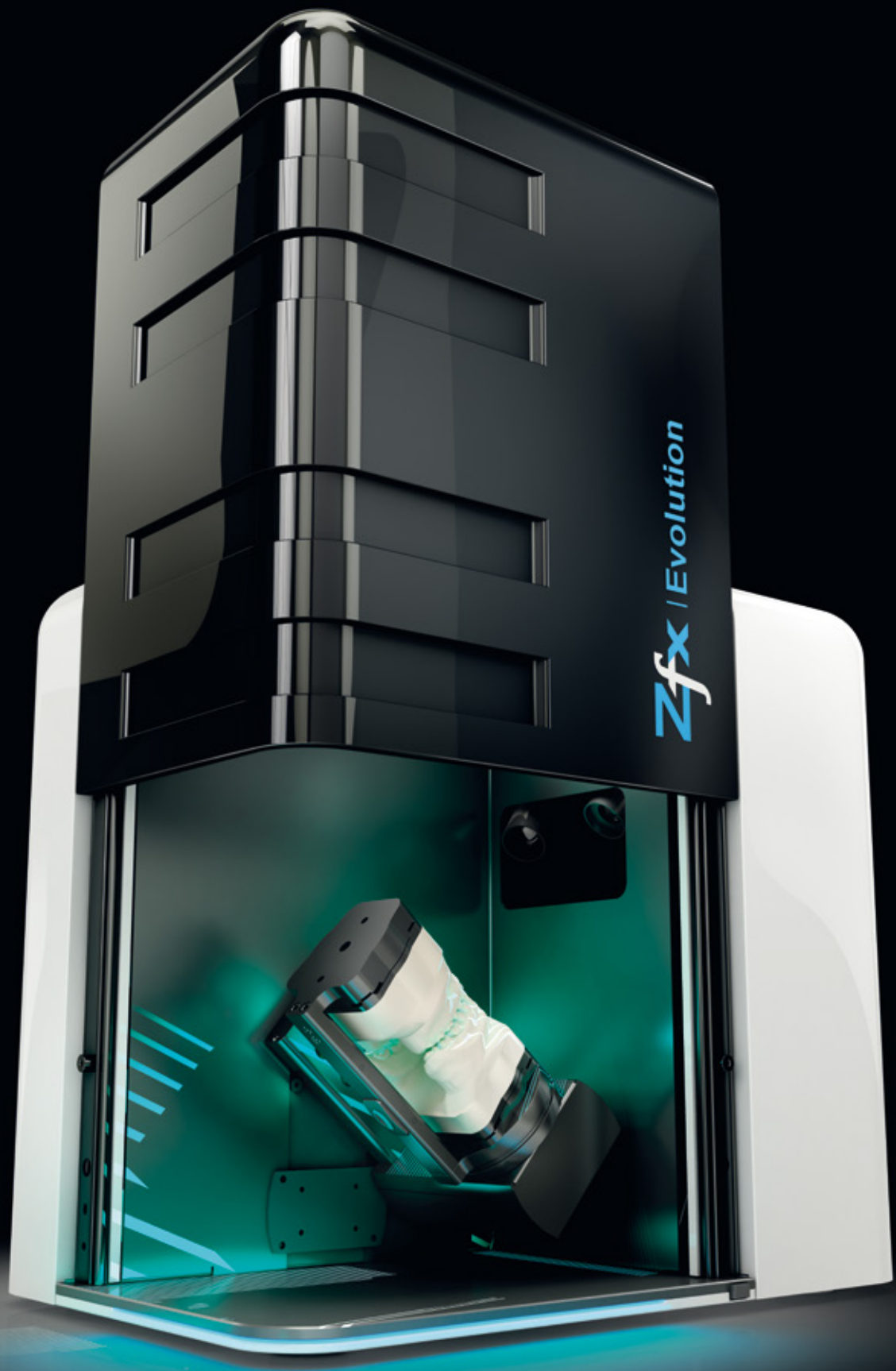# Zfx™ Evolution

User manual

Zahn success formula

zimmer | Zfx

1. Important Information

Important Information

Zfx TM Evolution Version 1.1.0 / April 2014

- ✕ This manual is part of the product.
- ✕ Ensure that you read this manual carefully.
- ✕ Provide this handbook and all documentation belonging to the product to all users.
- ✕ Read and follow all safety instructions as well as ➔ Chapter 3 "Installation / Putting Into Operation".
- ✕ Failure to observe the information contained in this manual relieves the manufacturer of any liability or obligation.
- ✕ Maintenance and repair services of the system may only be performed through service providers authorized and approved by Zfx GmbH.

Zfx™ Evolution is manufactured by Zfx GmbH.

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For any product inquiries, please include the version or serial number: This is indicated in the software program at the top left and on the rear panel of the device. In order to ensure long-term maintenance of value and readiness for use, please follow the maintenance advice in ➔ Chapter 8 "Maintenance".

Table of Contents

1. General Information

1.1 Product Description

You can find a data sheet and further technical data in ➔ Chapter 10 "Maintenance" of this manual.

1.2 Warranty Conditions

Please refer to the general sales and delivery conditions of Zfx GmbH.
➔ www.zfx-dental.com/en/general-terms-and-conditions-zfx-gmbh

1.3 Packaging

1.4 Transport Damage

In case of outward damage of the packaging at the time of delivery, customers should proceed as follows:

1 The recipient documents the loss or damage. The product and packaging are to be left unaltered and un-opened.

2 The product is not to be used.

3 The damage is to be communicated to Zfx GmbH (➜ contact information Zfx GmbH on Page 1).

4 The damaged product should not be sent back without prior authorization from Zfx GmbH.

If the product is damaged **without** recognizable damage to the packaging at the time of delivery,
please proceed as follows:

1 The damage is to be communicated without delay to Zfx GmbH (➜ contact information Zfx GmbH on Page 1).

2 The product and packaging are not to be altered.

3 The product and packaging are not to be used.

ℹ Please Note!
In case of the recipient violating any obligation indicated above, the damage is to be considered as having occurred after delivery (as set forth in ADSp. Art. 28 / CMR law, ➜ Chapter 5, Art. 30).

1.5 Storage

Before putting the product into operation after transport or storage, the system needs to be given adequate time in order for all component parts to reach the indicated operating temperature (18° - 25° Celsius). In higher moisture areas, the set-up time is to be extended accordingly in order to allow for the moisture to escape.

⚠ Caution!
Major temperature changes or high air humidity may cause water condensation, which can lead to an electrical short as well as misadjust the sensor unit. Keep the product dry and within the recommended temperature range.

For transport and storage please refer to the symbols stamped on the product shell:

⬆⬆ Keep upright; arrows point upright!	⊠ Do not stack!	☂ Keep dry!
🍷 Protect from shock!	🌡 Temperature range	

1.6 Delivery Contents

1.6.1 Standard

Pos.	Image	Number	Description	Quantity
1.		ZFX03001198	Zfx™ Evolution	1 QTY
2.		98.40.242	Desk power supply	1 QTY
3.		N/A	Power cord	1 QTY
4.		06.06.020	USB connection cord	1 QTY
5.		ZFX02001224	Calibration panel for Zfx™ Evolution	1 QTY
6.		ZFX02001225	Distance plates for Zfx™ Evolution	1 QTY
7.		ZFX02001247	Model basis for Zfx™ Evolution	1 QTY

Pos.	Image	Number	Description	Quantity
8.		ZFX02001226	Fixator for Zfx™ Evolution	1 QTY
9.		ZFX02002063	Blu Tack Adhesive 120 g	1 QTY
10.		ZFX03001037	CAD-PC DELL Precision T1700 - EU	1 QTY
11.		ZFX03001038	CAD-Monitor DELL Professional P210 56 cm (22") - EU	1 QTY
12.		ZFX10002325	Zfx™ Evolution Scansoftware	1 QTY
13.			User Manual	1 QTY

1.6.2 Optional

Pos.	Image	Number	Description	Quantity
1.		ZFX02001227	Zfx™ MultiDie Table for Zfx™ Evolution	1 QTY
2.		ZFX02001228 ZFX02001233 ZFX02001230 ZFX02001231 ZFX02001232 ZFX02001234	Arti-Synchronizer: ARTEX® 126 mm height ARTEX® 116 mm height SAM® STRATOS® KAVO® Panadent®	
3.		ZFX02002063	Blu Tack Adhesive 120 g	1 QTY

2. Safety / Advice

2.1 Symbols / Description of Danger Levels Used / Advice

In order to avoid personal injuries and damage to property, this document includes safety instructions and alerts according to different danger levels. These alerts are not intended to cover all potential risks or hazards.

ℹ Please note

supplies the user with important additional information.

⚠ Caution

indicates a potentially dangerous situation, which can lead to property damage or minor to fairly serious injuries.

⚠ Warning

indicates a potentially dangerous situation, which can lead to major property damage or serious to mortal injuries.

2.2 Safety Advice

Please respect this Safety Advice and carefully retain it in a user-accessible location. Make each user aware of the safety instructions. Refer to the safety instructions regularly as you operate, maintain and handle the product.

⚠ Caution

Please do not connect electronic equipment to power sources of a different voltage or frequency than indicated on the system labels. Instructions and warnings attached to the components are to be followed closely.
Any unplugging or connecting of cables during active system operation is strictly prohibited.

✕ Any unplugging or connecting of cables during active system operation is strictly prohibited.
✕ Zfx does not take on any support queries for problems resulting from the use of non-approved computer specifications.
✕ Ensure adequate ventilation, do not cover ventilation shafts.
✕ Do not expose the product components to rain, humidity, moisture or heat.
✕ Only use cables and electrical cords provided.
✕ Never exchange parts of the scanner with third-party components.
✕ Do not use cleaner or solvents like nitro, sanitary, alcoholic or grease detergent.
✕ Additionally installed software can limit the functioning of the system.

⚠ Warning

✕ The functioning of implanted medical devices (e.g. pacemakers, and defibrillators) can be influenced by electromagnetic fields.
People with implanted medical devices need to keep a safe distance of 5 meters from the product!
✕ The product is designed in accordance with the regulations on electromagnetic fields. Due to the complex interactions between appliances and mobile phones or wireless internet signals, however, an active mobile phone or wifi signal may potentially influence the functioning of the product.

2.3 Purpose Determination – Intended Use

2.3.1 General

The intended use comprises all instructions specified in the manual as well as complying with the inspection and maintenance instructions. When using the product, the national or local legal industrial safety regulations and accident prevention regulations are to be observed equally. The user is obligated to use flawless work equipment.

⚠ **Warning**
The assembly and use of the equipment components is only permitted indoors and within the specifications noted in ➔ Chapter 1.5 Storage.

2.3.2 Product-specific Information

The Zfx components are part of an optical scan unit used to record dental prosthetic images and works in dental technical laboratories, practical laboratories or production centers. Use other than as specified above qualifies as unintended and uunauthorized. If the Zfx components will be integrated into an existing network, the responsibility for the safety and functionality lies with the network operator.

⚠ **Caution**
Never disassemble the camera or projector of the sensor unit. The mechanical positioning of the camera within the sensor unit shall be exclusively performed by Zfx. Any manipulation at the aperture rings of the camera or projector may negatively affect the recording quality. Never readjust or twist the aperture rings of the camera and projector.

2.3.3 Decommissioning and Disposal

With the decommissioning of the Zfx components, the respective national or local regulations are to be observed. In case of any questions regarding the proper disposal of the Zfx components please refer to Zfx GmbH or an ISO 14001:2004 certified Disposal Company. The equipment components and accessories may not be disposed of with unsorted household waste.

⚠ **Caution**
Generated waste for man and the environment is to be safely given into recycling or disposal in accordance with the applicable national or local regulations. See also Directive 2002/96/EC (WEEE).

3. Putting into Operation

3.1 Location

Please arrange the scanner, computer, monitor, keypad and mouse in a way to allow for a comfortable and ergonomic work posture. The scanner should be easily accessible to facilitate opening the door to place and remove objects.

ℹ Please note

✕ The scanner is an optical measurement tool, which can be damaged as a result of negligence.

✕ Place the equipment on stable and even ground.

✕ Ensure a safe distance of a minimum of 0.25 m between sensor and wall.

✕ Do not expose the system to moisture (including rain) or heat (including solar radiation).

✕ Do not cover ventilation shafts in order to allow for adequate air circulation and cooling.

✕ Keep door closed while scanning.

✕ Avoid movement, collisions, shocks, concussions and vibrations near the sensor during the measurement process.

✕ Do not use scan sprays within the interior of the system.

✕ Ensure a constant room temperature between 18° C and 25° C.

✕ Keep the exposure to dust as low as possible.

3.2 System Connection

⚠ **Caution**

Never open the door before removing the transportation lock!

Never lay the Zfx™ Evolution in an non-upright position!

Removing the transportation lock

1 Put the backside including the transportation lock slightly beyond the table.

2 Remove the transportation lock using the included hex wrench.

3 Remove the transportation lock downwards from the scanner.

4 Put the scanner back on the table. Remove the warning label.

5 Open the door manually

6 Remove the securing of the rotating swivel unit.

Inserting the transportation lock

1 Securing of the swiveling axes.

2 Insert the transportation lock with open scanner door into the appropriate hole.

3 Slide up the transportation lock. At the same time the door is simultaneously moving down.

4 Screw it tight with the included hex wrench.

Connect all cables before putting the components into operation. Connect the computer to the monitor, keypad and mouse. Connect the scanner to the marked USB port of the computer using the USB cord. Avoid hot-plug, i.e. do not connect or disconnect cables while the system is in operation.

3.3 Electrical Connection

It is recommended to operate the scanner, computer and monitor through an outlet strip containing a switch as well as surge protection.

