CAD Training Part 1 C

This training will focus on making a simple assembly. This will be an accelerated version of the Lake Effect CAD Training. That document should also be read as it includes more practice including revolves.

This lesson will work on CADing the gearboxes we use on robots.

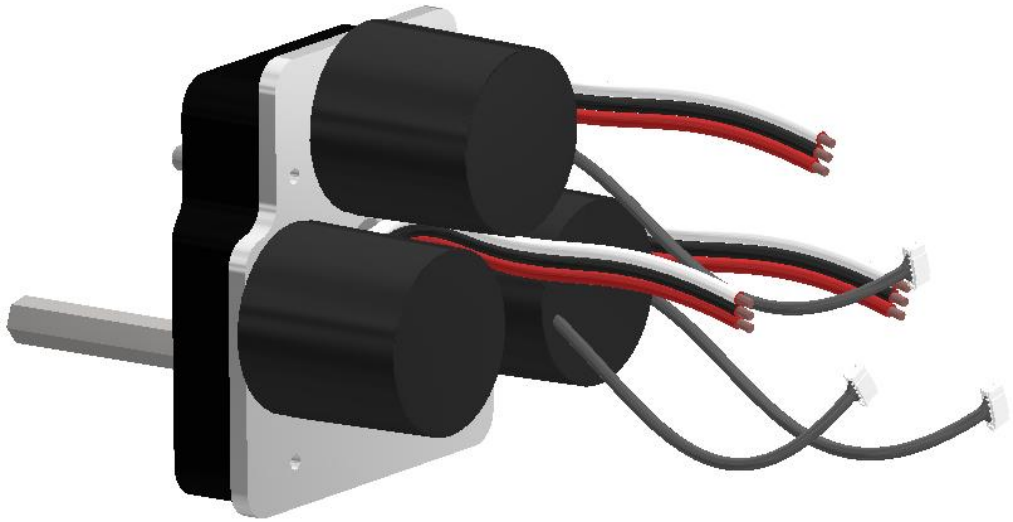

Figure 1: Gearbox assembly from turret bot CAD

C. Neo Motor

With the faceplate and cover done, the next part we need is the motor itself. Normally models for Commercial Off-The-Shelf (COTS) parts are taken from suppliers, but for the purpose of this practice we will be CADing the motors ourselves as they use features we have not seen yet. The NEO Cad can be downloaded from REV's website if you are interested. The dimensions used are also take from the drawings there.

Figure 2

1. Main Cylinder

While a cylinder can be made by extruding a circle, it can also be made by revolving a profile. We will use the latter as it is better for shapes with multiple radii. The profile is shown below. Do not use the rectangle tool for the largest section as there is a slight angle

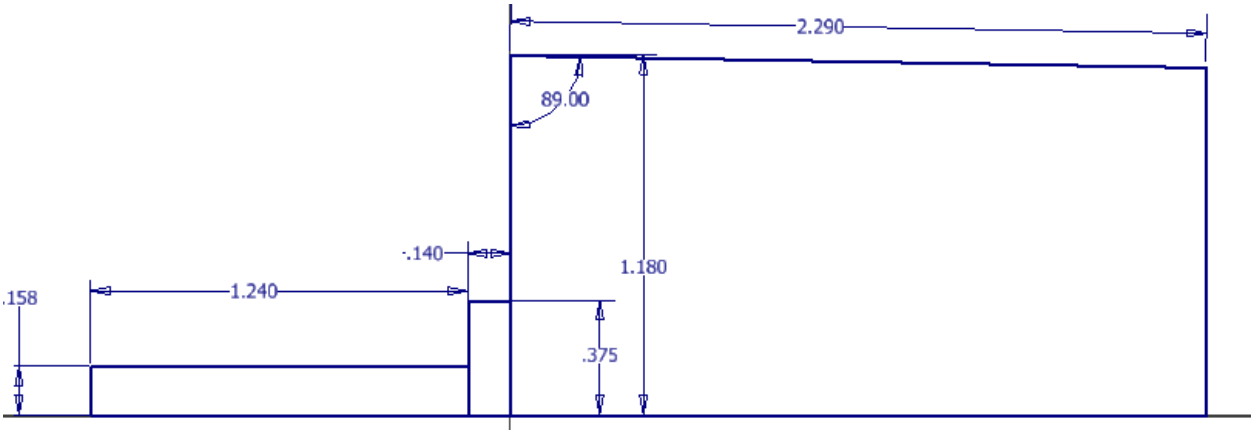

Figure 3

Revolve the profile around the centre axis and add a fillet of 0.02” to the outside edges.

