

## zebris FDM 1.12



## Software User Manual

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## 2 Foreword

Welcome to the User Manual of the zebris FDM Software.

This User Manual provides you the basic knowledge for operating the Software. It explains the installation and gives suggestions for preparing the measuring procedure and data recording.

Please additionally note the information relating to safety in the Technical Manual and please ensure to keep all the manuals directly next to the measuring system. The Operating Manual is an integral part of the product and will help you to operate the measuring system in accordance with the instructions.

The zebris Medical GmbH does not assume any liability whatsoever for injury to personnel or patients, or damage to the system, caused by non-observance of the information contained in the manuals, or improper use of the Measuring System.

Should you become aware of any errors when using this User Manual, or should you have any suggestions, we would be most grateful to receive your feedback at any time.

### Registered trademarks

Different brand names are referred to in this Manual. All these product names are used only for clarity's sake, or for editorial reasons and are trademarks belonging to the respective companies. When using brand names, the trademarks themselves and also the rights of the respective proprietors shall remain unaffected thereby.

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## Foreword

### 2.4 Conventions and symbols used

In this User Manual the following conventions are used.

Warnings are shown as follows:



Warnings indicate a potential hazard to the health and safety of the users and/or patients. The warnings describe the danger involved and how this can be avoided.

Important information is shown in the following way:



The warnings denote a potential hazard that can cause *damage* to, or *destroy* the device. The warnings describe the danger involved and how this can be avoided.



These warnings denote information that is *relevant for taking measurements*.

This User Manual is to be kept within easy reach so that the information it contains is available to the user at all times.

#### Note on modifications

In order to guarantee the quality of our products, we continually endeavor to improve our product line. It is possible that by the time this User Manual has been printed, the software and hardware configuration have undergone a further update. Therefore it is possible that some of the figures deviate from the product you have actually been supplied with.



Please note that there is not a new version of this manual for every new software release, as often new software releases have technical modifications invisible to the user.. The up-to-date version of the software manual can be obtained from the service area of our homepage.

## 3 Installation

### 3.1 System requirements

- Processor                    Intel Core i5 or equivalent
- Working memory        at least 4GB RAM
- Hard drive                at least 750GB of free space on the system drive  
(required for the database, especially when recording video)
- 3D graphic card        at least 1GB GDDR RAM, OpenGL 3.3, DirectX 9.0c
- Display                    Color monitor with at least 1024x768 pixels resolution.  
Your graphic card must be able to operate at the native resolution of your display.
- Ports                      1 free USB port per zebris device
- Operating system    Windows 7 64bit/32bit or 8.1 64bit
- System drivers          .NET 4.0 or higher  
DirectX 9.0c or higher  
latest driver for your graphic card



Windows XP is not longer supported since zebris FDM version 1.12.

## 3.2 Installing the zebris FDM software



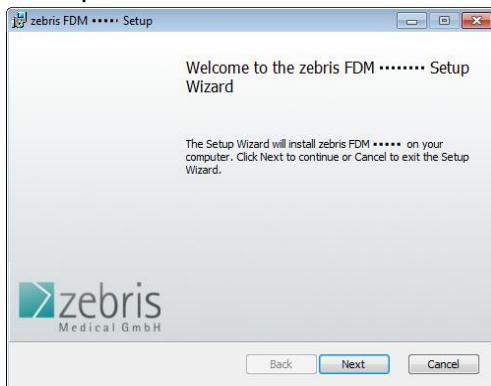
If a note appears during installation that your graphics hardware does not support OpenGL 3.3, you cannot run the software on your computer.

If your graphics hardware features two graphics chips, please switch in the corresponding software to the high-performance chip.

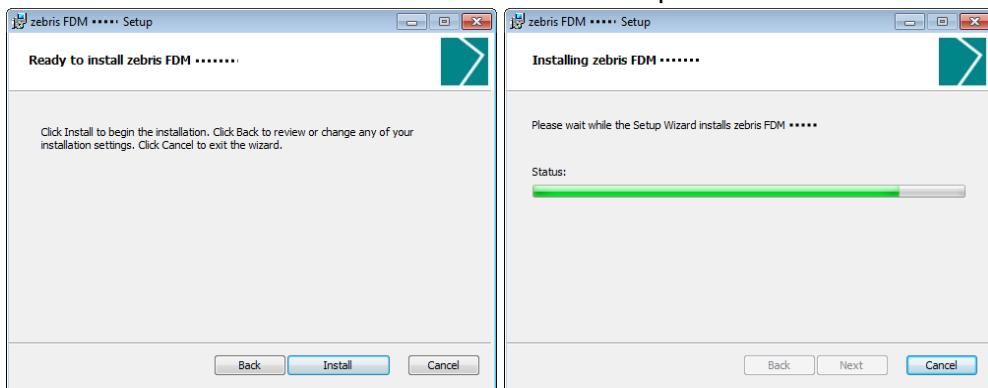
If your graphics hardware supports OpenGL 3.3 according to its specifications, please try to update the graphics driver.