⚠ **Caution**
The use of a non-approved power supply device or power cord can negatively influence the functioning and electronic safety. Only use the included power supply device and power cords for the connection of the equipment.

3.4 Internet Connections

Connect the computer with a network cable. If the computer needs to be integrated into an existing network, the responsibility for the safety and functionality rests with the network operator.

3.5 Computer

Where necessary adjust the date, time, time zone and country settings of the computer. The system settings may not be changed. No additional software may be installed on the computer (loss of warranty rights).

Caution
⚠ Only data processing devices (PC etc.) that are in accordance with the norms DIN / EN / IEC 60950, UL 60950 or CAN / CSA-C22.2 NO. 60950-00 may be connected to the scanner.

3.6 Installation User Software

The software has been preinstalled on the computer.

ℹ **Please note**
In case an update or renewed installation should become necessary, administrator rights are required!

3.7 Turn the device on / off

Launch the scanner only when it has reached the specified temperature range.

Turn the device on	Turn the device off
Turn the power strip on	Turn the PC off as usual
Turn the PC, monitor and scanner on with the on/off switch Scanner rear panel	Turn the PC, monitor and scanner off with the on/off switch Scanner rear panel
Login at the PC	Turn the power strip off

3.8 Language Settings

The language settings are accessible via Zfx-Dental-Manager and are transferred to the scan program.
If the desired language for the scan program is not available, this is indicated by the scan program.

4. The User Interface in Standard Mode

As soon as an order is captured and stored in Zfx™ Manager or in the Configurator, the scan button will be enabled for the scan software and the user can immediately start scanning. After starting, the user reaches the Operation Mode – Scan via the "Scan" button ➔ see the Chapter 5.5 "Operation Mode - Scan"

3D View

The following chapters will explain the described control panels in more detail.

① **Menu Selection**
➔ see Ch. 4.1

② **Information Display**
➔ see Ch. 4.2.

③ **Toolbar**
➔ see Ch. 4.3

④ **Operation Modes**
➔ see Ch. 4.4

⑤ **Scan Assistant**
➔ see Ch. 5.5.2

4.1 Menu Selection

New
Creates a new empty project

Open
Opens a new project

Save
Saves the current project

Calibration
Corrects mechanical deviatons

Service
Only qualified service personnel
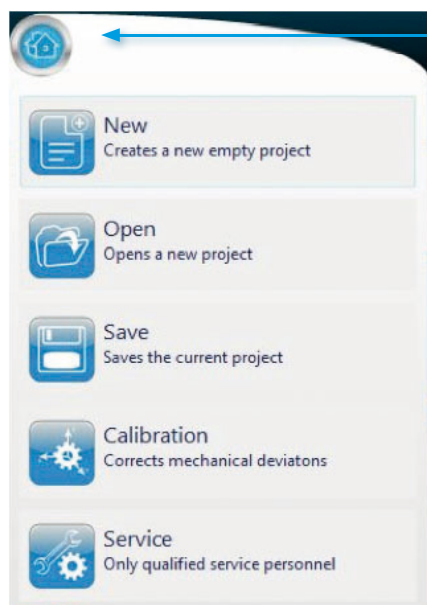
By clicking on the **"Home" Button** you can access the following applications:

✕ New
✕ Open
✕ Save
✕ Calibration
✕ Service

4.1.1 New

Create new files without using the Zfx™ Manager. The restoration and scan-method should be defined via the Configurator as described in the ➔ Chapter 5.4 "Operation Mode - Configuration". It is recommended to always define restorations with the Zfx™ Manager.

4.1.2 Open

Open the restorations created with the Zfx™ Manager or upload previously saved data sets.

4.1.3 Save

Save newly created or modified data sets.

4.1.4 Calibration

The system can be re-calibrated. Details on how to perform the calibration process are described in ➔ Chapter 5.3 "Calibration".

4.1.5 Service

The service mode provides important tools for system maintenance and checks.
The service mode is intended for use by qualified service personnel only and requires a password.

4.2 Information Display

Insert jaw model	The information display asks the user to work through predefined process steps, e.g. to position the jaw model on the scanner.
	In case the short description does not provide sufficient information to understand how to proceed, the user can access a detailed description of the next step to be followed by clicking the Info-Button with the left mouse button (LMB).

4. The User Interface in Standard Mode

4.3 Toolbar

The toolbar buttons are enabled or disabled by clicking the left mouse button. If a button is active, this is indicated by a frame around the button.
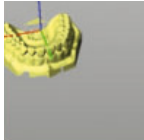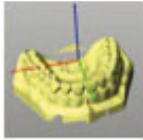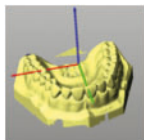
The toolbar can be docked or undocked in a blank area by double-clicking.

The toolbar is available in all operation modes (Configuration / Scan / Post Processing).
The toolbar is automatically disabled in the submenu "Additional scan".

1 **Zoom**   → see Ch. 4.3.1
2 **Alignment of 3D Data (Views)**   → see Ch. 4.3.2
3 **Selection of 3D Data**   → see Ch. 4.3.3
4 **Delete**   → see Ch. 4.3.4
5 **Undo**   → see Ch. 4.3.5
6 **Display of 3D Data**   → see Ch. 4.3.6

4.3.1 Zoom

		before	after
	Centers the scan on the screen (all data become visible)	before	after
	Automatically aligns the 3D scene with the data already displayed		deactivated

4.3.2 Alignment of 3D Data (Views)

	View of the scan object from the front		View of the scan object from the side (right-hand side)
	View of the scan object from the back		View of the scan object from above
	View of scan object from the side (left-hand side)		View of the scan object from below

4.3.3 Selection of 3D Data

	Rectangle Hold down Shift + LMB to drag out a rectangle.		**Clear selection** All 3D Data are unselected
	Lasso Hold down Shift + LMB to define a free-form area		**Invert selection** The selection is inversed.
	Select all All 3D Data is selected.		**Coherent selection** All scan areas, which are connected to the selection are marked

4.3.4 Delete

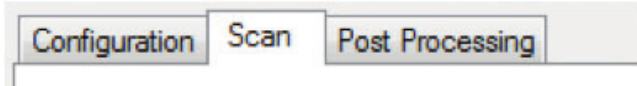|	
	Delete selection Delete all selected areas

4.3.5 Undo

	Undo The most recent commands can be undone. During an ongoing automated process, e.g. the repeated scan mode, this button is inactive.

4.3.6 Display of 3D Data

	Display Mode Single-colored or texture display Recommended setting: deactivated		**Light Sources** Adjustment of display "Properties"
	Pattern 2D pattern background can be displayed		**Adjustment of display "Properties"** The rotation point can be transferred from a centered (corresponds with the center of the scan object recording) to an outer position (position of cursor determines the rotation axis).

4.4 Operation Modes

By clicking on the respective tab, the user can access the different operation modes. The three different operation modes are described in detail in the following chapter.

Configuration ➔ see Ch. 5.4
The Configurator allows the user to re-check the scan order created with the Zfx™ Manager or – where necessary – add or remove a restoration.

Scan ➔ see Ch. 5.5
The Scan Mode contains a Scan Assistant guiding the user through the different scan steps necessary to complete the created order.

Post Processing ➔ see Ch. 5.6
The Post Processing Mode comprises the finishing process and processing of the scan data.

5. Operation Basics

5.1 General Advice for Achieving Good Measurement Results

> **ℹ Please note**
> ✕ Treat and transport the sensor with great care, as it is a highly sensitive optical tool.
> ✕ Do not make changes to the aperatures of the camera or projector lens.
> ✕ Keep the room temperature at a constant level (± 3° C) within the specified storage temperature range.
> ✕ Do not disassemble parts.
> ✕ Avoid movement, collisions, vibrations, shocks or impacts close to the sensor during the measurement process.

5.2 Mouse Button and Key Pad Commands

The mouse button combinations facilitate editing and aligning the 3D model.

	RMB Rotation in all directions		Alt + RMB Move clockwise or counter-clockwise with the display of the rotation axis in the line of view
	Hold down LMB + RMB Shift		Double click - LMB Place the scan in the center of the screen
	MMB (scroll or hold down + move the mouse) Enlarge / Minimize		Shift + LMB Mark
	LMB Zoom window		Ctrl + Shift + LMB Undo marking

5.3 Calibration

The Calibration process ensures that the system delivers accurate and reproducible 3D results within the measurement volume.

5.3.1 Calibration Accessories

	Calibration Plate (white)
	4 x Spacer Plates 1 x Ground Plate

Caution

The Calibration Plate is a certified measuring tool. During placement and removal, handle it by its base.

✕ Never touch the ceramic plate (test marks on the calibration could be damaged).

✕ Do not drop the Calibration Plate (risk of breakage or maladjustments).

Never wipe the ceramic plate or clean it with abrasives.

Scratches on the plate can significantly affect the measurement result).

Preparation:

Get the Calibration Plate, Ground Plate and 4 Spacer Plates ready.

i **Please note**:

The calibration sequence repeats itself for five different height levels.
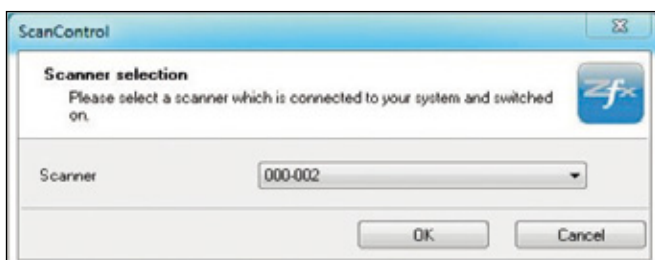

Start by clicking on the **"Calibration"** button

✕ Select the connected scanner.

✕ Confirm the selection by clicking **"OK"**.

5.3.2 Steps 1 - 5

❶ Insert and position the Calibration Plate with the Ground Plate in the scanner.

❷ Insert the second Spacer Plate

❸ Insert the third Spacer Plate

❹ Insert the fourth Spacer Plate

❺ Insert the fifth Spacer Plate

➔ Confirm the respective selection by clicking **"OK"**
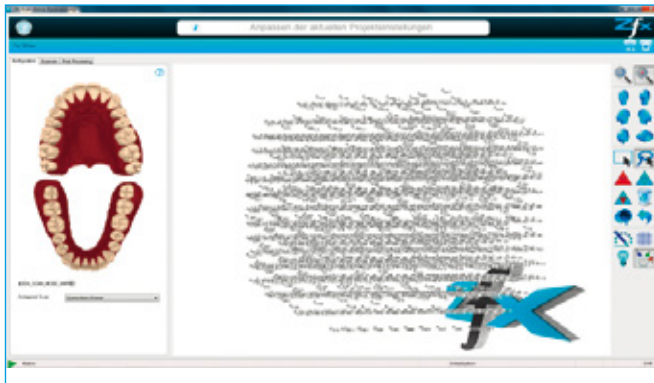
The Calibration Plate (in the respective height) is automatically brought into different positions while being measured.

As soon as all heights and positions have been recorded, the control points are detected and aligned automatically and the deviations compared against a reference data set.

> **i** | **Please note**:
> The process can take a few minutes, please follow the progress display at the bottom of the screen.
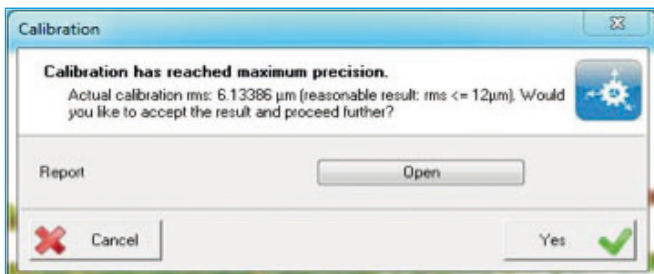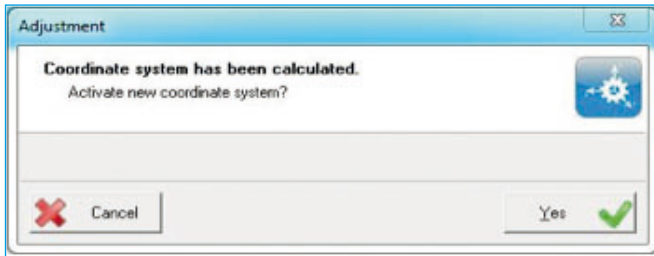

Finish the calibration process by clicking **"Yes".**

Following the calibration, the program automatically starts an adjustment, i.e. the projectors setting is checked, depending on the coordinate system.

Position the Calibration Plate with the Spacer Plate (# 2) and the Ground Plate (# 1) on the rotating and swivelling unit.

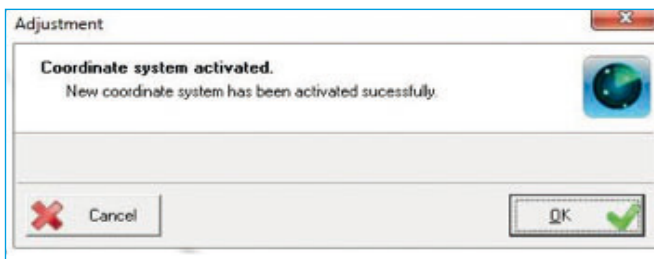Confirm selection by clicking **"OK".**

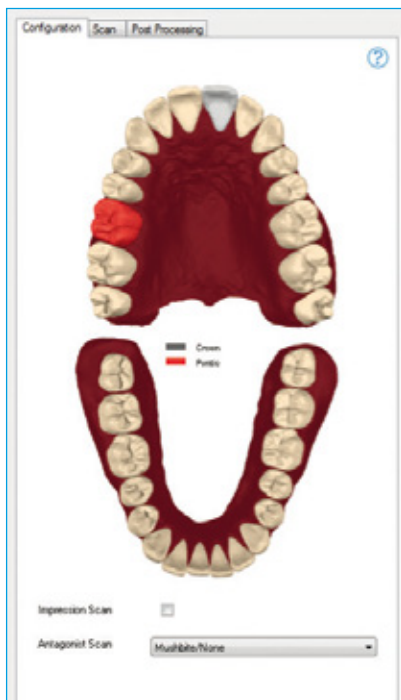Accept and active the new coordinate system by clicking **"Yes".**

i **Please note**:

This acceptance is recommended or there may be variations in the measurement result.

