

WINJAW+



Software User Manual WINJAW+

describes contained functions up to and including version 2.0
Illustrations in these instructions for use may differ.

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Please always state the serial number of the product when making inquiries!



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1 Foreword

Dear customers,

we are pleased that you have decided to purchase this product. The zebris Medical GmbH has been developing and manufacturing measuring systems with high standards of technology, safety and functionality for use in medicine, rehabilitation, diagnostics, sports and science since 1987.

The instruction manual of the system consists of 3 parts:

- Installation Instructions
- Software user manual
- Hardware user manual

The software and hardware operating instructions can be viewed in **WINJAW+** as online help (**F1 Key**). These operating instructions provide you with basic knowledge for the operation of the **WINJAW+** software. It extends the installation instructions and gives advice on how to prepare the treatment. Please also observe the safety information contained in the technical instructions for use and keep all instructions for use in the immediate vicinity of the JMA Optic system. The instructions for use are an essential component of the product and help you to operate the JMA Optic system as intended.

The zebris Medical GmbH accepts no liability for injury to personnel or patients or damage to the system resulting from non-observance of the information contained in the instructions for use or misuse of the system.

Should you notice any errors while working with the instructions for use or should you have any suggestions, we would be grateful if you could inform us at any time.

Registered trademarks

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zebris is a registered trademark and **JMA Optic** is an identification of the **zebris Medical GmbH**.

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1.1 Conventions and symbolism used

The following conventions are used in this manual.
Warnings are marked as follows:



Warnings indicate a potential risk to the health and safety of users and/or patients. The warnings explain the nature of the hazard and how it can be avoided.

Notes are marked as follows:



Notes indicate a potential danger that can lead to damage or destruction of the device. The notes explain the nature of the hazard and how it can be avoided.



Notes that are relevant for carrying out measurements are marked in this way.

Note on amendments:

To ensure our product quality, we are constantly striving to improve our product line. Under certain circumstances, an update of the software or hardware configuration may have occurred after this manual was printed. It is therefore possible that some of the illustrations may differ from what was actually delivered to you.



Please note that a new version of this user manual does not appear with every software release, as releases often contain technical changes that are not visible to the user. The latest version of the user manual is available from your dealer.

2 Software installation and activation

2.1 System requirements

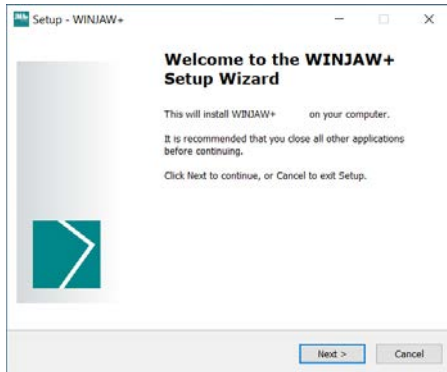
- Processor: Intel Core i5, x64, or alternatives with comparable performance
- RAM: mind. 4 GB RAM
- Hard disk: mind. 750 GB free space on the system drive
- Graphic card: 1 GB usable graphics memory
OpenGL 4.0 and higher
DirectX 9.0c and higher
Support of native monitor resolution
- Monitor: Monitor with a minimum resolution of 1024x768
- Connections: 2 x USB (1x Device, 1x SYNCCam)
- Operating system: Windows 10 version 1909 and higher



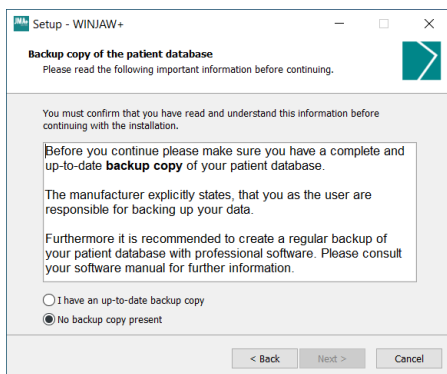
If you have any questions regarding the system requirements listed above, please contact your dealer's support department.

2.2 Installing WINJAW+ software

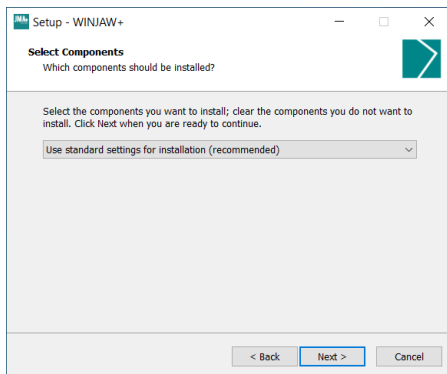
2.2.1 Step by step installation



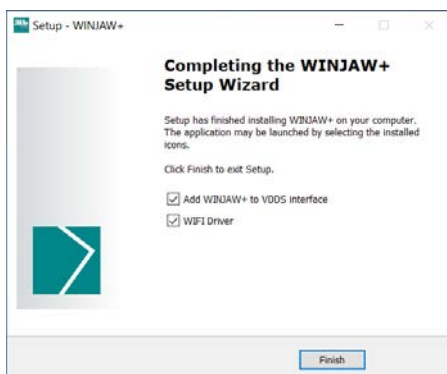
Open the "Software" folder on the installation disk and start the installation file named WINJAW+. Then click on **Next** to start the installation.



Confirm that you have made a backup of your database before starting the installation.



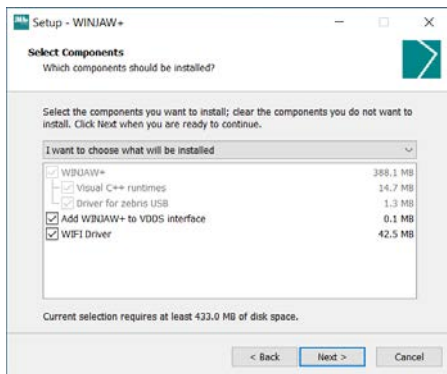
Click on **Next** to install the software on your computer.



After the installation is completed, the following window appears. Click **Finish** to complete the installation.

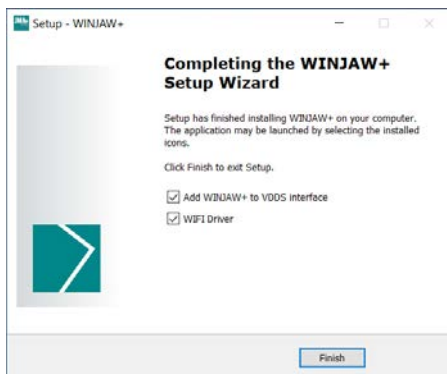
The software is now installed. An icon with the designation WINJAW+ has been created on the desktop. To start the software, you can either double-click this icon or start from the Start >> zebris >> WINJAW+

2.2.2 Customized installation



In the Select Components step of the installation wizard, you can also select the "I choose what to install myself" option by clicking on the selection list.

Here you have the option to exclude individual components from the installation by removing the check mark or to select non-installed components for installation by placing the check mark.



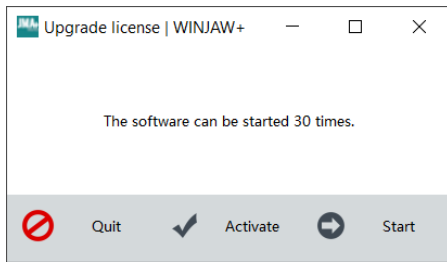
After the installation is completed, the following window appears. Click Finish to exit the Setup and continue with VDDS registration and WIFI Driver installation

The VDDS registration is done in a silent mode in the background.

The software is now installed. An icon with the designation **WINJAW+** has been created on the desktop. To start the software, you can either double-click this icon or start from the **Start >> zebris >> WINJAW+**.

2.3 Software activation

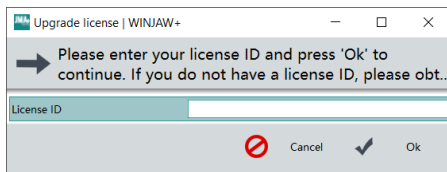
The installation file contains a selection of modules for unlimited use for 30 starts, after which the software must be activated.



Click on **Start** to run the program in trial mode with all available software modules or click on **Activate** to enter the license code.

If the application computer is not connected to the Internet, the activation must be performed offline.

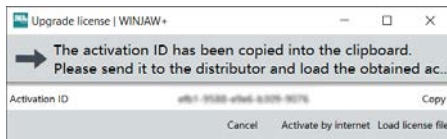
2.3.1 Enter license code



When you purchased the system you received a digit license code. You can find this license code on your USB data carrier and in your order documents of the zebris JMA Optic system. If you have purchased the device through a dealer, you can obtain the license code directly from your dealer.

2.3.2 Activation

You then have two options for activation, as described below.



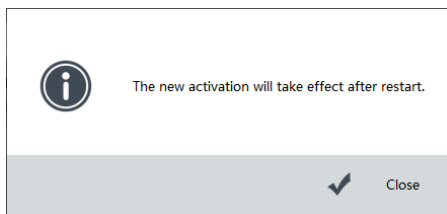
by Internet

If the PC has internet connection, the activation of the license code happens fully automatic. Therefore click on **Activate by Internet**. The activation code provided by the software will be compared with registered licenses. If the check is negative, a corresponding message appears.

Offline

The activation is carried out here by transmitting the activation code displayed by the software by telephone/fax/email/post.

1. You will be shown a 20-digit activation code. Please transmit this code to your dealer.
2. You will then receive a license file by email, which you can read in on the computer to be activated, e.g. via USB stick.



Then click on "Load license file" in the dialog box shown above, select the license file received and confirm. After an automatic restart of the software, the activation is complete.



Please note that the activation is per computer (workstation) and the number of activations is limited to 3 workstations by default. You can purchase additional activations on request from your dealer.

3 About WINJAW+

"About WINJAW+"

A click on the program logo opens the about dialog.



Description of function

The functionality and application of the software is described briefly.

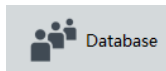
Software-related data

The name, version and installation date of the software or the last update are displayed here, as well as information on the operating system used, graphics hardware and the active license.

Manufacturer information

This field contains all relevant data of the software manufacturer.

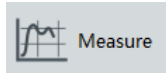
4 Functions



Database

The database contains options to create, edit and remove patients. You can also add, adjust and remove recordings, comments and descriptions.

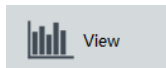
An **export/import** function allows large amounts of data to be archived and reused at another time.



Measure

After creating or selecting an existing patient, this button leads you to the module selection. Here you will see all modules that you can use with your license.

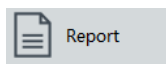
You can make device and recording settings.



View

The currently selected recording is opened for viewing and editing.

Depending on the recording module, you can export the data for further processing in CAD/CAM systems, for example.



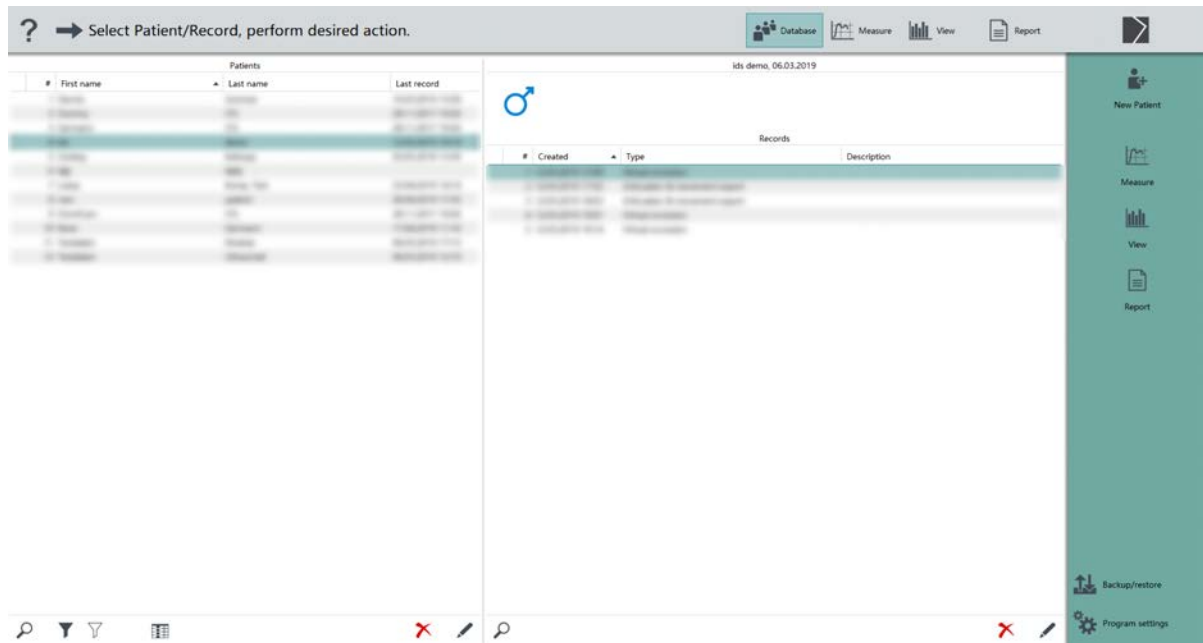
Report

The results of the currently selected recording are clearly displayed. The report offers a print function and a PDF export.

Depending on the recording module, you can export the data in CSV format for further processing.

5 Patient Database

After starting the program you are in the patient database.



Here you can manage patients and existing recordings and have access to import and export functions. Below you will find a detailed description of the user interface.

5.1 Hints and Navigation

Select Patient/Record, perform desired action.

Hints

Help and instructions for operating the software.

Database Measure View Report

Navigation

Here you can see which section of the program you are in. The currently active section is highlighted in color.

5.2 Patients

#	Name	Last name	Code	Born	Last record
1	Linda	Lang		16.01.1999	12.01.2016 15:48
2	Lindsey	Kafoops		20.02.1980	12.02.2020 17:41
3	Test	Patient		12.10.2015	12.01.2016 07:34
4	Test	Software		16.09.2013	29.11.2013 14:30
5	Testing	EMG & Relax Bite Module		12.01.2016	05.02.2016 12:20
6	Thorsten	Test	KOKNUIHJIBUIBN	04.05.1994	

The patients are listed here. The currently selected patient is highlighted.



Find Patient

With Search, the patient database can be filtered via an input line and thus searched for a specific patient. The search window is hidden by pressing "Esc" or clicking "Find" again.



Active Find

The fact that the find function is active is indicated by the display of a coloured symbol. Only data records with corresponding information are displayed.



add/remove Filter

The left button adds an individually configurable filter (detailed description see chapter [Filter](#))^[20].

The filter function is a possibility to search very large databases.



Columns

You can choose which patient data you want to display in the software.



Edit Patient Information

A click on "Edit patient file" opens the patient record. Here you can adapt patient information like base data, patient image, comments and project affiliation.



Delete marked items

After a separate confirmation, the patient and the records assigned to him/her will be irretrievably deleted.

5.2.1 Filter

Filter Adjustments

→ Select parameters for filtering patients.

Name contains

Gender Male Female Any

Born after dd.mm.yyyy

Born before dd.mm.yyyy

Code contains

Last record after dd.mm.yyyy HH:mm:ss

Last record before dd.mm.yyyy HH:mm:ss

Today This week This month This year

Labels Select labels

- Releaskandidat
- Softwaretest

Cancel Ok

Filter settings

Add parameters at this point to filter all entries in your database and display only the relevant patients/recordings.

Name contains

Insert the entire name or parts you know of it here.

Gender

Choose between the options "Female", "Male" and "Undefined"

Born after/ before

Limit the age of the searched patients by their date of birth.

Code contains

If you use the code field to uniquely assign patients, you can use these codes or parts of them to filter the complete database.

Last record after/ before

Limit the recording time of the recording period of the searched recordings.

Labels

If you have divided the patients in your database into groups, you can use this information to filter the entire database.

5.3 Patientent properties/ New Patient

When you create a new patient or edit the record of an existing patient (button **New Patient** or **Edit Patient information**), the following dialog appears:

The individual areas and their functions are explained below.

5.3.1 Properties

Properties	
First name*	<input type="text"/>
Last name*	<input type="text"/>
Gender*	<input type="radio"/> Male <input type="radio"/> Female
Date of birth*	<input type="text"/> dd.mm.yyyy
Code	<input type="text"/>
Email	<input type="text"/>
Street	<input type="text"/>
City	<input type="text"/>
Postal code	<input type="text"/>
State	<input type="text"/>
Country	<input type="text"/>
Work phone	<input type="text"/>
Home phone	<input type="text"/>

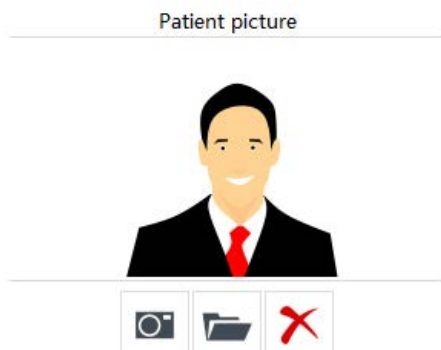
Patient data

Please enter the patient data here. Mandatory fields are first and last name as well as gender and date of birth.

The field "Code" gives you the possibility to assign a unique identification to the patient entry.

5.3.2 Patient picture

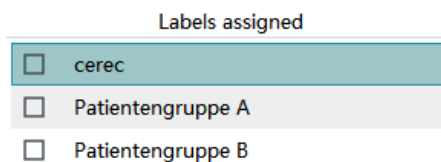
You can use this field to assign a picture to the patients.



Take new picture/open/remove

You can either use the buttons to open a connected camera and capture a patient image, or you can open an image that is already loaded onto your workstation. You can also delete the existing image.

5.3.3 Labels



Labels

For a better overview, patients can be assigned to groups. Enter a group name in the field on the left and add the patient to this group to better organize the entries in the database.



5.3.4 Comments & Clips

Comments

Write here any free text as a comment on this patient. You can show the comments later in the output report as "patient comments" and thus receive all necessary information for assessment.

Clips

To make recurring formulations and standardized designations quickly usable, you can add them as clip. How to add text modules is described below:



1. Mark Text

In the "Comments" field, select the text section that you want to create as a clip.

2. Save Clip

To create the selected text section as a clip, click **Save Clip**.



3. Enter Name

In this dialog box, you can define a name for the text module. Your selection is automatically adopted as a proposal.

Click **OK** to create the clip and it appears in the list with the specified name.



4. Define Cursor Position

Left-click the cursor at the position where you want to insert your clip.

5. Paste Clip

Left-click to select a block from the list, then click on **Insert** to move it to the current position in the comment field.

5.4 Records

#	Created	Type	Description
1	17.01.2020 15:39	Articulator & movement export	
2	17.01.2020 15:40	CMDfact® Interactor	
3	17.01.2020 15:46	Function	
4	17.01.2020 16:09	Jaw Relation	
5	17.01.2020 16:18	EPA	
6	20.01.2020 19:45	CMDfact® Interactor	
7	21.01.2020 09:21	Virtual occlusion	

All records of the currently selected patient are listed here. The currently selected admission is highlighted in color.



Delete marked items

After a separate confirmation, the selected data will be **irretrievably deleted**.



Edit record information

Here you can edit the description and comments for the recording.

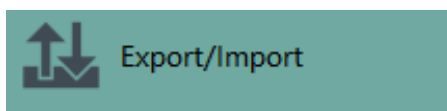
5.4.1 Recording details

This dialog can be opened by clicking on **Edit record information** on the right below the list of recordings.

You can change the description of the recording and add a recording comment (see [Comments & Clips](#)).

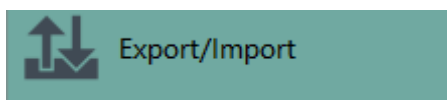
5.5 Export Data records

You can export patient and admission data from the patient database into the zebris own format "zebdb". This enables you to exchange individual data records, for example with colleagues who also work with the WINJAW+ software. Furthermore, you can create backup copies of the database in this way.



1. Export

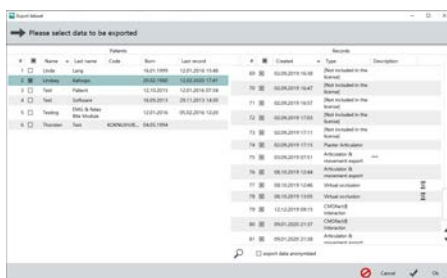
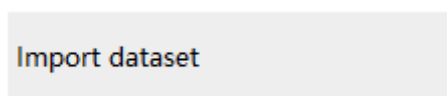
Click the **Export/Import** button at the bottom right of the toolbar.



2. Export Data Records

Select **Export dataset** to export the desired data from your database.

Export dataset



3. Select Data Record

Select all data records to be exported or saved.

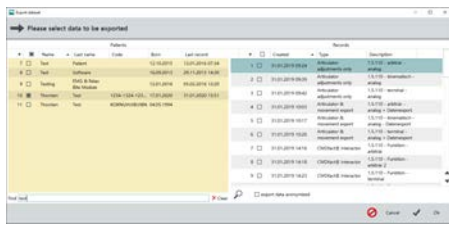
If you want to export or save all records of a patient, mark the check box at the corresponding patient entry.

This selects the patient with all records.

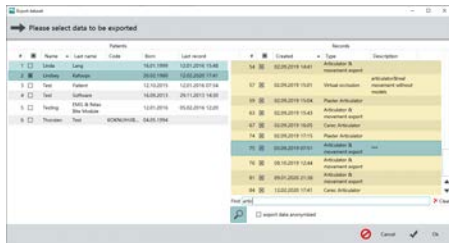
By mark / unmark the check box you can select each record individually.

3.1 Anonymized Data Export

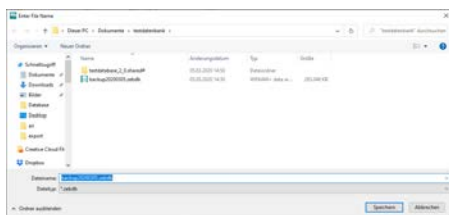
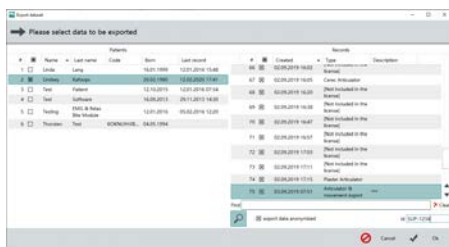
If the checkbox **Export Data anonymized** is selected, you can export anonymized data.



With this function you can pass on measurement data or recordings to third parties in an anonymized form. The first letters of the first and last name are retained. First and last name consists of the first letter of the original name + the individual id that you can define.



All other patient information is deleted. The admission description is replaced by the defined id.



4. Select Export Directory

Navigate on your hard disk to the location where the exported file or the backup of the database should be stored. Assign a name and then click **OK**.



The zebris Medical GmbH explicitly points out that the user himself is responsible for a data backup. zebris also recommends to create a regular backup of the patient database. The database of WINJAW+ is located in the user data directory.

Windows 10
C:\ProgramData\zebris\WINJAW+

ATTENTION: ProgramData is a hidden folder and must be made visible before.

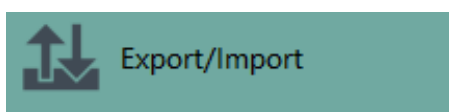
5.6 Import Data records

5.6.1 Import WINJAW+ data

zebris own Formats (.zebdb/.data)

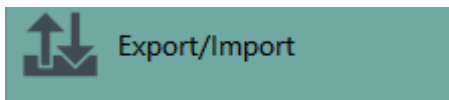
If you want to import data from old or new software packages, select the file with the extension .zebdb. You can export patient and record data from the patient database into the zebris own format "zebdb". This enables you to exchange individual data records, for example with colleagues who also work with the WINJAW+ software. You can import exported data with the restore function.

