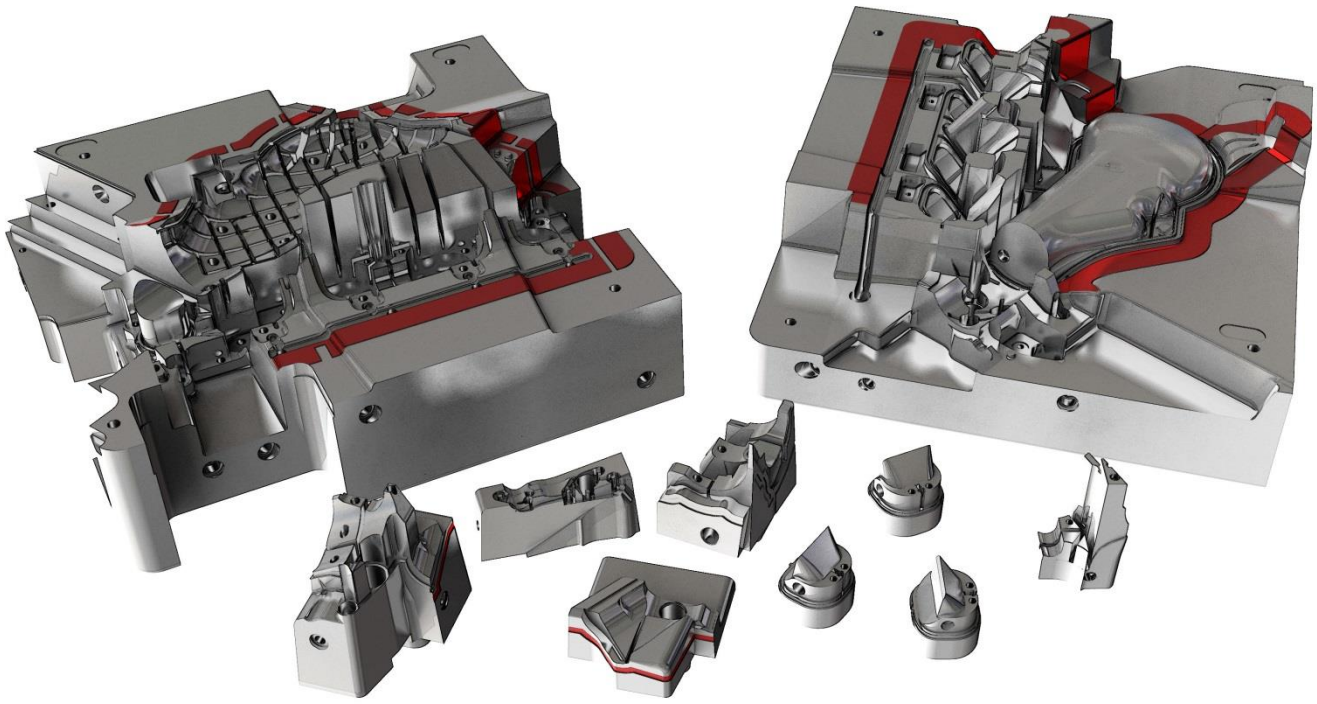
TopSolid Split

Training Guide

TopSolid'Split



MASTER YOUR MANUFACTURING PROCESS

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Note: If you are experiencing problems using this training guide, please feel free to send your feedback and comments to edition@topsolid.com.

Contents

Introduction

Philosophy

The **TopSolid'Split** module provides you with all the tools you need to design the different molding parts required to create the part to be injected. The splitting operation does not just mean separating a core block and a cavity block. Thanks to **TopSolid'Split** you will be able to directly create insert shapes and other cores.

Of course, it is sometimes necessary to use the mold environment to create these types of shapes. Therefore, you will be able to create these shapes in the second stage of your design process. Both methods complement each other and this guide will focus on the first stage.

A number of design steps must be performed to produce a final document that contains the different blocks.

Firstly, you have to retrieve a **3D model** designed on an external system, or a **part** or an **assembly** designed in **TopSolid**.

This data is then prepared and positioned in a **Split** document, by applying a **shrinkage factor**, and then used when defining a **parting edge** path. Wizards will guide you through these design tasks. From this point, you can design the **parting surfaces**, the **shut off surfaces** and the possible **inserts** required to create the process to obtain the part.

The final result will be an **assembly** document that you can manipulate as you wish to design your **tooling**.

As you can see, you work logically, on a **step-by-step** basis (see Annex*Annex* chapter), and the next step can only be accessed if the previous step has been completed and confirmed.

Importing the package

- From the **Home** tab, **import the project** named *TopSolid'Split Training* 7.14.TopPkg. This package contains all the documents needed to complete all of the exercises in this training guide.

Warning: Do not confuse the **Import Project** command (formerly known as **Import Project as Replication**) which creates a new project or synchronizes your documents (data exchange between the PDM server and the local PDM for example) with the **Import/Export** > **Import Package** command which creates new documents. You can only access the latter command by right-clicking on the node (root or folder) of a project. Halfway between these two commands, the **Import Project as Distinct Copy** command (accessible via **TopSolid** icon > **File**) allows you to create a new project and thus new documents.

Exercise 1

This exercise introduces you to the basic tools of **TopSolid'Split**. You will learn how to create simple core cavity blocks.

Concepts addressed:

- Creating an injection positioning
- Defining a shrinkage without part material
- Creating parting edges and parting surfaces
- Creating core cavity blocks

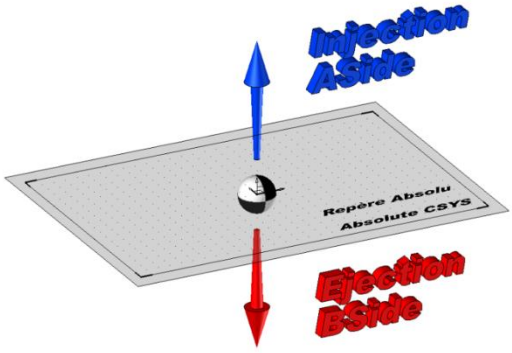
Starting the study

- From the Project tree, open the *remoteCover* part document from the *Exercise 01* folder.

Creating the injection frame

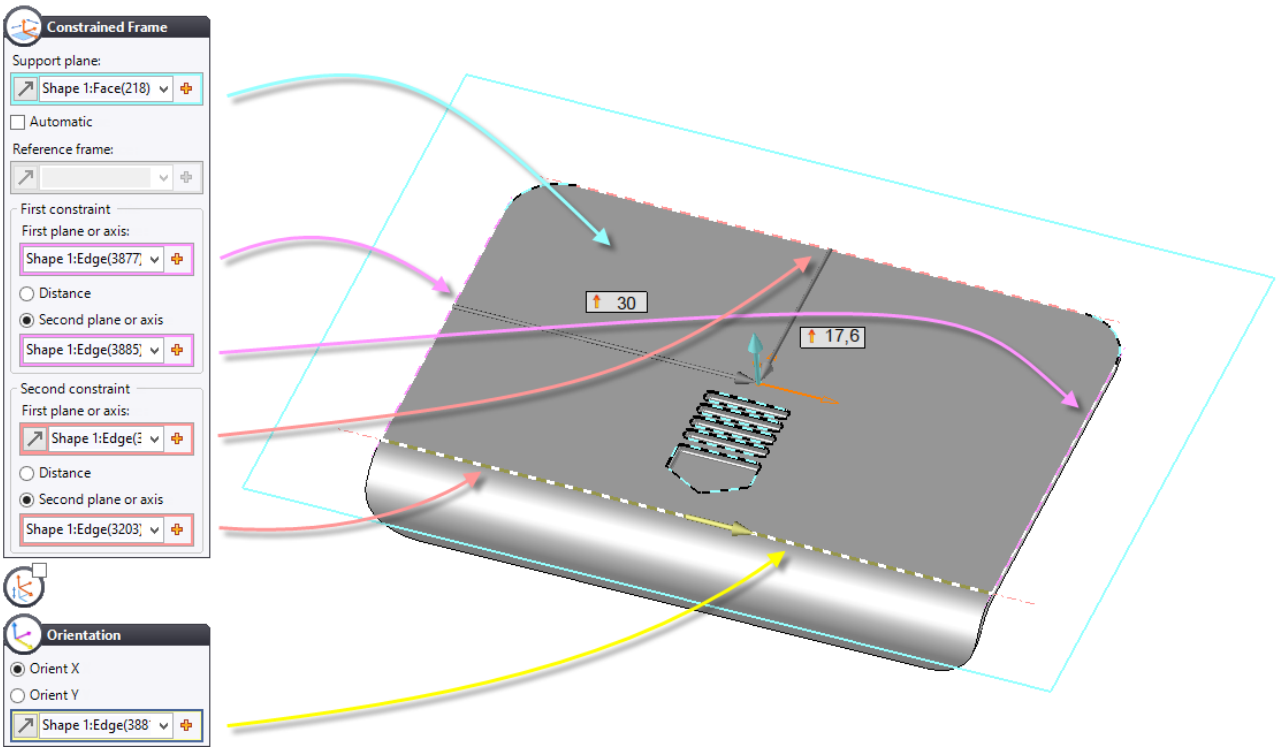
Note: Most of the time, your 3D model is oriented along a design or mounting frame (automotive part) which does not correspond to the part's injection frame and to **TopSolid'Split**'s conventions. By default, we will assume that in a **TopSolid'Split** document:

- - The section delimited by the **XY** plane and including **Z+** is the **A SIDE** section (injection).
- - The section delimited by the **XY** plane and including **Z-** is the **B SIDE** section (ejection).



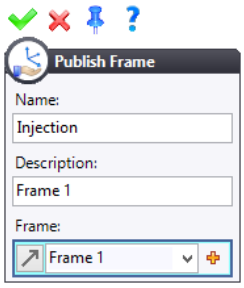
The part position, as the part geometry, must be considered as customer's data that cannot be modified. It is highly recommended that you create an injection frame on the part that will match the position and orientation of your part in the future mold.

- From the **Construction** tab, create a **constrained frame** on the part's top face, centered on the four main edges of the top face.



- **Confirm** the constrained frame.

- Right-click on the previously created frame and select the **Others** > **Publish Frame** command from the **Selection** section.
- Rename the frame *Injection*.



- **Save** the part document.

In TopSolid'Split

Including the part in the Split document

Note: There are several ways to include a part in the Split document:

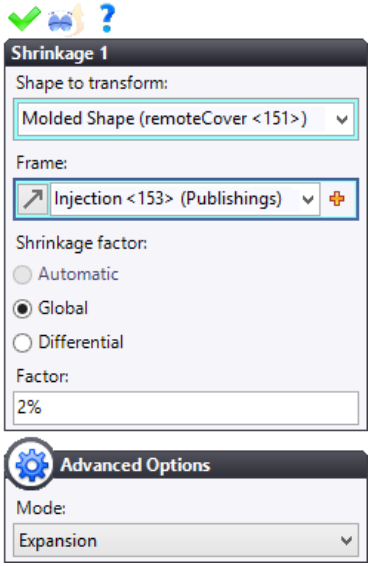
- Right-click on the part document's tab and select the **Split Blocks** command.
- Or right-click on the part document from the Project tree and select the **Split Blocks** command.
- Or create a new **document**, select **Split Blocks**, and then drag and drop the part document into the split document from the Project tree.

Here, we will select the first method.

- Right-click on the part document's tab and select the **Split Blocks** command.
- Select **Blank Template** and click on to **confirm**.

Defining the shrinkage

- In the dialog box that appears, adjust the **shrinkage** by selecting the **Injection** frame you previously published from the list of frames.
- Adjust the **shrinkage factor** to **Global** mode and enter *2%*.



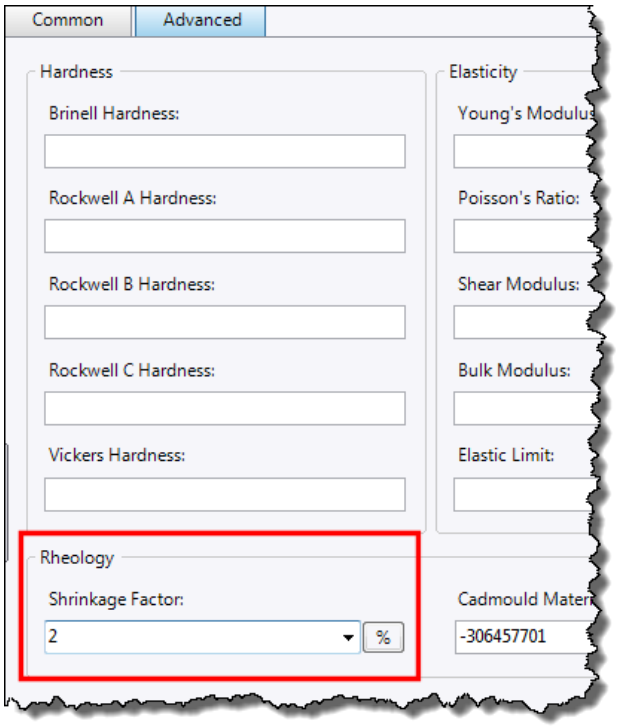
Note: In the advanced options, the following two shrinkage modes are available:

- **Shrinkage** mode: For a given shrinkage factor of 1%, 1% is subtracted from the final dimension. For example, for a length of 100mm, the result is 101.01 mm after the shrinkage calculation.
- **Expansion** mode: For a given shrinkage factor of 1%, 1% is added to the original dimension. For example, for a length of 100mm, the result is 101 mm after the shrinkage calculation.

- **Confirm** the shrinkage.

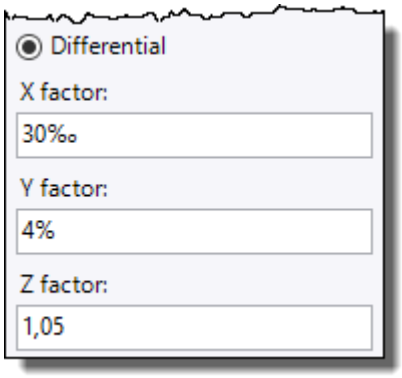
Note: There are three ways to adjust the shrinkage factor:

- **Automatic**: A material has been assigned to the part in the **TopSolid'Design** document and, if the **Shrinkage Factor** field has been adjusted, this overall value is directly retrieved.



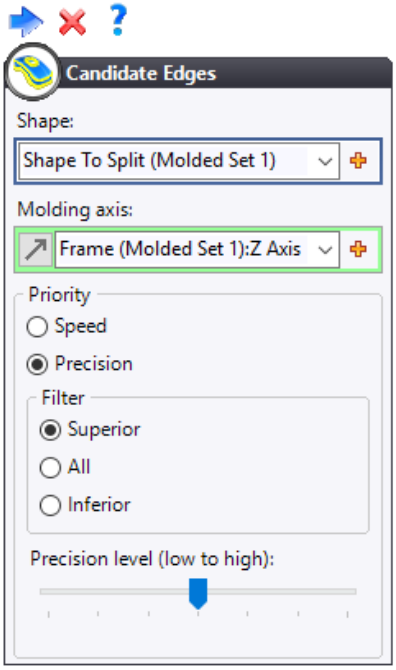
- **Global**: You can adjust a value which will be applied **uniformly** according to the three axes of the part (depending on the previously selected frame). The value can be given in %, ‰ or as a coefficient (for example, a shrinkage factor of 2% will give a coefficient of 1.02).

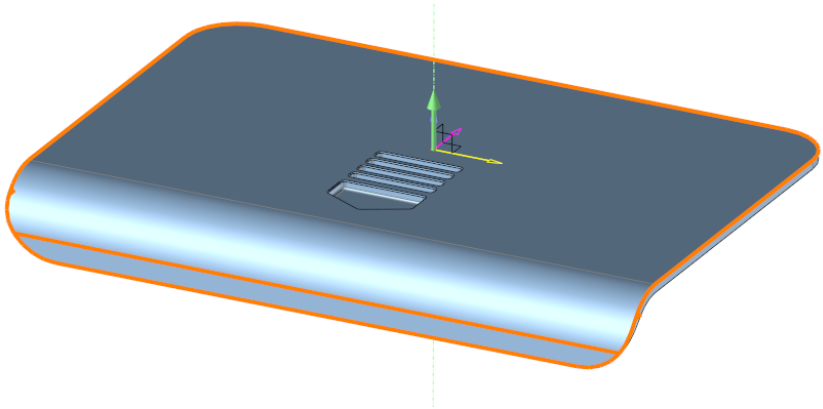
- **Differential**: You adjust a **different** value for each axis of the part (depending on the previously selected frame). The value can be given in %, ‰ or as a coefficient (for example, a shrinkage factor of 2% will give a coefficient of 1.02) and be adjusted independently on each axis.



Creating the candidate edges

- From the **Split** tab, select the **Candidate Edges** command. From the **Molding axis** drop-down list, select the **Z axis of the molded set frame**.



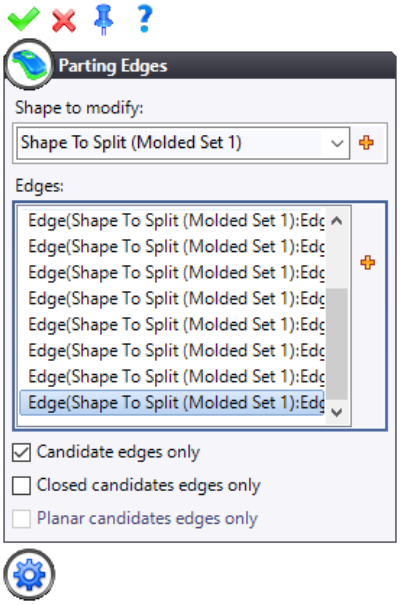


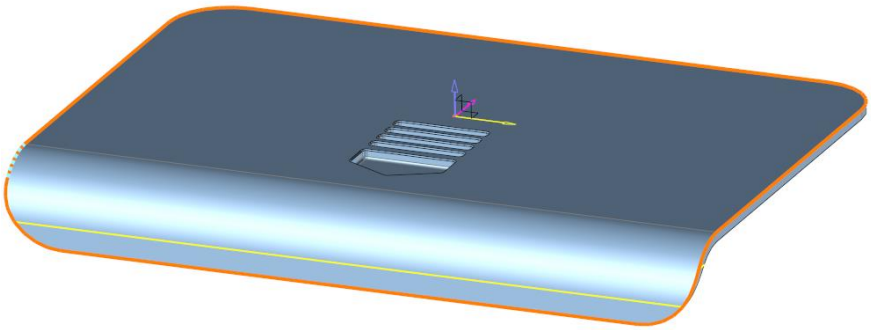
- Click on the icon to move to the next step.

Note: The candidate edge creation step is optional. It provides assistance to create the parting edges. You can create candidate edges several times on the part, based on different directions for example.

Creating the parting edges

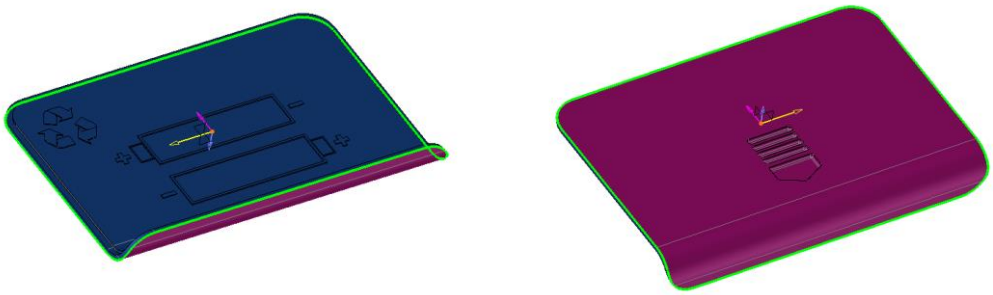
- Create the **parting edges**. Select the upper path as shown below.





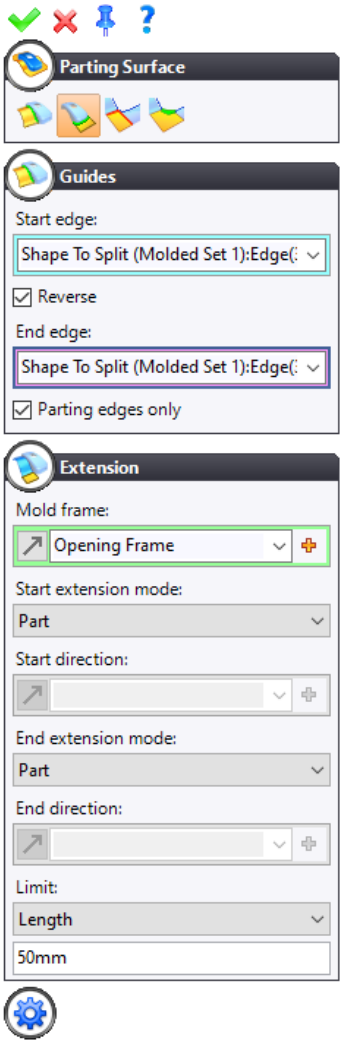
- Click on to **confirm**.

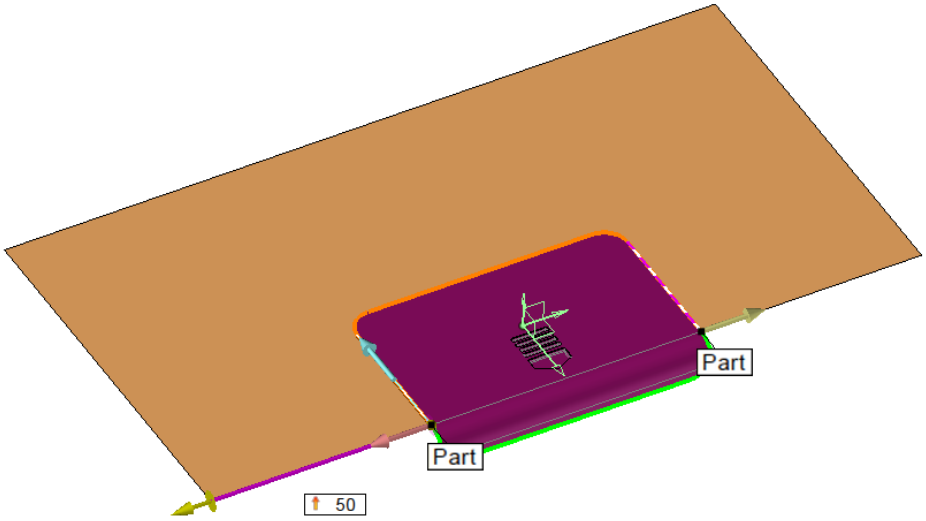
When confirming the parting edges, the molding areas are highlighted in colors if the parting edges properly split the part into two sections.



Creating the parting surface

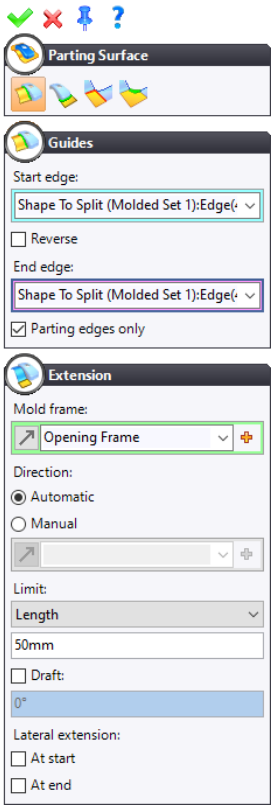
- Create a first **parting surface** using the **Planar** mode.
- Select the first edge of the path. The planar path is automatically selected.
- Adjust the extension **length** to *50mm*.

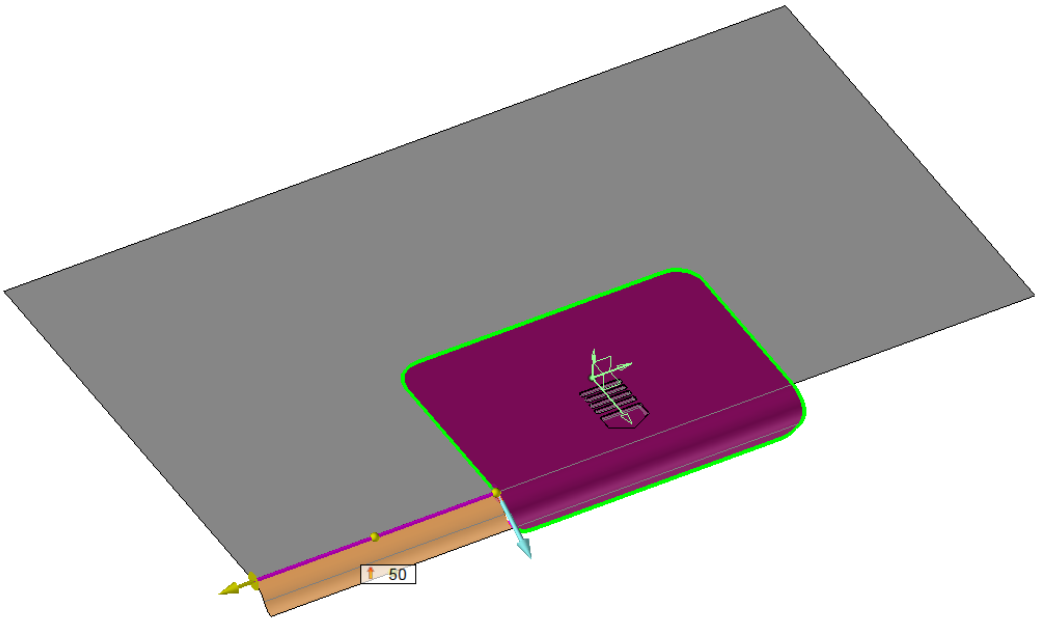




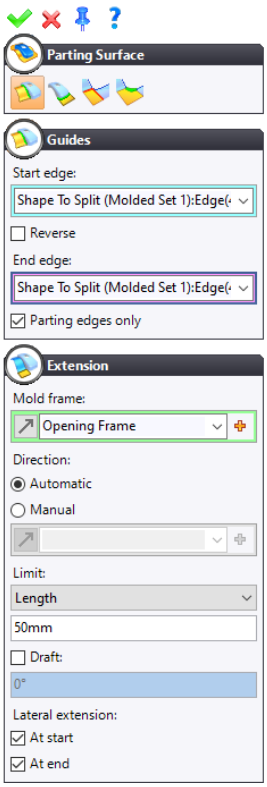
- **Confirm** the parting surface.

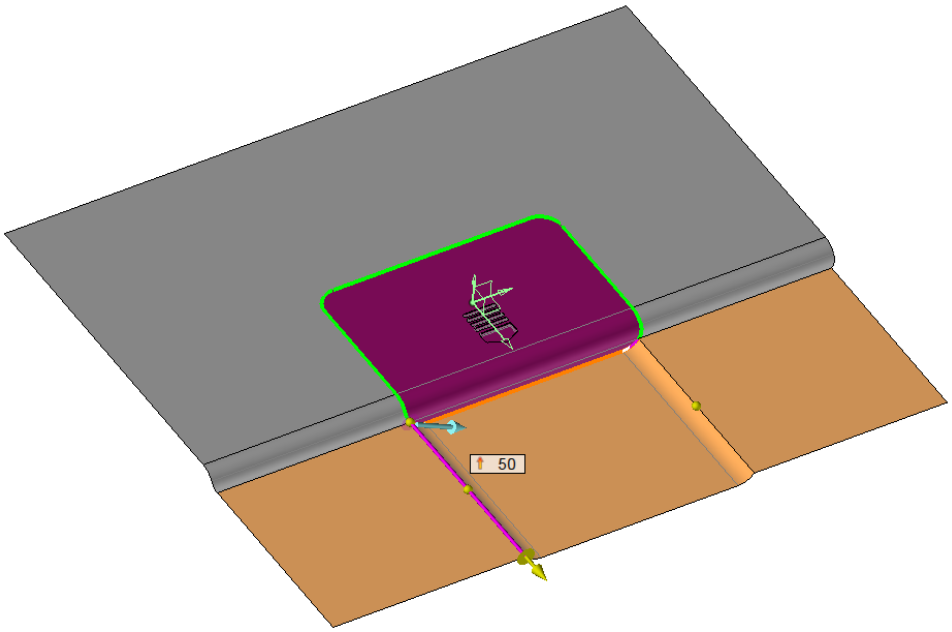
- Create a second **parting surface** using the **Extension** mode.
- Select the **start edge** and the **end edge** as shown below, and then select **Automatic** to calculate the extension direction.





- **Confirm** the parting surface.
- Repeat the procedure to create the opposite side surface.
- Create a new **parting surface** using the **Extension** mode. Select the remaining edge path. Double-click on the yellow spheres of the parting surface's side edges to create the **lateral extensions**.

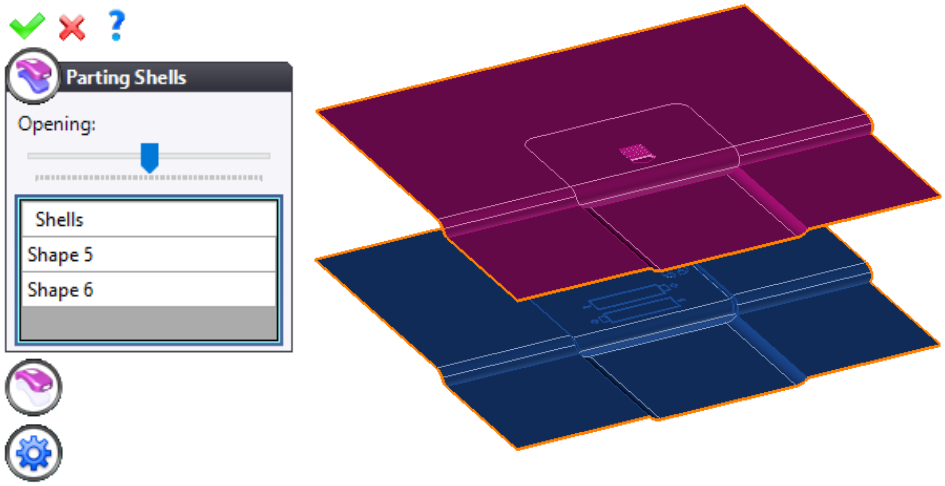




Creating the parting shells

- Select the **Parting Shells** command.

Note: Dragging the slider in the **Opening** area moves the shells according to the mold opening. Selecting one of the shells in the list allows you to move only this shell.

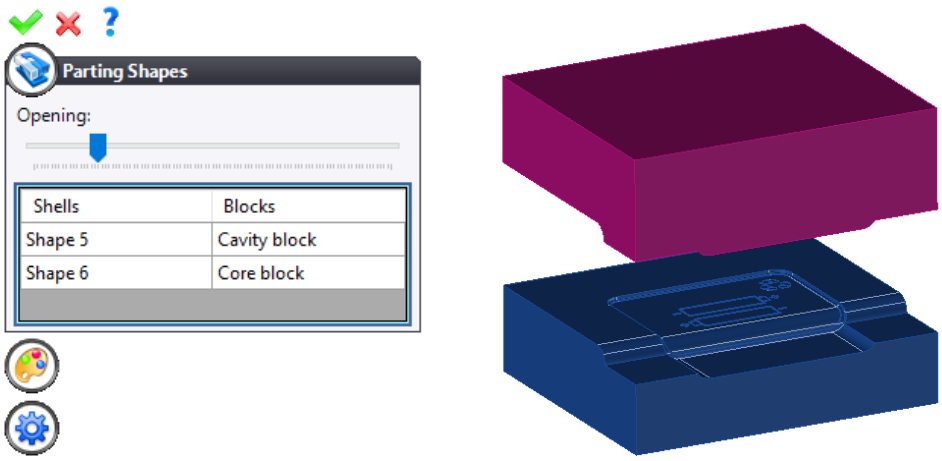


- **Confirm** the creation of the shells.

Creating the parting shapes

- Select the **Parting Shapes** command.

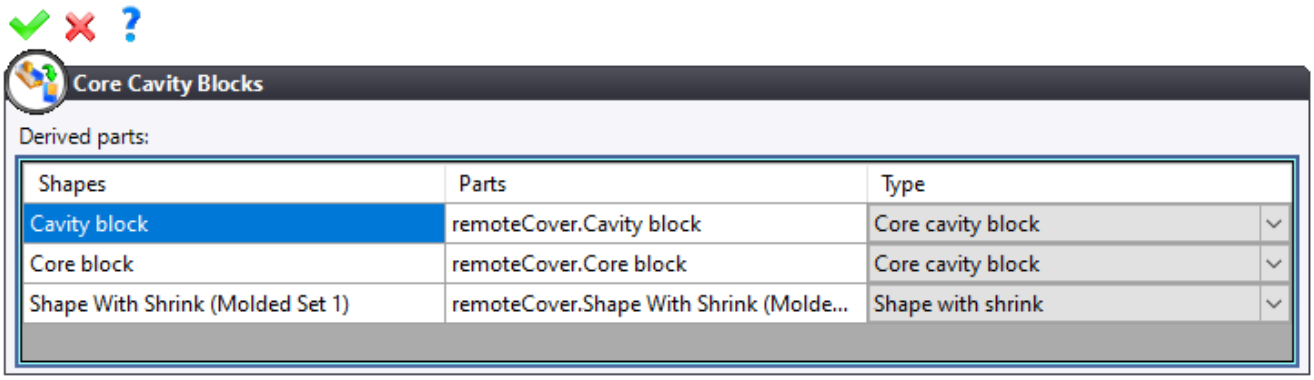
Note: Dragging the slider in the **Opening** area moves the shells according to the mold opening.



- Click on to **confirm**.

Creating the core cavity blocks

- Select the **Core Cavity Blocks** command and adjust the parameters as indicated below.



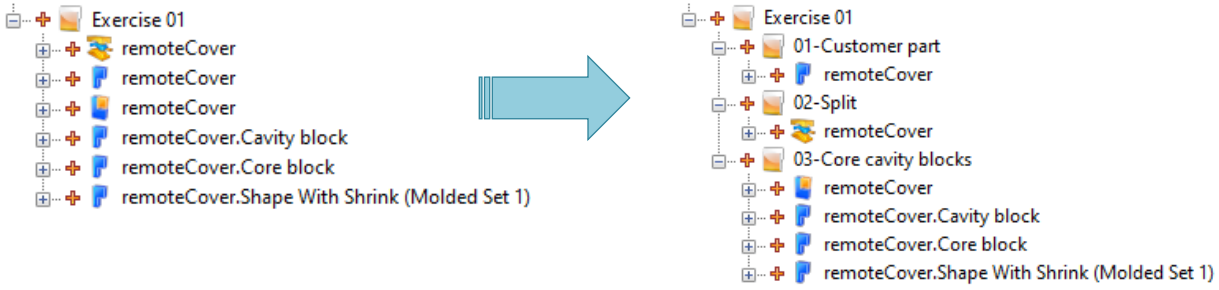
- **Confirm** the creation of the core cavity blocks.
- Select the destination folder.

Note: When creating the **core cavity blocks**, several documents are automatically generated for the PDM. Indeed, in a PDM, **a part** corresponds to **a file**.

You will always find the following documents:

- A part document for the **part with shrink**. It is the customer's part with the shrinkage. This part will be used to design the mold and will limit the molding elements (the pins for example).
- A part document for each **block**.
- A standard assembly document. The assembly is mounted with the different parts created automatically.

- From the Project tree, right-click on the *Exercise 01* folder and create three sub-**folders** named *01-Customer part*, *02-Split* and *03-Core cavity blocks*.
- Hold down the **Ctrl** key and select the *remoteCover* assembly document and the part documents for the core cavity blocks and the shape with shrink. Drag and drop this selection into the *03-Core cavity blocks* sub-folder.
- In the same way, rearrange the remaining documents as shown below.



Check-in

- From the Project tree, right-click on the *Exercise 01* folder and select the **Check In** command. This action checks all the documents contained in this folder into the vault.

Exercise 2

Concepts addressed:

- Defining a material with a predefined shrinkage value and applying the shrinkage to the part
- Adjusting the standard stock
- Creating shut-off surfaces
- Creating lofted parting surfaces
- Updating all documents created in **TopSolid'Split**
- Visualization in the assembly

Creating a standard material

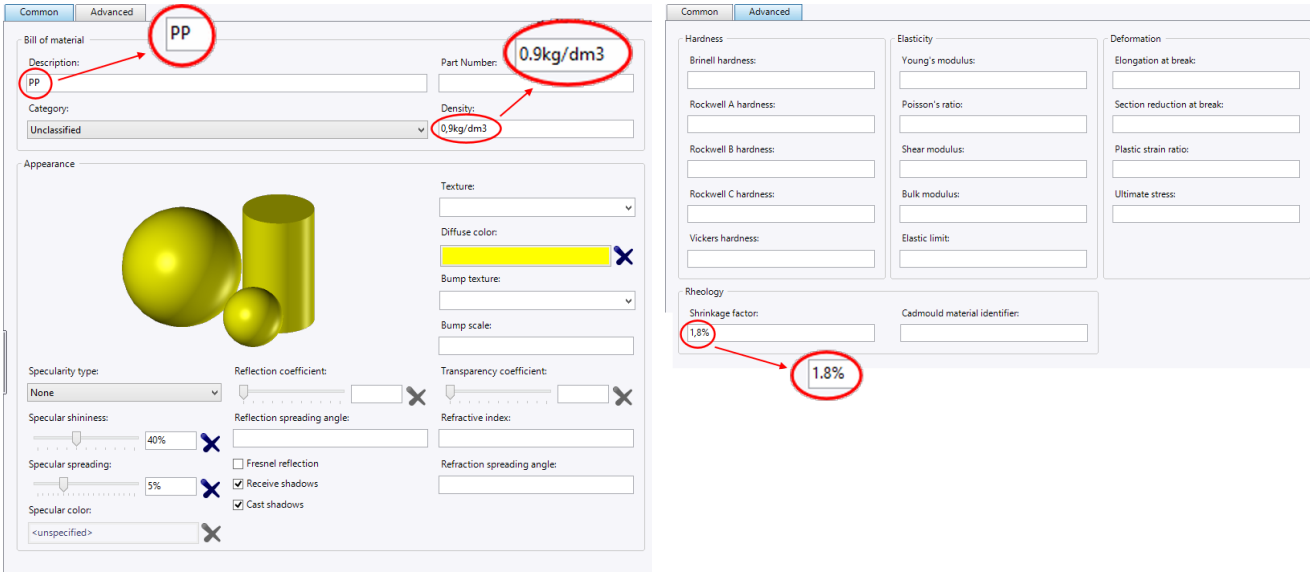
Creating a user library

- From the **TopSolid** > **File** menu, create a **new library** using a **blank template** and rename it *My standard*.
- Click on to **confirm**.

Note: This is the general method to create a user library. The user library can contain all types of standard elements such as standard materials, components, etc.

Defining the material

- Right-click on the library name and create a new **document**.
- From the **Advanced** tab, select a **Material** document and use a **blank template**.
- Enter the material characteristics as indicated below.



- From the library tree, rename the material document *PP*.
- **Check** the library into the vault.

Referencing the library

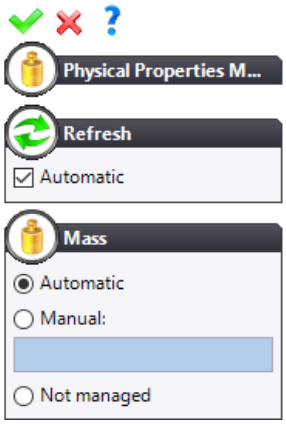
- Return to the *TopSolid'Split Training* project, then right-click on the **References** node and select the **Reference Library** command.
- Open the *My standard* library you previously created.

Starting a new design

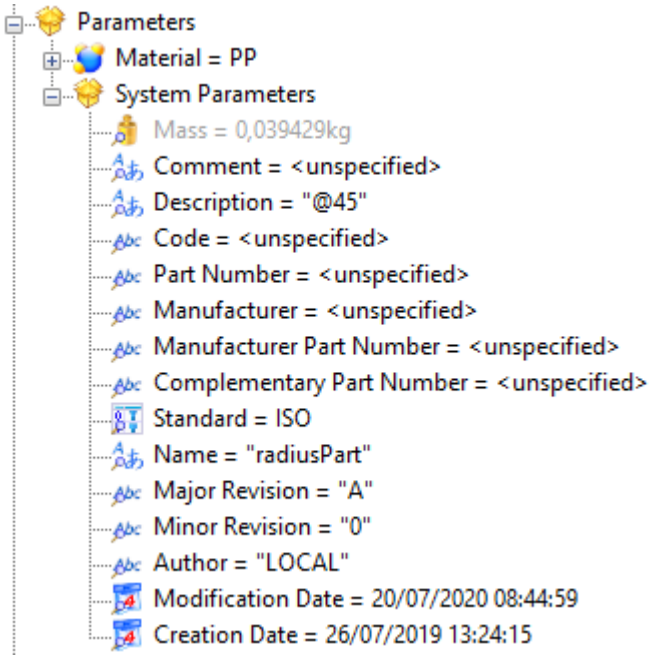
- From the Project tree, open the *radiusPart* part document from the *Exercise 02* folder.

Assigning the material to the part

- Open the *My standard* library.
- Drag and drop the material document into the part document's graphics area.
- From the **Tools** tab, open the document's **physical properties** and select **Automatic** for the mass calculation.



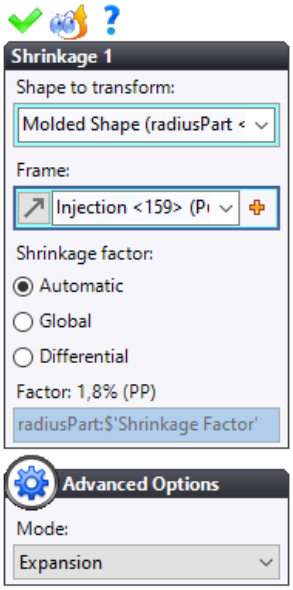
The properties defined on the part are listed in the Entities tree. You can find the material and the mass applied to the part.



Defining the shrinkage

- Right-click on the part document and create a **Split** document using a **blank template**.

The shrinkage is automatically provided by the material assigned to the part.

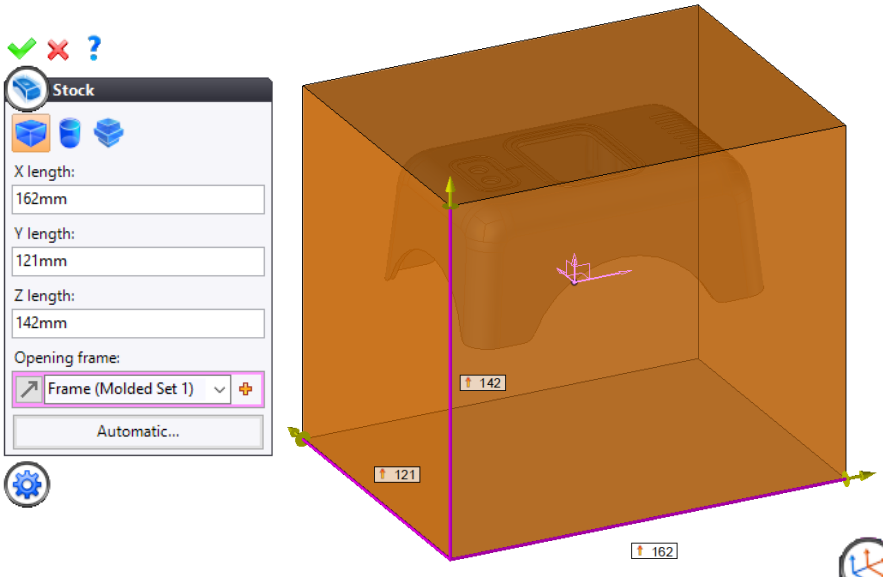


- Click on to **confirm**.

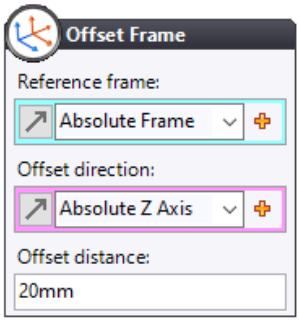
Adjusting the standard stock

A stock is automatically generated for the core cavity blocks when creating a split document. By default, it is centered on the **Molded set** frame and may not correspond exactly to what you want.

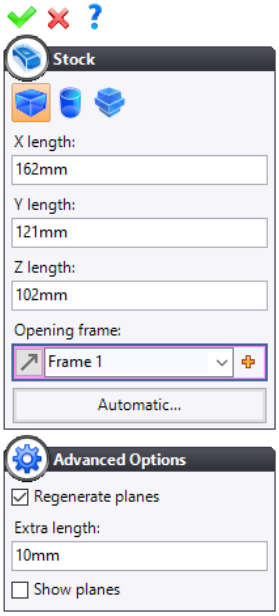
- Select the **Stock** command to edit the stock.

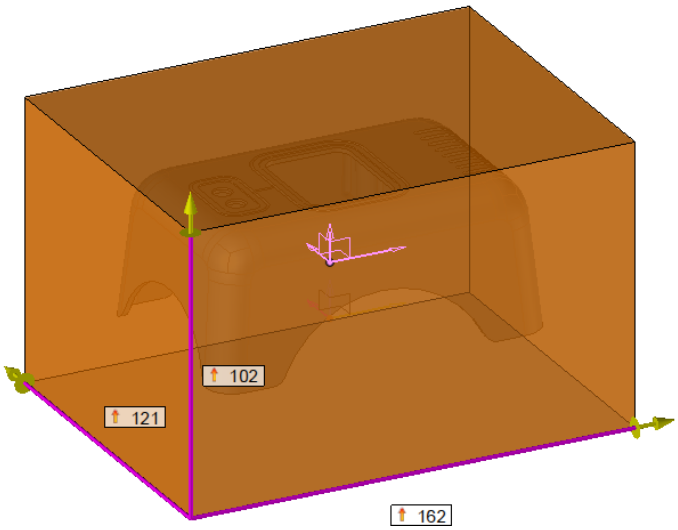


- Center the stock by creating an **offset frame** using the **special inputs**.
- Offset the **absolute frame** along the **absolute Z axis** by *20mm*.
- **Confirm** the offset frame.



The **Automatic** mode offers stock dimensions suited to the part. In the advanced options, the **Show planes** option displays the planes linked to the stock. These planes will be used to dimension the parting surfaces automatically.





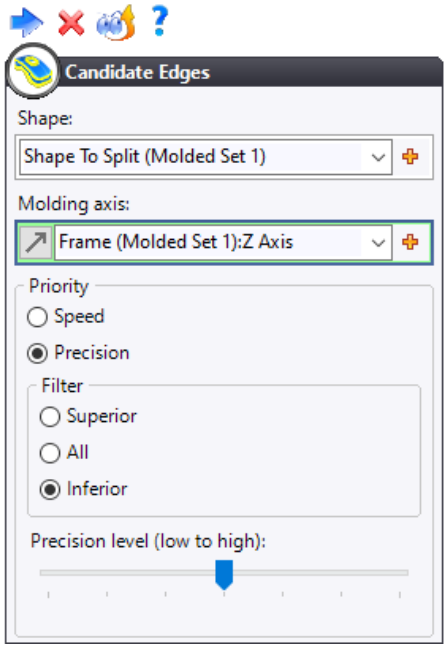
- **Confirm** the stock.

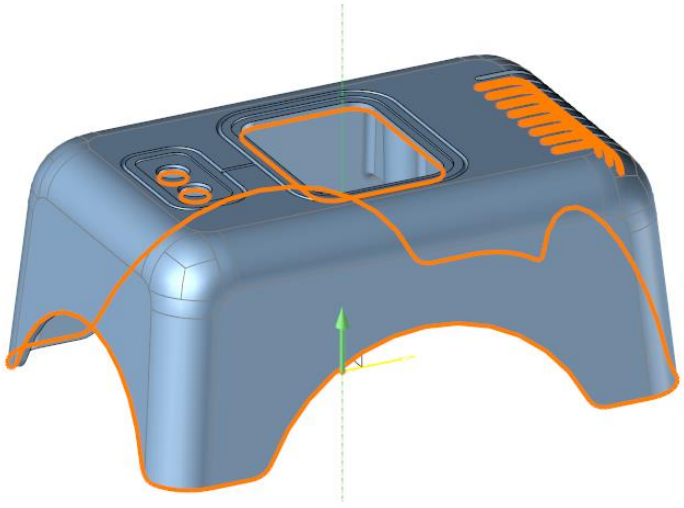
Note: To modify the default stock in the split document, you can either select the **Stock** command, or edit the **Stock** operation from the Operations tree in the **parting stage**.

Creating the parting line

Creating the candidate edges

- Select the **Candidate Edges** command. From the **Molding axis** drop-down list, select the **Z axis of the molded set frame**. Select the **Precision** mode and filter the **inferior edges**.



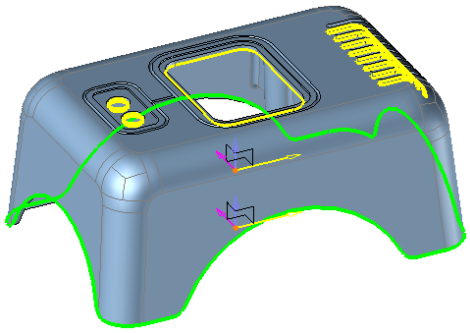


- Move to the next step.

Creating the parting edges

Note: We recommend that you generate several **Parting Edges** operations rather than one. It will be much simpler to modify and update the parting edges later.

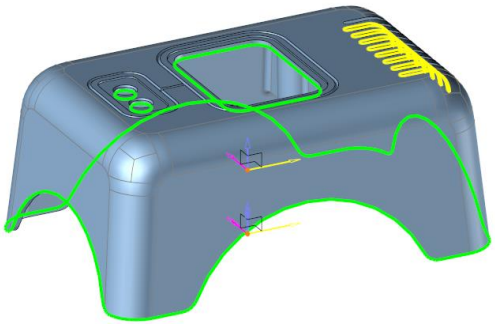
- Create the **parting edges** by selecting the part's external path.



- Click on to **confirm**.

Note: The molding areas are not colored since the generated parting edges do not yet properly define the parting line.

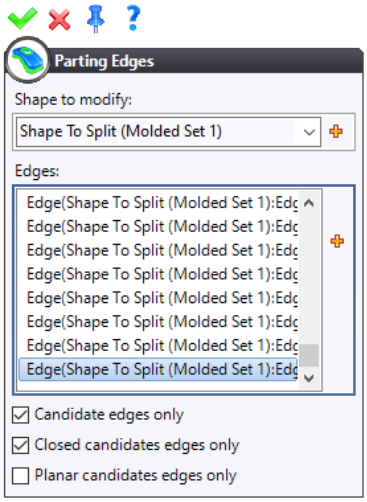
- Create the **parting edges** for the three lower edges of the openings to the left of the part.

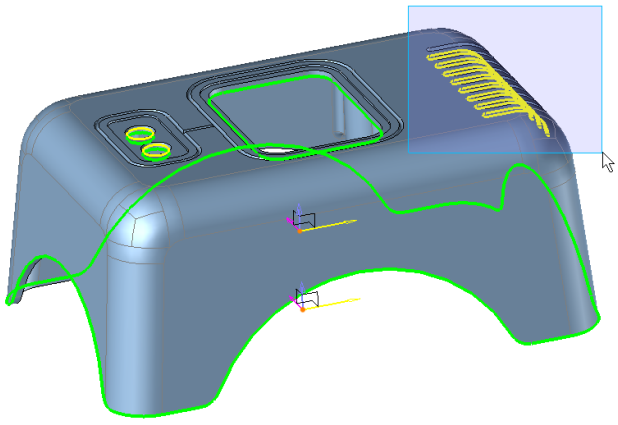


- Click on to **confirm**.

Note: The **Candidate edges only** option allows you to filter the part edges when selecting the parting edges using a selection box.

- Orient the part in order to draw a selection box around the parting edges that remain to be created.





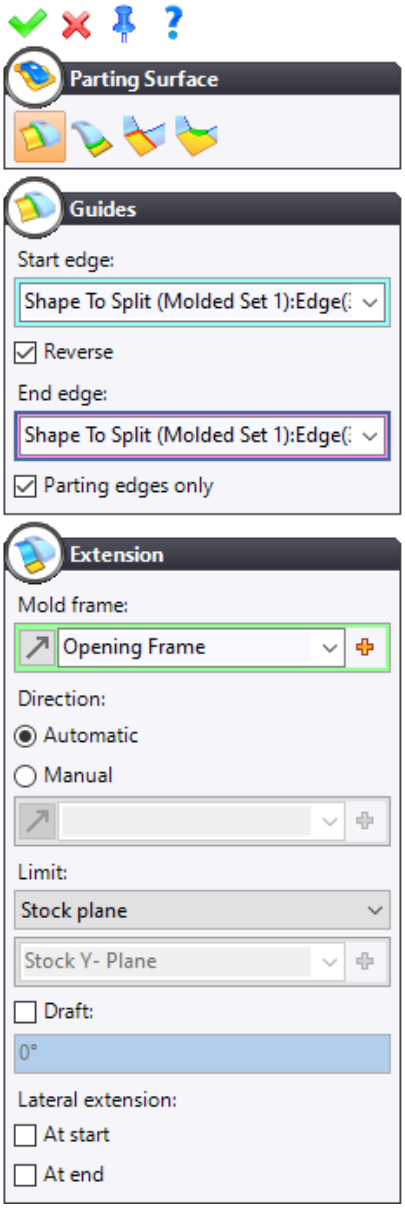
- Click on to **confirm**.

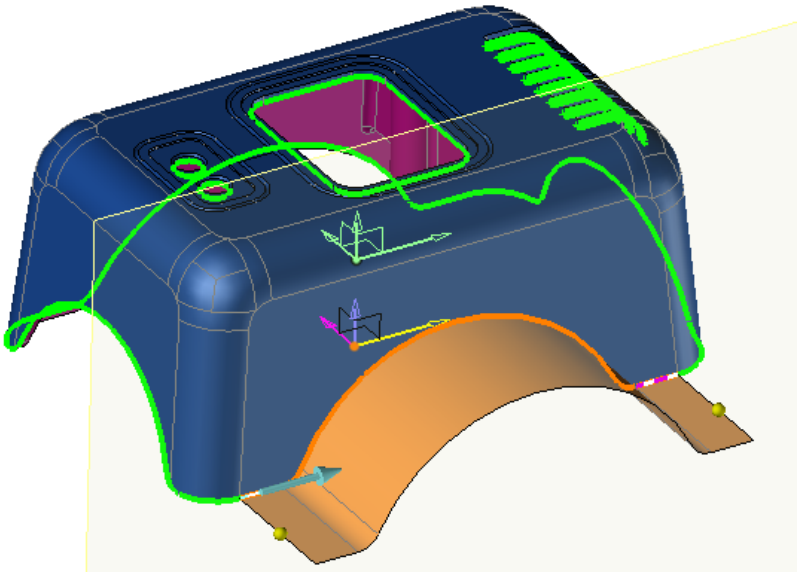
This time, the molding areas are highlighted in color.

Note: The order in which the **shut off surfaces** or the **parting surfaces** are created is not important to split the part.

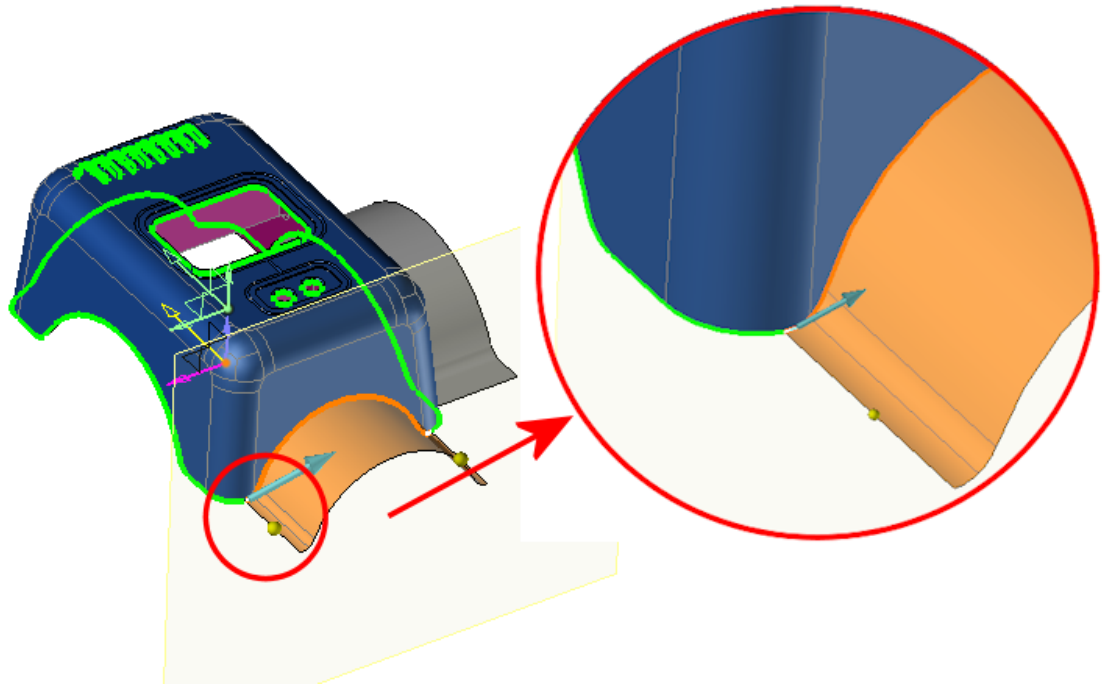
Creating the parting surfaces

- Create the **parting surfaces** for the four rounded sides by selecting the **Extension** mode and the **Stock plane** limit mode.