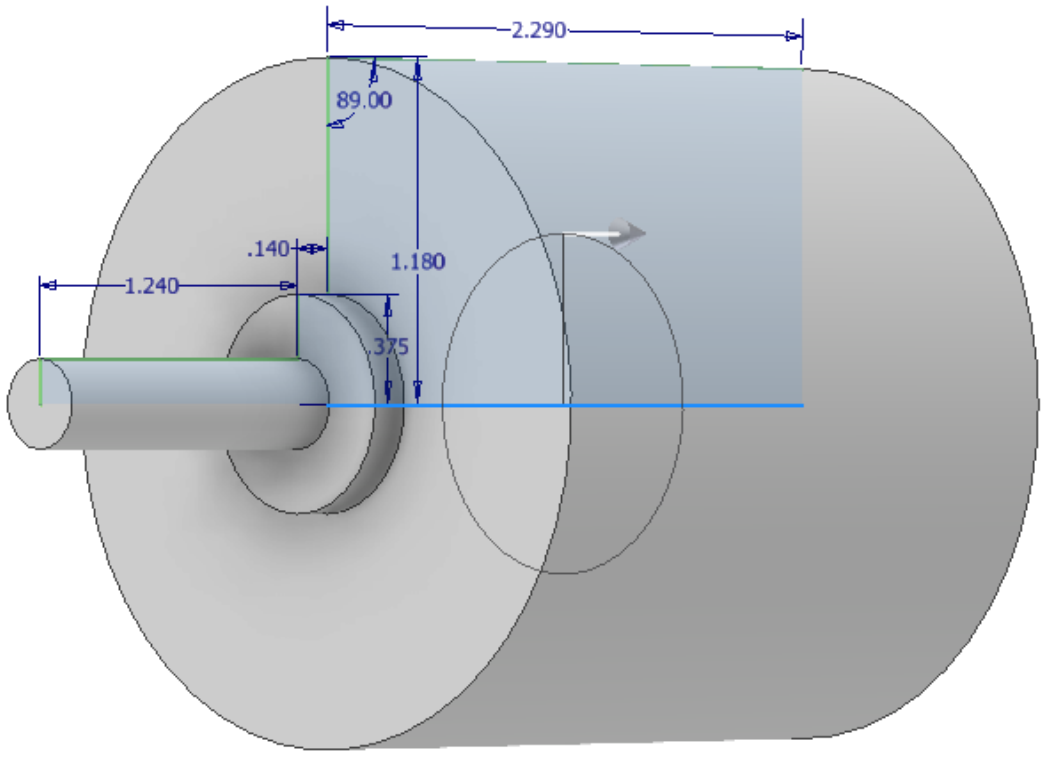

Figure 4

2. Screw Holes

To add holes for the mounting screws, create a sketch on the front of the motor. Add a construction geometry circle of diameter 2”. Add points at the top, left, bottom, and right.

To make the holes, use the hole tool set to tapped, ANSI #10-32.

