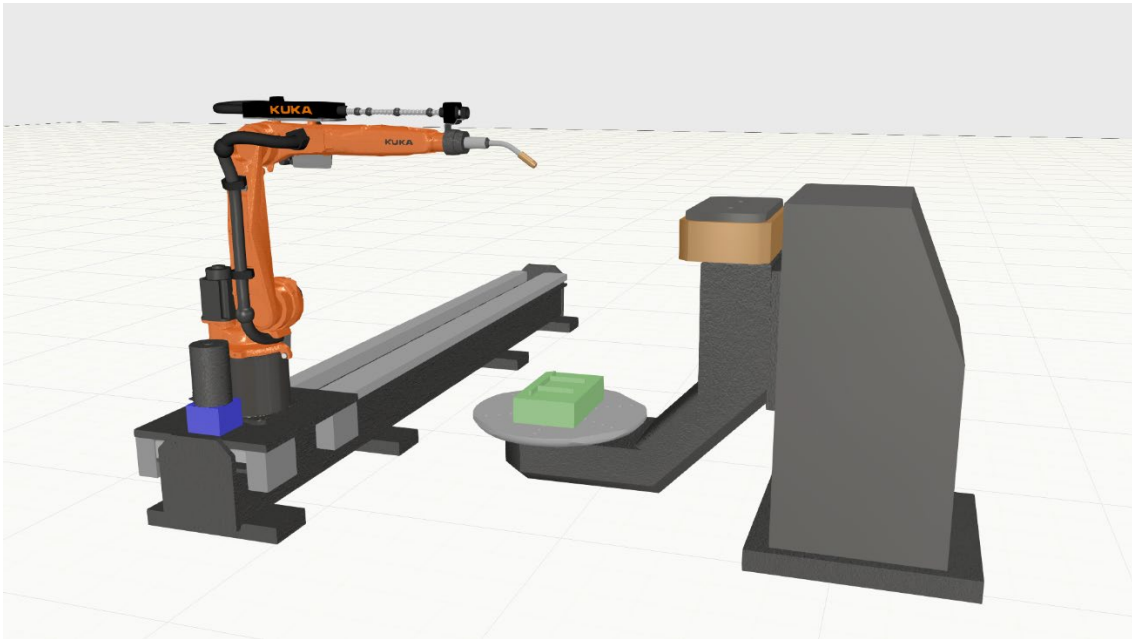


# Robotics OLP layout modelling tutorial

Visual Components 4.8 OLP | Version: July 1<sup>st</sup> 2024



Learn to model robot positioners, workpiece positioners and welding torches for OLP use and then use these options to setup a functioning layout.

This document includes the following topics:

- Component modelling
- Layout building and setup
- Importing and positioning a workpiece

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## Component modelling

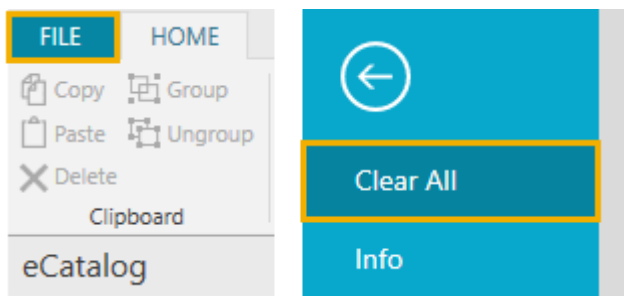
### Robot Positioner

This is an exercise for modelling a robot positioner (track) from existing CAD geometry. The exercise is divided into the following sections:

- Import Geometry
- Save the component
- Create a link
- Modify CAD data and add geometry to the link
- Finalize the robot positioner

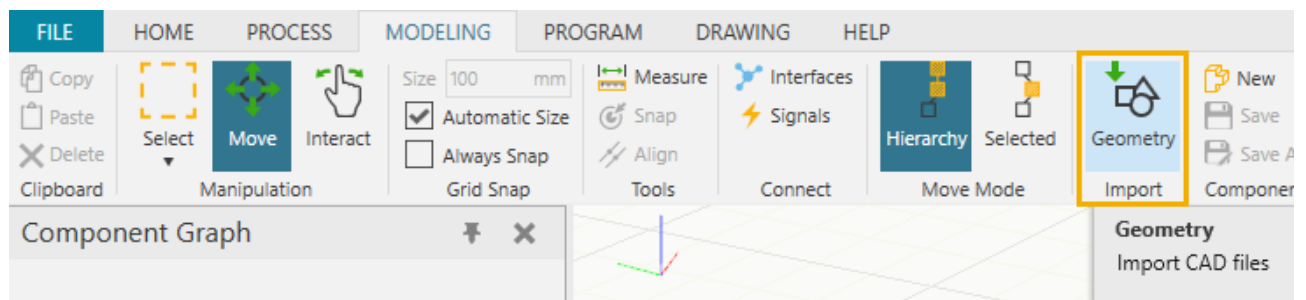
### Import Geometry

1. First, open an empty layout or clear the 3D world by clicking **FILE** then **Clear All**.



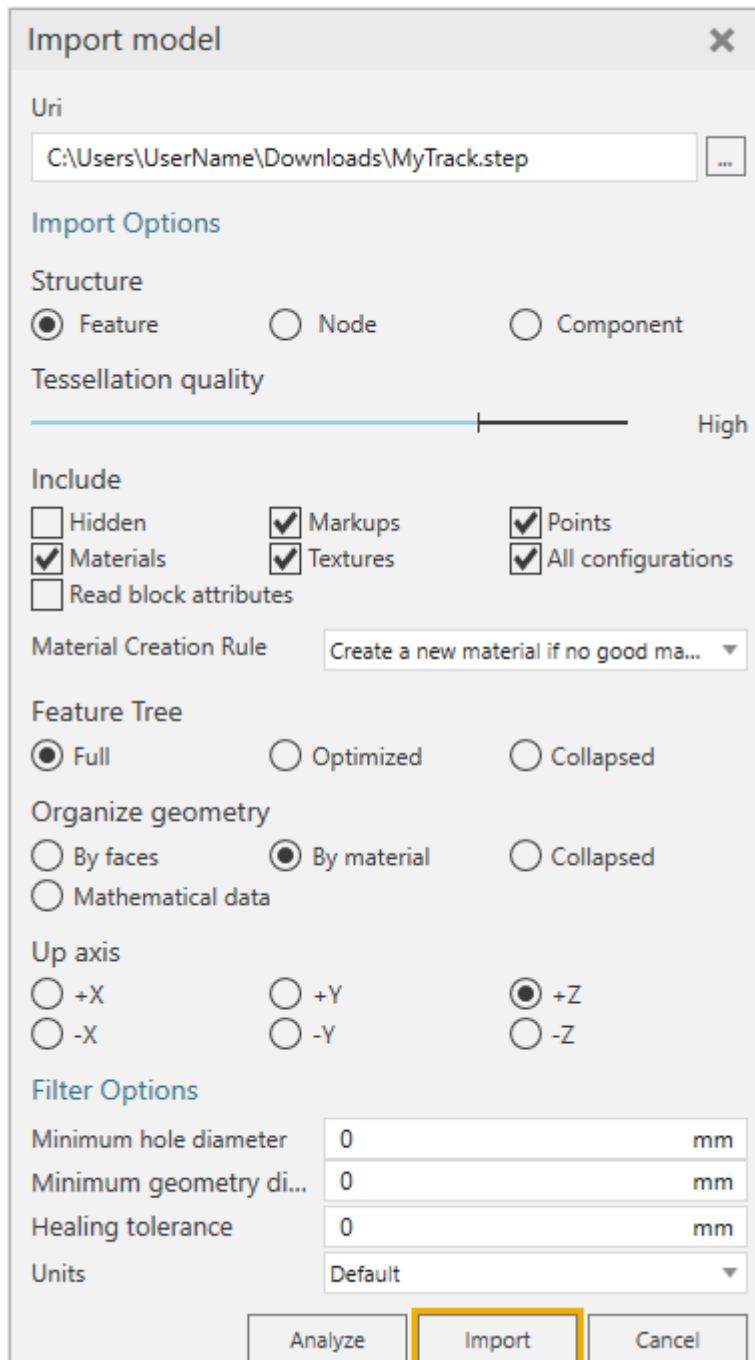
2. In the **MODELING** tab, import the geometry using the **Geometry** tool.

**Note:** Importing geometry is available in the **HOME**, **MODELING** and **PROGRAM** tabs.



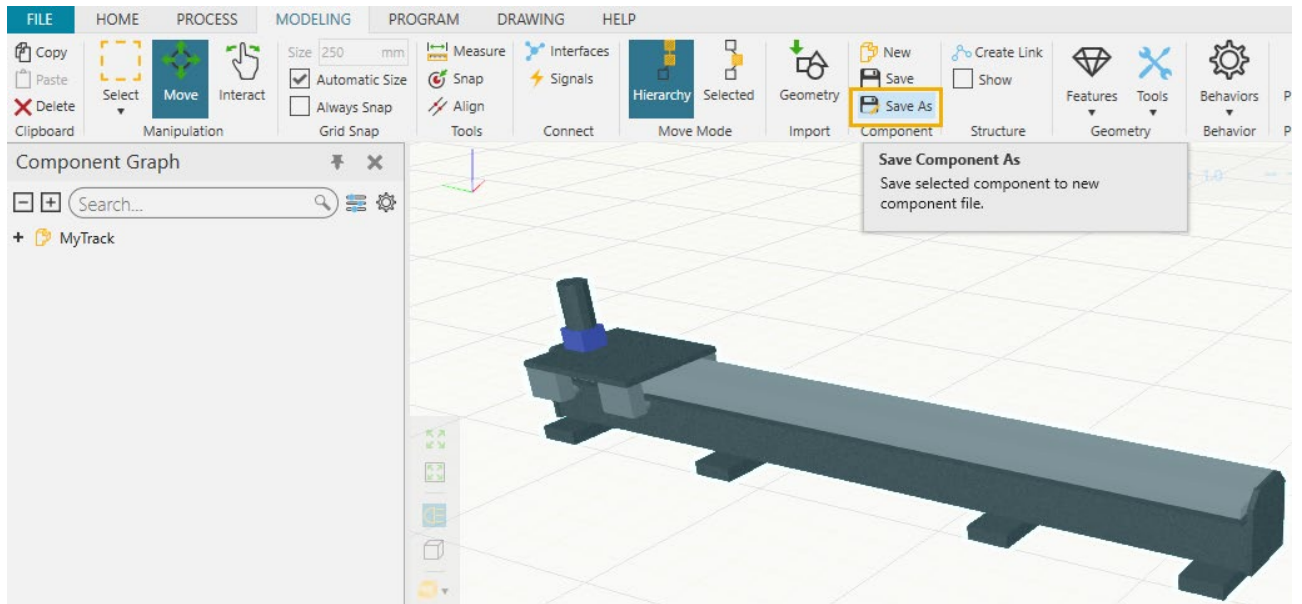
3. Select the *MyTrack.step* file included with the downloads for this lesson and click **Open**.

4. Select suitable import settings in the **Import model** panel. These import settings are explained in detail in the Visual Components Help documentation. For this tutorial the settings pictured below are suitable. Then click **Import**.

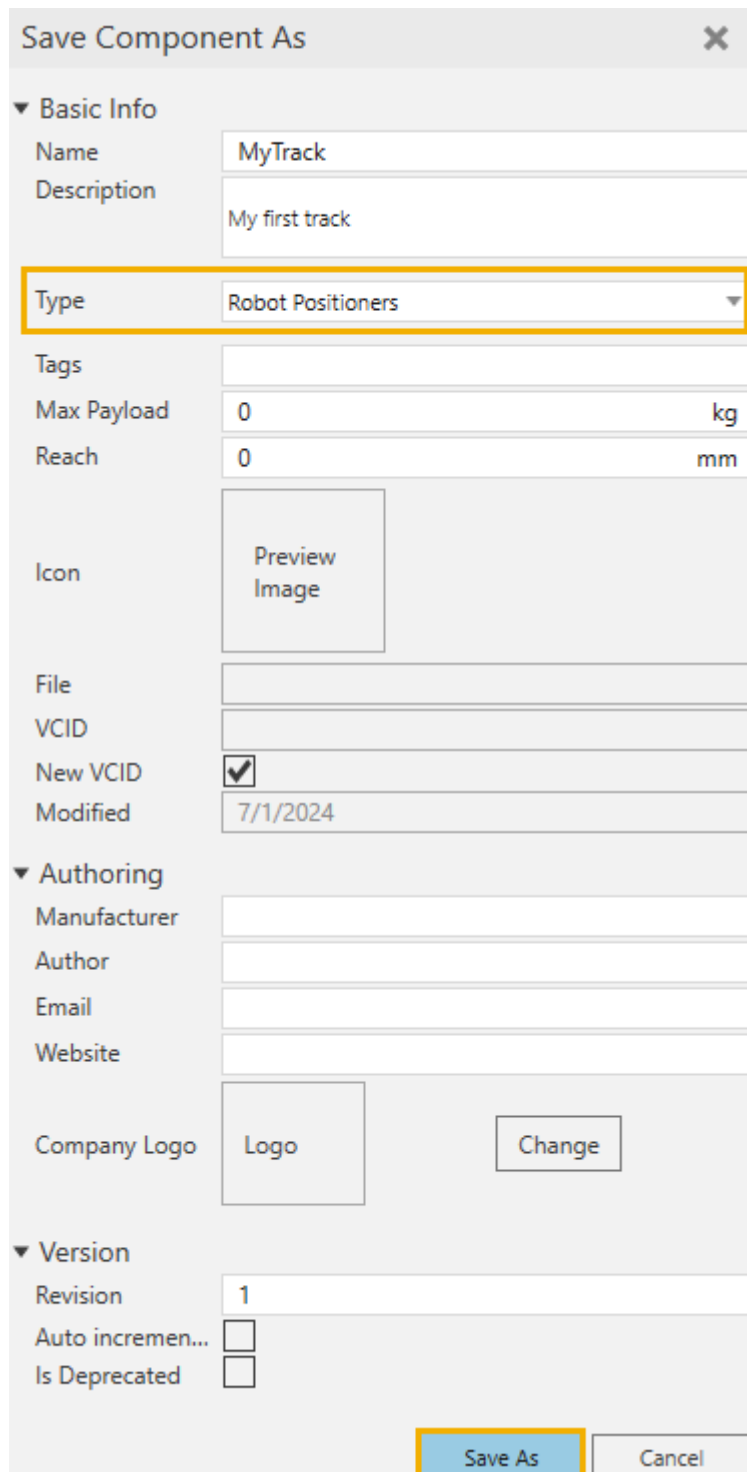


## Save the component

1. In the **MODELING** tab, to save the component from the **Component** group, select **Save As**.



2. In the **Save Component As** panel, set the **Type** to **Robot Positioners** and then click **Save As** to save the file to your computer. For example, you could save it to your **My Models** folder so you can access it easily from the **eCatalog**.



**Save Component As** [X]

▼ Basic Info

Name: MyTrack

Description: My first track

Type: Robot Positioners

Tags: [ ]

Max Payload: 0 kg

Reach: 0 mm

Icon: Preview Image

File: [ ]

VCID: [ ]

New VCID:

Modified: 7/1/2024

▼ Authoring

Manufacturer: [ ]

Author: [ ]

Email: [ ]

Website: [ ]

Company Logo: Logo [Change]

▼ Version

Revision: 1

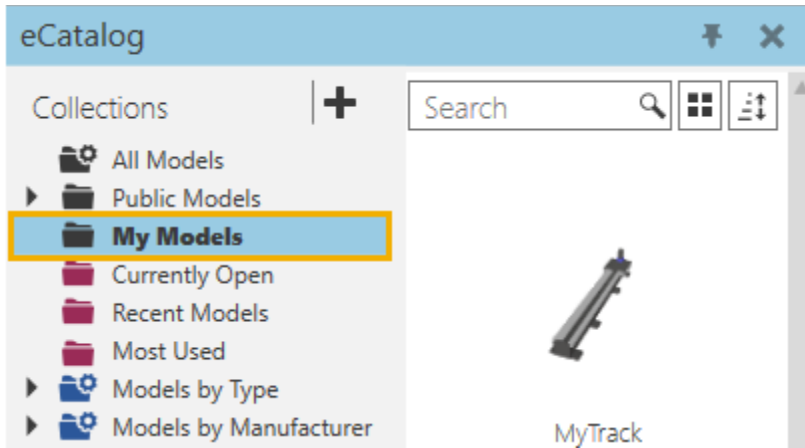
Auto incremen...

Is Deprecated

[Save As] [Cancel]

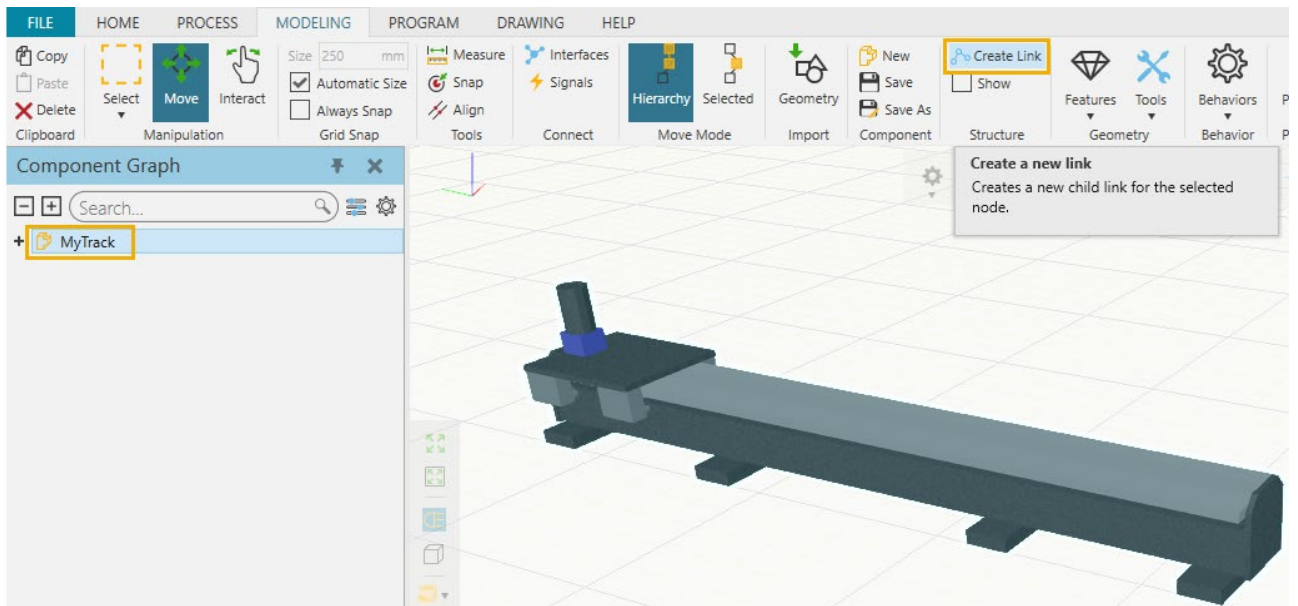
**Note:** You can find the path for **My Models** from the **eCatalog** folder tree.

**Example:** C:\Users\username\Documents\Visual Components\4.8\My Models

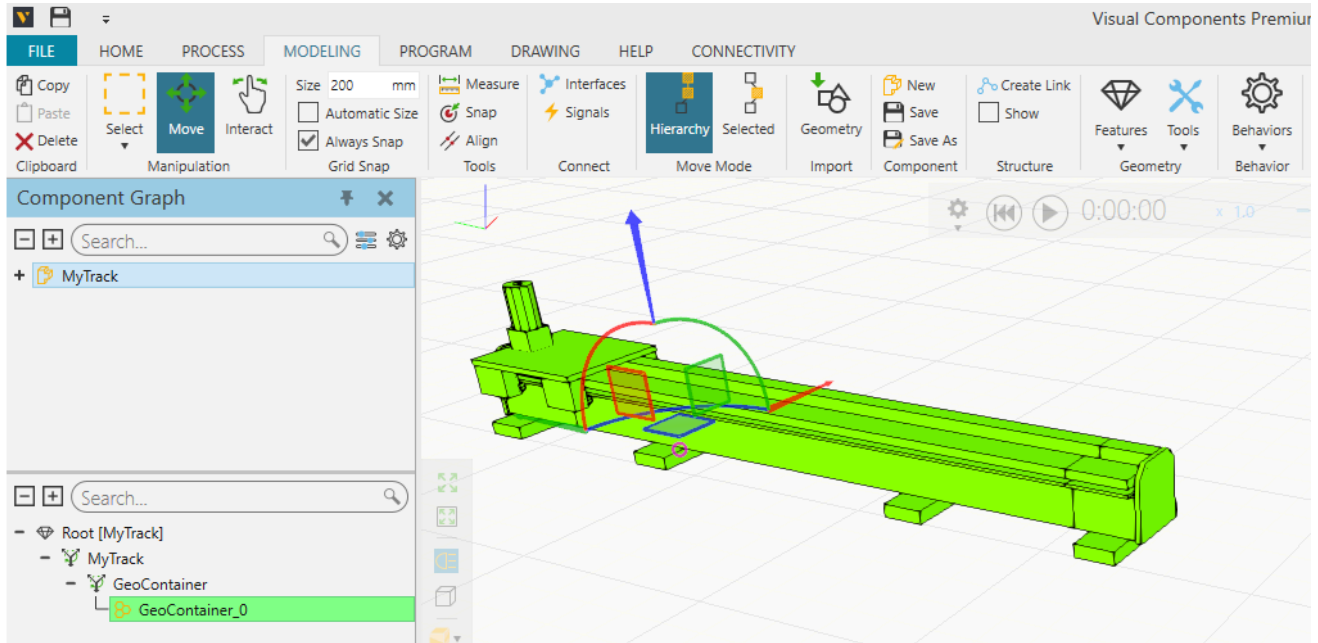


### Create a link

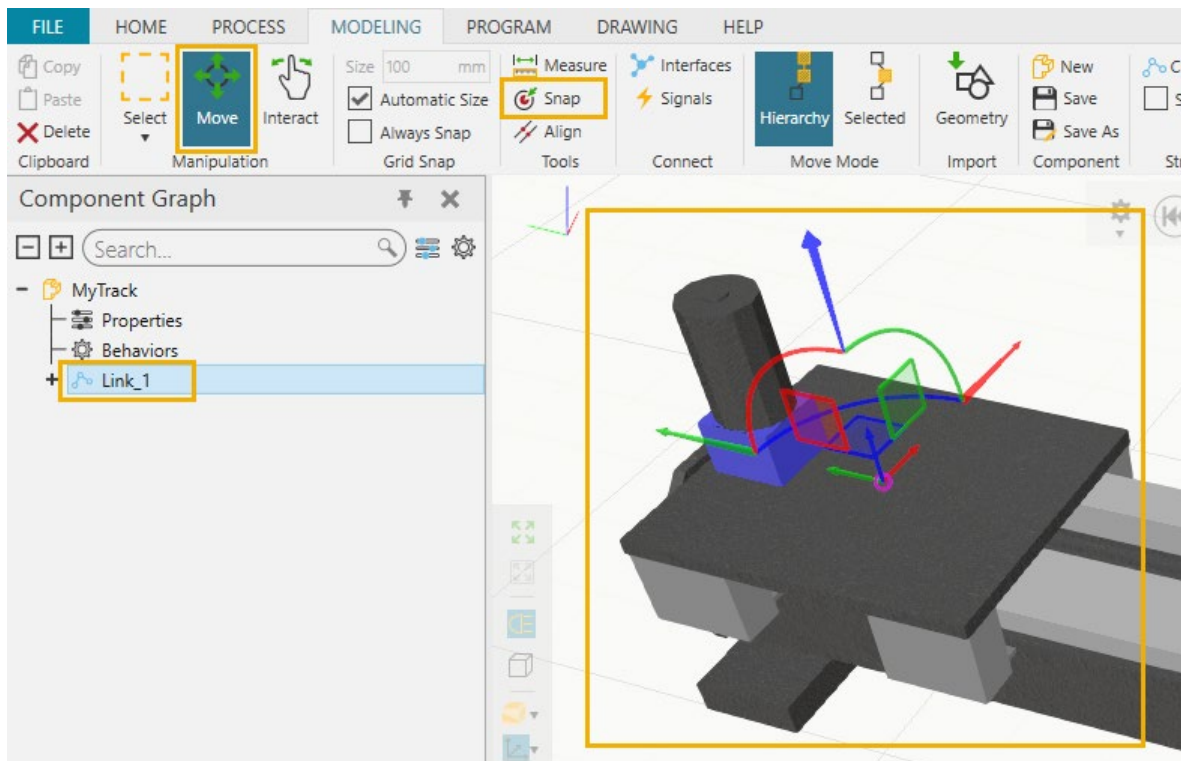
1. In the **MODELING** tab, from the **Component Graph** on the left, in the Component Node Tree select the **MyTrack** component and then from the **Structure** group in the ribbon, click **Create link**.



**Note:** When the **MyTrack** component is selected, in the **Component Graph** the whole component is selected and it will then appear highlighted in blue. If you select only the geometries from the Node Feature Tree below, the selected geometries will appear highlighted in green.



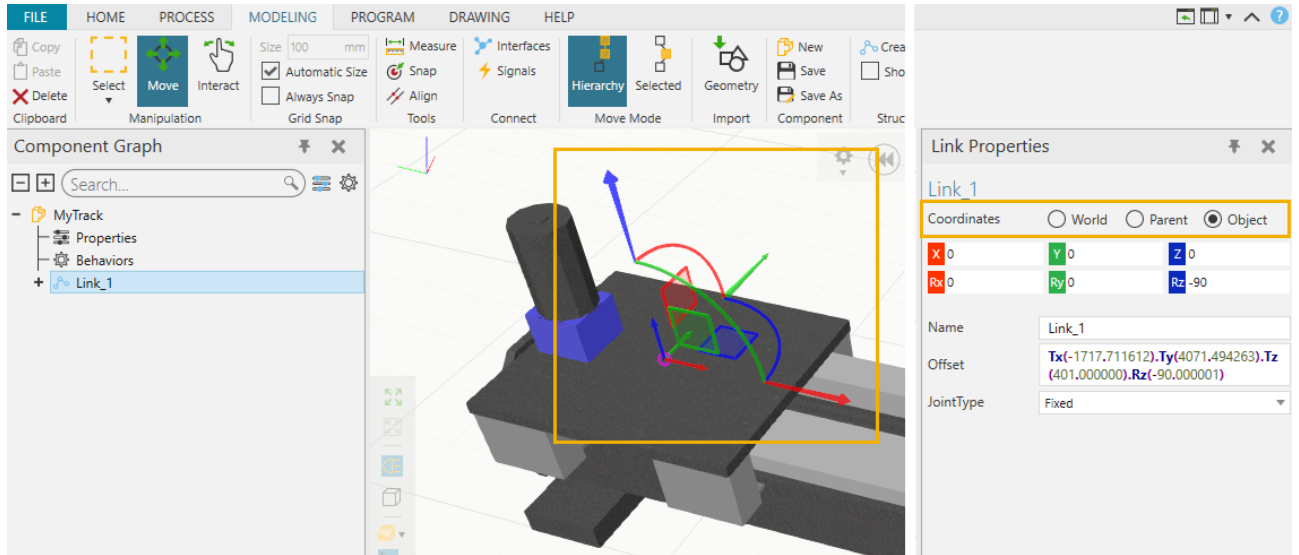
2. Select the **Link\_1** we created on the left, then select the **Move** tool from the **Manipulation** group, and use the **Snap** tool to snap the position of the link to the center of the track mount plate.



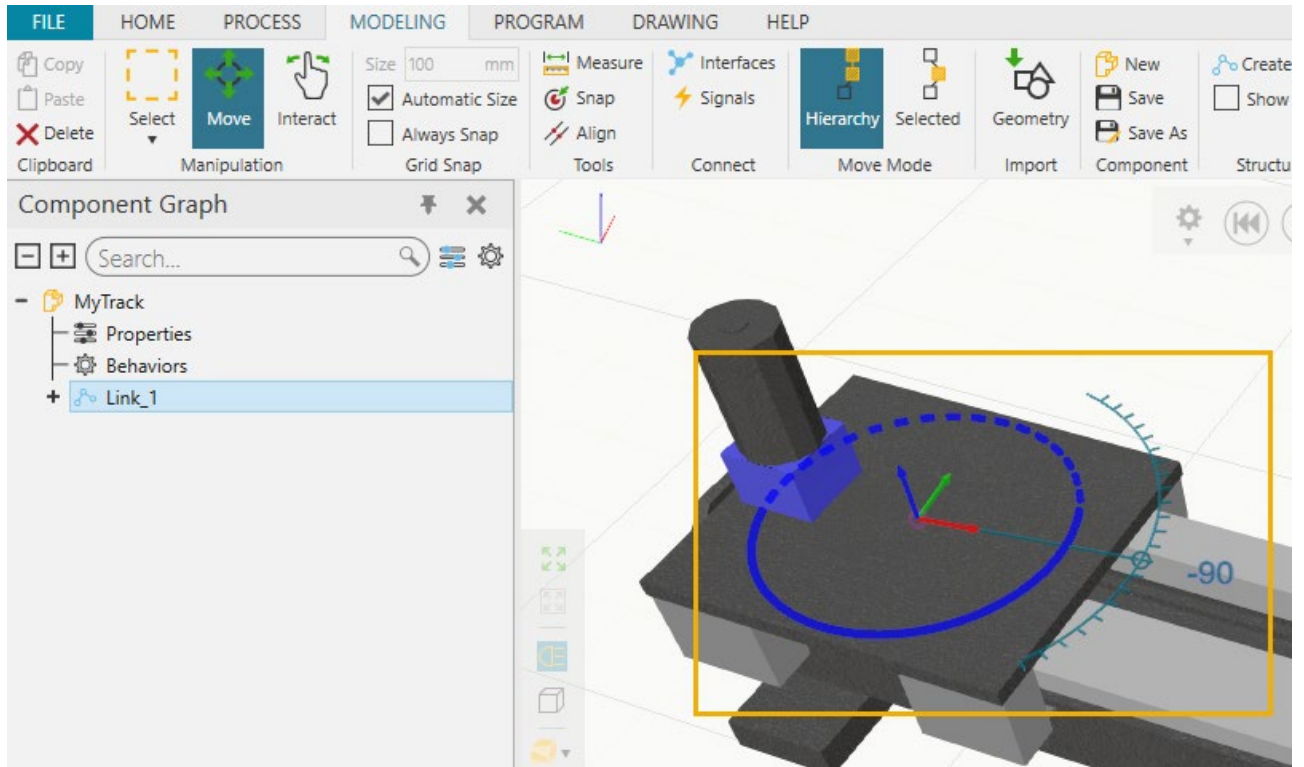


- With **Coordinates** set to **Object** in the **Link Properties** on the right, we must make sure that the link is oriented so that the Z-axis is pointing upwards and the X-axis is heading along the track.

To rotate the axis so that the red X-axis is heading along the track, in the 3D world select the blue Rz axis and using your mouse rotate it 90 degrees.



**Tip!** If you place your mouse cursor close to the degree indicators that appear, you can rotate the axis in increments of five degrees to set an exact value of e.g. 90°.

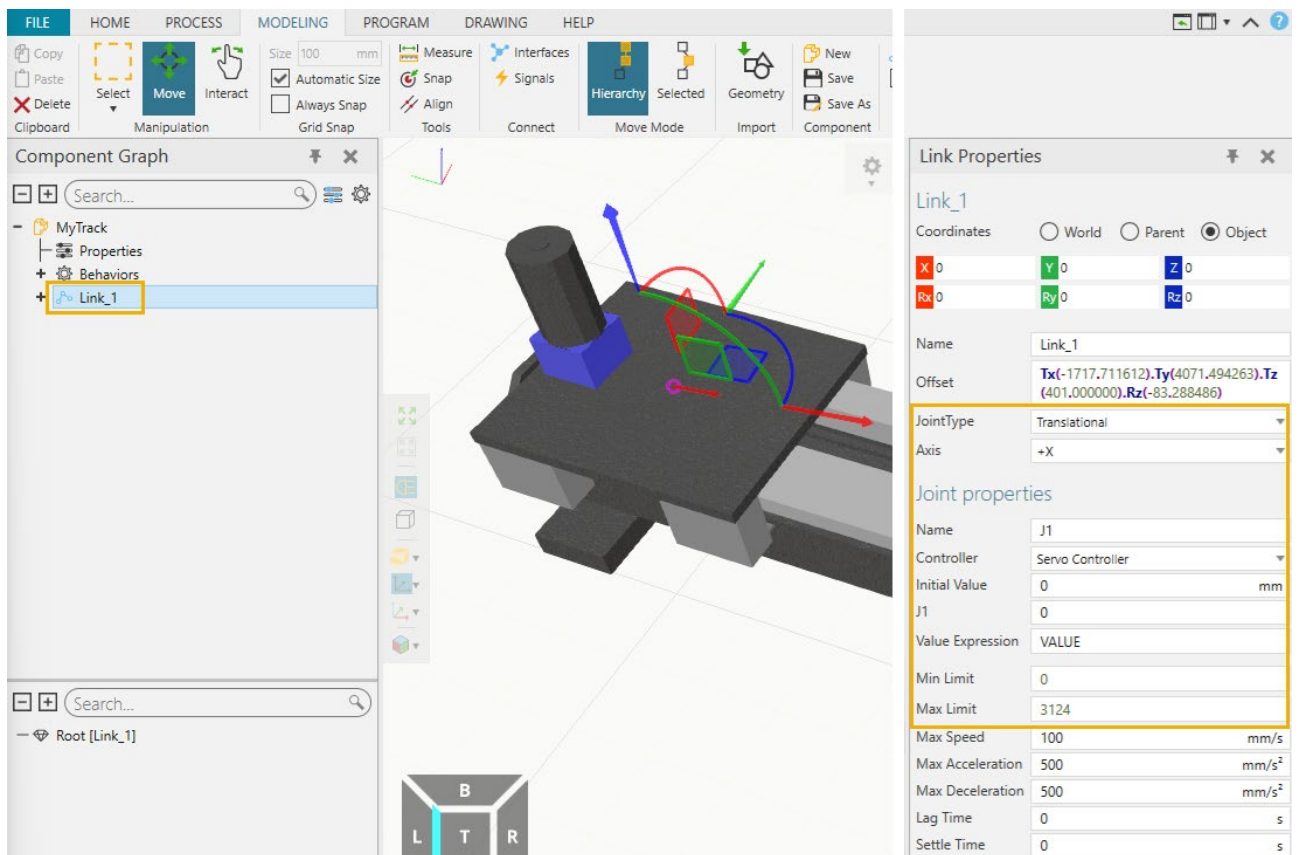


**Note:** For links and components, always check their orientation with **Coordinates** set to **Object**.

4. With **Link\_1** selected, in the **Link Properties** on the right the following properties should be set:

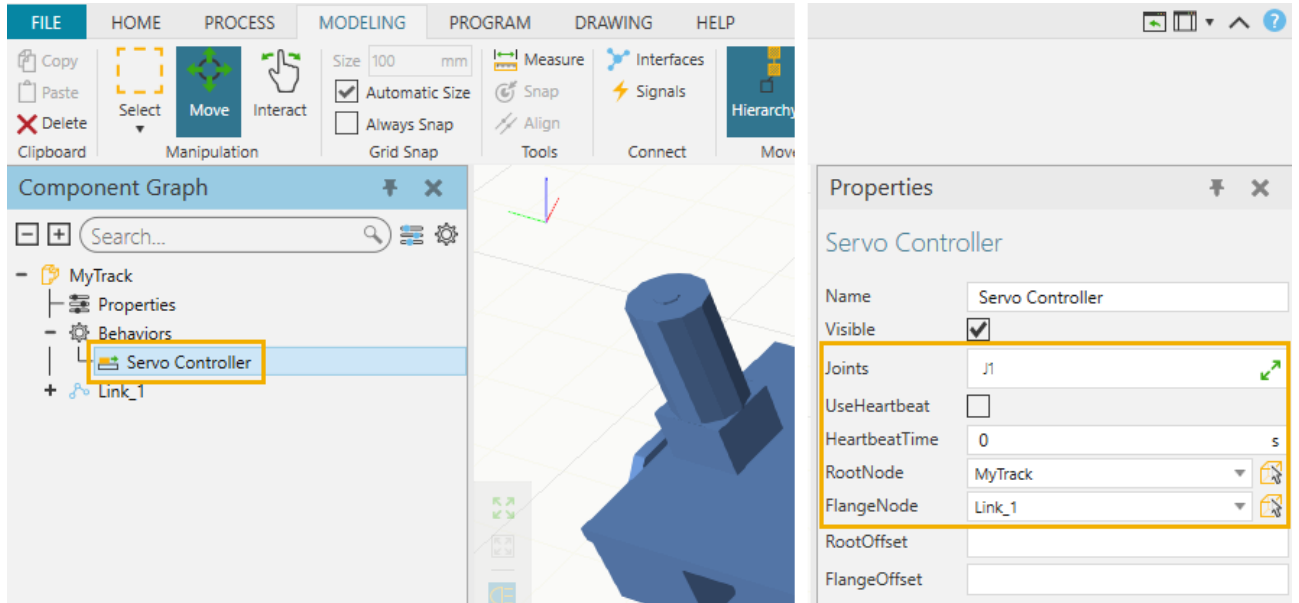
- Set **JointType** to **Translational**.
- Set the **Axis** to **+X**.
- Set the **Controller** to **New Servo Controller** which creates a **Servo Controller**.
- Set the **Min Limit** to **0** and **Max Limit** to **3124**.

**Tip!** If you have the **Link\_1** node oriented in the other direction, select another direction from the **Axis** list for the joint. If the track carriage moves the wrong way, choose – instead of + axis. You can also use the **Measure** tool to measure the **Min** and **Max Limit** for the track from the geometries.



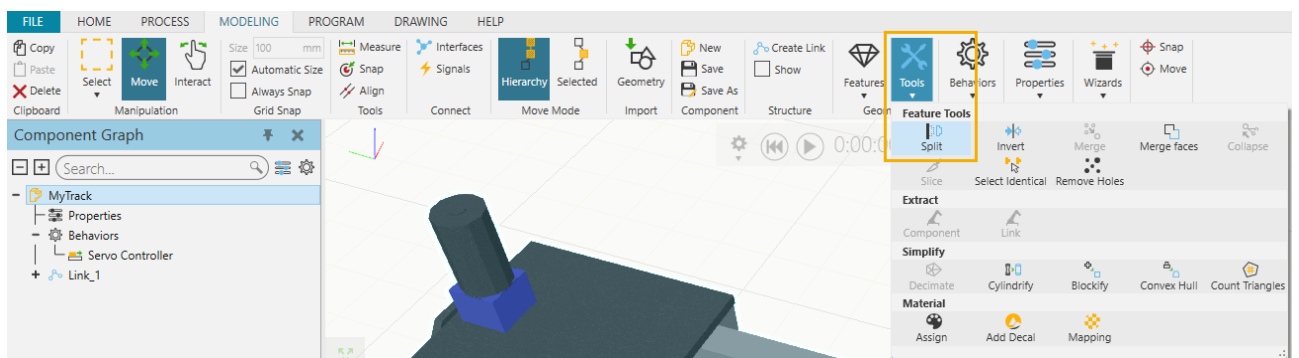
5. From the **Component Graph** on the left, in the Component Node Tree under **Behaviors**, select the **Servo Controller** that we created and make sure that in the **Properties** panel on the right the following properties are set:

- **Joints** is **J1**.
- **RootNode** is **MyTrack** (Component name).
- **FlangeNode** is **Link\_1**.

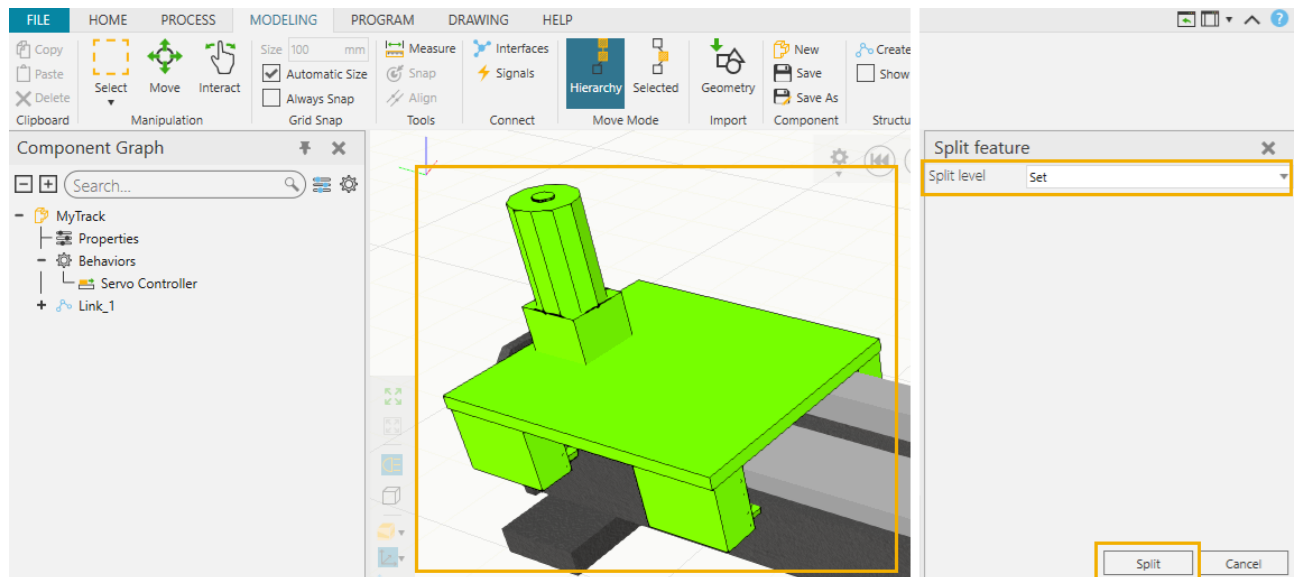


### Modify CAD data and add geometry to the link

1. To create the geometry for the moving link, the carriage geometry must be split from the whole component. So in the **MODELING** tab, from the **Tools** menu select **Split**.