### 3.2.1 Step-by-step installation

1. Please open the folder “software” on the installation data carrier and start the installation file named ....
2. Then please click on **Next** to start the installation.

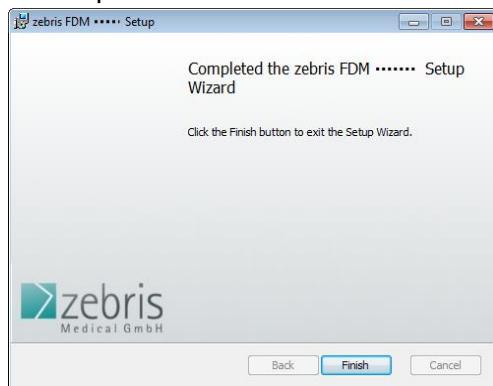


3. Click on **Install** to commence the installation. The process can take a few minutes.



## Installation

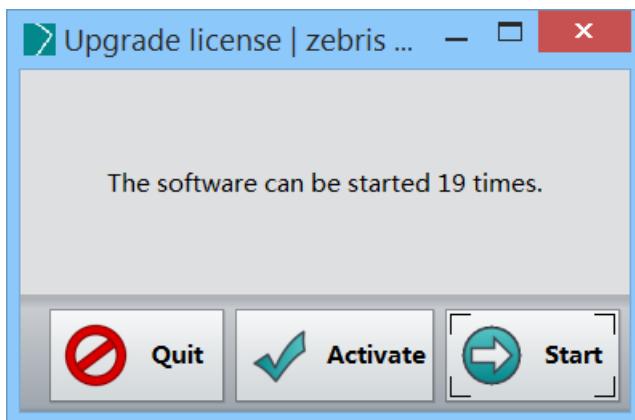
4. Once the installation has been set up, the following display appears. Click on **Finish** to complete the installation.



The software is now installed. A symbol with the designation zebris FDM has been created on the desktop. To start the software you can either double-click on this symbol, or start using the program group **Start >> Programs >> Zebris >> zebris FDM**.

### 3.3 Activating the software

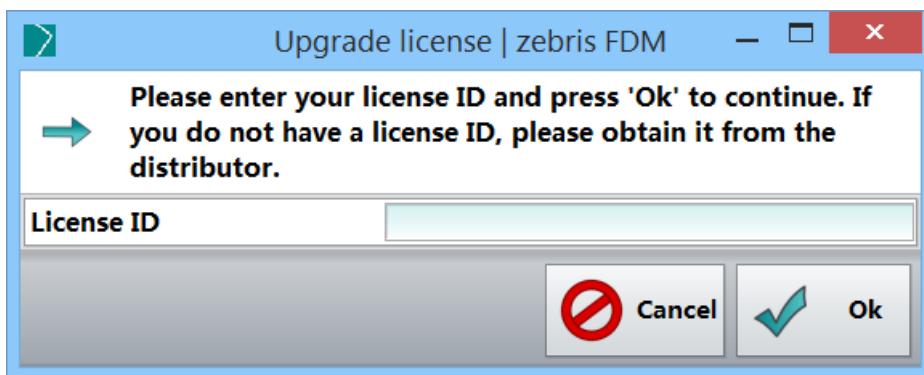
The installation file comprises a module selection for the unlimited use of 30 starts, afterwards the software has to be activated.



The activation of the software can either be done by internet or via phone/fax/email.

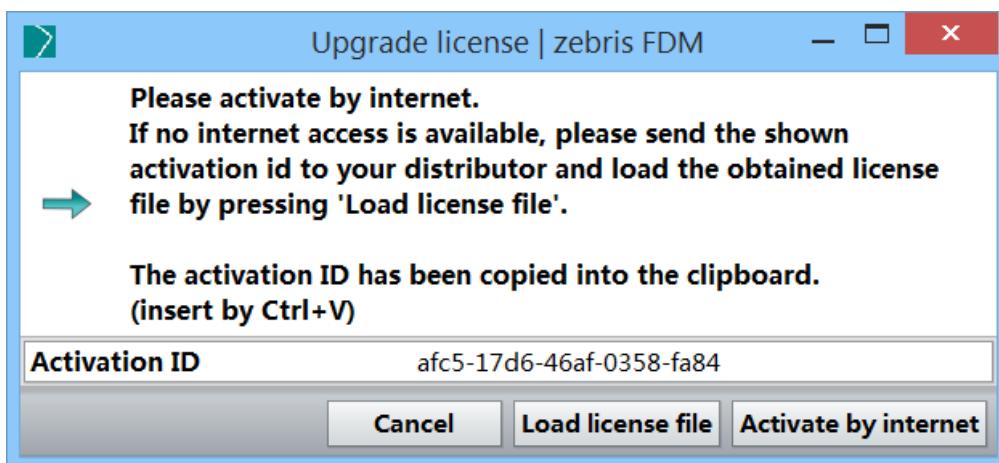
#### 3.3.1 Entering the license code

First the license code (eight-digit, e.g. 1234-5678) must be entered, which you purchased together with the software.



