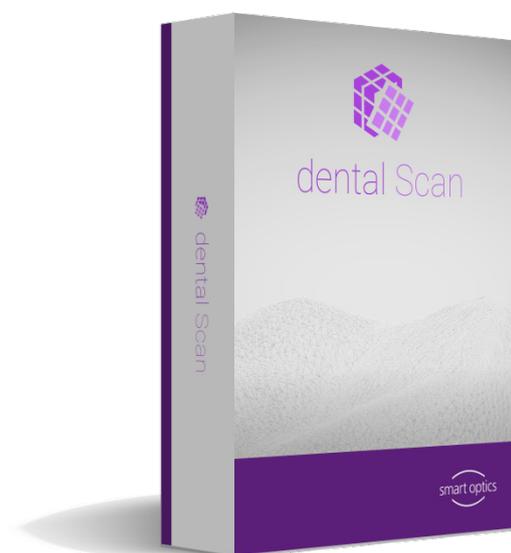# smart optics

User Manual

Software 3.4

dental Scan

dental Scan

A product from smart optics Sensortechnik GmbH

Legal notice

FIRST LEVEL SUPPORT FOR SMART OPTICS PRODUCTS

Find a reseller online in your region: List of resellers https://www.smartoptics.de/en/dental/reseller-locator/
or via the contact form https://www.smartoptics.de/en/contact/

CHANGES

smart optics reserves the right to make changes in the products and this documentation.
Current documentation: www.smartoptics.de (download sections)

BRANDS AND TRADEMARKS

Adesso Split, Artist/arTO	K. Baumann, DE-75210 Keltern
Artex	Amann Girrbach AG, AT-6842 Koblach
Baltic Denture System	Merz Dental GmbH, DE-24321 Lütjenburg
Denar	Whip Mix Corporation, Louisville, KY 40209, USA
exocad	exocad GmbH, DE-64293 Darmstadt
FlyCapture, UpdatorGUI	Point Grey Research, Inc.
Gamma	Gamma medizinisch-wissenschaftliche Fortbildungs-GmbH, A-3400-Klosterneuburg
Twin Tray	Klasse 4 Dental GmbH, DE-86159 Augsburg, DE
OnyxCeph₃™	Image Instruments GmbH, DE-09125 Chemnitz
PROTAR	KaVo Dental GmbH, DE-88400 Biberach/Riß
SAM	SAM Präzisionstechnik GmbH, DE-82131 Gauting
SILADENT, SilaPart®	SILADENT Dr. Böhme & Schöps GmbH, DE-38644 Goslar
Triple Tray	Premier Dental, Plymouth Meeting, PA 19462, US
Windows, .NET Framework, Visual C++	Microsoft Corporation

Royalty-free icons and illustrations from the Flaticon.com, Fotolia.com, Freepik.com and Pixabay.com image agencies were used in this Operating Manual.

Table of contents

1   About this manual

Please keep this Operating Manual in a safe place and pass it on with the product.

Types of manuals

Operating Manual
Device components, general safety instructions, technical data, commissioning, handling.

Installation Manual
Initial software installation, upgrades.

User Manual
Basics, operating procedures, settings, optional modules.

Graphic symbols and highlighting of important information

▷   Single operational step.

1.   Step by step instructions.

✓   Result of single operational step/step by step instructions.

NN   Cross reference to pages (with hyperlink).

🎓 www.smartoptics.de   Hyperlink to the video on the subject in the smart optics University.
University | dental Scan | Subject

More   Related subjects (with hyperlink)   NN

After the hyperlink, back to the starting point:
Use the page navigation of the PDF reader ("Previous View" and "Back").

🏷   Function or module that may be ordered additionally.

🖱   Mouse operation: the button to be pressed is highlighted.

💡 **TIP**
Tip, helpful advice.

ⓘ **NOTICE**

▷ Information on possible data loss or device damage with instructions on how to avoid it.

Illustrations

The device and software images may differ from the actual systems. Screenshots show sample data.

Units of measurement and numbers

Units of measurement	Units legally in force in Germany
	International System of Units (SI)
Numbers	Decimal system with decimal places

Measurement	Unit	Abbreviation
Mass/weight	Kilogram	kg
	Gram	g
Length	Metre	m
	Centimetre	cm
	Millimetre	mm
	Micrometre	μ
Angle	Degree	°
Time	Hour	h
	Minute	m
	Second	s
Electrical power	Watt	W
Electrical voltage	Volt	V
	Alternating current	AC
Electrical frequency	Hertz	Hz
	Gigahertz	Ghz
Electrical current	Ampere	A
Protection class	International Protection	IP
		1st digit: solids protection, 2nd digit: fluids protection
Temperature	Degree Celsius	°
Memory (PC)	Random-Access Memory	RAM
Data volume	Megabyte	MB
	Gigabyte	GB
CAD data format	Polygon file format	PLY
	Standard Triangulation Language	STL
	American Standard Code for Information Interchange	ASCII
	Mesh	MSH
	Point Cloud Measurement	PCM
Picture element	Pixel	Px (monitor), dpi (print)
	Megapixel	Mpx

2 About dental Scan

dental Scan is a software for smart optics 3D dental scanners.

dental Scan scans jaw models and impressions according to dental specifications, orthodontic models and multiCase projects. Objects in the size of the scanner measuring field can be scanned by dental Scan in the universal mode, which is industry independent.

dental Scan

Current version and manuals

www.smartoptics.de

The following can upgrade to Version 3.4:

— Vinyl series (Vinyl Open Air, Vinyl, Vinyl High Resolution),
— scanBox

Calibration data

Calibration data are a prerequisite:

— to start dental Scan;
— to obtain correctly calculated measurements.

Every scanner requires individually adjusted calibration data.

Initial installation

— The calibration data are not transferable to a different scanner.
— The installation of dental Scan also includes the calibration data.

2.1 System requirements

	Operating System	Processor (CPU)	Memory (RAM)	Free hard drive space	Graphics card (RAM)	USB ports
scanBox	Windows 10 (64 Bit)	i3 with 4 × 3.6 GHz i7 with 6 × 4,7 GHz	16 GB 32 GB	Approx. 40 – 100 GB HDD Approx. 100 – 250 GB SSD	1 GB 6 GB	USB 2.0 USB 3.0
Vinyl Open Air	Windows 10 (64 Bit)	i3 with 4 × 3.6 GHz i7 with 6 × 4,7 GHz	16 GB 32 GB	Approx. 40 – 100 GB HDD Approx. 100 – 250 GB SSD	1 GB 6 GB	USB 2.0 USB 3.0
Vinyl	Windows 10 (64 Bit)	i3 with 4 × 3.6 GHz i7 with 6 × 4,7 GHz	16 GB 32 GB	Approx. 40 – 100 GB HDD Approx. 100 – 250 GB SSD	1 GB 6 GB	USB 2.0 USB 3.0
Vinyl High Resolution	Windows 10 (64 Bit)	i5 with 4 × 3.8 GHz i7 with 6 × 4.7 GHz	32 GB	Approx. 100 – 250 GB SSD	6 GB	USB 3.0

1st entry: required; 2nd entry: recommended

2.2 Interfaces

You can link dental Scan to exocad® DentalCAD and OnyxCeph3™. All interfaces are available at no additional cost for all scanners.

The PC must comply with the system requirements of the third party systems. In case of different specifications, the highest requirements apply.

System requirements	
exocad® DentalCAD (dental CAD-System)*	wiki.exocad.com "Introduction"
OnyxCeph3™ (prosthetics software)	www.onyxceph.de "> Home | OnyxCeph3TM |About | System Requirements"
Baltic Denture System®	www.baltic-denture-system.de Dental Lab > Requirements
SilaPart CAD®	www.siladent.de/silapart-software Windows

*   smart optics is a reseller of exocad GmbH. If you are interested in exocad® DentalCAD please contact your smart optics reseller.

2.3 Modules and hardware based functions

Depending on the scanner, dental Scan modules are part of the scope of delivery or can be purchased additionally.

67   Additional modules must be activated.

Hardware dependency

Vinyl series, scanBox
Scope of delivery, Accessories

Some functions require accessories or specific scanner hardware features.

Availability of modules and functions

KEY
- ✔ Scope of delivery
- 🔑 Chargeable
- ▬ Not available
- ◖ Restricted use

	scanBox	Vinyl Open Air	Vinyl	Vinyl High Resolution
Projects				
Patient	✔	✔	✔	✔
Orthodontics	✔	✔	✔	✔
multiCase	🔑	🔑	✔	✔
Universal	✔	🔑	✔	✔
Presentation modes				
Complete Jaw	✔	✔	✔	✔
singleDie	✔	✔	✔	✔
secondDie	✔	✔	✔	✔
multiDie	🔑	🔑	✔	✔
Vestibular scans				
Simple	✔	✔	✔	✔
Articulator	▬	✔	✔	✔
Auto articulation	◖	✔	✔	✔
Twin Tray	▬	🔑	✔	✔
Texture scans				
Monochrome	✔	✔	✔	✔
Color	▬	✔	✔	✔
Impression scans				
Triple Tray®	🔑	🔑	✔	✔
Full impressions	✔	🔑	✔	✔
BD Key®*	🔑	🔑	🔑	🔑
High resolution scans				
HR Mode	▬	▬	▬	✔
Scan height				
Automatic Z axis	▬	✔	✔	✔
visual Z axis control	▬	✔	✔	✔

	scanBox	Vinyl Open Air	Vinyl	Vinyl High Resolution
Cutting				
Manual	✔	✔	✔	✔
Filter	✔	✔	✔	✔
Automatic	✔	✔	✔	✔
Other				
Calibration	✔	✔	✔	✔
Rescan	✔	✔	✔	✔
Correction scan	✔	✔	✔	✔
Additional scan	✔	✔	✔	✔

KEY
✔ Scope of delivery
🔑 Chargeable
— Not available
◑ Restricted use

* BD Key® – set for dental processes within the Baltic Denture System®,
www.baltic-denture-system.de

3 Basic operation

3.1 User interface

🔍 Word search for more information

Program window division

▶ Project info

▶ Menus

▶ 3D viewer

▶ Project management

▶ Project, Extras, Settings

Project
Patient
Dentist
Project ID 2021-11-30-122038

Modify mesh
Cut inwards
Cut outwards
Cut surface
Save
Add scan
Rescan
Trigger scan
Trigger scan sequence
View
Undo
Correction scan
Fill holes
Service position
Combine mesh
Delete matching

Upper Jaw   Scanbody-UJ

Use the modify mesh functions. Finish the project with the "Finalize Project" button.

More   Standby mode   13

3.1.1 Project info

Project definition information display:

Patient or project name

— In dental projects: first name and surname of the patient.
— In universal projects: project name.

Dentist

— Name of the dentist in a dental project started in dental Scan.
— Name of the customer in a dental project started in exocad®.
— Not used in universal projects.

Project ID (generated automatically)

— dental Scan projects: **[YYYY]-[MM]-[DD]-[hhmmss]**
— exocad® projects: **[YYYY]-[MM]-[DD]-[exocad-ID]**
   e.g. 2021-09-28_00001-001.

Tooth chart

— Coloring of the tooth positions with defined reconstruction;
— Color codes according to dental Scan or exocad®.

Displaying and hiding

▷ Click the arrow > at the project info.

✓ The project info is hidden.

▷ Click the arrow < at the edge of the program window.

✓ The project info is displayed.

More

3.1.2 2D viewer

The 2D viewer:

— shows the jaw model in the scanner as a black and white photo;
— is intended for dental projects with secondDie presentation.
— provides exact marking of tooth positions.
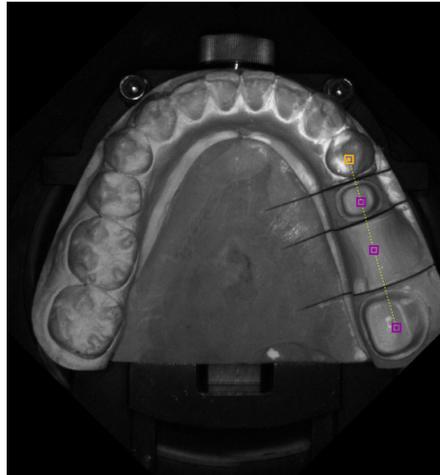
💡 **TIP**

2D images are displayed in the project status of exocad® DentalDB.

More

3.1.3 3D viewer

The 3D viewer:

— Shows the scans from all sides,
— is intended for the processing of workflows,
— is split horizontally for manual registrations/assignments.

More

3.1.4 Project management

The project is managed via the horizontal bar below the 3D viewer:

Status bar

Tabs

Info line

Actions

Upper Jaw

3D scan in progress...
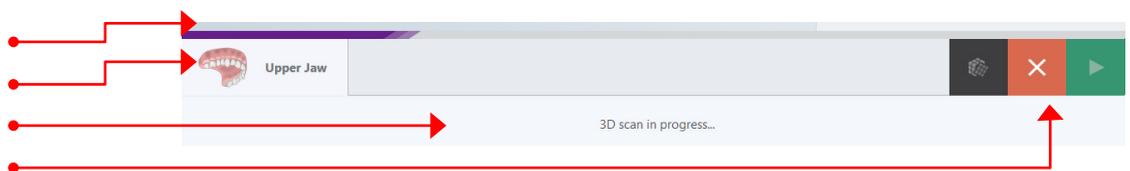
Status bar

— It displays the current progress of the data processing.

Tabs

— One tab per scan (number according to the project definition).
— Some tabs are assigned to another tab at the end of the workflow (additional scan, correction scan, multiDie).

Info line

— Instructions for the next step,
— Orientation on the procedure.

Actions

— Possible alternatives to end the processing step (e.g. matching, next, cancel).

3.1.5   Program window in the standby mode

When a project is finalized/closed, dental Scan goes into the standby mode (background readiness).

Opening the program window in the standby mode

▷ Double click the desktop icon of dental Scan.
  OR:

▷ Open the program window from the Windows taskbar:
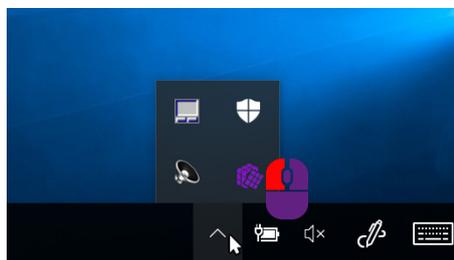
2. Click on 🔷 to open dental Scan.