You can import existing patient and admission data of different formats into the database. The exact procedure is explained below:



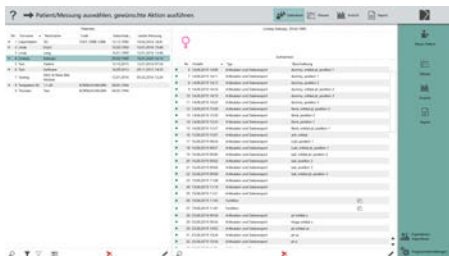
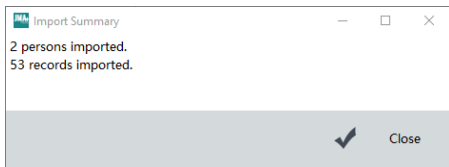
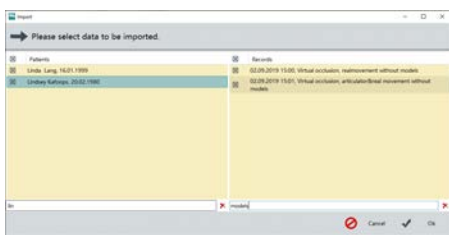
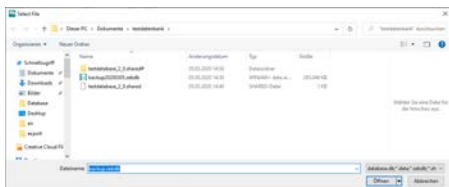
1. Import

Click the **Export/Import** button at the bottom right of the toolbar.



Export dataset

Import dataset



2.Import Dataset

Select **Import dataset** to import the desired data into your database.

3. Select data Records

Open the path on your hard disk or other storage medium, where the cords are stored. The files you need to select depend on the format.

4. Select Data Records

Select all records to be imported.

To import all patients of a group or project, set the check mark in the top row.

If you want to import all records of a patient, simply click on the check mark in front of the patient name.

If you click in a row with patient name, all recordings of the patient are displayed on the right side. You can also select these individually.

5. Import Summary

The dialog shows you a number of the imported patients and records after the data import has been completed. The list contains incorrect data records, as well as patients and records which have already been created and have therefore not been restored.

Project names from the old software are assigned to patients as a group with the prefix "Project".

6. Imported Data Records

Patients and the corresponding records that have been restored from a backup are marked with a green dot.

This marking remains active until the software is closed and restarted.

Import Summary
8 persons imported.
187 records imported.

18 records were not imported.

Record name	Person name	Reason
27.08.2015 11.22, Funktion	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27-08-2015 3D-Analyse	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27.08.2015 11.22, Funktion	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27-08-2015 3D-Analyse 2 Schichttechnische bestimmt...	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27.08.2015 11.33, Funktion	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27-08-2015 3D-Analyse Kondingpunkte bestimmt	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27.08.2015 11.39, Artikulator adjustments only, 27-08-2015 Artikulator Kondingpunkte bestimmt	Importdaten 3D, 24.01.1960	Record with the same creation time already exists
27.08.2015 11.41, Artikulator adjustments only, 27-08-2015 Artikulator kinematische Achse	Importdaten 3D, 24.01.1960	Record with the same creation time already exists

Close

7. Errors/Duplicates

If errors occur during the import or if you want to import records that already exist in your database, you will see a summary with corresponding notes.

5.6.2 Import of previous WinJAW 11.1

WinJAW 11.1 (16Bit)

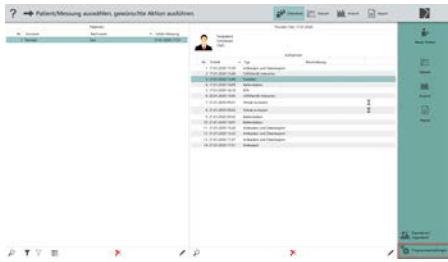
You will find the old database in your installation directory.

The default path to the database is: C:\Program Files\zebris\WinJaw\Data\Database.db

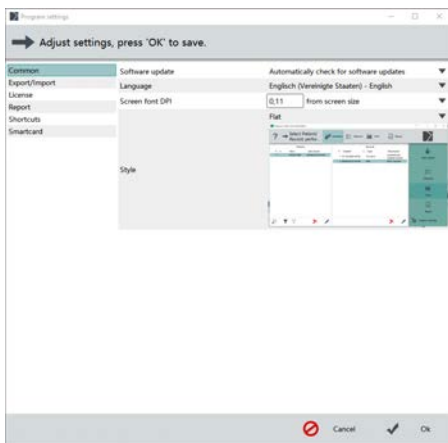
Alternatively, you can also copy the entire "Data" folder from the old software e.g. to a memory stick and import the data from this stick accordingly.

6 Program settings

6.1 Common



You can access the **Program settings** by clicking the Program Settings button at the bottom right of the Home screen toolbar.



Common settings **Software-Update**

Select whether or not to check for updates automatically. For automatic checking, please make sure that you have an active internet connection.

Language

Select the desired translation of the program interface from the list.

Screen font DPI

This factor determines the size of all display elements in the software.

Select Fixed to enter your own value.

Select From Screen Size as an alternative to dpi setting.

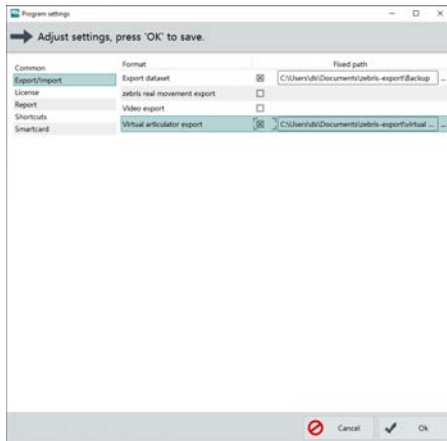
Select From System to result the value to Windows default settings.

External Database

If you have purchased the external database feature from your dealer, you can enter the path of the external database you use here.

6.2 Export settings with default path

You can specify a destination folder for each available export function in the program settings (database). If this setting is active, no save dialog ("Enter file name") is displayed and the files are saved directly in the default folder.



Export-Settings

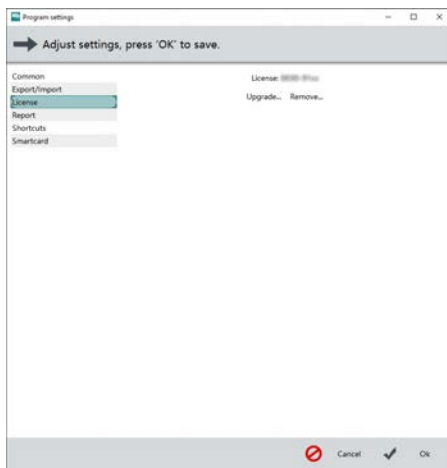
Click Export on the left side.

Setting Export Path

To specify a target path, mark the check box next to the corresponding export possibility and enter the export path.

If you have not set a fixed destination path, a dialog appears in which you can specify the location and name of the export file. Enter a different file name or click **Ok** to accept the displayed suggestion.

6.3 License



1. Select License

Click License on the left side.

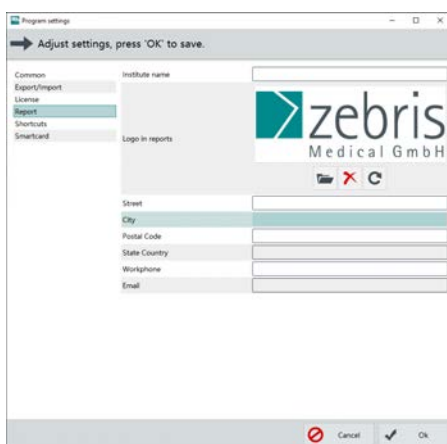
2. Upgrade License

In the right window the current user license is displayed. To renew the license, click the button **Upgrade**.

3. Remove License

If you want to remove the used license from this device please select the **Remove License** button.

6.4 Report



Select Report

Click Report on the left side.

Institute Name

You can customize the report by entering the name of your institution.

Logo in Reports

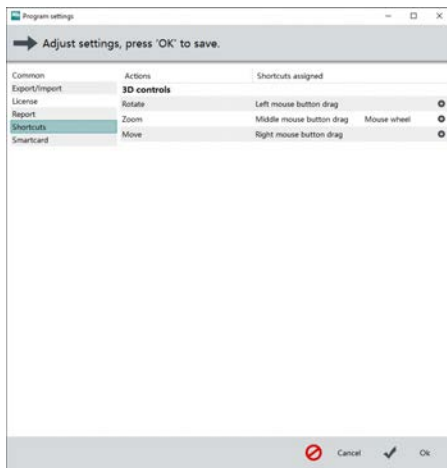
Click on the **folder symbol** to select a logo graphic that appears in the header of all reports.

Furthermore, the individual logo can be reset or deleted.

Additional Company Information

Here you can add information of your company like address and contact information.

6.5 Shortcuts



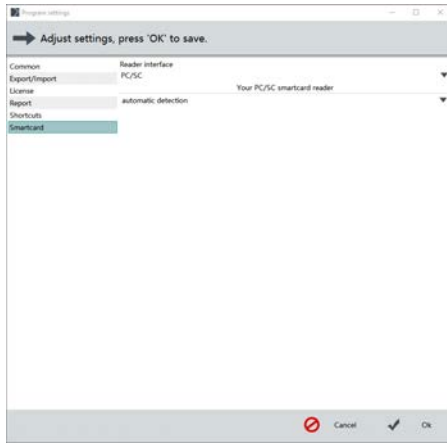
Select

Here you can determine the mouse function to handle the View of 3D graphics (skull, meshes).

6.6 Card reader

Here you can set up your card reader for the use of KVK or eGK. For the eGK a smartcard reader is required or for the KVK special readers such as smartcard keyboards from the German manufacturer Cherry.

The old health insurance card (KVK) only works with an installed CT-API driver.



1. Card reader

Select the entry Card reader on the left side.

2. Select Interface

On the right side, select the interface or the device with which you want to read the KVK or eGK:

PC/SC for eGK

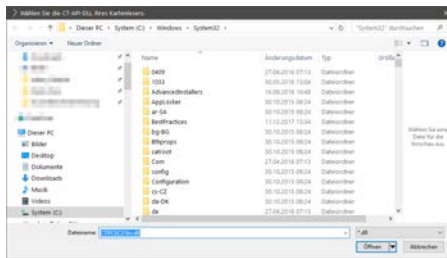
CT-API for KVK and eGK

If you have selected PC/SC, then confirm with **Ok**.

3. CT-API

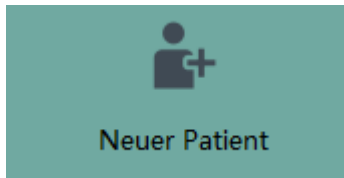
CT-API can read both KVK and eGK. The default suggestion is the driver of the EHEALTH-BCS keyboard G87-1504 from the manufacturer Cherry.

Then click Browse to select the appropriate dll file of your CT-API driver.



4. Select driver dll

Select the appropriate CT-API driver on your hard disk. For details please refer to the manual of the card reader manufacturer.



5. Insert Card

Insert a card into the reader.

6. Add new Patient

Click on New Patient and the card data will be inserted automatically.

7 Hardware Setup

Before you can use your Measurement System, please activate the system in the WINJAW+ device manager. First, please make sure, that all devices you want to use are connected to the PC and switched on. Then open the WINJAW+ device manager by clicking on the button **Hardware Setup**. After a short time all available devices are shown on the right side.

In case you want to set up different Hardware profiles, click on the Profiles on the left hand side.

Depending on your Measurement System you can establish the connection through USB or WiFi.

7.1 Connection via USB



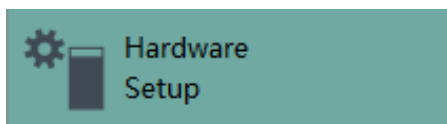
Automatic recognition

To establish the connection through USB, click on the icon with USB symbol. Double click the icon or alternatively you can select the device with a single click and click on the button **Insert selected devices**. Your device doesn't appear? Please have a look in the [chapter Troubleshooting](#) for further information.

7.2 Connecting the JMA Optic systems via Wifi connection

If you have received a Wifi USB dongle with your system, it is possible to connect the system directly from the user software via WLAN.

To do this, please connect the Wifi USB dongle supplied with the system to your laptop/ PC, then open the device settings in the WINJAW+ software and switch on your system.



The device settings can be opened to access the Wifi functionality.



To establish the connection through WiFi, click the icon with the WiFi symbol. Double click the icon or alternatively you can select the device with a single click and click on the button **Insert selected devices**.

7.2.1 First WIFI connection between software and hardware system

The following points must be observed when using the device for the first time or when using a new laptop/PC:

1. Plug In the WIFI Adapter

Please connect the supplied WLAN adapter to your PC.

2. Installing WINJAW+

Now carry out the installation of the WINJAW+ software ([for step-by-step instructions](#)^[11]). At the end of the installation process, the drivers for the WIFI adapter will be installed. Please confirm the installation of the drivers on your PC if necessary.

Deactivate internal WIFI adapters if necessary.

If your PC has other WIFI adapters, please deactivate them ([see chapter Disable internal WIFI adapter](#))^[33]

3. Setting up JMA Optic for operation with WIFI

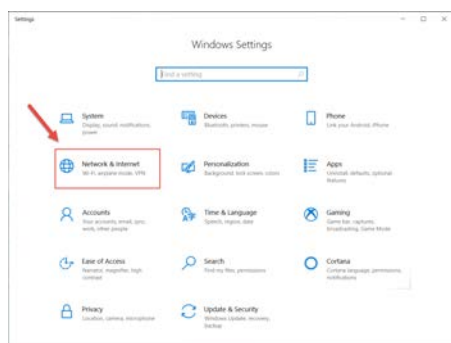
Now connect your JMA Optic to the PC with the USB cable. Then start the WINJAW+ software and click on "Measure" on the right and then on "Hardware Setup" at the bottom right.

After a short time, the JMA Optic instrument will appear in the instrument settings with a superimposed symbol for the USB connection (see Fig. 2). A little later, another JMA Optic instrument will appear with the symbol for a WIFI connection (see Fig. 3). Double-click on it to add it to the list of used devices and close the device settings with Ok. The JMA Optic is now ready for measurement via WIFI. The JMA Optic is now ready for measurement via WIFI.



The JMAO is always connected to the PC where it was last operated via USB. It can only be connected to one PC at a time.

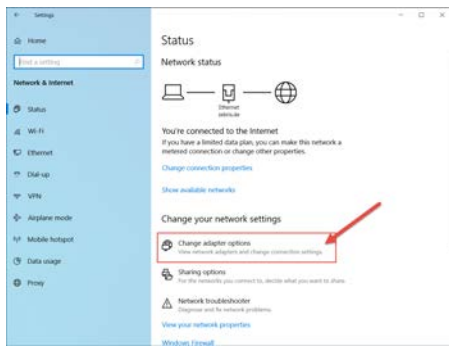
7.2.2 Disable internal WIFI adapters



Open Windows settings

- Press the Windows key and then click on the gear wheel in the bottom left corner, the "Windows settings" will open.

Select Network and Internet



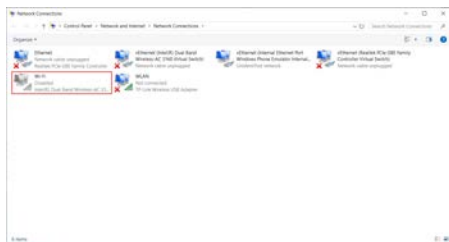
Select Change adapter options



Disable other WIFI Adapter

If the network connections are not displayed as shown in the screenshot (the third line with the manufacturer's designation "TP-Link Wireless USB Adapter" is important), change the view to "Tile" by clicking on the selection field marked with 1.

Now disable all other WIFI adapters (in the screenshot only one, marked with 2) by right-clicking > **"Disable"**. After deactivating, the tile is shown in grey with the note **"Disable"**.

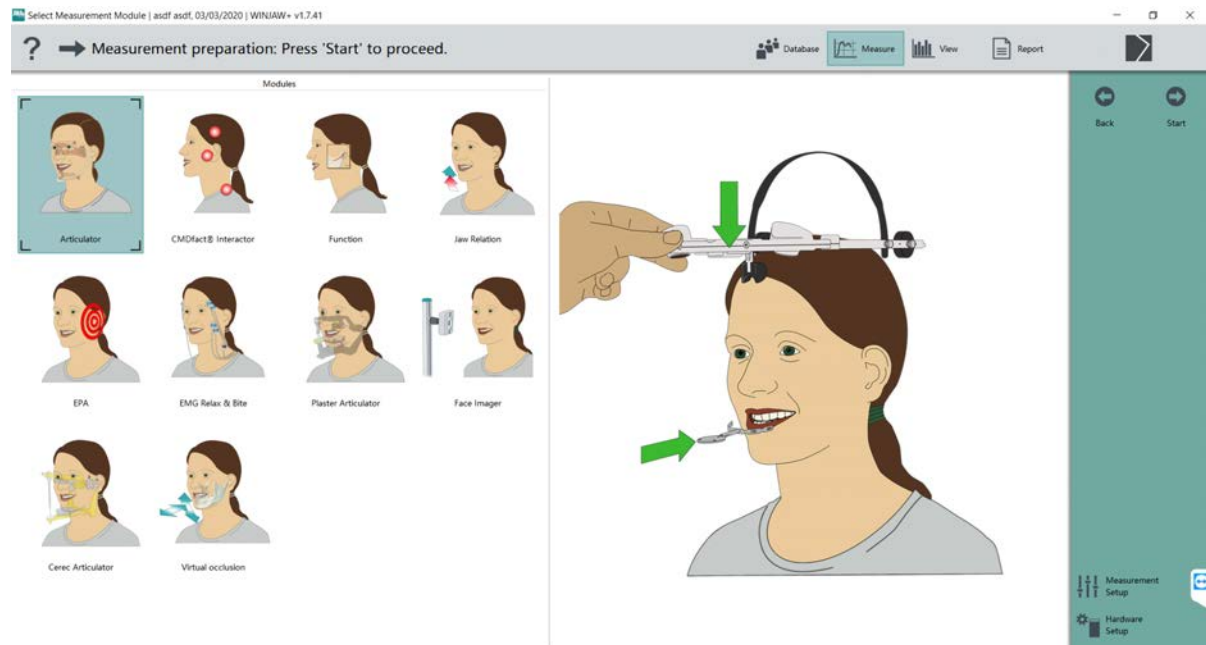


After internal WIFI Adapters have been deactivated, the PC must be restarted once (the zebris WIFI adapter remains plugged in). The system is then ready for operation.

8 Module selection

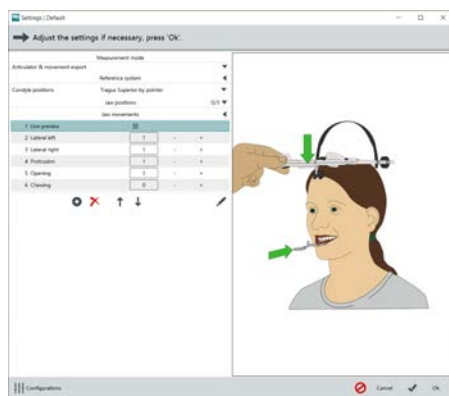
8.1 General

With a click on **Measure** you get from the database to the module selection. Depending on the license scope, the activated measurement modules are displayed. The system is expandable on the software and hardware side. Ask your supplier for additional application possibilities.



Select the Measurement module by single click on the corresponding Module Icon. The module is now highlighted with a colored background. Each module provides the possibility for an individual setting. For customized configuration, click on **Measurement Setup**. In the following chapter the settings are described in detailed.

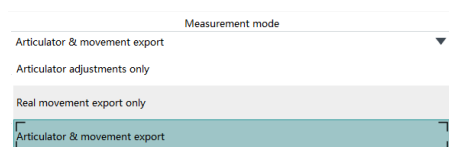
8.2 Measurement setup



The setting options depend on the connected measuring system and vary depending on the measuring module. The following list is exemplary:

- Measurement mode
- Reference System
- Face measurement
- Jaw positions
- Jaw movements

8.2.1 Measurement mode



Articulator adjustment only

In this mode, only data for the analog setting on standard articulators is generated. The advantage of this setting is that the data can be determined quickly and easily, with which the user produces individual splints or prosthetic fittings according to patient values.

Real Movement Data export only

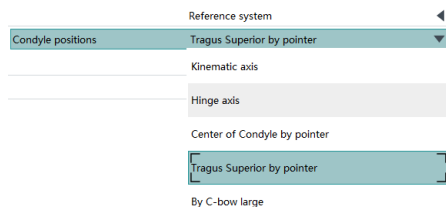
This mode, in conjunction with a coupling spoon (REF-Nr.: 01960320), allows you to combine motion data and the virtual patient situation in a digital workflow. The data processing is realized via CAD/CAM system interfaces.

Articulator & movement export

This mode combines analog and digital data acquisition. The articulator and real movement data export modes are combined. In this mode, the model can be transferred to the analog Artex articulator from Amann Girrbach via the coupling spoon in connection with the transfer table (REF-Nr.: 01960500).

8.2.2 Reference System

The reference system for which the patient images are created includes several individual setting options. To use all modules, it is first necessary to enter a cranial reference plane. Further possibilities for the transfer of the terminal and kinematic axis are possible.



Kinematic Axis

The patient makes a maximum opening, closing and protrusion movement. This can either be selected as a reference axis for the recording or compared with the center of rotation of the arbitrary axis

Hinge Axis

With an opening and closing movement of 10-18 mm, the patient performs a pure rotational movement in the terminal condyle position. This can either be selected as a reference axis for the recording or compared with the center of rotation of the arbitrary axis.

Centre of Condyle by Pointer

The axis determined by a previous achiography, which is marked as a point on the skin, can be adopted in this setting

Tragus superior by pointer

Anatomical point on the patient's ear taken from the tip of the pointer.

C-Bow

Anatomical point on the patient's ear taken from the olive of the c-bow.

Measurement specific Options

Depending on the selected procedure to define the condyle position, it's possible to enter the orbital and incisal point in addition (with a tip).

8.2.3 Face Measurement

Face measurement			
1 Left eye corner	<input type="checkbox"/>		
2 Right eye corner	<input type="checkbox"/>		
3 Left mouth corner	<input type="checkbox"/>		
4 Right mouth corner	<input type="checkbox"/>		
5 Static points upper jaw	<input type="text" value="0"/>	-	+
6 Dynamic points lower jaw	<input type="text" value="0"/>	-	+
7 Static lines upper jaw	<input type="text" value="0"/>	-	+
8 Dynamic lines lower jaw	<input type="text" value="0"/>	-	+

Distinctive reference points from the facial symmetry, the oral cavity or lines, e.g. for the facial profile, can be entered using the pointer. These can be measured statically on the upper jaw as well as dynamically on the lower jaw and thus be displayed in the graphical user interface of the software.

8.2.4 Jaw Positions

Jaw positions	
1 Habitual occlusion	<input type="checkbox"/>
2 Rest position	<input type="checkbox"/>
3 Jaw Relation	<input type="checkbox"/>

Different positions of the lower jaw to the upper jaw can be recorded under the given wording "Habitual occlusion", "Resting position", as well as "Jaw Relation" and can be added individually by name. The order can be changed by using the arrow keys.

8.2.5 Jaw Movements

Jaw movements			
1 Live preview	<input checked="" type="checkbox"/>		
2 Lateral left	<input type="text" value="1"/>	-	+
3 Lateral right	<input type="text" value="1"/>	-	+
4 Protrusion	<input type="text" value="1"/>	-	+
5 Opening	<input type="text" value="1"/>	-	+
6 Chewing	<input type="text" value="0"/>	-	+

The jaw movements to be performed can be individually determined and preset by switching special movement patterns and their frequency on and off. The order can be changed by using the arrow keys.