#### 3.3.2 Activation

Afterwards you have two possibilities of activation as described in the following.



## Installation

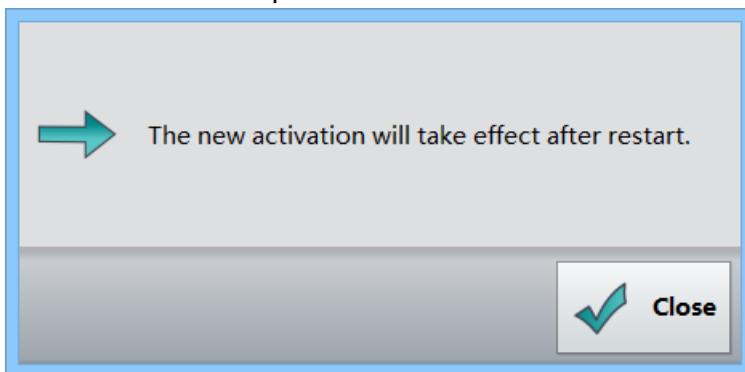
### Via internet

The activation is done completely automatically after verification of the activation ID that has been transmitted through the software before and comparison with the registered licenses. In case a negative verification occurs, a corresponding note appears.

### Offline

Activation is done offline via transmitting the activation ID that is displayed by the software through phone/fax/email/mail.

1. A 20-digit activation code (see figure above) is displayed. Please transmit this code to your qualified zebris dealer.
2. Afterwards you receive a license file, which you make available for example using a USB stick on the computer that shall be activated.
3. Afterwards you click on „load license file“ in the dialog window displayed above, select the received license file and confirm. After an automatic restart of the software, the activation is complete.



Please note that the activation is done per computer (work station) and that the number of activations is restricted to 3 work stations.

Further activations can be purchased upon request at your qualified zebris dealer.

## 3.4 Installing the zebris device drivers

Drivers are available on the installation file carrier in the file **Drivers**. When required, please start the installation as described in the following paragraphs.

### 3.4.1 zebris USB driver

The zebris USB driver required for the measuring platform is installed in the background. Please only install the USB driver separately when your PC cannot find the device resp. on demand of our support staff.

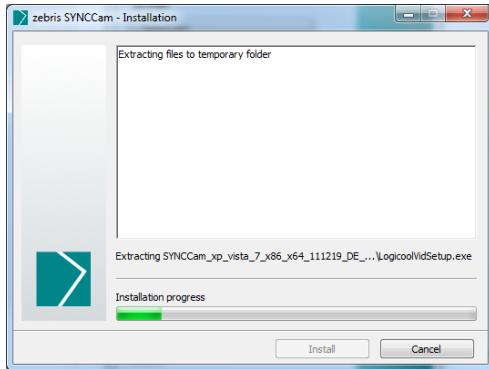
## Installation

### 3.4.2 SYNCCam driver



The installation of the driver is only recommended in case you have problems with standard Windows drivers (e.g. display failures, speed problems) or when you are using two and more SYNCCams at the same time.

1. The installation files are automatically transferred to your computer. The process can take a few minutes.



2. Select the language and then click on **Next** to continue the installation.

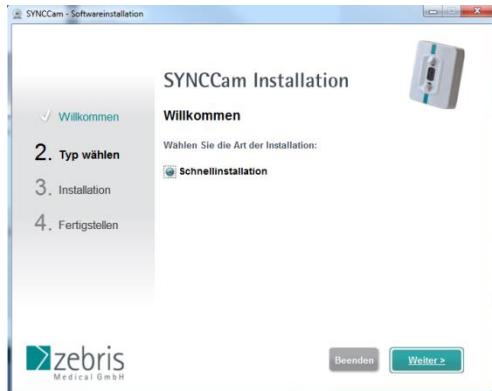


3. Connect your SYNCCam using a free USB port and then click on **Next**



## Installation

4. To continue the installation click on **Next**



5. The installation of the driver software can take a few minutes.



6. After successful installation you will see a live display of the connected camera. If the live display does not appear, please install the driver again.



7. Once the installation has been set up, the following display appears. Click on **Finish** to complete the installation. If you are asked to re-start your computer, please do so accordingly.

