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PROMADENT
Quality Dentalware

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2 FREEFORM

Creating individual bite splints is a breeze with FREEFORM. Developed in collaboration with dental technicians and dentists, BiSS focuses on the essential steps relevant for bite splint design. The result is a well thought-out and streamlined workflow that guides you step by step to the finished bite splint. BiSS relies on numerous automatism and above all a built-in A.I. that bring you to your goal as quickly as possible. However, due to the numerous optionally adjustable parameters, maximum flexibility is ensured so that even the most specific customer requirements can be implemented.

**From the scan
directly to the bite
splint.**

FAST · EASY-TO-USE · INTUITIVE

This user documentation explains all the important functions of FREEFORM so you can get started right away.

FREEFORM can be optionally upgraded as a *network multi-user license*.

Have fun with FREEFORM! :)

3 Installation

3.1 System Requirements

The system requirements listed below must be fulfilled:

- ✓ Windows 64 Bit
- ✓ At least 500 MB free file system memory, recommended 2 GB
- ✓ Processor with at least 2 cores at 2 GHz, recommended 4 cores at 2,5 GHz
- ✓ Free working memory at least 8 GB, recommended 16 GB working memory
- ✓ Free USB-2.0 connection
- ✓ Minimum display resolution 1200 x 900 Pixel
- ✓ Graphic card: e.g., HD Graphics 3000 DX10.1 (we recommend not to use AMD/ATI RADEON graphics cards)

3.2 Installation Notes

The installation of the program BiSS is done with the provided installation file *BiSS-5.4.X-setup.exe*. Run the file and follow the installation instructions.

To start BiSS you need a *dongle license*. Make sure that your license dongle, with a valid BiSS license, is connected to your computer before you start the program.

If you have a *BiSS multi-user network license*, please refer to the following section:

3.2.1 BiSS multi-user network license

In order for the network dongle to be recognized within your network, the following settings must be set before BiSS can be started the first time:

- ✓ Install BiSS
- ✓ Insert the network dongle into the device
- ✓ Open the installation directory of BiSS (on the same device)
- ✓ Run *DinkeyServer.exe* as Administrator
- ✓ Under *Startup Modes* on the left, select *Windows Service*
- ✓ Under *Network Configuration* on the right, select *Automatic*
- ✓ Click Start

Your firewall must recognize and allow Dinkey Server. Therefore, select *Automatically Configure Windows Firewall* when prompted to do so.

Dinkey Server now runs as a background service and doesn't need to be restarted manually after rebooting the device.

Note: *If you remove the dongle or add another dongle, a restart of Dinkey Server may be required.*

BiSS can now be started from all devices of your network, according to the number of purchased licenses.

3.3 Control

The software can be controlled with a commercially available mouse as a selection tool in the menu navigation and for rotating, moving, and zooming the model. Input via the keyboard is required for individual functions. The basic options for controlling the software are described in table 1. Below

you will find a complete summary of the possibilities for navigation with an explanation of the function.

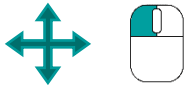

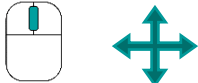



	Selection Tool	Move the cursor to the desired position and click the left mouse button.
	Rotate Model	Hold down the right mouse button and move the mouse.
	Move Model	Hold down the mouse wheel and move the mouse.
	Move Model	Hold down the right mouse button and shift key and move the mouse.
	Zoom Model	Rotate the mouse wheel to zoom in or out of the model's representation on your working surface.
	Set Rotation Center	With a center click on any point you can set the center of rotation.

table 1: Short overview: control of the program – overview mouse functions.

3.3.1 Overview of General BiSS Short Cuts

Shortcut	Description
<i>Ctrl + F</i>	Reset view to frontal view.
<i>Ctrl + S</i>	Save (attention: the step "align" must first be exited, otherwise the position change will not be saved").
<i>F10</i>	Clean memory.
<i>Drag mouse with right mouse button</i>	Rotate view.
<i>Drag mouse with middle mouse button</i>	Move view.
<i>Rotate mouse wheel in 3D area</i>	Zoom in / zoom out view (direction can be selected in the settings).
<i>Mouse wheel rotates over a spinner</i>	Change value (a spinner is a field for setting numbers with two small buttons on the side).

<i>Middle click on a part of the model</i>	Focus view on the clicked point.
<i>Right click on a part of the model</i>	Open context menu.
<i>Right-click in 3D area</i>	Open context menu.
<i>Right-click in a list of elements</i>	Open context menu.
<i>Restart User-Interface</i>	Change the language in the settings (or select the selected language again).

table 2: General BiSS shortcuts.

3.3.2 The Cube

Left clicking on the cube rotates the view as indicated by the black arrow. Depending on where you click:

Left click on cube	Description
<i>On the side that does not face forward</i>	This side is rotated to the front.
<i>One edge while one side faces forward</i>	This edge is rotated upwards while the side continues to face forward.
<i>The center of the side facing forward</i>	The back side is rotated to the front. The direction of rotation depends on whether you click above, below, left, or right of center.
<i>A corner pointing upwards</i>	The corner is rotated forward.
<i>Edge that belongs to a corner that faces forward</i>	The edge is rotated forward.
<i>Corner that belongs to an edge that points forward</i>	The corner is rotated forward.
<i>Edge pointing forward</i>	The edge is rotated 90° to the left or right, depending on which half of the edge you click on.
<i>Double click on the cube, one side facing forward</i>	The side is rotated to the front and aligned that the label is right side up.
<i>Triple click on the cube</i>	Reset the view to frontal view.

table 3: The navigation cube.

3.3.3 Repair-Tool

Navigation	Description
<i>← during manual repair</i>	Reverse.
<i>→ during manual repair</i>	Restore.
<i>+ during manual repair</i>	Enlarge tool radius.
<i>- during manual repair</i>	Reduce tool radius.
<i>Spacebar during manual repair</i>	Initiate repair of the marked area.
<i>Ctrl + left mouse button during manual repair</i>	The previous selection is not deleted but extended.
<i>Hold down CTRL + move the mouse wheel when repairing manually</i>	Adjusting the Intensity
<i>Hold down SHIFT + move the mouse wheel when repairing manually</i>	Adjusting the tool radius
<i>Press A</i>	Upper jaw is faded in and out
<i>Press S</i>	Lower jaw is faded in and out
<i>Shift + left mouse button in Repair mode</i>	A polygon can be drawn.

table 4: Navigation in the repair tool.

3.3.4 Attachments, Align

Navigation	Description
<i>Ctrl + drag left mouse button</i>	Rotate selected object.
<i>Shift + drag left mouse button</i>	Move selected object.
<i>Double click on a curved arrow</i>	Rotate 90° (in the Alignment tool).
<i>Ctrl + left click when aligning</i>	Select first point for aligning or connecting two components (some modes only).

table 5: Navigation for attachments, alignment.

3.3.5 Editing Curve Points

Navigation	Description
<i>Del</i>	Delete selected curve point.
<i>Double click on curve point</i>	Delete clicked curve point.
<i>Space bar during editing curve points</i>	Focus view on the selected curve point.

table 6: Navigation for editing curve points.

3.4 Launch the Program

When you have started BiSS, the window shown in image 1 appears. Here you get an overview of the available modules for BiSS Dental Software Suite. These are PRINT, MILLING, TRAYS, LOCATE, PUZZLE, VIEWER and FREEFORM.

You can see from the green checkmarks, which modules are enabled according to your license. You can now select which application you want to launch. To start FREEFORM, click on the FREEFORM Icon.

Furthermore, you have the possibility to be forwarded directly to your retailer via the button *visit shop*, but also to purchase further BiSS modules. This button only appears if there is an existing internet connection.

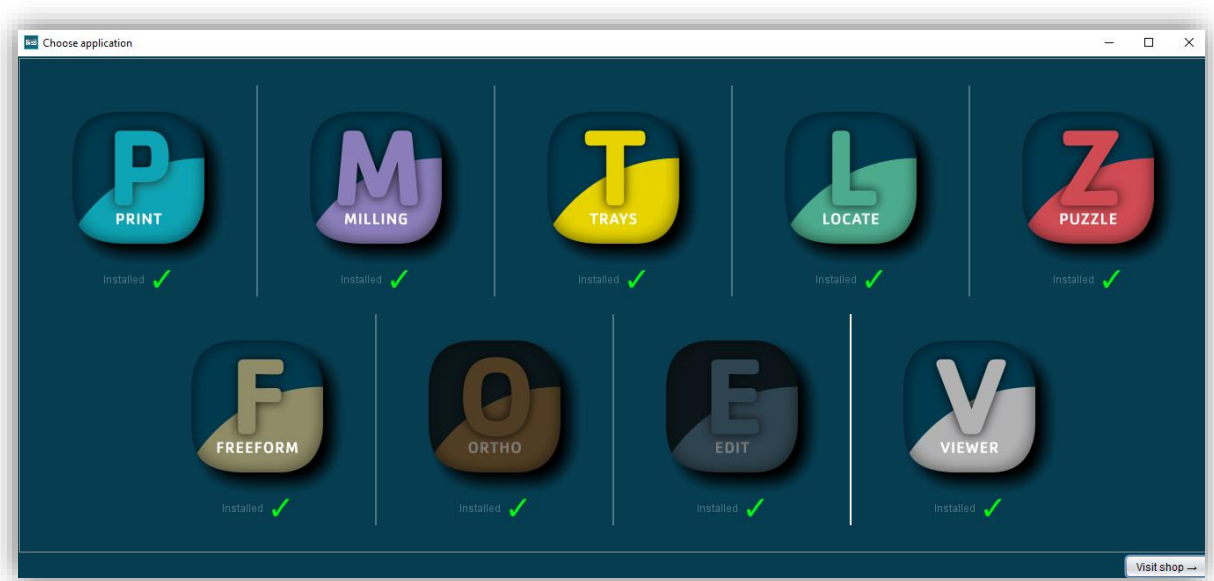


image 1: Welcome window after program launch.

4 The Workstation

4.1 Overview

Familiarize yourself with your BiSS workstation. The user interface is divided into the three main areas: navigation - action - model view

- ✓ You can access the *menu (burger)* via the navigation bar at the top. The < and > buttons navigate you step by step to the finished model. The individual processing steps of your workflow are displayed in the center. You can use the status bars to track the progress of your work. You can also select the buttons individually and go directly to the desired design step. You can recognize the currently selected design step by the darker coloring.
- ✓ On the left you will find the action window. Here you adjust the settings specific to each design step.
- ✓ The 3D model you are working on is displayed on the right. Via the text window you will receive messages and notes that support you in your work.

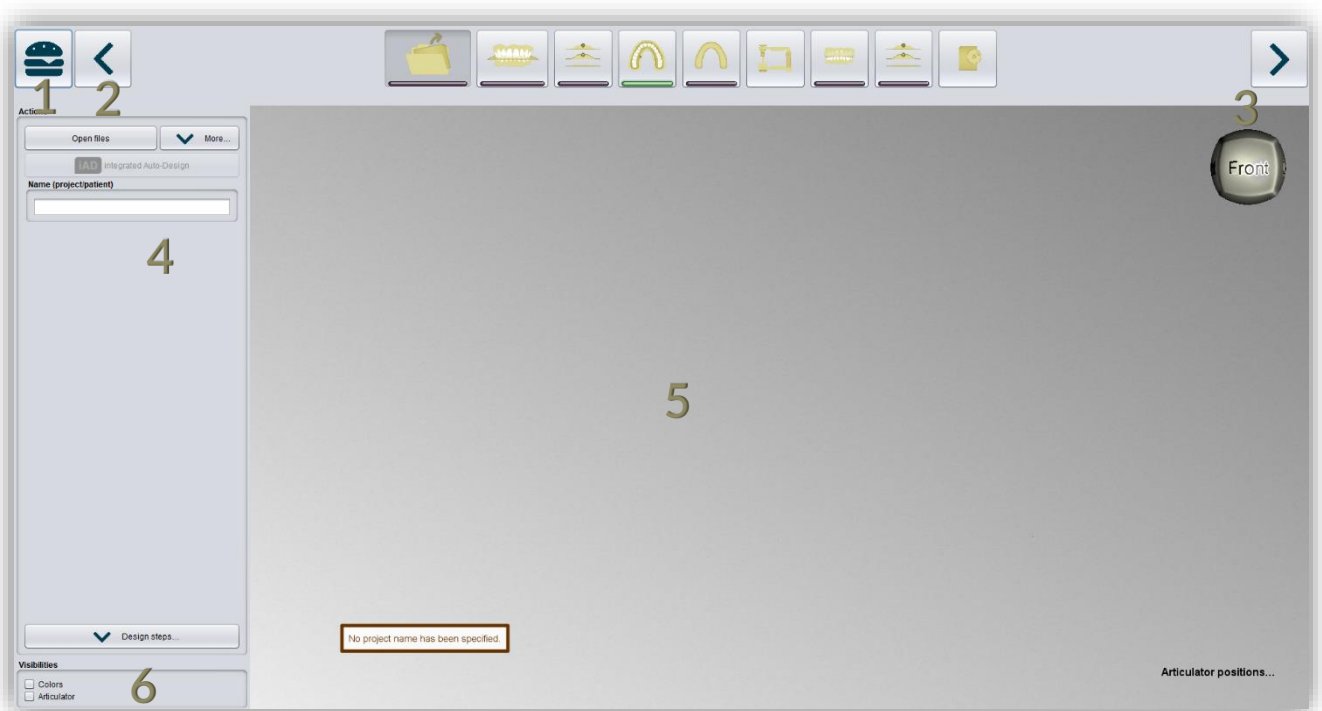


image 2: The BiSS program after launch 1) Menu: Contains settings, about us, other applications, new project. 2) Back: get back to the step before. 3) Next step: Complete the current processing step and proceed to the next step. 4) Action window: Individual for the respective work step. Here: Load file and define the work steps. 5) Work surface. 6) Visibility switch: Visible after loading the scans.