Finish the process by clicking **"OK".**
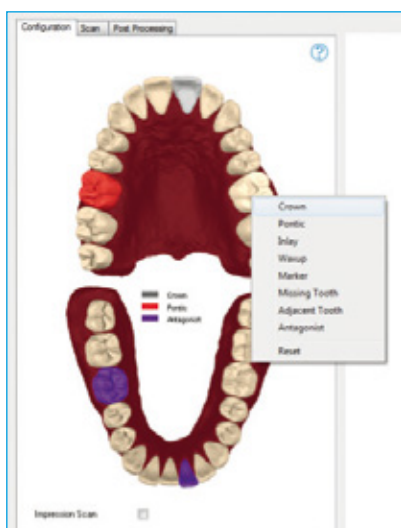
5.4 Operation Mode - Configuration

The Configurator displays the scan order created with the Zfx™ Manager in the form of a jaw model.

Where necessary, the order can be edited or extended.

According to the information specified here, the Scan Assistant will later lead the user through the necessary scan steps.

5.4.1 Selection of Additional Restorations

Select the tooth which is to undergo a status change with the cursor. Pressing the left mouse button opens the menu to select the desired new status. **"Reset"** resets the status of the tooth to its original one.

ⓘ **Please note**:
When changing the status of a tooth in the Configurator, it is recommended to check if the changes have been accepted by the Zfx™ Manager.

5.5 Operation Mode - Scan

When the order is recorded and stored in the Zfx™ Manager or the Configurator, the **"Scan"** button for the scan software will be available and the user can start scanning immediately.

5.5.1 User Interface Scan Mode
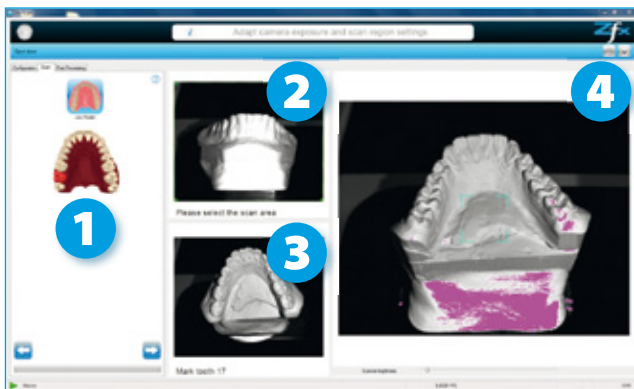
The following chapters will explain the described control panels in more detail.

1 **Scan Assistent**
→ see Ch. 5.5.2

2 **Define Scan Area**
→ see Ch. 5.5.3

3 **Teeth Selection**
→ see Ch. 5.5.4

4 **Brightness Setting**
→ see Ch. 5.5.5

5.5.2 Scan Assistent / Help
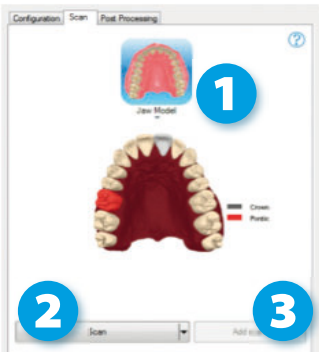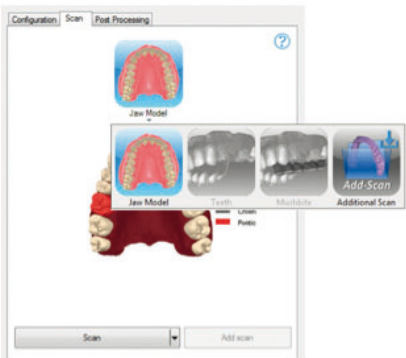
The Scan Wizard guides the user through the various steps which are required for the created order. The individual scan steps are shown with pictures and explained by the information display.

Insert jaw model	Information Display – By clicking the info sign with the LMB the user receives a detailed description of how the scanning step should be completed.
?	The Zfx GmbH homepage (www.zfx-dental.com) is launched.
	❶ By clicking on the **jaw model**, the scan steps necessary to complete an order are displayed (see image below). ❷ By clicking on **"Scan"** a new scan starts. 3D data are recorded or existing scan data are overwritten. ❸ A click on the **"Add Scan"** button captures additional scan data for an already scanned scan step. This application is not active for all scan types, but only for the single tooth scan or marker scan, since data could be subsequently required for these scans.
	The number of images describes the number of the required scan steps and depends on the restoration complexity. The sequence of the scan steps can be chosen freely after the basic information recording (e.g. jaw model). The scan step to be performed next can be selected by clicking with the LMB.

	The background color of the image provides information about the scan status of the different scan steps:

Scan Status

Background **green:**	3D data have been recorded.	
Background **blue:**	3D data have not been recorded yet.	
Background **grey:**	Scan step requires a prior step that has not been completed yet or the data can be recorded optionally, see Add-Scan.	

	The arrow keys allow the user to move back and forth between the scan steps in order to process the scan order.

|			
	Back The last scan step is discarded.		**Forward** Complete the scan and go to the next scan step.

5.5.3 Define Scan Area

In order to narrow the scope of the scan area in the image (top left), the area that is relevant for the order can be selected. This help to save time, since areas which are not relevant for the calculation of the 3D data are not captured.

The green selection frame defines the area that will be scanned. The initial position of the frame comprises the entire area available for scanning, which can then be adjusted manually.
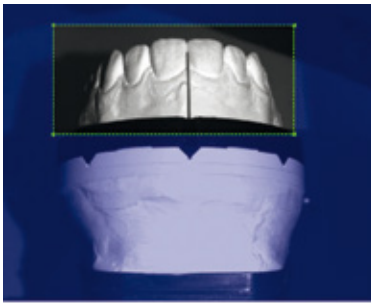
Scan area reduced to the section that is relevant for the order. It is recommended to choose the scanning area so that a part of the supporting base is scanned as well. Later the redundant data can be selected and deleted. ➔ Chapter 5.5.8 "Select and Delete Data Sets".

Adjust size of selection frame - Option 1
Place the cursor on one of the frame angles, hold down the left mouse button and drag out the frame to the desired size.

Adjust size of selection frame - Option 2
Place the cursor on one of the four frame side lines and drag the frame to the desired size keeping the left mouse button pressed.

Move the selection frame
Place the cursor inside the selection frame, hold the left mouse button down and drag the frame to the desired position.

Reset the selection frame
With a double click inside or outside the selection frame, the frame is reset and the entire available scan area is viewable again.

5.5.4 Teeth Selection

Mark tooth 16

FDI Dental Numbering System used

In the image for teeth selection (bottom left) the teeth to be scanned for the order are selected.

It is not absolutely necessary to select the individual teeth. The scan can be performed without this specification. Defining the teeth, however, can help to save time, since irrelevant teeth are not considered for the calculation of the 3D data.
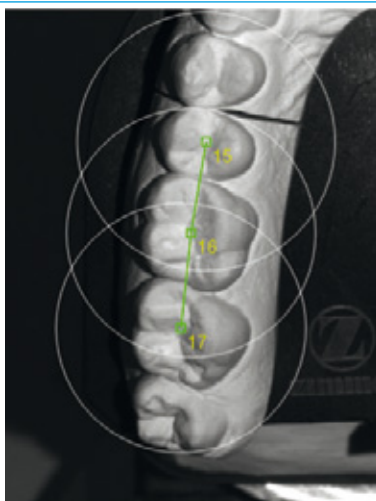
Below the image, the user receives a notification as to which teeth should be selected next.
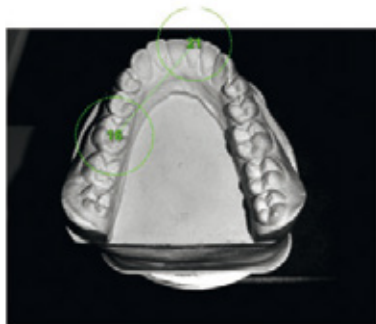
Mark additional areas

Marking
The marking of a tooth is done by clicking on it. Position and scan area can be corrected manually.

Position
Place the cursor within the green center frame, hold down the left mouse button and drag the circle to the desired spot.
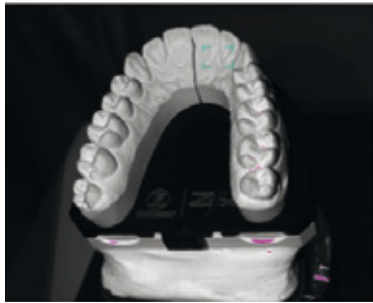
Scan Area
Increase or decrease the circle radius by clicking on a random spot in the circle, holding down the left mouse button and dragging in or dragging out the circle accordingly.

Delete
Placing the cursor within the circle and clicking the right mouse button removes the selection.
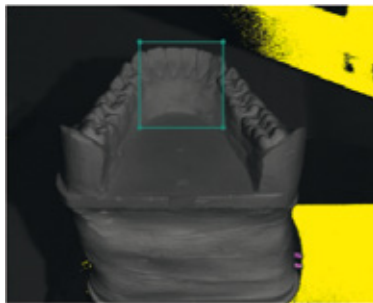
5.5.5 Brightness Setting

The optimal brightness for the scan area can be defined with the image for automatic brightness setting.

The necessity of this setting is not explicitly pointed out to the user. Nonetheless it is recommended to ensure an optimal illumination of the scan object, since it is immediately connected to the quality of the scan data.
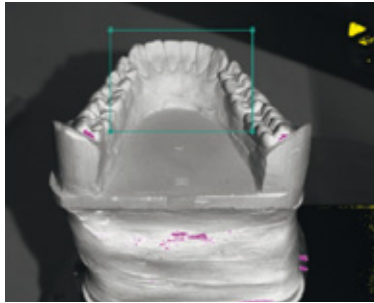

Bad illumination:
under-exposed
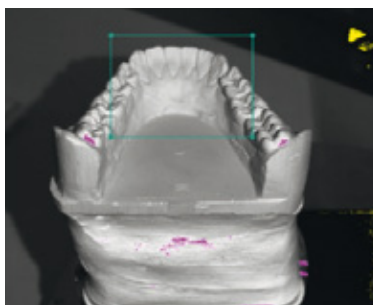
Good illumination:
normal exposure
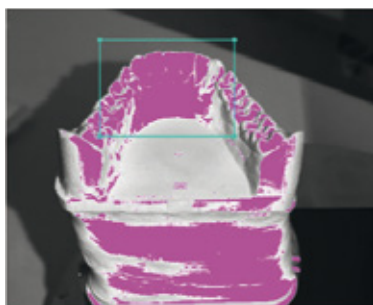
Bad illumination:
over-exposed

5.5.5.1 Automatic Brightness Setting

The green selection frame helps the user to determine, position and select the area on which the automatic brightness setting is to work.

The position should be selected in a way to allow for an optimal exposure of the area to be scanned.

With a double click inside the selection frame the optimal brightness for this area is set.

Reposition selection frame - Option 1
Place the cursor inside the selection frame, hold down the left mouse button and drag the frame to the desired position.

Reposition selection frame - Option 2
Place the cursor on the desired spot, confirm the position with a double click of the left mouse button. The frame jumps to the selected position.

Adjust size of the selection - Option 1
Place the cursor on one of the frame angles, hold down the left mouse button and drag out the frame to the desired size.

Adjust size of the selection - Option 2
Place the cursor to one of the four lines of the frame, hold down the left mouse button and drag out the frame to the desired size.

5.5.5.2 Manual Correction Possibilities for the Brightness Setting
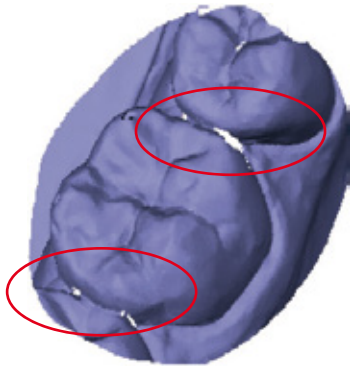

The brightness setting can be influenced individually with the help of the correction slider **"Scanner Brightness"** (at the bottom of the live image) in order to achieve an optimal illumination of the object.

5.5.6 Additional Scan in the Scan Step


Defective areas in the data model

The **Additional Scan** function allows the user to influence the scan result of a scan step (e.g. Jaw Model).

For this purpose, the dialog box "Additional Scan" is displayed after each scan step. With an "Additional Scan" missing data can be added by one or more additional scans and in this way the scan result can be improved The selection of the "Additional Scan" area is done by the user. The need for an Additional Scan depends on both the object's contour as well as the individual requirements of the user.

The Additional Scan is started by clicking on the respective button.