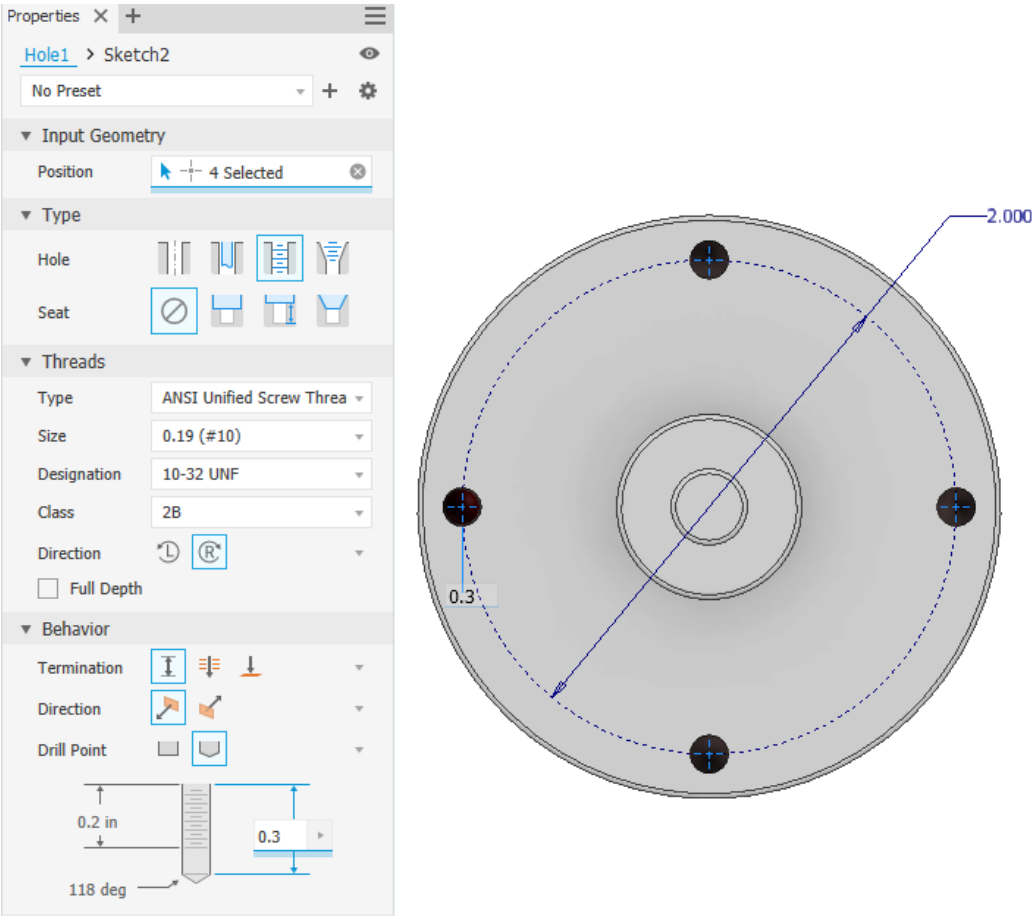

Figure 5

3. Keyway

You can create a new workplane on the shaft by selecting plane, clicking on the shaft, and selecting the appropriate plane from the left. Then create a sketch on the plane.

