



## **Instructions for use**

3D model scanner orthoX<sup>®</sup> scan.



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## Dear customer,

Thank you for choosing a quality product from Dentaureum.

It is essential to read these instructions carefully and adhere to them to ensure safe, efficient use and ensure that you and your patients gain full benefit. Instructions for use cannot describe every eventuality and possible application. In case of questions or ideas, please contact your local representative.

As our products are regularly upgraded, we recommend that you always carefully read the current instructions for use stored in the internet at [www.dentaureum.com](http://www.dentaureum.com), even though you may frequently use the same product.

## 1 General information

### Identification

Type: 3D model scanner orthoX®scan, REF 075-000-00

Manufacturer: Dentaureum GmbH & Co. KG | Turnstr. 31 | 75228 Ispringen | Germany



Read the GREY boxes for useful tips.



Read the BLUE boxes to avoid common errors and find safety information.

## 2 Product description



orthoX®scan is an optical 3D model scanner designed for digital, three-dimensional scanning of orthodontic models of human jaws.

## 3 Technical data

Dimensions	295 x 170 x 360 mm (W x H x D)
Weight	9 kg
Supply voltage	100 – 240 V~, 50/60Hz
Fuse protection	2 x T 1.6 A L 250 V
Power consumption	max. 60 W
Protection class	IP11
Operating temperature	15 °C – 30 °C / 59 °F – 86 °F
Storage temperature	-5 °C – 50 °C / 23 °F – 122 °F
Measuring point accuracy	< 20 µm
Output data format	STL
Ports	USB 2.0
Components supplied	3D model scanner orthoX®scan, model holder, USB storage device, 1x power cable, 2x USB cable

## 4 Safety instructions

**Always observe the following safety instructions when setting up, starting up and using the scanner:**

1. The device may only be operated by adequately trained personnel instructed on the intended use of the device and the following safety instructions.
2. We strongly advise against any use other than the intended use, as improper use may result in property damage and personal injury.
3. The device is solely intended for use in dry, indoor rooms.
4. The device was developed and manufactured according to the applicable safety standards and with the utmost diligence. However, the risk of electric shock, overheating or fire due to technical defects of single components cannot be ruled out completely. Therefore always switch the device off when it is left unattended for extended periods, e.g. over night. This will also benefit the environment as it reduces electricity consumption.
5. Only operate the device on a sturdy substructure (table, workbench, etc.) with a minimum weight bearing capacity of at least twice the scanner net weight listed in the technical specifications.
6. To remove objects that dropped into the scanner or to clean the inside of the scanner, the device must first be switched off using the on/off switch **E** (see Fig. 2).
7. If you detect damage or a functional defect, mark the scanner as defective and prevent it from being further operated until repaired.
8. Please be sure not to place anything other than the objects to be scanned into the scanner. Make sure no objects fall through the scanner opening.
9.  Be careful not to get any body parts caught in the cover or the mechanics. Dentaurem assumes no liability for improper use.
10.  Please do not touch the camera lens **G** inside the device (see Fig. 3).

## 5 Scanner description

### 5.1 Scanner components

#### 5.1.1 Rear view

- A** Type label with technical information
- B** 2x USB port
- C** Power supply with fuse

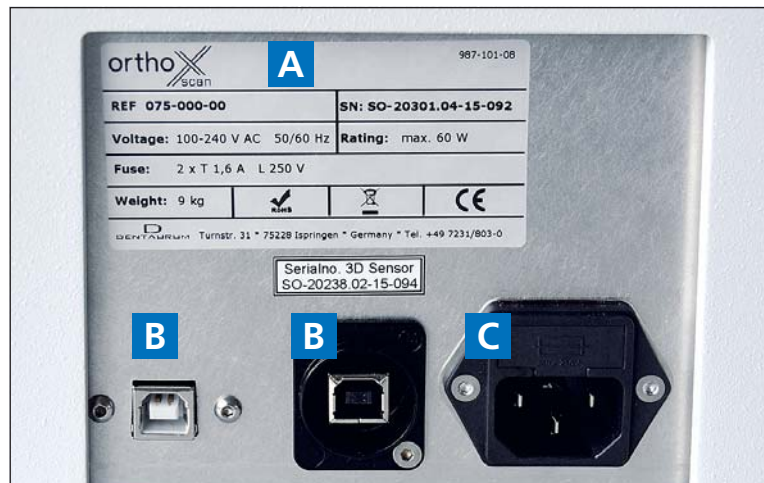


Fig. 1: Supply terminal on back of scanner

#### 5.1.2 Front view

- D** Cover
- E** On/Off switch
- F** Status bar
  - Blue = ready to use
  - Red = ongoing scanning process



To ensure safe operation, the scanning process only operates with the cover closed.



Fig. 2: Scanner front

### 5.1.3 Interior view

- G** Scanner camera
- H** Removable model holder
- I** Swivel axis
- J** Rotation axis

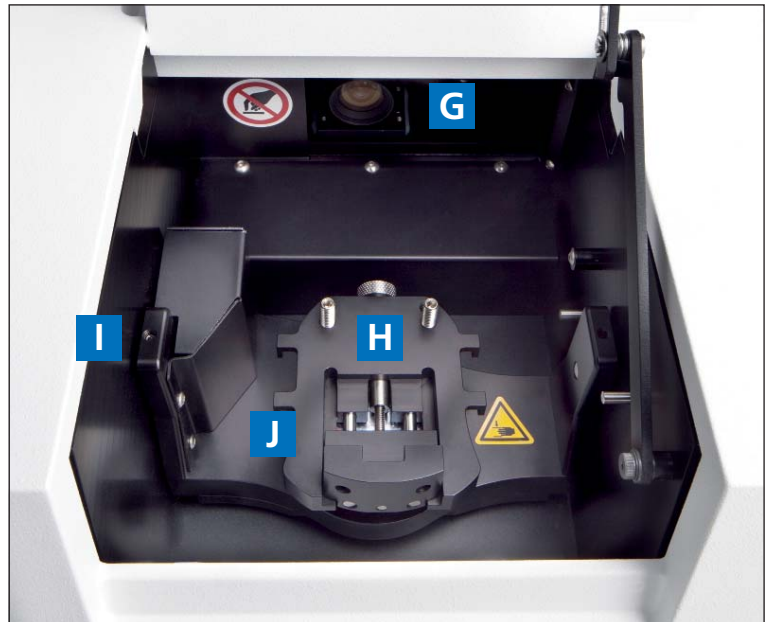


Fig. 3: Interior view

## 5.2 Operation of orthoX® scan

The key components of the 3D model scanner orthoX® scan are a 3D sensor in the scanner camera and a positioning mechanism.

During measurement the 3D sensor projects a striped pattern onto the object to be scanned. At the same time a camera records the striped pattern. The software uses the camera images to calculate a three-dimensional image of the object.

For a complete measurement, the object is positioned at various angles to the 3D sensor using the positioning mechanism of the scanner. The software then merges the single measurements acquired this way to a closed 3D model of the object.

## 5.3 Model holder

The model holder is removable and is secured in position in the orthoX® scan by a magnet. The model is fixed securely in position on the removable model holder by a clamping mechanism with the aid of a sure-grip screw.



Fig. 4: Removable model holder in orthoX® scan

## 6 Placing model in the 3D model scanner orthoX® scan

The model should be placed in the orthoX® scan with the model holder. The model holder is removable and is secured in position in the unit by a magnet. The model is fixed securely in position on the removable model holder by a clamping mechanism with the aid of a sure-grip screw.

### 6.1 Securing model on model holder

Place model in model holder with the anterior teeth facing towards the sure-grip screw. Secure model on holder by tightening sure-grip screw. First, scan the maxilla. Then, scan the mandible (see Fig. 5).



Fig. 5: Model holder with lower jaw model

### 6.2 Placing the upper and the lower model in occlusion in the model holder

After scanning the upper and the lower model, both models have to be scanned in occlusion (= vestibular scan). Leave lower model in the model holder and align upper model in occlusion on lower model. Once both are correctly positioned, fix the set of models on the model holder using rubber bands (please cross bands over to secure). Use the lateral hooks on the model holder to secure the rubber bands.



Fig. 6: Model holder with upper and lower jaw model in occlusion



Fix models tightly! Loose models can lead to unusable scan results. If necessary, insert a wax bite to position models correctly. The wax bite can stay on the model during scanning.

### 6.3 Placing model holder in the orthoX® scan model scanner

The model holder will only fit on the magnet retention plate in the scanner if you insert it in the correct position. The anterior teeth of the models on the holder must always face the camera on the inside of the scanner.




If the holder is inserted incorrectly, the holder is loose and allows a slight tipping movement.



Fig. 7: Lower jaw model with model holder in the orthoX® scan

## 7 Operating orthoX® scan scanner software

- Open the software by double-clicking the orthoX® scan icon  on your desktop.



Carry out axis calibration after transportation (see chapter 8.4).

### 7.1 Program interface

The program interface includes the tool bar with text box, the tool bar for re-scanning and articulation and the 3D Viewer.