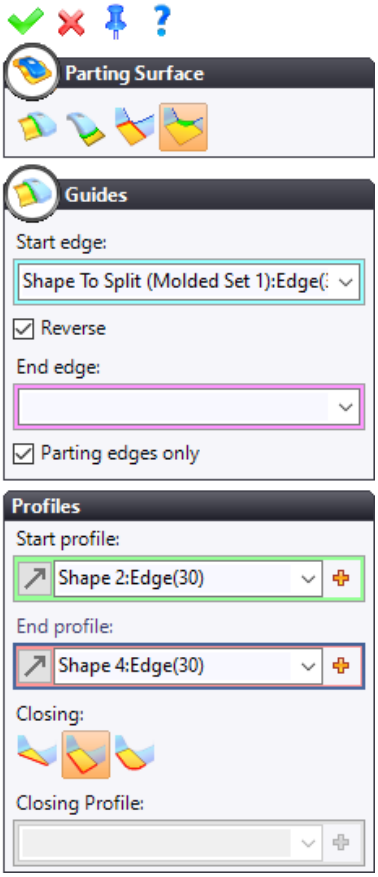


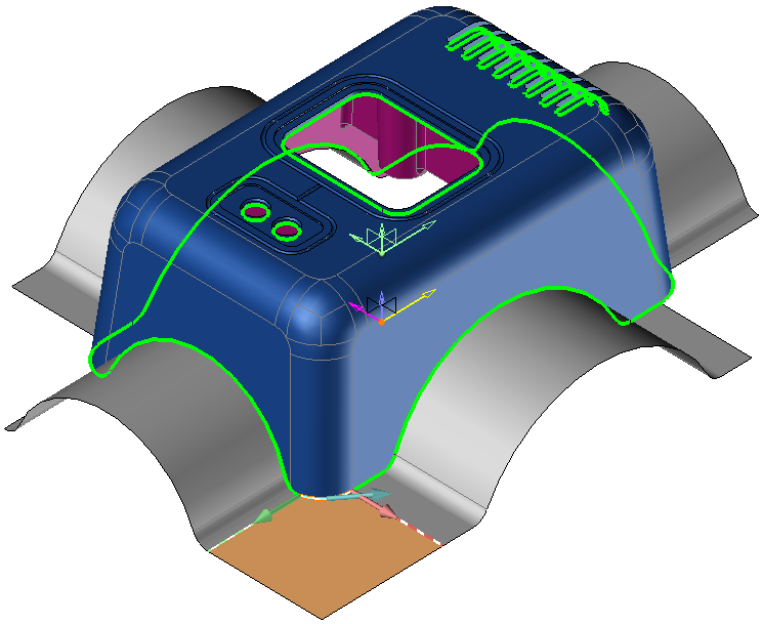


Note: For the two parting surfaces on the part width, make sure you select the small fillets on the edge path.



- Click on to **confirm**.
- Close the external parting line by creating four parting surfaces using the **Lofted with guides** mode. Select **Corner** as the closing type.

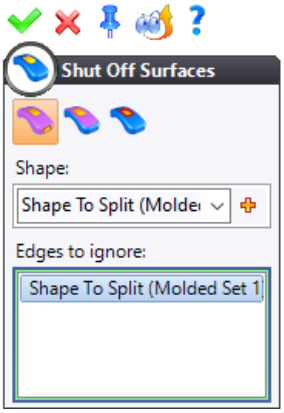


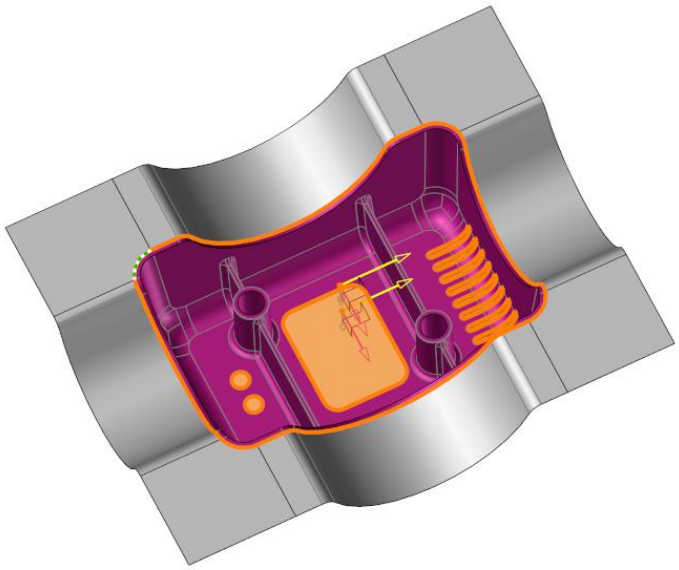


- Click on to **confirm**.

Creating the shut off surfaces

- Create the **shut off surfaces**. To do this, select the **Shape** mode and select the part in the graphics area. In the **Edges to ignore** field, select a bottom edge of the part so that no shut off surface is created here.



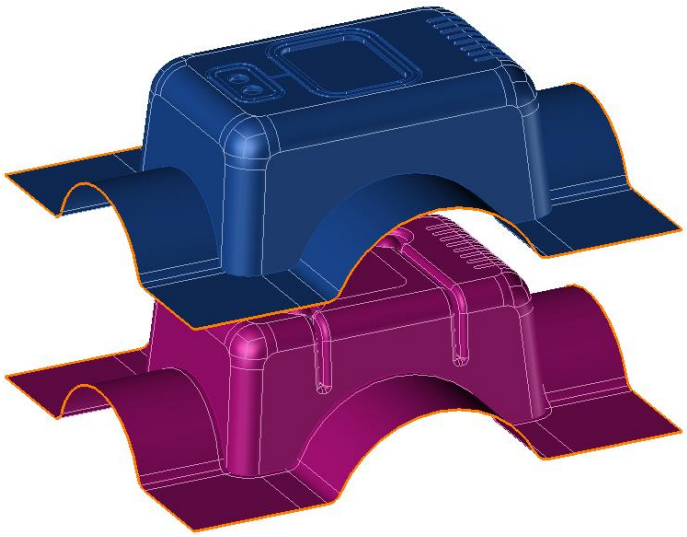


Note: **TopSolid** tries to automatically create as many surfaces as possible. In our case, all the surfaces are created.

Creating the shells, the parting shapes and the core cavity blocks

Creating the parting shells

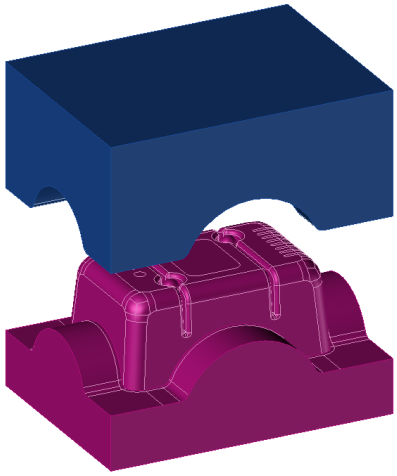
- Create the **parting shells**.



- Click on to **confirm**.

Creating the parting shapes

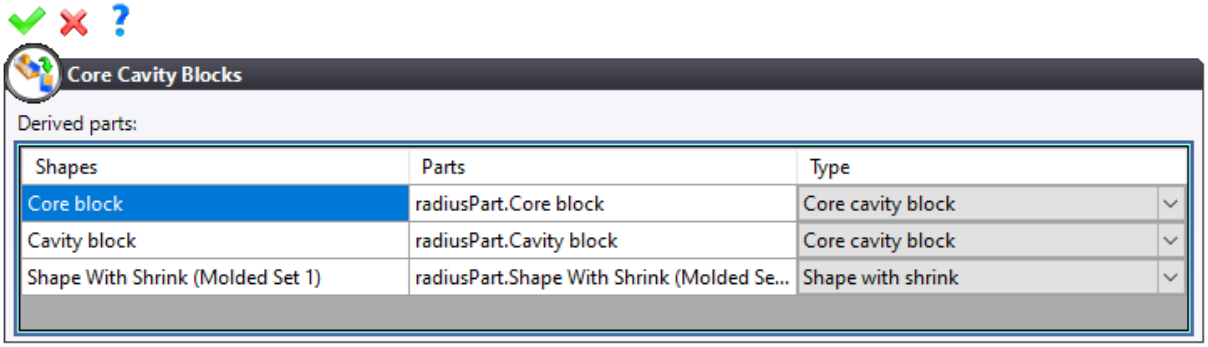
- Create the **parting shapes**.



- Click on to **confirm**.

Creating the core cavity blocks

- Create the **core cavity blocks**.



- Click on to **confirm**.
- Indicate where you want to create the core cavity blocks.

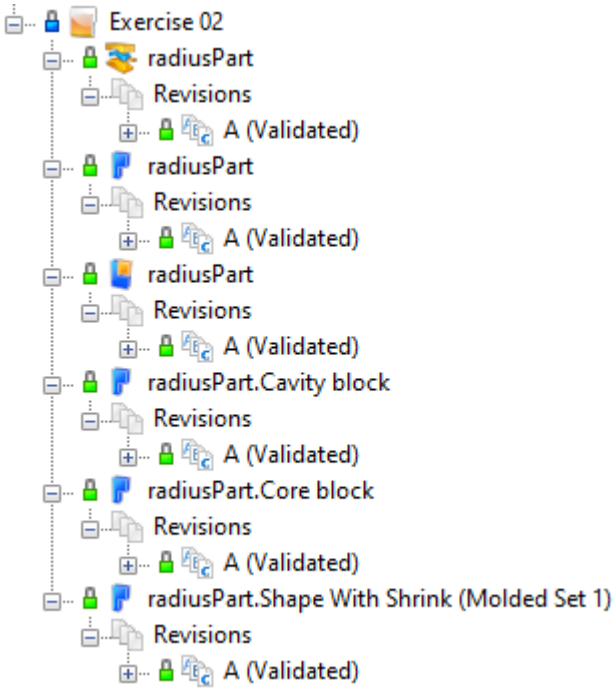
Check-in

- From the Project tree, **check** the *Exercise 02* folder into the vault.

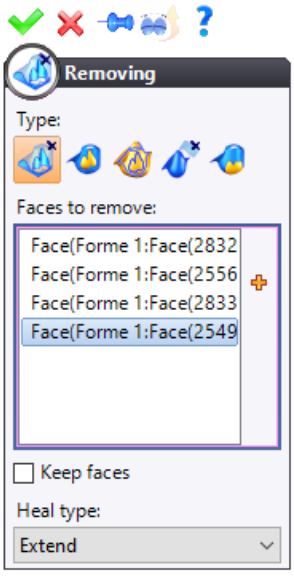
Update

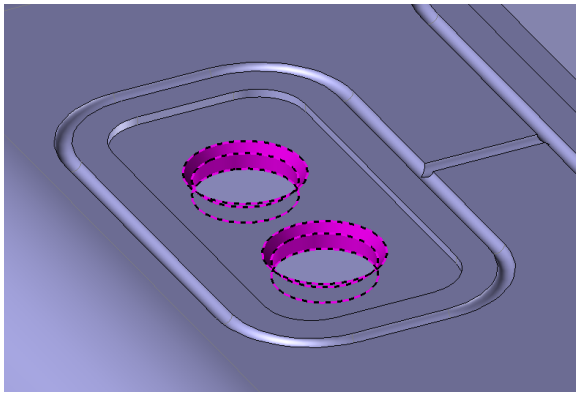
Modifying the part geometry

- From the Project tree, right-click on the assembly document named *radiusPart* and select the **Life Cycle (A- Design)** > **Validate** command. All the related documents are also validated.
- From the Project tree, enable the **Show revisions** icon and expand the **Revisions** node for each document.

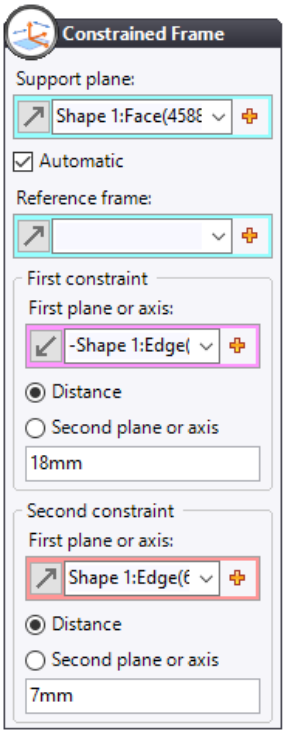


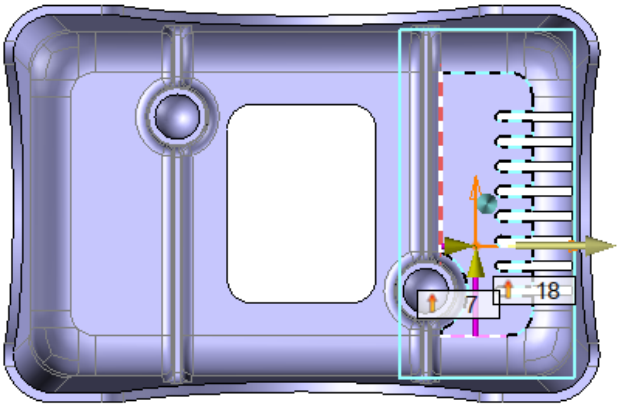
- Return to the part document.
- **Remove** the faces of the part's two holes by selecting the **Extend** heal type.



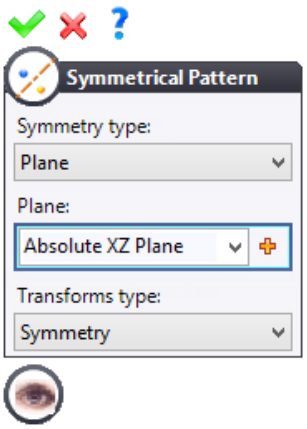


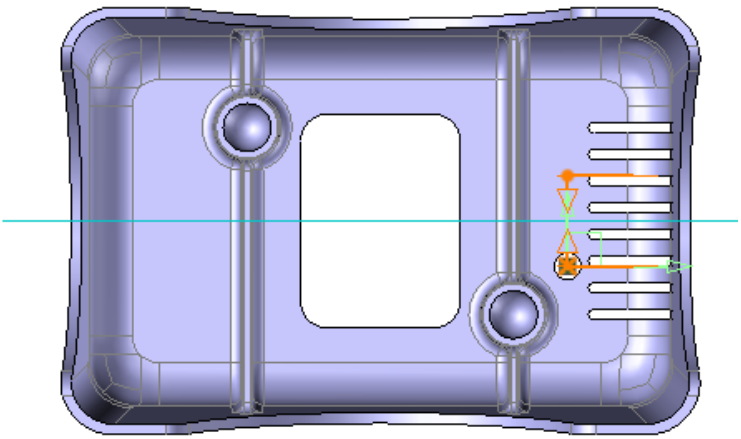
- Select the **Drilling** command and create a **constrained frame** using the **special inputs**.



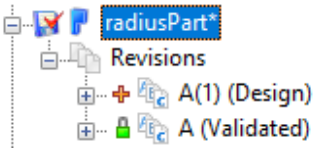


- Create a *Ø5mm* **through** hole.
- Click on to **confirm**.
- **Repeat** the previously created drilling to create a second drilling using a **symmetrical pattern** in relation to the **absolute XZ plane**.

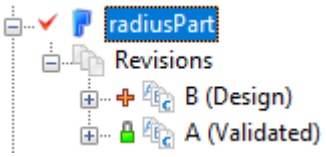




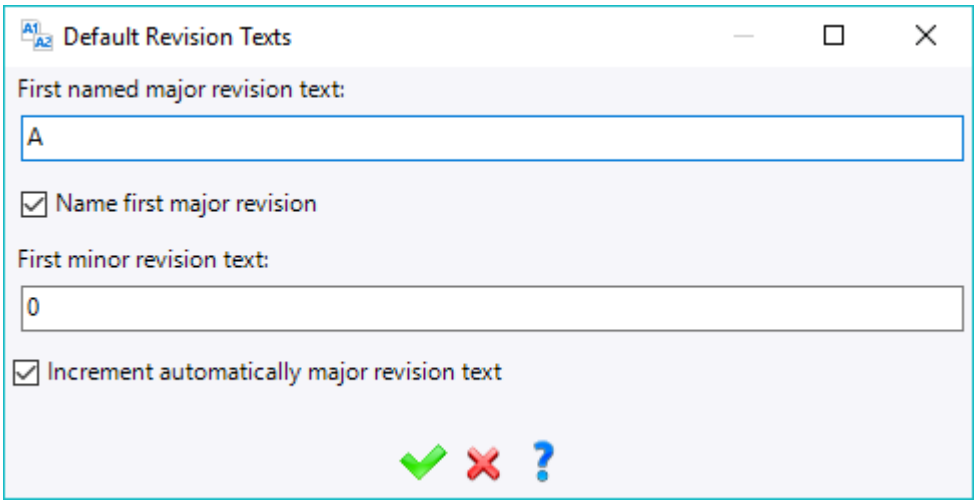
When you are finished modifying the geometry, you obtain the following result.



- **Save** the document. This action creates a new version of the part.



Note: You can define the default names of the major and minor revisions by right-clicking on the project name and selecting the **Others** > **Default Revision Texts** command. You can also choose whether or not to increment the major revision names automatically.



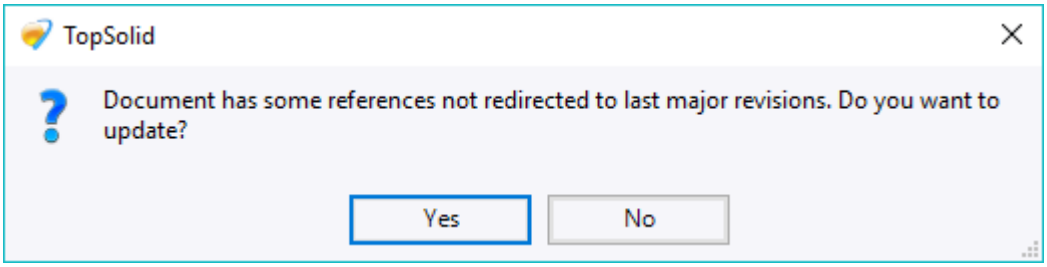
Check-in

- From the Project tree, **check** the *radiusPart* part document into the vault.

Split update

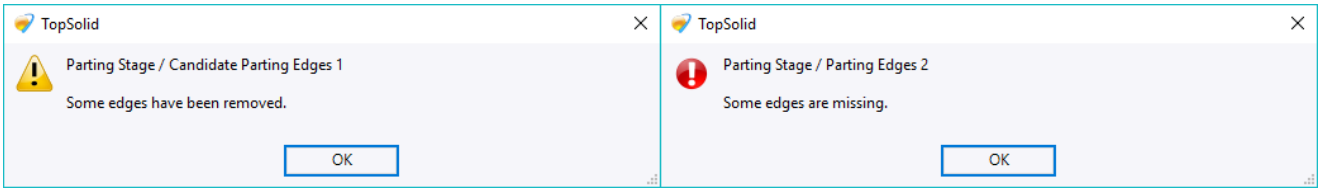
- Open the *radiusPart* Split document.

A message appears, warning you that the split document is not redirected to the last major revision of the part.



- Click on **Yes** to redirect the split document to the new part revision.
- Click on the icon to **redirect all references**.

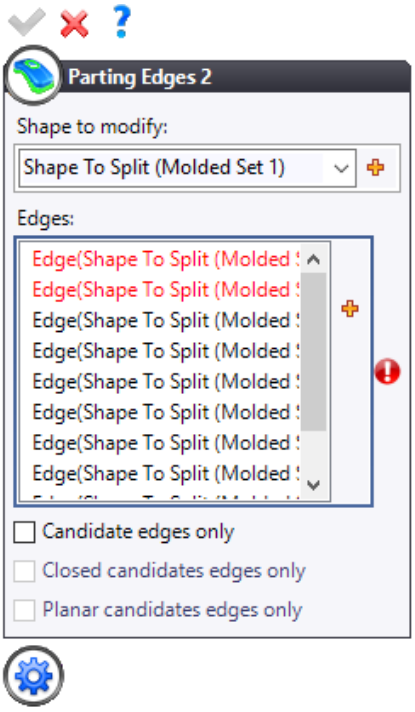
The update causes some items to be invalid that are shown in the following error messages.

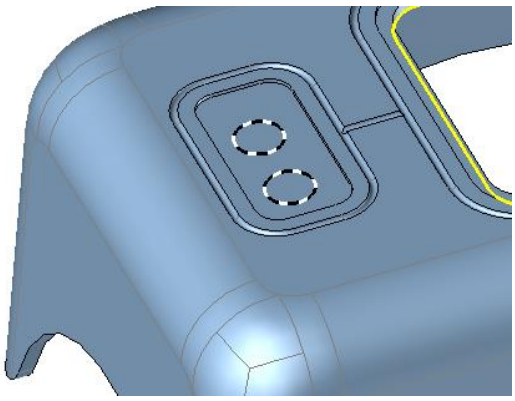


- Click on **OK** to confirm the messages.

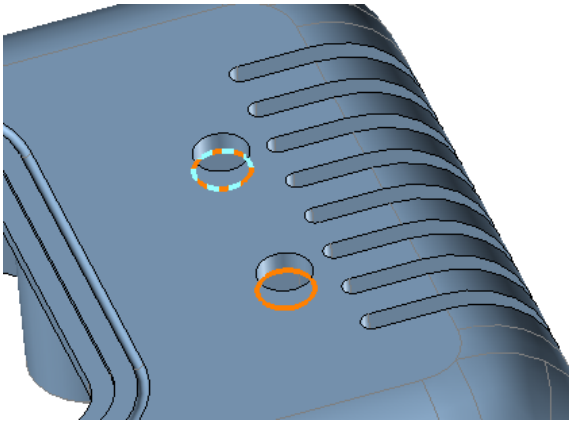
The split document is then invalid. 

Note: Clicking on the  icon allows you to identify what the problem is: the parting edges of the former holes are no longer recognized.





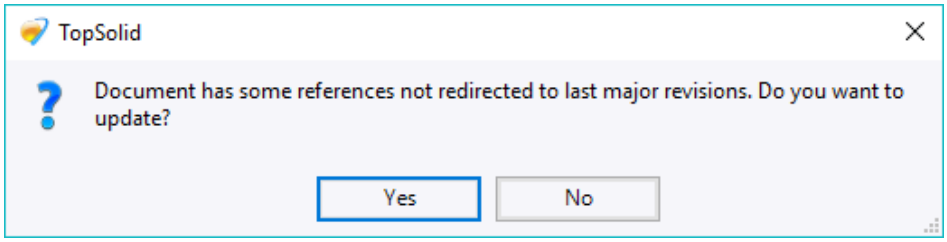
- In the dialog box, right-click and select the **Delete Invalid Selections** command.
- Select the edges of the new drillings instead.



- Click  to **confirm**.
-  **Save** the document.
- Update the parting shells by clicking on the  icon in the document's tab or by selecting the  **Parting Shells** command.
- Click on  to **confirm**.
- Once the parting shells have been updated, you are requested to update the  **parting shapes**.
- Click on  to **confirm**.

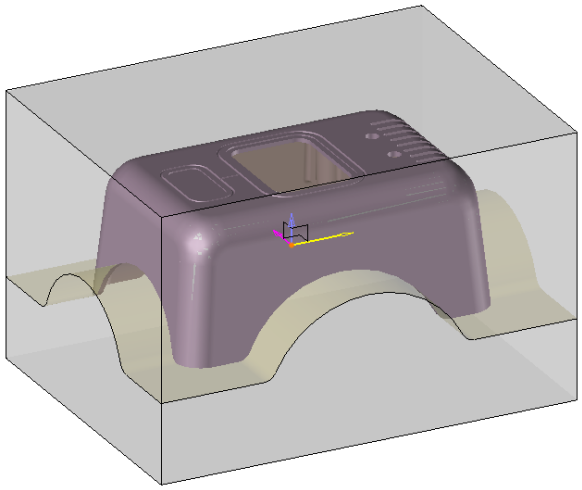
Updating the assembly

- Open the *radiusPart* assembly document. The following message is displayed.



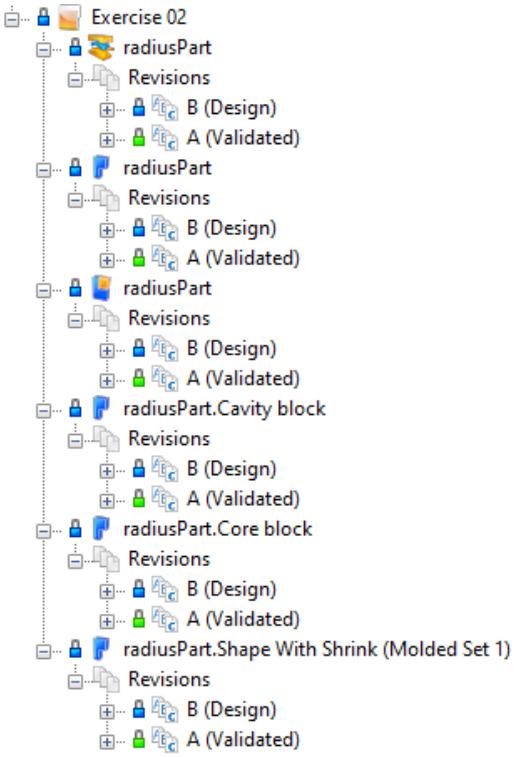
- Click on **Yes** to redirect the assembly document to the new split document.
- Click on to **confirm**.

The assembly is then updated.



- **Check** the *Exercise 02* folder into the vault.

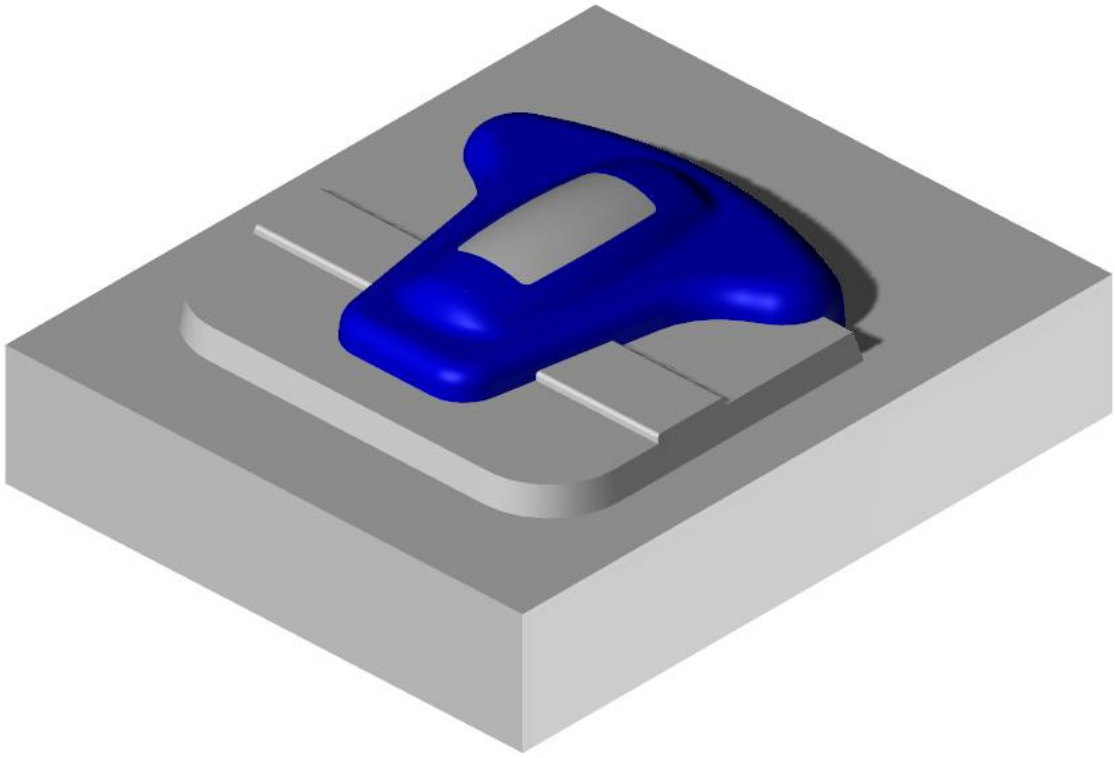
A B revision has been created for each document.



Exercise 3

Concepts addressed:

- Defining a differential shrinkage
- Positioning the part
- Creating a user stock
- Creating automatic parting surfaces
- Creating an interlock parting surface
- Creating insert surfaces
- Managing the different parts
- Updating the assembly

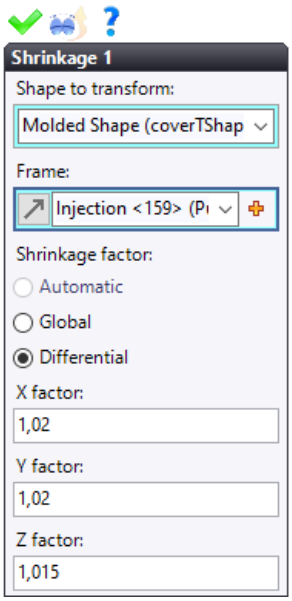


Starting the study

- From the Project tree, open the *coverTShape* part document from the *Exercise 03* folder.

Defining the differential shrinkage

- Right-click on the part document and create a **Split** document using a **blank template**.
- Apply a **differential** shrinkage and enter the factors as indicated below.



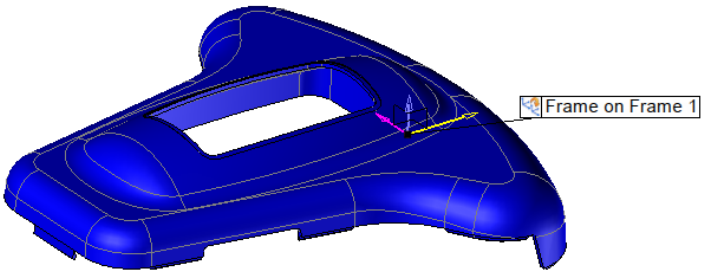
- Click on to **confirm**.

Note: The shrinkage values according to each axis of the reference frame can be expressed independently of each other in %, ‰ or as a coefficient.

Positioning the part

- Right-click on the part in the graphics area and select the **Edit Positioning** command.

You will notice that the part already has a **frame-on-frame** constraint with the published frame as the source frame and the absolute frame as the destination frame.



- **Confirm** the positioning.

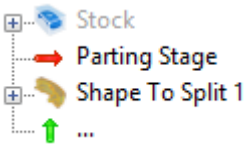
Creating a user stock

Defining a standard stock

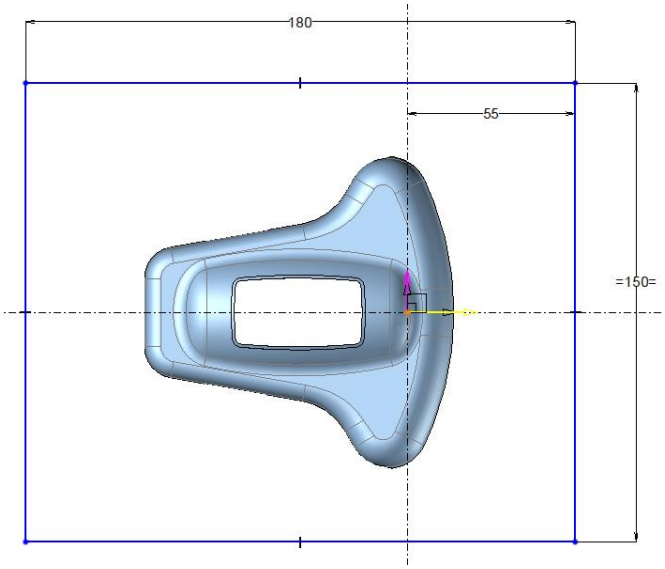
- Select the **Stock** command. The automatically created stock does not correspond to the stock we want to split.
- **Confirm** to exit the command.

Creating a user shape

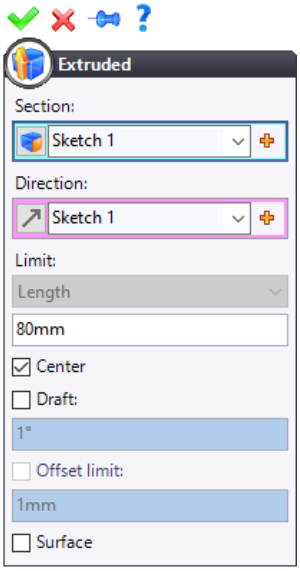
- From the Operations tree, move the insertion cursor under the **Stock** operation.

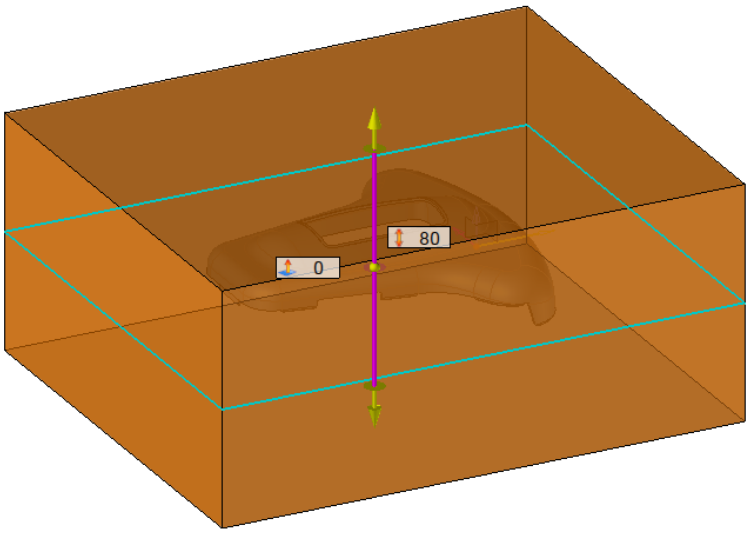


- Create a 2D **sketch** on the **absolute XY support plane**.
- Draw a **rectangle** and set the following dimensions and constraints.



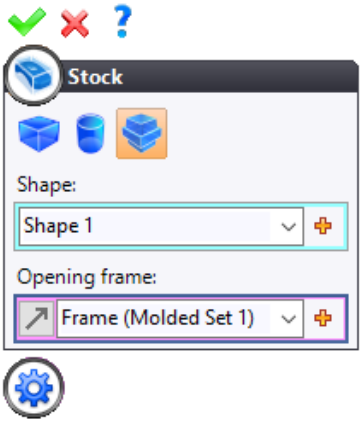
- Create an **extruded** shape of *80mm* and **center** it.





Defining a user stock

- Right-click in the graphics area and select the **End inserting** command. You can also click on the icon in the **Split** document's tab.
- Edit the **Stock** operation. Select the **User** option and select the previously created block.



- Click on to **confirm**.

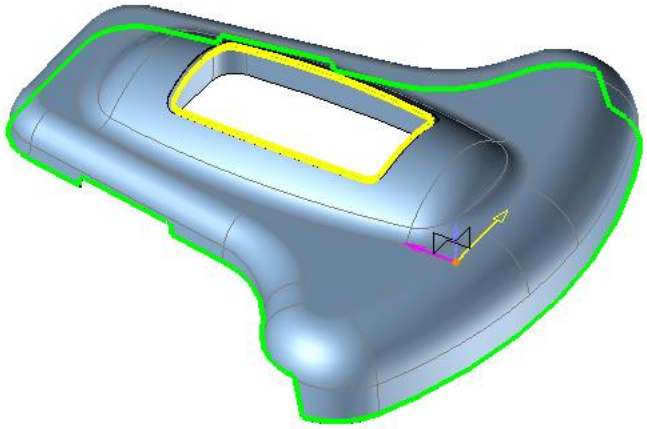
Creating the parting line

Creating the candidate edges

- Create the **candidate edges**. From the **Molding axis** drop-down list, select the **Z axis of the molded set frame**.
- Move to the next step.

Creating the parting edges

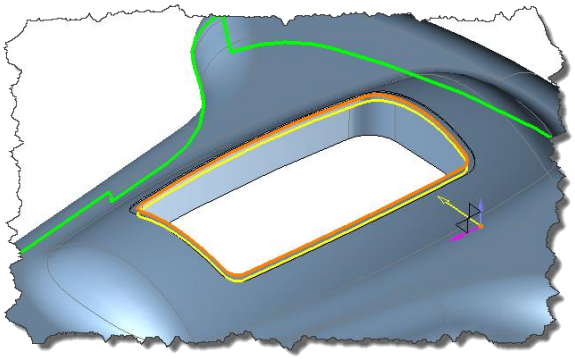
- Create the **parting edges**. Select the external path of the part as shown below.



- Click on to **confirm**.

Note: The molding areas are not colored. The parting edges you just created do not properly define the parting line.

- Create a **parting edge** for the part's central opening.

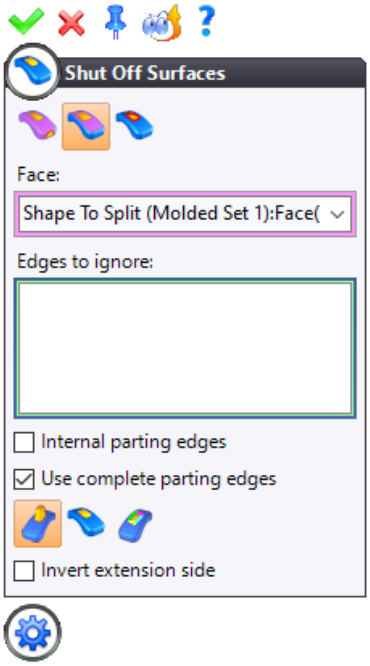


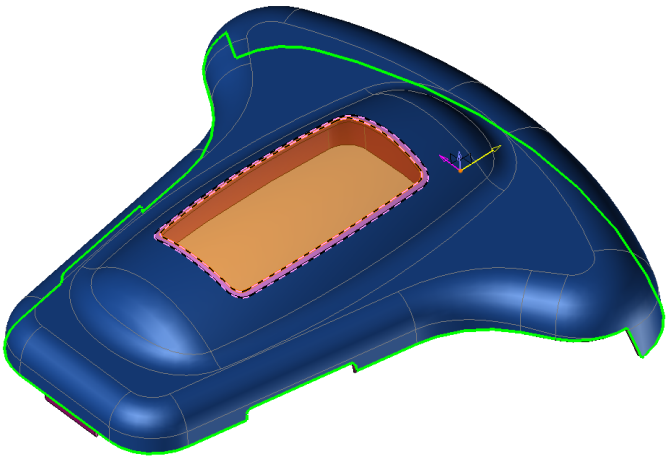
- Click on to **confirm**.

Note: The molding areas are colored since the parting edges now properly define the parting line.

Creating the shut off surfaces

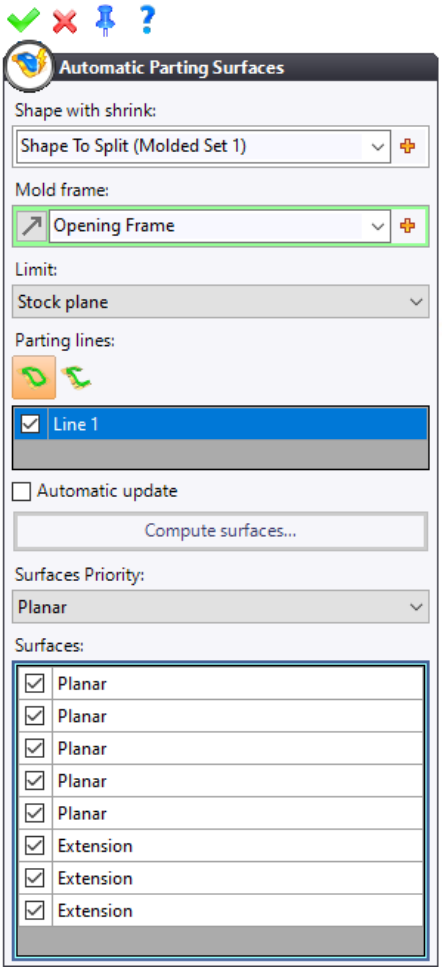
- Select the **Shut Off Surfaces** command and create the following surface using the **Face** mode.

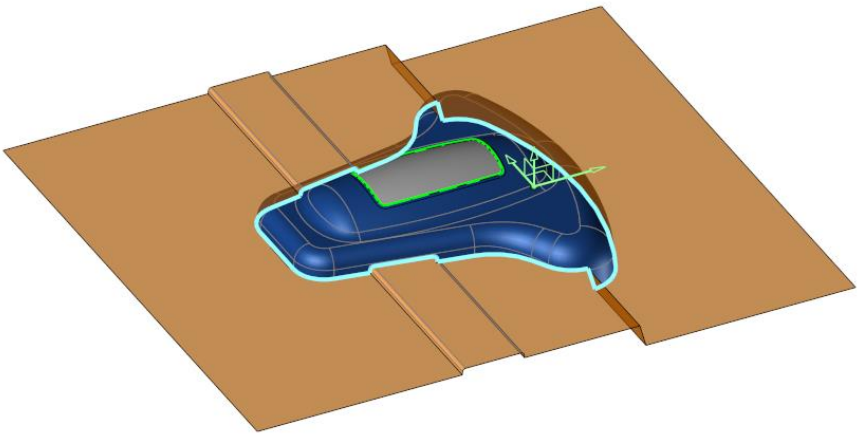




Creating the automatic parting surfaces

- Select the **Automatic Parting Surfaces** command and click on the **Compute surfaces** button.





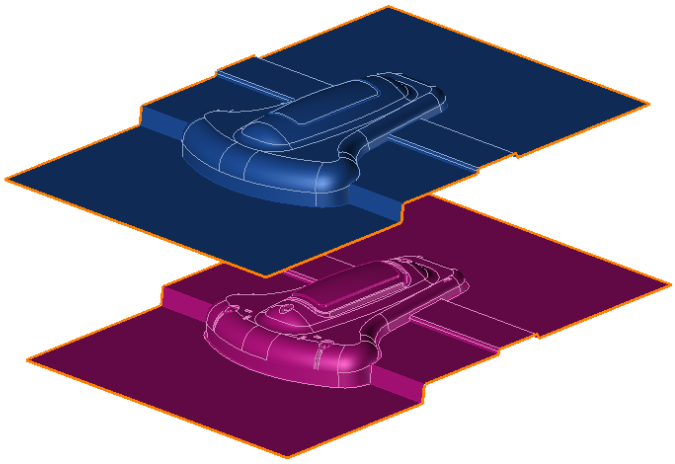
- Click on to **confirm**.

All the surfaces are automatically created. However, you can edit them if necessary.

Creating the parting shells

- Create the **parting shells**.

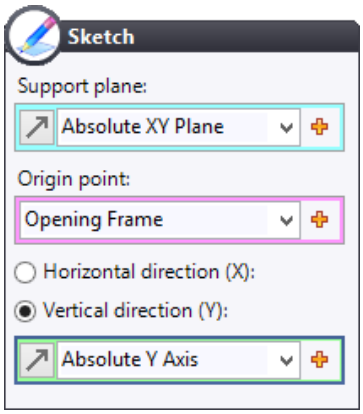
There are some errors on both shells. The invalid edges are displayed in red on the two shapes.



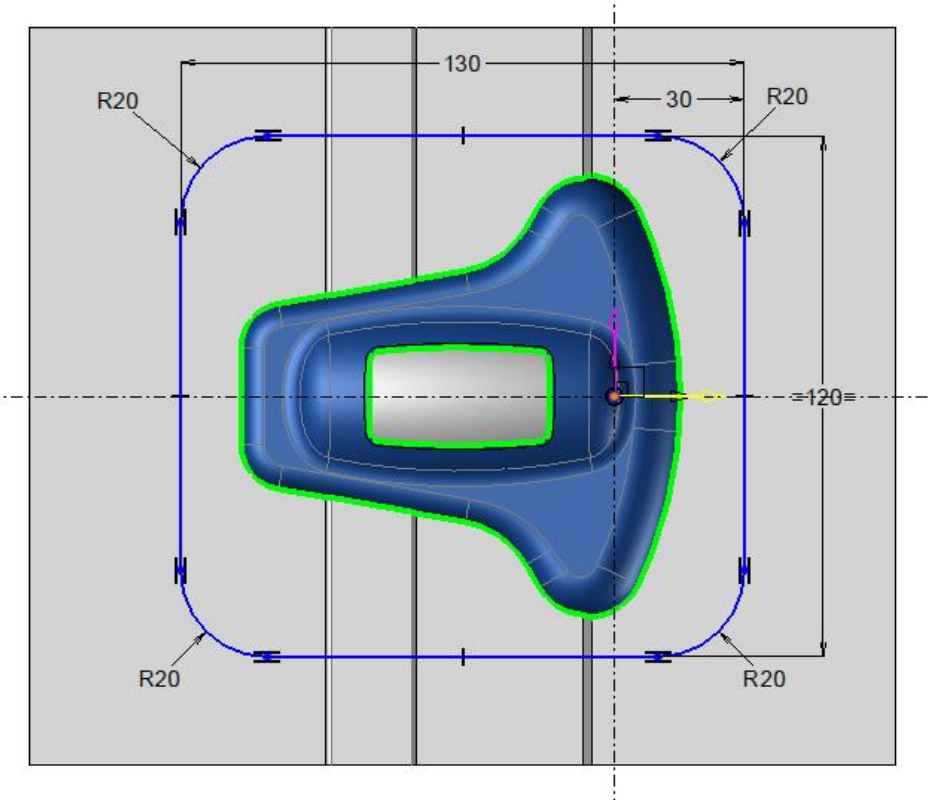
- Click on to **confirm**.

Creating the interlock parting surface

- Select the **Interlock Parting Surface** command to create a complex parting line.
- Select the **Section** mode and create a new **2D sketch** using the **special inputs**.

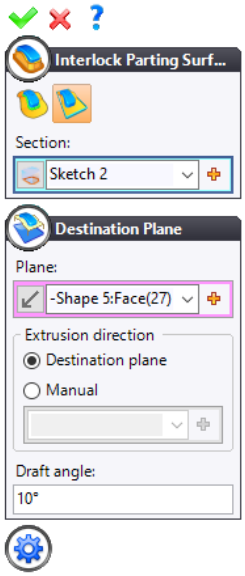


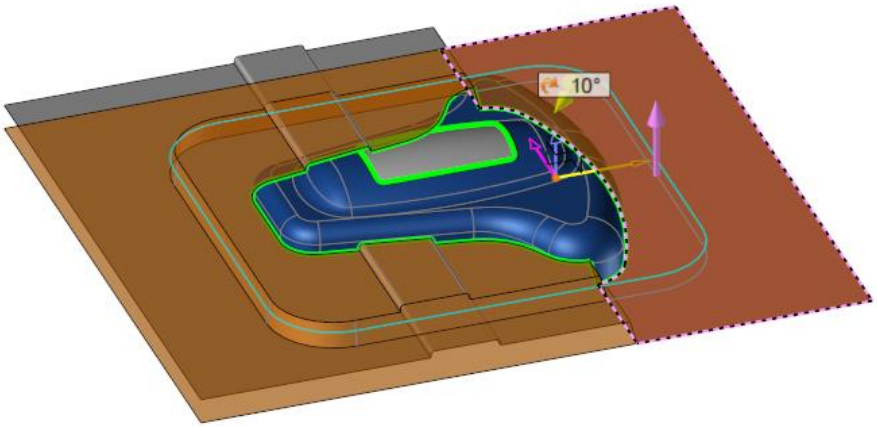
- Draw the following contour.



- **Confirm** the sketch.

- In the **Destination Plane** section, select the flat face of the bottom parting surface and enter a **draft angle** of *10°*.





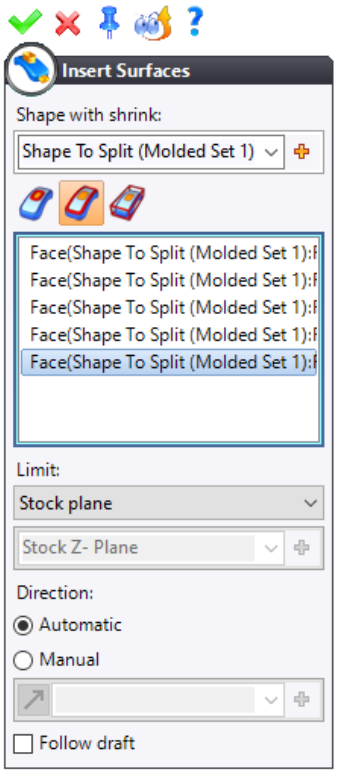
- Click on ✔ to **confirm**.

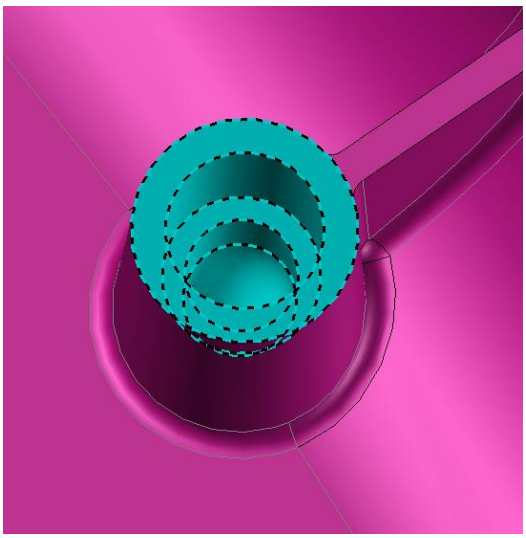
Creating insert surfaces

TopSolid'Split does not only generate the core cavity blocks. During the split operation, you can also create the inserts related to the split design.

Face mode

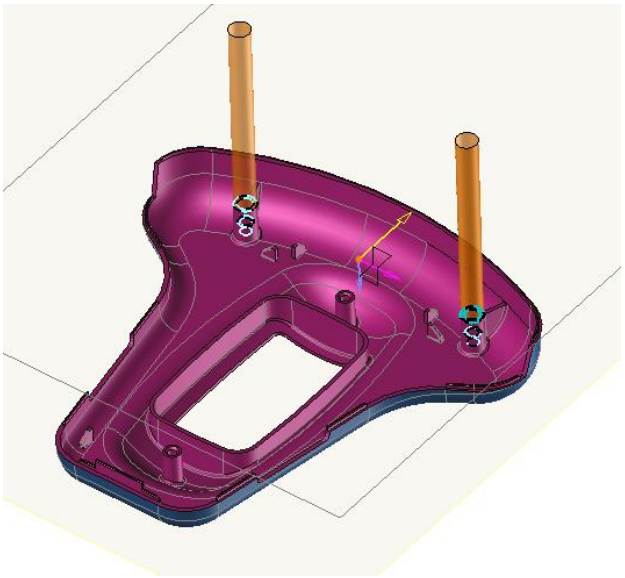
- Create the **insert surfaces** for the two symmetrical cylindrical pins.
- Select the **Faces** mode and select the faces of the area to be molded by the insert. Select **Stock plane** as the limit.





Note: You can use multi-selection to create several insert surfaces at the same time.

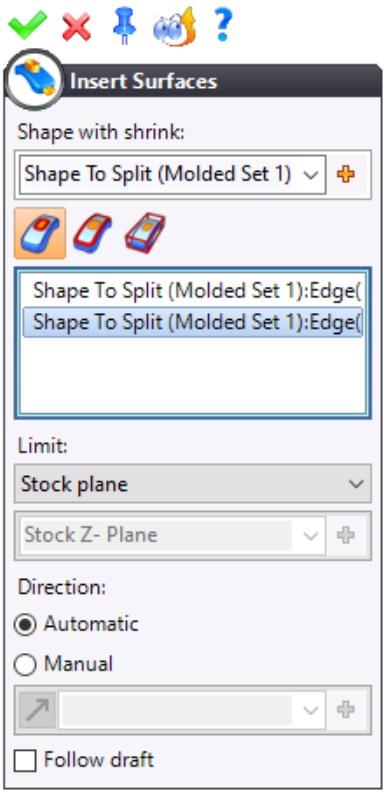
- Select **Automatic** as the direction.

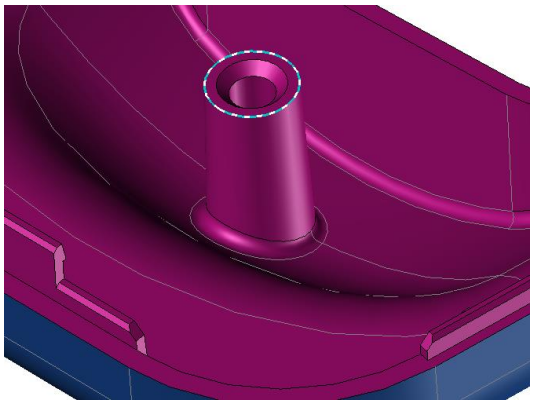


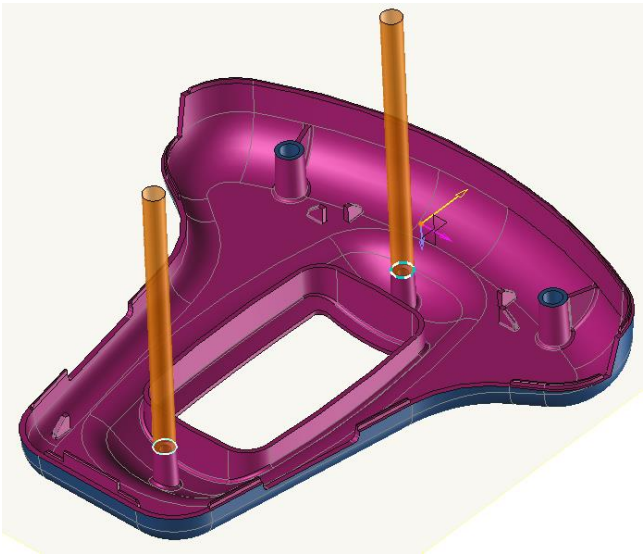
- **Confirm** the creation of the insert surfaces.

Profiles or loops mode

- Select the **Profiles or loops** mode for the other two cylindrical pins.
- Select the profile of the future insert by selecting an edge of the part.







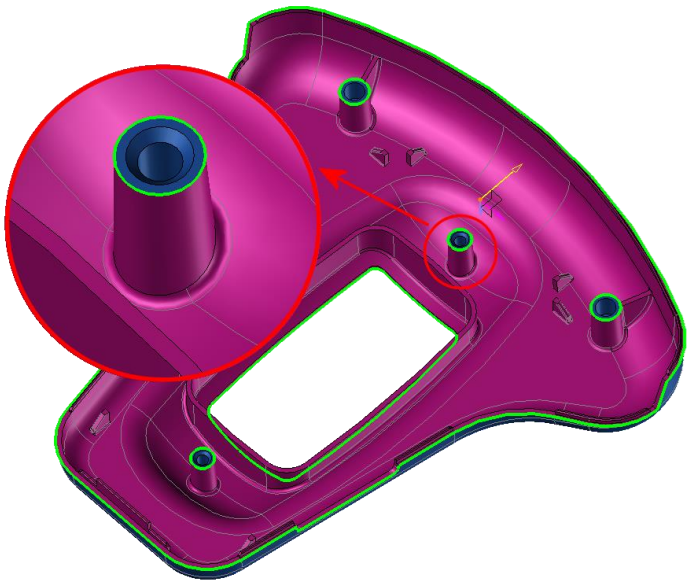
Note: To ensure the creation of an insert during the split process, you must create parting surfaces. **TopSolid** also needs to define a molding area for this insert. To do this, parting lines are necessary.
When creating an insert surface, if these parting lines have not been defined beforehand, **TopSolid** will create them automatically.

- Right-click in the graphics area and enable the **Display Parting Edges** and **Hide Parting Surfaces** commands.

Note: You can also quickly show or hide the Split geometries using the icon bar at the bottom right of the graphics area.

- **Hide/Show Shapes to Split**
- **Hide/Show Stock**
- **Hide/Show Parting Surfaces**
- **Hide/Show Parting Shells**
- **Hide/Show Parting Shapes**
- **Hide/Show Shapes With Shrink**

A parting edge has been generated for each insert surface and a new colored area is created.

