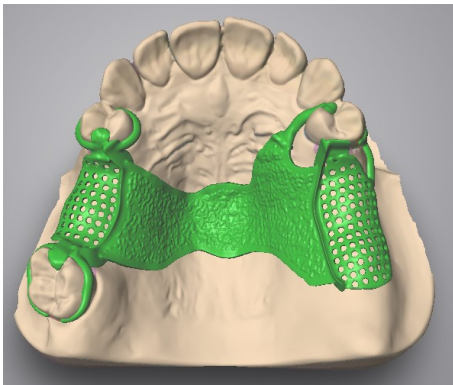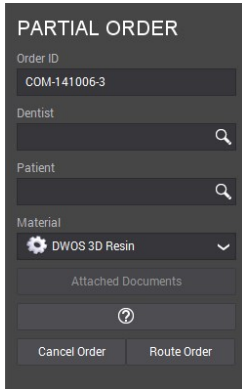# Partial Framework design

> The Partial design station is a CAD module dedicated to the design of partial removable prostheses. It allows building a framework on which the tooth will be placed manually.

To start working in the Partial Framework design station

1. Create a new partial order.
2. Scan the case including the palatal area or import a STL file in the Scan Import station.
3. Open the Partial design station.
4. Use the first icon on top of the side menu bar to define a survey axis and block the model.
5. Add and customize the components of the framework.
6. Merge the components together and exit.

Order Creation

PARTIAL ORDER

Order ID
COM-141006-3

Dentist

Patient

Material
DWOS 3D Resin

Attached Documents

Cancel Order   Route Order

1. Use the *New partial order* icon.
2. Rename the order (optional).
3. Enter dentist's and patient's name or click the dentist icon to access the dentist manager select dentist and patient from there.
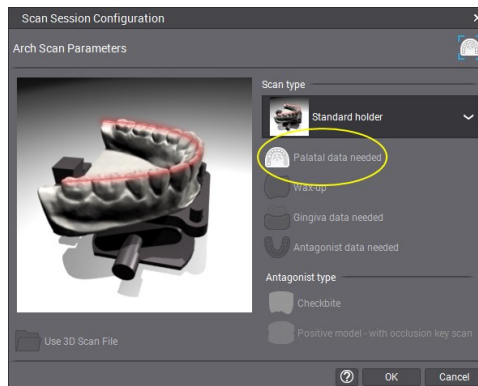4. Select the material for manufacturing the partial framework.
5. Route the order

.

Scan

Request palate scan

Palatal data needed:

Selecting this icon will tell the scanner that you need the palatal information. The scanning mechanism will then execute the required passing over the centre of the arch to ensure that it collects accurate data for that region.
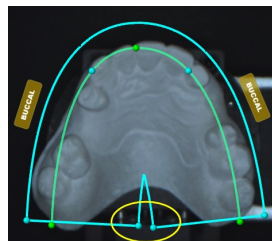

Area of interest

Place the center blue dots so that the palate is included in the area to precise scan.

After the precise scan is performed, click the *Exit* button ✓

Design

There are 3 main steps for going through the design process:

1. Block-out undercuts (surveyor)
2. Add and customize the components
3. Merge

Block-out undercuts (surveyor)

> Set an optimal angle to block major undercuts that might interfere with prosthesis insertion. It is similar to what would be accomplished with a surveyor in the traditional prosthesis fabrication method.
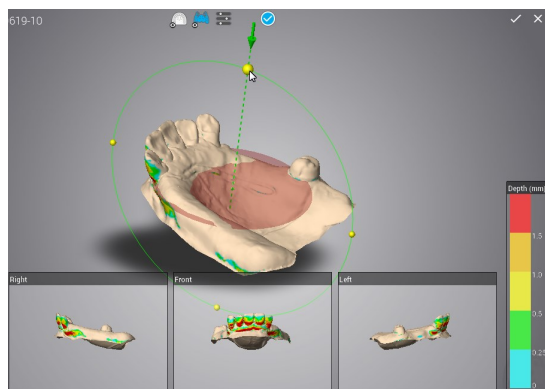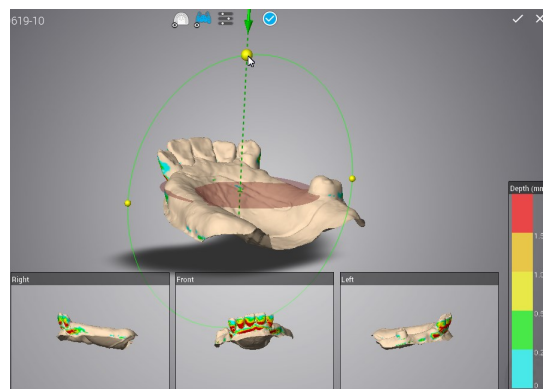

Figure 1: Movement front/back

Figure 2: Movement from side to side

The color scale is to be used as a reference for the depth of the undercuts. Position the model so that suitable retention is found where it is planned to place the clasps and retention bars. This is best accomplished if the design has already been thought of and/or sketched.