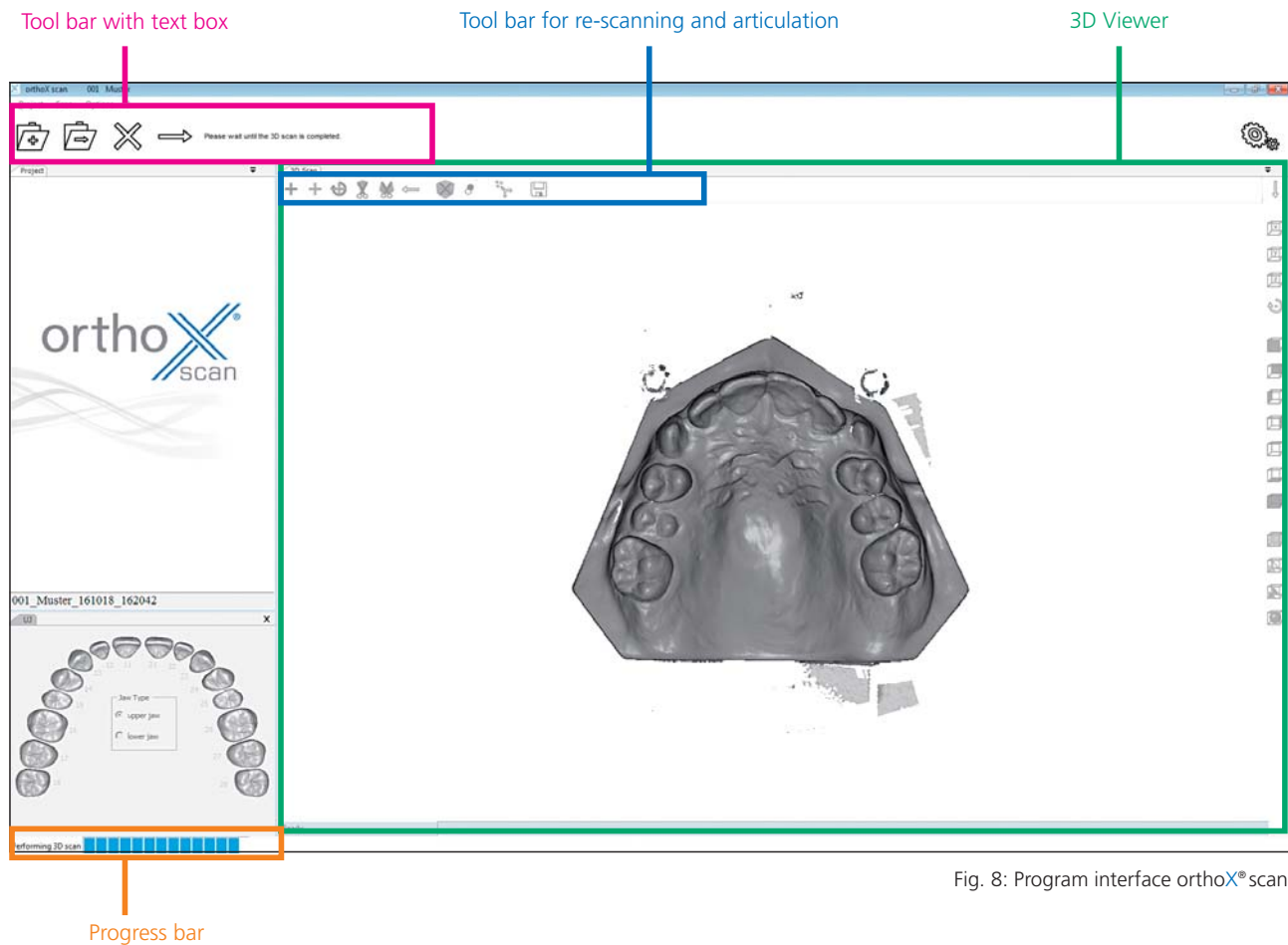


Fig. 8: Program interface orthoX® scan



### 7.1.1 Explanation of icons in tool bar

The tool bar is on the upper part of the interface (see Fig. 8). It consists of 8 icons that change depending on the functions available. Tips for the following step appear immediately next to this.



Fig. 9: Tool bar

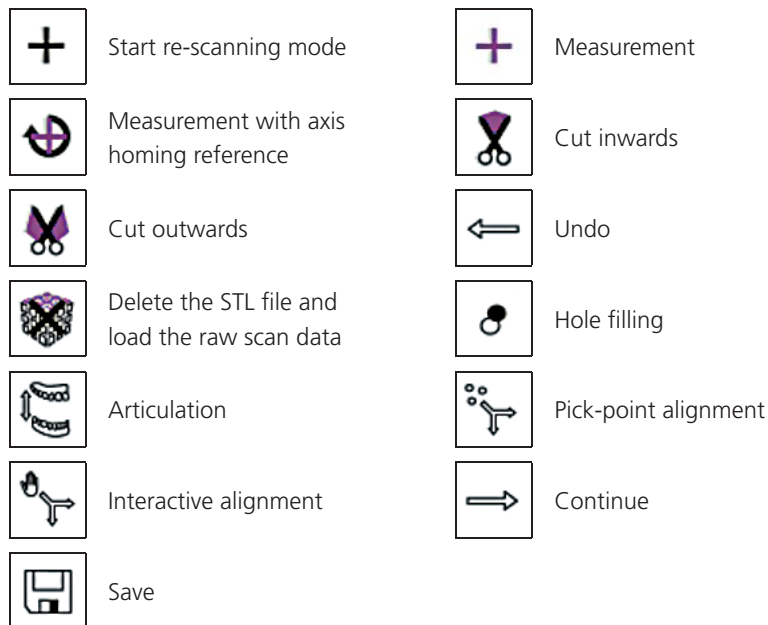


### 7.1.2 Explanation of icons in tool bar for re-scanning and articulation

The tool bar for re-scanning and articulation is on the upper left in the 3D Viewer (see Fig. 8). It contains 13 icons that are active depending on the functions available.



Fig. 10: Tool bar for re-scanning and articulation



### Mouse buttons

Press and hold left mouse button: Rotate model  
Press and hold right mouse button: Move model  
Turn mouse wheel: Zoom in/out

## 7.2 Selecting model to be scanned

- Enter the name of the patient and the patient ID (optional). The data you enter will be used as file name.
- Select the jaw/s to be scanned by clicking the respective icon.
- Depending on the selection you will be requested to insert the corresponding jaw model into orthoX® scan.

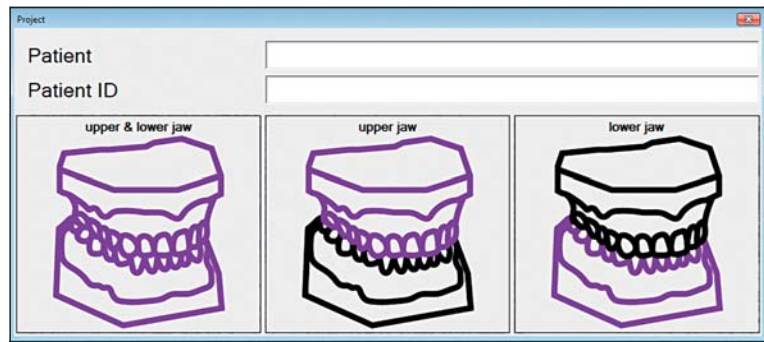


Fig. 11: Select jaw to be scanned

- Select one of the three options and follow the workflow instructions.

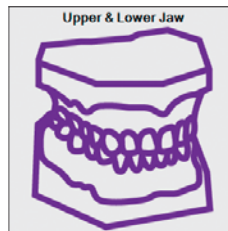


Fig. 12: Performs an upper jaw scan, a lower jaw scan and a scan of upper and lower jaw in occlusion.

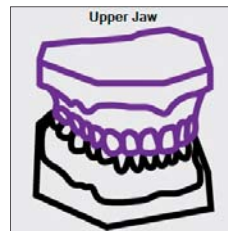


Fig. 13: Performs an upper jaw scan

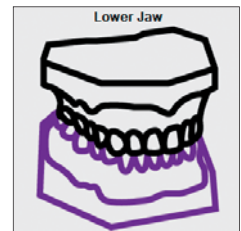


Fig. 14: Performs a lower jaw scan

The following chapter will explain the scanning process step by step using a scan of an upper jaw, a lower jaw and upper/lower jaw in occlusion (see Fig. 12). Scanning single jaws follows the same pattern.

## 7.3 Scanning model set

### Maxilla

- Fix the upper jaw model on the model holder, place the model holder in the correct position in orthoX® scan and close the cover.
- Start scanning by clicking on **3D Scan**.

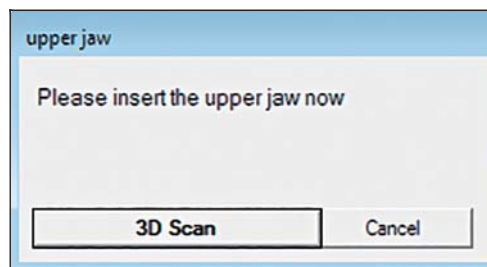


Fig. 15: Start 3D scan of upper jaw model

orthoX® scan will automatically scan the model with a defined scan strategy and perform a number of individual measurements from various angles. After a short time the upper jaw model will appear in the 3D Viewer.