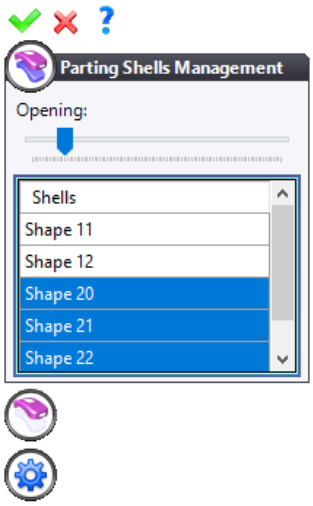


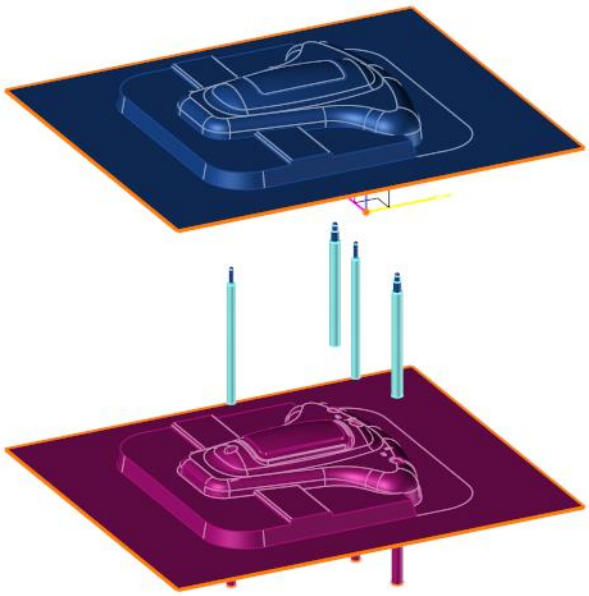
Note: Four predefined colors in the **Tools** > **Options** command are used to define the molding area mapping.

Updating the parting shells and parting shapes

Parting shells

- Recreate the **parting shells** to take the newly created surfaces into account.

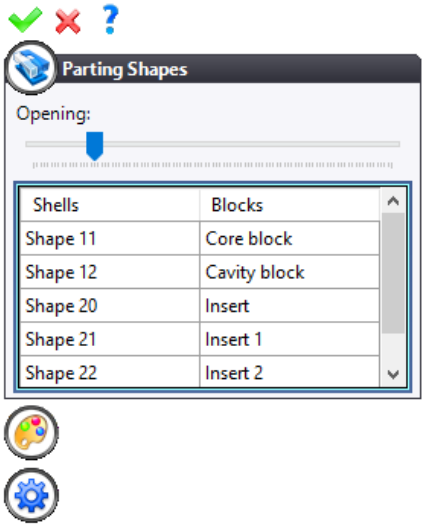


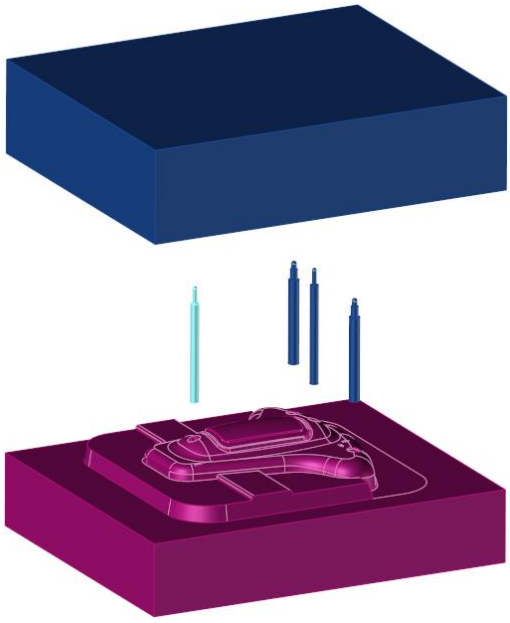


- Select the four insert shells so that they can move simultaneously. You can use the **Shift** and **Ctrl** keys on your keyboard to make selection easier.
- Click on to **confirm**.

Parting shapes

- Select the **Parting Shapes** command to create the parting shapes. This operation creates the core cavity blocks and the four inserts.
- Rename the insert shapes by double-clicking on the name of the shape to be modified.



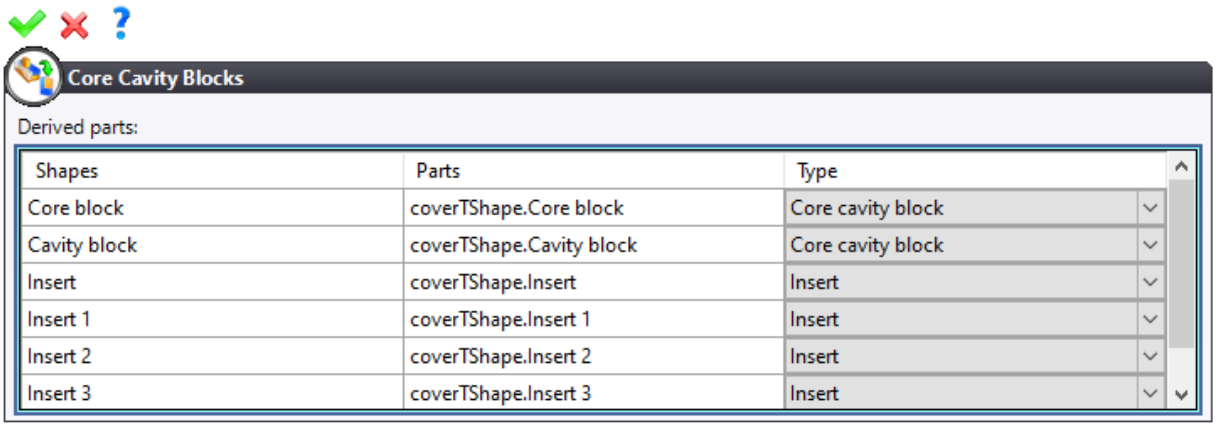


- Click on to **confirm**.

Creating the core cavity blocks

- Select the **Core Cavity Blocks** command.

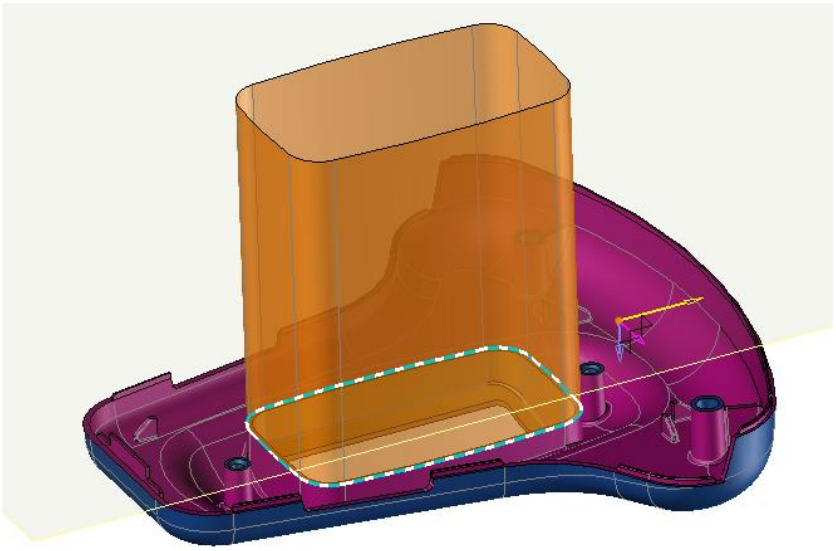
The name of each part becomes the name of the created file.



- Click on to **confirm**.
- Indicate where you want to create the core cavity blocks.

Creating the central insert

- In the *CoverTShape* split document, return to the **parting stage** to create a new insert.
- Create an **insert surface** using the **Profiles or loops** mode based on the external edge of the center shape.
- Select an **automatic** extrusion direction.



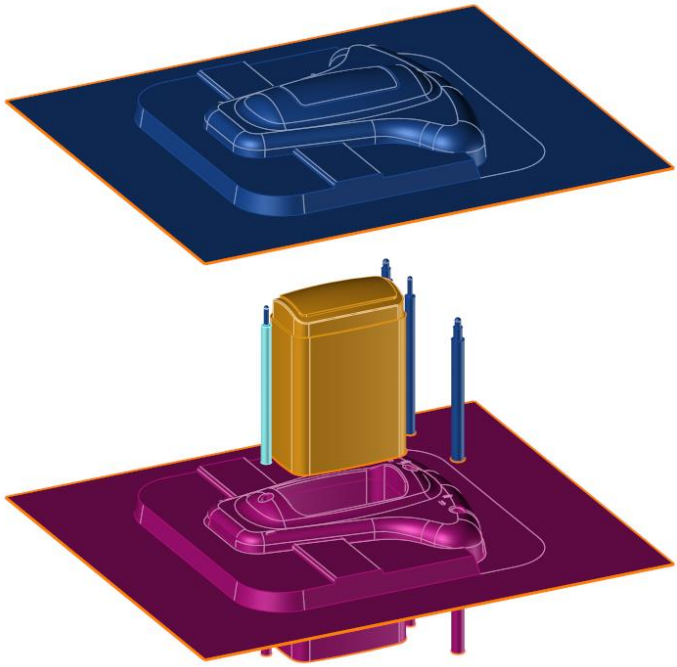
- Click on to **confirm**.

Update

Parting shells

Whenever a change occurs to the parting surfaces or the insert surfaces, you need to recalculate the parting shells.

- Select the **Parting Shells** command.



- Click on to **confirm**.

Parting shapes

- In the same way, recalculate the **parting shapes**. You can observe that a new shape has been created and you can rename it.
- Click on to **confirm**.

Core cavity blocks

- Recreate the **core cavity blocks**.
- Click on to **confirm**.

Note: When a new shape is created at the block split level, this shape is not automatically derived to create a new part. In this case, you need to relaunch the **Core Cavity Blocks** command to generate this part. The existing parts remain in place and only the new part is created.

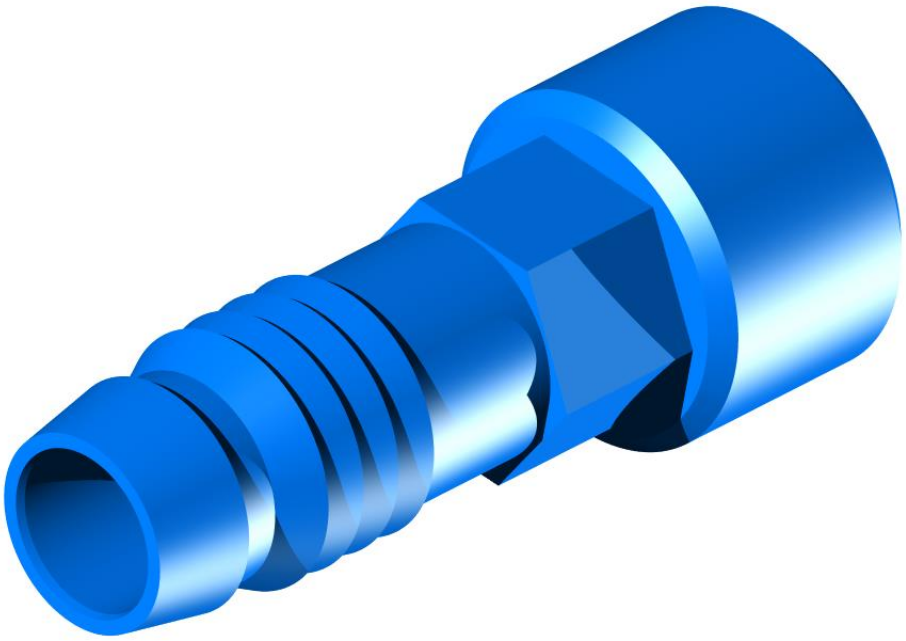
Check-in

- From the Project tree, **check** the *Exercise 03* folder into the vault.

Exercise 4

Concepts addressed:

- Creating a cylindrical stock
- Creating silhouette edges
- Imprinting edges on the fly
- Handling parting edges
- Creating edges on the fly
- Modifying the inserts

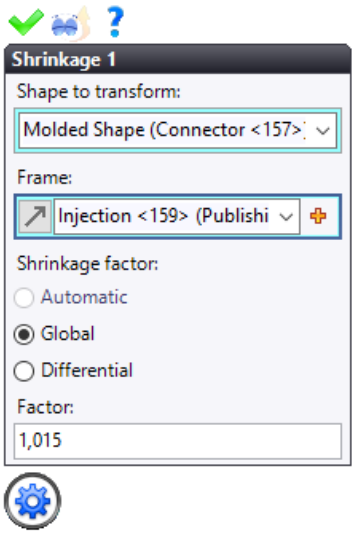


Starting the study

- From the Project tree, open the *Connector* part document from the *Exercise 04* folder.

Defining the shrinkage

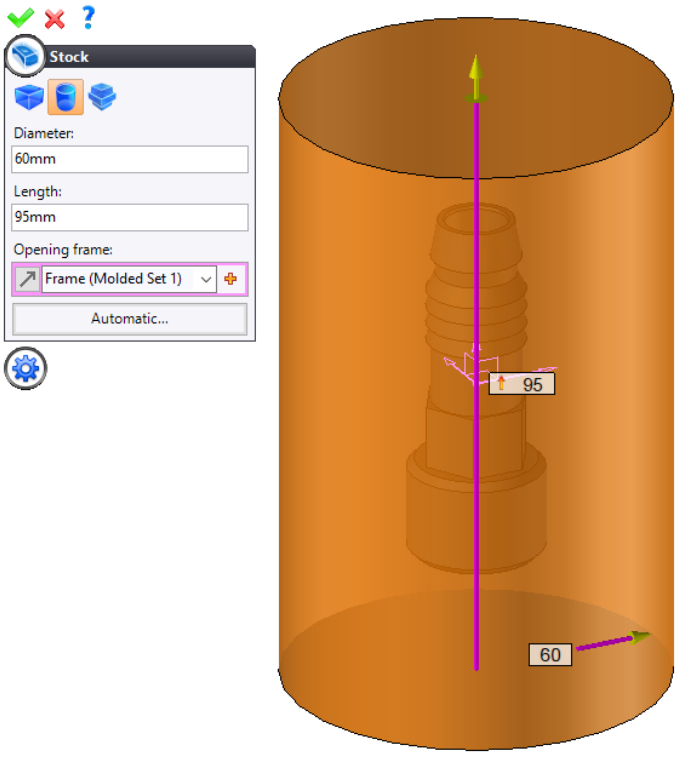
- From the part document, create a **Split** document using a **blank template**.
- Apply a **global shrinkage** of *1.015*.



- Click on ✔ to **confirm**.

Creating a cylindrical stock

- Select the **Stock** command.
- Select the **Cylinder** mode and enter the following values.

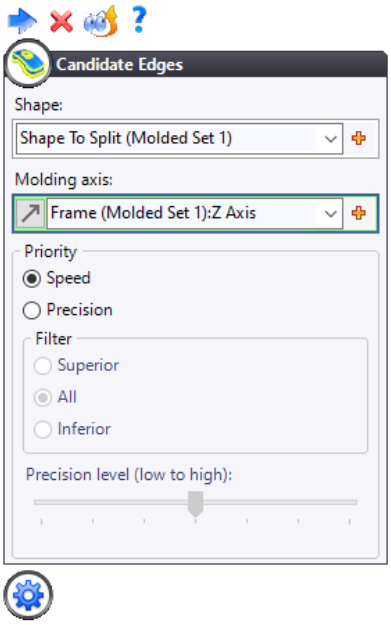


- Click on ✔ to **confirm**.

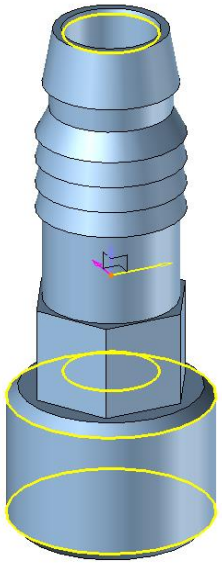
Creating the candidate edges

Default candidate edges

- Create **candidate edges** on the part along the **Z axis of the molded set frame**.

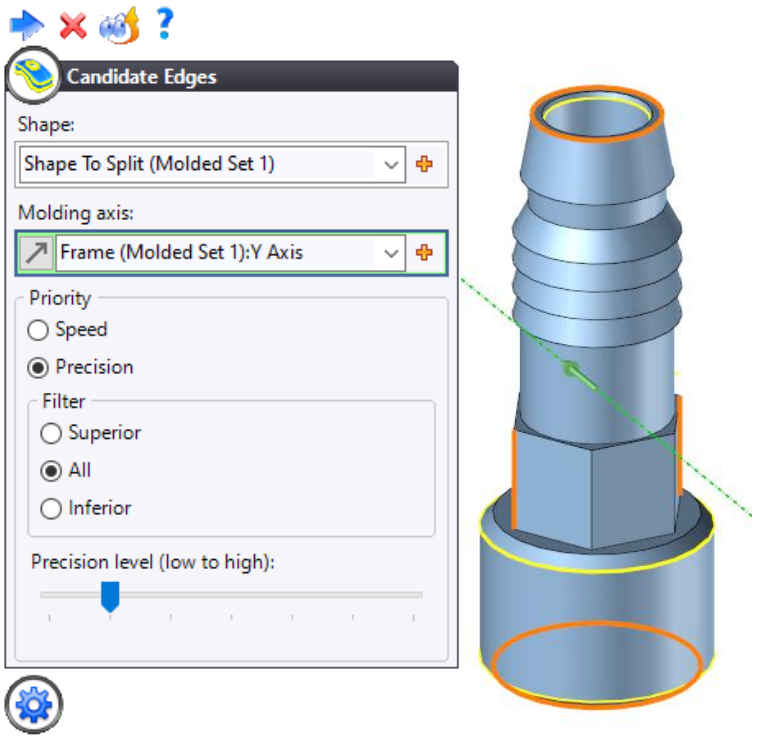


- Click on the icon to confirm the edge creation.



- Click on the icon to **cancel** the creation of the parting edges.

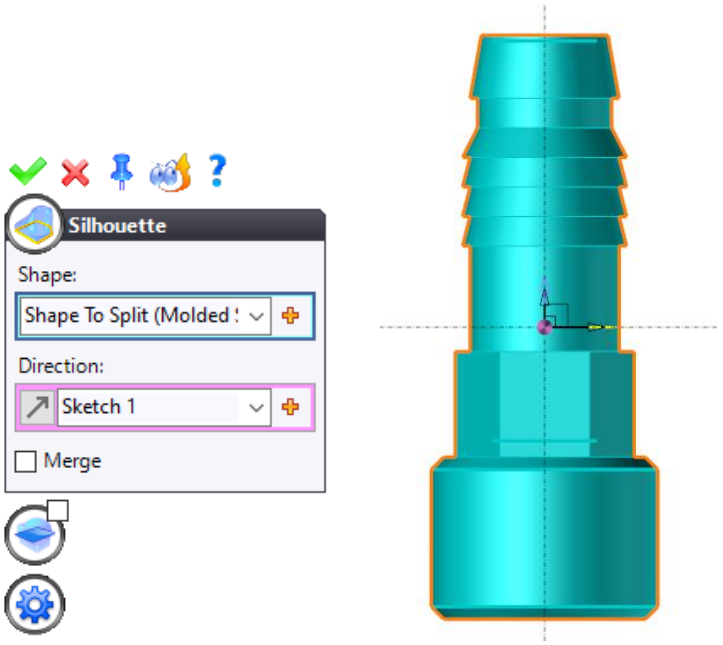
- Select the **Candidate Edges** command again and select the **Y axis of the molded set frame**.



Note: It is necessary to have physical edges on the part to be able to create candidate edges or parting edges. Therefore, you may need to create these edges if they are not designed on the part.

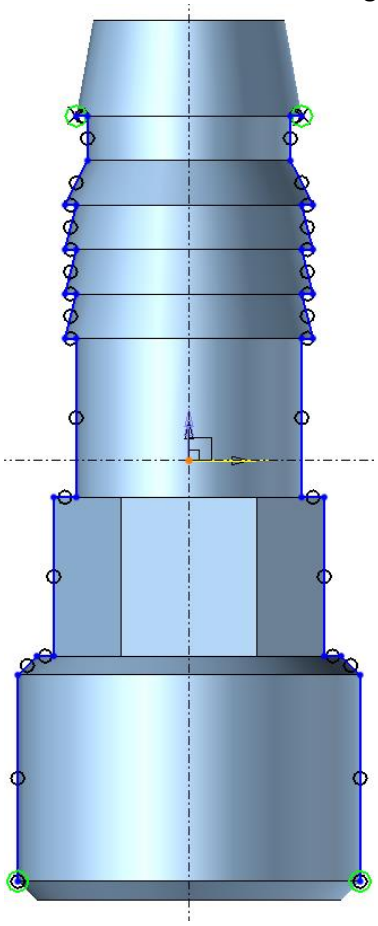
Creating the missing edges by imprint process

- Create a **sketch** on the **XZ** plane.
- Select the **Silhouette** command.



- Click on to **confirm**.

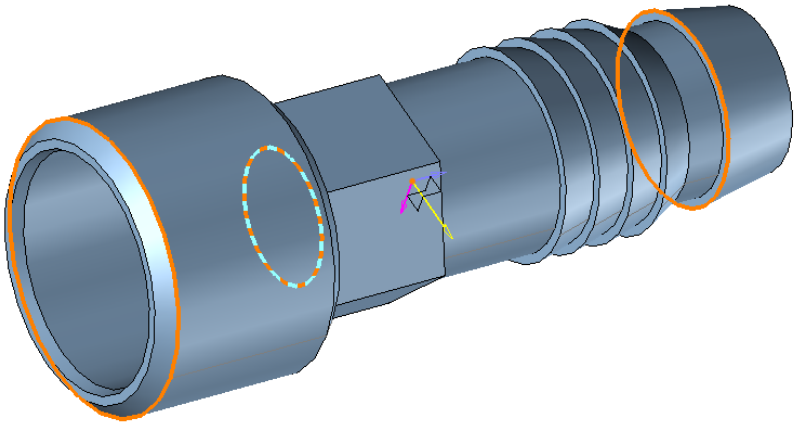
- Delete some segments and add constraints to obtain the following two profiles.



- **Confirm** the sketch.

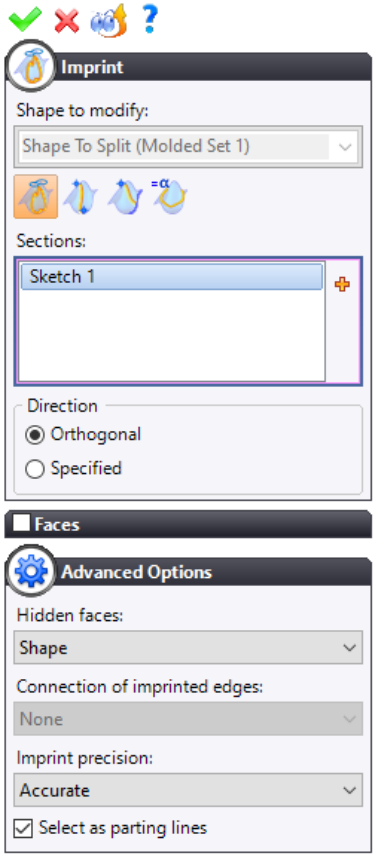
Creating the parting edges

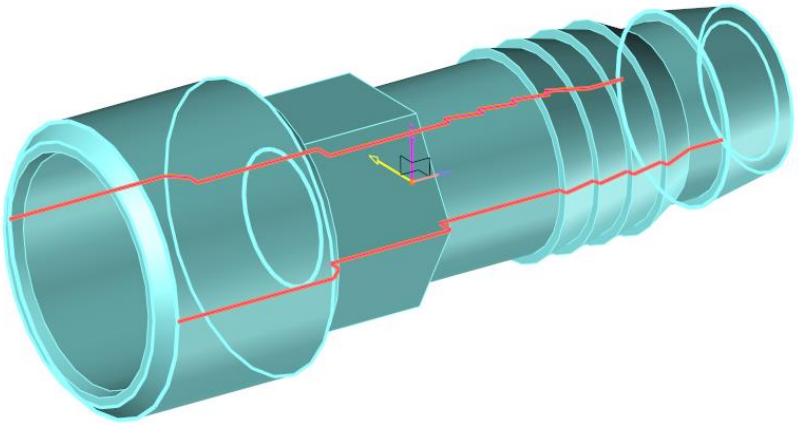
- Select the **Parting Edges** command and select the edges as shown below.



- Click on to **confirm**.

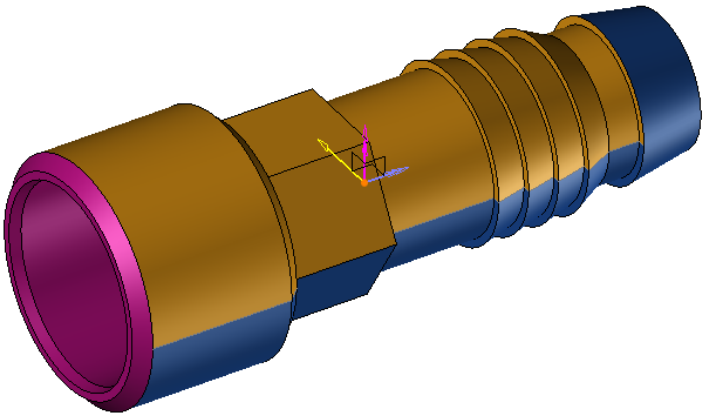
- Select the **Parting Edges** command again.
- Click on the **special inputs** and **imprint** the previously created sketch on the visible faces.

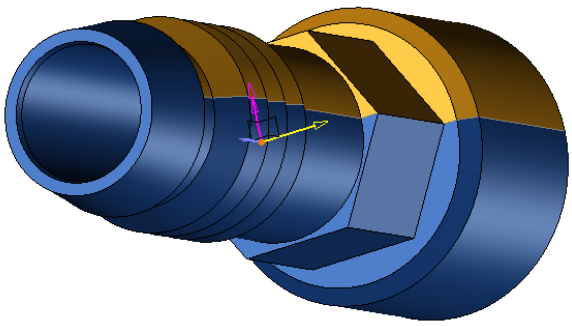




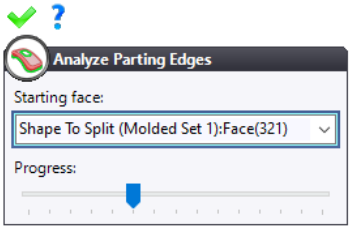
- **Confirm** the imprint operation.
- **Confirm** the creation of the parting edges.

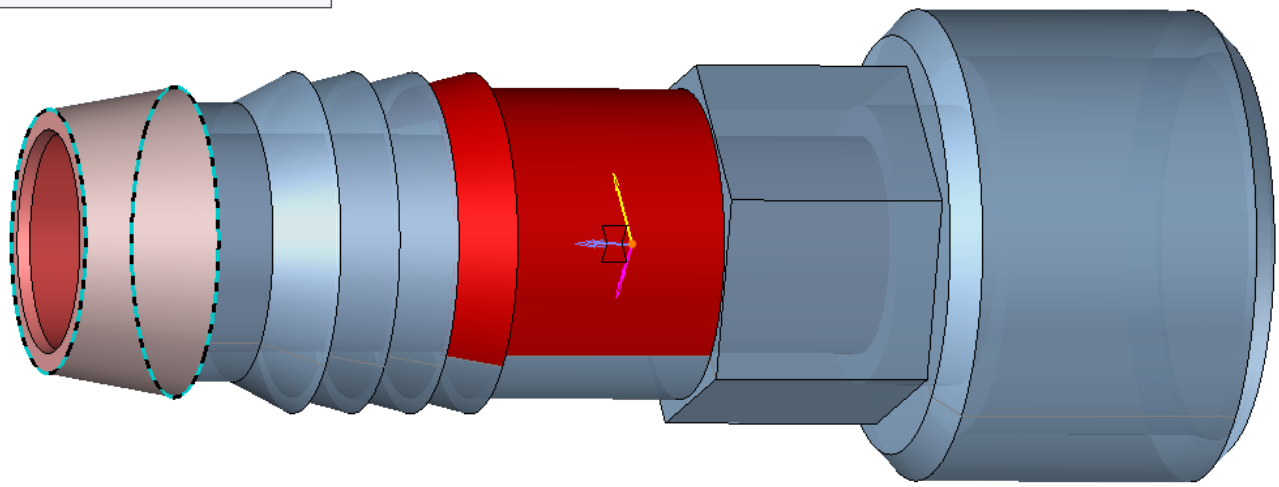
You will notice that the parting edges do not allow the molding areas to be properly split. The "inner shell" of the part is the same color as a section of the "outer shell" of the part.



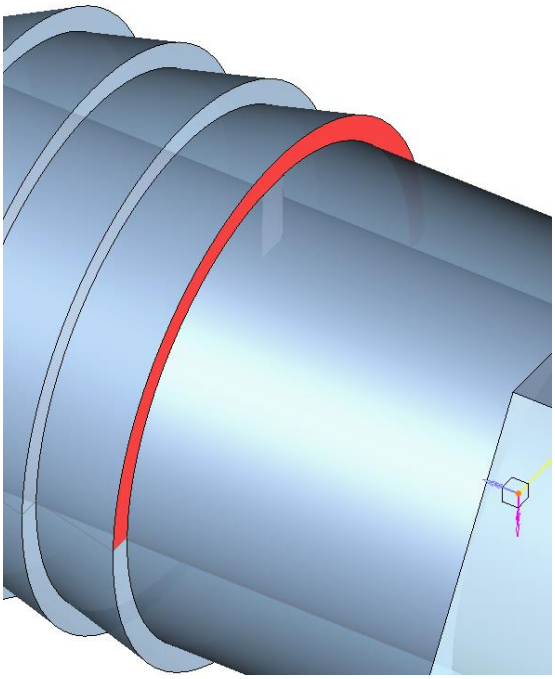


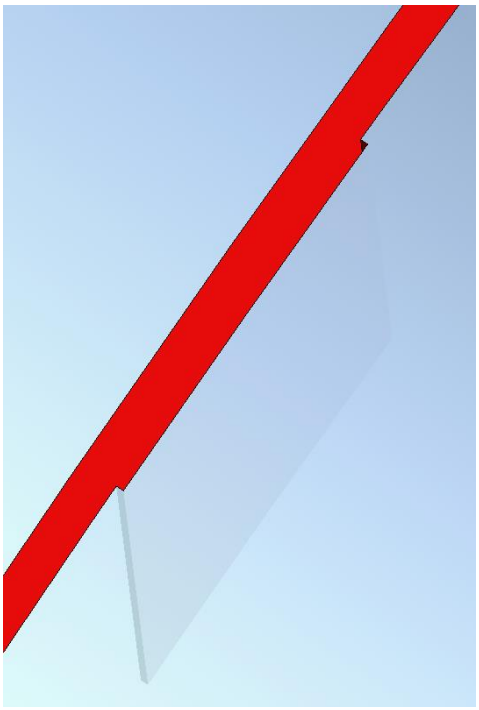
- To determine the missing parting edges, select the **Analyze Parting Edges** command from the **Analysis** tab.
- Select a start face (the end face as shown below, for example) and drag the cursor gradually to the right.





The faces are displayed in red in the graphics area. You only have to identify the area in which the red color spreads over the faces of the part.

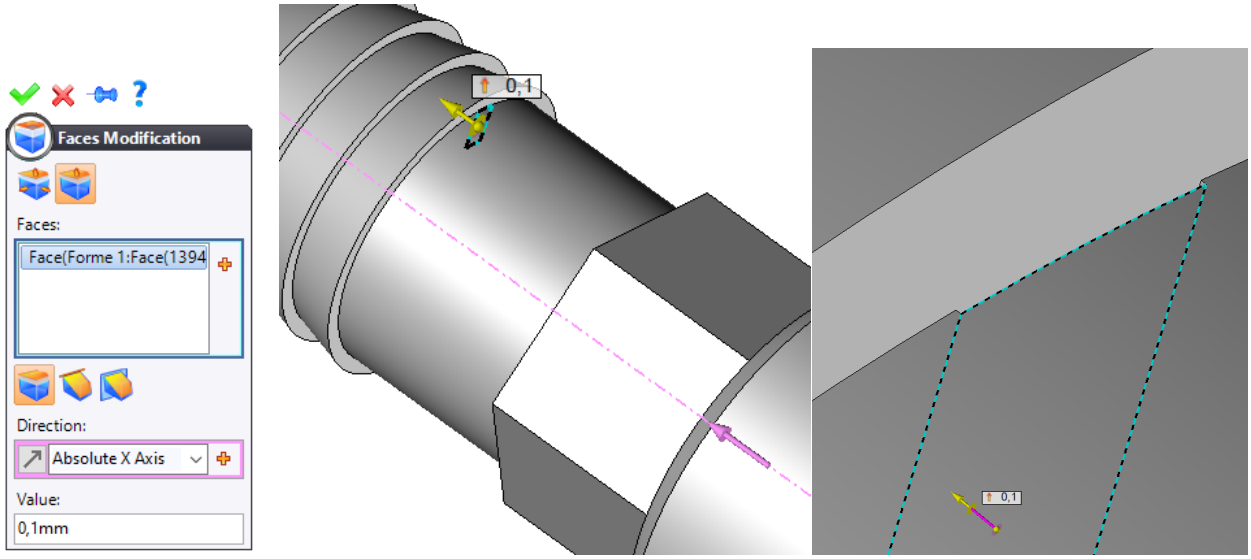




- **Confirm** the analysis.

Modifying the part geometry

- Open the *Connector* part document.
- From the **Shape** tab, select the **Faces Modification** command.
- Select the face to be moved, then adjust the **direction** and **value** as shown below.



- Click on to **confirm** the operation.

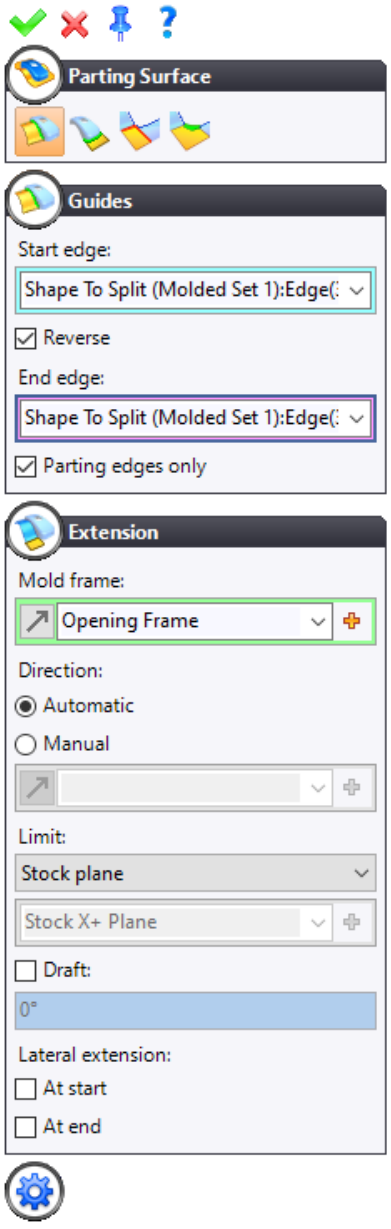
The hole has been filled in.

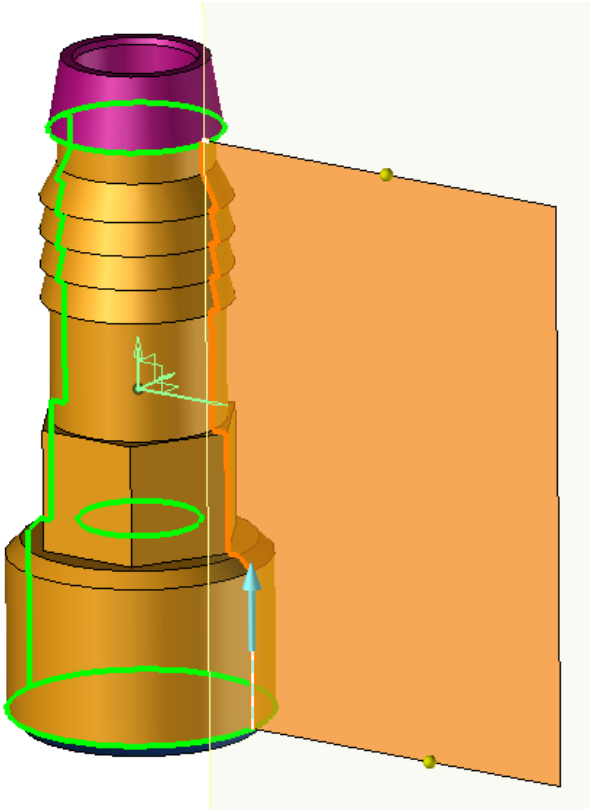
- **Save** and **close** the *Connector* part document.

Creating the parting surface

Extension parting surface

- Return to the *Connector* split document.
- Create a **parting surface** using the **Extension** mode based on the part's side edges.

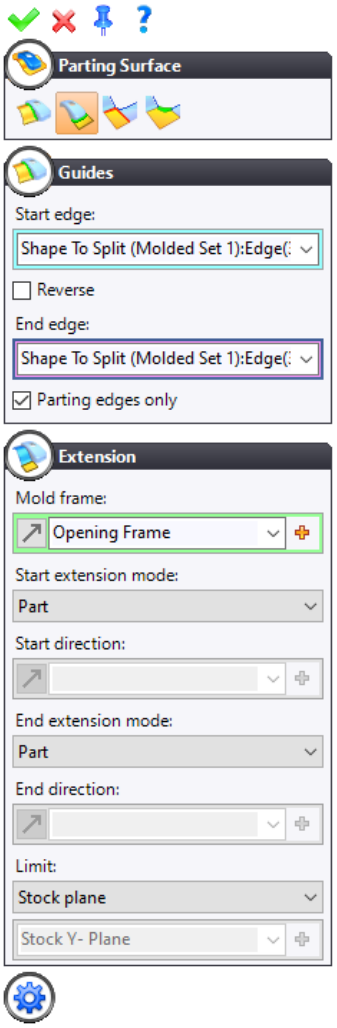


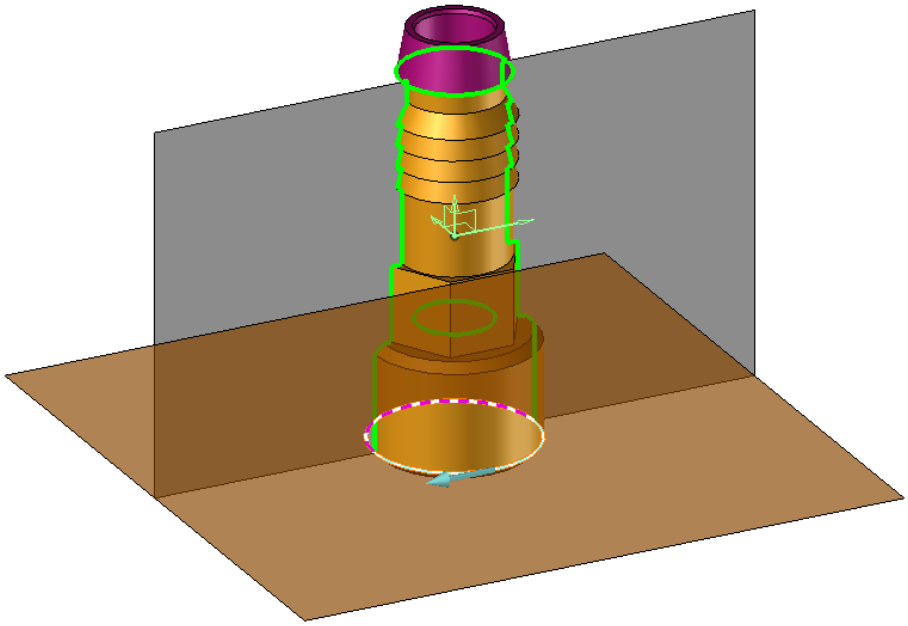


- Click on to **confirm**.
- Repeat the operation with the opposite edges.

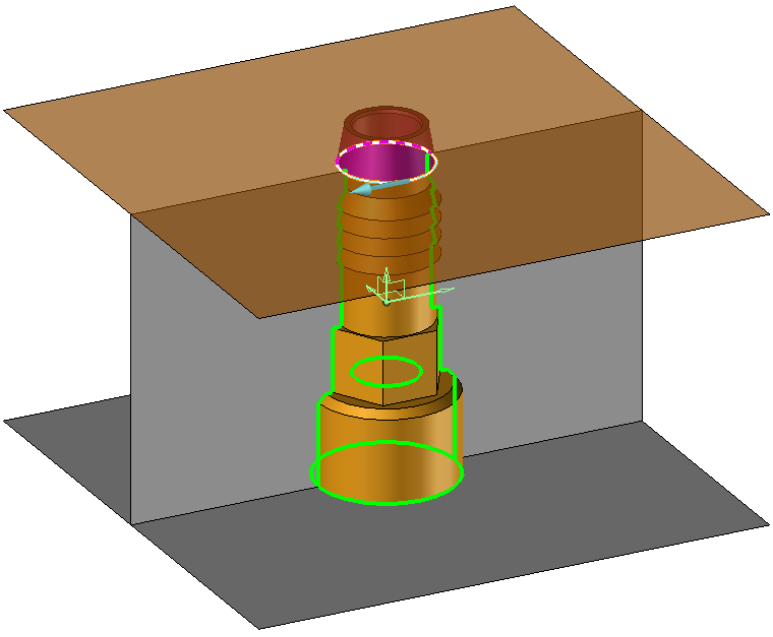
Planar parting surface

- Create a **parting surface** using the **Planar** mode for the part's bottom section.



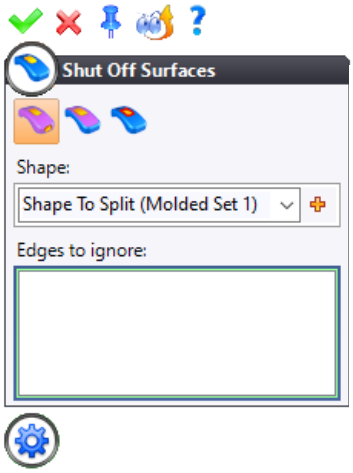


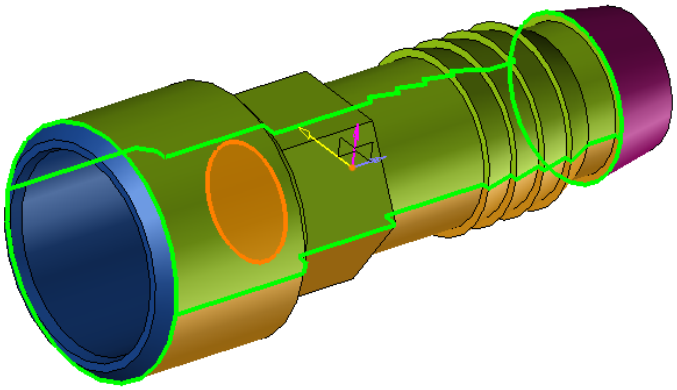
- Click on to **confirm**.
- Repeat the operation based on the top parting edge.



Shut off surface

- Create a **shut off surface** using the **Shape** mode.

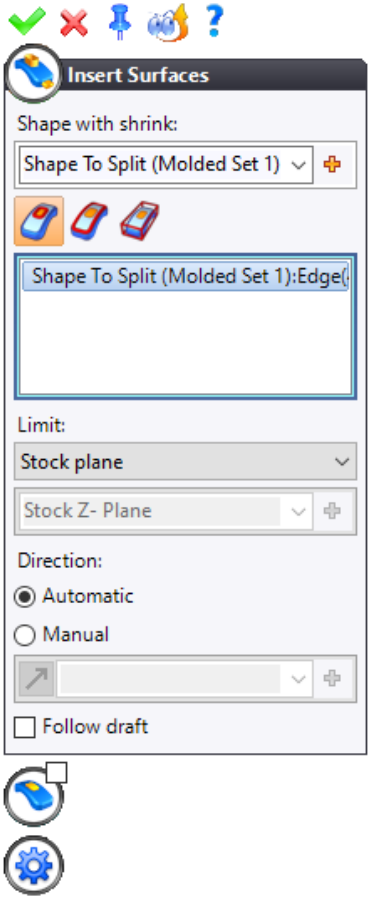


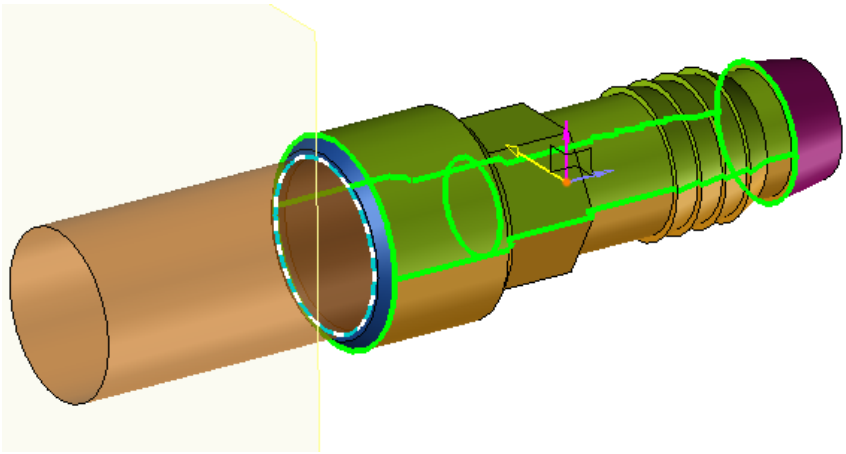


- Click on to **confirm**.

Insert surfaces

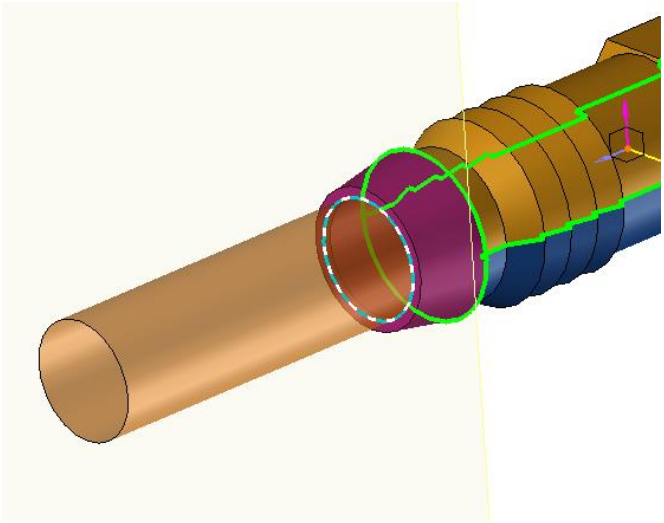
- Create an **insert surface** using the **Profiles or loops** mode to create the bottom pin.





- Click on to **confirm**.

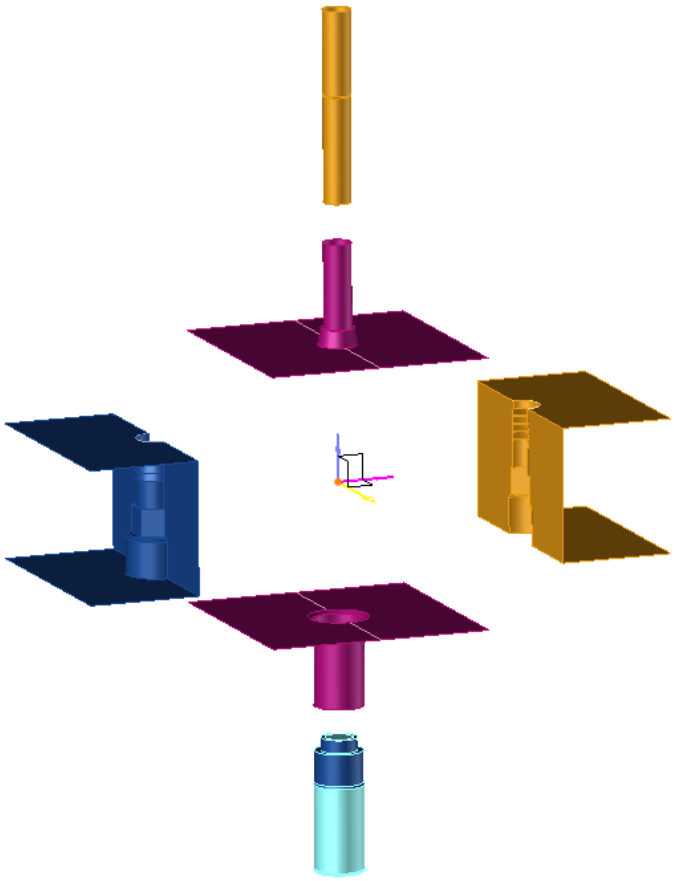
- Repeat the operation to create the top pin.



Creating the core cavity blocks

Parting shells

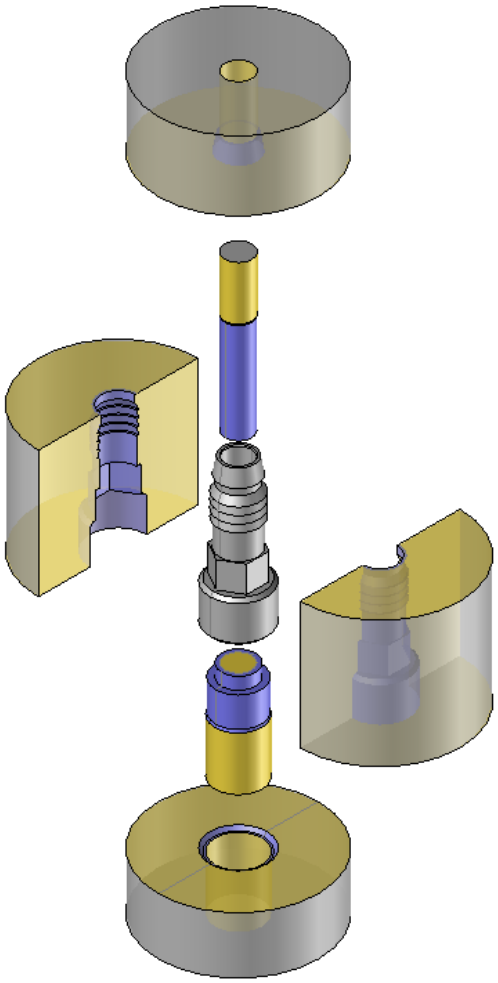
- Create the **parting shells**.

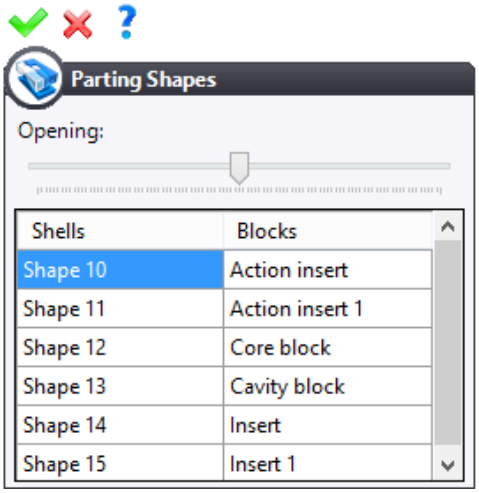


- Click on to **confirm**.

Parting shapes

- Create the **parting shapes**.

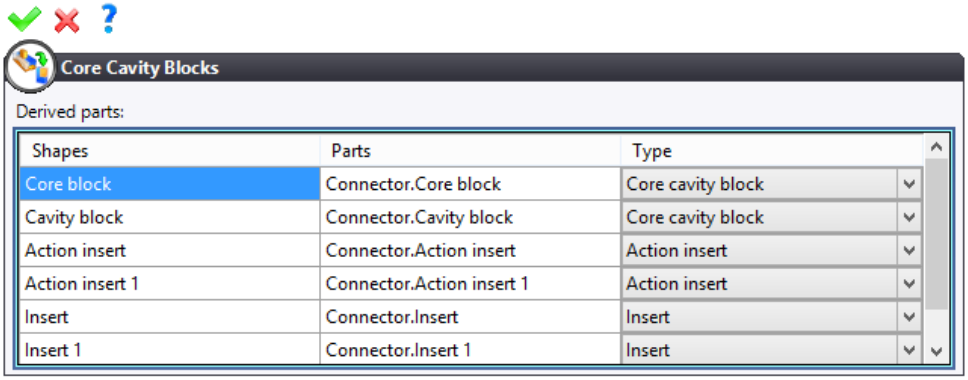




- Click on to **confirm**.

Core cavity blocks

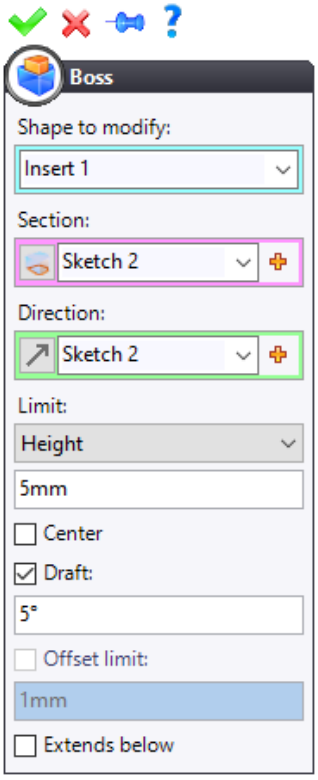
- Create the **core cavity blocks**.

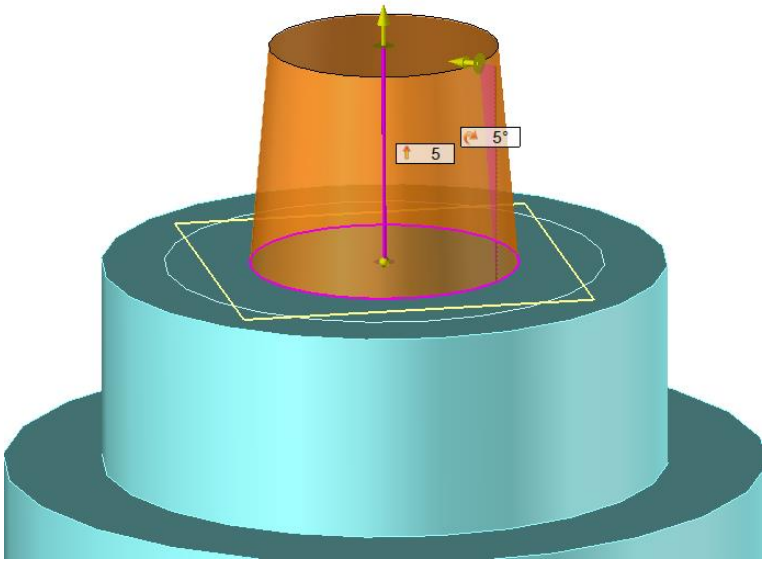


- Click on to **confirm**.

Modifying the insert surfaces

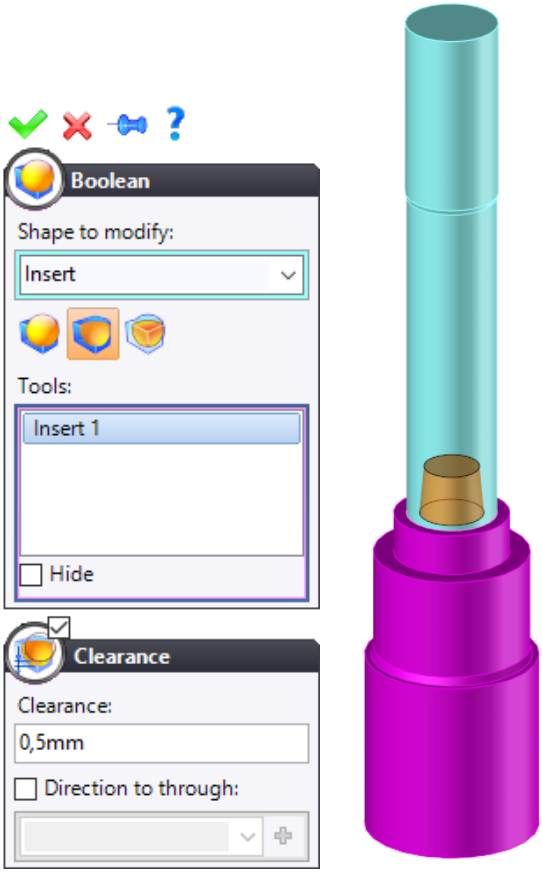
- From the split document, right-click on the bottom pin and select the **Show Only** command.
- Create a **sketch** on the flat face at the end of the bottom pin. Draw a *Ø6mm* **circle** centered on the pin's axis.
- Create a **boss** with the following settings.