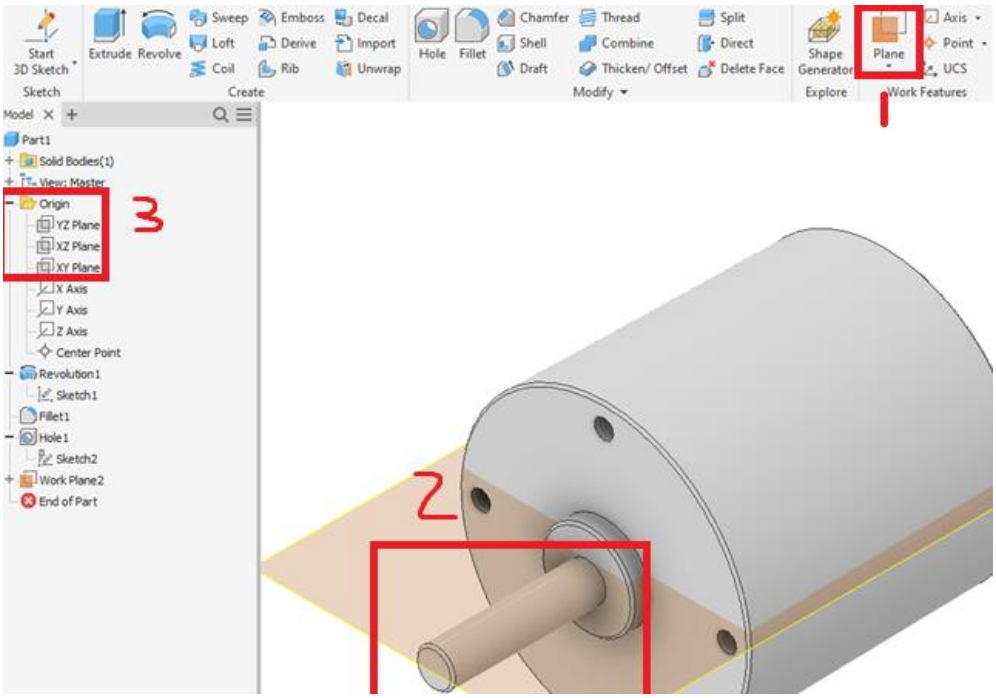

Figure 6

Use the slot tool to create a slot of 0.866x0.079” and cut with a depth of 0.04”.

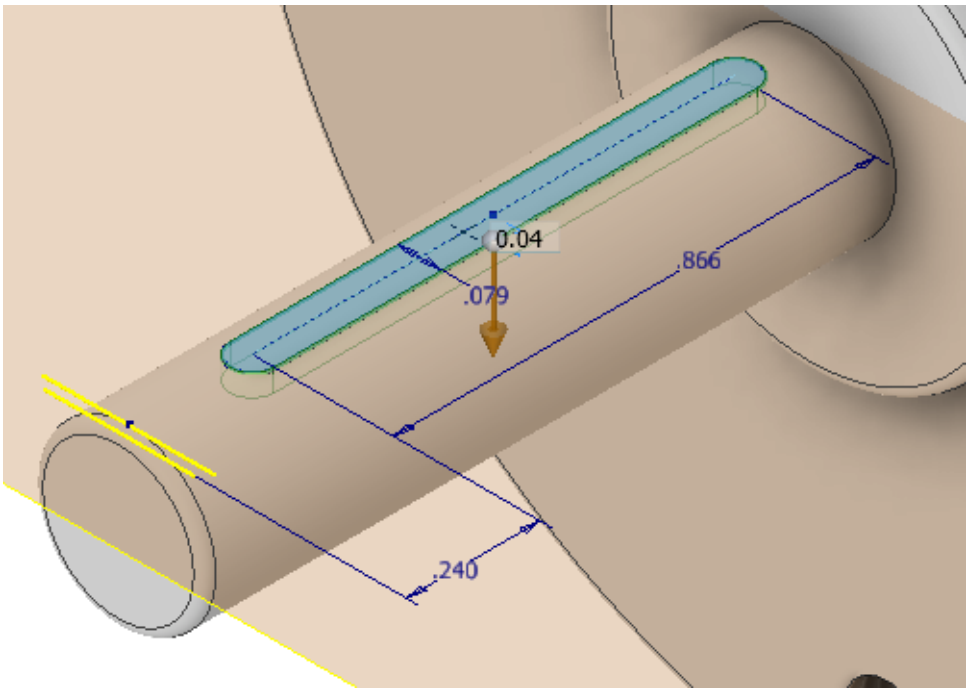

Figure 7

Hide the plane by right-clicking and unchecking “Visibility”.

4. Wires

It is important to know how the wires will fit when placing the motor, so we will include them in our CAD. While the official cad has the wires travelling back from the motor, we will only be creating the lip where they exit.

The first step is to create a new workplane on the outer surface. To do this, create a new sketch on the front face and create a construction line 45º from the horizontal, stretching to the edge of the motor. Once this is done, use the plane tool and select the line, followed by its end.

