Aras 3D Visualization 33

User Guide

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1 Introduction

1.1 Purpose

This User Guide describes how to use the Aras 3D Visualization (3DV) platform component within Aras Innovator.

1.2 Scope

This document provides instructions to define, manage, and validate all 3D Visualization (3DV) features. This Guide does not cover any custom or customized Aras 3DV functionality.

1.3 Target Audience

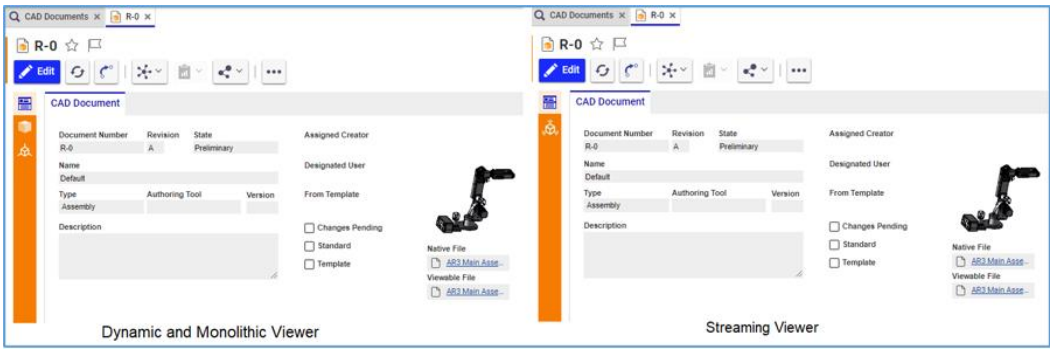
This User Guide is intended for Aras 3D Visualization (3DV) users responsible for utilizing the features outline in this document.

2 Introduction to Aras 3D Visualization (3DV)

Aras 3D Visualization (3DV) is an optional component for the Aras Innovator platform. It is a business-ready solution for converting and visualizing native 3D computer-aided design (CAD) files in Aras Innovator. Users upload 3D models from a CAD authoring tool into Aras Innovator as native 3D CAD files. The system automatically converts the uploaded native files into Stream Cache Single (SCS), Stream Cache Compressed (SCZ), 3D PDF viewable files, and other optional output formats. The users can view, manipulate, manage, and visually collaborate on the 3D models from the viewable files.

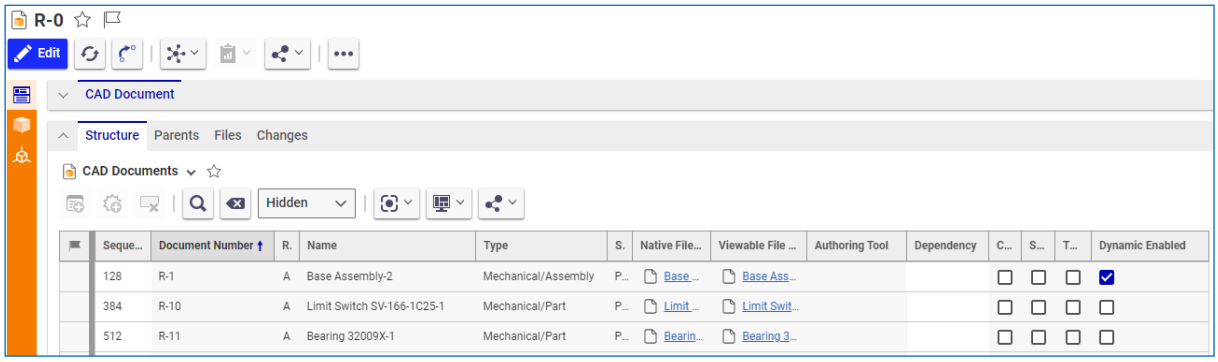
2.1 CAD Documents and 3DV

In Aras Innovator, a **CAD Document** Item represents a part or assembly drawing, specification, 3D model, and so on. For Aras 3DV visualization purposes, the **CAD Document** Item should be a mechanical part or assembly 3D model created in a CAD editor.



Hereinafter, a CAD Document will mean a **CAD** Document Item to simplify wording.

An assembly 3D model shows a complex product that consists of multiple parts (components). In such a case, a given CAD Document includes one or more other CAD Documents on its **Structure** Relationships tab. Another industry-common term is a parent CAD Document that has child CAD Documents. In technical terms, an assembly **CAD Document** Item has a **CAD Document Structure** Relationship Item for each included part **CAD Document** Item, where the assembly **CAD Document** Item is a source Item, and a part **CAD Document** Item is a related Item. A child CAD Document can be a leaf part or another parent (subassembly). The latter case is a multi-level CAD (Document) structure or assembly.



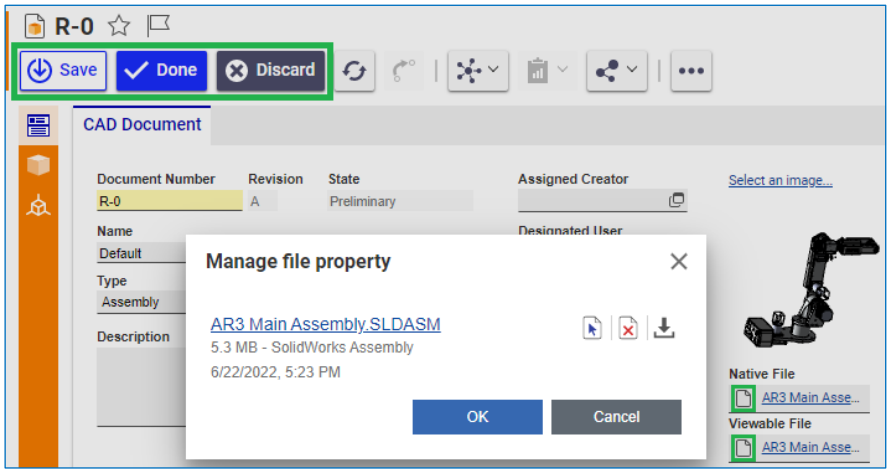
For more information on CAD Documents, see the *Aras Innovator Product Engineering 31 - User Guide.*

2.2 Managing 3D CAD Files

A CAD Document can have files associated with it. To show a 3D model of a part or assembly in Aras 3DV, the **Native File** property of a CAD Document should include a native CAD file with this 3D model. One CAD Document can have only one native CAD file.

A CAD Document can also contain a 3D PDF viewable file with the 3D model in the **Viewable File** property. The CAD Document Item form shows a link to this 3D PDF file.

End users with the Permission to edit a CAD Document in a given Item State can attach, download, replace, and remove native CAD and viewable 3D PDF files with 3D models to the **Native File** and **Viewable File** CAD Document properties using the standard Aras Innovator functionality provided with the **Manage file property** dialog. For more information on file management, see the *Aras Innovator Product Engineering 14 - User Guide*.



Additionally, admins and advanced users can import multiple native CAD files with 3D models into Aras Innovator with the Aras Batch Loader tool. CAD Documents and CAD Document Structures

can be automatically created during the import. This approach is efficient for uploading large CAD assemblies into Aras Innovator. For details about this tool and its requirements, see *Aras Innovator 21 - Batch Loader*.

Third-party connectors for CAD authoring tools can be an efficient way for end-users to manage adding and updating CAD Documents.

After a native CAD file is attached to a CAD Document, the Aras CAD Converter automatically schedules this file for conversion into the following three viewable files:

- SCS (Stream Cache Single)
- SCZ (Stream Cache Compressed)
- 3D PDF (Portable Document Format)

Once the conversion is successfully completed, the Aras CAD Converter attaches these files to the CAD Document. The Aras CAD Converter is a separate Aras 3DV component.

End users with the Permission to get and access CAD Documents can view 3D models from:

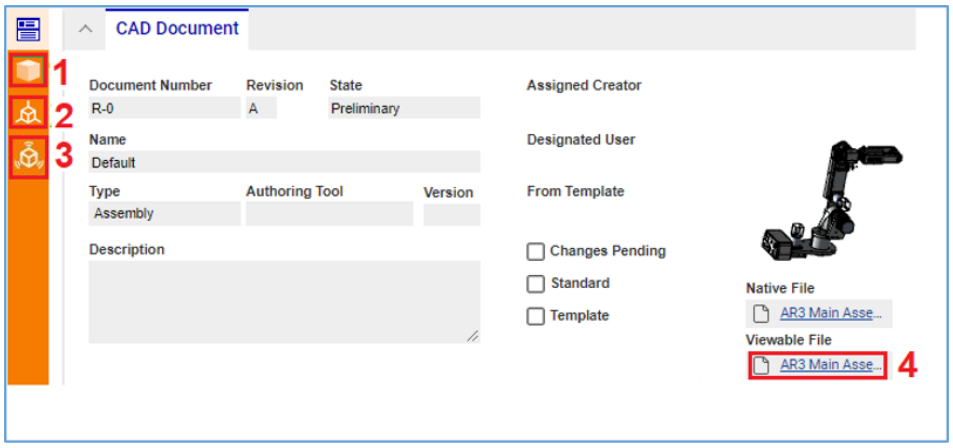
- SCS files using the Monolithic or Dynamic Viewer, which are separate Aras 3DV components.
- SCZ files using the Streaming Viewer.
- 3D PDF files using third-party PDF viewers and editors not included in Aras 3DV.

When a native CAD file with a 3D model is removed from a CAD Document, end users will not be able to view this 3D model because Aras 3DV automatically removes relationships between this CAD Document and a pertinent viewable SCS file.

Viewable SCS files are fully automatically managed by Aras 3DV: end users cannot access or manage them directly.

2.3 Accessing 3DV Functionality

Aras 3DV functionality is accessible from a CAD Document Item form as follows:



- The **Monolithic Viewer** sidebar. This viewer displays the Monolithic view of the selected CAD item.
- The **Dynamic Viewer** sidebar. This viewer displays the Dynamic view of the selected CAD item.
- The **Streaming Viewer** sidebar. This viewer also displays the Dynamic view of the selected CAD Item using an alternate view generation framework.
- The **Viewable File**. This link enables user to download the 3D model as a 3D PDF file.

Note: The Dynamic and Streaming Viewers have the similar functionality; however, the viewers available will depend on the installation of Aras 3DV.

Warning Please note that the output files of Dynamic/Monolithic Viewer and Streaming Viewer are incompatible with one another.
If the Streaming 3D Viewer is installed in an environment where the Monolithic or Dynamic 3D Viewers have been previously installed and used, all existing native files of existing CAD Documents need to be re-converted. There is no automated means to perform this reconversion.

2.4 Monolithic vs. Dynamic Viewer

Both Monolithic and Dynamic Viewers show a 3D model in Aras Innovator by rendering 3D component geometries stored in viewable SCS files. The difference between them is in the following:

- Which 3D models they can show.
- How they populate the view.
- What limitations they have.
- What functions they offer.

The Monolithic Viewer is the core 3D Visualization functionality and a prerequisite for the Dynamic Viewer. It can show a static 3D model of a component or assembly. Technically, this Viewer shows one viewable SCS file attached to a given component. In an assembly case, such a file is created from the files attached to all sub-assemblies and parts included in this assembly when it was loaded into the Viewer. The shown 3D model is a static assembly view because it cannot contain geometry changes to components made after the assembly view file had been created. Thus, the Monolithic Viewer features basic functionality for viewing the 3D model, isolating, and hiding assembly components.

The Dynamic Viewer provides optional 3D Visualization functionality in addition to the Monolithic Viewer. It can show a dynamic 3D model of an assembly only. Technically, this Viewer shows multiple viewable SCS files attached to all sub-assemblies and parts included in this assembly when it was loaded into the Viewer. Since a given model is a set of SCS files, displaying product manufacturing information is not included. The shown 3D model is a dynamic assembly view because it can contain geometry changes to components made after the assembly view file was created according to various structure resolutions: Latest, Released, and so on. Thus, in addition to the functionality included in Monolithic Viewer, the Dynamic Viewer has capabilities for manual geometry transformations and annotations. Aras Innovator Admins can also customize what content is displayed and how it is displayed in the Dynamic Viewer. Such customization is beyond the scope of this User Guide.

This Guide describes both Viewers in detail in the corresponding sections.

2.5 Dynamic vs. Streaming Viewer

The Dynamic and Streaming Viewers have similar functionalities. The differences are as follows:

- The Dynamic and Streaming Viewers use different, non-compatible view files (SCS, and SCZ respectively).
- For Streaming Viewer, a separate window service called Hoops Server is used. The HOOPS Server initiates individual Stream Services to support each Streaming Viewer instance.
- Larger datasets can be streamed from a server to a client in a single request with the help of the Streaming Viewer unlike Dynamic Viewer which uses individual client/server HTTP requests.

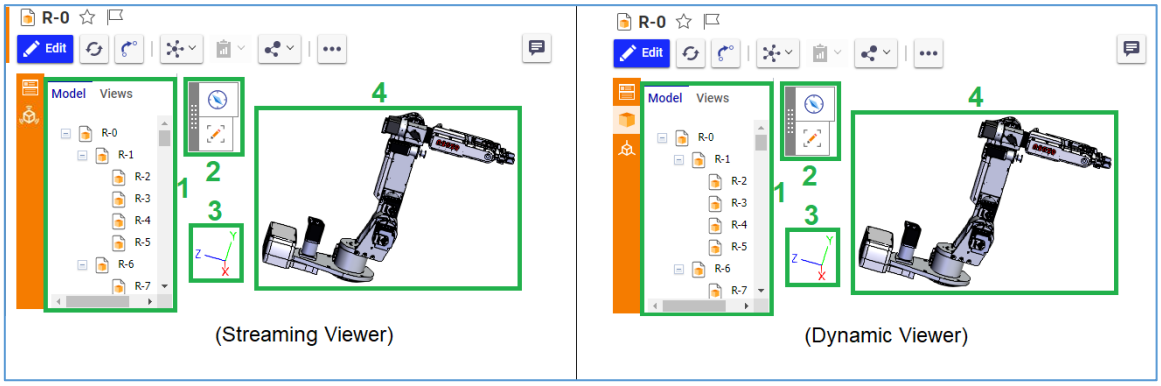
Warning	Please note that the output files of Dynamic/Monolithic Viewer and Streaming Viewer are incompatible with one another. If the Streaming 3D Viewer is installed in an environment where the Monolithic or Dynamic 3D Viewers have been previously installed and used, all existing native files of existing CAD Documents need to be re-converted. There is no automated means to perform this reconversion.

3 Aras 3DV UI

This section describes Aras 3DV UI elements general for the Monolithic, Dynamic and Streaming Viewers: the 3D scene, 3DV toolbars, and context menus.

3.1 3D Scene

A 3D scene is the same for Monolithic, Dynamic and Streaming Viewers.



The 3D Scene includes the following:

1. The **Model Browser** section. As its contents and visibility are different for the Viewers, it is discussed in a corresponding section for each Viewer.
2. The **3DV** toolbar.
3. The **Model Orientation** indicator.
4. A given 3D CAD model.

3.2 Aras 3DV Toolbar

The Monolithic, Dynamic and Streaming Viewers use the same **3DV** toolbar, which is dynamic and flexible. When opening any of the Viewers on a newly opened CAD Document, this toolbar is collapsed and located in the upper left corner of a 3D scene view.

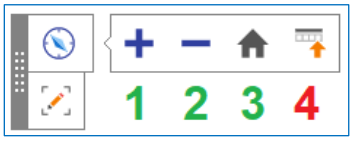
The collapsed **3DV** toolbar has the following elements:

1. The **Movement** bar: dragging this bar moves the **3DV** toolbar through the 3D scene.
2. The **View** button: clicking this button switches the 3D scene to the 3D model viewing mode and either shows or hides the **Basic Viewing** toolbar; see the *Viewing Toolbars* section.
3. The **Markup** button: clicking this button switches the 3D scene to the 3D model markup mode and either shows or hides the **Basic Markup** toolbar; see the Markup Toolbars section.

   A larger button indicates that the 3D scene is currently in a mode launched by this button. For example, if the **View** button is larger than the **Markup** button, the scene is in the viewing mode.

3.2.1 Viewing Toolbars

Clicking the **View** button on the collapsed **3DV** toolbar launches the viewing mode and either shows or hides the **Basic Viewing** toolbar, which includes the following buttons:



1. **Zoom Up** increases a 3D CAD model size on the canvas along the viewpoint center.
2. **Zoom Down** decreases a 3D CAD model size on the canvas along the viewpoint center.
3. **Reset View** sets the default 3D CAD model orientation and size on the canvas.
4. **Switch To Standard Toolbar** hides the **Basic Viewing** toolbar and shows the **Standard Viewing** toolbar.

   The **Standard Viewing** toolbar is fixed to the upper left corner of the 3D scene view: it cannot be moved through the 3D scene like the **Basic Viewing** toolbar. The **Standard Viewing** toolbar includes the same buttons as on the **Basic Viewing** toolbar with the exception of the **Switch To Standard Toolbar** button (4)—the **Switch To Basic Toolbar** button appears instead (15)—and the following additional items:

5. **Preferences** shows the **3D Viewer Preferences** pop-up dialog box for configuring the projection and zoom preferences; see the *3D Viewer Preferences* section.
6. **Zoom Window** enables a user to select an arbitrary area on the model to zoom into this area; see the *Zooming into Area* section.
7. **Orient to Face** shows a given 3D CAD model zoomed into a selected surface or part and oriented to a user; see the *Zooming into Part* section.
8. **Set Display Style** shows or hides a toolbar with options on how to display a given 3D CAD model; see the *3D Viewer Preferences* section.
9. **Measure** shows or hides a toolbar with options for measuring a given 3D CAD model; see the *Measuring CAD Models* section.
10. **Exploded View** shows or hides a toolbar with the slider exploding a given 3D CAD model; see the *Exploding CAD Models* section.

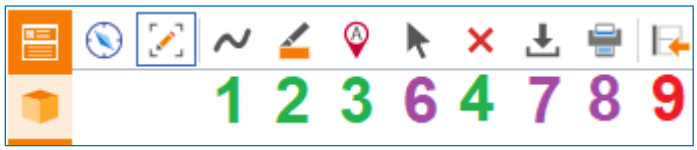
11. **Cross Section** shows or hides a toolbar with options for cross-section viewing of a given 3D CAD model; see the *Cross Section Viewing of the CAD* Model section.
12. **Model Browser** shows or hides the **Model Browser** section with quick viewing options as trees. The Monolithic have different **Model Browser** sections then in the Dynamic or Streaming Viewer; see the *Model Browser in Monolithic Viewer* and *Model Browser in Dynamic and Streaming Viewer* sections.
13. **Product Manufacturer Information** displays annotations and attributes contained in a 3D solid model that complement the geometric definition and complete the digital data set; see the *Product Manufacturing Information* section. This button is visible only in the Monolithic Viewer.
14. **Configurations** is the list of configurations available within the given 3D CAD model.
15. **Export SVG** enables a user to export an SVG Image file of the current 3D View to the local machine. See the *Exporting SVG Image file* section. This is only available for Dynamic and Streaming Viewer.
16. Switch to Basic Toolbar hides the Standard Viewing toolbar and shows the Basic Viewing toolbar.

3.2.2 Markup Toolbars

Clicking the **Markup** button on the collapsed **3DV** toolbar launches the markup mode and either shows or hides the **Basic Markup** toolbar, which includes the following buttons:

1. **Scribble** shows or hides buttons on the toolbar for drawing arbitrary lines on a given 3D CAD model; see the *Drawing on CAD Models* section.
2. **Highlight** shows or hides buttons on the toolbar for drawing rectangular areas on a given 3D CAD model; see the *Highlighting Areas on CAD Models* section.
3. **Label** shows or hides buttons on the toolbar for adding labels to a given 3D CAD model; see the *Putting Labels on CAD Models* section.
4. **Delete** removes selected markup items from a given 3D CAD model; see the *Deleting Markups on CAD Models* section.
5. **Switch To Standard Toolbar** hides the **Basic Markup** toolbar and shows the **Standard Markup** toolbar.

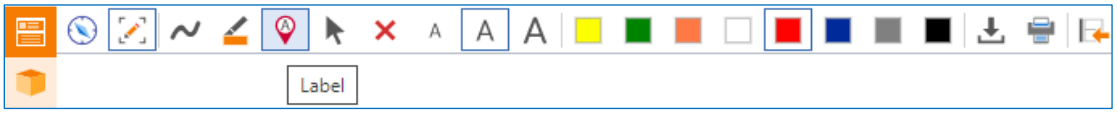
   The **Standard Markup** toolbar is fixed to the upper left corner of the 3D scene view: it cannot be moved through the 3D scene like the **Basic Markup** toolbar. The **Standard Markup** toolbar includes the same buttons as on the **Basic Markup** toolbar with the exception of the **Switch To Standard Toolbar** button (5)—the **Switch To Basic Toolbar** button appears instead (9)—and the following additional buttons:



6. **Select** selects **markups** on a given 3D CAD model.
7. **Download File** downloads a JPG image of a given markup.

8. **Print** uses the standard browser print function for markups. Depending on a given browser and its specific configuration, various print choices, such as printing on a printer or saving to PDF, are available.
9. Switch to Basic Toolbar hides the Standard Markup toolbar and shows the Basic Markup toolbar.

Unlike the **Basic Markup** toolbar, the **Standard Markup** toolbar is dynamic. The **Standard Markup** toolbar does not show or hide an additional toolbar containing functionality for a markup feature selected with the **Scribble** (1), **Highlight** (2), or **Label** (3) button. It displays the functionality of a selected markup feature. A selected feature and functionality options are enclosed by blue boxes. To hide the functionality options, click the selected feature.



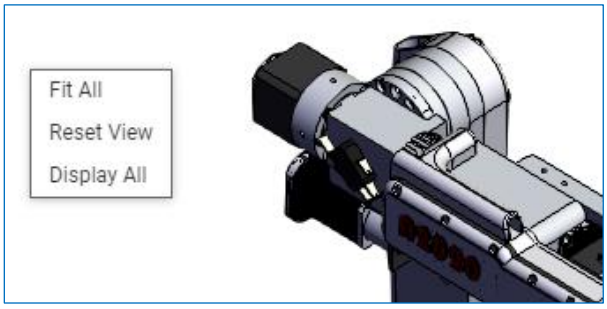
3.3 Aras 3DV Context Menus

The Monolithic, Dynamic and Streaming Viewers feature context menus for the 3D scene and a selected part. Both **3D Scene** and **Part** context menus are available only in the model viewing mode. Menu content depends on a given Viewer. This section discusses the menu options general for both Viewers.

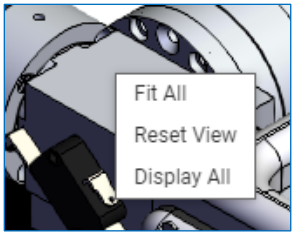
3.3.1 3D Scene Context Menu

To access the **3D Scene** context menu, right-click either:

- The canvas outside a given 3D CAD model.



- A given 3D CAD model with no selected parts.



The **3D Scene** context menu includes the following commands:

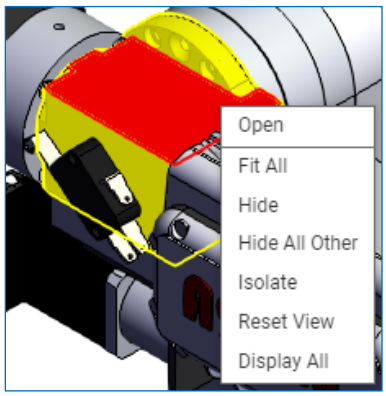
- Fit All sets the default 3D CAD model size so that all visible model parts are shown on the 3D scene.
- Reset View makes all 3D CAD model parts visible on the 3D scene (shows them) and sets the given 3D CAD model to its default orientation and size on the 3D scene.
- Display **All** makes all 3D CAD model parts visible on the 3D scene (shows them).

The Dynamic and the Streaming Viewer **3D Scene** context menu has additional commands; see the *3D Scene Context Menu in Dynamic Viewer and Streaming Viewer* section.

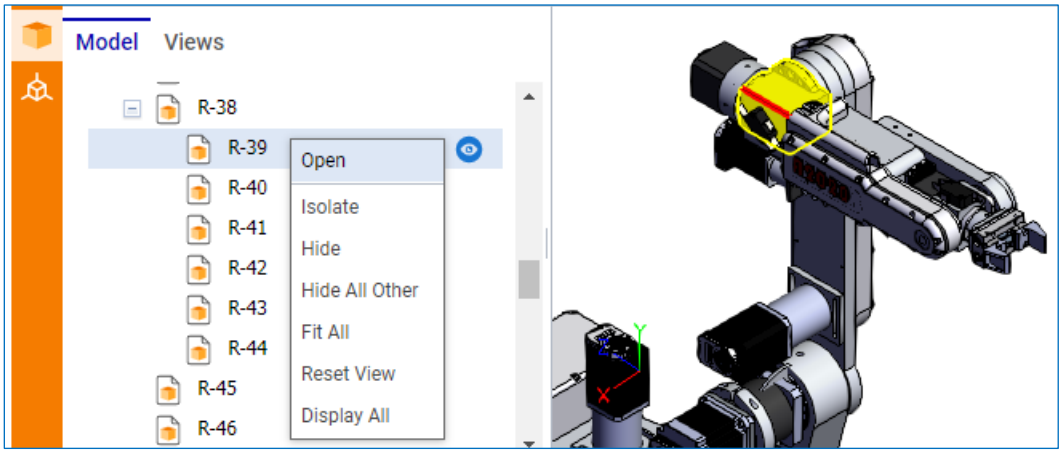
3.3.2 Part Context Menu

To access the **Part** context menu, click an individual part to select it and then right-click either:

- On a given 3D CAD model on the canvas.



- In the Model Browser.



In addition to the **Fit All**, **Reset View**, and **Display All** commands from the **3D Scene** context menu, the **Part** context menu includes the following commands:

- Open opens the CAD Document Item view of a selected part.
- Isolate makes everything transparent except the selected part and zooms into this part; see the *Zooming into and Isolating Part* section.
- Hide makes a selected part invisible on the 3D scene (hides it).
- Hide **All Other** makes unselected parts invisible on the 3D scene (hides them).

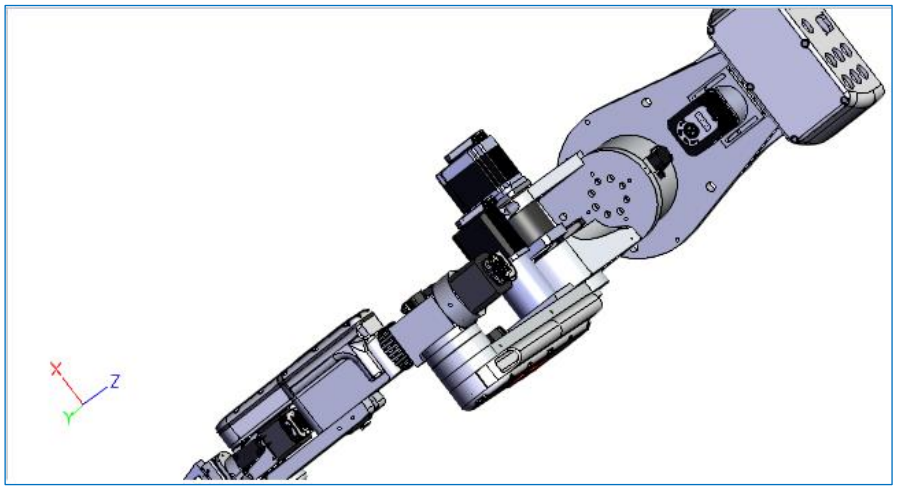
The Dynamic and Streaming Viewer **Part** context menu has additional commands. It is possible to select multiple individual parts in the Dynamic/Streaming Viewer. See the *Part Context Menu in Dynamic Viewer and Streaming Viewer* section.

4 General 3DV functionality

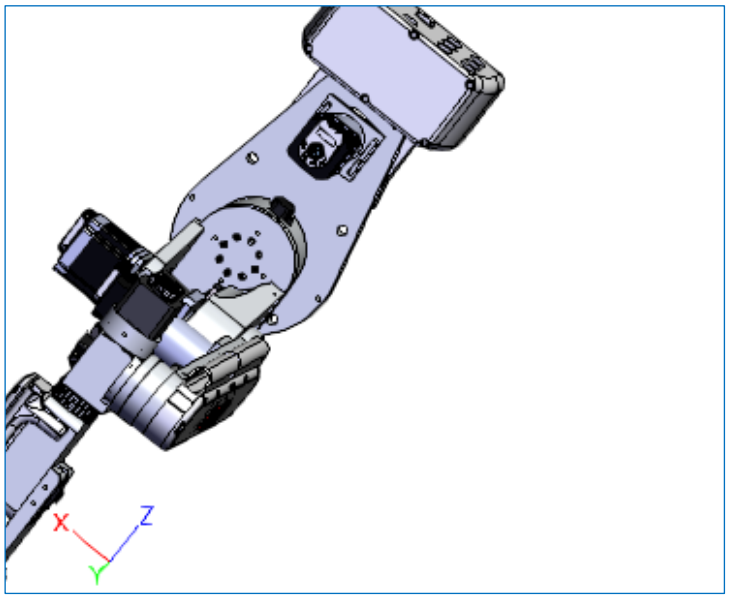
This section describes the Aras 3DV functionality general for the Monolithic, Dynamic and Streaming Viewers. This functionality enables end users to view and annotate 3D CAD models.

4.1 Viewing CAD Models

In the 3D model viewing mode launched with the **View** button on the **Basic Viewing** or **Standard Viewing** toolbar, an end user can view a 3D CAD model from different sides by clicking and dragging any place on the model or canvas. The **Model Orientation** indicator tells which side is toward the user and where the other sides are.

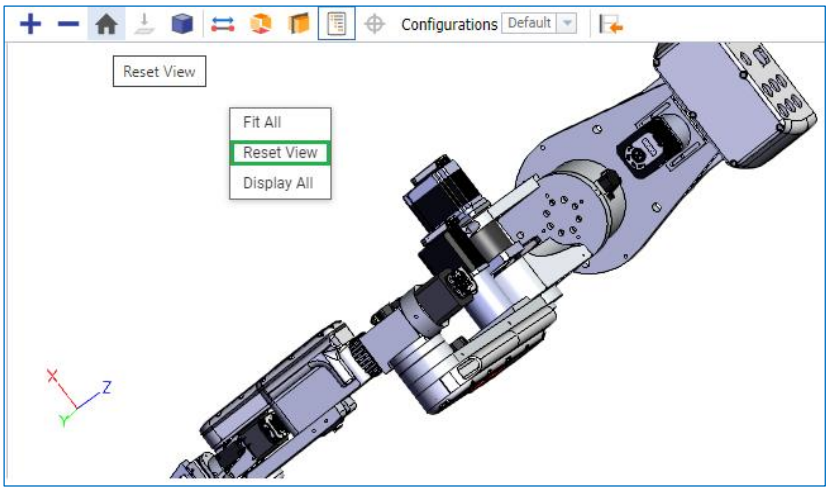


Right-clicking and dragging any place on the model or canvas pans the view—moves the model through the canvas without changing the model orientation.

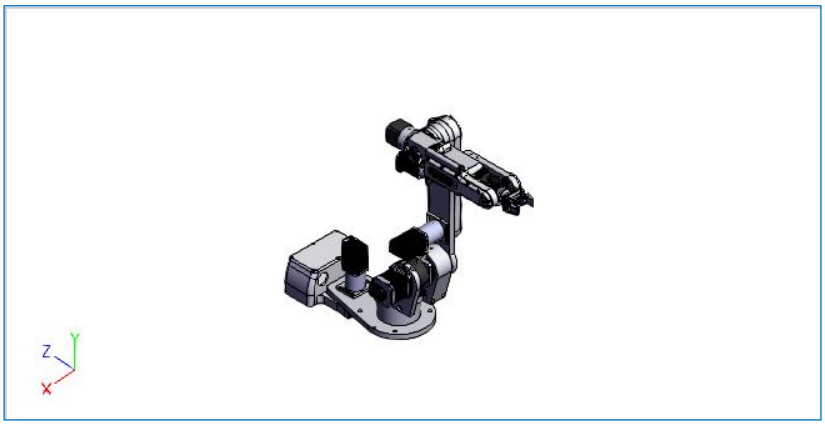


To show a 3D CAD model in its default orientation and size:

- Click Reset View on the Basic Viewing or Standard Viewing toolbar or 3D Scene or Part context menu.



And the model will return to its default orientation and position in front of the camera.