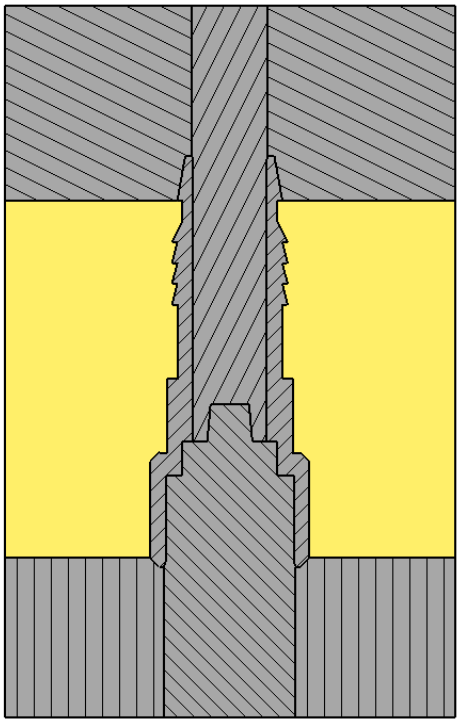


- Click on to **confirm**.
- **Show the parting shapes**.
- Hold down the **Ctrl** key and select the top and bottom pins, then right-click and select the **Show Only** command.

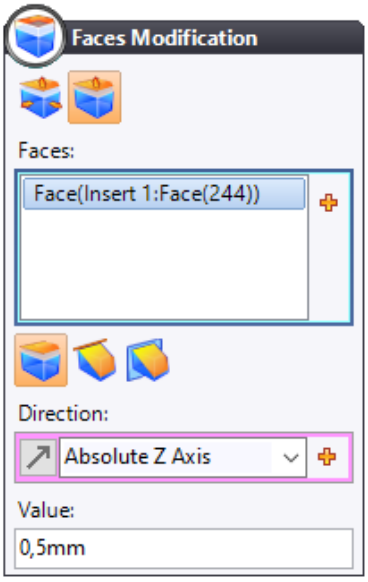
- Create a **Boolean** operation using the **Subtraction** mode. Enter a **clearance** of *0.5mm*.

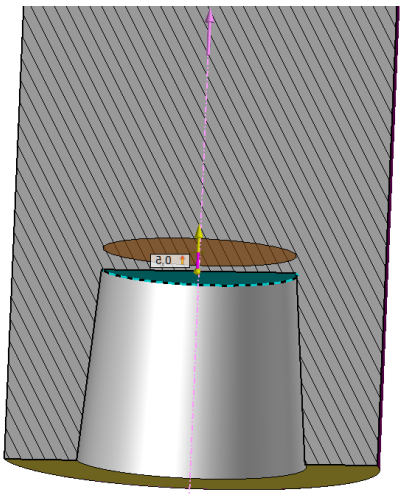


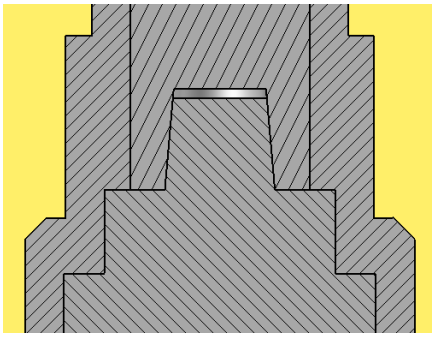
- Click on to **confirm**.
- **Show the parting shapes**.



- Select the **Faces Modification** command and use the **Move** mode to obtain the following result.







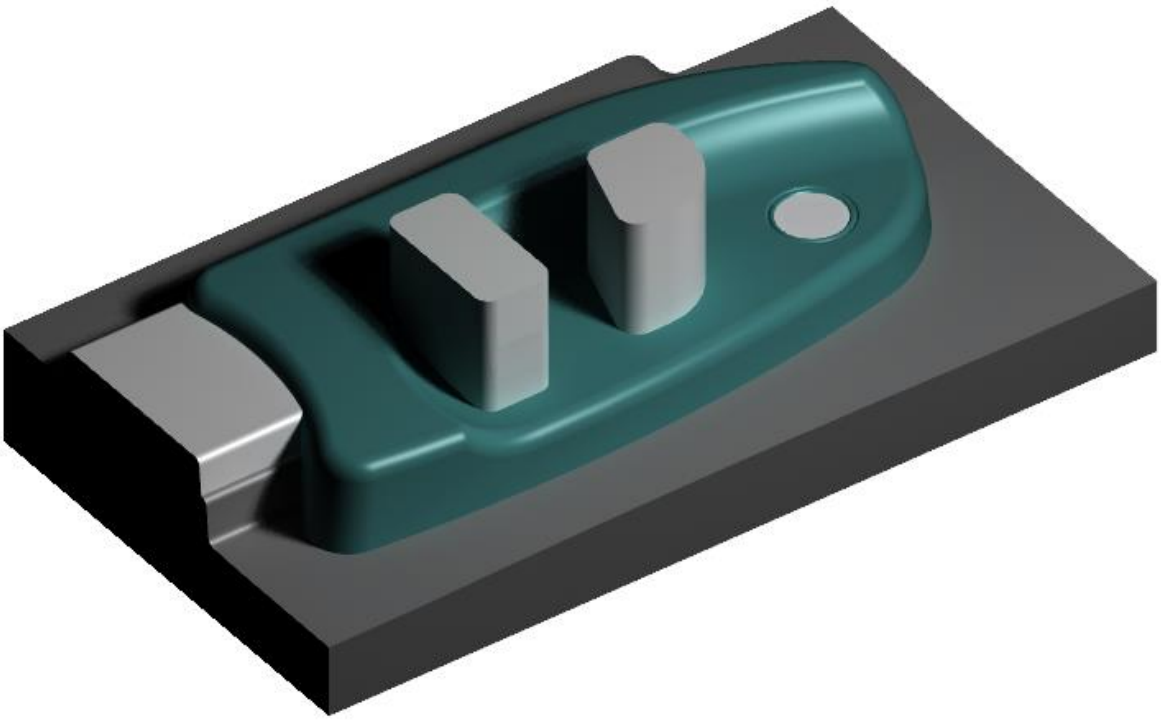
Check-in

- From the Project tree, **check** the *Exercise 04* folder into the vault.

Exercise 5

Concepts addressed:

- Creating a split document from an assembly
- Managing the different shapes of the split document
- Processing geometry linked to an insert
- Managing constraints on lofted parting surfaces
- Creating a side insert
- Creating an insert on sketch
- Creating the action inserts
- Inserting a component



Starting the study

Creating the split document

- From the Project tree, open the *doorArmrest* assembly document from the *Exercise 05* folder.
- Create a **Split** document from the assembly document.

Managing the different shapes

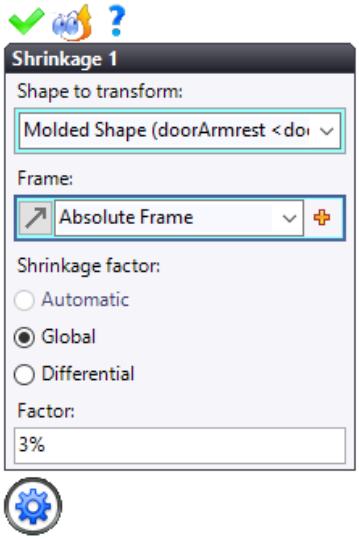
Note: If you want to perform a block split operation on an assembly of parts (for example, a molded part with metal inserts), you need to define the molded shapes and the insert shapes.

Defining the molded shape

- The **Molded Shapes** command opens automatically. Select the molded shape in the graphics area. The shrinkage will be applied to the plastic part.
- Click on to **confirm**.

Defining the shrinkage

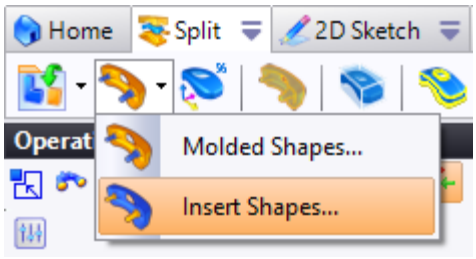
- Adjust the **shrinkage** to be applied to the **molded shape** to *3%*.



- Click on to **confirm**.

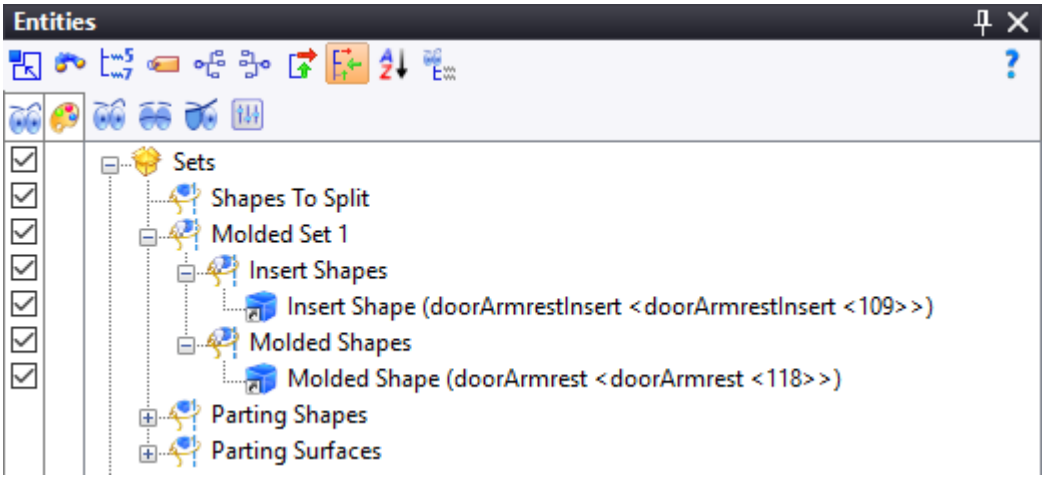
Defining the insert shape

- Select the **Insert Shapes** command and select the insert shape in the graphics area. This insert will be associated with the molded shape.



- Click on to **confirm**.

A **molded set** containing the molded shape and the associated insert is automatically created in the Entities tree.



The colors of the molded elements match the colors defined in the **Tools** > **Options** > **Split Blocks** > **Colors** command.

Creating the molded shape

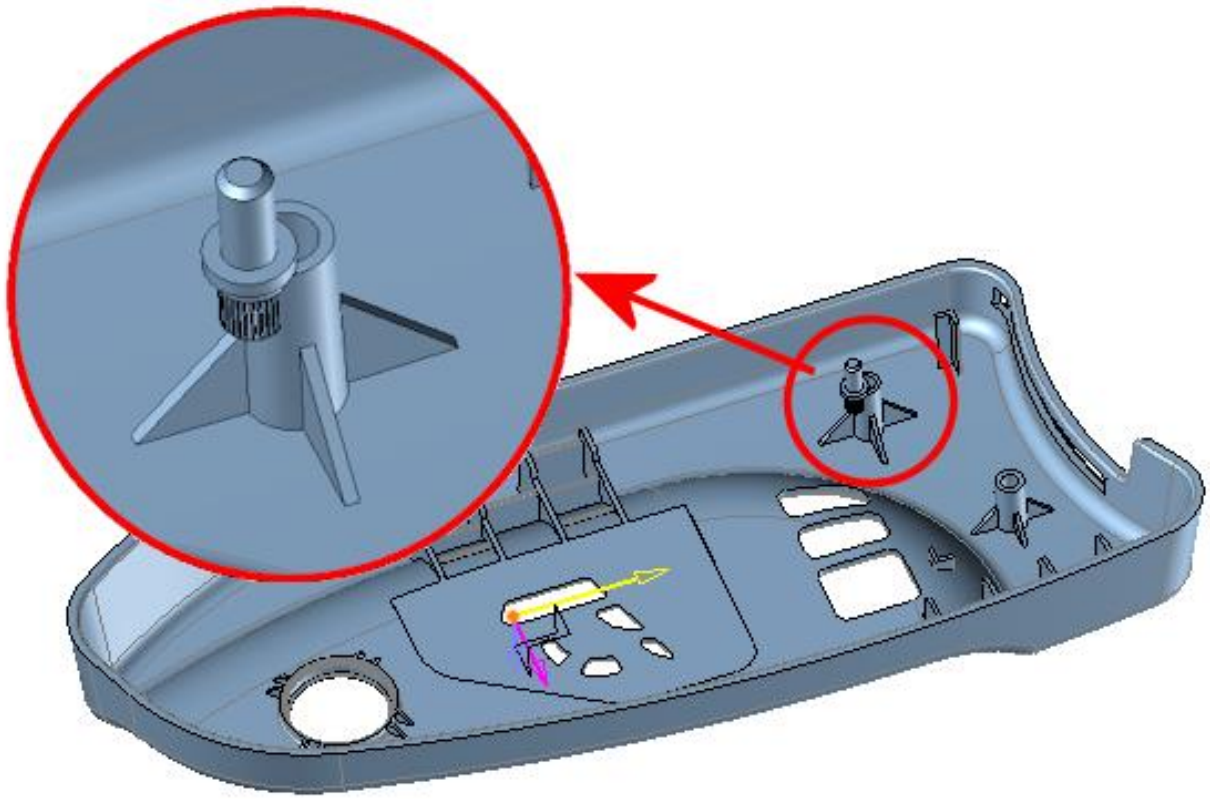
Creating the shape

- Switch to the **Parting stage**.

Note: A **shape to split** is already created in the Operations tree. It represents the union between the molded shape (and its shrinkage) and the insert shape(s).

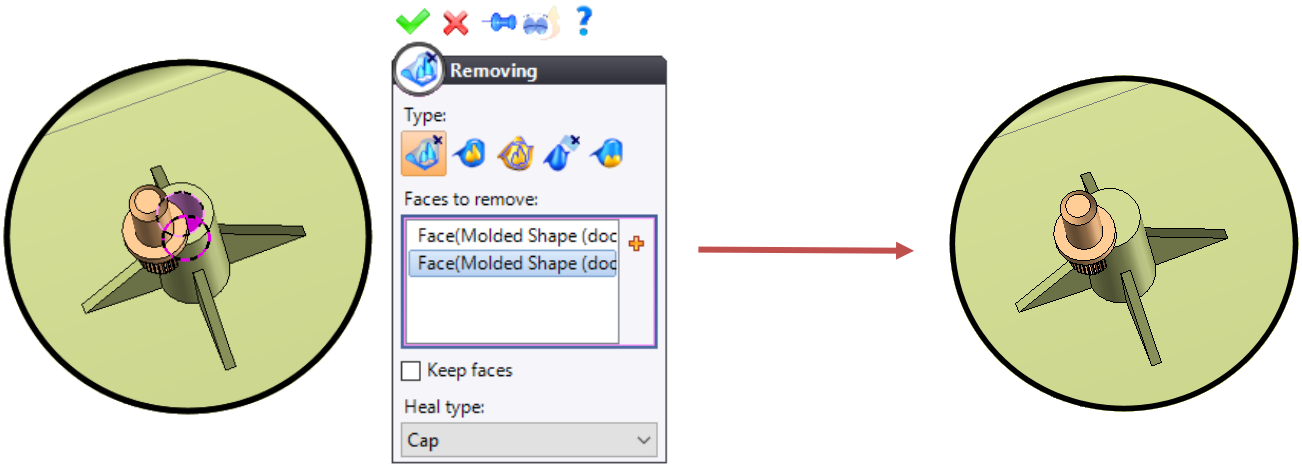
This shape to split will be used to calculate the parting line and create the parting shapes.

Here, the resulting shape to split is not appropriate since the current position of the insert no longer correspond to the position of the insert on the molded shape with shrinkage.

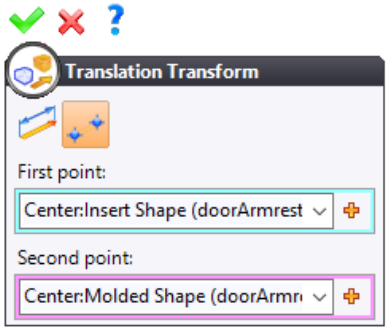


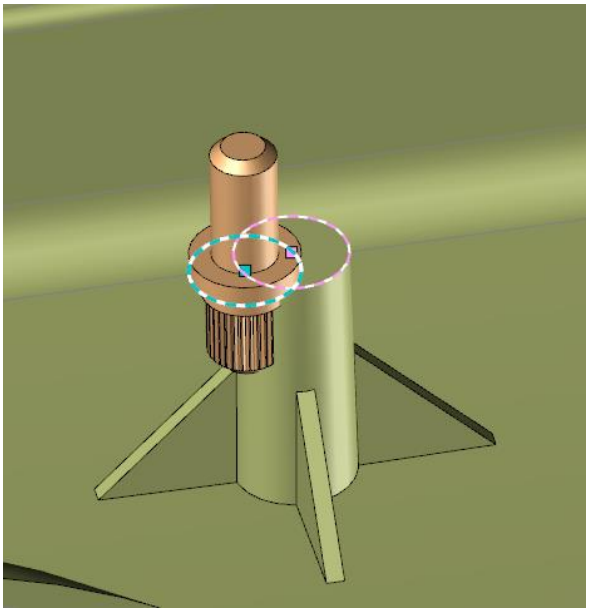
Geometry processing

- Switch back to the **Preparation stage** to modify the geometries of the molded shape and the insert.
- On the molded shape, fill the hole of the insert housing that is too large. To do this, **remove** the faces of the hole by selecting **Cap** as the heal type.



- From the **Shape** tab, select the **Other Operations** > **Transform** command to move the insert.
- Select the insert as the **shape to transform**, then click on the icon and select the **Translation Transform** command.
- Select the **By two points** mode and select the first and second points as shown below.



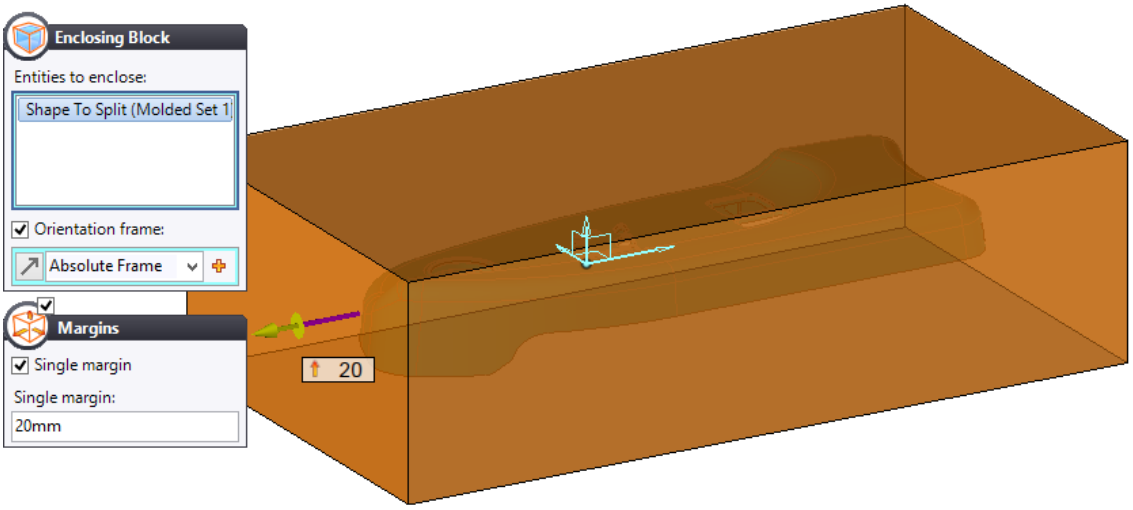


- **Confirm** the translation transformation.
- **Confirm** the transformation.
- Switch back to the **Parting stage**. The shape to split is updated.

Note: Concerning the processing of the geometries of the molded shapes, every case is different. The geometric processing that was performed on the molded shape and the insert is just one specific example.
Various types of processing are possible.

Creating an enclosing stock

- From the Operations tree, move the insertion cursor under the **Stock** operation.
- From the **Shape** tab, create an **enclosing block** from the shape to split by entering a **single margin** of *20mm*.



- Click on to **confirm**.
- **End the insertion**.
- **Edit** the **Stock** operation and select the previously created block to define the user stock.

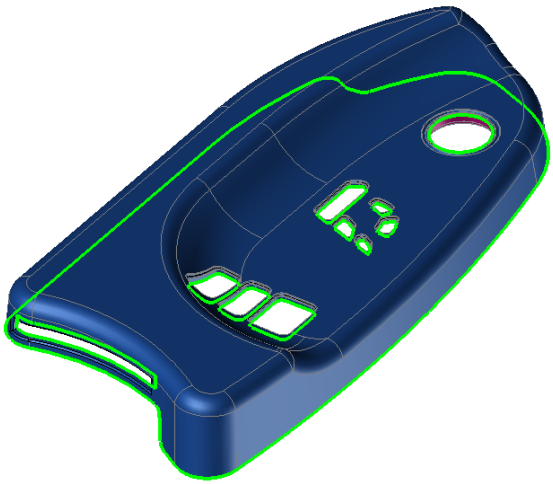
Creating the parting edges

Creating the candidate edges

- Create the **candidate edges**. From the **Molding axis** drop-down list, select the **Z axis of the molded set frame**.
- Move to the next step.

Creating the parting edges

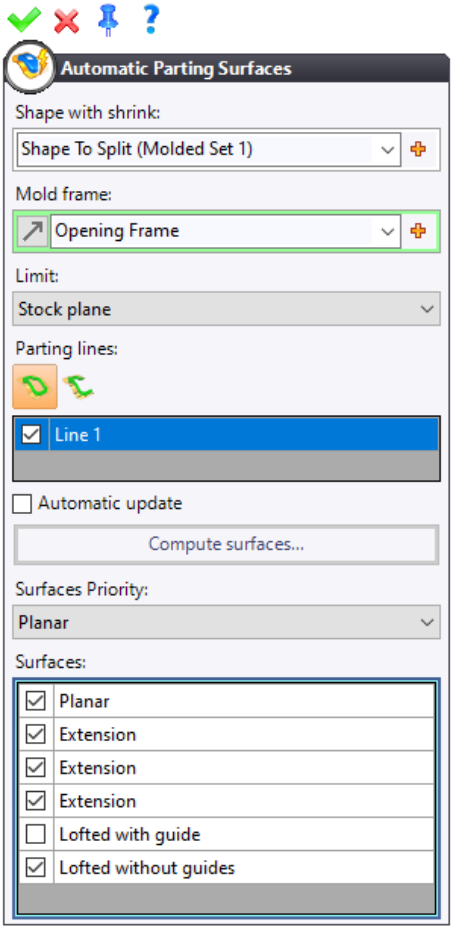
- Create the **parting edges**. Select the external path of the part.
- Click on to **confirm**.
- Create four other **Parting edges** operations for the part's openings.

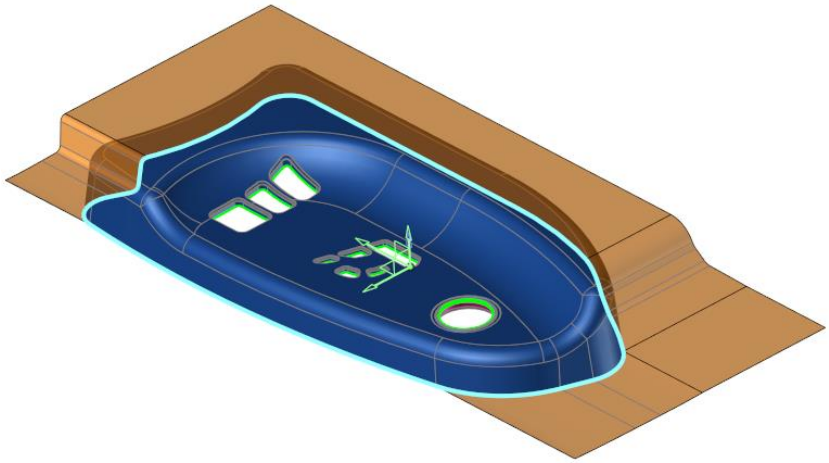


Creating the parting surfaces

Creating the automatic parting surfaces

- Create the **automatic parting surfaces**. To do this, click on the **Compute surfaces** button and uncheck the **Lofted with guides** box.

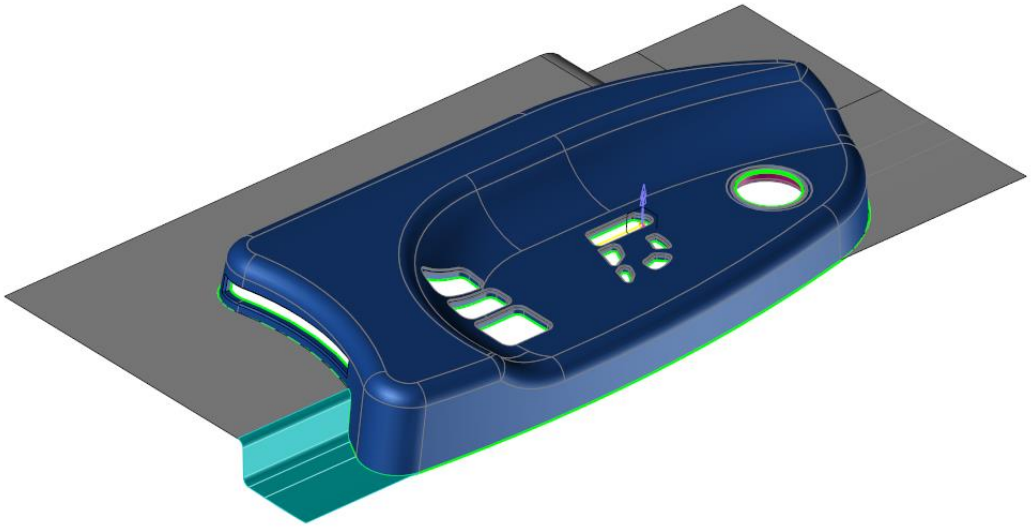




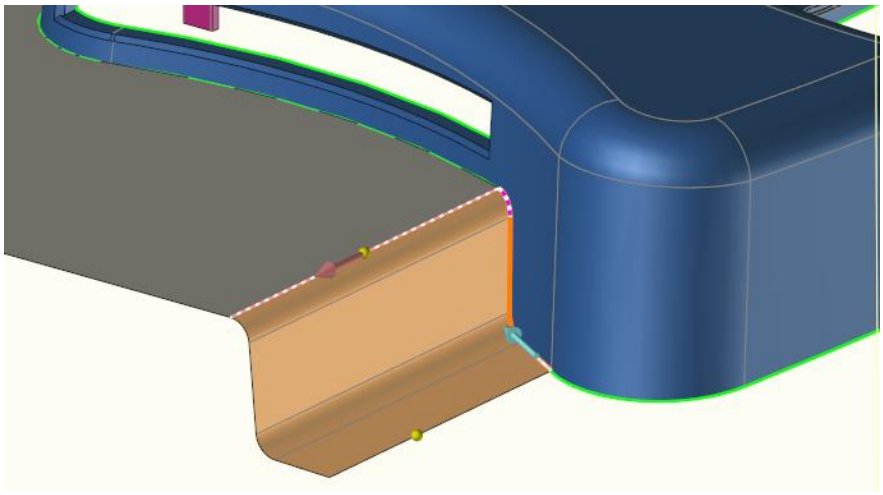
- Click on to **confirm**.

Editing the surfaces

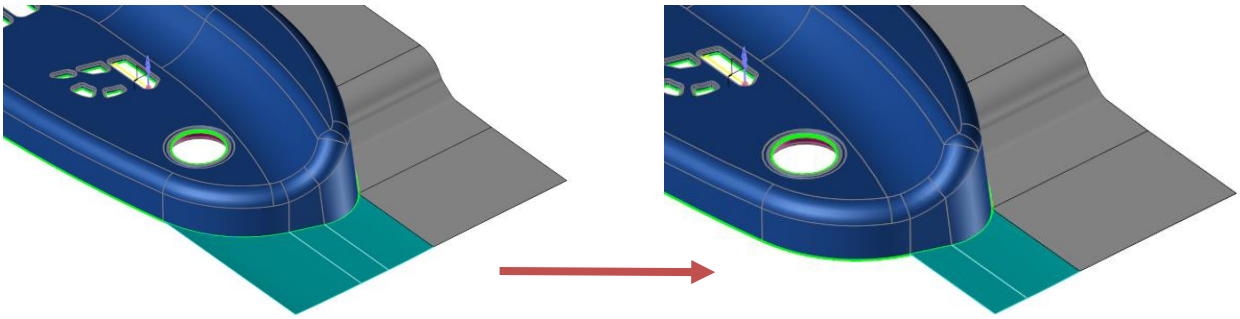
- Right-click on the surface as shown below and **edit** it.



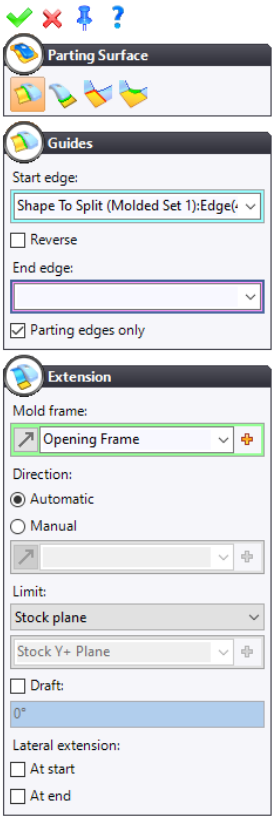
- Modify the start edge as shown below.

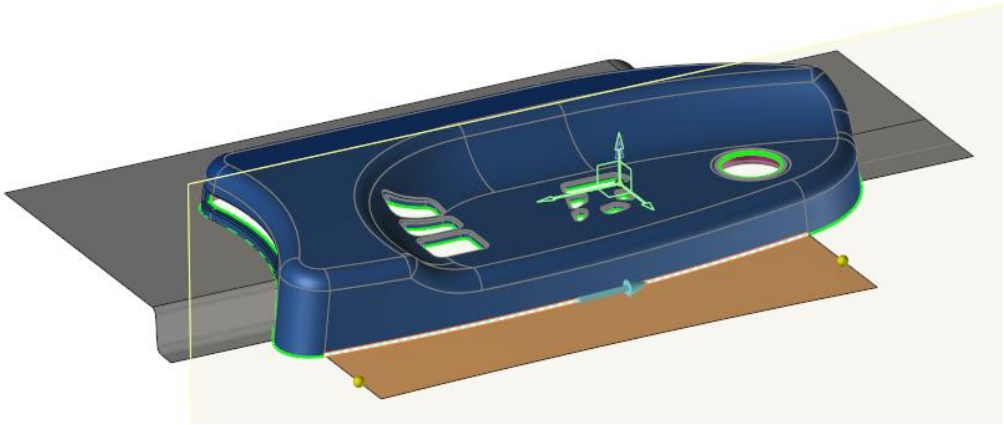


- Click on ✔ to **confirm**.
- Repeat the procedure for the following surface.



- Create a new **parting surface** using the **Extension** mode.

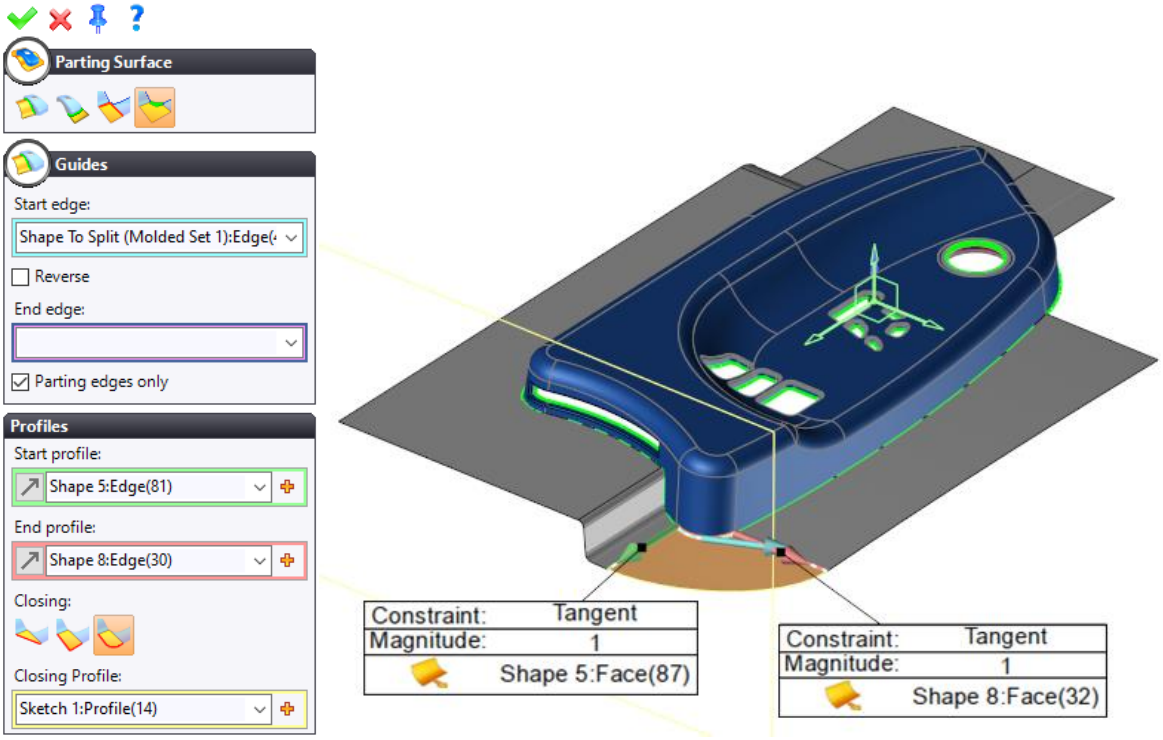




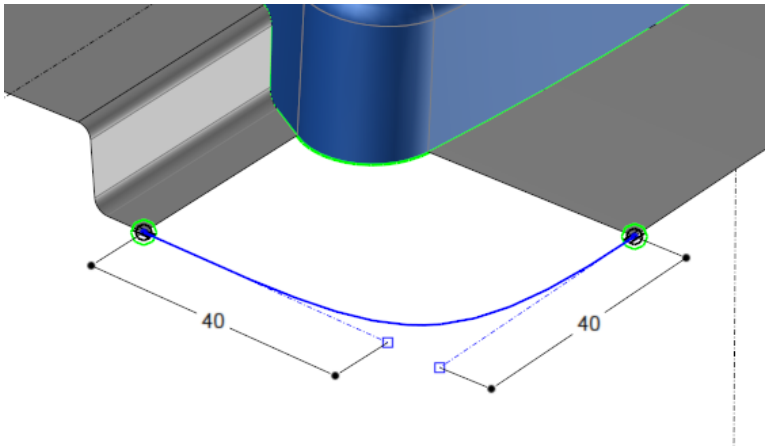
- Click on ✔ to **confirm**.

Creating the lofted surfaces with guides and tangency constraints

- Create a **parting surface** using the **Lofted with guides** mode and select **Profile** as the closing type. Select the **start edge** and then the **start** and **end profiles** as shown below. Right-click on the arrows of the start and end profiles to **add a constraint** to each profile.

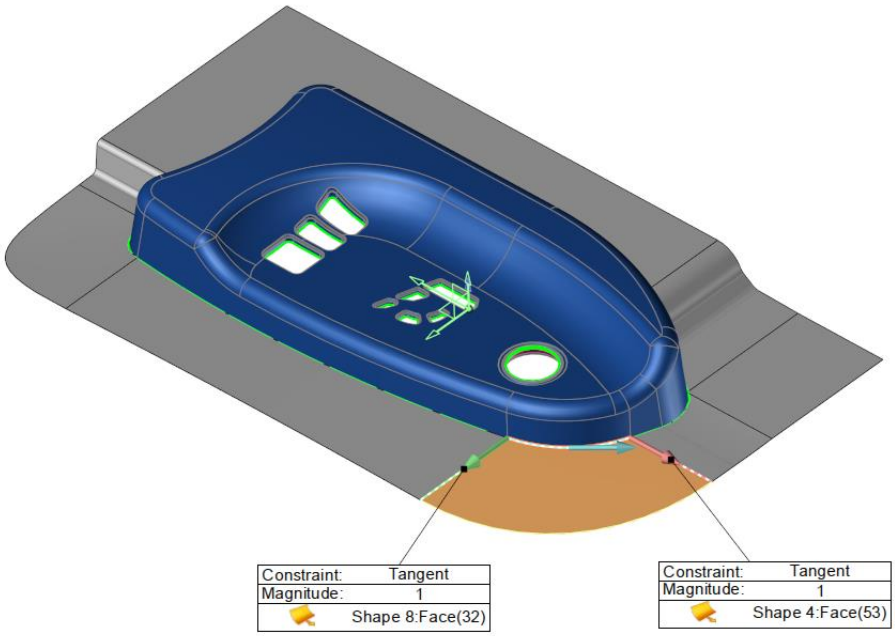


- Click on to **confirm**.
- Right-click on the previously created surface and **edit the sketch**.
- Modify the tangency values to *40mm*.



- **Confirm** the sketch.

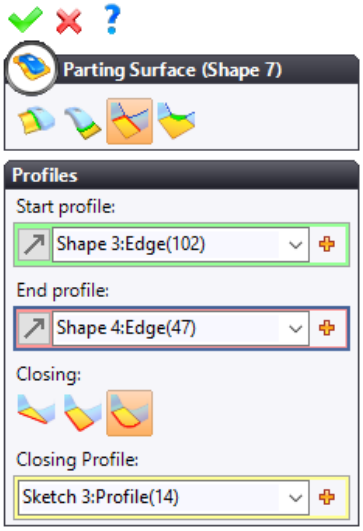
- Repeat the previous operation on the following surface.

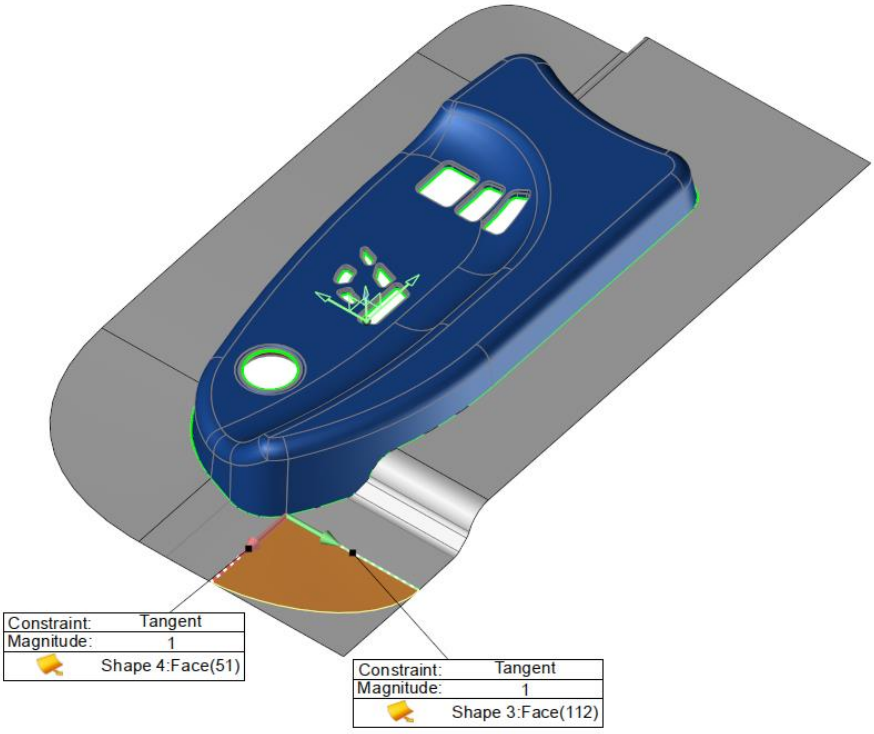


- Click on ✔ to **confirm**.

Creating the lofted surfaces without guides and tangency constraints

- **Edit** the surface as shown below, then right-click on the arrows of the start and end profiles and **add a constraint**.





- Click on ✔ to **confirm**.

Surface continuity check

Creating the parting shells

- Create the **parting shells**. Red edges indicate that errors were found, which is normal since the shut off surfaces have not yet been created.
- Click on to **confirm**.

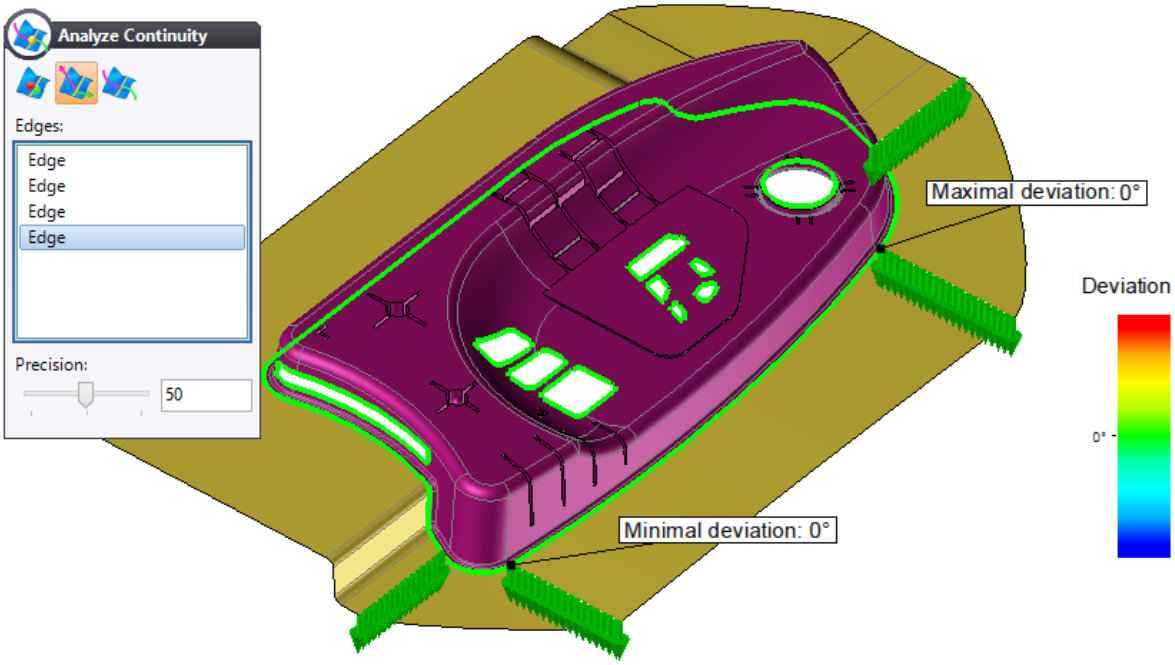
Continuity analysis

- From the Operations tree, **hide** the top parting shell.
- From the **Analysis** tab, select the **Analyze Continuity** command and select the **Tangency** mode.

Note: Analyzing the continuity in **Tangency** mode allows you to check the tangency continuity of the different parting surfaces that you have just created.

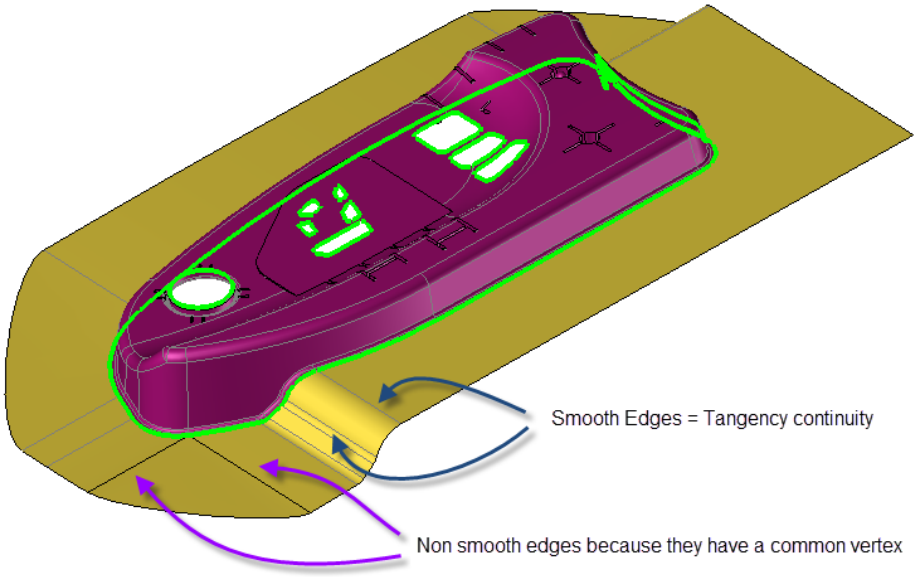
- Select edges or the lofted surfaces of the bottom parting shell.

The tangency deviations are represented by arrows. Here, the surfaces are continuous in tangency.



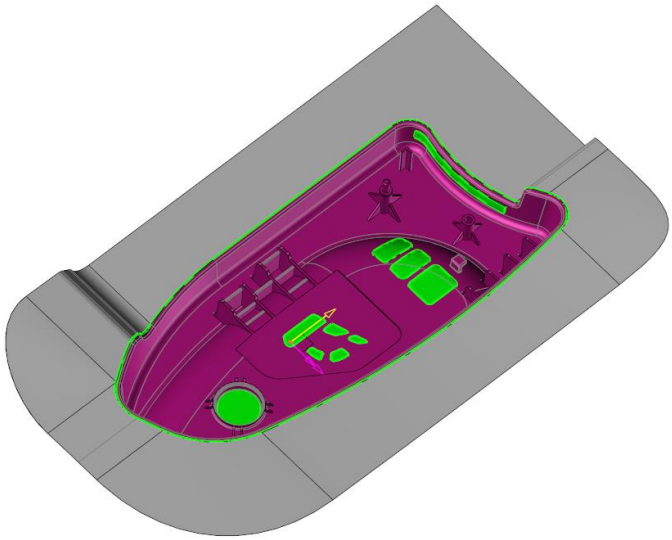
- Click on to **confirm**.

Note: On a sewn surface, you can quickly and visually determine whether its faces are continuous in tangency. In fact, the edges between tangency continuous faces are **smooth**. However, it must be mentioned that the edges of the lofted without guide surface are shown as **non-smooth** edges. Mathematically, they are not continuous in tangency because they have a common vertex, even though in our case we consider them as continuous in tangency with their neighboring surfaces.



Creating the shut off surfaces

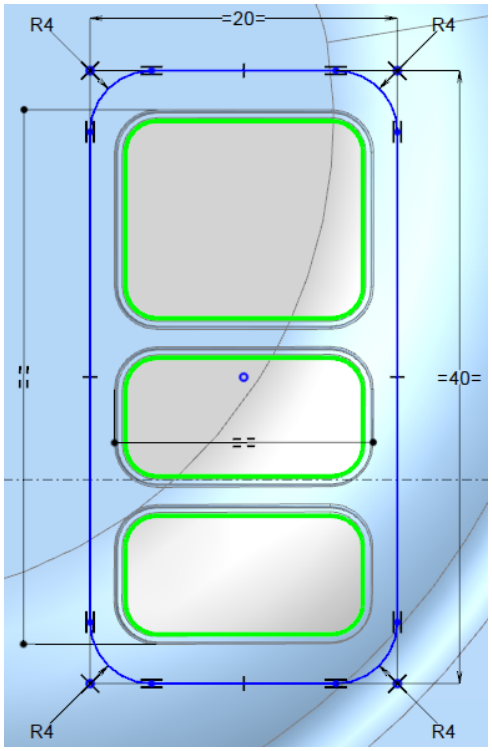
- Switch back to the **Parting stage**.
- Create four **Shut Off Surfaces** operations using the **Face** mode to close all openings.



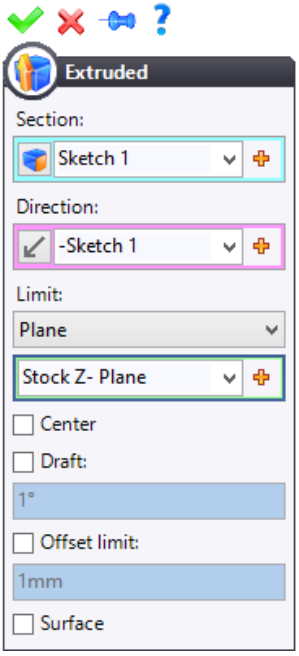
Creating surfaces for the vertical inserts

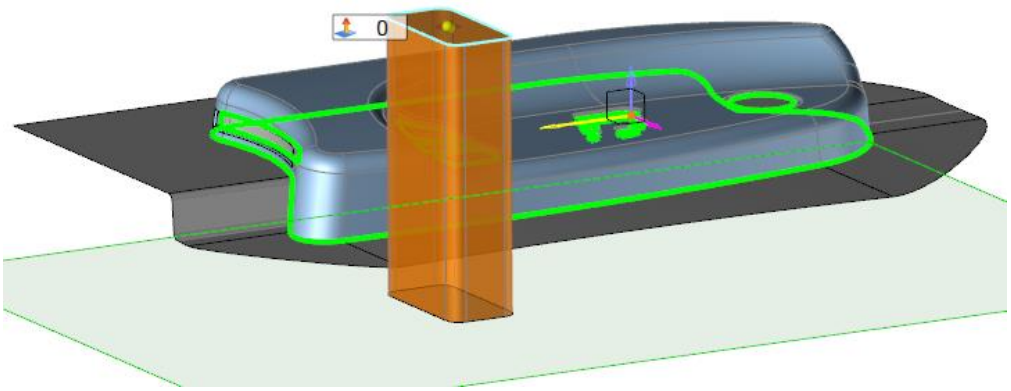
Insert surfaces on shape

- Click on the **Hide/Show Stock** icon at the bottom right of the graphics area to display the stock**.**
- Create a new **sketch** by selecting the stock's top face as the support plane.
- Click on the **Hide/Show Stock** icon again to hide the stock.
- Draw a **rectangle** with *4mm* fillets as shown below.



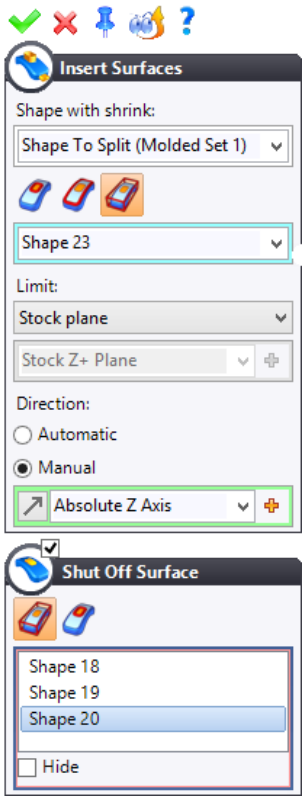
- Create an **extruded** shape from the previously created sketch. Select the **Z- plane of the stock** as the limit.

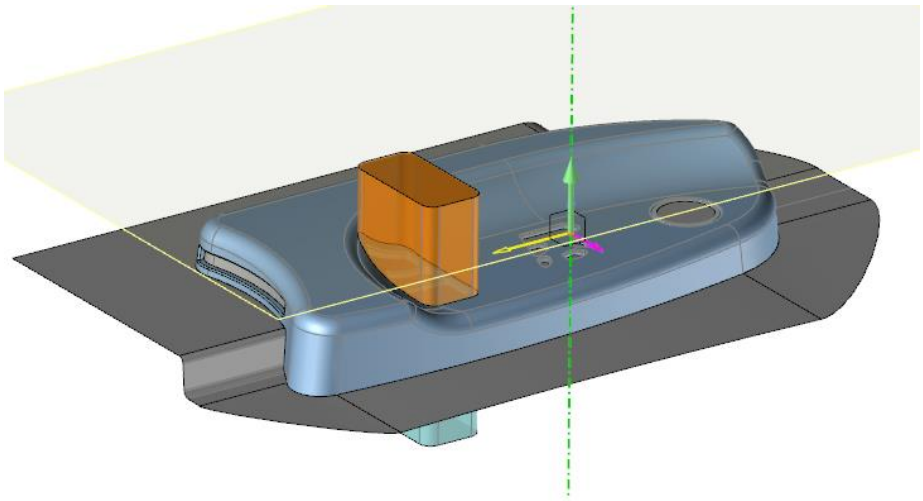




- Click on to **confirm**.

- Create **insert surfaces** using the **Shape** mode.
- Select the previously created extruded shape, and then select the shut off surfaces linked to that insert.





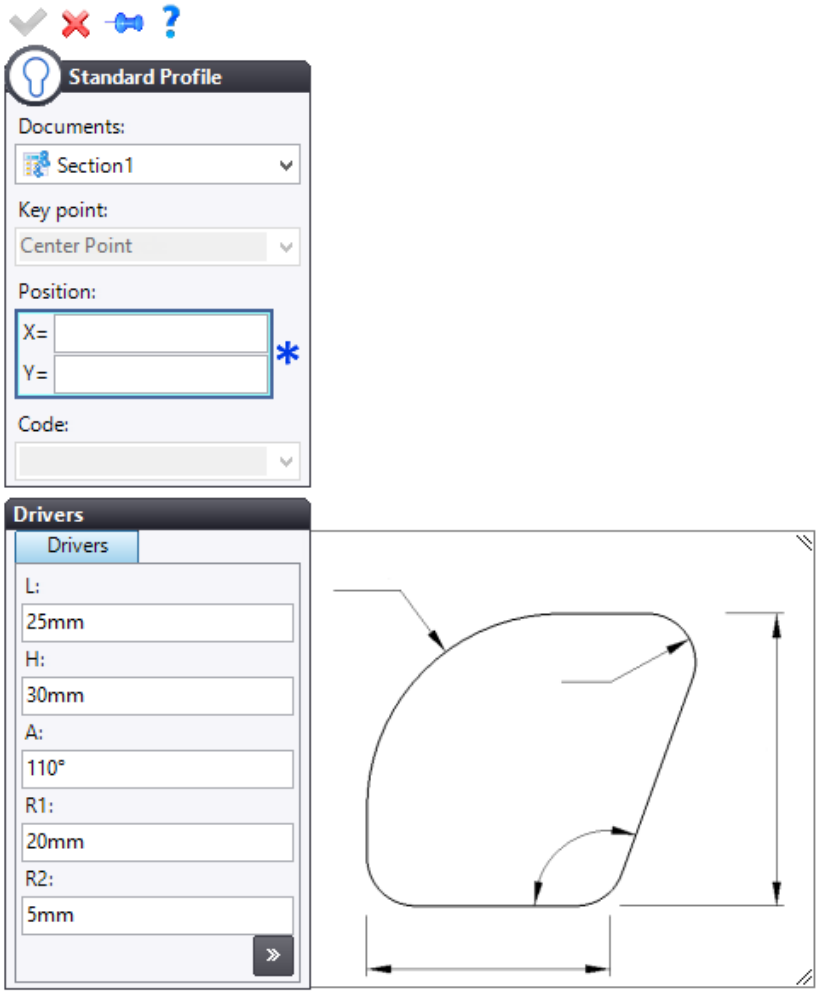
- Click on to **confirm**.

The parting edges between the insert surfaces and the shape to split are automatically created. Accordingly, the color of the molding areas is updated according to these new edges.

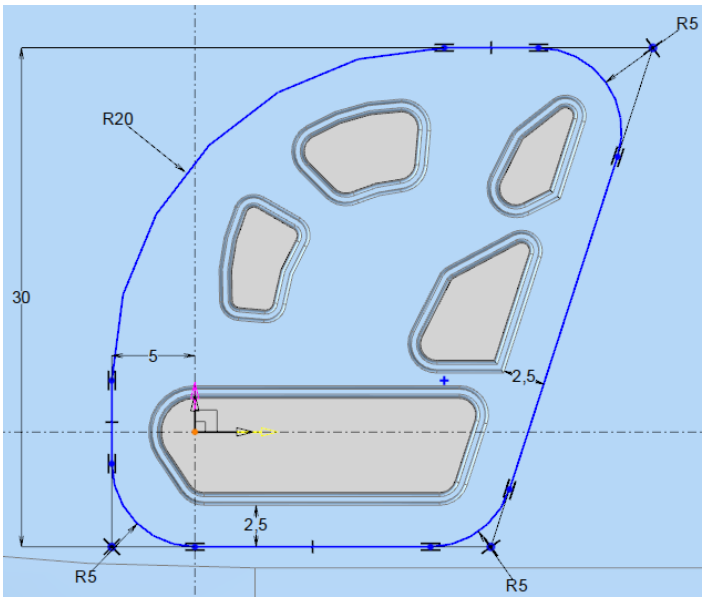
Note: Calculation and/or reaction times between each selection are longer when the result preview is displayed.

Insert surfaces on sketch

- Create a new **sketch** by selecting the **Z+ plane of the stock** as the support plane.
- Select the **Standard Profile** command. Select the **Section1** document. The driver values are automatically entered.



- Delete the 25mm dimension, the 110° angle and constrain the contour as shown below.