1. Click on **^** to open the hidden icons again.

💡 **TIP**

Opening from the taskbar is faster if you pin the icon of dental Scan to the taskbar in the Windows settings.

Ending the standby mode

Allow standby mode

📑 70

1. Right click the icon of dental Scan for in the system tray.
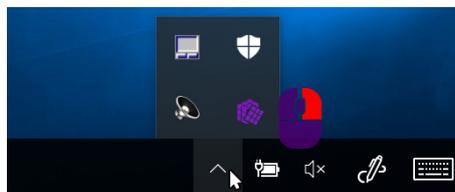
2. Select **Close** in the context menu.

✓ dental Scan is closed.

3.2 Workflows

A workflow is a defined sequence of work steps (scans, matching and, if necessary, registrations) based on the project definition (divided into individual tabs in the project management).

dental Scan arranges the necessary tabs in a meaningful order according to the project settings.

Guided workflows

There is a guided workflow for every project. The work steps are processed and completed in a specified, meaningful sequence.

The guided workflow is mandatory for the following scan modes: Baltic Denture, Triple Tray®, Twin Tray.

More

Free workflows ("IndepenDent mode")

🎓 www.smartoptics.de
University | dental Scan |
IndepenDent mode

Depending on the selected scan mode, a guided workflow ("IndepenDent") can be modified. A different scanning sequence is possible.

1. Click on the tab that you want to fill (even if only one is available, e.g. with multiCase).

▶ 2. Click on "Next".

✓ A tab dialog asks for the insertion of a scan object.

Tab processing symbol

Upper Jaw ✔	Mushbite	Gingiva-UJ	Situ-UJ

No symbol   — No scan data available

— Scan data available, but not matched

✔   — Scan data available and matched

4   Project definitions

A project definition specifies what and how to scan.

dental Scan saves the data in the project management file (SOP):

— **Patient**

Comprehensive dental project definition for all indications (jaw models, impressions).

— **multiCase**

Dental project definition for individual stumps.

— **Orthodontics**

Dental project definition for orthodontic indications (jaw models).

— **Universal**

General project definition for many objects.

The project definition **Patient** is proposed by default.

The default value can be changed.

exo   Alternatively, scan projects can be defined in a CAD system, e.g. exocad® DentalCAD.

4.1 Basic data

The basic data are entered when the project is set up and cannot be modified afterwards.

Basic data (dental)

Project definitions
Patient
multiCase
Orthodontics

Project definition

Patient	multiCase

Project ID   2021-11-30-161444
Dentist   Dent, Max
Patient   Smith, John
Notes

Basic data from exocad

In dental Scan, the basic data of an exocad® project must remain unchanged to keep the consistency with the exocad® data.

Project definition

Patient	multiCase

Project ID   2021-11-30_00002-001
Dentist   Doe, John
Patient   Rita Test
Notes

Project ID

dental Scan automatically assigns a unique, non-changeable project ID.

Format
YYYY-MM-DD-hhmmss (time stamp consisting of year-month-day-time).
The project ID can be expanded to include the patient name or project name.

In exocad® projects, the exocad® ID is added instead of the time, e.g. **87612-001_Smith-John**.

Dentist and patient

In dental projects, dentist and patient are optional data used to assign the project to a treatment case.

The fields are not divided so that you can structure the names as you wish, e.g.:

— [Title] [First name] [Surname].
— [Surname] [First name].

exo Names from ® projects are adopted according to `defaultsettingsDB`.

Comment

The comment can contain discretionary processing instructions or additional information (≈ 30,000 characters).

Example **multiCase project with tooth models belonging to several patients**
Comment: Number–Name–Tooth position:

exo In the exocad® DentalDB, the corresponding field is called "Comments".

Project name (universal projects)

A project name must be entered (maximum 204 characters, letters, numbers, special characters).

4.2 Texture scan

Project definitions:
Patient
multiCase
Universal
Orthodontics

Texture scans are used to add markings to the surface of a scan object in a scan. A model cast prosthesis, for example, can be precisely designed along a scanned contour line using the SilaPart® CAD system.

Depiction of textures in the 3D viewer:

monochrome
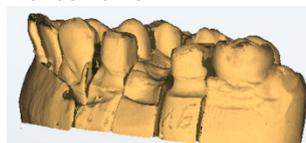
colored
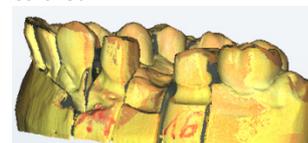
The monochrome or colored texture scan can be enabled in the project definition as a suggested value, as well as in the tab dialogs.

NOTICE

▷ Markings on preparation lines affect the measurement accuracy. Only place marks in areas that are not relevant to the fit.

▷ Optimized texture scans generally have the effect of smoothing the edges, for example of fissures and ridges. To obtain full edge definition, smart optics recommends non-optimised texture scans.

More

4.3   Starting a project

Before starting a scan, the project definition must be entered fully and correctly.

✔ Start

▷ Click on Start.

✓ The project definition can no longer be modified.

More

4.4   Patient project definition

🎓 www.smartoptics.de
University | dental Scan |
New project

The **Patient** project definition is suitable for all upper and lower jaw dental technical indications. It is characterized by the combination of indications for individual tooth positions, scan mode and presentation mode.

More

4.4.1   Indications for tooth positions in the upper and lower jaw

Dental indications are a prerequisite for the design of a dental prosthesis. You must select the preparations and options necessary for scanning.

dental Scan color codes

Tooth 23 🗑

Preparation
- ◉ Stump
- ○ Pontic
- ○ Inlay/Onlay
- ○ Veneer
- ○ Implant
- ○ Neighbor
- ○ Antagonist
- ○ Missing tooth

Options
- ◉ Aesthetic Plate
- ◉ Situ
- ◉ Gingiva
- ◉ WaxUp

Color codes

| Stump |
| Pontic |
| Inlay/Onlay |
| Veneer |
| Implant |
| Neighbouring tooth |
| Opposing jaw |
| Missing tooth |

Option symbols

X   Aesthetic template

*   Situ

°   Gingiva

+   Wax-Up

Displaying and hiding

▷   Click on any tooth position/a place outside the tooth chart.

✓   **Preparations** and **Options** are alternatively displayed and hidden.

Assigning the indication to a tooth position

▷   Click on the tooth position to which you want to assign an indication and on the desired indication.

✓   The tooth position is colored in the color of the indication, e.g.:
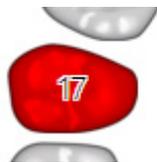
▷   To initiate a scan of an aesthetic template, situation model, gingiva or wax-up, click on one or several options.

✓   The option symbols appear next to the position number, e.g.:
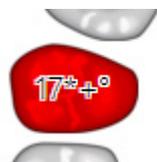
Individual copying of an indication

1. Assign an indication.

2. Hold the CTRL key.

3. Click on the next tooth position.

✓ The tooth position is colored and marked like the first one, e.g.:
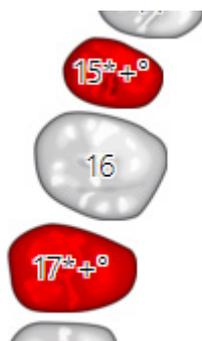
Copying an indication to several positions

1. Assign an indication.

2. Hold the SHIFT key.

3. Click on the last tooth position in the series.

✓ All tooth positions in the series is colored and identified in the same way, e.g.:

Deleting an indication

1. Click on the tooth position whose indication you wish to delete.

2. Click on the "Recycle Bin".

✓ The indication and the options are deleted from the tooth position.

3. To delete only the indication and not the option (or the other way round), click on the current indication, e.g. "Implant", or on the option, e.g. "Situ".

Example: Deleting the "Situ" option from tooth position 16
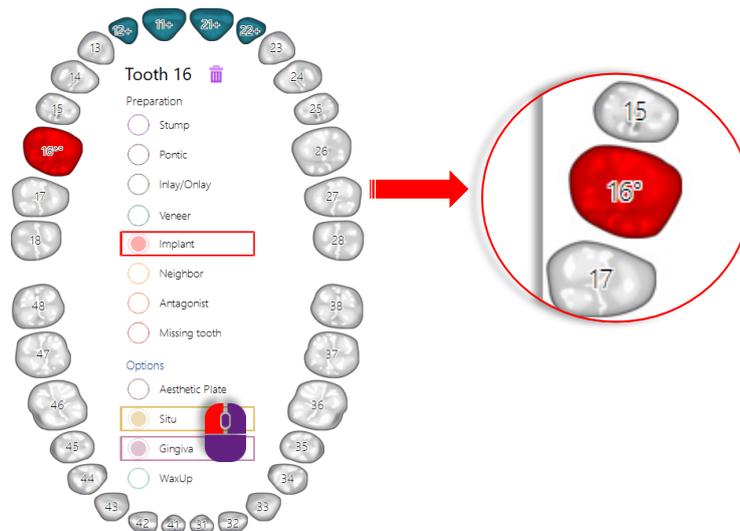
4. To delete the indication/option from another tooth position, hold the CTRL key and click on the next tooth position.

5. To delete the indication/option from a series of tooth positions, hold the SHIFT key and click on the next tooth position in the series.

Modifying an indication

1. Click on the tooth position.

2. Click on the new indication.

✓ The color and marking of the tooth position changes accordingly.

✓ An option is adopted for the new indication.
  If necessary, delete the option manually.

4.4.2 Scan modes of the "patient" project definition

The scan mode defines the workflow of the data to be recorded based on the indications.

Single model

Indications must exist for one jaw. The indication "Opposing Jaw" is possible for the other jaw to add a squeeze bite scan.

Two models in occlusion

Scan mode for models that are not articulated (vestibular scan without condylar reference).

Articulator [...]

8

An articulator can be used for the vestibular scan of articulated models. The scan mode must be suitable for the articulator. The scan of the physical articulator can be replaced by auto articulation.

The following articulators are scanned with a condylar reference:

ARTEX®; ARTEX® CN; PROTAR®; SAM® 1+2; SAM® 3+NEO; REFERENCE®; ARTIST/ARTO®; DENAR®.

Those articulators that have been specifically configured for your system in dental Scan can be selected. The scan mode "Articulator" (medium-quality scan) should be used for non-configured articulators.

To add an articulator, please contact your smart optics reseller.

NOTICE

▷ If the scan mode does not match the articulator, the results of the measurement is inaccurate. Select the articulator you are using or "Articulator" (medium-quality) as the scan mode.

Impression – two impressions in occlusion

The scan mode "Impression" is for single impressions; "Two impressions in occlusion" is for a workflow with a vestibular scan.

The "Impression" presentation mode must be assigned to at least one jaw.

An impression scan is not possible with the indication "Implant".

exo

exocad® projects with indications in the posterior region and the scan mode "Digital impression" can be scanned in dental Scan with the scan modes "Impression" or "Triple Tray®".

Triple Tray® (impression)

8, 67

The Triple Tray® module (activated) and the Triple Tray® impression holder are required.

An impression scan is not possible with the indication "Implant".

Indications (with the exception of Implant) can be for the posterior or anterior region. It is not possible to select a presentation mode.

Twin Tray

Scan mode for Twin Tray models from the manufacturer Klasse 4 Dental®
with an indication in the posterior region for the upper and lower jaw
(maximum 5 positions, except for Implant).

You need the universal plate and the 4 teeth bar to isolate segments.

8   It is not possible to select a presentation mode. The upper and lower jaw as
well as individual, presented segments are scanned in a single step.

Baltic Denture

www.baltic-denture-system.de

Scan mode for the production of full prostheses with the full solution Baltic
Denture System®.

You need a ^{BD}Key® with press fastening (Baltic Denture accessory) and a
8   ^{BD}Key® holder with a bottom impression holder (scanner accessory).

The indication "Missing Tooth" must be assigned to at least one tooth
position in the upper and lower jaw. It is not possible to select a
presentation mode.

The workflow with the scan mode **Baltic Denture** is not suitable for other
full denture systems.

exo   **Design of a full dental prosthesis with the exocad® module Full
Denture**

▷   Combine the indication "Full Denture" with an articulator scan mode in
exocad® DentalCAD.

The exocad scan modes "Two Plaster Models, in Occlusion" or "Digital
Impression" are not suitable for exocad® Full Denture.

Note on Triple Tray®, Twin Tray and Baltic Denture

NOTICE

▷ The scan modes Triple Tray®, Twin Tray and Baltic Denture require a
lot of computing power and memory. The PC must comply with the
recommended system requirements for dental Scan.

Processing

IndepenDent Mode:	— Not possible: Scans must be processed in the specified order.
Load project:	— Not possible: Projects must be processed and finalized without interruption.
Automatic cutting plane:	— Not possible, only manual cutting.

General note on full dentures

There is no scan mode available for full denture systems other than Baltic Denture. The following project definition is possible:

Preparation:	Missing tooth (one tooth suffices)
Option:	Aesthetic template (optional)
Scan mode:	— Impression
	— Jaw model
	— Articulator
	— Two impressions in occlusion
	— Two models in occlusion

The option **Aesthetic template** changes the order in the guided workflow: Aesthetic template, vestibular scan, upper jaw, lower jaw.

4.4.3   Upper jaw/lower jaw presentation "patient" project definition

The presentation mode is the method with which individual segments from the upper and lower jaw are presented.

📑 76, 27   secondDie is suggested by default. The preferred presentation mode can be set and changed individually when a jaw model is inserted.

singleDie

— Presentation mode for each individual segment in the jaw model.
— Requires several scans.

secondDie

📑 33   — Standard presentation mode in dental Scan.
— Scans every second segment in the jaw model.
— A maximum of two scans is required.
📑 38   — With 2D scan.

multiDie

8, 67

— Presentation mode for a maximum of 16 stumps per jaw (with two presentations).
— Scan of the segments without model base.
— Accessories: multiDie adapter.
— Activated module "multiDie/multiCase".

Complete jaw/complete jaw fast

— Presentation mode for jaw models without segment presentation.
— Suitable for opposing jaws, situ models, archiving.
— "Complete jaw fast": fewer single images (PCM), reduced quality, higher scanning speed.

Impression

— Special presentation mode for impressions.
— Expansion for the scan mode "Impression".

4.5   multiCase project definition

The **multiCase** project definition is used to scan individual segments without a model base. The segments (1 – 12) can belong to different treatment cases.