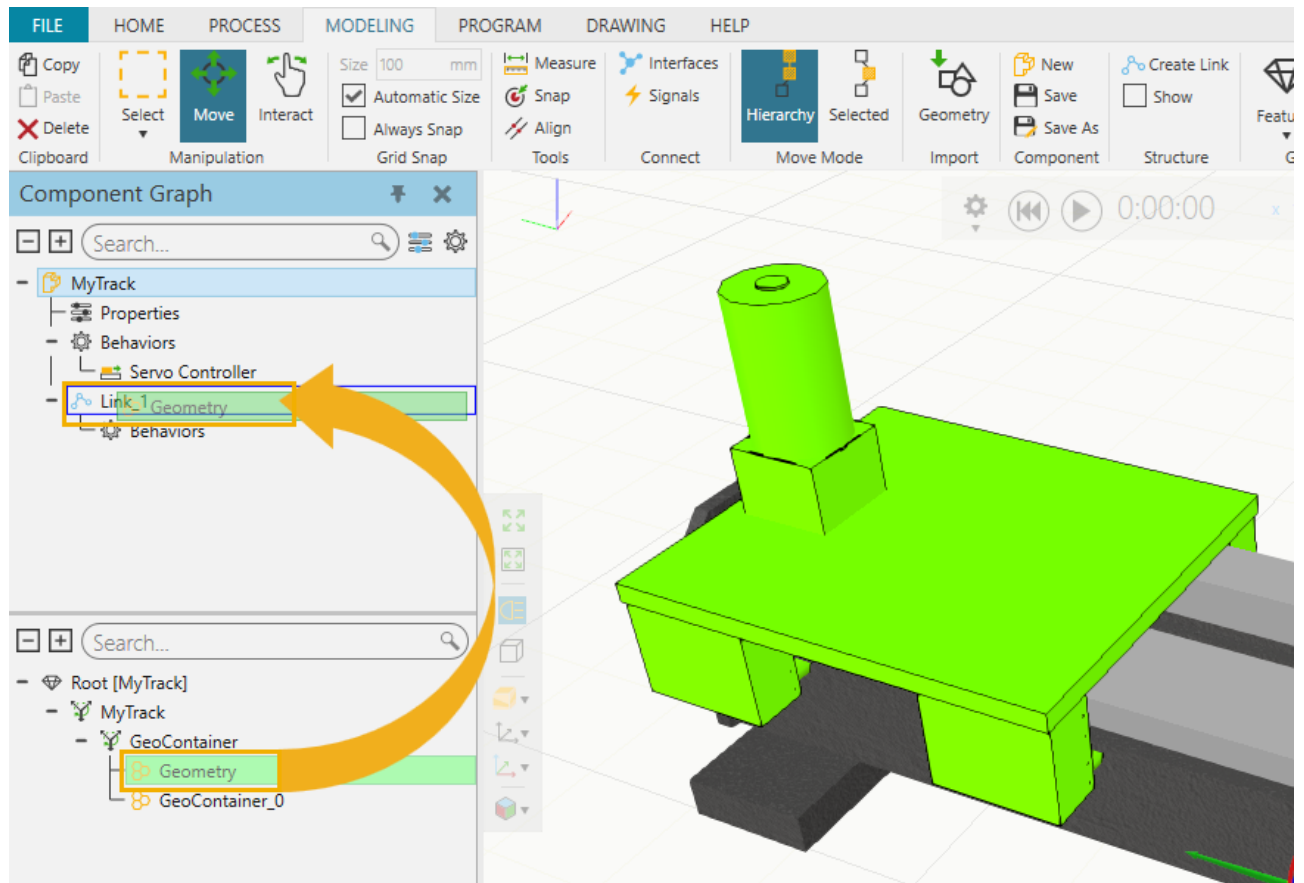
2. In the **Split feature** panel, set the **Split level** as **Set** (or **Faces** if it does not work with **Set**).
3. Then in the 3D view, holding the CTRL key, multiselect the required geometry parts that are moved with **Link 1**. Then click **Split** from the base of the **Split feature** panel.



**Tip!** Other useful tools that are sometimes required to modify a CAD model are **Explode** and **Slice**. See the Visual Components Help documentation for more information on these tools.

4. In the **Component Graph** on the left we should drag the separated geometries up from the Node Feature Tree to the Component Node Tree under **Link\_1**.

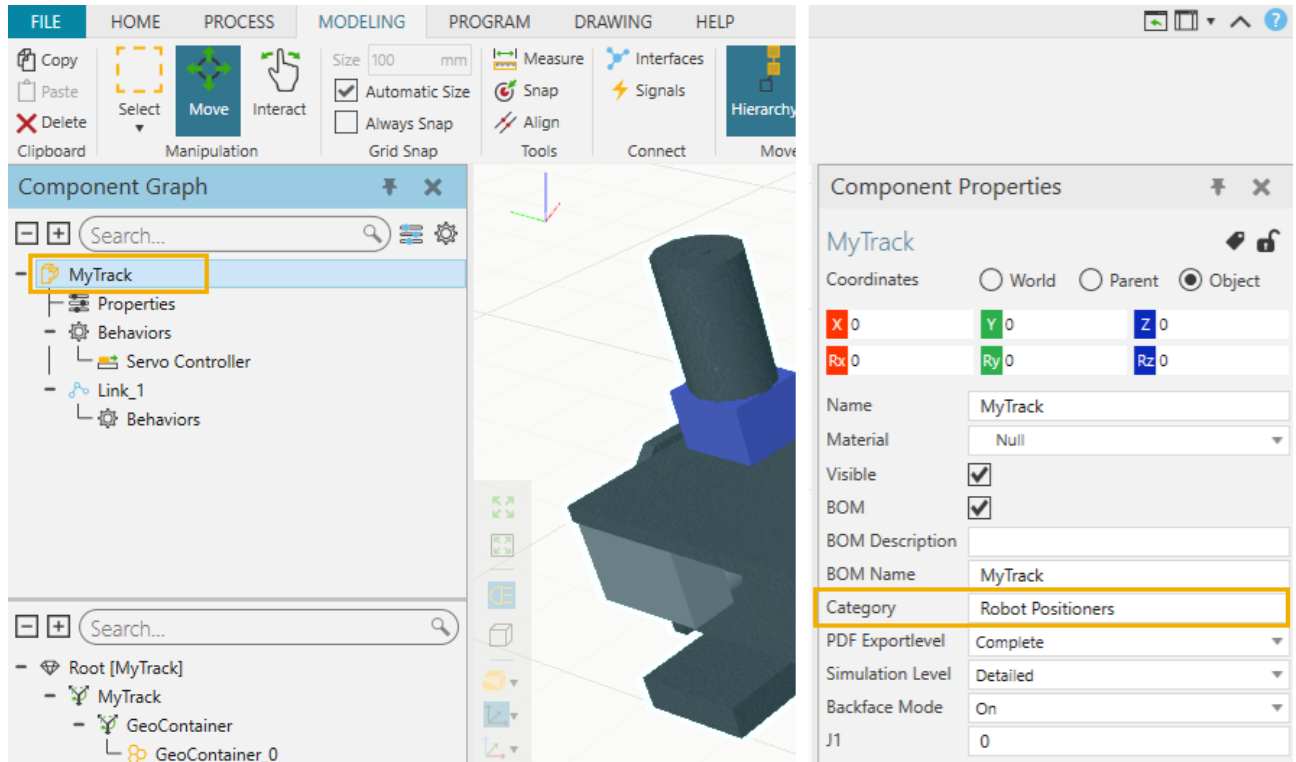
So holding the Shift key, left mouse click on **Geometry** and drag it up placing it under **Link\_1**.



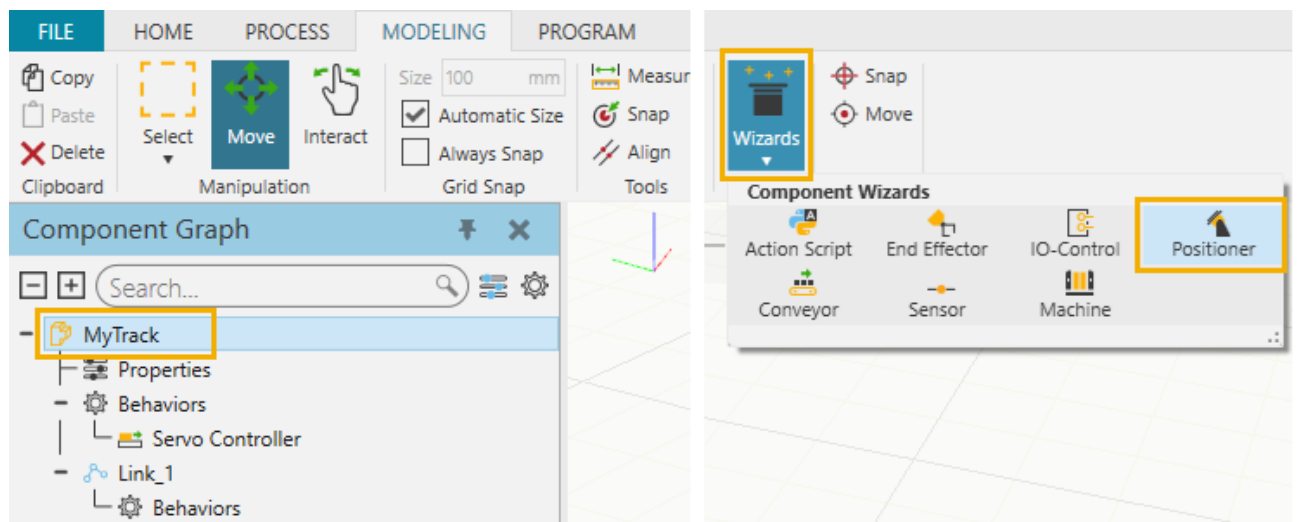
### Finalize the robot positioner

1. In the **MODELING** tab, selecting the **MyTrack** component and in its **Component Properties** over on the right, set the **Category** as **Robot Positioners**.

**Note:** This is required for the Robotics OLP product to recognize the component as a Robot Positioner.



2. Next select the **MyTrack** component and select **Wizards** from the ribbon and choose **Positioner**.

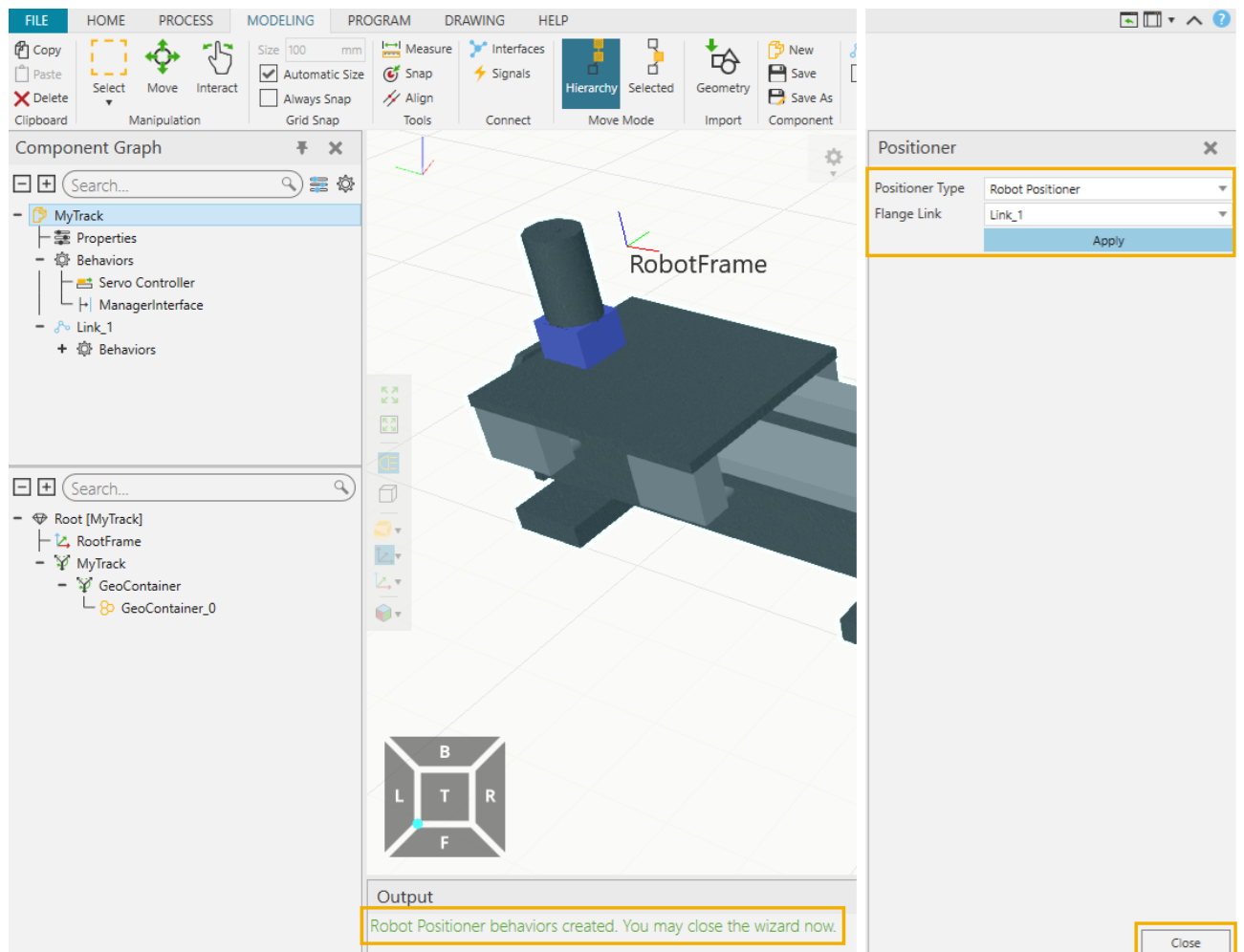


3. In the **Positioner** panel, set the following properties:

- **Positioner Type** to **Robot Positioner**.
- **Flange Link** to **Link\_1**.

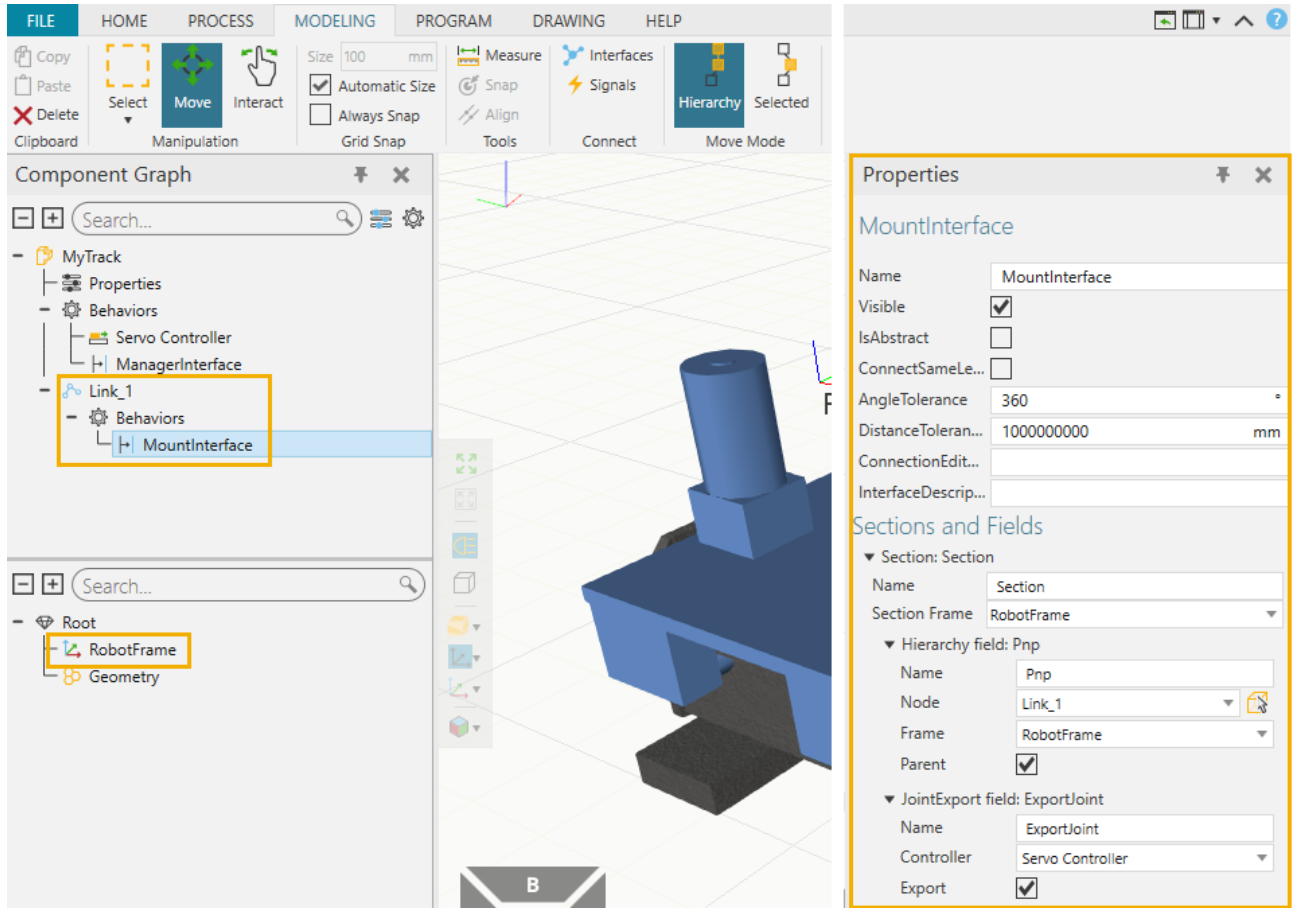
And then click **Apply**.

When the **Output** panel below states *Robot Positioner behaviors created. You may close the wizard now* you can then click **Close** in the lower right corner to close the **Positioner** wizard.



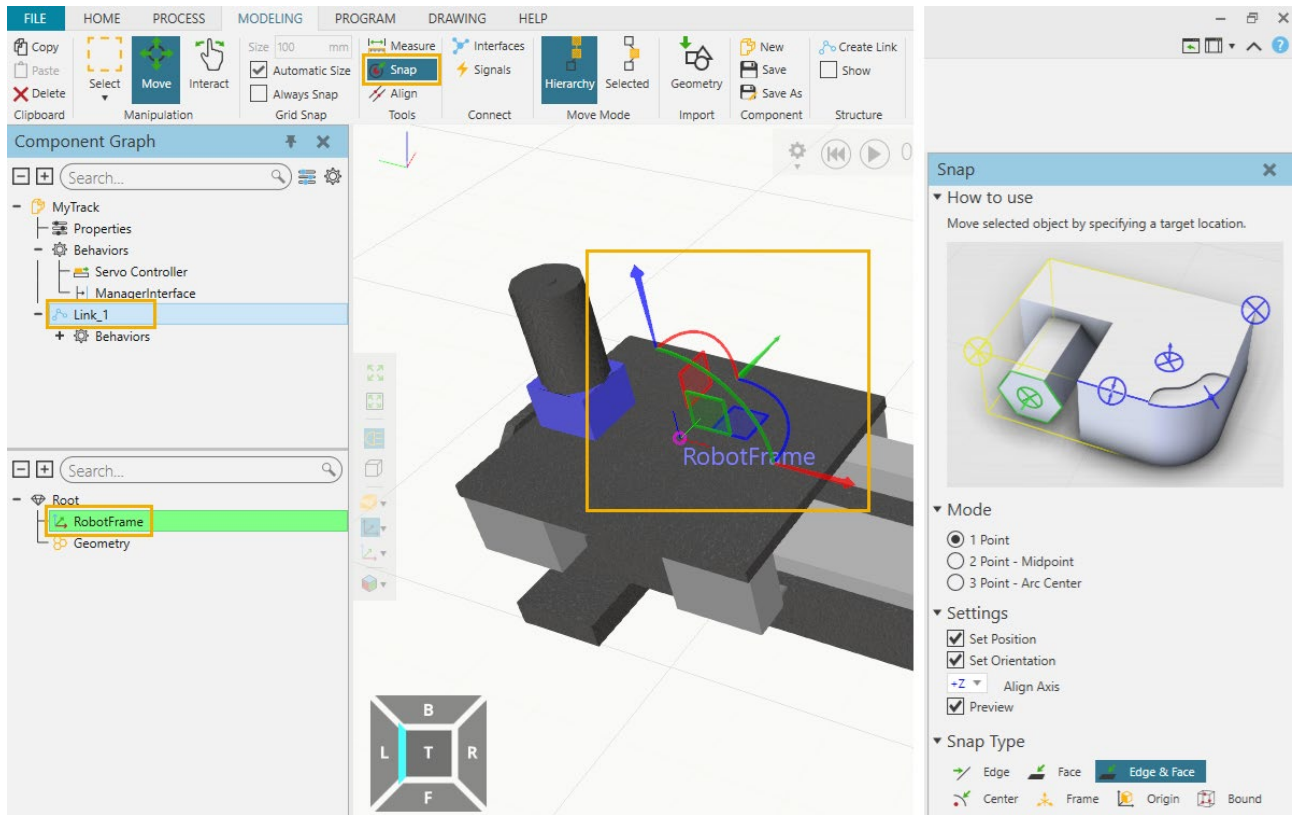
- The wizard will create a **MountInterface** behavior and a **RobotFrame** property that is used to connect the track to the robot.

The values in the **Properties** of the **MountInterface** component should be similar to the image below.

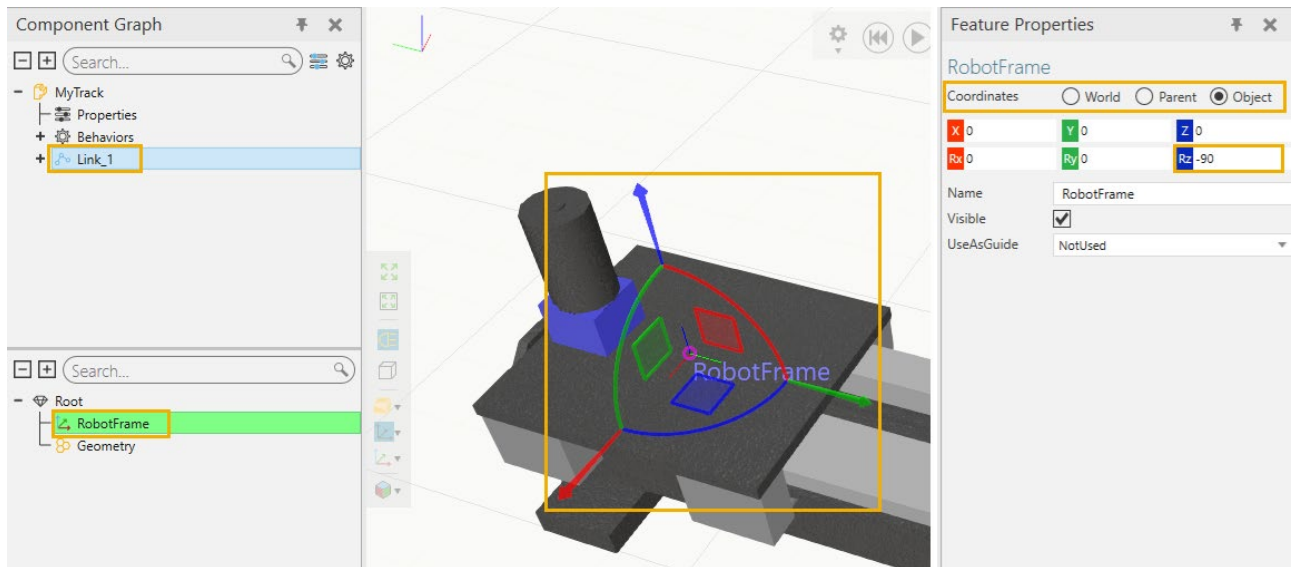




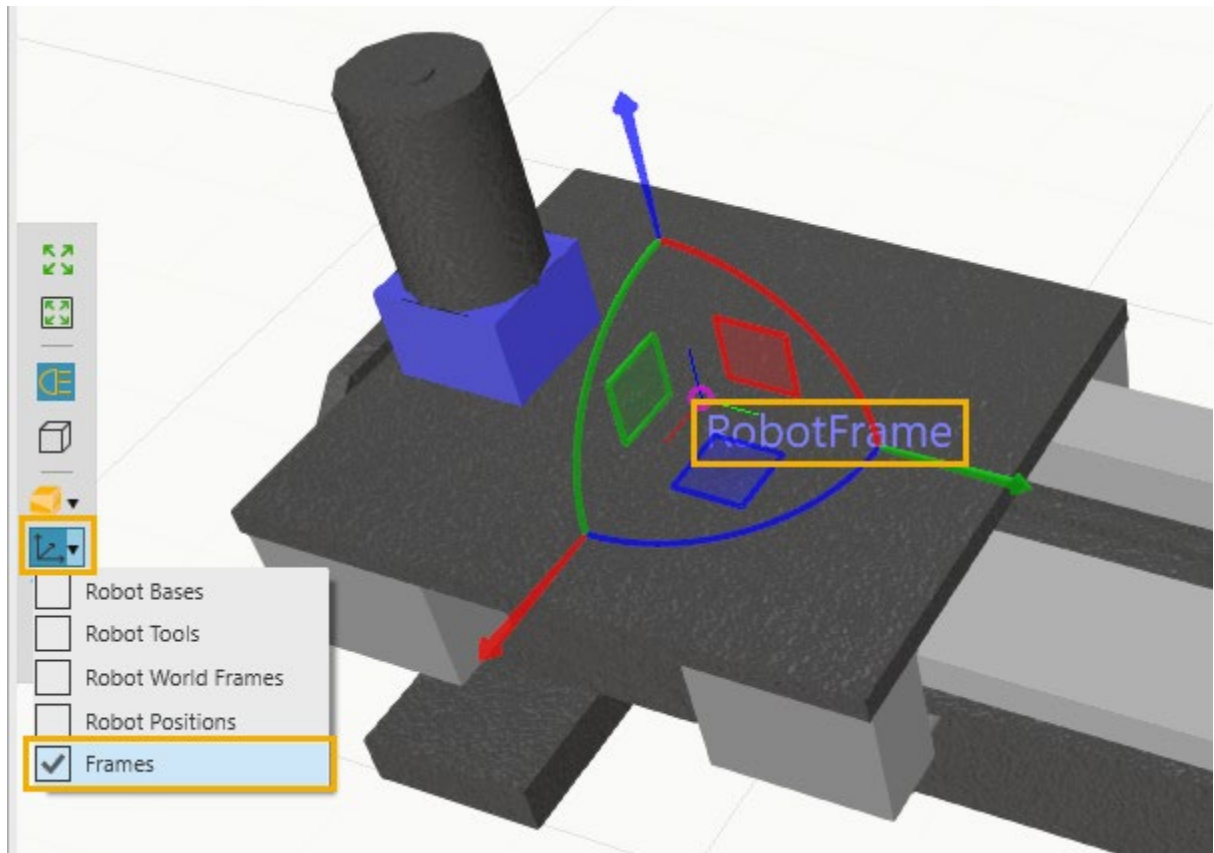
5. Select the **Link\_1** in the Component Node Tree on the left. And then from the Node Feature Tree below select **RobotFrame** under the **Root**, and using the **Snap** tool, snap it to the center of the track mount plate.



6. The position of this **RobotFrame** will be the position the robot component will later snap to when using the **PnP** mode. And to position the robot correctly, in **Feature Properties** on the right, with **Coordinates** set to **Object** we can rotate the **Rz** axis by **-90** degrees.

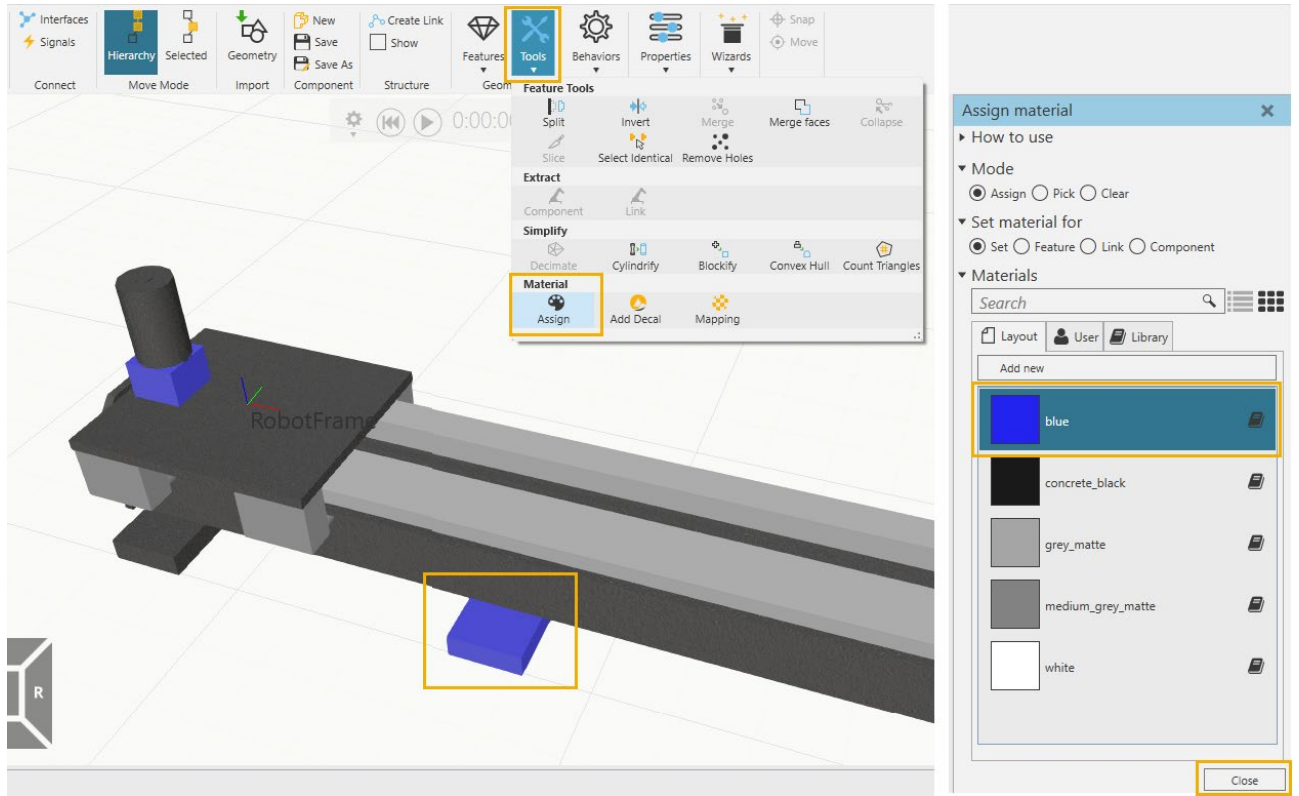


**Tip!** Enabling **Frame Types** and then **Frames** from the 3D World Toolbar allows you to visualize the Frame names in the 3D world view.

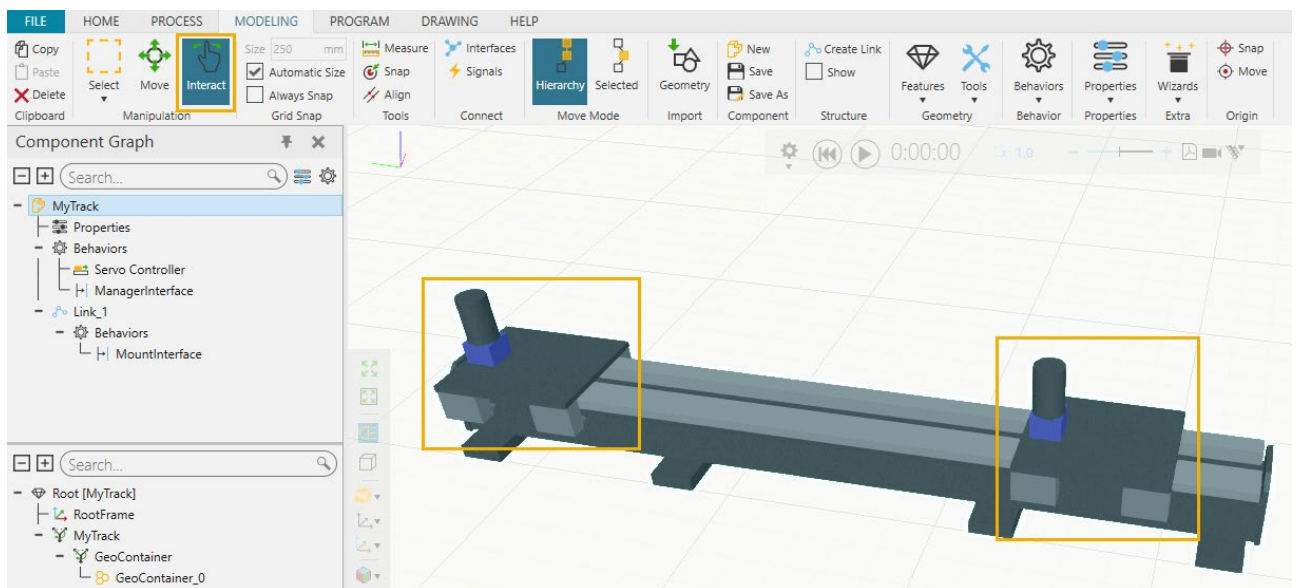


- In this example the imported robot positioner component already has materials assigned to it. If materials are not present, then you may assign materials to the component.

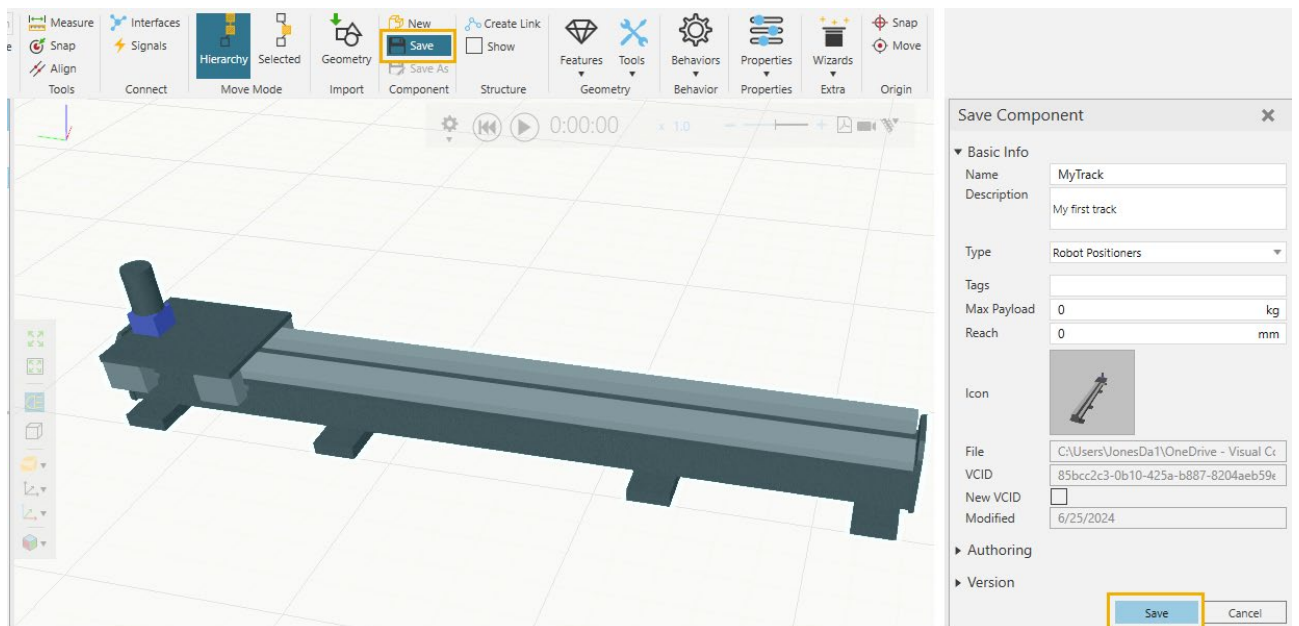
To do that, first select **Tools** from the ribbon and then **Assign**. And in the **Assign material** panel, select a material from the **Library** tab and assign it for the geometry by clicking the feature in the 3D view. And then click to **Close** the **Assign material** panel.



- Make sure the track carriage is moving correctly by selecting the **Interact** tool and jogging the carriage along the track in the 3D world.



9. And final step is to use the **Save** control to save the changes to the component.



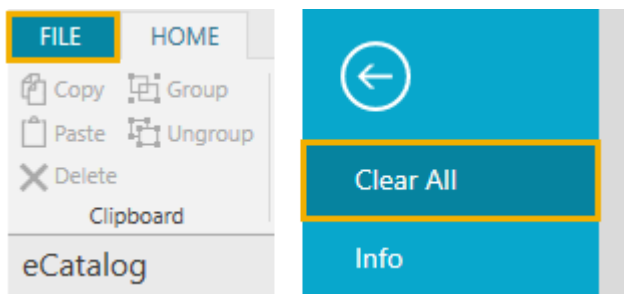
## Workpiece positioner

This is an exercise for modelling a 2-axis workpiece positioner from existing CAD geometry. The exercise is divided into the following sections:

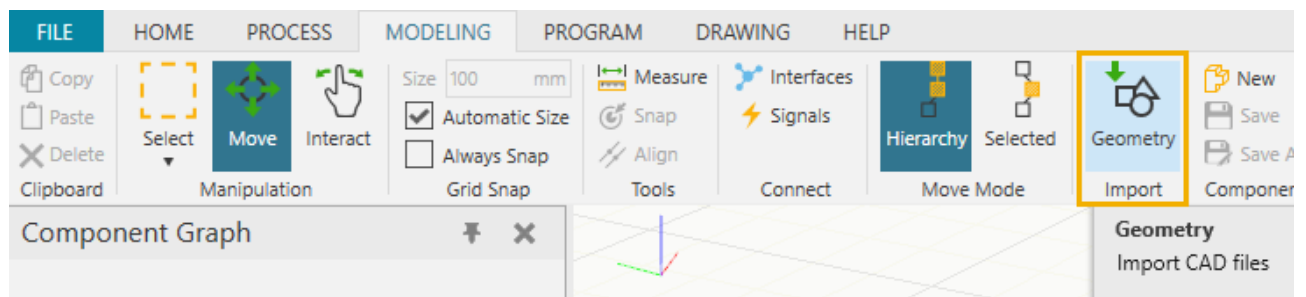
- Import Geometry
- Save component
- Create links
- Modify CAD data and add geometry to the links
- Finalize the workpiece positioner

### Import Geometry

1. First, open an empty layout or clear the 3D world by clicking **FILE** then **Clear All**.

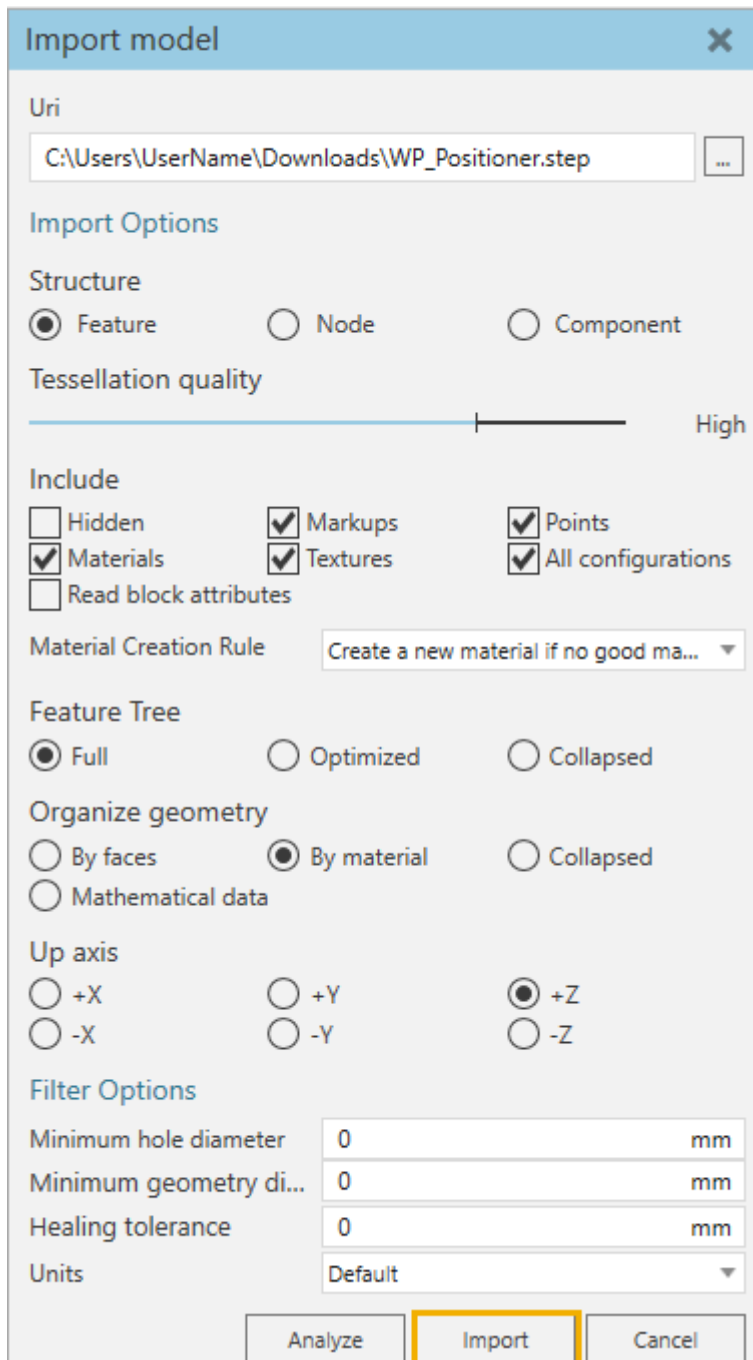


2. In the **MODELING** tab, import the geometry using the **Geometry** tool.



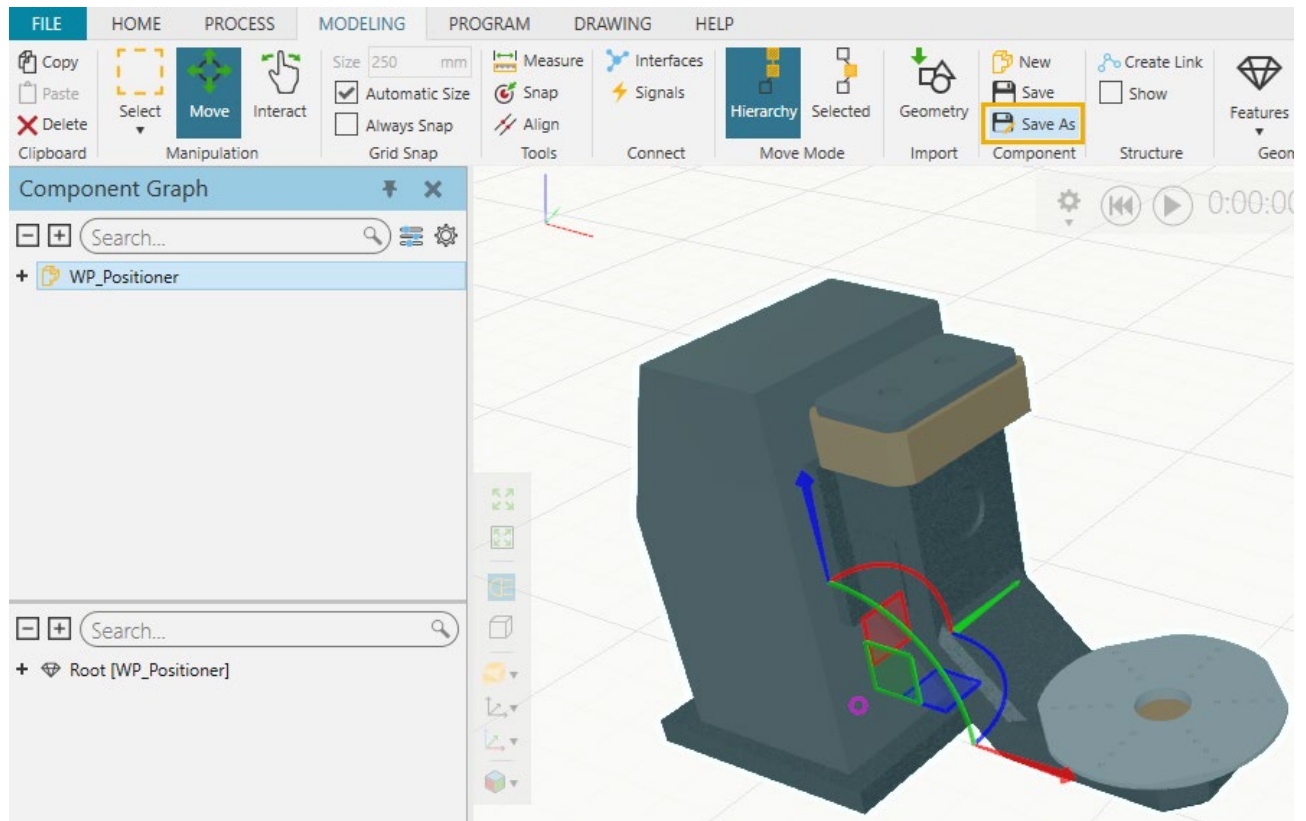
3. Select the *WP\_Positioner.step* file included with the downloads for this lesson and click **Open**.