8.2.6 Measured Parameters (Module Jaw Relation)

Measured parameters			
Retral position	<input checked="" type="checkbox"/>		
Target position	<input type="text" value="7"/>	-	+
Gothic arch	<input checked="" type="checkbox"/>		
Manual correction	<input checked="" type="checkbox"/>		
Guided registration	<input checked="" type="checkbox"/>		
Bite control	<input type="text" value="0"/>	-	+

Settings for determining the jaw relation can be made as follows:

Retral Position

The "Retral Position" refers to the position of the mandible that can be safely guided manually by the practitioner via the Lauritzen or Dawson handle. How many target positions (adduction points) are entered depends, among other things, on the accuracy of the shot or the patient's coordination ability. After completion of this procedure, an average value is calculated from the most obvious points and used for the therapeutic determination of the mandible.

Gothic Arch

The Gothic arch is designated by the arrow angle.

Manual Correction

With the manual correction, the dentist can intervene in the positioning of the lower jaw to make corrections.

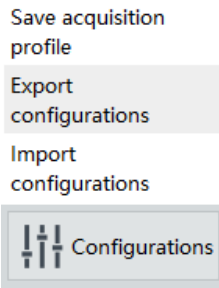
Navigated registration

The patient guides the lower jaw into the target position via visual feedback.

Bite control

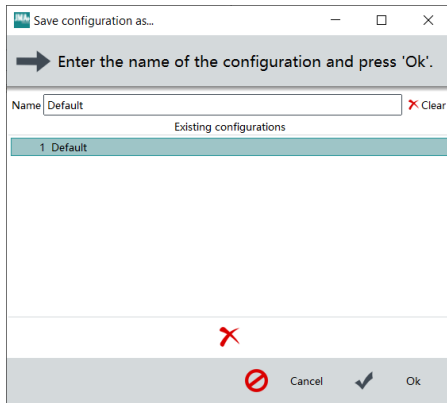
With the optimized bite the correct position can be documented.

8.3 Measurement Profile Management



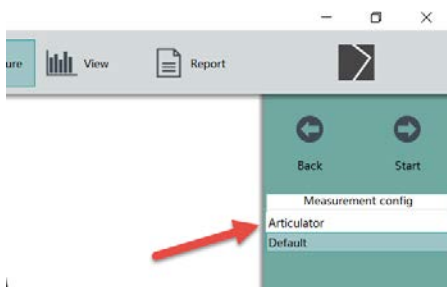
Configurations

In the Measurement Setup of each Measurement module, you will find the button **Configurations**. Here you have the possibility to save the Setup, Export the setup configurations or import already existing configurations.



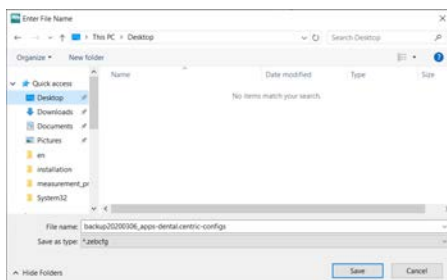
Save acquisitions profile

Under **Name** the new designation of a modified measuring profile can be inserted. The different measuring profiles are stored according to the sequence of numbers. The modified measuring profiles result from the manually performed adaptation of the user's measuring profile. They are stored exclusively in the license used.



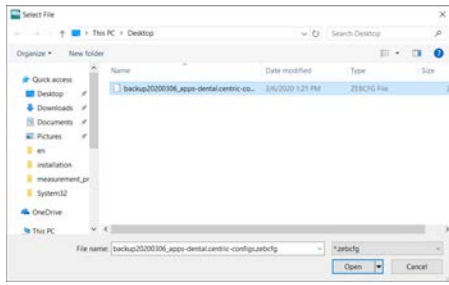
Select measuring profile

If you have created additional profiles, you will find them on the right side of the screen and the navigation buttons "Back" and "Start".



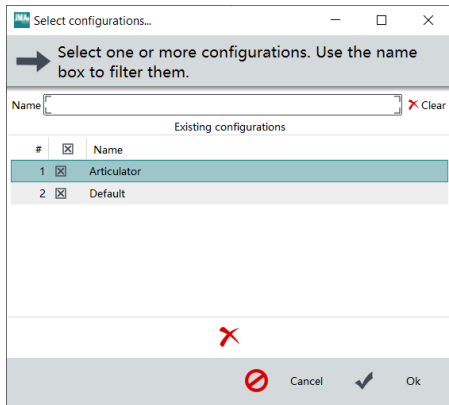
Exporting measurement profiles

Select "**Export configuration**" to export one or more of your created measuring profiles to a desired location. This gives you the possibility to transfer individual measuring profiles to further software licenses.



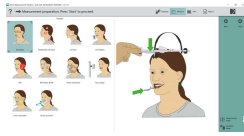
Importing measurement profiles

To import a recording settings backup for the software, select **"Import configurations"**. Use the path search to load the desired package with predefined measurement profiles. Helpful is the exact name of the backup files, e.g. with the name of the handler.



8.4 Measurement Preparation

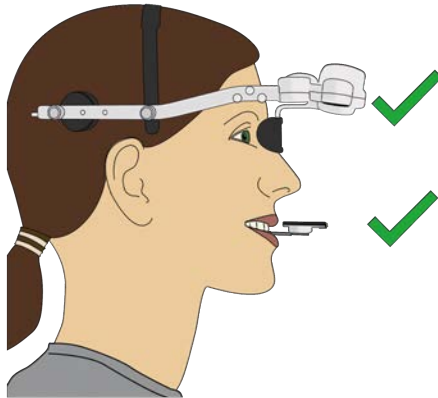
8.4.1 Head bow fixation on the patient



The measuring system should be placed on the test person's head at the latest in the measurement preparation step. There are 3 things to consider:

- Angle and position of camera to mandibular sensor system
- Attachment attachment to the lower jaw
- Patient orientation

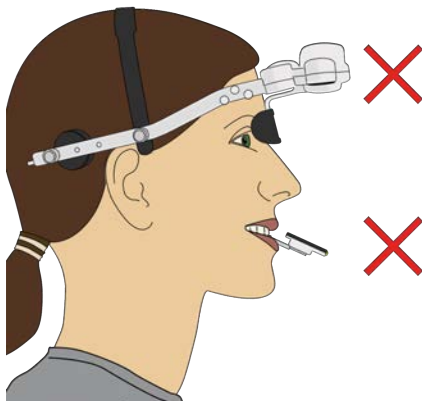
Angle and position of the head bow



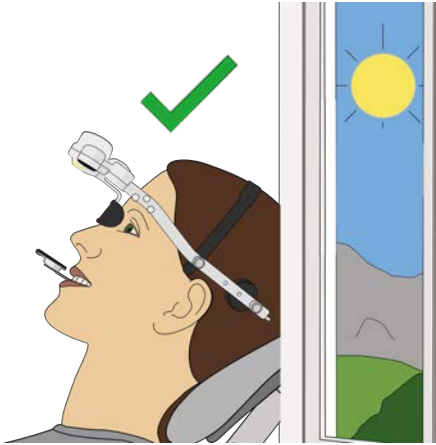
In an upright sitting position, the head bow must be positioned so that the bows are parallel to the floor.

Likewise, when attaching the attachment, make sure that it is fixed parallel to the occlusal plane.

Incorrectly attached head bow

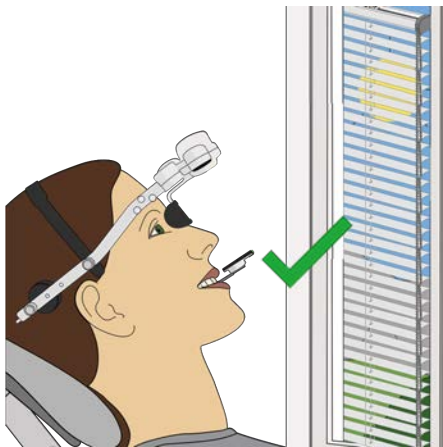


If the system is placed on the patient's head as shown, it cannot be guaranteed that the sensor will detect all positions and movements to be measured without errors.



Patient orientation

Do **NOT** place the patient towards the window.



Patient Orientation

If the patient is placed facing the window, protection from sunlight must be provided.



Patient orientation

The patient must be positioned for measurement in such a way that he/she is **NOT** sitting in the direction of a window or a galley front. The incoming infrared light may interfere with the measurement under certain circumstances, causing

- Signal Interruptions
- Jumps
- not recognizing the mandibular sensor



These instructions must be observed for each measurement. Only if these instructions are observed can a successful measurement of the patient be guaranteed.

8.4.2 Attachment Fixation

The order of the preparatory measures can vary depending on the practice organisation. For the start of an admission, the navigation unit and the para-occlusal attachment (REF no.: 01960260) should be firmly attached to the patient in the correct position.

Since the attachment serves to fix the lower jaw sensor, it must be firmly connected to the lower jaw teeth. If the space available for the attachment "chair side" is insufficient due to the tooth status or a very deep bite, possible variants of the attachment of the para-occlusal attachment (REF-No.: 01960260) can be individually worked out with the dental laboratory.

In the case of gaps and partially missing teeth, individually prepared bite templates can also be used in conjunction with special anchoring systems, e.g. clasps and button anchors.

The standard attachment of the para-occlusal attachment (REF-No.: 01960260) is carried out via the labial surfaces of the lower teeth. In order to use the entire attachment surface of the teeth and the interdental spaces, the standard para-occlusal attachment (REF-No.: 01960260) can be extended beyond the length of the attachment portion into the posterior tooth region. It must be decided individually whether the preparation of the para-occlusal attachment (REF-No.: 01960260) should be carried out by the dental laboratory on situation models.

1. Fixation with temporary material



Use a plaster model of the existing patient situation to make the individual attachment. Alternatively, you can have your dental laboratory perform this step.

The para-occlusal attachment (REF No.:01960260) must be adapted by bending at the lower dental arch. The shape then follows the dental arch as exactly as possible and has no contact with the upper teeth.



In particular, make sure that the upper teeth do not come into contact with the T-attachment or the luting material. This prevents subsequent, undesired detachment or kinking of the attachment during a measurement.



Once the material between the para-occlusal attachment (REF-No.: 01960260) and the labial surfaces of the teeth is cured, it can be fixed with temporary cement.

Alternatively, the prepared para-occlusal attachment (REF-No.: 01960260) can be fixed to the teeth with a small amount of tissue adhesive.

2. Fixation through bite registration material



With this method you can create the individual attachment in the session, directly on the patient. In the example, the following material was used:

greenbite apple

DETAX GmbH & Co. KG
Carl-Zeiss-Str. 4
76275 Ettlingen / Germany

In the first step, adapt the arms of the para-occlusal attachment (REF-No.:01960260) to the patient situation. Optionally, you can use a plaster model for this purpose, if available.



Apply the material to the para-occlusal attachment (REF-No.:01960260) and place it on your patient's mandibular dentition. Place the attachment as centrally as possible and in straight alignment. Instruct your patient to connect to the dental arch to avoid interfering contacts.



After the material is fully cured, you can remove the attachment and remove excess material.

For treatment you can attach the prepared attachment to the teeth with a small amount of tissue adhesive.

Alternatively, small amounts of low viscosity impression material can be applied to the attachment to provide additional retention across the interdental spaces and to attach the attachment.

8.4.3 Bite Fork

Basics of the bite fork

In relation to the sensors of the JMA Optic system, the bite fork has a position known in the coordinate system. The determined movement data can be exported via XML data file and allows to combine individual movements as well as model scans. This method gives the user the possibility to design splints and prosthetic restorations under patient-specific movements in a CAD software and to manufacture them via a CAM system.

Recording method with bite fork (REF-Nr.: 01960320)

The procedure for recording on the patient is as follows:



To determine the position of the upper jaw, the bite fork is first applied with a registration material which the patient bites into. The material hardens and is scanned intraorally or in the desktop scanner with the upper jaw model according to the specifications of the CAD/CAM software manufacturer in order to match the mesh and movement data in the design software.



During the measuring procedure, the bite fork (REF-No.: 01960320), which was previously supplemented with bite registration, is first inserted into the patient's upper jaw. Before this, the trouble-free return of the tray into the mouth was tested



The lower jaw sensor is then placed on the bite fork. This position is now registered by continuing the recording process.



Then, after removing the coupling tray (REF no.: 01960320), the mandibular sensor is placed on the para-occlusal attachment (REF no.: 01960260) and the mandible is registered in the habitual occlusion.

The motion recording follows as usual. After the recording is completed, the XML data record is available for supplementing the movement data in the CAD software.

8.5 Measurement Execution

With the **Start** button the recording of the selected module is started. A recording can be repeated at any time by clicking the Back button.

During the first recording on a patient, a transfer of anatomical points for referencing the sensor system is carried out. This process can be repeated for subsequent images by clicking on **Redefine lines & points**. Depending on the acquisition settings, anatomical points are transferred to the virtual environment. Follow the instructions.



Type of presentation

The tabs above the skull display refer to the display options. Either a generic skull can be displayed as a "model", or a 3D-grid

Zoom

The zoom buttons are used to enlarge "+" or reduce "-" the skull display. A click with the left mouse button on the 3D view determines the point to be zoomed. Zooming is also possible with the mouse scroll wheel. With "=" the graphics is adapted to the window size.

Prospects

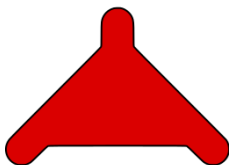
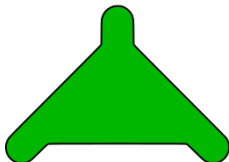
The buttons to the right of the zoom function allow you to select a standard perspective. The view from the left, right, front, back, top and the free perspective are available. The model can be rotated in the graphic as desired with the help of the mouse.



Note on sound signal

The start of recording is signalled by a high-pitched tone and the end by a low-pitched tone. Recordings like static point recordings as well as different jaw positions are confirmed with a tone.

Sensor status display



Sensor status JMAoptic

The signal field in the Sensor Check Strip lights up in green when the IR cameras are ideally assigned to the IR LEDs. Glasses, jewellery and other objects located between the navigation unit and the mandibular sensor can influence the recording or prevent the recording from starting (signal field red).

Make sure that the signal field below the pictogram is permanently lit up green during a recording. A red signal field means "Stop"! In this case, please check the recording area for obstacles, dirt or the charge level of the lower jaw sensor.

If a flickering or permanent red light appears in a free recording area, the system should be checked for a defect.

If a grey pictogram is displayed, the mandibular sensor is not active and you are currently between two recording times.

Sensor status Ultrasonic systems

The lamps in the sensor test bar at the bottom right-hand side light up in green during the measurement. For successful measurement, the correct calibration to the reference plane of the patient

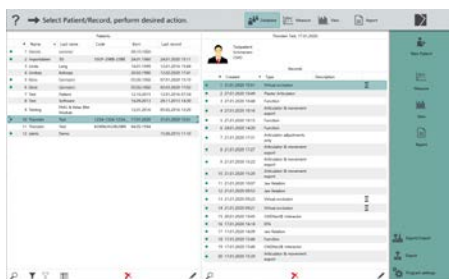


Condition. Glasses, but also ear jewellery or hair, which are located between the ultrasound transmitter and receiver can influence the measurement or prevent the measurement from starting. Make sure that the round signal fields 1-4 below the pictogram light up continuously in green during a measurement. Signal fields that light up red or even partially red mean "stop", please check the test section for obstacles or check plug connections and cables.

9 Edit Measurement (View Mode)

In the "View" mode the measurement can be viewed and analyzed. The individual functions of the view mode are explained in detail below. In the modules, there are different representations of the illustrations due to the specific application.

9.1 Basics



Select record

After selecting a record from the database, the individual images of the patient are listed on the right. Via the **Analysis** button or by double-clicking on the patient, the analysis mode is opened. When a recording is complete, the system first swEin Klick auf "Patientenakte bearbeiten" öffnet die Patientenakte. Darin können Sie Änderungen an den hinterlegten Patientendaten vornehmen. itches to view mode.

Click on "Play" in the right toolbar.

A time display shows the currently displayed point of time. The time display begins at 0.0 and ends at time X, the end of the recording. You can enter an individual time value or use the cursor position to display the current time of the recording.

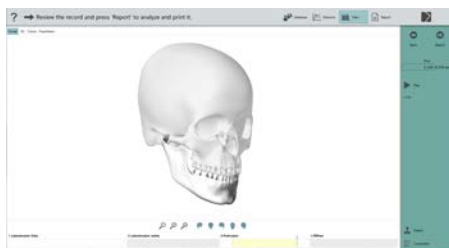
By clicking on "Back" you can return to the database.



Timeline

The timeline is shown below the Zoom and View functions. It gives information about the performed movements with its durations. A dashed line with arrow shows the current time point during play back mode. Movements can be hidden or shown by double-click in the corresponding movement area. Transparent blue background means that the movement will be skipped in the play back mode but also implies that this special movement won't be analysed in the report.

To select and analyse a specific area, move the cursor to an individually selected start point in the timeline and confirm with single click of the left mouse button.



The end of the selected range is determined by activating the Shift key and simultaneously single click the left mouse button.

This area is highlighted in yellow.

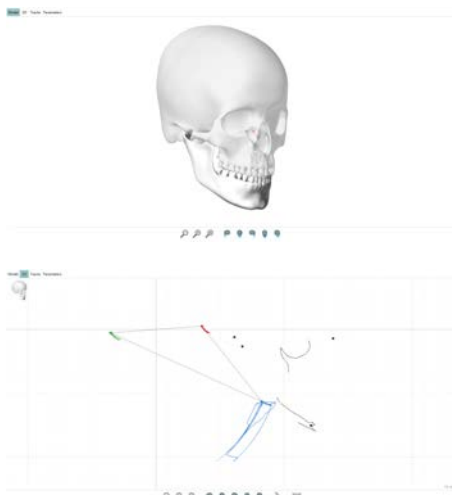
Now press the button "+" on the keyboard in combination with **Shift+left** mouse button.

The selected area is zoomed in and available for further procedure.

To zoom out the area, use the button "-" on your keyboard

9.2 View Options

The views can be moved and resized in all spatial directions using the mouse scroll wheel, "+" and "-" keys or the function of touch-enabled PCs.



Model

By clicking on the Model tab, the skull is displayed in 3D.

3D

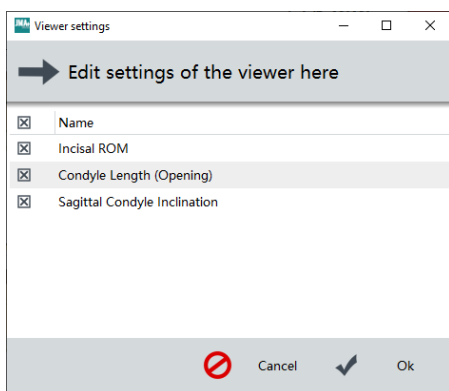
After selecting the **3D** tab, the overall view of all points and lines as well as the Bonwill's triangle is displayed.

Tracks

The condyle illustration shows the movement from above and from the side.

The incisal point display shows the movement of the incisal point from the front and from the side.

In the individual view, the movement track is also shown from above.

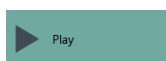


Customized View

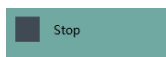
You can choose which information you want to display. Clicking on "Customize" opens the dialog box in which the required parameters are activated or deactivated by clicking the checkboxes.

The selection made here will be adopted in the report. The displayed data can be configured separately in the Report module.

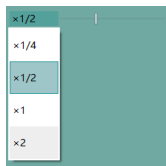
9.3 Functions



Play



Automatic playback of the recording by clicking this button. The recording is played and repeated until the Stop button is pressed.



Playback speed

A click on this button opens a list for selecting the playback speed.



Zoom

The magnifying glass with minus sign reduces the display by 20%.
The magnifying glass with plus sign enlarges the display by 20%.



Zoom to fit

The 3D view is centered in the view and the zoom factor is automatically adjusted to the acquisition window so that the model is fully visible.



Right View

Shows the 3D skull model from the right.



Left View

Shows the 3D skull model from the left.



Frontal View

Shows the 3D skull model from the frontal.



Top View

Shows the 3D skull model from the top.



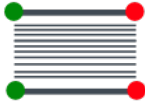
3D View

Shows the 3D skull model in the basic view.



Measuring angles and distances

Draws lines to determine angles and distances in the anatomical reference. The black line can be aligned in the desired direction as a reference line. The green line can then be used to determine distances and angles to the black line.



Condyle axis

Shows the condyle axis.

10 Report

In "Report" mode, the function parameters previously defined in View mode are evaluated and displayed.

10.1 Basics



Open Record in the Viewer

Select a record in the database under Records and click **Report** in the right toolbar or switch to the Report from View mode.



Report

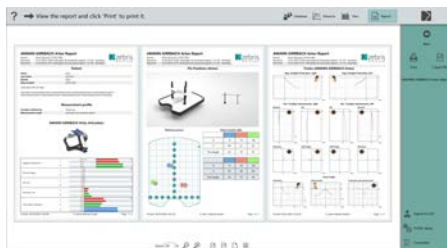
The report view allows to read and evaluate the data as a whole. These can be printed out from the report level by clicking on the printer symbol or saved as a pdf file. Under "Customize" the different parameters can be added or hidden in the report.

10.1.1 Comparison Report



Select Recordings

Two records of the same category can be compared directly with each other and also linked in the report view. The recordings stored under "Records" are marked with **"Ctrl" + left mouse button** and are directly related and displayed in the view via "Report". The report can then be printed out or saved as a pdf file.



Presentation in the comparison report

In the comparison report, the results of image A are shown in colour and those of image B in black. The assignment to the respective admission can also be seen in the header line.

10.1.2 Report Controls

View

With these buttons you can determine how many report pages are displayed at the same time. Alternatively, the slider can be used to zoom in/out.



1:1

Displays the report page as a whole.



Fit to width

The report page is zoomed to the full available width.



Fit to page

Displays the report pages in their original size. The size may differ from the printer paper size due to different screen resolutions.



Thumbnail view

Shows all report pages for overview as small pictograms.

Export and printer setup



Print

The report is output to the printer selected under **printer settings**.



Create PDF

The report is exported as a PDF file to any directory or to an external data medium.



Printer setup

Here the printer is selected and the settings for printing (e.g. format, page size, etc.) are changed.

Report properties



Customize

Show and hide individual report parameters. See chapter [Report Properties](#) ⁵⁴.

10.2 Report Structure



Headline

Title, project name, patient name, date of admission and the company logo are in the header.



Module specific data

Below the header line are the visualizations of the recorded data. This visualization differs depending on the selected module. Further information on the displayed data can be found in the respective module.

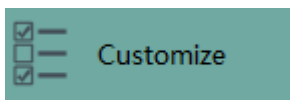
Patient	
Name	Thorsten
Last name	Test
Gender	Male
Date of birth	17.01.2020
Testpatient	
Schmerzen	
CMD	



Patient Information

Name, Last name, Gender, Date of birth and Comments
 For individual statements of the treating physician regarding the diagnosis and examination, a comment field is available in the patient file. These are then displayed in the report

10.3 Report Properties



Customize Report

To show or hide individual parameters of the report, click on **Customize** and the report settings appear. This information, which can be switched on and off, can be linked to specific questions, for example, for specific statements or targeted evaluations.

By clicking on the **Ok** button, your changes are accepted and you are returned to the database.



Edit Report settings

Predefined report variants are displayed on the left side. You can adapt and select these templates to your own requirements.