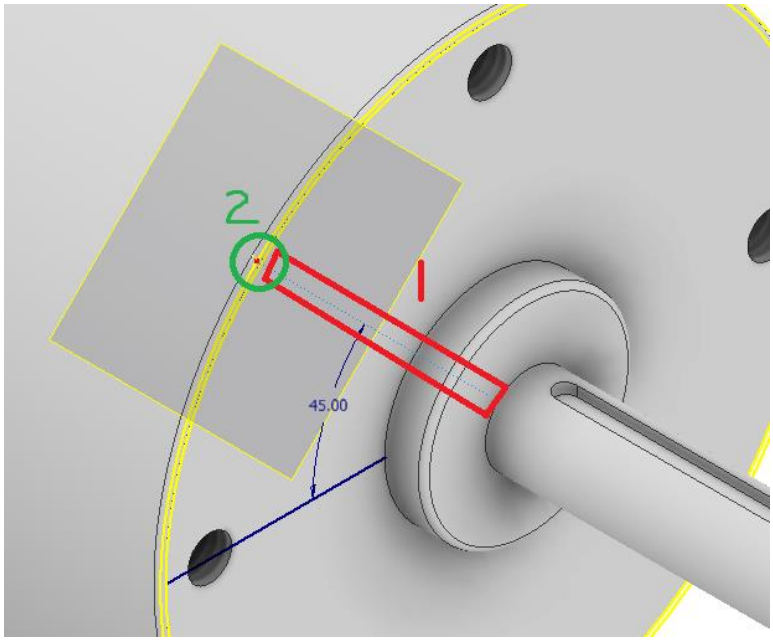

Figure 8

Now create a sketch on the plane, and draw a slot with a side length of 0.53” and width of 0.2”. Place it 0.1” from the outer edge and aligned with the end of the line from the previous sketch.

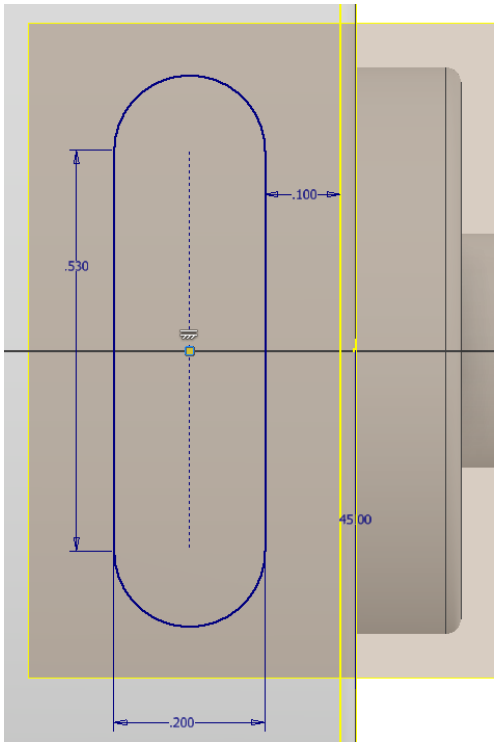

Figure 9

Now extrude the profile by 0.2” using the asymmetric mode so it connects to the main body. After extruding make the workplane and remaining sketch invisible.