5.5.6.1 User Interface and Settings (Additional Scan Mode)
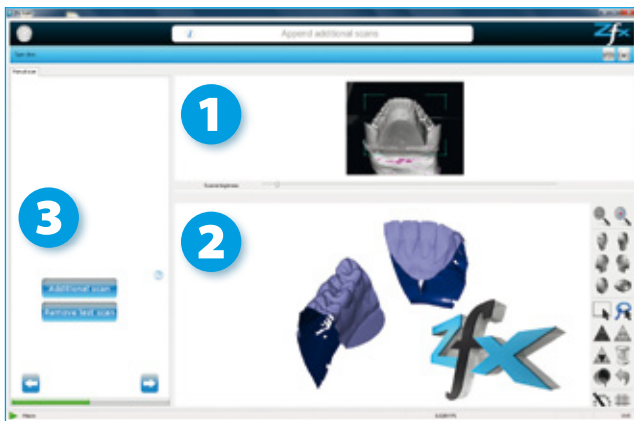
The user gets this view after each newly recorded scanning step. Here he has the opportunity to check if the scan data include flaws.

When flaws (which affect the scan result) are present, an additional scan is required. The object has to be repositioned in the scanner, so that the defects can be detected by the cameras, ➔ Chapter 5.5.6.2 "Start Additional Scan".

1 Camera Live Image / Brightness
2 Scan Dutton
3 Data Display

5.5.6.2 Additional Scan in the Scan Step

ℹ Please note
The numbering 1 - 3 corresponds to the processing sequence.

1. Data Display (3D)

The model can be positioned in the display window with the mouse functions (➔ see Chapter 5.2 "Mouse Button and Key Pad Commands"). It is important that the defective areas (holes in the 3D scan data) are visible. The user settings are immediately carried out by the rotary swivel unit and the model is repositioned. The action is accompanied by minor movement sounds. The toolbar is not available in this application. The picture in the display window is displayed in the preview mode, i.e. the surfaces are just as thinned out as displayed.

ℹ Please note
The desired position for the model can only be set within the maximum tilting range of the positioning unit. This means that a model cannot be scanned for instance from below. If the user should try a similar setting, the rotary swivel unit will automatically set itself to its maximum tilting position and show it in the 3D display window and the live image of the camera.

2. Camera Live Image

The Camera Live Image displays the position of the model in the scanner and can be zoomed with a click in window and by using the MMB (➔ see Chapter 5.2. "Mouse Button and Key Pad Commands").

ℹ Please note
The positions in the camera window are accurate positions and show the user which position has been or will be scanned.

3. Brightness

The Brightness can be adjusted for every additional scan in the Camera Live Image area as described in ➔ see Chapter 5.5.5.

4. Scan Button

Additional scan	The additional scan is started and data are being recorded.	**Remove last scan**	Data from the last additional scan are discarded.
←	Back – all additional scan data are discarded.	→	Complete additional scan. The whole model including all additional scan data are computed. Go to the next scan step.

5.5.6.2.1 Possible Problems with the Additional Scan

In case some of the defective areas could not be closed with the additional scan it may become necessary to treat the scan object with an anti-reflection spray. This is, however, only recommended for strongly reflective (shiny) or partly transparent (impression materials) surfaces.

⚠ Caution

Do not use anti-reflection spray inside the scanner. Always spray the scan object outside the scanner, otherwise the optics and functionality of the system may be spoiled.

5.5.6.3 Starting an Additional Scan with Already Completed Models

An additional scan is only possible while in Operation Mode. If further data recording for already completed models becomes necessary, the scan needs to be restarted from the required point.

ⓘ **Please note**
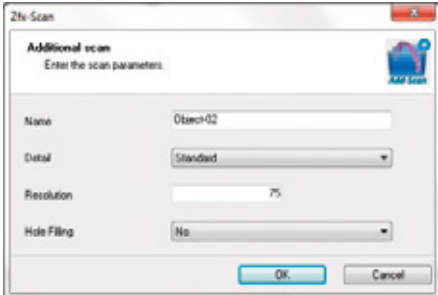
Check closely if sufficient scan data have been recorded and only then mark the additional scan process as completed.

5.5.7 Additional Scan – Add-Scan

A scan job, e.g. with 3 predefined scan steps (Jaw-Model / Teeth / Mushbite) can be expanded with one or more scanning steps with the aid of the function "Add-Scan". This function is necessary when more information about a restoration will be required or when the scanned data don't cover the desired range.

5.5.7.1 Start Add-Scan

	✕ Click the button "Add-Scan" ✕ Position the scan object in the scanner
	ℹ️ **Please note** Since the scanning step is not defined in the Dental Manager or via the configurator, no preview with the scan wizard is available. The additional scanning step is also displayed as an Add Scan image after the scan. ✕ Start Add-Scan by clicking "Scan".
	✕ Enter the Name and settings and confirm with **"OK"**. ℹ️ **Please note** The scan process is identical to scan data acquisition, in ➔ Chapter. 5.5 "Operation mode – Scan" or in ➔ Chapter 7 "Scan process"
	✕ Align the additionally acquired data to the base data base with the function Post Processing "Align mesh" (➔ Ch. 5.6.4).

ℹ️ **Please note**
Additional scan objects cannot be renamed or deleted: It is only possible to the delete the scan's content (3D data), but not the scanning step.

5.5.8 Select and Delete Data Sets

If a scan step has been completed, the user can select and delete unnecessary data. This function is available in all operation modes (Configuration / Scan / Post Processing).

ℹ️ **Please note**
Selecting and deleting 3D-Data has influence on the data amount to be saved. The smaller the amount of data, the smaller the necessary storage space on the storage device.
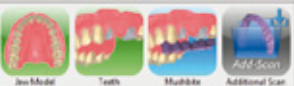
5. Operation Basics

Selection and Deletion Process

The area to be scanned is limited by the earlier definition of the scan area (➔ Ch. 5.5.3) and the tooth selection (Section 5.5.4). In order to select and delete redundant data, it is necessary that the previously scanned step is selected.

> **ℹ Please note**
> It is recommended to position the view of the 3D data using the methods described in the ➔ Chapter 4.3.2.

	Whether scanning data has already been collected, is shown by the background color (green / blue) in the scan wizard (Section 5.5.2).
	Before Uncut 3D data set Data remnants are discernible as grey areas
	Determine selection e.g. drag out a rectangle pressing SHIFT + LMB in order to select the unneeded data The different selection options are described in the ➔ Chapter 4.3.3 "Selection of 3D Data".
	After Redundant data areas are deleted.
	Delete Deletes the red marked areas
Tailoring for crowns: **Tailoring for inlays:** **Tailoring for bridges:**	Select a minimum of two teeth to every side. Also select the respective adjoining tooth. The completed 3D model may not be smaller than the corresponding squash bite, since the protruding teeth (to the left and to the right of the squash bite) serve as reference points for the alignment of the opposite jaw.protruding teeth (to the left and to the right of the squash bite) serve as reference points for the alignment of the opposite jaw.
	Undo The last commands can be undone.

5.5.9 Alignment of Data Sets

Generally the alignment happens automatically. The user is only required to perform the alignment of the data sets manually in cases where an automatic alignment is not possible, e.g. in an Add-Scan.
A manual alignment can be done using the function "Align mesh" in the Operation Mode Post Processing
(➔ see Chapter 5.6 "Operation Mode – Post Processing").

5.5.9.1 Interaction Window Alignment
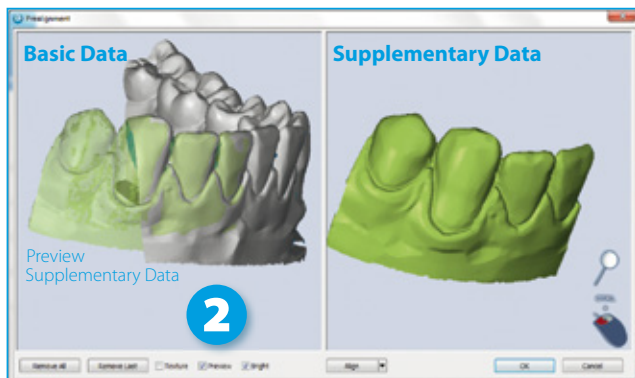
Display Window "Prealignment"

❶ **Texture:** Blend the texture of the data in or out.
   It is recommended to blend the texture out.

❷ **Preview** for applications:
   ✕ 3-point marking
   ✕ Automatic precision alignment "Align"
   The use of the Preview function is recommended, since it facilitates
   the alignment and the overlapping of the automatic fine alignment.

❸ **Bright (Brightness):** The background color can be set to black or
   light grey. The setting "bright" is recommended and – once selected
   – will be adopted for all following steps.

❹ **Align**: The Align function is an automatic precision aligment
   and provides the user with a more accurate alignment. Normally,
   the default setting is sufficient. For the setting options,
   ➔ see Chapter 5.5.9.3 "Application of the Align function"

❺ **OK:** The alignment is set as indicated and stored.

❻ **Cancel**: The alignment is closed without saving the alignment and
   not stored.

5.5.9.2 Manual Three-Point Alignment

During the manual alignment, a minimum of three identical points is marked in both data sets with the key combination Ctrl + LMB.
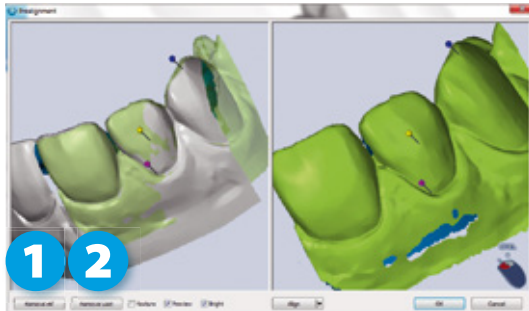
In order to identify three identical marker positions in both data sets it makes sense to choose a similar view for the data sets. The views of both data sets can be turned, zoomed and moved with the mouse as outlined in ➔ Chapter 5.2 "Mouse Button and Key Pad Commands" and placed in an identical position.
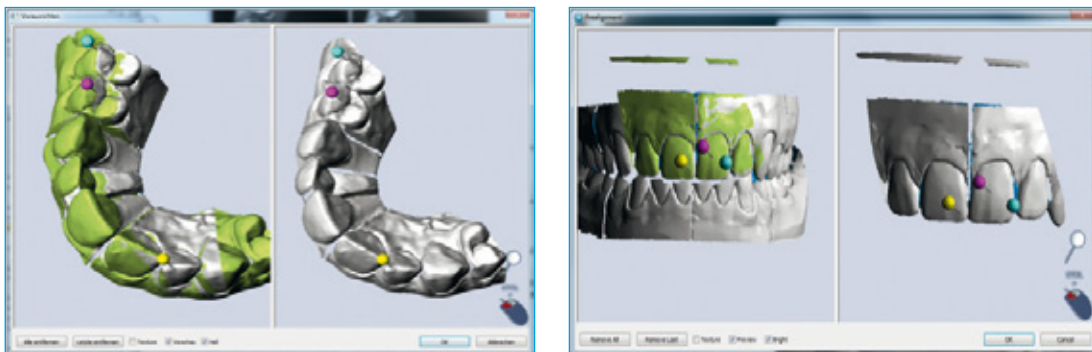
❶ Remove all: If all markers have to be discarded, they can be deleted by clicking on the "Remove all" button.

❷ Remove last: In case the last marker was set insufficiently, it can be undone via the button "Remove last".

i | **Please note**

It is recommended to activate the "Preview" button: The user can decide via Preview if the alignment is successful.

Examples:

The areas displayed in green in the left-hand image (in the active preview mode) show the matching of the alignment. The user can decide if the alignment is satisfactory or if new/further alignment points need to be defined. The result of the alignment can be accepted with "OK". Alternatively a more accurate automatic precision alignment can be made via the button "Align".

5.5.9.3 Application of the Align function

To use the automatic fine alignment, three identical points must be pre-selected, ➔ see Chapter 5.5.9.2 "Manual Three-Point Alignment". Based on this pre-alignment takes place the precision alignment of the two data sets on the basis of their object geometry (best-fit orientation).
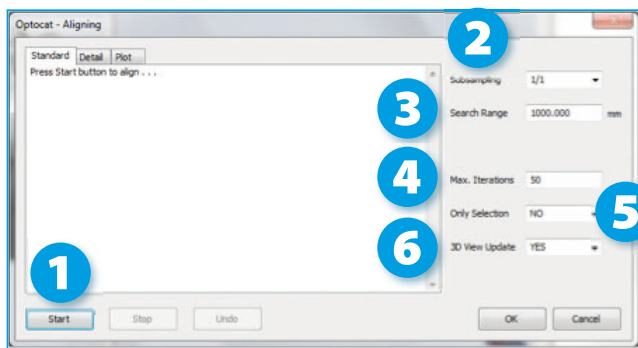
Dialog window Align function
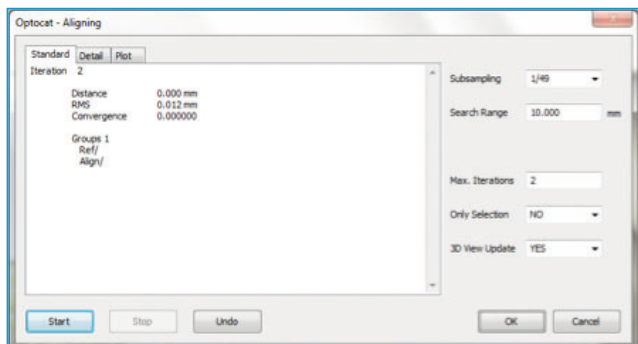
Information about the precision alignment result

Align Function Settings:

❶ **Start:** The alignment of the data sets will be optimized on the basis of the set parameters.

❷ **Subsampling:** With this rate is determined how many data points have to be used to optimize the fine adjustment: Each data point (1/1) or fewer data points.

❸ **Search Range:** The Search Range defines the radius of the overlapping area, within the matching data points are searched.

❹ **Max. Iterations:** Determines the maximum number of iterative optimization loops.

❺ **Only Selection:**
NO: the complete data set is used for the fine alignment.
YES: only the pre-selected data ranges are used for the fine alignment.