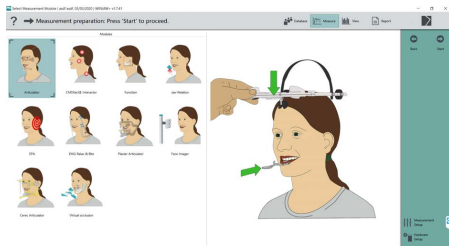
The categories are shown in the middle. A category can be shown or hidden using the "Add" (Plus) or "Remove" (X) button. Using the arrow buttons, the display sequence of the categories can be adjusted.

The parameters to be displayed can be set analogously on the right side.

11 Articulator Module

This module consists of the movements of protrusion, laterotrusion left and laterotrusion right. The recording results are to be considered differentiated depending on the movement process by the patient. The articulator values are usually performed under tooth contact. This allows the system to determine the value for setting the individual anterior guidance plate. The same applies to the lateral movements, which are then guided over the posterior or canine teeth. It should be noted that the values for articulator setting are generated from idle movements. For comparison, additional movements guided by the dentist on the patient can influence the significance of occlusal movement margins. We recommend that the prosthetic restorations created using the zebris values are subjected to a check under Function in the Patient's Mouth and corrected if necessary.

11.1 Perform Measurement



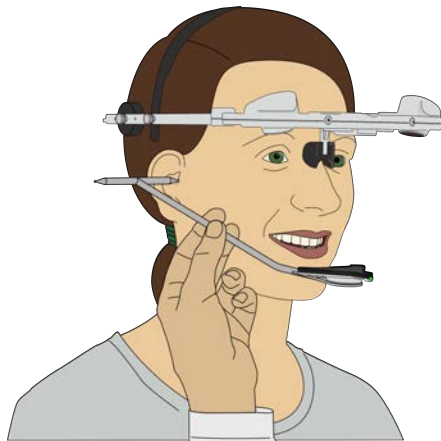
Modul selection

Select the articulator module on the left and then click on the Start button.

11.1.1 Reference Plane

The data is related to a level. If several exposures are to be made in one session, each of the subsequent exposures can be made with the reference plane already determined. Otherwise, a new reference plane is defined via the button Redefine reference plane.

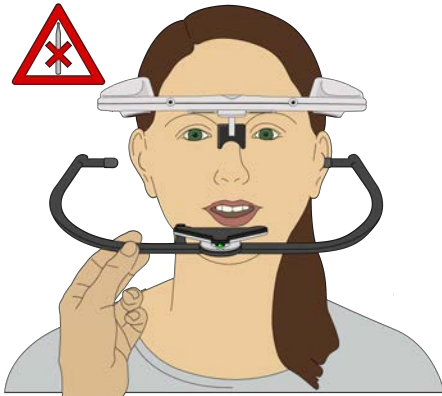
Define reference plane articulator with T-pointer



T-Pointer

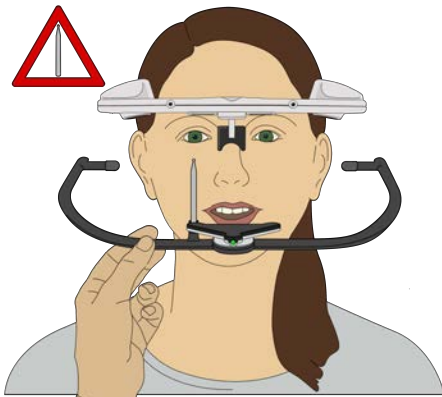
The possibility of transferring the images to different articulator systems makes it necessary to adjust the images to the planes such as Frankfurt horizontal, Camper's plane and the patient plane by calculation. This is taken into account during acquisition via the anatomical reference points.

Define reference plane articulator with C-Bow

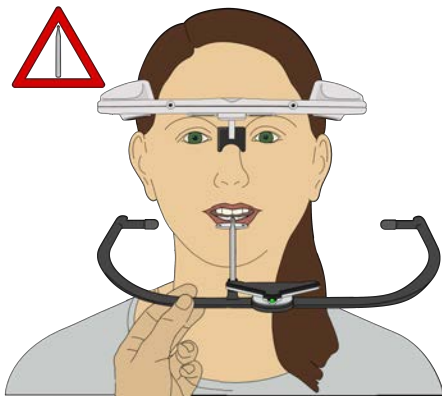


C-Bow

The C-Bow offers another possibility to define the reference plane on the patient. A special feature of the C-arm is that the infra-orbital point and the incisal point can also be measured.

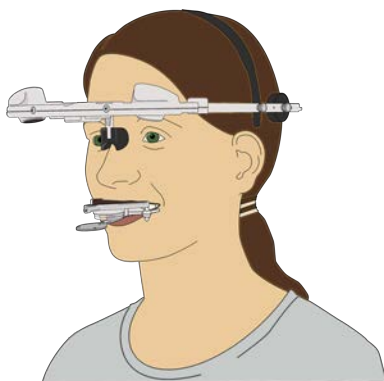


Measuring the Orbital point with the pointer



Measuring the incisal point with the pointer

Reference Plane Bite Fork



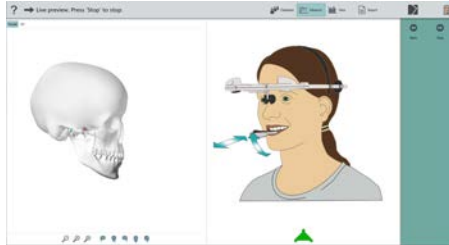
Reference Plane Bite Fork

The data acquisition of movements for transfer to CAD/CAM software, but also for transfer to a mechanical articulator by means of the zebris transfer table, requires the recording of the upper jaw position or coordinates via a special bite fork (REF-No.:01960320) and thus the determination of the lower jaw position in habitual occlusion.

During the procedure, it must be ensured that the positioning of the lower jaw in relation to the upper jaw is carried out correctly for the later processing of the data in the above mentioned systems.

11.1.2 Measuring Procedure

Slightly modified as under [functional analysis](#)^[62], the patient is instructed on this specific measurement, as all movements should be carried out with tooth contact. The patient performs these under the control of the dentist. Not only practicing the movement patterns, but also the controlled standardized execution of the data acquisition brings a higher data security and accuracy.

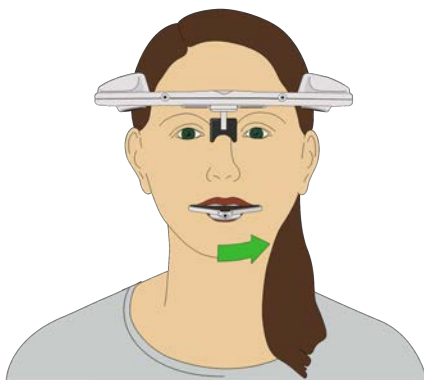


Live Preview

In the test movement section, movements can be displayed, checked and illustrated to the patient without saving the values. You can also use this mode to practice special functional movements with the patient. Please activate Start with click on **Start**. The test mode is switched to the following measurement mode by clicking the **"Stop"** button. This function can be switched off under measurement settings.

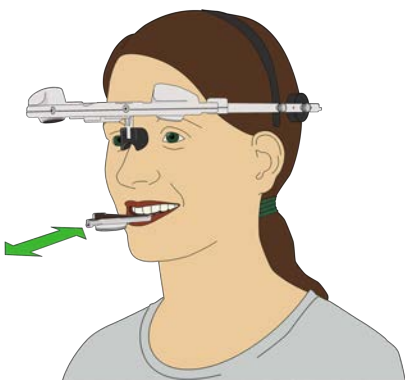
11.1.3 Measure Movements

Depending on the selected movement patterns, their number and their chronology, they are performed with the patient after the preview. In principle, all measurement sequences can be individually configured. Using the example of some standard movements, you will be guided through the recording protocol in the following.



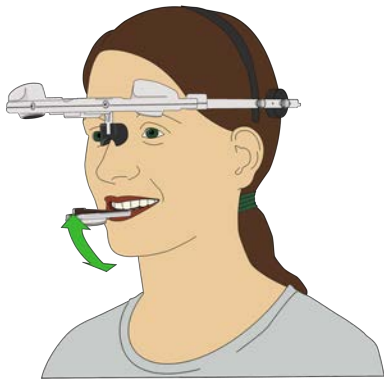
Lateral movement

The articulator recording begins with the maximum left and right lateral movement that can be achieved. The measurement process can be triggered by clicking on the "Record" button with the foot switch, the Enter button and the mouse button. The starting position is always the habitual final bite situation. At the end of the movement, the patient moves the jaw back to the starting position, whereby the measuring process is terminated after the return.



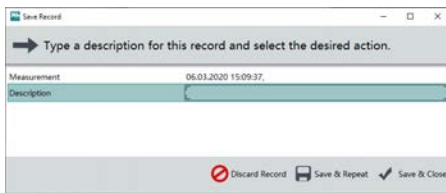
Protrusion Movement

Let the patient assume the starting position and perform a maximum protrusion movement from this position. Then the patient lets the lower jaw slide back to the starting position.



Opening Movement

Let the patient assume the starting position and perform a maximum opening movement from this position. Then the patient lets the lower jaw slide back into the starting position.



At the end of the measurement, a dialog box appears with the following options:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

11.2 View Mode

In the following, the parameters that are to be recorded specifically with the articulator module are explained. Basics for the operation of the view mode are described in the chapter [Edit measurement](#)⁴⁸⁾ (View mode).

Measurements in mode *Articulator adjustments only*

When measuring in Articulator mode, only the articulator-relevant data is displayed in the viewports in view mode. This includes the tabs **Model**, **3D**, **Tracks** and **Parameters**. As well as the display of the condylar path parameters in the Parameters block.

Measurements in mode *Articulator & movement export*

In the View mode the same data are played back as there were recorded in the Articulator adjustments only mode. The visible positions of the bite fork in the 3D tab are also displayed. The XML data can be transferred to the corresponding CAD/CAM system via the **zebris real Movement Export** button.

Measurements in mode *Real Movement export only*

In the measuring mode **Real Movement export only**, the movement display is realized via the reference plane assignment of the coupling spoon, the movement display via the bite fork positions. The data can be transferred to the interface of the CAD/CAM system via the zebris real movement export button.

11.2.1 Module specific Parameters

Parameters

The following data can be found in the Parameters tab:

- Incisal, Lateral right/left
- Incisal, Protrusion, Incisal Opening
- Condylar Path Length right/left
- Sagittal Condyle Inclination right/left

The green area marks the reference range in which the range of motion of patients in a reference group lies. The reference values are displayed if the age of the patient is between 20 and 60 years.

The values for the reference range are taken from the publication "*Standard an Limit Values of Mandibular Condylar and Incisal Movement Capacity*" (*International Journal of Computerized Dentistry* 2014;17(1); 9-20



Condyle path length

Specifies the determined length of the distance in which the condyle can move.

Sagittal Condyle inclination (reference: Frankfurt horizontal)

Indicates the inclination of the joint path on which the condyle can move.

11.2.2 Data export to CAD/CAM interface



zebris real movement export

To transfer the data of the acquisition modes "**Articulator & movement export**" and "**Real movement export only**" to the CAD/CAM interface, please click on the **zebris real movement export** button.



Virtual articulator settings export

With the **Virtual Articulator settings export**, not only the patient's individual movement data but also the upper jaw position in the articulator, including setting values, are exported

If you have selected a default path in the program settings, the data file is stored directly in this path. If this is not the case, a task window opens after pressing the button to manually specify a suitable storage location.

11.3 Articulator Report

In "Report" mode, the parameters previously defined under View are displayed and evaluated. The basics of operation are described in the Report chapter.

Depending on the articulator type, the levels are differentiated between Frankfurt horizontal (SAM S3), Camper's level (KaVo Protar) and patient level (Amann Girrbach Artex).

The scale values of the joint housing and the anterior guidance plates (individual) are adapted to these levels. Inserts (example SAM) for the articular path inclination or the Bennett movement are taken into account in the report and are highlighted in bold. The drawn curves on the second page are used to assess whether the measurements were taken with the correct movements. The data output for digital model transfer with the Artex, as well as the Stratos articulator table, is also output in "Report" mode.

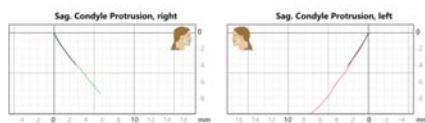
11.3.1 Module specific Parameters

The report consists of the elements described below. Depending on the specifications in the recording settings, certain statements can be read in the report. The patient-specific setting parameters of the respective selected articulator are displayed. In this case, the bars with the colors green/red/blue describe the individual data of the patient undergoing treatment.

11.3.2 Explanation of the report content

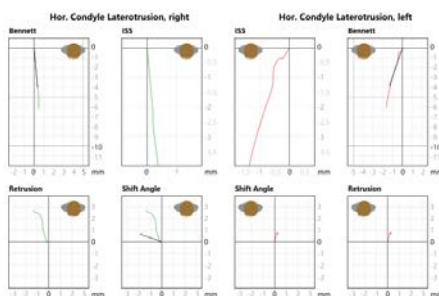
Motion Tracks

The movement traces shown are generated from the different movement specifications with respect to both joints and the incisal point. Depending on the selected axis position and reference plane, the condylar tracks can be displayed differently in their course and angle.



Sagittal condylar tract imaging

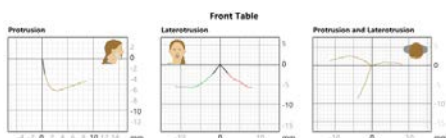
The sagittal articular path inclination is calculated in such a way that the best possible coverage of the recorded curves with the articulator's curvature is achieved, especially in the initial area. The diagrams show the condylar path inclination of the protrusion and opening movements.



Horizontal condylar path representations

The Bennett angle and the Immediate Sideshift are calculated from the movement of the mediotrusion condyle or swinging condyle, i.e. the condyle of the non-working side. The lines drawn in black correspond to the averaged curve of the Bennett insert of the articulator. The colored lines (red and green) correspond to the recorded movement traces.

Retraction is calculated from the sagittal movement of the laterotrusion condyle or resting condyle retro-cranially. The shift angle controls the condyle from a pure laterotrusion movement of "0°" continuously between a max. latero retraction "-20°" and latero protrusion "+20°".



Front table slideways

The angles to the anterior guidance are shown here. The anterior plate is adjusted according to the displayed curves. With the articulator, the sagittal, the left- and right-lateral anterior plate inclination and the inclination in the frontal projection are displayed.

Model transfer via transfer table

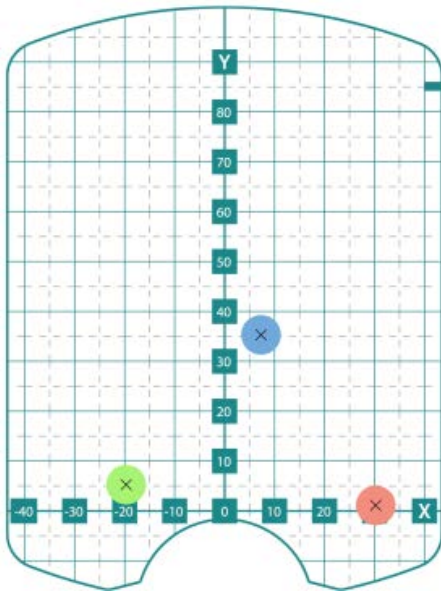
This section describes the position data and the setting heights of the positioning screws. This allows the models to be articulated based on the correct maxillary position. zebris offers 2 different transfer tables.

- REF01560050 Set Digital model transfer Adesso Split
- REF01560052 Set Digital Model Transfer Artex Splitex



Reference picture

The graphic representation shows the orientation of the coupling bucket on the positioning table (REF01560050; REF01560052), as well as a pictorial representation of how the screw length is measured.



Bite fork positioning

The diagram shows the alignment of the positioning screws on the positioning foil in top view. For this purpose, the positioning screws must be screwed into the coupling tray type SD in the correct length.

Values transfer table

X	8	31	-19
Y	35	0	5
Pin length	24	12	15

Bite fork Parameter

The table is used to determine the alignment of the three positioning screws on the film and the screw length to be set. With these parameters, the upper jaw can be articulated in the correct position in the ARTEX or Stratos.

12 Function Analysis (3D-Analysis)

The individual steps of a 3D analysis are described here using the standard settings. Further movement patterns, their sequence and number can be preconfigured via the recording settings.

12.1 Perform Measurement

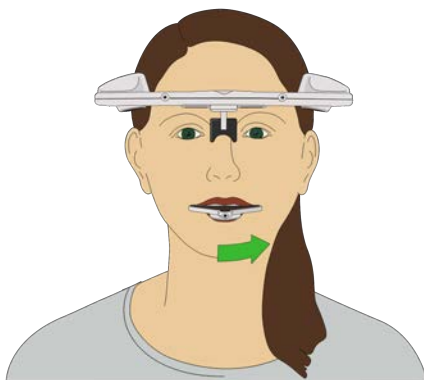


Module selection

Select the function module on the left and then click on the **Start** button.

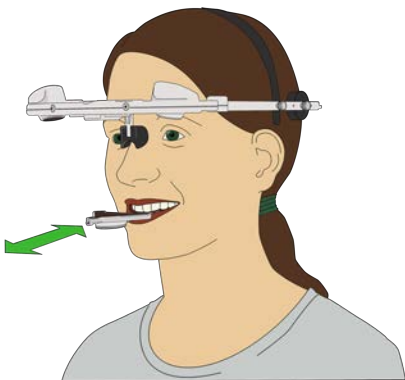
12.1.1 Measure Movements

Depending on the selected movement patterns, their number and their chronology, they are performed with the patient after the preview. In principle, all recording sequences can be individually configured. Using the example of some standard movements, you will be guided through the recording protocol in the following.



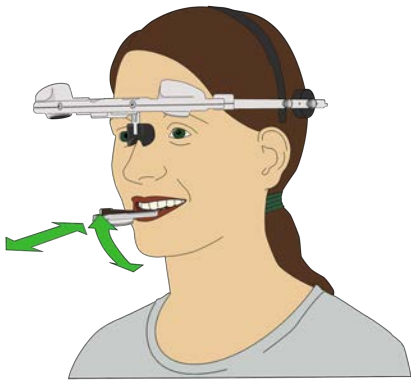
Lateral movement

The measurement in the functional analysis begins, for example, with the maximum left and right lateral movement that can be achieved. The recording process can be triggered by clicking on the "Record" button with the foot switch, the Enter key and the mouse button. The starting position is always the habitual final bite situation. At the end of the movement, the patient moves the jaw back to the starting position, whereby the acquisition process is terminated after the return.



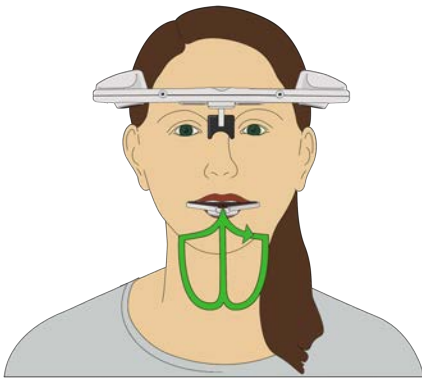
Protrusion movement

Let the patient assume the starting position and perform a maximum protrusion movement from this position. Then the patient lets the lower jaw slide back to the starting position.



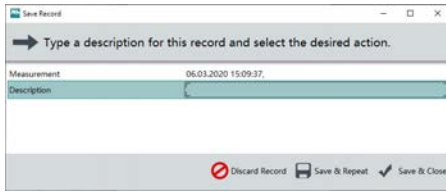
Opening Movement

Let the patient take the starting position and perform a maximum opening movement from this position. Then the patient lets the lower jaw slide back into the starting position.



Chewing, Posselt frontal, Posselt sagittal and user defined movement patterns

Further optional motion pattern are done analogue to previous described movements.



At the end of the measurement, a dialog box appears with the following options:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

12.2 View Mode

In the following, the parameters that can be recorded with the function module are explained. Basics for the operation of the view mode are described in chapter [Edit Measurement \(View mode\)](#)⁴⁸.

12.2.1 Module specific Parameters



Parameters

The following data can be found in the Parameters tab:

- Incisal, Lateral right/left
- Incisal, Protrusion, Incisal Opening
- Condylar Path Length right/left
- Sagittal Condyle Inclination right/left

The green area marks the reference range in which the range of motion of patients in a reference group lies. The

reference values are displayed if the age of the patient is between 20 and 60 years.

The values for the reference range are taken from the publication "Standard an Limit Values of Mandibular Condylar and Incisal Movement Capacity" (International Journal of Computerized Dentistry 2014;17(1); 9-20

Condyle path length

Specifies the determined length of the distance in which the condyle can move.

Sagittal Condyle inclination (reference: Frankfurt horizontal)

Indicates the inclination of the joint path on which the condyle can move.

12.3 Function Report

In the "Report" mode, the function parameters that were previously defined in the Analysis mode are evaluated and displayed. Basics for the operation of the report mode are described in the chapter Report.

12.3.1 Module specific Parameters

The report consists of the elements described below. Depending on the specifications in the admission settings, certain statements can be read in the report. The motion data in all spatial directions is queried and displayed in the context of scientifically based mean values. In this case, the bars with the colors green/red/blue describe the individual data of the measured patient, which can be immediately compared with the mean values (green pastel shade). This helps the user to make a basic statement as to whether a functional disorder or restriction is present.

12.3.2 Explanation of the report content

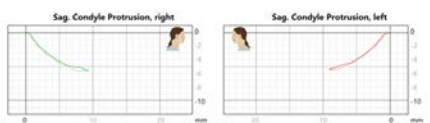
Motion recording

The movement traces shown are generated from the different movement specifications with respect to both joints and the incisal point. Depending on the selected axis position and reference plane, the condylar tracks can be displayed differently in their course and their angle.



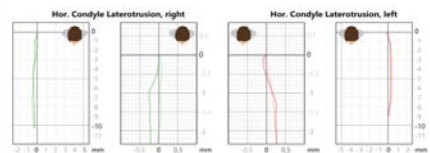
Condyle tracks at jaw opening, sagittal view

Each of the diagrams shown here illustrates the condylar movement when recording an opening movement.



Condyle tracks during protrusion, sagittal view

Each of the diagrams shown here illustrates the condylar movement when recording a protrusion movement.



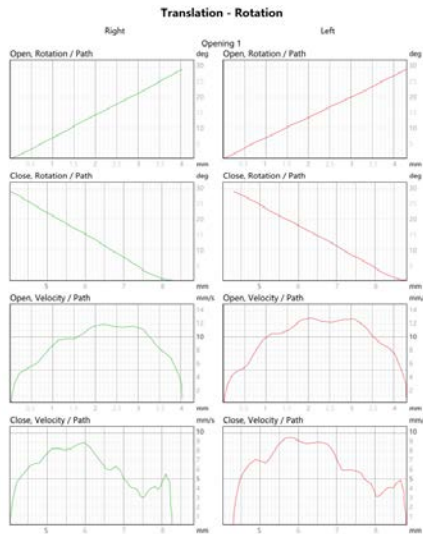
Horizontal Condyle path, cranial view

Each of the diagrams shows the condylar movement when recording a laterotrusion movement.



Incisal at jaw opening, frontal/ sagittal view

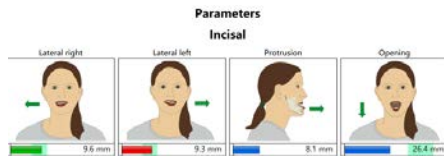
Each of the diagrams shown here illustrates the course of the incisal point when recording an opening movement.