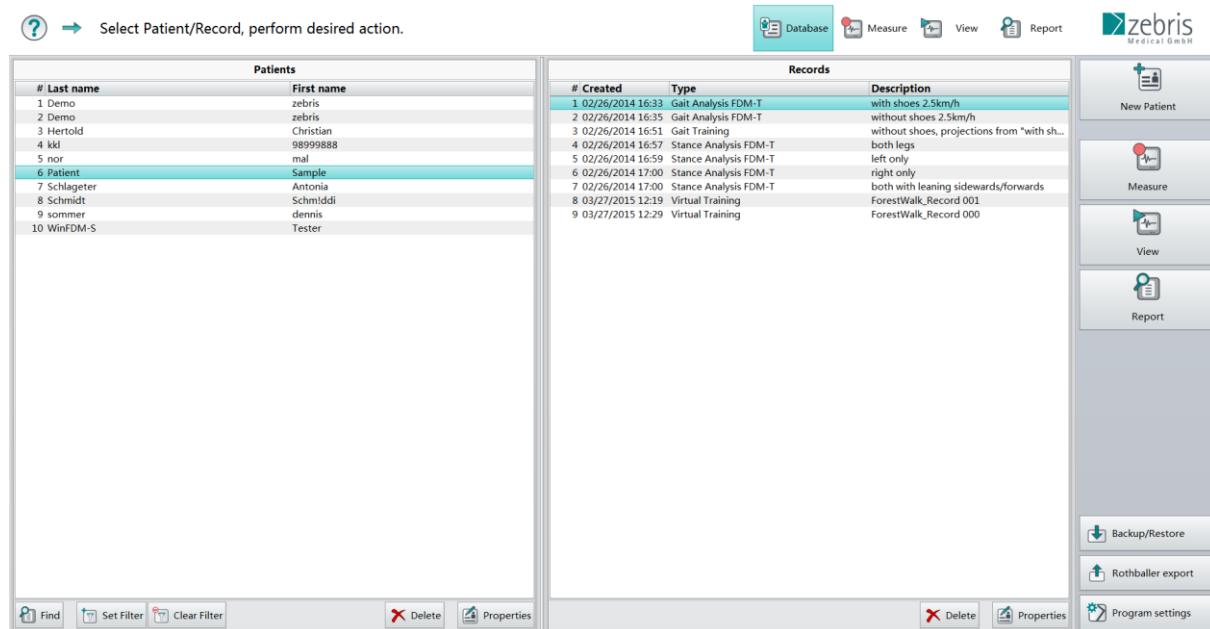
## Installation



When using several cameras, the driver installation does not, as a rule, have to be carried out again. If problems arise for displaying the cameras in the program, please then carry out this driver installation once again to ensure the correct function of the cameras.

## 4 The Patient Database

After starting the program you are in the Patient Database.



Select Patient/Record, perform desired action.

Patients		
#	Last name	First name
1	Demo	zebris
2	Demo	zebris
3	Hertold	Christian
4	kkI	98999888
5	nor	mal
6	Patient	Sample
7	Schlaegter	Antonia
8	Schmidt	Schmidti
9	sommer	dennis
10	WinFDM-S	Tester

Records			
#	Created	Type	Description
1	02/26/2014 16:33	Gait Analysis FDM-T	with shoes 2.5km/h
2	02/26/2014 16:35	Gait Analysis FDM-T	without shoes 2.5km/h
3	02/26/2014 16:51	Gait Training	without shoes, projections from "with sh...
4	02/26/2014 16:57	Stance Analysis FDM-T	both legs
5	02/26/2014 16:59	Stance Analysis FDM-T	left only
6	02/26/2014 17:00	Stance Analysis FDM-T	right only
7	02/26/2014 17:00	Stance Analysis FDM-T	both with leaning sideways/forwards
8	03/27/2015 12:39	Virtual Training	ForestWalk_Record_001
9	03/27/2015 12:39	Virtual Training	ForestWalk_Record_000

Here you can manage the patients as well as previous measurements and have access to import and export functions. In the following you will also find a detailed description on the user interface.

### 4.1 Data Backup



The manufacturer zebris Medical GmbH explicitly states, that the user is responsible for backing up his/her data and furthermore recommends to create a regular backup of the patient data base. The zebris FDM database can be found in the user data folder

- Windows 7  
C:\ProgramData\zebris\zebris.fdm.data#
- Windows XP  
C:\Documents and settings\All Users\application data\zebris\zebris.fdm.data#

## 4.2 Information and Navigation

 Select Patient/Record, perform desired action.



### Information

Help and instructions for using the software.

### Navigation

Here you can see the section of the program you are actually in. The active section is marked in color, respectively.

## 4.3 Patients

Patients		
#	Last name	First name
1	Demo	zebris
2	Demo	zebris
3	Patient	Sample
4	Schlageter	Antonia

Find Set Filter Clear Filter Delete Properties

### List of patients

Here, the names of the patients are listed. The patient currently selected is marked in color.

### Deleting a patient

After a separate confirmation, the patient is irretrievably deleted together with all the measurements assigned to him.