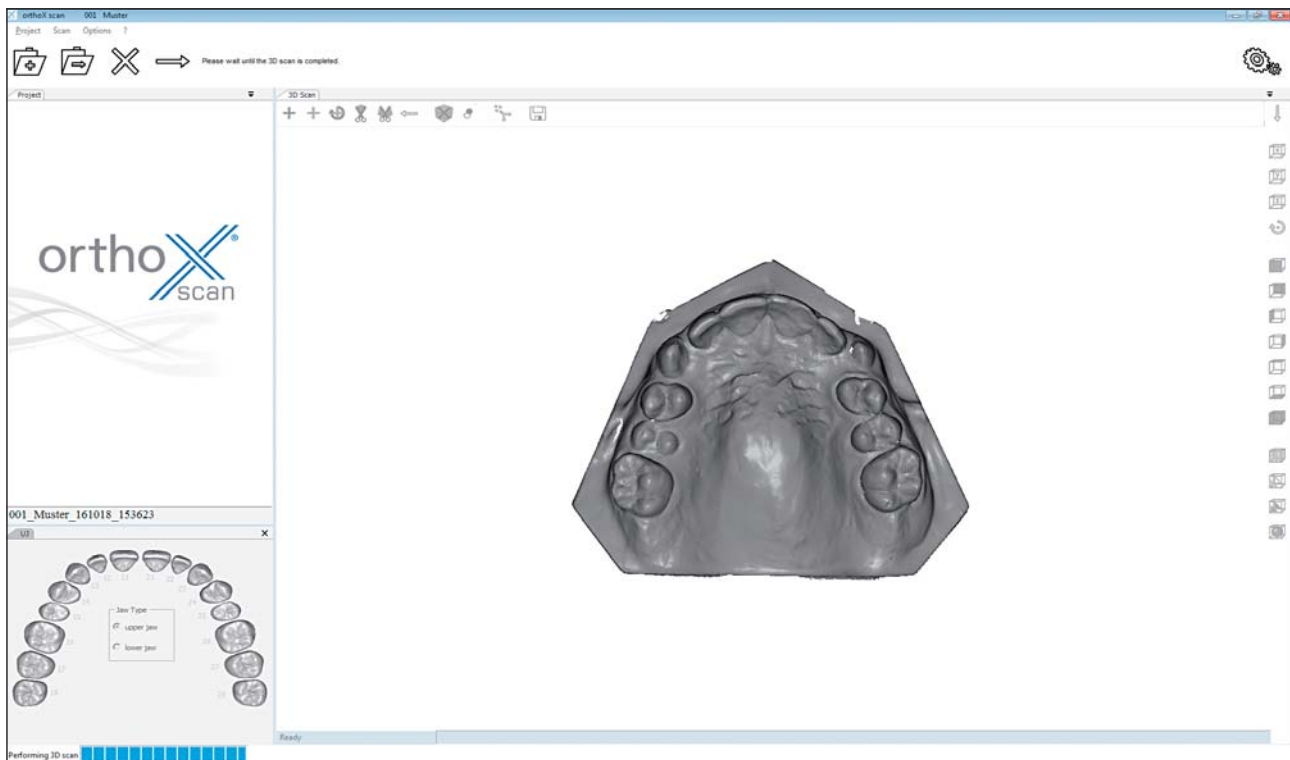



Fig. 16: Scan of upper jaw in 3D Viewer

- Analyze the upper jaw scan and re-scan, if necessary (see chapter 7.4).

## Mandible

- Continue the process by clicking on **Continue** .
- The next window will ask you to insert the lower jaw model.
- Fix the lower jaw model on the removable model holder, close the cover and click on **3D Scan** to start scanning.

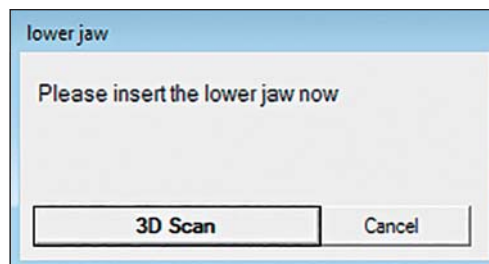


Fig. 17: Start 3D scan of lower jaw model

orthoX®scan will automatically scan the model with a defined scan strategy and perform a number of individual measurements from various angles. After a short time the lower jaw model will appear in the 3D Viewer.

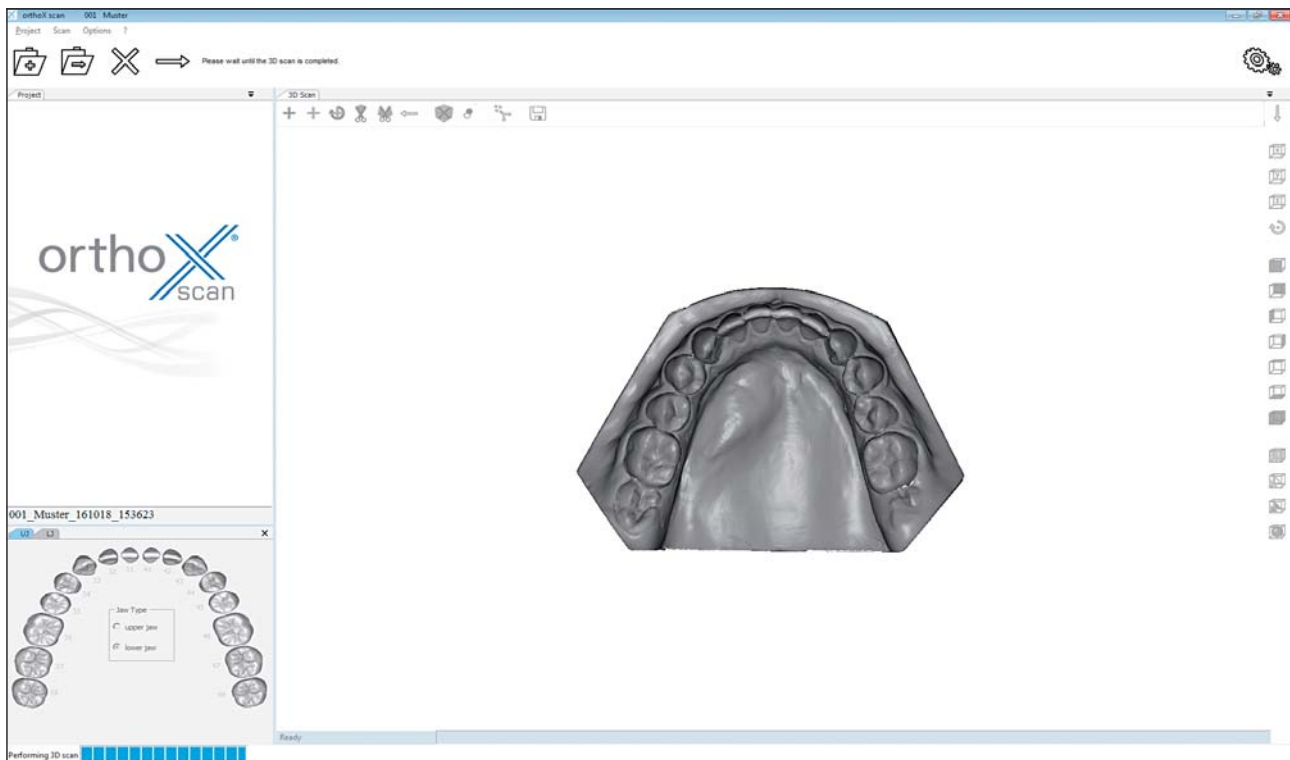



Fig. 18: Lower jaw scan in the 3D Viewer

- Analyze the lower jaw scan and re-scan, if necessary (see chapter 7.4).

### Upper and lower jaw in occlusion

- Continue the process by clicking on **Continue** .
- The next window will ask you to insert the upper and lower jaw models in occlusion.
- Place both models into the scanner for the vestibular scan (see chapter 6.2). Close the cover and start the scanning process by clicking on **3D Scan**.

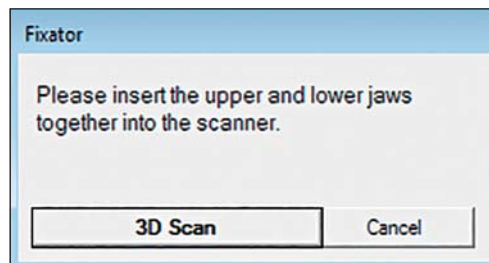


Fig. 19: 3D scan of upper and lower jaw models in occlusion



Use a wax bite, if necessary.

The vestibular area will be scanned by the device. A preview of the scan appears in the 3D Viewer.