When completed with the surveying step, validate ☑ to apply the block-out.

Edit blocked model

With the help of the Add/Remove material function, use the waxing tools to create local retention areas by shaping the blocking wax. This step would typically prepare the model for placement of the clasps.

1. Click the third icon from the side menu bar.
2. Remove virtual wax where you want to create undercuts.
3. Add virtual wax where you want to protect the soft tissues from direct contact.
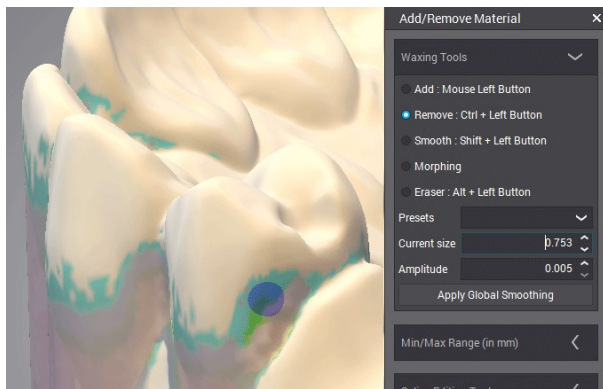

Figure 3: Removing the blocking wax along the clasp path. Referring to the color scale, we can see that the retention will be in the range of 0 - 0.25 mm (blue color)
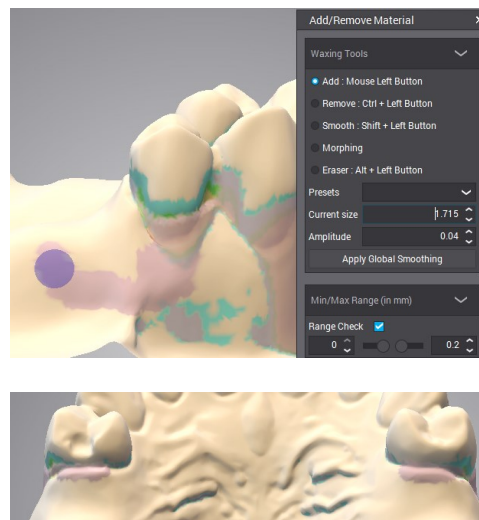

Figure 4: Adding blocking wax on the soft tissues along the path of buccal and proximal bars. With the range check, it is possible to control the offset (here 0.2 mm)

Add and customize the components

Once the blocking wax is applied, you can start to create the partial framework.

1. Click the *Design partial* icon from the menu bar
2. All components that are available in this station are grouped in a multi-designer window
3. Click the icon of the element to add **1**
4. Define its parameters
5. Click *Create* **2**
6. The *Delete* button can be used for the element you are currently drawing.

> You can also delete elements with the right-click menu when this element is validated.

Clasp

1. With a left click, free-draw around the tooth a path for the clasp. You may have to rotate the view in order to encircle the tooth properly.
2. Once it is drawn, you can edit using the green dots: Move the dots by clicking and dragging them.Click and release a dot to delete it.Click on the line to add a dot.
3. Use the parameters to customize the shape of the clasps.
4. Click *Create* to confirm the current design, or *Delete* to discard.
5. Start drawing another clasp. Click *Create* after each one.