Translation - Rotation

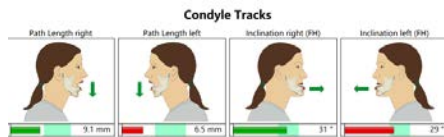
"Open, Rotation" (degrees) / "Close, Rotation" (degrees)
 The diagrams show the mouth opening or jaw rotation angle as a function of the speed of movement. Due to the type of line course, conclusions can be drawn about a trouble-free jaw movement. In case of a homogeneous movement, the diagram shows a largely smooth and rising curve.

"Open, speed" (mm/s) / "Close, speed" (mm/s)
 The solid green line represents the speed curve of the right side during mouth opening and closing. The red curve shows the left side. When the intercondylar axis is moving undisturbed, the curves appear in a bell shape.



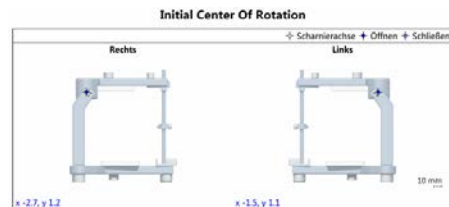
Incisal point

The bar charts show the extent of the range of motion starting from the incisal point in frontal and sagittal projection, in laterotrusion left and right, and in protrusion and mouth opening.



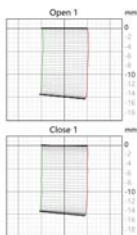
Condyle tracks

The bar graphs show the path length and the path inclination of the two condyles during the protrusion movement.



Initial center of rotation

The Initial Rotation Center tab shows the position of the rotation axis during opening and closing in relation to the mean rotation axis during the opening movement.



Condylar axis movement

The diagrams show phase representations of the intercondylar axis of opening and closing movements.

13 Jaw Relation Analysis

The module "Jaw relation" enables the determination of the correct lower and upper jaw relation. This can be done with the classic support pin register, jig, aqualizer or a hand-guided positioning. Furthermore, the targeting of the lower jaw into a determined position is supported in real time. This is transferred via registration material for diagnostic evaluation and prosthetic fitting. This registration can also be used for the determination and diagnostic evaluation of temporomandibular joint positions with the help of the EPA module.

13.1 Description of the neuromuscular relational determination

This module allows the adjustment of the relation of the lower jaw to the upper jaw by means of ballistic, fast closing movements on a previously made jig.

Before determining the neuromuscular target positions, the jig with plateau is inserted. Then the position of the habitual occlusion is registered without manipulation. This is followed by the relaxation of the masticatory muscles. Afterwards the patient is instructed to close slowly from the maximum opening of the mandible to approx. 8-10 mm before plateau contact. From this position the jig is closed with maximum or ballistic speed. This procedure is repeated several times. The positions are registered. The number of repetitions is set in the Measurement Setup, "Measured parameters". In the diagrams (incisal point, condylar position) the system displays each individual target position as a point on a target. The repetitions can be used to check whether the patient is able to reproduce a neuromuscular centric jaw relation. If several target positions are centered in the target, it can be assumed that the patient is able to reproduce this position. The position can be directly coded with a bite registration in the mouth.

13.2 Principles for execution

Incisal positioning

The blocking is done in the upper jaw via a plateau, Jig, Aqualizer or similar. The height depends on the condition of the occlusion, bite position, vertical dimension and the goal of the treatment to be achieved. In principle, any method can be carried out electronically supported by the relation measurement

Habituelle on plateau

The habitual position determined by programming the muscles and repeated swallowing is registered at the level of the plateau in order to maintain the ratio of the subsequent recordings.

Retral position

With the activation of the retral position it is possible to assess the distance of the TMJ to the bilaminar zone. This is possible in the original as well as in the new mandibular position.

Target position

Target positions are the ballistic movements to be performed on the jig inserted in the maxilla, which represent the hit area for the averaged adduction point (MCP).

Gothic arch

The arrow angle recording enables the determination of the central relation by displaying the arrow angle apex.

Gothic Arch

It is possible to operate different procedures (methods) in one recording session by combining both recording variants.

Target Position & Manual correction

Arrow-angle points, like adduction points, can be moved therapeutically in their final position immediately after recording, individually or in combination. This point, called the averaged target position, can be changed in its position with the left mouse button and simultaneous shifting.

Guided registration

Once the position has been determined, the patient can find it by sliding on the plateau using the feedback. By visually following the cross into the target position and by means of a simultaneous acoustic signal, orientation is helpful for the patient. The closer the lower jaw comes to the target point, the faster the sound interval becomes. In addition, the tone colour changes to a higher tone.

Bite control

For control purposes, the cured bite registration is to be re-used via optimization by correction. It is removed from the mouth and ideally trimmed or ground, depending on the registration material used. Fans and imperfections in the gum area can be considered and removed. The registration prepared in this way is inserted again in the same session. The patient is in the position determined by the registration and the bite control can be triggered.

13.3 Preparation on patient

Fabrication of the maxillary plateau

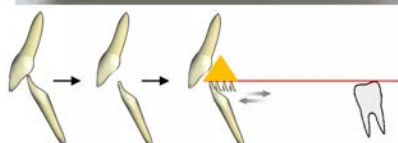
The plateau is designed so that the front teeth of the lower jaw meet the plateau during closing movements without posterior contact, i.e. a slight locking is initiated. Depending on the tooth status (e.g. missing mandibular front), a miniature pin can also be inserted into a mandibular base plate or a modified interim base plate.



For example, the plateau can be made of an autopolymerizate and can be attached to the upper teeth or palate either with retention elements or temporary cement, adhesive cream or silicone. If the tooth status is appropriate, this plateau can be incorporated into a bite template. The plateau is manufactured parallel to the chewing plane. It is adjusted to a vertical dimension parallel to the occlusal plane, which corresponds to the later, therapeutic bite height or comes as close as possible.



To produce the plateau, upper and lower jaw models are placed in an articulator with bite registration and locked at the articulator support pin. This ensures a realistic horizontal and vertical alignment of the mandible. The free spaces between the maxillary and mandibular teeth are checked and corrected if necessary by lateral control movements. The plateau is adjusted to a vertical dimension parallel to the occlusal plane, which is as close as possible to the subsequent therapeutic height. In the habitual final bite situation, the boundary of the incisal edges of the mandibular incisors is marked palatally in the upper jaw front and the minimum size is determined by a further marking.



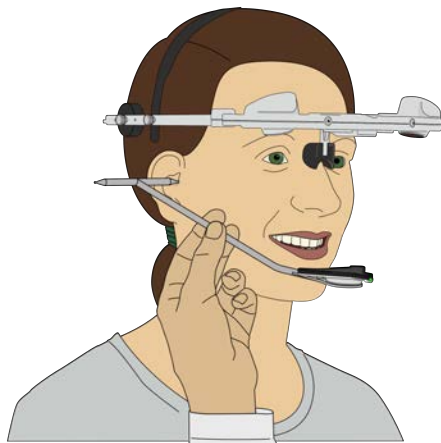
13.4 Perform Measurement

In principle, all measurement sequences can be individually configured. In the following, you will be guided through the measuring procedure using the example of some standard movements.



Module selection

Select the Jaw Relation module on the left and then click on the Start button.



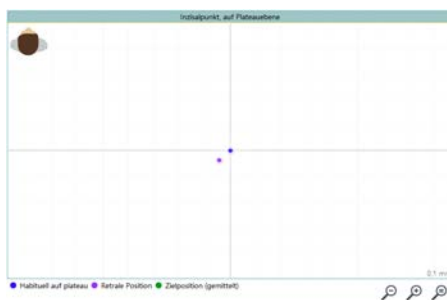
Starting the recording

Anatomical points are transferred to the virtual environment. These are both tragus superior in connection with the lowest point at the lower orbital rim, the infra-orbital point (orbitals). This point is determined by the nasal support.



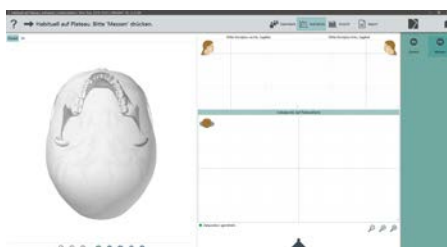
Condyle parameter fields

The fields of the parameters right and left condyle show the initial position of the condyles and in the following recordings the change of position from the sagittal view.



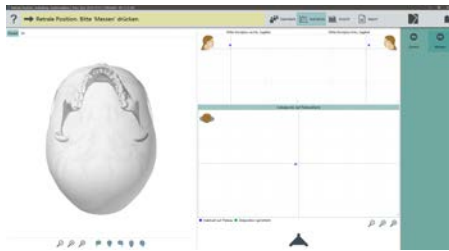
Incisal point parameter field

The field of the incisal parameter allows the view of the position change from a cranial perspective. The legend below provides information about the performed steps with associated points.



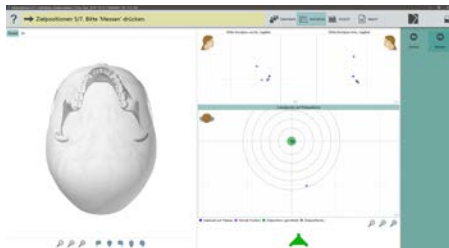
Habitual on plateau

The output recording is intended for the usual position. This is done with a tool, jig, plateau or Aqualizer. The position is shown as a blue dot in the field.



Retral position

This is registered in the retral mandibular position of the lower jaw and is marked as a purple dot.

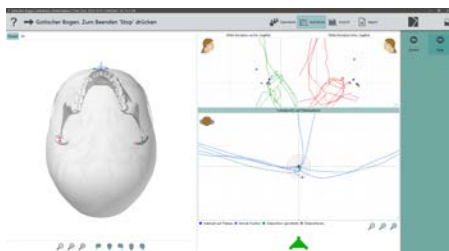


Target positions

After deprogramming of the muscles, fast, reflex-like closing movements to the plateau level are performed. This measurement records the ballistic closing movements for the neuromuscular relation.

Hit rate

The quality of the hit field is assessed by the dispersion of the individual target points. After the number of ballistic closing movements has been completed, outliers are automatically excluded. The intersection of the closest points is used for the final target position.

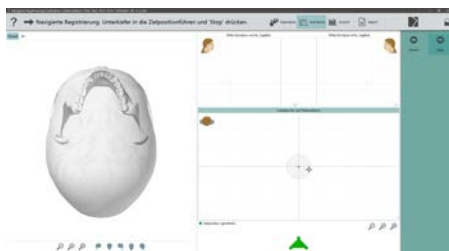


Gothic arch

In addition to the positioning, the recording based on the gothic arch can be used. It uses the tip of the arrow to determine the centric condyle position and thus the new position of the lower jaw in relation to the upper jaw.

Change target position

The practitioner can correct this position and take it into account therapeutically. The position can be actively moved to the desired position with the mouse.



Guided registration

The patient is asked to move the target cross to the green dot on the target. A rising and falling signal tone additionally signals the proximity of the moving cross to the target point. The higher and faster the tone, the closer it is to the point.

Registration

A bite registration is made with registration material and the new position of the lower jaw to the upper jaw is fixed.



At the end of the measurement a dialogue window appears on screen:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

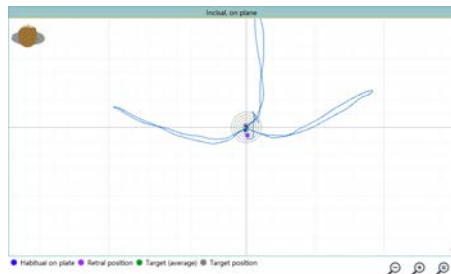
Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

13.5 View Mode

In the following, the parameters that can be recorded specifically with the Jaw Relation module are explained. Basics for the operation of the view mode are described in the chapter Edit measurement (View mode) ⁴⁸.

13.5.1 Module specific Parameters



Representation of incisal point on plateau

The individual positions of the lower jaw are recorded during the treatment and can be viewed in view mode. In addition to the recorded coordinates, the graphic display shows a picture of movement during the treatment.

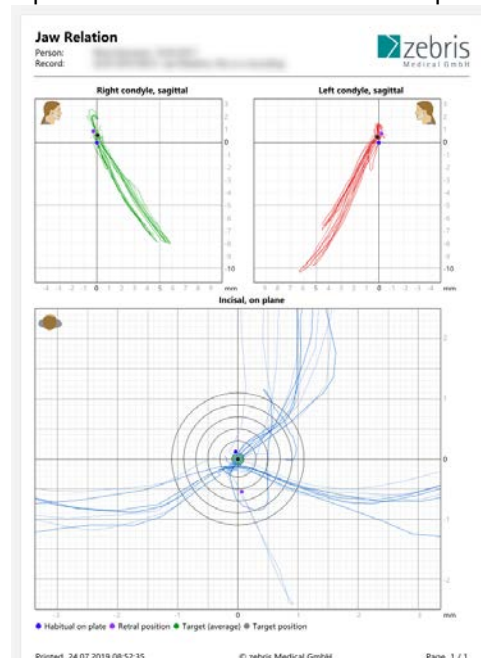


Representation of condyles sagittal

The individual recorded positions can be seen from the condyle position on the left and right. This allows a direct comparison of the differences between the individual recorded positions, e.g. retral position compared to habitual position.

13.6 Jaw Relations Analysis Report

The Jaw Relation Report can be started directly after the recording from the view mode or via the database. The report includes the graphical representation of the target. The placement of the recorded positions in relation to the condyles is displayed in sagittal view, separately for the left and right side. The various recorded positions are represented in the target and the condylar views by color-coded dots. In the representation field of the target, the trajectories are also shown. The basics for the operation in report mode are described in the chapter Report ⁵².



14 EPA - Electronic Position Analysis

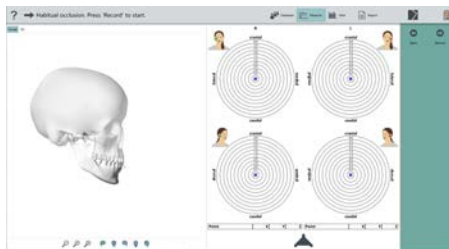
The **Electronic Position Analysis** allows the position of the condyles in relation to the upper jaw to be determined. Registration material inserted between the rows of teeth can be compared and the position of the rails can be checked. Furthermore, the points are set in relation to the condylar track. The diagnosis of pain positions caused by condylar malocclusions can be supported.

14.1 Perform Measurement



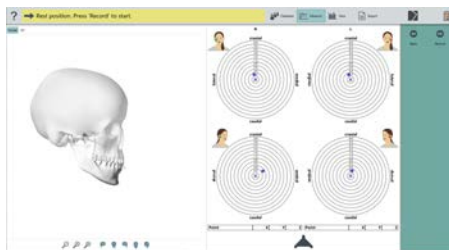
Module selection

Select the function module on the left and then click on the **Start** button. Depending on the settings in the Measurement Setup following positions can be registered.



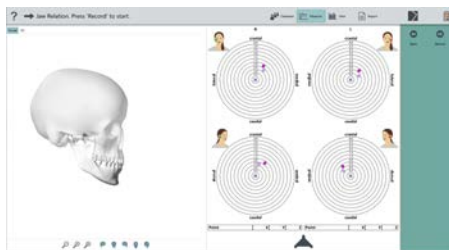
Habitual occlusion

This is a position that the patient takes habitually. This can be for example the patient's usual final bite position.



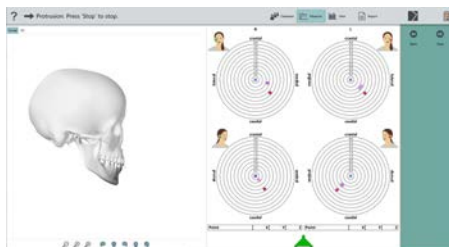
Rest position

The Rest position determines the distances between upper and lower jaw with relaxed muscles.



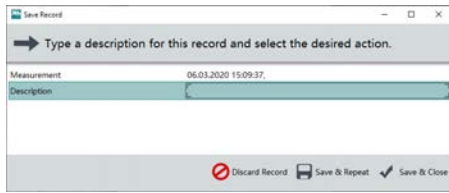
Jaw Relation

With Jaw Relation a new relation between upper and lower jaw is determined.



Protrusion or specific motion recording

This section enables the possibility to record a motion track



At the end of the measurement a dialogue window appears:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

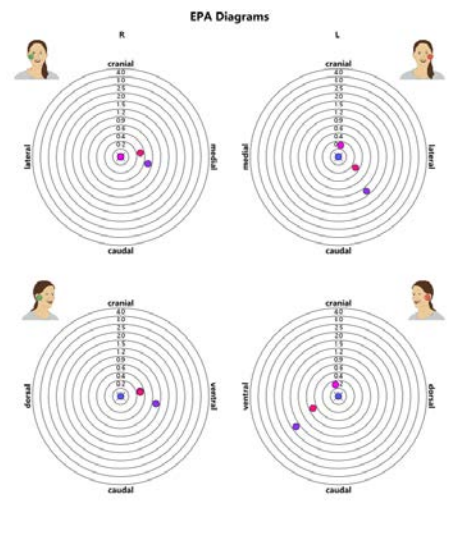
The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

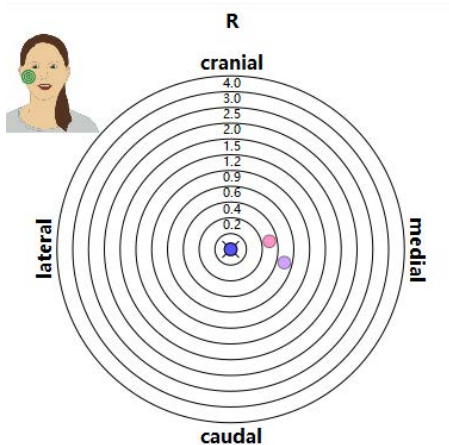
14.2 View Mode

In the following, the presentation of the reference and target position is explained. Basics for the usage of the view mode are described in chapter [Edit measurement \(View mode\)](#).⁴⁸



Reference position

The targets allow to view the temporomandibular joint positions in the joint space from the frontal view and from the profile view of the right and left condyle. The determined positions describe the point of passage of the previously determined axis which defines the starting position of the condyles in their current position at the final bite.



Target Position

The target is shown at measuring distances with a resolution of 0.2 mm; 0.3 mm and 0.5 mm up to a maximum value of 4.0 mm in radius. The target position of the condyles is thus determined in relation to a reference position.

Point	X	Y	Z	Point	X	Y	Z
Max. intercuspitation	0.0	-0.0	-0.0	Max. intercuspitation	-0.0	-0.0	-0.0
Habitual occlusion	0.8	-0.2	0.9	Habitual occlusion	0.8	-1.0	1.4
Rest position	0.1	0.1	0.5	Rest position	0.1	0.4	0.1
Jaw Relation	0.4	0.1	0.4	Jaw Relation	0.4	-0.3	0.5

The legend below the targets provides detailed description of the recorded points.

14.3 EPA- Report

The basics for using the report mode are described in the chapter Report [\[52\]](#).



The EPA record is called up directly after recording or via the database. The reports contain the graphical representation of the targets from frontal as well as sagittal view. The different position recordings are represented in the targets by colour-coded dots. Additionally, the coordinates are listed in the lower report section. The measuring field for the trajectories is attached to the targets.

15 Cerec Articulator

The measurement consists of the movements protrusion, laterotrusion left and right, and an opening movement. The recording results are to be treated differentiated depending on the movement process by the patient.

With the help of an Occlusal Attachment (REF-No.:01960350), the patient movements are recorded in order to determine the setting values for the digital Cerec Articulator.

15.1 Attachment mounting

In a difference to the other measuring modules, a special occlusal attachment is used here. The reason for this is the compatibility with the Cerec articulator.

For this reason, the attachment must be attached parallel to the occlusal surface and symmetrically to the alveolar ridge.

Preparation on the patient



Mark overbite on patient

Mark the edge of the incisors before attachment fixation.

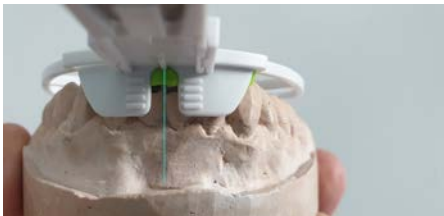
The height of the overbite is required during measurement to calculate the inclination of the sagittal condylar path of the Cerec articulator.



Fix the sensor metal plate with the attachment and clip on the positioning template.



Apply silicone to attachment.



When mounting the attachment, make sure that it is placed in the middle of 41 and 31.

The attachment must be placed parallel to the occlusal surface.



The attachment must be placed centrally on the alveolar ridge.

15.2 Perform Measurement

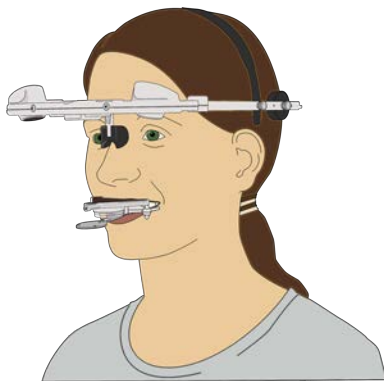


Module selection

Select the Cerec articulator module on the left and then click on the Start button.

15.2.1 Reference Plane

The transfer possibility to the digital Cerec Articulator makes it necessary to adapt the measurement to the bite fork used as well as the Condylar distance, the leg length and the Balkwill angle by calculation.



Upper JAW with Bite Fork/ Attachment

The data acquisition of movements for the transfer to the CAD/CAM software requires the recording of the upper jaw position or coordinates via a special bite fork/ attachment set.

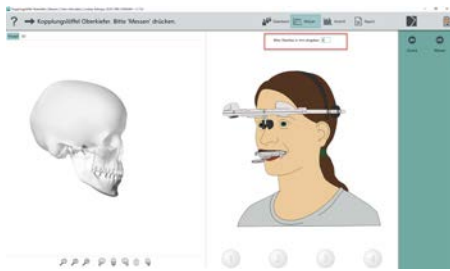
15.2.2 Measuring procedure

Slightly modified from the chapter [Functional Analysis](#)^[62], the patient is instructed on this specific measurement, since all movements should be performed with tooth contact. The patient performs these under the control of the dentist. Not only practicing the movement patterns, but also the controlled standardized execution of the data acquisition brings a higher data security and accuracy.

Depending on the selected movement patterns, their number and their chronology, they are performed with the patient after the preview. In principle, all measurement sequences can be individually set up in the configuration. Using the example of some standard movements, you will be guided through the measurement protocol below.

Test movement

In the test movement section, movements can be displayed, checked and illustrated to the patient without saving the data. You can also use this mode to practice special functional movements with the patient. Please activate with "**Start**". The Preview mode is switched to the following measurement mode by clicking the "**Stop**" button. This function can be switched off under measurement settings.



Enter overbite

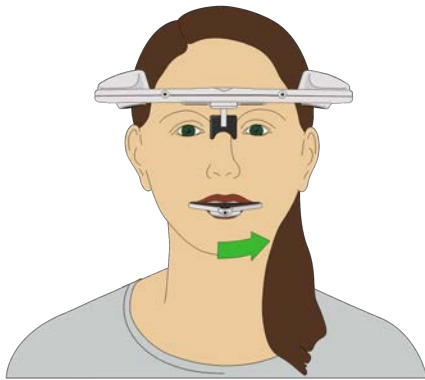
In order to take the overbite into account in the calculation of the setting values, the overbite must be entered here in mm.

Likewise, pressing the measure button confirms the position of the measuring system on the patient's head. From this point on the measuring system can no longer be moved.