- 4. Select suitable import settings in the **Import model** panel. These import settings are explained in detail in the Visual Components Help documentation. For this tutorial the settings pictured below are suitable. Then click **Import**.



## Save the component

1. In the **MODELING** tab, to save the component from the **Component** group in the ribbon, select **Save As**.



- 2. In the **Save Component As** panel, save the workpiece positioner component in the same manner as the robot positioner, except here the **Type** would be a **Workpiece Positioners**.

And then click **Save As** to save the file to your computer. For example, you could save it to your **My Models** folder so you can access it easily from the **eCatalog**.

The image shows a 'Save Component As' dialog box with the following fields and options:

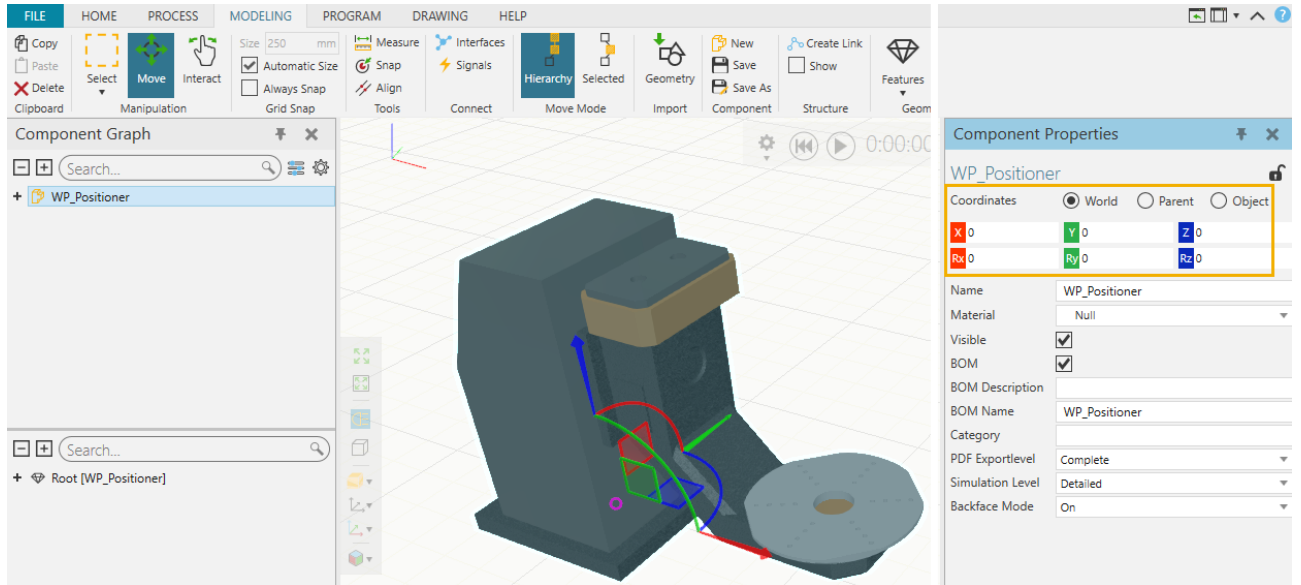
- Basic Info**
  - Name: WP\_Positioner
  - Description: My first positioner
  - Type: Workpiece positioners (highlighted in yellow)
  - Tags: (empty)
  - Max Payload: 0 kg
  - Reach: 0 mm
  - Icon: Preview Image
  - File: (empty)
  - VCID: (empty)
  - New VCID:
  - Modified: 7/1/2024
- Authoring**
  - Manufacturer: (empty)
  - Author: (empty)
  - Email: (empty)
  - Website: (empty)
  - Company Logo: Logo (with Change button)
- Version**
  - Revision: 1
  - Auto incremen...:
  - Is Deprecated:

Buttons: Save As (highlighted in yellow), Cancel

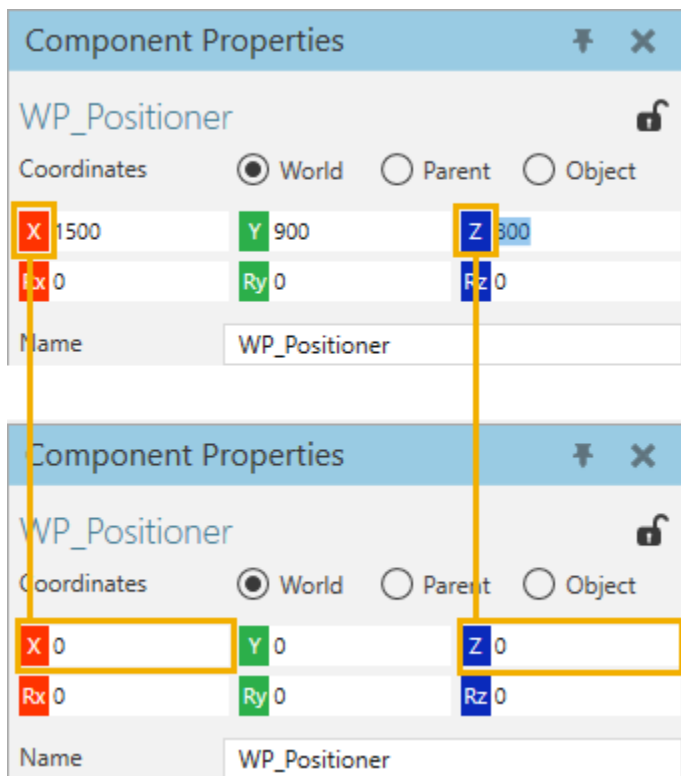


### Create the links

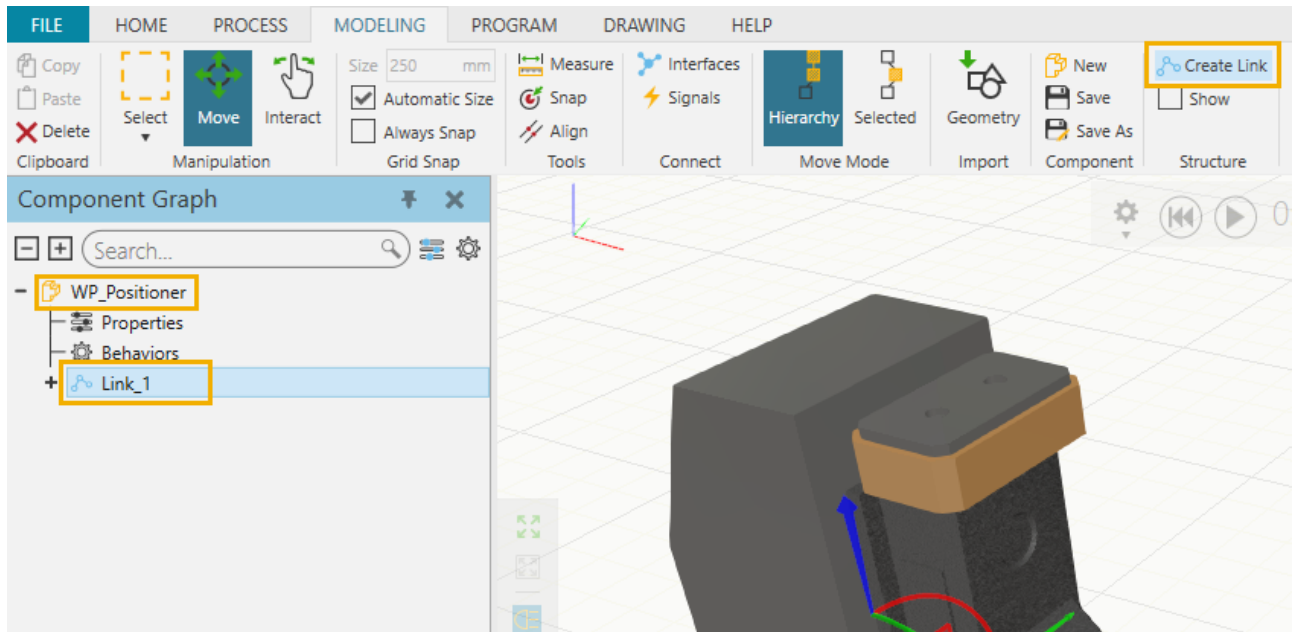
1. Before modifying the component, make sure it is at the origin of the 3D world. In the **MODELING** tab, selecting the **WP\_Positioner** component and in its **Component Properties** on the right, set all X, Y and Z **Coordinates** to **0** in **World** coordinates.



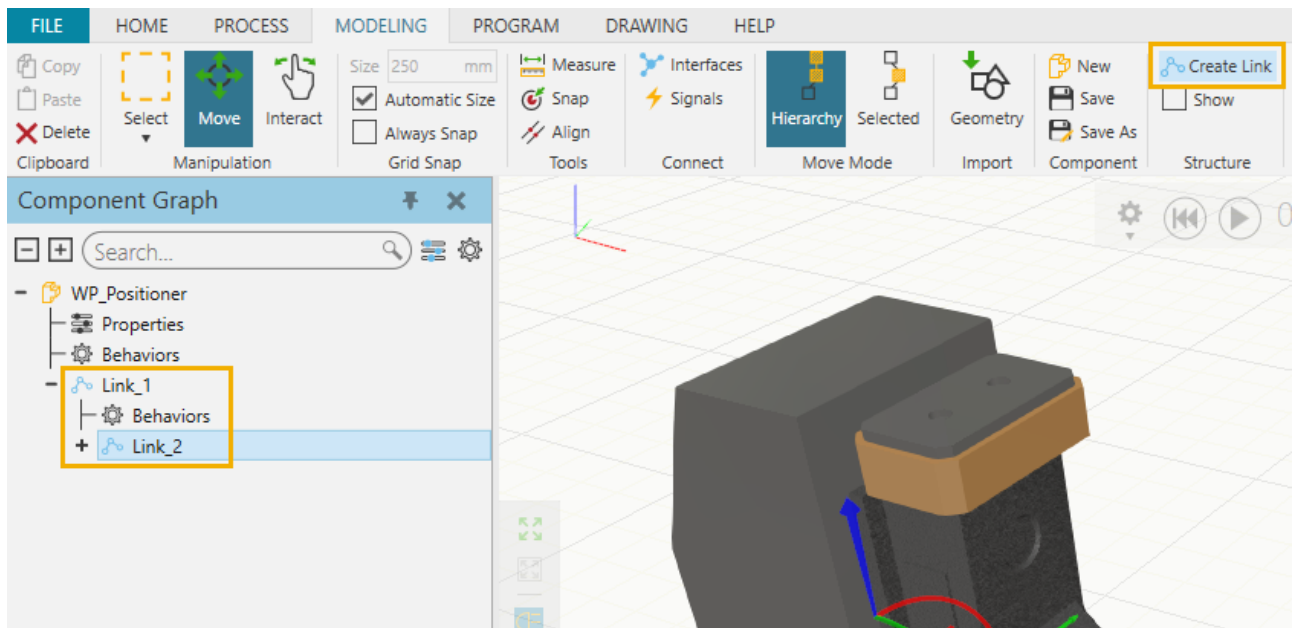
**Tip!** To quickly reset the **Coordinates** to **0**, you can click on the red X, green Y or blue Z axis controls.



- From the **Component Graph** on the left, select the **WP\_Positioner** component and then from the **Structure** group in the ribbon, click **Create link** which will create a new **Link\_1**.

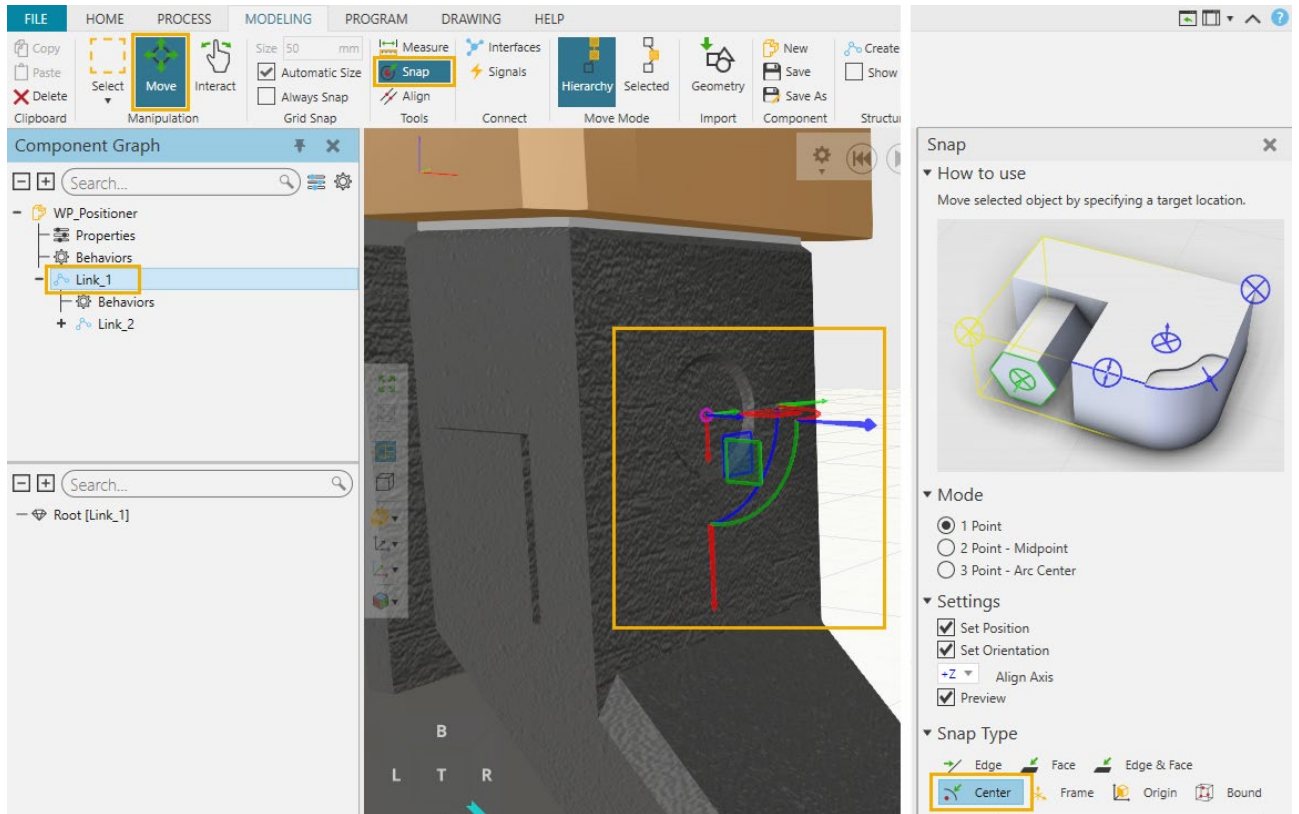


- And then with the **Link\_1** selected, click **Create link** again to create another link **Link\_2** inside **Link\_1**.

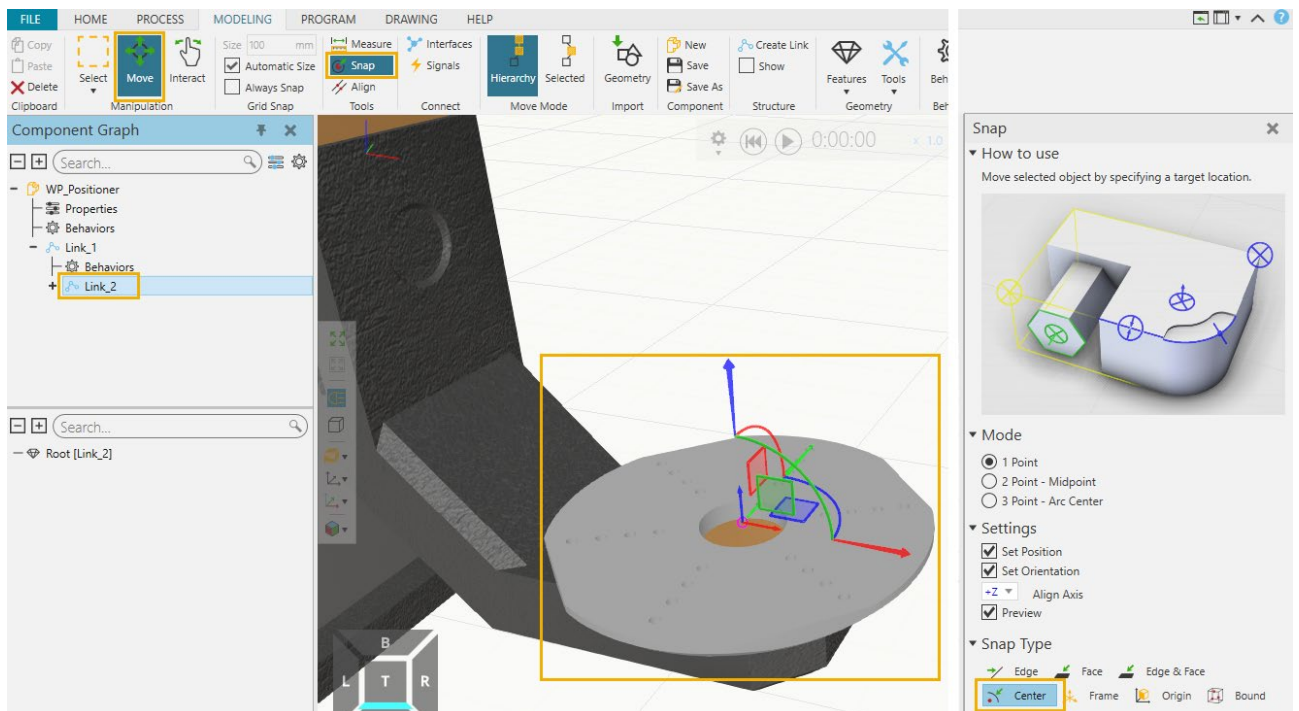


4. Select the **Link\_1** we created in the Component Node Tree on the left and then select the **Move** tool from the **Manipulation** group in the ribbon and use the **Snap** tool to snap the position of the link to the first joint of positioner.

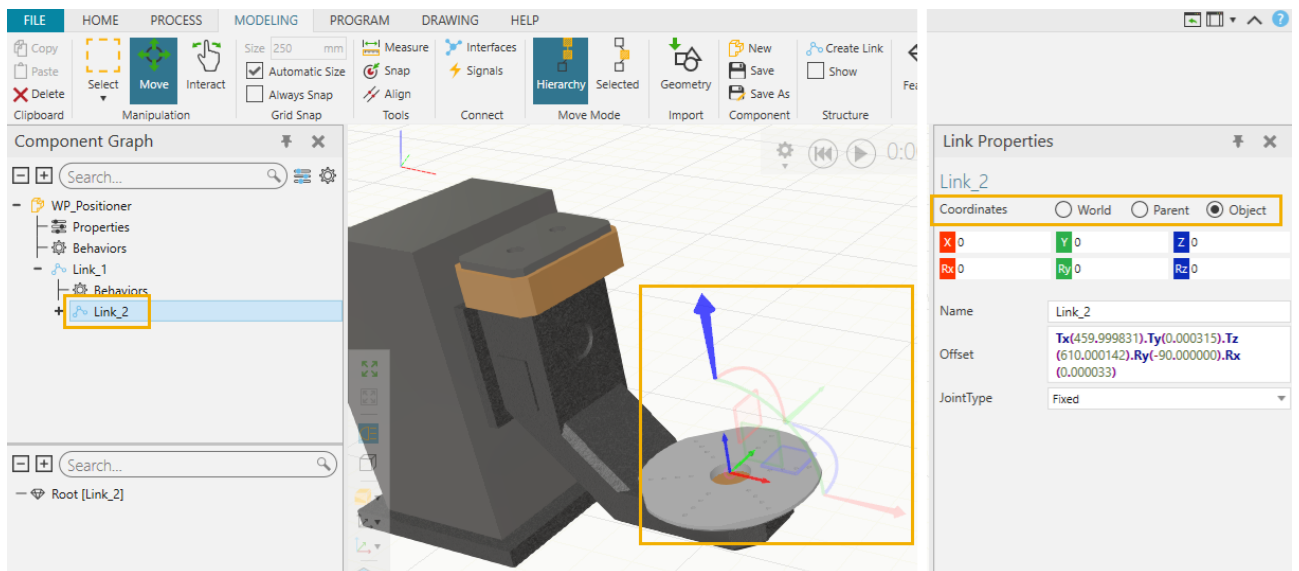
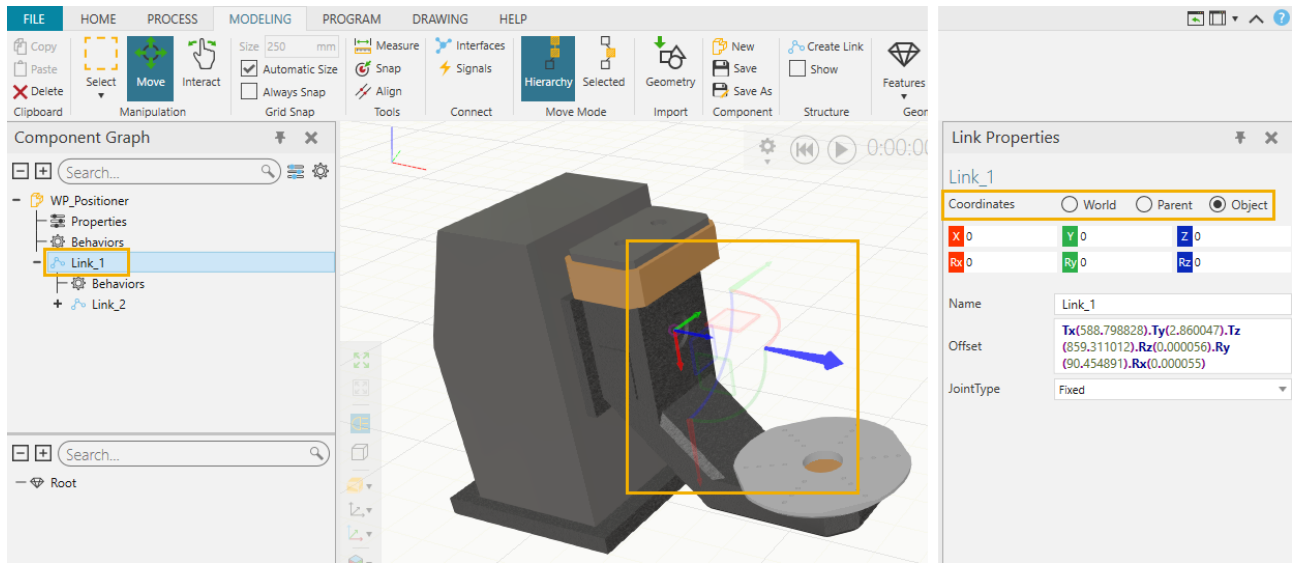
**Tip!** To quickly snap to the center of the link try selecting the **Snap Type** as **Center**.



5. Then select **Link\_2** and using the **Snap** tool again, snap the position of the link to the center of the workpiece positioner plate.



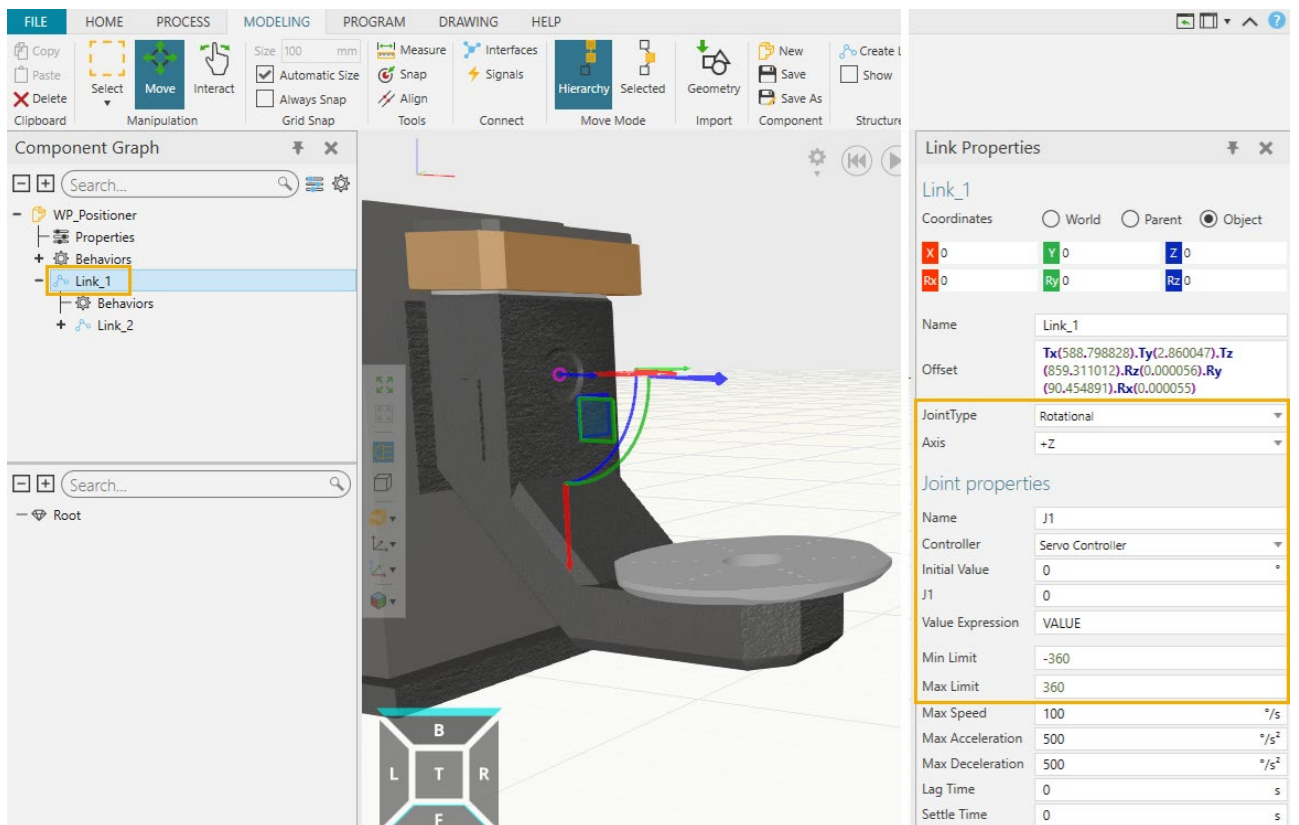
6. With **Coordinates** set to **Object** in the **Link Properties** on the right. We must make sure that **Link\_1** and **Link\_2** are oriented so that both axes rotate around their Z-axis.



7. With **Link\_1** selected, in its **Link Properties** on the right, the following properties should be set:

- Set **JointType** to **Rotational**.
- Set the **Axis** to **+Z**.
- Set the **Controller** to **New Servo Controller** which creates a **Servo Controller**.
- Set the **Min Limit** to **-360** and **Max Limit** to **360**.

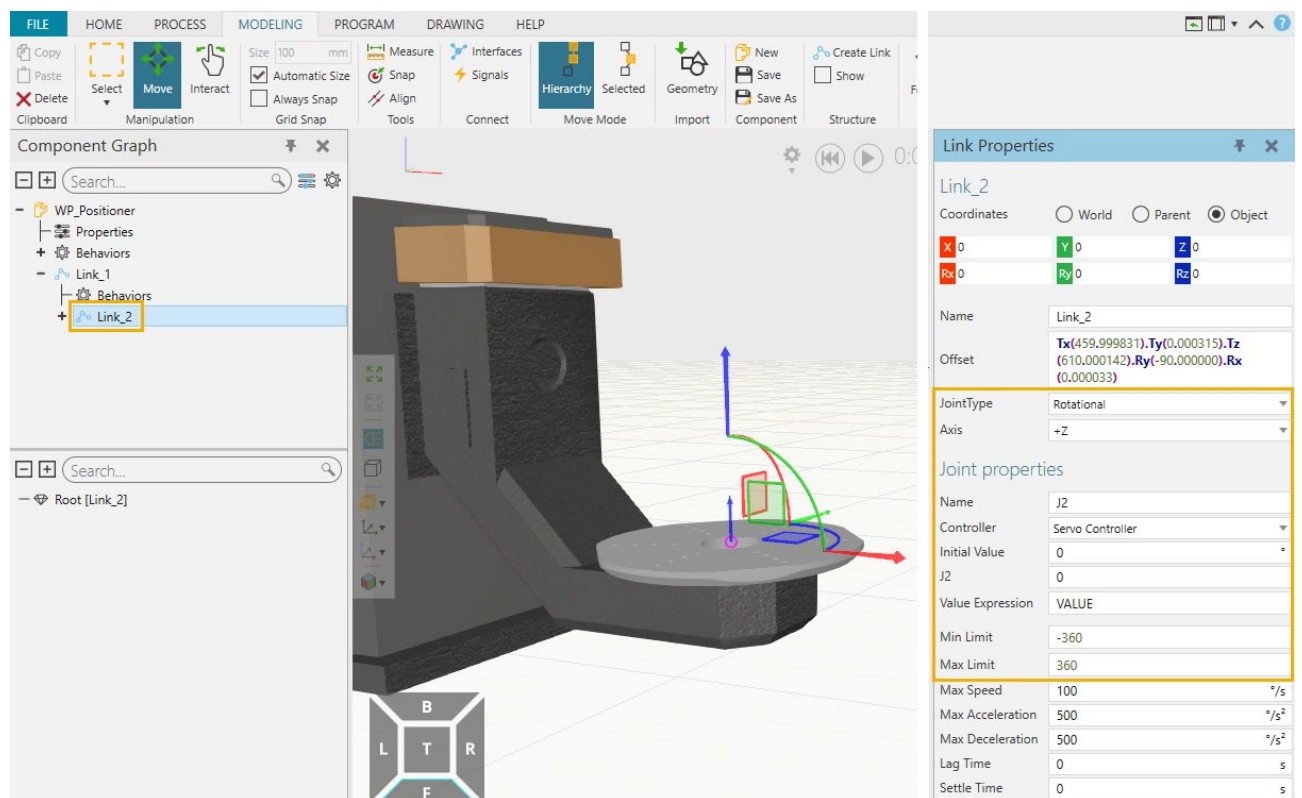
**Note:** When modelling a real component, the limits are checked from the specifications or from the robot teach pendant.



8. Then with **Link\_2** selected, in the **Link Properties** on the right, the following properties should be set:

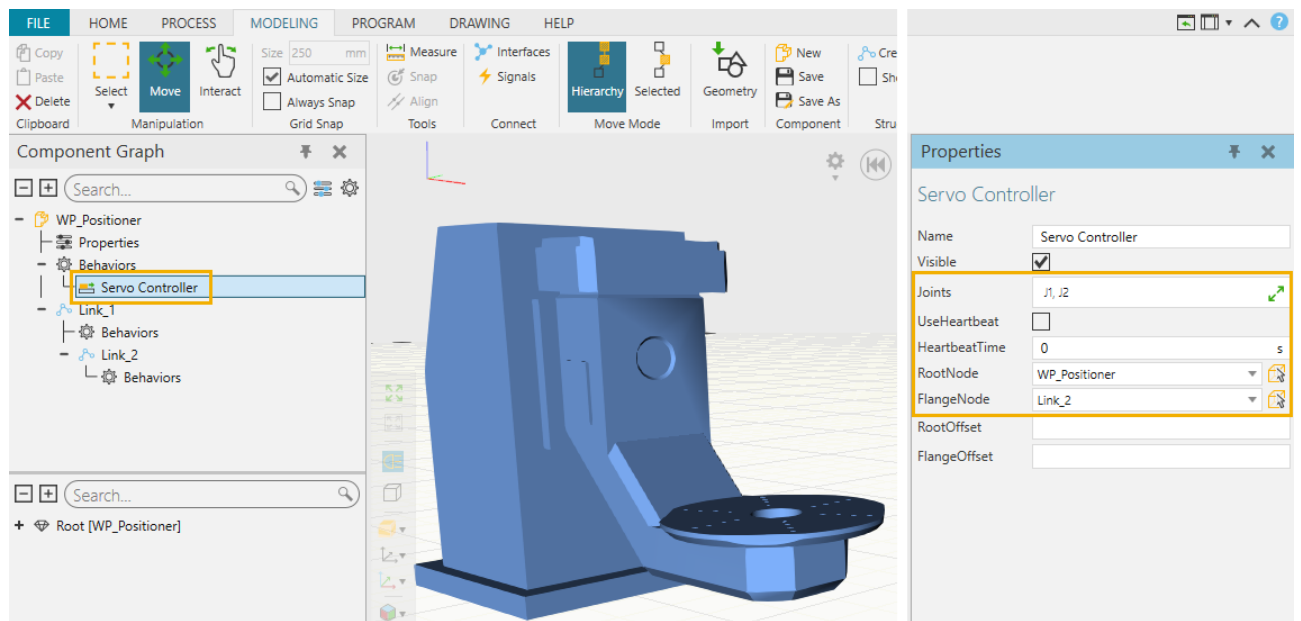
**Note:** For **Link\_2** we will just select the **Server Controller** we already created for **Link\_1**.

- Set **JointType** to **Rotational**.
- Set the **Axis** to **+Z**.
- Set the **Controller** to **Servo Controller**.
- Set the **Min Limit** to **-360** and **Max Limit** to **360**.



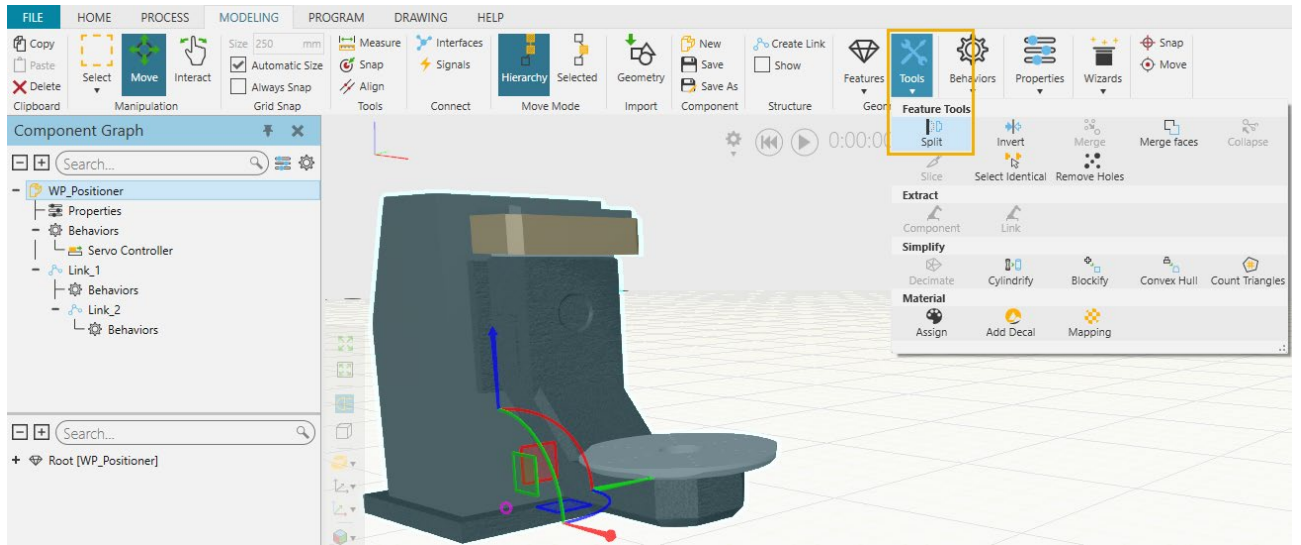
9. From the **Component Graph** on the left, in the Component Node Tree under **Behaviors** select the **Servo Controller** that we created and make sure that in its **Properties** panel the following properties are set:

- **Joints** is **J1, J2**.  
**Note:** If Joints **J1, J2** do not appear, click the green arrows and use the **Add/Remove items** control.
- **RootNode** is **WP\_Positioner** (Component name).
- **FlangeNode** is **Link\_2**.

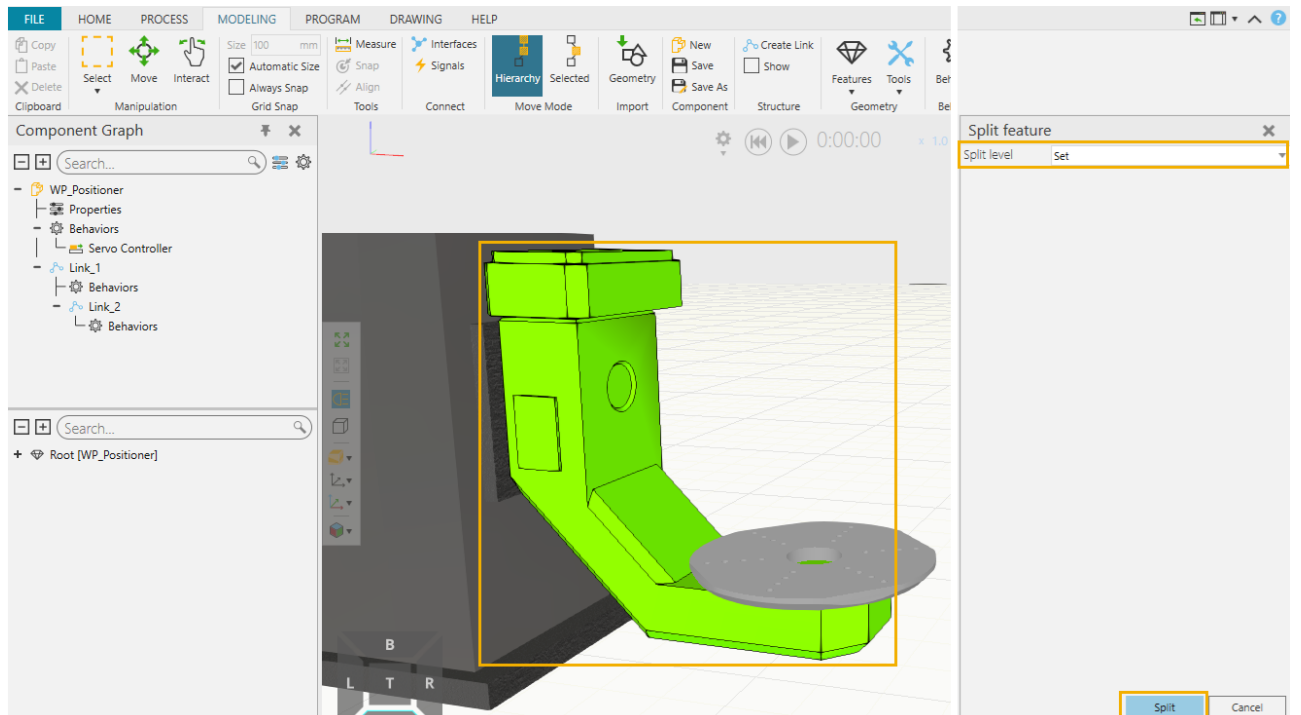


### Modify CAD data and add geometry to the link

1. To create the geometry for the moving links, we must split the geometry. So in the **MODELING** tab, from the **Tools** menu select **Split**.