### Searching the database for a patient

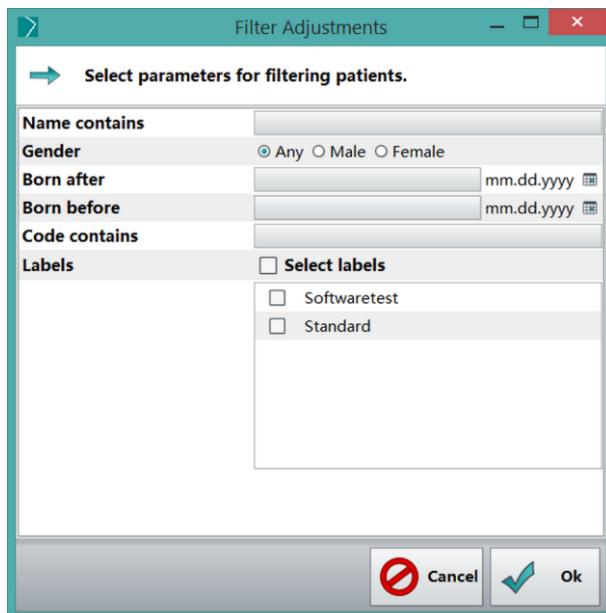
Using the function **search** the patient database can be searched for a specific patient through the input line. The search window can be faded out through pressing Esc or clicking again on "Search".

### Processing the patient file

With a single click on **properties** the patient file opens (see Patient file / New patient patient).

### Selecting the filter function

By using the filter function, you determine which patients are shown in the list. Click on **Set filter** to call up the filter settings. Click on **Cancel filter** to display all patients (standard setting)



Patients		Filtered - 1/4
#	Last name	First name
1	Schlageter	Antonia

### Search parameters

The search parameters include the possibility to filter patients according to specific criteria.

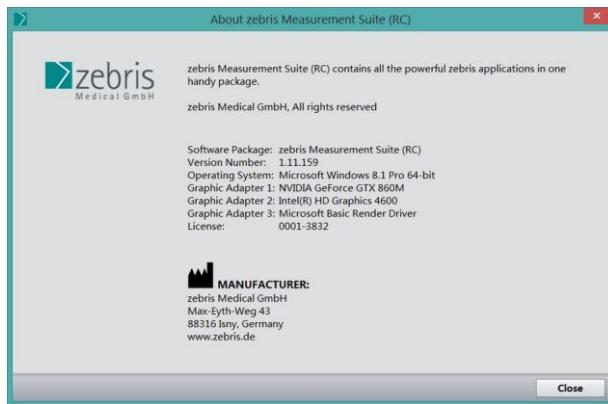
A filter is active when all visible patients above the patient list on the upper right are displayed (patients displayed/all).

## 4.4 About zebris FDM



### View „About zebris FDM“

A click on the **question mark** opens the window



### Functional description

The functioning and the application of the software are briefly described.

### Software-related data

The software's name, version and the date of installation resp. the last update as well as information on the used operating system, the graphic hardware and the active license are displayed.

### Manufacturer's information

This field contains all relevant data on the software manufacturer

## 4.5 Recordings

Records			
#	Created	Type	Description
1	03/13/2015 10:30	Gait Analysis FDM-T	1.5 kmh - Schuhe
2	03/13/2015 10:33	Gait Analysis FDM-T	1.5 kmh - Socken
3	03/13/2015 10:51	Gait Training	1.5 kmh - Feld 1 - Socken
4	03/13/2015 10:55	Gait Training	1.5 kmh - Feld 2 - Socken
5	03/13/2015 10:59	Gait Training	1.5 kmh - Feld 3 - Socken
6	03/13/2015 11:07	Gait Analysis FDM-T	0.5 kmh - Socken
7	03/13/2015 11:22	Gait Training	0.5 kmh - Feld 1 - Socken
8	03/13/2015 11:28	Gait Training	0.5 kmh - Feld 2 - Socken
9	03/13/2015 11:31	Gait Training	0.5 kmh - Feld 3 - Socken
10	03/13/2015 11:35	Gait Analysis FDM-T	1 kmh - Socken
11	03/13/2015 11:42	Gait Training	1 kmh - Feld 1 - Socken
12	03/13/2015 11:46	Gait Training	1 kmh - Feld 2 - Socken
13	03/13/2015 11:50	Gait Training	1 kmh - Feld 3 - Socken

### List of recordings

Here all recordings of the patient are listed who has just been selected. The selected recording is marked in color.