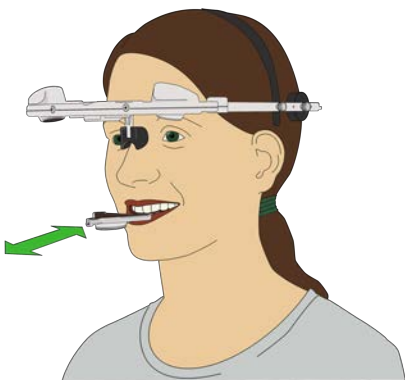
Live Preview

In the test movement section, movements can be displayed, checked and illustrated to the patient without saving the values. You can also use this mode to practice special functional movements with the patient. Please activate Start with click on **Start**. The test mode is switched to the following measurement mode by clicking the **Stop** button. This function can be switched off under measurement settings.



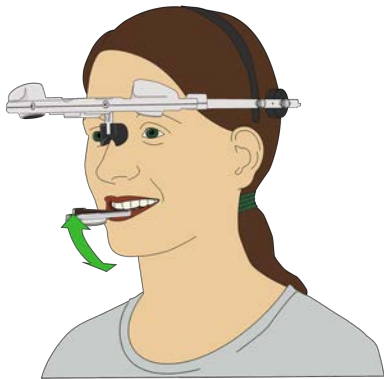
Lateral movement

The Cerec articulator measurement begins, for example, with the maximum reachable left and right lateral movement. The measurement process can be triggered by clicking on the "Measurement" button with the foot switch, the Enter button or the mouse button. The starting position is always the habitual final bite situation. At the end of the movement, the patient moves the jaw back to the starting position, whereby the measuring process is terminated after the return.



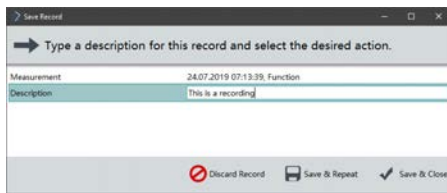
Protrusion movement

Let the patient take up the starting position and perform a maximum protrusion movement from this position. Then the patient lets the lower jaw slide back to the starting position.



Opening movement

Let the patient take up the starting position and perform a maximum opening movement from this position. Then the patient lets the lower jaw slide back into the starting position.



At the end of the measurement a dialogue window appears on screen.

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

15.3 View Mode

Basics for the operation of the view mode are described in the chapter [Edit measurement \(View mode\)](#)^[48].

15.4 Articulator Report

In "Report" mode, the parameters previously defined under "View" are displayed and evaluated. The basics of operation are described in the chapter [Report](#)^[52].

15.4.1 Module specific Parameters

The report consists of the elements described below.

The patient-specific setting parameters of the digital Cerec articulator are displayed. The bars with the colors green/red/blue describe the individual data of the patient undergoing treatment.

15.4.2 Explanation of the report content



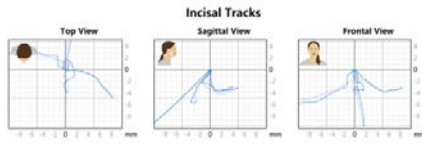
Recording profile

Information on the definition of the condyles and the used measurement mode is displayed. Comments created in the view are also displayed at this point.

Articulator parameters

The calculated parameters necessary to adjust the digital Cerec articulator to the individualized patient parameters are listed here. The sagittal condylar path inclination, the Bennett angle and the immediate side shift are displayed.

The parameters Balkwill angle, condyle distance and leg length are predefined.



Tracks of the incisal point

The tracks of the incisal point are displayed from occlusal, sagittal and frontal view.

16 Plaster Articulator PS1

The recording consists of the movements of the protrusion, laterotrusion left and laterotrusion right. The recording results are to be considered differentiated depending on the movement process by the patient. The articulator values are usually performed under tooth contact. This allows the system to determine the value for setting the individual anterior guidance plate. The same applies to the lateral movements, which are then guided over the posterior or canine teeth. This application supports the Zirkonzahn PS1 3D articulator.

16.1 Perform Measurement

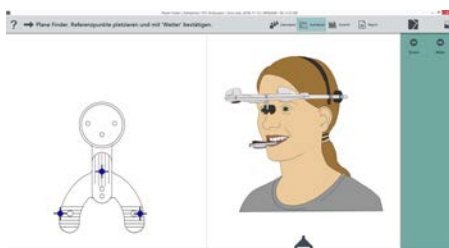


Module selection

Select the Plaster Articulator PS1 module on the left and then click on the Start button.

16.1.1 Reference plane

The data is related to a certain plane. In order to obtain data for the **PlaneFinder PS1** system, the reference plane must be defined differently than for the other images. The procedure is described below.



PlaneFinder reference plane

The possibility to transfer the data to the **PlaneFinder PS1-3D articulator system** makes it necessary to determine patient-specific information such as the Natural Head Position (NHP) for exact calculation of the occlusal plane.

Reference points such as the position of the incisal point and the position of the first maxillary molars are determined via the **PS1 bite fork**. This allows the position of the upper jaw to be determined exactly.



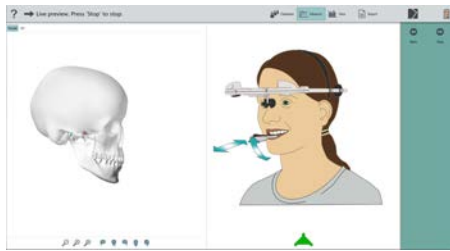
Reference plane bite fork

The data acquisition for the transfer of patient data to the CAD/CAM interface PlaneSystem Software Tool, requires the recording of the upper jaw position via the bite fork, as well as the determination of the lower jaw position with a bite registration in habitual occlusion.

Only this recording procedure ensures that the position of the lower jaw in relation to the upper jaw is correctly reproduced during subsequent processing of the data in the CAD/CAM system.

16.1.2 Measuring procedure

Slightly modified from the 3D analysis, the patient is instructed on this measurement, as all movements are carried out under tooth contact. The patient performs these movements under the control of the dentist. The practice of the movement patterns as well as the controlled standardized execution of the data acquisition increases the data security.

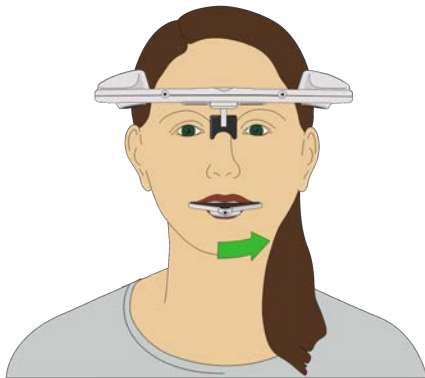


Preview

In the test movement section, movements can be displayed, checked and illustrated to the patient without saving the values. You can also use this mode to practice special functional movements with the patient. The test mode precedes the measuring mode.

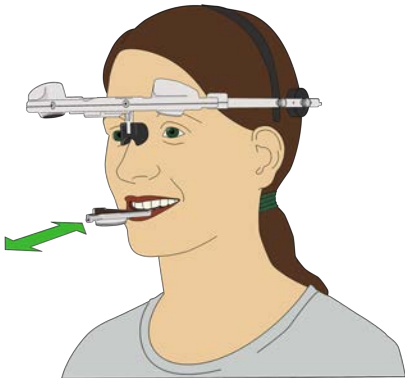
16.1.3 Measure Movements

In principle, all measurement sequences can be individually configured. In the following, you will be guided through the measuring procedure using the example of some standard movements.



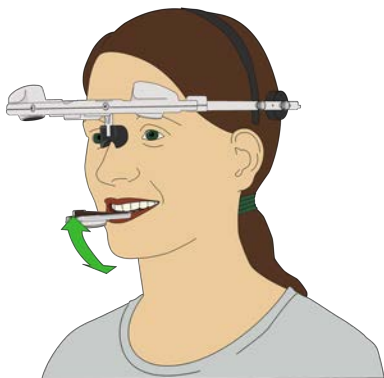
Lateral movement left/right

The Plaster Articulator analysis begins with the left and right lateral movement. The measurement process can be triggered by the foot switch, the enter key and the mouse by clicking on the "Record" button. The starting position is always the habitual final bite situation. At the end of the movement the patient moves the jaw back to the starting position.



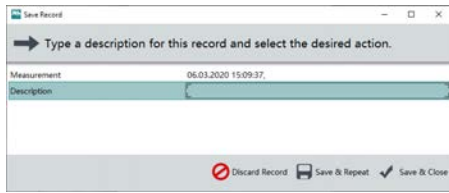
Protrusion movement

Let the patient take up the starting position and perform a maximum protrusion movement from this position. Then the patient lets the lower jaw slide back to the starting position.



Opening movement

Let the patient take up the starting position and perform a maximum opening movement from this position. Then the patient lets the lower jaw slide back into the starting position.



At the end of the measurement a dialogue window appears:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

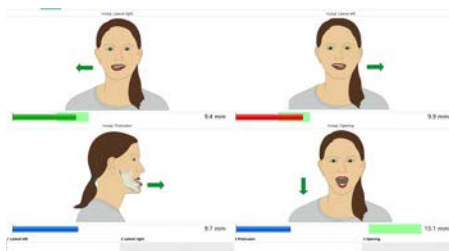
16.2 View Mode

In the following, the parameters that can be recorded specifically using the function module are explained. Basics for the operation of the view mode are described in chapter Edit Measurement (View Mode) [63].

Measurements with the Plaster Articulator mode

When recording in PlaneFinder PS1 mode, only the articulator-relevant data is displayed in the preview windows in view mode. This includes Model, 3D, Incisal point and Parameters tabs. As well as the display of the condylar path parameters in the Parameters block.

16.2.1 Module specific Parameters



Parameters

The following data can be found in the Parameters tab:

- Incisal point, lateral right/left, protrusion and opening
-

The green area marks the reference range in which the range of motion of patients in a reference group lies. The reference values are displayed if the age of the patient is between 20 and 60 years.

The values for the reference range are taken from the publication "Standard an Limit Values of Mandibular Condylar and Incisal Movement Capacity" (International Journal of Computerized Dentistry 2014;17(1); 9-20

Condylar track length

Specifies the determined length of the distance in which the condyle can move.

Joint path inclination (reference: Frankfurt horizontal)

Indicates the inclination of the articular path on which the condyle can move.

16.3 Plaster Articulator PS1 Report

In "Report" mode, the parameters previously defined in "View" mode are evaluated and displayed. Basics for the operation of the report mode are described in the [chapter Report](#) [52].

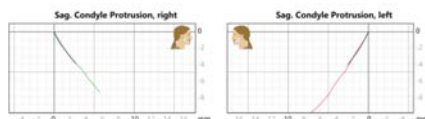
16.3.1 Module specific Parameters

The report consists of the elements described below. Depending on the specifications in the admission settings, certain statements can be read in the report. The patient-specific setting parameters of the PS1 3D articulator are displayed. In this case, the bars with the colors green/red/blue describe the individual data of the patient undergoing treatment.

16.3.2 Explanation of the report content

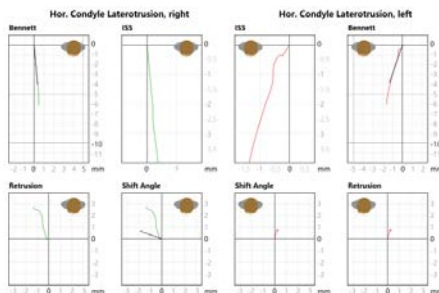
Motion Tracks

The movement traces shown are generated from the different movement specifications with respect to both joints and the incisal point. Depending on the selected axis position and reference plane, the condylar tracks can be displayed differently in their course and angle.



Sagittal condyle tract imaging

The sagittal articular path inclination is calculated in such way that the best possible coverage of the recorded curves with the articulator's curvature is achieved, especially in the initial area. The diagrams show the condylar path inclination of the protrusion and opening movements.

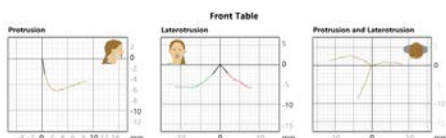


Horizontal condyle path visualizations

The Bennett angle and the Immediate Sideshift are calculated from the mobility of the mediotrusion condyle or swinging condyle, i.e. the condyle of the non-working side. The lines drawn in black correspond to the averaged curve of the Bennett insert of the articulator. The colored lines (red and green) correspond to the measured movement traces.

Retrusion is calculated from the sagittal movement of the laterotrusive condyle or resting condyle in a retro-cranial direction.

The shift angle controls the condyle from a pure laterotrusion movement of "0°" continuously between a max. latero retraction "-20°" and latero protrusion "+20°".



Front table slideways

At this point the angles to the anterior guidance are displayed. The anterior plate is adjusted according to the shown curves. In the PS1 3D articulator, the sagittal anterior plate tilt and the tilt to the left and right are displayed in the frontal projection.

17 Relax and Bite

This module enables the measurement of muscle tension and relaxation.

17.1 Description of EMG

The zebris DAB Bluetooth EMG 8 measuring system or the integrated EMG channels of the JMANalyser+ system register the action potentials of the muscles using skin surface electrodes.



DAB-Bluetooth EMG 8

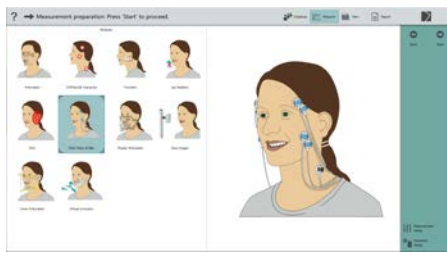


JMANalyser+ BT2 A4

This is similar to the registration of the action potentials of the heart muscle by the ECG. By simultaneously connecting the EMG measuring amplifiers to the zebris measuring system JMANalyser+ basic device and deriving the measuring signals by means of attached skin surface electrodes, the muscle action potentials can be directly superimposed on the jaw movement data. The special software module "Relax & Bite" in the Winjaw+ software allows the use of the EMG measurement sensors (1-4 channel, A/AN amplifier) in conjunction with the JMANalyser+ BT2 A2/A4 measurement unit or the DAB Bluetooth Box as a stand-alone system, even without motion analysis sensors.

The external DAB Bluetooth EMG 8 system, which is assigned to the measurement environment in the WINJAW+ software's Device Manager, can be expanded to 8 or, in conjunction with the JMANalyser+ BT2 A2/A4, to 10/12 channels. On the one hand, the measurement is displayed and recorded in real time on the PC, and on the other hand, it can be checked, evaluated and finally stored in the database. Executed measurements are stored in the database with date and recording time under the patient with the standard designation "EMG Relax & Bite".

17.2 Perform Measurement



Module selection

Choose the module "EMG Relax & Bite" and then click the Start button.

#	<input type="checkbox"/>		Max duration, sec	-	+
1	<input checked="" type="checkbox"/>	Relax	3	-	+
2	<input checked="" type="checkbox"/>	Relax position 2	3	-	+
3	<input checked="" type="checkbox"/>	Relax position 3	3	-	+

Measurement settings

Via "Measurement Setup" the user enters the setting mode.

The standard setting is differentiated between "Relax" and "Bite" application. The settings include the measurement duration in sec. and the number of selected measurement channels. Furthermore, measuring processes can be switched on or carried out individually, and user-edited ones can be added.

Other measurements, e.g. in different mandibular positions, can be created and named using the "+" sign. The arrows, up/down, can be used to determine the respective order of the measurements. Measurements can be switched on or off via the checkmark.

#	<input type="checkbox"/>		Max duration, sec	-	+
1	<input checked="" type="checkbox"/>	Bite	3	-	+
2	<input checked="" type="checkbox"/>	Bite Position 2	3	-	+
3	<input checked="" type="checkbox"/>	Bite Position 3	3	-	+

#	<input type="checkbox"/>		Max duration, sec	-	+
1	<input checked="" type="checkbox"/>	Fatigue	3	-	+

17.3 EMG Relax & Bite Report

In the "Report" mode, the signals are evaluated and displayed which were previously selected in the "View" mode. The EMG Signals show the RAW-Value for each recorded position and movement in relation to the selected muscles. Depending on the selected position of the electrodes and the skin impedance, the signals can vary in the software evaluation.

17.3.1 Module specific Parameters

The basics for operating the report mode are described in the chapter [Report](#) ⁵².



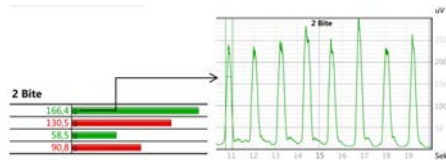
"Bite & Relax" report

The report shows the measured envelopes of the signals as well as the average muscle activity as a bar chart. The level of activity, the symmetry and the stability of the resting tone are shown.



"Bite" Report

The report shows the average value of the EMG signal during biting within the bar chart, as well as the corresponding time curve in which the signal is displayed as an envelope. The evaluation includes the height, symmetry and uniformity of the muscle potentials. Attention must be paid to the symmetry to the left and right of each muscle group.



Evaluation of the enlarged measurement section

The signals selected as measuring range are displayed here in the report. In the display, the tabular value is shown as a crossbar in the diagram. The tabular value is equal to the scale value in μV .

18 CMDfact® Interactor

The "CMDfact® Interactor" module enables the recording and evaluation of the functional range of motion (motion capacity) and the coordination of mandibular movements.

The speed of the condyles in the course of movement can be used to obtain an impression of how well the movement is coordinated. For this purpose, the movement information of the opening and closing movement is specially analysed.

As it is usual, the speed (acceleration) increases during the opening movement, followed by a decrease in speed when the maximum opening position is reached. During the closing movement the whole process is repeated, resulting in first an increasing and then a decreasing acceleration. A physiological course of speed is characterized by a largely one-summit shape of the speed curve during opening and closing of the jaw.

Deviating from this, the condylar speed behavior can be characterized by two- or multi-peak profiles, in each case related to the jaw opening or the jaw closure. Two- and multi-peak velocity profiles indicate temporary loss of velocity due to arthrogenic, sometimes also myogenic problems. Losses of speed during movement related to the right and/or left temporomandibular joint can be considered as symptoms of dysfunction if they occur repeatedly.

18.1 Perform Measurement

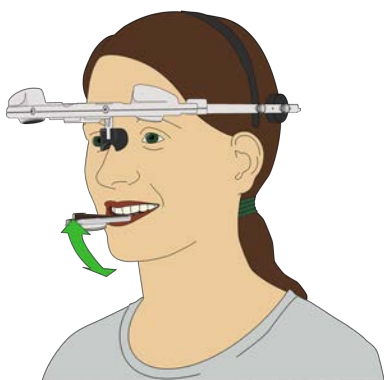
In principle, the measurement sequences can be individually set up in the Measurement Setup. Using the example of some standard movements, you will be guided through the measurement protocol below.



Module selection

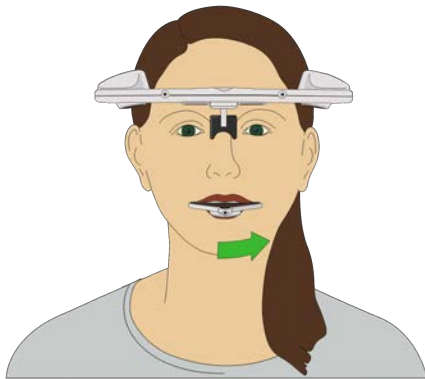
Select the CMDfact® Interactor module on the left and then click on the Start button.

18.1.1 Measure Movements



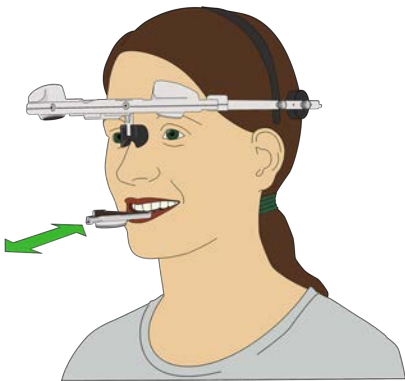
Opening movement

For example, the CMDfact® Interactor measurement starts with the maximum opening movement to be achieved. The recording process can be triggered by clicking on the "Record" button with the foot switch, the enter button or the mouse button. Let the patient take up the starting position and perform a maximum opening movement from this position. Then the patient slides the lower jaw back to the starting position.



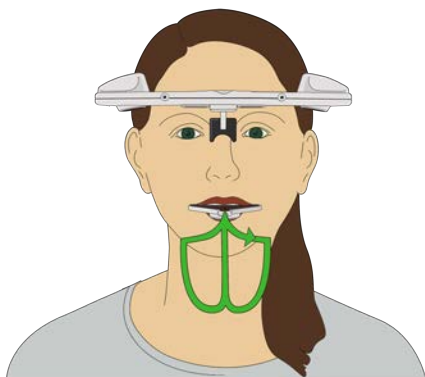
Lateral movement

Recording of the left- and right-lateral boundary movement. The starting position is always the habitual final bite situation. At the end of the movement, the patient moves the jaw back to the starting position, whereby the recording process is completed after the return.



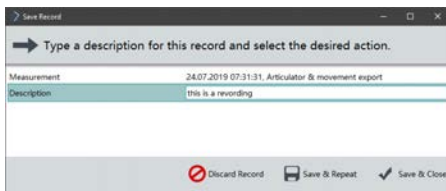
Protrusion movement

Let the patient take up the starting position and perform a maximum protrusion movement from this position. Then the patient lets the lower jaw slide back to the starting position.



Chewing, Posselt frontal, Posselt sagittal and user defined movements

Further optional movement pattern are handled analogue to previous described movements.



At the end of the measurement a dialogue window appears on screen:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

18.2 View Mode

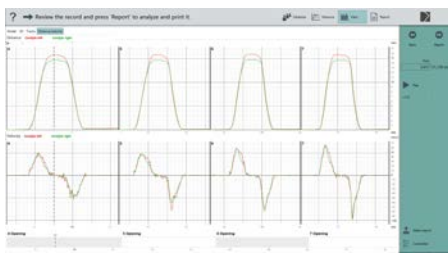
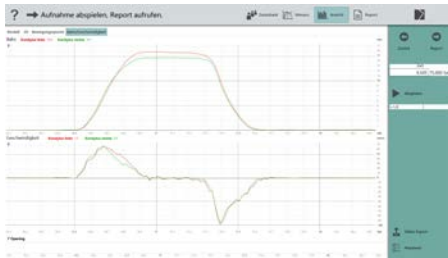
The parameters explained in this section are those that can be specifically recorded with the interactor module. Basics for the operation of the "View mode" are described in chapter [Edit measurement \(View mode\)](#) ⁴⁸.

18.2.1 Module specific Parameters

Path / Speed

The tab Distance / Velocity contains the condyle course during the opening and closing movement. Regardless of other movements recorded, only data of the opening and closing movement are evaluated in this tab.

On the left side an example of a single peak speed curve is shown.



If several opening movements are recorded in one measurement, they are shown in series.

Further information on this diagram can be found in the following publication: *"Motion analysis of the mandible: guidelines for standardized analysis of computer-assisted recording of condylar movements"* (**International Journal of Computerized Dentistry** 2015;18(3); 201-223

18.3 CMDfact® Interactor Report

In the "Report" mode, the results of the CMDfact® Interactor measurement that were previously defined in the "View mode" are evaluated and displayed. The basics for working in the report mode are described in the chapter Report ⁵².

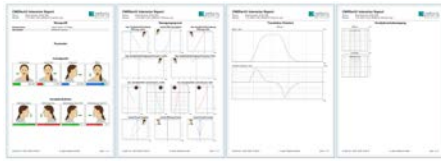
18.3.1 Module specific Parameters

The report consists of the elements described below. Depending on the specifications in the recording settings, certain statements can be read in the report. The motion data in all spatial directions is queried and displayed in the context of scientifically based mean values. In this case, the bars with the colors green/red/blue describe the individual data of the measured patient, which can be immediately compared with the mean values (green pastel shade). This helps the user to be able to make a basic statement as to whether there is a functional disorder or restriction.