4.2 Closing the Program

To close the program, select the **X icon** at the upper right corner of the program window and choose **close** under the **menu** button.

There is a query whether to close despite unsaved changes. Changes are both changes made by the user and calculation progress.

4.3 Settings

Under the **menu** button you will find the **settings tab**, see image 3. If you select settings, a new window opens with four tabs: appearance, load & save, control, updates and advanced.

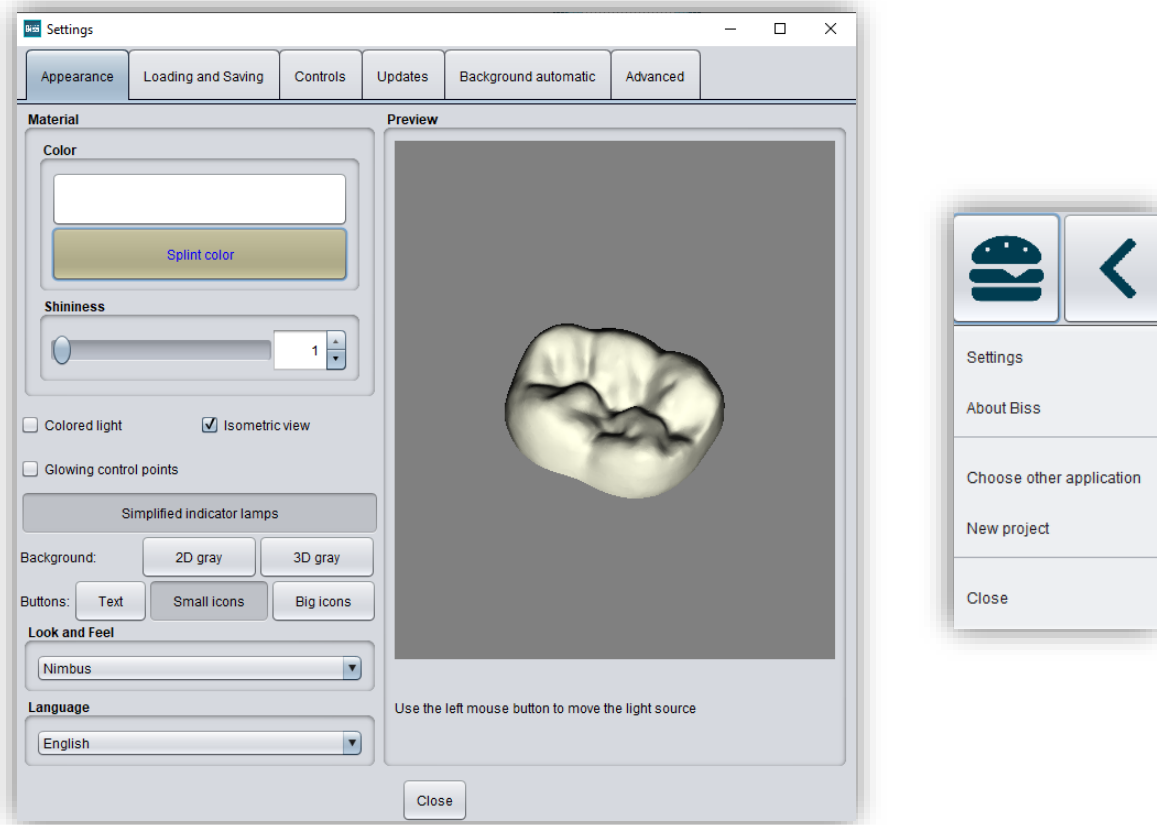


image 3: Changing the appearance of the model and the working environment.

The settings window can be closed by clicking the **close** button in the middle below of the window or the **X** in the top right corner. Your settings will be applied and saved.

4.3.1 Appearance

Under the *appearance tab*, shown in image 3, you can adjust the appearance of the loaded scans and the tray to your needs by selecting a color and intensity of gloss. Further setting options are summarized in table 7.

FEATURE	DISCRIPTION	DEFAULT-VALUE
Colored light	Active: Multiple colored light sources from slightly different directions. Inactive: White light source.	inactive
Isometric view	Active: Isometric view Inactive: Perspective view.	active
Glowing control points	In the "trim edge" step, the currently set curve points are displayed as a light source. Attention: Requires a lot of computing power.	inactive
Simplified indicator lights/ Detailed indicator lamps	Changes the appearance of the status bars that indicate progress within the workflow.	simplified indicator lights (active)
Background - 2D gray/ 2D colored	Selects the background of the windows - gray or colored.	2D colored
Background - 3D gray/ 3D colored	Selects the background of the 3D model - gray or colored.	3D grey
Look and feel	Selects the design of the windows.	Nimbus
Language	You can choose between German and English language.	English, with English system language

table 7: Appearance settings.

4.3.2 Loading and Saving

Behind the *loading & saving tab* (image 4) you can set in which format your model should be exported. The file formats .STL, .OBJ and .PLY are available for selection. You can also activate automatic saving of your project and set a time interval for automatic saving.

Note: *When you save automatically, your project file is saved in .LFL format. There is no file export.*

This function is used exclusively to restore the project after an irregular termination of the program. The folder for automatic saving should only be used for this purpose. In addition, if the PUZZLE application has been unlocked, you can decide here in which folder the data for PUZZLE should be exported. This folder must be the same as the monitoring folder of PUZZLE. If you check the box *Ask for additional location to save to*, you can select a new location each time. This must also be the same as the monitoring path of PUZZLE. If you want the data to be sent to PUZZLE automatically with every export, then you must check the box *Send to PUZZLE when exporting*.

Furthermore, you have the option to determine whether color data should be loaded and exported.

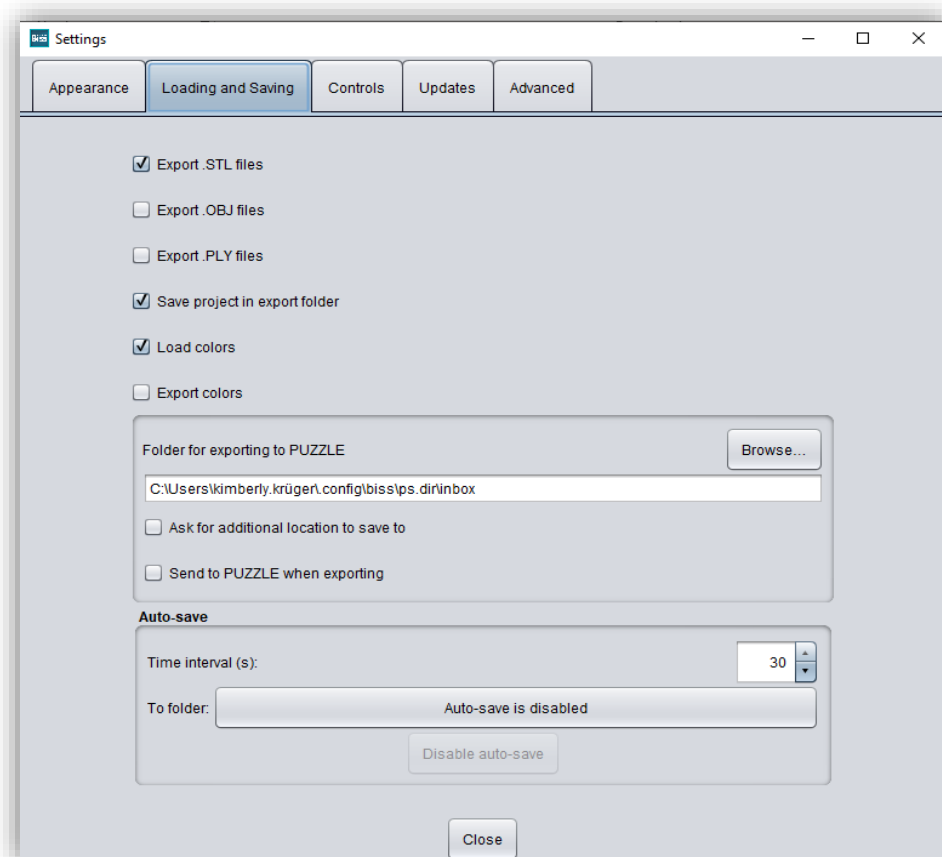


image 4: Loading and saving settings.

4.3.3 Control

In the *control tab*, see image 5, you can adjust the mouse behavior and the message size.

Mouse behavior Select whether your model is enlarged or reduced when scrolling up.

Message size Determine the size of the displayed messages on your workstation by entering a factor.

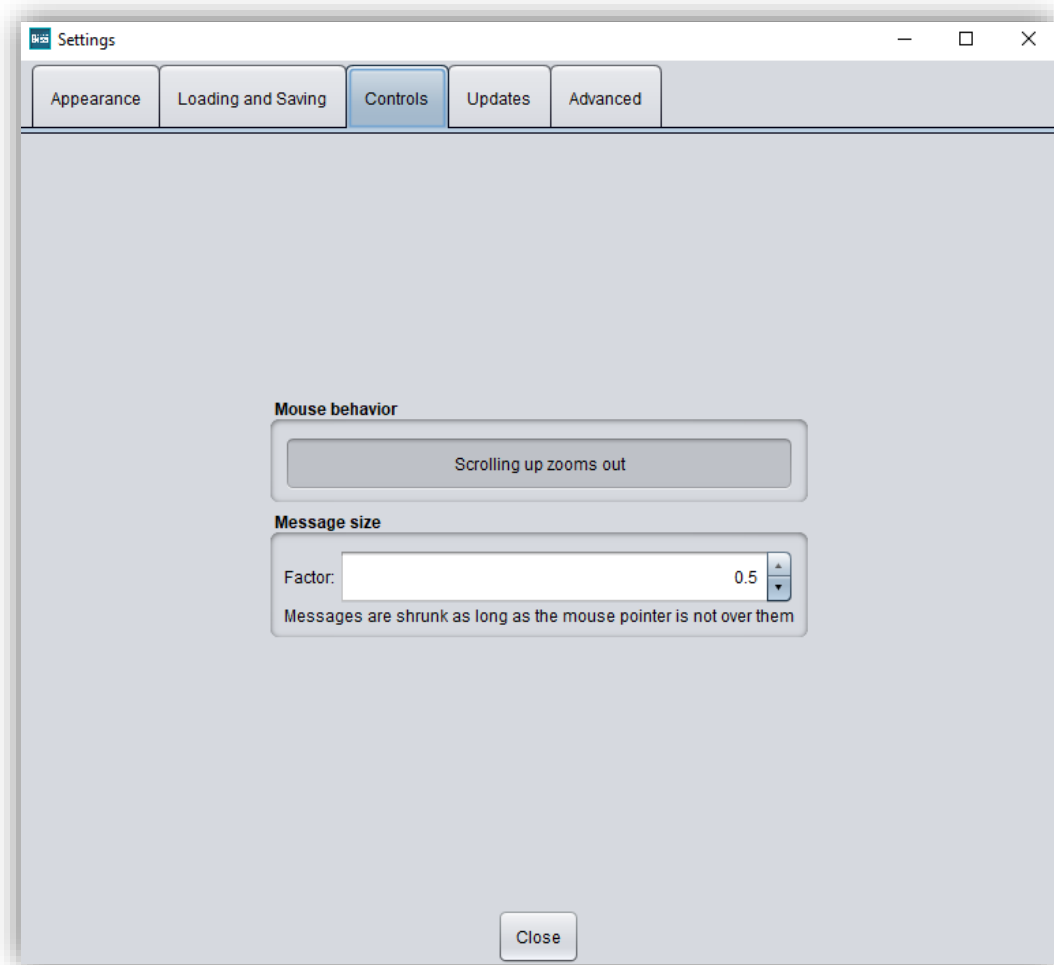


image 5: Custom setting of mouse behavior and message size.

4.3.4 Updates

In the *updates tab* in image 6, you can check if new updates are available for BiSS. To do this, click the button *check for updates*.