To modify a component once it turned yellow, click OK to exit the *Partial design tools* window, right-click on the component to modify, and select *Edit element*.
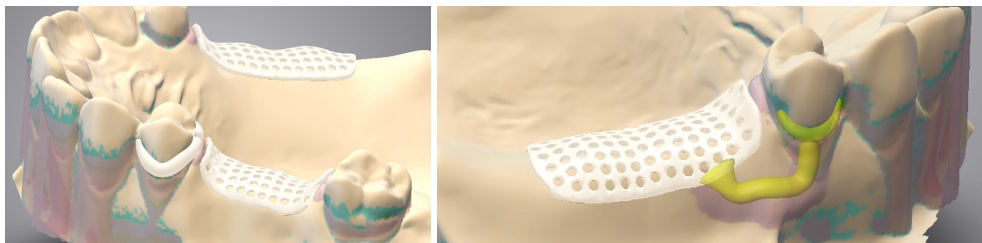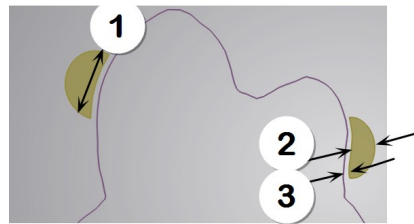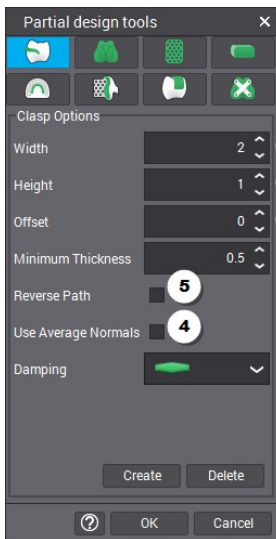

Figure 5: Different usage of the clasp tool

Figure 6: Clip view of a clasp encircling a molar and the identification of *width, height and offset* parameters

4

Checking this box will change the way the components are computed on regards to the model surface. It will calculate an average vertical axis to the model and use this axis to build the added component. Try using it if you are not satisfied with the components shape's adequacy with the model.
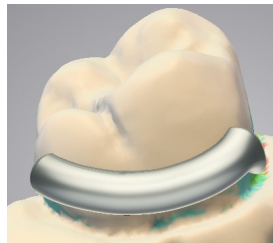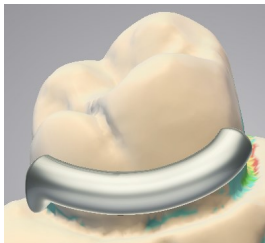
5

The *Reverse path* checkbox can be used on asymmetrical damping selections in order to change on which end to apply the damping, once the clasp is already traced.

The minimum thickness parameter is defined by the material's minimum thickness

Palate

Use this tool to define the perimeter of a palatal plate.

1. Click to place points on the model, or just freely draw with the mouse left-click down. Close the area by pressing the "C" on the keyboard. Then you can edit your perimeter:
   - Move the dots by clicking and dragging them.
   - Click and release a dot to delete it.
   - Click on the line to add a dot.
2. Click *Create* to confirm the shape.
3. The parameters are applied only when all components are designed and you click OK to exit the design window.

To modify a component once it turned yellow, click OK to exit the *Partial design tools* window, right-click on the component to modify, and select *Edit element*.
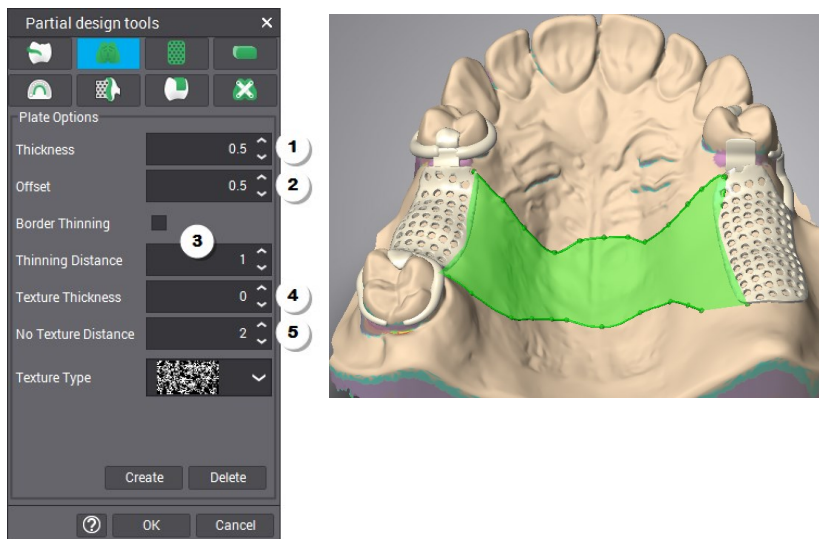
1) Thickness of the palatal plate. Note that the total thickness is the result of the plate thickness plus the texture thickness.

2) The space between the plate and the patient's palate.

3) Check this box to create a gradual thickness reduction all around the plate. The distance from the edge where will start the reduction is set in the field under it.