8, 67

A multiDie adapter is required for multiCase projects.
The "multiDie/multiCase" module must be activated.
The slots of the multiDie adapter are numbered:
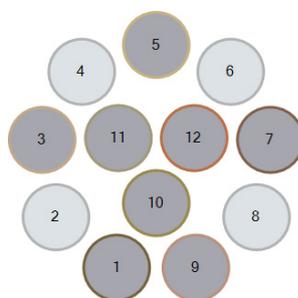
▷ Click on the slots that you want to occupy in whatever order you wish. You can click them again to clear a mark.

✓ The marked slots turn dark grey.

exo **The following applies to exocad® projects:**

— "multiDie Practice" is displayed in the field **Dentist**.

— No exocad® slot labels are displayed (data is saved in the project file (*.SOP)).

4.6   Universal project definition

The **Universal** project definition is intended for solid, opaque objects the size of the measuring field, e.g. tools, jewels, toys or figures.

Universal scans do not have a defined workflow. At least two scans are required for a complete 3D model (360° representation). Additional scans can be created individually and combined with the first scan.

4.7   Orthodontics project definition

The **orthodontics project definition** is intended for orthodontic indications and is therefore limited to complete jaw scans (individually or in occlusion).

Impressions cannot be scanned in orthodontics projects.

"Complete jaw" is specified as the presentation mode and cannot be changed in the project definition.

4.7.1   Orthodontics project definition scan modes

The scan mode determines an orthodontics project.

1. Start by selecting a button Upper Jaw, Lower Jaw or Upper and Lower Jaw.

scanBox: No option

2. For Upper and Lower Jaw:
   Specify the occlusion method in the **Scan Mode** field.

Single model

— The only scan mode for Upper Jaw or Lower Jaw without occlusion.

Two models in occlusion

— Suggestion for Upper and Lower Jaw,
— Suitable for non-articulated models (without condylar reference).

Articulator [...]

22 See "Patient" project definition, scan mode Articulator [...]

5   Tab dialogs

When starting a workflow or when selecting a tab ("IndepenDent Mode"), dental Scan asks you to insert a scan object into the scanner.

5.1   General functions in the tab dialogs

All tab dialogs have the same structure:
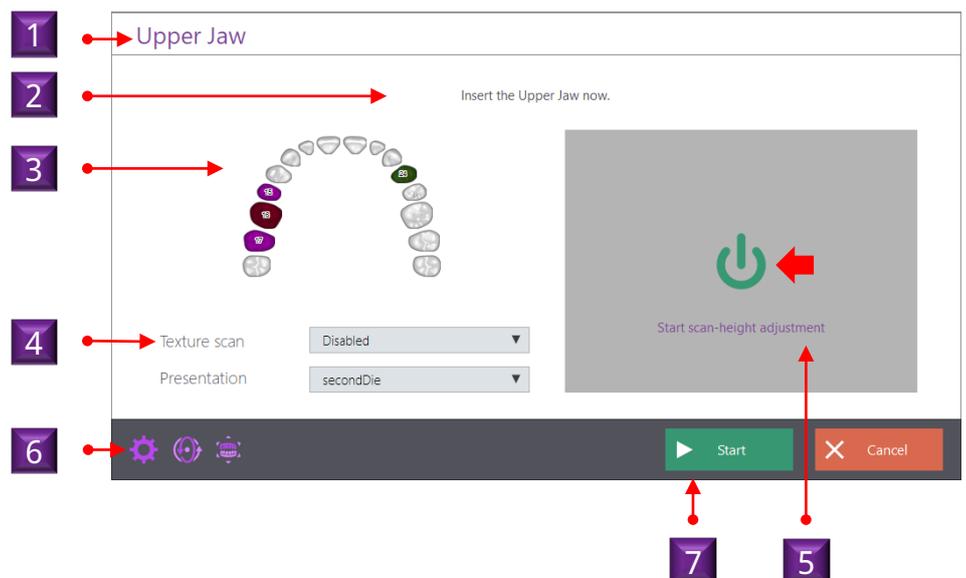
Glossary 87

1. **scan object**: What is to be scanned?

2. **Instruction:** What should you do with the scan object?

3. **Project information**: What indication was defined?

4. **Project properties:**

   4.1 Should textures be scanned on the scan object?

   4.2 How should the presentation be done?

5. **Determination of the scan height:**
   What is the optimal height of the scan object in the measuring field?

6. **Scanner control:**
   Settings, service position, global scan strategy, HR mode.

7. **Dialog control:** How do you wish to proceed?

Texture mode

— 77 — Suggested value adjustable, can be selected for each scan.

— 9 — **Monochrome** (single color) is always possible; **Color** (polychrome), texture scans with certain scanners.

Presentation

— Can be selected in dental tab dialogs.

— Scanning without presentation with "Complete Jaw" or "Complete Jaw Fast".

Settings

— 69 — Open the settings to change relevant values before the current scan, e.g. the type of plaster, the scan quality for a specific dental indication or the cutting filters.

Service position

— 61 — Execution of the "Service position" (resetting the axes) function.

Globalscan strategy ("Enhanced mode")

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University | dental Scan |
Enhanced Mode

ON / OFF

Toggle switch in dental or orthodontic tab dialogs:

— determines the number and perspective of the camera images (PCM files)

— simple enhanced mode strategy ("OFF"), e.g. 13 images (PCM files) for a complete jaw,

— extended enhanced mode strategy ("ON"), e.g. 24 images (PCM files) for a complete jaw.

— Simple (OFF) is enabled by default.

— Extended (ON) is useful for complex scan object and dental indications.

Procedure

1. Click the OFF icon.

2. Start the scan.

✓ The scan is carried out once with an extended enhanced mode strategy. "ON" is not saved.

💡 **TIP**

The file names in dental Scan projects indicate which Globalscan strategy was used to scan, e.g.: `2019-07-03-101351-upperjaw_#A190703101459_GlobalEnhanced_w90h-60.pcm`

HR mode

— Toggle switch, available on scanners with high-resolution cameras

— HR enabled (ON): highest resolution of the scanner camera, more precise results, longer scan times.

ON / OFF

Procedure

1. Click the OFF icon.

2. Start the scan.

✓ The scan is carried out once with a lower camera resolution and a shorter scan time. "OFF" is not saved.

NOTICE

▷ The HR mode requires a lot of computing power and memory. Use a PC that meets the recommended system requirements for dental Scan.

Start | Cancel

▶ A tab dialog can be confirmed with **Start** or **Next** if the scan object is positioned inside the scanner and the settings are correct. The result is displayed in the 3D viewer of the tab.

✕ A tab dialog can be cancelled without editing the task (scanning, presentation). The tab remains empty. You can cancel the scan if, for example, the project definition was created incorrectly.

Skip | Repeat scan | Check and rescan

Actions for singleDie and secondDie presentations:

▶ Skip

↻ Repeat

⊕ Rescan

— Proceed to the next step without presentation.
  This results in a lack of 3D data.
— Rescan the last scanned segments.
— View the last scanned segments in the 3D viewer and rescan if
  necessary.
— Not possible after the last presentation.

5.2   Determination of the scan height

Depending on the scanner, the scan height can be determined individually.

Scanners with unchangeable scan height

1. Shorten or increase the base height of the models.

2. Compensate for small differences in height with adhesive pads.

Scanners with automatic Z axis

🎓 www.smartoptics.de
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Z axis control

The Z axis is moved to an average height depending on the object. You can determine the scan height individually by means of the live image.

You can repeat the following process as often as you like:

1. In the live image, click on **Start scan height determination**.

✓ The scanner moves the Z axis 45° towards the camera.

The live image now shows the front of the scan object. A dashed white contour line marks the standard Z focus plane. This line cannot be moved and always lies in the centre of the image.
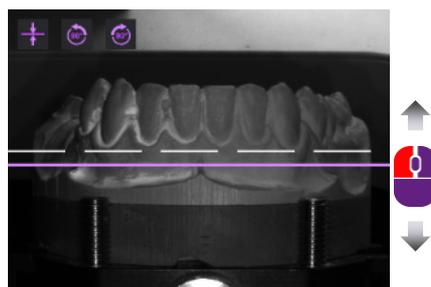
2. To change the scan height, move the mouse over the image.

✓ A purple line follows the mouse. Outside of the measuring field, the line turns red (= position not possible).

3. Click when the purple line is in the centre of the area to be scanned.

4. The scanner moves the scan object to the new height. The dashed white line now is at the desired height.

5. To turn the scan object 90° to the left or right, click on the 90° icons.

✓ The dashed white line must be perfectly centred in the area to be scanned.

6. To reset the scan height to the default, click "Undo".

5.3 Inserting a jaw model

Upper jaw

Lower jaw

After selecting a tab, dental Scan asks you to insert the corresponding jaw model. The tooth chart is displayed according to the project definition.

Information on inserting can be found in the Operating Manual.

More

5.4 Inserting models in occlusion

The tab dialog depends on the scan mode and the scanner. A vestibular scan follows for bite registration purposes follows in all cases.

5.4.1 Two models in occlusion

Vestibular

Auto articulation 32

Scan mode: "Two models in occlusion"

After selecting the tab, dental Scan asks you to insert the non-articulated models together.

Information on positioning can be found in the Operating Manual.

5.4.2   Articulator

Vestibular

Scan mode: "Articulator […]"

The articulator scan with a physical articulator requires a scanner from the Vinyl series and achieves a result with a condylar reference.

The scan mode "Articulator" achieves an average-quality result.

💡 **TIP**

A different articulator system than in the project definition can be selected in the tab dialog.

Insert the articulator

Auto articulation 📄 32

After selecting the tab, dental Scan asks you to insert the articulator.

Scanning

1. Follow the software instructions.

✓ After the articulator scan, dental Scan asks you to remove the articulator.

2. Comply immediately with this instruction.

❗ **NOTICE**

▷ Incorrectly positioned articulators can slip off the system plate and cause damage to the device or the scan object. Insert and remove the articulator immediately when prompted.

5.4.3   Auto articulation

The auto articulation is:

— a calculation of the vestibular scan based on the scans of the upper and lower jaw
— possible with models and full impressions
— available with all scanners

The upper and lower jaw must have been scanned previously. A scan of the occlusal model or articulator is not necessary.

Prerequisites

Scans:	The scan of the upper and lower jaw has been performed.
Occlusion:	Occlusion is suitable for auto articulation.

1. Start the auto articulation.

✓ dental Scan matches all tabs and calculates the occlusion.

2. Please check whether the occlusion was calculated correctly. If not, cancel the process and repeat the auto articulation. A manual alignment is not possible.

Possible causes of errors

— The occlusion is not suitable for auto articulation. Carry out a vestibular scan (with an occlusal model or an articulator).
— The wrong articulator was selected as scan mode. Define a new project.

More

5.5   Presentation segments (singleDie or secondDie)

A presentation of individual segments (including implant segments) is used to scan the interdental areas. The presentation starts automatically after the jaw scan or scan body scan.

singleDie: Scan of every single tooth position
secondDie: Scan of every other tooth position, a maximum of two scans for one jaw

1. Remove any teeth that are not listed or color-coded.

2. With Next, the presented stumps is scanned and added to the scan of the jaw model.

5.6   Presentation segments (multiDie)

A presentation of individual segments is used to scan the interdental areas (not possible for scan body segments). The presentation starts automatically after the jaw scan.
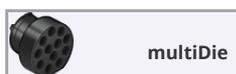
multiDie

A new **multiDie** tab is displayed in the project.

Scanner accessories: multiDie adapter.

Insertion of tooth models

▷ Insert the required segments into the multiDie adapter:

— 1 − 3 segments: Slots 2, 5 and 8
— > 3 segments: You can select the slots freely

TIP

Recognizing the positions of the slots on the multiDie adapter:
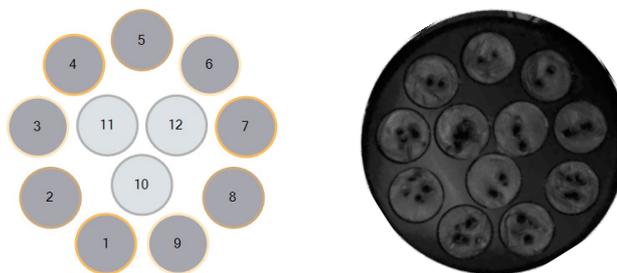
5.7   Inserting multiCase segments

When starting a multiCase project, dental Scan requests the insertion of the multiCase adapter.

Insertion of tooth models

Scanner accessories: multiDie adapter

▷   Use the slots marked in dark grey. You can arrange the segments in any order you like. Leave space between the segments.

✓   Slots marked in light grey are not scanned.

5.8   Inserting an impression

Upper jaw

Lower jaw

Scan mode: "Impression"; "Two impressions in occlusion"
Presentation: "Impression" for one or both jaws

"Impression", "complete jaw" or "complete jaw fast" is possible for the opposing jaw. A jaw scan with the presentation of individual segments is not possible.

Scanner accessories: universal plate

Inserting the impression

After selecting the tab, dental Scan asks you to insert the universal plate.

5.9   Inserting a Triple Tray® impression

🎓 www.smartoptics.de
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How to do a Triple Tray®
Impression Scan

Inserting a Triple
Tray® impression

When starting a project with the scan mode Triple Tray®, dental Scan asks you to insert the impression of the upper jaw.

Scanner accessories: Triple Tray® impression holder

▷ Insert the requested impression facing up.

✓ The top is scanned.

For the opposing jaw, dental Scan asks for the other side of the Triple Tray® impression.

The workflow is guided (predefined sequence, mandatory completion).

> **NOTICE**
>
> ▷ The scan mode Triple Tray® requires a lot of computing power and memory. Use a PC that meets the recommended system requirements for dental Scan.

More

5.10   Insertion of a ᴮᴰKey®

🎓 www.smartoptics.de
University | dental Scan |
How to Scan Baltic Denture

Inserting the ᴮᴰ Key

When starting a project with the scan mode Baltic Denture, dental Scan asks you to insert the ᴮᴰKey®.

Scanner accessories: ᴮᴰ Key® holder, impression holder Triple Tray® (bottom part)

1. Attach the ᴮᴰKey® with the ᴮᴰKey® Lock (Baltic Denture accessory).

2. Fasten the ᴮᴰKey® inside the ᴮᴰKey® holder on the bottom part of the impression holder, with the upper jaw side up.

✓ The top is scanned.

3. When dental Scan asks for the lower jaw, turn the ᴮᴰKey® holder.

The workflow is guided (predefined sequence, mandatory completion).