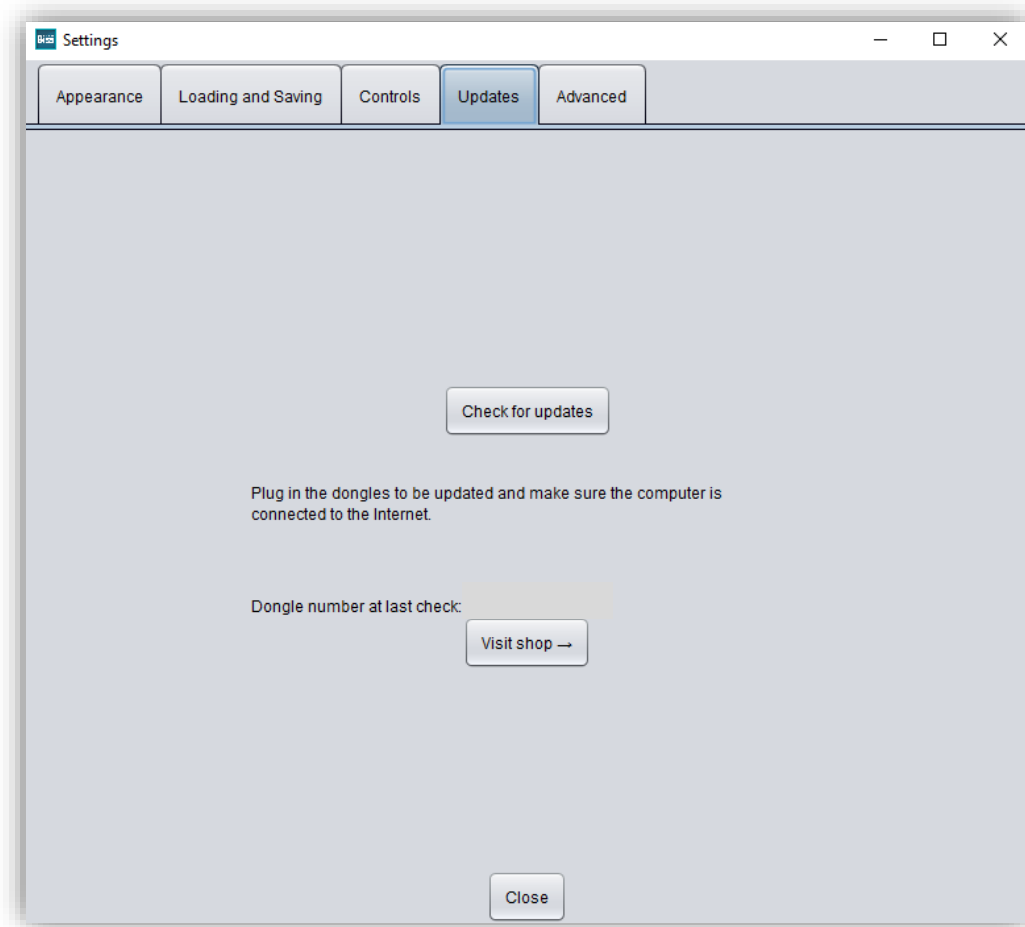


image 6: Update-settings.

Afterwards, a window like the one shown in image 7 opens and informs you about available updates. This can be for example a new software version that is ready for download or a license update for your dongle. You need this function e.g. when purchasing additional modules or extending a license.

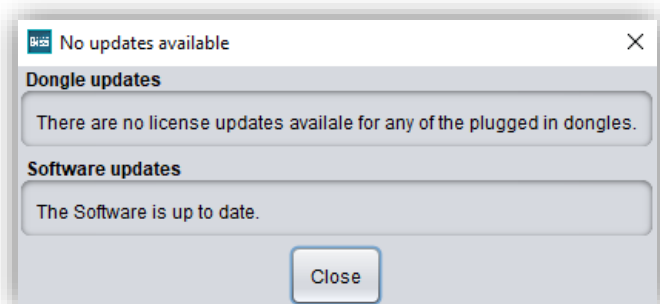


image 7: No updates available.

4.3.5 Background automation

Under this tab, you can make a few settings for coupling with the **PUZZLE** application, image 8.

Select **tilt by 45°** if the splint is to be tilted directly when placed in PUZZLE. The same applies to **hollow side up** or **hollow side down**. Otherwise, you can define an individual output angle under **other angle**.

A folder in which the data to be processed by FREEFORM will be located must be created under the **These directories are being watched** section. You can create any number of folders by **adding a path**. If you want to **edit** or **delete a path**, the path must first be marked. You can determine in which interval FREEFORM scans the folder created above for new data. To do this, select a value under **Wait for further files (s)**. You can then select the file format in which the generated model should be exported. Options under **Export result as** are the .GBS project file, .PLY files, .STL files and .OBJ files.

Tip: To guarantee fast work with the PUZZLE connection, you should always select the project file.

Then select a folder in which the finished models are to be exported automatically. By default, the folder C:\Users\[your user name]\.config\biss\ps.dir is selected. You can also select a different file path by clicking **Browse**.

Attention! If you change the file path, the monitoring file path in PUZZLE must be the same. Otherwise, PUZZLE will not be able to import any data from the newly created folder into the software.

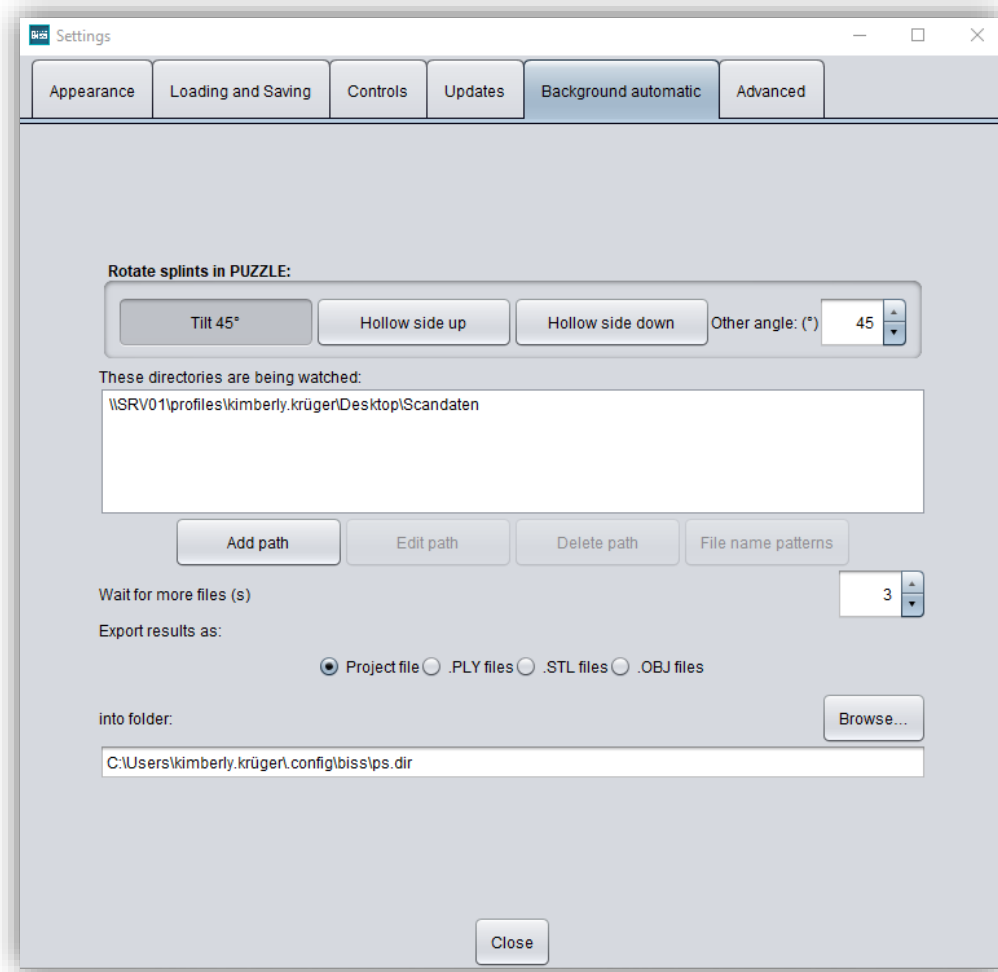


image 8: Background automation

4.3.6 Advanced

Under the *advanced tab* you will find advanced settings, see image 9.

Select *edit protected attachments* if you still want to edit protected attachments (e.g., change rotatability and position).

Note: Only activate this function if, you are absolutely sure. Careless editing and subsequent saving of protected attachments can result in a corrupted file and render the attachment unusable. Contact your supplier at any time if you need assistance.

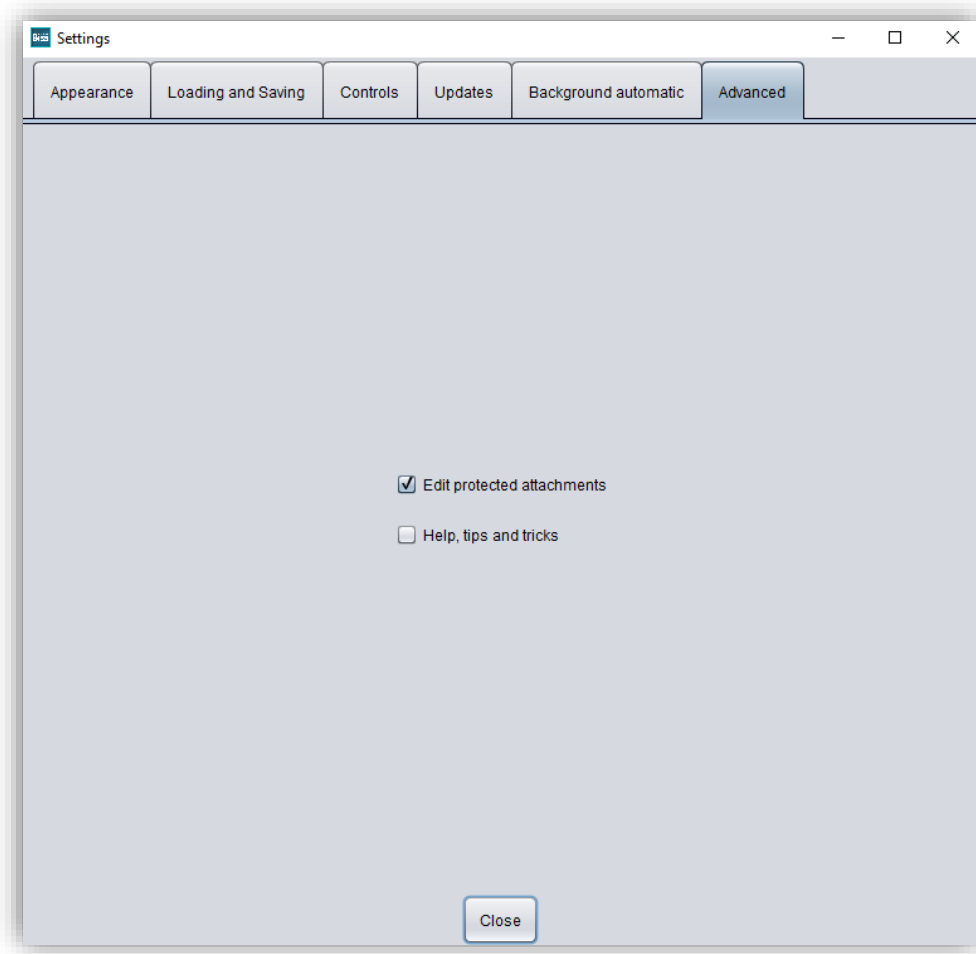


image 9: Advanced settings.

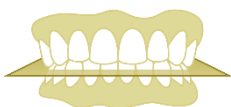
5 From Scan to a Printed or Milled Bite Splint

5.1 The Workflow



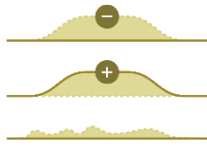
Load

Import data in .STL, .OBJ or .PLY formats



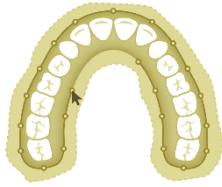
Align

Automatic or manual alignment of upper and lower jaws and modification of components



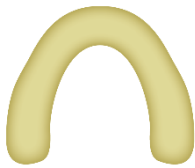
**Repair
&
Edit**

Add material, remove material, and smoothen



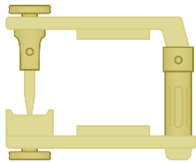
Specify Edge

Setting the bite splint shape and automatic determination of the insertion direction



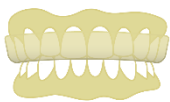
Splint shape

Defining the splint shape



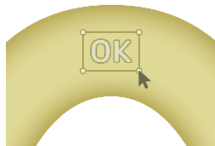
Articulator

Adjustment of articulator



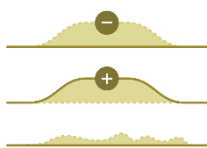
Adjustment

Choice of adjustment: With or without build-up in the posterior region, anterior or canine guidance



Labels

Attachment of label tags



**Repair
&
Edit**

Removal or application of material, automatic smoothing of edges



Save

Export all components to .STL, .OBJ or .PLY formats.

table 8: The workflow.