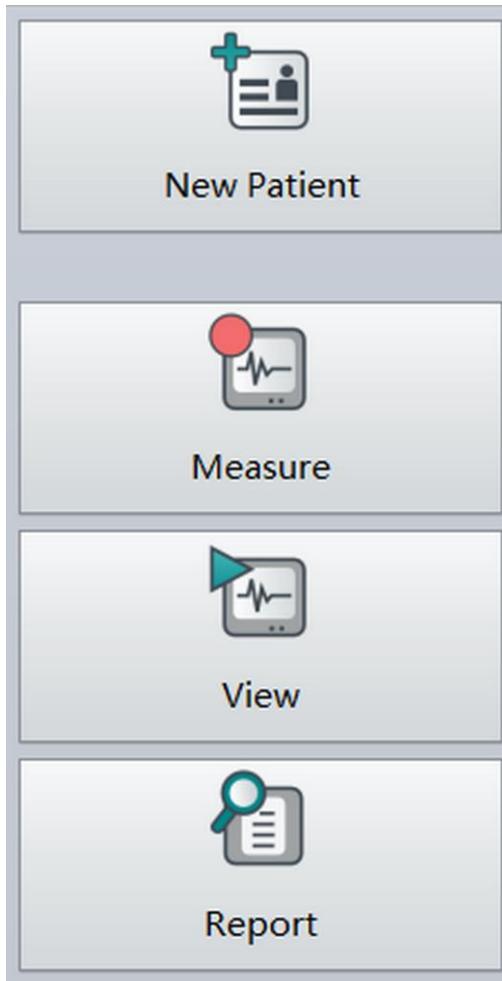
### Deleting a recording

After a separate confirmation, the selected measurement is irretrievably deleted.

### Details of the recording

Here you can edit the description and comments on the recording (see Details of the recording).

## 4.6 Functions



### Begin new measurement

*With a single click you can select the measurement application.*

### Displaying the measurement & editing

*The currently selected measurement is opened for viewing and editing.*

### Showing the measurement results

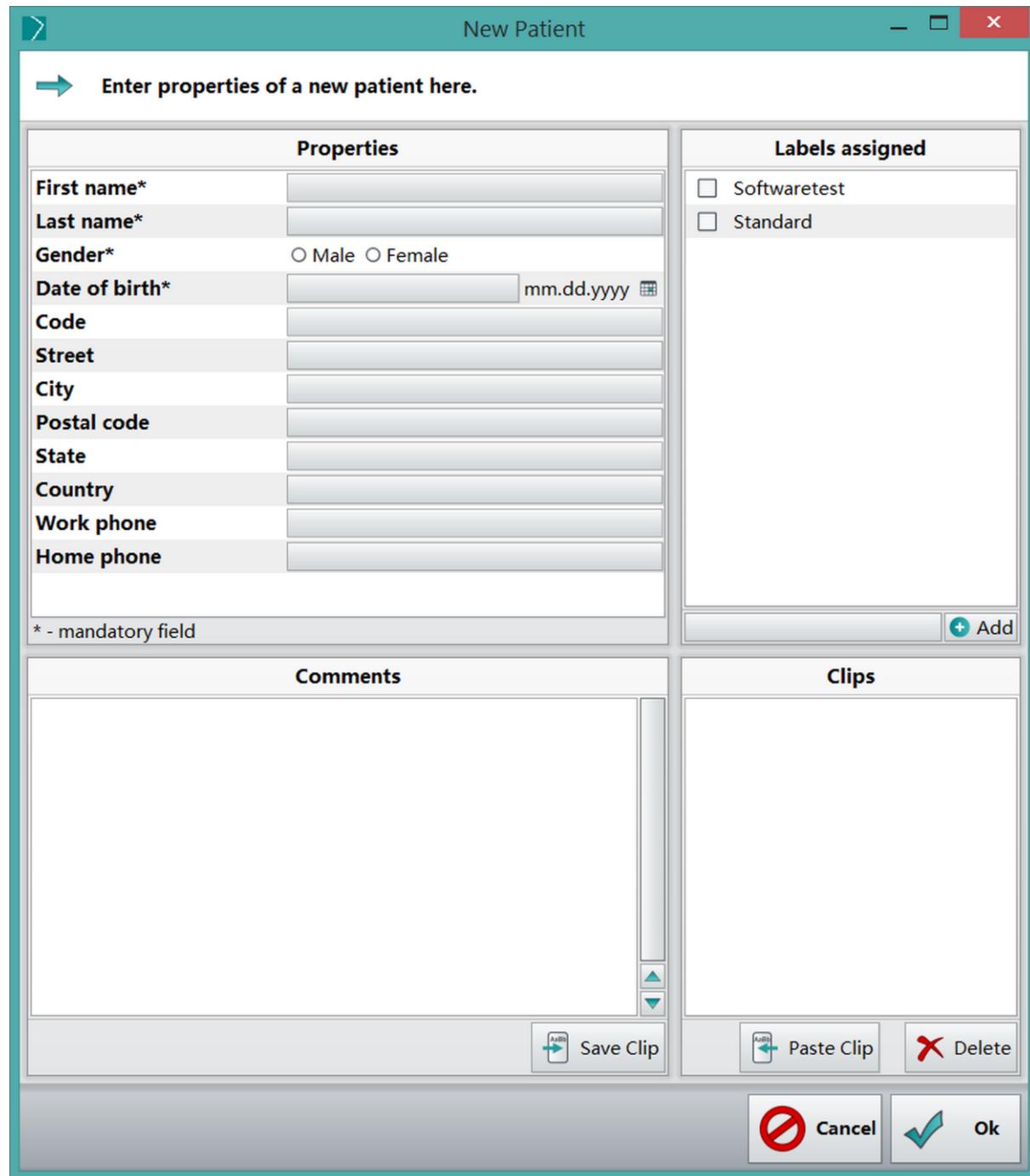
*The measuring results of the measurement selected now are shown clearly. The report provides a print function and PDF export.*

### New patient

*Click here to create an entry for a new patient.*

## 4.7 Patient file / New patient

When you create a new patient or edit the file of an existing patient (button **New** or **Properties**), the following dialog appears:



The screenshot shows the 'New Patient' dialog window. At the top, there is a header bar with the title 'New Patient'. Below the header, a message says 'Enter properties of a new patient here.' with a green arrow icon.