More

5.11 Inserting a Twin Tray model

🎓 www.smartoptics.de
University | dental Scan |
How to Scan Twin Tray

Inserting a
Twin Tray Model
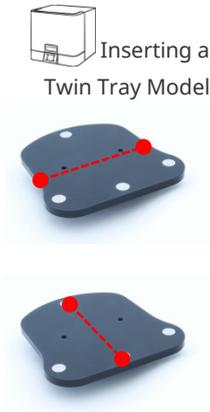
When starting a project with the scan mode Twin Tray, dental Scan requests the insertion of the closed twin tray model to proceed with the vestibular scan.

Scanner accessories: 4 teeth bar, universal plate

1. Fasten the Twin Tray model crosswise on the universal plate. This allows you to adjust the scan height better.

✓   After the vestibular scan, dental Scan requests the insertion of the open model and the segments.

2. Fasten all parts lengthways on the universal plate. Place the 4 teeth bar in the middle, even if there is no segment to be presented.

The workflow is guided (predefined sequence, mandatory completion). Rescans are possible, bur cutting only after registration and matching.

NOTICE

▷ The scan mode Twin Tray requires a lot of computing power and memory. Use a PC that meets the recommended system requirements for dental Scan.

5.12 Squeeze bite, gingiva, wax-up, situ, scanbody

Project definition
Patient

Gingiva
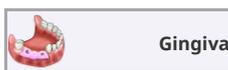
Gingiva

In addition to a jaw scan, further tabs are displayed in the project for the corresponding indications.

⸺ **Aesthetic template**
for toothless jaws
⸺ **Squeeze bite**
as a representative of the opposing jaw in the scan mode "Single Jaw"
⸺ **Gingiva**, **Wax-up** and **Situ**
for segments with the corresponding identification

After selecting the tab, dental Scan asks you to insert the jaw model with the appropriate addition.

Scanbody scans

For the preparation "Implant", dental Scan requests an additional jaw scan (with scan bodies) and a presentation of the implant segments with scan body.

▷ Attach the scan bodies according to the instructions of the manufacturer.

More

5.13   Inserting a universal object

Inserting Objects
(Universal Mode)

When starting a universal scan, dental Scan asks you to insert an object (item).

Title of the tab dialog = Project name

Scanner accessories: Universal plate

▷ Fasten the universal object securely and motionless on the universal plate.

✓ The universal object must lie completely within the measuring field, the side to be scanned facing up.

More

5.14   Inserting a correction model

When starting a correction scan, dental Scan asks you to insert a correction model.

▷ Remove all those segments that are not needed for the correction from the correction model.

✓ The purpose of the correction scan is to replace defective parts of another scan.

More

6 Workflow functions

6.1 2D scans for presentations

A 2D scan is a black and white photo seen from above. The 2D scan is used to mark the exact position of all indexed teeth. dental Scan requires a 2D scan for the preparation of 3D jaw scans (presentation mode secondDie, singleDie).

2D scan with markers

In the photo, boxes mark the estimated position (colors according to the indication, neighbouring segments connected by a line).

💡
📄 69
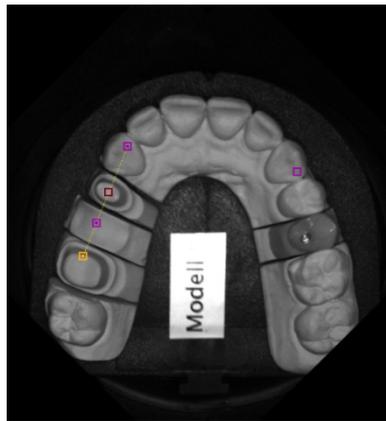
TIP

Allow the tooth numbers to be displayed as a guide.
The boxes allow you to see which stump needs to be presented (filled = presented; not filled = not presented).
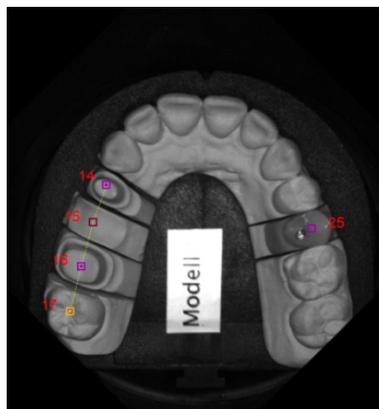
If you change the setting with the 2D viewer open, click the photo to refresh the view.

Moving all markers

This method is used for the rough alignment of the entire positioning.

1. Click with the right and left mouse button together on any box and keep both mouse buttons pressed.

2. Drag the markers to the correct position in the photo.
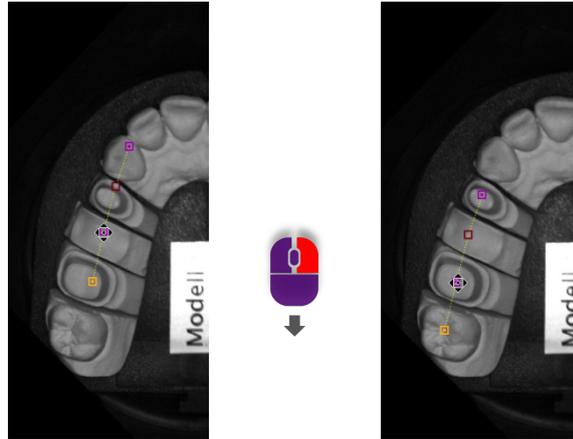
3. Release the mouse button when the target position has been reached.

✓ All markers are moved.

Moving individual markers

This method is used for the precision alignment of individual markers.
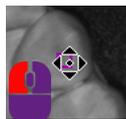
1. Click with the left mouse button on a marker and keep it pressed.

2. Drag the marker to the correct position in the photo.
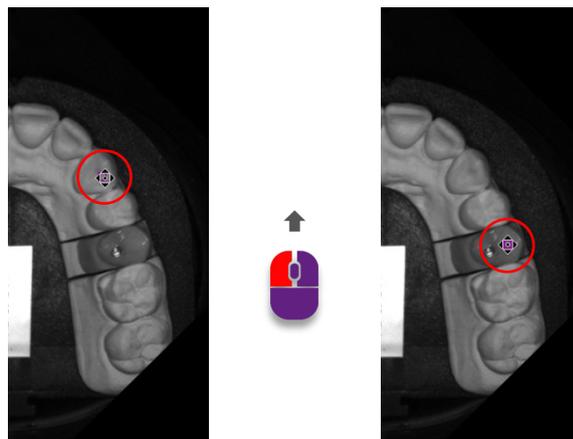
3. Release the mouse button when the marker in the photo is on the centre of the tooth.

6.2 Registration and alignment

Alignment (combination)

Several scans can be wholly or partially combined, e.g. a universal scan can be combined with an additional scan to form a complete 3D model.

Registration

The relative position of two scans to each other is determined, e.g. the position of the upper and lower jaw with a vestibular scan (bite registration).

Automatic calculation

If there is enough data available, dental Scan calculates the registration or alignment/assignment automatically.

Manual alignment

If there is not enough data available for an automatic calculation or if the automatic calculation needs to be corrected, manual alignment is carried out.

6.2.1 "Assignment" tabs for registration and alignment

Method
✔ possible
— not possible

Tab	Function	Automatic	Manual
Vestibular	Vestibular scan (bite)	✔	✔
Registration	Scan mode Baltic Denture (bite)	✔	—
Registration	Scan mode Triple Tray®	✔	—
Registration	Scan mode Twin Tray	✔	✔
multiDie	multiDie presentation	✔	✔
Correction	Correction scan	—	✔
	Mesh combination (additional scan)	—	✔

6.2.2   Automatic registration

All relevant scans of the project must be created in order to be able to start the automatic registration, e.g. those of the upper and lower jaw in the vestibular scan (➡ info line in the 3D viewer).

▶ 1. The scans are automatically registered with **Next**. A color pattern shows whether the automatic registration was successful.

Example: Vestibular scan with and without single jaws
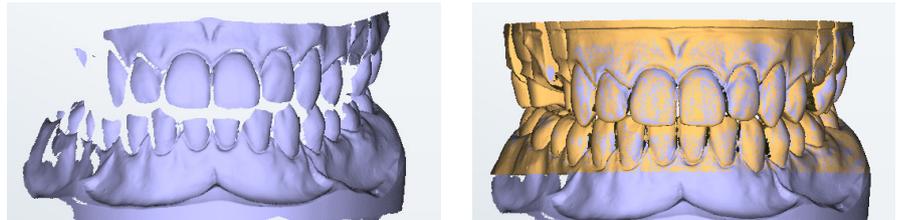
59 2. Check all sides

▶ 3. The automatic registration is saved with **Next**. All scans are matched.

Error

The automatic registration/assignment is incorrect if the preview shows an offset.

41 1. Correct it manually.

2. With vestibular scans you can repeat the automatic registration (delete matching, then start again).

More   Delete matching   45

6.2.3   Manual alignment

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Manual Alignment

dental Scan places both scans in the 3D viewer for manual alignment (assignment). Points common to both scans must be marked with a click of the mouse. After this, dental Scan recalculates the registration.

💡

TIP

71

🖱 If the functions of the mouse buttons have been changed, the following applies: Double click instead of a single left click.

1. To correct an automatic registration, left click on the scan in the preview (e.g. jaw in orange).

✓ The 3D viewer is split horizontally. The vestibular scan, for example, is displayed at the top, the jaw scan or the correction scan at the bottom.

TIP

You can enlarge the upper or lower area of the viewer by moving the dividing line while holding down the left mouse button.
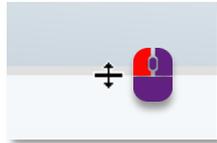
2. Rotate the scans so that the perspectives match:

— both together via the **View** menu
— individually with the mouse (click next to the scan, not on it)

3. Mark the same point above and below with the left mouse button.

✓ The points appear marked in color. Pay attention to precise positioning.

4. You can refine the alignment:

— CTRL key + left mouse button for further markings (maximum six in other colors)
— Click once on a position to move the closest marker there
— Press the DEL key to delete the mark

5. Click on Next.

✓ After the calculation, the 3D viewer shows a two color preview. Repeat the steps to make corrections.

6. Click on Next.

✓ All scans in the project are matched and the result displayed. The manual assignment is done.

More

6.3 Presentation with multiDie

multiDie

dental Scan requests the presentation after the jaw scan and temporarily adds the **multiDie** tab. Insert the segments into the adapter:

If more than twelve segments have to be presented, dental Scan requests two multiDie presentations, one after the other.

1. Insert the requested segments into the multiDie adapter:

2. Start the scan.

3. Check whether all segments were scanned correctly. If not, you can:

— make corrections (mesh processing functions)

— cancel and repeat the process.

4. Start the automatic alignment of the segments on the jaw model.

41, 59

5. Check the result from all sides. Pay attention to the colors.

6. Make manual corrections if necessary.

7. The jaw scan is recalculated with Next. The **multiDie** is closed. The presentation is ready.

Manual registration multiDie presentation

Manual registration can improve the automatic registration of the multiDie presentation per segment.

1. Click on the segment to be registered manually.

2. The 3D viewer is split (jaw scan above, segment below).

3. Rotate the jaw scan and the segment so that the perspectives match:

— both together via the **View** menu,

— individually with the mouse (click next to the scan, not on it).

4. Mark the same point above and below with the left mouse button.

✓ The points appear marked in color. Pay attention to precise positioning.

5. You can refine the registration:

Ctrl +

— CTRL key + left mouse button for further markings (maximum six in other colors),

— Click once on a position to move the closest marker there,

— Press the DEL key to delete the mark.

First marking in segment (1) and jaw scan (2):

1   2
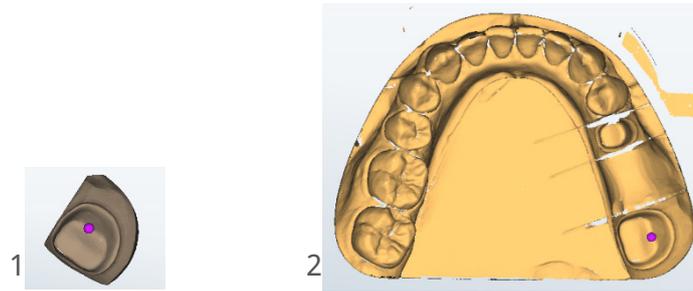
✓ Confirm the registration by clicking on Next. You can:

— register the next presented segment manually,

— end the registration with Next.

6.4   Matching and project finalization

Matching is a calculation that uses individual recordings and measured values to generate a data set in 3D data format. Matched scans display a green tick mark in the tab; unmatched scans display the matching icon.

79   There are several setting options for matching. By default, all scans are automatically matched during scanning and when the project is finalized.

6.4.1   Manual matching

You can carry out all routine work without manual matching. For special work, e.g. an additional scan or a correction scan, you have to match the corresponding scan manually.

In workflows with a vestibular scan, you can only match after the entire workflow has been completed. Then all scans are matched together.

1. Click on the tab whose scan you wish to match.

2. Click on "Matching" in the project control.

✓ Matching is calculated and the result displayed in the 3D viewer. The tab gets a green tick.

6.4.2   Delete matching

You can undo the matching of individual scans in a project.

1. Select the tab whose matching you want to delete.

2. Click on **Edit mesh** | **Delete matching** (active if the selected scan is matched and deletion is allowed).

Upper jaw

Tab with matching symbol

✓ Now you are able to edit the unmatched data. Data that has been cut after matching is restored by **Delete matching**.

✓ You can repeat the registration in a dental project with a vestibular scan.

6.4.3   Check matching (3D)

At the end of the dental workflow (**Patient** project definition with option), you can visually check the result of several matching processes in the 3D viewer.

1. Click on "Show result" in the project control. The button is displayed when all scans have been matched.

73 ✓ The 3D viewer loads all results and displays them in contrasting colors. Vestibular scan and jaw scan are separated. The colors are configurable and indicate which scan the data originate from.

2. Check the results of the matching process from all sides.

3. To exit the checking view, click again on "Show result".

4. To change a matching, click on the relevant tab. Correct or replace the scan.

✓ If everything is OK, you can finalize the project.

More

6.4.4 Finalizing the project

The completion of the project after a workflow completes all data for subsequent use in a CAD system, e.g. exocad® Dental CAD. Depending on the scan quality, the amount of data is reduced ("thinned").

1. Click on "Finalize the project".

   ✓ If there are still unmatched scans, you will receive a message.