5.2 Open File

On the left side of the program window, you will find the action menu. Using the *open file* button, you can load your scan data into the program or open an already existing .LFL project file (image 10). After selecting the button, a window will open where you can choose the desired file in the .OBJ, .STL or .PLY format.

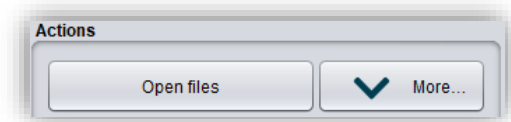


image 10: Open the scan data.

Hint: You can load multiple scans at once if you hold down Ctrl, select all the files you want, and then click open. If you click on "More...", you can load and unload individual scans.

If BiSS cannot recognize what type of scan it is from the file name, a „could not determine purpose of data“ windows open. Select which type of scan is displayed in the preview (image 11).

Hint: BiSS can automatically detect which type of scan it is. BiSS distinguishes between upper jaw, lower jaw, implant reference scan and no implant reference scan. For this to work, there are certain requirements for the file names (see table 9).



image 11: Assignment of the loaded jaw models.

File Type	Condition
<i>File is upper jaw</i>	<ul style="list-style-type: none"> ✓ contains <i>mandibel, mandubul, mandible</i> or ✓ contains <i>lowerjaw, lower-jaw, lower.jaw, lower_jaw</i> or ✓ ends with <i>occlusion_l</i> or ✓ is <i>uk</i>
<i>File is lower jaw</i>	<ul style="list-style-type: none"> ✓ contains <i>maxill</i> or ✓ contains <i>upper-jaw, upper.jaw, upper_jaw</i> or ✓ ends with <i>occlusion_u</i> or ✓ is <i>ok</i>

table 9: File name components for automatic detection of the scan type.

After you load your scans, the model is automatically aligned. Note this later when exporting your work, see section *Save the Job*.

5.2.1 Colored Representation of an Intraoral Scan

It is possible to display intraoral scans in color in FREEFORM. To do this, simply load your color scan. BiSS recognizes .PLY files with textures as well as .OBJ or .PLY files with vertex colors. You can also disable the loading of colors under *menu / settings / load and save*.

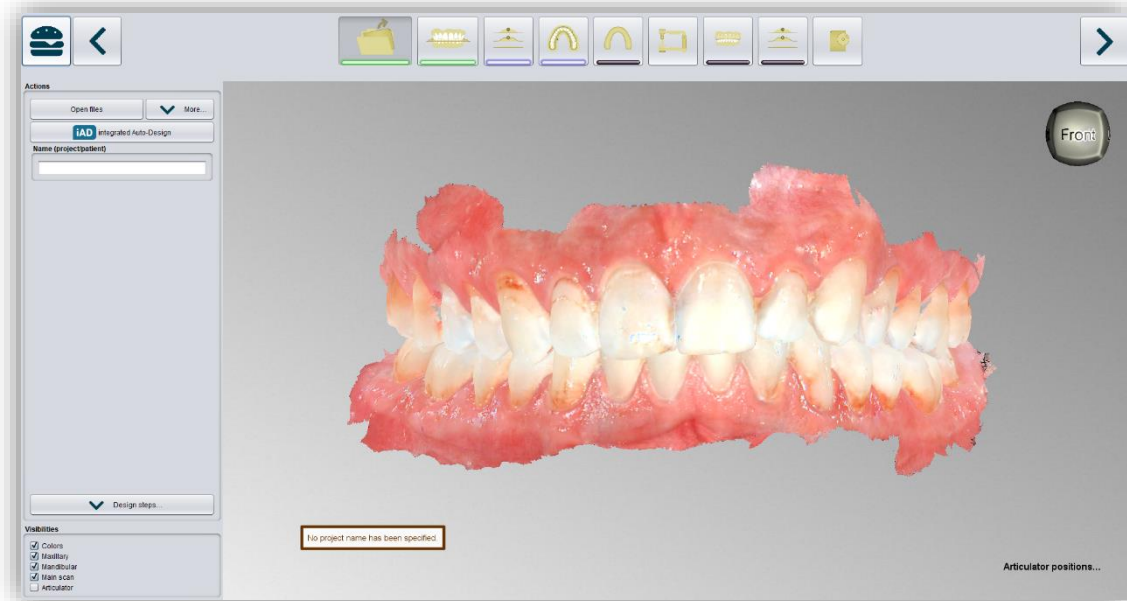


image 12: Color scan with textures.

5.2.2 Unload Scans

Of course, you can also unload the loaded scans again. To do this, use the *unload upper jaw* or *unload lower jaw* button shown on the action window on the left, see image 13.

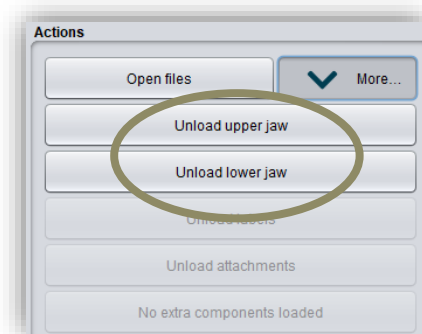


image 13: Unload models

5.2.3 Assign a Project Name

After loading the scan data, it is possible to assign a user-defined name (e.g., project/patient) to the project (image 14). To do this, enter the desired project name in the *name (project/patient)* field. This name also appears in the top line of the BiSS window. If the project remains unnamed, you will see a corresponding message "No project name was entered". However, it is possible to continue without naming.

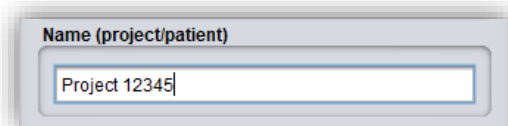


image 14: Enter project name.

Hint: BiSS remembers the project name. If you add a label to your splint (see chapter Adjustment

The adjustment can be selected in this step.

5.2.4 Tool radius compensation

If the splint is to be milled, you can set a cutter radius correction in this step to ensure an exact fit of the rail. To do this, simply select the *Tool radius compensation* field and enter the desired value in mm, see image 35.

5.2.5 Create ridges

Under the item *Create ridges automatically*, you can choose whether your splint should have a *posterior ridge* or whether the posterior teeth should remain free. If you want a posterior ridge, you can enter the desired values for the *raise* and the *width* in mm, see Fig. 35. For ridges in the anterior region, the procedure is the same as for ridges in the posterior region. Here you can select whether an anterior, canine or posterior guide is to be created. Then click on *Apply* and the ridge appears in light green according to the values entered with the control points included, see image 36.

If you now want to rework the ridge manually, click on one of the black dots. A window with the *control point properties* will now appear on the left-hand side, see image 37. Here you can modify the structure by editing the individual control points either by moving the point with the mouse or by entering the values in mm (image 37).

CONTROL POINT PROPERTIES	Description
Height (mm)	Specifies the height of the control point in millimeters above the scan surface.
Width (mm)	Specifies the width of the wax wall at the control point in millimeters.
Depth (mm)	Specifies the depth of the wax wall at the control point in millimeters.
Rounding radius (mm)	Specifies the rounding radius in millimeters at the ends of the wax wall.
Widening	Indicates the widening of the wax wall towards the bottom.

Change all by the same value (Shift)	Changes all properties by the same value.
Edit individually	Processes a single control point.
Set all to the same value (Ctrl)	Sets all control points to the same value.
Aligning the mounting edge straight	Aligns the ridge.
Round ends	The ends of the ridge are rounded off

Table 12: Splint control point properties.

As soon as a control point is selected, black arrows appear and the shape of the structure can be adjusted by moving them, see image 38.

If you want to discard all manual changes, click **Apply** again; if you want to delete the adjustment, click **Delete ridge**. If you want another adjustment in the same jaw or want to add a new one after deleting, click on **new ridge**.

If you now want to grind in the adjustment, the check mark for **Grind in chewing movement** must be set. You can now **simulate the chewing movement** and then display the result. If a chewing simulation has been carried out, the areas of the splint to be ground in are highlighted in red, but these can be hidden at the bottom left under visibilities (image 39).

Labels) or if you want to save your project, BiSS uses the project name you specified by default - for a faster work.

5.2.6 Your Personal Workflow

If you don't need one or more of the possible designing steps of BiSS in your machining process, you have the option to deselect individual functions. To do this, simply remove the check mark from the relevant function. These functions will then no longer be displayed in the navigation bar. You will find the function palette shown in image 15 on the left side of the action window when you are in the *load step*. BiSS remembers your setting until the next time you open it, so you don't have to make this selection every session.

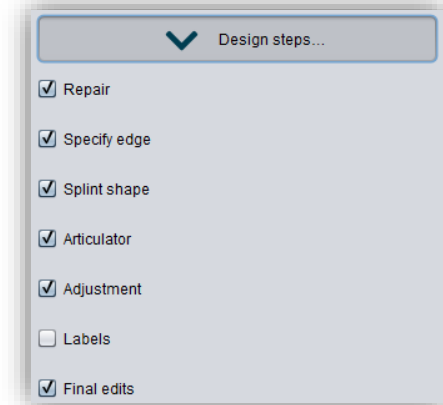


image 15: Design step selection.

Once you have made all the necessary settings, click >, to set the occlusal plane for your scan.

-
- ✓ Click on "Open file"
 - ✓ Select the file to load
 - ✓ Determine the upper and lower jaw or reference scans
 - ✓ Give your project a meaningful name
-

5.3 Align Object

In this processing step, you can align all loaded components. On the one hand, these are the main scans for the upper and lower jaw free components, if applicable.

You will see the *adjust jaws individually*, *edit components*, and *join pinned components and main scan*, image 16. If none of these are selected, then the *align occlusal plane* function is active, see image 17.

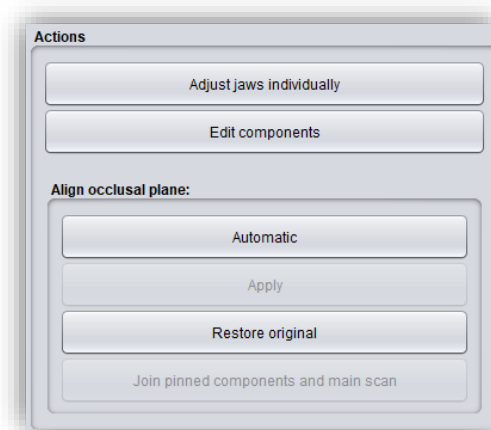


image 16: Action menu – align object.

5.3.1 Align Occlusal Plane

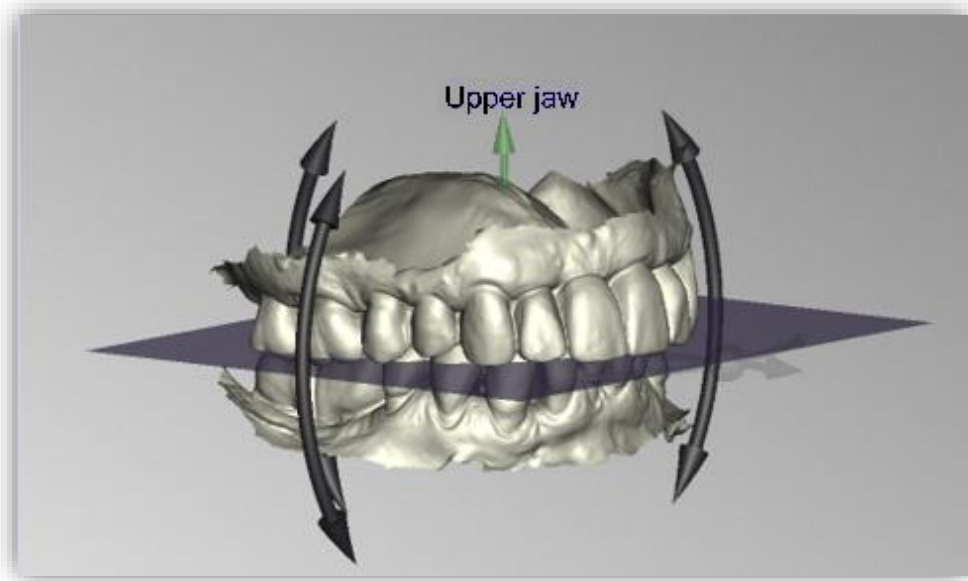


image 17: Automatically aligned occlusal plane. The position of the plane can be adjusted manually.

You can align the occlusal plane automatically or manually on the loaded scan. The simplest method is to first align the model automatically. This is already done automatically in the background or by clicking the **automatic** button in the action window (image 16). The plane is now automatically aligned.

Now you can check the position on the scan by moving, rotating, or zooming in/out with the mouse as described in the **Control** section.

If you would like to readjust the position of the occlusal plane, click on the appropriate direction arrow that shows you the possible change in position of the occlusal plane and thus move the plane while holding down the left mouse button. Double-clicking on the rotation arrows rotates the occlusal plane by 90°. Alternatively, click directly on the semitransparent plane. If you are content with your work, click **apply**. If necessary, you can automatically align your scan again.