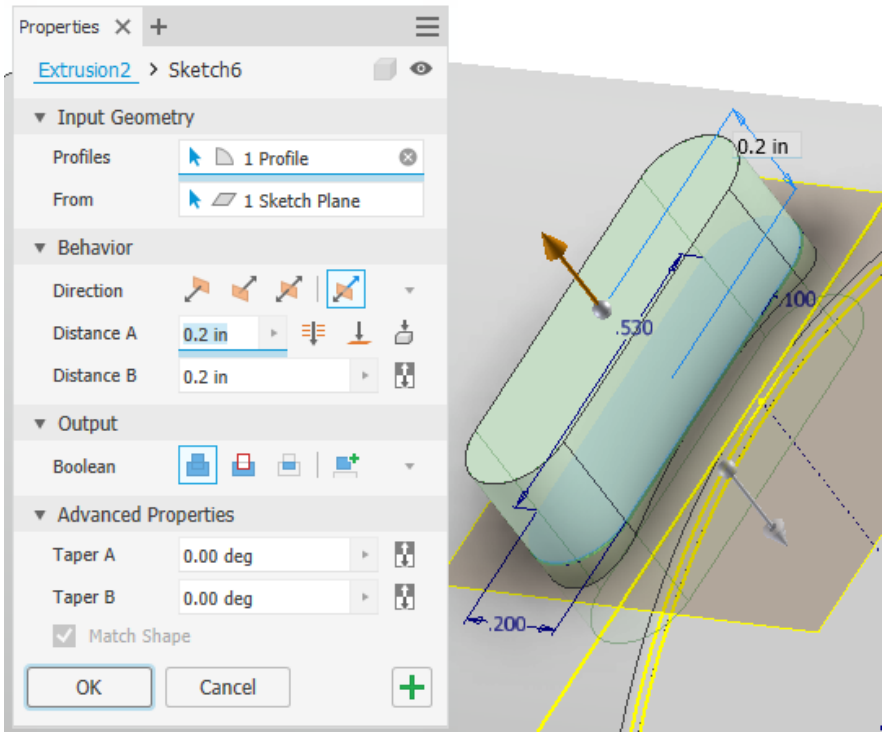

Figure 10

The next step is to create a sketch on top with circles for the wires. You will need 4 circles, 3 with a radius of 0.18” and the 4th with 0.16”. The space between them is also 0.18”. The top circle should be concentric with the top arc.

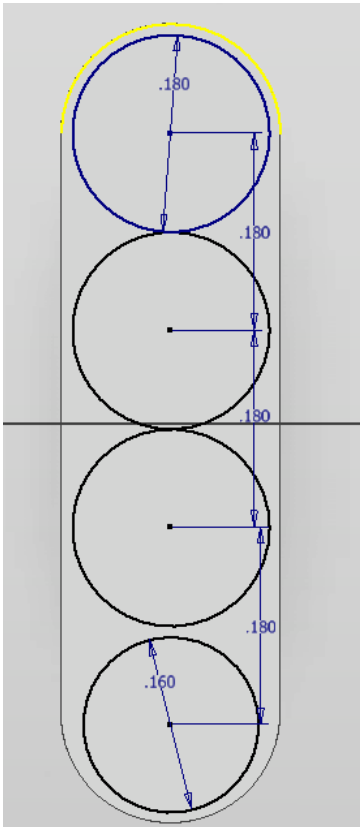

Figure 11

Now create a new 3D sketch, and draw a line starting at the top point. Hold the control key when placing to allow for free placement. Once the line is created, use the Perpendicular Constraint to make it perpendicular to the flat face.

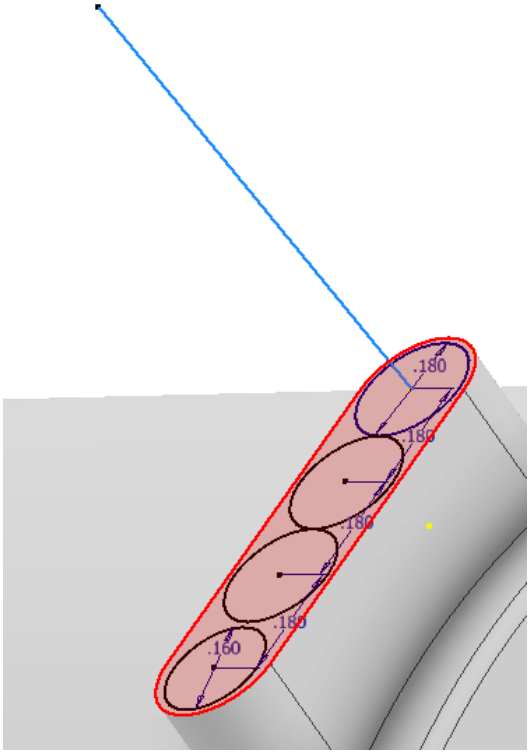

Figure 12

Next create another line originating at the end which runs parallel to the motor along whichever default axis is most appropriate. Make the first line 0.75” long and the second 2”. Finally add a bend with a radius of 0.6”.