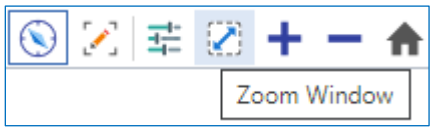


4.1.1 Zooming

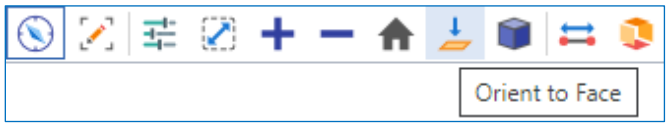
The zooming options are the following:

- Wheel mouse button: rotate this wheel button to zoom in or out according to the zoom configuration set in the **3D Viewer Preferences** dialog box; see the Zoom Preferences section.
- The **Zoom Up** and **Zoom Down** buttons on the **Basic Viewing** and **Standard Viewing** toolbars: click the appropriate button to zoom in or out along the 3D scene viewpoint center.

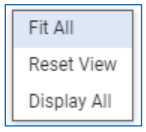
- The **Zoom Window** feature available from the **Standard Viewing** toolbar: click this button and select an arbitrary area on the 3D scene to zoom into this area; see the *Zooming into Area* subsection.



- The **Orient to Face** feature available from the **Standard Viewing** toolbar: selects a surface and click this button to orient and zoom a given 3D CAD model into this part or surface; see the *Zooming into Part* subsection.



- The **Fit All** feature available from the **3D Scene** and **Part** context menus: click this command to restore the default 3D CAD model size fitting the 3D scene canvas without changing the current model orientation; see the *Zooming into and Isolating Part* subsection.

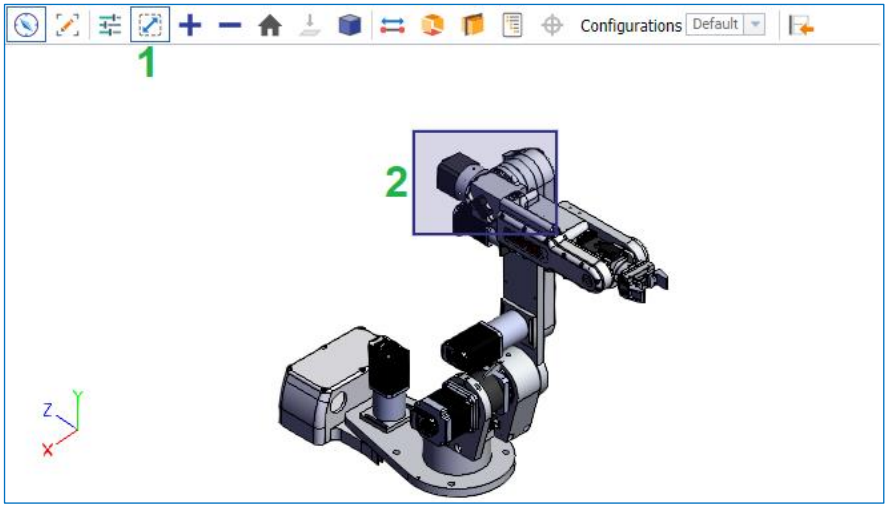


- The **Isolate** feature available from the **Part** context menu: select a part or surface and click this command to zoom into this part or surface and make all other parts and surfaces transparent; see the *Zooming into and Isolating Part* subsection.

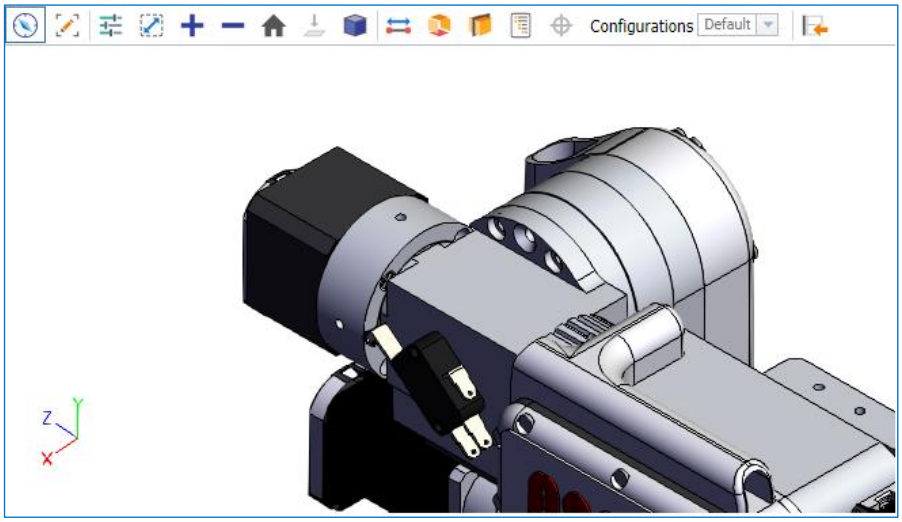
4.1.1.1 Zooming into Area

To zoom into an area on the 3D scene:

1. Click the Zoom **Window** button on the **Standard Viewing** toolbar.
2. Select the area by clicking and dragging.



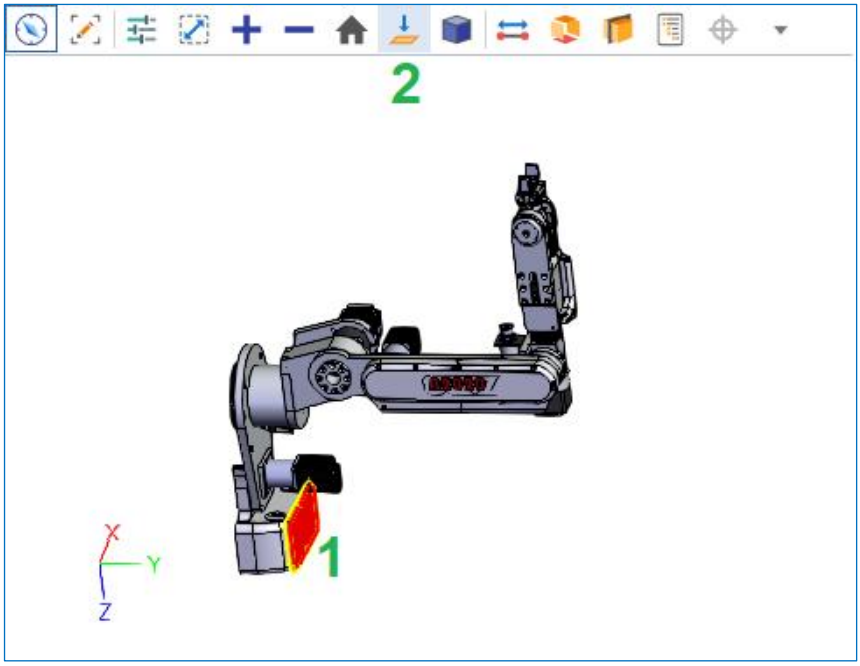
The selected area will fit the 3D scene canvas.



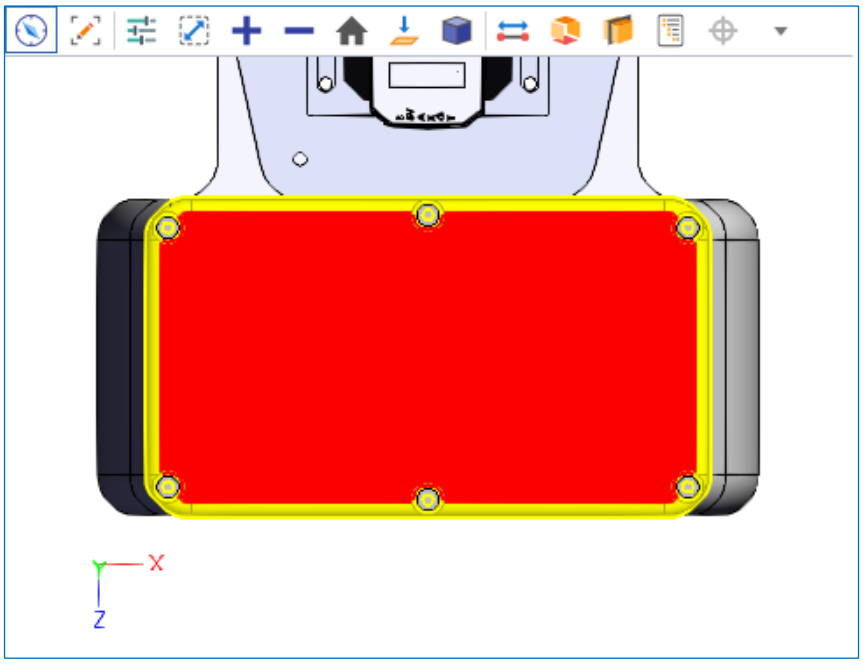
4.1.1.2 Orienting Model to Face

To orient a 3D CAD model to a surface on its part:

1. Select the part or surface
2. Click the Orient to Face button on the **Standard Viewing** toolbar.



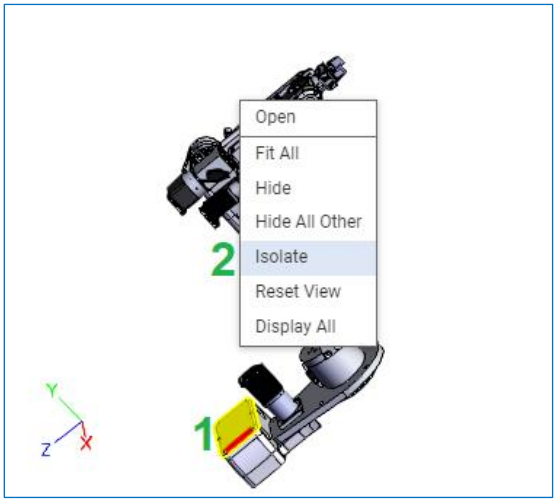
The selected part or surface will fit the 3D scene canvas and be oriented to the user.



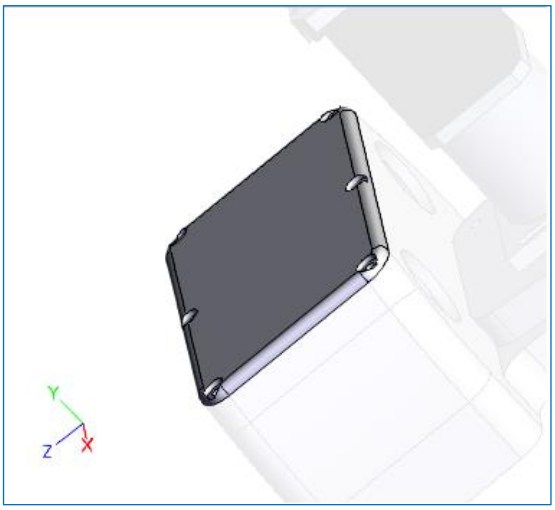
4.1.1.3 Isolating Part

To zoom into a selected part in a 3D CAD model and make all other parts transparent:

1. Select the part or surface.
2. Right-click and click the Isolate command.



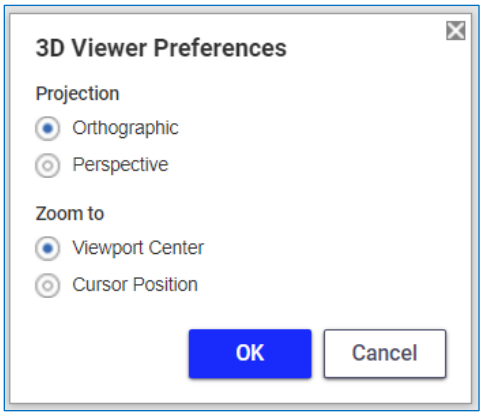
The selected part will fit the 3D scene canvas without changing the orientation, and all other parts will be transparent.



4.1.2 3D Viewer Preferences

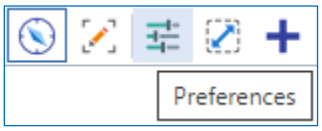
With the **3D Viewer Preferences** dialog, an end user can configure the following preferences for viewing:

- **Projection**: a 3D model projection mode.
- **Zoom to**: an alignment points for zooming with a wheel mouse button.



These configurations are persistent for a given Viewer and logged-in user. An end user can have different configurations for the Monolithic and Dynamic/Streaming Viewers.

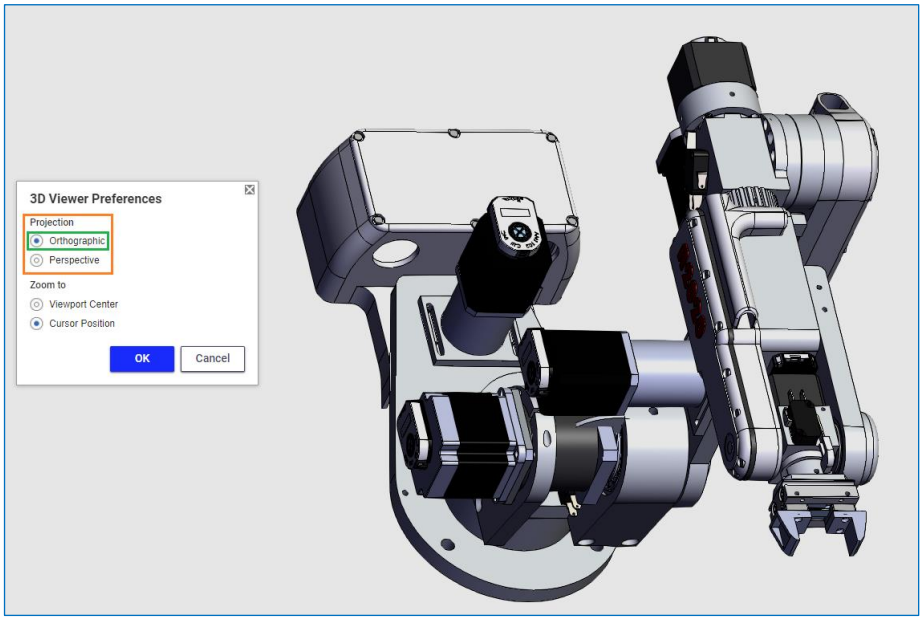
The **Preferences button** on the **Standard Viewing** toolbar provides access to the **3D Viewer Preferences** dialog.



4.1.2.1 *Projection Preferences*

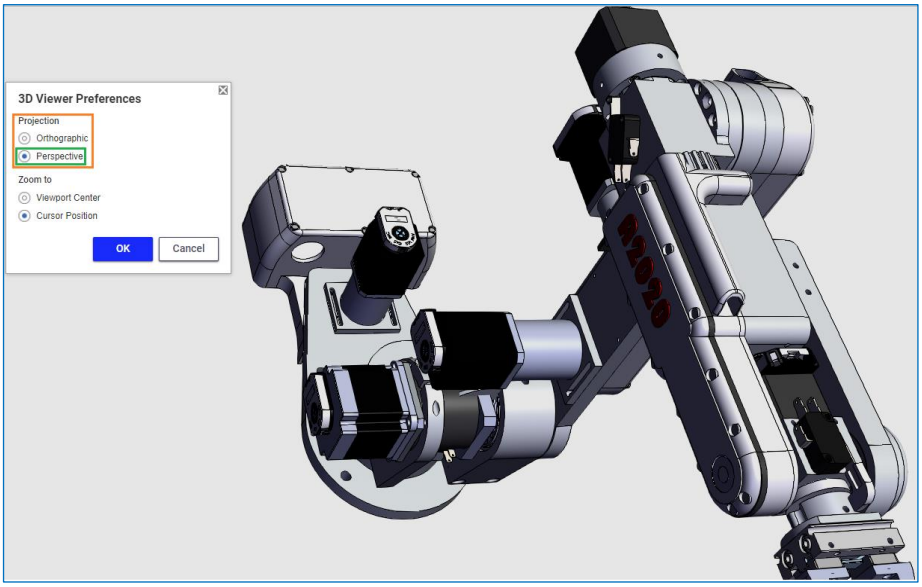
The **Projection** preference in the **3D Viewer Preferences** dialog offers the following options for projecting a 3D model on a scene:

Orthographic: to show all objects on a 3D scene at the same scale regardless of their distance to a user. The farthest and nearest objects have the same size. This setting is default and reflects the legacy orthographic view projection behavior.

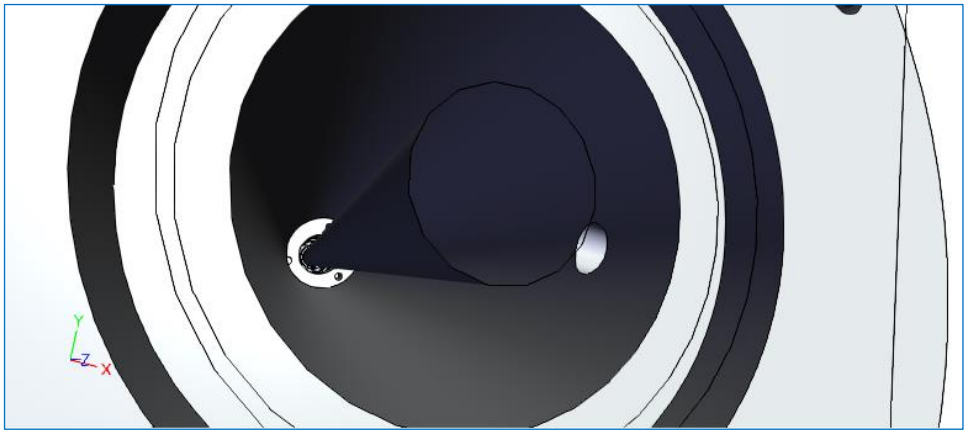


Perspective to show the following:

- To show all objects on a 3D scene at different scales correspondingly to their distance to a user. The farther objects have smaller sizes than the nearer ones.

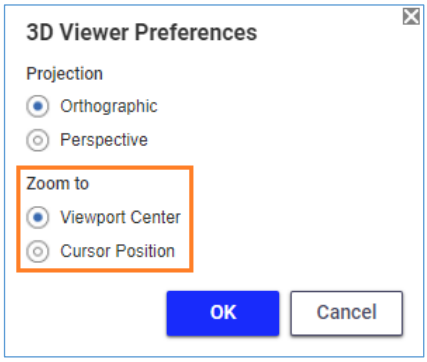


- To zoom through a model. A user can view the model from the inside.



4.1.2.2 Zoom Preferences

The **Zoom** preference in the **3D Viewer Preferences** dialog offers the following options for zooming with a wheel mouse button:



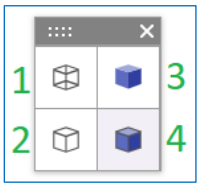
- **Viewport Center**: to zoom in and out along the 3D scene viewpoint center regardless of the current cursor position. This setting is the default and reflects the legacy zooming behavior.
- **Cursor Position**: to zoom in and out along the current cursor position.

These settings do not change the behavior of the **Zoom Up** and **Zoom Down** buttons on the **Basic Viewing** and **Standard Viewing** toolbars to zoom in and out along the 3D scene viewpoint center.

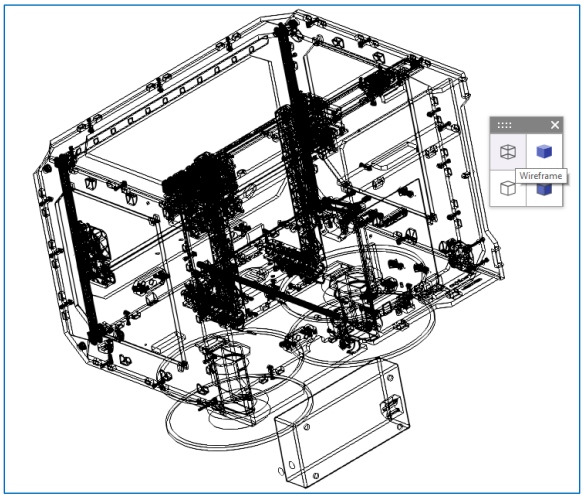
4.1.3 Configuring Display Style

The **Set Display Style** button on the **Standard Viewing** toolbar provides access to a separate toolbar with options on how to display a given 3D CAD model.

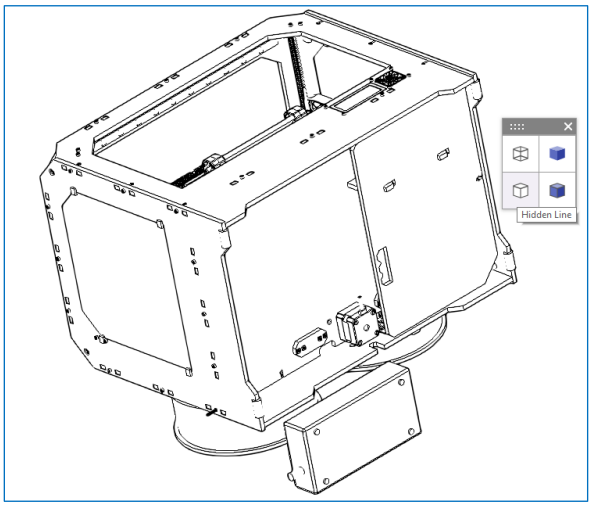
With the toolbar in question, an end user can set the following ways of displaying a 3D CAD model:



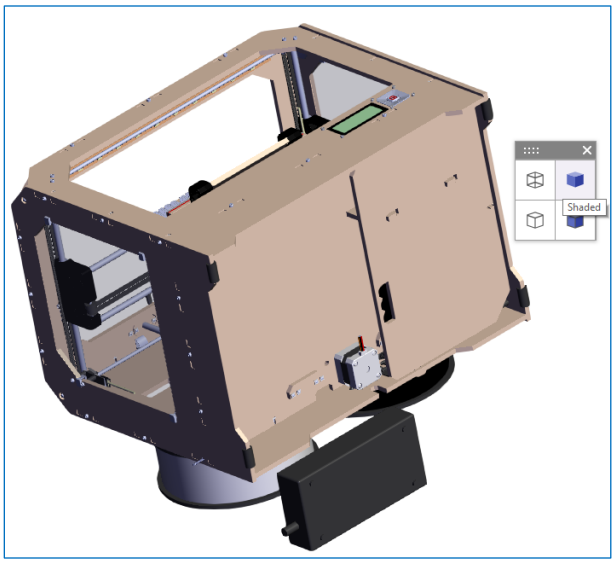
1. **Wireframe**: outer and inner model wireframes (edges) are shown in black. All surfaces are transparent.



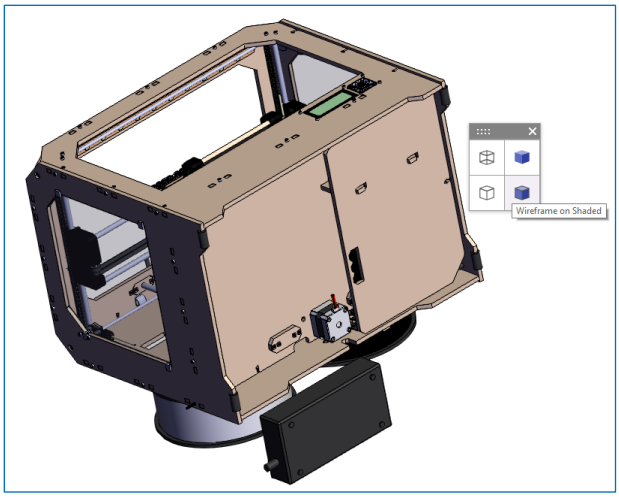
2. **Hidden Line**: outer model surfaces are shown in white with black edges.



3. **Shaded**: outer model surfaces are shown in color with transparent edges.



4. **Wireframe on Shaded**: outer model surfaces are shown in color with black edges. This is the default display style.

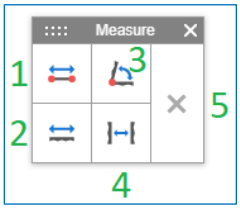


4.1.4 Measuring CAD Models

The **Measure** button on the **Standard Viewing** toolbar provides access to the separate **Measure** toolbar with options for measuring the geometrical parameters of a given 3D CAD model.

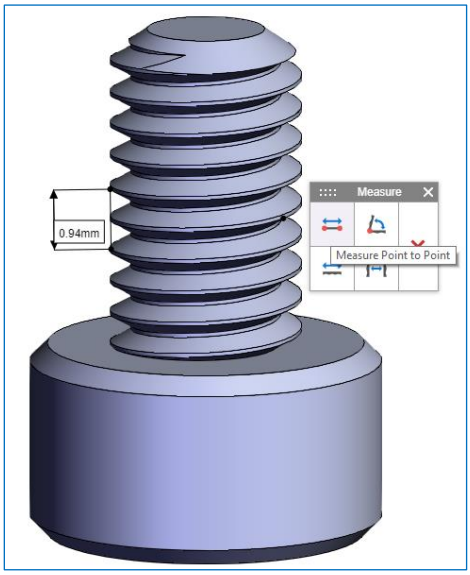
With the **Measure** toolbar, end users can perform the following measurements of a CAD model:

Note: Measurements are displayed in the CAD model authored units.



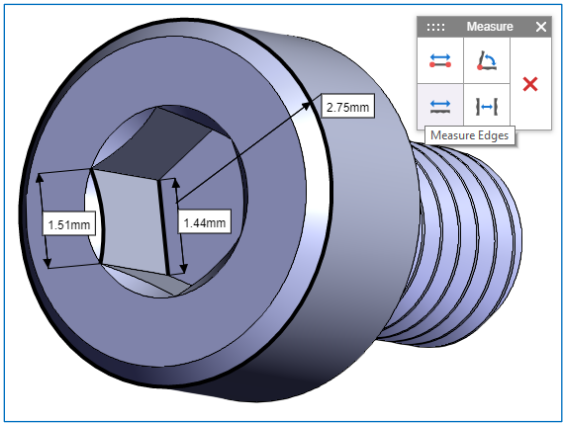
1. **Measure Point to Point**: a distance between two arbitrary points.

   Click this button and then click twice on a model to set these points.



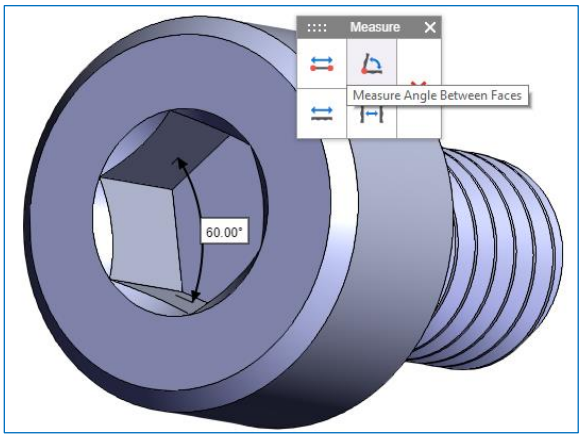
2. **Measure Edges**: a length or radius of an arbitrary edge depending on the edge type.

   Click this button and then click an edge. The measured edges are bold.



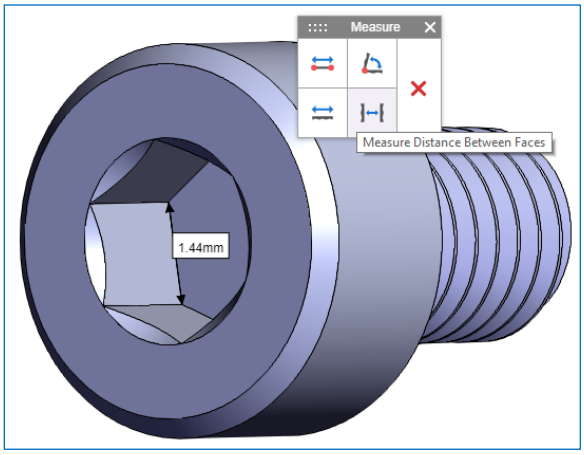
3. **Measure Angle Between Faces**: an angle in grades between two arbitrary surfaces.

   Click this button and then click two appropriate surfaces.

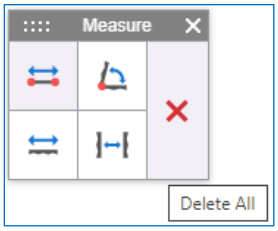


4. **Measure Distance Between Faces**: a distance between two arbitrary surfaces.

   Click this button and then click two appropriate surfaces.

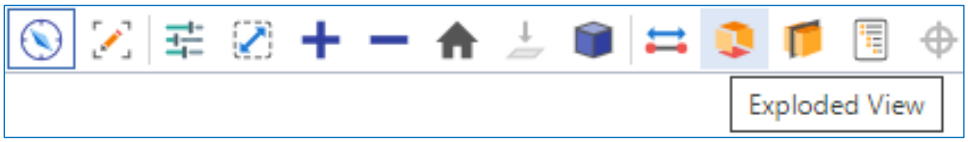


5. Click **Delete All** to clear a model from all measurements.

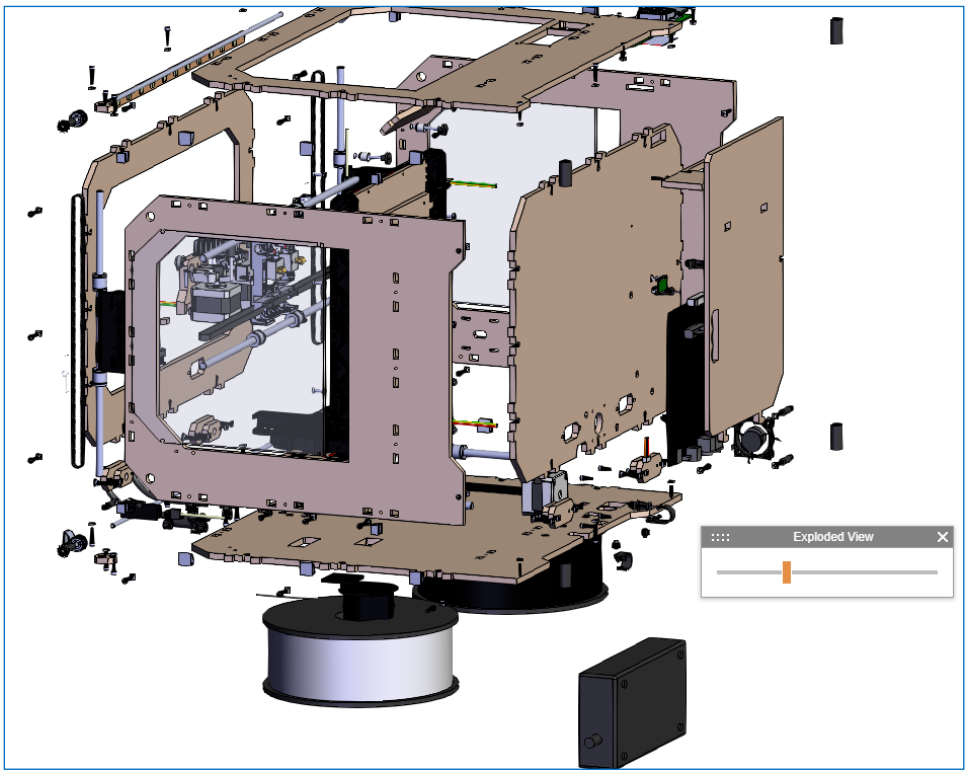


4.1.5 Exploding CAD Models

The **Exploded View** button on the **Standard Viewing** toolbar provides access to the separate **Exploded View** toolbar.



With the **Exploded View** toolbar, end users can view assemblies as a set of separated parts to be fitted by dragging the slider: the more it is moved to the right, the more separated the parts become.



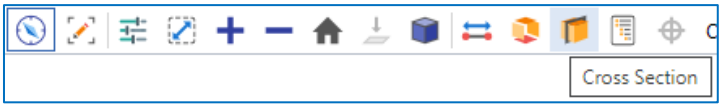
In the exploded view, other viewing and markup features are available except for measurements. A measurement that had been done before exploding a given 3D model is hidden during exploding and becomes visible once this 3D model is shown not exploded.

To quit the exploded view, either:

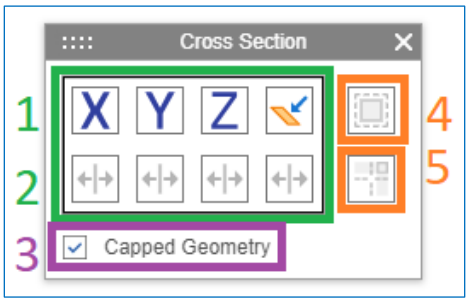
- Close the **Exploded View** toolbar
- Click **Reset View** in the **3D Scene** or **Part** context menu.