Clicking the **restore original** button will undo any alignment. Click > to move to the next editing step.

Hint: *If you've made changes to the alignment but have not yet clicked "apply", the button will not say ">" but "apply and continue".*

- ✓ Click on "automatic"
 - ✓ Check the position of the plane on the scan
 - ✓ Make a manual readjustment
 - ✓ Click on "apply"
-

5.3.2 Single Align

Click the *align individually* button, if you want to align the loaded jaw models to each other individually.

Select the respective individual component with a mouse click. You can now rotate and move these components as you wish.

5.3.2.1 Load Bite Scan...

Via the *load bite scan...* button, you can self-explanatorily load an additional bite scan and align the jaws to the bite scan.

You can choose between automatic *one-point alignment*, *3-point alignment* or *manual alignment* and subsequent fine adjustment via the *automatic fine adjustment* button.

5.3.3 Edit Components

You can load additional components into BiSS as *free components* and edit them in a variety of ways:

- ✓ Delete small components below a selected value limit.
- ✓ Load any number of free components.
- ✓ Align manually, with one-point alignment or with 3-point-alignment.
- ✓ Connect to the scan in a variety of ways.
- ✓ Load bite scans to align the main scans to each other.

5.3.4 Align – Overview of all Functions

ALIGN OCCLUSAL PLANE	
Automatic	The occlusal plane is automatically aligned. This is the initial state after loading the main scans.
Apply	Accepts the occlusal plane after it has been aligned manually.
Restore original	Restores the original orientation of the scan data in space.
SINGLE ALIGN	
Load bite scans...	Another scan can be loaded into the project.
Automatic fine adjustment	Performs an automatic fine adjustment of the loaded scan.

Select first point (ctrl)	One-point alignment for pre-adjustment of the loaded scan.
3-point alignment: first triangle	3-point alignment for pre-alignment of the loaded scan.
EDIT COMPONENTS	
Load free components	Free components can be loaded into the project, such as (...).
Anchor in upper jaw	The free component is firmly connected to the upper jaw.
Anchor in lower jaw	The free component is firmly connected to the lower jaw.
Delete	The selected component will be deleted.
Delete all free components	All free components are deleted.
Delete small free components	Free components that are smaller than a selected limit, are deleted.
Reset transformation	Transformation steps are reversed.
Select first point (ctrl)	Select first and second point for one-point alignment.
3-point alignment: first triangle	Select the first and second points for the 3-point alignment.
Don't align, just select	Activate the checkbox if the free component should not be aligned.
Connect: affix	 Scan and component, which approximately touch each other, are glued, i.e. a gap between them is calculated away and they are joined together.
Connect: interspace	 The scan and the component are superimposed in at least one place. All surfaces/volumes that are duplicated are now reduced to one surface/volume. All surfaces/volumes that are new are added.
Connect: sew up	 The scan and the component touch and are connected.




Connect: union		The scan and the component are joined together. All internal overlaps are calculated away from the component.
Connect: intersection volume		By means of a Boolean operation, all parts of 2 data sets that do not overlap are calculated away.
Connect: difference		The penetrated volume of the free component is subtracted from the scan.

table 10: Align - overview of all functions.

Once you have loaded a component, you can right-click on it and make some settings (image 18):

- ✓ you can *delete* the free component.
- ✓ you can *pin* the free component to the upper or lower jaw.
- ✓ the free component can be *exported* individually.
- ✓ with *resize* the file can be enlarged in the whole with + or reduced with -.
- ✓ make a free component *watertight*, i.e., you have a crown, e.g., where the preparation margin is not closed. You can therefore look inside. This can now be closed with a click.
- ✓ you can *reset the transformation or undo the last move*.

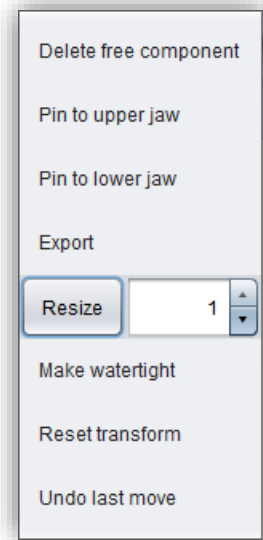


image 18: Extra settings for free components.

5.4 Repair

The repair of data is possible. This may be necessary if there are artifacts in the surface information. The repair trims and smoothest the artifacts and closes holes. In addition, material can be added or removed manually.

Note: *It should be noted that this distorts the surface and can lead to inaccuracies. Therefore, it is recommended to regenerate scans with artifacts and other irregularities.*

Furthermore, you can apply material to the surface, remove material or smooth the surface. To do this, select the corresponding option in the action window. You can also select the *tool radius* in millimeters (image 19).

5.4.1 Repair

Activate the **repair button** in case it's not activated yet. For repairing, select the areas of the model you want to edit, with the left mouse button. The repair will be executed when you confirm your selection by pressing the space bar afterwards. If you hold down the ctrl key, you can select several areas at once. Otherwise, the previously selected area disappears when you release the mouse button and restart. If you hold down the shift key, you can draw a **polygon** that indicates the area to be repaired. We can distinguish two cases here. If the marker touches the boundary area of the model, the marked area will be removed. Here we can **smoothly close** the area through holes downright cut with a smooth edge. If the boundary area remains untouched, the data in the area will be removed and the hole will be closed again using extrapolated data. In addition, a cross-section can be drawn using the **blue circle button**.

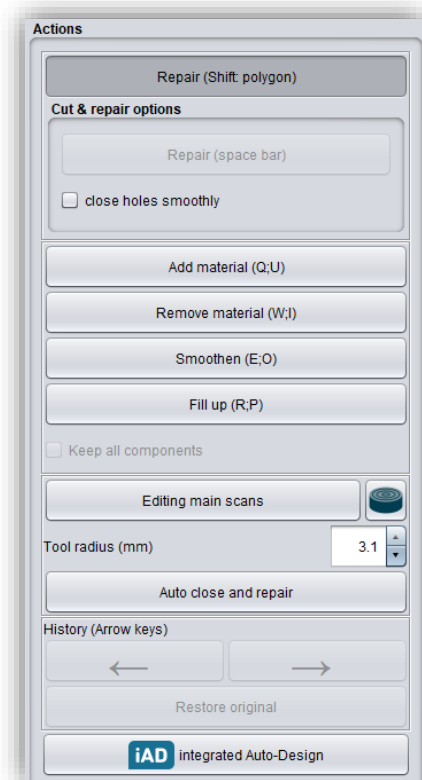


image 19: Action menu - repair.

5.4.2 Application, Removal and Smoothing

The tools **remove**, **apply** and **smooth** are executed immediately, i.e., you do not have to confirm the input with the space bar. The intensity of this processing can be adjusted using the **intensity slider**. You can use the left arrow to undo individual editing steps and continue working on an earlier editing status or **restore original**.

5.4.3 Fill Up

The **fill up** function is particularly suitable for filling holes. This tool works in the same way as **apply**, but is even more fun, see image 20.

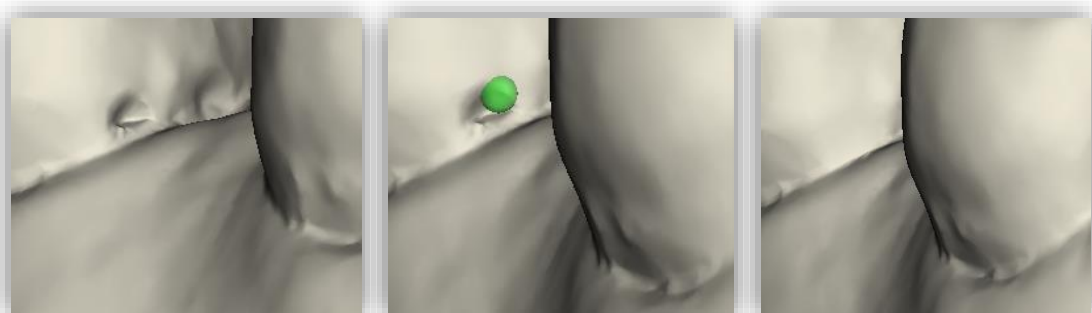


image 20: The fill up tool now makes it even easier to close holes and depressions.

5.4.4 Process Main Scans / Process Extra Components

The *edit main scans/edit extra components* button allows you to choose which scan you want to edit.

5.4.5 Automatic Close and Repair

This function automatically closes possible holes in the scan and repairs scan artifacts by deleting "defective" parts of the mesh (e.g., self-intersections) and then closes the holes.

Click > to move to the next editing step or the *iAD* button to have the splint created automatically from here.

-
- ✓ Select the repair tool
 - ✓ Select the radius of your tool and, if necessary, the intensity
 - ✓ Select the areas to be edited
-

5.5 Specify Edge

In this step, the margin of your bite splint is determined. To do this, first define the insertion direction automatically or manually. Then define the splint margin by defining a margin curve or by automatic marginal curve calculation in the jaw in which the splint is to be created. You can also block out individual areas manually.

5.5.1 Show Upper/Lower Jaw

Click on *show upper jaw* or *show lower jaw* (image 21), to get a top view of the corresponding jaw, see image 22.

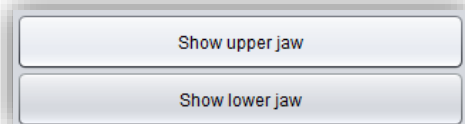


image 21: Show upper/lower jaw.

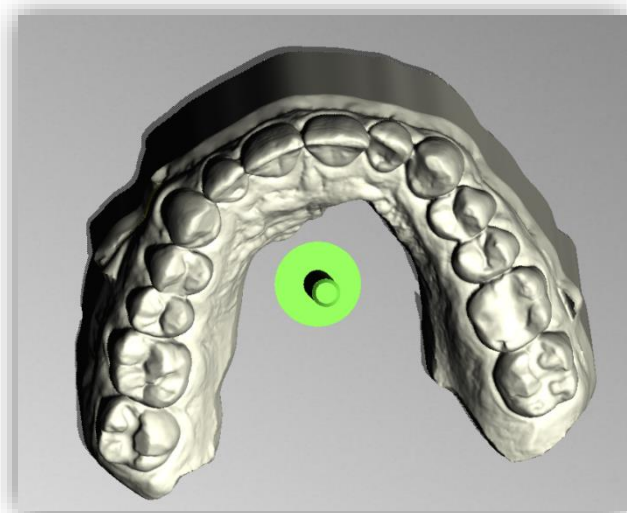


image 22: Display the upper jaw. The green arrow indicates the current insertion direction.

5.5.2 Set the Insertion Direction

BiSS can set the insertion direction automatically. To do this, click the *automatic* button, see image 23.

BiSS determines the insertion direction in such a way that the undercuts generated are kept to a minimum. The undercuts created are color-coded and blocked out for splint creation.

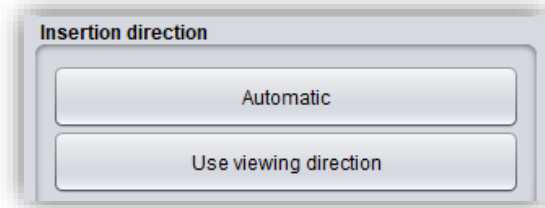


image 23: "Automatic" button for automatic setting of the insertion direction.

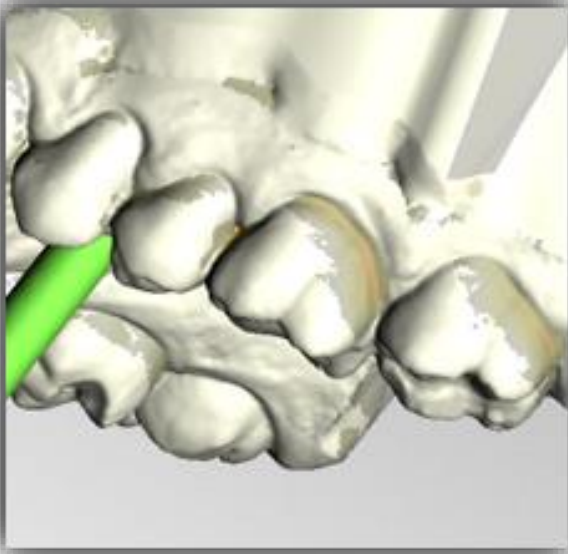


image 24: Representation of the undercuts.

You can also set the insertion direction manually. To do this, move the model to the desired position by holding down the right mouse button. Then click the *use viewing direction* button. BiSS adopts the current viewing direction as the insertion direction. All areas underneath are automatically blocked out.

The *insertion direction* is represented by a green arrow.

5.5.3 Manual Blocking

In some cases, it may be necessary to block out areas manually. For example, in the case of deep fissures that are to be blocked out before the splint is generated. To do this, select the *block out* button, set the tool radius and move over the corresponding areas of the scan while holding down the left mouse button.