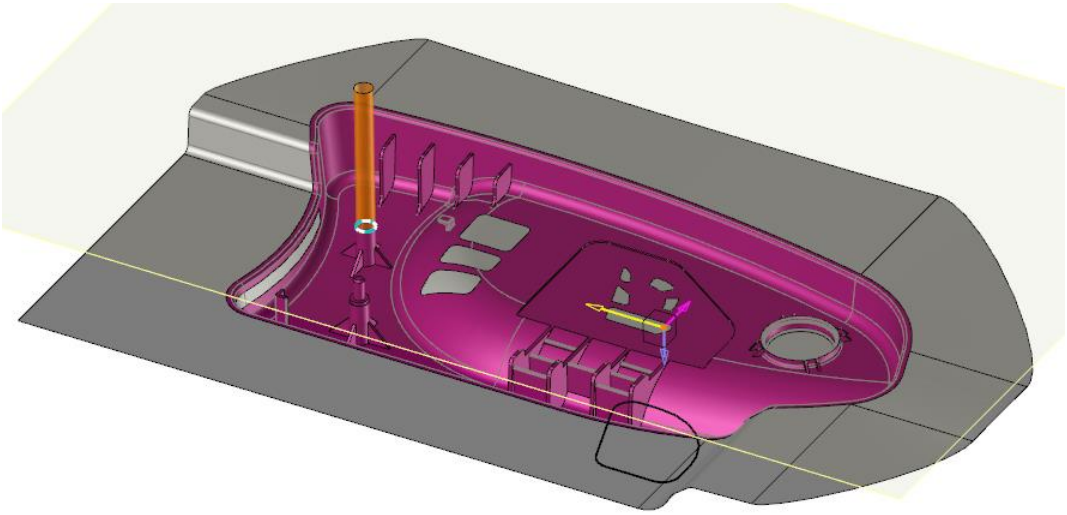
- **Confirm** the sketch.

- Create **insert surfaces** using the **Profiles or loops** mode.
- Select the previously created sketch.
- Click on to **confirm**.

You will notice that the color of the molding areas is updated following the creation of new parting edges.

Insert surfaces on edge

- On the bottom side of the part, create an **insert surface** in **Profiles or loops** mode by selecting the following part edge.

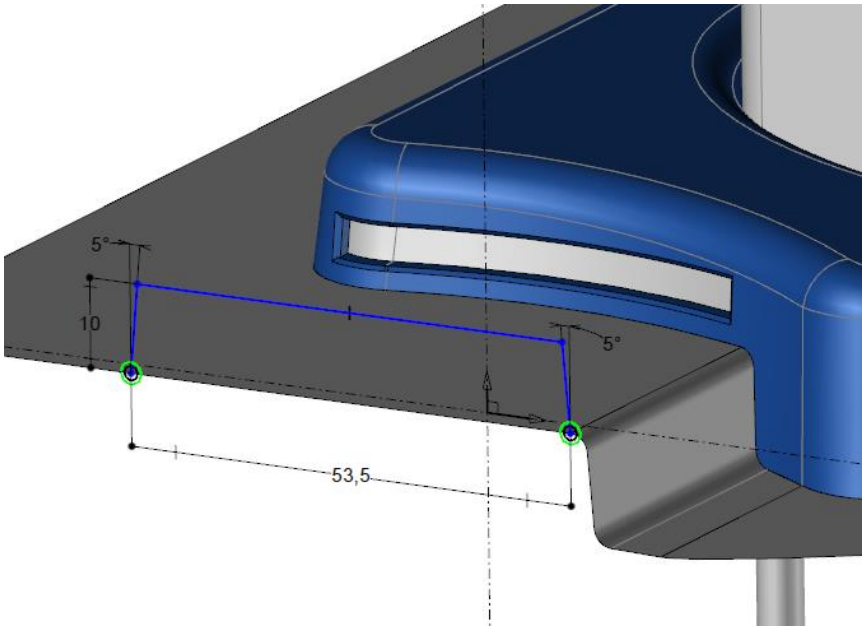


- Click on to **confirm**.

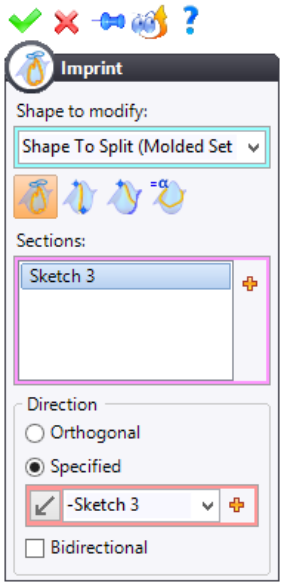
Creating a surface for the side insert

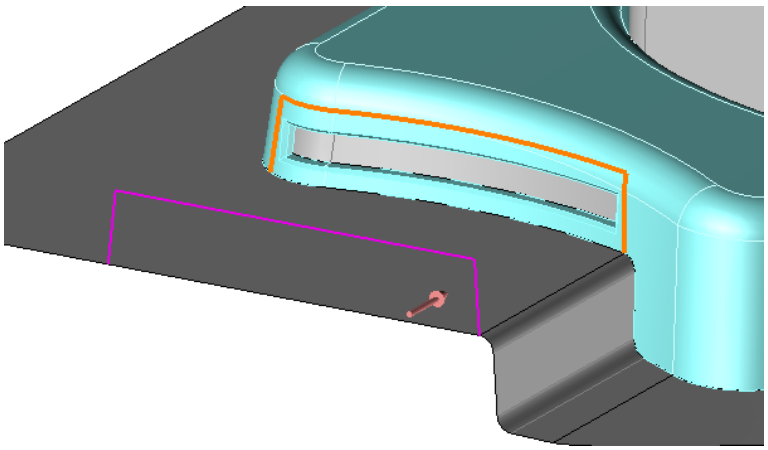
Note: In the case of a side insert that is located on the outside of the part, we recommend that you create the surfaces of this insert by creating parting surfaces rather than insert surfaces.

- Create a new **sketch** by selecting the **X+ plane of the stock** as the support plane.

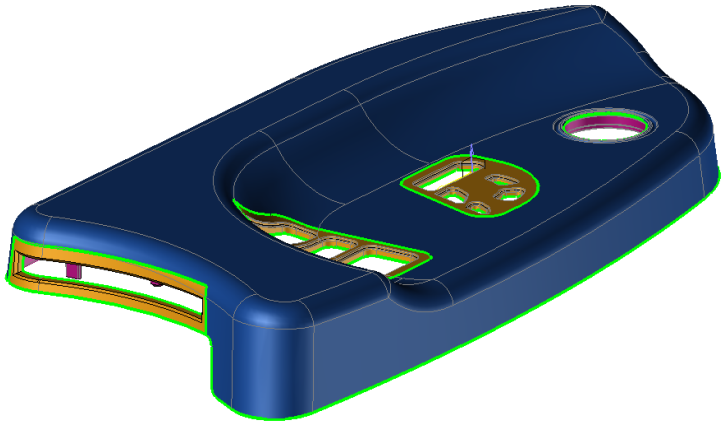


- **Imprint** the resulting sketch on the shape to split. Select **Specified** as the imprint direction (normal to the sketch).

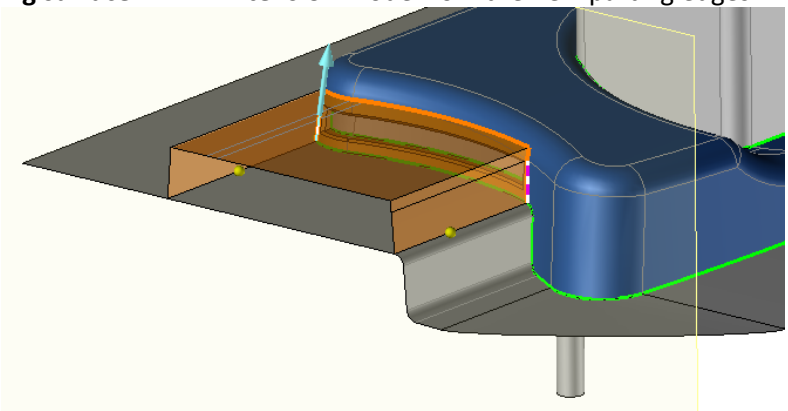




- Create a new **parting edge** on these new edges.



- Click on to **confirm**.
- Create a **parting surface** in **Extension** mode from the new parting edges.



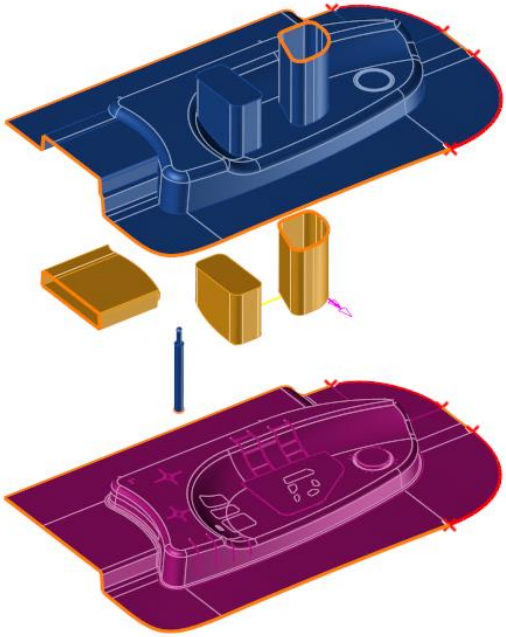
- Click on to **confirm**.

Creating the parting shapes

Creating the parting shells

- Create the **parting shells**.

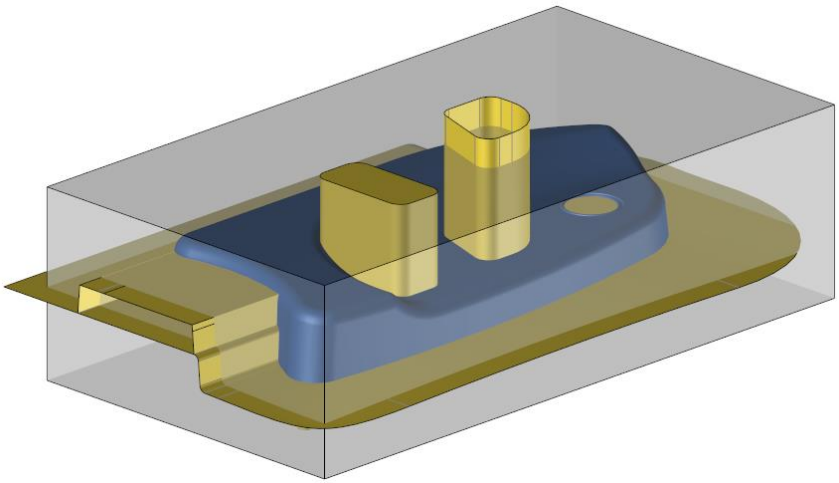
Some edges of the top and bottom shells are shown in red, which means there is a problem: the parting shells are not valid for the split operation.



- Click on to **confirm**.

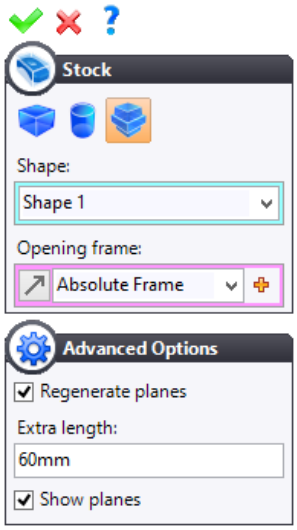
Editing the stock

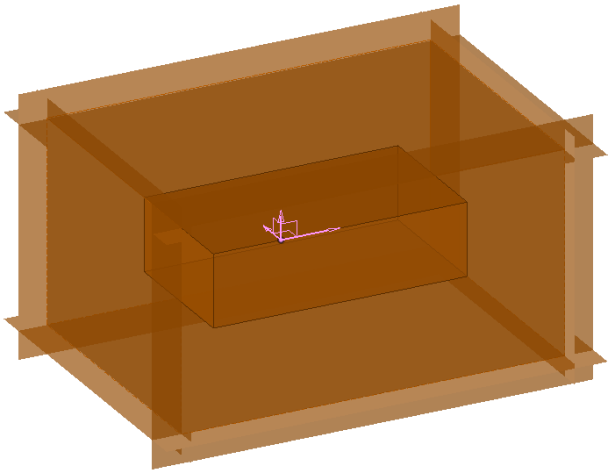
- Click on the **Hide/Show Stock** icon in the graphics area**.** The defined parting surfaces do not allow you to split the stock.



- Select the **Stock** command to edit the stock defined earlier in the exercise.

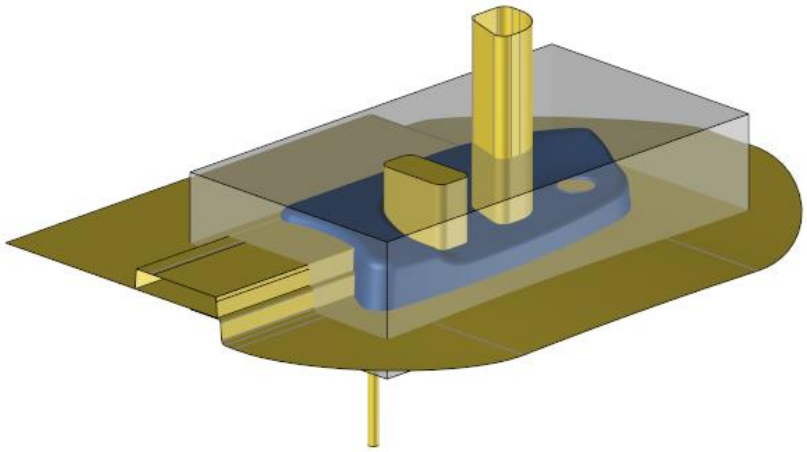
- Click on the **Advanced Options** icon and set an **extra length** of *60mm* to the planes generated by the stock.



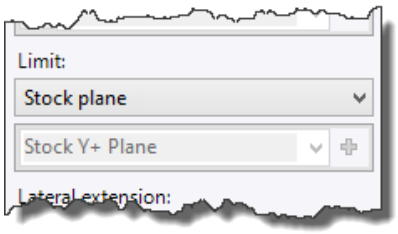


- Click on to **confirm**.

The parting surfaces are updated and will allow the stock to be split and the core cavity blocks to be created.



Note: When creating the stock, planes are generated on each face of the stock and are offset to an extra length set by the user.
These planes are used when creating the parting surfaces and insert surfaces, when the selected limit is **Stock plane**.

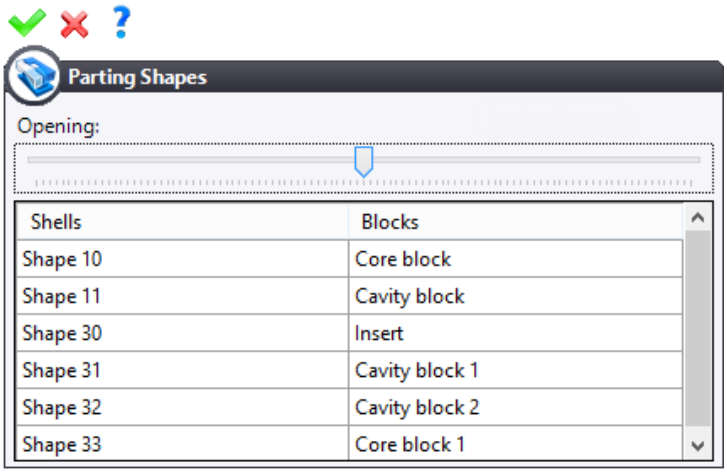


Updating the parting shells

- **Hide the stock**.
- Generate the **parting shells** to update them.
- Click on to **confirm**.

Creating the parting shapes

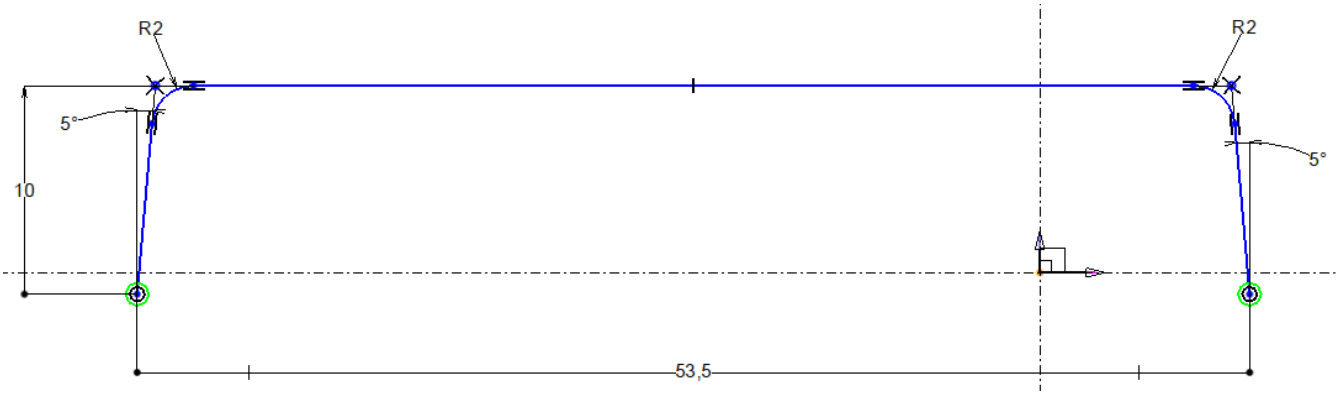
- Create the **parting shapes**.



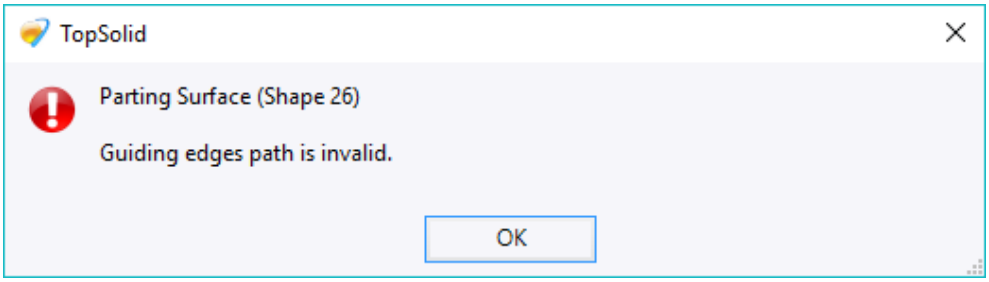
- Rename the blocks if necessary.
- Click on to **confirm**.

Modifying the side insert

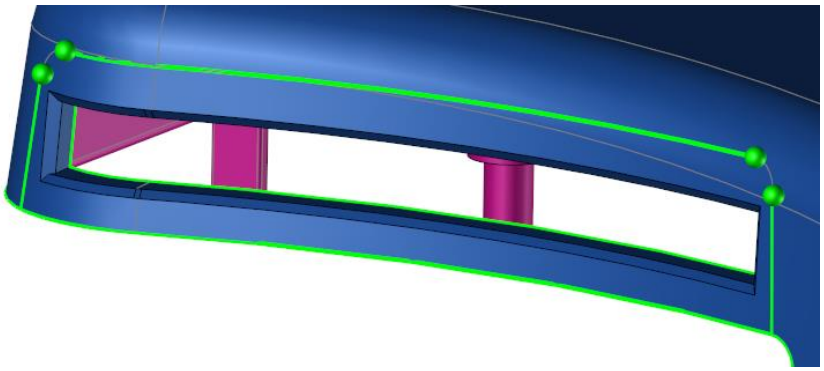
- From the Entities tree, **edit** sketch 3 which generates the side insert.
- Add *2mm* fillets to each top vertex of the contour.



Following this modification, the document is updated, which results in errors. The parting edges based on the sketch imprint are no longer closed. The surface based on these edges is therefore invalid.



The green spheres indicate that the parting edge path is open.



- Right-click on the open parting edge in the graphics area and select the **Edit** command.
- Add the two edges resulting from the fillet imprint operation to close the edge.

The parting surface linked to this edge is updated.

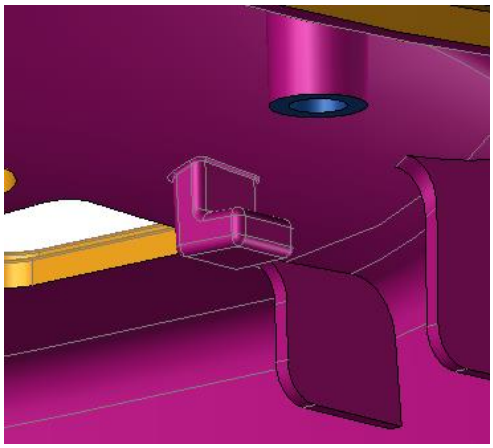
- Click on to **confirm**.
- Recreate the **parting shells** to update them.
- Click on to **confirm**.
- **Confirm** the update of the **parting shapes** that follows the update of the shells.

Adding a lifter component

Creating the lifter shape

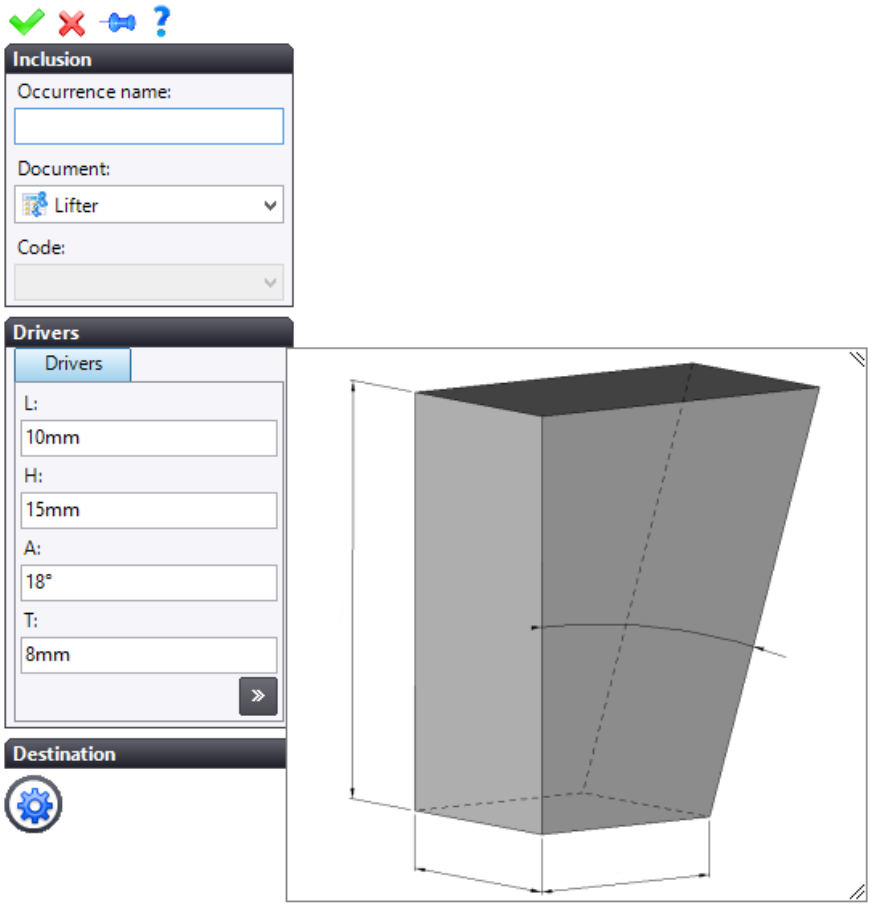
- Switch to the **Parting stage**.
- Click on the **Hide/Show Parting Surfaces** icon.

You will notice that a hook is located inside the part.

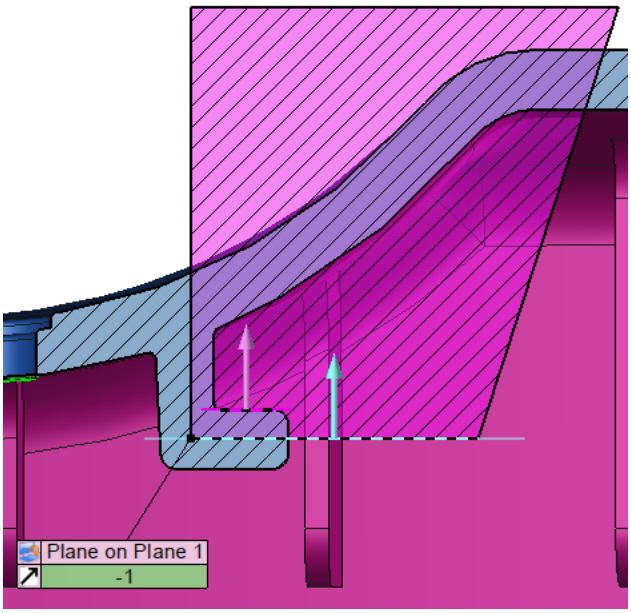


- From the Project tree, drag and drop the *Lifter* family document from the *Exercise 05* > *Components* folder into the graphics area.

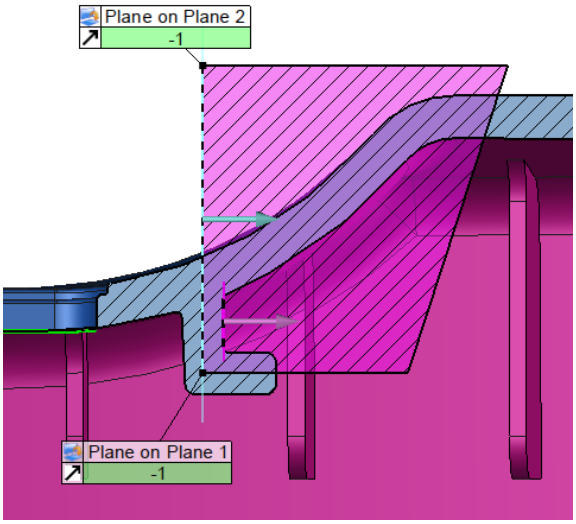
- Enter the following values for the drivers.



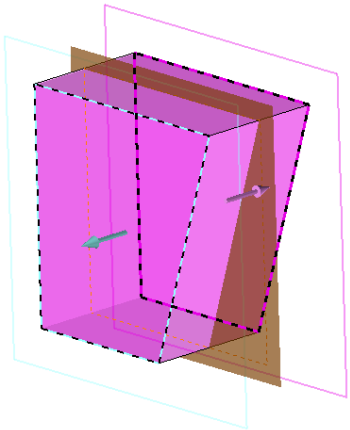
- Click on ✔ to **confirm**.
- For the positioning, select the bottom face of the lifter as the **source** geometry and the hook's horizontal top face as the **destination** geometry.
- Double-click in the green zone of the **Plane on Plane 1** constraint label and enter an offset value of *-1mm*.



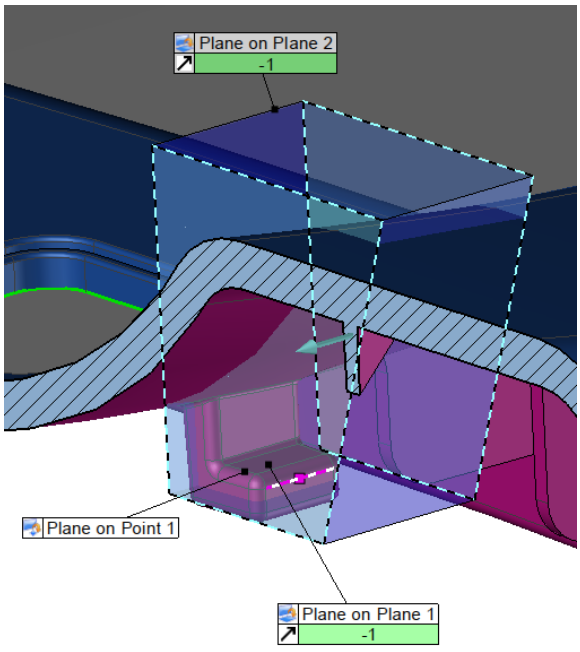
- Repeat the procedure with the two vertical planes.



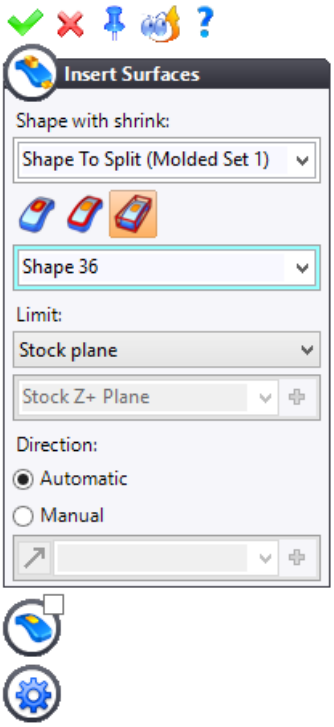
- Select the **Plane on Point** command. For the **source plane**, create a **midplane** between the two side faces of the lifter.

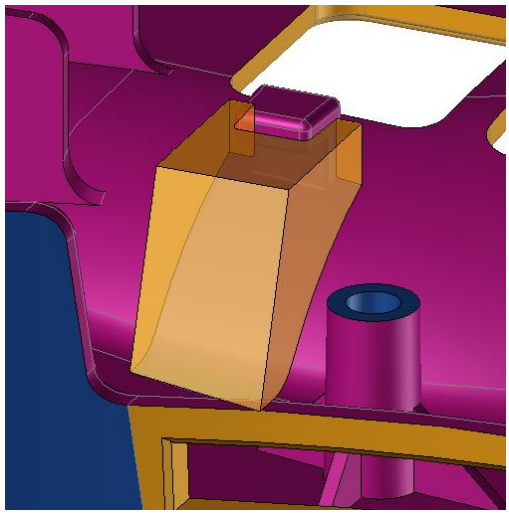


- Click on to **confirm**.
- For the **destination point**, select the midpoint on one horizontal edge of the hook.



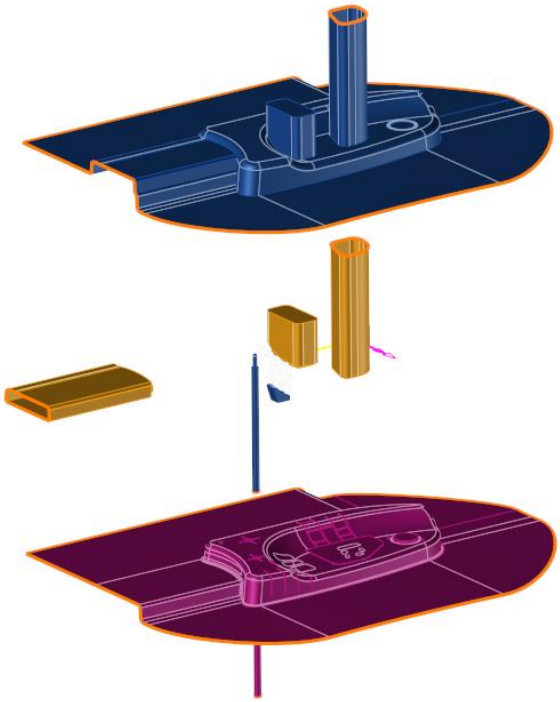
- Create an **insert surface** using the **Shape** mode.



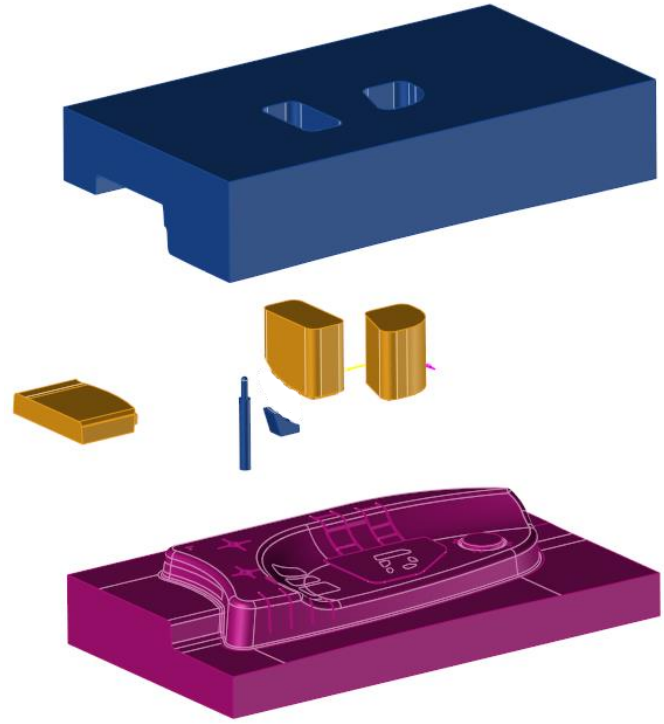


Core cavity blocks

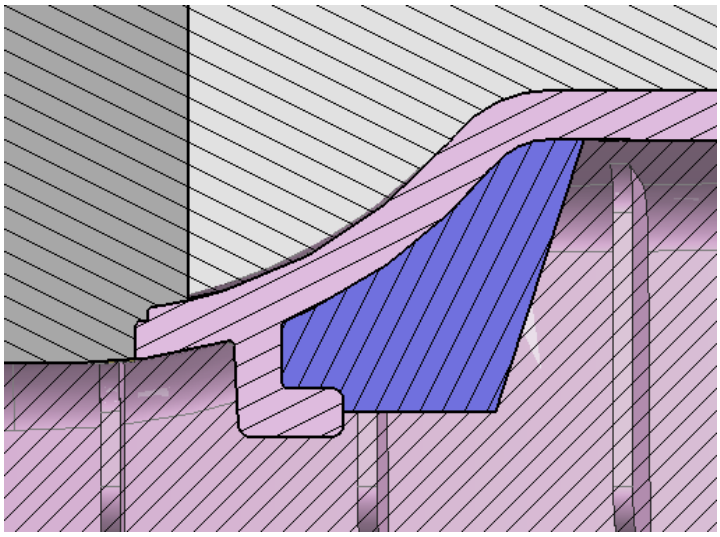
- Recalculate the **parting shells**.



- Calculate the **parting shapes**.



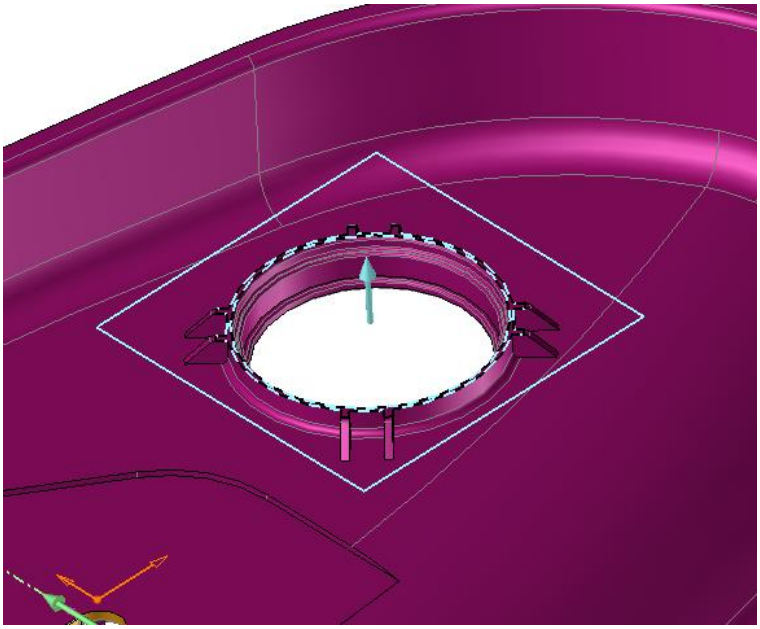
- Recalculate the **core cavity blocks** to create the new part.



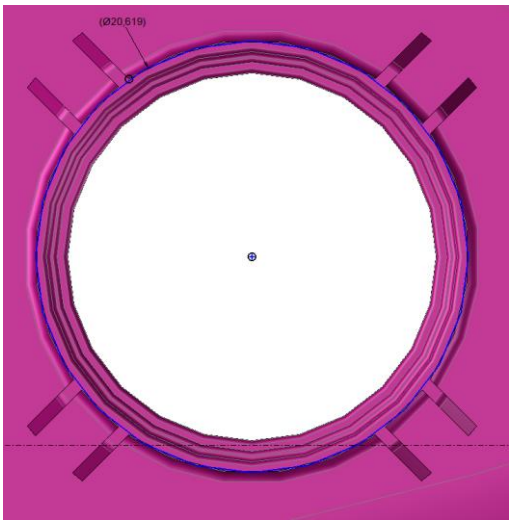
Inserts (post-split insert)

Creating the inserts

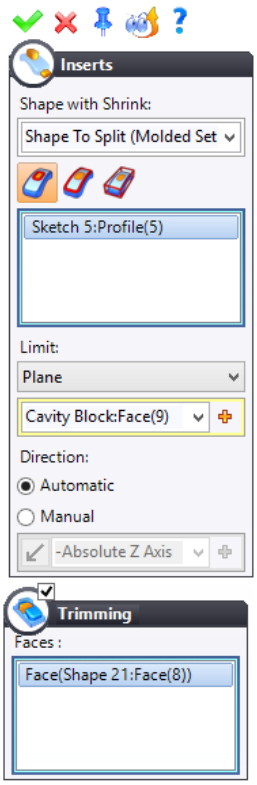
- **Hide the parting shapes** and **show the shapes to split**.
- Create a new **sketch** by selecting the outer face of the cylindrical opening that has not yet been processed, on the lower side, as the support plane.

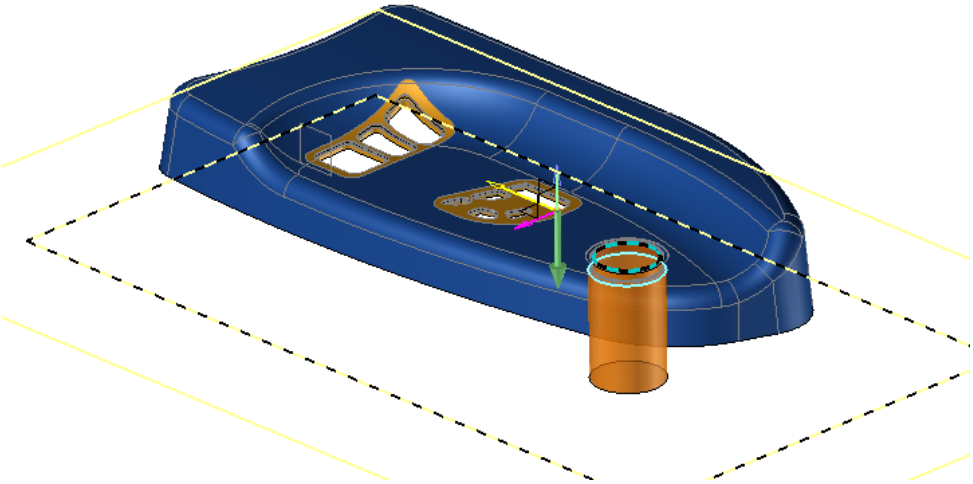


- Create a **circle** using the **Free size** mode, centered on the opening and passing through the vertex of one of the ribs.

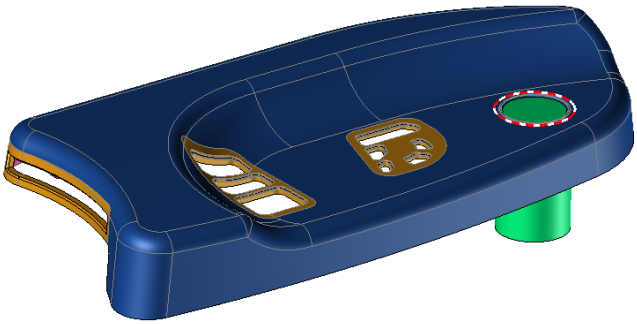


- Create an **insert** using the **Profiles or loops** mode. Select the circle sketch.
- Right-click in the graphics area and **show the stock**. Select the bottom plane of the stock as the limit plane of the insert.
- **Hide the stock**.
- Always via the contextual menu, **show the parting surfaces**. Select the split face as the trimming face of the insert.
- **Hide the parting surfaces**.

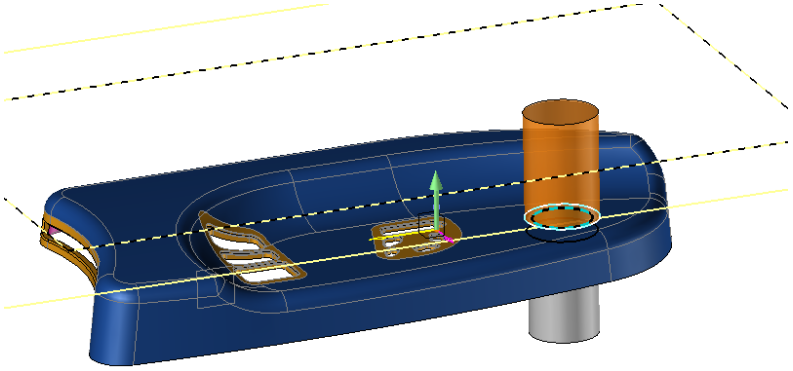




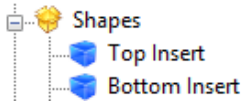
- Click on ✔ to **confirm**.
- Create a second **insert** based on a loop on the top side of the shape to split. Select the top loop of the opening.



- Select the top face of the stock as the limit plane of the insert.
- Select the face of the previously created insert as the trimming face.

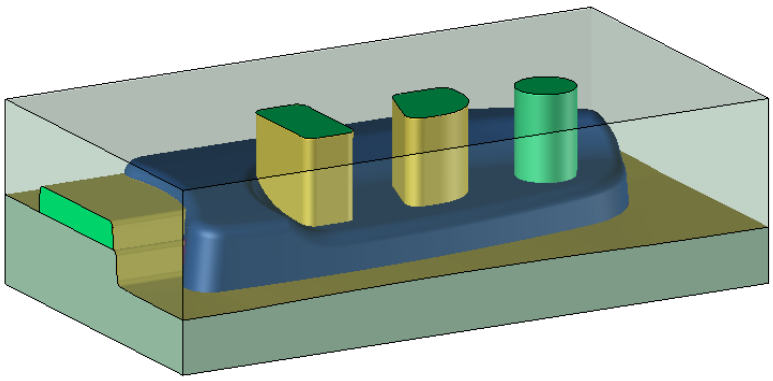


- Click on ✔ to **confirm**.
- In the Entities tree, rename the last two shapes created.



Creating processes for the inserts

- **Subtract** the core and cavity blocks using the corresponding inserts.



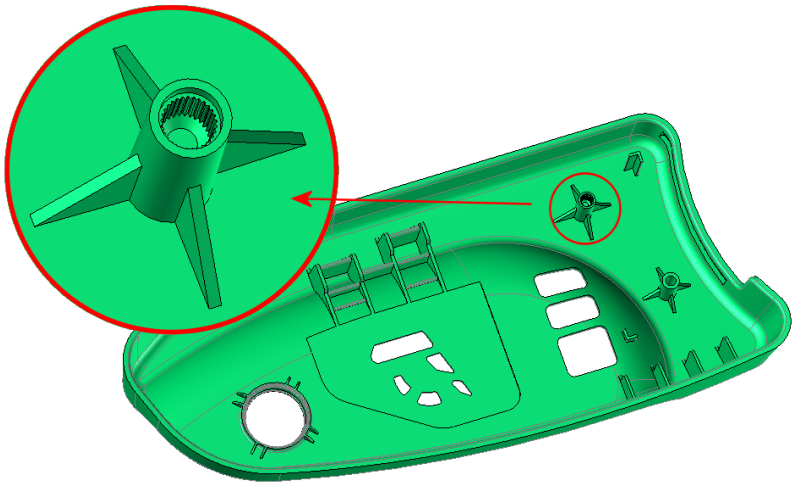
Creating the core cavity blocks

- Create the **core cavity blocks**.
- Click on to **confirm**.

Shape with shrink

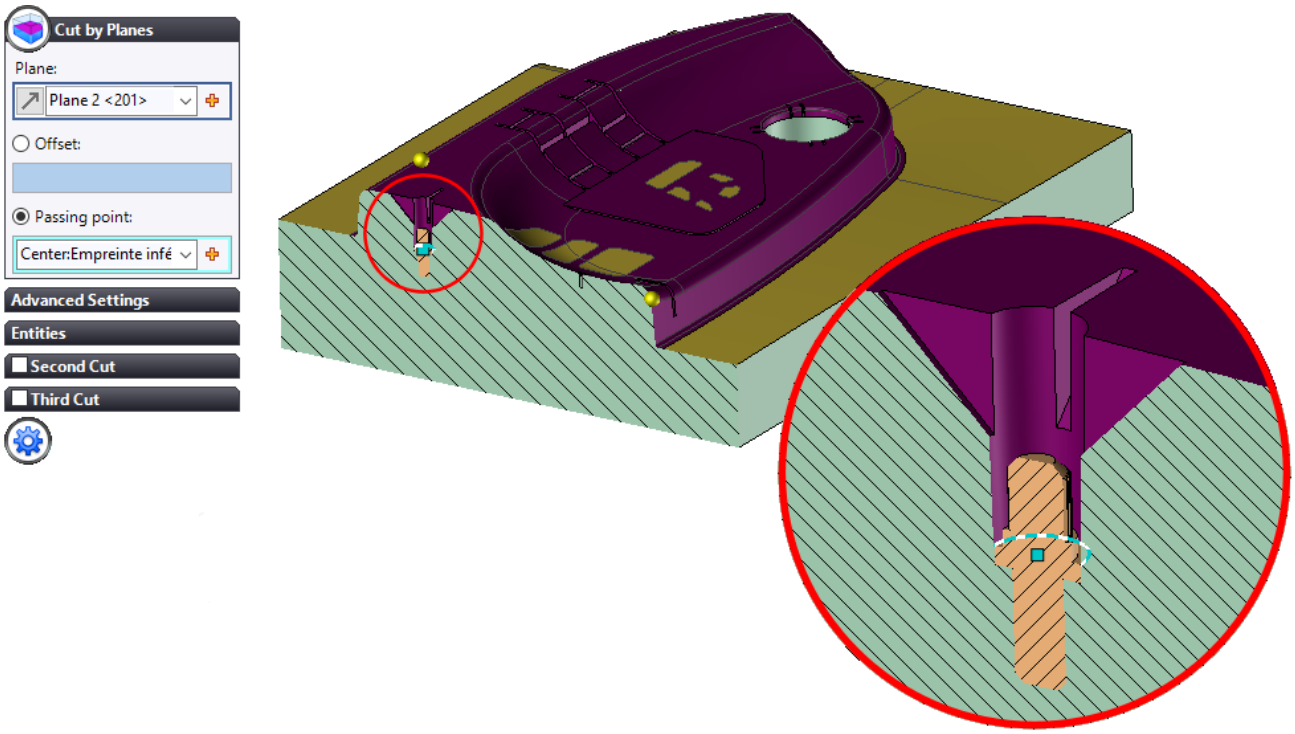
- From the assembly document's Parts tree, select **Hide All** to hide all the parts listed in the tree.
- Filter the parts listed in the tree by checking the **Shape with shrink** function. The **Show All** command allows you to show the part with shrink.

Reminder: **Shape with shrink** = **Shape to split** (= Molded shape with shrinkage + Insert shape) – **Insert shape**.



Core block

- Show the core block and the insert.
- Create a graphical **cut** of the block and the insert according to the **YZ** plane and passing through the center of the insert.

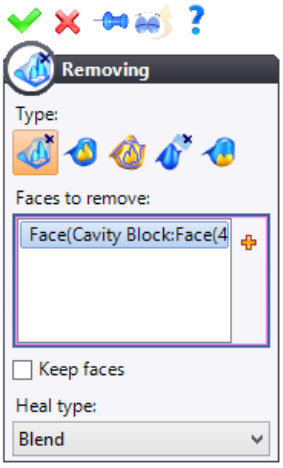


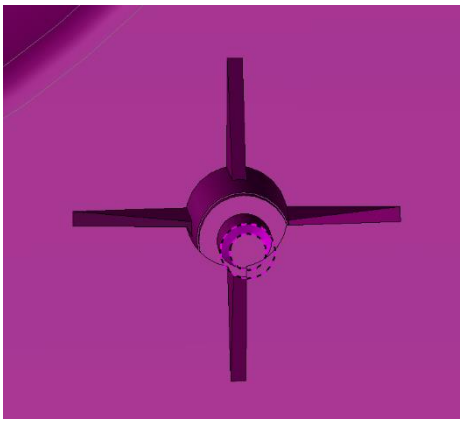
- Click on to **confirm**.

The insert has been subtracted from the core block.

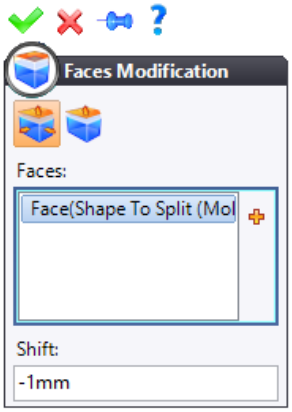
Modifying the insert's housing

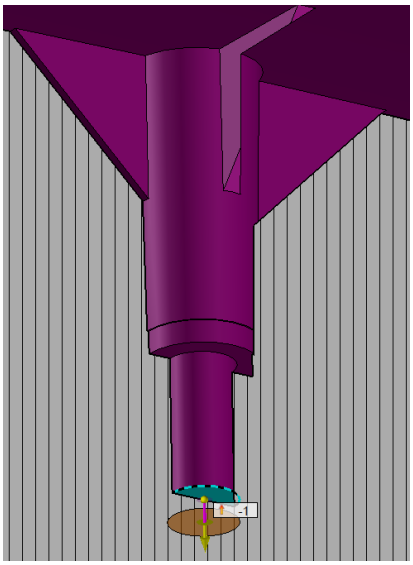
- Right-click on the core block and select the **Open Document** command.
- **Remove** the chamfers inside the housing by selecting the **Faces** mode and the **Blend** heal type.

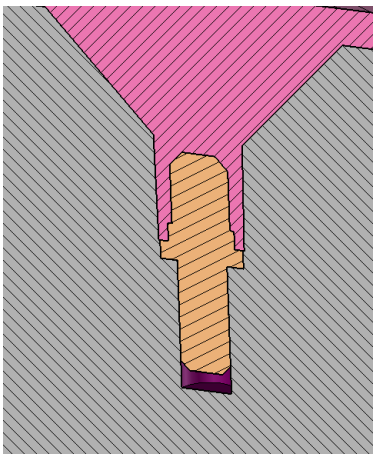




- From the **Shape** tab, select the  **Faces Modification** command and shift the bottom of the hole to *1mm* downward.







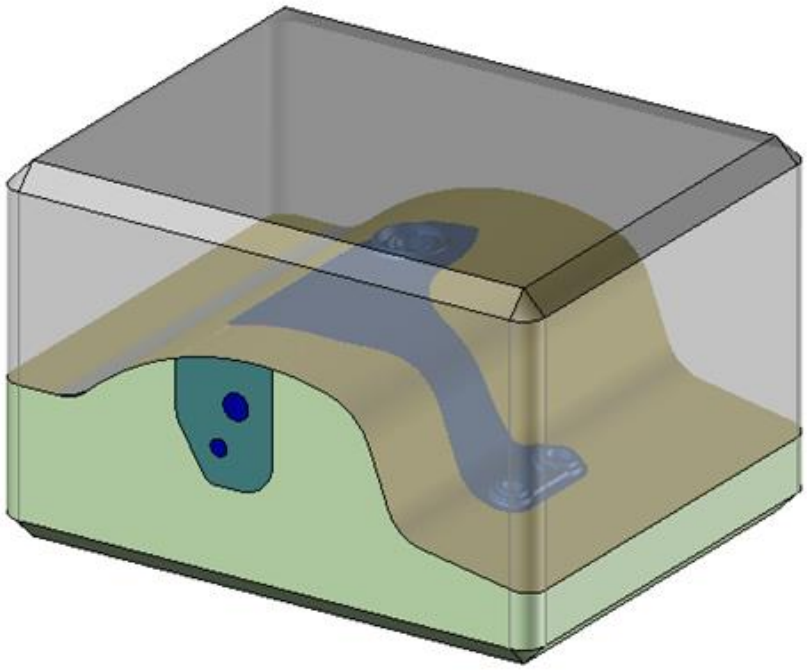
Check-in

- From the Project tree,  **check** the *Exercise 05* folder into the vault.

Exercise 6

Concepts addressed:

- Using Design surfaces as parting surfaces
- "Inserts" of inserts
- Operations on parting shapes

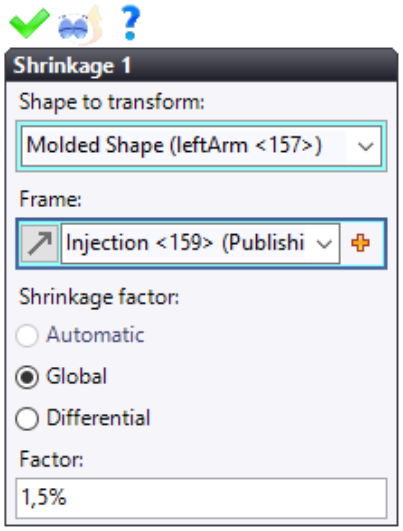


Starting the study

- From the Project tree, open the *leftArmt* part document from the *Exercise 06* folder.

Defining the shrinkage

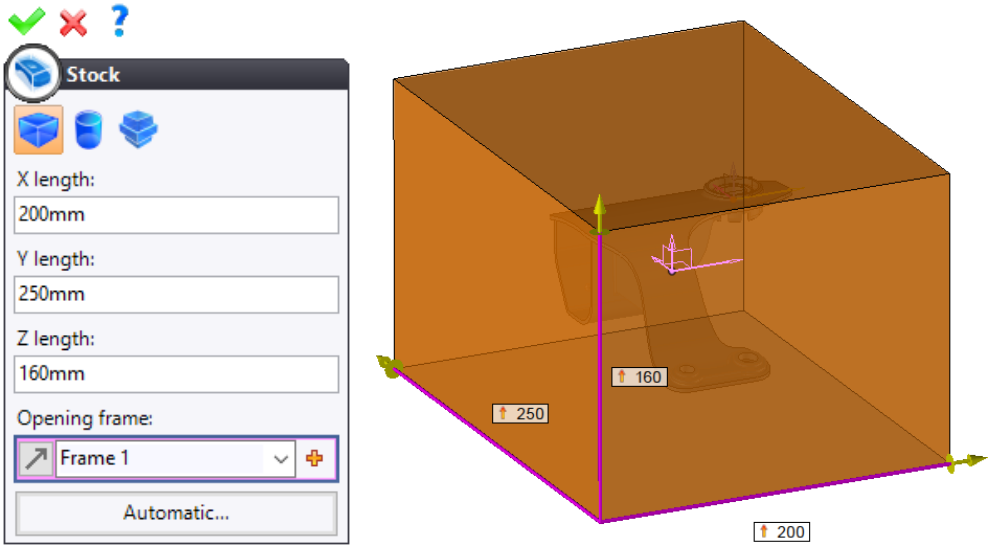
- From the part document, create a **Split** document using a **blank template**.
- Apply a **global shrinkage** of *1.5%*.



- Click on to **confirm**.

Creating the stock

- Edit the stock, and then modify the origin frame by creating a **frame by point and 2 directions**.
- For the frame origin, create an **offset point** of *20mm* along **X**.
- Create a **center of mass point** as the **reference point** of the offset point.



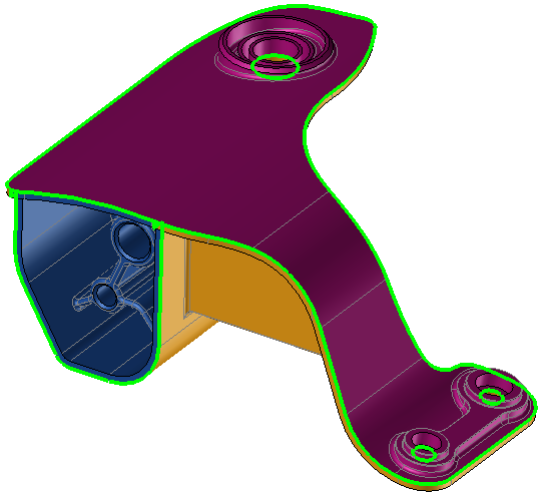
- Click on to **confirm**.

Creating the parting line

Creating the candidate edges

- Create the **candidate edges**. From the **Molding axis** drop-down list, select the **Z axis of the molded set frame**.
- Move to the next step.

Creating the parting edges



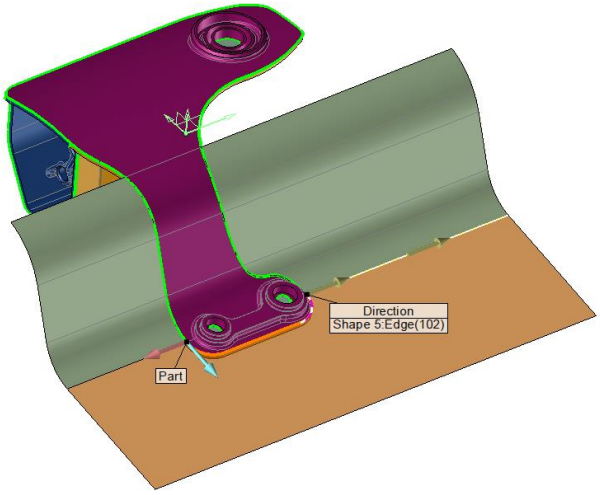
- Create the **parting edges**. Select the external path of the part.
- Click on to **confirm**.
- Create other three **Parting edges** operations for the part's circular openings.
- Click on to **confirm**.
- Create a last **Parting Edges** operation to define the future side insert.
- Click on to **confirm**.