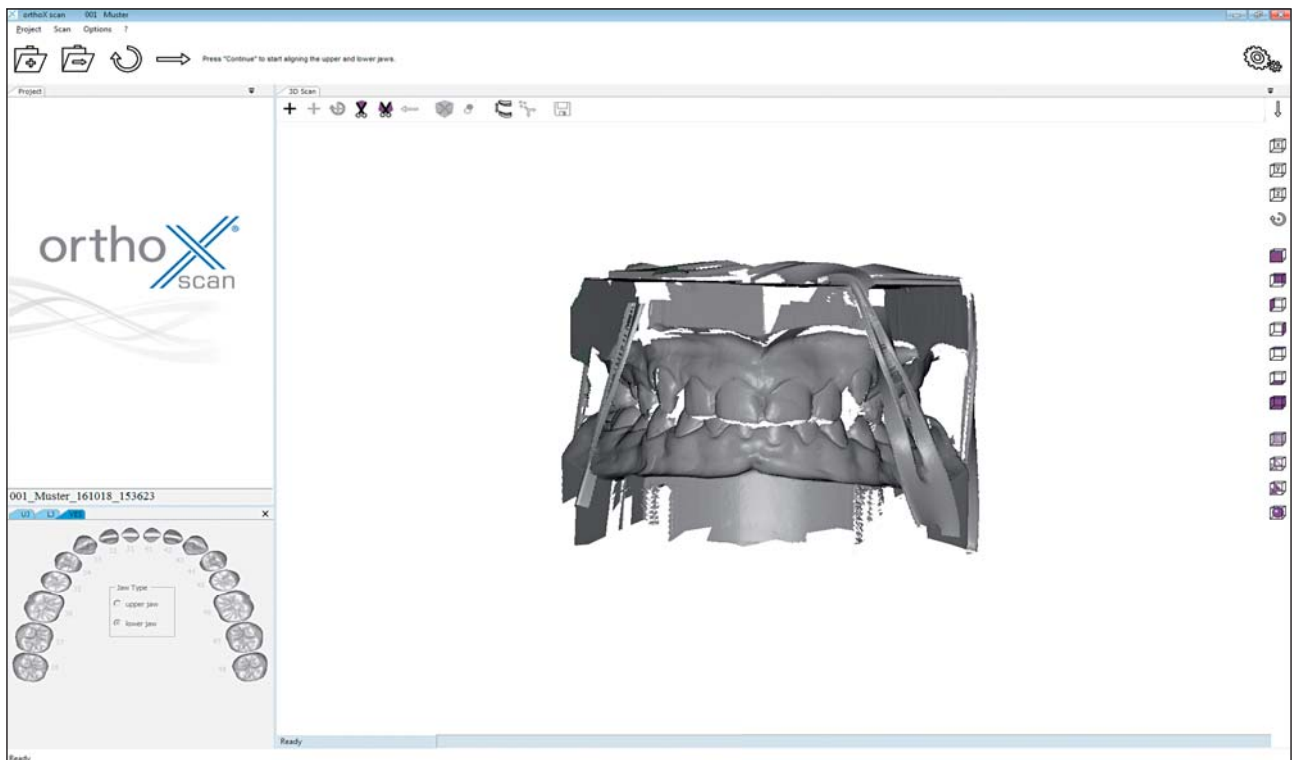



Fig. 20: Vestibular scan in the 3D Viewer

To automatically align the upper and the lower jaw click on **Continue**. . The software now includes the previously generated upper and lower jaw scans in the vestibular scan and creates a preview.

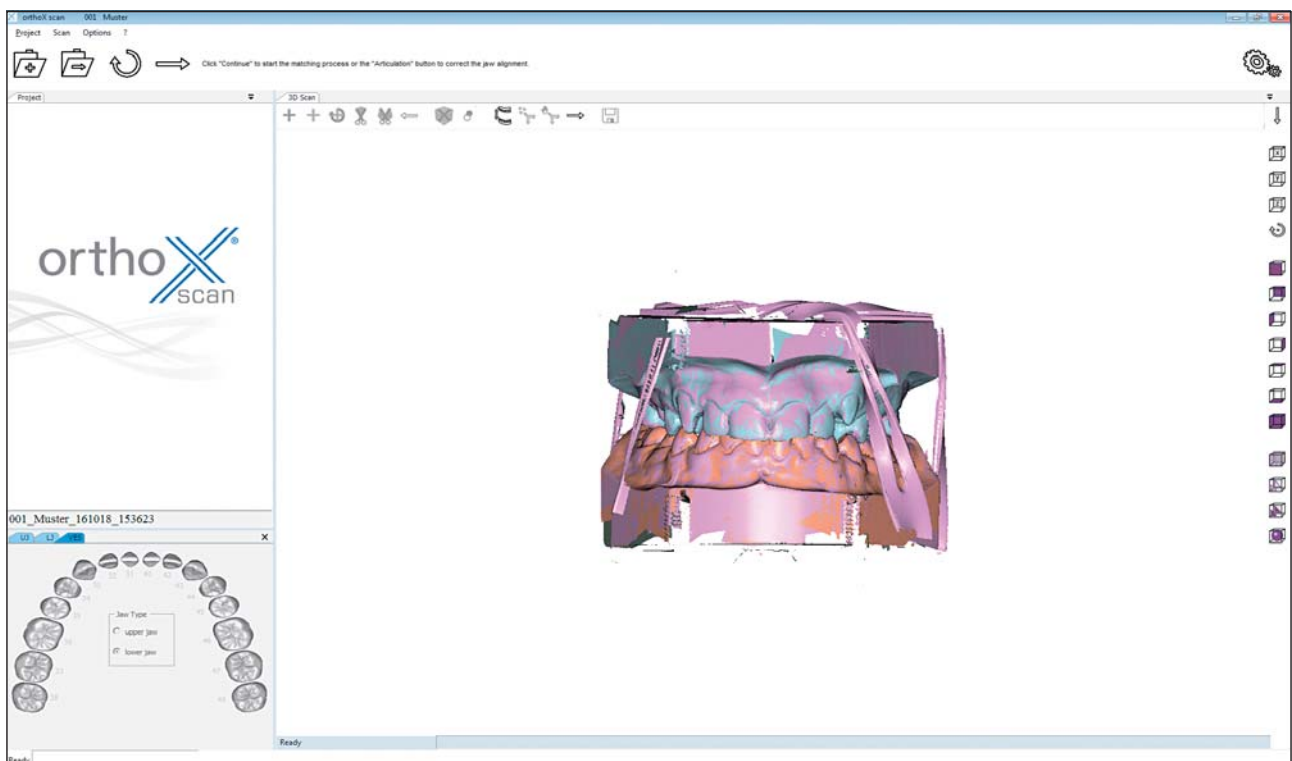



Fig. 21: Vestibular, upper jaw and lower jaw scan



The various color patterns of the upper and lower jaw as well as the vestibular scans make it easier to recognize an offset.

- Check if preview is correct.
- If you find the data set not to be good, you can repeat this step by clicking on **Articulation**  (see chapter 7.5).



The jaws will be roughly aligned. Minor deviations are allowed and will be corrected during the matching process. However, if matching does fail, you can repeat the manual aligning.

If you find the data set to be good you can confirm with **Continue** . The software automatically starts the matching process. This may take a few moments.



The recorded measurements are automatically assembled using special algorithms and put together to STL data. This process is called matching. The quality settings of STL files are described in chapter 8.1.

Once the images have been matched, the finished data set is reloaded into the 3D Viewer and displayed.

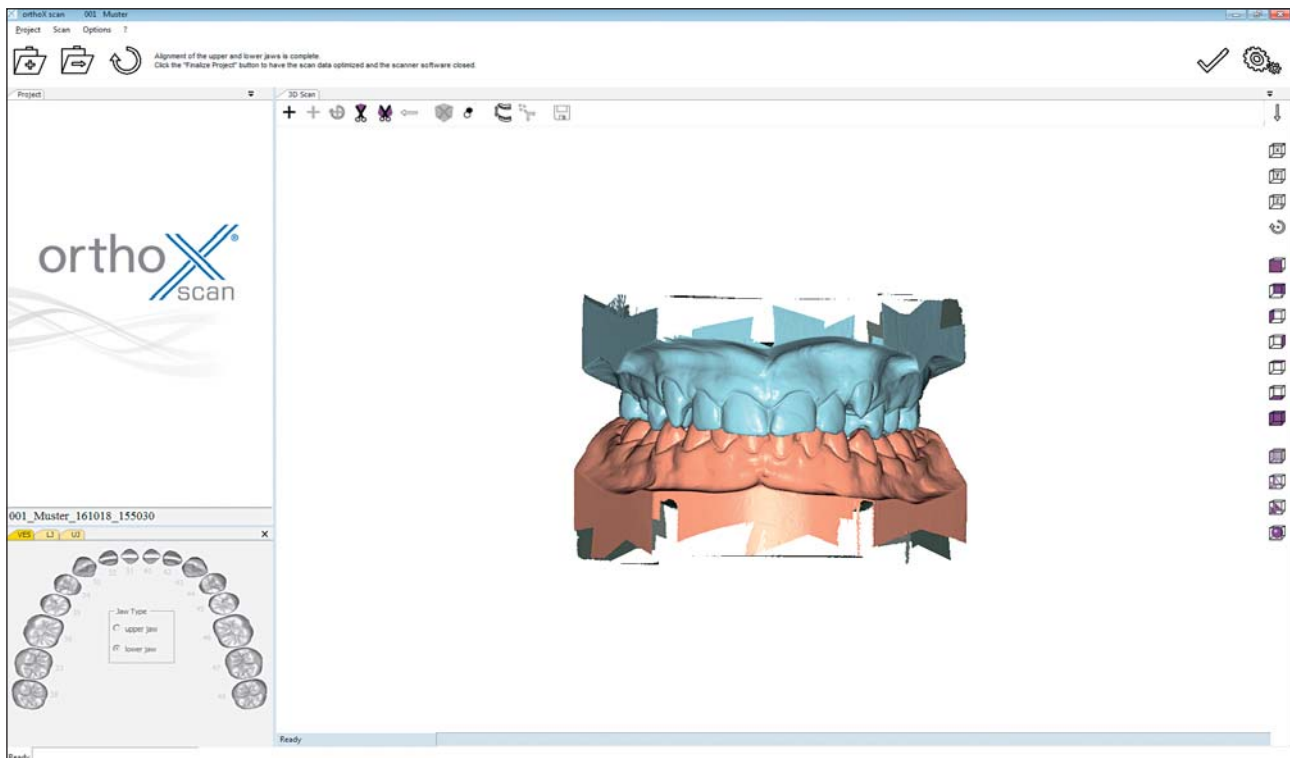








Fig. 22: STL data set

Now you can remove excess areas from the model. Use the cutting icons ( or ) to edit the data set.