2. To finalize the project, click on Start matching and close the software. Start matching matches without completing the project.

   ✓ All scans are matched, a 3D data file (PLY, STL (optional)) saved and the project closed. dental Scan goes into the standby mode.

If dental Scan is closed without completing the project, the scan data is not thinned. Matched data can still be used for a construction.

6.5 Replacing a scan

In free workflows, you can replace incorrect scans, e.g. a lower jaw on an upper jaw tab. All other scans are kept.

💡 **TIP**
Replacement is not possible in guided workflows.
The project has to be started anew. The scan modes affected are:
Baltic Denture, Triple Tray®, Twin Tray (all "Patient" project definitions).

1. Click on:

   — the tab you wish to replace,

   — Cancel (project control),

   — Yes in the **Restart** message.

   ✓ The existing scan is deleted. You cannot undo this action.

   ✓ dental Scan asks you to insert the scan object.

2. Follow the instructions to replace the deleted scan.

6.5.1   Replacing a vestibular scan

In the case of a vestibular scan, the scan itself may be incorrect (e.g. due to a swapped model) or also the alignment of the jaw scan with the vestibular scan.

Repeating the alignment

1. Click on Cancel:

— after the automatic alignment,
— after or during manual alignment.

✓ The alignment is removed and the original vestibular scan displayed again.

2. To repeat the alignment, click on Next.

Repeating a vestibular scan

1. Click on Cancel repeatedly until the message **Restart** is displayed.

2. The vestibular scan restarts when you click on Yes

7   Mesh processing

The **Mesh processing** menu contains correction and cutting functions for editing the 3D data networks ("Mesh").

Mesh processing opens automatically at any point in time in a workflow. Appropriate functions are active, depending on the context.

7.1   Automatic cutting plane

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University | dental Scan |
Automatic cutting plane

In the case of dental models, the model base is also scanned; in the case of universal objects, the fastening material. These components are unnecessary and must be cut. The automatic cutting plane simplifies this process.

After scanning, the cutting plane is displayed as a frame with purple points and arrows.

Vertical rotation axis →

← Height regulator

↑ Horizontal rotation axis
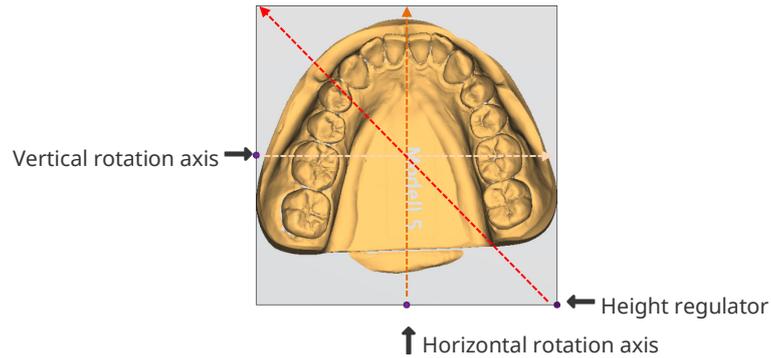
Saving the cut

Before matching

— Scan components below the cutting plane are hidden (not deleted).

Ctrl + 🖱

— The position of the cutting plane can be reset:
Press the CTRL key + the mouse wheel at the same time.

After matching

— The cut components are automatically removed and cannot be
restored.

Choosing a suitable perspective

The operation of the automatic cutting plane depends on the view in the
3D viewer. After scanning, the top of the scanned object is displayed (**Top**
view).

▷ Change the view so that the 3D viewer shows:

— the cutting plane as a trapezoid (oblique),
— the height regulator (arrows),
— the superfluous components.

Changing the cutting plane

After scanning, the automatic cutting plane cuts the model base
horizontally. The lower part of the scan is hidden.

The automatic cutting plane can be:

— lifted (to cut more),
— Lowered (to cut less),
— rotated horizontally and vertically to change the angle of the cutting
plane.

Keyboard operation

▷ Press the arrow keys to move the cutting plane up or down.

Mouse operation

Tilted view
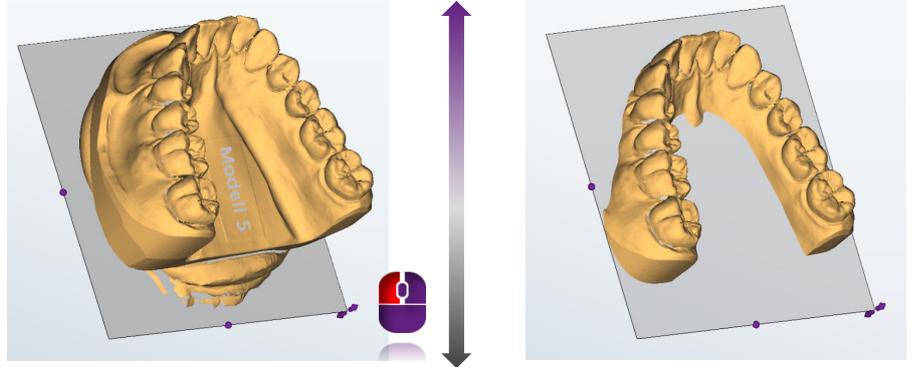
1. Click the arrows. Hold the mouse button down.

2. Move the mouse until the cutting plane is at the desired height.

View of the **right side**
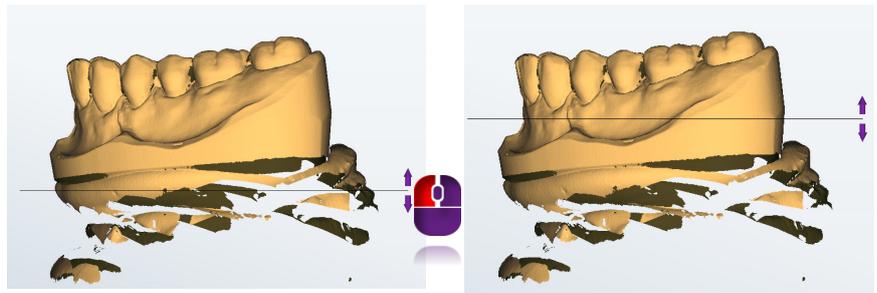
Rotating the cutting plane

The cutting plane can be rotated vertically and horizontally. This allows you to straighten scans, e.g. if the model was mounted at an angle.

When the mouse hovers over a handle, the axes of rotation are displayed as circular auxiliary lines.
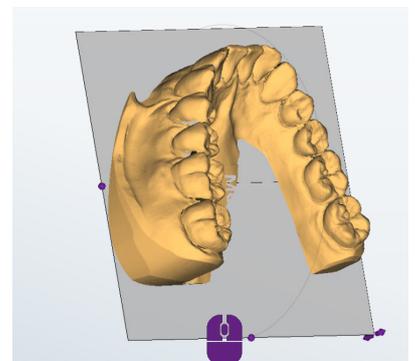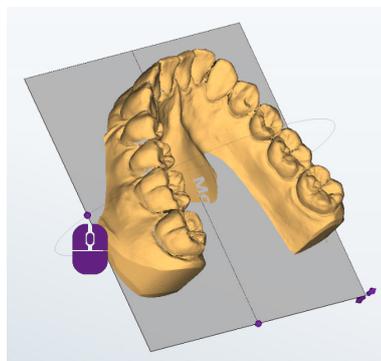
1. Click on the desired handle. Hold the mouse button down.

2. Move the mouse along the axis of rotation.

3. Release the mouse button when the cutting plane has been rotated sufficiently to cut the scan correctly. You can now change the height.

A scan can be divided by rotating the cutting plane, e.g. a whole jaw to a partial jaw.

💡 **TIP**
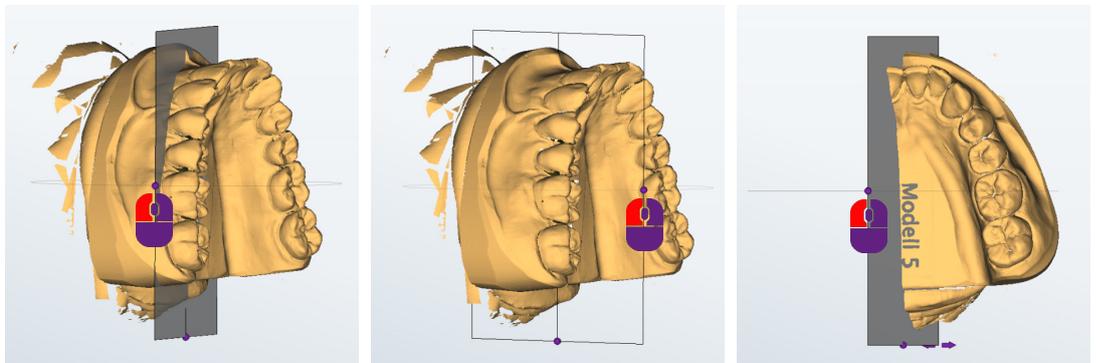
Ctrl + 🖱 — CTRL + mouse wheel ➡ Reset the cutting plane to its initial position.

7.2   Cutting

🎓 www.smartoptics.de
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Cutting Tools

✂ ✂ ✂

Cutting scans:

— removes unnecessary scan components,
— accelerates the processing time,
— reduces data size.

More

7.2.1   Cutting inside, cutting outside, cutting the surface

Cutting inside

✂ — deletes all data inside the cutting line,
— through all levels (3D).
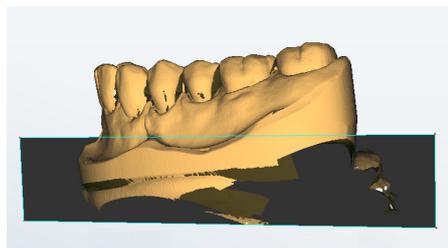
Cutting outside

— deletes all data outside the cutting line,

— through all levels (3D).

Cutting the surface

54
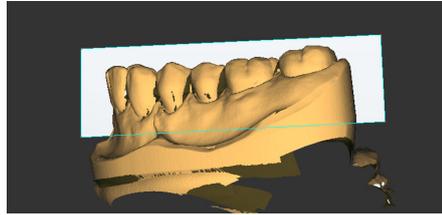
— deletes surface data inside the cutting line,

— special application: preparation of a correction scan,

— lower levels (3D) remain in place.
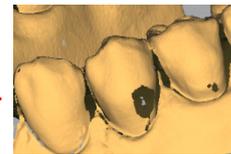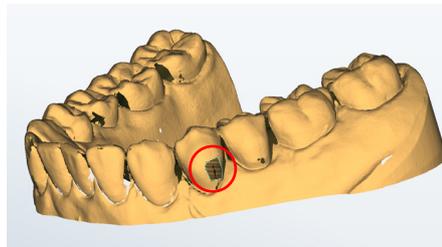
7.2.2   Cutting procedure

1. Activate a cutting function.

2. Click around the desired area. The more often, the more precise is the cutting line:
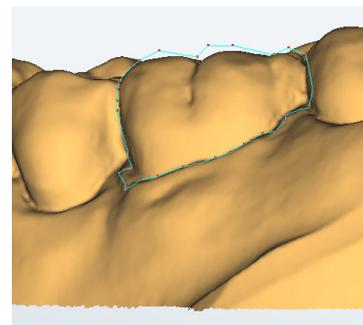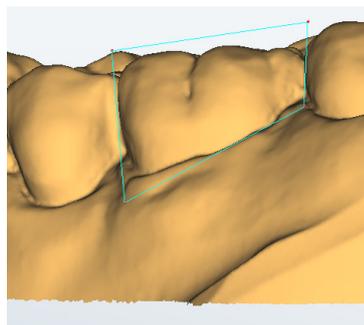
"Lasso"   You can also hold the left mouse button and drag around the desired area.

3. Finish with the right mouse button.

You can cut multiple areas, one after the other.
Saving is only necessary if:

— a rescan follows,

— the previous cuts should not be undone.

Additional functions:

Esc — delete the cutting line with ESC.

← — undo last action (possible several times).

7.3 Rescan

The **Rescan** correction function is used to "close holes" in scans. Holes appear because narrow points in the scan object (e.g. interdental spaces in jaw models) or reflective surfaces cannot be fully measured. The correction of holes is important for subsequent designs made in a CAD system.

💡 **TIP**

The result is better if the neighbouring segments are removed before the rescan.

📄 53 The function **Close holes** suffices for the documentation of complete jaw models.

The appropriate moment for a rescan is:

— previous to cutting (**Mesh processing** menu),
— previous to matching,
— previous to a correction scan.

7.3.1 Rescan procedure

The function includes **Rescan [activate]**, **Launch scan** and **Launch scan sequence**.

1. Select **Mesh processing | Rescan** to activate the function.

✓ An arrow and a crosshair is displayed in the 3D viewer. Blue areas cannot be measured from the camera perspective.
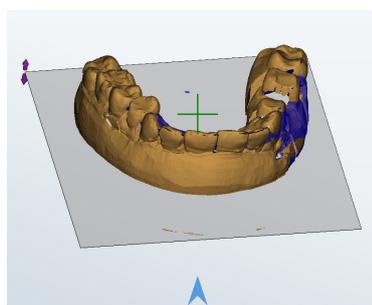
2. Rotate the scan until the desired perspective is reached (**View** menu, right mouse button). The crosshair turns red if a rescan is not possible in the displayed position.

✓ The rescan area must be visible (not invisible or blue).

3. Click on **Launch scan** or **Launch scan sequence** (three images from a slightly offset perspective).

✓ The rescan starts (axis movement of the scanner). All visible, non-blue areas are measured.
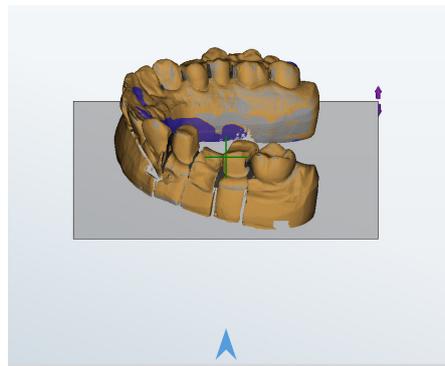
The results of the rescan is displayed in color. The rescan mode remains active.

4. Repeat this process until all areas have been rescanned.

5. Click on **Rescan**.

✓ Scan and rescan data are combined.

6. To end this process and continue, click on Next.

Additional functions:

— Undo last action (possible several times).