Creating the shut off surfaces

- Create the three **shut off surfaces** at once using the **Shape** mode.
- Click on to **confirm**.

Creating the parting surfaces

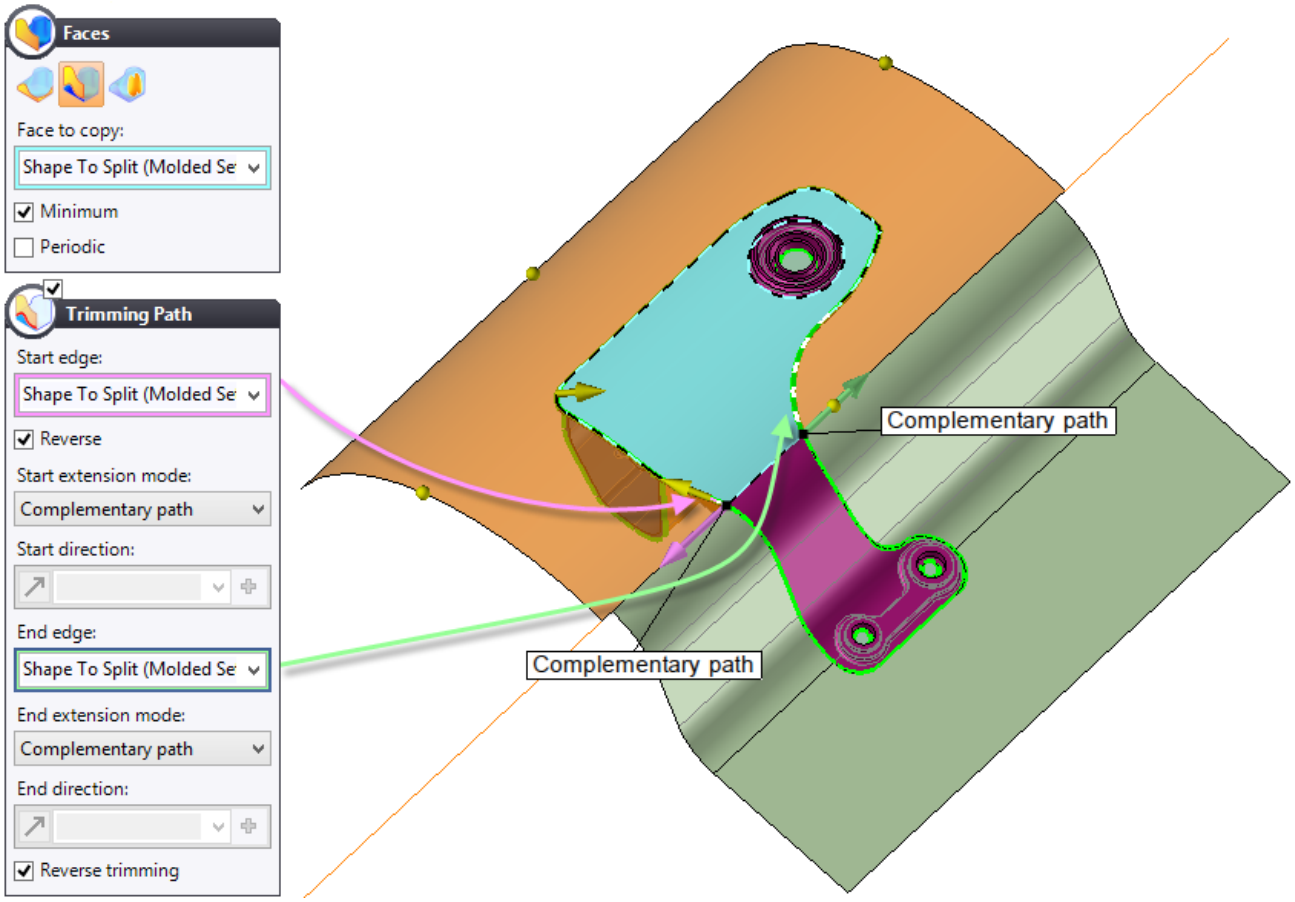
- Create two **parting surfaces** in **Extension** mode using an **automatic** extension direction to the **stock plane**.
- Click on to **confirm**.
- Create a **parting surface** in **Planar** mode.
- Click on to **confirm**.



For the rest of the exercise, it will be difficult to finish the parting line by creating **Extension** or **Planar** parting surfaces. The surface on which the parting edge path is based is very large and consists of only one surface.

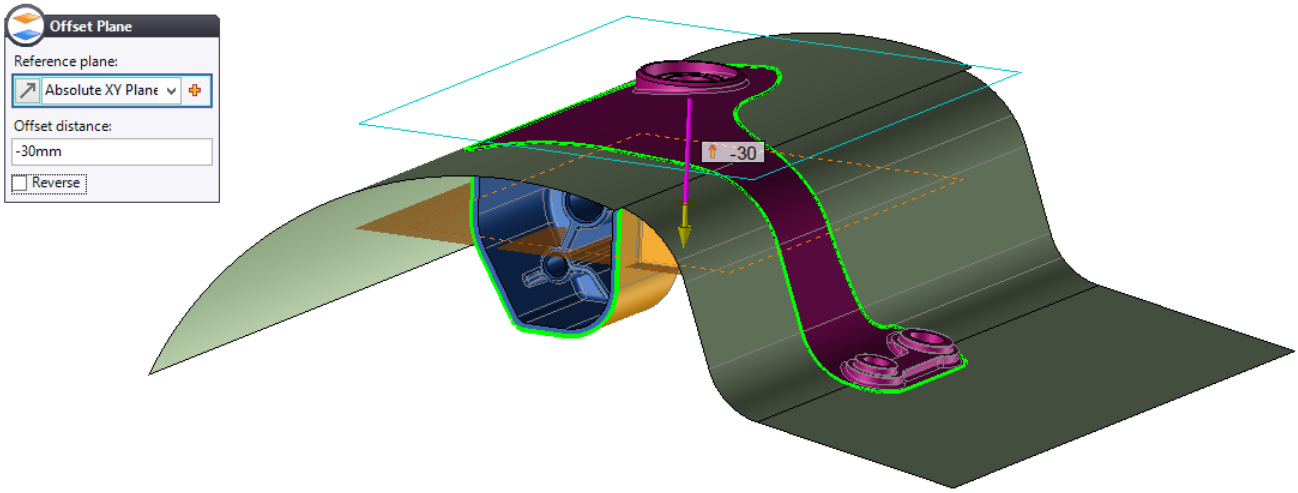
Face copy

- From the **Surface** tab, select the **Faces** command and create a face copy using the **Face with trimming path** mode.



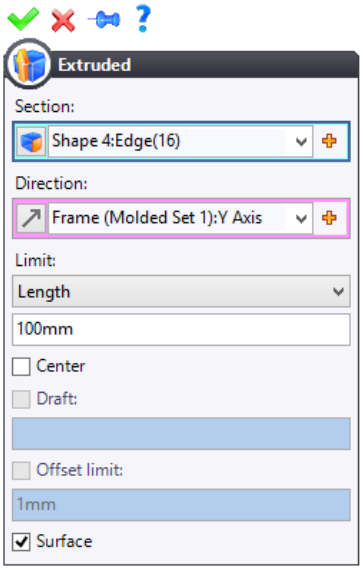
Warning: Make sure to extend the face on each side using the yellow spheres so that it goes beyond the limits of the stock.

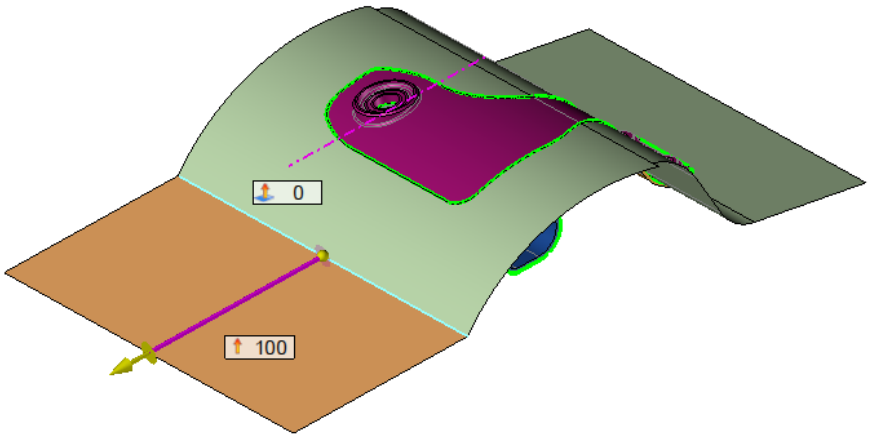
- Click on ✔ to **confirm**.
- **Trim** the resulting face by creating an **offset plane** of *-30mm* from the XY reference plane.



- Click on ✔ to **confirm**.

- Select the **Extruded** command. In the **Section** field, enable the **face selection** by clicking on the icon, and then click on the boundary edge of the surface. Adjust the extrusion direction along **Y** and enter a length of *100mm*.





- Click on to **confirm**.

Note: **TopSolid'Split** provides dedicated tools to help you create core cavity blocks. As a reminder, a **Split** document is similar to a **Part** document. Accordingly, you will find all the volume, surface and part design tools, etc.

Addition as parting surfaces

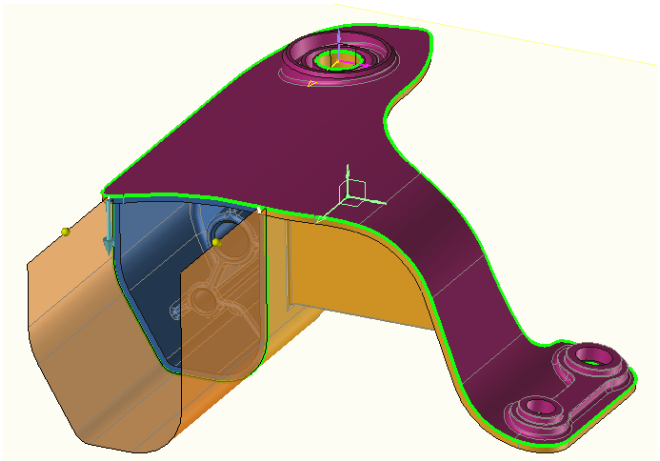
- Hold down the **Ctrl** key and select the last two surfaces created. Right-click and select the **Add in Parting Surface Set** command.

The parting surface set is available in the Entities tree's **Sets** folder.

- Click on the icon to hide or show all parting surfaces.

Creating a parting surface for the side insert

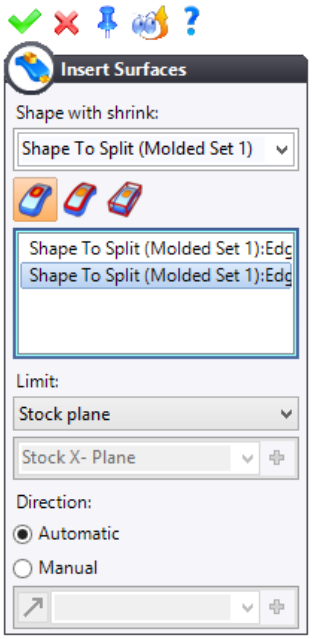
- Create a **parting surface** in **Extension** mode to create the surface of the side insert. Select an **automatic** extension direction to the **stock plane**.

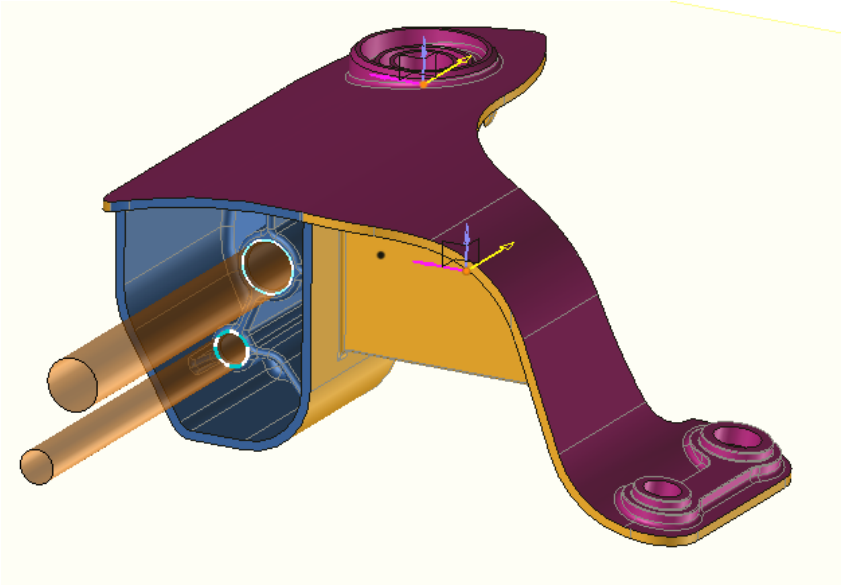


- Click on to **confirm**.

Creating the insert surfaces

- Create two **insert surfaces** on the edge loops as shown below.





- Click on to **confirm**.

In this way, two side insert surfaces will be created in the main side insert.

Creating the parting shapes

Parting shells

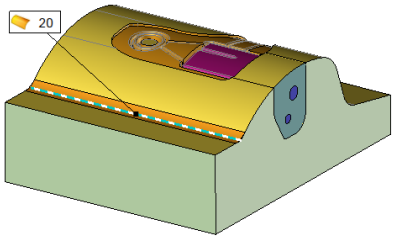
- Create the **parting shells**.
- Click on to **confirm**.

Creating the parting shapes

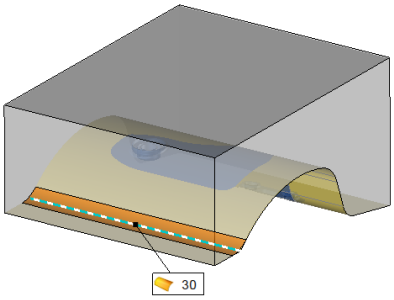
- Create the **parting shapes**.
- Click on to **confirm**.

Modifying the geometry of the parting shapes

- Create a *20mm* **fillet** on the core block's closing edge and another *30mm* fillet on the opposite edge on the cavity block.



Core block



Cavity block

Creating the core cavity blocks

- Create the  **core cavity blocks**.
- Click on  to **confirm**.

Check-in

- From the Project tree,  **check** the *Exercise 06* folder into the vault.

Exercise 7

Concepts addressed:

- Replacing a part
- Repairing existing operations
- Editing the parting line
- PDM management

Starting the study

- From the *03-Core cavity blocks* sub-folder of the *Exercise 01* folder, validate the life cycle of the *remoteCover* assembly document. To do this, right-click on the document and select the **Life Cycle (A-Design)** > **Validate** command.

The part document and split document are also validated since they are the references of the assembly document.

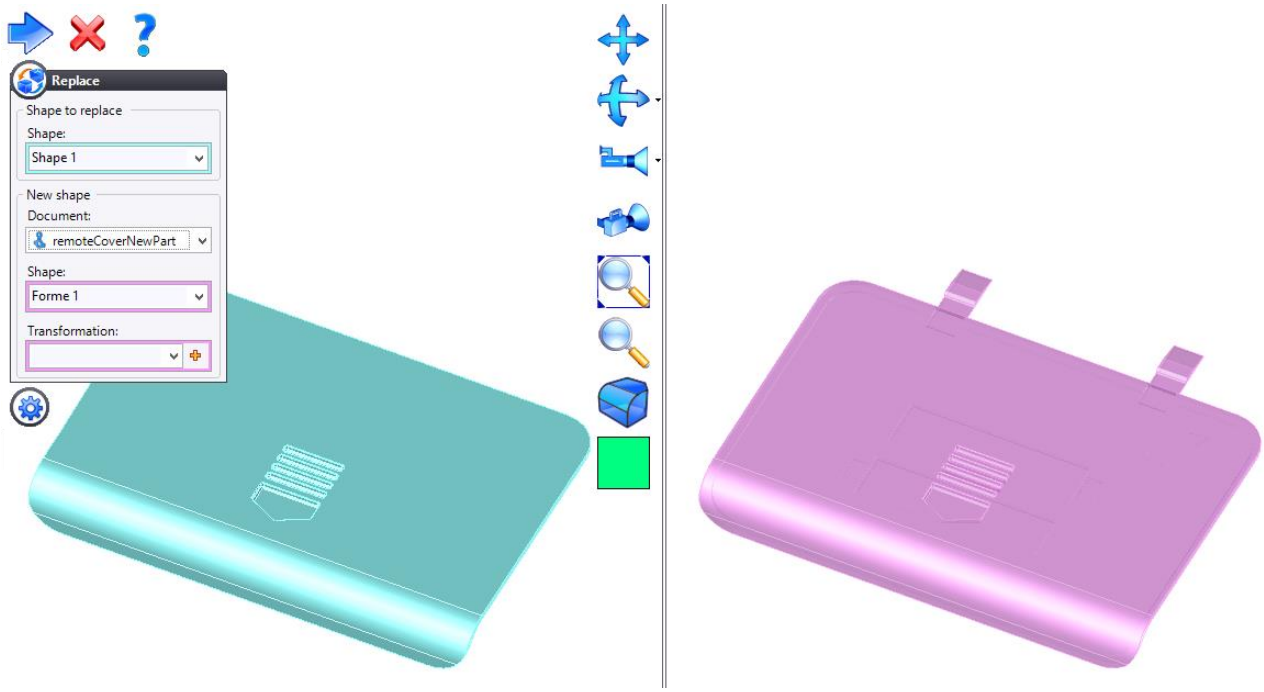
- In the *01-Customer part* sub-folder, create a new sub-folder named *New part*.
- From the *Exercise 07* folder, **copy** the *remoteCoverNewPart* part document and **paste** it into the *New part* folder.
- Open the *remoteCover* and *remoteCoverNewPart* documents.

Replacing the part

- In the *remoteCover* document, **replace** the geometry of the part with the geometry of the *remoteCoverNewPart* part.

The **shape to replace** is automatically selected.

- In the **New shape** field, select the *remoteCoverNewPart* document from the drop-down list.

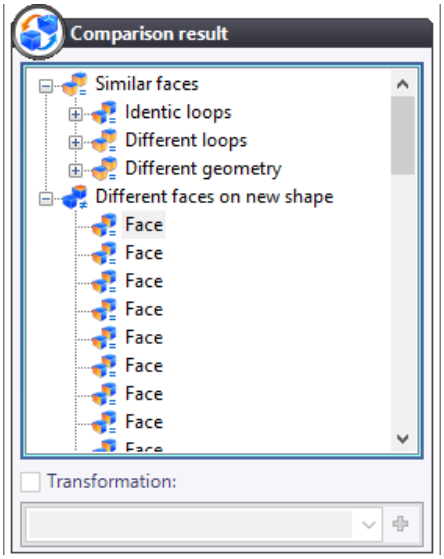


Note: If the new shape used to replace a shape geometry comes from another document, this document must be open before launching the command.

The screen is automatically shared between the two documents and the camera of the two documents is synchronized.

- Leave the **Transform** field empty.
- Move to the next step.

The dialog box displays the comparison result between the two shapes. Up to this point, the command is identical to the **Compare** command.

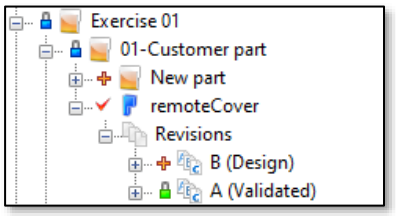


- Move to the next step.

The replacement operation starts from this point.

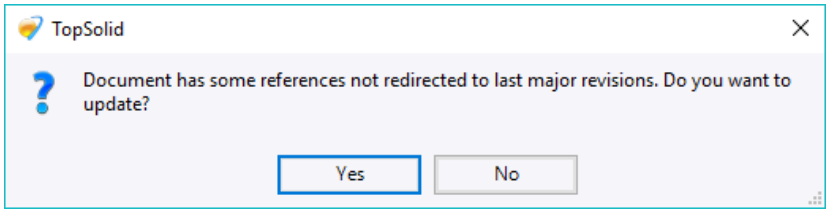
- **Confirm** the replacement.
- **Save** the *remoteCover* document.

When saving the document, a **B major revision** is automatically created for the *remoteCover* document.

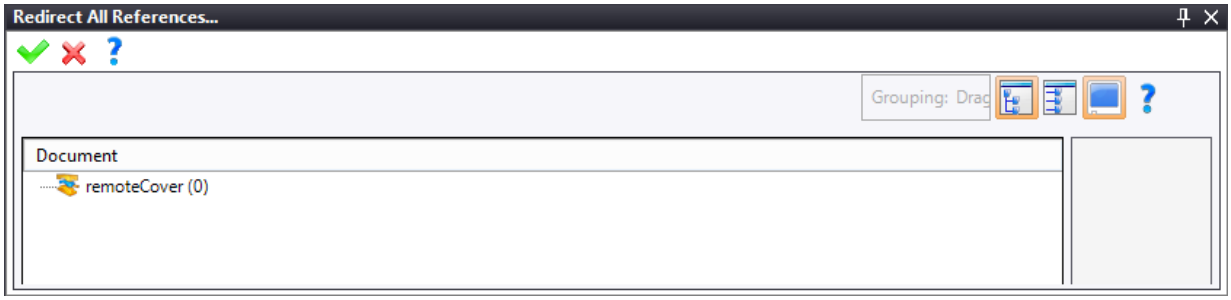


- Open the split document.

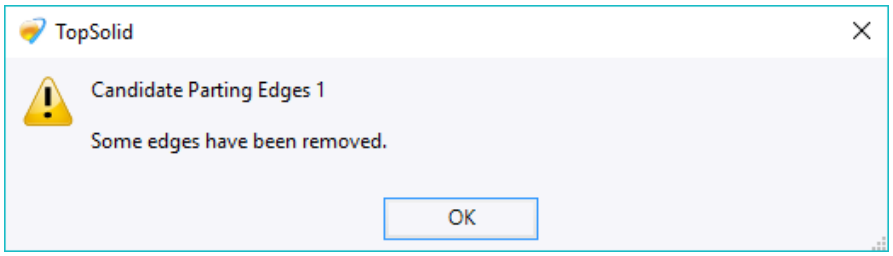
A warning message appears indicating that the part referenced by the split document has been modified and changed version.

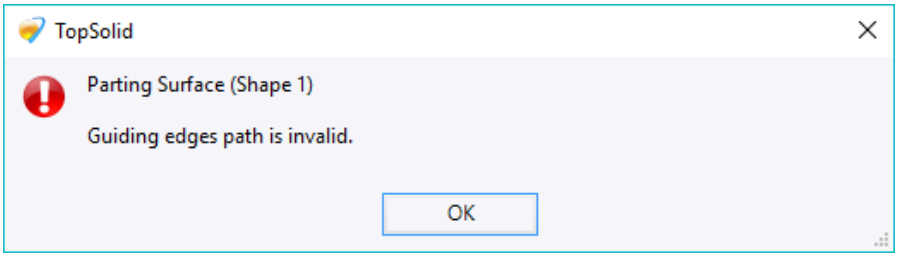


- Click on **Yes** to redirect the split document to the new part version.
- **Confirm** the redirection of all references.



Note: Redirecting the split document to the new version of the part will update the split document. Warning messages appear indicating that errors occurred during update.



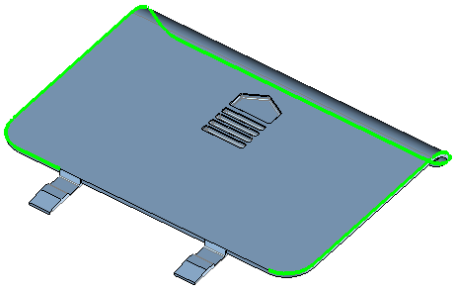


Repairing the parting line

- Switch back to the **Parting stage**.
- Right-click in the graphics area to **display the parting edges** if they are hidden.

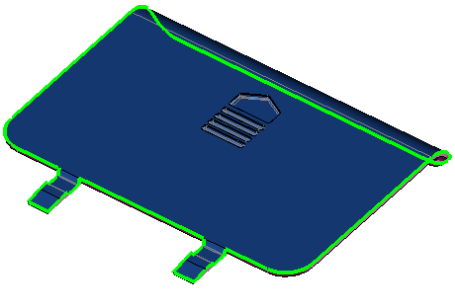
Parting edges

The parting edge path is not closed anymore.

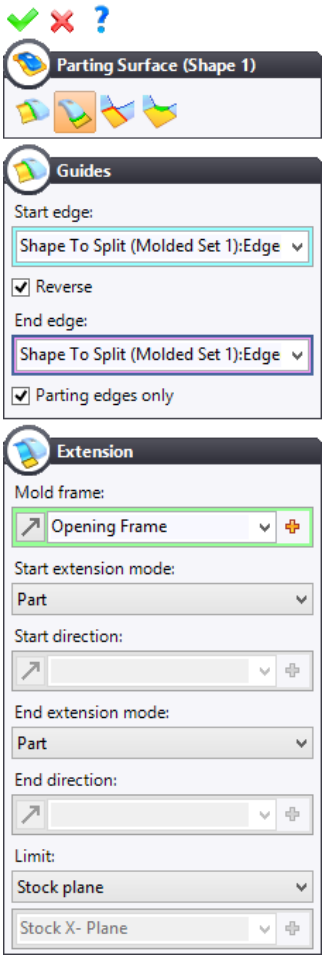


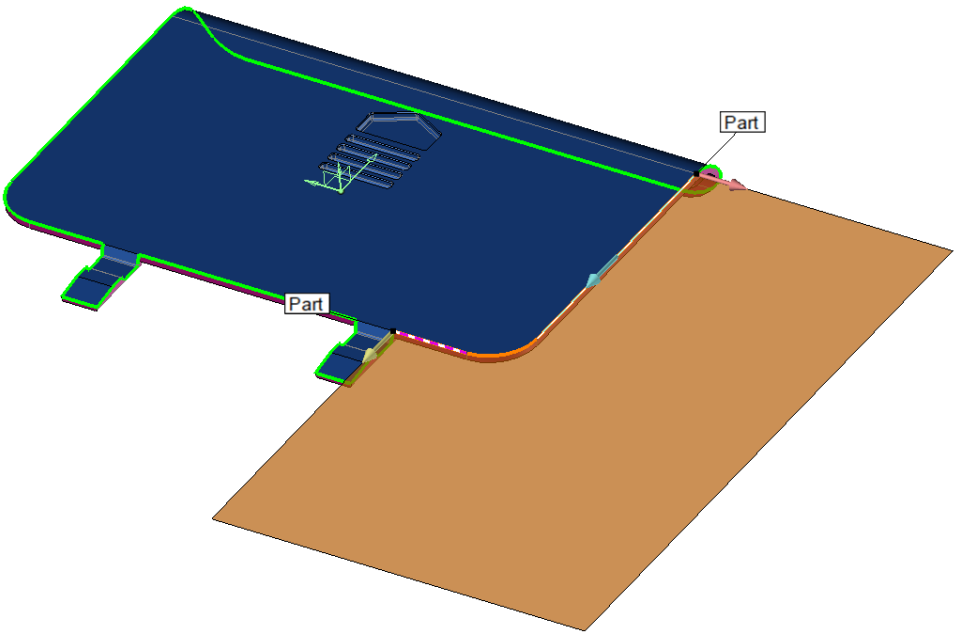
- From the Operations tree, move the insertion cursor under the **Parting Edges** operation.
- Create a new **Candidate Edges** operation using the Z axis of the molded set frame.

- Move the insertion cursor up to the **Parting Edges** operation.
- Edit the edge path and add the missing edges following the part modification.



- Edit the invalid parting surface by clicking on the icon in the document's tab. Modify the end edge of the guiding edge path and modify the end extension direction of the path to create the following parting surface.

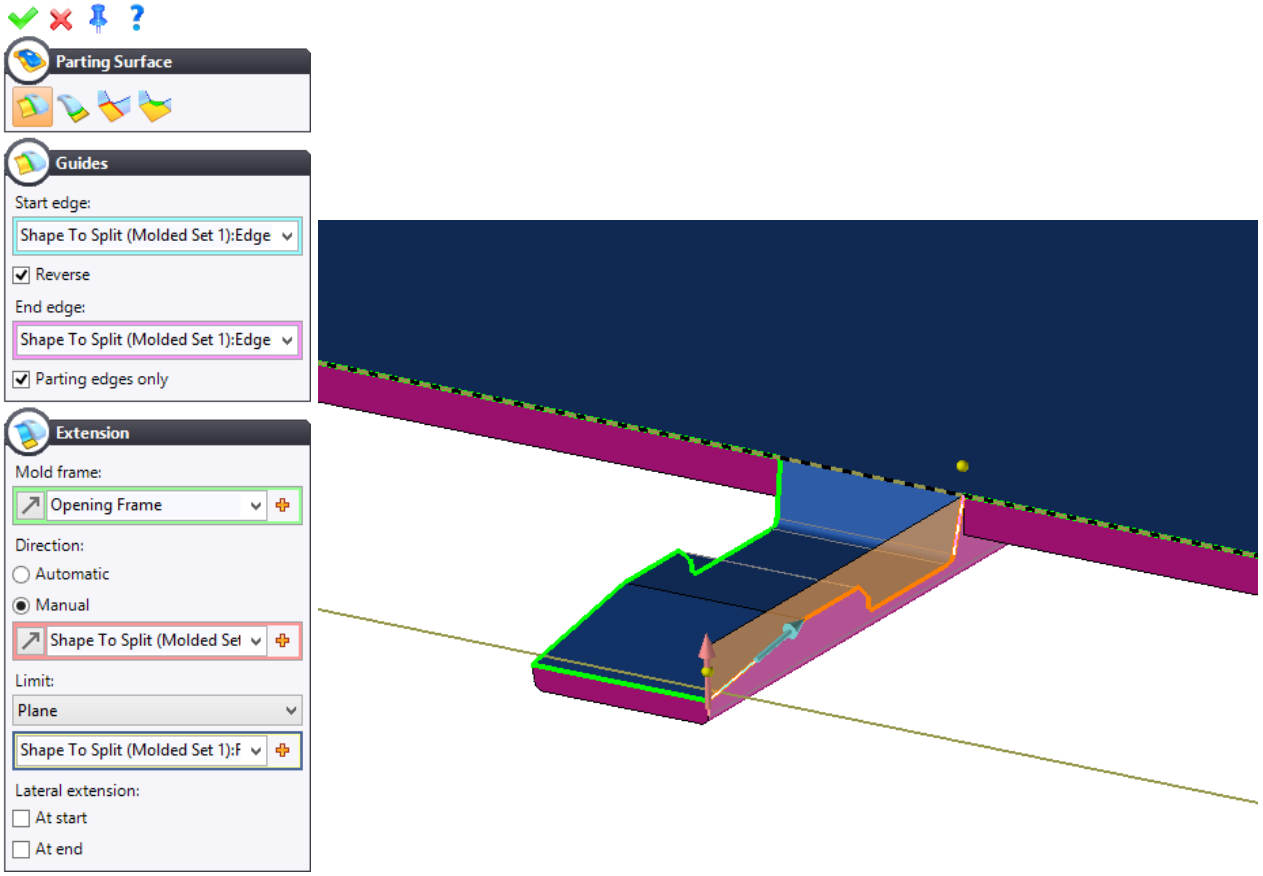




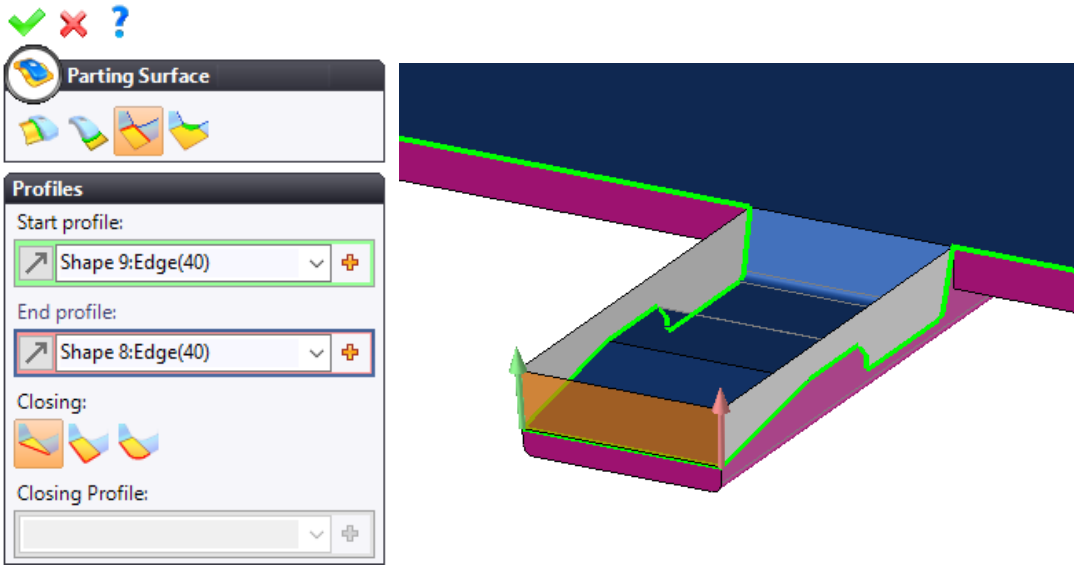
- In the same way, create the symmetrical **parting surface**.

Parting surfaces

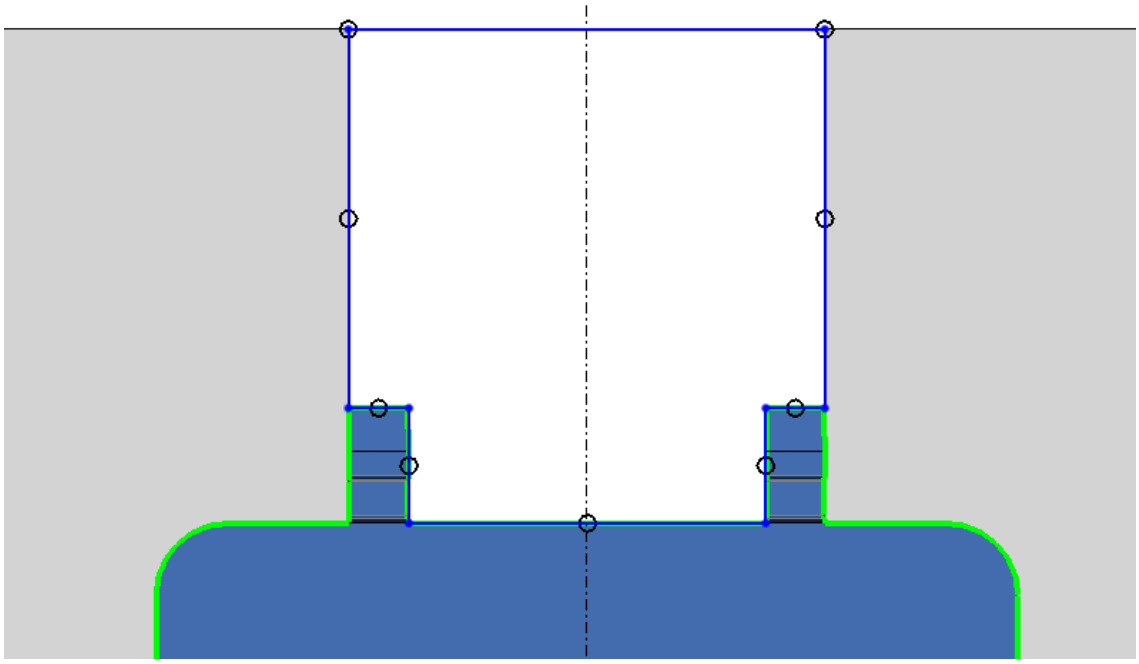
- Create four **parting surfaces** in **Extension** mode on the side faces of the two tabs. Indicate the extension direction by selecting the edge at the end of the tab. The surface is limited by a plane (the part's top face).



- Repeat the operation on the other side of the tab and then on the second tab.
- Create two **parting surfaces** in **Lofted without guide** mode for the end of the tabs.



- **End the insertion**.
- Create a new **2D sketch** based on one plane of the side flat surfaces.
- Create a **contour** in **Passing** mode based on the parting surface's edges.



- **Confirm** the sketch.
- Create a **flat** surface from the previously created sketch.
- Right-click on the flat surface and select the **Add in Parting Surface Set** command.

Creating the parting shapes

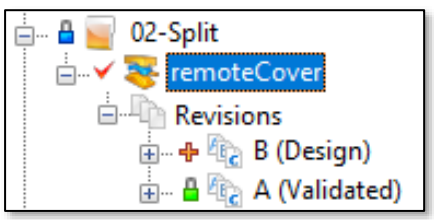
Updating the parting shells

- Create the **parting shells** to update them.
- Click on to **confirm**.

Updating the parting shapes

- **Confirm** the **parting shapes** to update them.
- **Save** the *remoteCover* split document.

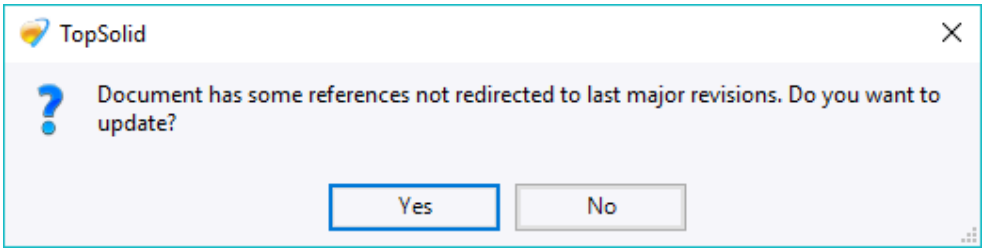
When saving the document, a **B major revision** is automatically created for the *remoteCover* document.



Updating the assembly

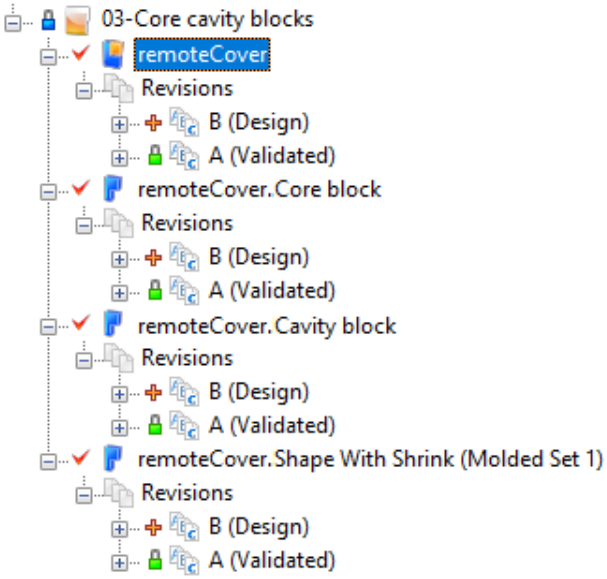
- Open the *RemoteCover* assembly document.

A warning message appears indicating that the part referenced by the split document has been modified and changed version.



- Click on **Yes** to confirm the update.

The assembly document and the part documents take a major revision.



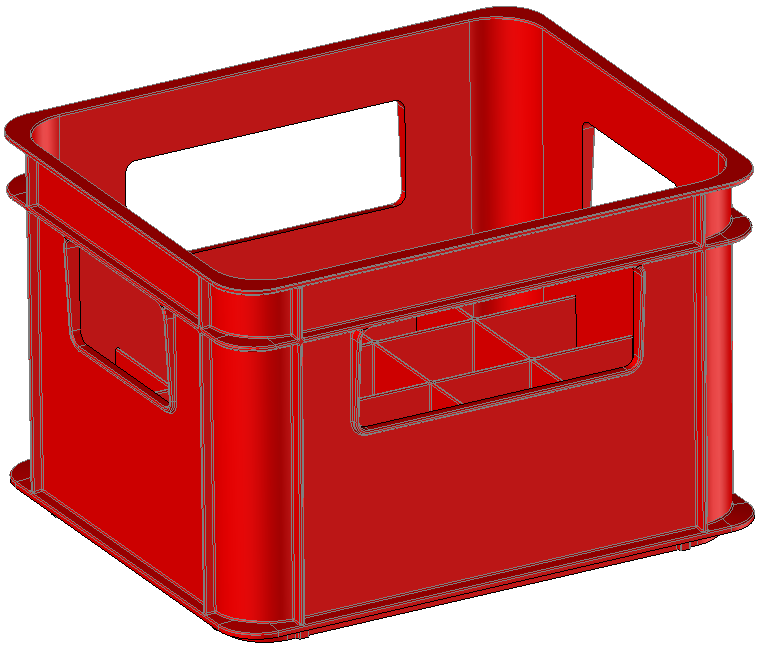
Check-in

- From the Project tree, **check** the *Exercise 01* folder into the vault.

Exercise 8

Concepts addressed:

- Creating parting edges in planar mode
- Using the Split commands to obtain the main parting shapes
- Modifying the parting shapes manually to have the right number of core cavity blocks

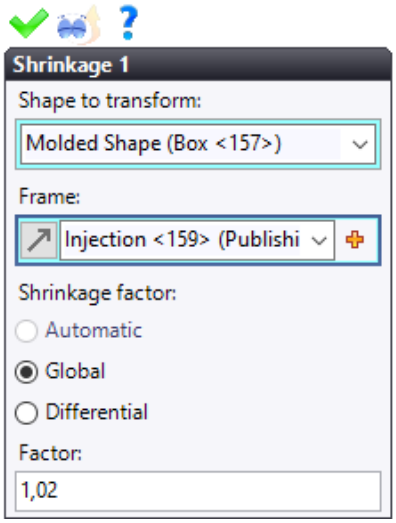


Starting the study

- From the *Exercise 08* folder, open the *Box* part document.

Defining the shrinkage

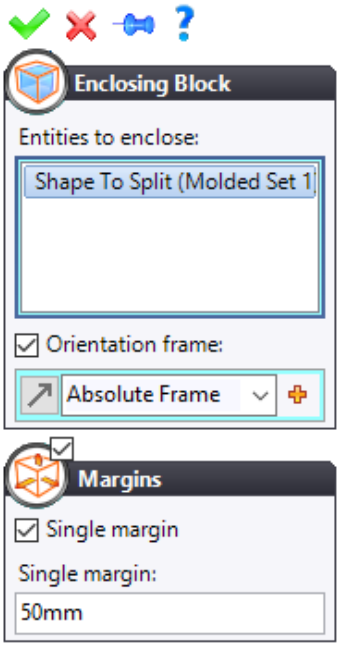
- Create a new **Split** document from the part.
- Apply a **shrinkage factor** of *1.02*.

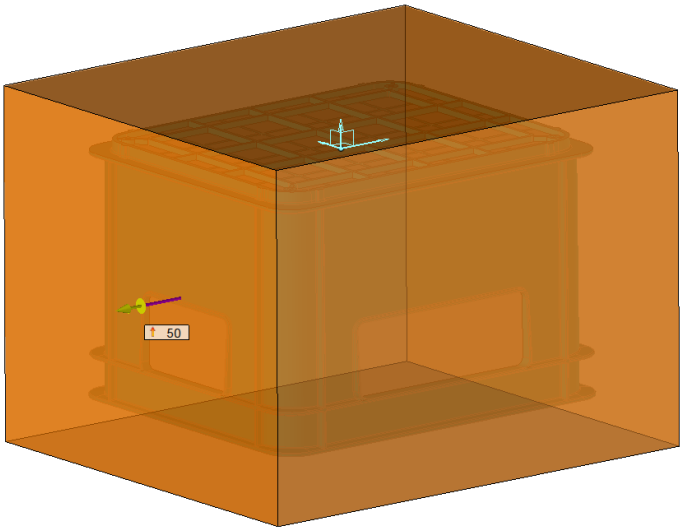


- Click on to **confirm**.

Defining the stock

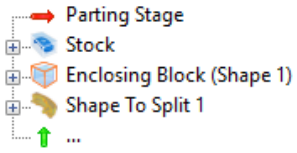
- Create an **enclosing block** around the part and enter a **single margin** of *50mm*.



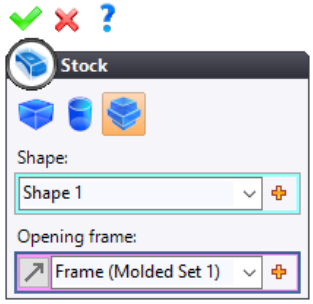


- Click on to **confirm**.

- From the Operations tree, move the **Enclosing Block** operation under the **Stock** operation.



- Select the **Stock** command and select the previously created block as the **user stock**.

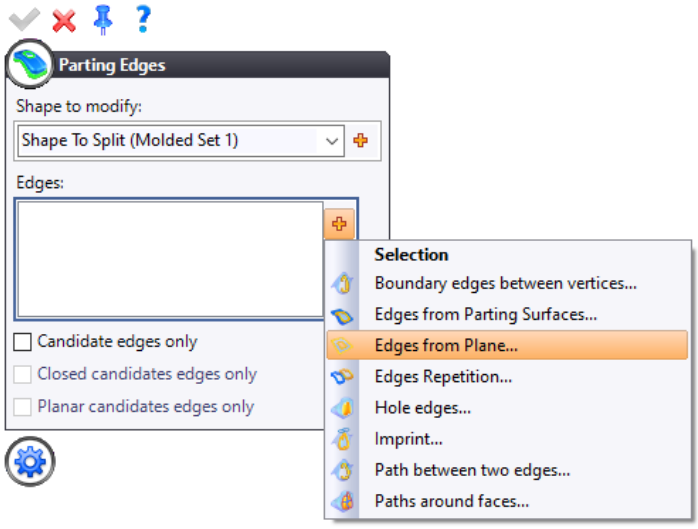


- Click on to **confirm**.

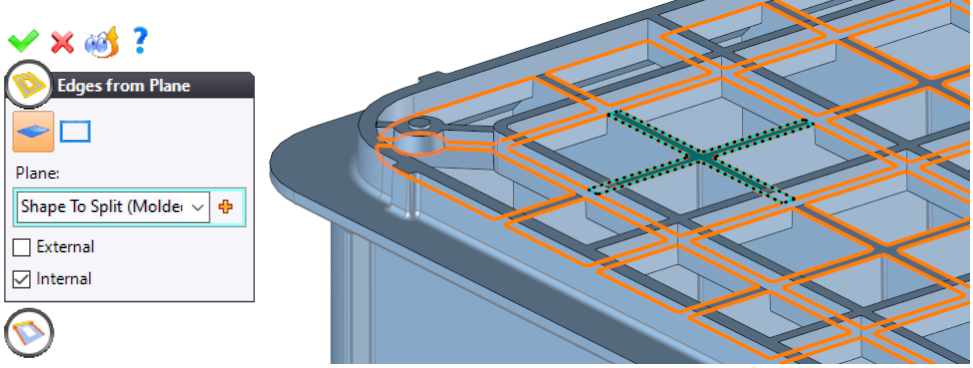
Creating the parting line

Parting edges

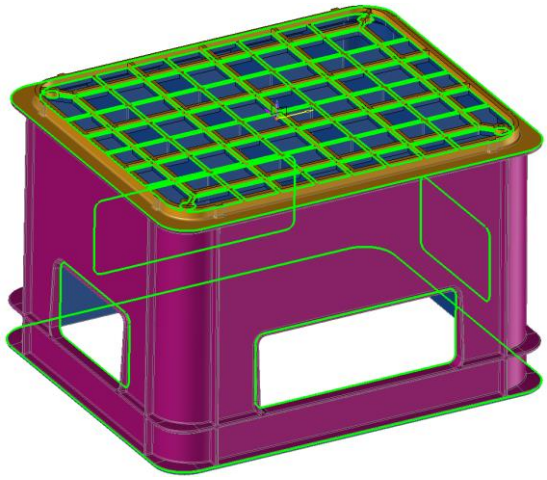
- Select the **Parting Edges** command.
- Click on the icon and select the **Edges from Plane** command.



- Select the circular edge as shown below as the plane to be used. Check the **Internal** box to select only the hole edges.

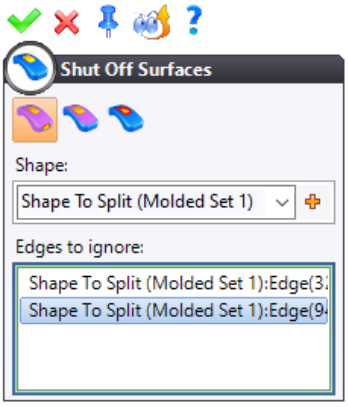


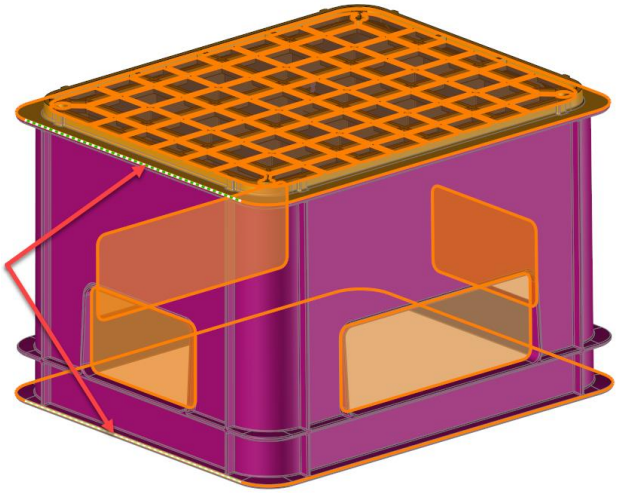
- Click on to **confirm**.
- Create three more parting edge operations for the top edge, the bottom edge and the side openings.



Shut off surfaces

- Create the **shut off surfaces** for the side openings using the **Face** mode. Select the bottom edge and the top edge of the part as the **edges to ignore**.

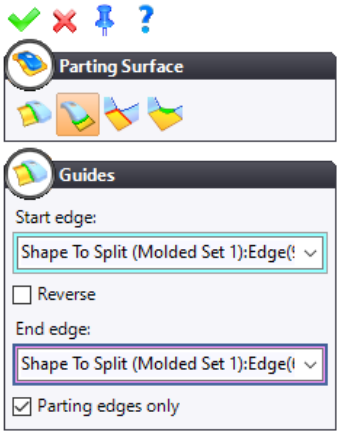


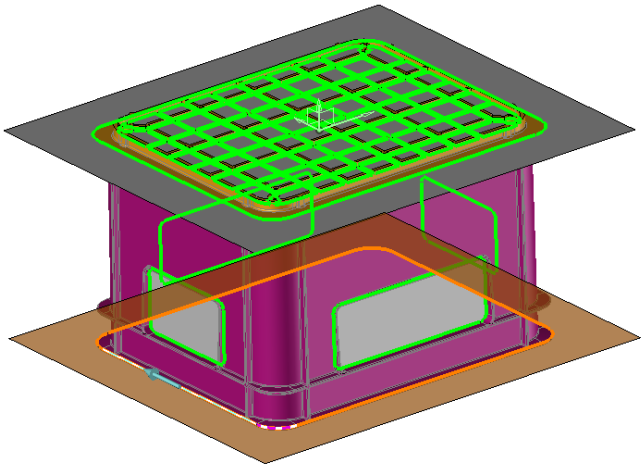


- Click on to **confirm**.

Parting surfaces

- Create the top and bottom **parting surfaces** using the **Planar** mode.

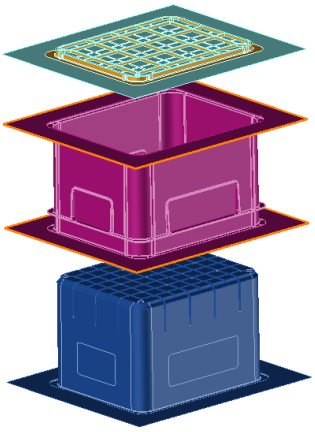




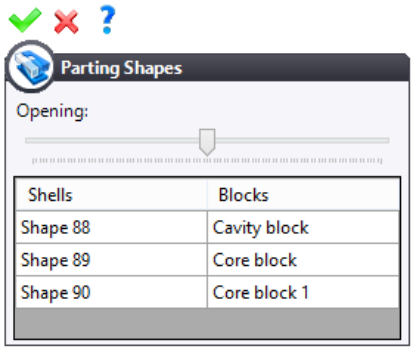
- Click on to **confirm**.

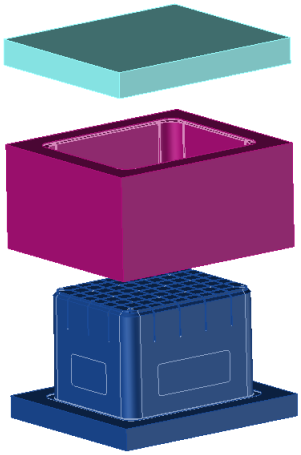
Creating the main core cavity blocks

- Select the **Parting Shells** command.



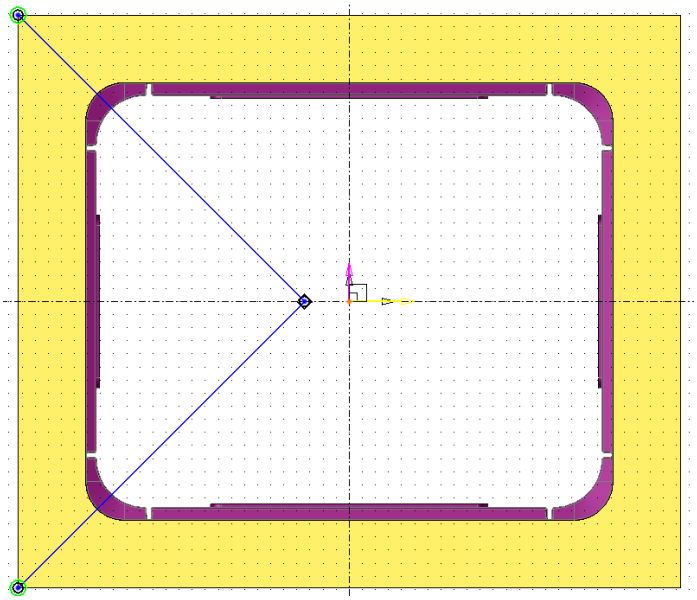
- Calculate the **parting shapes**.



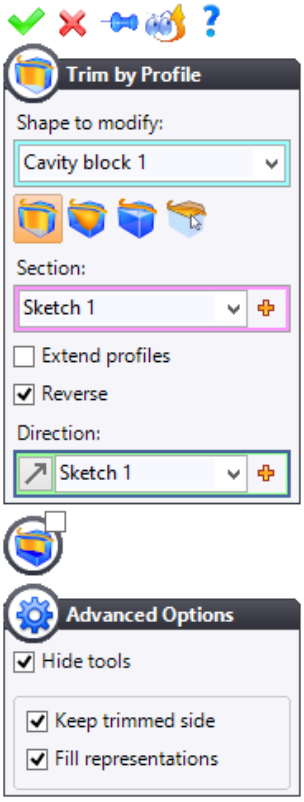


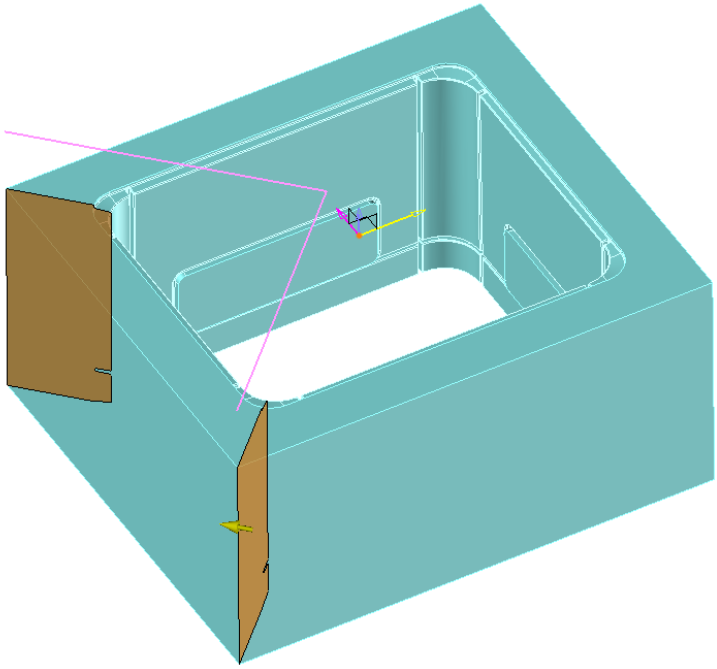
Cutting the center block

- Right-click on the core and cavity blocks and **hide** them.
- Create the following **sketch** on the Z+ plane of the stock.