- Select a cutting tool ( oder ) and left-click around the respective area to select it.
- To complete the process, click on the right mouse button. The model is cut and can be reset with **Undo**  if necessary.



The smaller the data set, the smaller the data volume to merge.

- After cutting the data set, save the scan data by clicking on **Save** .
- Click on **Finalize project**  to conclude the project.

Clicking on **Finalize project**  will also open a dialog box for dynamic thinning to adapt the size of the STL file (see Fig. 23).

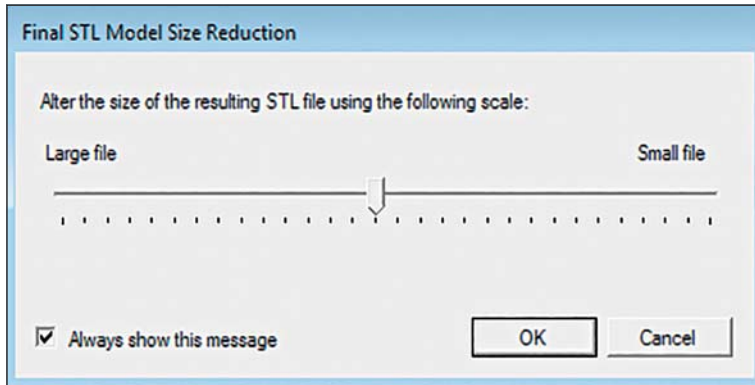



Fig. 23: Window that opens when you click on **Finalize project**.



## 7.4 Re-scanning

If the scan displays faulty areas, you can correct the scan using the re-scanning function. Click on **Start re-scanning mode**  on the top left in the 3D Viewer to open the re-scanning function (see Fig. 24).

- A green crosshair will appear in the middle of the 3D Viewer. Position the model in such a way that the crosshair is next to the area that needs to be filled (see Fig. 24).

### Mouse buttons

Press and hold left mouse button: Rotate model

Press and hold right mouse button: Move model

Turn mouse wheel: Zoom in/out



To perform a successful re-scan, always position the crosshair on existing data (see Fig. 24).

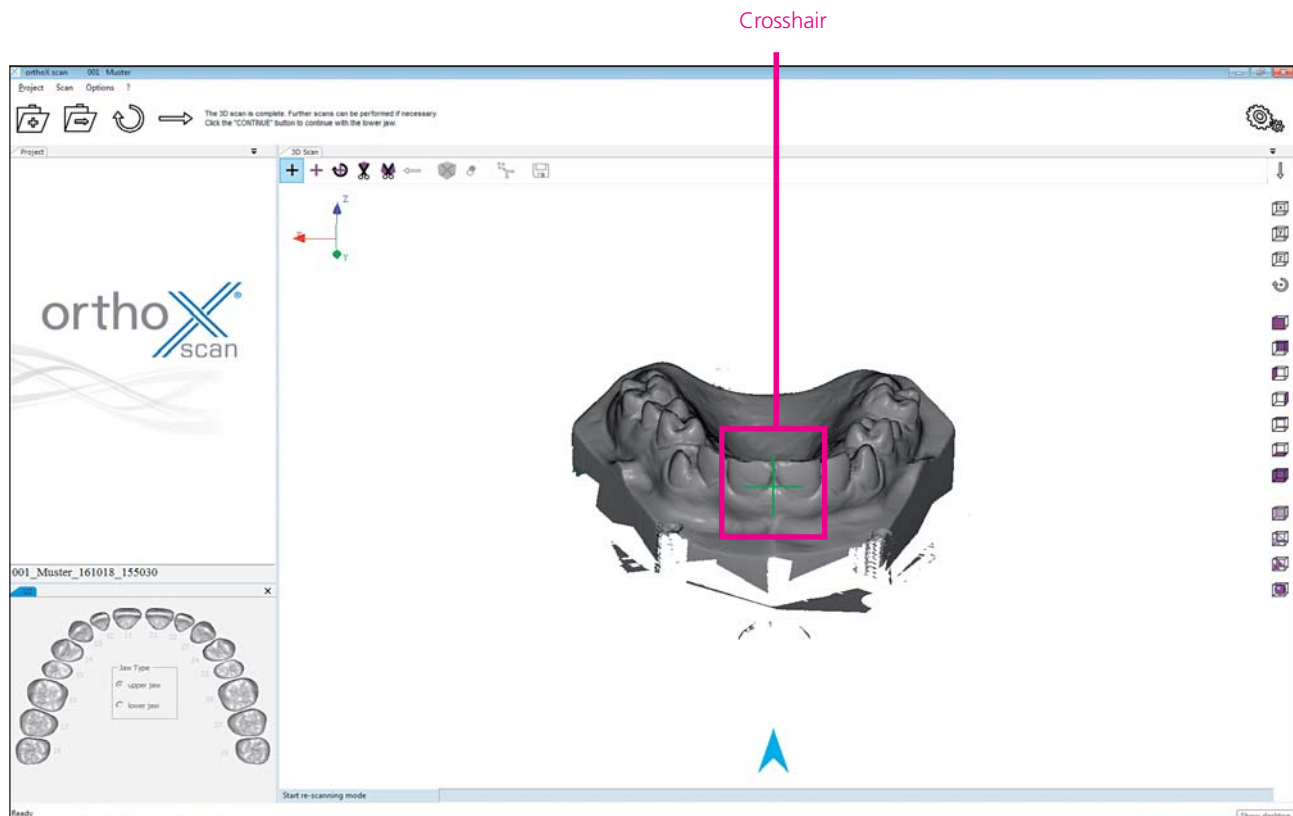



Fig. 24: Re-scanning function with crosshair

- Start the re-scan by clicking on **Measurement** . Repeat the process until all areas are recorded.

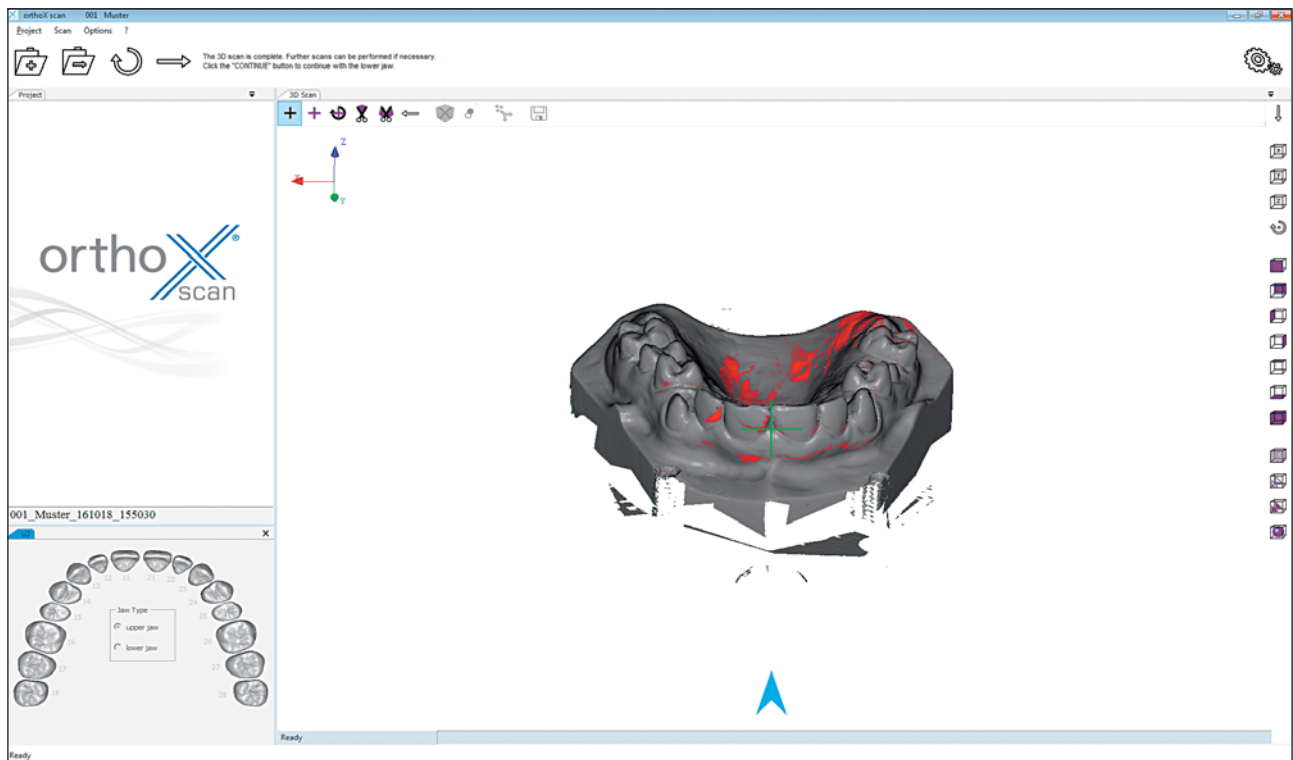



Fig. 25: The re-scanned areas appear red

After finishing the re-scanning process, continue with the workflow.