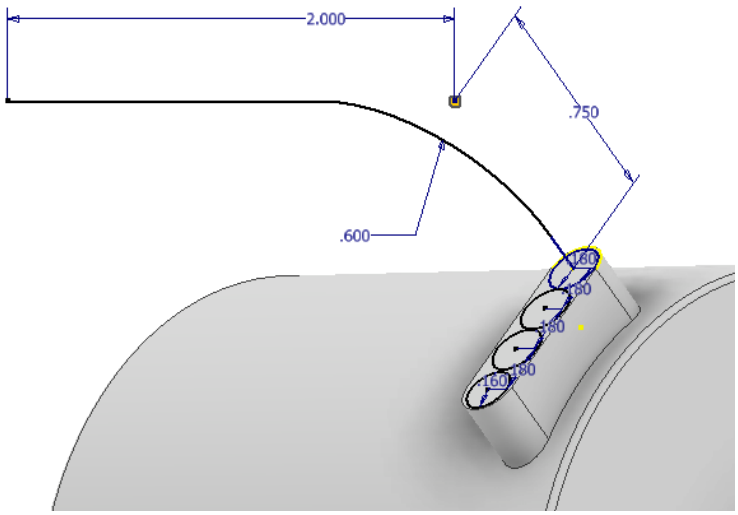

Figure 13

Finally, exit the sketch and use the Sweep tool, first selecting the 4 circles as the profile and the line as the path.

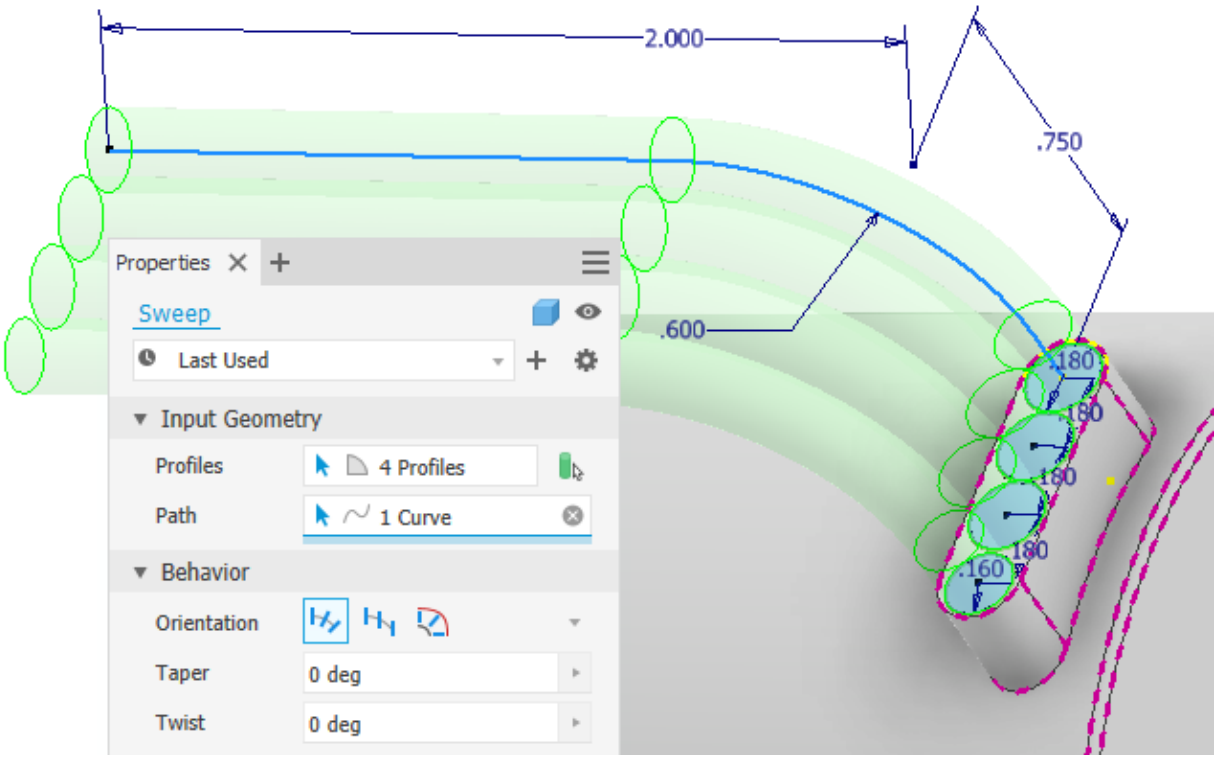

Figure 14

5. Finishing touches

The following colours are recommended:

- Body: Glossy Black
- Shaft: Polished Aluminium
- Wires (top to bottom)
    - Smooth White
    - Smooth Black
    - Smooth Red
    - Smooth Black