18.3.2 Explanation of the report content

Motion recording

The motion traces shown are generated from the different movement specifications in relation to both joints and the incisal point. Depending on the selected axis position and reference plane, the condyle tracks can be displayed differently in their course and angle.



Report structure

The CMDfact® Interactor Report is based on the structure of CMDtrace.

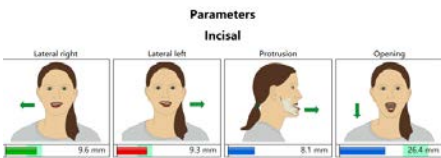
The report template is divided into 5 sections:

- Measurement profile
- Parameters
- Motion tracks
- Translation - rotation diagrams
- Condyle axis diagrams



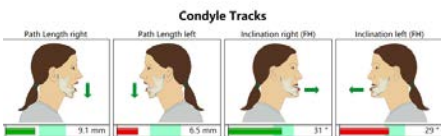
Measurement profile

The measurement profile section shows the method used to define the reference plane and the module used to perform the measurement.



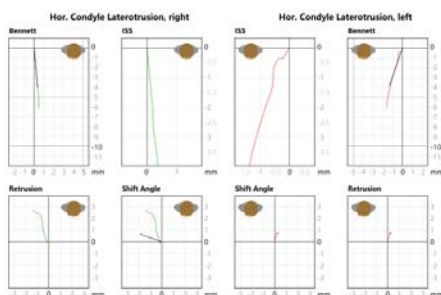
Incisal point

The bar charts show the extent of the range of motion starting from the incisal point in frontal and sagittal view, in laterotrusion left and right, and in protrusion and mouth opening.



Condyle tracks

The bar graphs show the track length and inclination of the two condyles during the protrusion movement.



Condyle track during protrusion, sagittal view

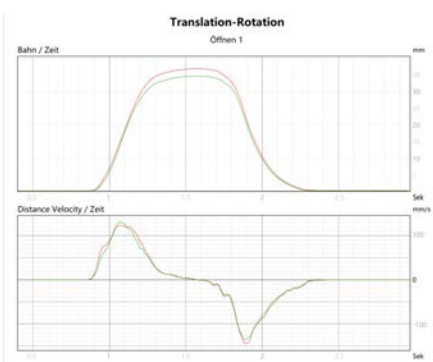
The diagrams show the condyle movement when recording a protrusion movement.

Horizontal condyle path, cranial view

The diagrams show the condyle movement when recording a laterotrusion movement.

Incisal at jaw opening, frontal/ sagittal view

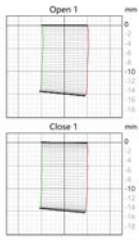
The diagrams show the course of the incisal point when recording an opening movement.



Translation - Rotation

The diagrams show the angle of mouth opening or jaw rotation in relation to the speed of movement. Due to the shape of the lines, conclusions can be made regarding a disturbance-free jaw movement. In the case of a homogeneous movement, the diagram shows a single-peak speed curve.

This diagram shows the condylar course during the opening and closing movement. Independent of the other recorded movements, only data of the opening and closing movement are evaluated in this diagram.



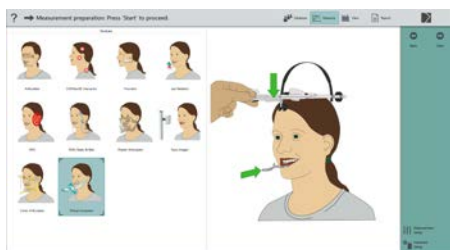
Condylar axis movement

These diagrams show phases of the intercondylar axis for opening and closing movements.

19 Digitale Occlusion Analysis

This module consists of individual patient movements as well as the digitized jaw models. You have the possibility to view contact relations on the occlusal surfaces of the teeth, statically and dynamically, already during the recording. When analyzing, you can insert up to four transversal sectional planes through the models and identify early contacts. You can also determine which areas are subject to particularly frequent loading.

19.1 Perform Measurement



Module selection

Select the Digital Occlusion module on the left and then click the **Start** button.

19.1.1 Import tooth Meshes

With the **Digital Occlusion** module you have the possibility to import 3D models into the application via a respective scan bite fork.



Import

Start the import procedure by clicking this button in the lower right corner of the module's start window.



Select bite fork

Select the bite fork that is used for the measurement and click on "**Next**".



Automatic import: Bite fork

Suitable 3D data formats are *.stl and *.ply.

1. Select **Import Model** to import the scan data.
2. Load upper jaw model including bite fork. Follow the instructions to match the models with 3 points.



Import upper jaw with bite fork

1. Select **Import Model** to import the scan data.
2. Load upper jaw model including bite fork. Follow the instructions to match the models with 3 points.



Automatic import: lower jaw

The lower jaw model is added to the upper jaw model. The position match from upper to lower jaw is transferred from the scanner system.

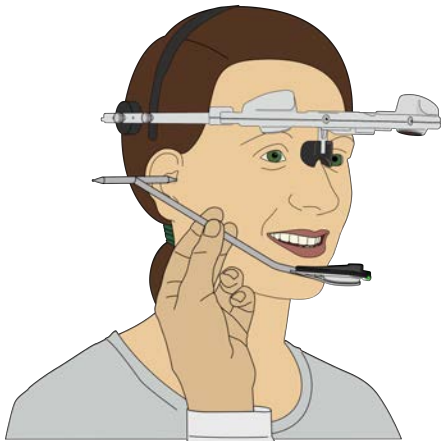


Automatic import: manual adjustment of the lower jaw

In the last step of the Import wizard, it is possible to manually change the relation of the upper jaw to the lower jaw.

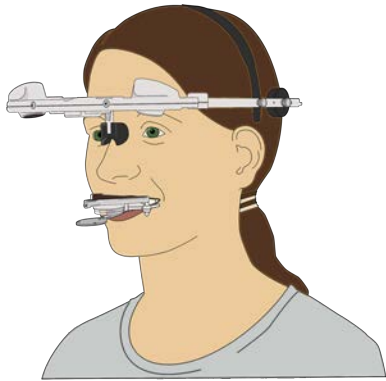
19.1.2 Reference Plane

The data is related to a plane. If several recordings are made in one session, each of the following recordings can be made with the reference plane previously determined. Otherwise, a new reference plane can be defined by clicking the button Redefine reference plane.



Reference plane for articulator

The possibility of transferring the data to different articulator systems makes it necessary to adjust the recordings to the planes such as Frankfurt horizontal, Camper's plane and the patient plane by calculation. This is taken into account during registration by the anatomical reference points.



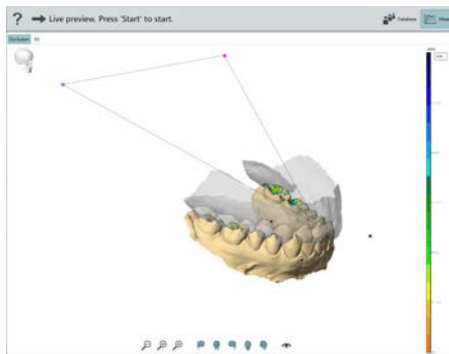
Reference plane bite fork

The registration of movement data for transmission to CAD/CAM software, as well as for transmission to a mechanical articulator by using the zebris transfer table (REF-ID:01560050 / 01560052), requires the measurement of the upper jaw position or coordinates via a special bite fork and thus the definition of the lower jaw position in habitual occlusion.

During the procedure, it must be ensured that the positioning of the lower jaw in relation to the upper jaw is carried out correctly for the subsequent processing of the data in the above-mentioned systems.

19.1.3 Measuring procedure

Depending on the recording settings, positions and movements are measured. By using the original tooth surfaces of the patients, the digital occlusion module offers a variety of options to support the evaluation of the individual tooth or bite situations.



Test movement

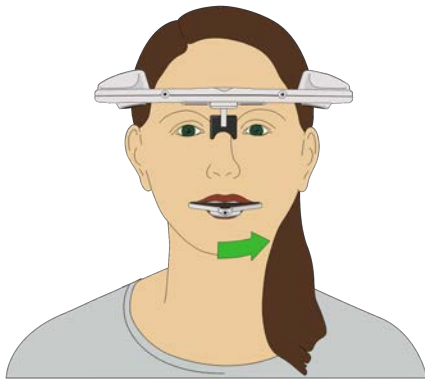
In the test movement section, movements can be displayed, checked and illustrated to the patient without saving the values. You can also use this mode to practice special functional movements with the patient. Please activate with **Start** Preview. The test mode is switched to the recording mode by pressing the "Stop" button. This function can be switched off under Recording Settings.

The Digital Occlusion module offers special control features, which are explained in the chapter [Control elements](#).

19.1.4 Measure Movements

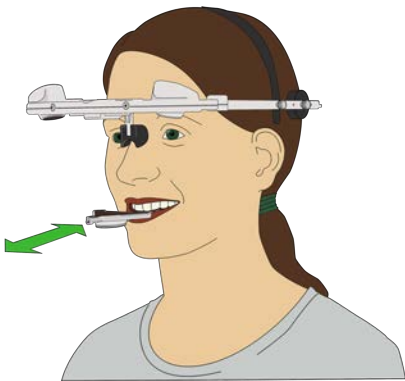
Depending on the selected movement patterns, their number and their chronology, they are performed with the patient after the preview. In general, it is possible to configure all recording sequences individually. Using the example of some standard movements, you will be guided through the recording protocol in the following.

During the measurement, it is possible to display the contact relationships of the teeth in real time. It is also possible to monitor the frequency of tooth contacts.



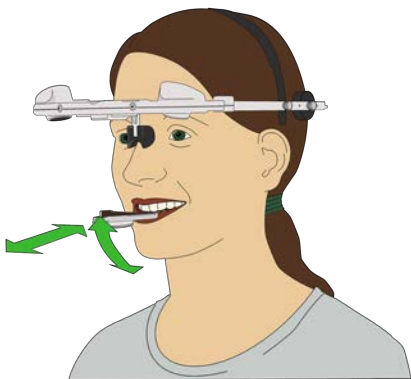
Lateral movement

For example, the articulator recording begins with the maximum left and right lateral movement that can be achieved. The recording process can be triggered by clicking on the "Record" button with the foot switch, the Enter key and the mouse button. The starting position is always the habitual final bite situation. At the end of the movement, the patient moves the jaw back to the starting position, whereby the recording process is ended after the return.



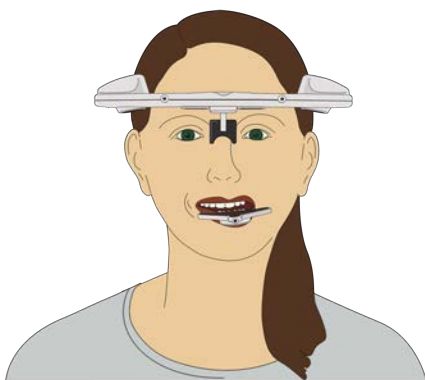
Protrusion movement

Let the patient take up the starting position and perform a maximum protrusion movement from this position. Then the patient lets the lower jaw slide back to the starting position.



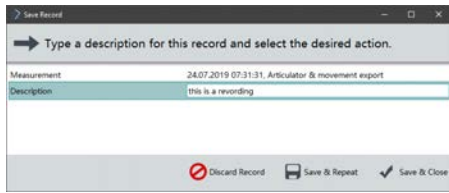
Opening movement

Let the patient take up the starting position and perform a maximum opening movement from this position. Then the patient lets the lower jaw slide back into the starting position.



Chewing movement

Let the patient take up the starting position and start a chewing process from this position. It is possible to work with a standardized chewing object such as gummy bears.



At the end of the measurement a dialogue window appears:

Discard Record

The measurement is discarded and returns to the preview mode to perform a new measurement.

Save & Repeat

The measurement is saved and returns to the preview mode to perform a new measurement

Save & Close

The measurement is saved and goes directly to the view of the completed measurement.

19.2 View Mode

The following chapter describes the functions that can be used specifically with the Virtual Occlusion module. Basics for the operation of the view mode are described in the chapter [Edit measurement \(View mode\)](#) [48].

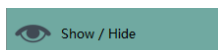
19.2.1 Control elements



Control elements

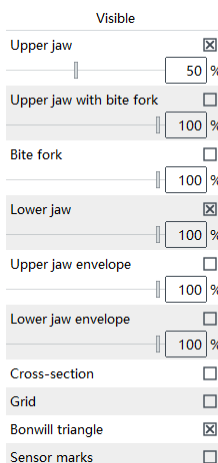
The main controls are located on the right side of this module. These elements can be used to initiate individual actions such as the import of mesh/model data or analysis functions.

To leave the detailed information, click on the button "Back".



Show/Hide models

in this submenu the following actions can be performed.



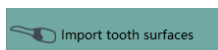
- Display mesh data
- Display cross sections
- Calculating detailed description of envelopes
- Displaying the grid in the background
- Show/ hide the Bonwill Triangle
- Show/ hide markers

Calculate the digital FGP (Functional Guided Path)

An FGP can be generated by selecting an interval in the timeline.

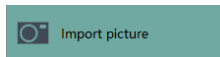
Transparency

The model can be displayed semitransparent by using the slider.



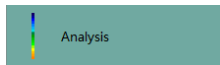
Import 3D data

Starts the Import Wizard to import mesh data (see Importing models) for detailed description.



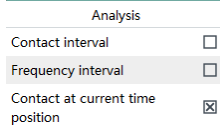
Import images

Enables the import of 2D images (see [Import images](#))⁹⁸.

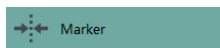


Analysis

in this submenu the following actions can be performed

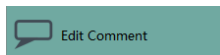


- Contact interval: Visualisation of the contact situation over a defined measuring interval e.g. the chewing cycle
- Interval Frequency analysis: display of frequently addressed areas/contacts over a defined measuring interval e.g. the chewing cycle or sequences of the chewing cycle
- Current contact: Represents the contact relationship between the upper and lower jaw depending on the distance.



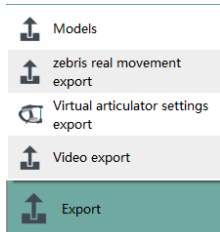
Marker

Displaying the movement tracks of the bite fork



Edit comment

Create and edit recording comments



Export

In this sub menu you can start various exports (see [Data export](#))⁹⁸



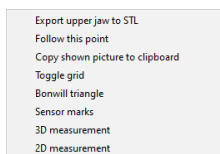
Contact/occlusion analysis

This function visualises the contact relations on the occlusal surfaces of the imported models in coloured form, allowing the user to view the contacts and the closeness of the models to each other via an adjustable colour filter.



Frequency Analysis

Use this function to find out which contact areas are particularly frequently stressed over a certain period of time.



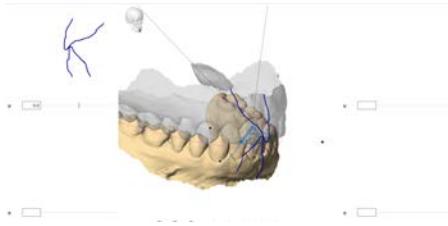
Right mouse button

In addition to the control elements, you have the possibility to click with the right mouse button on any part of the jaw model. A small selection menu appears:

- Export Jaw to STL: exports the selected mesh/model to any directory.
- Current image to clipboard: saves the current image to the clipboard
- Toggle grid: show/ hide the grid
- Bonwill triangle: show/hide the Bonwill triangle
- Sensor marks: show/ hide the three reference/ sensor marks of the bite fork
- 3D measurement: For measuring distances in space
- 3D measurement: For measuring distances in projection view

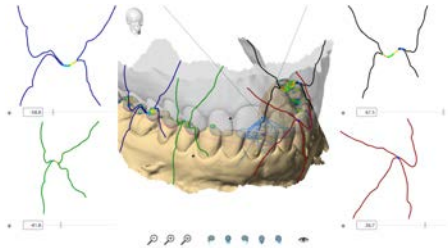
1. Show/hide models

The functions "Cross-section", "Upper jaw envelope" and "Lower jaw envelope" are described in detail here.

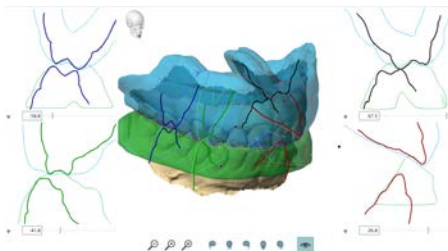


Display / perform cuts through the model

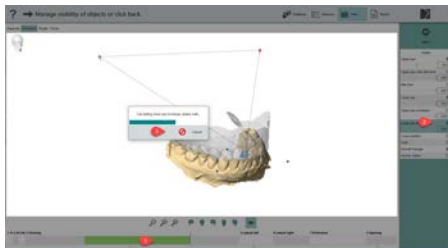
Up to 4 cuts can be defined. The placement is done with the slider.



Example with 4 sections and display of contact points.

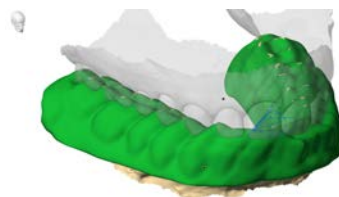


Example with 4 cuts and envelope curves of upper and lower jaw.



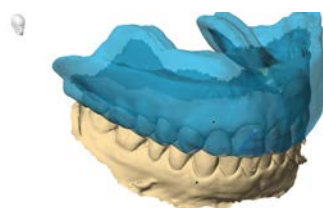
Calculate envelopes

1. Define the interval for calculating the envelope in the timeline with 2 clicks at the beginning and end. Attention, after the first click hold down the Shift key.
2. Checkbox Activate envelope



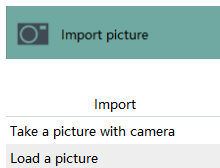
The calculated envelope is displayed.

In the example calculated from the chewing movement of a mandibular and maxillary envelope.



2. Import Pictures

Import of 2D images and matching on the 3D model.



Display / perform cuts through the model

You can display up to 4 cuts in parallel. With the help of the slider the cut can be placed along the model.



Taking a picture with a camera

The requirement for taking a picture with the camera is a selected picture source in the zebris device settings. If this is not the case, the illustrated message appears.



Adjust the camera and take the picture. The 2D image is then placed in 3D space.



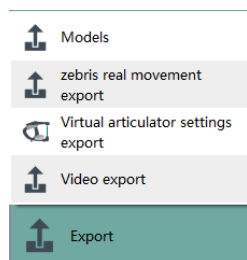
Match image with 3D model

With the help of the 3 handles **zoom**, **rotate** and **move** the 2D image can be positioned in 3D space.

3. Data export

In the measurement application, there are a total of 4 different export options

- Export models (see [Export of Meshes](#))^[114]
- zebris real movement export
- Virtual articulator settings export (see [XML - virtual articulator settings export](#))^[110]
- Video export (see [Video Export](#))^[113]

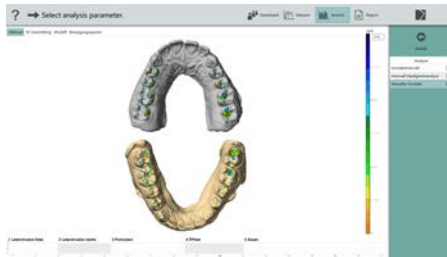


If you have selected a default path in the program settings, the data file is stored directly in this path. If this is not the case, a task window opens after pressing the button to manually select a suitable storage location.

19.2.2 Module specific Parameters

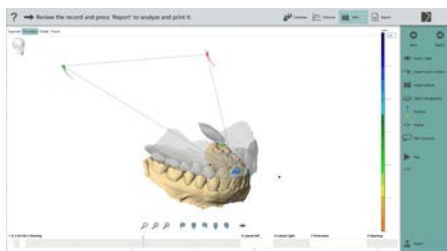
The **digitale occlusion** module offers various options for analyzing the recordings or the imported model in view mode.

Various functions can be used via the tabs. The following table explains the tabs and the respective special functions on the right.



Separate

The presentation of the jaw models in a separated view allows you to visually check the appearance of the contacts during the recorded motion sequences (Occlusion Analysis mode)



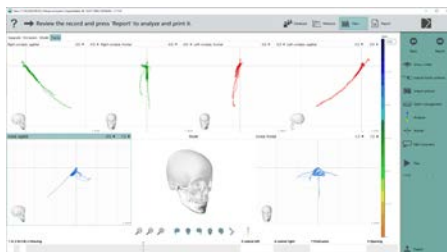
Occlusion

In the Occlusion card, the models, the condylar trajectories, the trajectory of the incisal point and the Bonwill triangle are displayed. You can display the recorded patient movements on the basis of the jaw models and, for example, analyze contact conditions.



Model

If you do not have scanned models available, you can use this tab to display a generic skull. Furthermore you have the possibility to import scanned model data into the application.

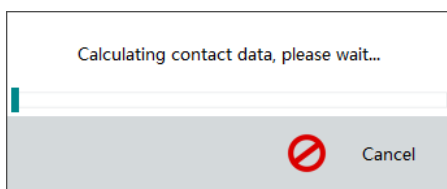


Tracks

As in the Function and Articulator modules, the movement traces of the condyles and incisal point are shown here.

19.3 Digital Occlusion- Report

The **Report** in the Digital Occlusion module presents the results of the previous analysis.



Preparation

The data required for display are calculated and prepared after the analysis is completed (View mode).



Displayed Data

Depending on the configuration, the output report contains information about the contact conditions on the occlusal surfaces, as well as the frequency analysis, which provides information about which contact areas are used most often.

Images, including the time stamp, from the analysis of the image are displayed.

In addition, the bite fork used, as well as the imported models and, if available, comments on the image/patient are displayed.

20 Troubleshooting

This section contains any error messages that occur and suggested solutions. If an error message occurs, the suggested solutions are helpful. If this does not provide the desired solution to the problem, contact customer support.

20.1 General

"3D display not possible, your graphics driver does not support OpenGL 3.3 (Irrlicht)"

"3D view cannot be created (OpenGL x.y)"; or: "OpenGL error code - 1285"

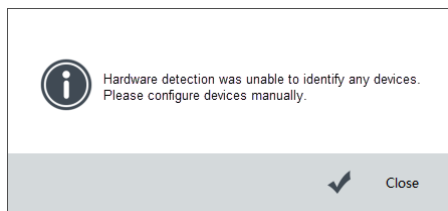
<i>Possible reason</i>	<i>Solution</i>
OpenGL 3.3 not supported	During the software installation it is checked whether your graphics hardware supports OpenGL 3.3, which is necessary for the correct execution of the software.
Graphics driver was changed	If you receive this error message after installation, you may have two graphics chips or your graphics driver has been changed in the meantime. Systems with two graphics chips usually offer a switching option. In case of a driver change, please update the graphics drivers.
Minimum requirements/ specifications not met	You must determine whether your PC meets the minimum hardware specifications required. This information can be found in the chapter " System requirements " ¹¹ of this manual.

„Timeout reading from USB"

Possible reason

USB cable not plugged in

Unit not switched on



Solution

Connect the USB cable of your device to the PC

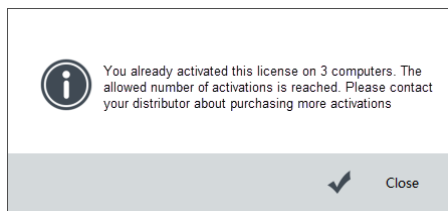
Switch on the device with the corresponding switch or establish the power supply via the power supply unit. For details, please refer to the hardware user manual.

Device detection fails

No devices could be detected. If you have already plugged in the devices, please check the power supply and switch on the plugged in devices.

By clicking on Close you can manually add devices to a profile.