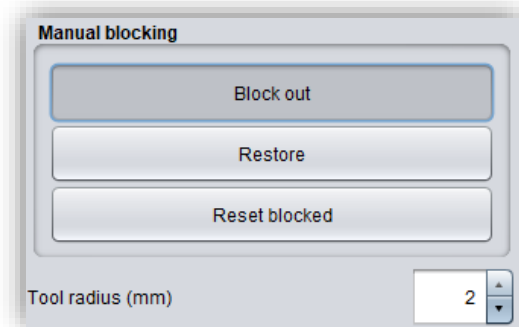


image 25: Manual block out. The tool radius can be adjusted, you can restore or reset everything.

To undo the blocking out, select *restore* button and move over the relevant areas with the left mouse button pressed, see image 26, or reset everything.

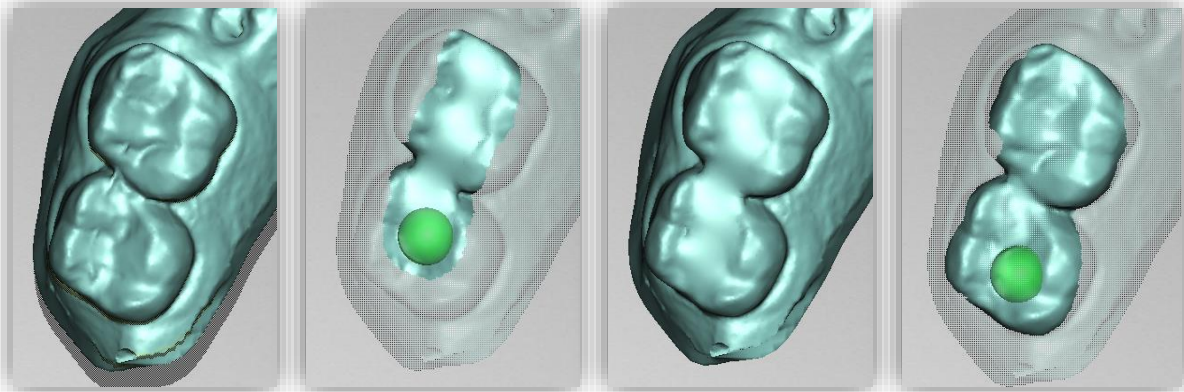


image 26: Before blocking out - block out - after blocking out - restore.

5.5.4 Set Boundary Curve

The *define edge* button is already selected by default in this step (image 27). You can therefore immediately start to *automatically calculate* the marginal curve in the desired jaw with the help of the built-in A.I.. To do this, simply check the box next to "Calculate lower or upper jaw boundary curve". The software recognizes the tooth geometries and places the curve at the gingival margin (or at the desired distance below the value *Gum distance mm*). The values below can be used to specify whether a recess should be made frontally, the *distance from the incisal edge* and for *which teeth* the recess should be made. We recommend the adjacent values for the equator values for a good fit.

If the spline is to be placed directly on the tooth neck, then the check mark for *Find equator* must be removed. Individual points of the boundary curve can be moved or deleted manually after the automatic calculation. This allows the curve to be reworked manually if necessary. If the spline is to be placed directly on the offset surface, i.e. the distance between the rail and the model is considered, a tick must be placed next to *Place curve on offset surface*.

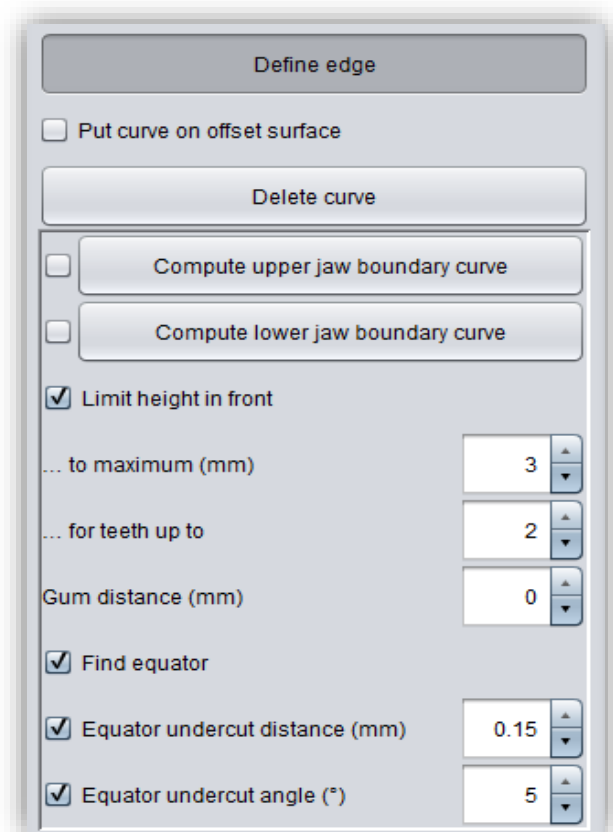


image 27: Buttons for setting the boundary curve.

Tip: Each time you change a setting, you must click *Delete curve* once so that the A.I. can adopt your adjusted values. This also applies if you change the checkmark from *Calculate upper jaw boundary curve* to *Calculate lower jaw boundary curve* or vice versa.

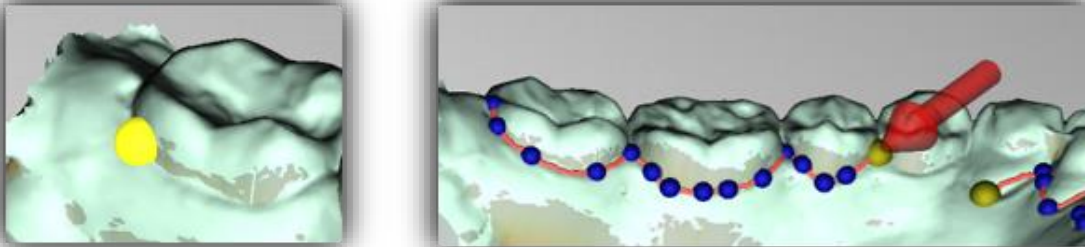


image 28: LEFT - Select the starting point of the boundary curve. RIGHT - Define the boundary curve by setting several points.

If you want to define your boundary curve completely individually, deactivate both automatic boundary curve calculations, left-click on your jaw model to *define the boundary curve manually* and set the starting point (image 28) and all other points through which the spline (boundary curve) should run. You can also hold down the left mouse button and drag the point to the desired position. The set points are displayed in blue and are connected with a red curve. The starting point and the currently set point are highlighted in yellow, see image 28. You can move an already set point in your spline by selecting a point, holding down the left mouse button and dragging it to the desired position. Continue setting further points until you have defined a *closed boundary curve*.

Close this curve by selecting the first point of the curve again. Individual points can be deleted individually by double-clicking or pressing the delete button.

Tip: Rotate the view of your jaw model by pressing the space bar to center the view on the selected control point.

After closing, the defined boundary curve is displayed in green (image 29), if it is free of self-intersections.

If the curve contains a problematic point, then a red arrow will appear pointing to that point. You now have the opportunity to make corrections by moving individual points or defining additional points along the curve if necessary. If you want to

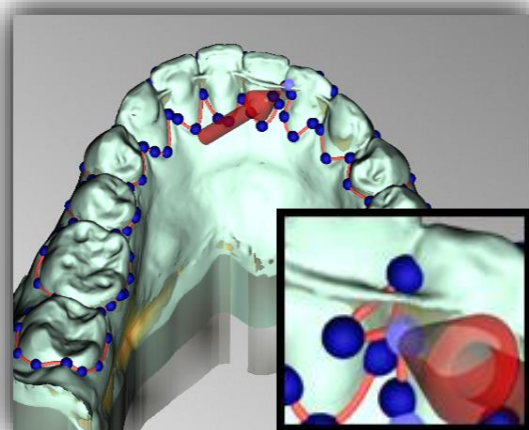


image 29: Closed spline. Indication of problematic area.

delete the entire spline, then click on the *delete curve* button.

This edge curve now defines the outer edges of the bite splint and thus the splint shape.

If you have defined the insertion direction and margin curve, then > to continue. The margin curve is now trimmed, automatic repairs are made, and the medial axis is set.

-
- ✓ Set the splint shape by defining the boundary curve automatically or manually
 - ✓ Set the insertion direction
 - ✓ Block out desired areas if necessary
-

5.6 Set the Splint Shape

In this editing step, you can make further settings that define the final splint shape. You can extend the edge or define holes. If you don't want to make such changes to the created splint shape, you can skip this step.

5.6.1 Pull Down Edge

You can manually extend the splint edge at the desired points. To do this, activate the Extend edge button. The splint is now displayed transparently, and the original edge is highlighted in green. You can now set the desired extent of the extension (in mm).

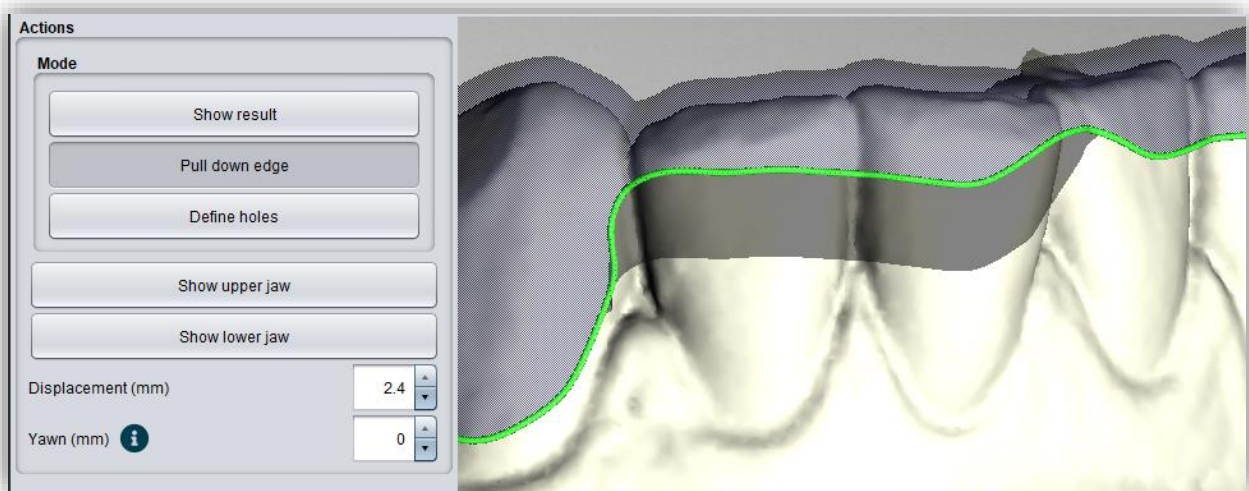


image 30: Extending the rail edge by 2.4 mm.

Now hold down the left mouse button and move over the edge areas that you want to extend, see image 30. The extension is immediately displayed in a transparent gray.

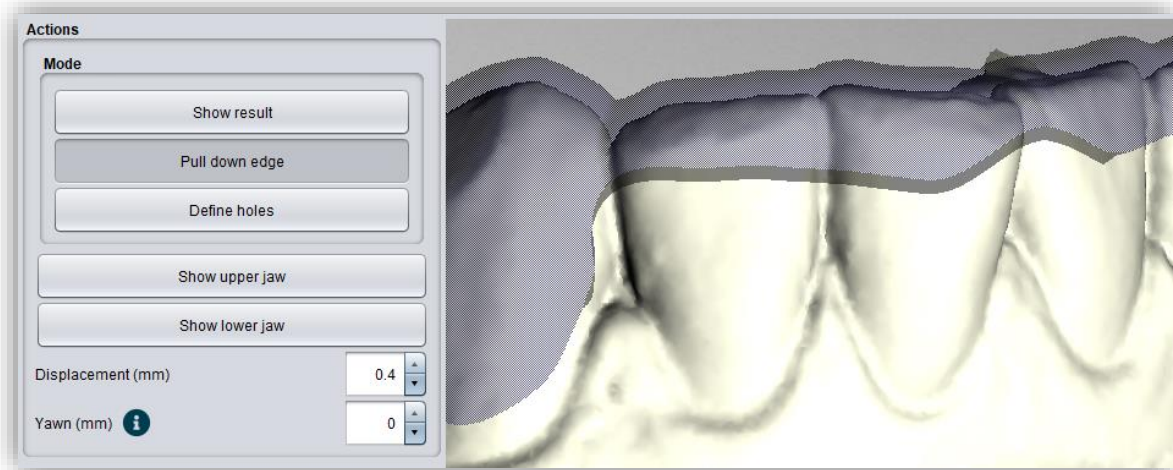


image 31: Extending the rail edge by 0.4 mm.

If you want a different value in some places by which the edge should be extended, change the value and move over the corresponding areas again. If the extended edge is to be reset, the extension (mm) can be set to 0 and the corresponding edge area marked again to place the edge directly on the spline again. The desired visual distance between the two jaws can be set using the "Expand (mm)" field.

5.6.2 Define holes

If required, the rail can be provided with one or more holes.