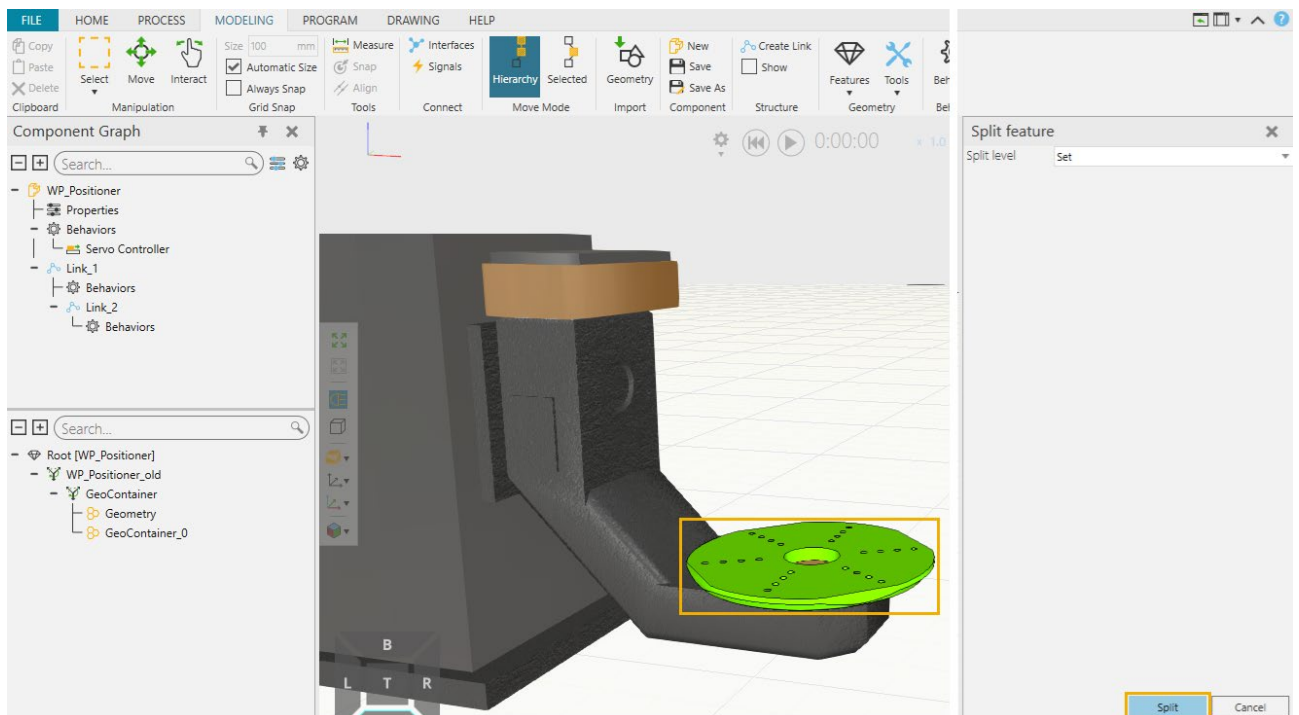


2. In the **Split feature** panel, set the **Split level** as **Set**.
3. Then beginning with the geometry for **Link\_1**, in the 3D world view holding the CTRL key, multiselect the required geometry parts that are moved. Then click **Split** from the base of **Split feature** panel.





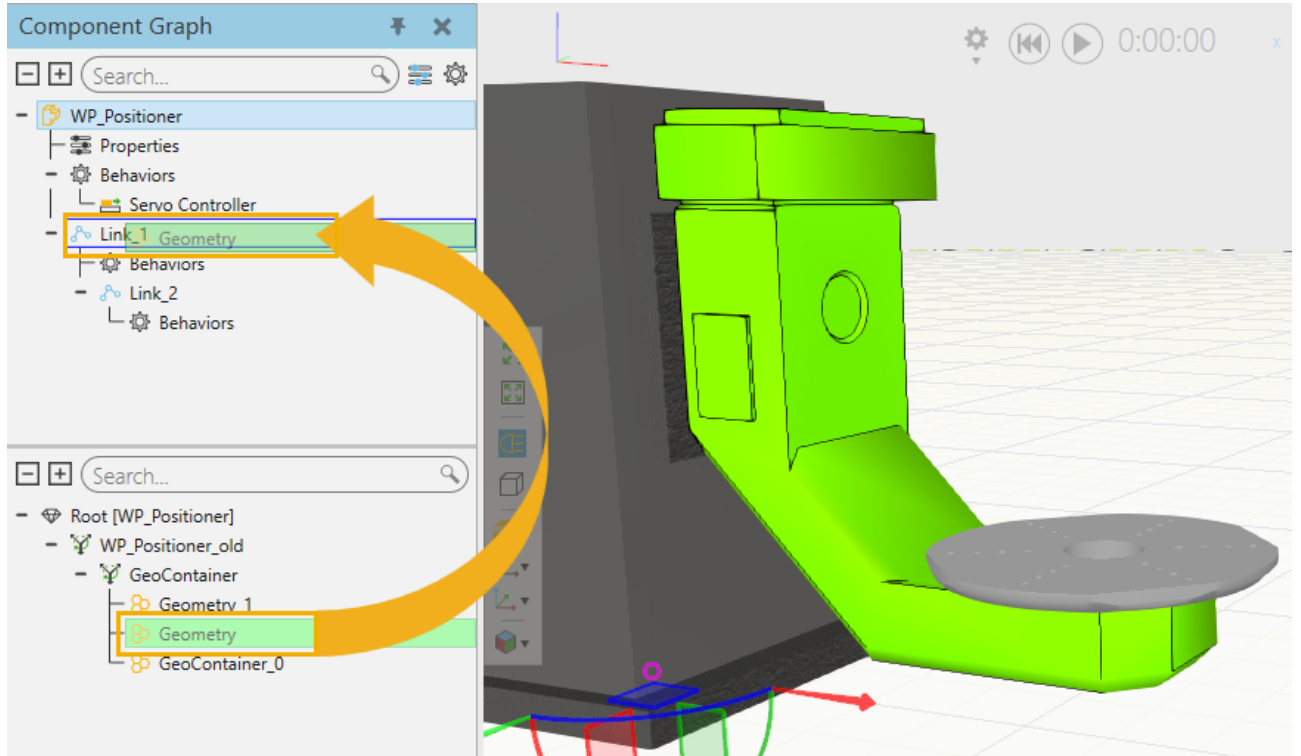
#### 4. Then we will do the same for the geometry for **Link\_2**.



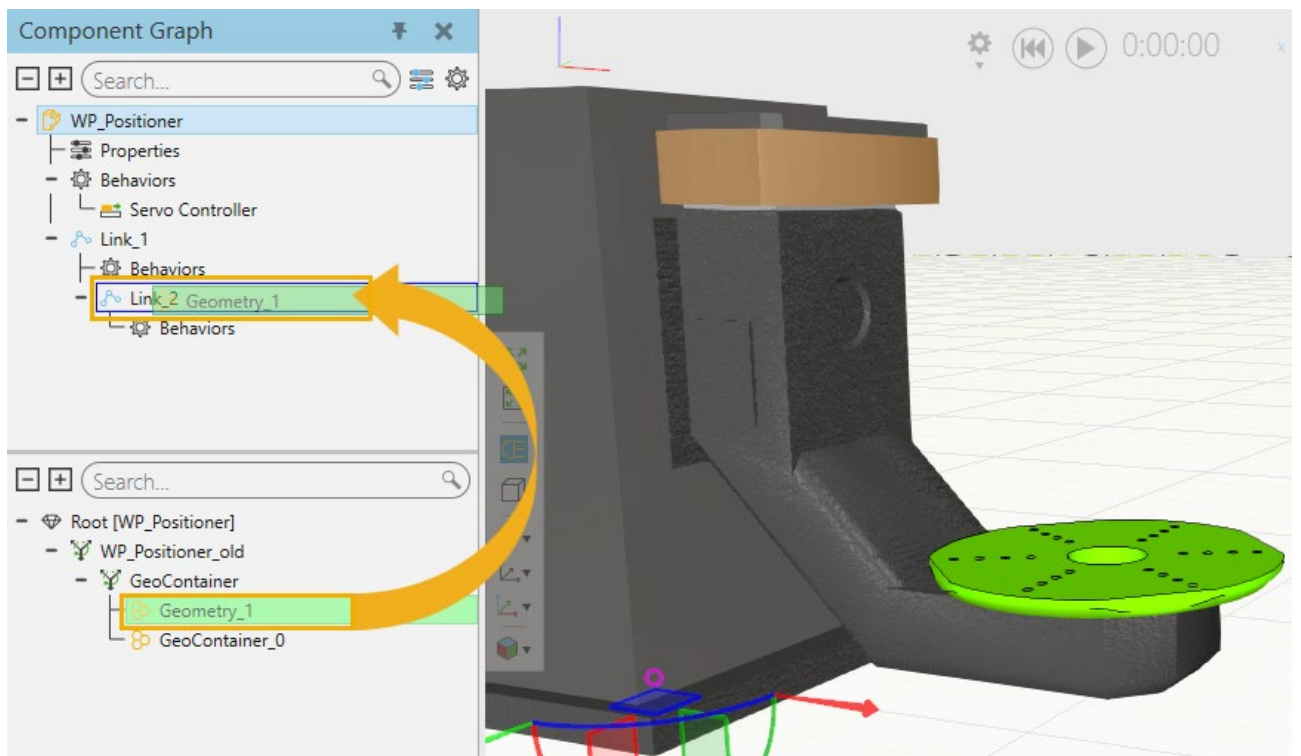
**Tip!** Other useful tools that are sometimes needed for modifying the CAD model are **Explode** and **Slice**. See the Visual Components Help documentation for more information on these tools.

- 5. In the **Component Graph** on the left we should drag the separated geometries up from the Node Feature Tree to the Component Node Tree under **Link\_1** and **Link\_2**.

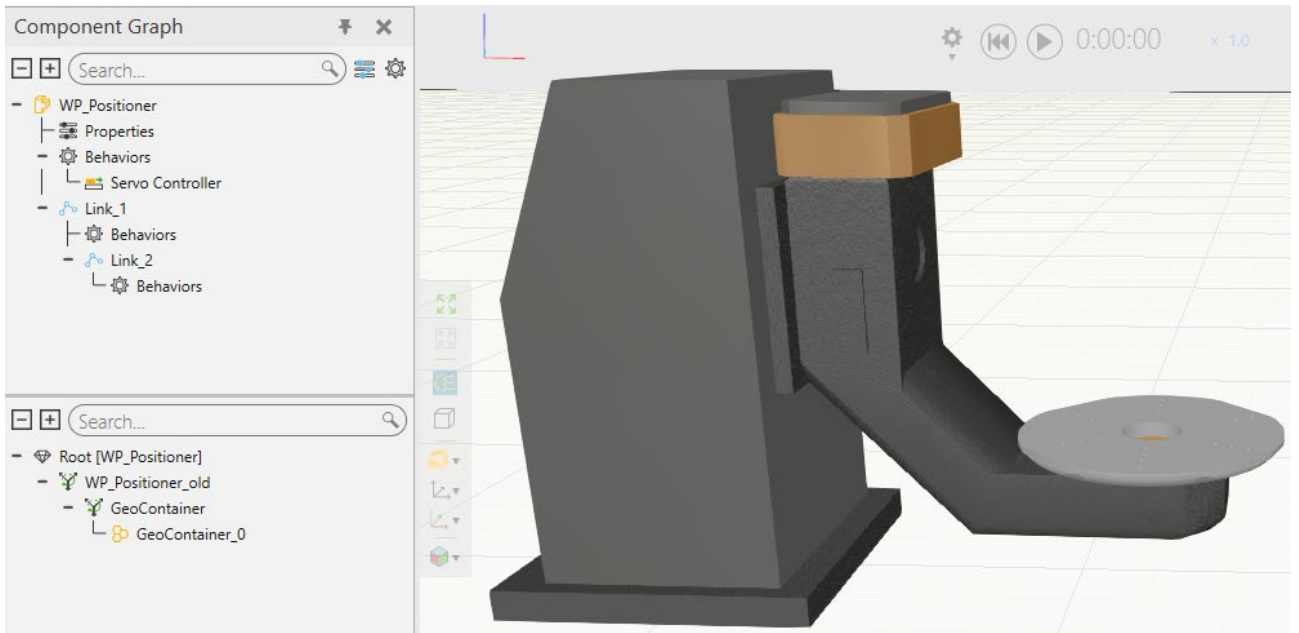
Holding the Shift key, left mouse click on **Geometry** and drag it up placing it under **Link\_1**.



And holding the Shift key, left mouse click on **Geometry\_1** and drag it up placing it under **Link\_2**.



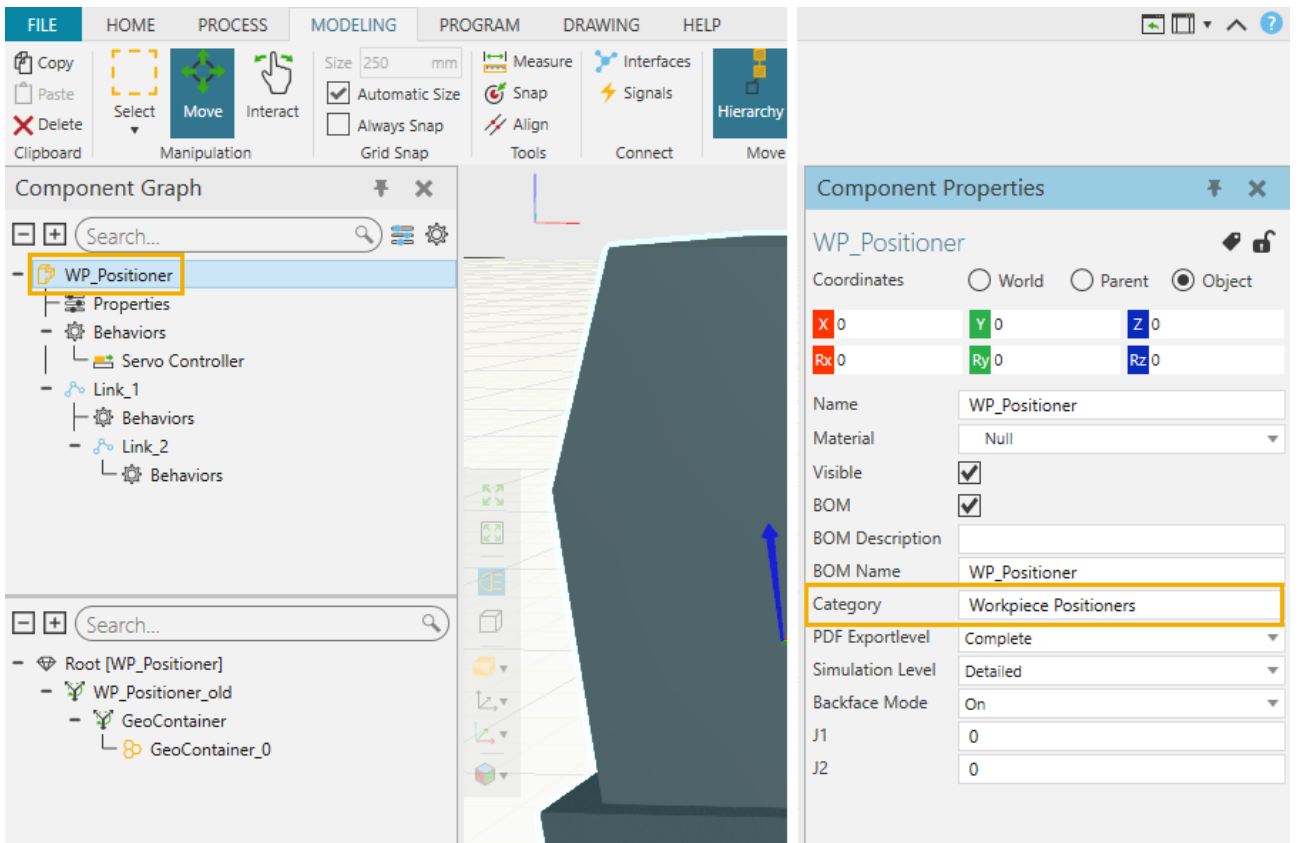
6. After that the **Component Graph** should appear as in the image below.



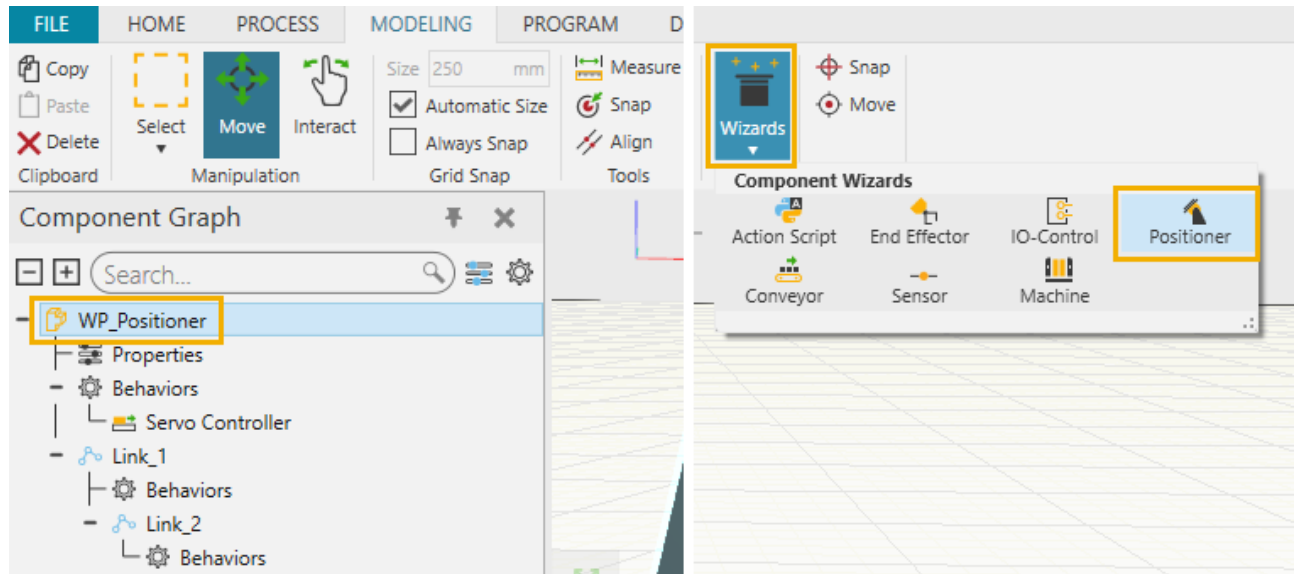
**Finalize the workpiece positioner**

1. In the **MODELING** tab, selecting the **WP\_Positioner** component and from its **Component Properties** over on the right, set the **Category** as **Workpiece Positioners**.

**Note:** This is required for the Robotics OLP product to recognize the component as a Workpiece Positioner.



- Next select the **WP\_Positioner** component and selecting **Wizards** from the ribbon choose **Positioner**.

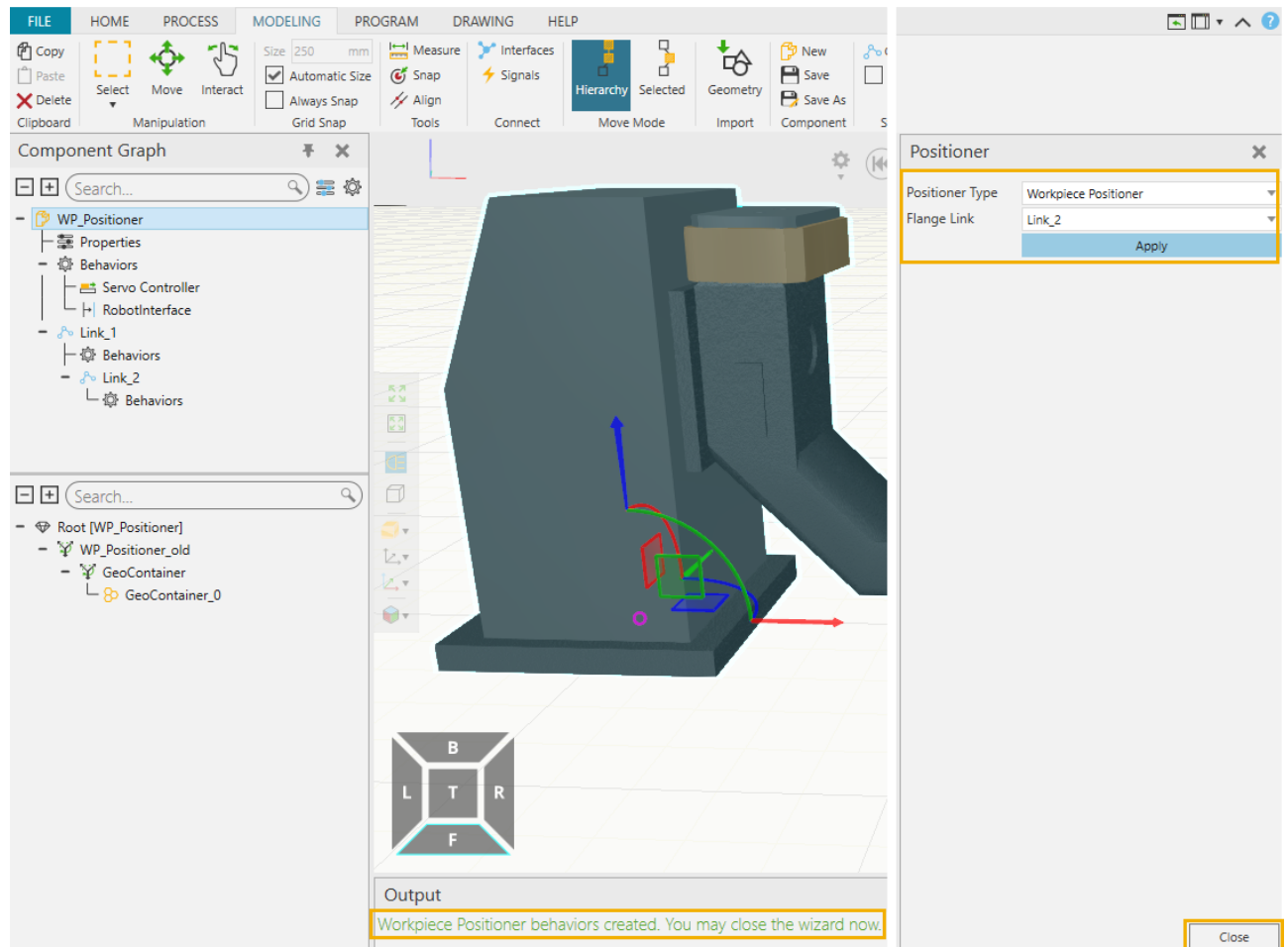


3. In the **Positioner** panel, set the following properties:

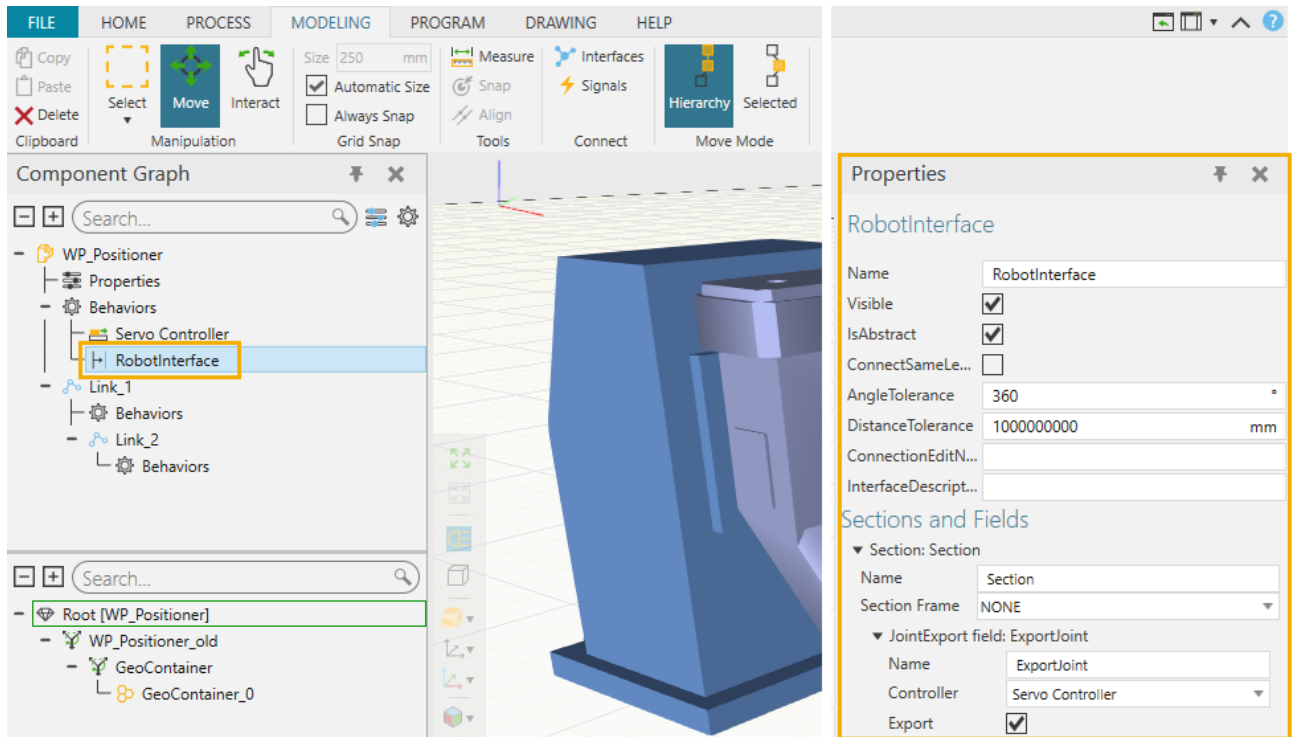
- **Positioner Type** to **Workpiece Positioner**.
- **Flange Link** to **Link\_2**.

and then click **Apply**.

When the **Output** panel below states *Robot Positioner behaviors created*. You may close the wizard now you can then click **Close** in the lower right corner to close the **Positioner** wizard.

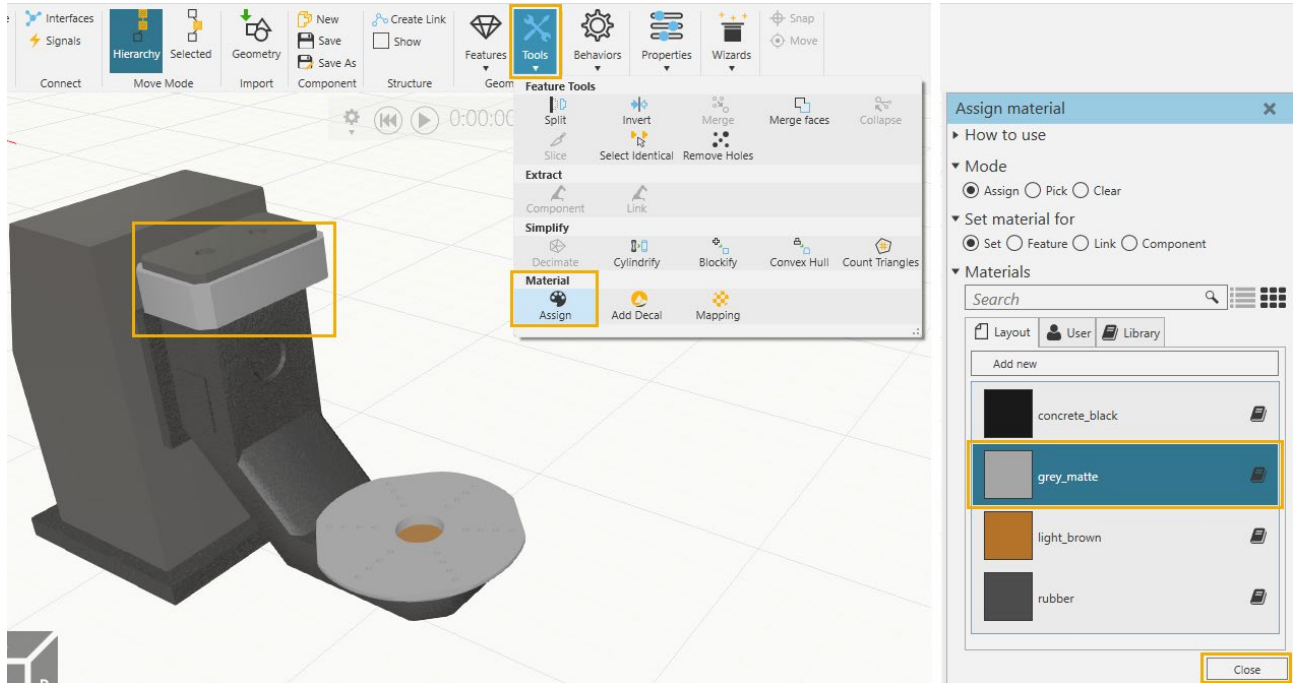


The wizard creates a **RobotInterface** behavior with MountFrame. The **Properties** of the **RobotInterface** should be similar to the image below.

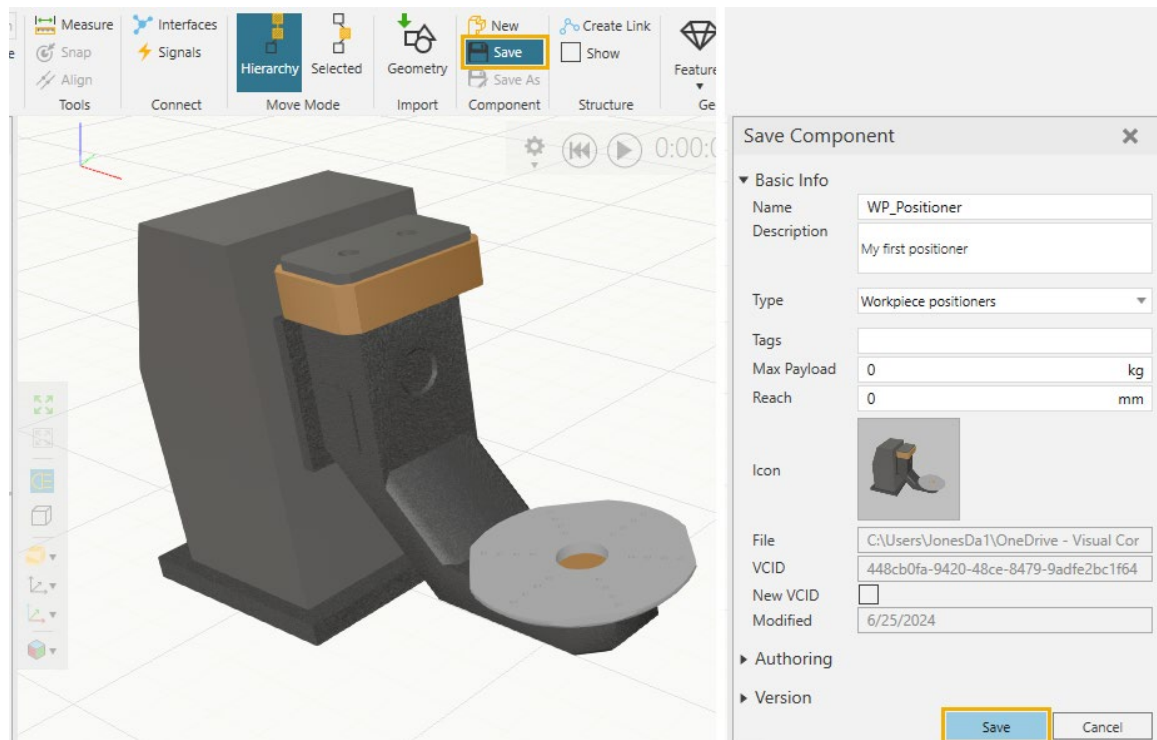


- 4. In this example the imported workpiece positioner component already has materials assigned to it. If materials are not present, then you may assign materials to the component.

To do that select **Tools** from the ribbon and then **Assign**. And in the **Assign material** panel, select a material from the **Library** tab and assign it for the geometry by clicking the feature in the 3D view. And click to **Close** the **Assign material** panel.



- 5. And the final step is to use the **Save** control to save the changes to the component.



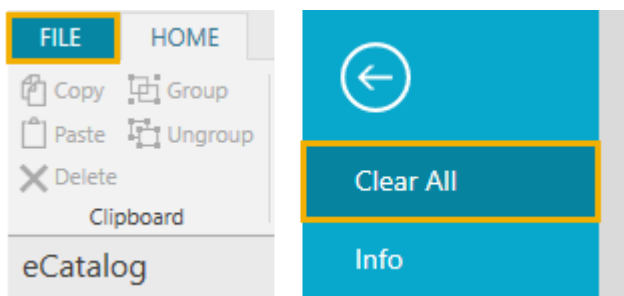
## Welding torch

This is an exercise for modelling a basic welding torch from existing CAD geometry. For the basic welding torch, we only need to model one link for the wire in order to have the wire separated in the collision detection. This exercise is divided into following sections:

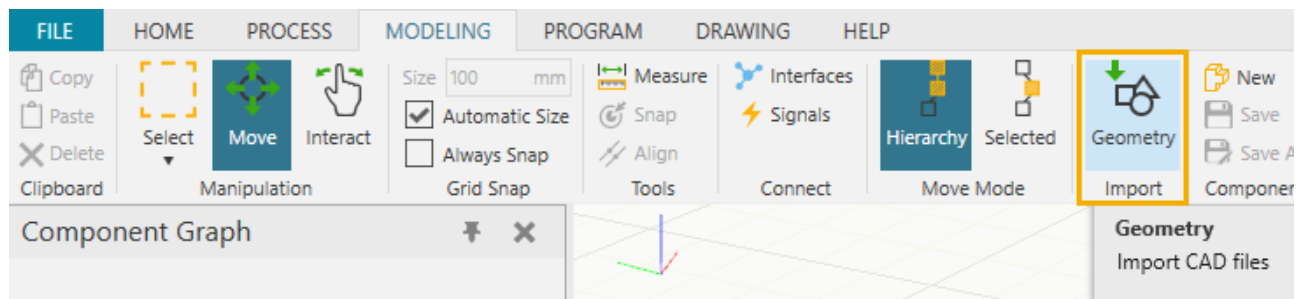
- Import Geometry
- Save component
- Create link for wire
- Modify the CAD geometry, model a new wire and add it to link

### Import Geometry

1. First, open an empty layout or clear the 3D world by clicking **FILE > Clear All**.



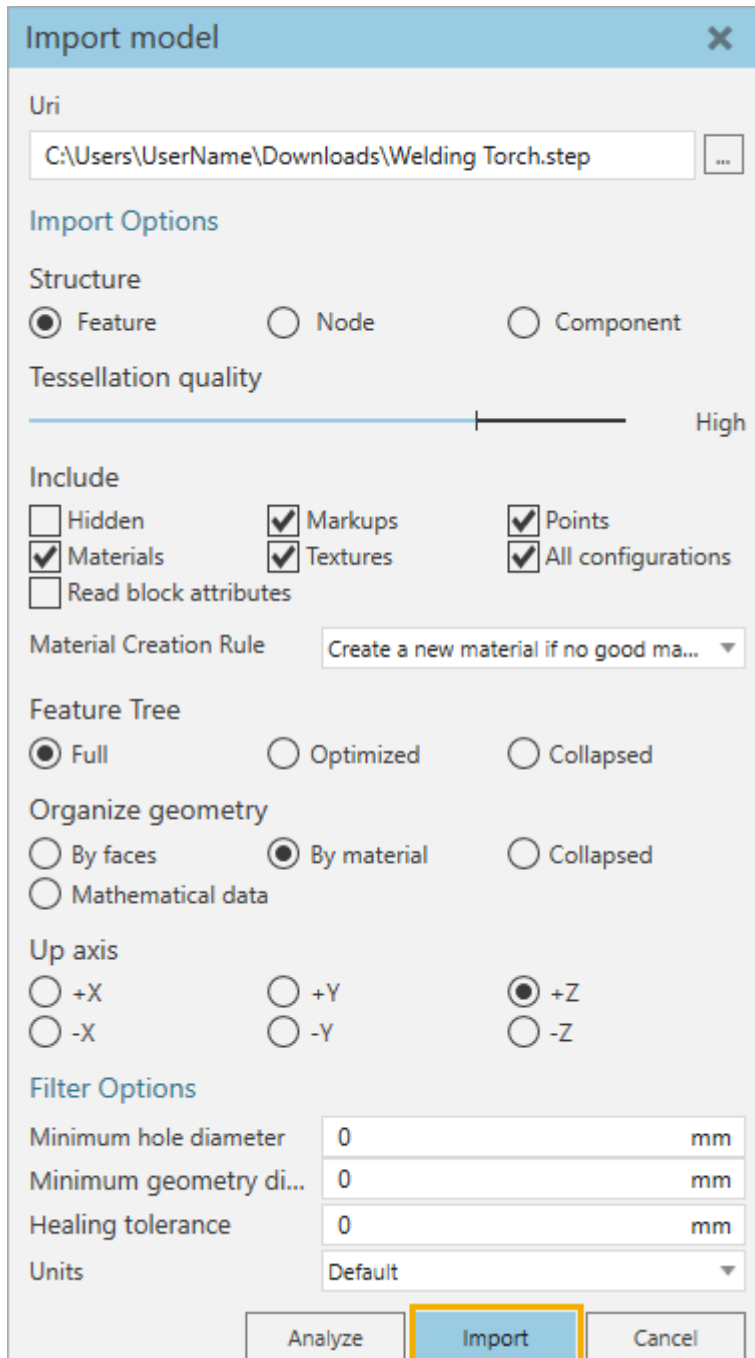
2. In the **MODELING** tab, import the geometry using the **Geometry** tool.



3. Select the *Welding Torch.step* file included with the downloads for this lesson and click **Open**.

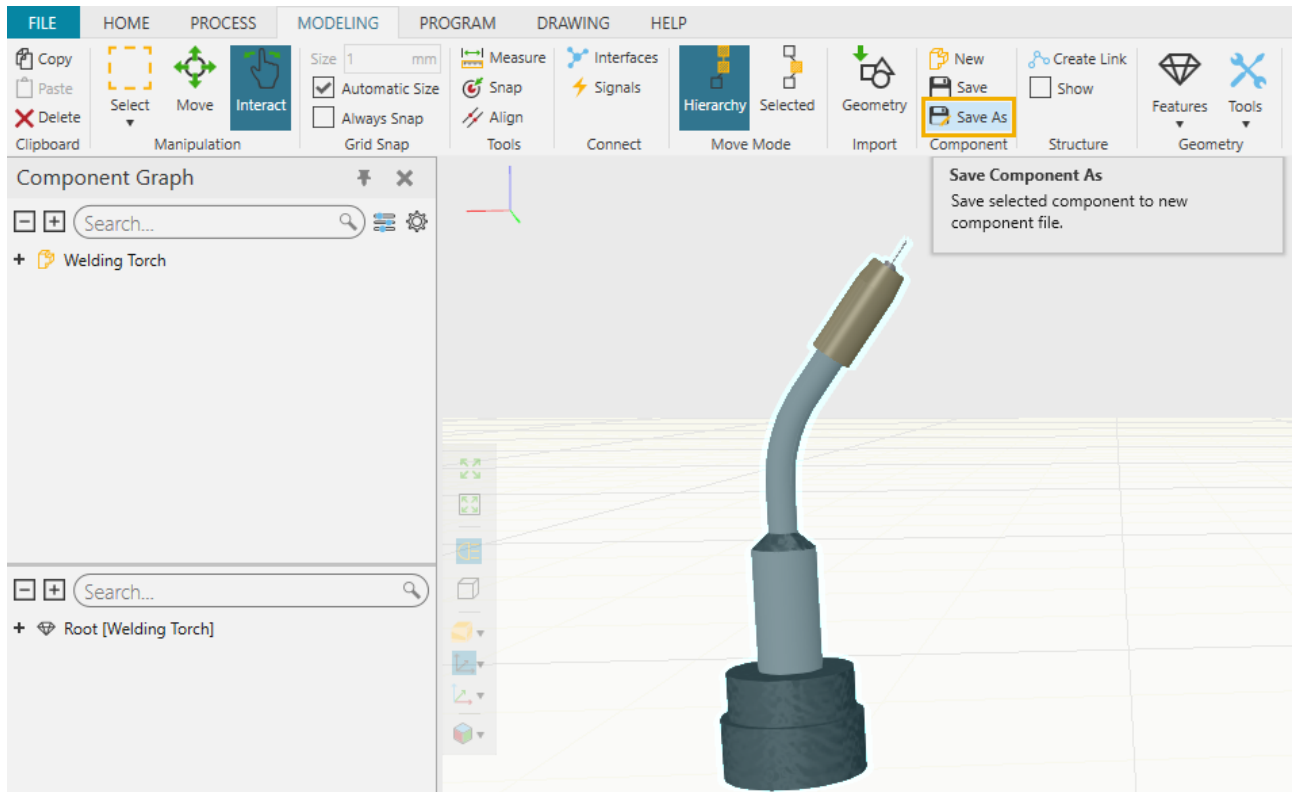


- 4. Select suitable import settings in the **Import model** panel. These import settings are explained in detail in the Visual Components Help documentation. For this tutorial the settings pictured below are suitable. Then click **Import**.



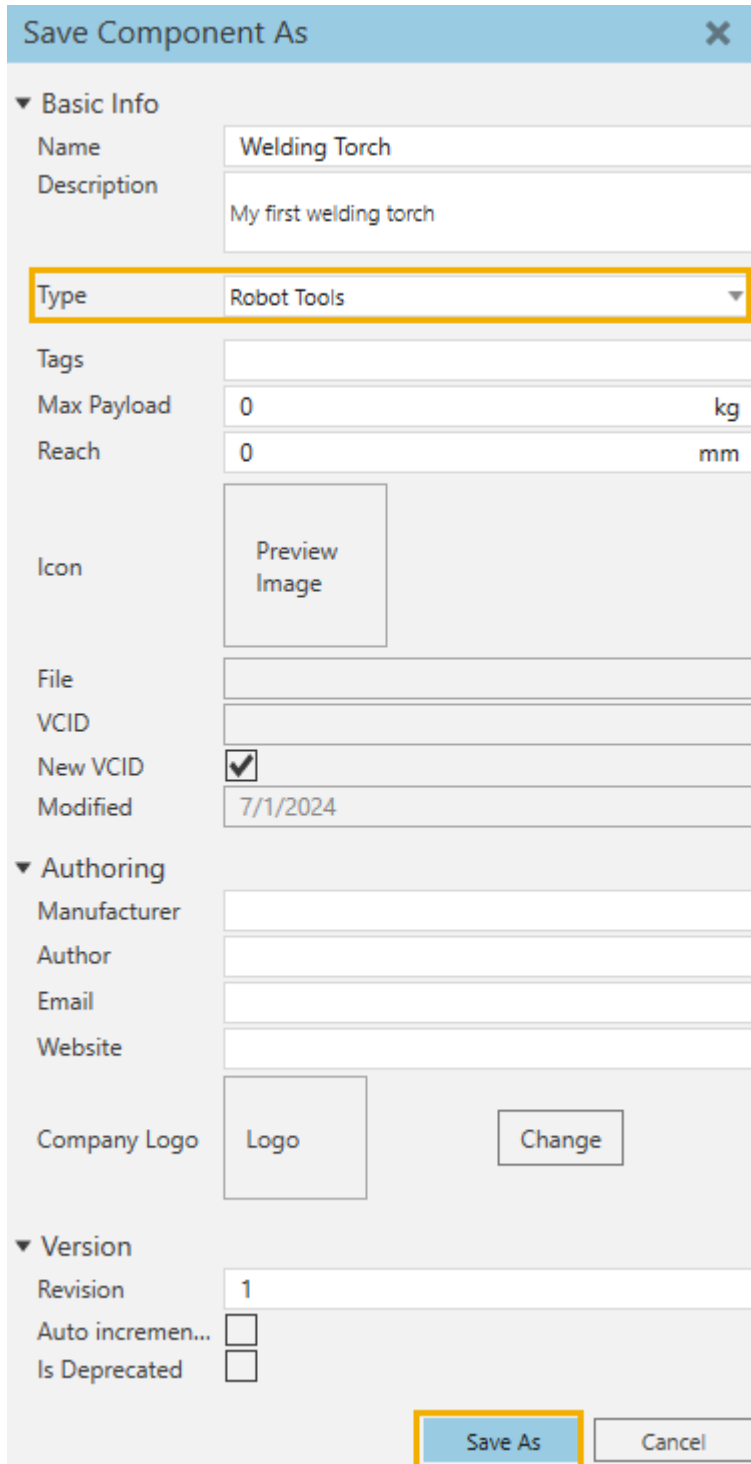
## Save the component

1. In the **MODELING** tab, to save the component from the **Component** group, select **Save As**.



2. In the **Save Component As** panel, save the welding torch component in the same manner as the previous components, except here the **Type** would be **Tools** or **Robot Tools**.