"Further activation is not possible"



Standard license can be activated free of charge on a maximum of three different PCs. If you want to activate a fourth PC, please contact the support.

For an additional activation the license extension can be purchased.

"Unknown data format [...].object"



Database is corrupt, a backup is necessary.

To solve the problem, first create a backup of your patient database.

- Uninstall WINJAW+,
- Directory must be renamed: "C:\ProgramData\zebris\WINJAW+_damaged",
- Reinstalling WINJAW+ software

"External database cannot be opened"

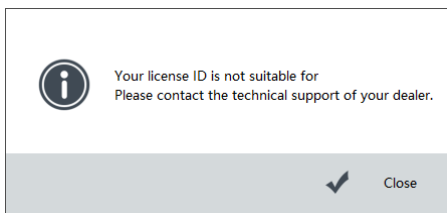
The following error message appears when starting the software:



External database has already been started on another PC

- Close the WINJAW+ software on all other PC systems and restart the WINJAW+ software on your PC,
- First work locally on your PC, then merge your data with the external database using the "Backup/Restore" function

"License ID is not compatible with the software version"



Each license code is associated with a specific OEM vendor software. This message is a sign that the sent software key does not match the delivered software version.

Please contact your dealer's support to solve the problem.

"It could not be checked for software updates"



To check for software updates, make sure that your PC has an active Internet connection.

Check your wireless connections or your LAN connections, if applicable, and try the update again.

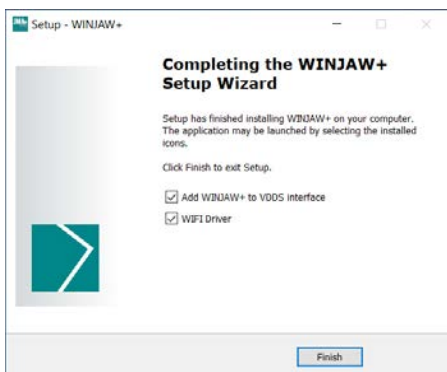
20.2 Installation

"Adapter could not be found."



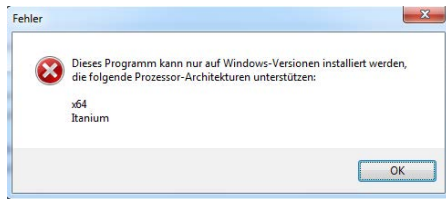
During the installation, the dialog on the left appears.

Please make sure that the supplied Wlan adapter is connected to your PC.



If you do not want to install the drivers for the WLAN adapter, you can set the selection during installation so that this step is skipped.

"Error during installation"



The following dialog appears during installation.

The WINJAW+ software can only be installed from systems with Windows versions that support 64bit architectures.

You must determine whether your PC meets the minimum hardware specifications (see [System Requirements](#)^[11]).

This information can be found in the chapter "System requirements" of this manual.

20.3 No Connection through WIFI possible

1. Please make sure that the WIFI stick is connected via USB before booting the computer.
2. If the WIFI stick is not plugged in when the computer starts up, the computer must be restarted with the WIFI adapter plugged in.
3. If the message "Service is not running, WIFI connections are not possible" appears when opening the device settings, this can possibly be remedied by restarting the computer. It may be necessary to reinstall the driver software supplied on the WIFI stick.

20.4 JMAlyser - Measurement does not start

1

2

3

4

Status LED is continuously red.

A marker is defective and the system must be sent to the dealer for repair

1

2

3

4

Adjacent status LEDs are red

A microphone or microphone segment is defective and the system must be returned to the dealer for repair

1

2

3

4

all 4 status-LED's are red

Possible reasons for this can be:

The mandibular sensor is not plugged in.

The ultrasonic markers of the sensor are covered

Cable break

In any case, when one or more markers are continuously red, please contact your dealer for further procedure. If the markers are flickering, kindly check first the instruction given in chapter [Output Values](#)^[107].

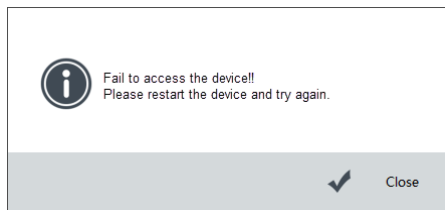
20.5 SYNCCam



1. Check that the USB plug is properly connected to the computer and camera. If the LED is green, the camera is receiving power via USB.
2. Call up the Hardware setup and delete the current hardware profile ('Delete' top right), confirm with 'Ok' and start the automatic device detection by opening the device settings again. After confirming, check whether the camera has been added.
3. Plug the USB cable into another socket on your PC and repeat step 2.
4. Open the Windows Device Manager and search for the entry Image Processing Devices >> "Logitech HD Pro Webcam C930". If it does not exist, unplug the USB cable and plug it in again. Windows will now install the camera drivers, then the device will appear in the list. If this does not happen, or if the name of the camera is simply "HD Pro Webcam C920", the entry must be activated again via "Update driver...". Windows updates the drivers and requires a restart.

20.6 Perform Measurement

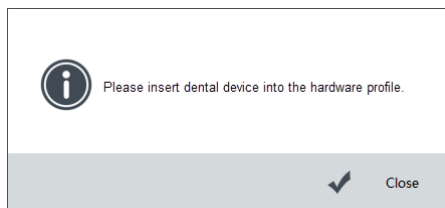
"Failed to access the device"



When starting the measurement this dialog appears.

Make sure that the system is connected and switched on.
Add your system via the device manager and start the recording again.

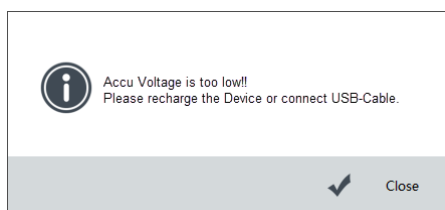
"Add device in the device settings"



This dialog appears when the measurement settings are selected.

Please make sure you have turned on your system, check the device settings and select your system again to add it to the current session.

"The battery charge is too low!"

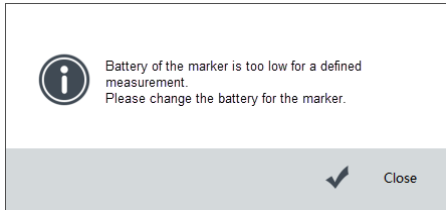


When starting the measurement this dialog appears.

Make sure that the system has sufficiently charged batteries. To perform the measurement, place the system in the charging cradle or connect the system to your PC with the USB cable.

- 40min continuous measurement,
- Average measuring time 1 min,
- 40 Measurement without charging possible.

"Lower jaw sensor battery is too low to take a reading."



When starting the measurement this dialog appears.

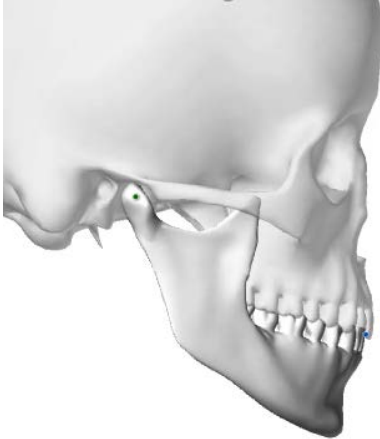
Open the battery compartment with the tool provided (TORX T6) and insert a new button cell battery (type CR1632).

Start the measurement again.

- 50 hour continuous measurement,
- Average measuring time 1 min,
- 3000 measurements possible without battery change.

"Lower jaw of 3D skull moves upward"

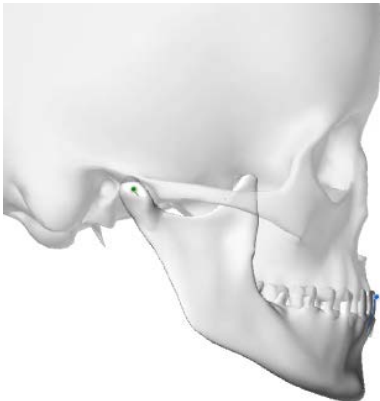
Lower Jaw Position at start movement



When referencing the reference system, "left" and "right" were confused.

Repeat the measurement and pay close attention to the instructions of the WINJAW+- Software.

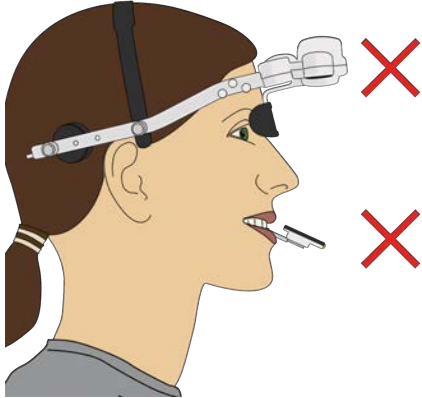
Lower Jaw Position at opening movement:



20.7 Output values

"Output values are not correct or not displayed in the report."

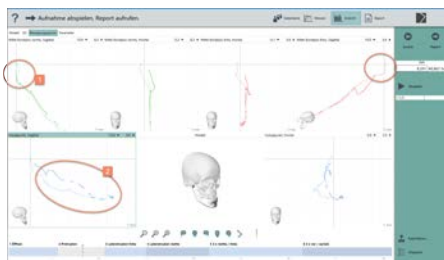
If the output values are not displayed correctly in the view or report, this can have various reasons.



- Measuring system was not placed on the patient head as recommended:
- Head bow is too low or too high on the patient's head.
- Paraocclusal attachment was not placed parallel to the occlusal plane.

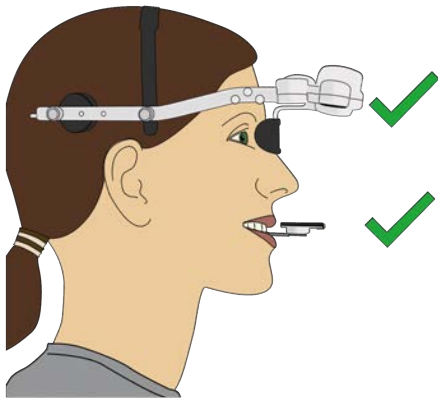


Disturbance of the system during measurement by direct sunlight on the treatment area.



The results include unphysiological cranial movements of the virtual condyles (1), as well as interruptions and jumps (2) within the movement paths.

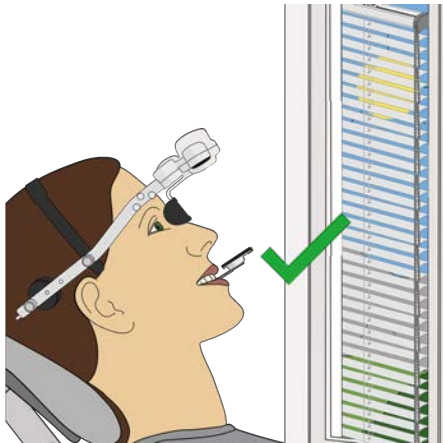
These problems can be solved by the following settings:



- Place the measuring system correctly on the patient.
- Reproduce the paraocclusal attachment, ensure that it is aligned parallel to the occlusal plane and repeat the measurement.



Relocate the patient or ensure that no direct sunlight on the treatment place is possible.



21 Data Import Interfaces

WINJAW+ provides some interfaces for data exchange with other software packages, such as practice management software. To find out whether your software is capable of one of these interfaces, please refer to the manufacturer's information.



In the WINJAW+ software, the first name, last name and, since version 1.10, the date of birth of the patient are mandatory data for the patient database. If images are transferred from older software packages that do not contain the date of birth, the field initially remains empty. However, if a date of birth is required for an action, the system will display a corresponding message.



In the following the setup of the interface and the available scope are described. If the interface is provided by more than one provider, your third party software is referred to as **third party software** in the following.

22 Data Export Interfaces

WINJAW+ provides an interface to further process or evaluate the recorded data with CAD/CAM programs.

22.1 zebris - own formats

For zebris Medical GmbH proprietary formats the naming is suggested as follows:

date of birth YYYYMMDD][first letter first name][first letter last name]_[date of recording YYYYMMDD]-[recording time HHMMSS]_[module name]_[export name (optional)]-[type (optional)]-[subtype (optional)]_[numbering if files with the same name already exist at the destination (optional)]. [file extension].

The naming of the files cannot be changed when fixing the target paths (see [Export \(Define default path](#) ⁹⁸)).

There are a total of 6 different export options in the measuring application

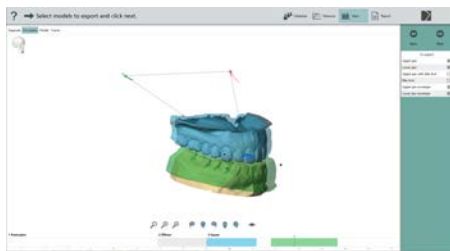
- XML - zebris real movement export
- XML - Virtual articulator settings export
- CSV export from the report
- CSV export (raw data) from the database
- Video export
- STL - Export of mesh/3D models

22.1.1 XML - zebris real movement export

This export interface is available in View mode in the articulator module. The XML data format is intended for further processing by software packages with XML parser function, which have been agreed upon with zebris.

In addition to meta information such as patient and admission data, above all the movement data of the patient are output, which can later be merged with mandibular scan data.

zebris real movement export



To transfer the data of the acquisition modes "**articulator and data export**" and "**real movement data export**" to the CAD/CAM interface, please click on the button **zebris real movement export**.

22.1.2 XML - virtual articulator settings export

The XML data format is intended for further processing by software packages with XML parser function, which have been reconciled with zebris.

Virtual articulator settings export



This export is only available if the recording mode "**Articulator and data export**" has been selected in the measurement settings.

The generated export file contains the position of the upper jaw in the articulator, patient-specific movement paths, articulator settings and rank of motion parameters for laterotrusion, protrusion and opening movement.



Amann Girrbach GmbH

Description of the coordinate system of the XML file using the Amann Girrbach Artex articulator

22.1.3 CSV-Export from Report

This export interface is available in **Report** mode.

All curves visible in the report are output as individual CSV files (comma separated values). You can select the format for the CSV file.

The system will also create separate CSV files for parameters and patient or measurement information. You can easily open and edit this file as a table in Excel, for example.

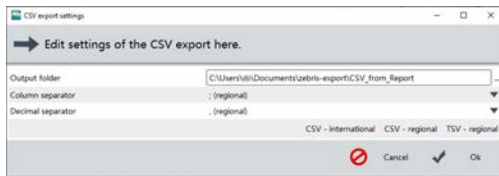
The first row contains all descriptions, starting with the patient and admission information.

The standard deviation of parameters is displayed as an extra column with the name of the parameter and the addition "SD" (standard deviation).

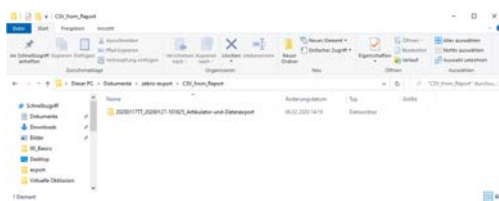
Text qualifiers are the quotation marks ("), separator is the semicolon (;), the default setting is taken from the defaults of your operating system, you can select a different separator during export if necessary.



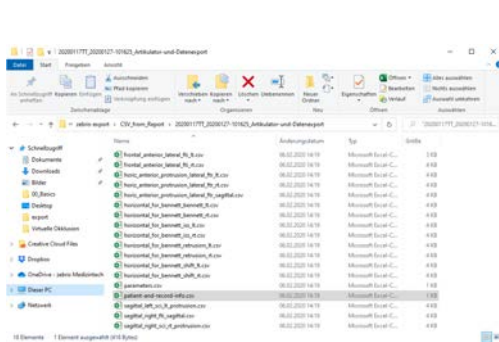
The first step is to open a report and press the CSV Export button.



The next step is to define the output directory, separators and decimal separators. The default settings are taken from the defaults of your operating system. Confirm with **Ok**.



A separate directory is created in the export directory for each measurement. This directory contains the CSV files for this report.

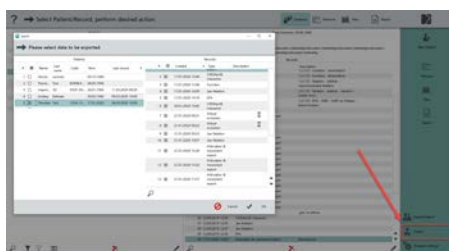


22.1.4 CSV-Export (Raw Data) from Database

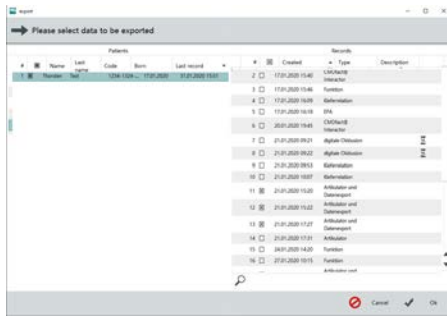
This export interface is available in the database.

With this export it is possible to get the raw data of the measurement in CSV format. Raw data means that each defined point, e.g. condylar, incisal or even an anatomical point, can be selected and exported in the export dialogue.

Text qualifiers are the quotation marks ("), separator is the semicolon (;), the default setting is taken from the defaults of your operating system, if necessary you can select a different separator when exporting.



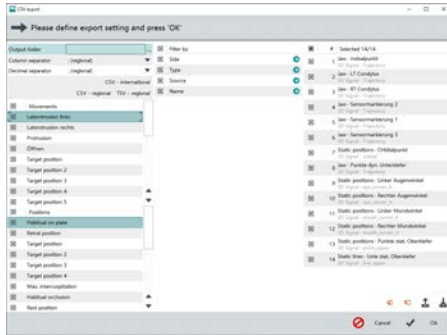
Start CSV raw data export in the database by clicking on **Export**.



Select the patient or recording to be exported.

Here you have the additional possibility to search for patient, code or type of measurement and description of the measurement with the quick search.

Confirm the selection with **Ok**.



The export settings dialog is divided into 3 columns.

Column 1:

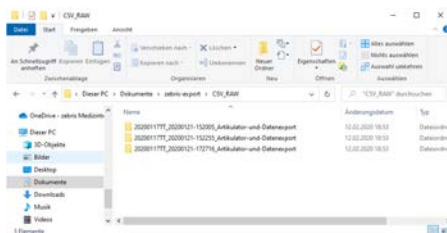
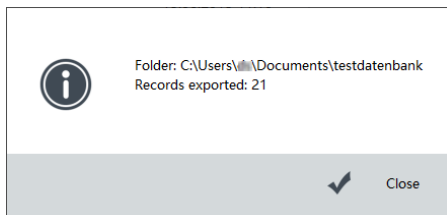
- Definition of output directory and separator
- Selection whether movements and which movements are to be exported
- Selection whether items and which items are to be exported

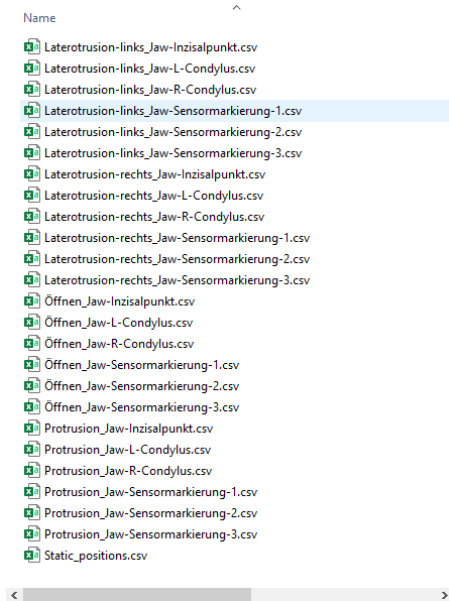
Column 2:

- You can use this filter to configure the points to be exported

Column 3:

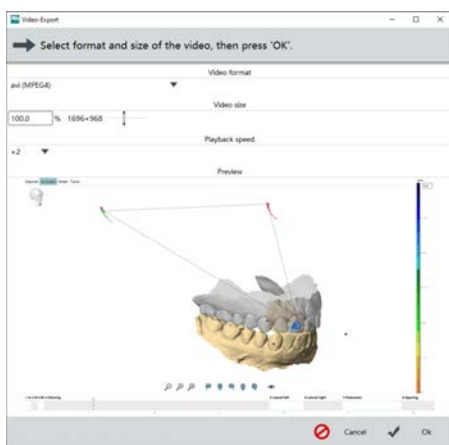
- Display of the filtered points
- Final selection of the signals to be exported





22.1.5 Video Export

Video-Export



This function allows you to create a video of the displayed recording in **View** mode.

In the video, all buttons are removed and the display elements are shown according to your settings.

When calling the function, you will see a preview image of the video and can make settings related to the created video.

Video format

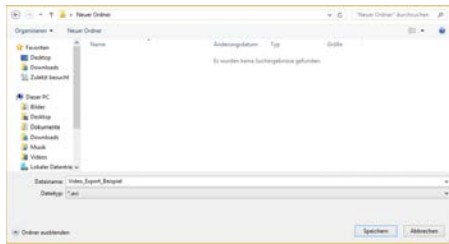
If your video player has problems playing, you can select a different file format here. Please note that the resulting file size varies due to different compression of the formats.

Video size (Resolution)

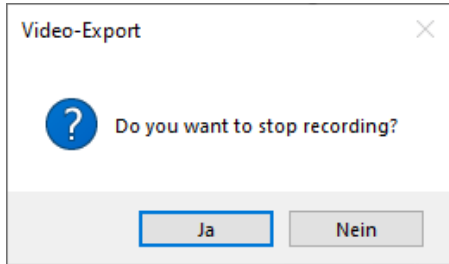
Here you can change the image size of the video, default setting is the size available on your monitor (100%).

Playback speed

You can set the playback speed here, please note that exporting the measurement at a lower speed takes longer because more intermediate images are generated.



The second step is to select a location and a name for the video.



After you confirm the location, the video export will run in live mode. After clicking into the image, a query appears asking whether the video should be stopped at this point. The display speed may vary depending on the processing power of your computer, but the video is always generated at the playback speed you specify.



You can play the finished video with any video player that supports the generated format.

If errors occur during playback or if playback is not possible, try generating the video in another format or contact the manufacturer of your video player.

22.1.6 Mesh Export

Export of model data / meshes

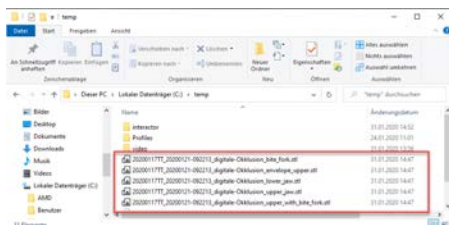


To export the model data / meshes it is first necessary to select the desired model.

The maximum configuration here would be:

- Upper jaw
- Lower jaw
- Bite fork/upper jaw
- Bite fork
- Envelope curve upper jaw
- Envelope curve lower jaw
-

Then select the export directory and confirm with **Ok**. You will then find the model data in your selected export directory.

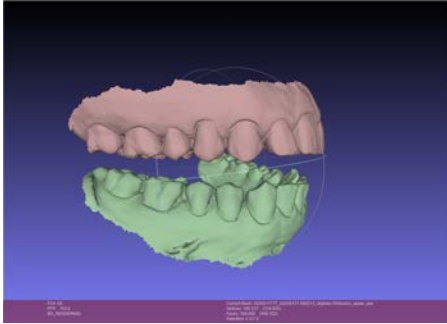


The models are exported in their current position and situation. This means that you can, for example, define a therapeutic situation and export it for further processing in a third-party program.

The model data /meshes can be in 2 different coordinate systems.

1. Axis-orbital system:

If you have defined a reference system on the subject's skull during the measurement.



<http://www.meshlab.net>

2. Bite fork system:
If you have selected Real movement mode in the measurement settings