4.1.6 Cross Section Viewing of the CAD Model

The **Cross Section** button on the **Standard Viewing** toolbar provides access to the separate **Cross Section** toolbar.

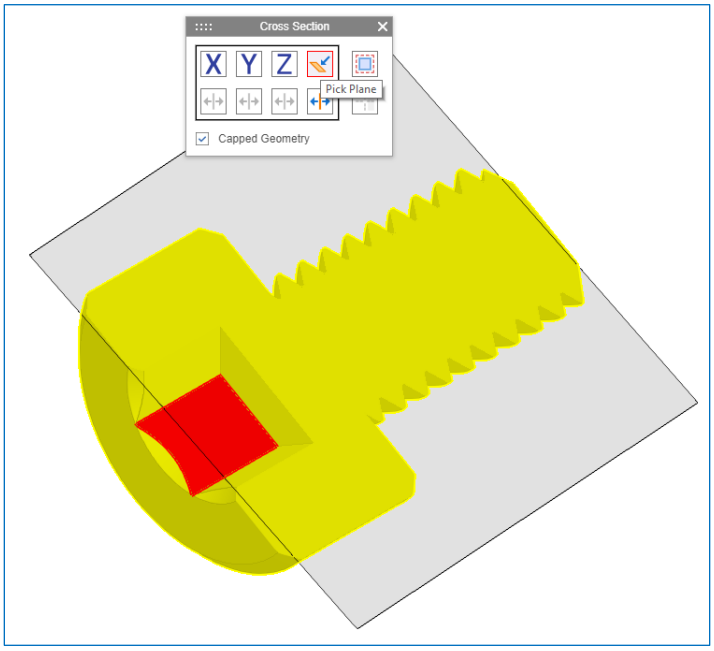


With the **Cross Section** toolbar, end users can view a 3D CAD model in sections as follows:

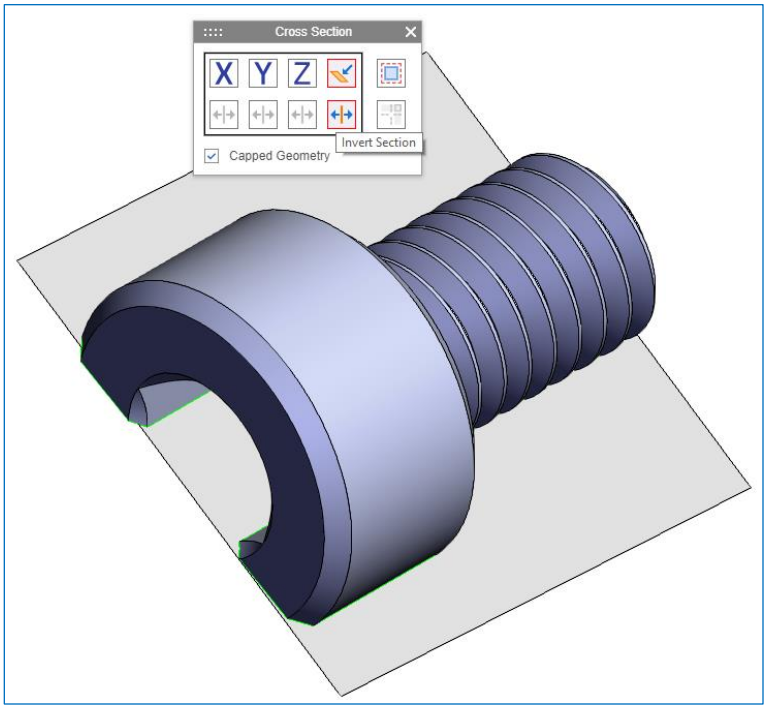


1. Model cutting plates can be specified with the set of plane buttons:
   - The **X**, **Y**, and **Z** buttons are to set the cutting planes according to the model coordinate system.
   - The **Pick Plane** button is to set an arbitrary cutting plane by clicking a target surface and then clicking this button.

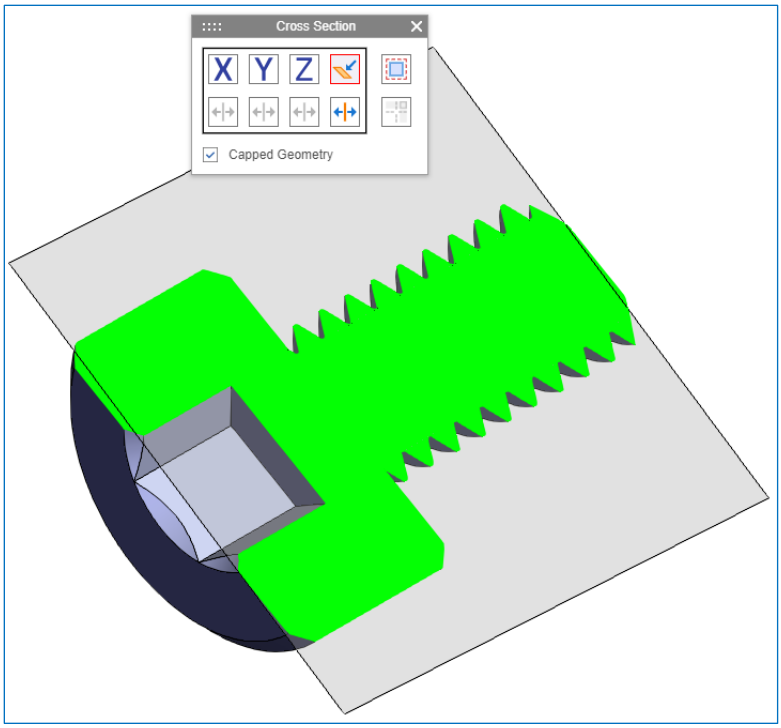
   Dragging the cutting planes cuts the model into sections.



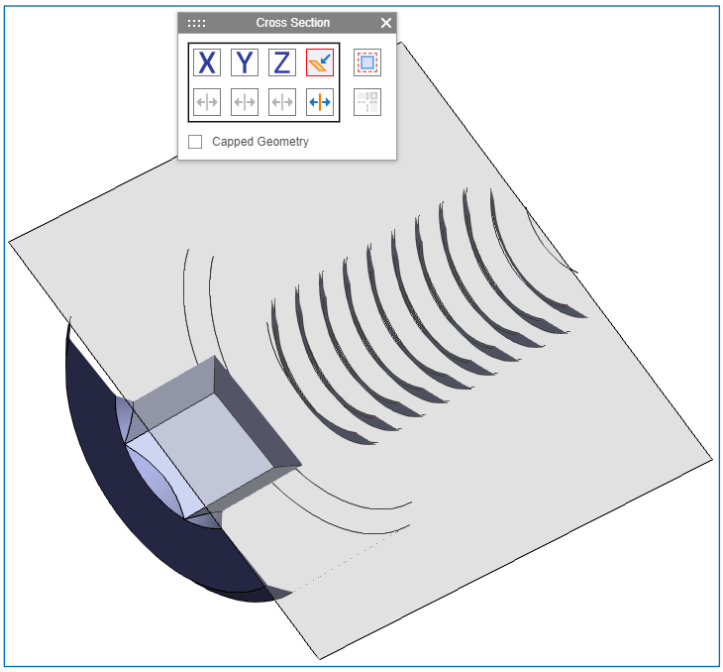
2. Each plane button includes its own **Invert Section** button to determine which of the cut sections is visible.



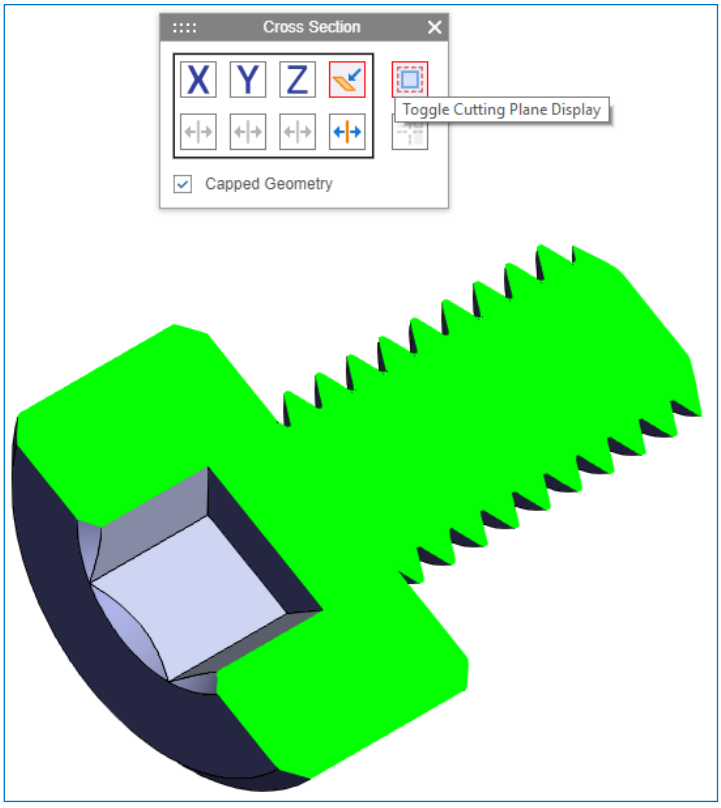
3. Selecting the **Capped Geometry** check box displays a cut section in green.



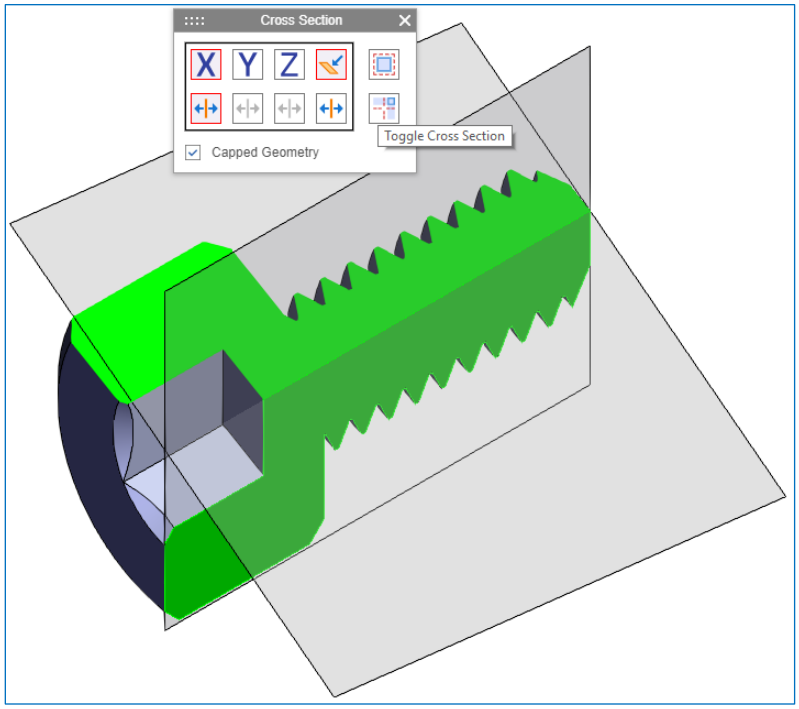
If this check box is cleared, a cut section is hollow.



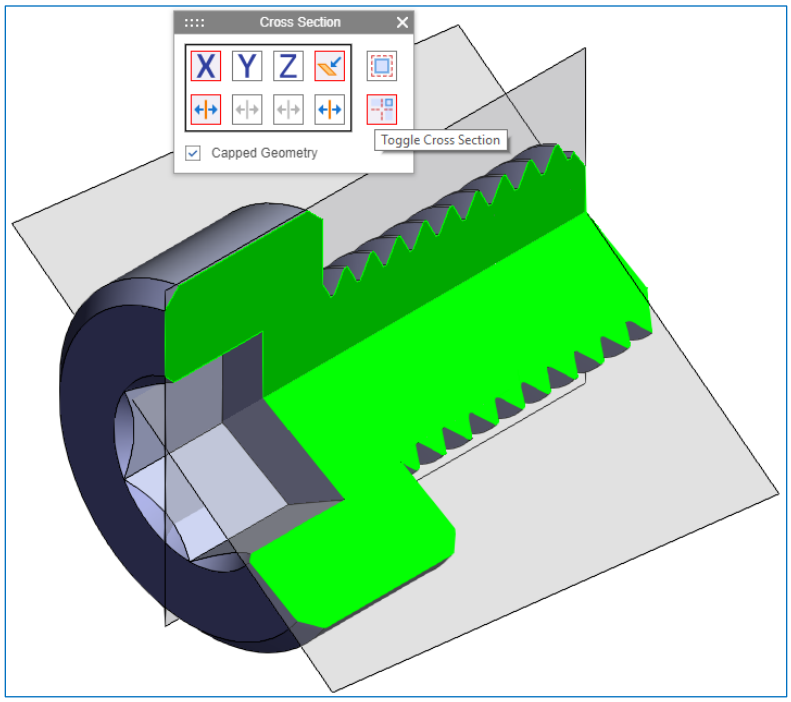
4. Clicking the **Toggle Cutting Plane Display** button hides or shows the cutting planes.



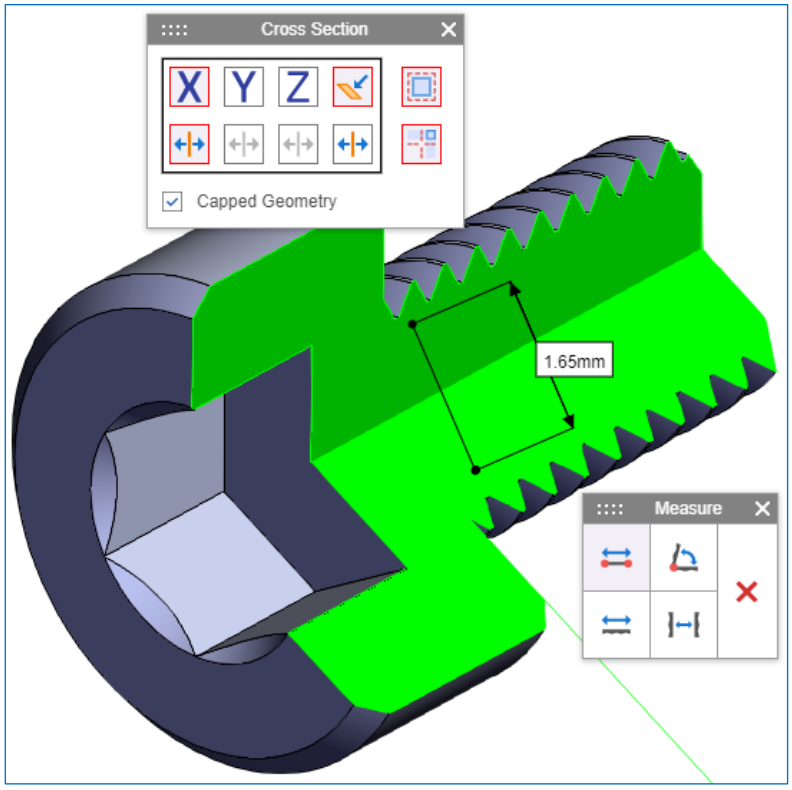
5. When using several cutting planes, the **Toggle Cross Section** button becomes available for selecting which sides of the planes can cut.



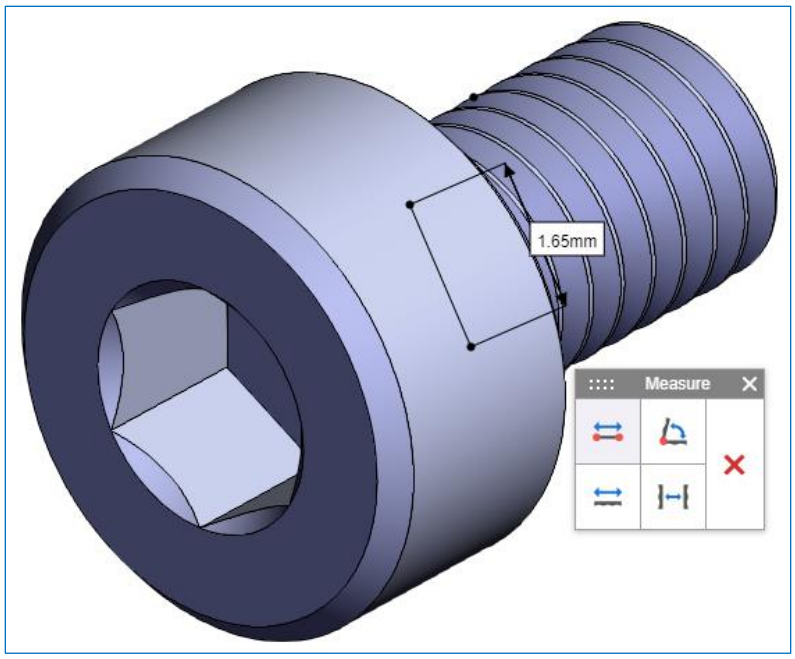
Clicking the **Toggle Cross Section** button toggles the cutting sides of the planes. This button can be combined with the **Invert Section** buttons of these planes.



To enable other viewing and markup functionality in the cross-section model view, the cutting planes should be hidden.



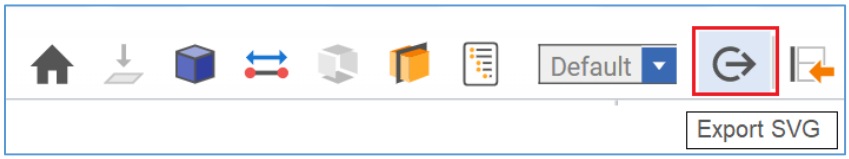
To quit the cross-section model view, the **Cross Section** toolbar should be closed.



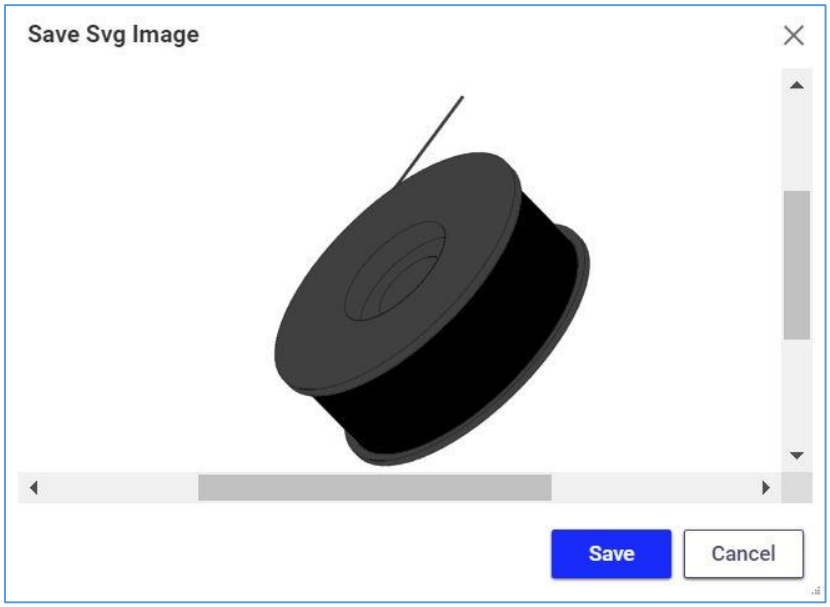
4.1.7 Exporting SVG Image File

The following steps outline the process of exporting the SVG image file of a current 3D View to a local machine using **Export SVG**:

1. Select a necessary Dynamic View Definition.
2. From the **Standard Viewing** toolbar, click **Export SVG**.



The **Save SVG Image** dialog box appears.

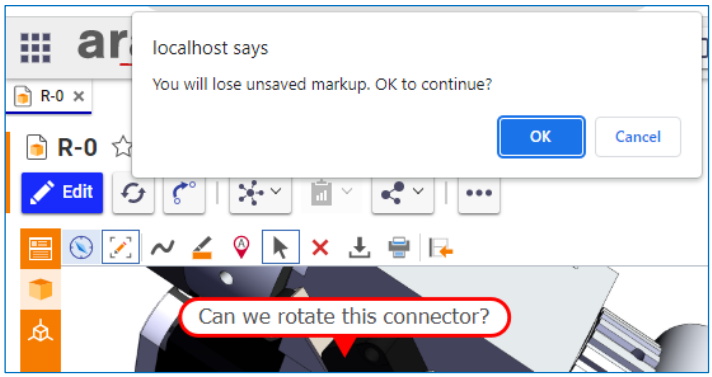


3. Click **Save**.

4.2 Marking up CAD Models

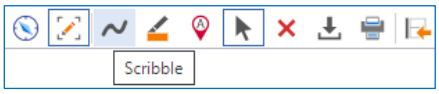
In the 3D model markup mode launched with the **Markup** button on the **Basic Markup** or **Standard Markup** toolbar, an end user can annotate a 3D CAD model with arbitrary lines, highlighted areas, and labels.

A 3D model view with markup items should be explicitly saved before switching to the model viewing mode because all current markups are not saved and will be lost during this switching: the viewing 3D scene will not have them.

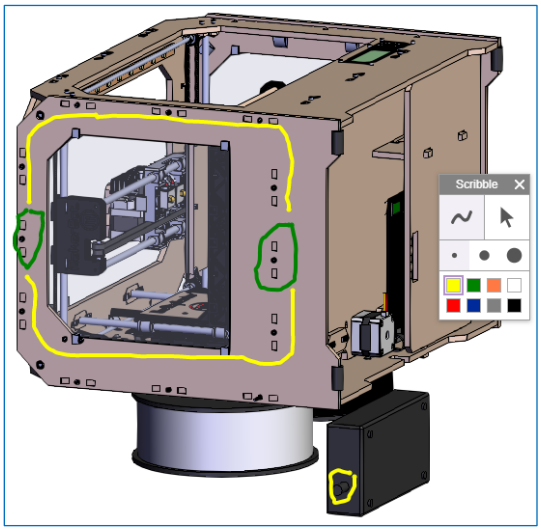


4.2.1 Drawing on CAD Models

The **Scribble** button on the **Basic Markup** or **Standard Markup** toolbar provides access to the scribble feature.

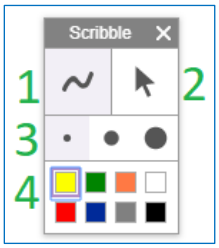


With the discussed feature, an end user can draw arbitrary lines on a 3D CAD model.

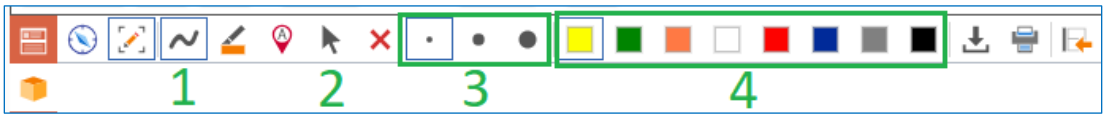


Depending on a given toolbar, the feature is displayed as follows:

- **Basic Markup**: as the separate **Scribble** toolbar.



- **Standard Markup**: as additional buttons on this toolbar.

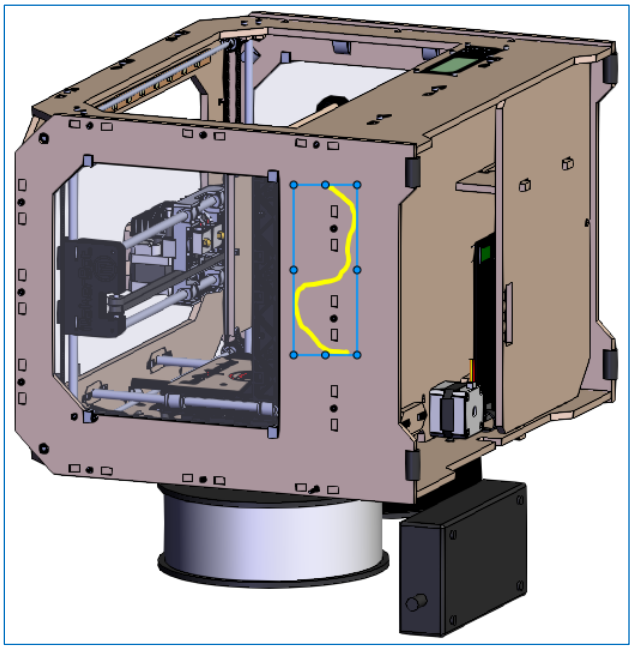


The scribble feature provides the following functionality:

1. **Scribble**: to draw arbitrary lines on a 3D CAD model.
2. **Select**: to select markups on a 3D CAD model.
3. **Line widths**: to set the width of a line to be drawn.
4. **Line colors**: to set the color of a line to be drawn.

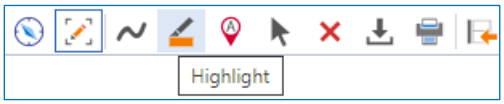
To use a feature or option, a user should click its button.

To select a line, a user should click **Select** and then select this line. A selected line has blue edges with circles and cannot be repositioned.

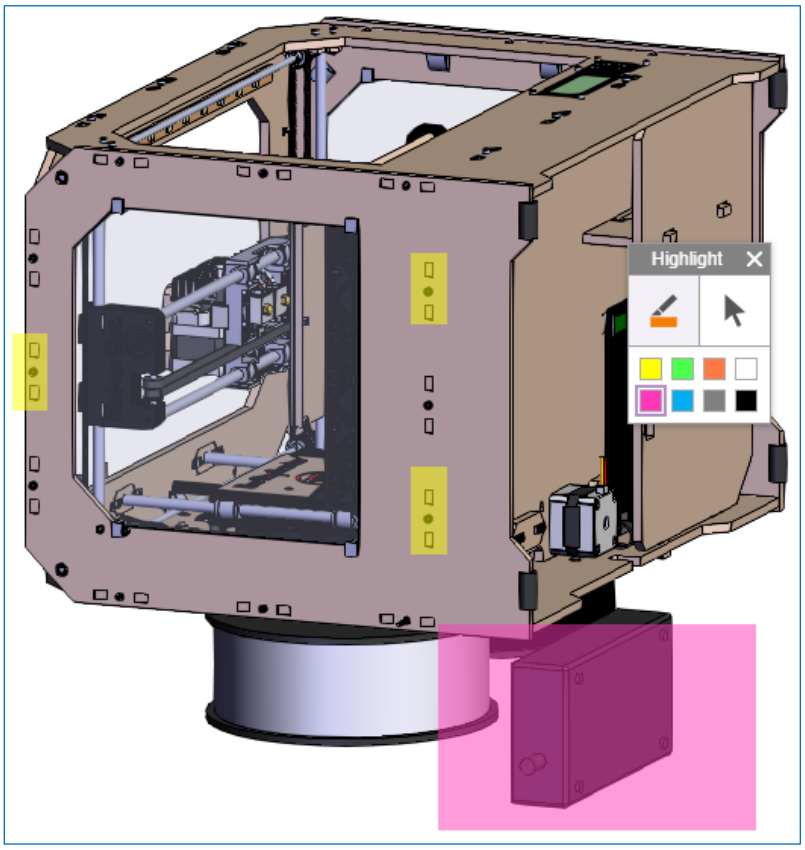


4.2.2 Highlighting Areas on CAD Models

The **Highlight** button on the **Basic Markup** or **Standard Markup** toolbar provides access to the highlighting feature.

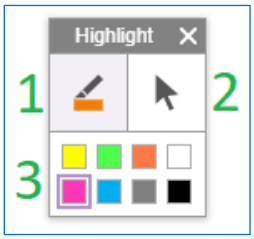


With the discussed feature, an end user can draw arbitrary rectangular areas on a 3D CAD model.



Depending on a given toolbar, the feature is displayed as follows:

- **Basic Markup**: as the separate **Highlight** toolbar.



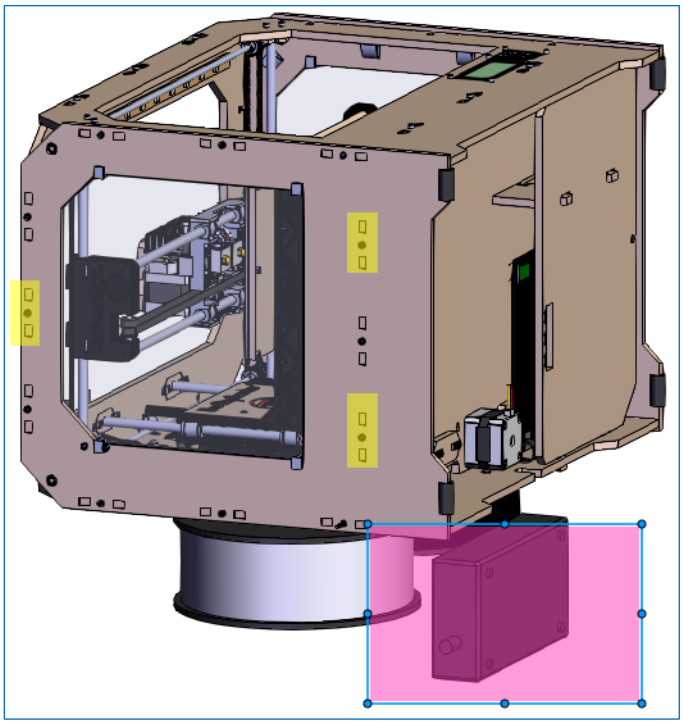
- **Standard Markup**: as additional buttons on this toolbar.

The highlighting feature provides the following functionality:

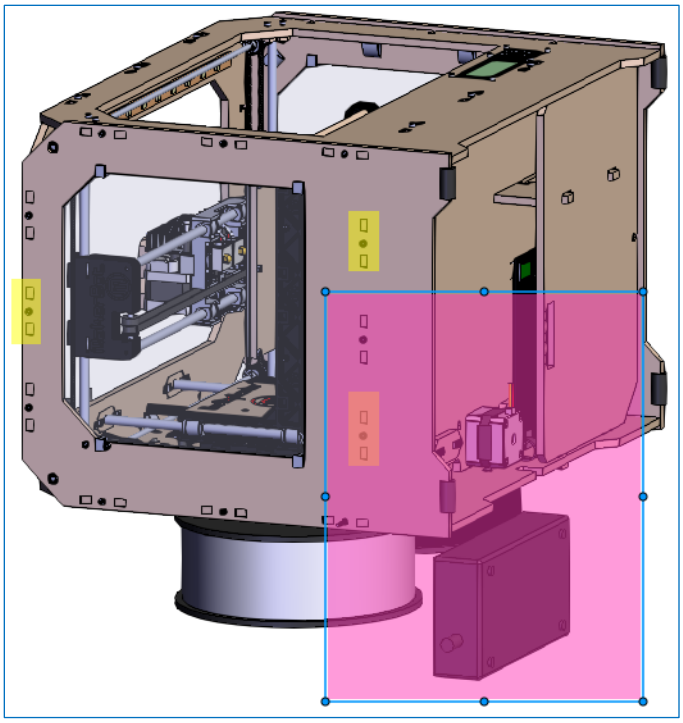
1. **Highlight**: to draw arbitrary rectangular areas on a 3D CAD model.
2. **Select**: to select markups on a 3D CAD model.
3. **Rectangle colors**: to set the color of a rectangular area to be drawn.

To use a feature or option, a user should click the required button.

To select a drawn rectangle, a user should click **Select** and then select this rectangle. A selected rectangle has blue edges with circles and can be repositioned.



