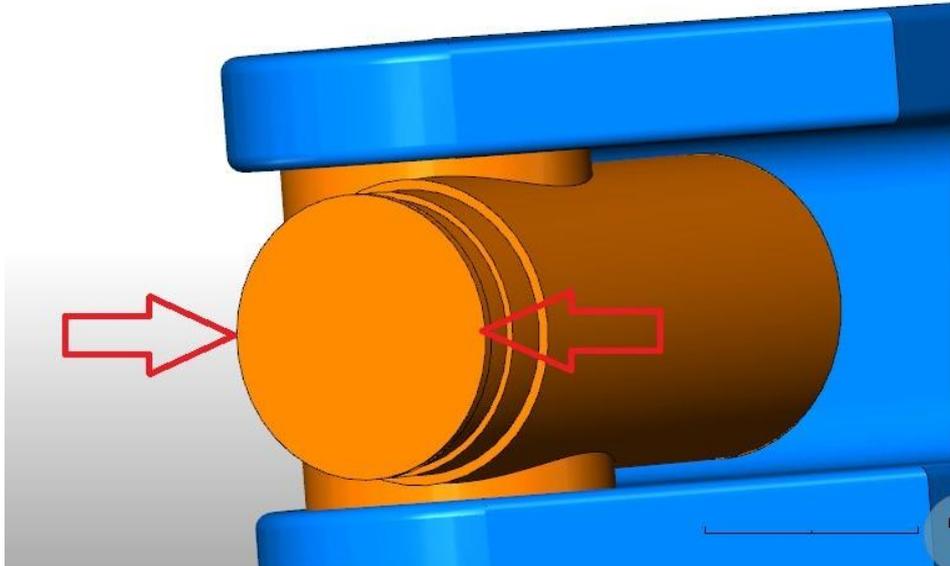
Note the X-axis position for this location.

$X_1 =$  \_\_\_\_\_

**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 (SDM)

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.

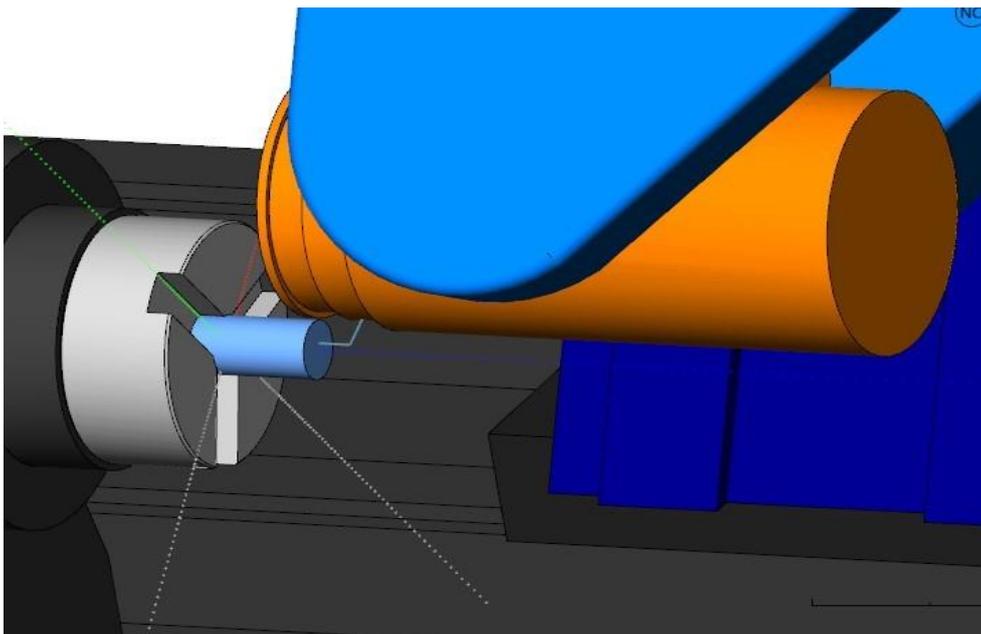


SDM = \_\_\_\_\_

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

## Step 3 - Read the X-Axis Position with Spindle Rotated Down 90 Degrees ( $X_2$ )

For the next reading you need to rotate the spindle axis 90 degrees so that it is oriented horizontally as shown in the image below. Touch the OD of the spindle ring with the end of indicator and take the reading while the indicator is taken back to zero.



Note the X-axis position for this location.

$X_2$  = \_\_\_\_\_

#### Step 4 – Calculate the Adjusted X-Axis Position ( $X_3$ )

The  $X_3$  value is the adjusted X value to let us know where the center of the spindle axis is in this position. To get the  $X_3$  value, simply subtract the spindle radius found in the step 2 from the  $X_2$  value found in the step 3.

$$X_3 = X_2 - (\text{SDM} / 2) = \underline{\hspace{2cm}}$$

#### Step 5 - Find the X-Axis Position of the Center of Rotation ( $X_P$ )

To calculate  $X_P$ , you simply subtract  $X_3$  from the  $X_1$ . This tells us the difference in X for the two points. This measurement will be used in your machine setup to determine the center of rotation for your spindle axis.

$$X_P = X_1 - X_3 = \underline{\hspace{2cm}}$$