❻ **3D View Update**:
NO: 3D image is not updated (less memory usage)
YES: Every change in an optimization loop is updated in the 3D image.

> **ℹ Please note**
> Once changed all parameter settings (Subsampling, Search Range etc.) are used for other projects as the default value.

5.5.10 Matchholder (Marker) / Scan Body

The coded matchholders are a special feature, since they allow not just the precise determination of the implant analog's position in the model, but also the automatically detection of the implant platform and size.

Using the coded matchholders a file is created for every tooth. The data for determination of the implant analog position in the model is recorded accurately and transferred to the Zfx™ Manager for further processing.

The uncoded matchholders serve as scan bodies and are only recorded as such.

⚠️ **Caution**

Do not overwrite or damage the codes on the matchholders, since this can lead to the marker not being recognized by the system anymore. The Matchholder must be thoroughly captured by the scan. When this is not possible due to a dense arrangement, perform the marker scan with the Add-Scan function (in the working step).
Coded markers can be used multiple times per restoration.

5.5.10.1 Matchholder (Marker) - Coding

The matchholders are coded by Zfx GmbH and supplied as an optional accessory.

ℹ️ **Please note**

Use of coded Matchholders is recommended for optimum results. The platform and size of the implant being restored are transferred into the Zfx CAD software and data entry errors are avoided.

5.5.10.2 Matchholder (Marker) - Selection

Marker status	Description	Note
Coded Matchholder	The matchholder´s body passes the information regarding the position of the implant analog in the model to the Zfx™ Manager in a separate file for every scanned matchholder. The code passes the information regarding the exact implant's platform and size.	Advantage No separate recording is necessary.
Uncoded Matchholder	The position of the matchholder is only recognized as a body in the whole scan data packet. No separate implant platform or size data is available.	Disadvantage The implant platform and size need to be selected manually in the Zfx™ Design CAD software.

It is not mandatory to use a coded matchholders, since an uncoded matchholder will be recorded as a scan body and displayed as such.

5.5.10.3 Matchholder (Marker) – Scan

Free-standing Matchholders

The matchholders is recorded with the **"Marker Scan"** button.

If the marker scan was successful, it can be observed by the appearance of a green frame. The next scan step is only available after the successful recording of the marker.

ℹ️ Please note

All positioned Matchholders must be marked with a green frame. If this is not the case, repeat the marker scan or detect markers with an additional scan "Add-Scan" within the step described below.

Matchholders interfere each other
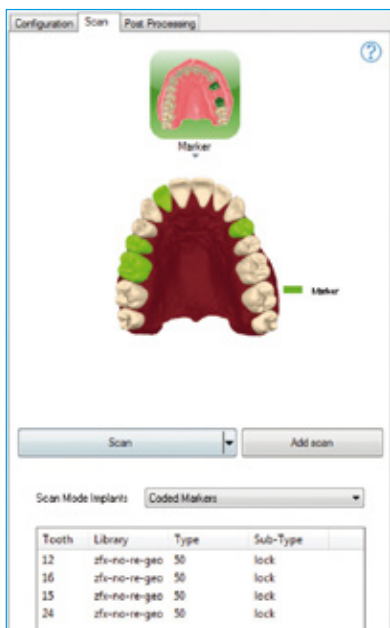
FDI Dental Numbering System used

Two closely spaced markers cannot be scanned at the same time, since the lateral surfaces are covered by the other marker, and therefore are not clearly detected. The scan step "Marker" is divided into two or three steps of data collection. This allows for the option to use the "Add Scan" function as needed.

"Add Scan" within the working step – Procedure:

Example: Marker for teeth 12 / 15 / 16 / 24 needed

- ✗ Position the Marker on position 12 / 16
- ✗ Start "Scan" (left button)
- ✗ Select the tooth e.g. for 12 / 16
- ✗ Scan with two positioned marker on 12 / 16
- ✗ Observe the list in the scan assistant: 12 / 16 are viewable in the list
- ✗ Remove the Marker for 7 / 3 and position them on 15 / 24 without any change in the position of the scan object
- ✗ Start "Add scan" (right button)
- ✗ Select the tooth e.g. for 15 / 24 - scan
- ✗ The list of Markers is expanded by marker 15 / 24 via Add Scan.

ℹ️ Please note

For scans within one working step, the last scanned view will always appear, but all data are recorded in the 3D data set. The data volume of a step is extended by the function "Add Scan".

5.5.10.4 Matchholder (Marker) – Type definition

With coded matchholders, a table with information in the scan wizard regarding the matchholder is shown, e.g. tooth, implant system, platform size. This data can be discerned by the system with the help of the codes.

The exact Sub Type needs to be added manually by the user.
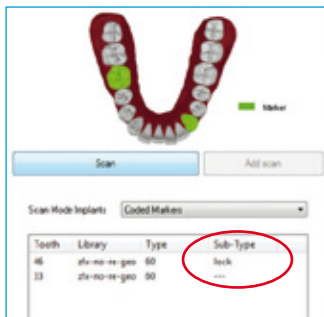
FDI Dental Numbering System used

The exact **Sub Type** needs to be added manually by the user.

Sub Type selection:
A drop-down menu is activated when the user clicks the right mouse button on the cell in the column **"Sub-Type".**

Possible Sub-Types are:

Lock   anti-turn = rotation prevention
No lock   rotating freely = no rotation prevention
TI-Base   hybrid abutment consisting of a
              titanium base and an attached body section

ℹ️ **Please note**
It is necessary and required that the exact Sub Type description is chosen for the selected matchholder.

5.5.11 MultiDie

The feature "MultiDie" enables the user to scan up to 12 individual dies from different patients.

Needed accessory:

Zfx™ MultiDie Table for Zfx™ Evolution - ZFX02001227 – please see Delivery Contents, ➔ Chapter 1.6.2 "Optional".

The scan feature "MultiDie" is launched from the Zfx™ Manager. When the "MultiDie" mode is selected, the Zfx™ Manager automatically transfers all the necessary information to the scan program and displays Multi-Scanning instead of the dental chart.
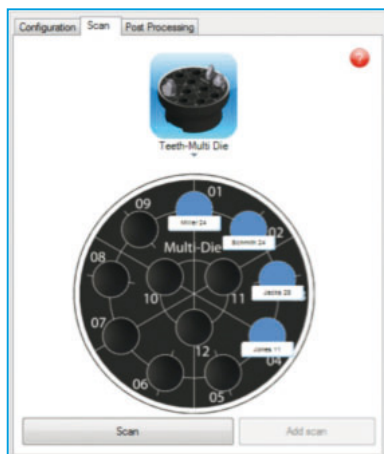
Please note

The following actions are recommended:

Zfx™ Manager:

✕ Assign name and tooth number of patient to the respective position available on the MultiDie Table

✕ Group similar restorations together

Scanning Program:

✕ The scan program corresponds to the previously described sections. Scan settings can be adjusted as usual.

## 5.6 Operation Mode – Post Processing

The Operation Mode Post Processing supports the user in the post-processing and preparation of the scan data.

The scanning step can be hidden or displayed by clicking on the images.

If an image is marked with an X, this means that view is hidden.

The editing functions can be started by clicking the left mouse button on the edit icon or on the text description.
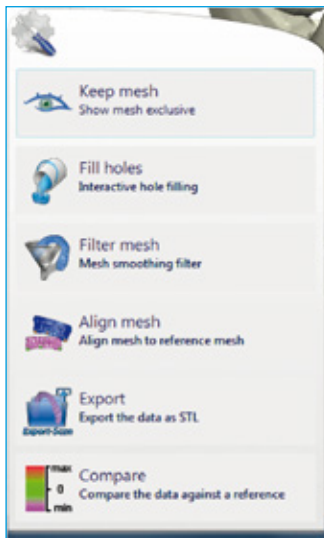
Possible functions:
- ✕ Keep mesh ➔ (Ch. 5.6.1)
- ✕ Fill holes ➔ (Ch. 5.6.2)
- ✕ Filter mesh ➔ (Ch. 5.6.3)
- ✕ Align mesh ➔ (Ch. 5.6.4)
- ✕ Export ➔ (Ch. 5.6.5)
- ✕ Compare ➔ (Ch. 5.6.6)

5.6.1 Keep mesh

With the selection of the function "Keep mesh" with the left mouse button, just the single view of the selected scan situation is visible. All other scan data are blended out.

ℹ **Please note**

For complete instructions on the Toolbar (➔ see Ch. 4.3) / Mouse Button and Key Pad Commands (➔ see Ch. 5.2).

5.6.2 Fill holes

The function "Fill holes" (holes filler wizard) is an interactive tool that allows the user to fill missing 3D data (holes) in the data set calculation. There is the option to automatically fill all holes or only the selected holes.
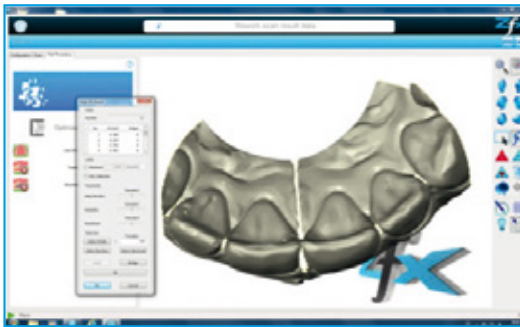
With the predefined standard parameters the edges of the holes are evened out before filling. This leads to a hole free data set with only few iterations.

All surface edges are marked yellow.

It is advisable when filling holes to display only the scanning situation that has to be processed (Keep mesh).

ℹ️ Please note

The holes filling **CANNOT** be reversed (the "undo" function is inactive). All other Toolbar functions (➔ see Ch. 4.3) and Mouse Buttons and Key Pad Commands (➔ see Ch. 5.2) are active.

5.6.2.1 The control window for the holes filling assistant shows 5 sections:

Section 1: Holes

In this section the number of holes is listed according to size and number of edges; the user can select individual holes.
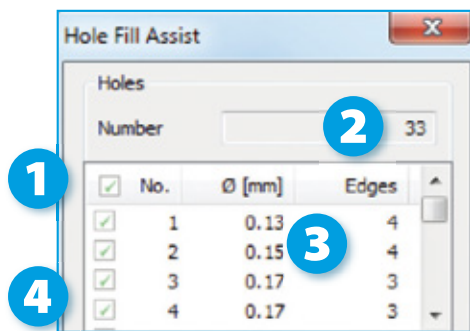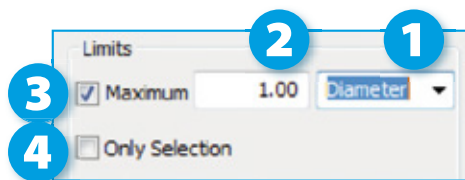

1. Activate or deactivate all holes
2. Number of found holes in consideration of the size and selection status in the "restriction"
3. Sort by diameter or number of edges
4. Activate or deactivate one hole
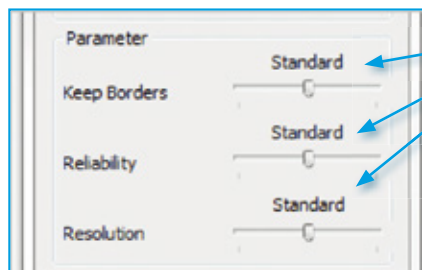
In the initial view all holes are marked in yellow.

Section 2: Limits

Here the holes to be closed can be limited according to their size and selection status.

1. Unitdescribing "hole size", either diameter or number of edges
2. Hole size
3. Activate the limits
4. Activation of the restriction on selected areas

Section 3: Parameter

Determine how a hole has to be filled.

Sliders, each with 5 steps to set the fill mode

Keep Borders

- ✕ **No:** The assistant automatically evens out the holes edges in order to achieve a better filling result.
- ✕ **Less / Standard / More:** The preservation of the edges is weighed progressively.
- ✕ **Exact:** The edge of the hole is not changed. This can lead to a hole not being filled, since, without prior evening out, it exhibits an edge geometry too complex to fill.

Reliability

- ✕ **Lowest:** With the lowest reliability setting, the assistant pays little attention to the form of the filling, the priority rests on closing the holes. Depending on the geometry of the edges this can lead to bigger artifacts surfacing or some holes being closed only partially.
- ✕ **Low / Standard / High:** The assistant pays increasing attention to homogeneous transitions at the edges of the holes. Partially filled holes are not allowed, which means that a hole might not be closed if the geometry is too complex.
- ✕ **Highest:** Additional calculation effort is invested in order to achieve the best possible homogeneous filling.

Resolution

- ✕ **Standard:** The resolution of the filling orients itself after the medium resolution of the holes edges.
- ✕ **Lowest / Low / High / Highest:** Decreases or increases the resolution in relation to the "Standard" mode to a maximum of one third or triple fold.

5. Operation Basics

Section 4: Selection

Selection of specific triangles with the option to delete them and thus remove interfering structures.
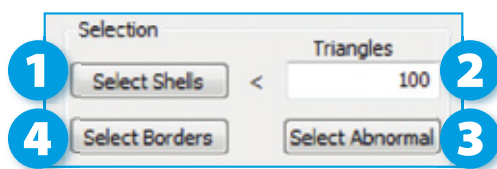
1 Selection of contiguous surface elements having no more than the number of triangles, which is specified in the right field.

2 Maximum number of triangles for the selection of acontiguous area

3 Selection of triangles which are not correctly bonded to the surface

4 Selection of all boundary triangles

When the restriction of selected areas is active, all "selection" actions are performed only on the selected area.