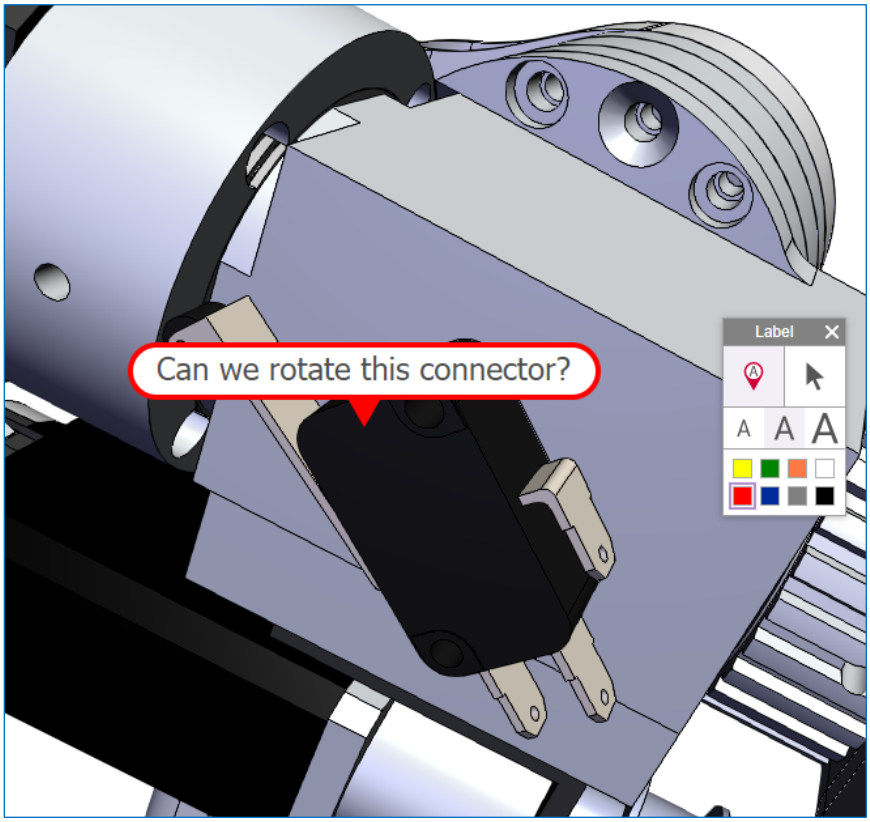
Dragging the blue circles on the edges of a selected rectangle repositions this rectangle.



4.2.3 Putting Labels on CAD Models

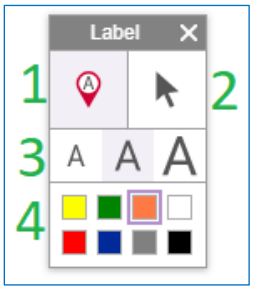
The **Label** button on the **Basic Markup** or **Standard Markup** toolbar provides access to the label feature.

With the discussed feature, an end user can put arbitrary labels with comments on a 3D CAD model.

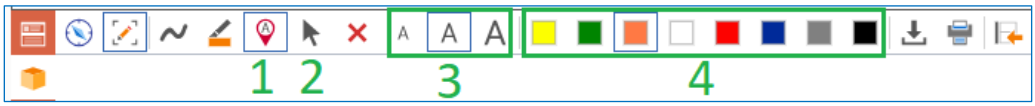


Depending on a given toolbar, the feature is displayed as follows:

- **Basic Markup**: as the separate **Label** toolbar.



- **Standard Markup**: as **additional** buttons on this toolbar.



The label feature provides the following functionality:

1. **Label**: to add labels to a 3D CAD model.
2. **Select**: to select markups on a 3D CAD model.
3. **Font sizes**: to set the size of a text to be written in a new label.
4. **Label colors**: to set the color of a label to be added.

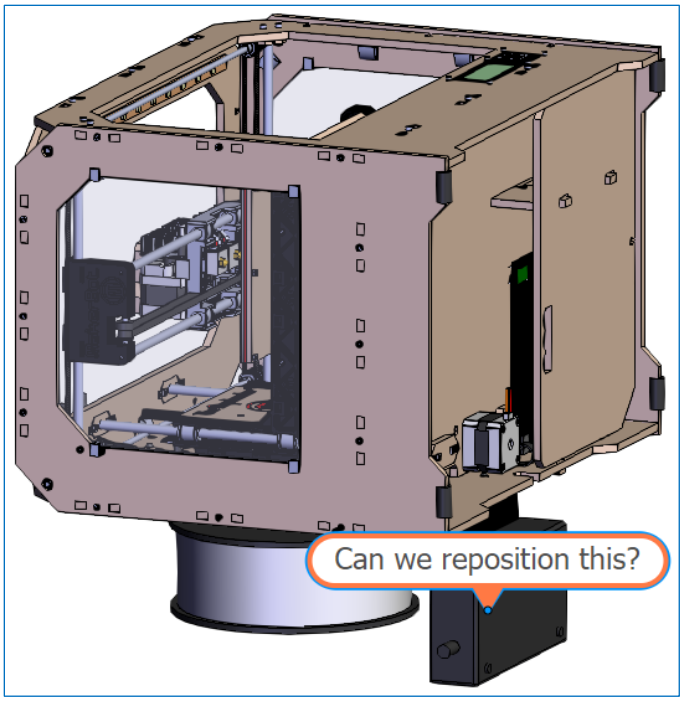
To use a feature or option, a user should click the required button.

The following steps outline the process to create a label:

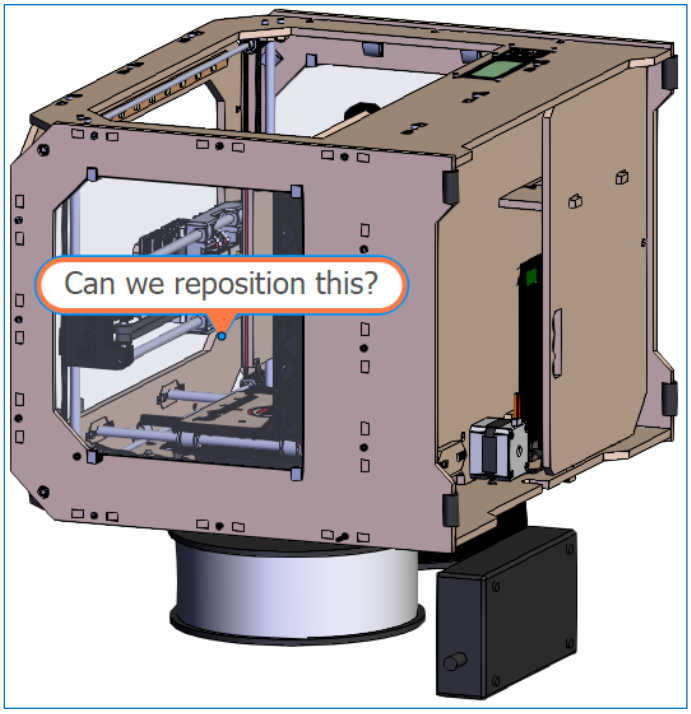
1. Click the **Label** button.
2. Click on a 3D CAD model where the label should be put.

3. Enter the appropriate text inside the label.

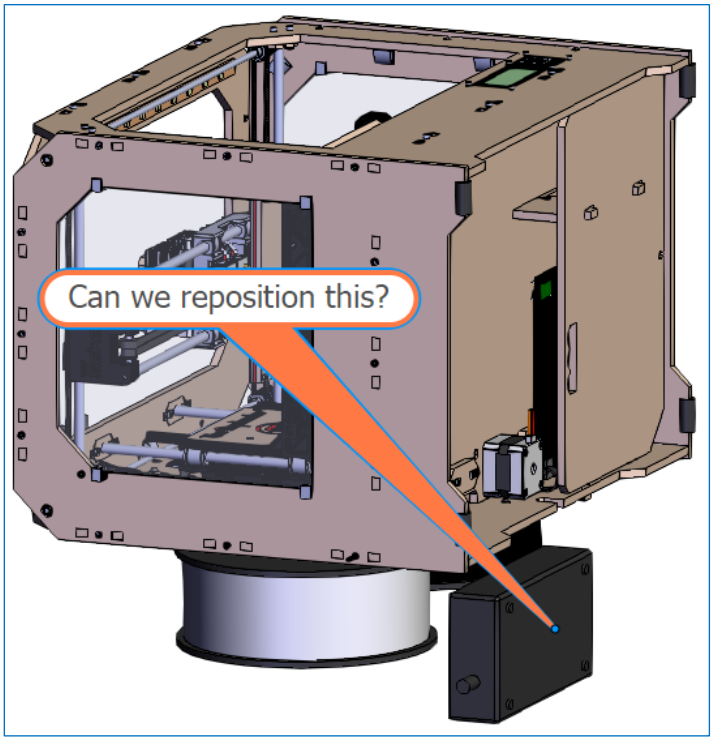
4. Click the **Select** button.
5. To select a label, a user should click **Select** and then select this label. A selected label has blue edges with a circle at the bottom point and can be repositioned.



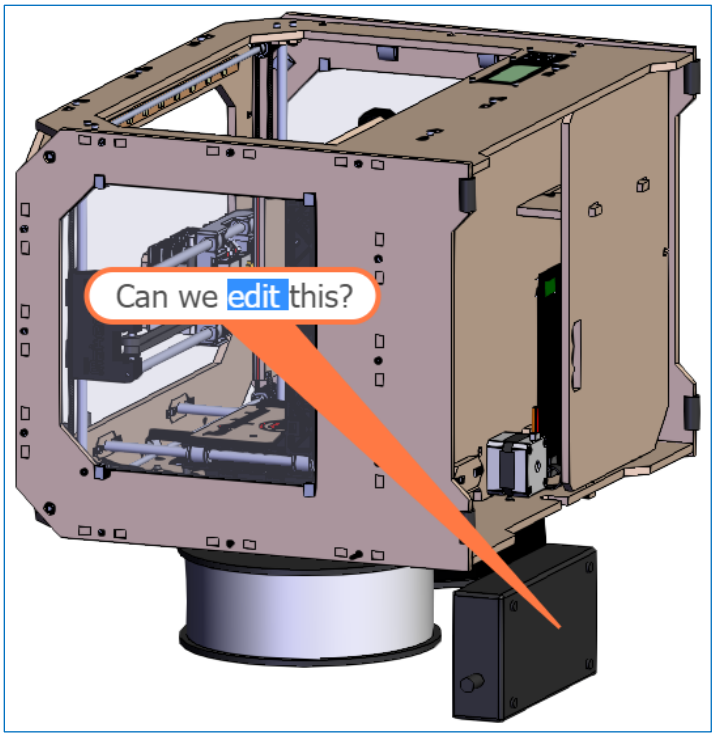
6. To move an existing label to a new position, a user should select this label and drag its colored frame below the text box and above the blue bottom circle.



7. To change where a label points to, a user should select this label and drag its blue bottom circle.



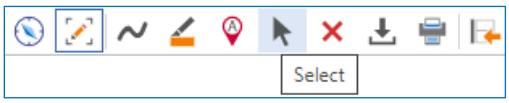
8. To change the label text, a user should click inside the label and edit the text.



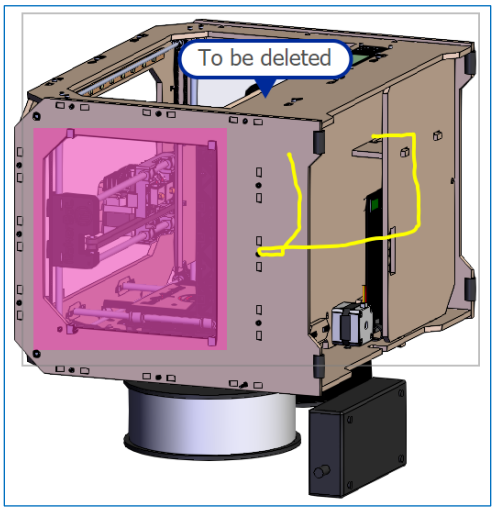
4.2.4 Selecting Markups on CAD Models

End users can select a single or several markup items for further actions. Selected items have bold blue edges with circles. Further actions, position, and a number of the circles depend on the markup type of each item—see an appropriate section.

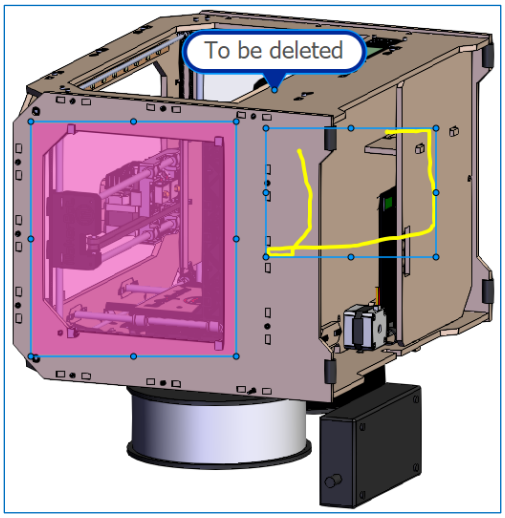
To select a single markup item, a user should click **Select** on the **Basic Markup** or **Standard Markup** toolbar and then click the item.



To select several markup items, a user should click **Select** on the **Basic Markup** or **Standard Markup** toolbar and then drag the cursor to specify the rectangular selecting area.



All the markup items within the selected area become selected.



4.2.5 Deleting Markups on CAD Models

To delete one or more markup items:

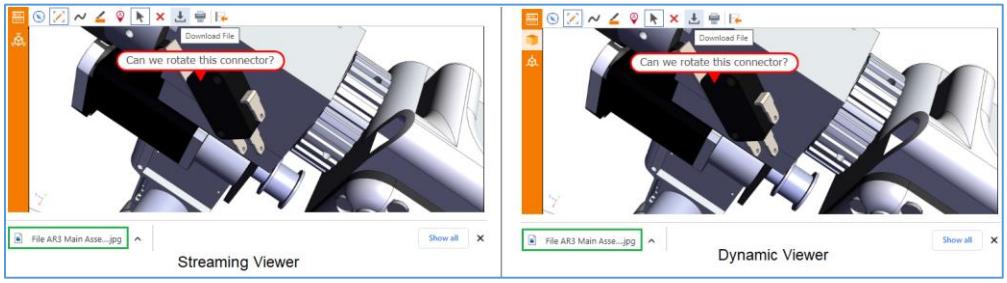
Select the markup items. There are two ways to delete the Markup on CAD Models:

- Click Delete on a Markup toolbar.
- Press Delete on the keyboard.

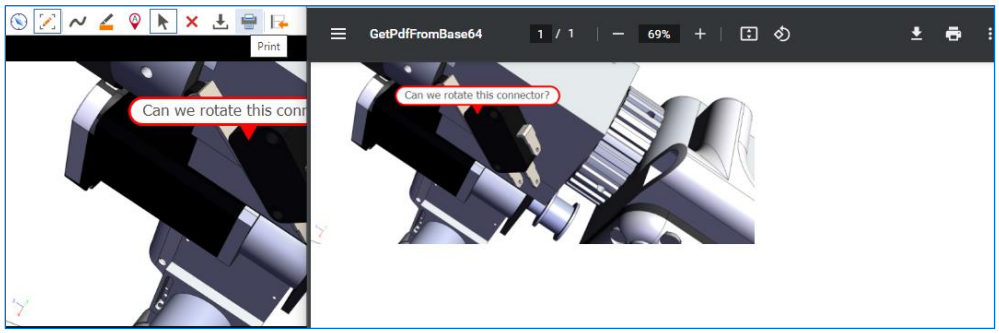
4.2.6 Saving and Sharing Markups

The options for saving and sharing a markup of a 3D CAD model are the following:

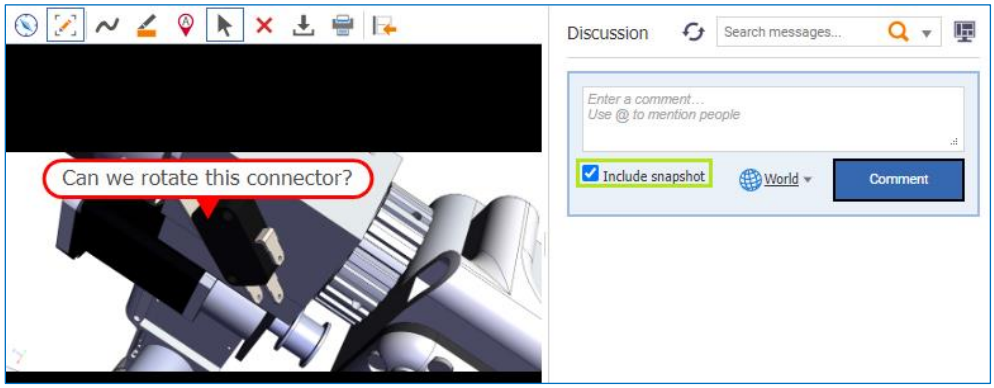
- Downloading a JPG image of the model view with annotations with the **Download File** button on the **Standard Markup** toolbar.



- Printing a markup with annotations with the **Print** button on the **Standard Markup** toolbar. Depending on a given browser and its specific configuration, various print choices, such as printing on a printer or saving to PDF, are available.



- Attaching a markup snapshot to a discussion message with the **Include snapshot** check box. See the *Visual Collaboration* in 3DV section.



5 Monolithic Viewer

The Monolithic Viewer features are outlined within this section.

The Monolithic Viewer shows a static 3D CAD model of a component or assembly featuring all general Aras 3DV functionality for viewing and annotating 3D CAD models described in the *General 3DV functionality* section. Additionally, it can display product manufacturing information included in a given model as discussed in the *Product Manufacturing Information* subsection.

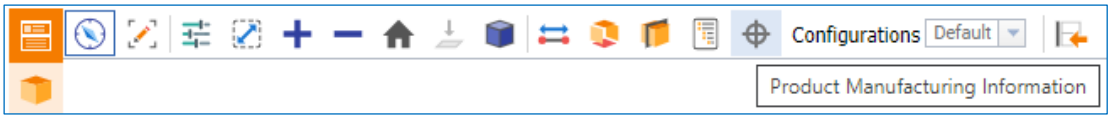
A 3D CAD model shown in the Monolithic Viewer is static because this Viewer shows technically a single viewable SCS file attached to a given CAD Document. For an assembly, such a file is created from the SCS files attached to all children of this CAD Document that were at the moment of loading into the Viewer. The Monolithic Viewer benefits are lightweight rendering and the ability to display product manufacturing information and configurations in some cases. The main Monolithic Viewer limitations are the lack of support for resolutions besides as-saved. The Dynamic and the Streaming Viewer resolves this disadvantage by supporting various structure resolution, such as the latest, and has several other enhancements, such as custom rendering, Saved Views, and the Digital Mockup support.

The Monolithic Viewer fully reuses the 3D scene canvas, 3DV toolbars, and context menus described in the Aras 3DV UI section. It also features the simple Model Browser for browsing assembly parts and model views as discussed in the *Model Browser in Monolithic Viewer* subsection.

The Monolithic Viewer does not support multi-selection: only one subassembly, part, or surface can be selected during viewing.

5.1 Product Manufacturing Information

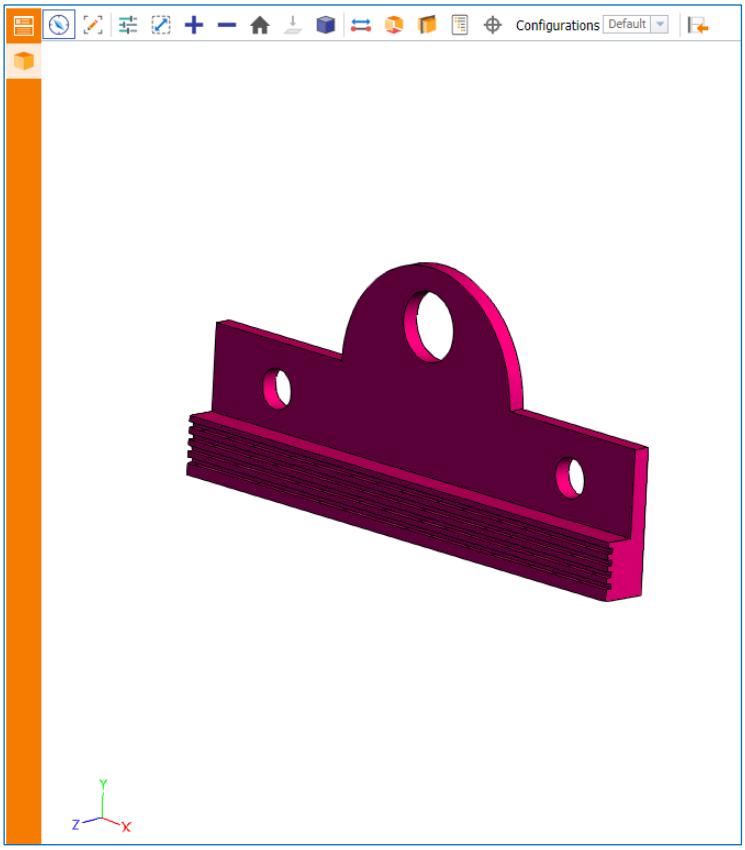
The **Product Manufacturing Information** button on the **Standard Viewing** toolbar provides access to the product manufacturing information (PMI) included in a 3D CAD model.



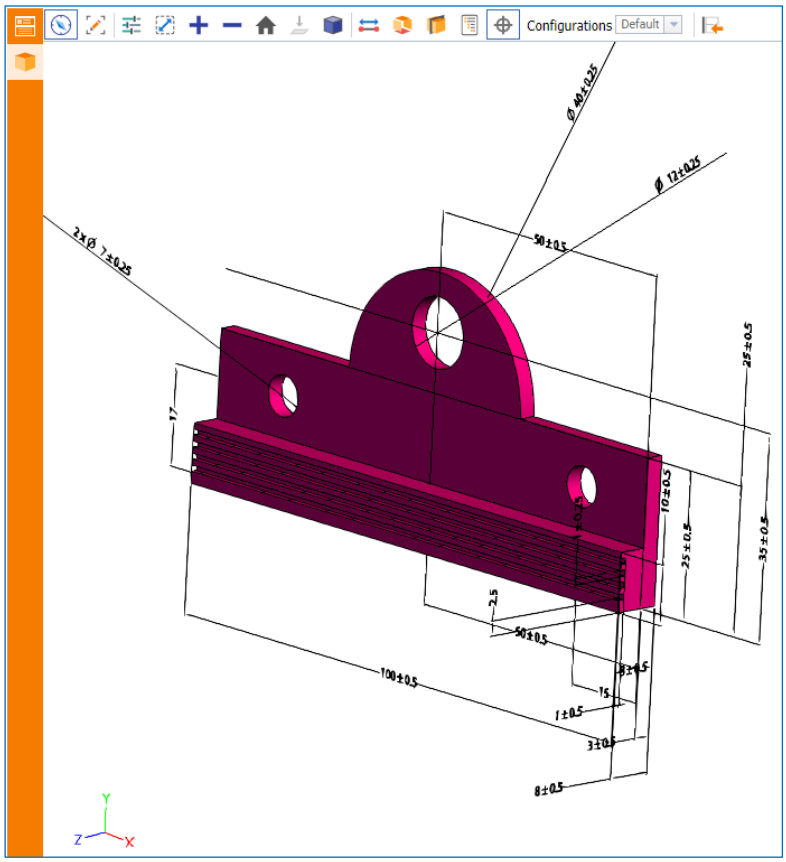
PMI is non-geometric attributes embedded in a 3D CAD file that convey various non-geometric data necessary for manufacturing parts and assemblies, like geometric dimensions and tolerances, 3D annotations (text), surface finishes, material specifications, and so on. It combines a model-based definition with a 3D model eliminating 2D drawings or digital documents to provide engineering or manufacturing data.

PMI is typically stored at the assembly level within native CAD files and is included by default in the process of converting the native CAD files into viewable SCS files. Consequently, the Monolithic Viewer can show a 3D model and PMI that are both sourced from an SCS file.

By default, a 3D CAD model is shown without its PMI.



Clicking the **Product Manufacturing Information** button shows or hides the model PMI.

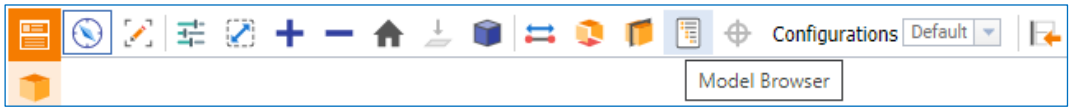


When shown, graphic PMI may be positioned such that it is hard to read or interferes with some other rendered 3D component geometry. An end user should rotate a model to view and read a given PMI piece conveniently.

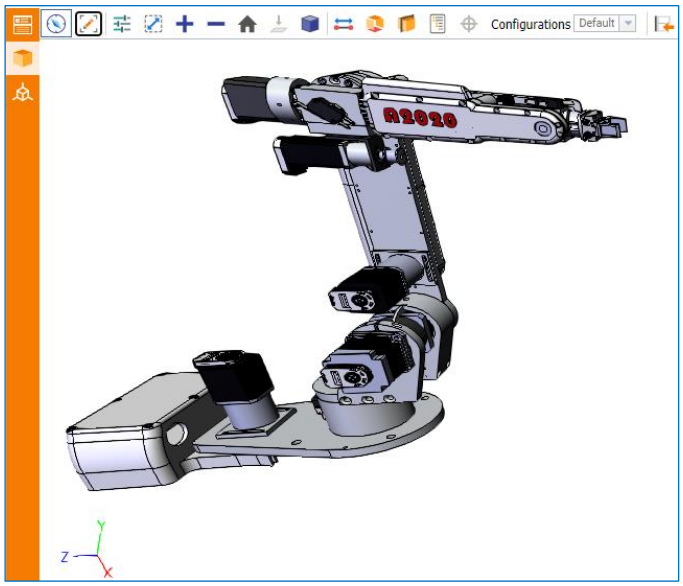
The shown PMI reflects the current CAD View. To view PMI attached to a different CAD View, select it on the **Views** tab.

5.2 Model Browser in Monolithic Viewer

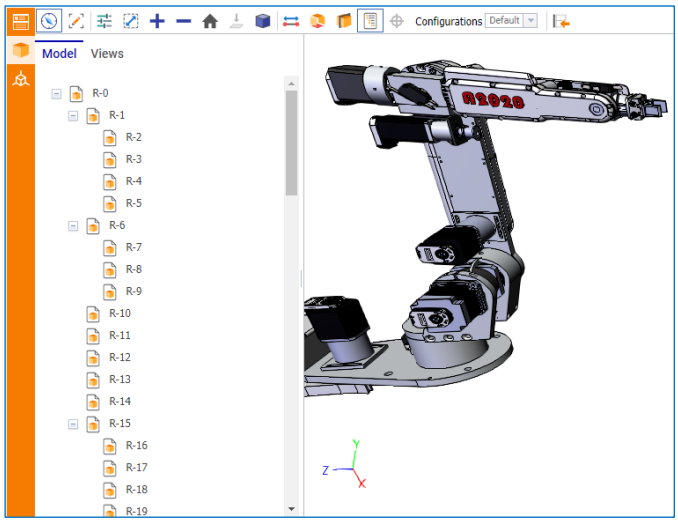
The **Model Browser** button on the **Standard Viewing** toolbar provides access to the **Model Browser** section.



By default, the **Model Browser** section is hidden at the first opening of the Monolithic Viewer for a given CAD Document in the current logging session.



Clicking the **Model Browser** button shows or hides the **Model Browser** section right after the left sidebar.



The **Model Browser** section has two tabs:

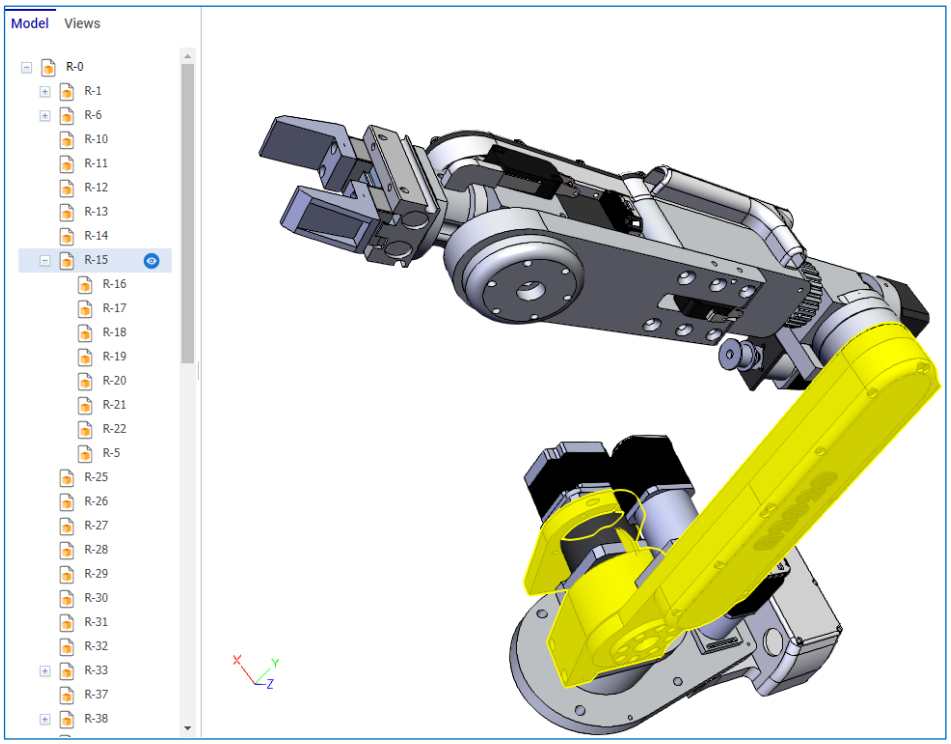
- **Model**: a multi-level tree of CAD Documents included in a CAD assembly representing a given 3D CAD model with capabilities to:
  - Navigate through the subassemblies and parts included in the given assembly.
  - Quickly select a necessary subassembly or part.
- **Views**: a list of model views to switch quickly between viewing positions available for a given 3D CAD model.

5.2.1 Browsing CAD Model Assemblies and Parts with Monolithic Viewer

The **Model** tab of the **Model Browser** section provides end users with quick navigation through an assembly structure shown as a tree of CAD Documents.

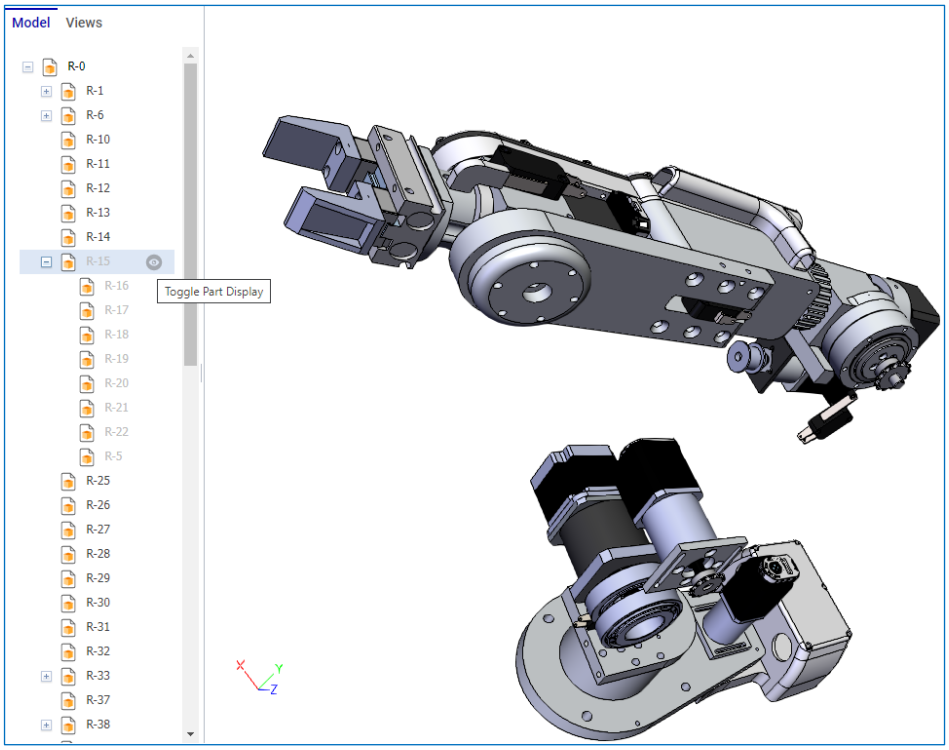
5.2.1.1 Selecting Parts in Model Browser

Part selection is synchronized between the CAD Document tree on the **Model** tab of **Model Browser** and a given 3D CAD model. Clicking a part or surface on the model selects this part on the model and its CAD Document in the tree. And vice versa, clicking a CAD Document in the tree selects its part or assembly on the model as well.



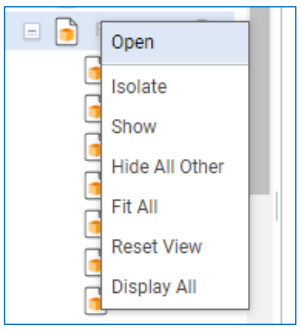
5.2.1.2 *Hiding and Unhiding Parts with Model Browser*

Each CAD Document in the **Model** tab of **Model Browser** has the **Toggle Part Display** button to hide or show its represented part or assembly on the model. CAD Documents of hidden parts and assemblies are light grey in the tree.