## 7.5 Aligning maxilla and mandible manually

If the upper and lower jaws are not aligned correctly, use the articulation function to correct the alignment.

Start articulation with the **Articulation** icon  in the tool bar above the 3D Viewer. In the window that opens, you can choose between automatic aligning or manual aligning using at least three reference points.

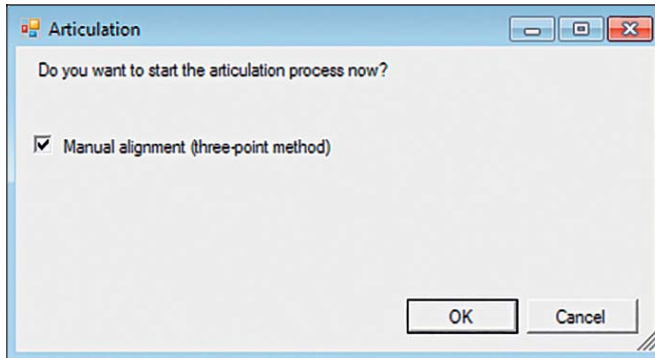


Fig. 26: Window for manual alignment



The individual scans must be merged to obtain a complete STL data set with both jaws aligned. You need to determine reference points in the scans for the alignment.

- Select at least three distinctive reference points by clicking once with the left mouse button on the colored jaw. When selecting, make sure you use points that can definitely be reflected in the vestibular scan.
- To set these points and move the models you will need to use the following shortcuts:
 

CTRL + left mouse-click:	Rotate model
CTRL + right mouse-click:	Move model
Left mouse-click:	Set points
DEL:	Delete last point
SPACE BAR:	Change to vestibular scan

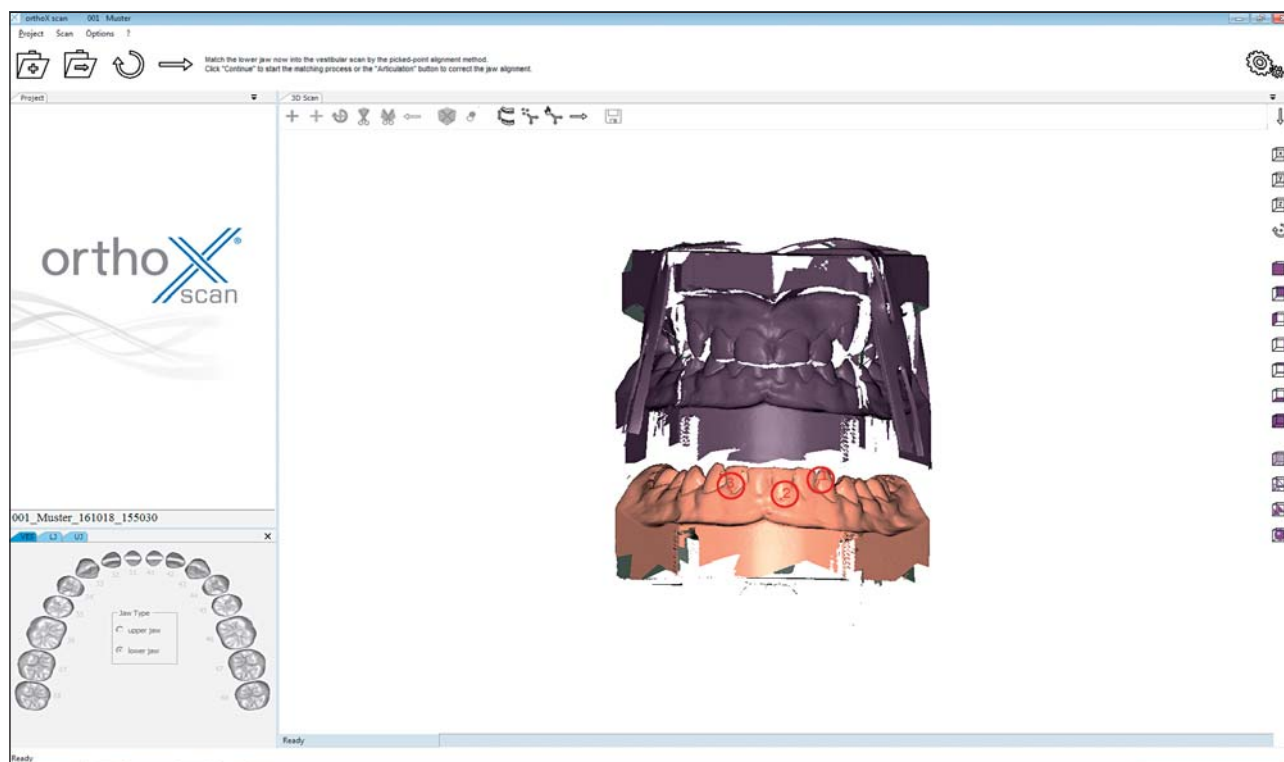


Fig. 27: Selecting reference points on the lower jaw scan. The selected points must be visible on the vestibular scan.

- When you have determined at least three points on the lower jaw scan, click on SPACE to change to the vestibular scan. Next, place three points in the same sequence on exactly the same places in the vestibular scan.

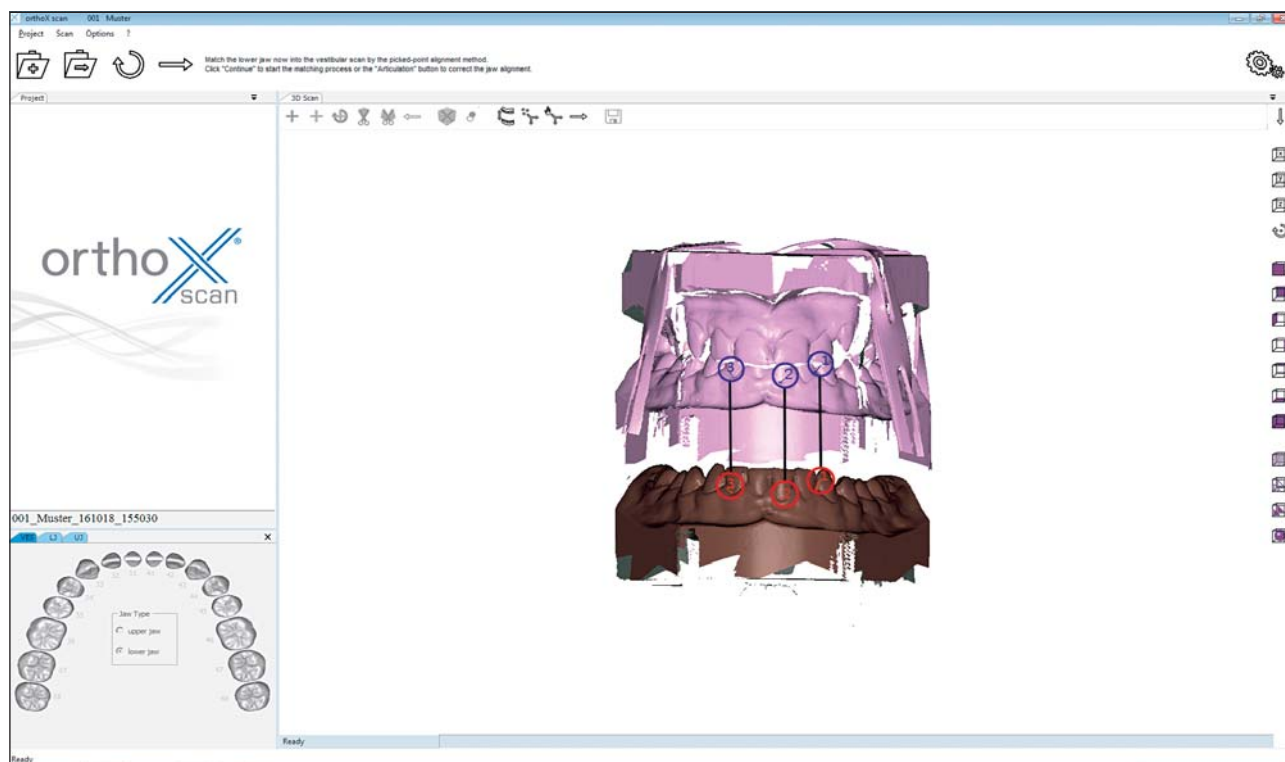


Fig. 28: Determining the points in the lower jaw and vestibular scan

- After setting the last point on the vestibular scan, both scans are put on top of each other.