And then click **Save As** to save the file to your computer. For example, you could save it to your **My Models** folder so you can access it easily from the **eCatalog**.



**Save Component As** [X]

▼ Basic Info

Name: Welding Torch

Description: My first welding torch

Type: Robot Tools

Tags: [ ]

Max Payload: 0 kg

Reach: 0 mm

Icon: Preview Image

File: [ ]

VCID: [ ]

New VCID:

Modified: 7/1/2024

▼ Authoring

Manufacturer: [ ]

Author: [ ]

Email: [ ]

Website: [ ]

Company Logo: Logo [Change]

▼ Version

Revision: 1

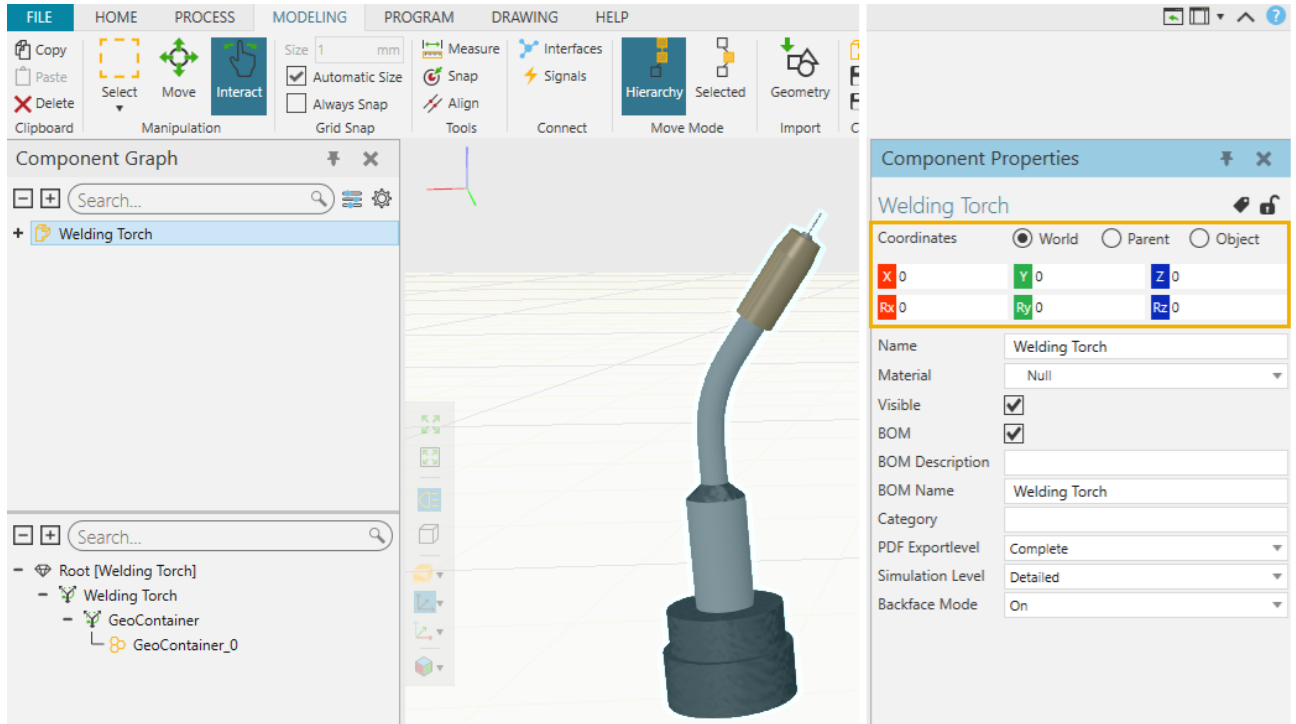
Auto incremen...:

Is Deprecated:

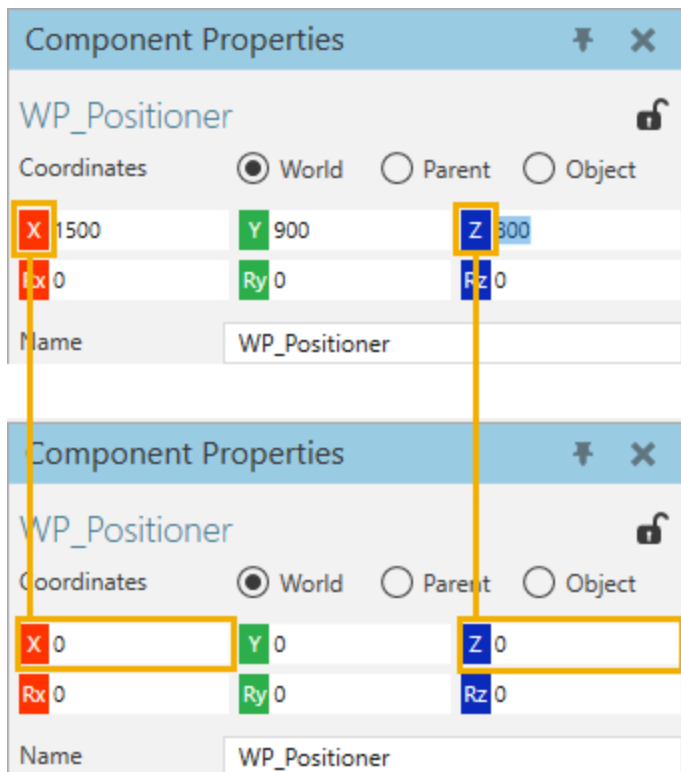
[Save As] [Cancel]

### Create link for wire

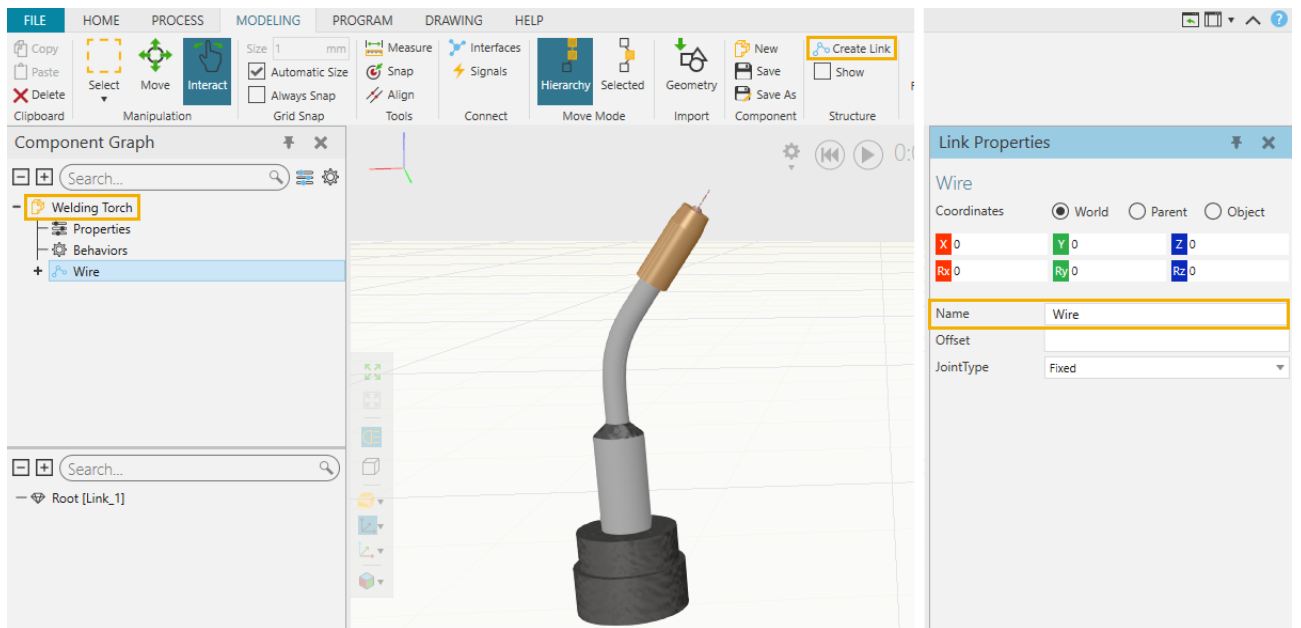
1. In the **MODELING** tab, before modifying the component, make sure it is at the origin of the 3D world. Select the whole component and in **Component Properties** on the right, set all **Coordinates** to **0** in **World** coordinates.



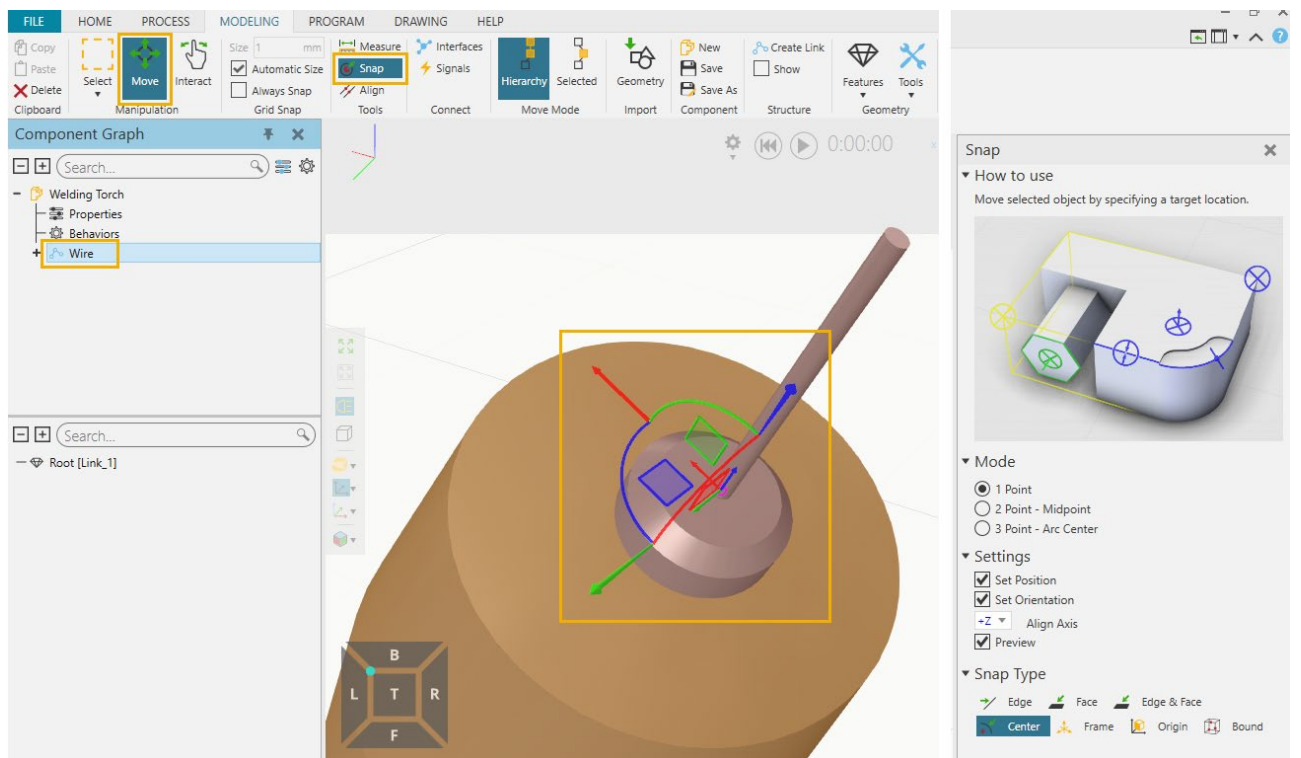
**Tip!** To quickly reset the **Coordinates** to **0**, you can click on the red X, green Y or blue Z axis controls.



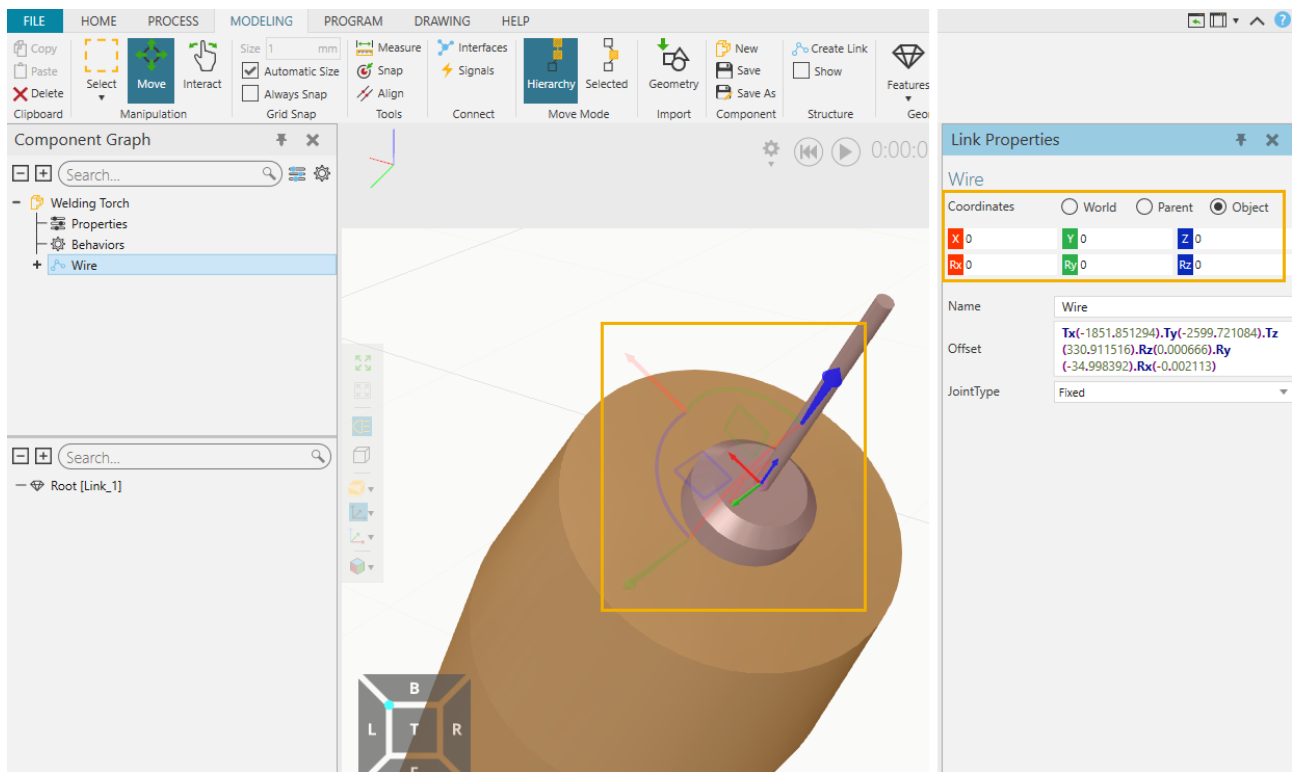
- From the **Component Graph** on the left, select the **Welding Torch** component in the Component Node and then from the **Structure** group in the ribbon, click **Create link** and name the link **Wire**.



- Select the **Wire** link on the left, then select the **Move** tool from the **Manipulation** group and use the **Snap** tool to snap the position of the center point of the base of the wire.



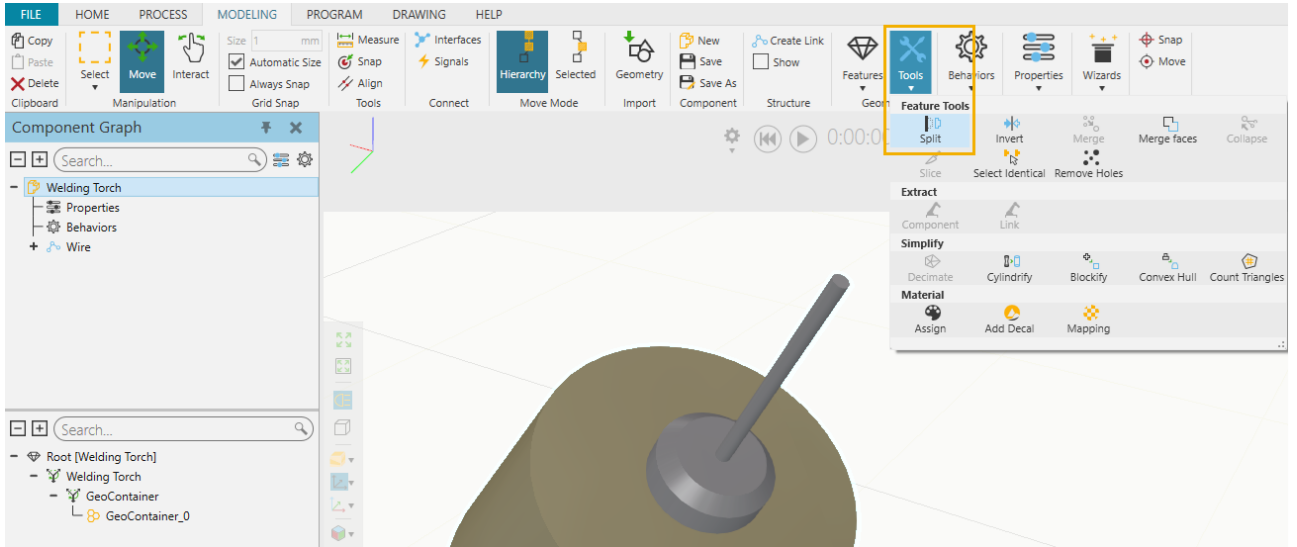
4. With **Coordinates** set to **Object** in the **Link Properties** on the right, we must make sure that the link is oriented so that the Z-axis is pointing upwards.



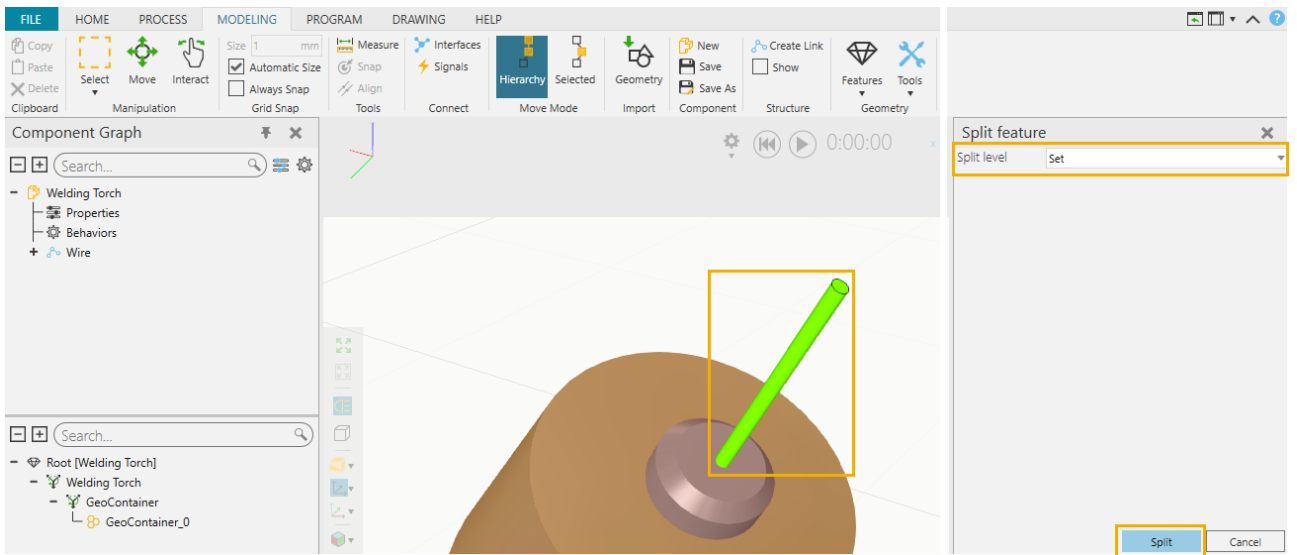
### Modify CAD geometry, model a new wire and add it to a link

In welding, we sometimes need to change the length of the wire. And to modify the dimensions of the wire in the model as well, we need to model the wire again.

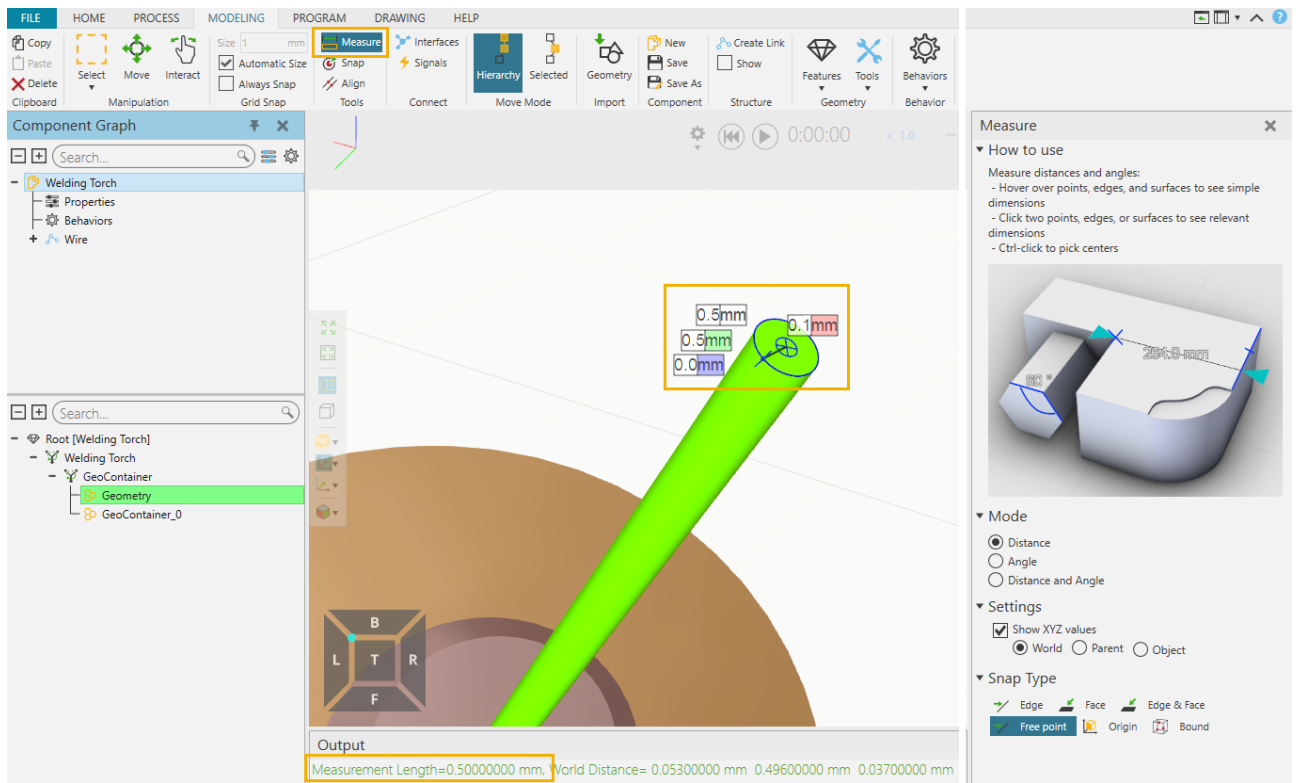
1. In the **MODELING** tab, to first separate the wire from the torch, from the **Tools** menu in the ribbon select **Split**.



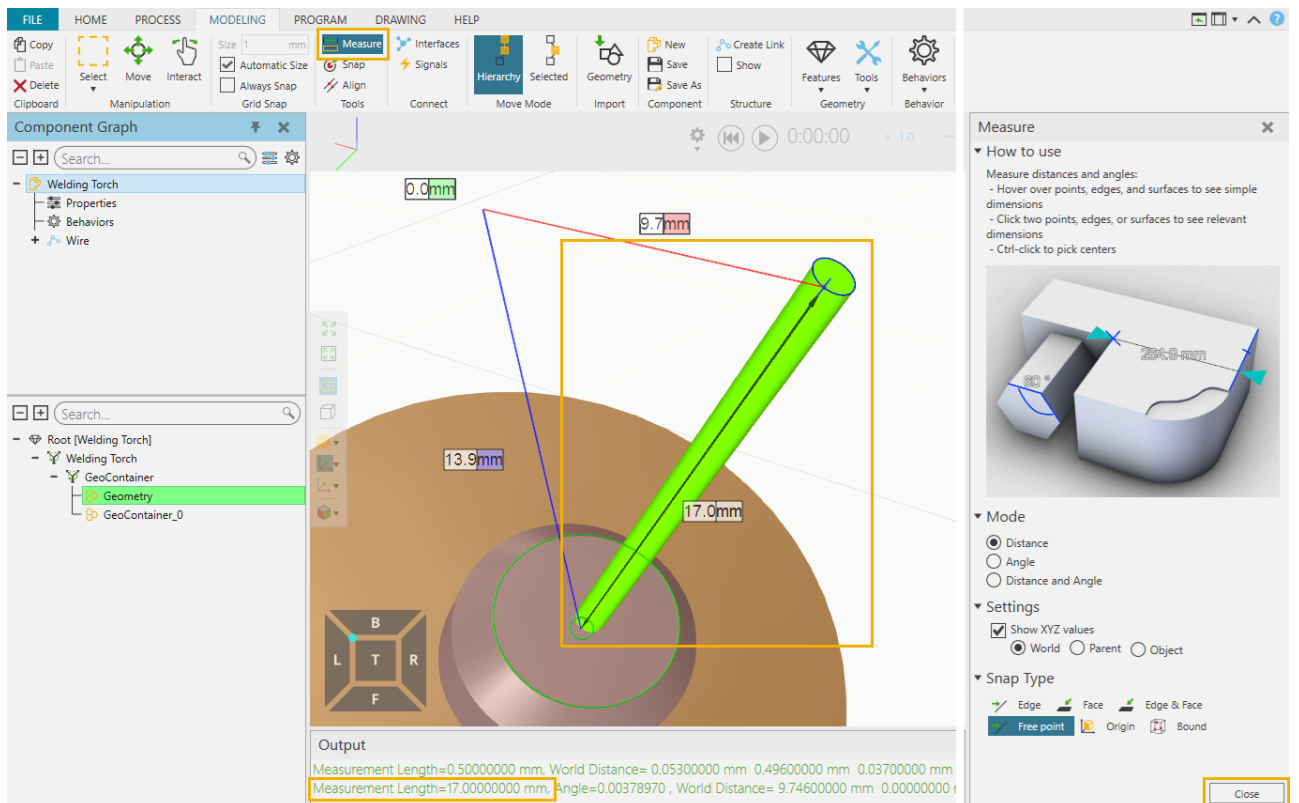
2. Then selecting the wire geometry, click **Split** from the base of **Split feature** panel.



- Then from the **Tools** group in the ribbon, select the **Measure** tool and measure the radius of the wire, noting the results that appear as *Measurement Length* in the **Output** panel below.

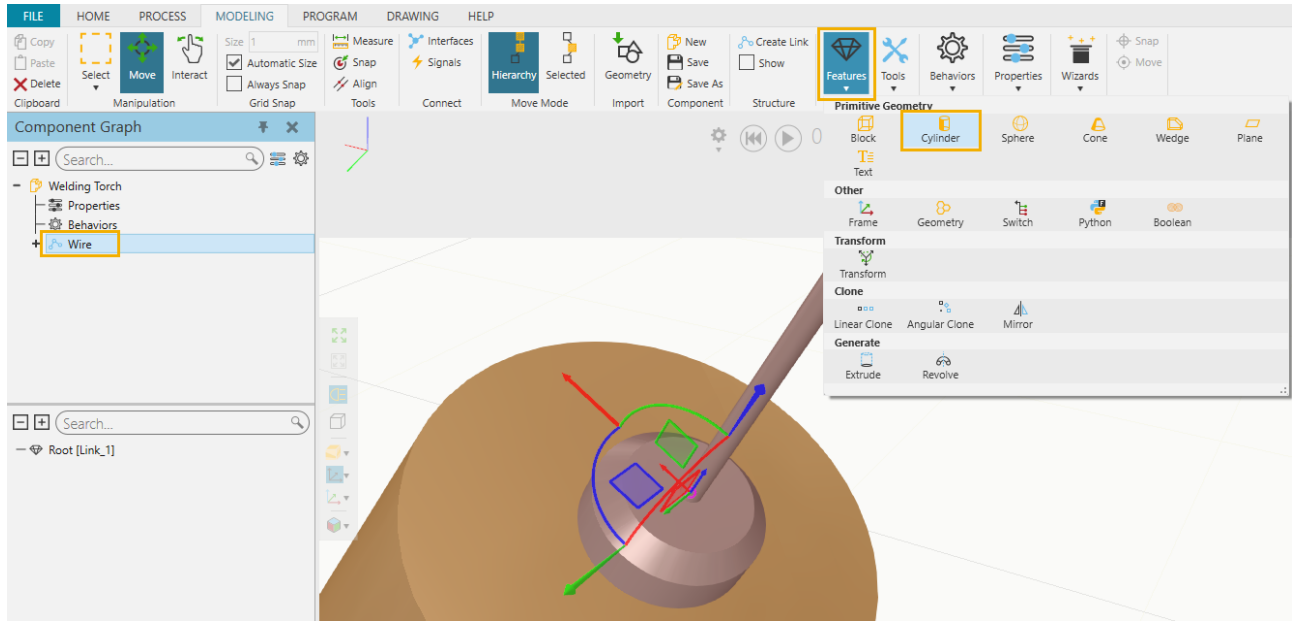


- And then measure the length of the wire. Then click to **Close** the **Measure** tool.

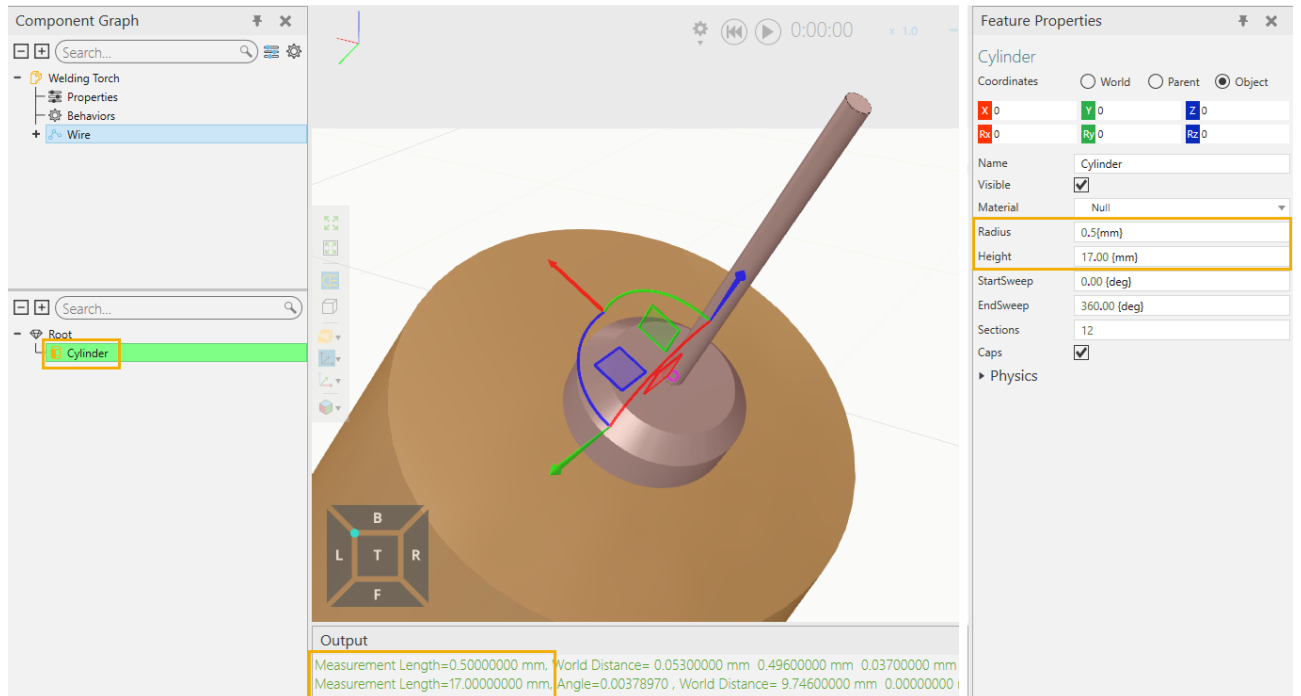




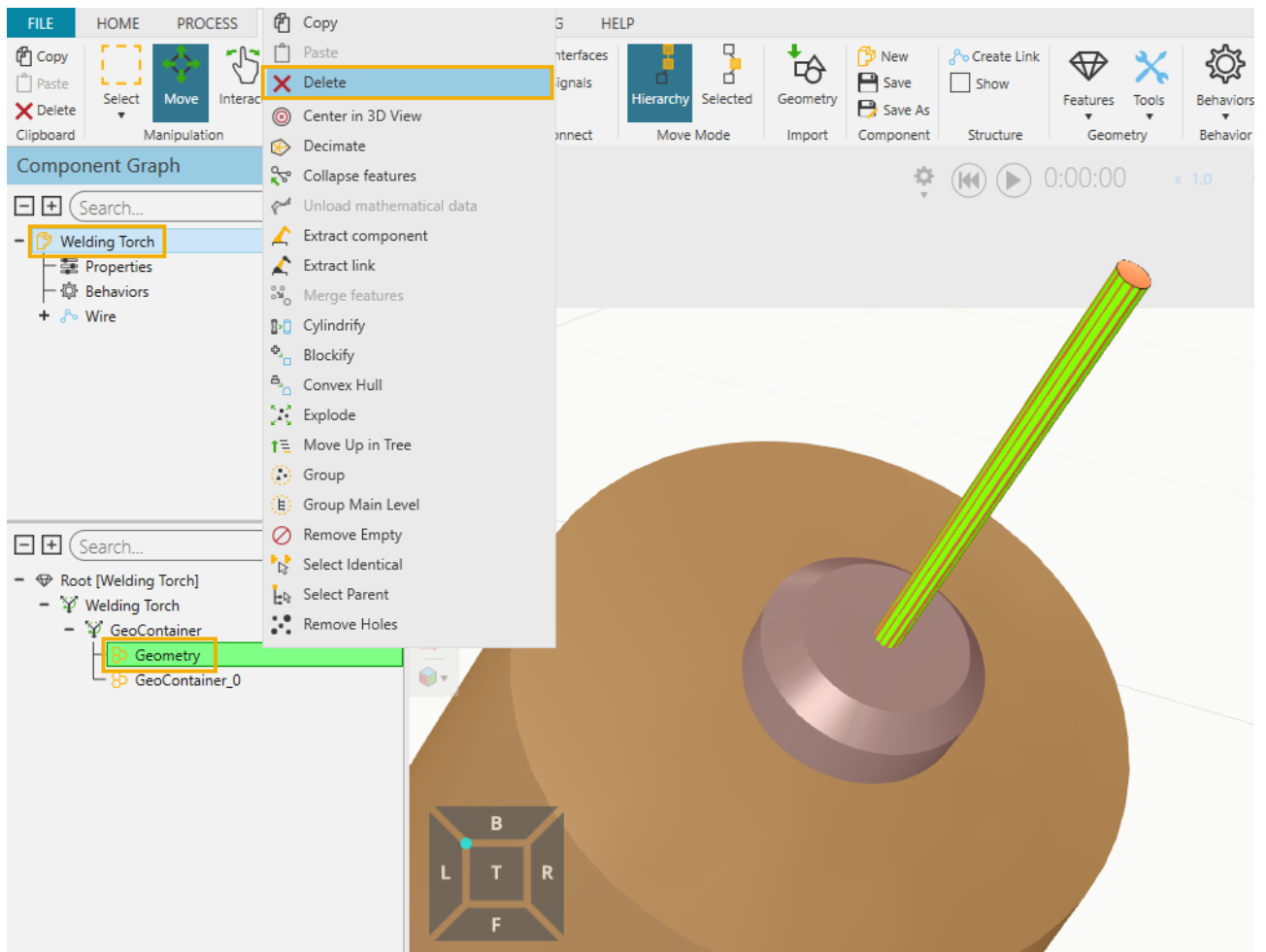
5. Selecting the **Wire** link from the Component Node Tree on the left, selecting **Features** from the ribbon use the **Cylinder** tool to model a new wire.



6. If we have placed the wire link correctly, the wire should appear in the correct location. Then in the **Feature Properties** of the new **Cylinder** component, set the **Radius** and **Height** to the *Measurement Length* values that appear in the **Output** panel e.g. **0.5 (mm)** and **17.00 (mm)**.

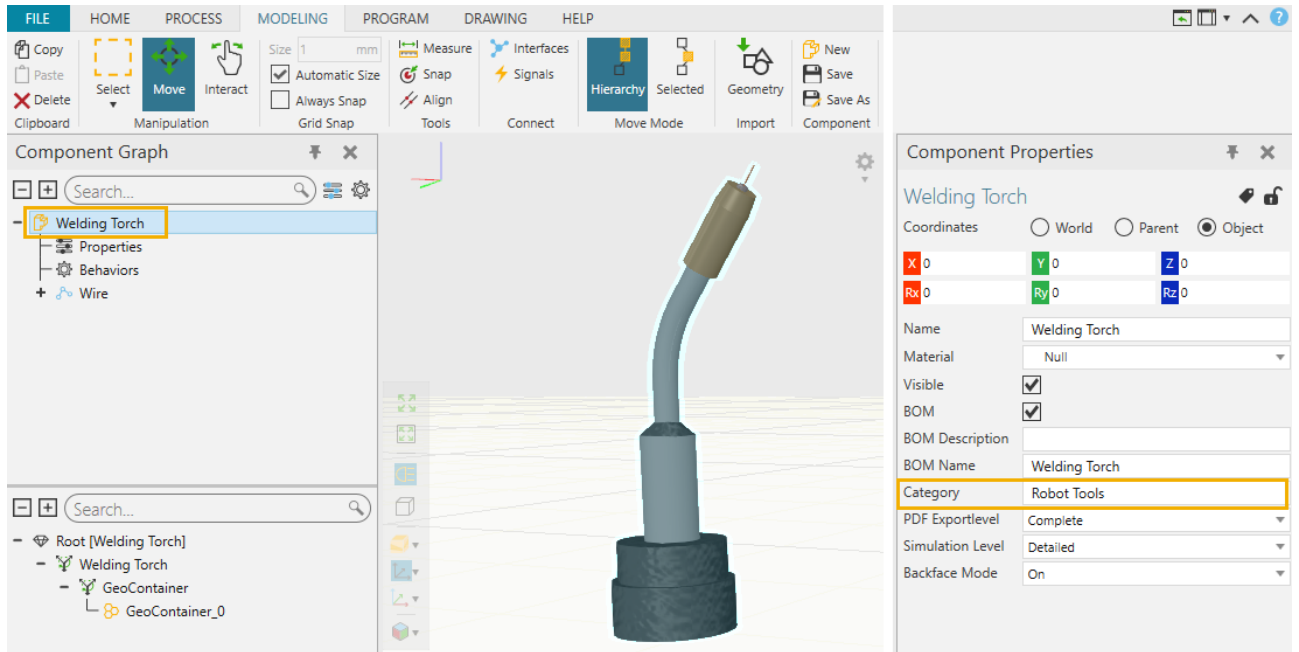


7. Then from the **Component Graph** on the left, select the **Welding Torch** component and from the Node Feature Tree below, under the **Root** select the **Geometry** of the original wire, right-click on it and click **Delete** to remove it.



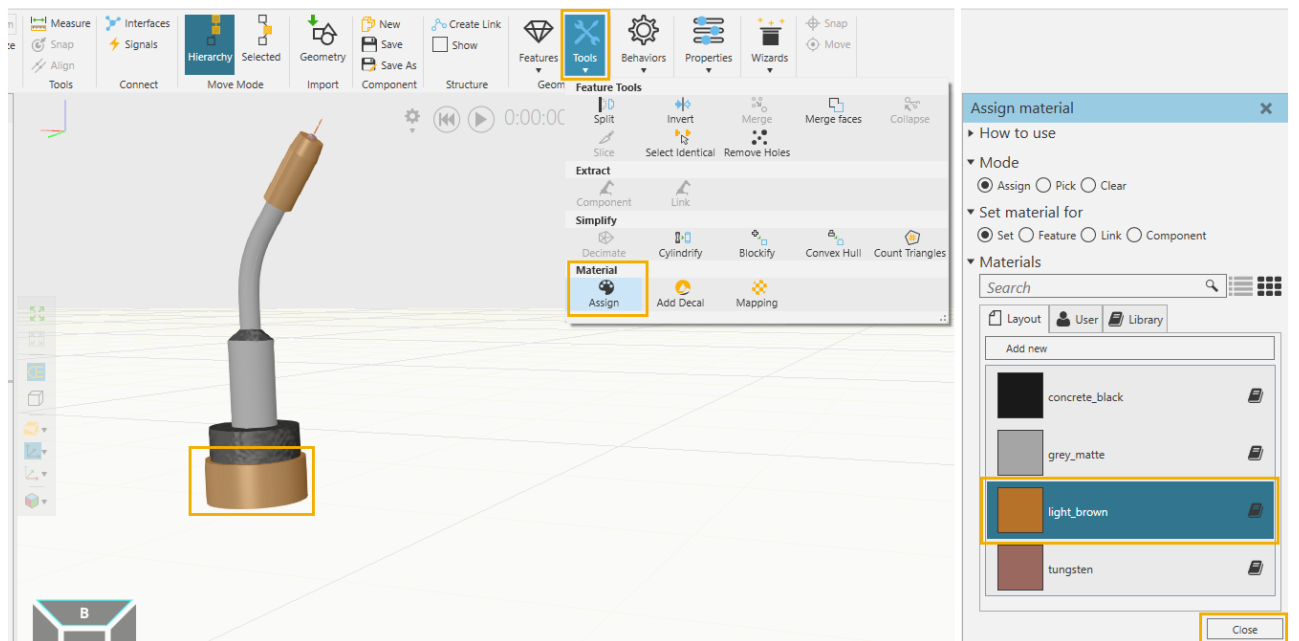
### Finalize the welding torch

1. In the **MODELING** tab, selecting the **Welding Torch** component and from its **Component Properties** over on the right, set the **Category** as **Tools** or **Robot Tools**.