5.2.1.3 *Part Context Menu in Model Tree*

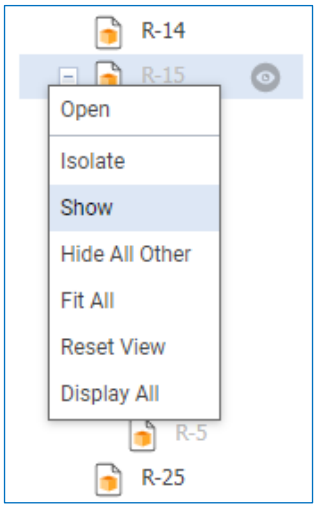
Right-clicking a CAD Document in the **Model** tab of **Model Browser** displays the **Part** context menu for this CAD Document and its represented part or assembly.



The **Model** tree fully reuses the **Part** context menu, its commands, and their behavior as discussed in the *Part Context Menu* section. The only exception is the **Hide** command, which is:

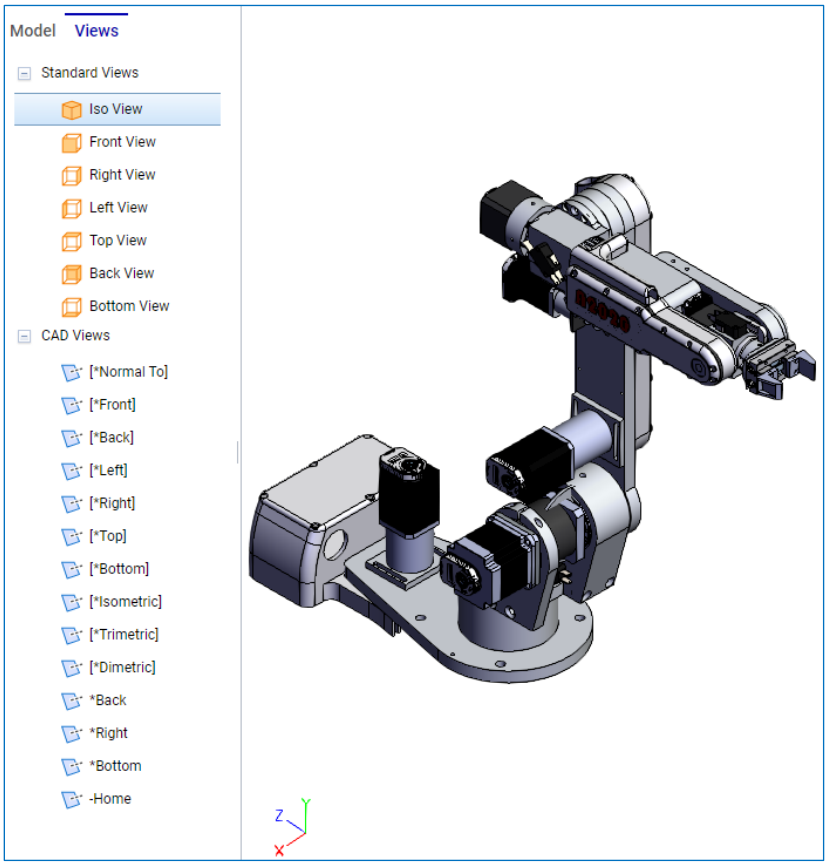
- Shown for a CAD Document whose part or assembly is visible on a 3D CAD model.
- Replaced by the **Show** command for a CAD Document whose part or assembly is hidden on a 3D CAD model.

Clicking the **Show** command makes a given hidden part or assembly visible on a 3D CAD model.



5.2.2 Browsing CAD Model Views with Monolithic Viewer

The **Views** tab of the **Model Browser** section provides end users with options of viewing positions available for a given 3D CAD model.



The **Views** tab has two view groups:

a. **Standard Views**: viewing positions of standard 3D sides available for all 3D CAD models:
   - Iso View
   - Front View
   - Right View
   - Left View
   - Front View
   - Top View
   - Back View

b. **CAD Views**: viewing positions of specific sides and orientations embedded in a given 3D CAD model with a CAD editor.

Clicking a given **viewing** position rotates a given 3D CAD model to a corresponding side and orientation.

6 Dynamic and Streaming Viewer

Dynamic Viewer

The Dynamic Viewer is based on and requires the Monolithic Viewer.

A 3D CAD model shown in the Dynamic Viewer is dynamic because this Viewer shows an assembly dynamically generated on the fly from multiple viewable SCS files attached to the Items, such as CAD Documents, which were the children of the context Item, such as a CAD Document, representing an assembly at the moment of loading into the Viewer. This is also referred to as “shattered” viewing.

The Dynamic Viewer limitations are as follows:

- Not available for single components without structure.
- No support for product manufacturing information included in a 3D CAD model.
- No support for configurations.

The Monolithic Viewer resolves these limitations.

Streaming Viewer

A 3D CAD model shown in the Streaming Viewer is also dynamic as the viewer shows an assembly dynamically generated from multiple viewable SCZ files.

The Streaming Viewer enables user to stream large datasets from a server to a client in a single request, that, in some cases, provides an improved response time than multiple individual requests. The Streaming Viewer limitations are as follows:

- No support for product manufacturing information included in a 3D CAD model.
- No support for configurations.
- No support for BLOB Storages on cloud environments.
- Only one Streaming Viewer can be installed on one machine at a time.

Warning	The Dynamic and Streaming Viewers are not compatible with each other. Only one of the two viewers can be installed. If the Streaming 3D Viewer is installed in an environment where the Monolithic or Dynamic 3D Viewers have been previously installed and used, all existing native files of existing CAD Documents need to be re-converted. There is no automated means to perform this reconversion.

Warning	The Streaming Viewer currently cannot be deployed in a cloud environment. The HOOPS Server must be deployed with networked file access to a single vault containing view files for rendering.

Users can do the following with the Dynamic and Streaming Viewers:

- Manually move, rotate, and mark up geometry from the Viewer.
- Add and remove additional parts and assemblies from the 3D scene using Digital Mockup.
- Configure what is retrieved from the CAD structure and how it is shown in the Viewer.

There are out-of-the-box features specific to the Dynamic and Streaming Viewers—additional Aras 3DV functionality for displaying, annotating, and collaborating on a 3D CAD model.

It shows a dynamic 3D CAD model of an assembly featuring all general Aras 3DV functionality for viewing and annotating 3D CAD models described in the *General 3DV functionality* section. In addition to the general functionality, it provides its own features described in this section.

The Dynamic and Streaming Viewers fully reuse the 3D scene canvas and 3DV toolbars outlined in the *3 Aras 3DV UI* section. It also extends the general 3DV context menus as outlined in the *Dynamic Viewer and Streaming Viewer Context Menu* subsection.

The extended 3DV context menus provide functionality for:

- Adding markup lines onto a 3D CAD model as outlined in the Markup Lines in Dynamic Viewer and Streaming Viewer subsection.
- Transforming geometries of parts and subassemblies as outlined in the *Manual Geometry Transformation* subsection.

The outlined viewer features the Tree Grid View (TGV) Model Browser for browsing assembly parts and standard model views as outlined in the Model Browser in Dynamic Viewer and Streaming Viewer subsection. Users can also save and use custom model views.

It also supports multi-selection: one or more subassemblies, parts, and surfaces can be selected during viewing as discussed in the *Multi-Selection* subsection.

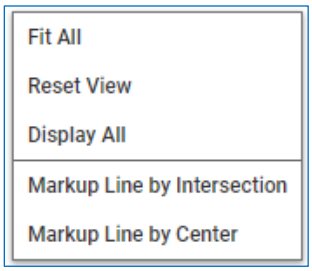
Administrators of the Aras Innovator platform can customize the Dynamic and Streaming Viewers. For more information on the customization see, *Aras 3D Visualization 33 - Administrator Guide*.

6.1 Dynamic Viewer and Streaming Viewer Context Menus

The Dynamic Viewer and the Streaming Viewers fully reuses the general **3D Scene** and **Part** context menus outlined in the *Aras 3DV Context Menus* section. It also extends these context menus with commands discussed in this section.

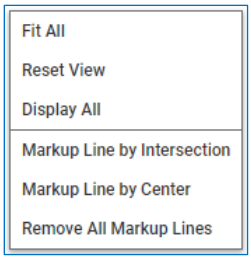
6.1.1 3D Scene Context Menu in Dynamic Viewer and Streaming Viewer

The **3D Scene** context menu in the Dynamic and Streaming Viewers fully reuses the general **3D Scene** 3DV context menu, its commands, and behavior as outlined in the *3D Scene Context Menu* section.



In addition to the general commands, the 3D Scene Dynamic and Streaming Viewer context menu includes the following ones:

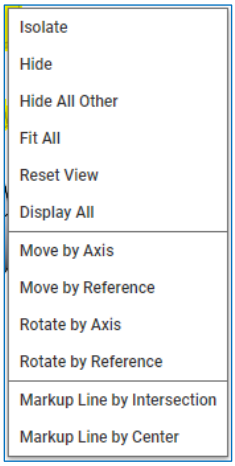
- **Markup Line by Intersection**: to add a markup line between two arbitrary points on a 3D CAD model; see the *Adding Markup Lines by Intersection* section.
- **Markup Line by Center**: to add a markup line between the centers of two arbitrary edges on a 3D CAD model; see the *Adding Markup Lines by Center* section.
- **Remove All Markup Lines**: to clear a 3D CAD model from all markup lines; see the *Removing Markup Lines* section. This button is dynamic: it is displayed only when one or more markup lines exist on the model. If there are no markup lines, the button is absent on the menu.



6.1.2 Part Context Menu in Dynamic and Streaming Viewers

The **Part** context menu in the Dynamic and Streaming Viewers fully reuse commands and behavior from the following context menus:

- General **Part** 3DV context menu as outlined in the *Part Context Menu* section.
- Custom **3D Scene** Dynamic and Streaming Viewer context menu as outlined in the *3D Scene Context Menu in Dynamic Viewer and Streaming Viewer* section.



In addition to the reused commands, the Part Dynamic and Streaming Viewers context menu includes the following ones:

- **Move by Axis**: to move a part or subassembly selected on a parent assembly 3D CAD model along one or more axes in the coordinate system of this part or subassembly; see the *Moving Parts by Axis* section.
- **Move by Reference**: to move a part or subassembly selected on a parent assembly 3D CAD model along a surface or edge of another part or subassembly; see the *Moving Parts by Reference* section.
- **Rotate by Axis**: to rotate a part or subassembly selected on a parent assembly 3D CAD model along one or more axes in the coordinate system of this part or subassembly; see the *Rotating Parts by Axis* section.
- **Rotate by Reference**: to rotate a part or subassembly selected on a parent assembly 3D CAD model along a surface or edge of another part or subassembly; see the *Rotating Parts by Reference* section.

6.2 Digital Mockup

In Aras 3DV, a digital mockup is an ad-hoc arrangement of 3D component geometry on the 3D scene for analysis, review, or other purposes. End users can visualize collections of 3D assemblies, subassemblies, and parts in a manner that may be different from how these objects were defined within a CAD editor.

Using the Dynamic or Streaming Viewers digital mockup features, the end users can:

- Place additional assemblies, subassemblies, and parts onto a single 3D scene as outlined in the *Adding Additional Models to 3D Scene* section.
- Manipulate the position, orientation (by 3D rotation), and display of assemblies, subassemblies, and parts on a single 3D scene as outlined in the *Manual Geometry Transformation* section.
- Annotate assemblies, subassemblies, and parts on a single 3D scene with markup lines as outlined in the *Markup Lines in Dynamic and Streaming Viewers* section.
- Store an ad-hoc 3D scene view of a digital mockup for future use as outlined in the *Saved Views* section.
- Share and restore a digital mockup from a snapshot in the discussion panel as discussed in the *Visual Collaboration* section.

6.3 Markup Lines in Dynamic and Streaming Viewers

In the Dynamic and Streaming Viewers, a markup line is a red dashed line that connects two arbitrary surfaces or edges for illustrative purposes, like marking spots that should be fitted.

The Dynamic and Streaming Viewers has two markup line types:

- Between two arbitrary points on any surfaces or edges.
- Between two arbitrary edges. In this case, a line is automatically placed between the centers of given edges, which can have different shapes.

While viewing one or more 3D CAD models in the Dynamic Viewer or in the Streaming Viewer, an end user can annotate these models with one or more markup lines of any type as outlined in this section. The end user can also combine markup lines with manual geometry transformation of the models that is outlined in the *Manual Geometry Transformation* section.

The Dynamic and Streaming Viewers do not embed markup lines into a 3D CAD model native and viewable files.

A 3D CAD model view with markup lines can be saved and shared.

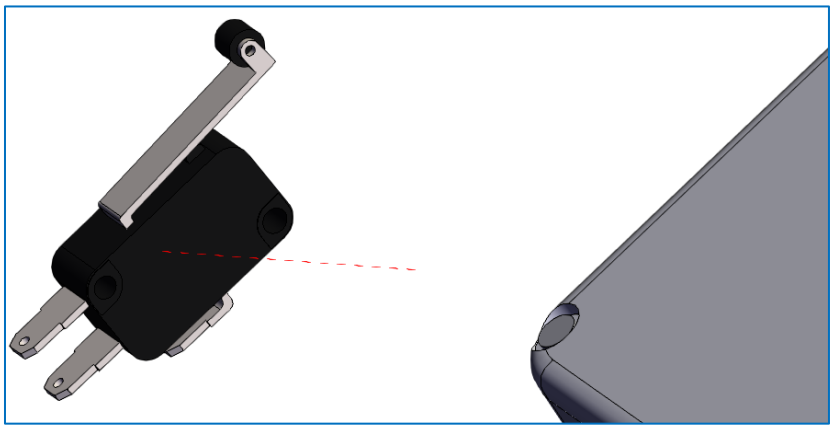
To quit adding a markup line, press Escape on the keyboard.

6.3.1 Adding Markup Lines by Intersection

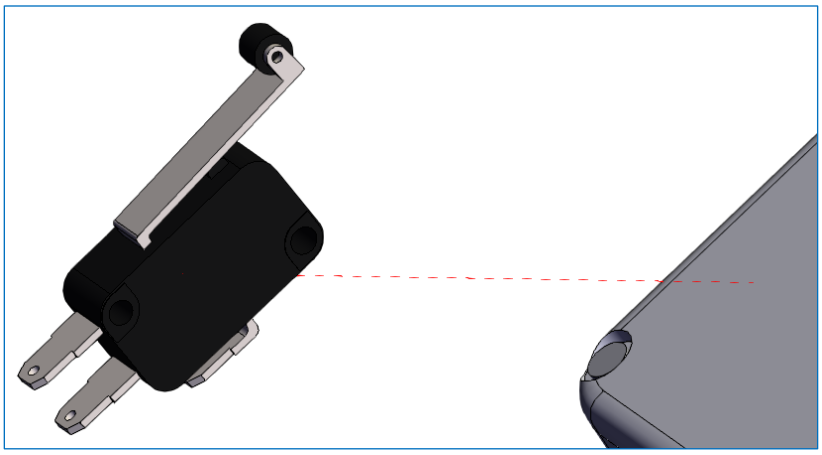
The following process outline the process to draw a markup line between two arbitrary points on one or more 3D CAD models:

1. Right-click anywhere on the 3D scene.
2. Click **Markup Line by Intersection**.

3. Click on the first point.



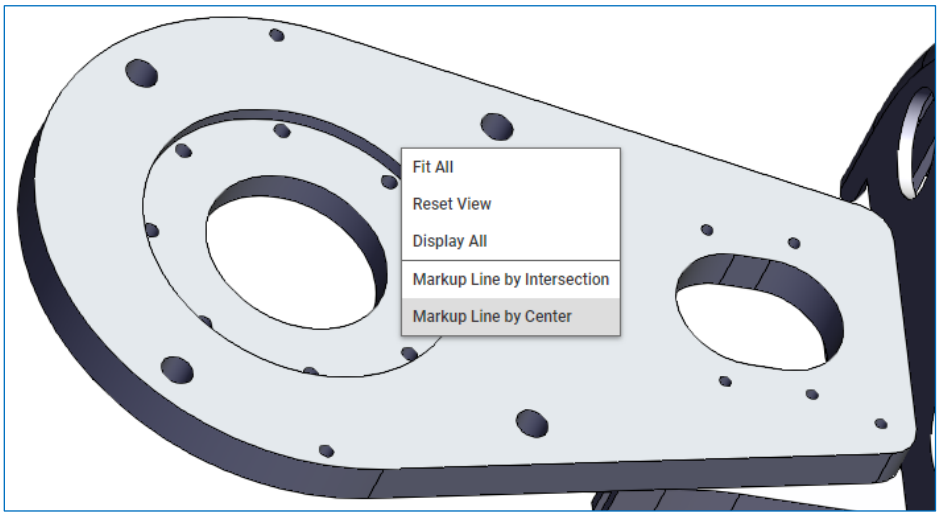
4. Click on the second point. The markup line is created.



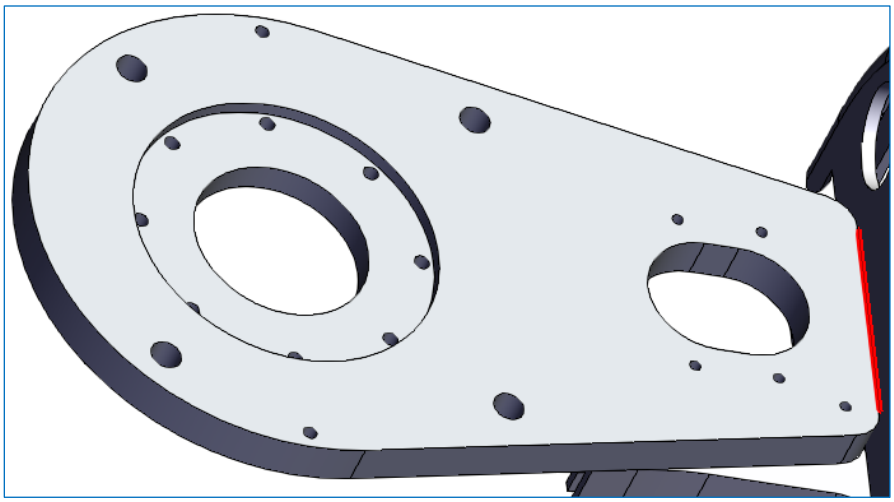
6.3.2 Adding Markup Lines by Center

The following steps outline the process to draw a markup line between the centers of two arbitrary edges on one or more 3D CAD models:

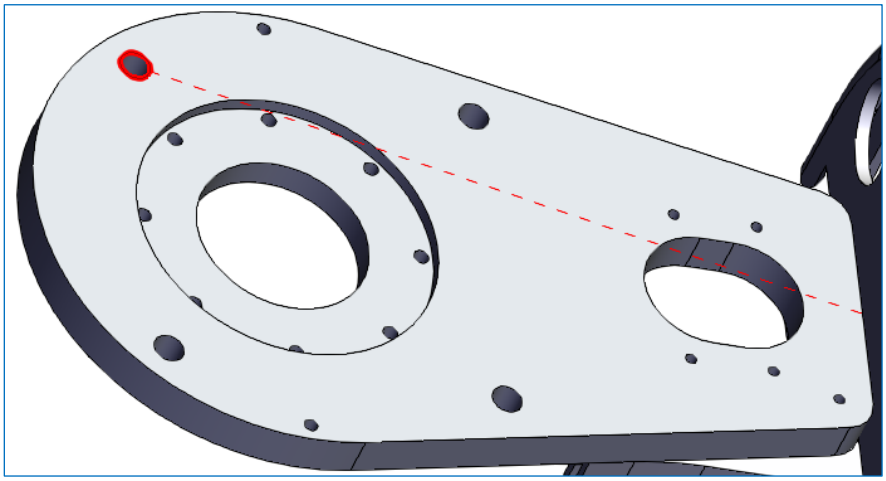
1. Right-click anywhere on the 3D scene.
2. Click **Markup Line by Center**.



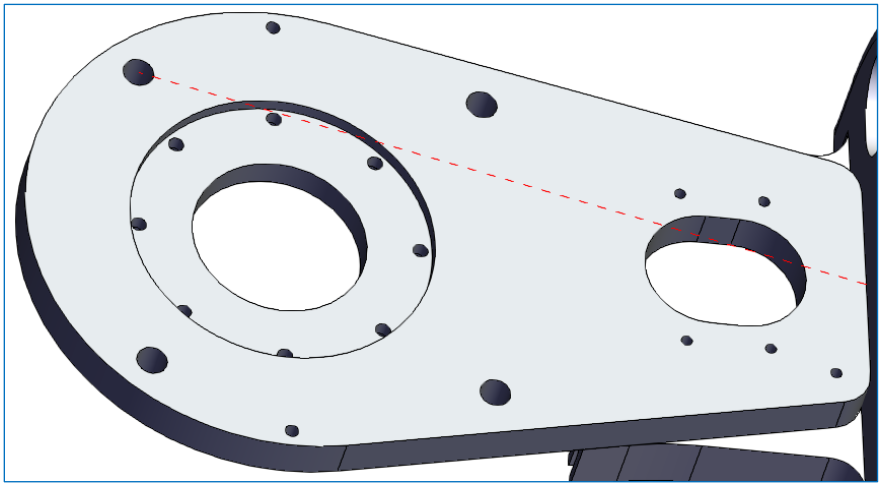
3. Click on the first edge.



Note: Edges available for selection are highlighted with red while hovering over them.

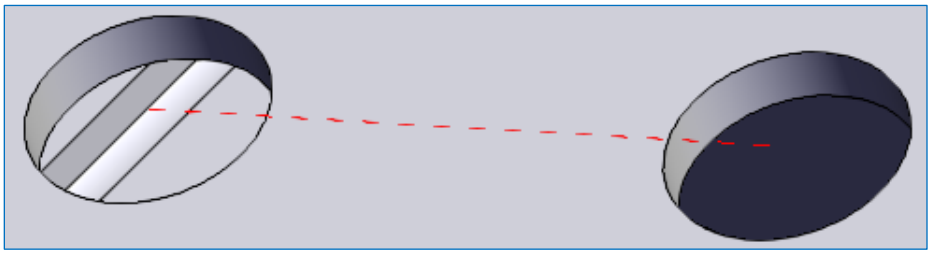


4. Click on the second edge. The markup line between the centers of the two edges is created.



6.3.3 Removing Markup Lines

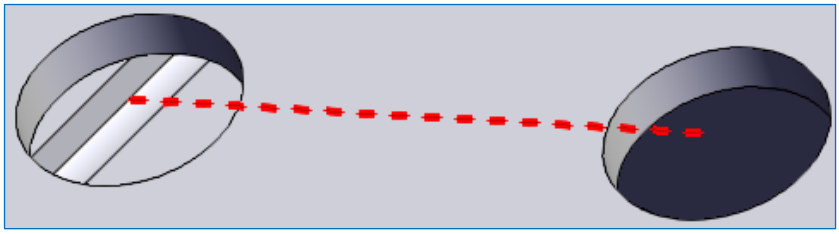
An end user can remove a single markup line or clear given 3D CAD models from all lines with a single command.



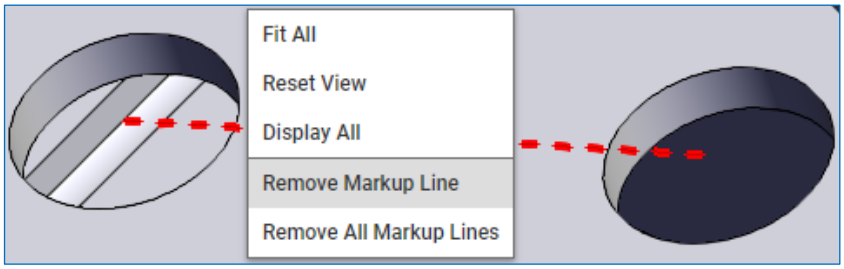
6.3.3.1 Removing Single Markup Line

The following steps outline the process o remove an existing markup line on one or more 3D CAD models:

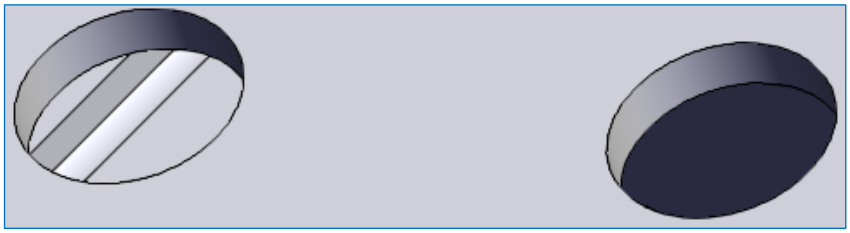
1. Click the markup line to be removed. The line becomes bold.



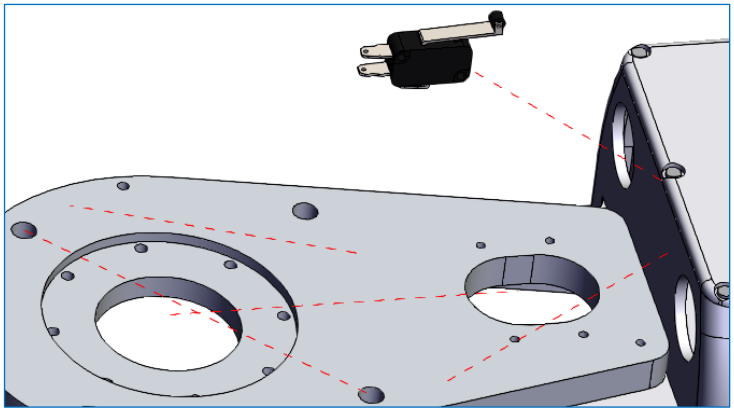
2. Right-click and then click **Remove Markup Line**.



The markup line is removed from the 3D scene and cannot be restored.

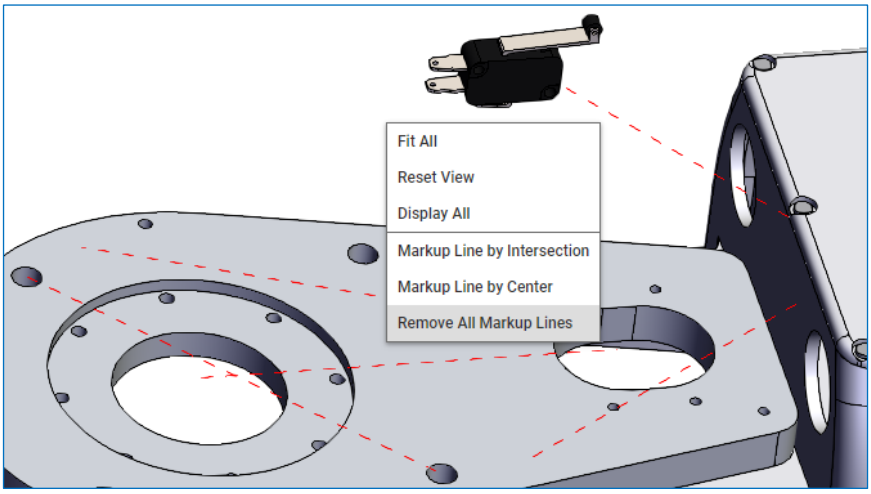


6.3.3.2 Clearing 3D Scene from All Markup Lines

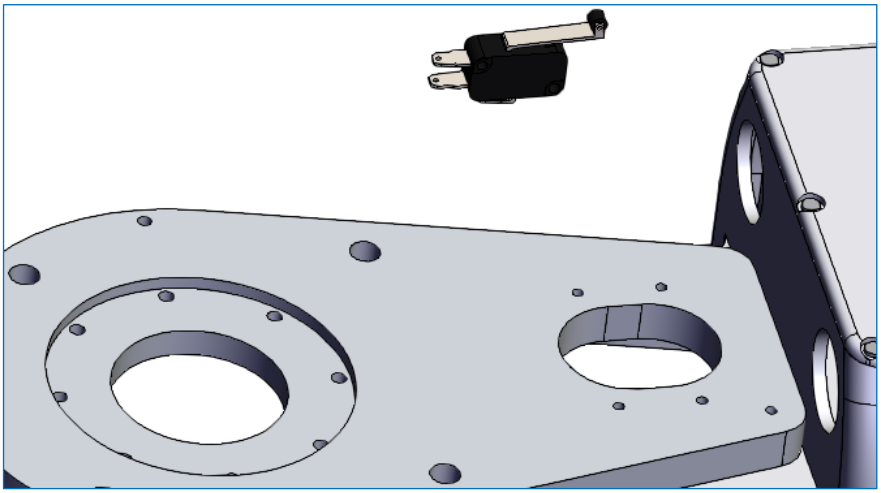


The following steps outline the process to clear 3D CAD models on the 3D scene from all markup lines:

1. Right-click anywhere on the 3D scene.
2. Click Remove All Markup Lines.



All markup lines are removed from the 3D scene and cannot be restored.



6.4 Manual Geometry Transformation

A 3D CAD assembly is a set of viewable SCS and SCZ files in the Dynamic and Streaming Viewers respectively, an end user can manually transform the geometry of one or more SCS and SCZ files from the assembly right in these viewers. As such a file can be a subassembly or leaf part, the user can move and rotate a given subassembly or part on the 3D scene along:

- The X, Y, and Z axes in the coordinate system of this given subassembly or part.
- A surface or edge of another part.

The end user can move and rotate a single subassembly or part with multiple geometry transformation sessions to achieve its necessary position and orientation. Multiple subassemblies and parts can be moved and rotated on the 3D scene.

The user can also add markup lines to the moved and rotated subassemblies and parts as well as move and rotate the ones with existing markup lines. While moving and rotating, the existing markup lines preserve their connections. For more details on markup lines, see the Markup Lines in Dynamic Viewer and Streaming Viewer section.

The Dynamic or Streaming Viewers does not embed manual geometry transformations into 3D CAD model native and viewable files.

A 3D CAD model view with manual geometry transformations can be saved as outlined in the *Saved Views* section.

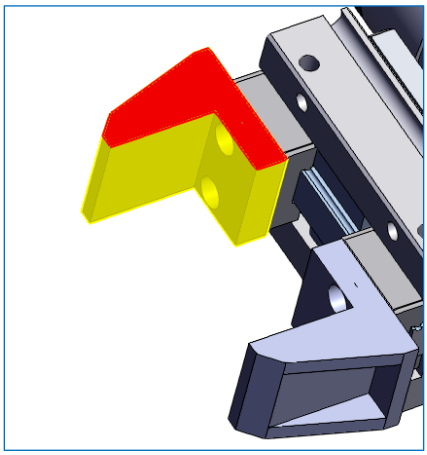
To quite the manual geometry transformation of a subassembly or part, either:

- Click on the 3D canvas outside a 3D CAD model.
- Press Escape on the keyboard.

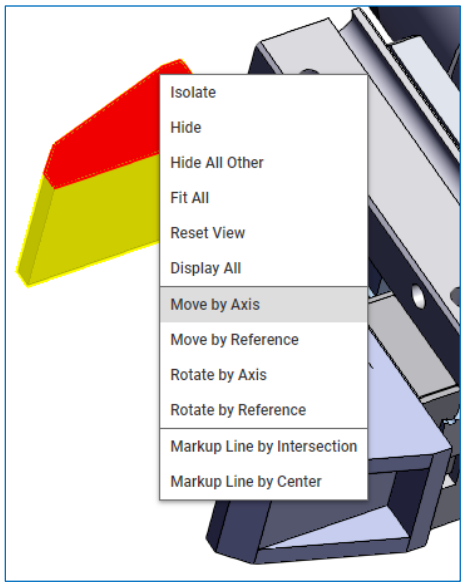
6.4.1 Moving Parts by Axis

The following steps outline the process to move a subassembly or a leaf part along one or more of the X, Y, and Z axes in its own coordinate system:

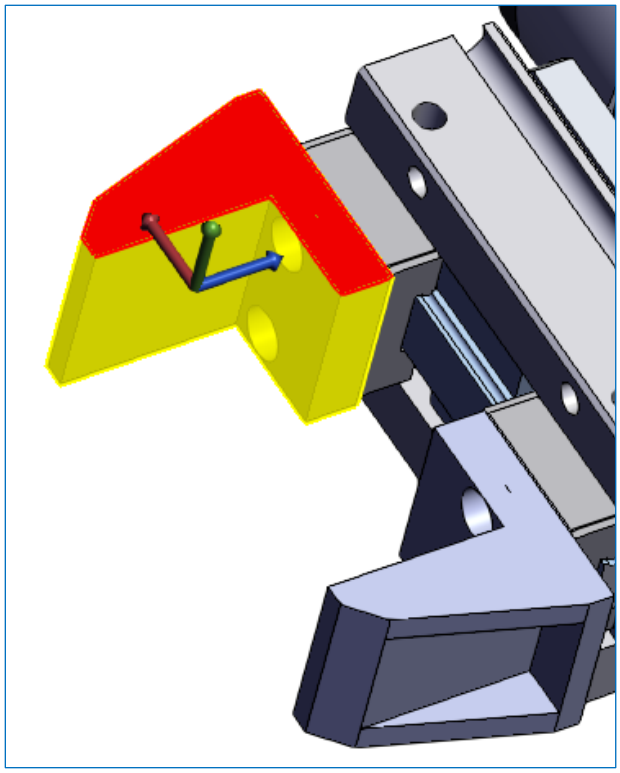
1. Select the subassembly or part.