The main area is divided into several sections:

- Properties:** A grid of input fields for personal information:
  - First name\*
  - Last name\*
  - Gender\* (with radio buttons for Male and Female)
  - Date of birth\* (with a date picker field)
  - Code
  - Street
  - City
  - Postal code
  - State
  - Country
  - Work phone
  - Home phone
- Labels assigned:** A list of checkboxes for assigning labels:
  - Softwaretest
  - Standard
- Comments:** A large text area for comments with scroll bars on the right.
- Clips:** A section for managing clips with buttons for Save Clip, Paste Clip, and Delete.
- Buttons:** At the bottom are two main buttons: 'Cancel' (with a red circle and slash icon) and 'Ok' (with a green checkmark icon).

In the following the individual fields and their function are briefly explained.

## 4.7.1 Properties

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

### Patientdata

Please enter the patient data here:  
*Obligatory fields are the first name and the surname as well as gender and date of birth.*

The box **Code** gives you the possibility of allocating the patient entry a unique identifying designation.

## 4.7.2 Labels

With this field you can allocate the patient to a group.

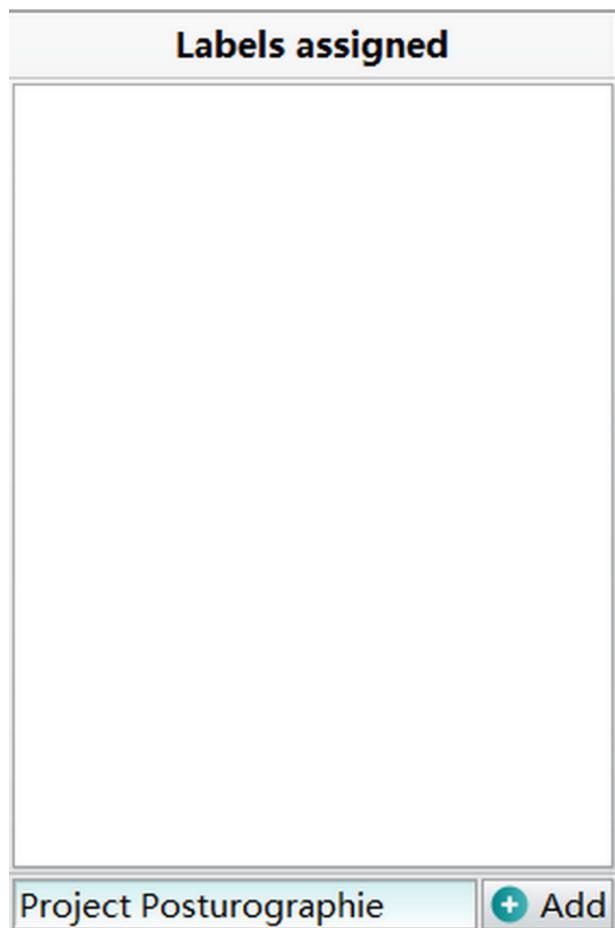
You will then have the possibility of showing only the patients of a certain group in the database. Therefore, please select this/these group(s) in the filter settings (see Selecting the filter function, p.19).

Labels assigned	
Project Posturographie	 Add

### Creating a new label

Enter the name for the new group to be created here and click on **Add**.