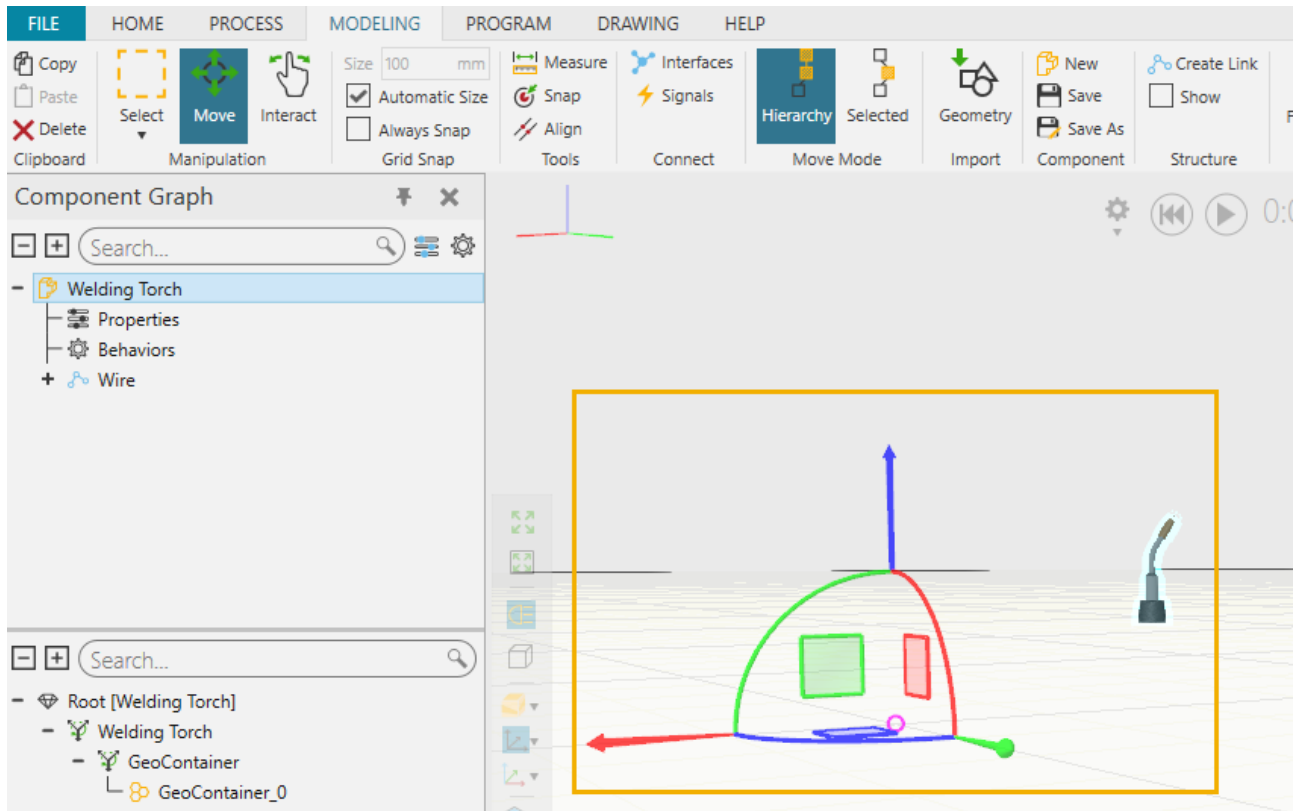


2. In this example the imported torch component already has materials assigned to it. If materials are not present, then you may assign materials to the component.

To do that select **Tools** and then **Assign**. And in the **Assign material** panel, select a material from the **Library** tab and assign it for the geometry by clicking the feature in the 3D view. And then click to **Close** the **Assign material** panel.

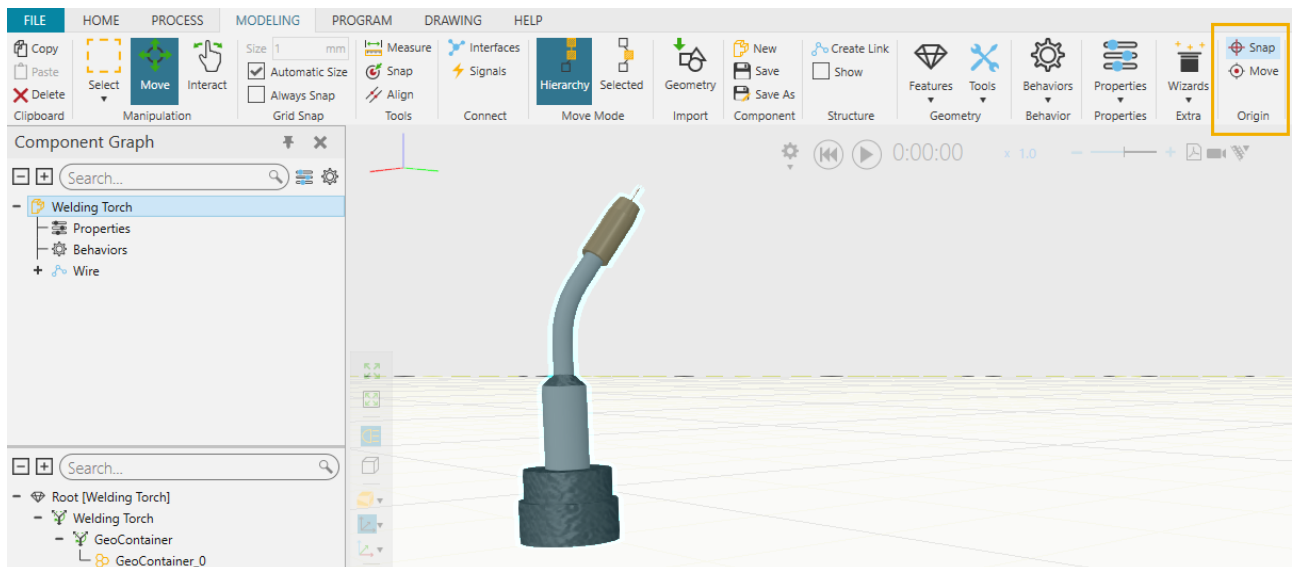


- If we zoom the camera out, we can see that the origin of the component is not at its center. So will need to set its origin.

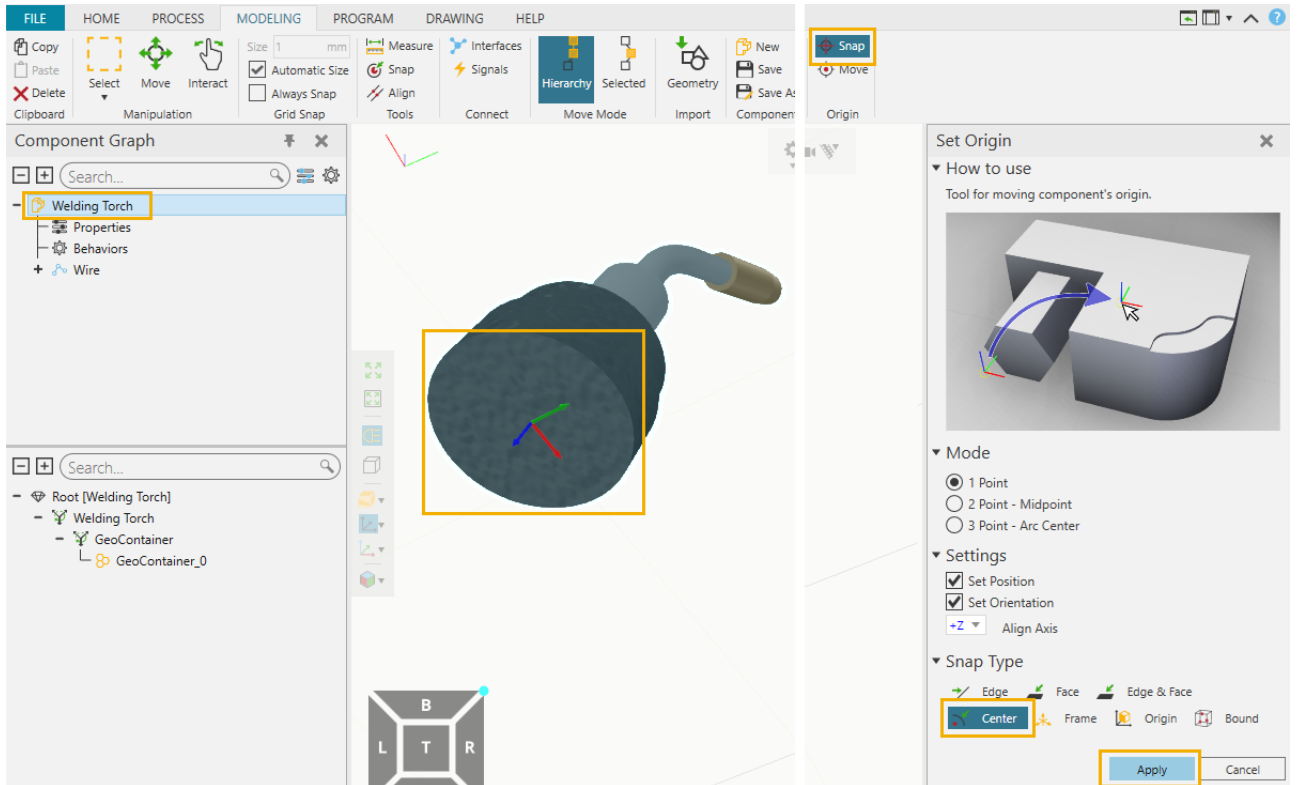


- To set the origin, from the **Origin** group in the ribbon we can use the **Snap** and/or **Move** tools.

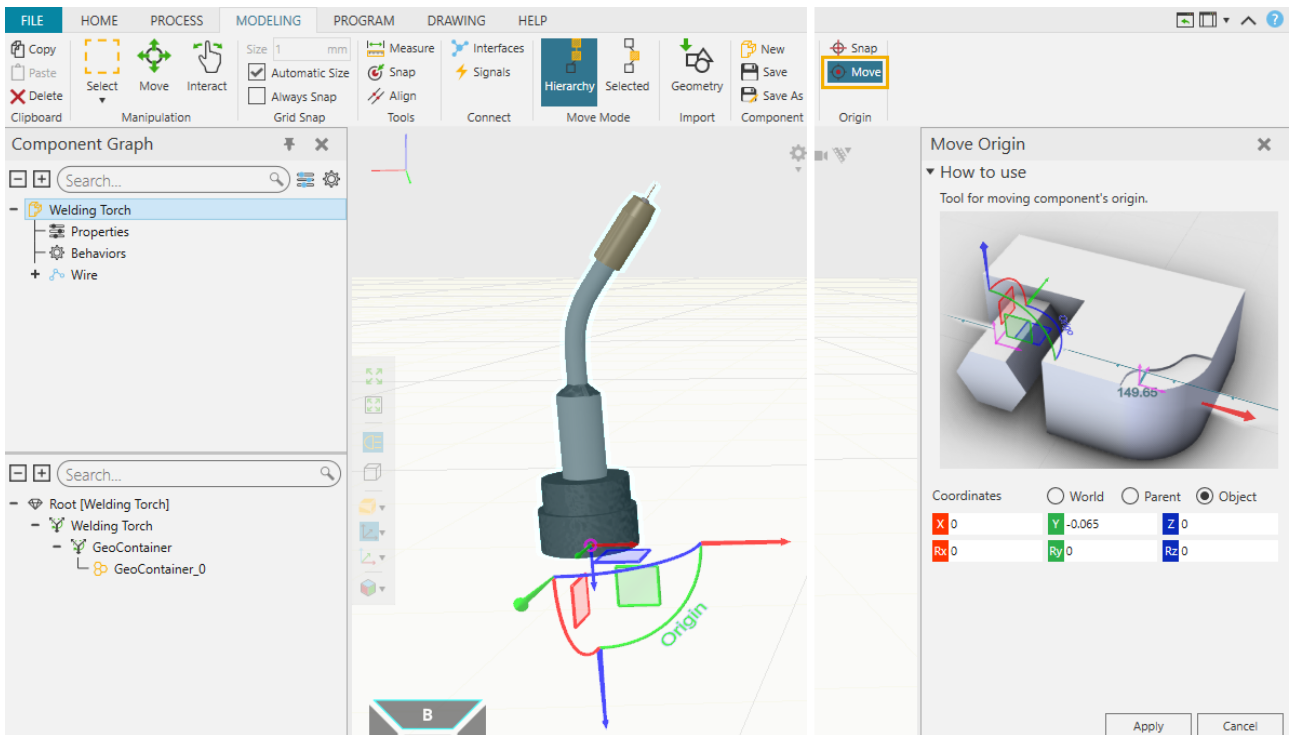
**Note:** The **Origin** group is available in the **HOME** and **MODELING** tabs.



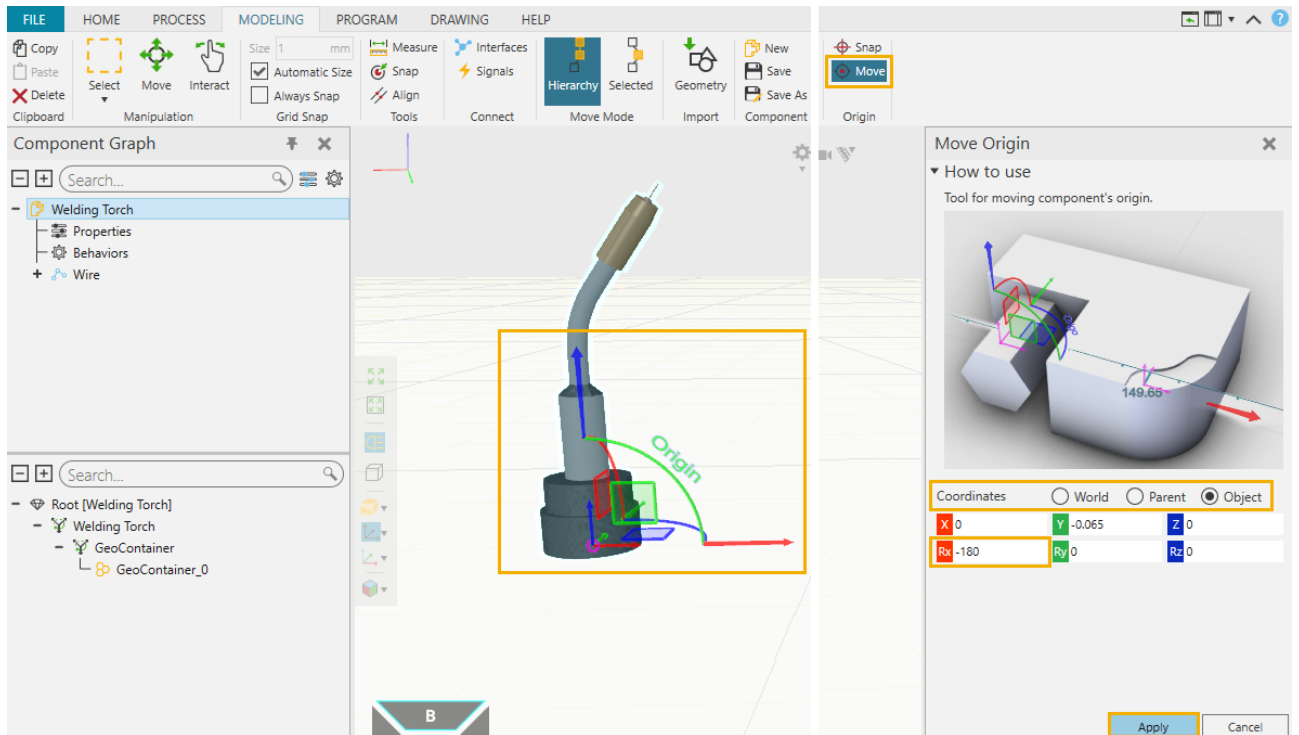
- Use **Snap** Origin and enable the **Center** option to attach the origin frame to the bottom of the torch component, then click **Apply**.



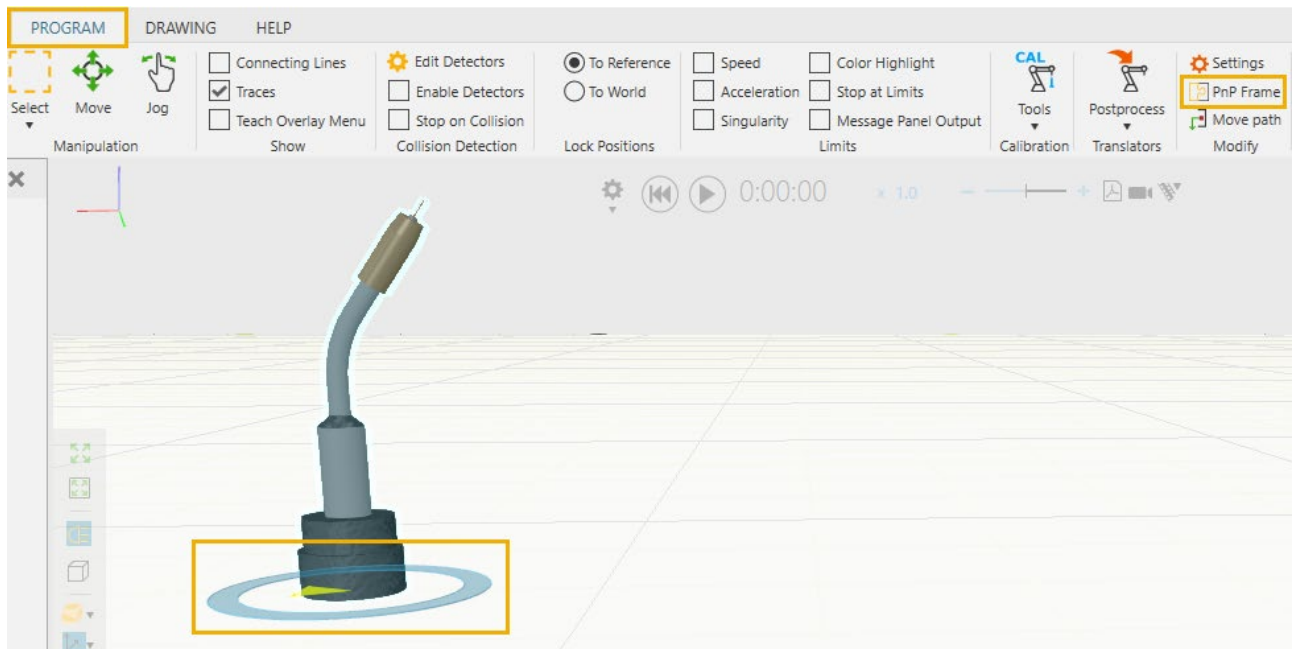
- And if necessary, use the **Move Origin** tool to rotate the frame.



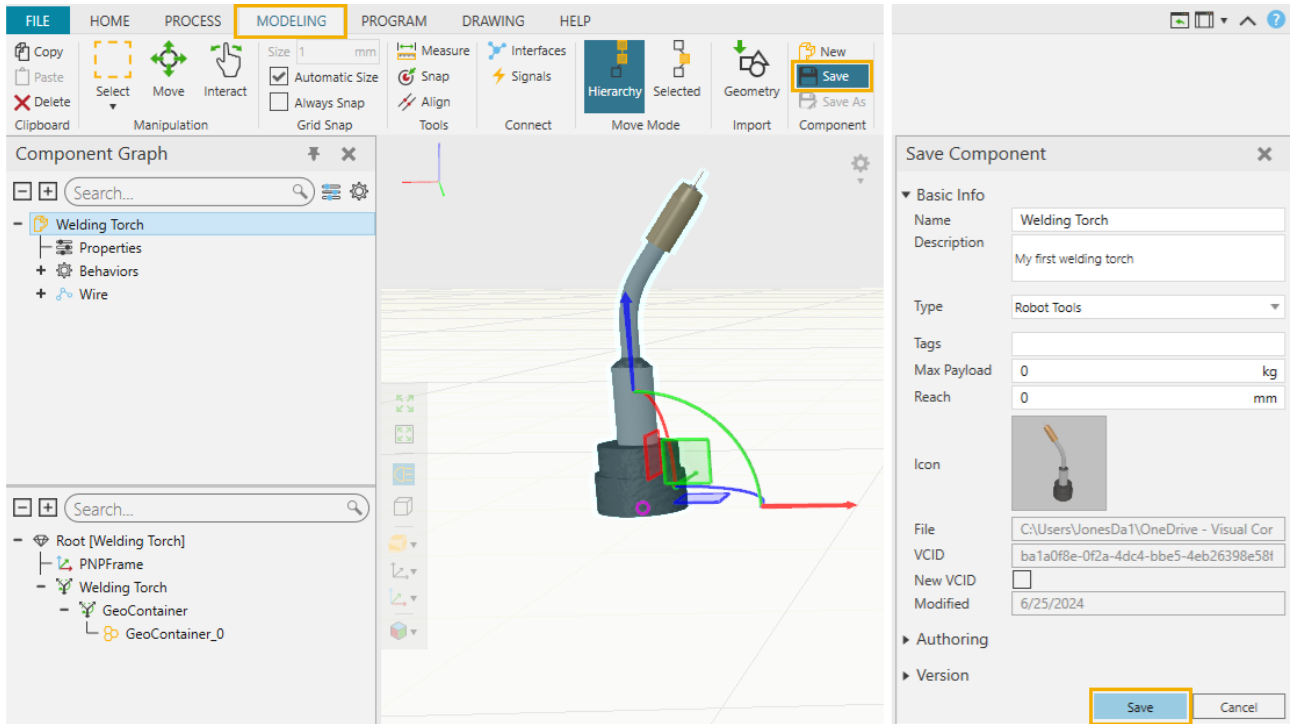
- In this example in **Move Origin** with the **Coordinates** set to **Object**, we will rotate the **Rx** axis by **-180** degrees and then click **Apply**.



- Then in the **PROGRAM** tab, from the **Modify** group in the ribbon select **PnP Frame** to add a PnP frame to the new component origin.



- And the final step is to return to the **MODELING** tab and use the **Save** control to save the changes to the component.

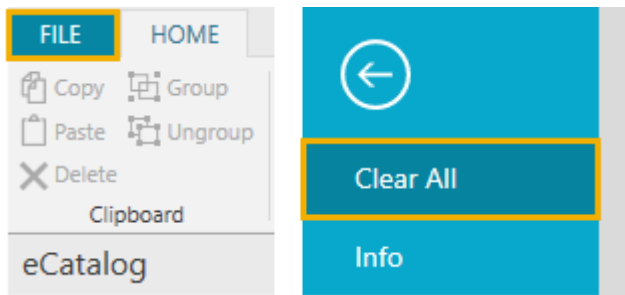


## Building a layout

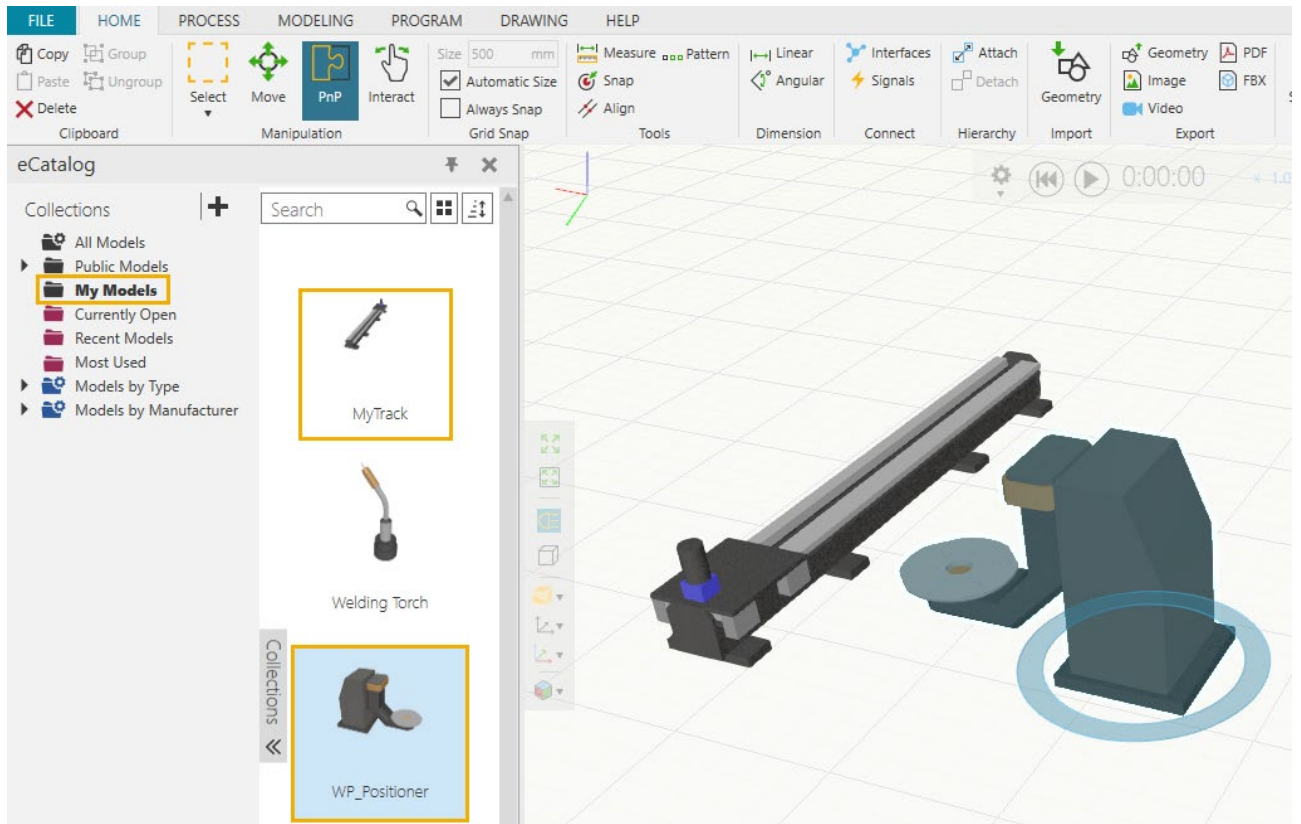
### Building a layout from the modelled components

In the previous chapters we modelled a robot positioner, workpiece positioner and a welding torch. So now let's build a layout using these components.

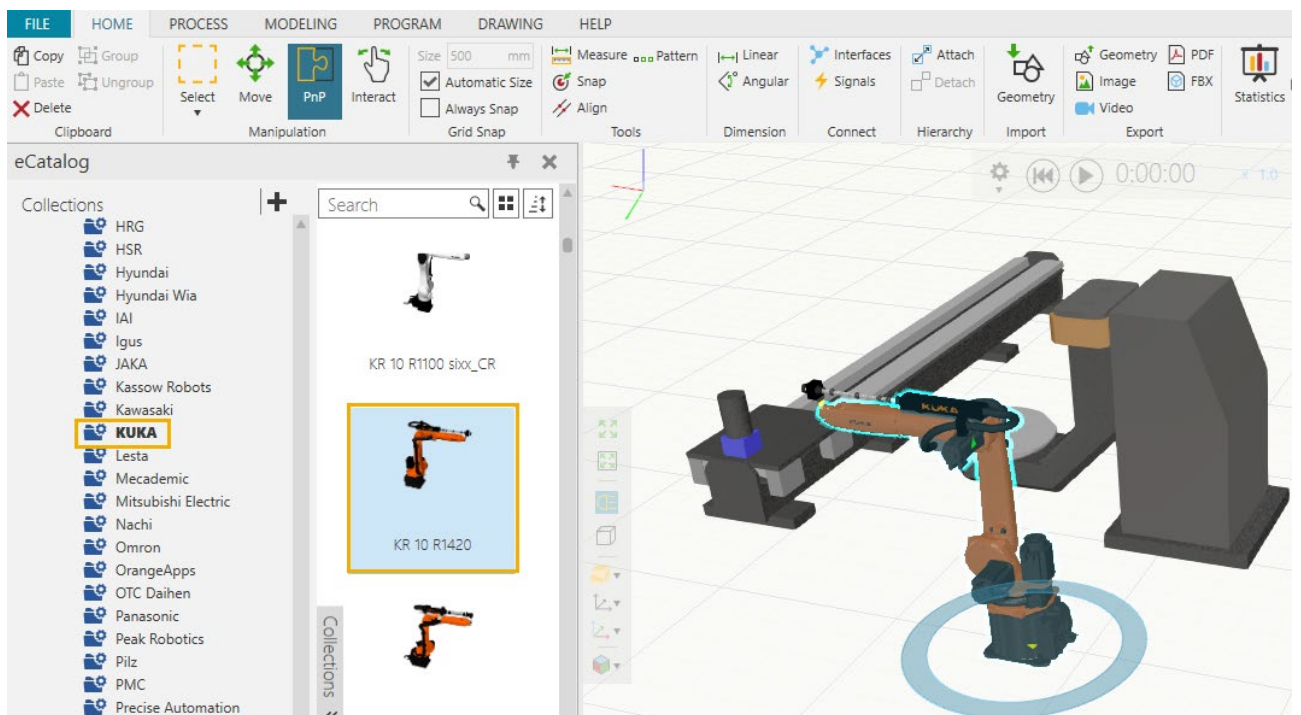
- First, open an empty layout or clear the 3D world by clicking **FILE > Clear All**.



- In the **HOME** tab, add the robot positioner and workpiece positioner. If you have saved the components in the **My Models** default location, then you can drag and drop these components from the **My Models** section of the **eCatalog**.

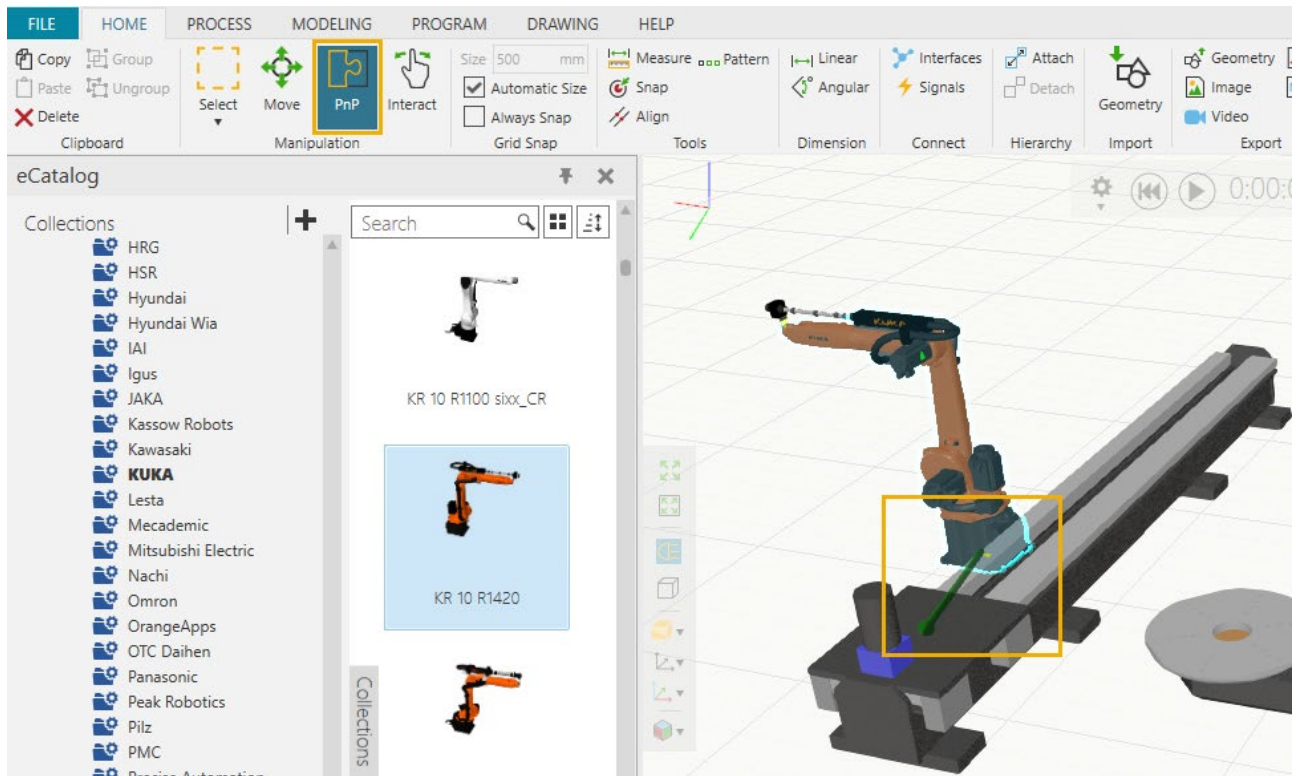


- Then from the **eCatalog** we will add an example robot. For example from **Models by Type**, then **Robots** and **KUKA** drag in the **KR 10 R1420**.

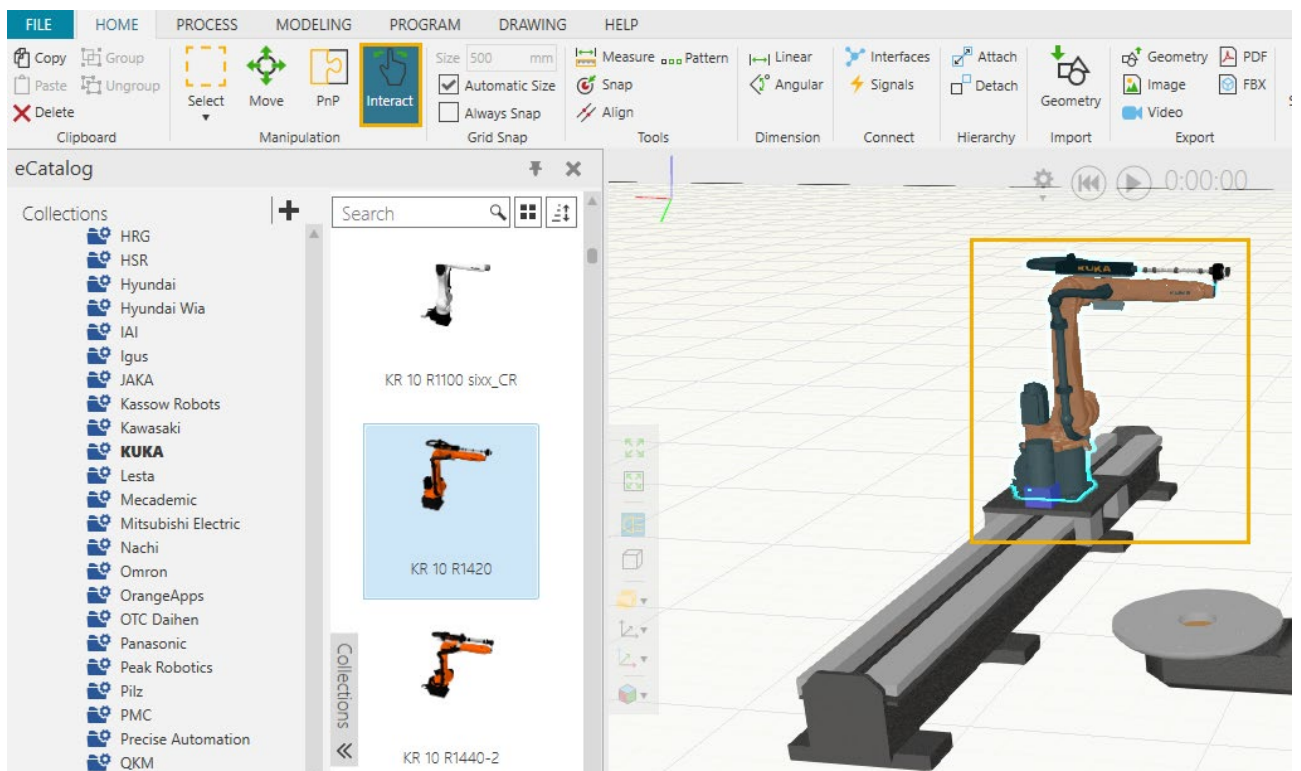




- Using the **PnP** tool, bring the robot closer to the mount interface of the robot positioner. A green arrow will appear and you can then snap the robot to the positioner.

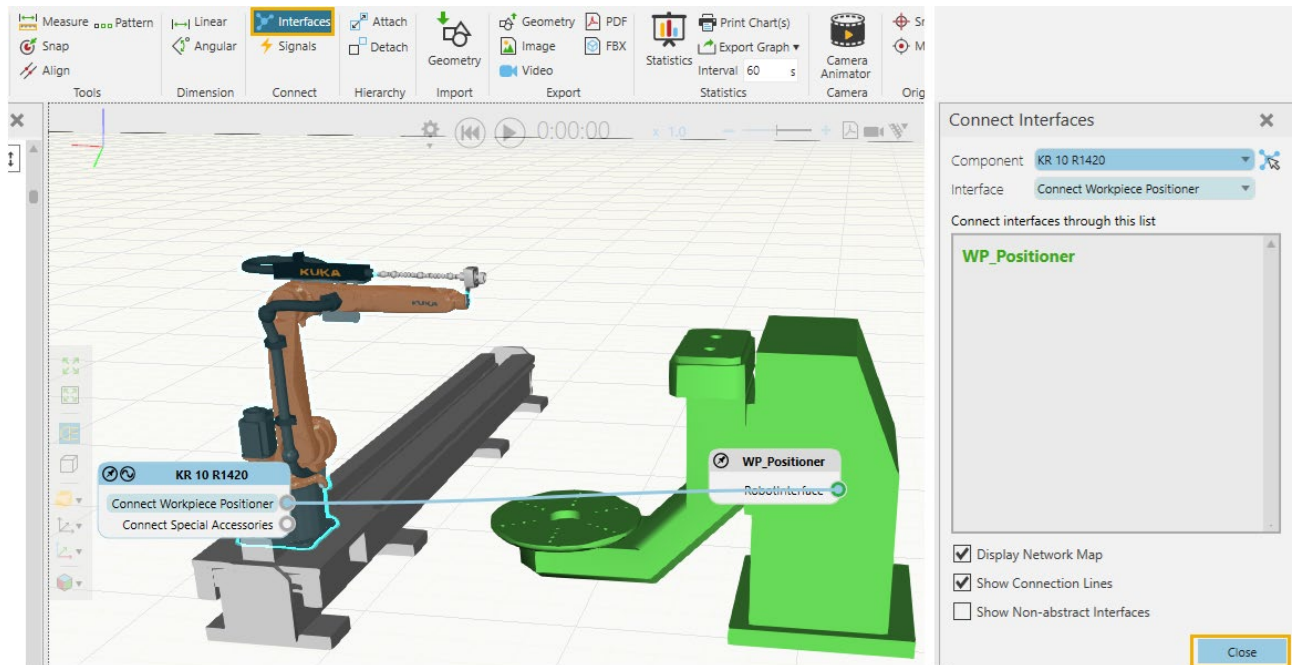


- If we now select the **Interact** tool and jog the pedestal on the track, the robot moves along with it the track.



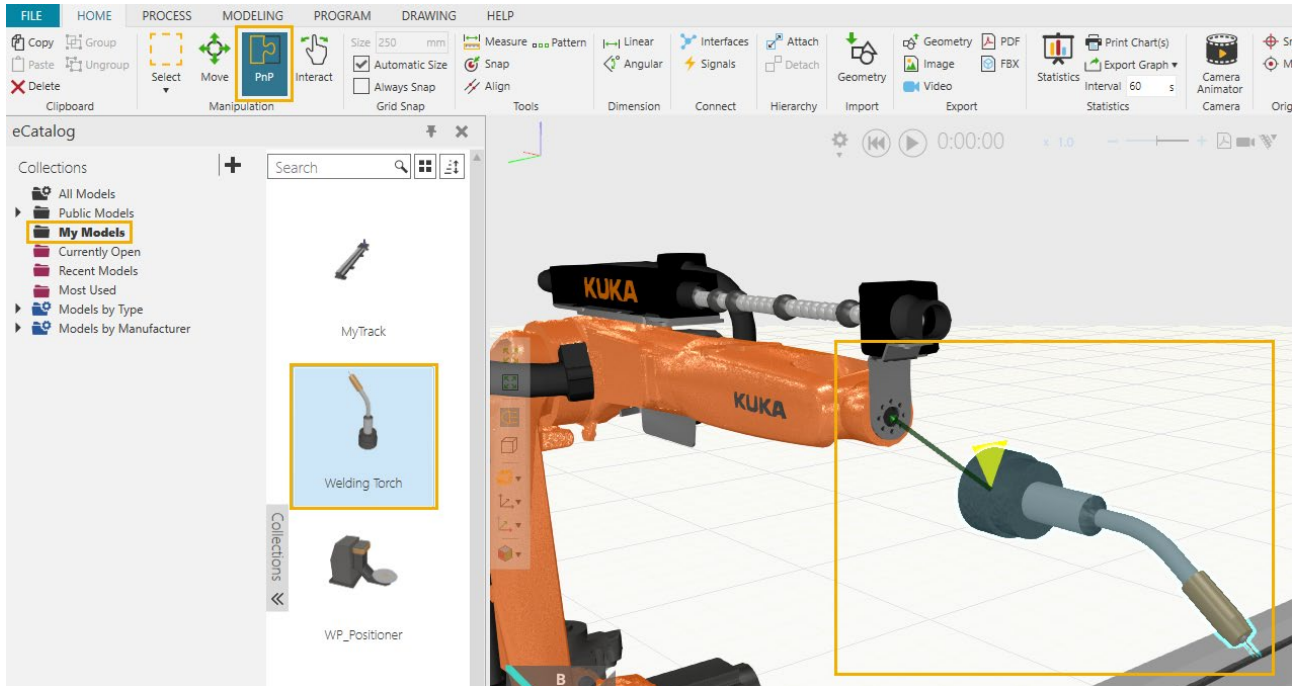
6. We should now connect the interfaces between the robot and the workpiece positioner. Click on **Interfaces** and select the robot to see its interfaces.

Then left mouse click and drag a connection line from **RobotInterface** to **Connect Workpiece Positioner**. And then click to **Close** the **Connect Interfaces** panel.



## Connecting the Welding Torch

The next step is to connect the welding torch to the robot mount flange. If you saved the component in the **My Models** folder, you can drag and drop it from the **My Models** section of the **eCatalog**. And then using the **PnP** tool, mount the tool to the flange of the robot.