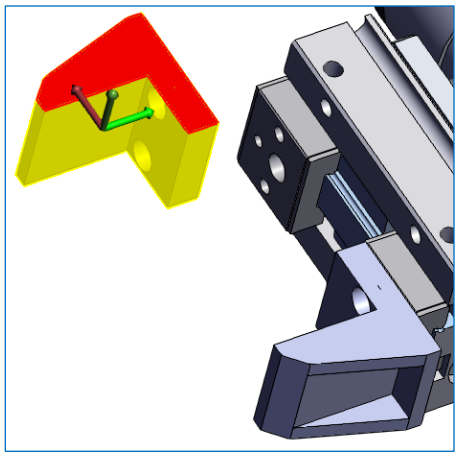
2. Right-click the subassembly or part.



3. Click **Move by Axis** in the **Part** context menu. The **X**, **Y**, and **Z** movement axes appear near the model.

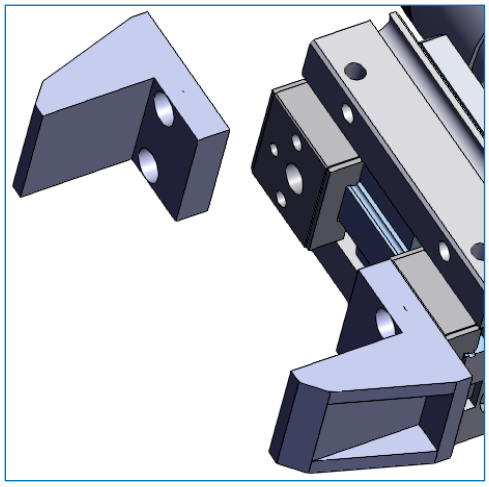


4. Drag the **X**, **Y**, and **Z** axes by one to move the subassembly or part as necessary.

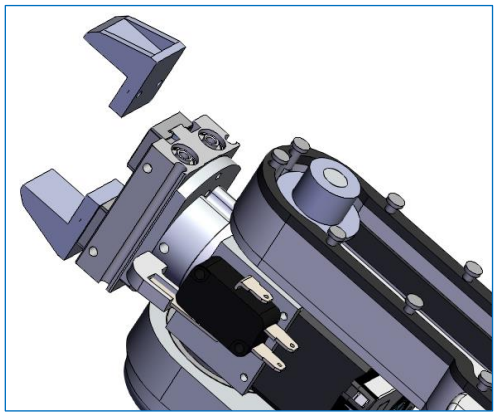


5. Once the necessary position is achieved, quit the manual geometry transformation mode. This can be done in two ways:

   - Click outside the moved subassembly or part.
   - Press Escape on the keyboard.



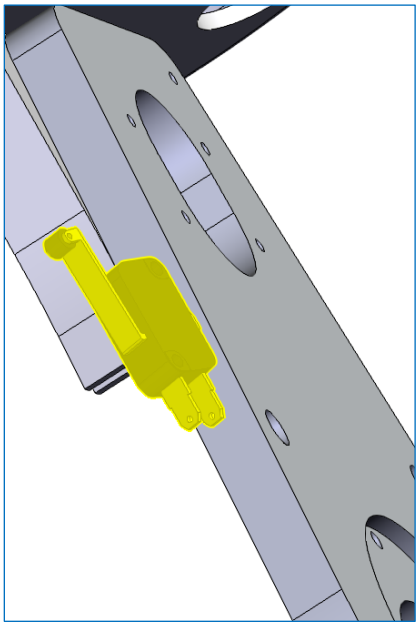
The new subassembly or part position is preserved. The 3D CAD model is ready for viewing and other manipulations.



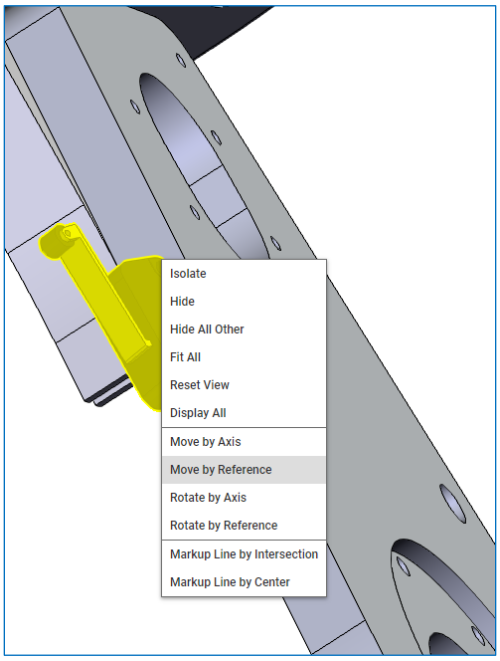
6.4.2 Moving Parts by Reference

The following steps outline the process to move a subassembly or a leaf part relatively to a surface or edge of another part:

1. Select the subassembly or part to be moved.

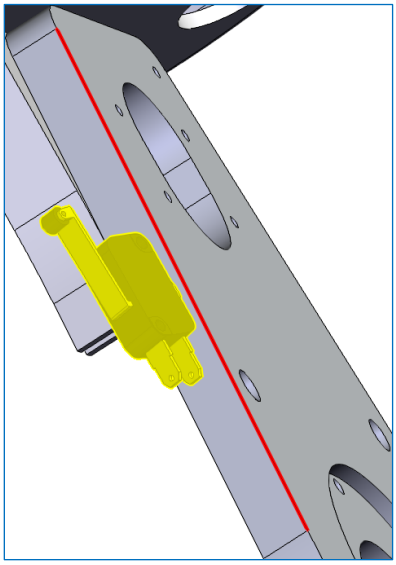


2. Right-click the subassembly or part to be moved and click **Move by Reference**.



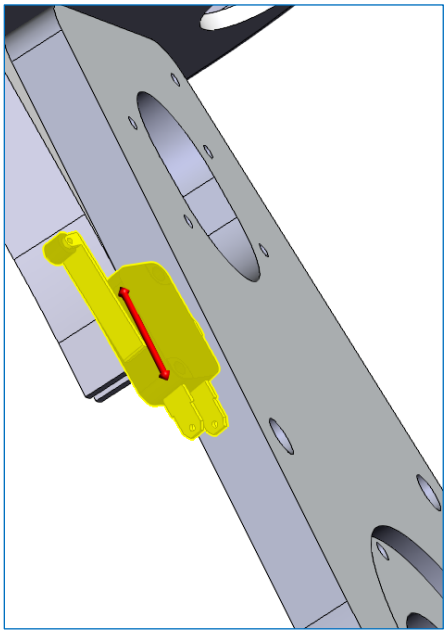
3. Select a surface or edge of another part along which the first subassembly or part should be moved.

Note: Surfaces and edges available for selection are highlighted with red while hovering over them.

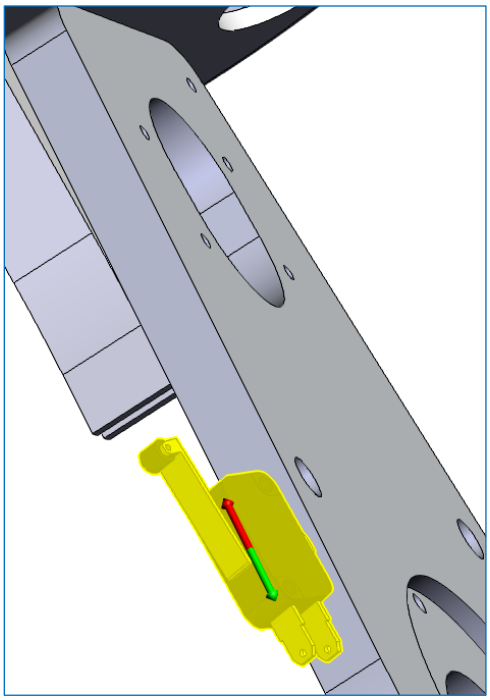


A movement axis appears near the model.

Note: The system automatically detects a valid axis for movement along a given object.

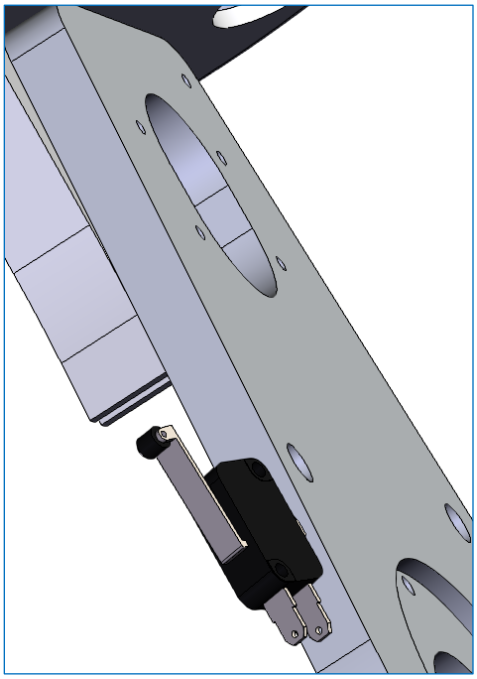


4. Drag the axis to move the subassembly or part as necessary.

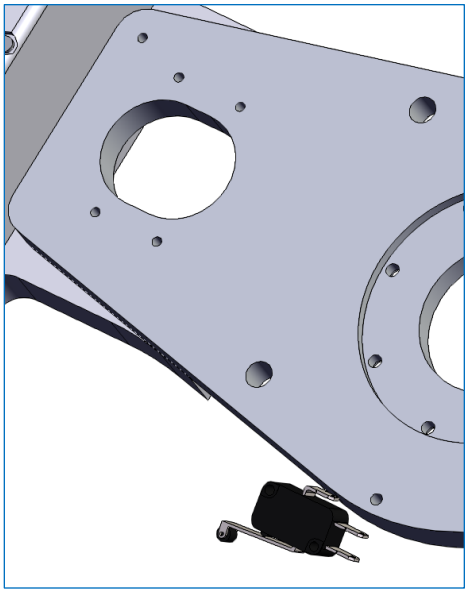


5. Once the necessary position is achieved, quit the manual geometry transformation mode. This can be done in two ways:

   - Click outside the moved subassembly or part.
   - Press Escape on the keyboard.



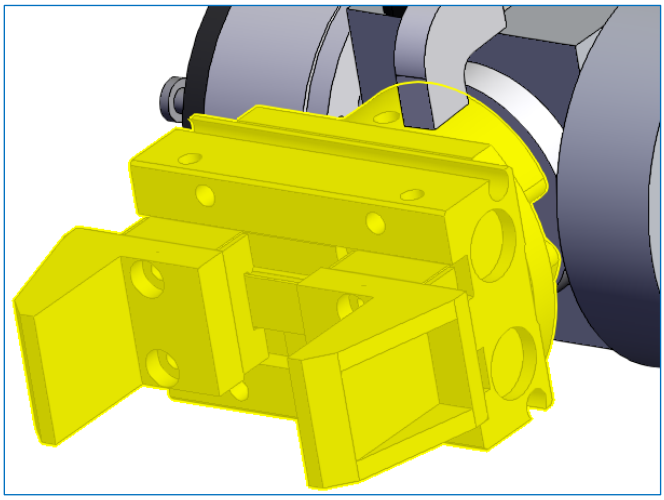
The new subassembly or part position is preserved. The 3D CAD model is ready for viewing and other manipulations.



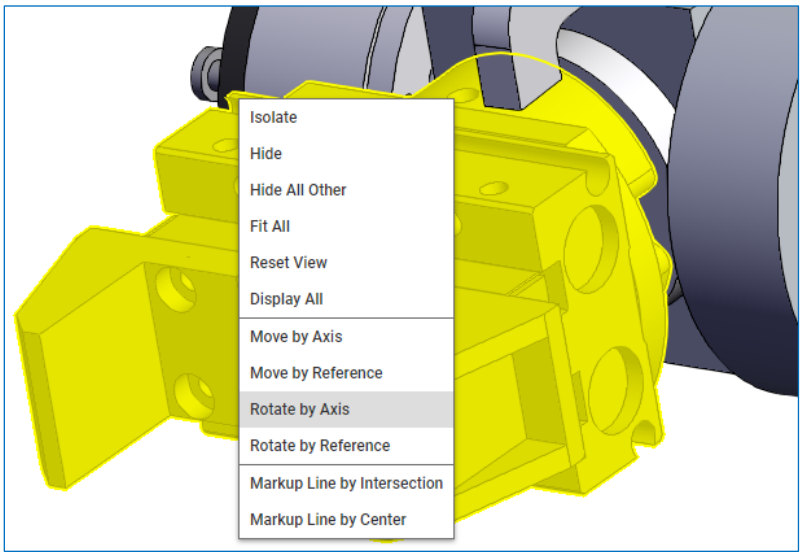
6.4.3 Rotating Parts by Axis

The following steps outline the process to rotate a subassembly or a leaf part along one or more of the X, Y, and Z axes in its own coordinate system:

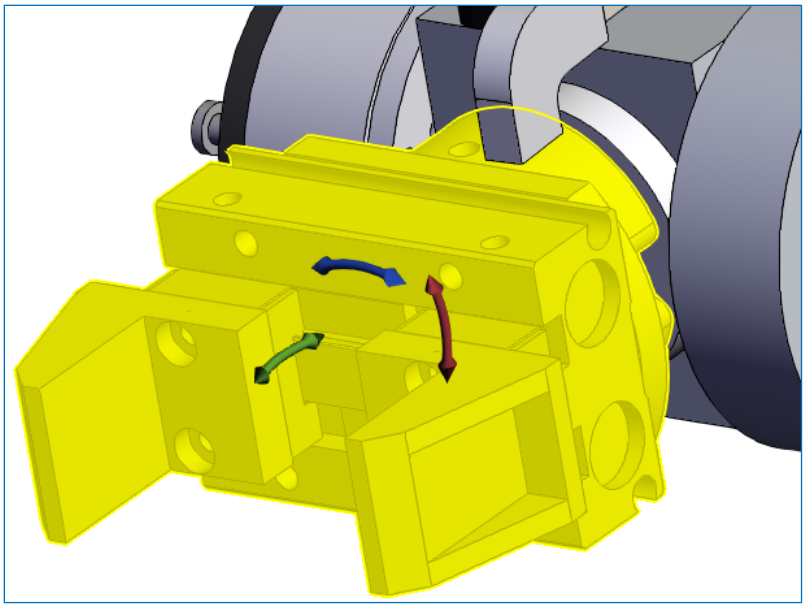
1. Select the subassembly or part.



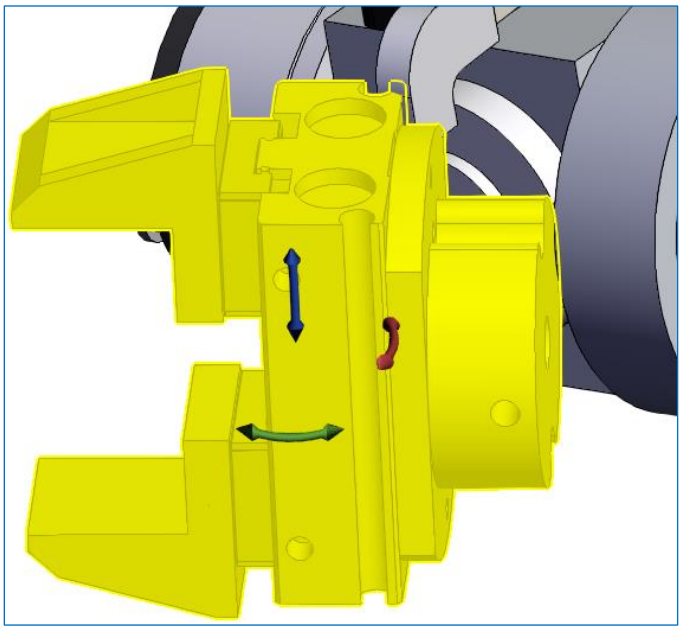
2. Right-click the subassembly or part.



3. Click Rotate **by Axis** in the **Part** context menu. The **X**, **Y**, and **Z** rotation axes appear near the model.

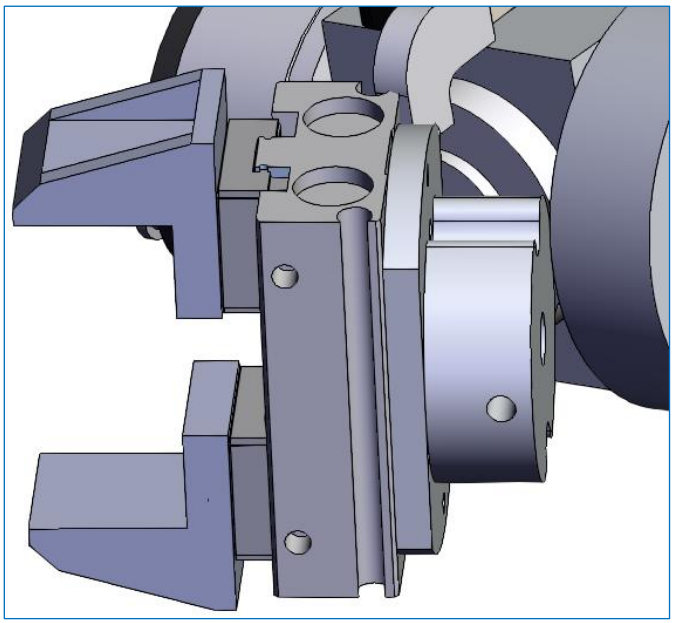


4. Drag the **X**, **Y**, and **Z** axes by one to rotate the subassembly or part as necessary.

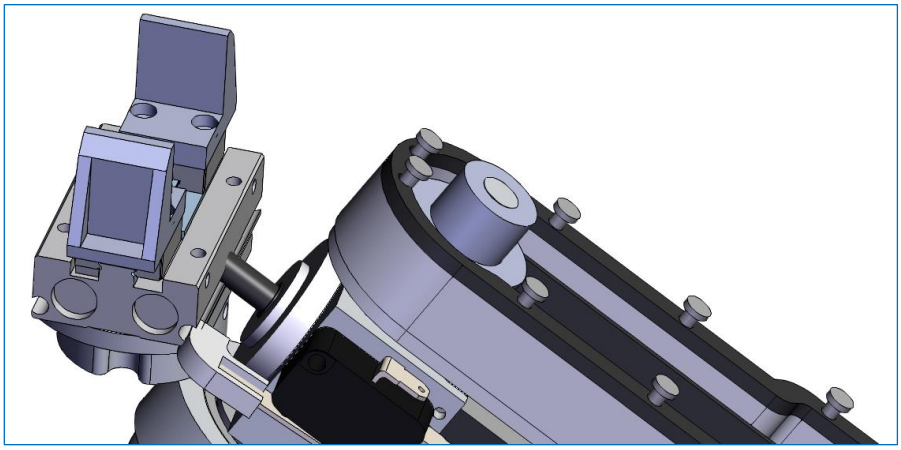


5. Once the necessary orientation is achieved, quit the manual geometry transformation mode. This can be done in two ways:

   - Click outside the rotated subassembly or part.
   - Press Escape on the keyboard.



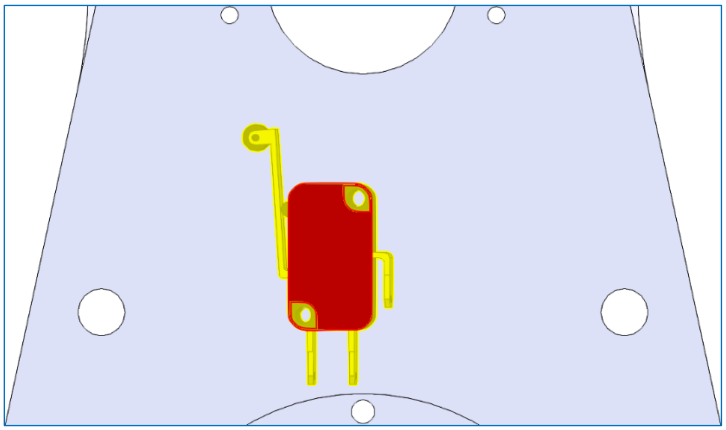
The new subassembly or part orientation is preserved. The 3D CAD model is ready for viewing and other manipulations.



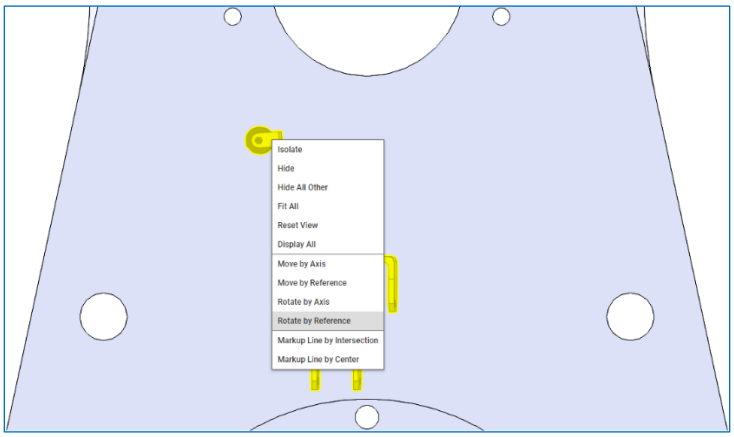
6.4.4 Rotating Parts by Reference

The following steps outline the process to rotate a subassembly or a leaf part relatively to a surface or edge of another part:

1. Select the subassembly or part to be rotated.

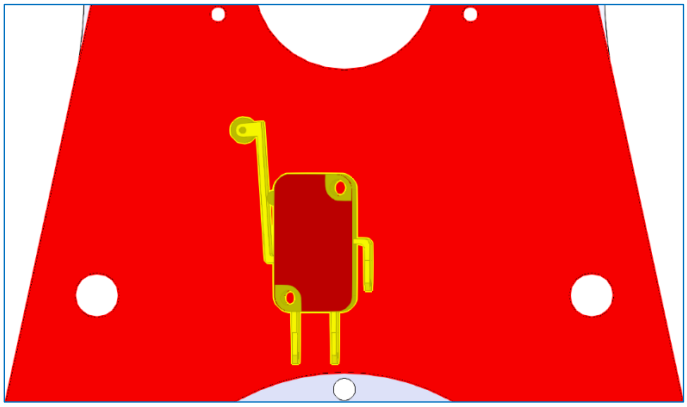


2. Right-click the subassembly or part to be rotated and click **Rotate by Reference**.



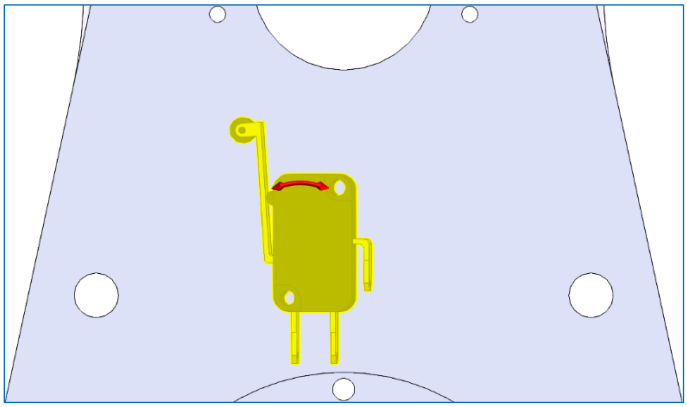
3. Select a surface or edge of another part along which the first subassembly or part should be rotated.

Note: Surfaces and edges available for selection are highlighted with red while hovering over them.

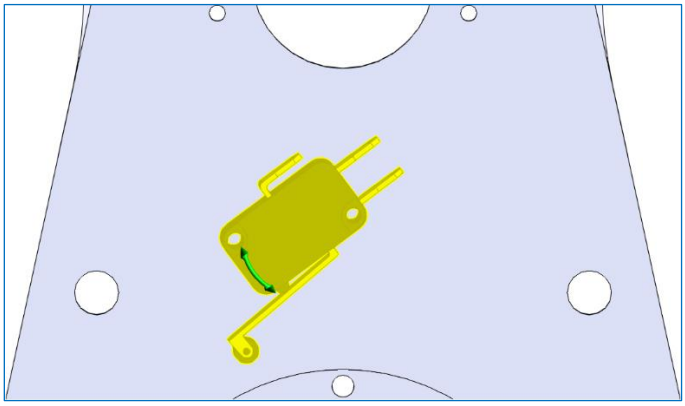


A rotation axis appears near the model.

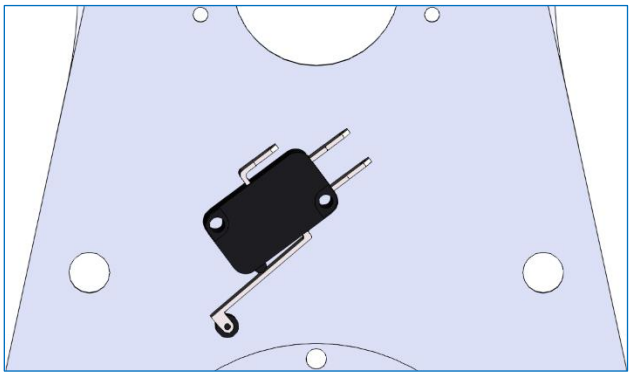
Note: The system automatically detects a valid axis for rotation along a given object.



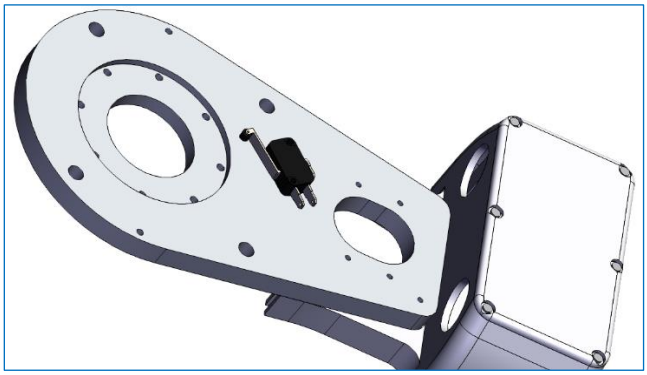
4. Drag the axis to rotate the subassembly or part as necessary.



5. Once the necessary orientation is achieved, quit the manual geometry transformation mode. This can be done in two ways:
   - Click outside the subassembly or part.
   - Press Escape on the keyboard.



The new subassembly or part orientation is preserved. The 3D CAD model is ready for viewing and other manipulations.



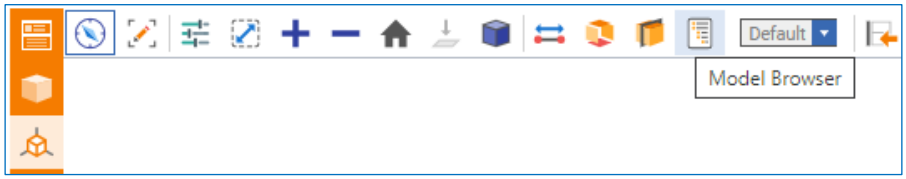
6.4.5 Removing Manual Geometry Transformations

The following steps outline the process to clear the 3D scene from all manual geometry transformations:

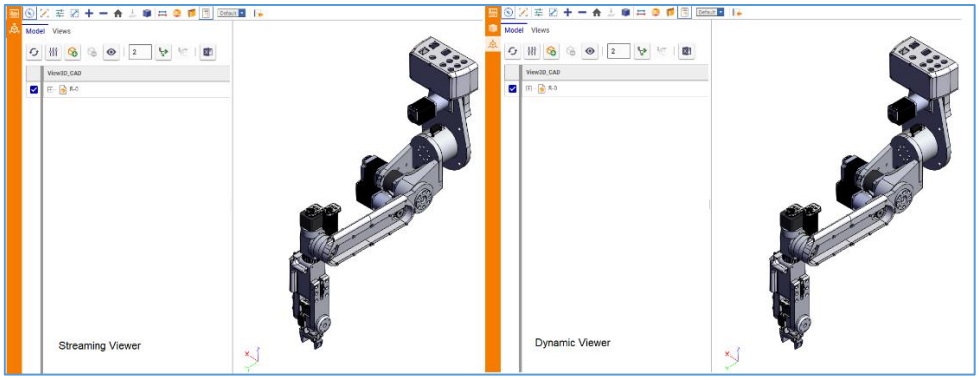
1. Right-click anywhere on the 3D scene and click **Reset View**.
2. All 3D CAD models will be set to their default orientations and sizes on the 3D scene, and unsaved manual geometry transformations will be lost and cannot be restored.

6.5 Model Browser in Dynamic and Streaming Viewers

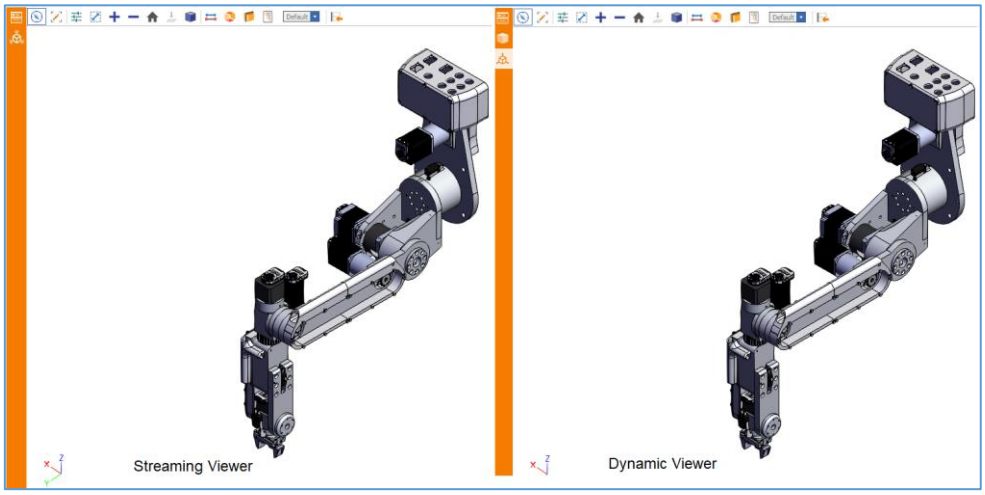
The **Model Browser** button on the **Standard Viewing** toolbar provides access to the **Model Browser** section.



By default, the **Model Browser** section is shown at the first opening of the both Dynamic as well as the Streaming Viewer for a given CAD Document in the current logging session.



Clicking the **Model Browser** button shows or hides the **Model Browser** section right after the left sidebar.



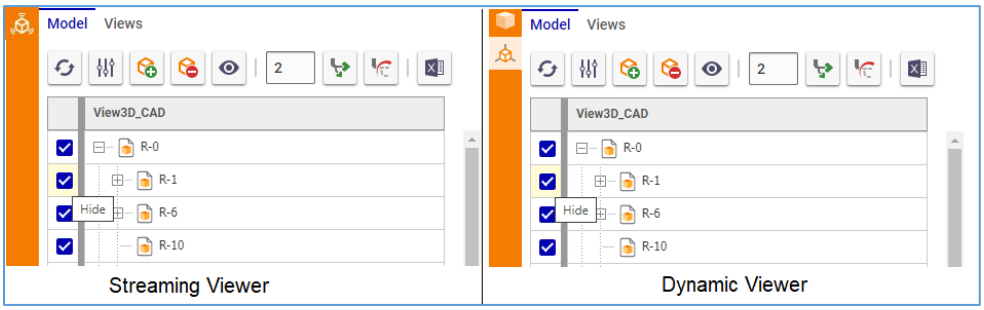
The **Model Browser** section has two tabs:

- **Model**: a Tree Grid View (TGV) showing a tree of CAD Documents included in a CAD assembly representing a given 3D CAD model with capabilities to:
  - Navigate through subassemblies and parts in a given assembly.
  - Quickly select a necessary subassembly or part.
  - Configure which CAD Document versions should be loaded into the Dynamic or in the Streaming Viewers through Structure Resolution Parameters.
  - Create and manage digital mockups.
- **Views**: a list of model views with capabilities to:
  - Create, delete, and restore Saved Views.
  - Switch quickly between viewing positions available for a given 3D CAD model.