7.4   Close holes

Narrow points in the scan object, interdental spaces in jaw models or reflective surfaces cannot be fully measured. Those areas not measured are displayed as "holes" in the 3D viewer.

The function **Close holes** fills small, flat areas in matched scans automatically. **Close holes** is suitable for low accuracy requirements, e.g. for documentation (not for designs with a CAD system).

Close holes procedure

1. Select **Mesh processing | Close holes** (active after matching).

2. Enter the maximum size of the holes to be filled in square millimetres (suggested value 10 mm^2). The higher the value, the less precise the result.

✓ All holes on flat surfaces up to the maximum size are closed. **Undoing** is not possible. A changed value is saved until dental Scan is closed.

7.5 Correction scan

Subsequent changes to the indication or deficiencies in a scan object (e.g. bubbles, distortions) cause defective areas in a scan. Such errors cannot be corrected with the same scan object. The defective part can be replaced with a second scan object, e.g. a tooth position.

7.5.1 Correction scan procedure

1. Follow the original workflow. Match all tabs.

2. Start the correction scan workflow in the corresponding tab with **Mesh processing | Correction scan**.

Cut the surface

3. In the scan to be corrected, cut the surface of the defective area.

4. Start the scan of the correction model by clicking on Next.

✓ dental Scan adds a correction tab.

Correction

Cut outside/inside

5. Cut the correction scan to fit the correction area and the neighbouring areas.

6. When you click on Next, dental Scan splits the 3D viewer horizontally (scan to be corrected above, correction scan below).

✓ dental Scan requests a manual assignment so that the correction scan can be inserted into the scan to be corrected.

7. Rotate the scans so that the perspectives match:

— both together via the **View** menu,
— individually with the mouse (click next to the scan, not on it).

8. Mark the same point above and below with the left mouse button.

✓ The points appear marked in color. Pay attention to precise positioning.

9. You can refine the alignment:

— CTRL key + left mouse button for further markings (maximum six in other colors),
— click once on a position to move the closest marker there,
— press the DEL key to delete the mark.

10. Confirm the registration by clicking on Next.

✓ The **Correction scan** tab is closed. The original scan is corrected now.

8   Adding a scan

An additional scan is:
— a global scan,
— independent of the workflow.

In a project, the additional scan can:
— be left as is (additional tab),
— be combined with another scan.

Universal projects

In universal projects, additional scans are the only way to scan additional perspectives of the universal object. The combination of two scans creates a complete 3D model.

Patient and orthodontics projects

An alternative jaw model can be scanned in dental projects with a free workflow. An occlusion scan or an articulator scan can be completed.

Prerequisites

Universal project: The first scan has been created and matched.

Dental project: All scans (workflow) were created and match.

Additional scan types

	Which object holder is necessary?	Can the additional scan be combined (scan from the workflow)?
Single object	Universal plate/object holder	Yes
Several objects	multiDie adapter	No
Occlusion	Object holder with knurled screw	No
Articulator	Articulator	No

TIP

Alternative methods:

— replace tab (scan again),

— correct (replace) a part of a scan.

8.1 Procedure

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University | dental Scan |
Add scan

1. Select the desired type from **Add scan**.

For all project types:

— Single object
— Multiple objects (with multiDie adapter)

For dental projects:

— Occlusion
— Articulator

2. A name is suggested: **[Type] #**. Add a meaningful, clear, short description.

3. Insert the scan object.

▶ Start

4. Click on Start.

✓ The scan object is scanned and the result is displayed in a new tab.

5. Edit the scan if necessary (**Mesh Processing** tools). Match manually.

✓ The additional scan is ready.

Now you can:

— combine the additional scan with another scan,
— finalize the project.

8.2 Combine mesh

A matched additional scan can be combined with another scan of the project if the following applies:

— additional scan type: Single object;
— the dental scan itself does not consist of combined data such as a vestibular scan.

Combine mesh is also possible after loading a project.

1. Click on the Tab with the additional scan.

2. Select **Mesh Processing | Combine Mesh**.

3. In the Combine dialog, select the tab you wish to process. Only tabs that can be combined can be selected.

4. Click on OK.

   ✓ A tab with a split 3D viewer is displayed in the project (additional scan below, selected scan above).

5. Assign the scans manually.

6. Finally click on Next.

   ✓ The scans are combined: they cannot be separated again. dental Scan calculates a complete 3D model.

💡 **Tip**
— Before combining: "Mesh Processing" (cutting, rescan).
— Before the manual assignment: Rotate the scans
   Dental projects: same perspective
   Universal projects: mirrored (if the opposite side was scanned).

9 View

Under **View**, you find functions for controlling the view in the 3D viewer.

9.1 Perspective

The cube icons determine from which perspective the scan is displayed in the 3D viewer.

— The default is the **Top** perspective (bird's eye view).
— Other perspectives are temporarily activated and not saved.
— Changing the perspective is useful for visual control, cutting, and assigning.

9.2 Representation

The sphere icons determine the representation of the 3D data model.

— A change applies to all tabs as long as dental Scan is open or in standby mode.
— **Points** and **Triangles** show the geometric structures that make up the 3D representation. These representations help to analyse a 3D measurement.
— The best representation for scanning and editing is **Gouraud shading** (active by default when the software starts).

The geometric structures (points and triangles):

— are displayed correctly in matched scans, since dental Scan only calculates the 3D data model during matching,
— are very delicate and can only be seen with a high magnification (zoom).

Points

Triangles (networks)

Gouraud shading(default)
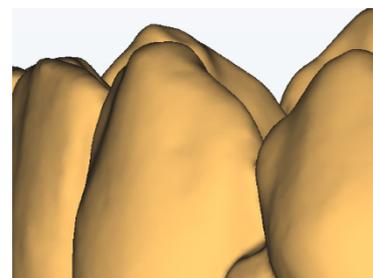
9.3   Rotating, moving, zooming

📄 74, 71

You can use the mouse to move, rotate, and zoom scans for checking or editing them.

Movements are slightly faster if the 3D objects are displayed by pixels while they are being moved (setting).

The functions of the mouse buttons can be changed.

9.3.1   Selecting the axis of rotation

Functions for determining the axis of rotation when the mouse is moved

▷ Select **View** and the desired axis of rotation.

X (longitudinal, horizontal, abscissa),
Y (perpendicular, vertical, ordinate),
Z axis (vertical relative to the X and Y axis, 3rd dimension, applicate).

✓ Scans are rotated via the activated axis (otherwise **All Axes**).

9.3.2   Rotating the scan with the mouse

1. Right click the central point of the planned rotation (inside or outside the scan).

2. Hold the mouse button down and move the mouse.

✓ The scan rotates – depending on the central point – around the activated axis.

3. Release the mouse button to finish.

✓ The rotation has finished.

💡 **TIP**

Free rotation (with standard mouse button assignment):

⇧ Shift + 🖱

— SHIFT key + mouse click ➡ fastens the scan to the mouse.
— Release the SHIFT key, move the mouse (also zooming, moving)
    ➡ The scan rotates.
— Double click to finish.

Example: Rotation around the Y axis
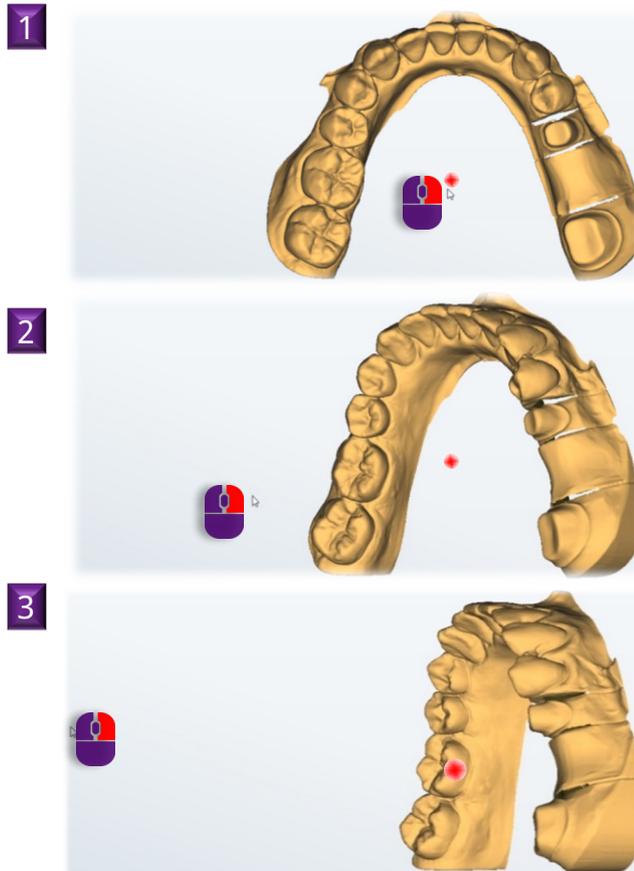
9.3.3 Moving the scan with the mouse

1. Click with both mouse buttons on the starting point of the planned movement (inside or outside the scan).

2. Hold both mouse buttons down and move the mouse.

✓ The scan follows the motion of the mouse.

3. Release the mouse buttons when the desired position has been reached.

✓ The scan has been moved.

9.3.4 Zooming the scan with the mouse

You can zoom smoothly in and out up to a maximum or minimum size.

▷ Point the mouse to any area of the software window.

To enlarge:

▷ Turn the scroll wheel towards your hand.

To reduce:

▷ Turn the scroll wheel away from your hand.

✓ Release the mouse wheel when you reach the targeted size.

10 Service position

You find **Service position** in the menu bar and in the context, e.g. in the tab dialog when starting a scan.

When inserting or removing scan objects, the axes of the scanner can move or the position of the scan object inside the scanner can change. As a result of such movements, the actual position of the axes no longer corresponds to the position that was last saved by dental Scan.

Service position corrects the position of the axes and moves them to the home position.

11 Projects

Many files are part of a scan (together: project). Under **Projects**, you find functions for managing projects.

81 Projects are saved in the work folder:

`C:\Users\[Username]\Documents\3D-Scanner\Work\[year].`

11.1   New project

After the standby mode or with the software open, a new project must be created manually. If a project is open, it is saved and closed when a new project is created.

When the software starts, dental Scan requests a new project.

More   Project definitions   15

11.2   Load project

Projects can be loaded and edited, e.g. to cut scans. dental Scan saves each project in a folder under the current work folder.

Folder and project names consist of the creation date and optionally the patient or project name.

▷   Open the desired project folder and then the project file (`.SOP`). Other file formats (e.g. `.PCM`) cannot be loaded.

✓   dental Scan asks whether work on the project should be resumed or restarted (depending on the project; dental projects with the scan modes Baltic Denture, Triple Tray® and Twin Tray must be restarted):

Resume

— All files are kept.
— Scans can be edited.

Restart

— All files except for the project file (.SOP) are deleted.
— All scans must be repeated.

Load exocad® project:

63   In dental Scan you can also load exocad® projects.

Changes to the project are possible if you open it in exocad® DentalDB. In most cases the scans have to be repeated.

exocad® projects with scans contain two project files (`.SOP` and `.dentalproject` (exocad® project type)).

1.   Open the exocad® folder, by default `C:\CAD-Data`, and then the project folder.

2.   Select the desired file format (by default `.dentalproject`).

✓   The scan data is loaded.

11.3   Save project as

Finalized projects can be archived as ZIP files.

1. Load the project that you want to archive. All scans must have been matched.

2. Select **Save project as**.

✓ A ZIP file is saved in the project folder.

3. Check the ZIP file. You can then delete the the scan data (PCM) to free up disk space.

11.4   Close project

Projects can be closed while they are being processed. The current processing status is saved and dental Scan goes into the standby mode.

Dental projects with the scan modes Impression, Baltic Denture, Triple Tray® and Twin Tray cannot be resumed after closing them.

11.5   Scanning with exocad® DentalCAD

exocad® DentalCAD and dental Scan are connected by means of an interface. Scan projects are created and processed in the exocad® DentalDB application. The workflows of dental Scan are adapted to exocad® projects.

exocad® projects are saved in the work folder of exocad® DentalCAD.
Up to version 2.2 Valletta:
`C:\Program Files (x86)\exocadFramework\CAD-Data\`
As of version 2.3 Matera:
`C:\CAD-Data\`

smart optics recommends installing exocad® Dental CAD with version 2.3 Matera or higher using the smart optics Setup.

Creating and loading an exocad® project
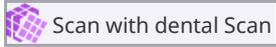
1. Create or edit your exocad® project in the DentalDB application ("exo"). Save the project.

2. Click on "Scan" to start dental Scan.

3. Follow the workflow. With existing projects, you can decide whether you want to resume or restart.

✓ dental Scan loads the corresponding data.

Correcting exocad® indications in projects

exocad® projects use the exocad® color codes and also the option symbols.

If you change the indications in an exocad® project, you have to scan again:
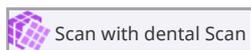
1. Correct the definition of the exocad® projects in the DentalDB application and save the project.

2. Click on Scan to start dental Scan.

3. Click on Restart in the first and second message **Load Project**.

✓ Measurements based on the old indication are deleted.

4. Follow the workflow.

Correspondence of the scan modes of exocad® and dental Scan

exocad® DentalDB (since v.2.3 Matera)	dental Scan
Two plaster models, in occlusion	Options: Two models in occlusion / Articulator / Articulator Reference® / Articulator Artist/Arto® / Twin Tray
Two plaster models, in articulator Options:	
A	Articulator Artex®
S	Articulator SAM® 3
S (alt)	Articulator SAM® 1+2
P	Articulator PROTAR®
Denar	Articulator DENAR®
Bio-Art	Articulator*
Panadent PCH	Articulator*
Panadent PSH	Articulator*
AD2	Articulator*
Digital impression	Options: — Triple Tray® — Impression

* Data processing with medium quality articulation

12   Extras

Calibration and **Settings** are important extra features.

12.1   Calibration

Calibration is a prerequisite for performing correct measurements. Calibration is mandatory after installation or an upgrade.

Recommended repetitions:

— Once a month (with automatic reminder) with:
constant, normal operating temperatures,
normal production volumes.
— Once daily with:
changing or high operating temperatures,
high production volumes,
— after transporting the scanner.

Insertion of the
Calibration Model

You need:

— a 3D calibration model,
— the object holder recommended for your scanner.

The principle of calibration

Every 3D calibration model is measured on a 3D coordinate measuring machine. The reference values are therefore very accurate.