4) The texture is applied starting at the top of the plate. The value that is set here is added to the plate thickness. A "0" will result in no texture at all.

5) The setting is to leave an area without any texture all around the plate.

Grid

1. Click to place points on the model, or just freely draw with the mouse left-click down. Close the area by pressing the "C" on the keyboard. Then you can edit your perimeter:
   - Move the dots by clicking and dragging them.
   - Click and release a dot to delete it.
   - Click on the line to add a dot.
2. Click *Create* to confirm the shape.
3. Start drawing another grid. Click *Create* after each one.

To modify a component once it turned yellow, click OK to exit the *Partial design tools* window, right-click on the component to modify, and select *Edit element*.

Figure 7: The texture is applied when you click OK to the design tools window.

Bar

Use the bar tool to connect the clasps to the main structure (grid or palate).

1. Set two end points to define the bar.
2. Click Create.
3. Define another bar.

To modify a component once it turned yellow, click OK to exit the *Partial design tools* window, right-click on the component to modify, and select *Edit element*.
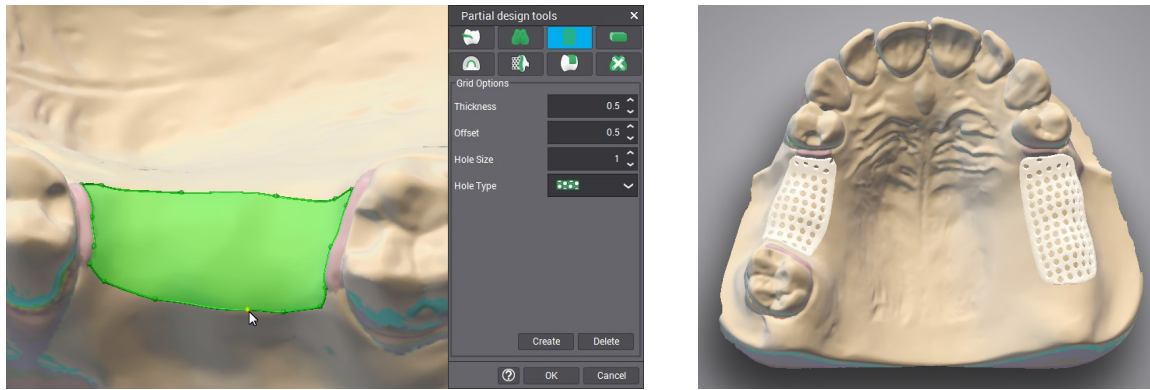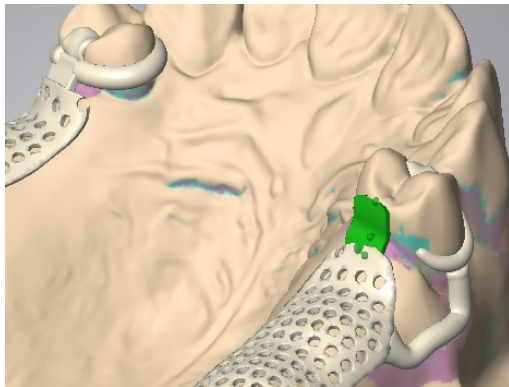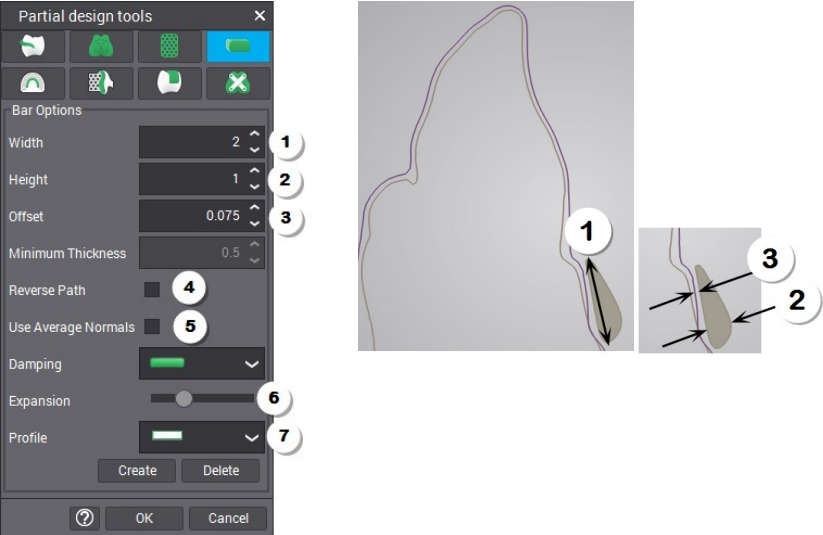
Bar options

Damping

The *Damping* drop-down offers 14 types of damping to apply on bars.