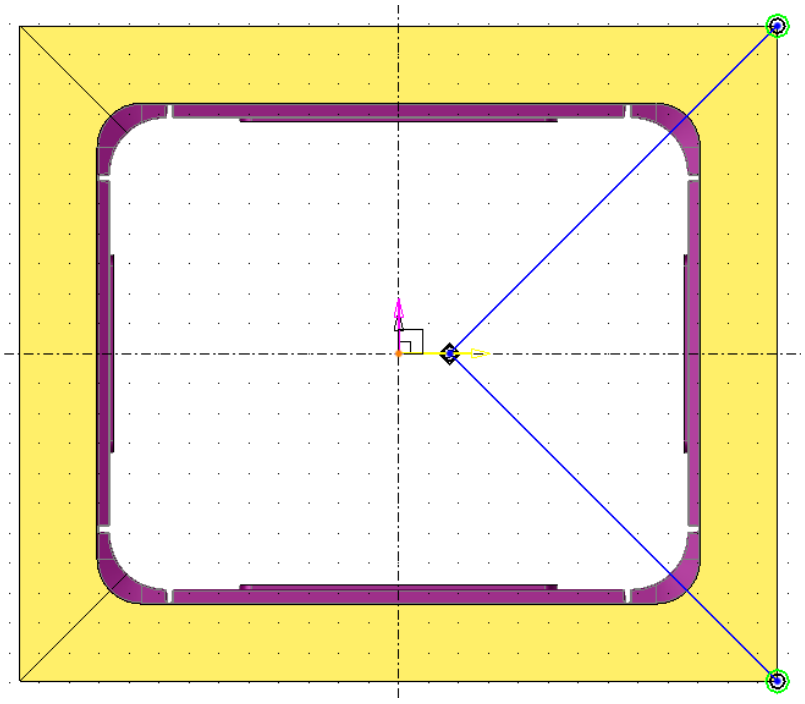


- Select the **Trim by Profile** command and trim the center block using the previously created sketch. Check the **Keep trimmed side** box in the advanced options.

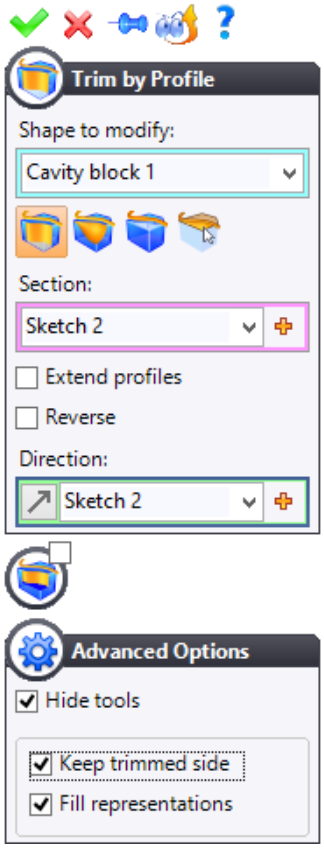


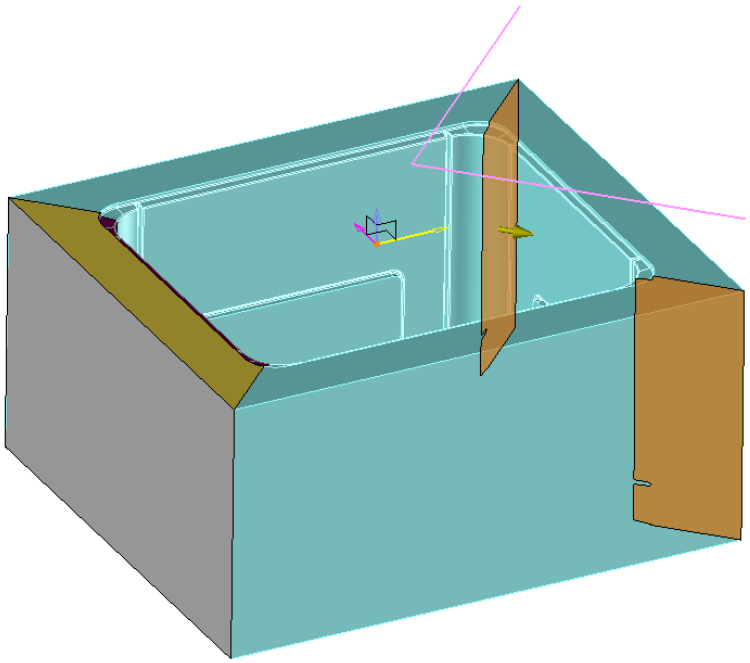


- Create a new **sketch** on the Z+ plane of the stock.

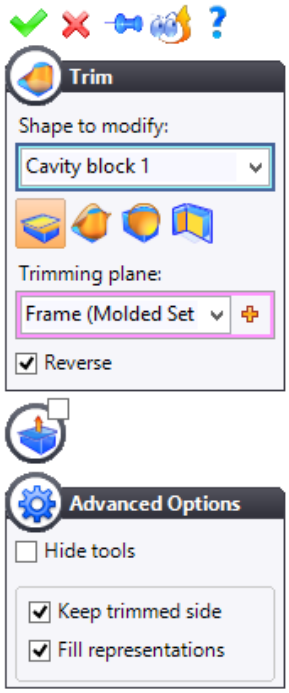


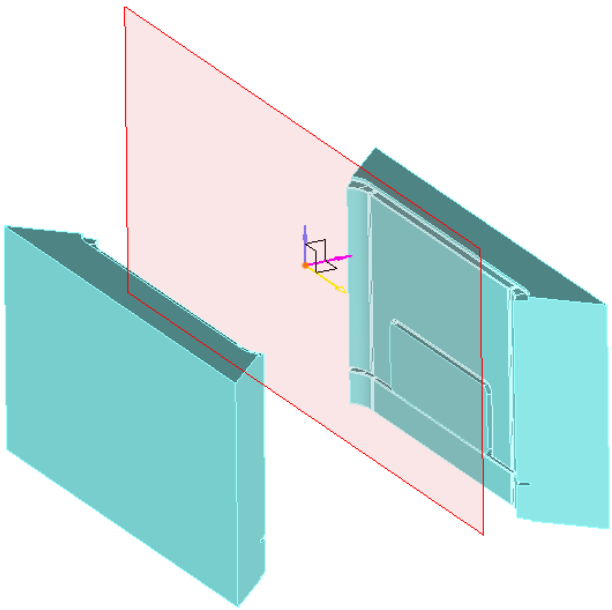
- Select the **Trim by Profile** command again and trim the remaining section of the center block. Check the **Keep trimmed side** box.





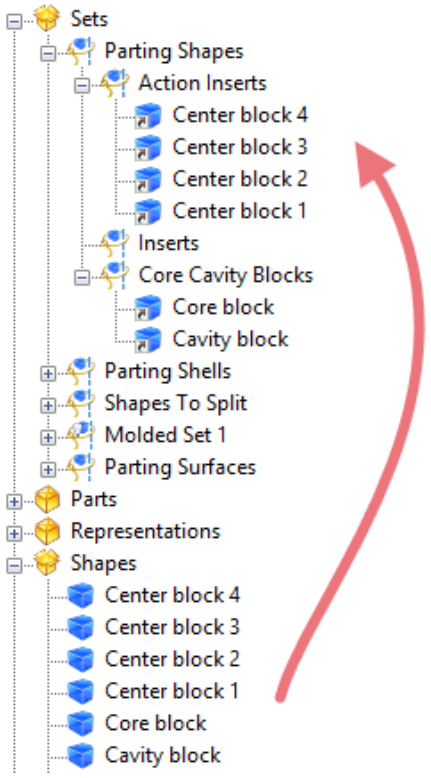
- In order to split the remaining shape in two, **trim** this shape using the injection frame's XZ plane and keep the trimmed side.



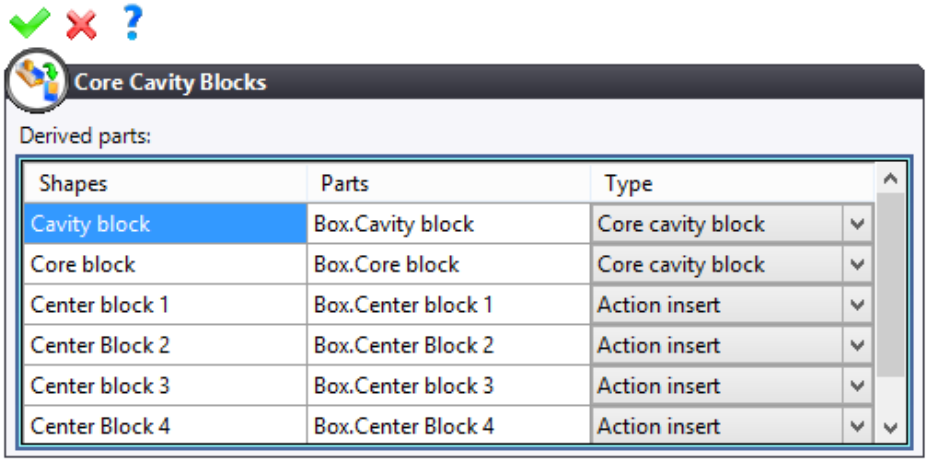


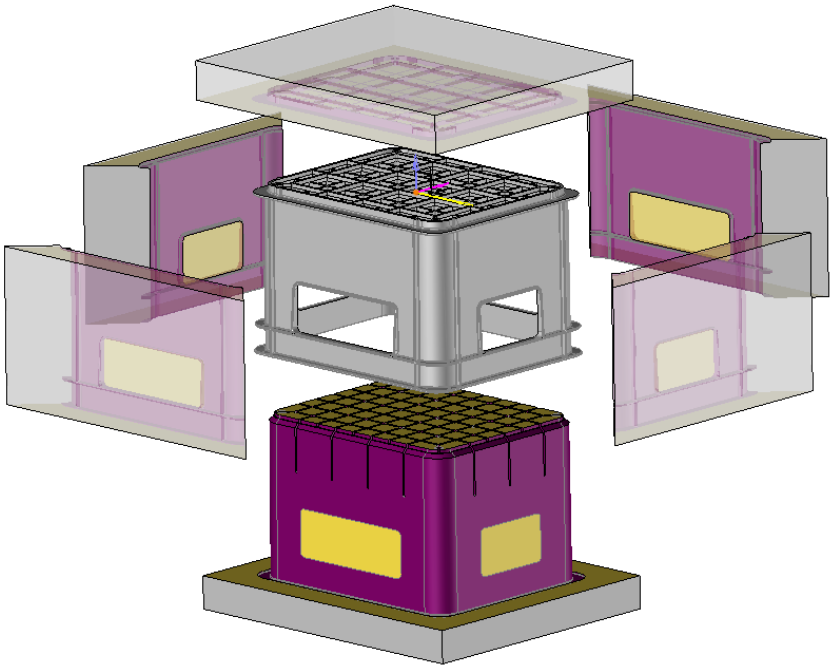
Creating the core cavity blocks

- From the Entities tree, rename the new shapes resulting from the trim operations and drag and drop them into the **Action Inserts** set.



- Select the **Core Cavity Blocks** command.





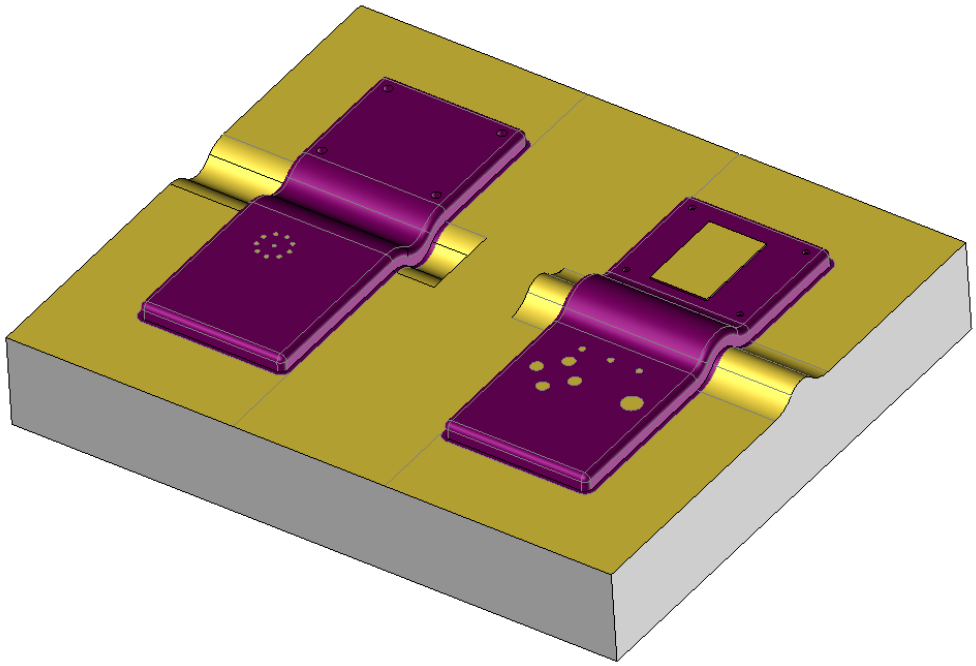
Check-in

- From the Project tree, **check** the *Exercise 08* folder into the vault.

Exercise 9

Concepts addressed:

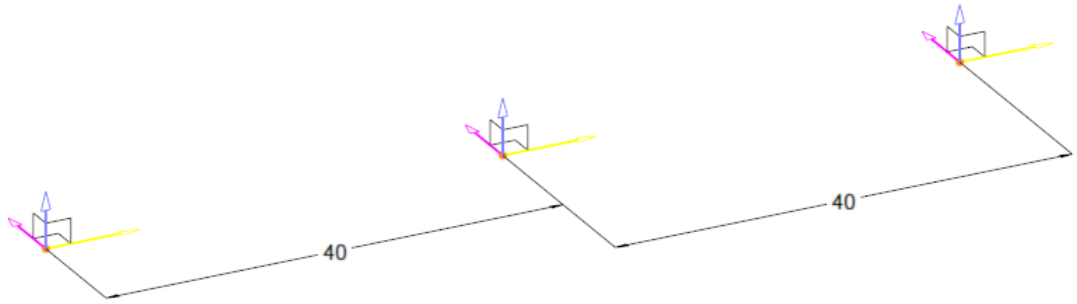
- Positioning two parts in a split document
- Declaring two molded sets
- Editing the core cavity blocks



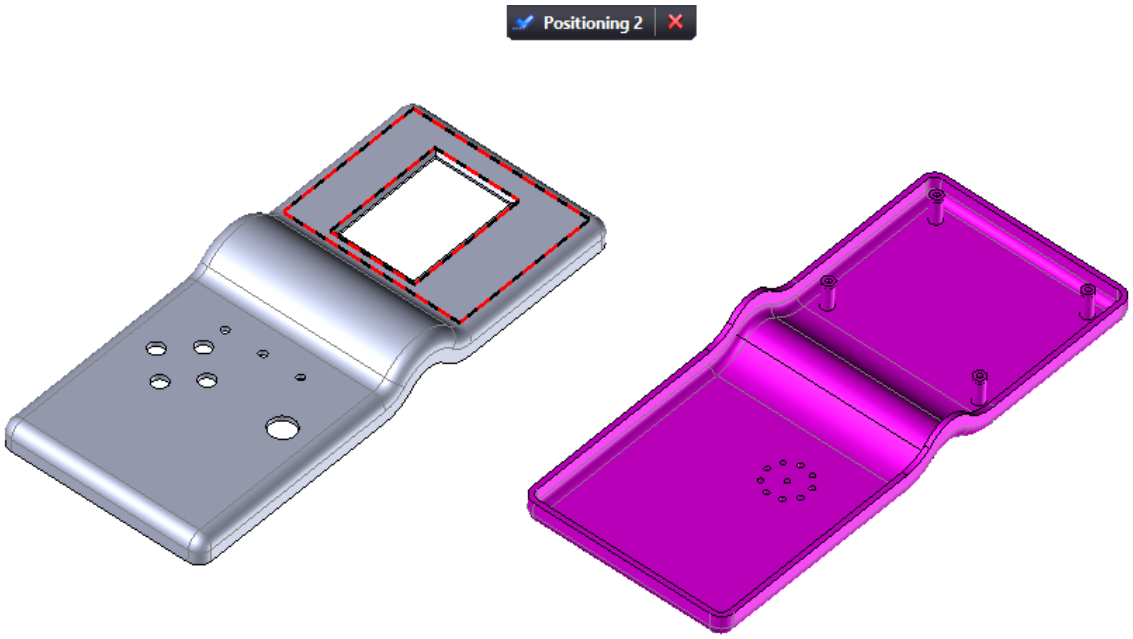
Starting the study

Creating the split document

- Create a **Split** document in the *Exercise 09* folder.
- Rename this document *Front + rear cover.*
- Create a first **offset frame** by *40mm* from the absolute frame along X+.
- Create a second **offset frame** by *40mm* from the absolute frame along X-.



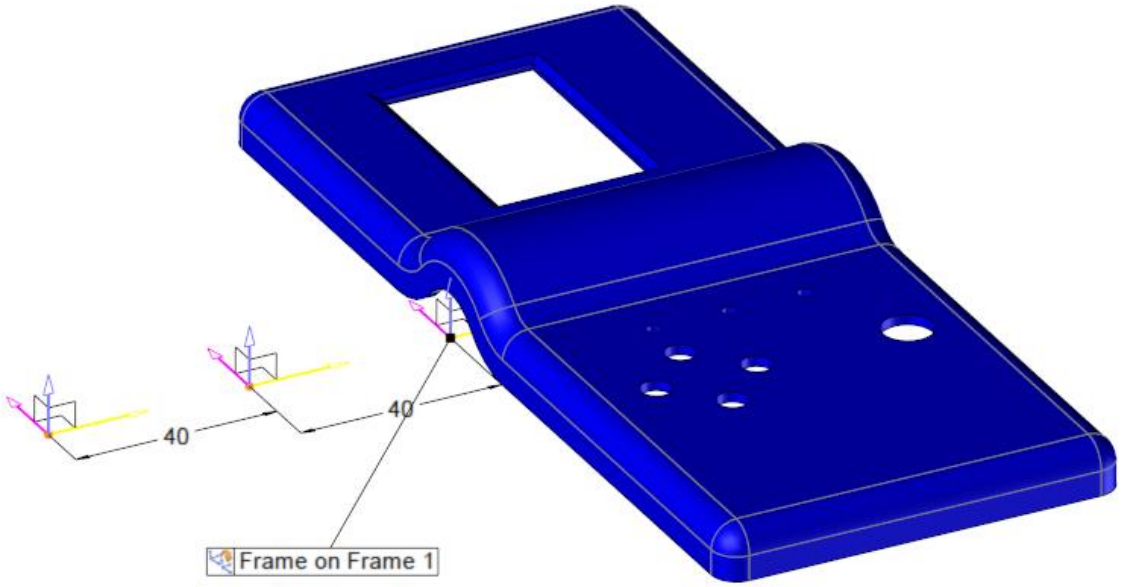
- Drag and drop the *Front cover* part document to the split document's graphics area.
- Repeat the operation for the *Rear cover* part document.



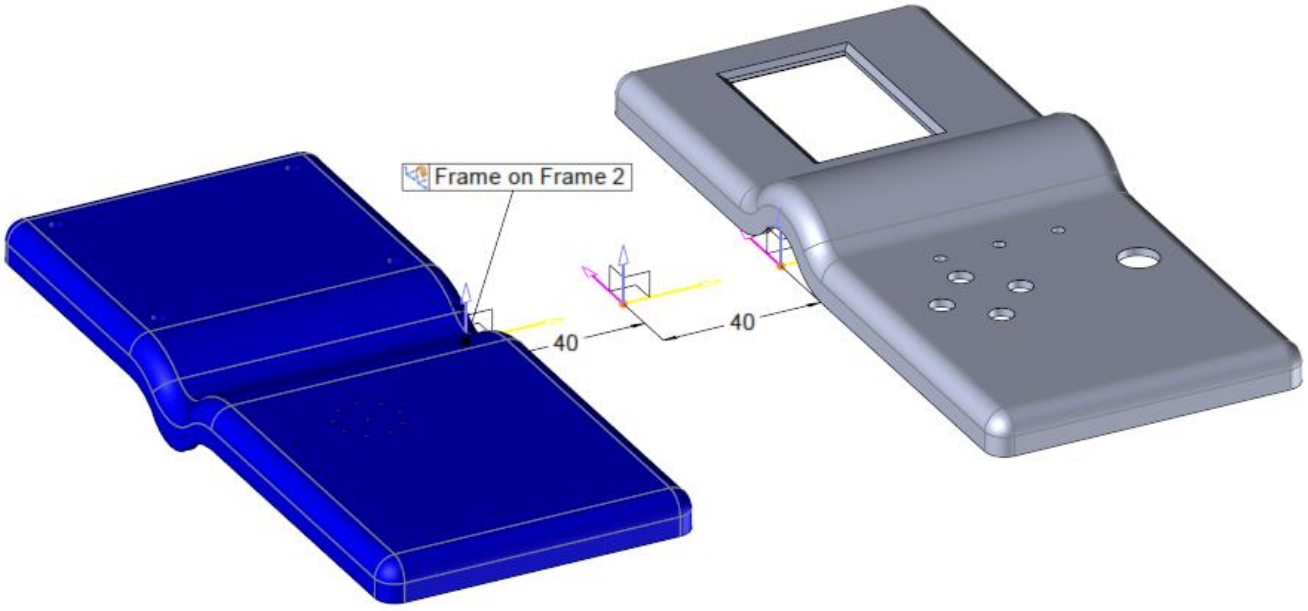
- **Confirm** the positioning.

Positioning parts

- **Edit the positioning** of the *Front cover* part.
- Since the first part is fixed, right-click on it and select the **Unfix** command.
- Create a **frame on frame** constraint between the part's published frame and the X+ offset frame.



- **Confirm** the positioning.
- In the same way, position the second part on the second frame.



- **Confirm** the positioning.

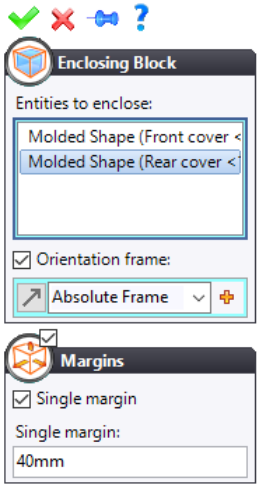
Defining the molded shapes, the stock and the shrinkage

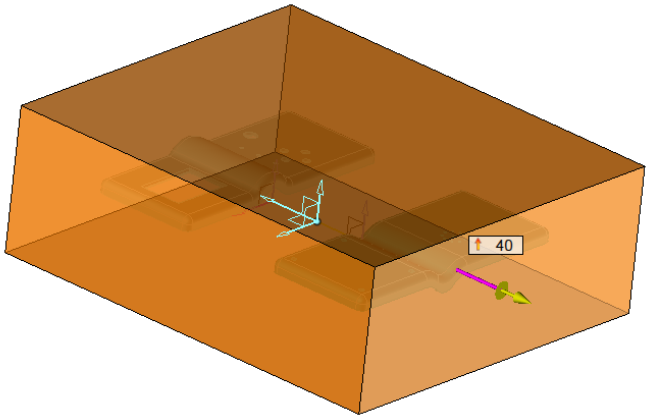
Molded shapes

- Create a first **molded shape** from the *Front cover* part, and then **confirm**.
- Create a second **molded shape** from the *Rear cover* part, and then **confirm**.

Stock

- Switch to the **Parting stage**.
- Create an **enclosing block** that includes the two parts and enter a **single margin** of *40mm*.



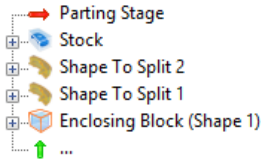


- From the Operations tree, move the **Enclosing Block** operation under the **Stock** operation, and then create a **user stock**.

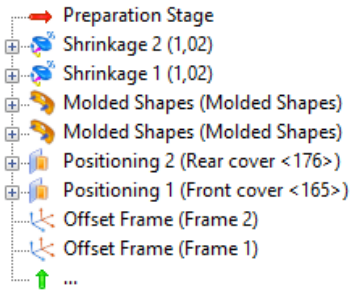
Shrinkage

- Apply a **shrinkage** of *1.02* to the *Front cover* part.
- Repeat the operation for the *Rear cover* part by applying the same shrinkage.
- Create a first **shape to split** by selecting the first part.
- Repeat the operation for the second part.

The Operations tree should look like this in the **parting stage**.



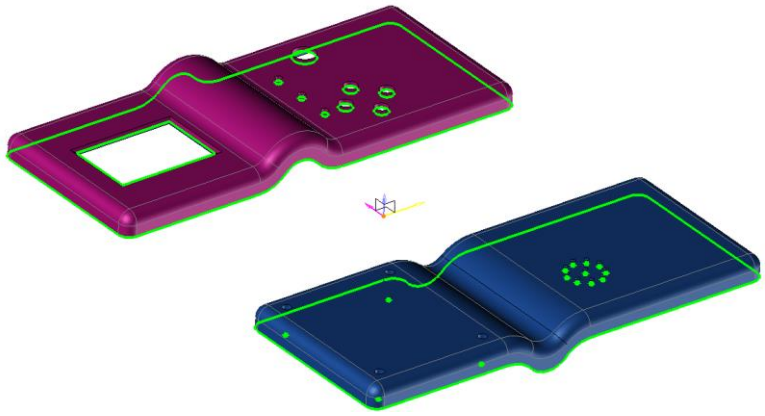
The Operations tree should look like this in the **preparation stage**.



Creating the parting line

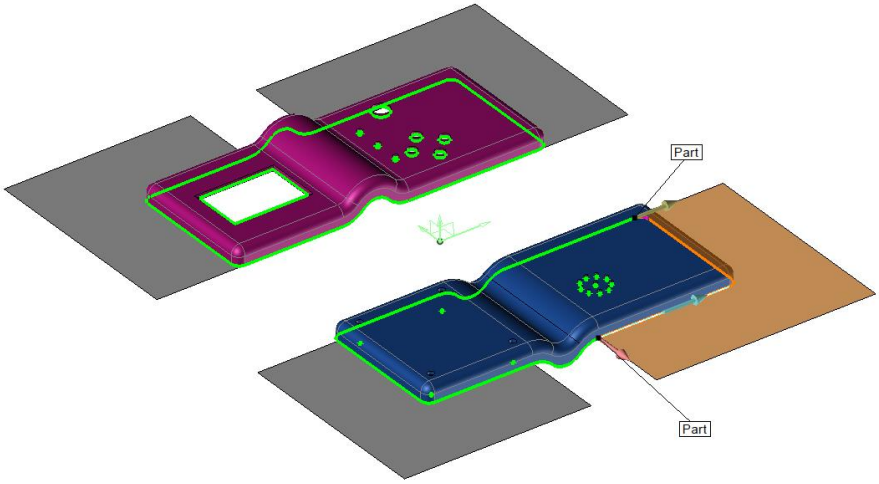
Parting edges

- Create the **parting edges** on the two parts, making sure that you select the right part to be modified each time.

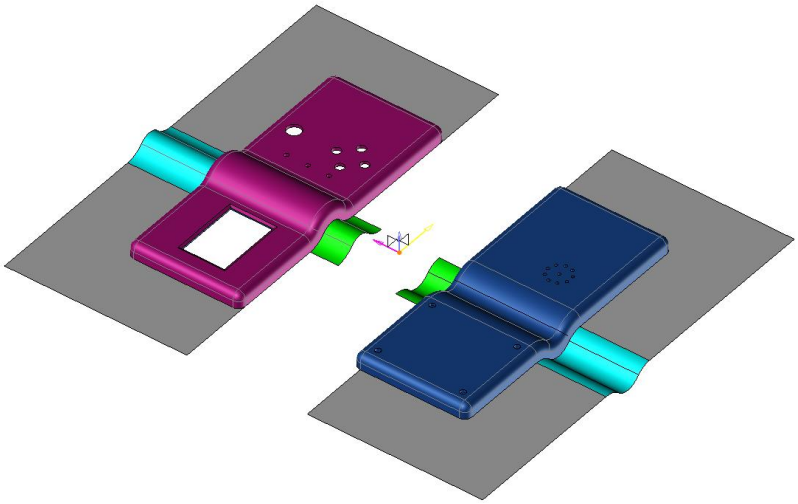


Parting surfaces

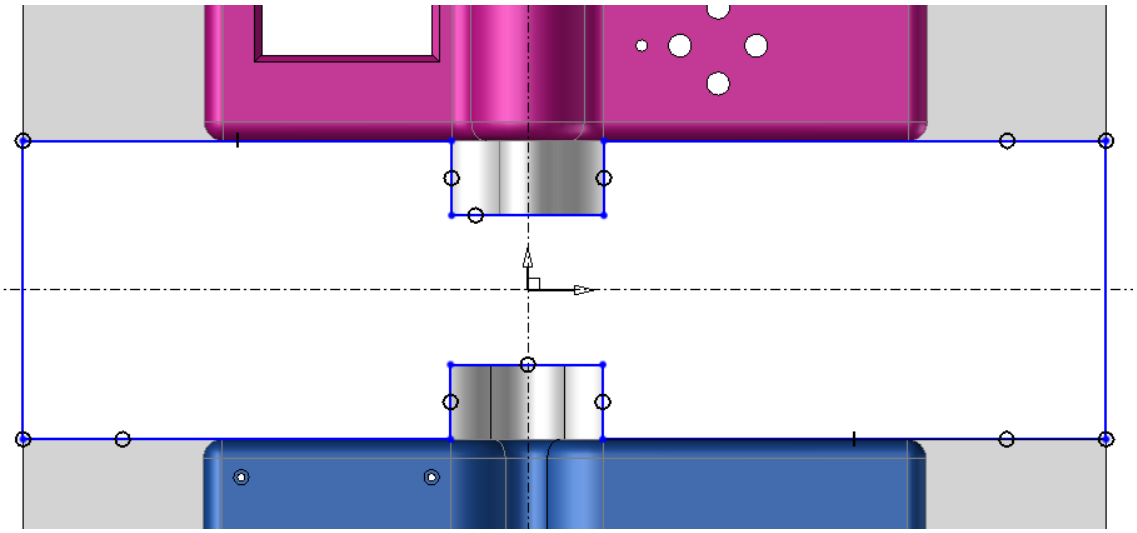
- Create the following **parting surfaces** using the **Planar** mode.



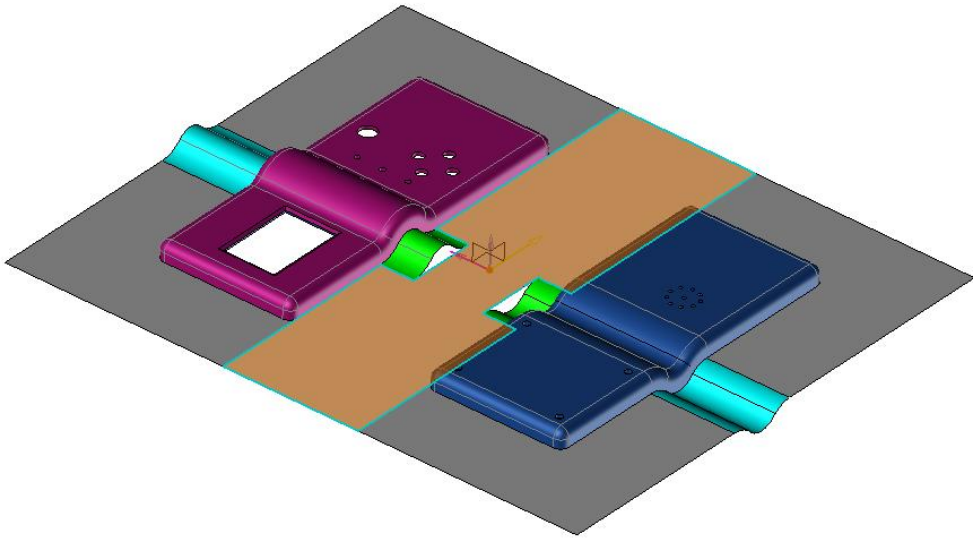
- Create the following **parting surfaces** using the **Extension** mode and extend the two blue surfaces to the stock plane and the two green surfaces to a *20mm* length.



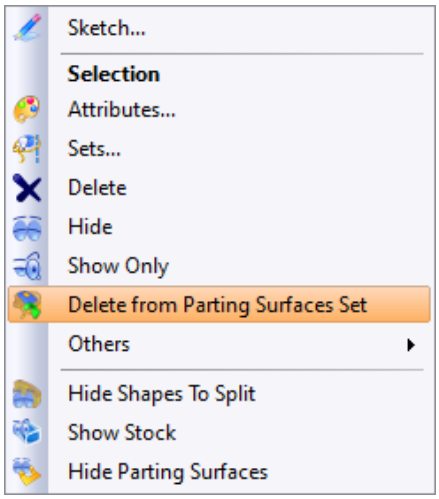
- Create the following **sketch** on the absolute XY plane.



- Create a  **flat** surface from the previously created sketch.

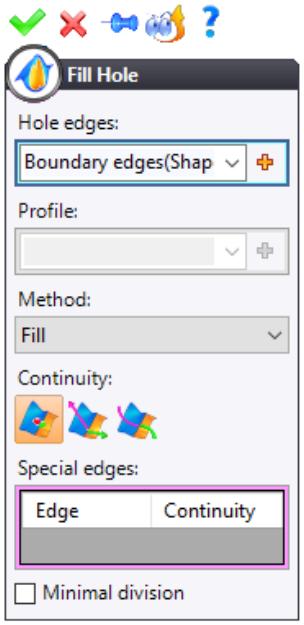


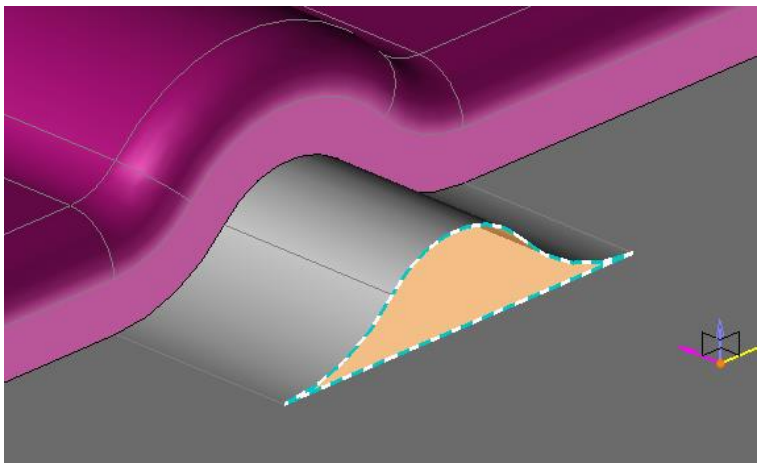
- Right-click on the two green surfaces and select the  **Delete from Parting Surface Set** command.



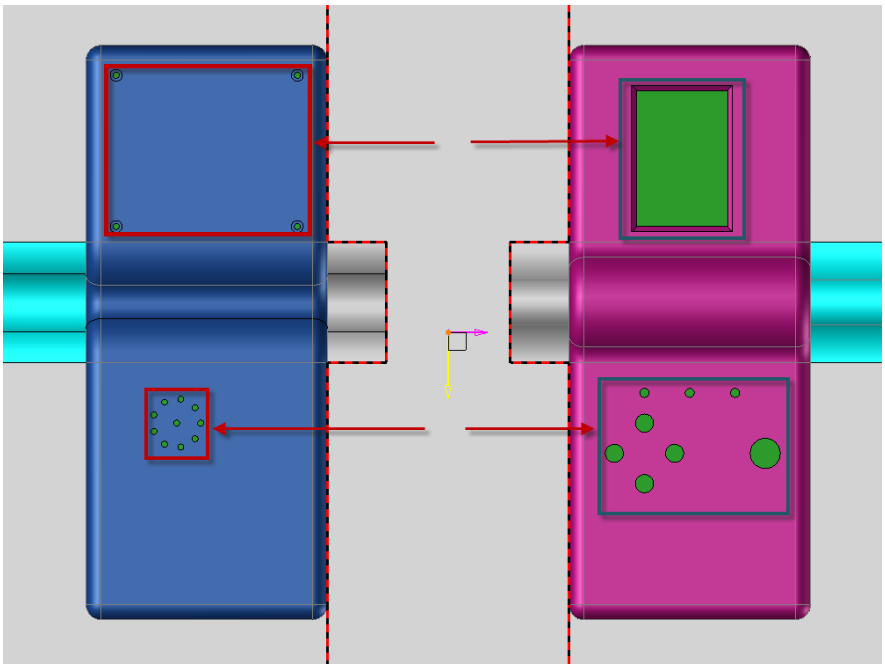
-  **Sew** these two surfaces with the central surface.
- Right-click on the resulting surface and select the  **Add in Parting Surface Set** command.

- Create the two missing surfaces using the **Fill Hole** command.



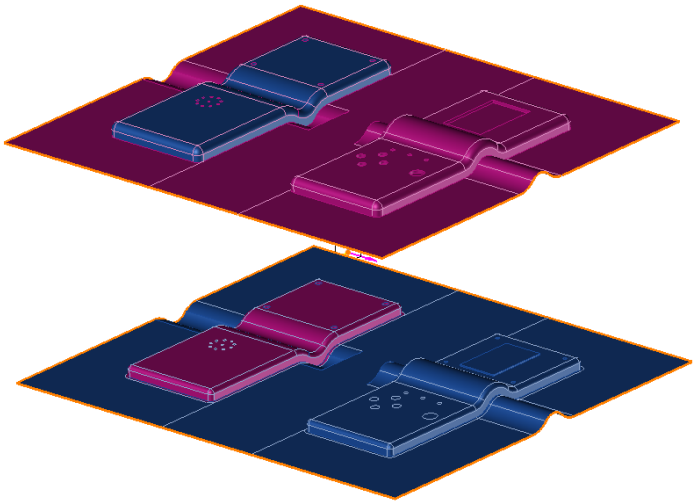


- Create the **shut off surfaces**.

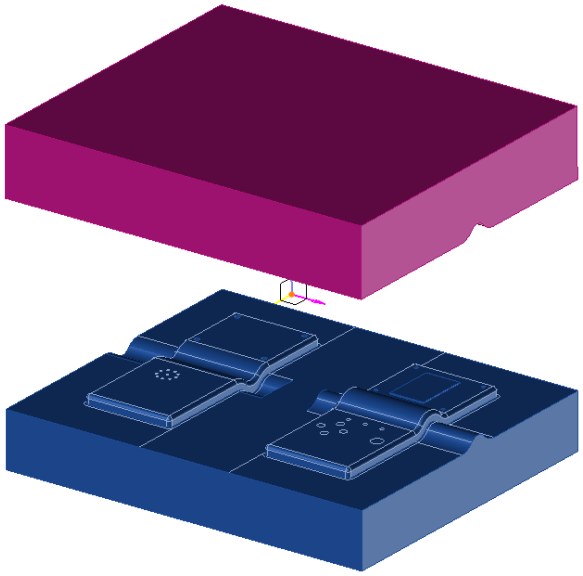


Creating the core cavity blocks

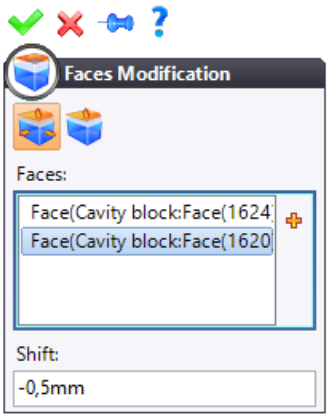
- Create the **parting shells**.

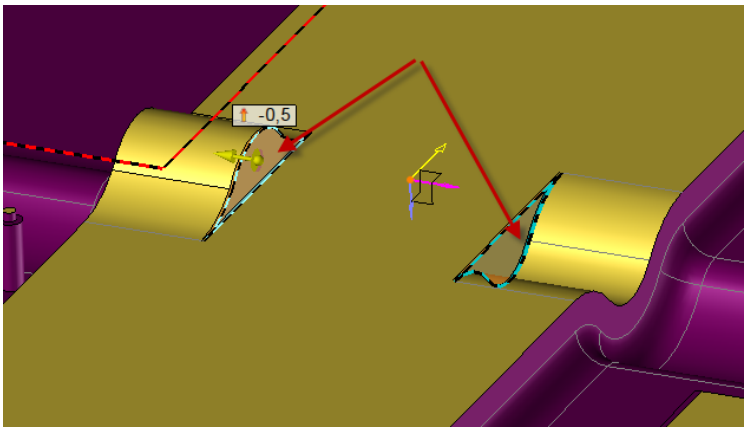


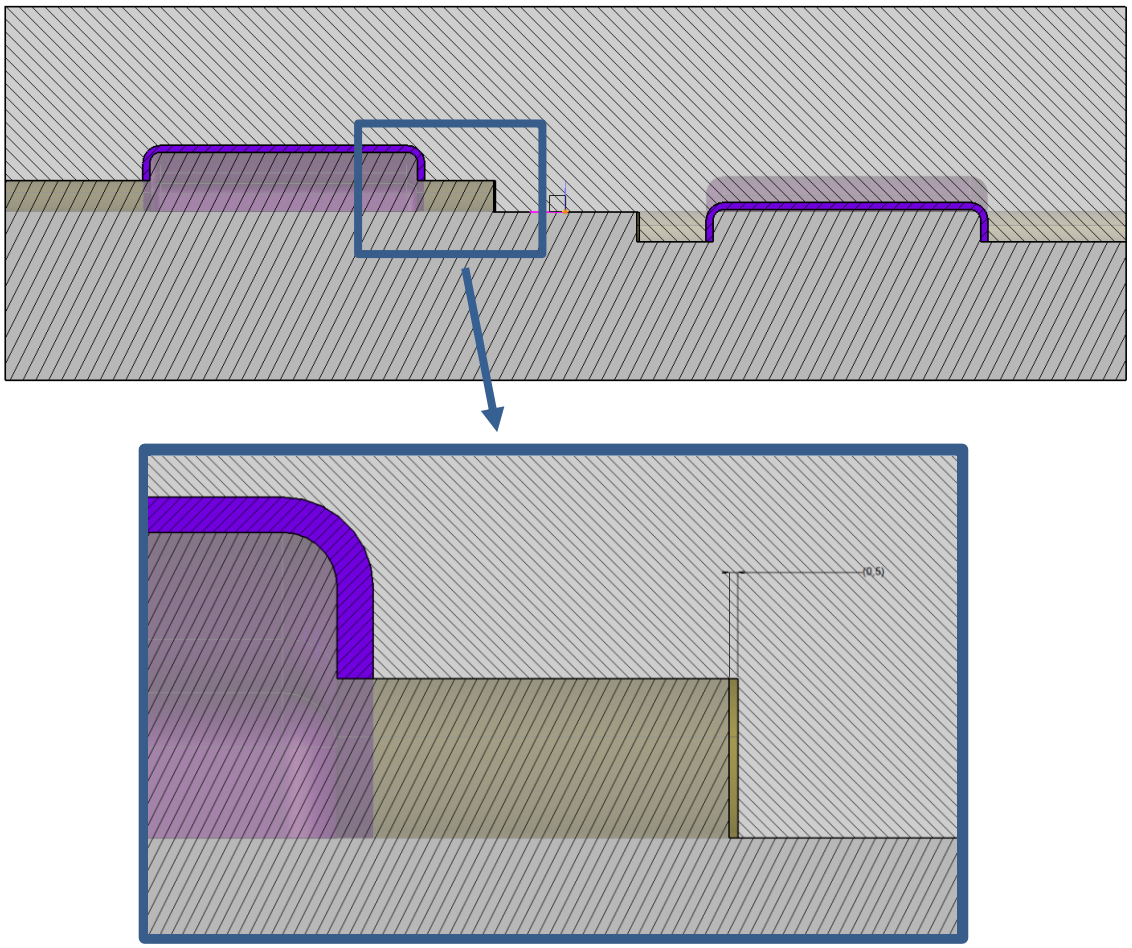
- Create the **parting shapes**.



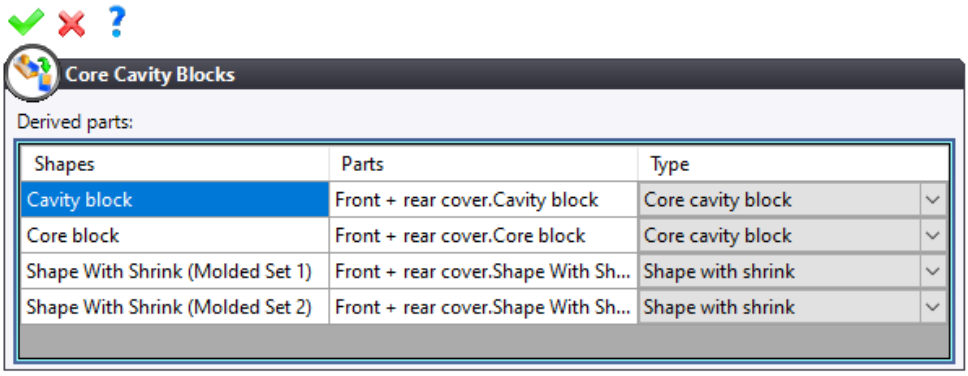
- **Hide** the core block.
- From the **Shape** tab, select the **Faces Modification** command and shift the following two faces by *0.5mm* along Y-.







- Create the **core cavity blocks**.



Check-in

- From the Project tree, **check** the *Exercise 09* folder into the vault.

Exercise 10

Concepts addressed:

- Creating parting edges using repetition

Starting the study

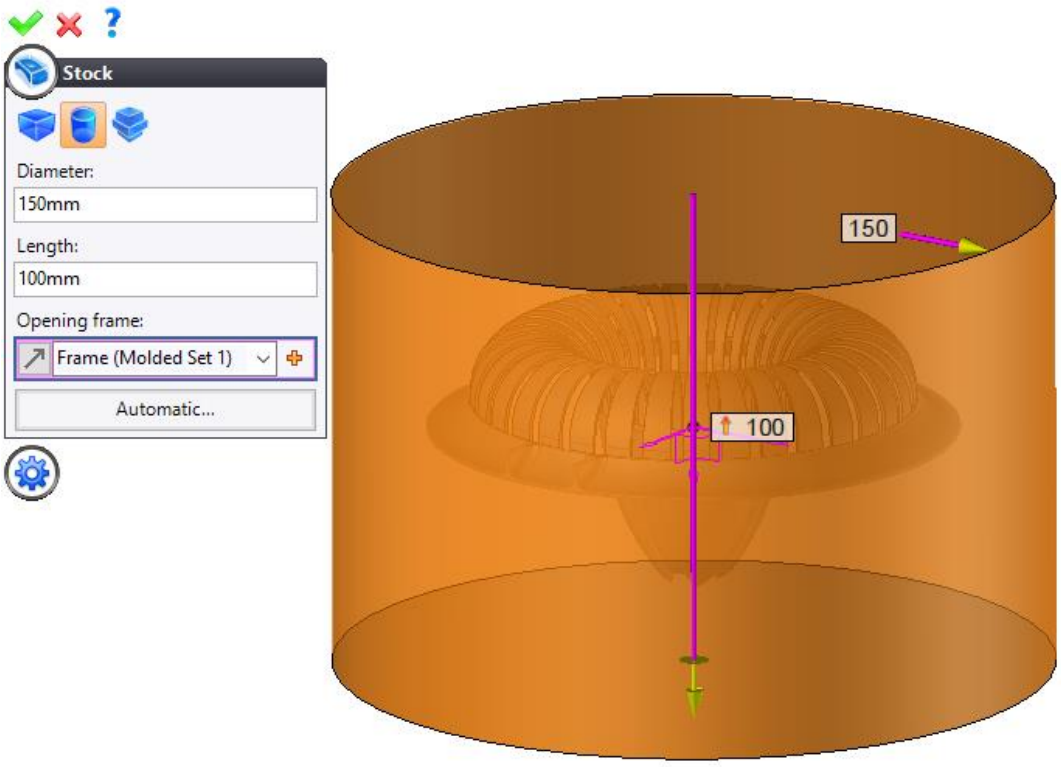
- From the *Exercise 10* folder, open the *Juicer* part document.
- Right-click on the absolute frame and select the **Others** > **Publish Frame** command from the **Selection** section.
- Create a **Split** document from the part document.

Defining the shrinkage

- Apply a **shrinkage factor** of *1.005*.

Defining the stock

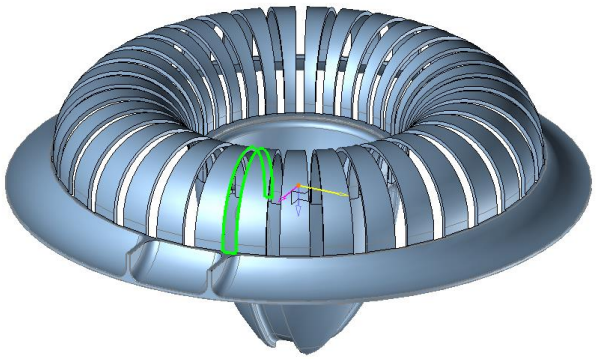
- Creating a cylindrical **stock** as shown below.



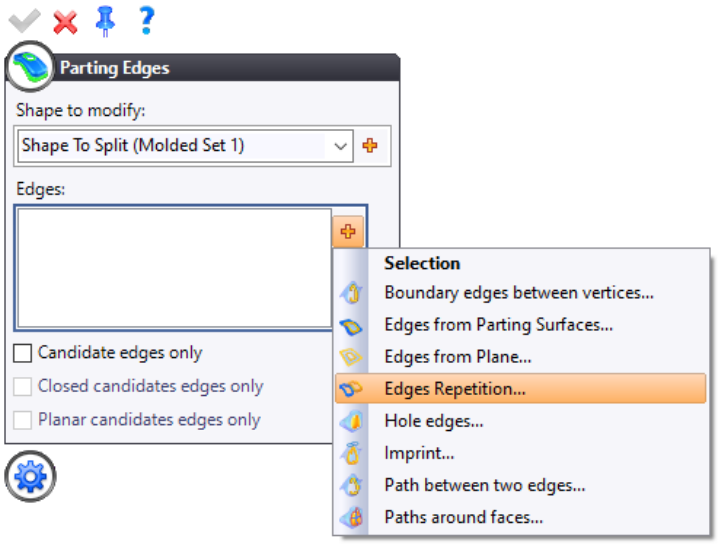
Creating the parting line

Parting edges

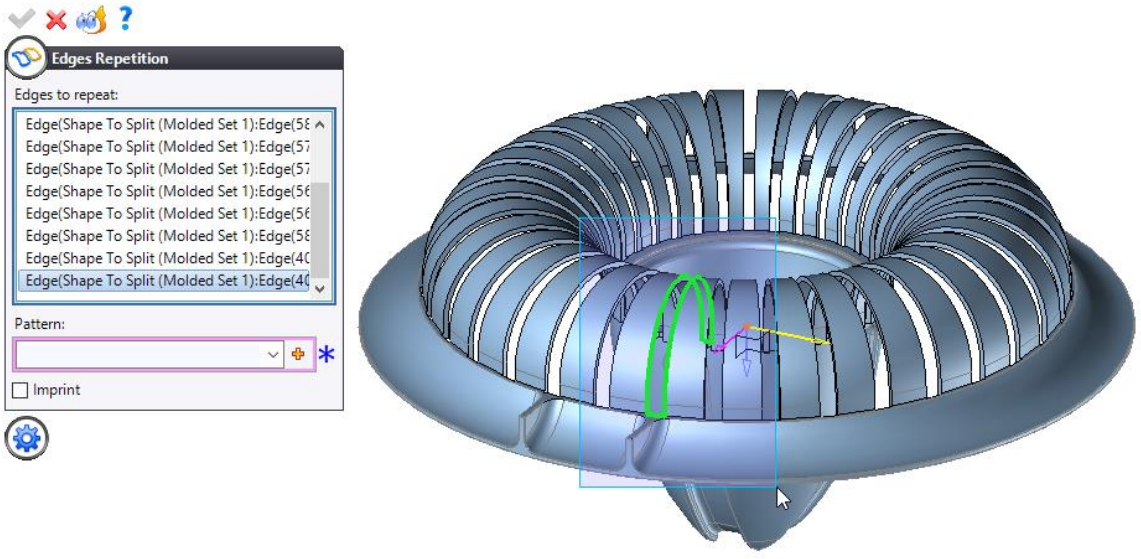
- Right-click in the graphics area and select the **Parting Edges** command. Make sure that you pin the dialog box.
- Create the parting edges for the first opening.



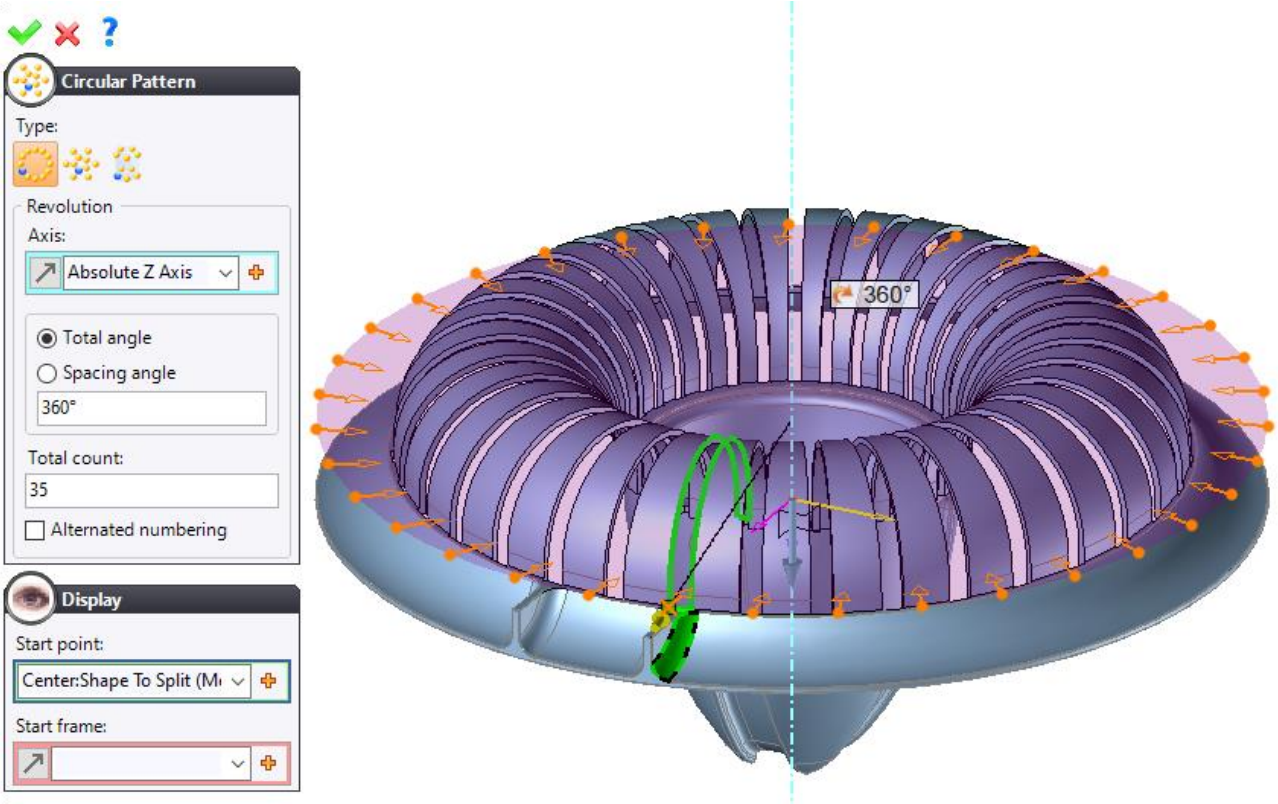
- Create the **parting edges** using edge repetition.



- Draw a selection box that includes the edges of the first opening.

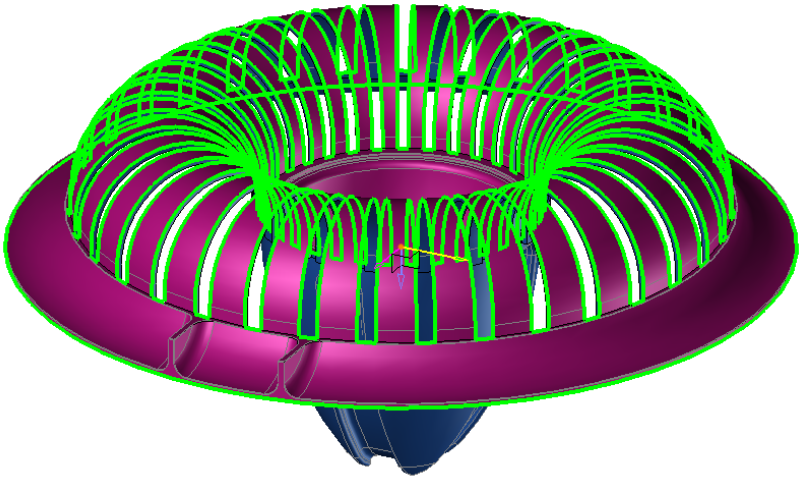


- Click on the icon from the **Pattern** field and create a **circular pattern** around the **Z** axis with a **total count** of *35*.