Reference values in millimetres

#1: Cylinder height (51.45 – 53.55)
#2: Distance between the hemispheres (9.8 – 10.2)
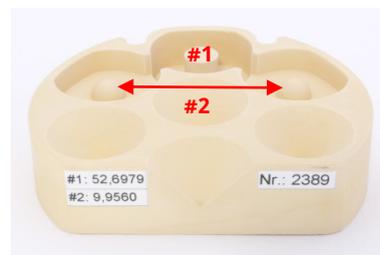
dental Scan compares the values:

Measured values — Reference values = Correction values

The calibration is successful if the new measurement matches the reference values.

Procedure

NOTICE

▷ A calibration results in inaccurate measurements if the entered values do not belong to the 3D calibration model. Enter the digits as on the label, with commas and decimal places.

1. Confirm the binding instructions for calibration or select **Calibration**.

✓ The **Calibration** dialog shows the last entered values and when the last calibration was performed.

2. Enter the values indicated on the label of the 3D calibration model into fields **#1** and **#2**:

✓ Start

3. Click on Start.

✓ dental Scan checks whether the entered values are permissible.

4. Wait for the process to finish.

✓ You are advised of its completion. If successful, you can start scanning.

Error message	Possible cause
3D calibration failed.	— The calibration was interrupted. — There is no 3D calibration model inside the scanner. — Incorrect values were entered. — The axes were not in the service position.

What to do after a failed calibration

▷ Inaccurate measurement results are likely. Therefore, you should only scan for testing purposes.

▷ Restart dental Scan and the scanner and perform the calibration again.

▷ If it fails again: Have the scanner checked by a smart optics sales partner.

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12.2　Adding an activation code

In addition to standard functions, dental Scan includes optional modules which can be activated:

8 — Virtual articulator (for the articulator scan),
— multiCase/multiDie,
— secondDie,
— Full Impression,
— Twin Tray Fastmode.

68 You can see the already activated modules or those included in the scope of delivery of your dental Scan version in the info dialog.
An activation code consists of numbers and letters, e.g.:

ABCD-EFG12-34H5

Each code applies individually to a specific module and a specific scanner. Activation codes are saved as part of the calibration data, in the file Scanner.xml.

Module activation

You receive the activation code from your smart optics reseller.

1. Start dental Scan.

2. Select **Extras | Add activation code**.

3. Enter the code.

4. Restart dental Scan.

✓ The module is available for use.

Error	Possible cause
Module not available after the code has been entered.	— Wrong code entered. — Software restart omitted. — The code is not valid for the sensor number of the scanner*.
OK not active after the code has been entered.	— More activation codes entered than allowed*.

*　Please contact your smart optics reseller with the following information:
　　dental Scan version number, sensor number and version number of the scanner.

12.3   Deleting old PCM data

PCM files (single measurements) take up a lot of storage space in the work folder of dental Scan. Only the results of finalized projects are necessary (PLY, STL files).

PCM files older than 30 days can be deleted by dental Scan.

PCM files belonging to exocad® projects are not deleted.

12.4   Info

Licence information and further information about your software version can be found in the info dialog.

Important for support cases:

— external and internal version number,
— commit (version control),
— date and time of the version,
— Activated modules.

More

13 Settings

Settings can be found in context-related manner (bottom menu bar, project definition, tab dialogs). Most changes are effective immediately. Comprehensive changes such as the display language require a software restart.

TIP

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After an upgrade or a new installation, you can continue to work with your personal settings.

More

13.1 General

13.1.1 Language

Concerns:	Software texts (operating items, info line, messages).
Effect:	Display in the selected language.
Comment:	Changing the language requires the software to be restarted.

▷ Select language and restart dental Scan.

Default value: Windows language

13.1.2 Tooth numbering system

18

Concerns:	"Patient" project definition.
Effect:	Labelling of the tooth chart:
	— FDI (Europe),
	— UNS (US).
Comment:	The tooth numbering system of dental Scan can differ from the one in the CAD system.

▷ Select your preferred tooth numbering system (dental chart).

Default value: FDI (Europe)

13.1.3 Project mode

📋 15   Concerns: Project definition.

Effect: Suggested value for creating new projects:

Patient, **Universal**, **multiCase** or **Orthodontics**.

Comment: "Patient" stands for dental projects.

▷   Select the project mode that you use most often.

Default value: Patient

13.1.4 Extended (general)

Standby mode

📋 13, 46   Concerns: Standby mode.

Effect: Standby after project completion (workflow) and

Close project (function).

Comment: Standby speeds up the software restart.

▷   Disable if dental Scan should be closed after the project has been finalized. Useful if you rarely use dental Scan.

Default value: ☑ – enabled

Go to the removal position

Concerns: Presentation (singleDie, secondDie).

Effect: The stump to be presented is moved to the removal position.

Comment: When disabled: Start at the service position.

Default value: ☑ – enabled

Use standard mouse button configuration

📄 12	Concerns:	3D viewer
	Effect:	Moving, rotating and zooming the scan with the mouse.

Default value: ☑ – enabled

By default

Rotate the scan		Hold the right mouse button, move the mouse.
Move the scan		Hold both mouse buttons, move the mouse.
Assignment		Left click.
Zooming		Turn the mouse wheel.

When disabled

Rotate the scan		Hold the left mouse button, move the mouse.
Move the scan		Hold the right mouse button, move the mouse.
Assignment		Left double click.
Zooming		Turn the mouse wheel (no change).

13.2 Visualization

13.2.1 Rendering

Smoothing

📄 12	Concerns:	3D viewer.
	Effect:	Surface smoothing of the scan.
	Comment:	Optical effect, has no influence on the 3D measurement.

▷ Select a value between 0 – 100.

Default value: 0 (OFF)

Brightness reflection

12

Concerns:	3D viewer.
Effect:	Brightness of the light reflection on the scan.
Comment:	Optical effect, has no influence on the 3D measurement.

▷ Select a value between 0 – 100.

Brightness 0
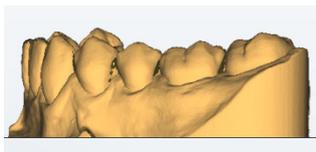
Brightness 100
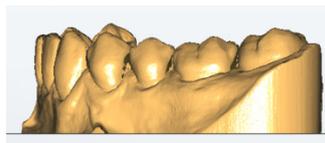
Default value: 0 (OFF)

Reflectance

12

Concerns:	3D viewer.
Effect:	Intensity of the light reflection on the scan.
Comment:	Optical effect, has no influence on the 3D measurement.

▷ Select a value between 0-100.

Default value: 0 (OFF)

Transparency

12

Concerns:	3D viewer.
Effect:	Transparency effect of the scan.
Comment:	Optical effect, has no influence on the 3D measurement.

▷ Select a value between 0.1 and 1.0.

Transparency 0.1

Transparency 1.0
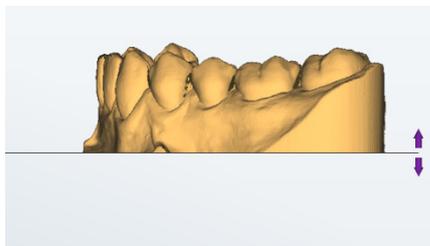
Default value: 1.0

13.2.2   Colors

Object | multiDie/multiCase | Rescan object | Rescan shadow

	Concerns:	3D viewer.
📋 12	Effect:	Colors for a uniform, clear representation.

Option	All scans.
multiDie/multiCase	Single segments.
Rescan object	Newly scanned areas in the rescan.
Rescan shadows	Areas that cannot be scanned in the rescan.

📋 45, 52, 54   Comment: **Colors in the 3D viewer are not photorealistic and have no influence on the 3D measurement.**

Texture scans change the color representation.

— **Shadow color:** helps to find the right perspective during the rescan.

— **Object color rescan**: applies to the following: Rescan (after launching), correction, matching.

▷ Click on a color box and select a color from the Windows color scheme (please no dark or light colors, pay attention to the contrast to the background).

Comparison of display types (material: light brown)

Object color	Monochrome texture scan	Color texture scan

Default values:

Option

RGB 251, 188, 94 | Color hue 24, saturation 228, brightness 162

multiDie/multiCase

RGB 205, 170, 125 | Color hue 22, saturation 107, brightness 155

Rescan object

RGB 192, 192, 192 | Color hue 160, saturation 0, brightness 181

Rescan shadows

RGB 0, 0, 102 | Color hue 160, saturation 240, brightness 48

13.2.3 Extended (View)

Show point cloud when moving objects

📑 12

Concerns:	3D viewer
Effect:	Representation when moving the scan with the mouse.
Comment:	Optimizes speed.
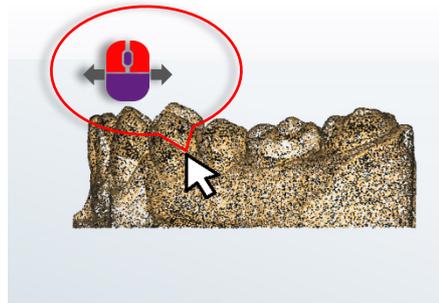
Default value: ☐ – disabled

Show point cloud in highest quality

📑 12

Concerns:	3D viewer
Effect:	Display in best resolution.
Comment:	Optical effect, has no influence on the 3D measurement. High performance of the graphics card is required.

▷ Disable if it causes problems.

Default value: ☑ – enabled

Show shadows in the rescan mode

📑 52

Concerns:	Rescan mode.
Effect:	Shadows to highlight those areas that cannot be rescanned.

📑 73

Comment:	— Shadow: blue (the color can be changed); it disappears by changing the perspective of the camera.
	— After rescanning: grey areas were rescanned (the color can be changed but not disabled).

Example: Rescan areas
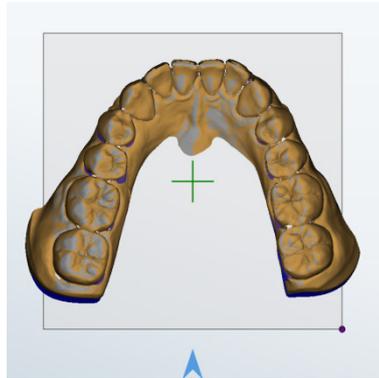
With shadow	**Without shadow**
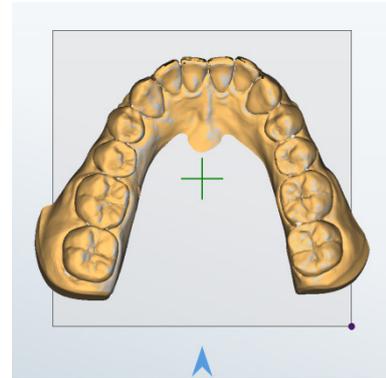
▷   Disable if you don't need to highlight unscannable areas.

Default value: ☑ – enabled

Show tooth numbers in the preview image

📄 12, 38

Concerns:	2D viewer
Effect:	The tooth number is displayed next to the marking of a tooth position.
Comment:	If a cutting radius is also defined, circular cutting lines in the size of the cutting radius are displayed in the 2D viewer.

Cutting Radius 📄 79

Simple position markers	**UNS numbering**	**FDI numbering with a 12 mm cutting radius**
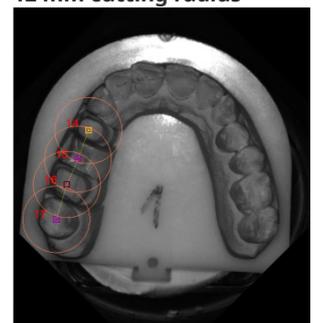
▷   Enable tooth numbering as a guide.

Default value: ☐ – disabled

13.3 Scanning

13.3.1 Presentation mode

24   Concerns: Presentation of individual segments of a jaw model.

Effect: Suggested value for the presentation mode in new projects:

— **singleDie**

Presentation of each individual tooth in the jaw model, one after the other,

— **secondDie**

Presentation of every second tooth; reduces the scanning processes to a maximum of two,

— **multiDie**

Presentation of all segments with the multiDie adapter.

Comment: — The enabling of the presentation mode can also be done in the tab dialogs.

— "Complete jaw" (no presentation) is not possible as a suggested value.

▷   Select the presentation mode that you use most often.

Default value: secondDie

13.3.2 Plaster type

Bright | medium | dark

Concerns: Color of the scan object

Effect: Light intensity of the sensor during the 3D measurement.

Comment: The scanner measures the brightness of colors differently than the human eye.

▷   Please test colorful materials before conducting productive scans.

▷   Black items must always be scanned with a scan spray.

Default value: Medium

13.3.3   Texture mode

Disabled | monochrome | color

Concerns:	Markings on the surface of a scan object.
Effect:	Scans with markings, e.g. contour lines for model cast prostheses (manufactured using SilaPart® from SILADENT (CAD system)).
Comment:	— Color texture scans show markings in different colors; otherwise they have the same information value.
	— The enabling of texture scans can also be done in the tab dialogs.
	— Single color (monochrome) texture scans are possible with all scanners.

📋 17

▷ Select the suggested value **Monochrome** or **Color** to always start scans with texture scan.

Default value: Disabled

Optimization for markings (reduces edge sharpness)

Concerns:	Markings on the surface of a scan object.
Effect:	— Optimizes texture scans to calculate marked contour lines in a particularly precise manner.
	— It is advantageous for the production of a model cast prosthesis.
Comment:	Side effect: General smoothing of edges in the 3D data, e.g. also smoothing of fissures or sharp edges of the scan object.

▷ Enable if needed. Use texture scans without markings for full edge sharpness.

Default value: ☐ – disabled

13.3.4   Extended (scanning)

Switch to the rescan mode after each presentation

📋 33, 52

Concerns:	Presentation of single segments.
Effect:	Enables the rescan mode after a presentation.
Comment:	Can be useful if presented segments have to be rescanned on a regular basis.

Default value: ☐ – disabled

13.4 Processing

13.4.1 Quality

Standard | opposing jaw | squeeze bite | impression scan | wax-up | gingiva | abutment | situ

Concerns:	Dental indications, other scans (standard).
Effect:	Sensor accuracy/resolution
	Size of the 3D model dataset.
Comment:	Four quality levels: **Very high, high, normal, low**.
	The higher the resolution, the larger the data set.

▷ Select the appropriate quality level, e.g. "very high" for complex dental constructions, "low" for archiving.

Default value: High, impression scan: Very high

13.4.2 Cutting Tools

Enable the automatic cutting plane

47

Concerns:	Automatic cutting plane.
Effect:	Method to cut the model base.
Comment:	The height of the cutting plane can be individually regulated; areas below the cutting plane are deleted during matching.