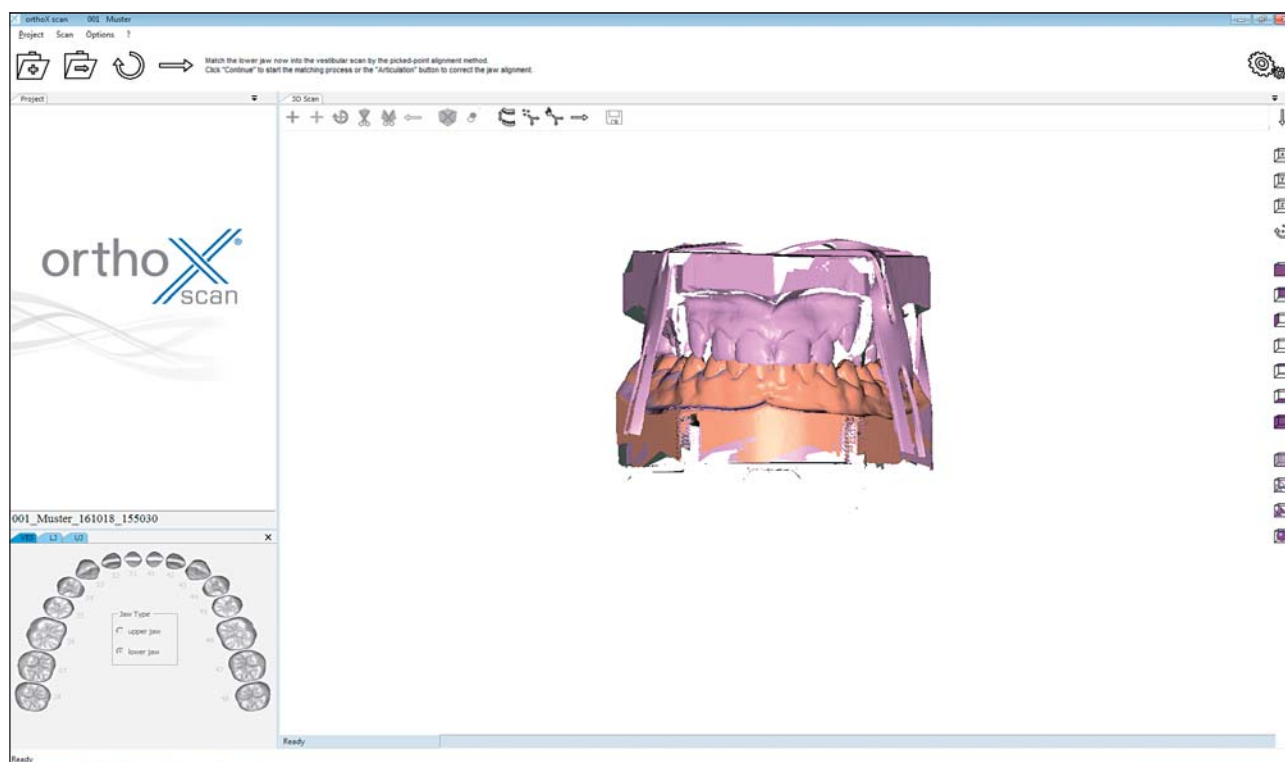




Fig. 29: Matching lower jaw and vestibular scans according to selected points

The lower jaw has been matched. Click on **Continue**  to start matching the upper jaw.

- Proceed with the upper jaw the same way as for the lower jaw and align it (see Fig. 27 – 29).
- When you have matched both jaws, confirm with **Continue** .
- The vestibular scan will appear colored in the 3D Viewer.
- Continue the process by clicking on **Continue** .

Now the jaws will be calculated. After a few seconds the 3D Viewer will show the result.

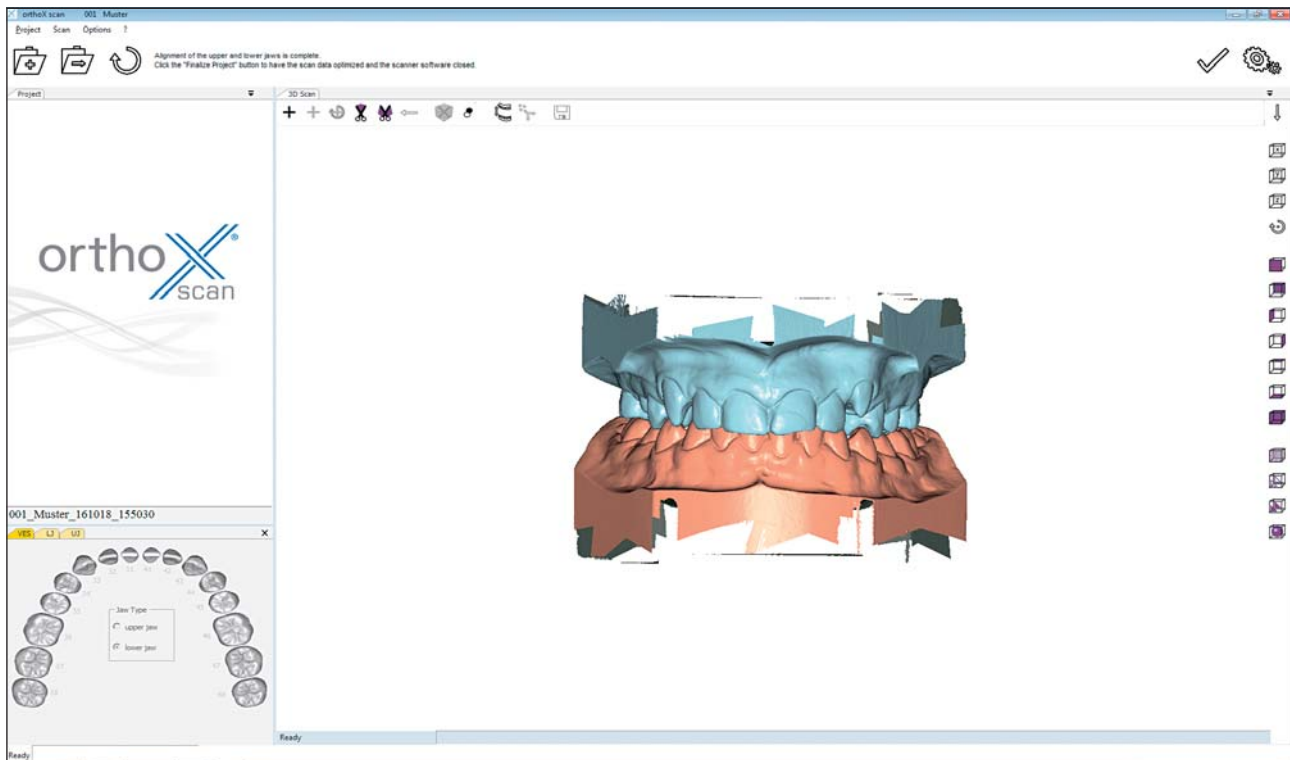


Fig. 30: Complete scanned model set

- Check if the displayed scan in the 3D Viewer is correct.

## 8 Options

Under *Options*, you can find the program and scan settings, as well as the axis calibration. The individual settings are explained below.

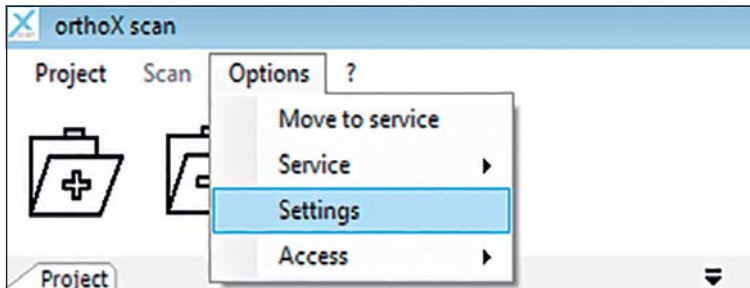


Fig. 31: Options -> Settings

### 8.1 Matching

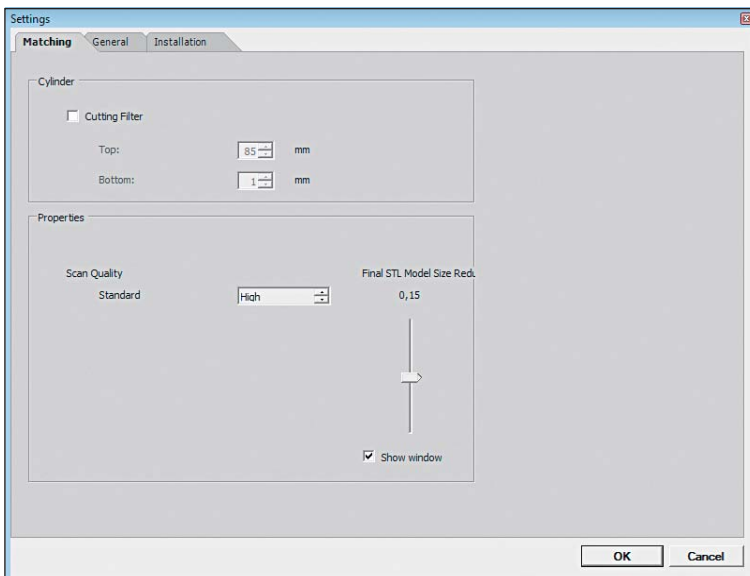


Fig. 32: Options -> Settings -> *Matching*

#### ■ Cylinder:

The check box will activate a cutting filter which automatically cuts the upper and/or lower section of the models. The unit of measurement is millimeters.

#### ■ Properties:

The *Scan Quality* determines the STL accuracy and, along with it, the data size.

- **Very high:** Maximum resolution of the sensor. This means the pixels are as close as possible.
- **High:** The data set will use a slightly larger distance between pixels than the setting *very high*.
- **Normal:** The distance between pixels is higher than in the setting *high*.
- **Coarse:** Largest distance between pixel.

Determine final STL file size using the slide control for *data reduction* on the right.