## Setting up the layout

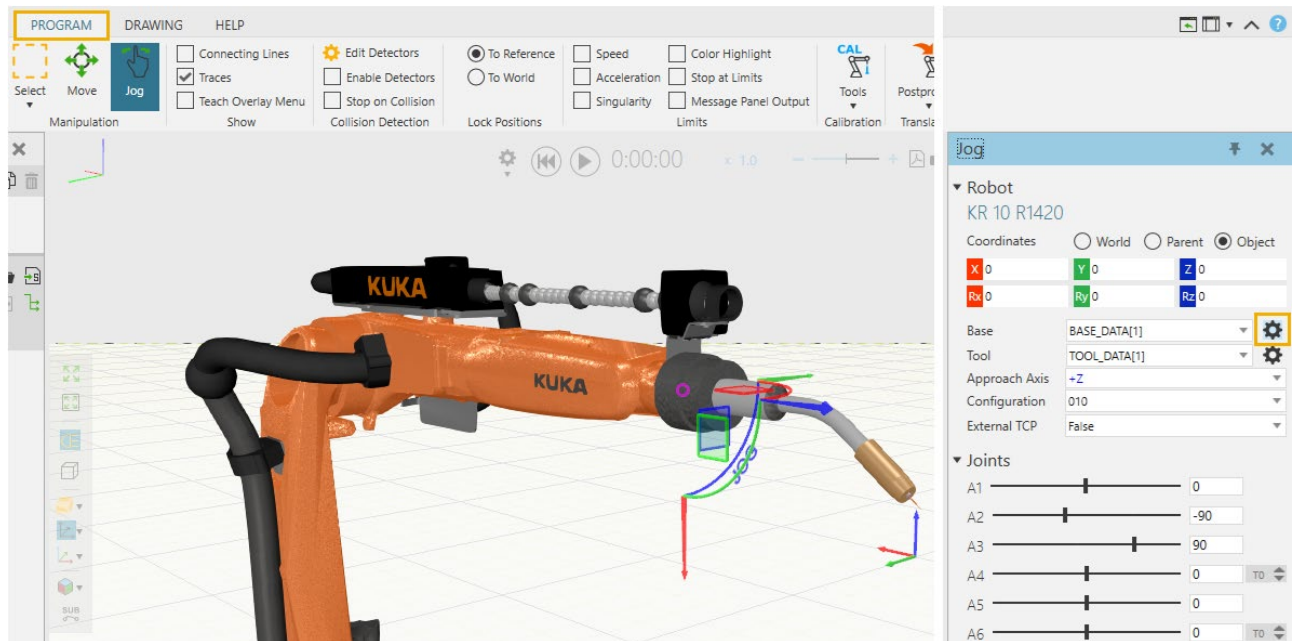
After the layout is modelled, the final step is to set up the base and tool coordinates correctly.

### Assigning Base and Tool frames

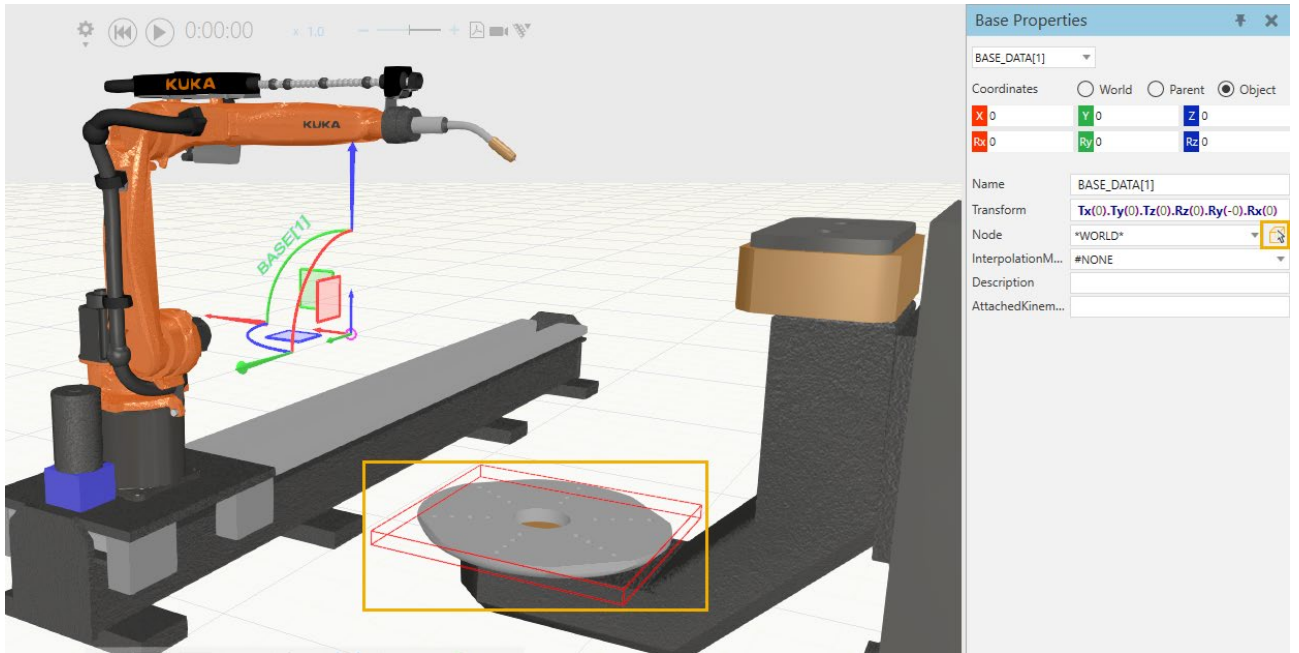
If the system is using synchronized motion between the workpiece positioner and the robot, a synchronized base frame must be created at the centre of the positioner rotating plate.

#### Assign the Base frame:

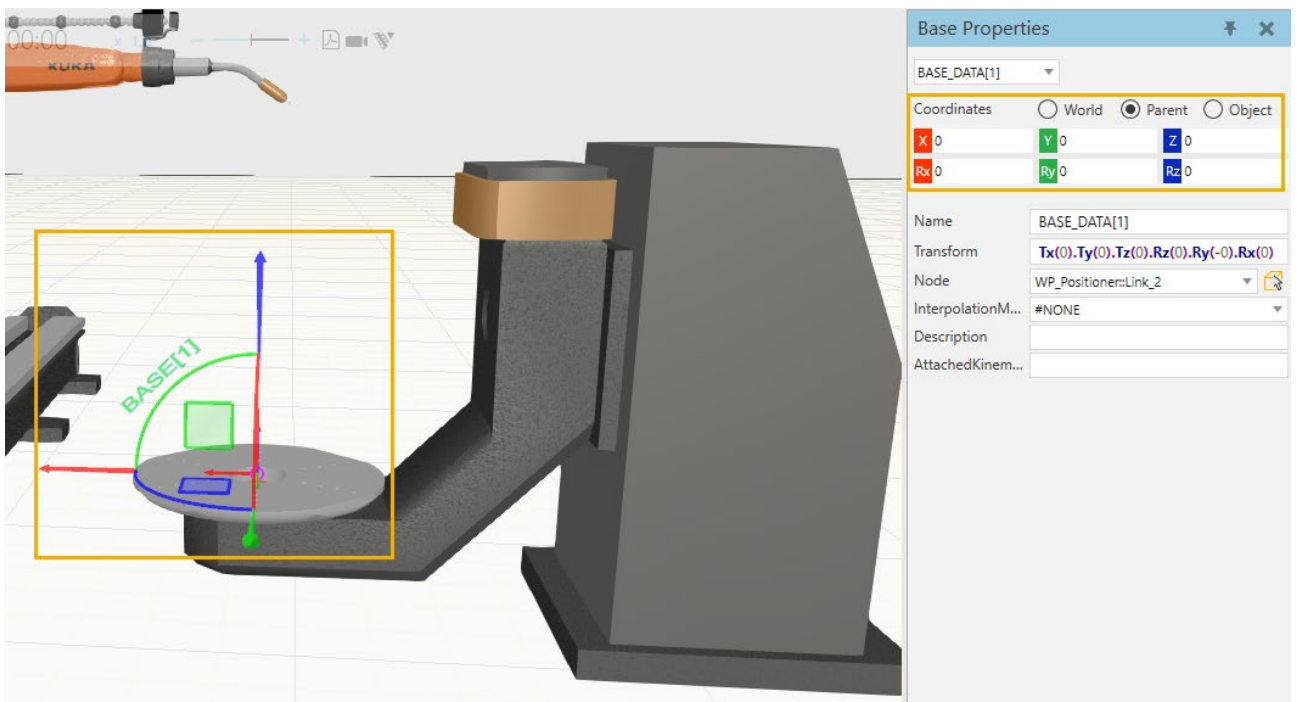
1. In the **PROGRAM** tab, select the robot and go to the **Jog** panel on the right side. Choose **Base** and click on the gear icon on the right-hand side as shown below.



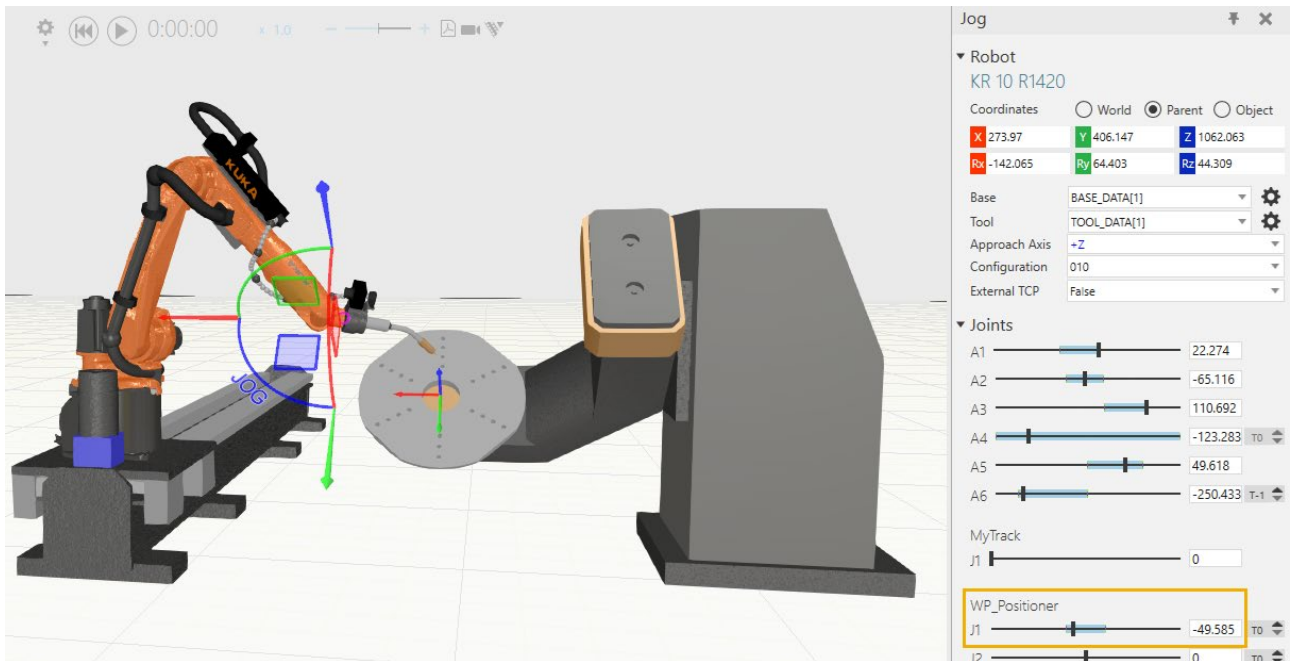
2. A **Base Properties** panel will appear. By default, the node would be **\*WORLD\***. Click on the yellow pick property control and choose **Link\_2** from the workpiece positioner



3. Now set the **Coordinates** to **Parent** and reset all the X, Y and Z values to zero so that the frame is in zero location with respect to the parent frame (which in this case is the workpiece positioner plate).

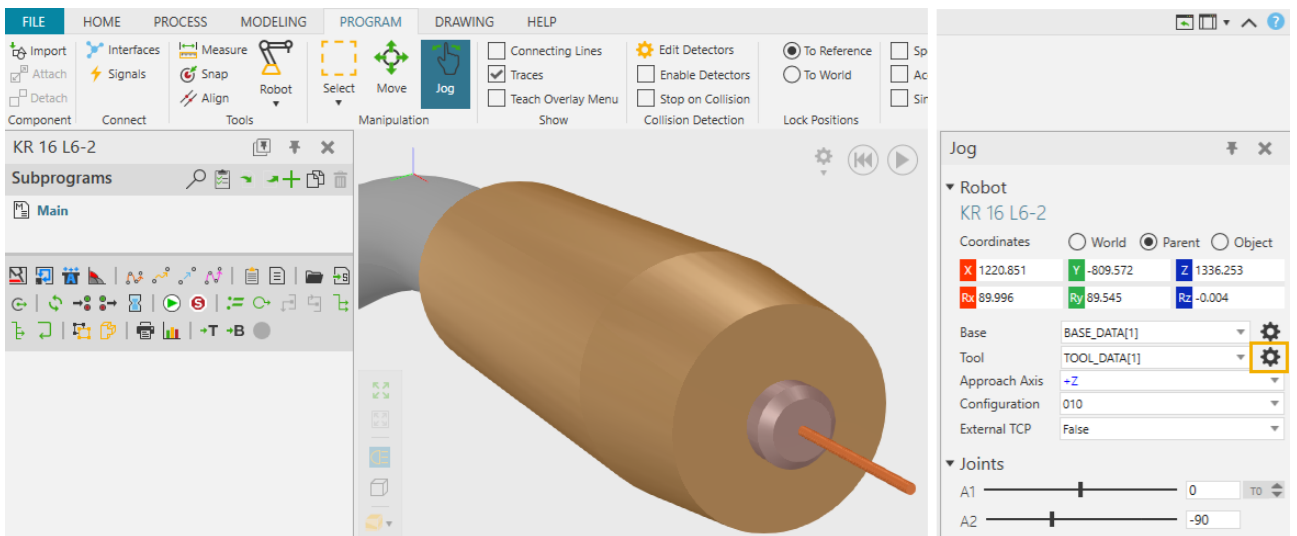


- 4. If you now return to the **Jog** panel and jog the workpiece positioner axes, the robot will move in synchronized motion along with them.

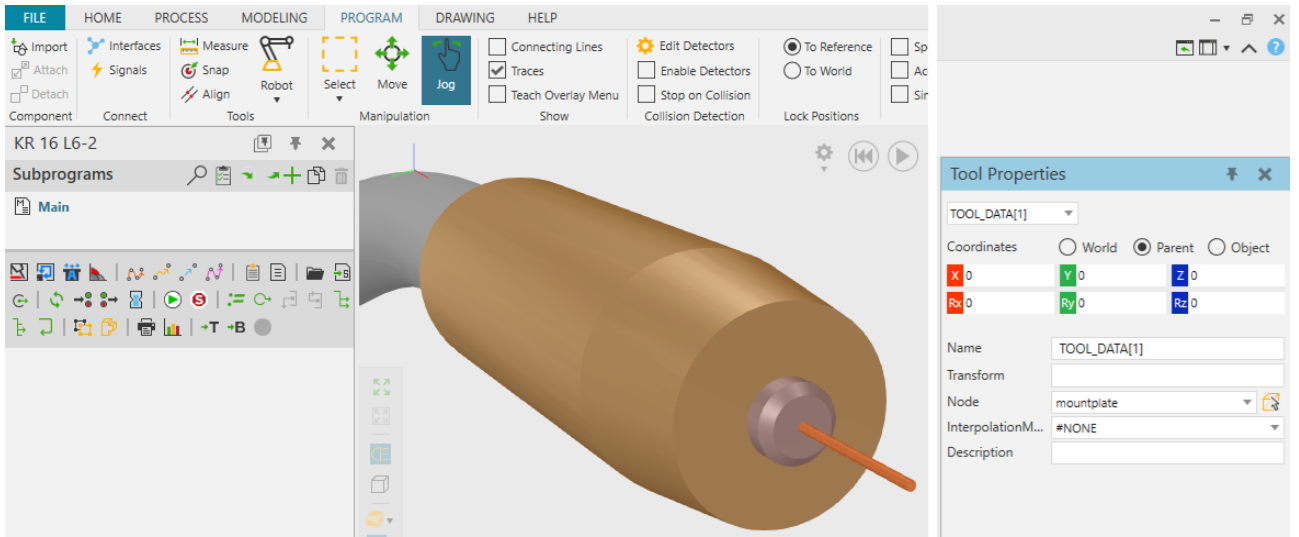


**Assign the Tool frame:**

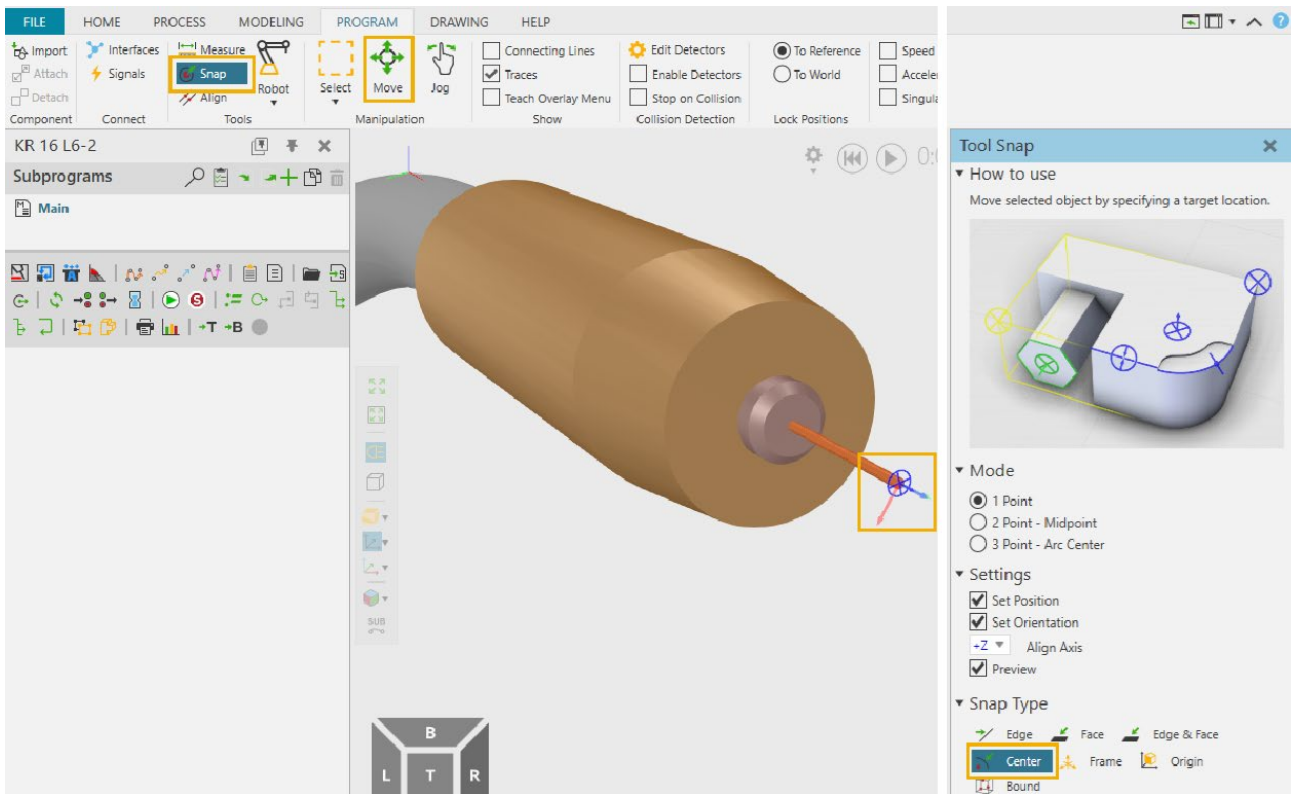
- 1. In the **PROGRAM** tab, similar to the **Base**, click on the gear icon for the **Tool**.



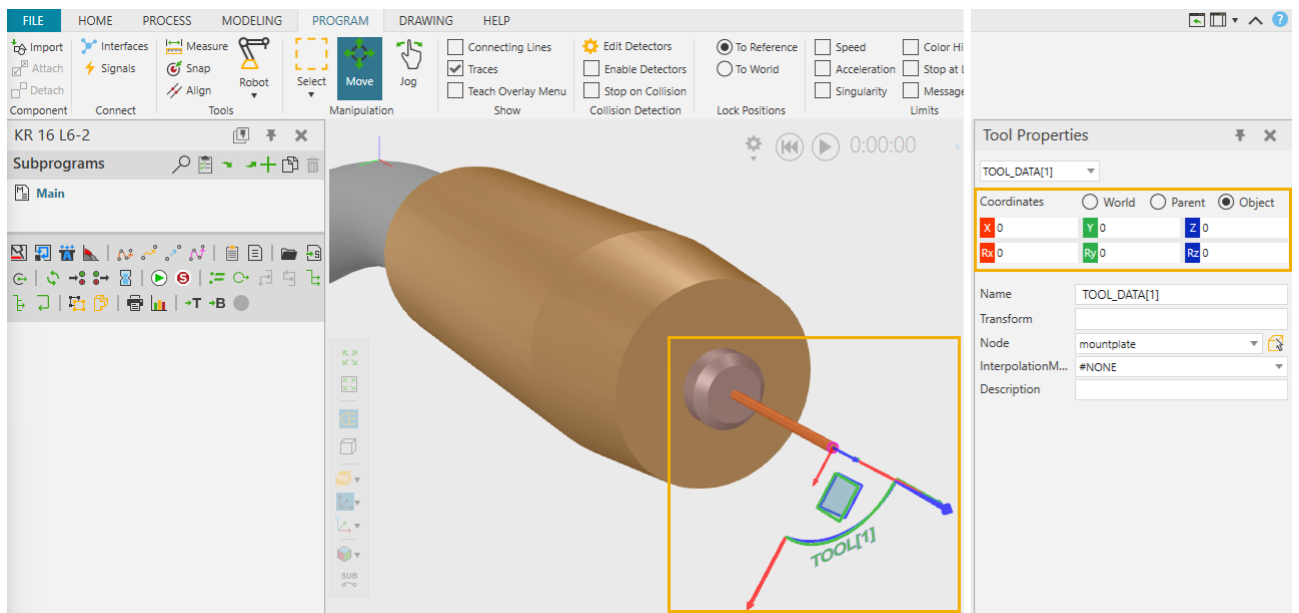
2. A **Tool Properties** window will appear.



3. Then selecting the **Move** tool, click on the **Snap** tool, choose the snapping mode as **Center** and assign the link to the center of tool tip.



4. In the **Tool Properties**, with **Coordinates** set to **Object** check that the Z-axis is pointing outwards, and the X-axis is pointing towards the robot.



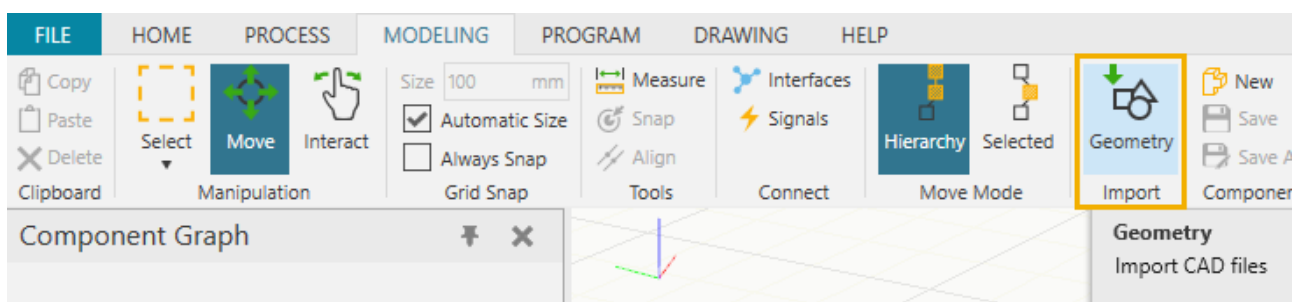
5. Manually rotate around the Z-axis with the **Move** tool manipulator if the X-axis is not pointing towards the robot by default.
6. At this step, the layout is completely setup and ready to be used. You can now import the required workpiece/part to be welded. The next chapter will cover how to correctly attach the workpiece in the layout.

## Importing and positioning the workpiece

### Importing the workpiece

To import a workpiece, follow below steps:

1. In the **MODELING** tab, import the geometry using the **Geometry** tool.



2. Now, the browsing option allows you to choose the required CAD file from the computer. If you wish you may select the example *WeldPiece.step* file included with the downloads for this lesson and click **Open**. See Visual Components Help documentation for all supported CAD files.



3. After choosing the file and clicking **Open**, an **Import model** panel will appear as shown below. Choose your options as shown in the image below and click **Import**. See Visual Components Help documentation for details on the import options.

The screenshot shows the 'Import model' dialog box with the following settings:

- Uri:** C:\Users\UserName\Downloads\WeldPiece.step
- Import Options:**
  - Structure:** Feature (selected), Node, Component
  - Tessellation quality:** High (slider)
  - Include:** Hidden (unchecked), Materials (checked), Read block attributes (unchecked), Markups (checked), Textures (checked), Points (checked), All configurations (checked)
  - Material Creation Rule:** Create a new material if no good ma... (dropdown)
  - Feature Tree:** Full (selected), Optimized, Collapsed
  - Organize geometry:** By material (selected), By faces, Collapsed, Mathematical data
  - Up axis:** +Z (selected), +X, -X, +Y, -Y, -Z
- Filter Options:**
  - Minimum hole diameter: 0 mm
  - Minimum geometry di...: 0 mm
  - Healing tolerance: 0 mm
  - Units: Default (dropdown)
- Buttons:** Analyze, **Import** (highlighted), Cancel

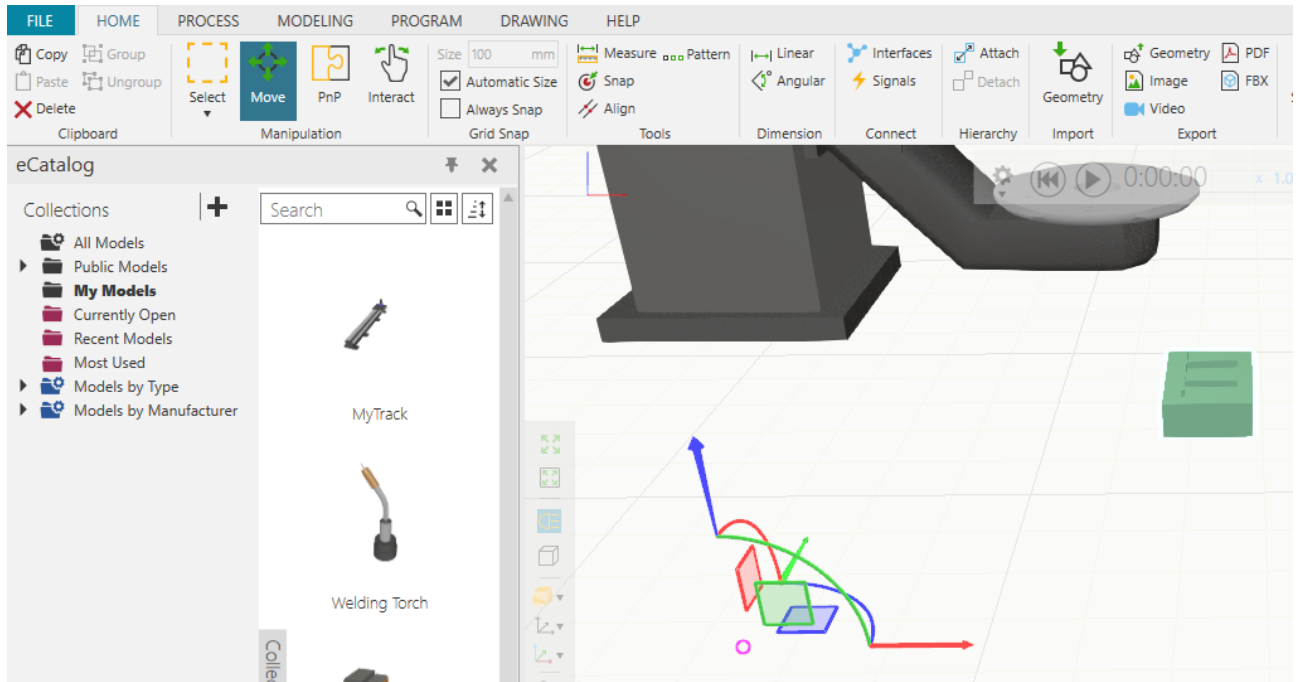
4. You can now move the workpiece in the 3D world using manipulation tools.

## Positioning the workpiece

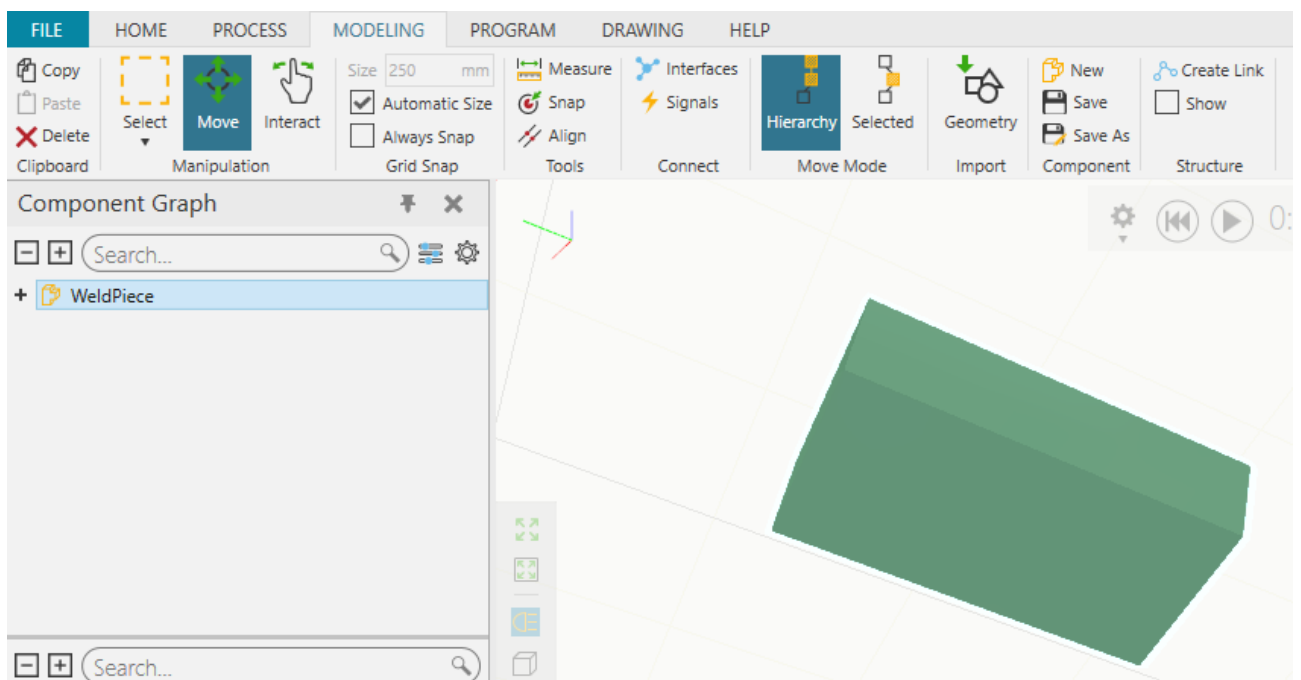
### Setting the workpiece origin

Workpiece origin refers to the XYZ handle by which you can move a component in the 3D window.

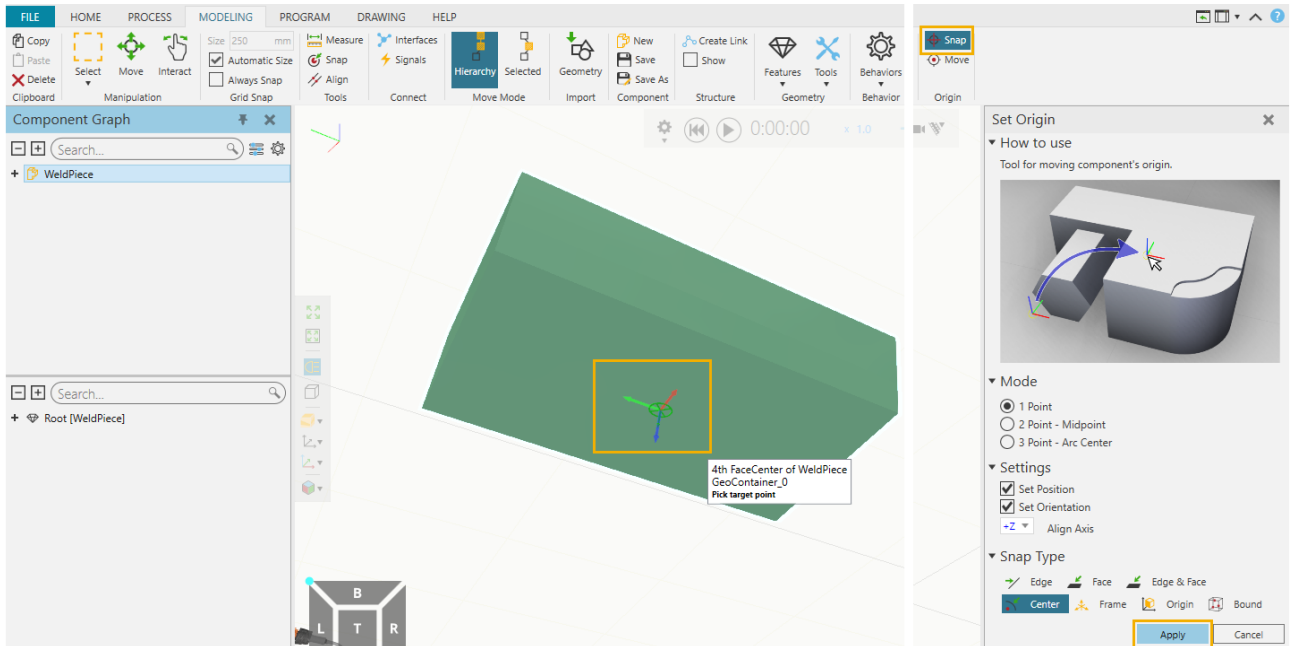
1. Sometimes the origin of the CAD model does not lie on the component and can be somewhere far from the component.



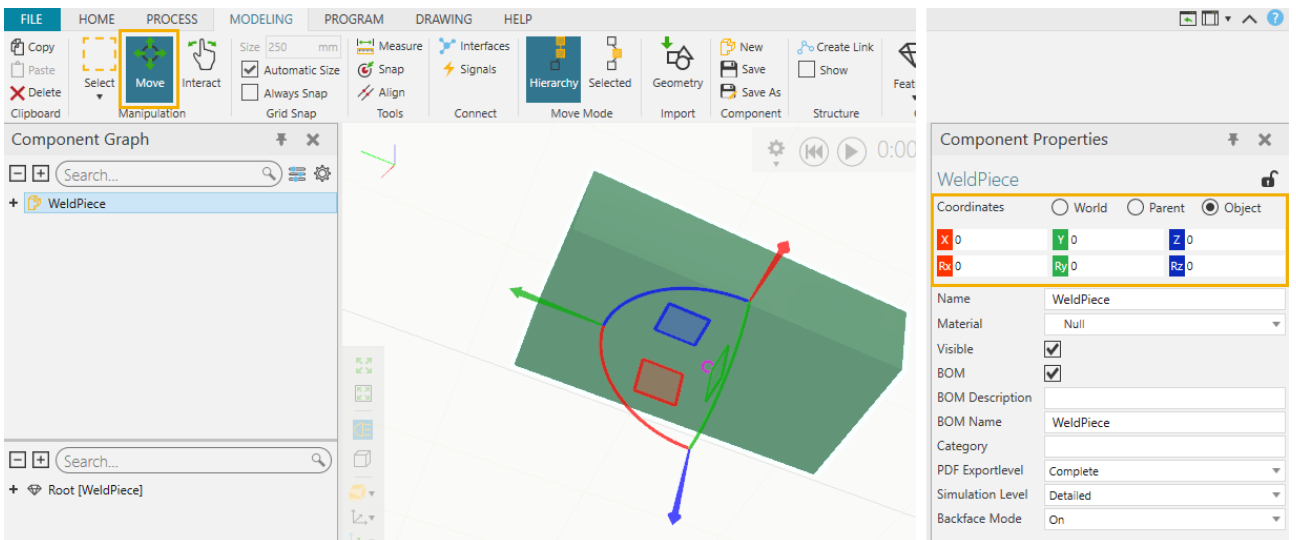
2. To move the workpiece correctly in the 3D world view, it's better to place the origin somewhere at the base of the component and in a position where it is easy to snap it to the workpiece positioner. Let's begin by rotating the component so we can see its base.



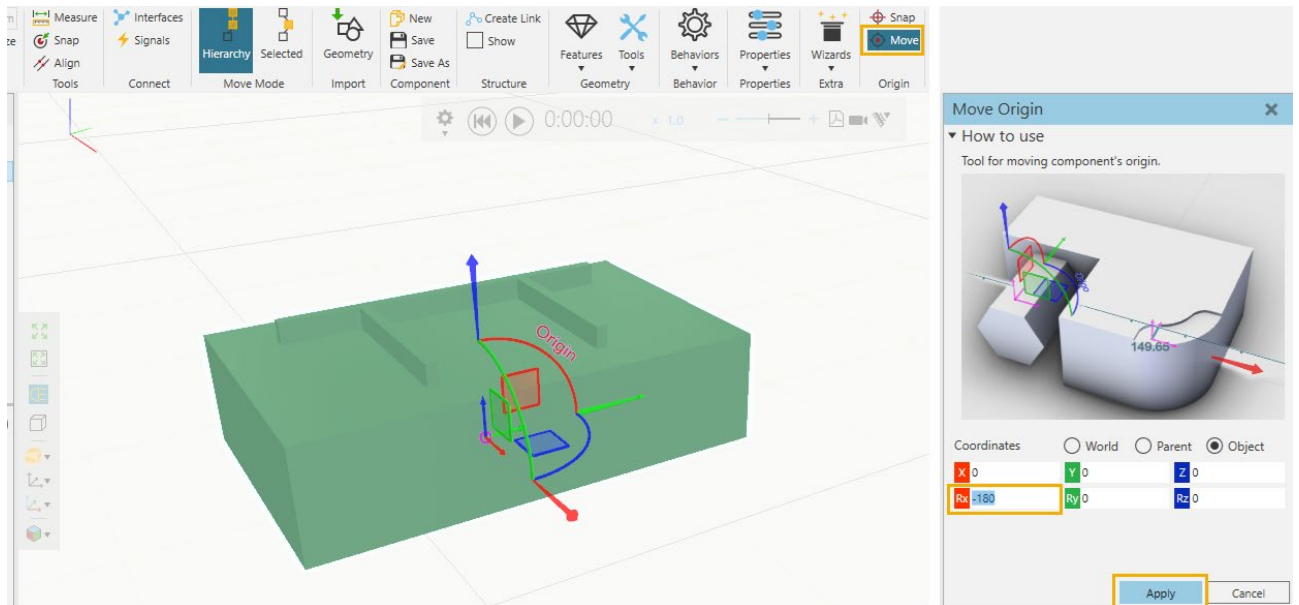
- Then in the **MODELING** tab, from the **Origin** group select **Snap**. Then snap the origin, for example at the center of the base of the component and click **Apply**.



- If we now check the component using the **Move** tool, in its **Component Properties** with **Coordinates** set to **Object**, we can see that the origin should be adjusted to match the workpiece positioner we will attach it to.



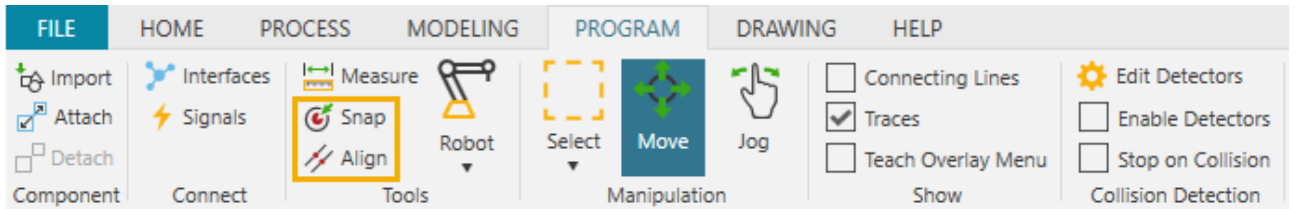
5. So then using the **Move Origin** tool, in **Move Origin** with **Coordinates** set to **Object**, we will rotate the **Rx** axis by **-180** degrees and then click **Apply**.



### Snapping and aligning the workpiece

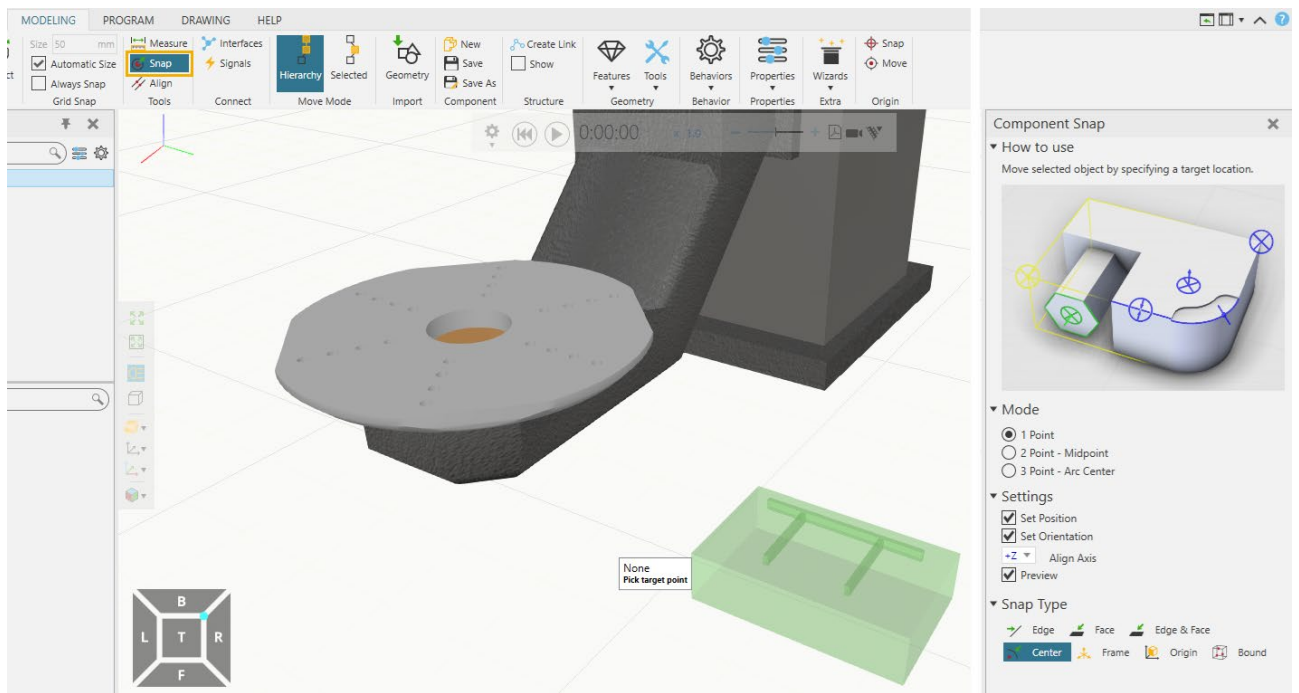
After setting the origin correctly, now the workpiece can be moved and placed in a correct position on the workpiece positioner. To do this, **Snap** and **Align** from the **Tools** group. can be used.