▷ Disable if you do not use the cutting plane.

Default value: ☑ – enabled

Automatic cutting of the multiCase/multiDie adapter

24, 25

Concerns:	multiDie presentation mode
	multiCase project definition.
Effect:	Automatic cutting of the adapter and presentation of the segments.
Comment:	Additional manual cutting is possible.

▷ Disable if you do not use multiCase/multiDie.

Default value: ☑ – enabled

Cutting radius for the stump

Concerns:	Automatic cutting in dental projects.
Effect:	Data in the radius around indexed tooth positions is saved, everything else is cut.
Comment:	— 2D viewer: The cutting radius becomes visible around the marked tooth positions (size of the circles = cutting radius).
	— Everything is scanned without a cutting radius.

Highest value	Lowest value	Default
200 mm	**12 mm**	**200 mm**

Cutting Radius
2D and 3D viewers
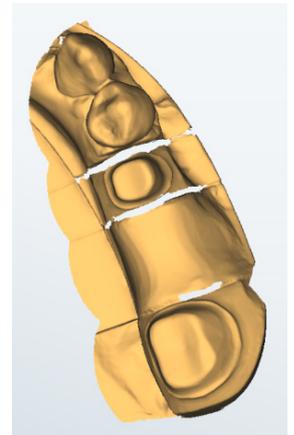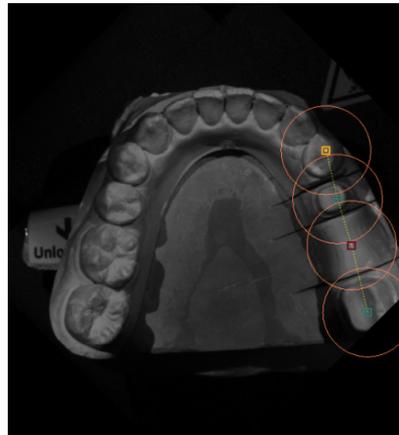
▷ Test the size with typical jaw models.

Default value: ☐ – disabled

13.4.3   Extended (Processing)

Start matching immediately after the scan

📄44

Concerns:	🔲 Automatic matching.
Effect:	Forces matching directly after scanning; applies to suitable projects, e.g. complete jaws individually.
Comment:	No pause in the workflow for manual mesh processing before matching; the cutting filters and the automatic cutting plane are taken into account.

▷ Enable if you don't need to manually edit scans.

Default value: ☐ – disabled

All tabs can be matched in a single step

📄 44

Concerns:	🔲 Manual matching.
Effect:	Matching is performed simultaneously on all unmatched tabs (otherwise individually).
Comment:	Not relevant for vestibular scans (the following always applies for these: Matching in one step).

▷ Disable if you wish to always check the scan data before matching.

Default value: ☑ – enabled

Allow cutting of PCMs

📄 47

Concerns:	Manual cutting (**Mesh processing**).
Effect:	Allows cutting of single images (PCM) instead of 3D data (PLY, STL).
Comment:	— Accelerates subsequent processes.
	— It has no influence on the automatic cutting plane.

▷ Disable if manual cutting should only be possible after matching.

Default value: ☑ – enabled

Background matching

📄 44

Concerns:	🔲 Automatic matching.
Effect:	Matching while the scanning process is running.
Comment:	Accelerates the subsequent data processing.

▷ Disable if you wish to always check the scan data before matching.

Default value: ☑ – enabled

13.5   Export

13.5.1   Work folder

📑 46, 81

Concerns:	Saving location.
Effect:	Path specification for dental Scan projects.
Comment:	The following applies to the [YYYY] subfolders:

— automatic change to the current year after a software upgrade,

— no automatic change at the turn of the year.

exo   When scanning with a CAD system, its work directory applies. For exocad®:

`C:\CAD-Data` (depending on the exocad® version).

▷ Change the path specification to organize the scan data (local shared folder, network path for shared use). Enter the path or select it from the folder structure using the **...** button.

A cache directory can be useful for a network path.

> Default value:
> `C:\Users\[Username]\Documents\3D-Scanner\Work\[YYYY]`

13.5.2   Cache directory

🎓 www.smartoptics.de
University | dental Scan |
Cache Directory
📑 46, 81

Concerns:	Network work directory.
Effect:	Specifying the path to a fast cache directory results in scan projects being processed in the cache directory and loaded into the work directory when the project is finalized.
Comment:	— It makes sense if scan data is saved in the network and it takes too long to save/load data there.
	— Must be located on a fast drive (SSD).

▷ Enter the path or select it from the folder structure using the **...** button.

> Default value: ☐ – disabled
> When enabled `C:\Users\[User]\AppData\Local\Temp\3D-Scanner\`

13.5.3   Data alignment

Save scan data with transformed coordinates
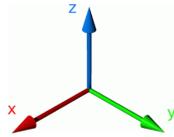
Concerns:	Scan data
Effect:	— Transformation of the XYZ coordinates.
	— dental Scan saves two PLY or STL files, one as "custom_transform", e.g.`2019-05-14-150913-upperjaw_`**`custom_transform`**`.ply`
Comment:	— Each point of the scan data is located in the 3D data network using 3 coordinates (standard orthogonal coordinate system XYZ (latitude, longitude, height)).
	— dental Scan and the CAD software must use the same coordinate system.

▷ Enable if an adjustment to the CAD software is necessary.

▷ Assign the X, Y and Z coordinates (positive or negative, i.e. mirror or rotate). dental Scan automatically corrects geometrically impossible combinations.

Default value: ☐ – disabled

13.5.4   Extended (export)

Also save the scan data in STL format

📄 46, 61

Concerns:	Project completion
Effect:	Combination of all scan data (individual images in PCM format) to form an STL file (in addition to the standard PLY format).
Comment:	PLY: Polygon File Format (with texture information)
	STL: Standard Triangulation Language (without texture information)

▷ Enable if your CAD system requires data in STL format.

> **NOTICE**
>
> ▷ If you close the project after matching all tabs, a PLY file is saved. End projects with "Finalize project" to create STL files.

Default value: ☐ – disabled (only PLY)

Additionally create vestibular mesh

📑 31

Concerns:	Vestibular scan.
Effect:	A 3D data file (PLY, STL - optional) is created for the vestibular scan.
Comment:	This setting is not required for vestibular scans that are created with **Add Scan**.

Default value: ☐ – disabled

Use patient names in the project name

📑 16

Concerns:	Projec tdefinition - Project ID.
Effect:	— Default naming (unique ID: Timestamp `YYYY-MM-DD-hhmmss`, e.g. **2019-05-10-135720**
	— Naming with patient or project names: The name is added, e.g. **2019-05-10-135720-Smith,Jane**
Comment:	Project folders and project files are also named using the timestamp.

▷ Enable to generate names with patient or project names.

Default value: ☐ – disabled

13.5.5   Diagnosis data

Export stripe images (service folder)

Concerns:	Technical support, **not for users.**
Effect:	Creation of stripe photos (black and white photos with the stripe projection of the scanner). Saving location: `C:\ProgramData\3D-Scanner\DeviceCharacteristics\Service` This setting is not saved.
Comment:	Stripe images are used to analyse technical problems.

▷ Enable in consultation with the technical support and scan immediately.

▷ Send the PGN files to the technical support.

Default value (cannot be changed): ☐ – disabled

Extended logging

Concerns:	Technical support, **not for users.**
Effect:	Creation of log files.
	Saving location:
	`C:\Users\[Name]\AppData\Local\3D-Scanner\Sessions`
	Subfolder with timestamp (project start and completion)
Comment:	Log files are used to analyse technical issues. Enabling is saved until dental Scan is closed.

▷ Enable in consultation with the technical support, scan immediately and sent the log files to the technical support.

Default value: ☐ – disabled

13.6   Restore default settings

dental Scan saves:

— the default settings in the installation folder,
— a work copy in the local user folder:
   `C:\Users\[Username]\AppData\Local\3D-Scanner`.

The file `UserSettings.xml`:

— contains the user settings (**Settings** dialog).
— It must be deleted to restore the default settings.

💡 **TIP**

Make a backup copy of the file `UserSettings.xml` so that you can restore your old personal settings if necessary.

1. Exit dental Scan.

2. Open Windows Explorer

3. Under **View**, activate the checkbox **Hidden Elements**.

4. Open the folder:
    `C:\Users\[Username]\AppData\Local\3D-Scanner`.

5. Delete the file `UserSettings.xml`.

6. Start dental Scan.

✓ The default settings apply again. Personal settings are saved in a new `UserSettings.xml` file.

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14.1 Icons

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Scan tabs

Icons		\Scans
		Aesthetic template
		Upper jaw, lower jaw (toothed or toothless)
		Vestibular, toothed – toothless Baltic Denture
		Wax-up of upper and lower jaw
		Situ of upper and lower jaw

Icons		\Scans
		Scanbody in upper and lower jaw
		Gingiva of upper and lower jaw
		Squeeze bite of upper and lower jaw
		Triple Tray® impression of upper and lower jaw
		Impression of upper and lower jaw
		Twin tray upper and lower jaw, with and without occlusion
		Additional scan and mesh combination
		Correction scan
		multiCase/multiDie
		Calibration

14.2 Menus and key combinations

NumLock

Mesh processing		Add Scan	Visualization		Service position
Cut inside	I	Single object	Front	7	—
Cut outside	O	Several objects	Back	9	
Cut the surface	U	Occlusion	Left	4	
Save	Ctrl + S	Articulator	Right	6	
Rescan	R		Top	8	
Trigger scan	T		Bottom	2	
Trigger scan sequence	Ctrl + T		Points		
Undo Rescan, Cut	Ctrl + Z		Triangles		
Correction scan			Gouraud shading		
Close holes			X Y Z		
Combine mesh			All axes		
Delete matching					

📁	❘❙❘	⚙
Project	**Extras**	**Settings**
New project	Calibration	
Load project	Add an activation code	
Save project as	Delete old PCM data	
Close project	Info	

14.3 Glossary

Definition of important terms	
Activation Code	Code to activate: — a chargeable module, — a free upgrade period (up to 3.4.2).
Work folder	Folder in which scan projects are saved.
Export data	3D data generated from the scan data. Basis for the CAD software, open file format (PLY, optionally STL) for many applications.
IndepenDent mode	Any desired order of the scans in a project.
Calibration data	Data to perform the calibration of a scanner (specific). The sensor number of the scanner (➡ type plate/sticker) matches the name of the calibration data folder (e.g. SO-20242.01-13-062).
Calibration	A metrological term: — Alignment of the scanner to the values of an industrially calibrated model. — Alignment of the motion axes based on the individual calibration data.
Matching	Calculation that generates a data set in PLY or STL format (3D model data set) based on individual images and measured values (scan data).
Scan	Measurement in 3D, based on individual images (PCMs), converted into a 3D model data set by means of matching.
Scan object	Object to be scanned: Universal object (item), dental model or dental impression.

Definition of important terms	
Vestibular scan	Scan of jaw models in occlusion. — Its purpose is to align the upper and lower jaw scans. — It is the basis of an anatomically correct reconstruction in the CAD system.

14.4   File Paths

How to find protected Windows folders using a placeholder

▷ Replace unknown parts of a path with %.

The search terms are independent of the Windows language:

```
%appdata%        ➜ C:\Users\[Username]\AppData\Roaming
%programfiles%   ➜ C:\Program Files
%programdata%    ➜ C:\ProgramData
```
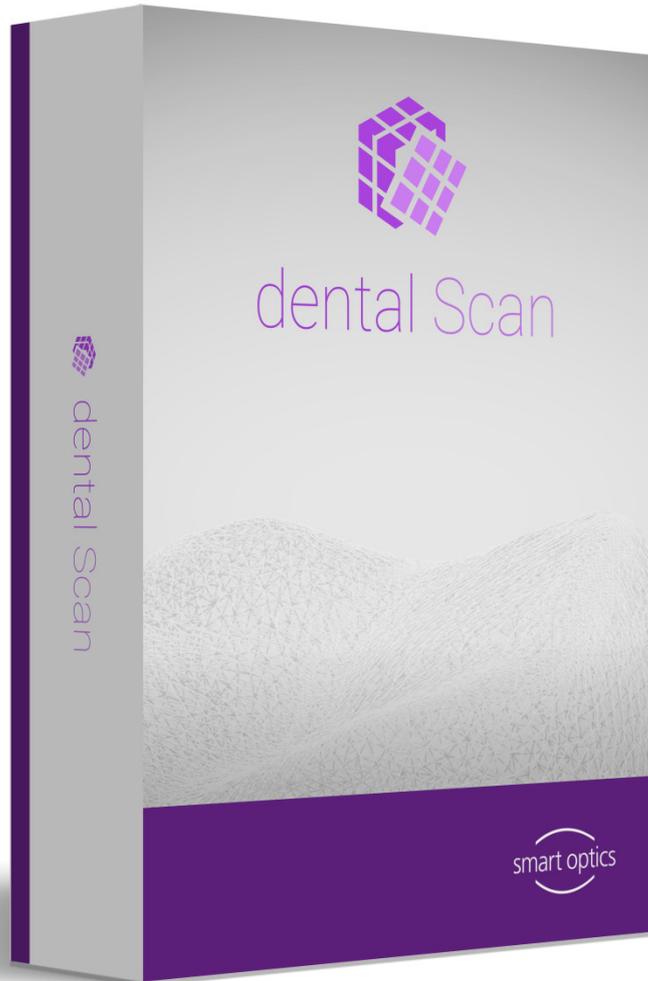
Default file paths

Folder	Path
Target folder (setup)	`C:\Program Files\3D-Scanner\dental Scan`
Work folder (standalone)	`C:\Users\[Username]\Documents\3D-Scanner\Work\[YYYY]`
Work folder (with exocad® v.2.3 Matera or higher)	`C:\CAD-Data`
Calibration data	`C:\ProgramData\3D-Scanner\DeviceCharacteristics\Sensors`
User settings, log files	`C:\Users\[Username]\AppData\Local\3D-Scanner`

smart optics

Manufacturer

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DGZ
Qualitäts Management System
Deutsche Gesellschaft für Zertifizierung
DIN EN ISO 9001

DGZ
Qualitäts Management System
Deutsche Gesellschaft für Zertifizierung
DIN EN ISO 13485

dental Scan

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