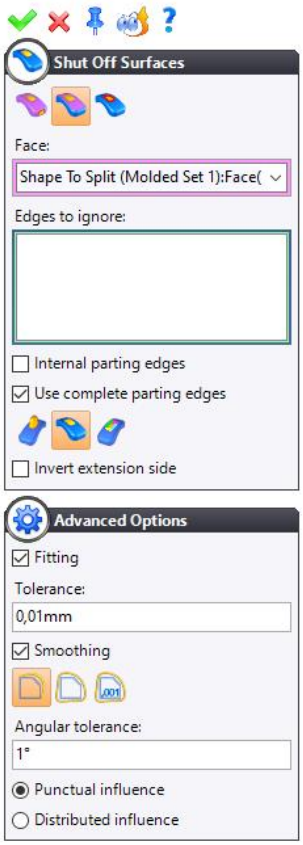
- **Confirm** the pattern, and then the repetition.

- Create the parting edge at the bottom of the fillet.

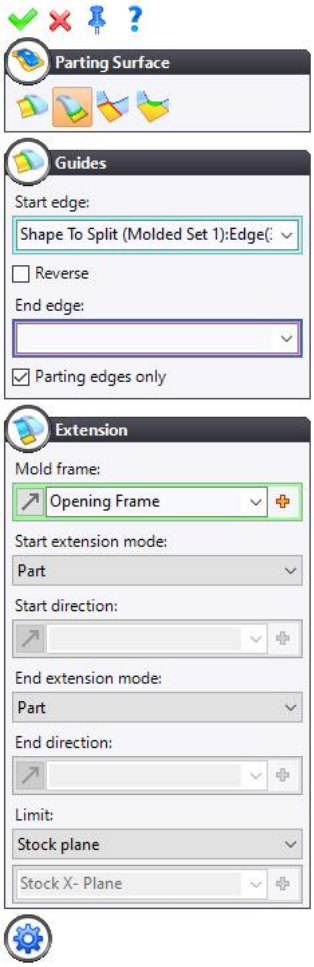


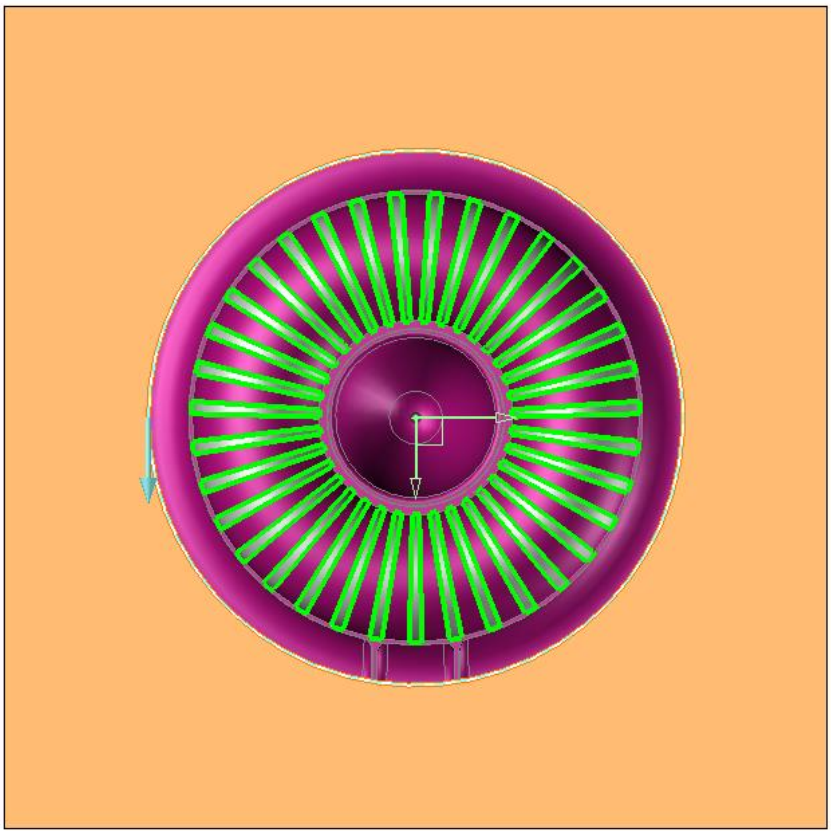
Parting surfaces

- Create the **shut off surfaces**.



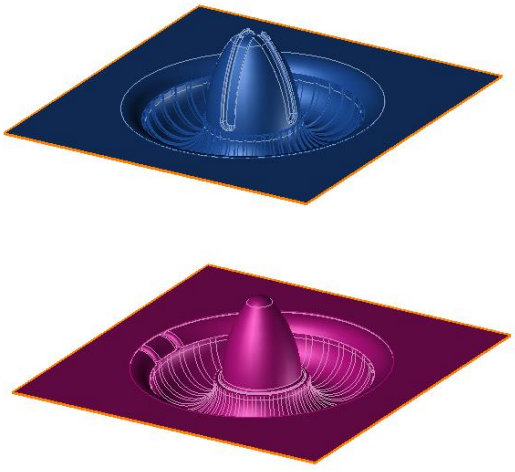
- Create the following **parting surface** using the **Planar** mode.





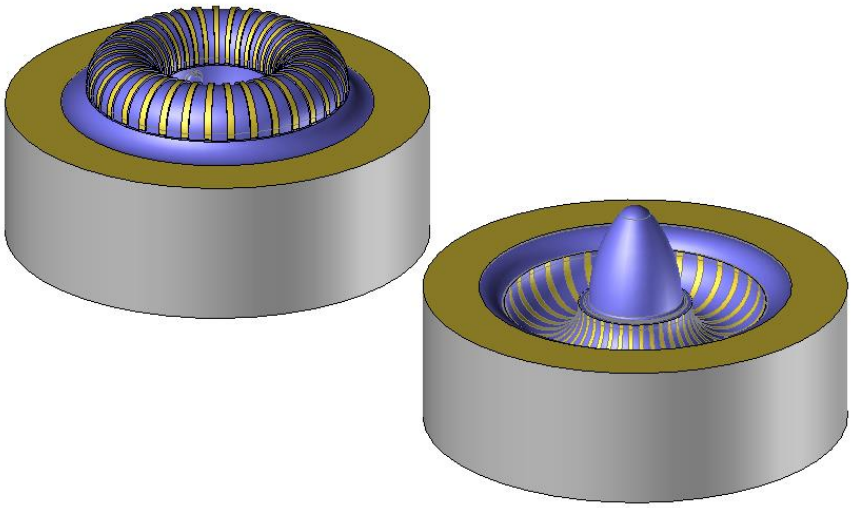
Creating the core cavity blocks

- Create the **parting shells**.



- Create the **parting shapes**.

- Create the **core cavity blocks**.



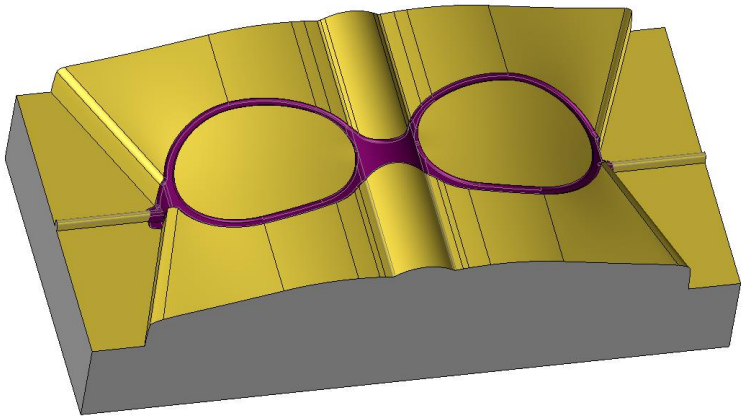
Check-in

- From the Project tree, **check** the *Exercise 10* folder into the vault.

Exercise 11

Concepts addressed:

- Creating parting surfaces based on vector profiles



Starting the study

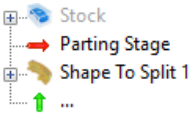
- From the *Exercise 11* folder, open the *Glasses* part document.
- Create a  **Split** document from the part document.

Defining the shrinkage

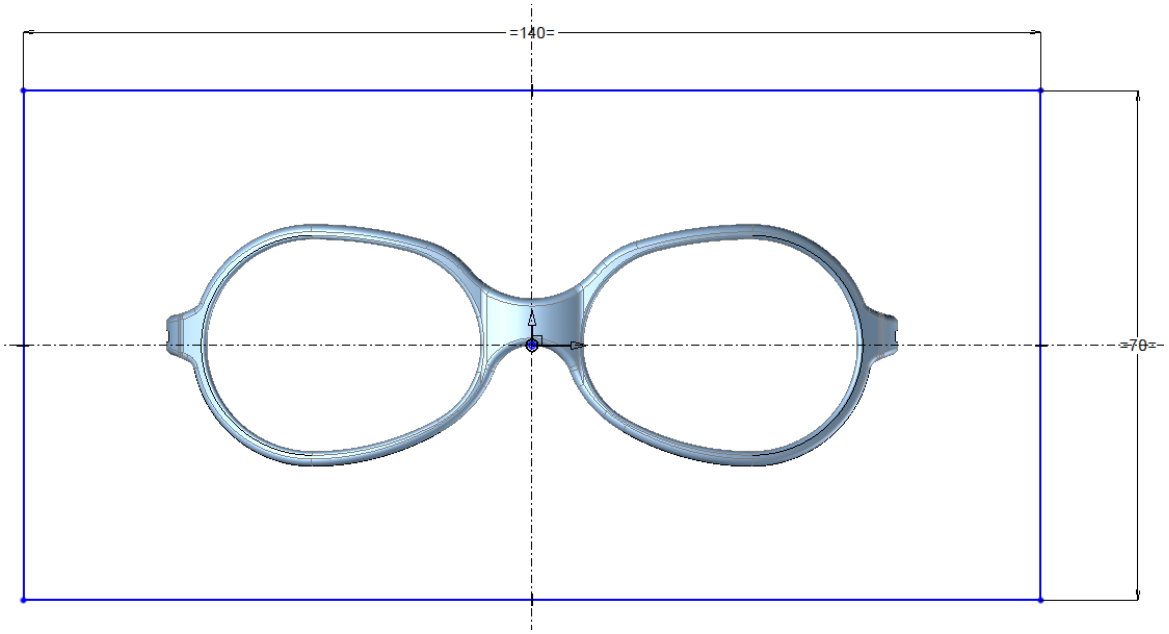
- Apply a **shrinkage factor** of *1.006*.

Creating a user shape

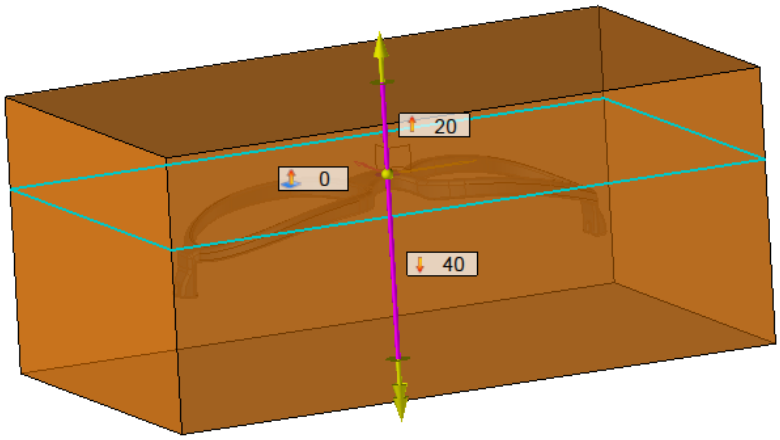
- From the Operations tree, move the insertion cursor under the **Stock** operation.



- Create a 2D **sketch** on the **absolute XY support plane**.
- Draw a *140x70mm* **rectangle** and set the following constraints.



- Create an **extruded** shape of *20mm* with a **second side** of *40mm*.



Defining a user stock

- Right-click in the graphics area and select the **End inserting** command.
- Select the **Stock** command again. Select the **User** option and select the previously created block.
- Click on to **confirm**.

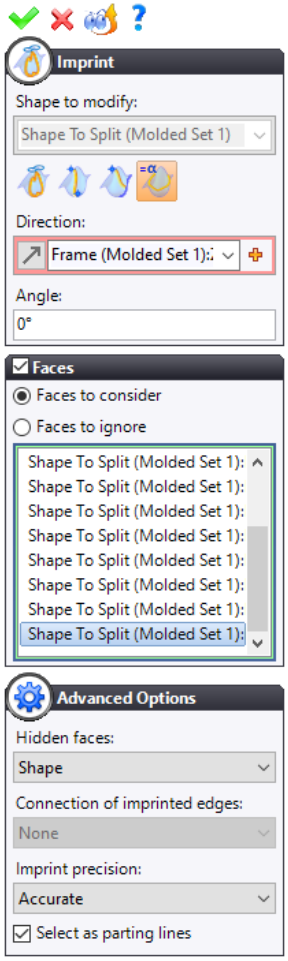
Creating the parting line

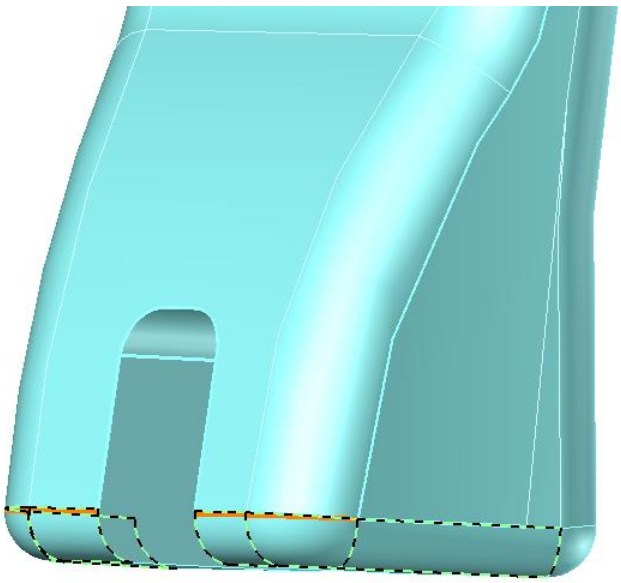
Creating the candidate edges

- Select the **Candidate Edges** command. From the **Molding axis** drop-down list, select the **Z axis of the molded set frame**.

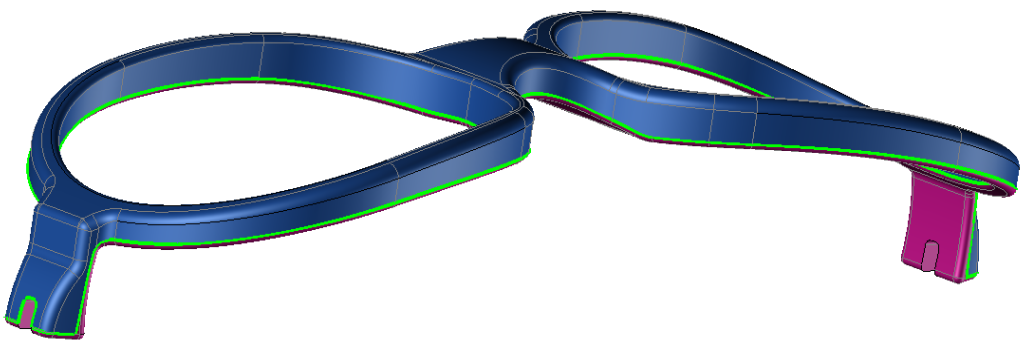
Creating the parting edges

- Select the **Parting Edges** command.
- Click on the **special inputs** and perform an **imprint** operation using the **Isoclines** and **Faces** modes. Select the faces to consider as shown below, then add the faces on the opposite side.



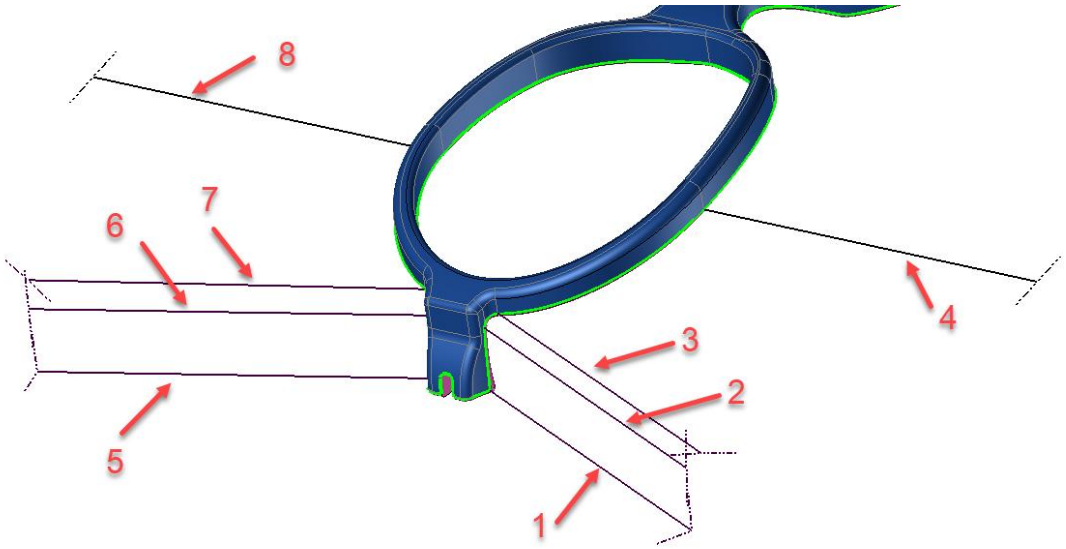


- **Confirm** the imprint operation.
- Select the additional parting edges and click on to **confirm**.

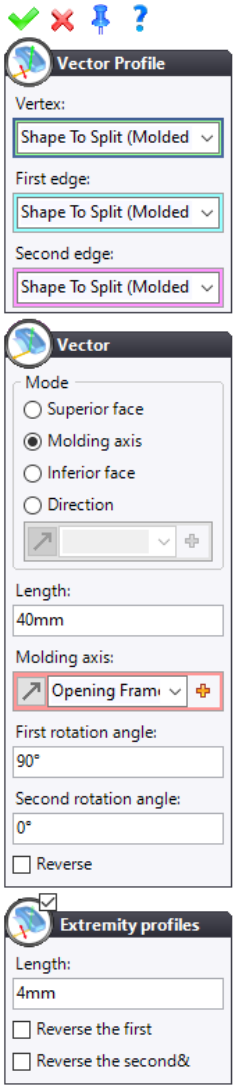


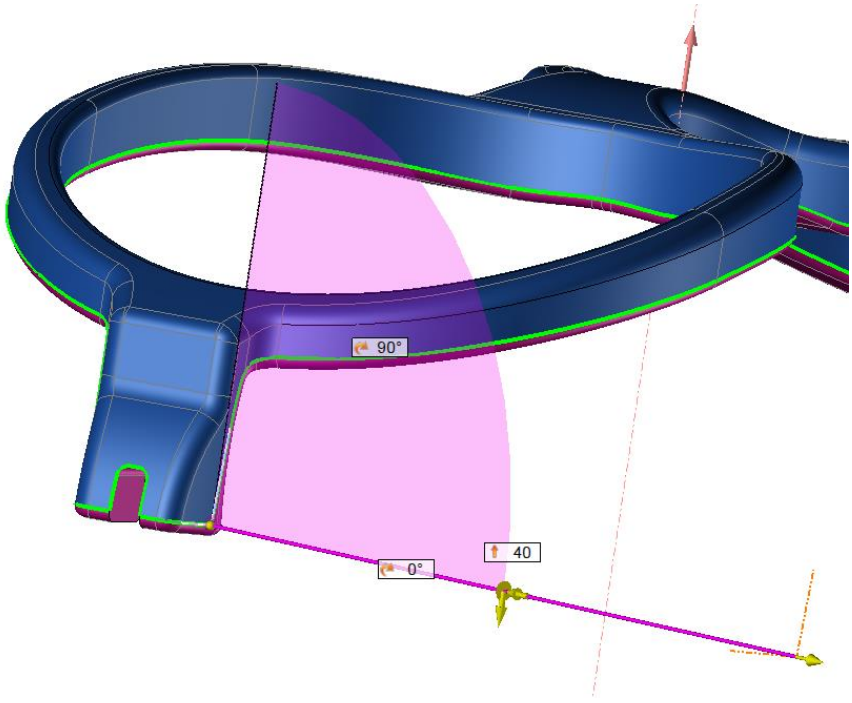
Creating the vector profiles

This operation allows you to create vector profiles from a selected point on a parting line edge path. The profile can either be orthogonal to the molding axis or tangential to the faces connected to that point.



- Create a  **vector profile** as shown below.

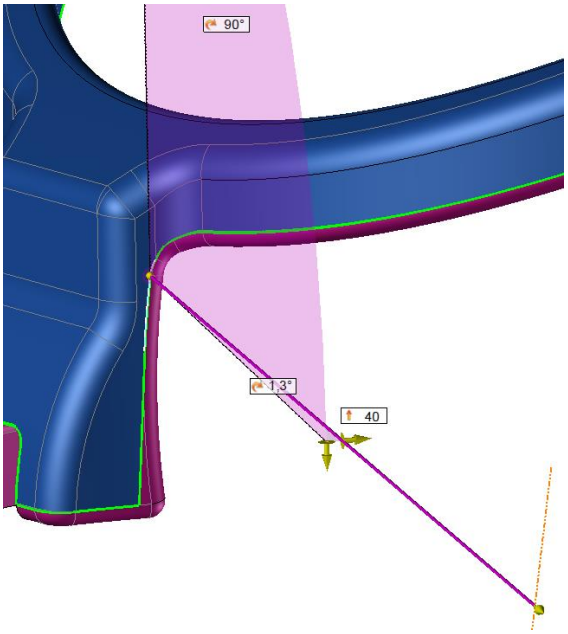




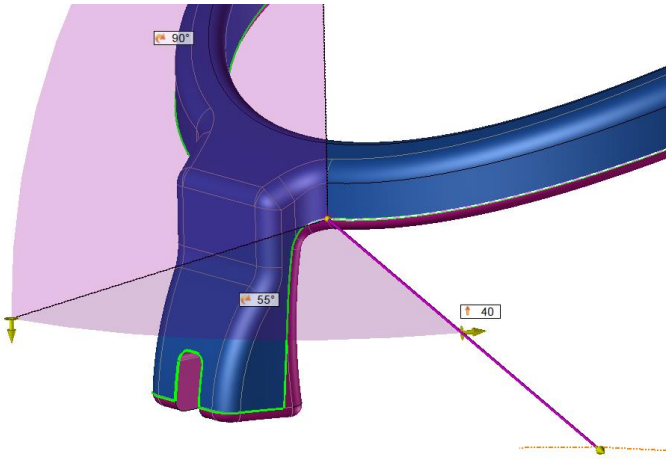
- Click on  to **confirm**.

- Repeat the operation to create the following vector profiles.

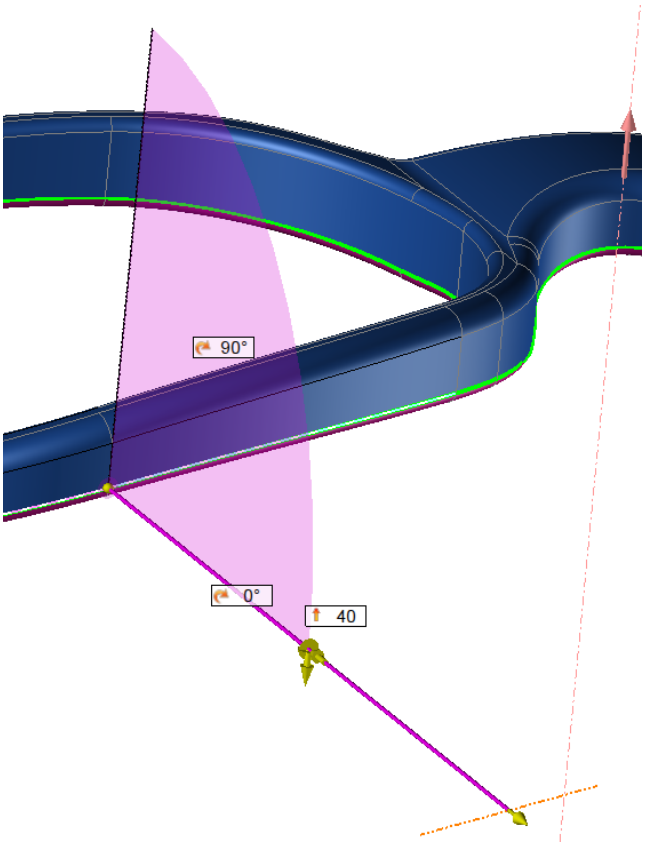
Vector profile (2)



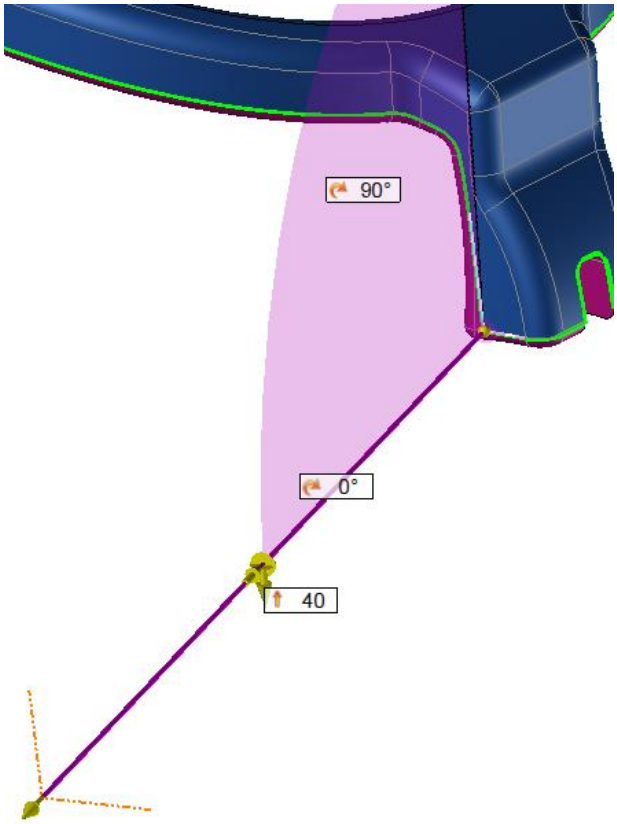
Vector profile (3)



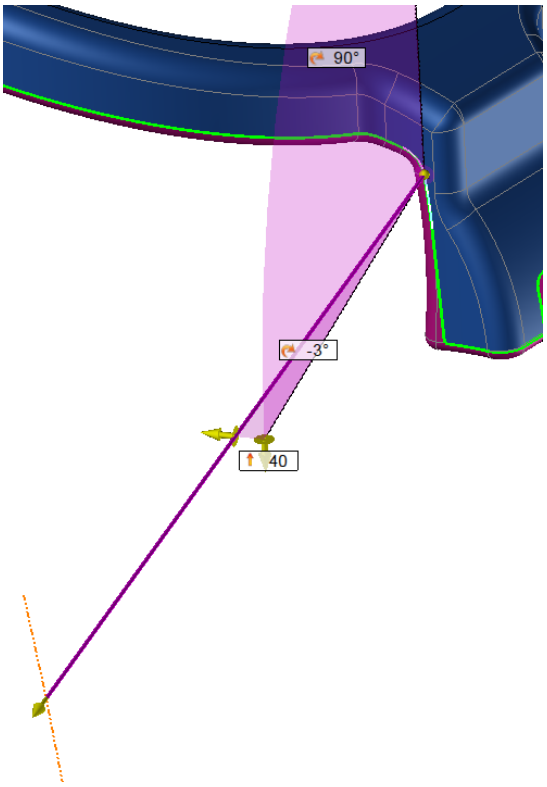
Vector profile (4)



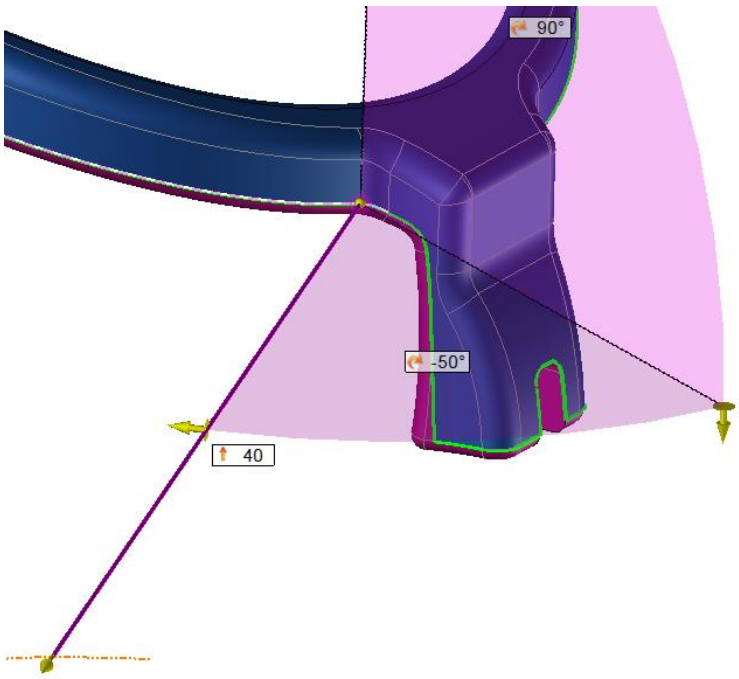
Vector profile (5)



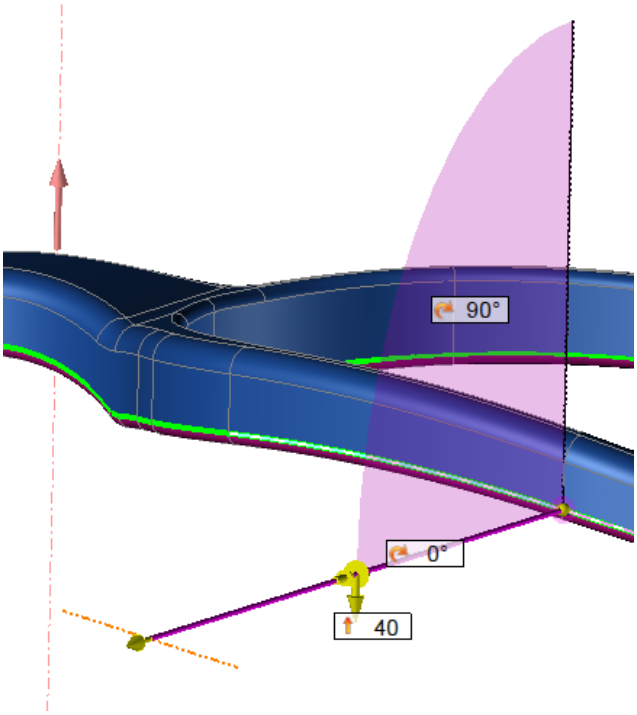
Vector profile (6)



Vector profile (7)



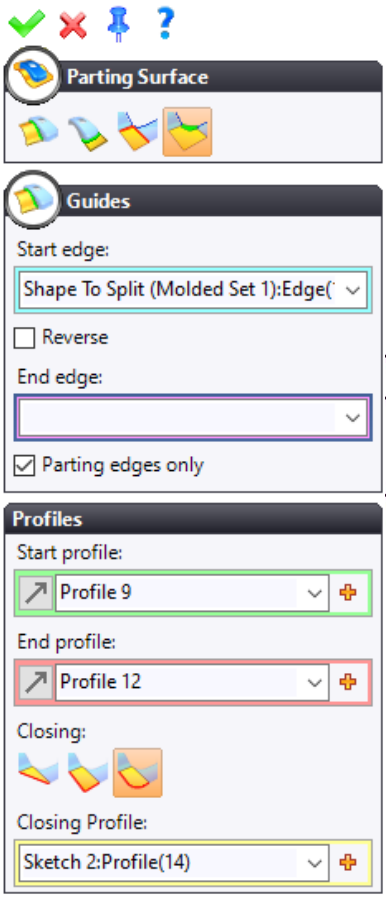
Vector profile (8)

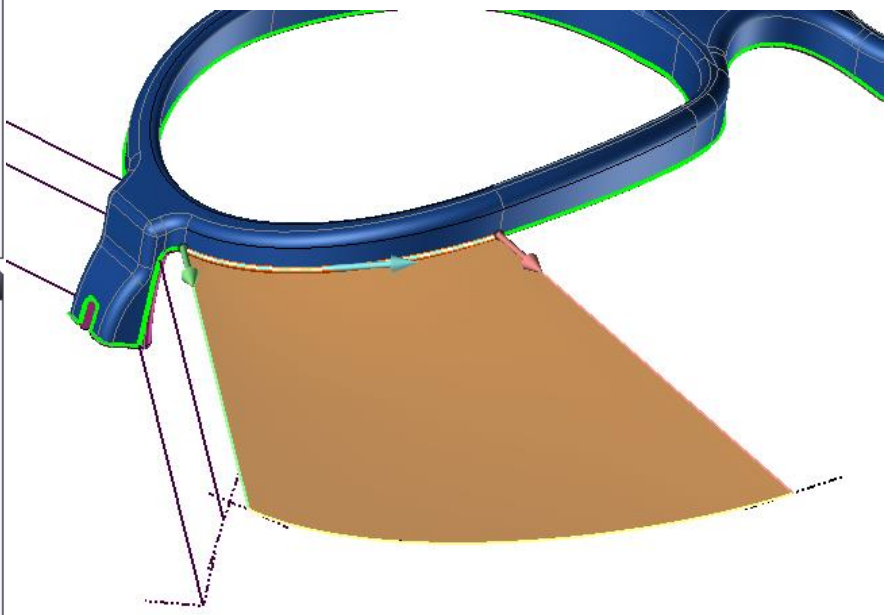


Creating the parting surfaces

The parting surfaces can be created based on the previously created vector profiles.

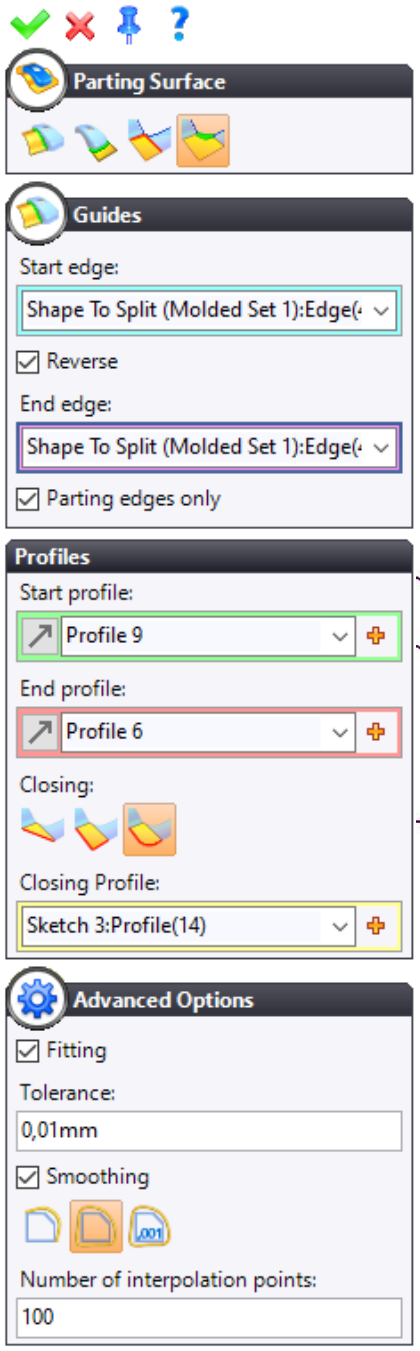
- Create a **parting surface** using the **Lofted with guides** mode and select **Profile** as the closing type.

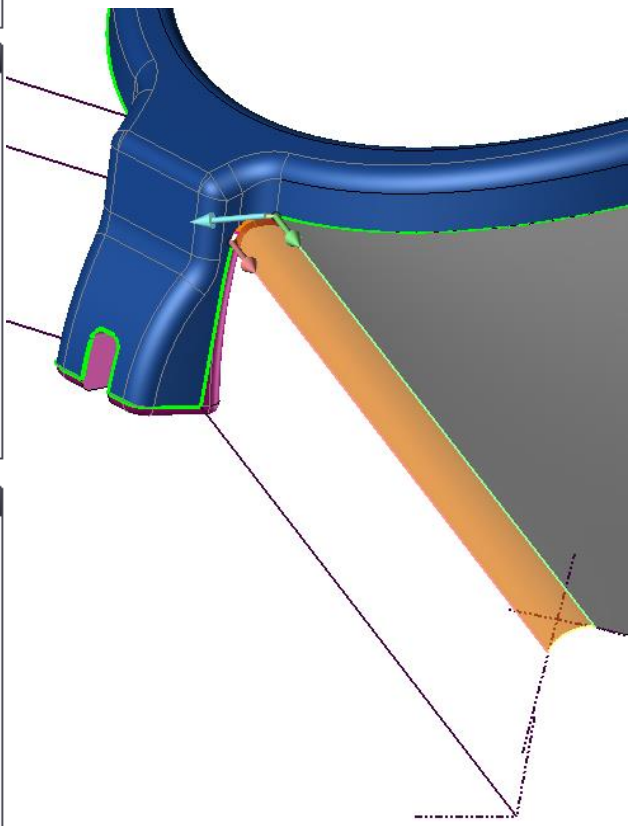




- Click on to **confirm**.

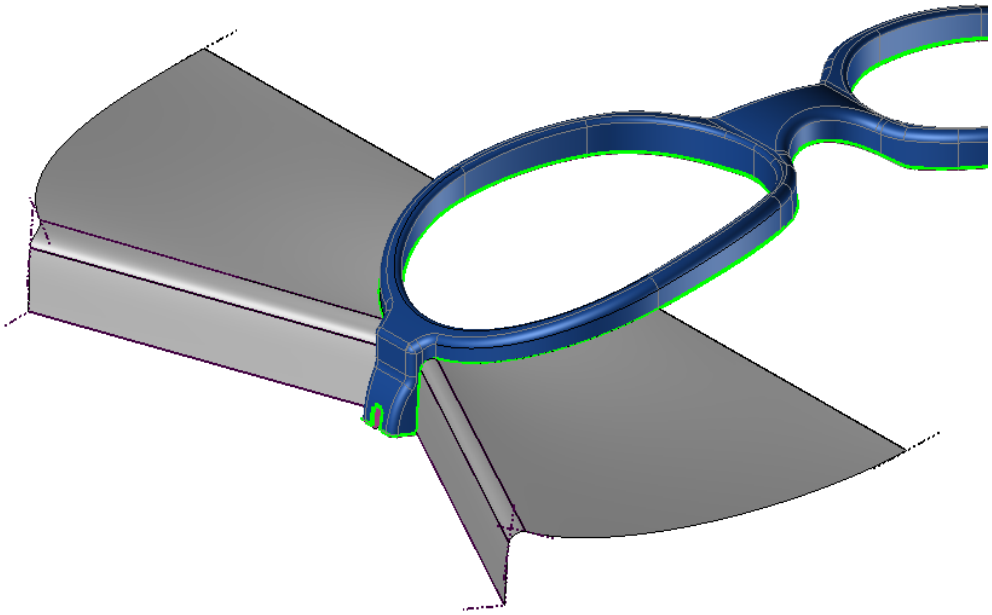
- Create a new **parting surface** using the **Lofted with guides** mode and select **Profile** as the closing type. In the advanced options, check the **Smoothing** box and select the **Global** mode because the parting line is considered discontinuous.



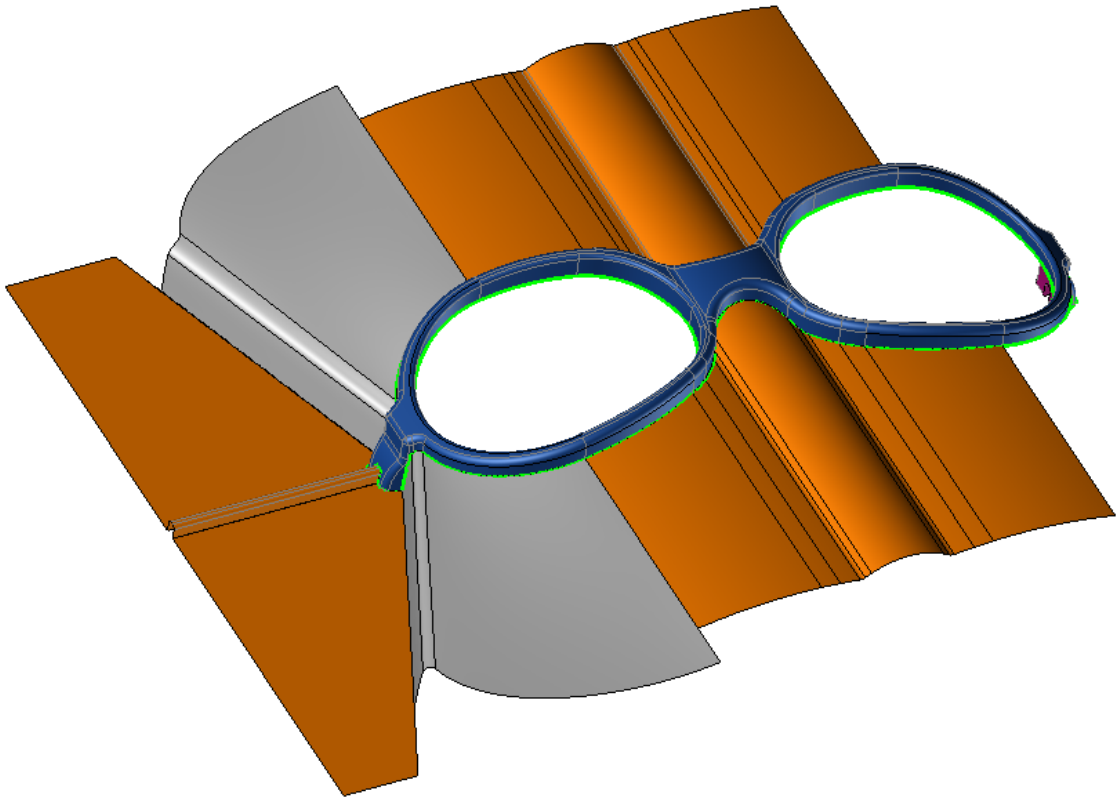


- Click on to **confirm**.

- Repeat the previous operations to obtain the following surfaces.



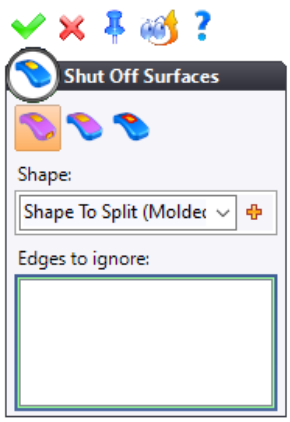
- Create the missing parting surfaces using either the **Extension** or **Planar** mode.

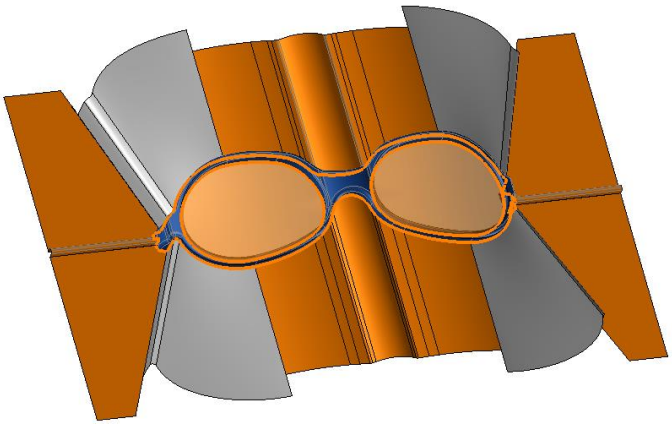


- **Repeat** the surfaces by symmetry using the absolute YZ plane.

Creating the shut off surfaces

- Create the **shut off surfaces**. To do this, select the **Shape** mode and select the part in the graphics area. In the **Edges to ignore** field, select a bottom edge of the part so that no shut off surface is created here.

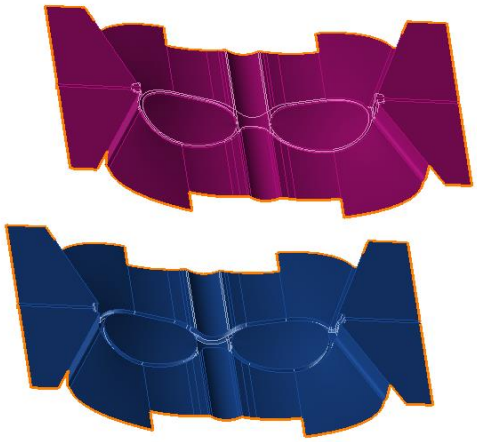




Creating the parting shapes

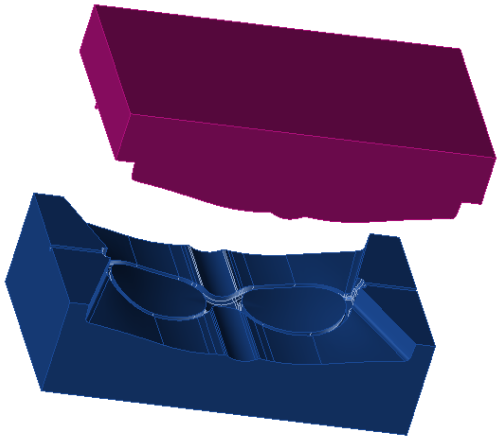
Parting shells

- Create the **parting shells**.



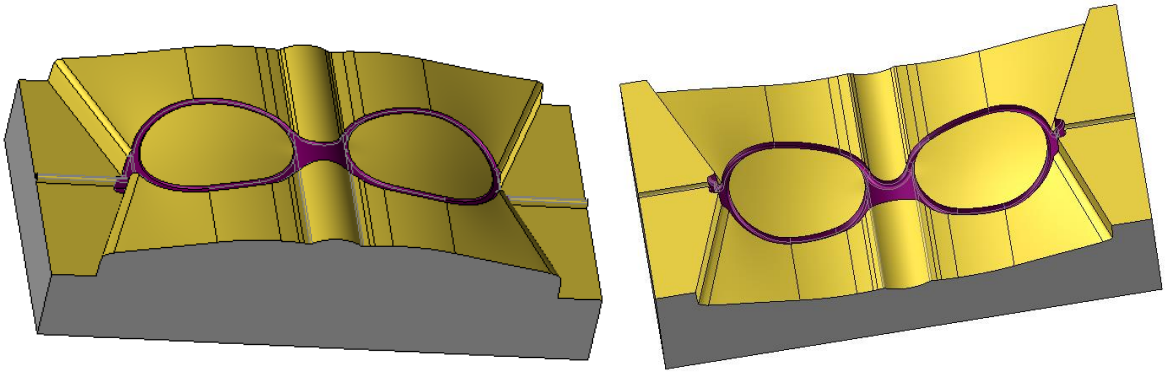
Creating the parting shapes

- Create the **parting shapes**.



Creating the core cavity blocks

- Create the **core cavity blocks**.



Check-in

- From the Project tree, **check** the *Exercise 11* folder into the vault.

Exercise 12: Template Linked to Core Cavity Blocks and Inserts

Introduction

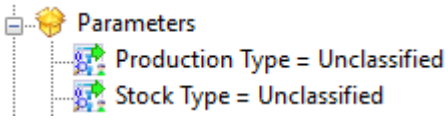
When the core cavity blocks are generated, the template selected to create the part documents is blank.

Accordingly, the core cavity blocks and the inserts have no material and the physical properties are not calculated, meaning that you need to manually apply the material and calculate the properties on each part.

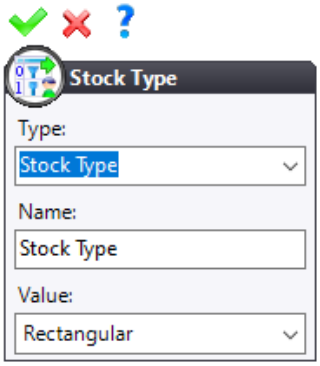
You can avoid this by creating a part template that is specific to the core cavity blocks and the inserts.

Creating the template with calculated stock dimensions

- From the **TopSolid** menu, select the **File** > **Document Templates** > **Open My Templates** command.
- Create a **Part** document using the **Steel Part** template and rename it *Block Template*.
- From the Entities tree's **Parameters** folder, double-click on the **Stock Type** parameter.

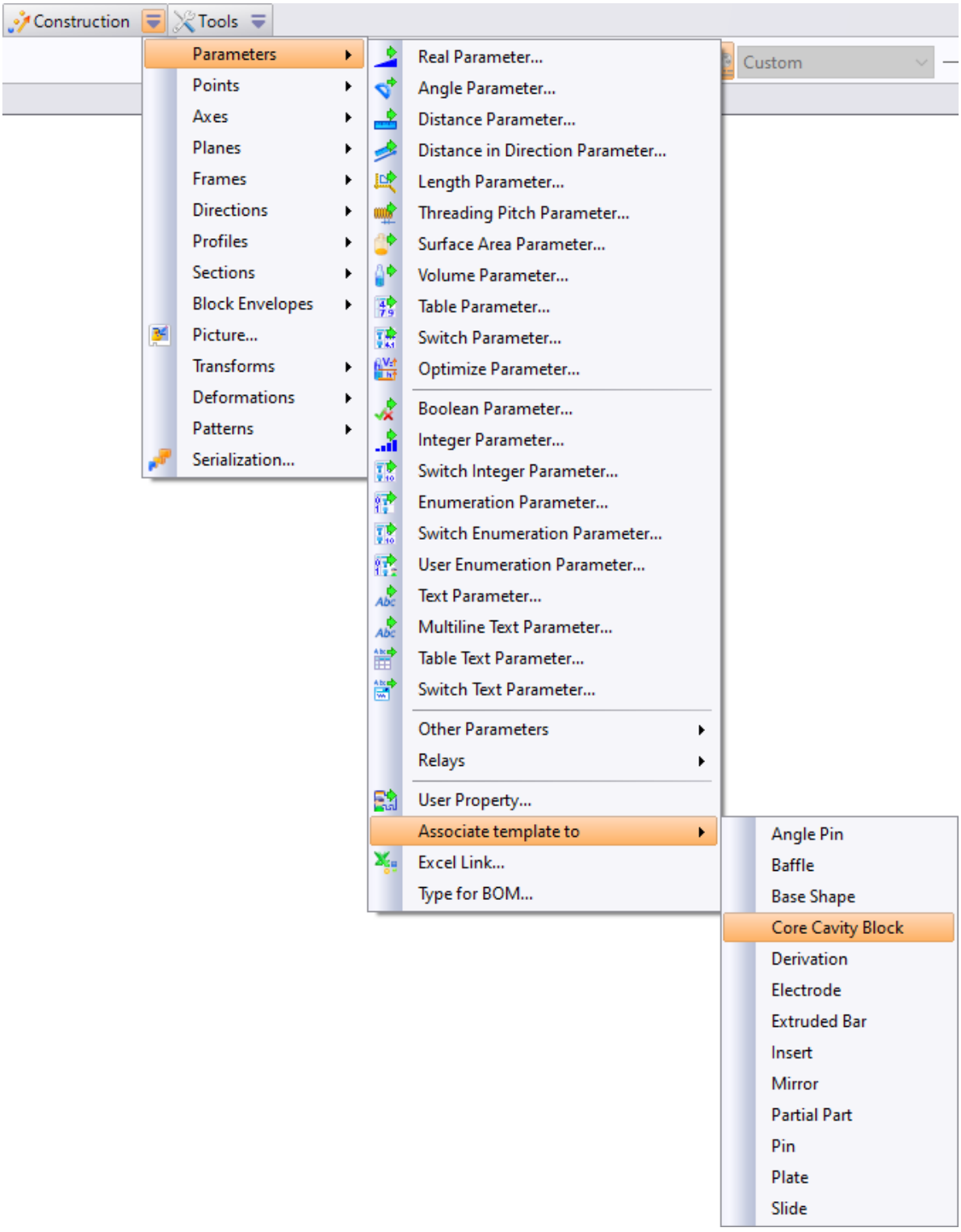


- Select the **Rectangular** value from the drop-down list.

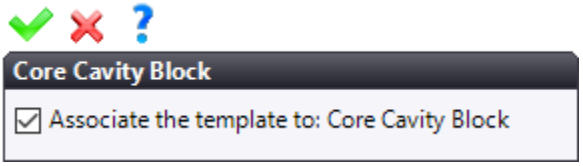


- Click on to **confirm**.
- From the Entities tree, open the **Parameters** > **Stock Calculation** > **Rectangular** folders, double-click on the **BoxXSizeMargin**, **BoxYSizeMargin** and **BoxZSizeMargin** parameters and enter margin values for the stock calculation.
- Click on to **confirm**.

- From the **Construction** tab, select the **Parameters** > **Associate template to** > **Core Cavity Block** command.

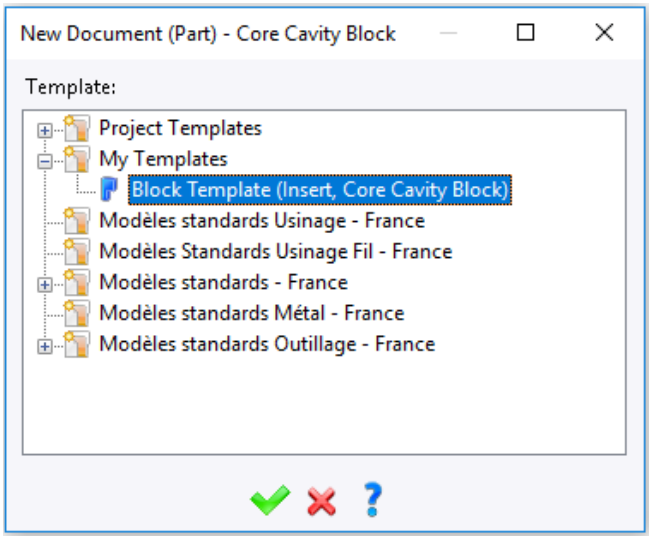


- Check the **Associate the template to: Core Cavity Block** box and **confirm**.

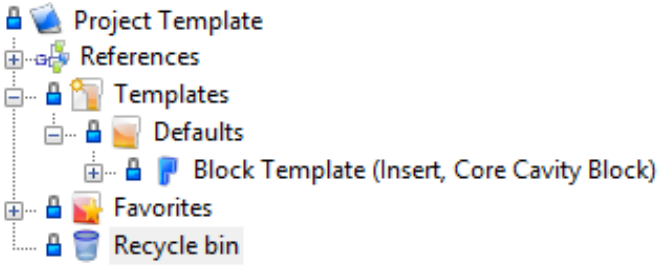


- Repeat the operation by selecting the **Associate the template to** > **Insert** command.

Note: When creating the core cavity blocks, **TopSolid** will propose to select a document template.



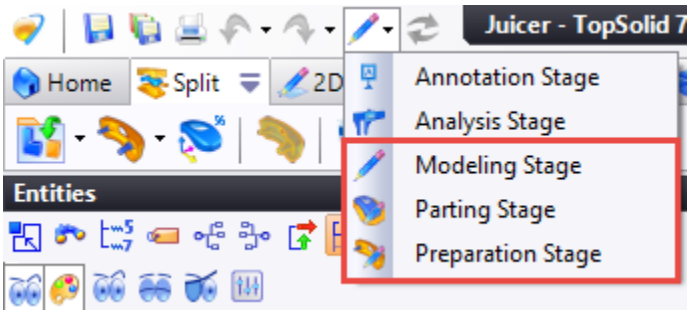
You can also store the core cavity block template in the **Templates** > **Defaults** folder of the project template. In this way, the template will be selected by default and **TopSolid** will not ask again.



Annex

Introduction

Throughout the creation of the molded parts, the **TopSolid'Split** module will go through three specific stages. These stages follow a design order. Dedicated operations are performed at each stage. You may sometimes need to go back to an earlier stage. In this case, you only have to select the desired stage from the drop-down menu as shown below.



Order and description of the different stages of the split document

First stage: Preparation stage

Main **TopSolid'Split** operations:

Positioning
Molded shapes
Shrinkage

Second stage: Parting stage

Main **TopSolid'Split** operations:

Shape to split
Stock
Candidate edges
Parting edges
Shut off surfaces
Parting Surface

Third stage: Parting stage

Main **TopSolid'Split** operations:

Parting shells
Parting shapes
Core cavity blocks

Notes