6.5.1 Browsing CAD Model Parts in Dynamic and Streaming Viewers

The **Model** tab of the **Model Browser** section is a Tree Grid View (TGV) showing a tree of CAD Documents included in a CAD assembly representing a given 3D CAD model. End-users can quickly navigate through the assembly structure, configure which part versions are shown through Structure Resolution Parameters, and create digital mockups as discussed in this section.

The **Model** TGV browser reuses the standard TGV toolbar, context menu, grid, and behavior.



For the **Model** TGV toolbar details, see the *TGV Model Browser Toolbar* subsection.

For the **Model** TGV context menu details, see the *TGV Part Context Menu* subsection.

The **Model** TGV grid shows a CAD Document tree recursively: the first level is the immediate children of the top-most parent, the second level is the children of the immediate children, and so on. A child with its own children is a separate tree branch.

6.5.1.1 TGV Model Browser Toolbar

The **Model** TGV reuses the standard TGV toolbar and extends it with the following features to explore and manage a multi-level CAD Document structure of a given CAD Document:

1. **Refresh**: to update the multi-level CAD Document structure with the latest data.
2. **Parameters**: to display the **Parameters** dialog box for selecting which versions of child CAD Documents to retrieve from the dataset and show in the Dynamic and Streaming Viewers; see the *CAD Structure Version Preferences* section.
3. **Add Model**: to add an additional 3D CAD model of an assembly, subassembly, or part to the 3D CAD scene with a 3D CAD model of the given CAD Document; see the Adding *Additional Models to 3D Scene* section.
4. **Remove Model**: to remove an additional 3D CAD model of an assembly, subassembly, or part from the 3D CAD scene with a 3D CAD model of the given CAD Document; see the *Removing Additional Models from 3D Scene* section.
5. **Visibility**: to display the **Display Settings** dialog box for setting up Item TGV visibility.
6. **Grow Depth**: to set up the level of the multi-level CAD Document expansion.
7. **Grow**: to expand the given multi-level CAD Document structure.
8. **Trim**: to collapse the given multi-level CAD Document structure.
9. **Export to Excel**: to save the given multi-level CAD Document structure as an Excel file.

This document discusses only the feature specific to the Dynamic and the Streaming Viewers: **Parameters** (2), **Add Model**, **Remove Model** (4).

6.5.1.2 TGV Part Context Menu

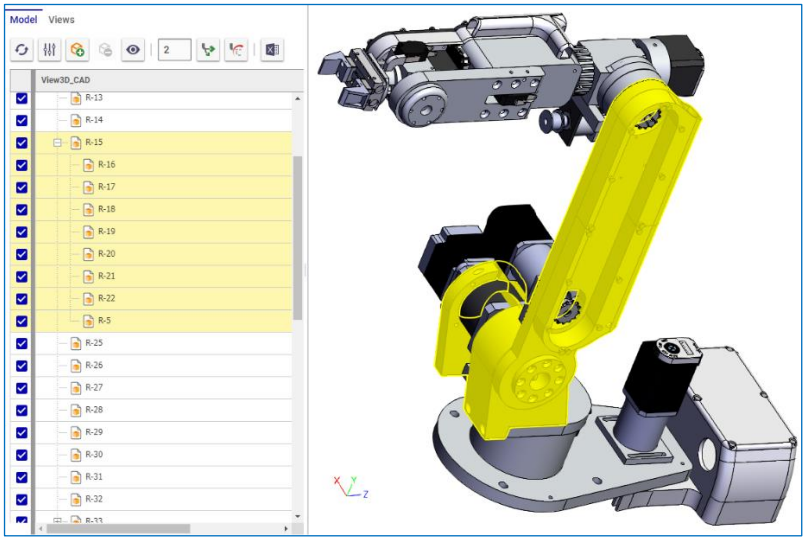
Right-clicking a CAD Document in the **Model** TGV browser grid displays the **Part** TGV context menu for this CAD Document and its represented part or assembly.

The **Model** TGV browser grid fully reuses the general **Part** context menu, its commands, and their behavior as outlined in the *Part Context Menu* section. In addition to the reused commands, the **Part** TGV context menu includes the following ones:

- **Grow**: to expand the given multi-level CAD Document structure.
- **Trim**: to collapse the given multi-level CAD Document structure.
- **Show**: to make a given hidden part or assembly visible on a 3D CAD model.

6.5.1.3 Selecting Parts in TGV Model Browser

Part selection is synchronized between the **Model** TGV browser and a given 3D CAD model. Clicking a part or surface on the model selects this part on the model and its CAD Document in the TGV grid. And vice versa, clicking a CAD Document in the TGV grid selects its part or assembly on the model as well.



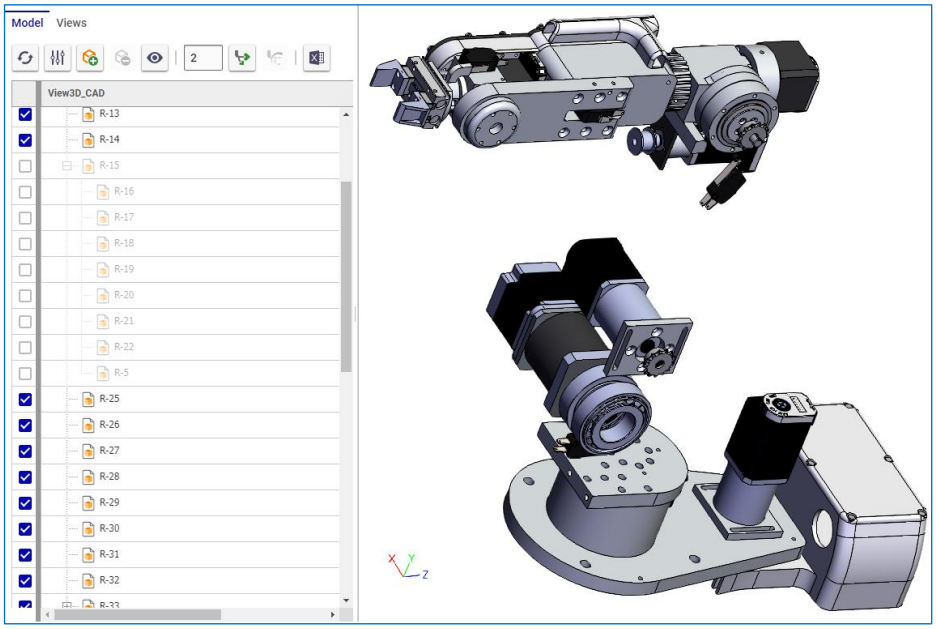
6.5.1.4 *Hiding and Showing Parts with TGV Model Browser*

Each CAD Document in the **Model** TGV grid has a check box to hide or show its represented part or subassembly on the model:

- **Selected**: a given part or subassembly is visible.
- **Cleared**: a given part or subassembly is hidden.

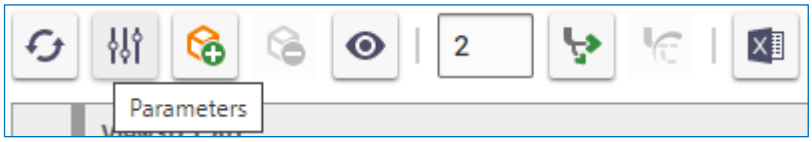
When hiding or showing a subassembly, all parts included in this subassembly (child parts) are automatically hidden or displayed as well.

CAD Documents of hidden parts and assemblies are light grey in the tree.



6.5.1.5 *CAD Structure Version Preferences*

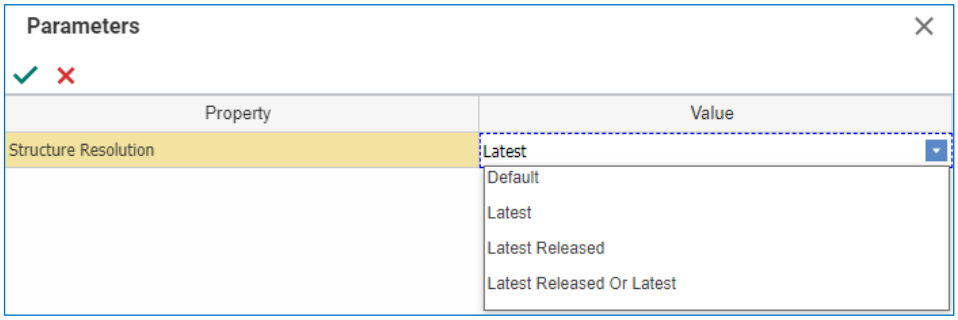
The **Parameters** button on the **Model** TGV toolbar provides access to the **Parameters** dialog with options on which versions of child CAD Documents should be retrieved from the dataset and shown in the Dynamic or in the Streaming Viewer.



As a CAD Document is a versionable Item and has the Item States, a child CAD Document attached to a parent CAD Document can have multiple versions, and the attached child version may or may not be:

- The latest
- In the **Released** State

To set which child CAD Document versions should be retrieved from the dataset and shown in the Dynamic/Streaming Viewer, the **Parameters** dialog has the following options:



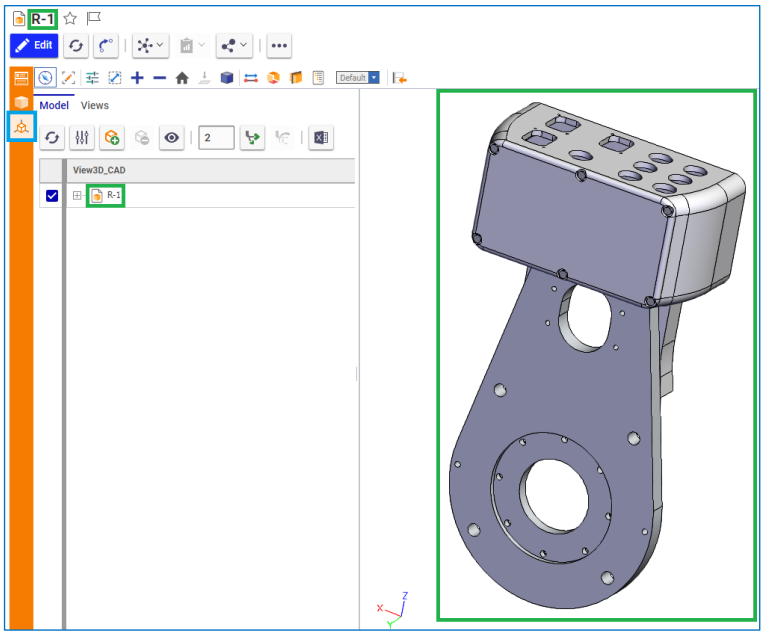
- **Default**: only the versions of children that are attached to given versions of parents, regardless of the States of these children and whether they are the latest or not.
- **Latest**: only the latest versions of children, regardless of their current State and whether they are attached to given parents or not. This is the default setting.
- **Latest Released**: only the latest versions of children in the **Released** State, regardless of whether they are currently attached to given parents or not.
- **Latest Released Or Latest**: the latest versions of children in the **Released** State if they exist; otherwise, their latest versions, regardless of whether they are currently attached to given parents or not.

Both the Dynamic and the Streaming Viewer resolves the CAD Document structure according to the current setting in the **Parameters** dialog recursively for each branch. A child with its own children is a separate tree branch. At first, the Viewer validates the immediate children of the top-most parent (the first level), then the children of each immediate child (the second level), and so on for each level.

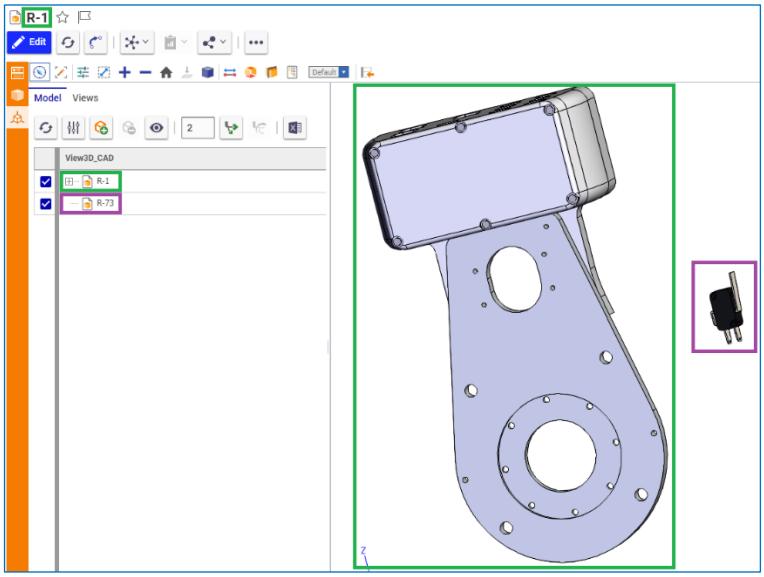
6.5.1.6 *Adding Additional Models to 3D Scene*

The **Add Model** button on the **Model** TGV toolbar enables end users to create a digital mockup by adding additional 3D CAD models onto a single 3D CAD scene with a context 3D CAD model. For the digital mockup details, see the *Digital Mockup* section.

A context 3D CAD model is a 3D CAD model on a 3D scene shown from a CAD Document of this model.

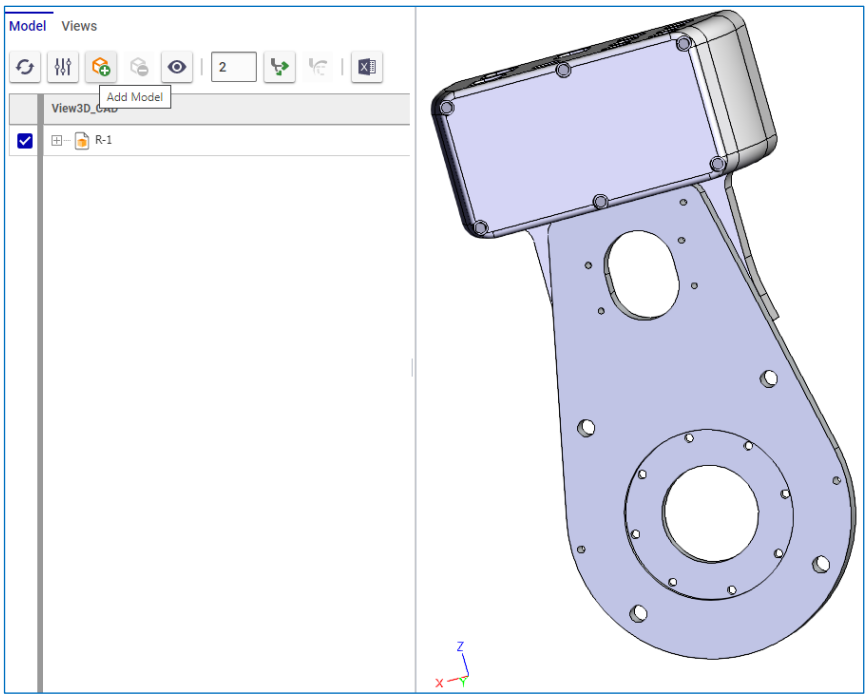


An additional 3D CAD model is a 3D CAD model on a 3D scene shown from a CAD Document of another model present on this scene.

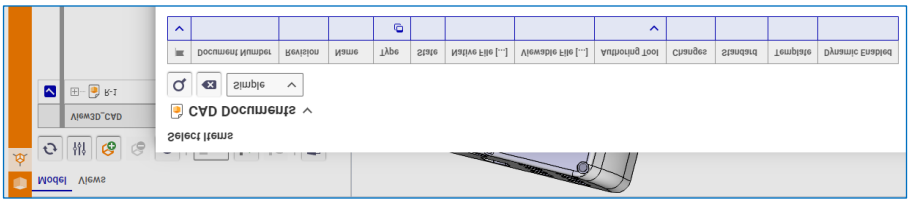


To add an additional 3D CAD model of an assembly, subassembly, or part to a context 3D CAD model of an assembly or subassembly shown in the Dynamic or in the Streaming Viewer:

1. Click the **Add Model** button on the **Model** TGV toolbar.

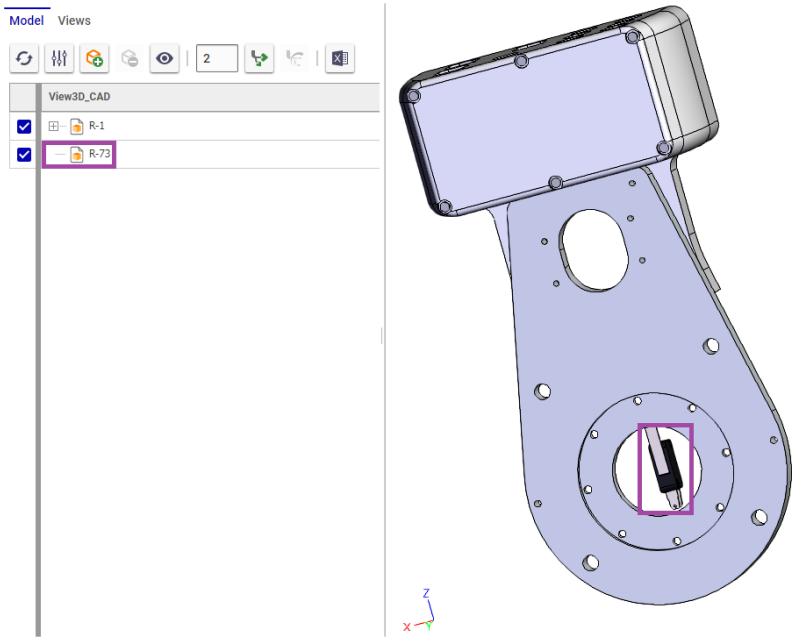


2. The Select Items – CAD Documents dialog appears.



3. Using the standard search procedure, search for a CAD Document whose 3D CAD model should be added to the 3D scene.

4. Select the searched CAD Document and click OK. The Dynamic /Streaming Viewer and its Model TGV browser are refreshed. The context 3D CAD model keeps its position and orientation. A 3D CAD model from the selected CAD Document appears on the 3D scene in the original position and orientation of the context 3D CAD model. The selected CAD Document appears in the Model TGV grid as another root item.

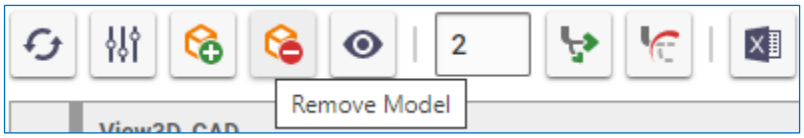


5. Adjust the position and orientation of the newly added 3D CAD model as necessary by moving and rotating this model as discussed in the *Manual Geometry Transformation* section.

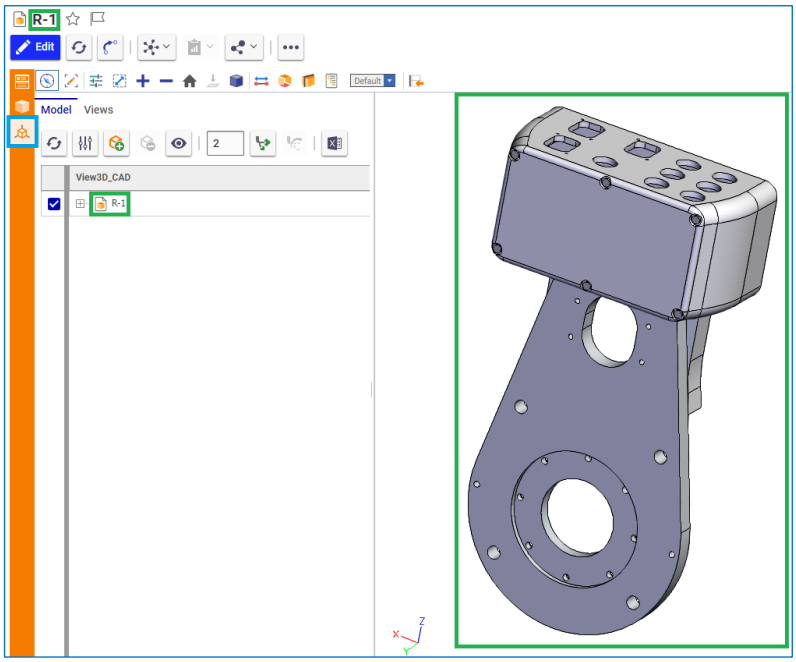
Note:	In the **Model** TGV grid, the context CAD Document may not be at the top because this grid is sorted using the sorting logic of an associated Query Definition.

6.5.1.7 *Removing Additional Models from 3D Scene*

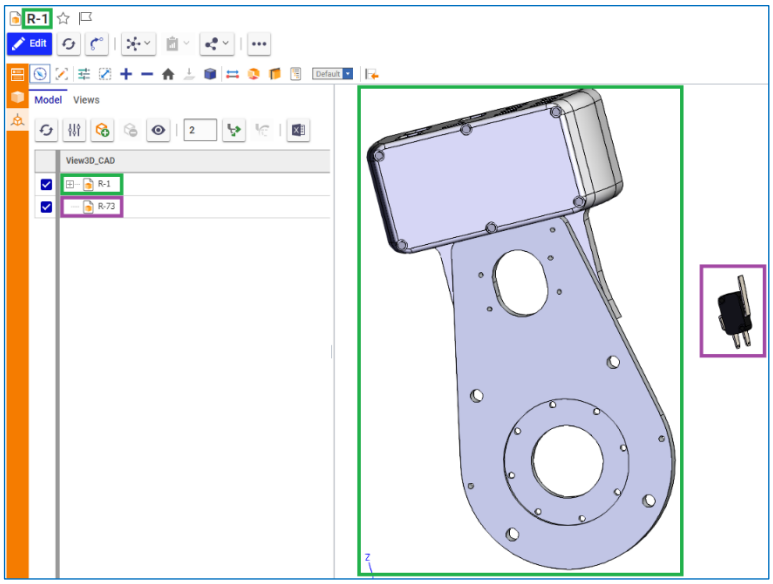
The **Remove Model** button on the **Model** TGV toolbar enables end users to modify a digital mockup by removing additional 3D CAD models from a single 3D CAD scene with a context 3D CAD model. For the digital mockup details, see the *Digital Mockup* section.



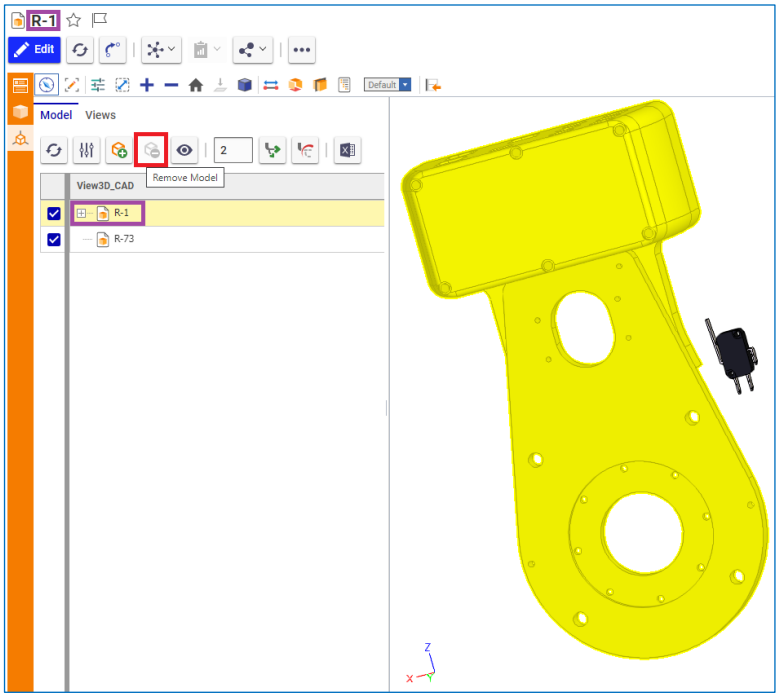
A context 3D CAD model is a 3D CAD model on a 3D scene shown from a CAD Document of this model.



An additional 3D CAD model is a 3D CAD model on a 3D scene shown from a CAD Document of another model present on this scene.



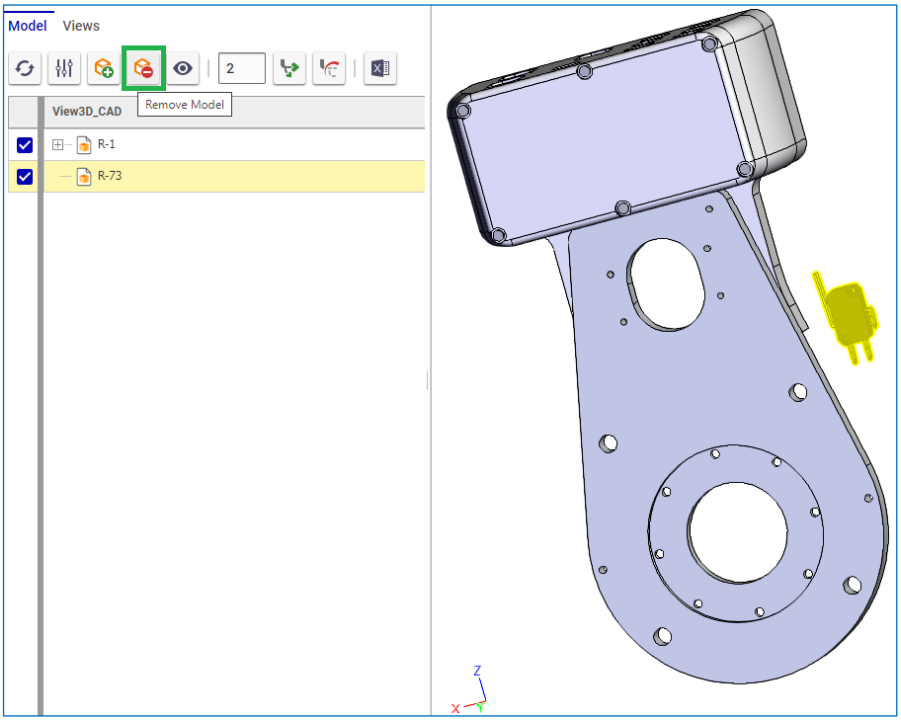
The context 3D CAD model cannot be removed from the 3D scene: the **Remove Model** button is disabled when the context 3D CAD model assembly, its subassembly, or part is selected.



The **Remove Model** button is also disabled when no assemblies, subassemblies, or parts are selected. It becomes enabled only when an additional assembly, subassembly, or part is selected.

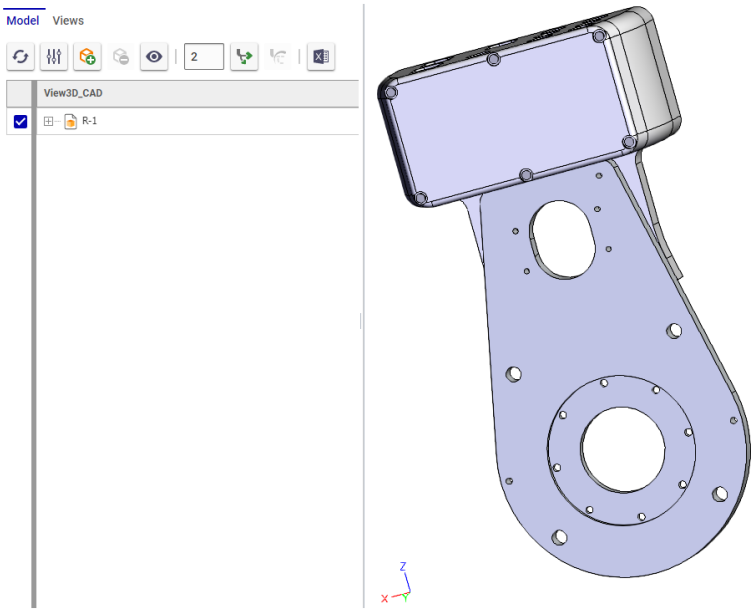
To remove an additional 3D CAD model of an assembly, subassembly, or part from a context 3D CAD model of an assembly or subassembly shown in the Dynamic/Streaming Viewer:

1. Select the 3D CAD model or CAD Document of the additional assembly, subassembly, or part to be deleted from the 3D scene.



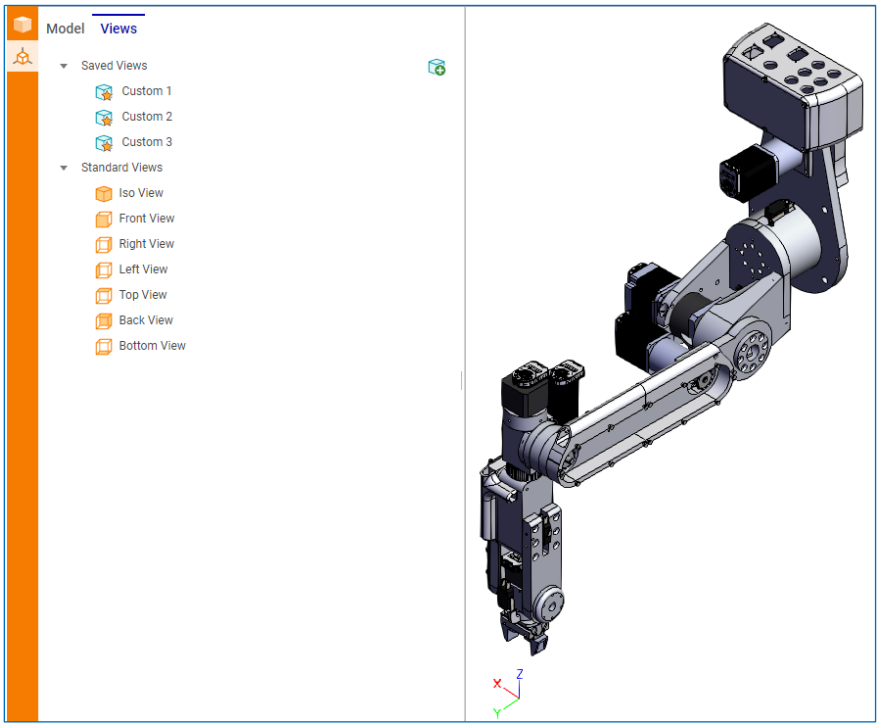
2. Click the **Remove Model** button on the **Model** TGV toolbar. The Dynamic/Streaming Viewer and its **Model** TGV browser are refreshed. The context 3D CAD model keeps its position and orientation. The 3D CAD model of the deleted assembly, subassembly, or part disappears from the 3D scene. The CAD Document of the deleted assembly, subassembly, or part disappears from the **Model** TGV grid.

Warning	Be careful when clicking the **Remove Model** button because there is no warning or prompt to confirm the removal. An unsaved 3D scene view will be lost, and it will not be possible to restore it.



6.5.2 Browsing CAD Model Views in Dynamic and Streaming Viewers

The **Views** tab of the **Model Browser** section in the Dynamic or in the Streaming Viewers provides end users with options of viewing positions available for a given 3D CAD model.



The **Views** tab has two view groups:

- **Saved Views**: custom viewing positions created and saved by user as discussed in the Saved Views section.
- **Standard Views**: viewing positions of standard 3D sides available for all 3D CAD models:
  - **Iso View**
  - **Front View**
  - **Right View**
  - **Left View**
  - **Front View**
  - **Top View**
  - **Back View**

Clicking a given viewing position rotates a given 3D CAD model to a corresponding side and orientation.

6.6 Saved Views

The Dynamic Viewer and the Streaming Viewers both provides end users with the Saved Views feature for restoring 3D scene views of one or more 3D CAD models.

The end users can create custom Saved Views to preserve the current View state as discussed in the *Creating Saved Views* section. When creating a Saved View for a 3D scene view, the following functions applied to this 3D scene view are saved with the Saved View: the selected Dynamic View Definition, applied Parameter Values, selected View Mode, added parts and assemblies, and the current camera position.

Some view parameters cannot be saved and restored; for example, the display style, exploded increment, measurements, and cutting planes.

At any time in the future, end users can apply an existing Saved View to a 3D scene to restore their digital mockup or favorite viewing position as discussed in the Restoring Saved Views section. When restoring a Saved View for a 3D scene view, the abovementioned saved functions are re-applied to the scene.