Section 5: Action

Initiating the filling, building bridges, closing the assistant.
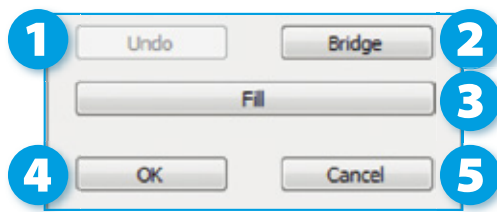
1 Undo the last action

2 Adding bridges to e.g. connect edges or islands

3 Start the filling process with the edge conditions set above

4 Exit the wizard and save the set parameters. On the next start, the same parameters are preselected.

5 Exit the wizard without saving the parameters

Example for creating a bridge:
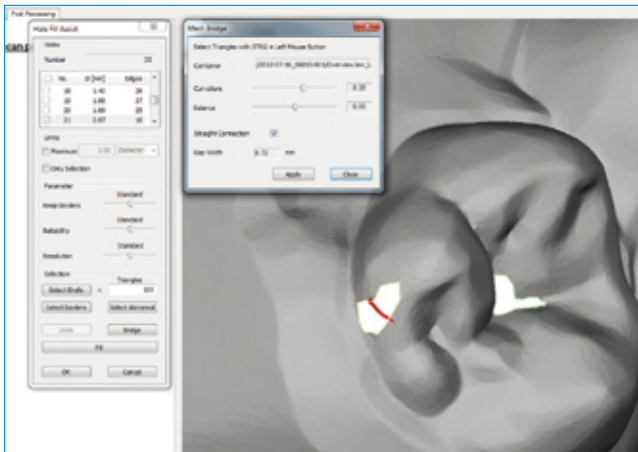
Click the **"Bridge"** button and accept or adjust the settings.
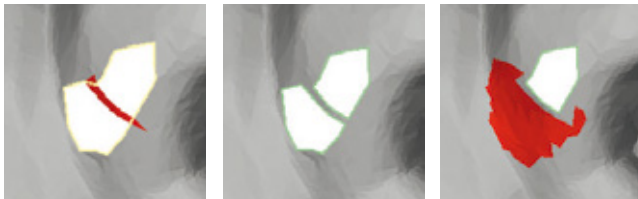
✕ Hold down the "Ctrl" button and select the two triangles to be connected by the bridge.

✕ By clicking on "Apply", the bridge is accepted and the hole edges are updated accordingly.

✕ Close the control panel "Mesh Bridge" by clicking the "Close" button

✕ The split hole can then be filled through selection of the hole number (Section 1 - Holes) and confirm with button "Fill" (Section 5 - Action).

Example of the surface before and after filling
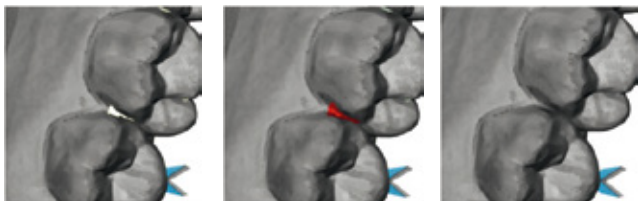
5.6.3 Filter mesh

The function "Filter mesh" smoothes out the displayed surface (polygon net) of a scan object.

ℹ Please note

After working on the 3D data set with the function "Fill holes", smoothing out the surface is recommended.

5.6.4 Align mesh

The function "Align mesh" is described in ➔ Chapter 5.5.9 "Alignment of Data Sets".

5.6.5 Export

With the "Export" function the 3D data sets can be exported and saved in different file formats (see Fileformat selection). In this way the data can be transferred to different 3D Dental CAD processing programs, sent as e-mail, or loaded as a comparison data set in the scan program.

"Export" Procedure:
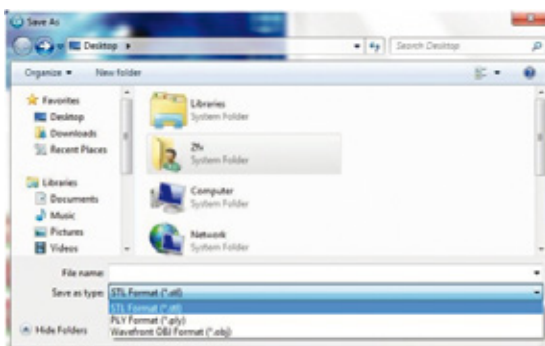
✕ Press the **"Export"** button
✕ The Explorer window opens
✕ Select the file path (if not already given)
✕ Select the appropriate file format
✕ Assign the file name
✕ Save by clicking the **"Save"** button.

5.6.6 Compare

The Compare function allows the user to read data sets from previous recordings and to compare them with the active data set.

The function is useful for example for comparing milled dental models to the output data set.

"Compare" Procedure:
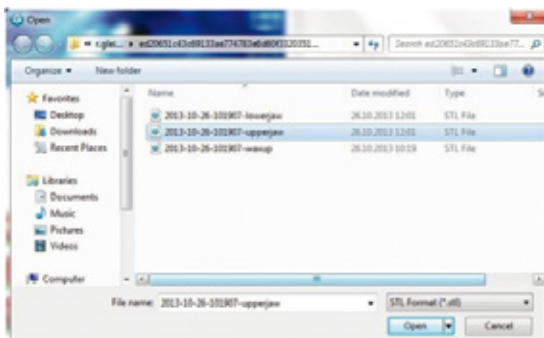
✕ Press the **"Compare"** button
✕ The Explorer window opens
✕ Select the file path (if not already given)
✕ Select the data set to compare
✕ Open the file by clicking the **"Open"** button
✕ The user is asked to align the data sets,
   → see Chapter 5.5.9 "Alignment of Data Sets"
✕ Adopt the alignment by clicking **"OK"**
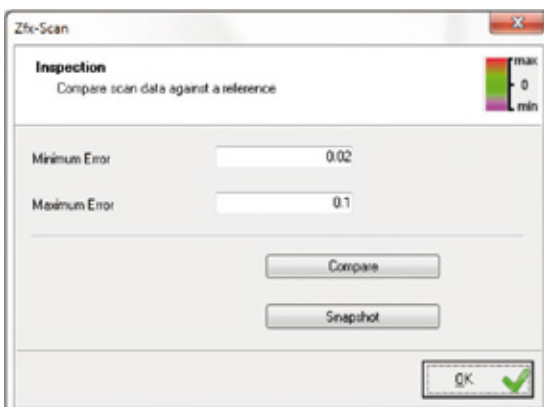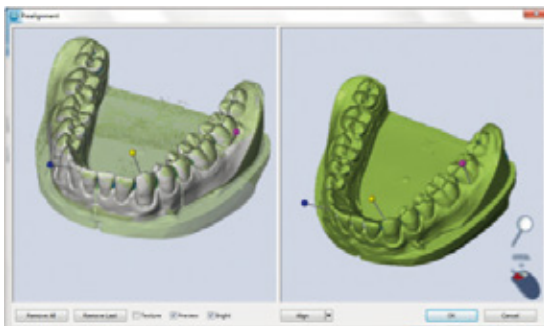
✕ The **"Inspection"** window opens
✕ The range of error where the two data sets are compared to each other can be changed with the minimum error and maximum error settings.
✕ We recommend adopting the parameters as proposed in order to achieve a   comparison result.
✕ Press the **"Compare"** button
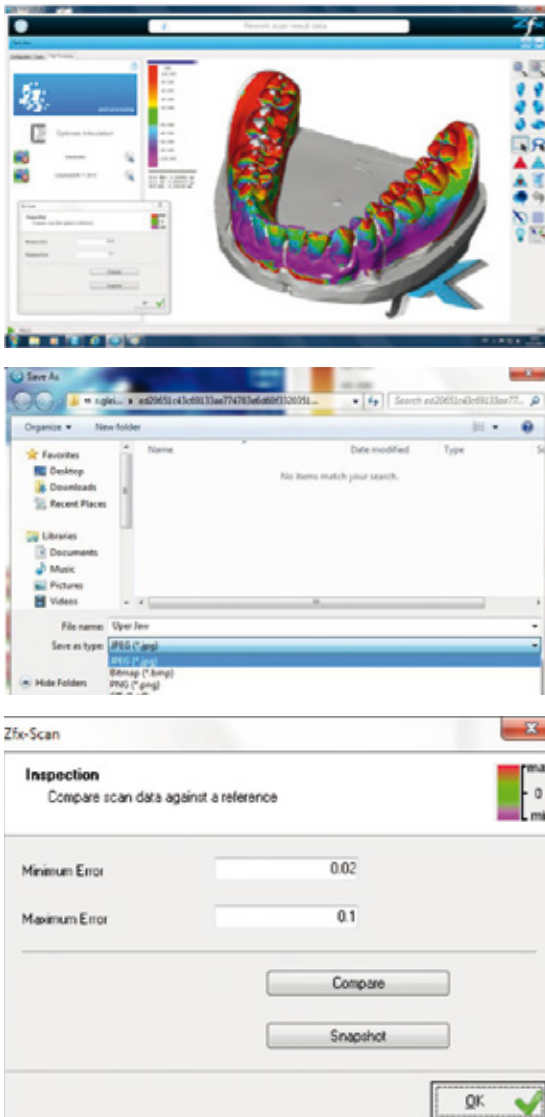
✕ The deviations between the current and the charged data sets are computed and displayed in color.

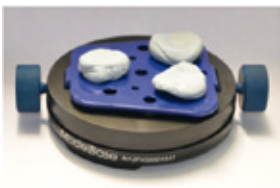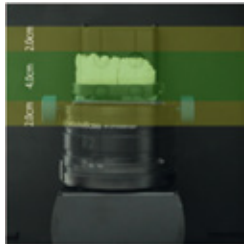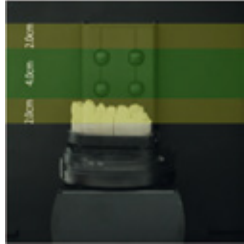Each distance value is assigned a color according to the displayed color chart.

✕ **Green areas:** Matches in the area of the minimum error value (no deviation of the data sets).
✕ **Red areas:** Deviation of the data sets. The deviation is greater than the positive value of the maximum error.
✕ **Magenta areas:** The deviation of the data sets is greater than the negative value of the maximum error.

✕ The comparison can be saved as an image file by clicking the button **"Snapshot".**
✕ Explorer window opens
✕ Select the file path
✕ Select the appropriate file format
✕ Assign the file name
✕ Save by clicking the **"Save"** button.
✕ If the comparison is completed, the "Inspection" window can be closed again by clicking **"OK"**.

6. Placing the Scan Object in the Scanner

The scan position is dependent on the scanning strategy and on the holders used during the application.

6.1 Model Base

	To place the scan object on the "Model Base" the user should use BluTack Art: ZFX02002063		The scan object should be positioned centrically to the rotation axis.
	The user should take care to position the scan object securely to make sure that the position of the scan object does not change while individual model segments are being removed		Wrong position The scan object is positioned too high.
	The scan object may not jut out over the blue perforated sheet.		Wrong position The scan object is positioned too low.
	Wrong position The scan object is placed too far back.		The Spacer Plates serve to set the right height.
	Wrong position The scan object is positioned too far to the front.		

6. Placing the Scan Object in the Scanner

6.2 MultiDie

Fill the pre-assigned acceptance holes with dental putty and flatten it. Press the individual teeth (dies) into the putty, so that they can be detected well by the scanner.

6.3 Zfx™ Synchronizer

For the alignment of the Zfx™ Synchronizer, please observe the operating instructions for the Zfx™ Synchronizer and fix it to the scanner with the fixing base.

7. Scan Process

7.1 Overview of the Possible Scan Processes

✕ Standard plaster models

✕ Fully anatomical crowns / bridges

✕ Single veneered copings / wax-ups

✕ Anatomically reduced veneered copings and frameworks

✕ Bridge frameworks / wax-ups

✕ Inlays / onlays / inlay bridges

✕ Soft tissue model

✕ Situational (Pre-Op) scan

✕ Implant / scan body (where available in the Zfx™ Manager)

✕ Bite registration or aligned jaw model

✕ Placing markers

ⓘ Please note

The scan order is defined with the Zfx™ Manager or the Configurator. The scan software will subsequently determine the different scan steps.

ⓘ Please note

The Zfx™ Synchronizer is recommended for use with Zfx™ Evolution, since it has been designed for compatibility with the system.

7. Scan Process

7.2 Scan Procedure

1 **Open scan order:** Enter the order in the Zfx™ Manager specifying the required
restorations, patient data, material specifications etc.
➜ Ch. 5.4 "Operation Mode – Configuration"

2 **Start scan order:** Start scan order via the Zfx™ Manager or directly from the scan program
➜ Ch. 5.5 "Operation Mode – Scan"

3 **Scan object:** Place scan object in the scanner
➜ Ch. 6 "Placing the Scan Object in the Scanner"

4 **Setting brightness:** Optimum illumination of the scan area
➜ Ch. 5.5.5 "Brightness Setting"

5 **Define scan area:** Select the scan area with the frame adjustment
➜ Ch. 5.5.3 "Define Scan Areas"

6 **Tooth selection:** Select the scan area with the position circle
➜ Ch. 5.5.4 "Teeth Selection"

7 **Start Scan:** Start Scan with the arrow to the right
➜ Ch. 5.5.2 "Scan Assistant / Help"

Scanner scans the object and records the data (this process can take a few minutes).

8 **Additional Scan:** The user can add more scans to the data set
➜ Ch. 5.5.6 "Additional Scan in the Scan Step"

9 **Select data set:** Delete unnecessary data
➜ Ch. 5.5.8 "Select and Delete Data Sets"

10 **Conclude scan**

or repeat whole scan process ➜ back to point 4.

Depending on the number of process steps displayed in the Scan Assistant, the scan procedure will be
repeated with the points 1 to 10 for process step two and for all following process steps of a scan order.
But it can be extended by the function "Alignment of Data Sets" (➜ see Chapter 5.5.9).