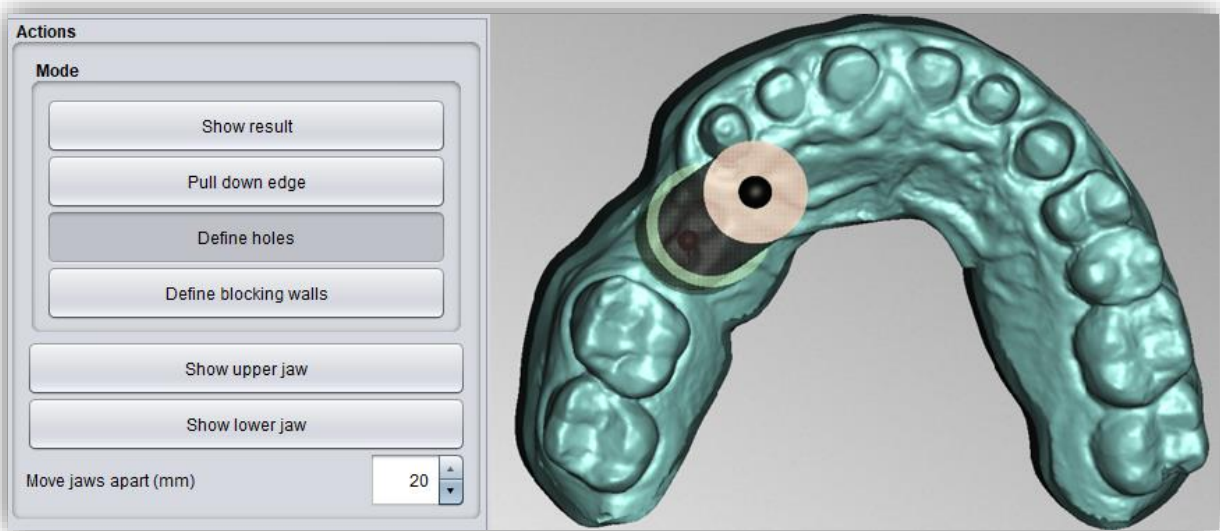


image 32: Edit holes.

To insert holes, click on *define holes* and then click on the corresponding position of the scan. The hole is inserted and displayed as a transparent preview. The hole is displayed in red, the chimney in green, see image 32.

The hole is inserted in the insertion direction by default and placed directly above the scan surface. The hole view has two spherical black handles. The lower handle can be used to move the hole, and the upper handle can be used to change the slope.

If you click next to the handle, *another hole* will be created. If you right-click on the hole, a context menu appears. You can *delete* the corresponding hole or *align* it according to the insertion direction.

You can also use the *in-insertion direction* button to align the hole again according to the splint insertion direction.

Further setting options are summarized in the following **Fehler! Verweisquelle konnte nicht gefunden werden.:**

HOLE SETTINGS	DESCRIPTION
Closed	Activate if a closed hole shall be created.
Wall height (mm)	Sets the wall height in millimeters. The wall is added to the tray and is the "edge" of the hole.
Wall thickness (mm)	Sets the wall thickness in millimeters.
Round	Enable for a round hole. Disable for a rectangular hole.
Diameter (mm)	Specifies the diameter of the round hole in millimeters.
Align with insertion direction	Aligns the selected hole in the insertion direction of the tray.
Delete	Deletes the selected hole.

table 11: Hole setting options. The settings are applied to the next project.

5.6.3 Block out areas that go underneath themselves

If this option is activated, all overhangs due to block-outs are ignored. The splint is then created everywhere with a constant distance around the bite mold.

5.6.4 Smooth Outside

If you want the outside of the splint to be smoothed, check the *smooth outside* option. If the option is not activated, the topography of the inside (with corresponding wall thickness) is adopted on the outside of the tray, see image 33.

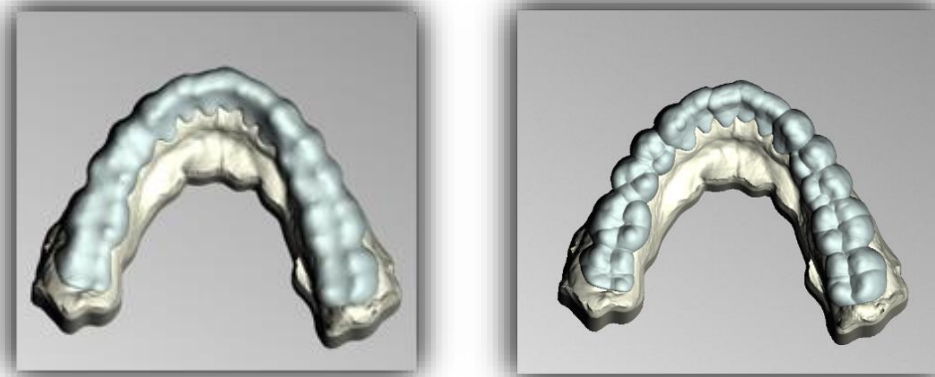


image 33: LEFT - Outside smoothed. RIGHT - Outside not smoothed.

For an optimum fit, a *gap* of 0.01 mm is recommended, but can be increased individually to ensure a looser fit. For the *protected minimum thickness*, always adhere to the specifications of the manufacturer of the materials used.

5.7 Articulator

In this editing step, you can set the articulator individually. The value for the *bite blocking/bite elevation* can be set under *Opening*. The *condylar path inclination* and *Bennett angle* can also be set. For the *chewing simulation*, which is only used in the next step, the movement value of 4 mm is sufficient for *laterotrusion on the left*, *laterotrusion on the right* and *protrusion*. If the splint is not to have any holes after grinding, a check mark must be placed next to *Prevent interpenetration*.

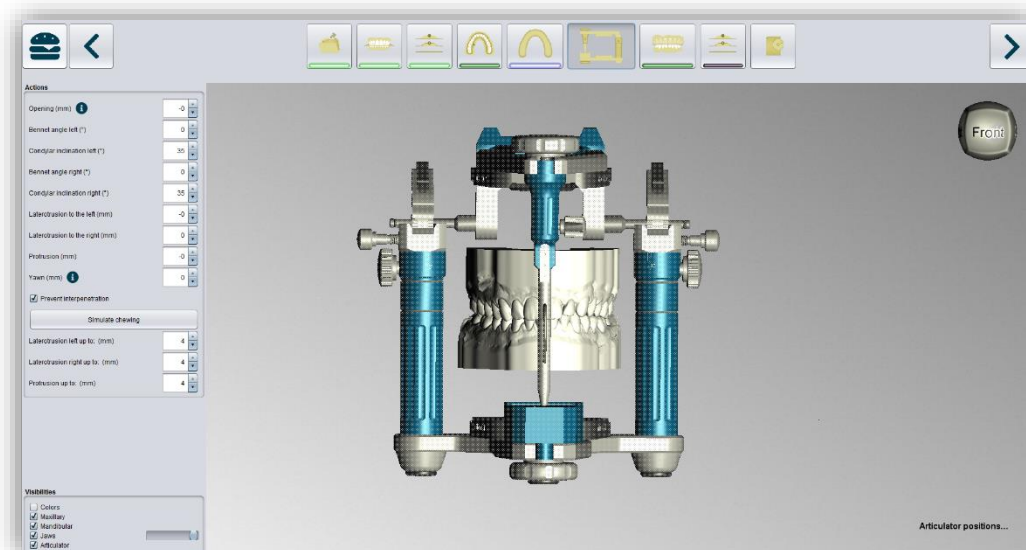


image 34: View of the "Articulator" editing step.

5.8 Adjustment

The adjustment can be selected in this step.

5.8.1 Tool radius compensation

If the splint is to be milled, you can set a cutter radius correction in this step to ensure an exact fit of the rail. To do this, simply select the *Tool radius compensation* field and enter the desired value in mm, see image 35.

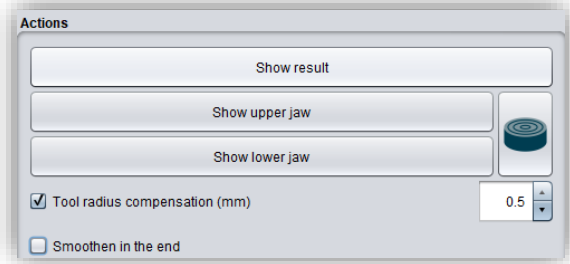


image 35: Adjust tool radius compensation.

5.8.2 Create ridges

Under the item *Create ridges automatically*, you can choose whether your splint should have a *posterior ridge* or whether the posterior teeth should remain free. If you want a posterior ridge, you can enter the desired values for the *raise* and the *width* in mm, see Fig. 35. For ridges in the anterior region, the procedure is the same as for ridges in the posterior region. Here you can select whether an anterior, canine or posterior guide is to be created. Then click on *Apply* and the ridge appears in light green according to the values entered with the control points included, see image 36.

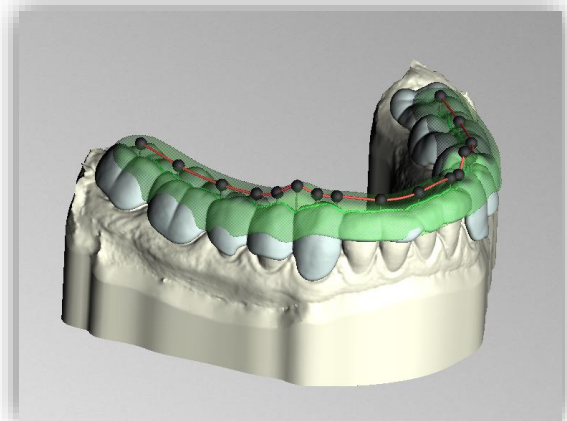
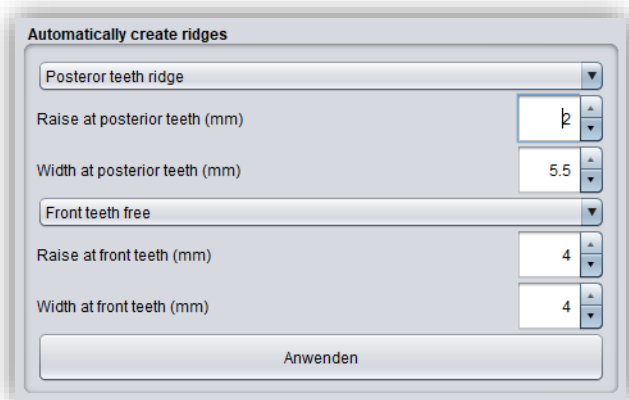


image 36: LEFT: Input area for ridges. RIGHT: Posterior tooth build-up according to the values entered.

If you now want to rework the ridge manually, click on one of the black dots. A window with the *control point properties* will now appear on the left-hand side, see image 37. Here you can modify the structure by editing the individual control points either by moving the point with the mouse or by entering the values in mm (image 37).



image 37: LEFT: Selection options for ridges in the anterior region RIGHT: View after selecting a control point

CONTROL POINT PROPERTIES	Description
Height (mm)	Specifies the height of the control point in millimeters above the scan surface.
Width (mm)	Specifies the width of the wax wall at the control point in millimeters.
Depth (mm)	Specifies the depth of the wax wall at the control point in millimeters.
Rounding radius (mm)	Specifies the rounding radius in millimeters at the ends of the wax wall.
Widening	Indicates the widening of the wax wall towards the bottom.
Change all by the same value (Shift)	Changes all properties by the same value.
Edit individually	Processes a single control point.
Set all to the same value (Ctrl)	Sets all control points to the same value.
Aligning the mounting edge straight	Aligns the ridge.
Round ends	The ends of the ridge are rounded off

Table 12: Splint control point properties.

As soon as a control point is selected, black arrows appear and the shape of the structure can be adjusted by moving them, see image 38.

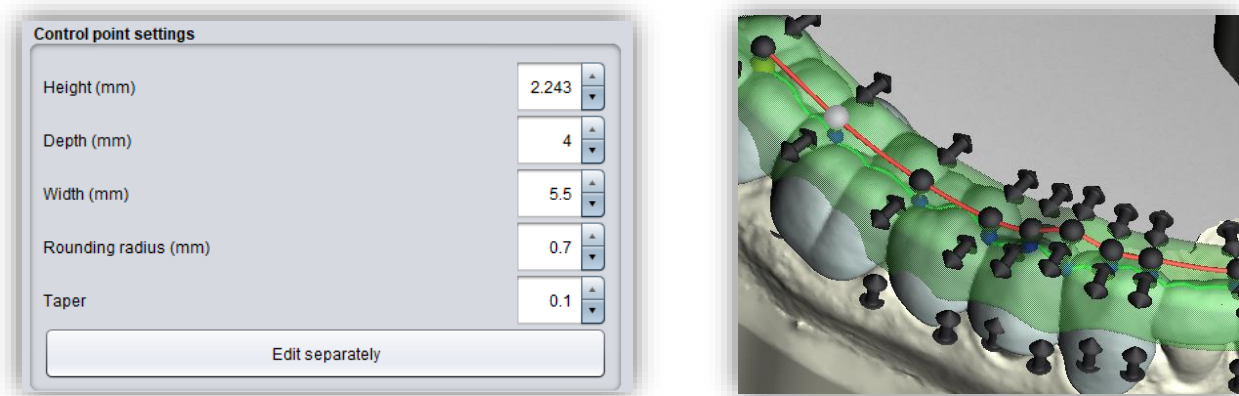


image 38: LINKS: LEFT: Input area for control point. RIGHT: Control points of the posterior tooth ridge

If you want to discard all manual changes, click **Apply** again; if you want to delete the adjustment, click **Delete ridge**. If you want another adjustment in the same jaw or want to add a new one after deleting, click on **new ridge**.