**Note:** The **Tools** group is available in the **HOME**, **PROCESS**, **MODELING** and **PROGRAM** tabs.

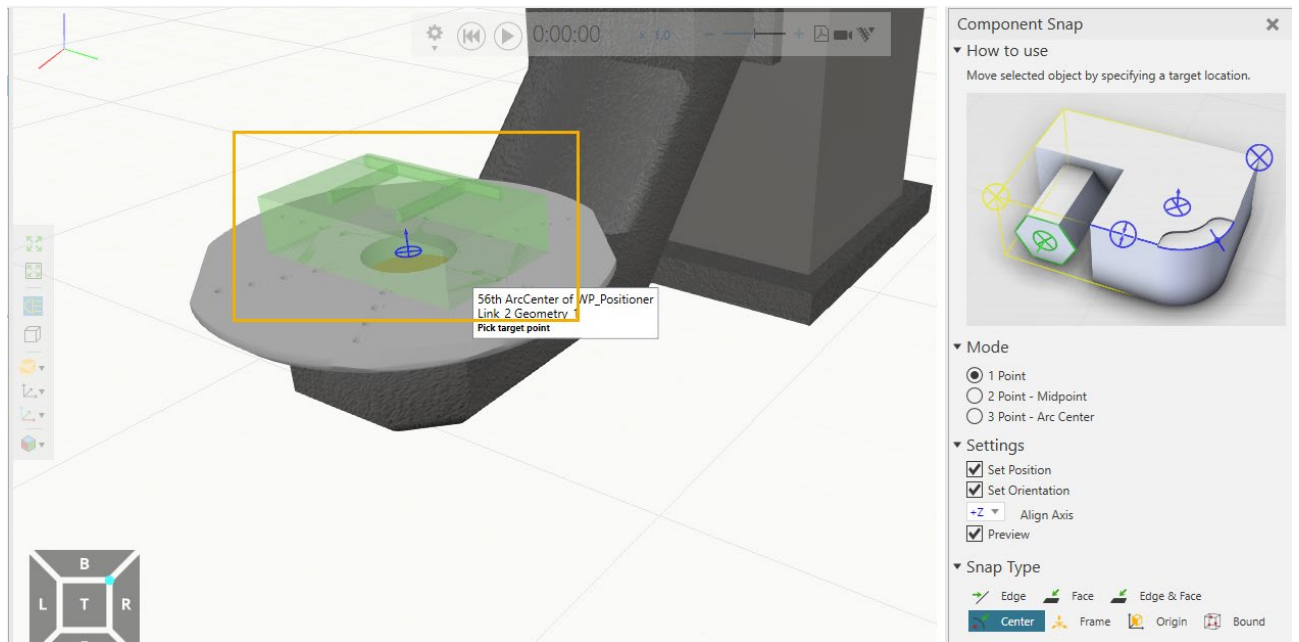


### Snap tool:

1. Let's first place the workpiece close to the workpiece positioner. And in the **MODELING** tab, click on the workpiece and from the **Tools** group, select the **Snap** tool.

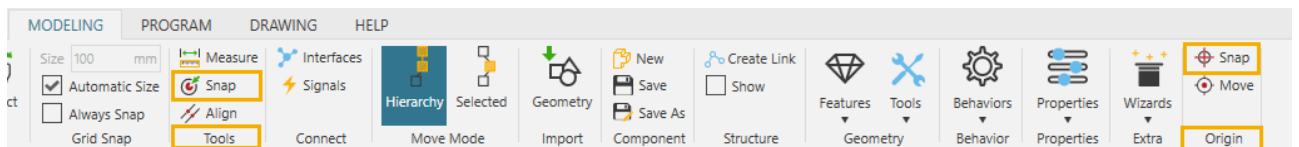


- Now hover your mouse over the workpiece positioner. You can see a preview of where the workpiece will be snapped on the workpiece positioner. Then left mouse click after choosing the correct target location.



**Note:** Please note the difference between **Snap (Origin)** and **Snap (Tools)**.

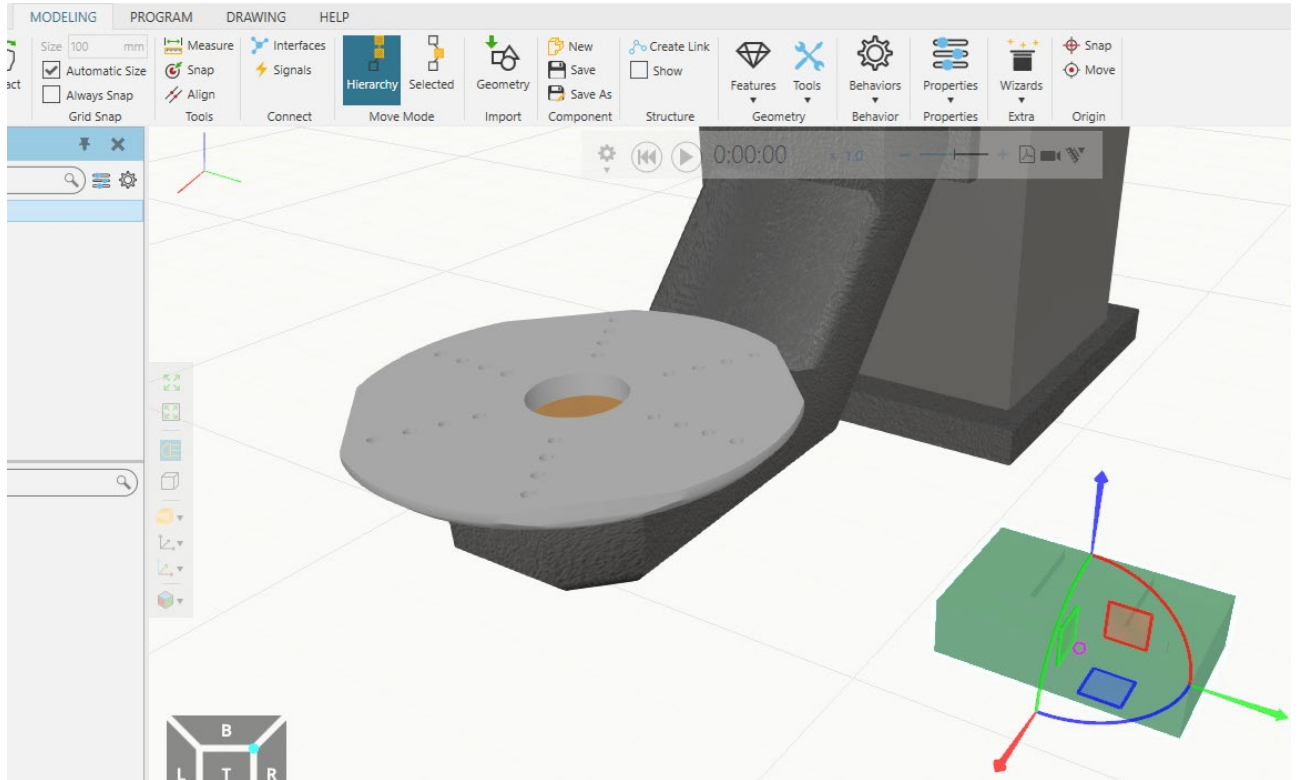
- Snap (Origin)** allows you to change the position/orientation of the component origin.
- Snap (Tools)** allows you to change the position/orientation of the whole component



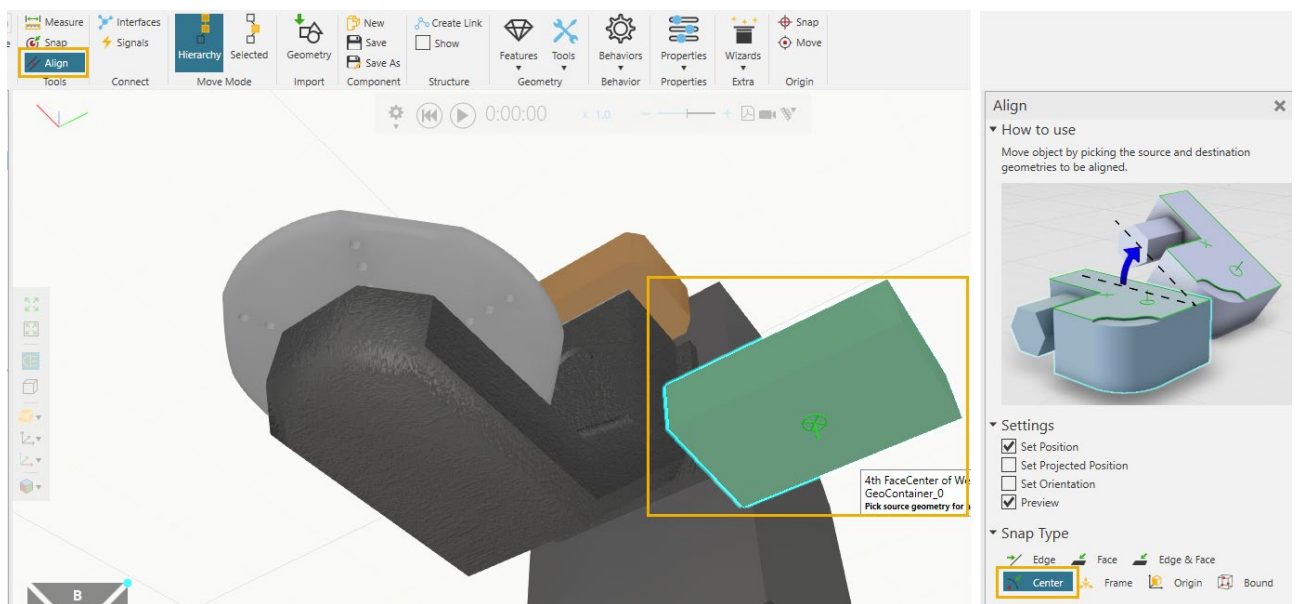
**Align tool:**

We have used **Snap** to position the workpiece on the workpiece positioner. We are now going to try positioning the same workpiece again, but instead using the **Align** tool.

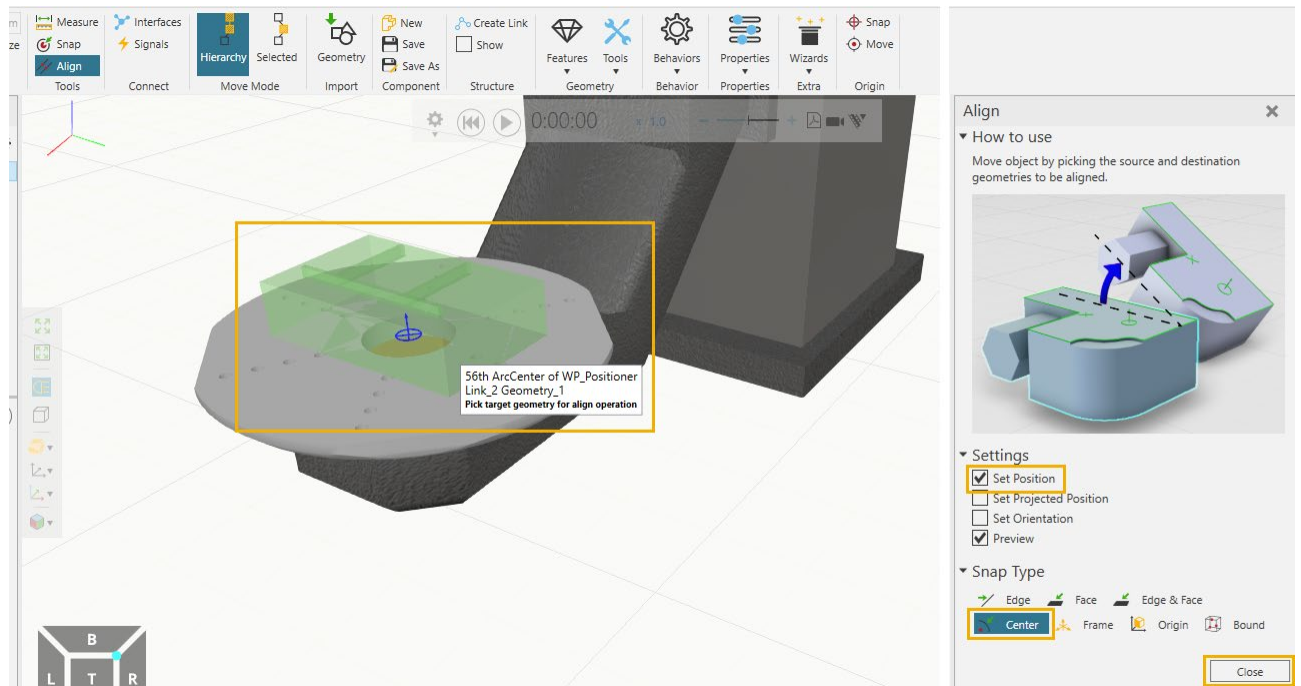
1. In the **MODELING** tab, let's first place the workpiece close to the workpiece positioner.



2. Then rotate the camera view so we can see the base of the workpiece. Then from **Tools** click on **Align**. We will select **Snap Type** as **Center** and select the center of the base of the workpiece as the first alignment point.



3. Then with **Set Position** enabled in the **Align Settings**, pick the second point for alignment on the surface of the workpiece positioner. And then click to **Close** the **Align** panel.



**Note:** Note the difference between the **Snap** and **Align** tools.

- **Snap** tool: when snapping the first picking point would by default be the workpiece origin.
- **Align** tool: the first picking point can be any surface based on the **Snap Type** options you choose

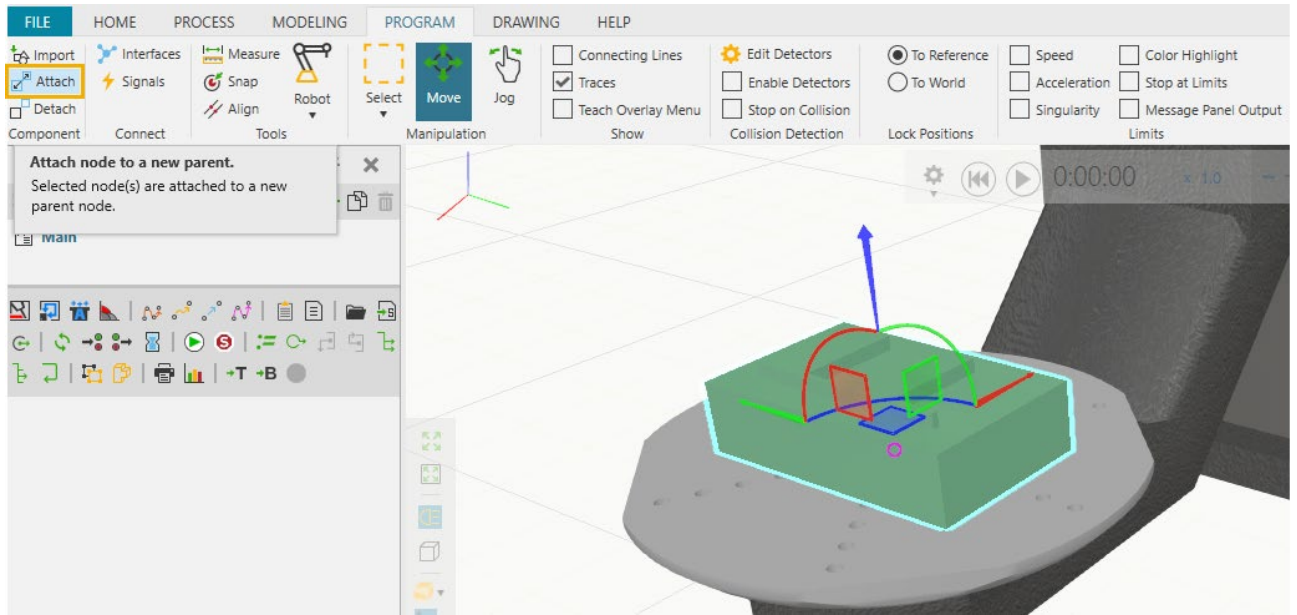


### Attaching the workpiece

After positioning the workpiece correctly by using either **Snap** or **Align** tools, you need to attach the workpiece to the workpiece positioner so that the workpiece is connected to it and moves along with it.

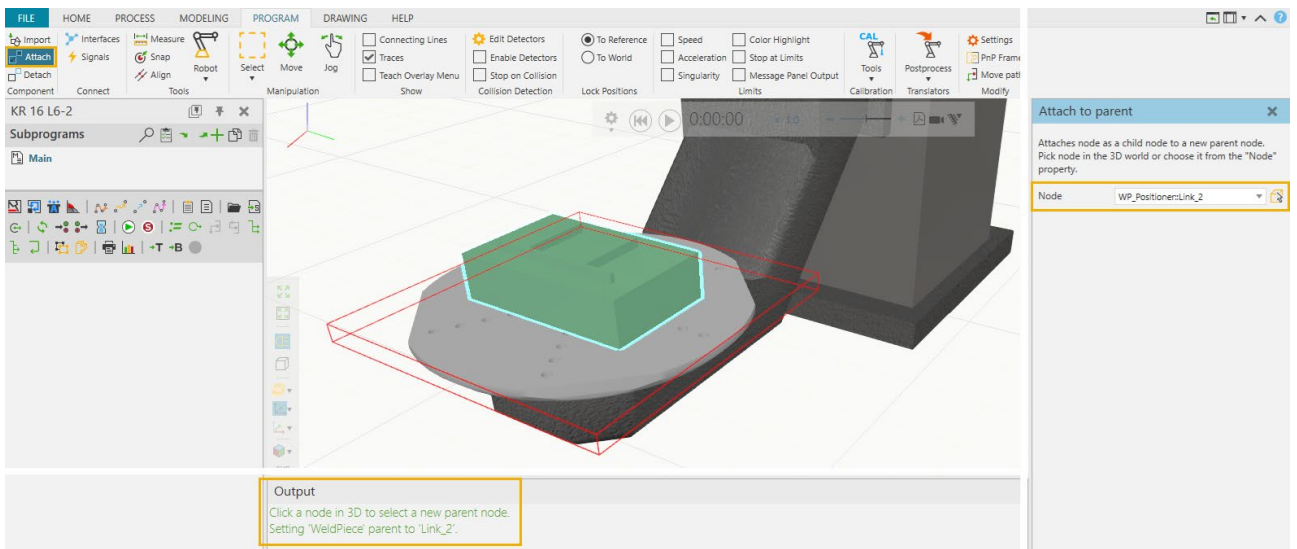
1. In the **PROGRAM** tab, select the workpiece and click on the **Attach** tool from the **Component** group.

**Note:** The **Attach** tool is available in the **HOME** and **PROGRAM** tabs.

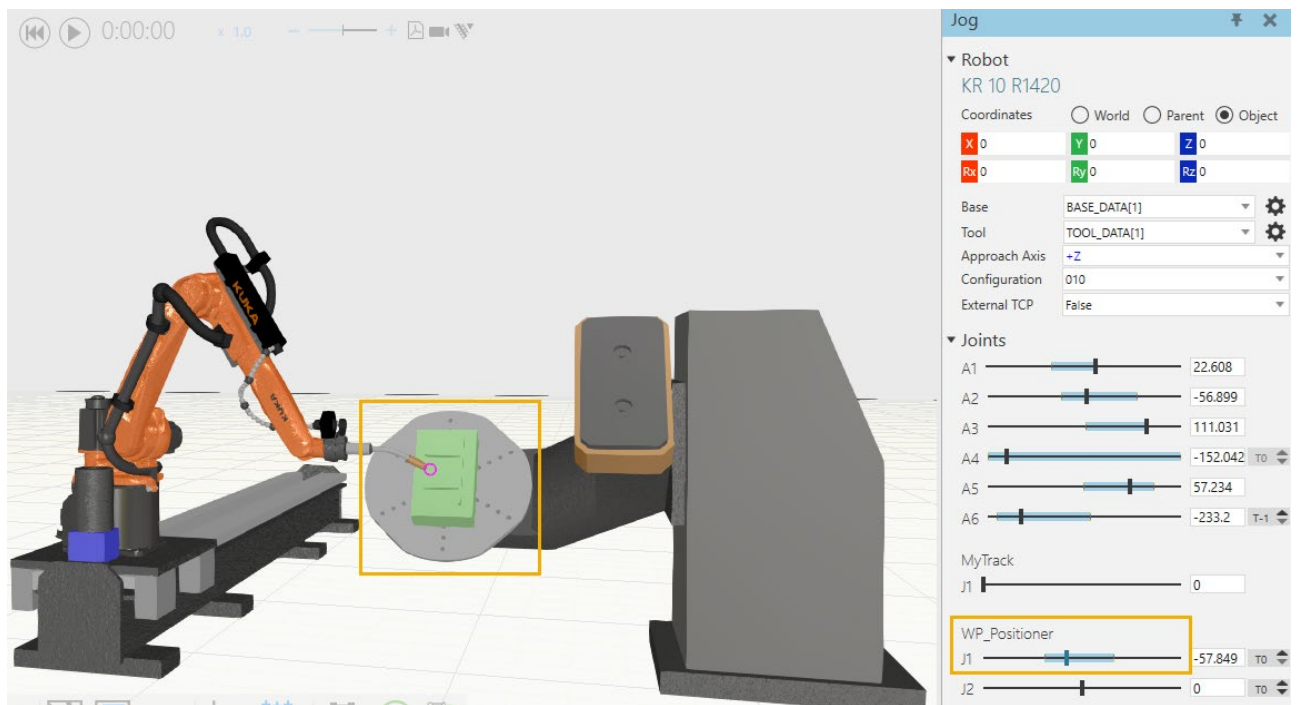


2. Hovering the mouse over the workpiece positioner, a red bounding box appears which you can use to select the last link of the workpiece positioner. Note the messages that appear in the **Output** panel below.

**Note:** The other option is to select the attach position from the **Node** list on the right.



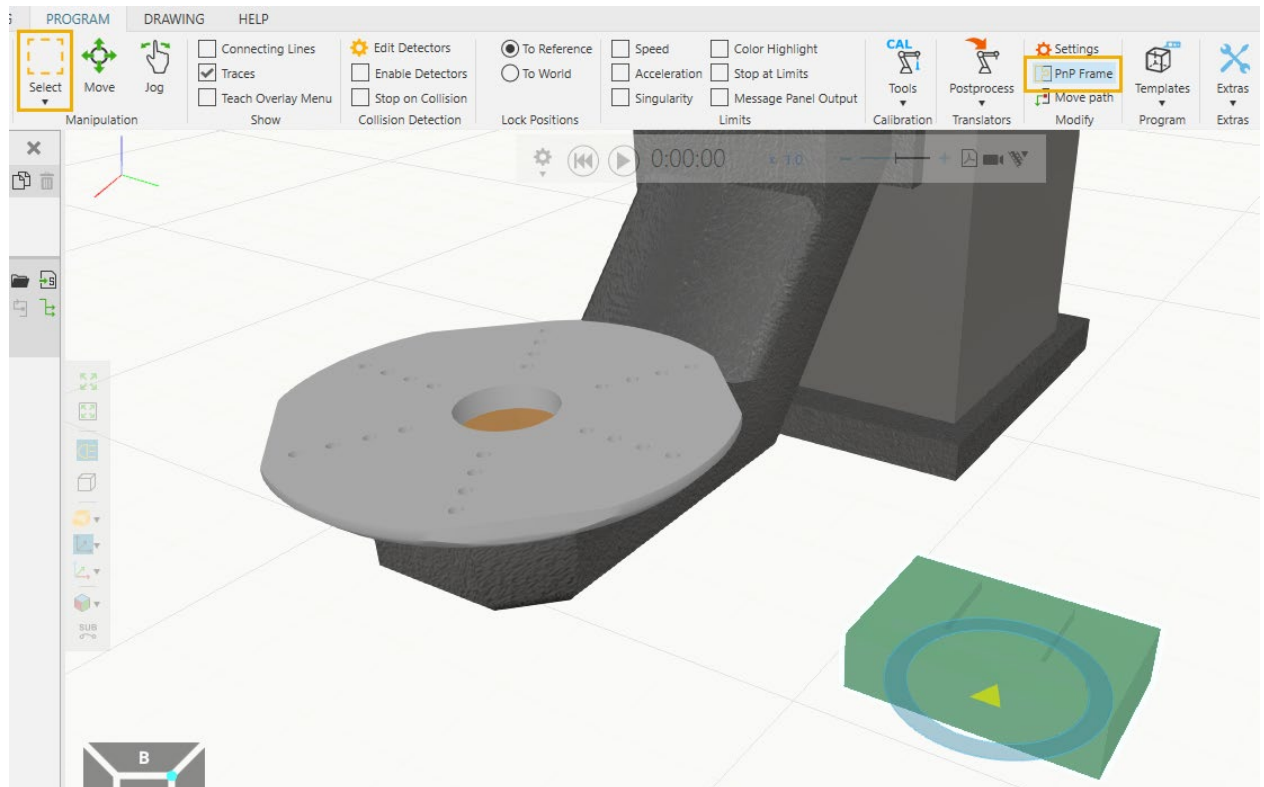
3. So now if we **Jog** the robot, when the workpiece positioner moves the attached workpiece will move with it.



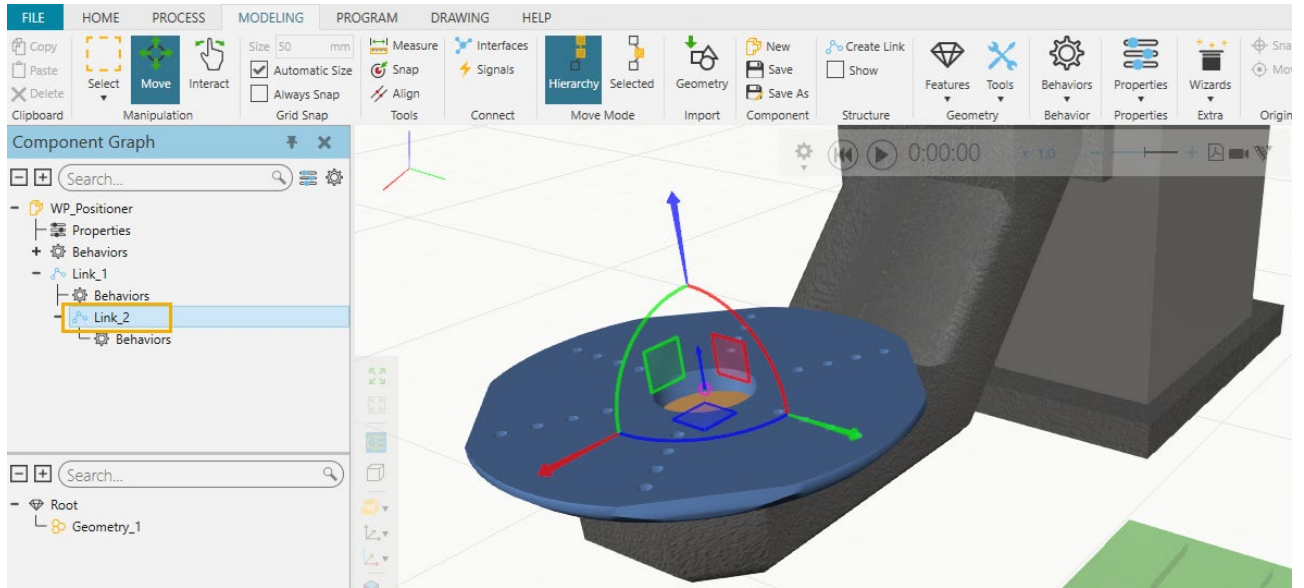
## Creating a PNP-interface

It is possible to create a PNP-interface on top of the workpiece positioner or fixture. By doing this, you can just hover the workpiece over the workpiece positioner and the workpiece will jump to this interface.

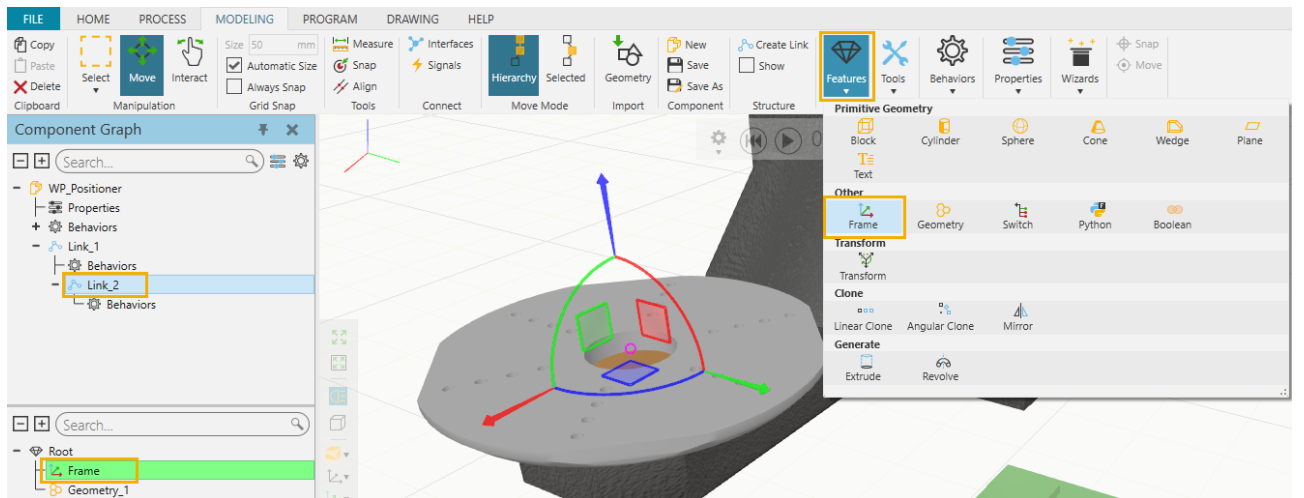
1. In the **PROGRAM** tab, let's first place the workpiece close to the workpiece positioner. Then selecting the workpiece, from the **Modify** group select **PnP Frame** to add a PnP frame to the component origin.



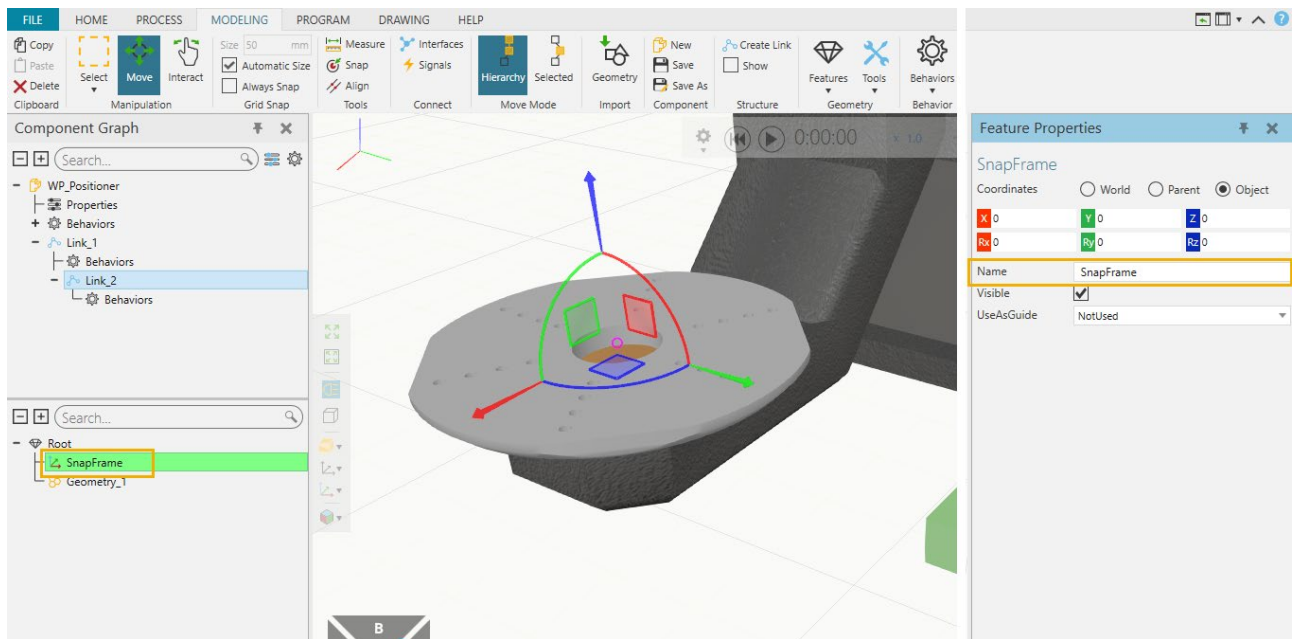
- Then in the **MODELING** tab, select the workpiece positioner link where you wish to create the interface the workpiece will snap to using PnP.



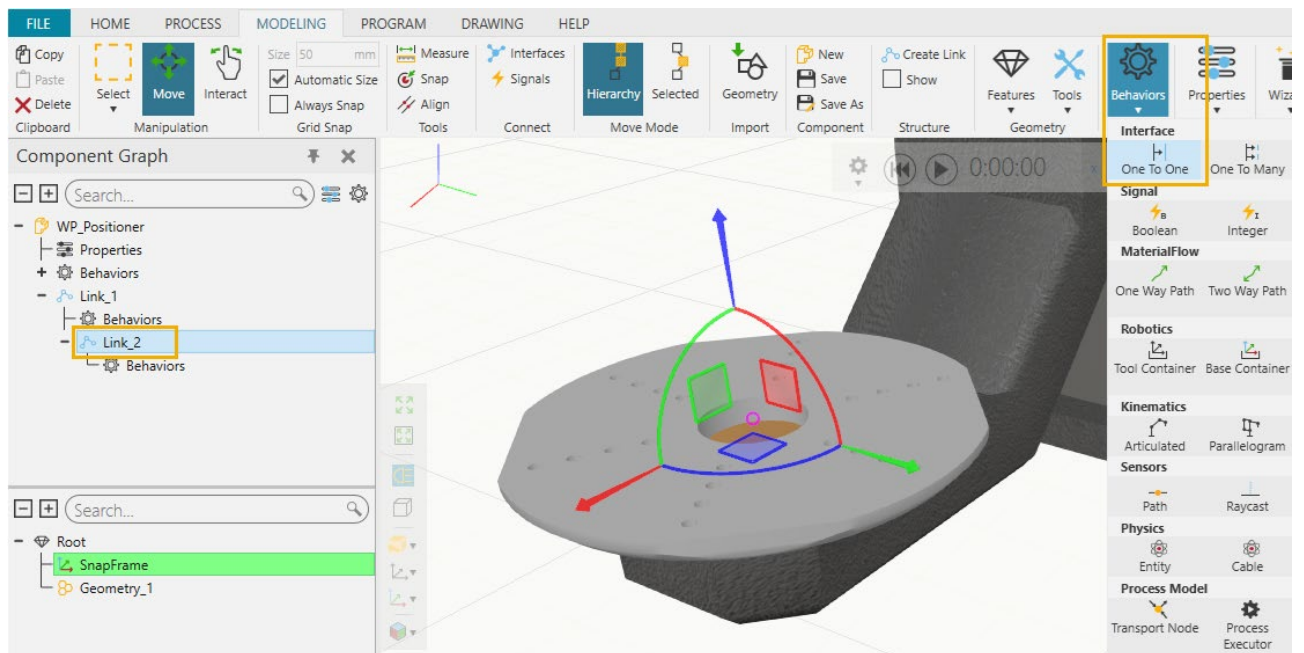
- From the **Features** menu in the ribbon select **Frame** which will create a **Frame** under the **Root** in the Node Feature Tree for **Link\_2**.



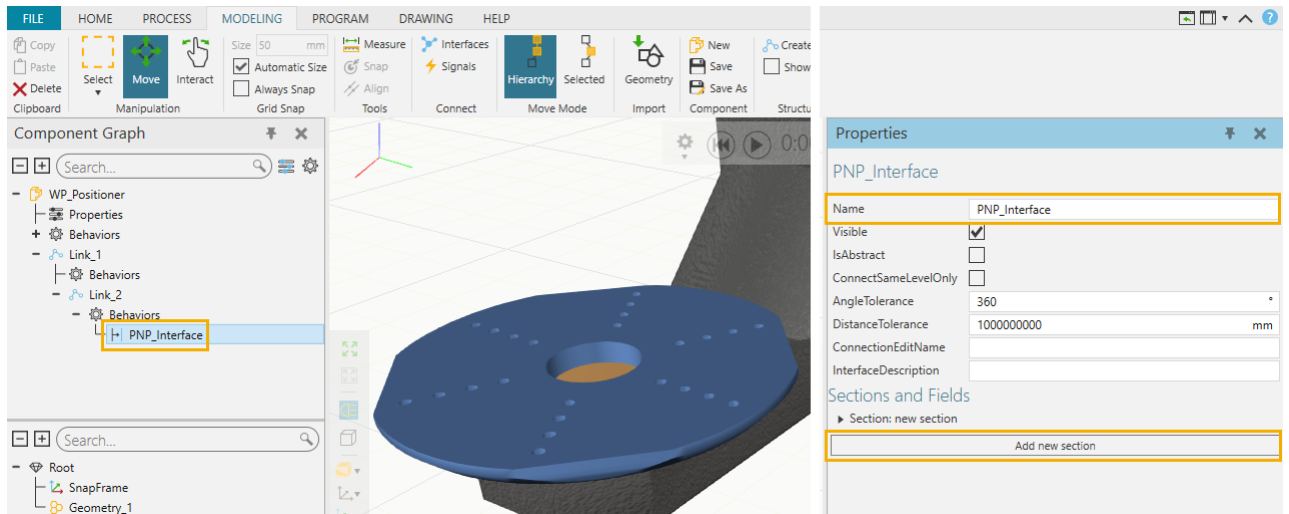
4. Select the **Frame**, and if necessary use the **Snap** tool to place it where you want the workpiece to be snapped. Then from its **Properties** on the right give it a unique name, for example **SnapFrame**.



5. Then with **Link\_2** selected, from **Behaviors** in the ribbon, select **One-to-One** interface.

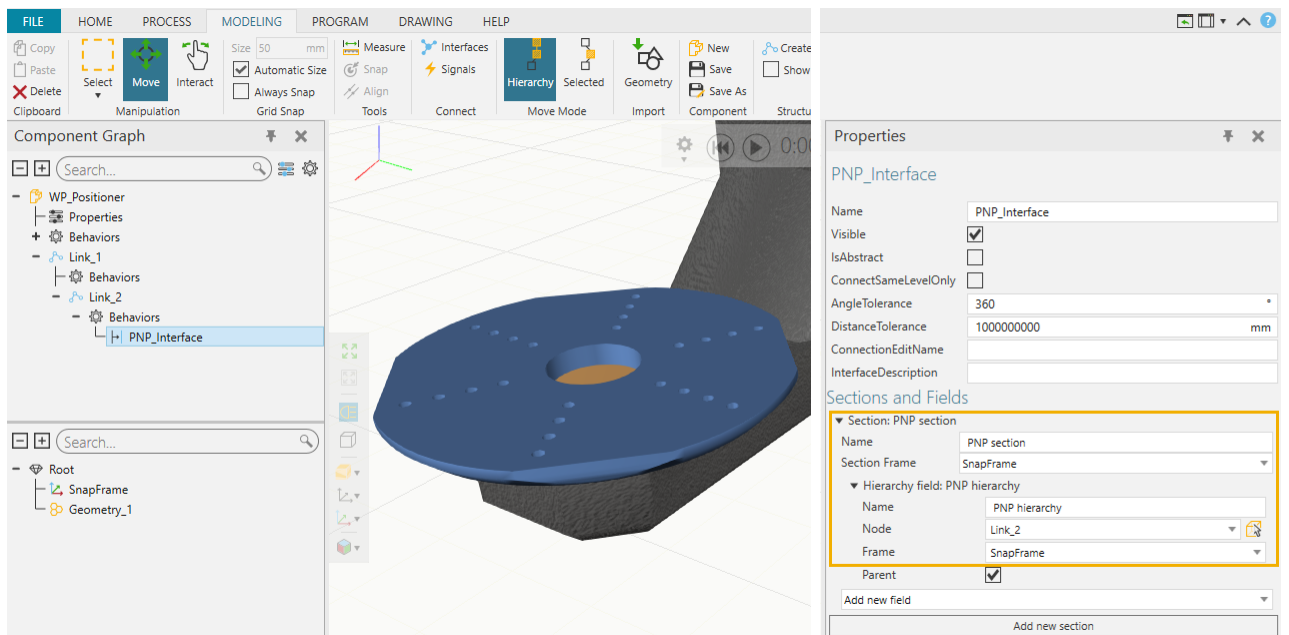


6. Select the interface that is added to the Component Node Tree under **Link\_2 Behaviours** and rename it to for example **PNP\_Interface**. And then in the **Properties** of the **PNP\_Interface**, click on **Add new section**.



7. In the interface **Properties** set the properties of the **Section: new section** as follows:

- For **Name** give it a name, for example **PNP section**.
- **Section Frame** choose **SnapFrame** from the list.
- **Add new field** select **Hierarchy**. And for **Name** give it a name, for example **PNP hierarchy**.
- **Node** select **Link\_2**.
- **Frame** select **SnapFrame**.



8. In the **HOME** tab, select the **PnP** manipulation tool. Then select the workpiece and hover it on top of the workpiece positioner. A green arrow will appear, and the workpiece jumps to the **SnapFrame** location that was created.