4 The Reverse path checkbox can be used on asymmetrical damping selections in order to change on which end to apply the damping, once the bar is already traced.

5 Checking this box will change the way the components are computed on regards to the model surface. It will calculate an average vertical axis to the model and use this axis to build the added component. Try using it if you are not satisfied with the components shape's adequacy with the model.

6 The Expansion slider can be used for damping types that have an expanding edge on one side or on both sides. Adjust it by sliding the cursor on the scale. It controls the width of the wide edge(s).
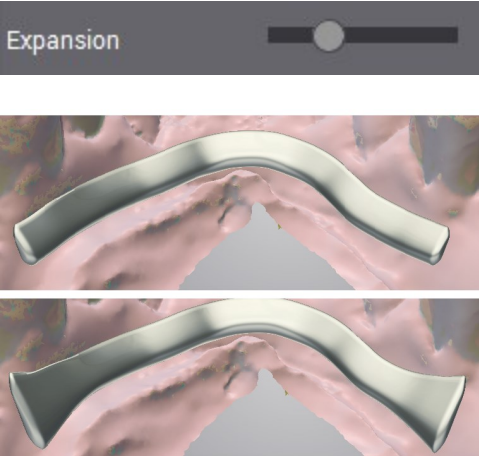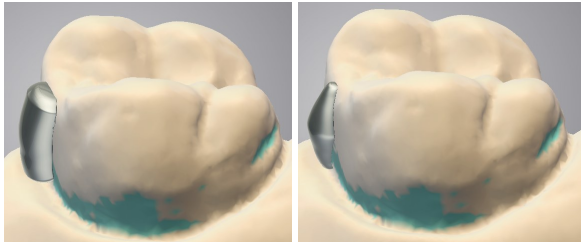

Figure 8: Effect of the Expansion slider on an inferior bar

Figure 9: These are the 6 damping types that can have an expansion factor.

Profile

The shapes in this menu represent what the cross-section of the bar would look like. Here are two examples of bars: one with a triangular profile and the other with an oval profile.
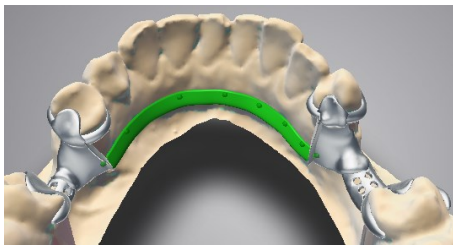
Inferior bar

> Add it on designs for the mandibular arch to create support behind the anterior teeth.

The options are the same as for the bar tool. View bar options.

You can have a different set of default values for each type of bar. This is managed in the preferences window.
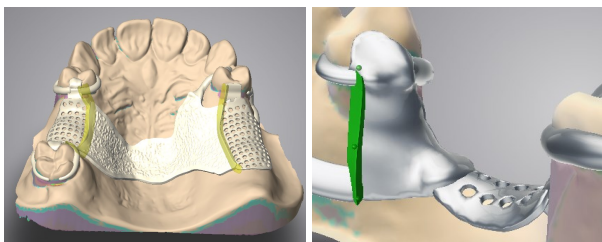

Finish line bar

> Add this type of bar on the grids edges. Increase its height so that is can efficiently contain the poured acrylic.

The options are the same as for the bar tool. View bar options.

You can have a different set of default values for each type of bar. This is managed in the preferences window.
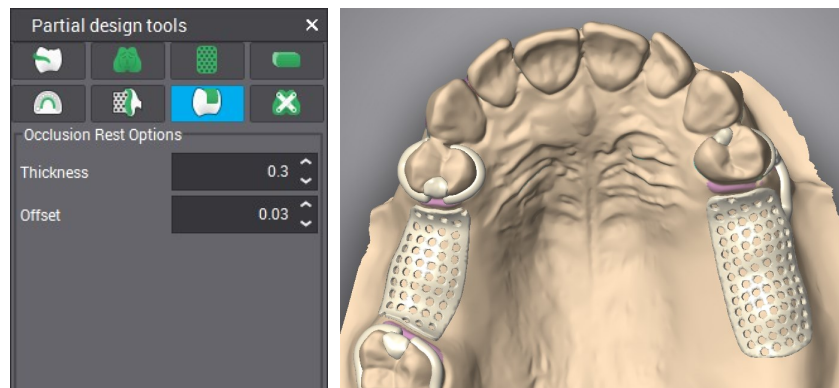
Occlusion Rest

Use this tool to create a support area for the antagonist teeth

If you have loaded a scan for the antagonist, the automatic interference correction will trim the occlusal surface according the contacts. This will be done upon the final merge.