7.3 Practical Examples

Two practical examples for:

✕ **Matchholder scan:** Implants with coded Matchholders

✕ **Articulator:** Scan of a complete jaw / antagonist alignment

Can be found in ➜ Ch. 11 - "Practical Examples".

7.4 Abort Scan

A scan can be aborted between every step of a scan order with the exit button "Close Window", with exception of an already launched scan: In that case, the user has to go with the left arrow button back and conclude the scanning process.

A process step can be aborted regardless of whether or not a scan has been performed. All data already recorded by the time of abort is automatically saved in the patient file created with the Zfx™ Manager.
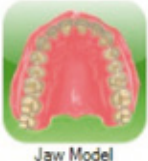
7.5 Restart of an Aborted Scan Order

An already existing scan order can be restarted at a later stage.
The data stored in the patient file are automatically loaded from the Zfx™ Manager into the scan program with the start of the scan program.

1 Start the Zfx™ Manager

2 Select the patient file

3 Start the scan program via the scan button

Alternatively the user can get direct into the Scan program opening the patient file via Explorer.

	The image background of the Scan Assistant indicates if data has already been recorded:		
Jaw Model	**Green background:** Data necessary for this scan step already exists	Jaw Model	**Blue background:** Data necessary for this scan step is still missing

Depending on what is required, scan steps can be repeated, skipped or missing scan steps can be amended.

8. Maintenance

Premature wear, a shortened product life cycle and malfunctions are caused through improper maintenance and care. Perform proper maintenance and care regularly and only through trained Zfx technicians. Zfx recommends the signing of a maintenance contract with Zfx.

8.1 Cleaning and Maintenance

The components are to be maintained with care and proper detergents.

⚠ **Caution**
- ✕ Do not use cleaner or solvents such as nitro, PER, sanitary, alcohol-containing or grease detergents!
- ✕ Never adjust or twist the aperture rings of the camera and projector.
- ✕ Do not clean the projector and camera lenses since this may cause damage.

ℹ **Please note**
Always keep door closed in order to reduce the gathering of dust in the system interior.

8.2 Regular Measures

- ✕ Clean dirty spots with a moist cloth but without detergent.
- ✕ Wipe the door and the outer shell with a fine dry dusting cloth.
- ✕ Clean the guide rails and the interior of the scanner with a small vacuum cleaner.

⚠ **Caution**
Do not use compressed air and do not touch the lenses.

9. Malfunctions

Please notify technical support of any malfunctions which cannot be solved with the help of the information contained in the table below.

9.1 Solving Malfunctions

Problem	Description	Solution
Program does not start	✕ Error message OPTOCAT Message 6171: OPTOCAT licensing : wrong coded informations (Error) !	✕ Turn scanner on ✕ Close the scanner door ✕ Check the network connection ✕ Restart the Zfx™ Manager
Calibration not successful	✕ Error message: several marks could not be read	✕ Check Calibration Plate for damages.
	✕ rms value > 12 µm	✕ Contact service technician.
Failed recognition of the scan area or scan holes in the scan Image	✕ Despite optimal alignment and exposure, an area cannot be scanned	✕ Apply Zfx™ anti-reflection spray. ✕ Change the position of the model. ⚠ **Caution** Do not apply Zfx™ anti-reflection spray within the system interior. Always remove the scan object from the scanner before spraying or the optical components may be affected.
Malfunctioning of the scanner though incorrect location	✕ Equipment heats up considerably	✕ Equipment heats up considerably
Protection fuse blow: Substantial temperature changes or high air humidity can lead to water condensation and thus electrical shorts, as well as twist the original setting of the sensor unit.	✕ Condensation ✕ Electrical short ✕ The sensory unit has been twisted though substantial temperature changes.	✕ Contact service technician ✕ Wait until the equipment reaches room temperature (18° - 20°) and is completely dried.
Bar code at Zfx™ Synchronizer	✕ The program cannot read the bar codes.	✕ Check if the code marks are damaged or contaminated. Repeat the recognition process. ✕ If it is still not possible to recognize the code marks, please contact your service.
Scan process aborted	✕ The scanner suddenly stops during the scan process.	✕ Check the power supply ✕ Close the scanner door ✕ Restart the program

10. Product Description

Zfx™ Evolution

Technical Specifications

Zahn success formula

Zfx
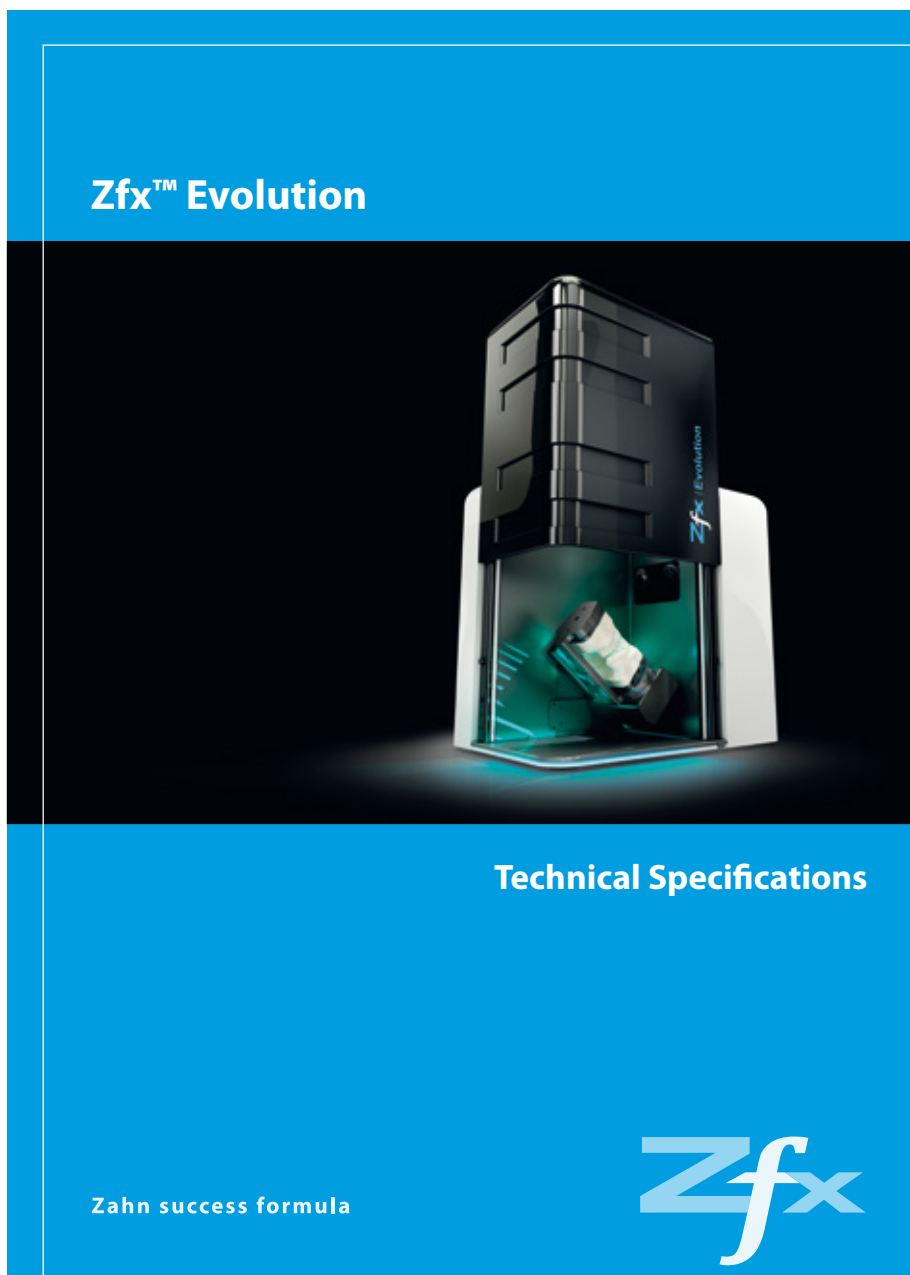
Zfx™ Evolution

Zfx™ Evolution Set of Components consisting of:

- ✕ Sensor
- ✕ Positioning unit
- ✕ Calibration plate
- ✕ Electronics
- ✕ Cable set
- ✕ Table power supply

General

Power supply (external)	AC 90 - 265 Volt, 50 – 60 Hz
Power input	70 W
Interface	USB 2.0
Operating system	Windows 7 64 Bit

Sensor

Camera sensor		b/w, CCD, USB
Camera resolution		2 x 1.280 x 1.024 Pixel
Projection unit		Miniaturised Projection Technique
Light source		25 W LED (green)
Number of projected fringes		128
Minimum acquisition time	ms	980
Triangulation angle	degrees	20
Base length	mm	85
Operating distance	mm	210
Field of view[1]	mm	135
Field of view size[2]	mm	105 x 85
Measuring depth[3]	mm	66
x,y resolution[4]	µm	83
Resolution limit (z)[5]	µm	4
Noise (z)[6]	µm	± 6
Feature accuracy[7]	µm	±10

Positioning Unit

Positioning unit		2-axis
Turn angle	°	± 360
Tilt angle	°	+45 bis -90
Dynamic		Synchronous turn and tilt motion
Positioning accuracy	°	< 0,5
Positioning speed	°/s	> 120
Maximum load limit	kg	1,5
Usable volume	mm	120 x 90 x 90

2

Zfx™ Evolution

Calibration Plate

Material		Precision glass ceramic
Dimensions	mm	120 x 80 x 1.8 (with rounded areas R = 60 mm)
Colour		White, opaque, matt finished
Structuring		Dark chrome raster with calibration markers
Structure accuracy	µm	± 3
Temperature operating range	℃	18 – 25

Please note:

All data specified in this data sheet apply to single image captures only.

The measurement specifications given are average values for the central measuring range achieved under defined measurement conditions and after precise calibration of the sensor. They solely apply in combination with the system configuration provided by Zfx. Furthermore, all accuracy and resolution details depend on the object surface and the scanning conditions.

[1] All values stated in this data sheet are approximated values within set tolerances, indicating the range of values. For example, the field of view `135' may have an image diagonal which may vary by ± 10%.

[2] Field of view size in relation to the operating distance.

[3] Maximum distance in z-direction.

[4] The values for lateral resolution are calculated theoretically (ratio of the field of view and pixel number of camera chip used).

[5] The resolution limit is defined as the theoretically achievable accuracy (ratio of field of view to number of pixels of the camera chip).

[6] The noise value is measured as deviation of the measured points against a best-fit curve. The noise of the measured 3D-data highly depends on the noise of the camera chip.

[7] Characteristic feature accuracy of the type series. The determination of the characteristic feature accuracy is based on VDI Guideline 2634.

10.2 Protection Fuse

Approved protection fuses are:

Fuse   218 3.15P   T 3.15A L 250 VP   BSI, CSA

⚠ **Caution**

The replacement of protection fuses is only permitted if performed by trained service personnel. Only the above mentioned type may be used. The use of non approved protection fuses will result in the forfeiture of both warranty and guarantee rights.

10.3 Operating Conditions

Allowed temperature range:	min. 18° C to max. 25° C
Allowed max. relative humidity:	80 %
Allowed max. over MSL:	2000 m
Allowed only in internal spaces	

10.4 Environment Conditions, Transport and Storage

Temperature range:	min. -18° C to max. 55° C
Air humidity:	5 % to max. 95 %
Air pressure:	min. 700 hPa to max. 1060 hPa
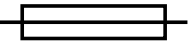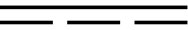
⚠ **Caution**

Substantial temperature changes or extremes and high air humidity may cause condensation and thus electrical shorts, as well as influence the original setting of the sensor unit.

10.5 Projector - Type Tag

The type tag is located on the back of the equipment.

Symbol	Meaning	Symbol	Meaning
Type	Equipment type		Attention: Observe the instruction given in the user manual!
SN	Serial number		CE marking
REF	Material number		Disposal information, see "Intended Use"
	Protection fuse		Equipment under protection class III
	Direct current		

10.6 Function Light

The function light indicates the operation status of the scanner or if there is an interference:

Display:	Status
Steady light:	Readiness
Fast double blinking:	Error message, e.g. open door
Slow blinking:	Scan in process

11. Practical Examples

11.1 Marker Scan

Settings in the Zfx™ Manager
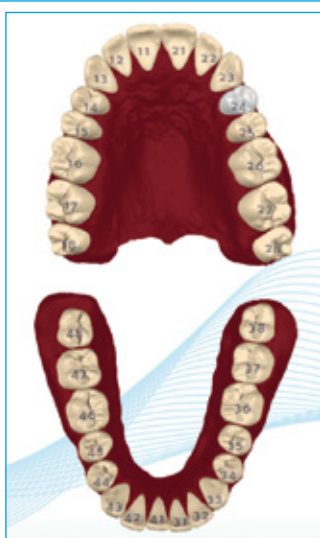
FDI Dental Numbering System used

Scan Example:
Entry in the Zfx™ Manager
Create new order: Enter patient, technician and order data

Order data

Anatomical crown:	Tooth 24
Implant type:	Custom Abutment
Gingiva Scan:	On
Save the order:	

The scan order is created already with the Zfx™ Manager, from where the scan then can be started.
A click on the "Scan" button starts the scan program. The user interface as described in ➔ Chapter 5.5.1 appears.

Procedure in the scan program

With the Configurator, the user can then re-check the scan order created with the Zfx™ Manager and
add a restoration if necessary.

ℹ️ **Please note**

Not all Dental Manager programs are compatible with the additional configuration. Please always check if
the Dental Manager accepted the restoration created through the Configurator.