If you now want to grind in the adjustment, the check mark for **Grind in chewing movement** must be set. You can now **simulate the chewing movement** and then display the result. If a chewing simulation has been carried out, the areas of the splint to be ground in are highlighted in red, but these can be hidden at the bottom left under visibilities (image 39).

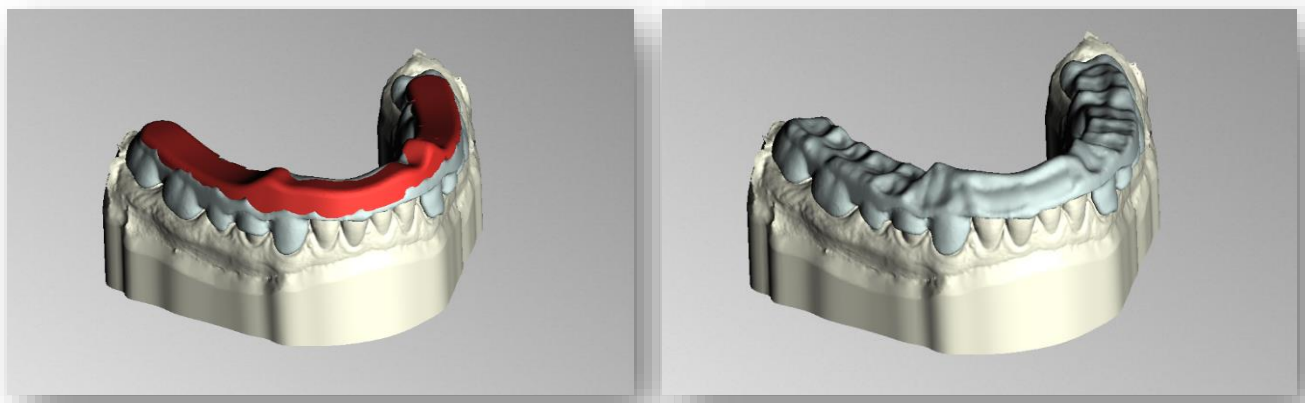


image 39: LEFT: Area to be ground in is highlighted in red. RIGHT: Area to be ground in has been hidden. This is the result of a ground-in adjusted splint.

5.9 Labels

You can add a *label* to your splint to clearly identify it after printing (is preferably used for parameter tests). This can be a simple text or an image file in .BMP, .JPG, .PNG or .GIF format.

Right-click on the part of your model where you want to add the label and select either *new text label* or *new image label* (image 40). The labeling can be applied to any part of the splint, regardless of the surface topography.

If you have selected new text label, then enter your text in the input line provided in the action window. If you have assigned a project name, this will be used by default. Of course, you can change the text. If you want to add an image label, then click on the image icon and select your image file (Image 41).



image 40: TOP: Label context menu. BOTTOM: Preview text label.

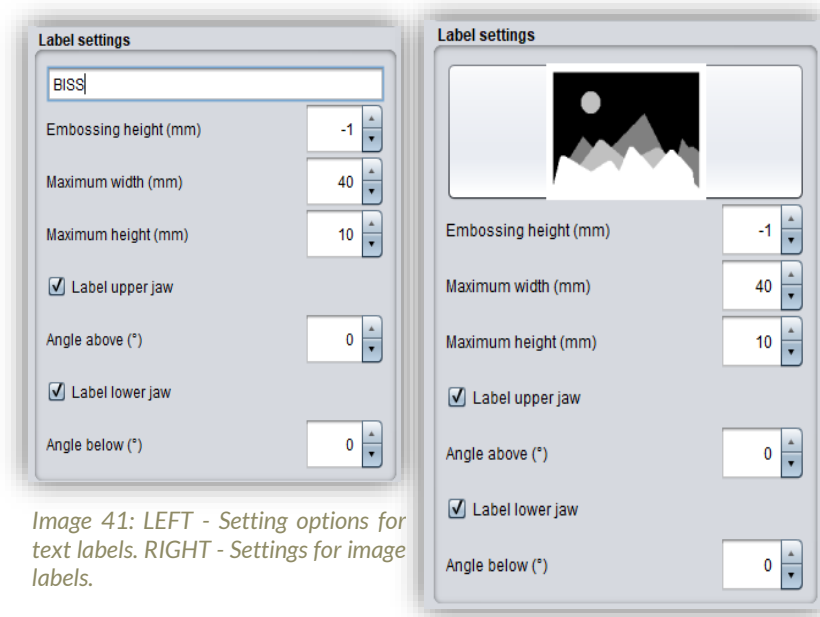


Image 41: LEFT - Setting options for text labels. RIGHT - Settings for image labels.

The selected labels are displayed on the model in design mode (image 40). You can change the *properties* of the labels, such as size, angle, and depth of the sweep in the action window.

In the upper display field, there is a list of your added labels. You can select a label from this list and add it again by clicking on the

other jaw of the splint in the appropriate place or edit only its properties.

Click *show results* if you want your labels to be added to the 3D splint. You can edit the labels at any time afterwards. Reactivate the editing mode by clicking on your splint. Make a right click on the splint.

5.10 Final Edits

In this designing step, you have another opportunity to edit your splint. For example, you can repair areas, add, or remove material and smooth areas.

The functionality is identical to the repairing step and is described in detail in the *Repair* chapter.

Tip: If you have forgotten to apply the cutter radius correction, you can activate it here once by clicking on the button. Automatic smoothing has also been integrated for the final finish.

5.11 Save the Job

Now you have the possibility to *save* the whole project in a project file .GBS or to *export splint* and all components as .STL, .OBJ or .PLY for further processing. In addition, you can also export individual intermediate states, *export the splint aligned*, start directly with a *new project*, or return to the start screen and *choose another application* (image 42).

5.11.1 Save BISS-Splint-Project

Select *save* to save the project file .LFL. If you have already saved the project or no project name is set, select *save as*.

5.11.2 Send BiSS-Files to PUZZLE

If you have purchased the PUZZLE application, then you can send the data directly to PUZZLE so that they are placed fully automatically. To do this, it is necessary to set the storage path beforehand (see chapter Loading and Saving).

5.11.3 Export Splint

Select *export trays* in the actions window or *> Export* in the top menu bar to export the splint as an .STL, .PLY or .OBJ file.

5.11.4 Export Aligned

You can export the data in *original position*, or already aligned for 3D printing.

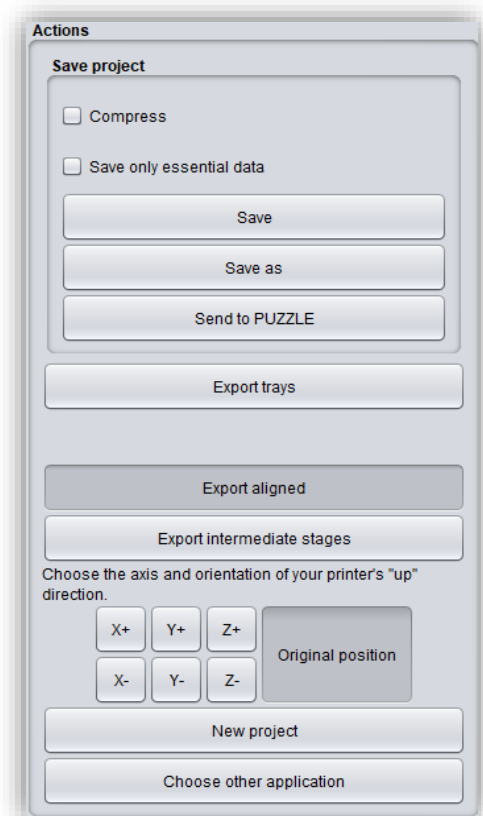


image 42: Selection for saving and exporting.

Therefore, activate the *export aligned button* and select the axis and orientation that points upwards for your printer. If *export aligned* is not activated, the default is to export in the coordinate system used by BiSS, i.e., the set occlusal plane is the x-z plane. Export in *original position* means that the data is exported in the same coordinate system in which the main scans were originally loaded.

5.11.5 Export Intermediate Stages

To export an intermediate status, select the processing statuses that you want to export and then click *export* (image 43).

The processing statuses and their sequence correspond to the BiSS workflow and are self-explanatory in terms of terminology. Therefore, a description of the individual stages is unnecessary at this point.

Stage	Upper jaw	Lower jaw
Original	<input type="checkbox"/>	<input type="checkbox"/>
Extra components	<input type="checkbox"/>	<input type="checkbox"/>
Auto-repaired	<input type="checkbox"/>	<input type="checkbox"/>
Auto-assembled	<input type="checkbox"/>	<input type="checkbox"/>
Manually repaired	<input type="checkbox"/>	<input type="checkbox"/>
Fringe cut off	<input type="checkbox"/>	<input type="checkbox"/>
Holes closed	<input type="checkbox"/>	<input type="checkbox"/>
Base added	<input type="checkbox"/>	<input type="checkbox"/>
Mid surface without holes	<input type="checkbox"/>	<input type="checkbox"/>
Mid surface	<input type="checkbox"/>	<input type="checkbox"/>
Mid surface (closed)	<input type="checkbox"/>	<input type="checkbox"/>
Splint shape	<input type="checkbox"/>	<input type="checkbox"/>
Splint shape with ridges	<input type="checkbox"/>	<input type="checkbox"/>
Splint shape (smoothed)	<input type="checkbox"/>	<input type="checkbox"/>
Attachments assembled	<input type="checkbox"/>	<input type="checkbox"/>
Labeled	<input type="checkbox"/>	<input type="checkbox"/>
Final repairs	<input type="checkbox"/>	<input type="checkbox"/>
Simplified	<input type="checkbox"/>	<input type="checkbox"/>

image 43: Export intermediate state. Select the desired intermediate levels and click "export".

5.11.6 New Project

Clicking on *new project* opens a new project. The old project is closed if it was saved before. If it has not been saved yet, then there is a hint about it.

5.11.7 Choose Other Application

Return to the start screen and select another BiSS application.

6 Software-Updates

6.1.1 Update-Availability

You will automatically receive a message when a new update is available for your software. Alternatively, you can click the *check for updates* button via Menu - Settings - Updates. If no update is available, the message shown in image 44 appears.

6.1.2 Install Update

Click on the provided link and download the new software version. Install the software in the desired directory. We recommend uninstalling the old version first. Manually added implant libraries should be preserved.

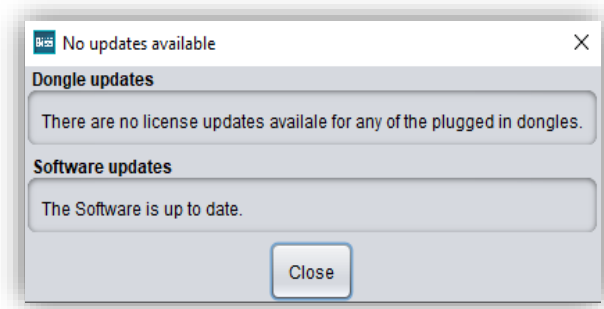


image 44: No software-update available.

7 Dongle-Updates

In some cases, a dongle update is required:

- ✓ Your monthly license has expired, and you would like to extend it
- ✓ You have purchased another BiSS module, e.g., Premium iAW
- ✓ You have purchased another workstation for your multi-user network license
- ✓ For more extensive updates, a dongle update may also be required so that you can benefit fully from the BiSS updates.

7.1 How to know that a dongle update is required?

You will be notified when a dongle update is ready for you:

7.1.1 At Startup

You will automatically receive a message when you start BiSS if there is a new update available for your dongle. The prerequisite is that your dongle has not yet expired.

7.1.2 Via the Menu

Go to the menu and then via settings to the updates tab. Click on the *check for updates button*. If there is an existing license update for your dongle, you will see it.

7.1.3 Execute the UpdateClient.exe

In the installation directory of BiSS is the *UpdateClient.exe*. If BiSS does not start anymore, because your license has expired, you can start the update client this way, for updating your dongle or the software.

7.2 Execute Dongle-Update

Make sure that your BiSS dongle is plugged into the PC from which you will perform the dongle update.

Start the update client and follow the instructions.

8 Warning and Notes - Disclaimer

The software does not create dental prostheses and is only suitable for the further processing of digitally produced components in dentistry and orthodontics. Further use outside dentistry and orthodontics is not suitable.

The software leaves behind temporary files if it has not been terminated properly, e.g. in the event of a system crash. The user must then manually delete these files from his temporary files folder to free up disk space.