Support bar

Use them to stabilize the framework and avoid movement or breakage during the fabrication. They can be removed once the design is produced.

1. Click on the starting point.
2. Click on the end point.
3. The bar is created, arched above the design.

The options are the same as for the bar tool. View bar options.

You can have a different set of default values for each type of bar. This is managed in the preferences window.

Click OK in the *Partial design tools* window when all the above are designed.

Pin

You can add a standard pin to your design.

1. Click the *Add Pin* icon from the side bar.
2. Set the diameters and height values.
3. With the mouse right-click down, rotate the model
4. Click on the grid and the defined pin will be placed. The view axis sets the pin axis.
5. Click OK.
6. Reselect the Pin icon to place another pin.
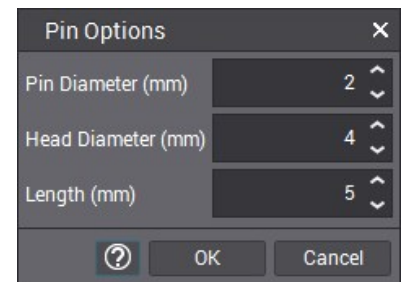
Before the merging, you can **right-click** on the components to access the following options:

- Edit element: It reopens the design tools so that you can modify the path or the parameters of this component.
- Add/Remove Material: Lets you freely shape the surface of the component. **The Smooth tool can be used on the edges and junctions.**
- Correct interference with model: This function trims the component with the scanned model. This ensures that the prosthesis never interferes with the existing teeth and tissues. The trimming is usually done automatically, but it might be necessary to do it manually in specific situations.
- Delete: Erases the element from your design.

Import STL model (optional)

This button is to import any custom part that you would like to add to the design: pin, attachment, partial element, etc. As long as it is STL format, you can add it.

1. In the *Import STL Model* window browse to the STL file to import
2. In the *Confirm* window:
    - Click Yes to place the centre of the part in the centre of the model
    - Click No to apply no repositioning (superimpose the (0,0,0) coordinates of both the model and the imported part).
3. Right-click on the element and select *Recompute*. By using the Transforms interface, you can position and scale the element you've added.
4. Once you click Finish design at the end of the CAD session, the custom element is merged with the other components to create one surface that exports as a single STL file.

Merge

> 1. Click the *Finish Design* icon.

The merging operation creates one unique uninterrupted surface out of the multiple components that were assembled to create the design.

The merging parameters that are set in the Preferences window.

Smooth distance

This value is applied were intersecting components are trimmed, to avoid acute angles. The longer the distance, the smoother is the transition between components.

Repair mesh after merge

This option can be activated when a first attempt to merge has failed. The operation will take longer but has better chances to succeed.

Force result

If the merging does not succeed after trying the repair option (a large number of intersecting components is a potential cause for fails), this will force the design to route forward to production anyway. The resulting file may be unsuited for certain manufacturing process, among milling notably; but can still be used with others, such as 3D printing.
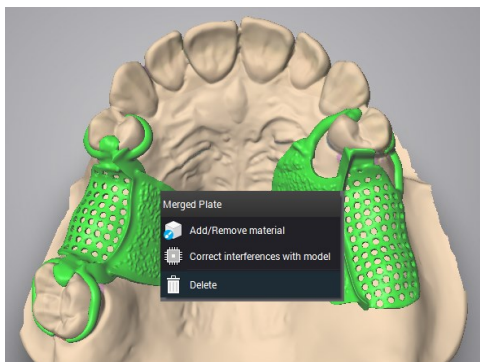
After the merging and before exiting, you can right-click on the components to access the *Add/Remove material* tool. Select Delete to "unmerge" the design so that the components can be edited separately.

Add tag (optional)

You can use the generic Serial ID tool to mark the design.

Exit

Click the Exit button to route the case forward to production. The manufacturing files are produced and can be extracted from the Production Management station.