For the chosen example, 3 steps are required, ➔ see Chapter 5.5.2 "Scan Assistant / Help"

ℹ️ **Please note**
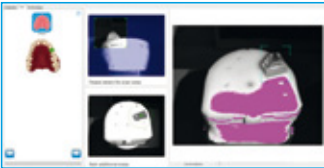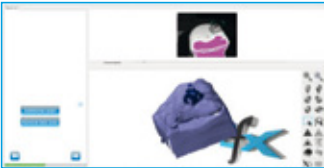
The image in the Scan Assistant (➔ see Chapter 5.5.2 "Scan Assistant / Help") becomes green as soon the
3D data of a working step have been recorded. Optional - change of the processing sequence described in
➔ Chapter 5.5.2 "Scan-Assistant": the user can select the next step with the left mouse button.

11. Practical Examples

Working Step 1/3 – Upper Jaw Scan

	✕ Open the scanner door ✕ Insert the upper jaw model ✕ Position the jaw on the Model Base, ➔ see Chapter 6 "Placing the Scan Object in the Scanner" ✕ Close the scanner door Start scan by clicking on the **"Scan"** button
	✕ Set brightness ➔ (Ch. 5.5.5) ✕ Define scan area ➔ (Ch. 5.5.3) ✕ Select tooth ➔ (Ch . 5.5.4)
	➔ Start scan by clicking the **"Arrow"** button to the right
	The user now can decide if further data should be recorded. The button "Additional Scan" starts an additional scan, ➔ see Chapter 5.5.6 "Additional Scan in the Scan Step - Additional Scan" If no additional scan is necessary since all relevant data has already been recorded: ➔ complete the process by clicking the **Arrow button** to the right.

Working Step 2/3 – Gingiva Scan

	✕ Open the scanner door ✕ Remove the adjacent teeth from the model ✕ Insert the gingiva ✕ Close the scanner door Start scan by clicking on the **"Scan"** button
	✕ Set brightness ➔ (Ch. 5.5.5) ✕ Define scan area ➔ (Ch. 5.5.3) ✕ Select tooth ➔ (Ch . 5.5.4)
	➔ Start scan by clicking the **"Arrow"** button to the right
	The user can now decide if further data should be recorded. The button "Additional Scan" starts an additional scan, ➔ see Chapter 5.5.6 "Additional Scan in the Scan Step - Additional Scan" If no additional scan is necessary since all relevant data has already been recorded: ➔ complete the process by clicking the **Arrow button** to the right. The program automatically advances to the next step.
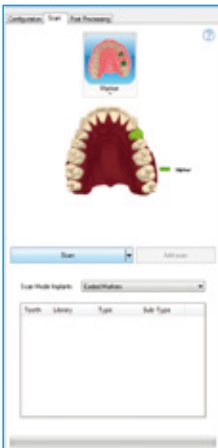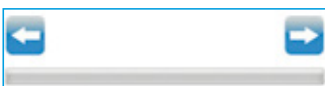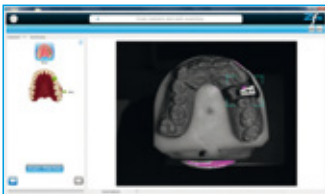
ℹ️ **Please note**

If it is not possible to automatically align the data from step 1 and step 2 (e.g. because the model slipped on the supporting plate), the user is prompted to align the records. Procedure:
➔ see Chapter 5.5.9 "Alignment of Data Sets"

11. Practical Examples

Working Step 3/3 – Marker Scan

	✕ Open the scanner door ✕ Insert marker (Matchholder) in the jaw model ✕ Position the adjacent teeth ✕ Selection: coded Marker or uncoded Marker ✕ Close the scanner door Start scan by clicking on the **"Scan"** button
	✕ Set brightness ➔ (Ch. 5.5.5) ✕ Define scan area ➔ (Ch. 5.5.3) ✕ Select tooth ➔ (Ch . 5.5.4)
	➡ Start scan by clicking the **"Arrow"** button to the right
	✕ Set brightness again ➔ (Ch. 5.5.5) ℹ️ **Please note** When setting the brightness for the Matchholder recognition, overexposure is better than underexposure.
	Start recognition of Matchholders with the **"Scan Marker"** button.
	The user can recognize if the marker recognition was successful by the appearance of the green frame around the marker and display of the marker type. If both conditions are met, the right Arrow button will be enabled and the user can start the scan. ➡ Start the marker scan by clicking the **"Arrow"** button to the right.

The user now can decide if further data should be recorded.
The button "Additional Scan" starts an additional scan,
➔ see Chapter 5.5.6 "Additional Scan in the Scan Step - Additional Scan"

If no additional scan is necessary since all relevant data has already been recorded: complete the process by clicking the **Arrow button** to the right.
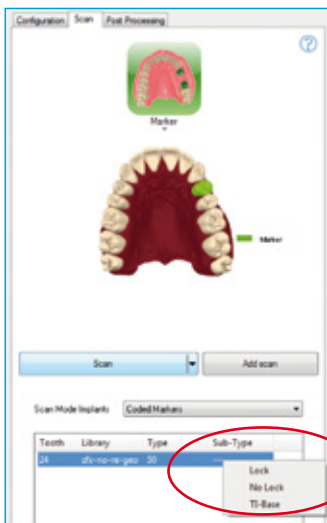
FDI Dental Numbering System used

Enter Sub-Type
Open the Sub-Type drop-down menu with the right mouse button and select a sub type.

ℹ Please note
It is necessary and required to enter the exact type description for the selected Matchholder (Marker).

Sub-Types can be:
Lock: anti-rotation = rotation prevention
No lock: rotating freely = no rotation prevention
TI-Base: hybrid abutment consisting of a titanium base and an attached body section

Scanning process is completed and all the necessary data have been recorded.

The user can select and delete unnecessary recorded data collected, ➔ see Chapter 5.5.8 "Select and Delete Data Sets".

ℹ Please note
All images in the Scan Assistant are green, ➔ see Chapter 5.5.2 "Scan Assistant / Help", this means that 3D data were recorded for every scan step.

11.2 Coded Zfx™ Synchronizer

With the help of a coded Zfx™ Synchronizer no further platform selection is required and thus the error rate can be reduced.

The determination of what has to be scanned happens in the Zfx™ Manager, from which the scan is usually started.
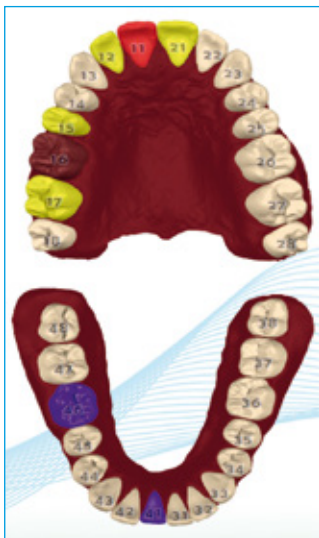
FDI Dental Numbering System used

Scan example:

Entry in the Zfx™ Manager:

✕ Create new order

✕ Enter order data

The order may be as follows:

Reduced coping:	Tooth 11
Anatomical crown:	Tooth 16
Antagonist:	Teeth 41 / 46
Neighbour teeth:	Teeth 12 / 21 and 15 / 17
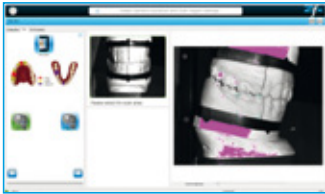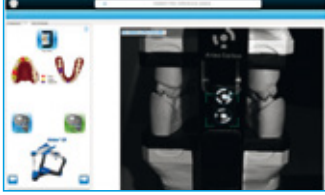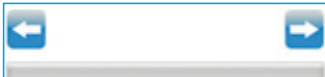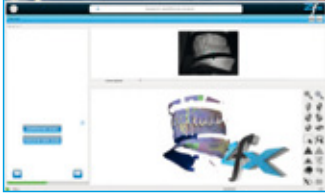
✕ Select Antagonist Type - Virtual Articulator

✕ Save order

✕ Start scan by clicking on the **"Scan"** button

The "Scan" button in the Zfx™ Manager starts the scan program. The user interface for the Scan mode appears as described in ➔ Chapter 5.5. "Operation Mode – Scan".
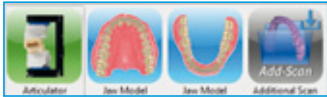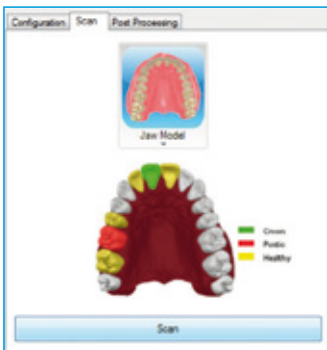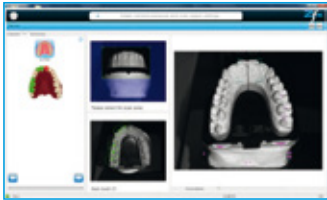
Working step 1 of 3 – Whole jaw model scan
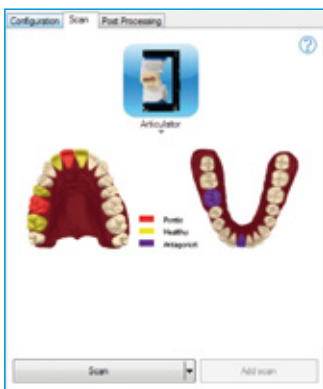
✕ Open the scanner door

✕ Insert the Zfx™ Synchronizer with attached both jaw models

✕ For the attachment of the jaw to the Zfx™ Synchronizer, see detailed description for the Zfx™ Synchronizer

✕ Close the scanner door

✕ Start scan by clicking on the **"Scan"** button

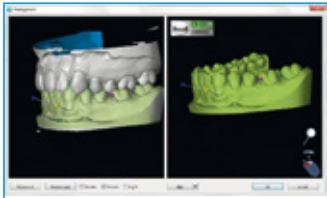|	
	✗ Set brightness ➜ (Ch. 5.5.3) ✗ Define scan area ➜ (Ch. 5.5.5) ✗ Select the setting plane ("Frankfurt horizontal plane" or "Camper plane")
	➡ Start scan by clicking the **"Arrow"** button to the right.
	The coded marks of the Zfx™ Synchronizer are automatically recognized. If a code cannot be read, please consider the note in the ➜ "Malfunctions", Chapter 9. ℹ️ **Please note** The program recognizes only coded Zfx™ Synchronizer.
	➡ Continue the scan by clicking the **"Arrow"** button to the right
	The user now can decide if further data should be recorded. The button "Additional Scan" starts an additional scan, ➜ see Chapter 5.5.6 "Additional Scan in the Scan Step - Additional Scan"
	If no additional scan is necessary since all relevant data has already been recorded: ➡ complete the process by clicking the **Arrow button** to the right.
	The data are computed again and summarized in a 3D data set. This process takes a few seconds, please consider the progress bar indicator. When the data are recorded, the program automatically advances to the next step.

11. Practical Examples

Working step 2 of 3 – Upper Jaw Scan

	A manual selection for the next step is not necessary (optional), → see Chapter 5.5.2 "Scan Assistant / Help".
	✕ Open the scanner door. ✕ Remove the Zfx™ Synchronizer from the scanner. ✕ Remove the model from the Zfx™ Synchronizer – see detailed description for the Zfx™ Synchronizer ✕ Attach the upper jaw model to the Model Base and insert it in the scanner ✕ Close the scanner door Confirm by clicking on the **"Scan "** button
	✕ Set brightness → (Ch. 5.5.5) ✕ Define scan area → (Ch. 5.5.3) ✕ Select tooth → (Ch . 5.5.4)
	The user now can decide if further data should be recorded. The button "Additional Scan" starts an additional scan, → see Chapter 5.5.6 "Additional Scan in the Scan Step - Additional Scan" If no additional scan is necessary since all relevant data has already been recorded:　→　complete the process by clicking the **Arrow button** to the right.
	The user is asked to align the data sets → see Chapter 5.5.9 "Alignment of Data Sets" Confirm the alignment by clicking **"OK "** The program computes the needed data and switches automatically to next working step.

Working step 3 of 3 – Lower Jaw Scan

	A manual selection for next working step is not necessary (optional), ➔ see Chapter 5.5.2 "Scan Assistant / Help".
	✕ Open the scanner door. ✕ Remove the upper jaw model from th scanner. ✕ Attach the lower jaw model to the Model Base and insert it in the scanner ✕ Close the scanner door Confirm by clicking on the **"Scan "** button
	✕ Set brightness ➔ (Ch. 5.5.5) ✕ Define scan area ➔ (Ch. 5.5.3) ✕ Select tooth ➔ (Ch . 5.5.4)
	The user now can decide if further data should be recorded. The button "Additional Scan" starts an additional scan, ➔ see Chapter 5.5.6 "Additional Scan in the Scan Step - Additional Scan" If no additional scan is necessary since all relevant data has already been recorded: complete the process by clicking the **Arrow button** to the right.

11. Practical Examples

	The program computes the needed data and all working steps in the Scan Assistant are marked as recorded.
	The user is asked to align the data sets → see Chapter 5.5.9 "Alignment of Data Sets". Confirm the alignment by clicking **"OK ".** The program computes the needed data and switches automatically to next working step.

In conclusion or after each working step, if unnecessary recorded data have to be deleted, the user can select and delete those data.

	→ see Ch. 5.5.8 "Select and Delete Data Sets"

ⓘ Please note

All recorded data sets can be displayed and edited at the same time through the button Post Processing.

With this program feature, all the useless data fragments in all views can be removed at the same time.

End of Scan Process

Notes

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