## 8.2 General

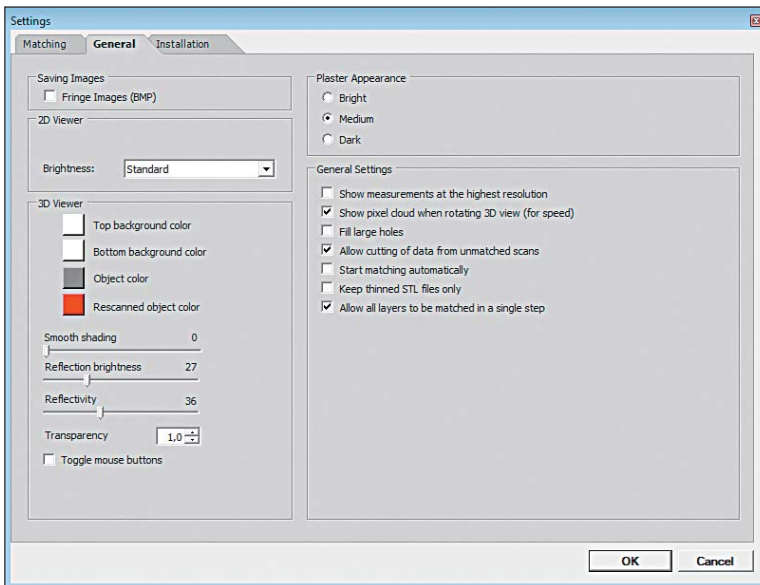


Fig. 33: Options -> Settings -> **General**

### ■ Saving images:

When *Fringe Images (BMP)* is activated, a bitmap of the respective scan position is produced. This image, which also shows the light stripe, is saved to the project directory. These images serve as a tool for technical support in the event of measuring errors.


### ■ 3D Viewer:

- Top background color: Configure the background color of the top section in the 3D Viewer.
- Bottom background color: Configure the background color of the bottom section in the 3D Viewer.
- Object color: Determine the color to display the 3D object in.
- Re-scanned object color: Determine the color to display the last manually-added exposure in.
- Smooth shading: Further smoothing of the surface of the 3D object in the 3D Viewer. This setting does not affect the 3D measurement.
- Reflection brightness: Use to adjust the reflection of light onto the object in the 3D Viewer.
- Reflectivity: Determine the intensity of the reflection onto the object in the 3D Viewer.
- Toggle mouse buttons: Activating the check box will change the layout of your mouse to move and turn the object in the 3D Viewer.

### ■ Plaster appearance:

This will affect the light intensity of the sensor during measurement. Depending on the surface of the plaster to be scanned, you can choose between *Bright*, *Medium* and *Dark*.

### ■ General settings:

- Show measurements at the highest resolution: The check box will show the object in even higher resolution in the 3D Viewer. Calculating the object, adding new exposures as well as movements will be significantly more demanding on the graphics card and may result in time lag.
- Show pixel cloud: Activating the check box will show the object as a cloud of pixels in the 3D Viewer when moved with the mouse. This optimizes the rendition speed during the movement.
- Fill large holes: If there are isolated data gaps after a scan, they can be closed with the *Hole filling* function . The size of the hole to be filled is determined by entering the area in mm<sup>2</sup>, with a top limit. We recommend using this function only for small holes located on straight surfaces.
- Allow cutting of data from unmatched scans: You have the options to cut STL files or PCM files. We recommend cutting the STL file first.
- Start matching automatically: After scanning, the individual images are automatically merged into a data set without having to manually trigger this process.



- Keep thinned STL files only: With this setting activated, only thinned data sets will be saved. The original data will automatically be deleted.
- Allow all layers to be matched in a single step: When activating this check box, the software will successively merge all tabs into a separate STL data set. When deactivated, the tabs must be matched separately.

## 8.3 Installation

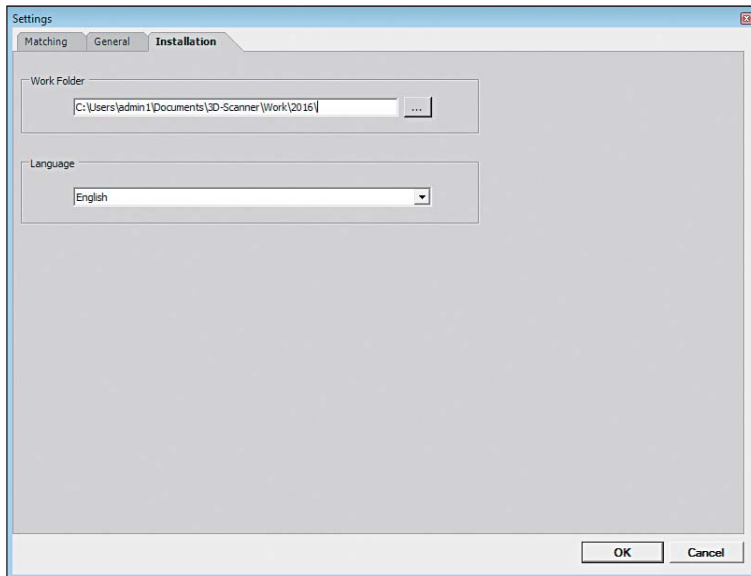


Fig. 34: Options -> Settings -> *Installation*

- **Work Folder:**  
You can change the location of the scan data. All data will be saved to this folder.
- **Language:**  
You can choose the language you require.

## 8.4 Axis calibration

! Insert a single jaw model in the orthoX® scan for axis calibration (see chapter 6).

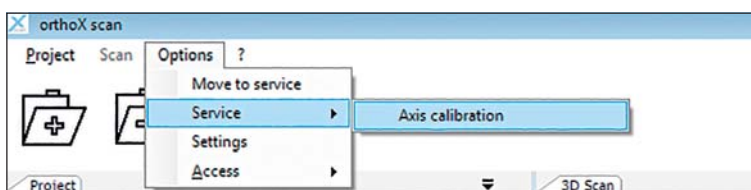


Fig. 35: Options -> Service -> Axis calibration

After axis calibration, click on **OK** to finish process.



Carry out axis calibration every four weeks and after each transport.

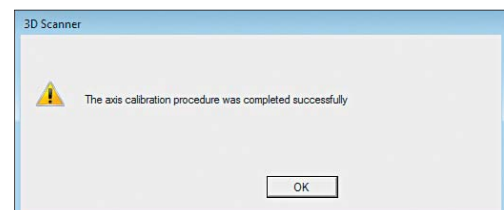


Fig. 36: Finish axis calibration

## 9 Repair and maintenance

The axes should be calibrated once every month, after every transport and as needed to ensure the axes are properly aligned.

If orthoX® scan operates regularly, you must carefully remove dust and foreign objects from the bottom area with a vacuum cleaner. Switch off the scanner before cleaning. The scanner camera is inside the scanner at the far end. Do not touch the camera lens! Do not attempt to clean the camera, as improper cleaning can result in damage.

The outside of orthoX® scan should be wiped down with a damp microfiber cloth. Do not use paper towels or similar, as this could leave slight scratches in the paint.

## 10 Malfunction and repair

Please note that orthoX® scan is a delicate optical device. Maintenance and repair must therefore always be performed by trained professionals. In case of malfunctions that cannot be resolved by re-starting the scanner, please contact your local representative.

## 11 Environment and disposal

### 11.1 Packaging

We recommend keeping the packaging to transport the scanner or to return it in the event of a warranty claim.

### 11.2 Environment and disposal

Return orthoX® scan to the manufacturer or local contact for disposal. orthoX® scan is designed for commercial or industrial use only. Therefore it cannot be disposed of via the public waste disposal authority.

Contact your local representative or the manufacturer directly for disposal.

## 12 Quality information

Dentaurum ensures a faultless quality of the products manufactured by us. The recommendations provided are based upon Dentaurum's own experiences. The user is solely responsible for the correct use of the 3D model scanner and the generation of scanned data. Responsibility for failures cannot be taken, as we have no influence on the processing on site.

Should you have any questions, please contact your local representative. You can also find information and instruction videos on orthoX® at [www.dentaurum.com](http://www.dentaurum.com).

## 13 Explanation of symbols used on the label



Please refer to the label. Additional information can be found at [www.dentaurum.com](http://www.dentaurum.com) (Explanation of the symbols used on the label REF 989-313-00).

## 14 Conformity declaration

### EC-Declaration of Conformity

according Machinery Directive 2006/42/EC, Annex IIA

DENTAURUM GmbH & Co. KG  
Turnstr. 31  
75228 Ispringen

hereby declares that the design and construction of the laboratory equipment described below, including the version marketed by us, comply with the basic regulations governing safety and health as stated in the EC Guidelines. This declaration will become invalid if the laboratory equipment is modified or altered in any way without our prior consent.

Description of unit: Optical 3D-Scanner

REF: **075-000-00**

Type of unit: **orthoX<sup>®</sup> scan**

Start with No.: SO-20300.00-13-001

#### EC guidelines

2006/42/EC

2014/35/EU

2004/30/EU

Machinery directive

Directive relating to electrical equipment designed for use within certain voltage limit

Directive relating to electromagnetic compatibility

#### Applied unified standards

DIN EN ISO 12100:2010

DIN EN 61326-1:2013

DIN EN 61010-1:2010

Date and manufacturers signature:

30.09.2014

Signatory:

  
GmbH & Co. KG  
Turnstr. 31 · 75228 Ispringen · Germany  
- i.V. Dipl.-Ing. (FH) Klaus Merkle -  
Production Manager Mechanic

# Dentaurum Group

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Date of information: 03/17

Subject to modifications



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