However, a restored 3D scene view is not guaranteed to match the original 3D scene view because a Saved View includes only input information for a Query Definition which execution may return a different result set.

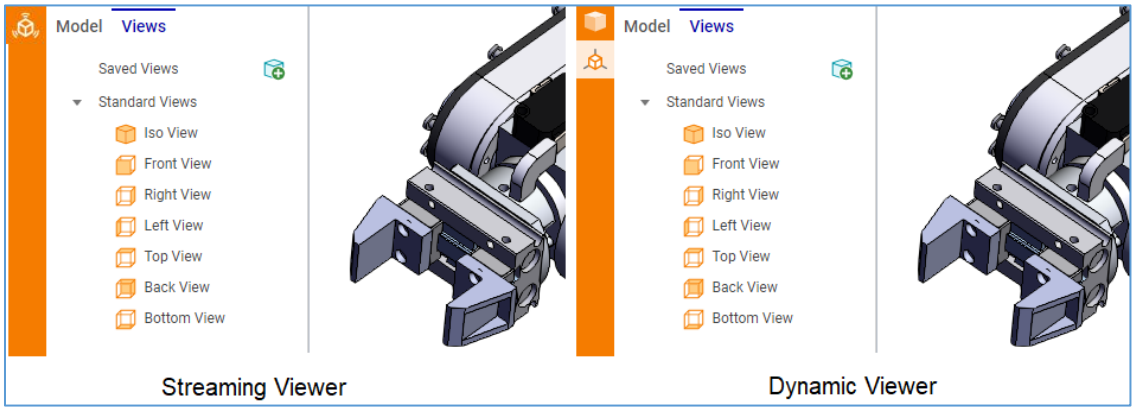
Saved Views given to a CAD Document will remain associated with all versions of this CAD Document.

End users can delete unnecessary Saved Views as discussed in the 6.6.3 Deleting Saved Views section.

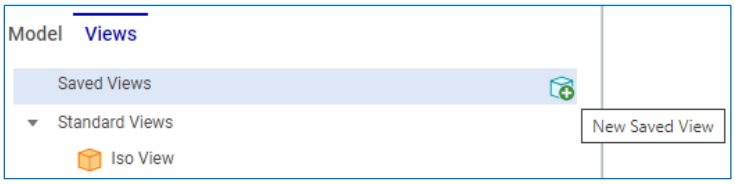
6.6.1 Creating Saved Views

The following steps outline the process to create a custom Saved View of a given 3D scene in the Dynamic or in the Streaming Viewers:

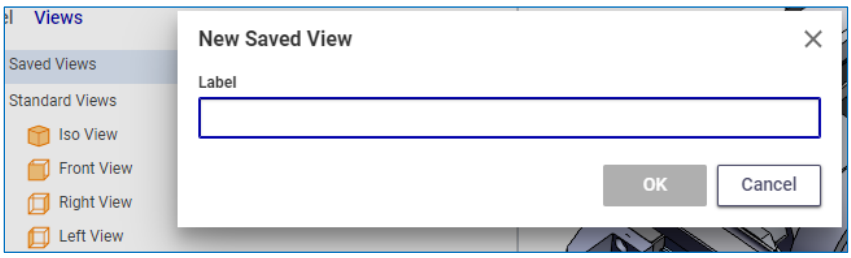
1. Go to the **Views** tab of the **Model Browser** section.



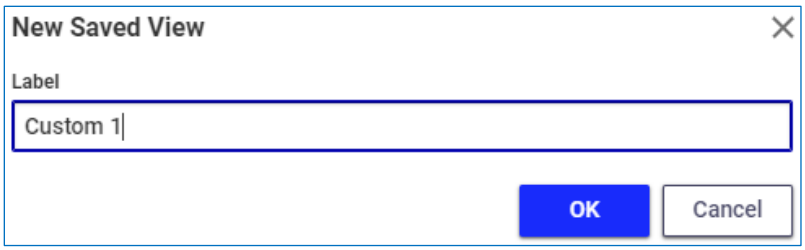
2. Click the **New Saved View** button on the **Saved Views** group row.



The **New Saved View** dialog box appears.

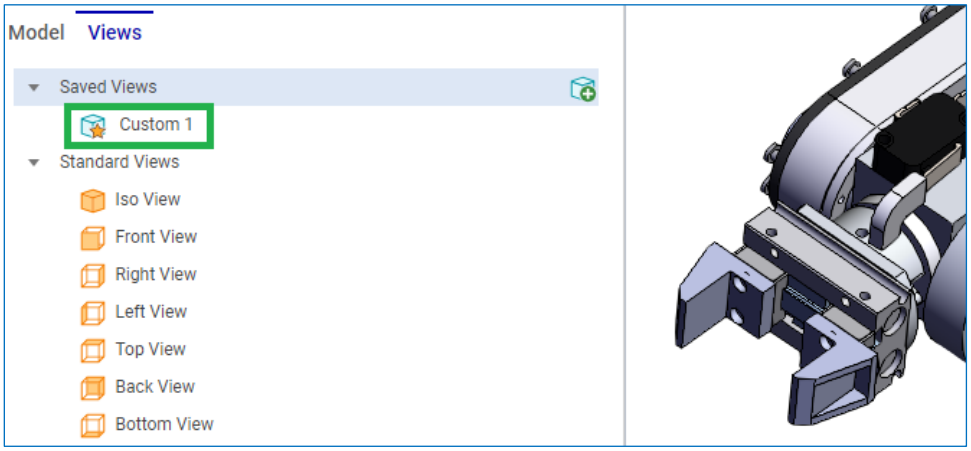


3. In the **Label** field, enter a valid name for the new Saved View. This field is required. A valid name should be up to 32 alphanumeric characters long. The **OK** button becomes enabled only when a valid name is provided. Names of Saved Views are not required to be unique.



4. Once a valid name is entered, click the **OK** button. The **New Saved View** dialog box disappears. A new Saved View is created for a given CAD Document and associated with the selected Dynamic View Definition. The new Saved View appears as a new row with the name given at step 3 in the **Saved View** group on the **Views** tab of the **Model Browser** section.

Note: Clicking the **Cancel** button will cancel the operation, and a Saved View will not be created.

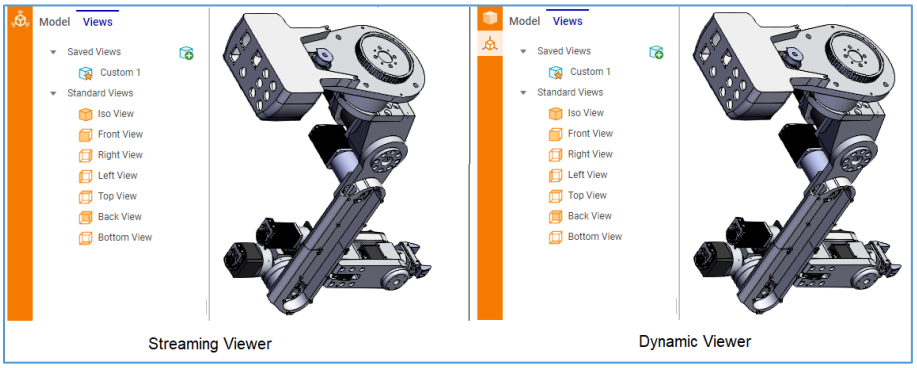


When a Saved View is created for a Dynamic View Definition of a CAD Document, it can only be accessed and restored from the Dynamic View of this CAD Document Item and on this selected Dynamic View Definition.

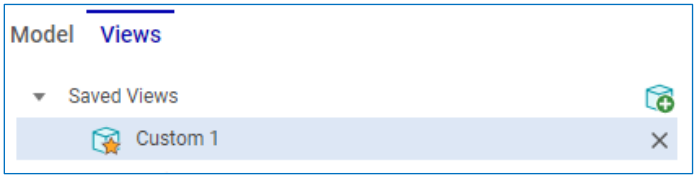
6.6.2 Restoring Saved Views

The following steps outline the process to restore a custom Saved View of a given 3D scene in the Dynamic or Streaming Viewer:

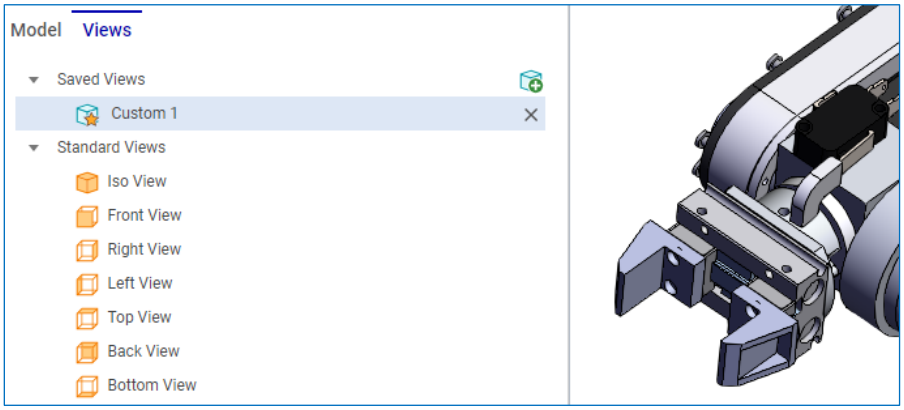
1. Select a necessary Dynamic View Definition.
2. Go to the **Views** tab of the **Model Browser** section.



3. In the **Saved Views** group row, click the row of the necessary Saved View.



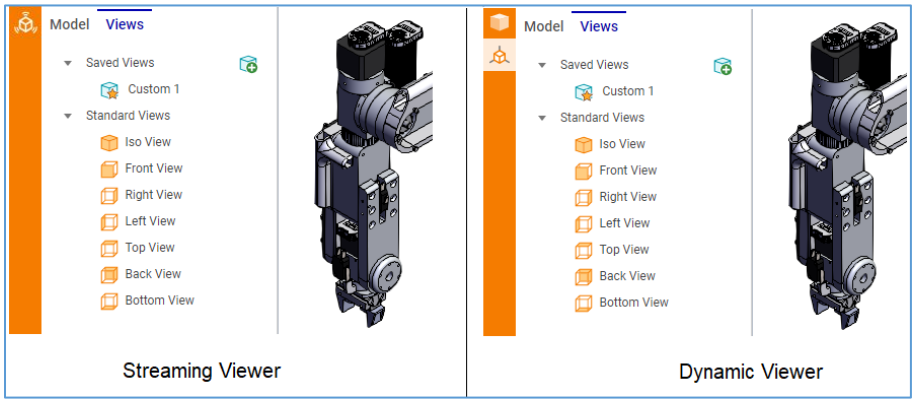
The 3D scene is re-rendered to restore a view preserved in the selected Saved View. Any previous settings for Parameters or selected View Mode are overridden.



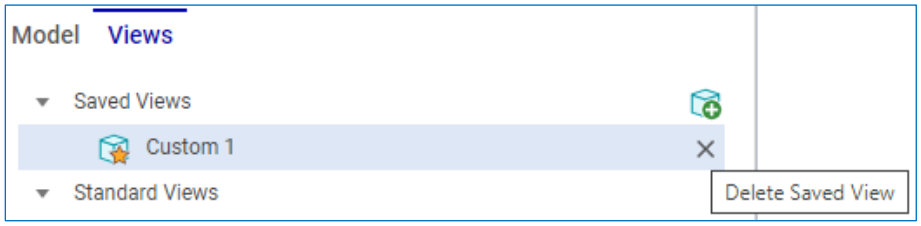
6.6.3 Deleting Saved Views

The following steps outline the process to delete a custom Saved View of a given 3D scene in the Dynamic or Streaming Viewer permanently:

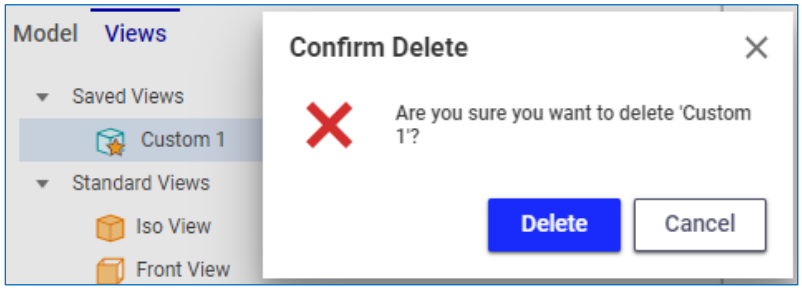
1. Select a necessary Dynamic View Definition.
2. Go to the **Views** tab of the **Model Browser** section.



3. In the **Saved Views** group row, click the **X** (**Delete Saved View**) button on the right side of the row of the Saved View to be deleted.

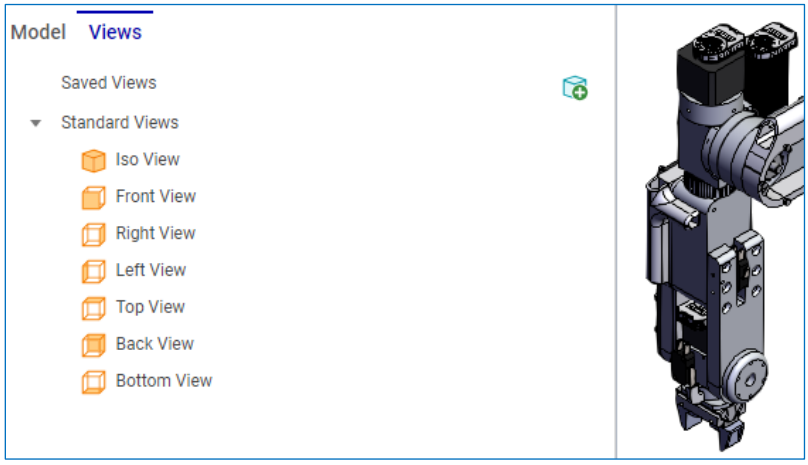


The **Confirm Delete** dialog appears.



4. Click **Delete** in the **Confirm Delete** dialog. The Saved View is permanently deleted and cannot be restored.

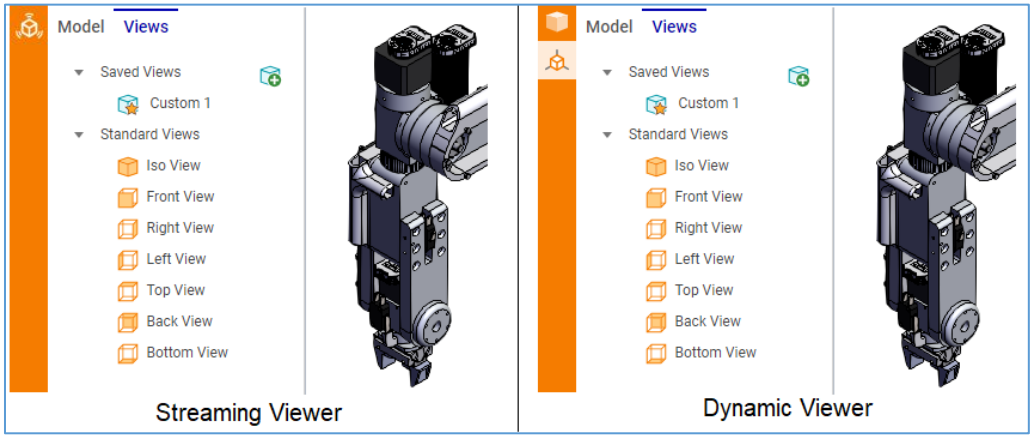
Note: Clicking the **Cancel** button will cancel the operation, and a Saved View will not be deleted.



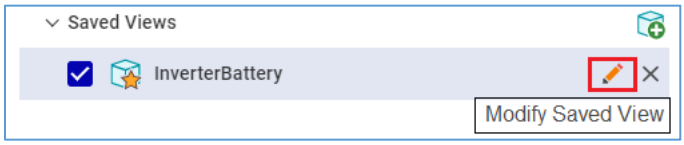
6.6.4 Renaming Saved Views

The following steps outline the process of renaming a custom Saved View of a given 3D scene in the Dynamic or Streaming Viewer:

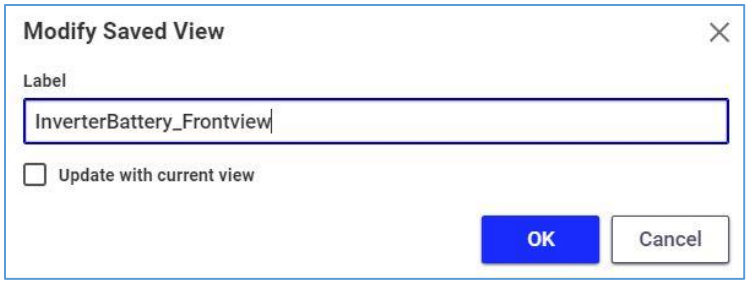
1. Select a required Dynamic View Definition.
2. Go to the **Views** tab of the **Model Browser** section.



3. In the Saved **Views** group row, click **Modify Saved View**.



4. In the **Modify Saved View** dialog box, modify the name of the Saved View and click **OK**. The Saved View name is now updated.

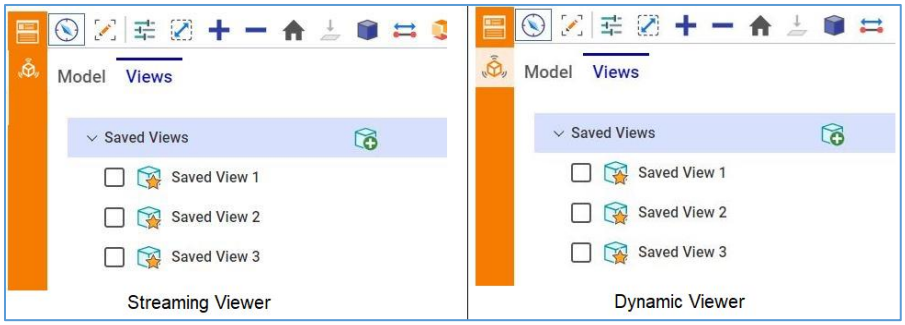


Note: The **Update with current view** field preserves the current camera position, visibility status, applied parameter values, and selected view mode for the 3D model.

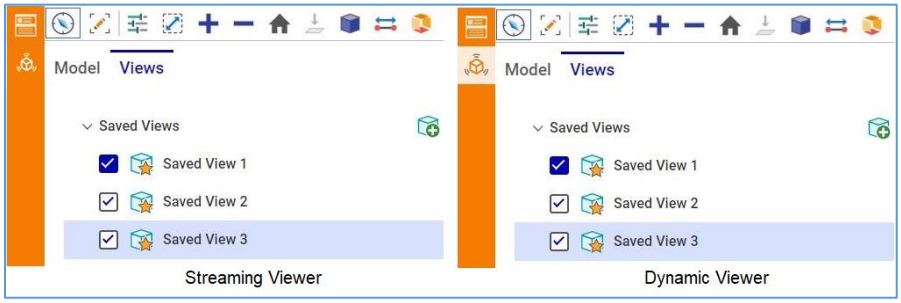
6.6.5 Loading Multiple Saved Views

The following steps outline the process of selecting and loading multiple Saved Views to restore 3D scene views of a CAD model:

1. Select a necessary Dynamic View Definition.
2. Go to the **Views** tab of the **Model Browser** section.



3. Select the views to load from the list of Saved Views by pressing the **Control**(ctrl) key on the keyboard and selecting the checkboxes. By default, the initial saved view selected by the user becomes the primary saved view and has a solid checkbox, while the other secondary saved view selections have the white checkbox.



When the user selects the checkbox for each saved view in the list, the 3D viewer loads the Saved Views incrementally.

> **Note:** The primary Saved View restores the camera angle, any applied query parameters, the view mode, any the geometry transformations and annotations and visible geometry. Loading additional secondary views will only add any additional visible geometry.

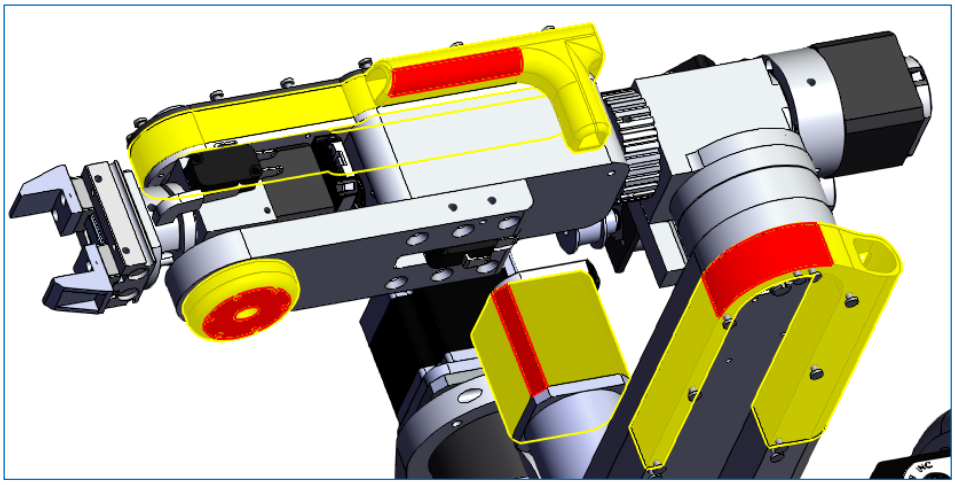
4. The end user can remove or deselect the secondary saved views. However, if the user deselects or removes the primary saved view, all of the other saved viewes are also deselected.

6.7 Multi-Selection

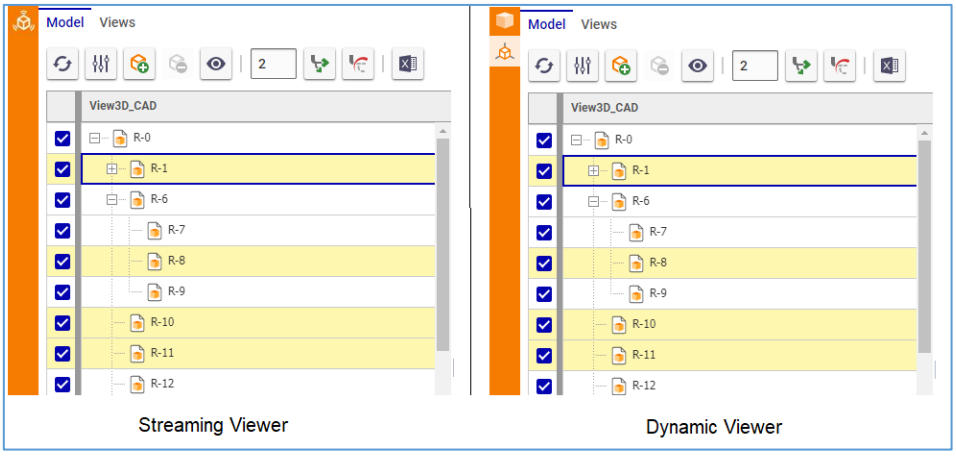
The Dynamic and Streaming Viewers also support multi-selection: one or more subassemblies and parts can be selected during viewing.

There are two ways to select multiple subassemblies and parts:

- Click each object on the 3D scene to be selected while pressing the Ctrl key on the keyboard.

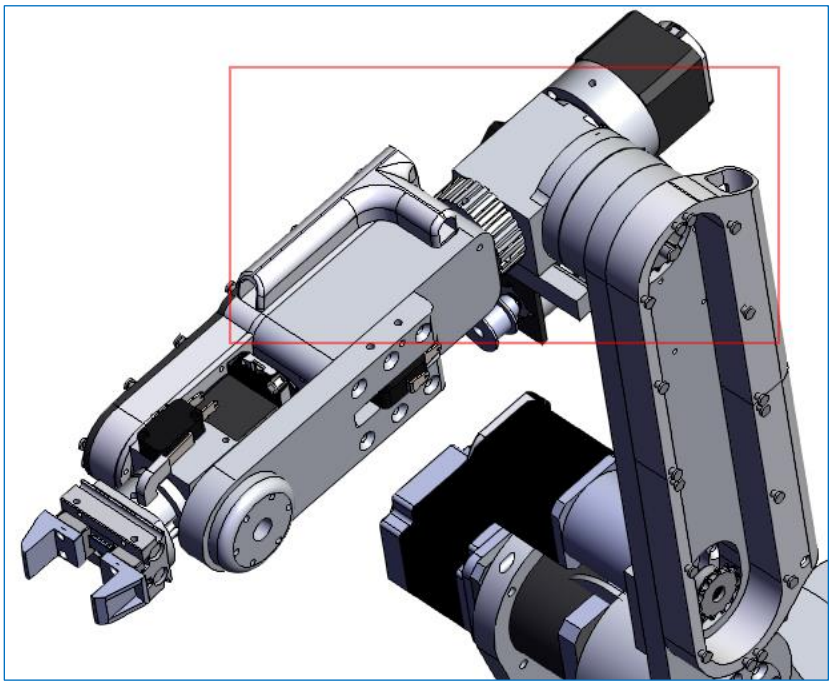


- Click each **CAD Document** in the Models TGV grid to be selected while pressing the Ctrl key on the keyboard.

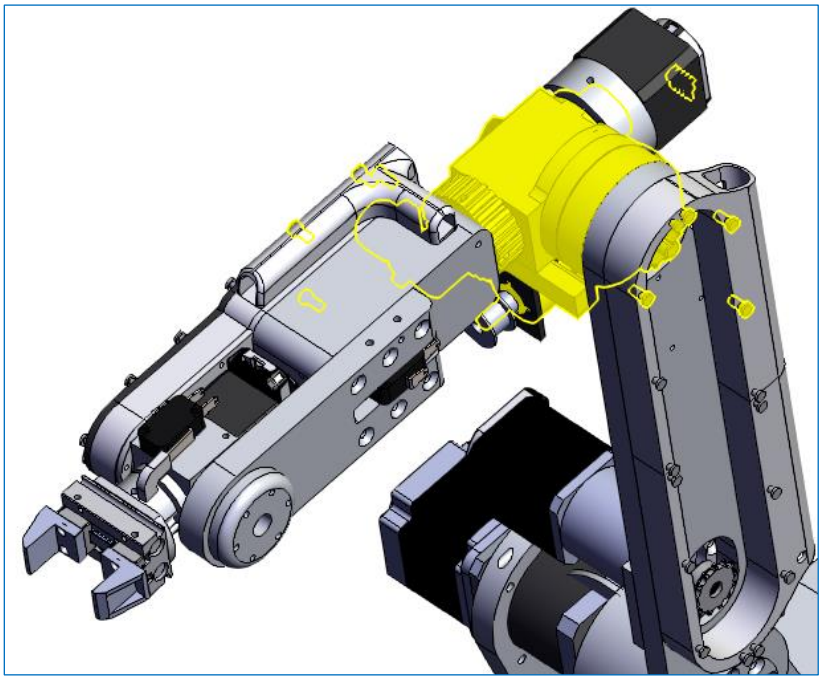


- Click and drag the cursor on the 3D scene while pressing the Ctrl key on the keyboard to select multiple objects in an arbitrary area. Incremental additions to selection are possible while pressing Ctrl. Objects selected depends on a dragging direction:

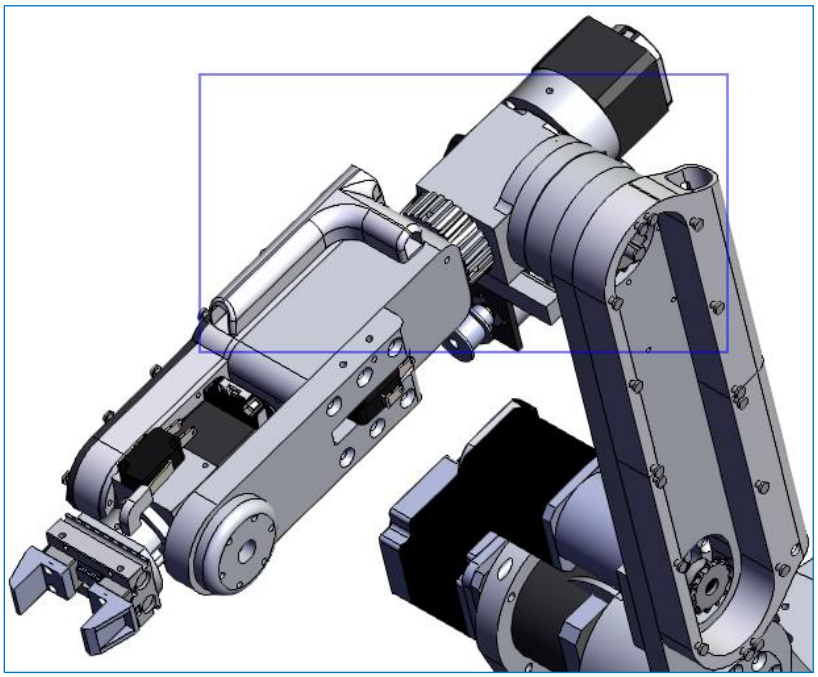
- If dragging from left to right, the selection box is red.



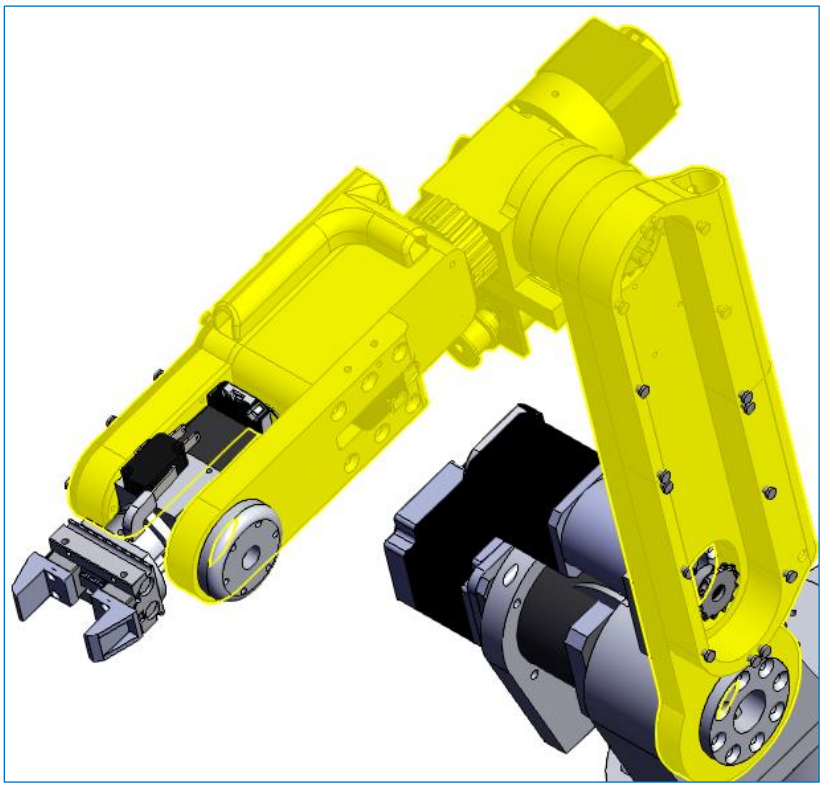
The dragging right will select objects which are completely enclosed in the red selection box area.



- If dragging from right to left, the selection box is blue.



The dragging left will select objects which are partially enclosed in the blue selection box area.



7 Visual Collaboration in 3DV

3D Visualization was introduced with Visual Collaboration as a tool used to help end users visualize complex product information with a simple user interface. With a part of this capability, users can freeze 3D scene views, add markups (graphics and text), and save the resulting image with a comment as a piece of a discussion thread. Users can then reconstruct a 3D view by selecting the graphic in the associated message.

Visual Collaboration gives users the ability to define snapshots of 3D scene views with associated comments to define discussion threads related to 3D design, for example. This feature also provides the ability to reset a 3D scene view to restore the original view when a snapshot was created. For the Dynamic and Streaming Viewers, restoring a 3D scene view necessitates the re-execution of the query used to define the view, any parameters used, the View Mode, added parts and assemblies, and the camera position. There is an ability to add a 3D markup to a snapshot on an SSVC comment.

8 3D PDF

When a native CAD file is attached to a CAD Document, the Aras CAD Converter converts it into a viewable file and a 3D PDF file. The latter is automatically attached to the **Viewable File** field on the CAD Document Item form. Clicking a button or link in this field launches a pop-up dialog for downloading (publishing) a given 3D model as a 3D PDF file. End-users can share this 3D PDF file and view the 3D CAD model in this file with third-party PDF viewers. Working with such viewers is out of the scope of this Guide.