**Labels assigned**



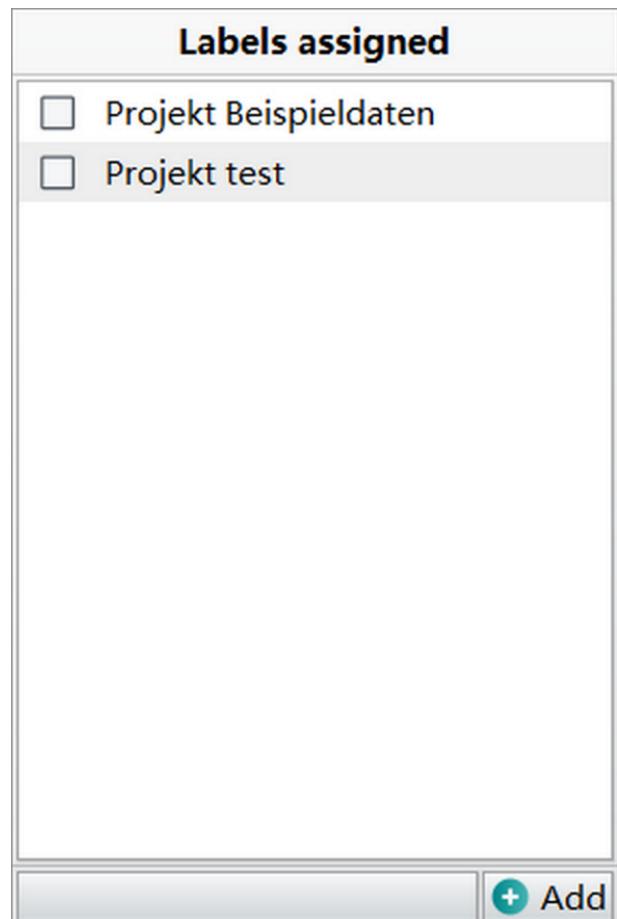
Project Posturographie + Add

The **newly created group** appears in the list. The tick to the left of it shows that the patient is allocated to this group.

**Labels assigned**

<input type="checkbox"/>	Projekt Beispieldaten
<input type="checkbox"/>	Projekt test

**Add**

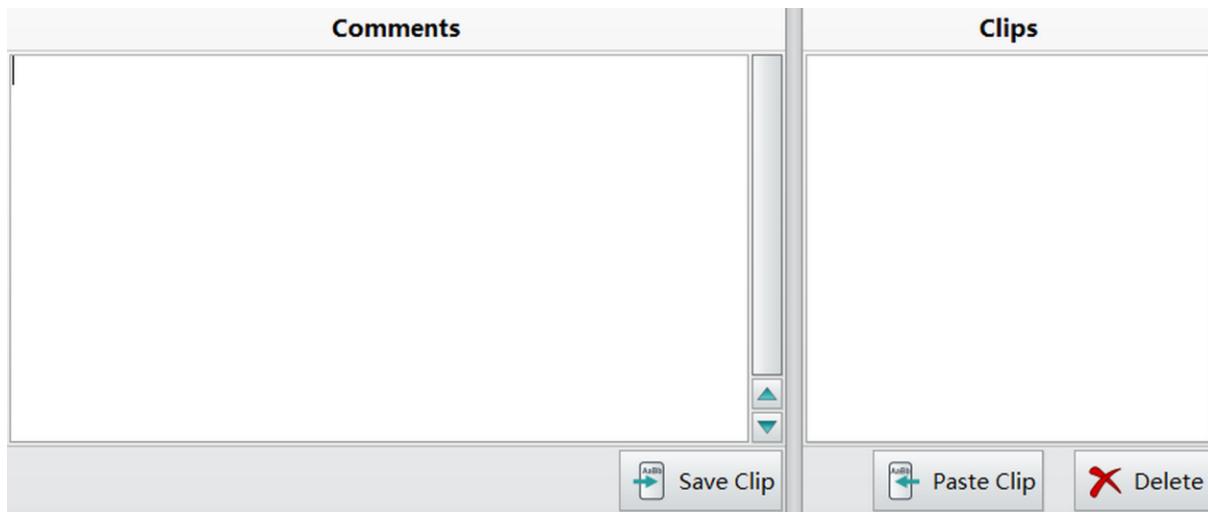


#### Allocating a patient to several labels

By clicking on the tick you can carry out or cancel the allocation.

Groups to which no patients are allocated any longer disappear automatically after closing the dialog.

#### 4.7.3 Comments & Clips



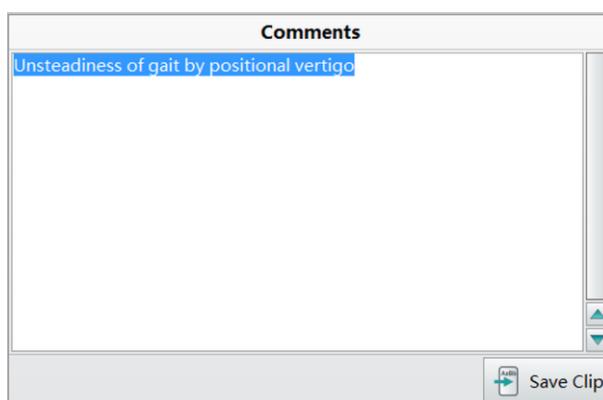
##### Comments

*Write any free text here as a comment on this patient.*

##### Clips

*This list contains all the text clips you have defined*

##### Creating text clips

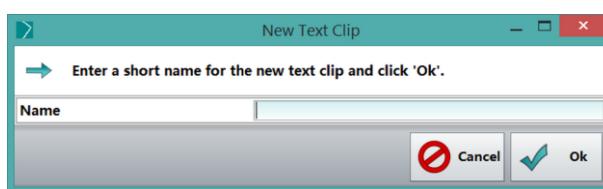


##### 1. Mark the text

*Mark the text section in the box "Comments" that you wish to create as a text clip.*

##### 2. Save

*To save the marked text section as a text clip, click on **Save Clip**.*

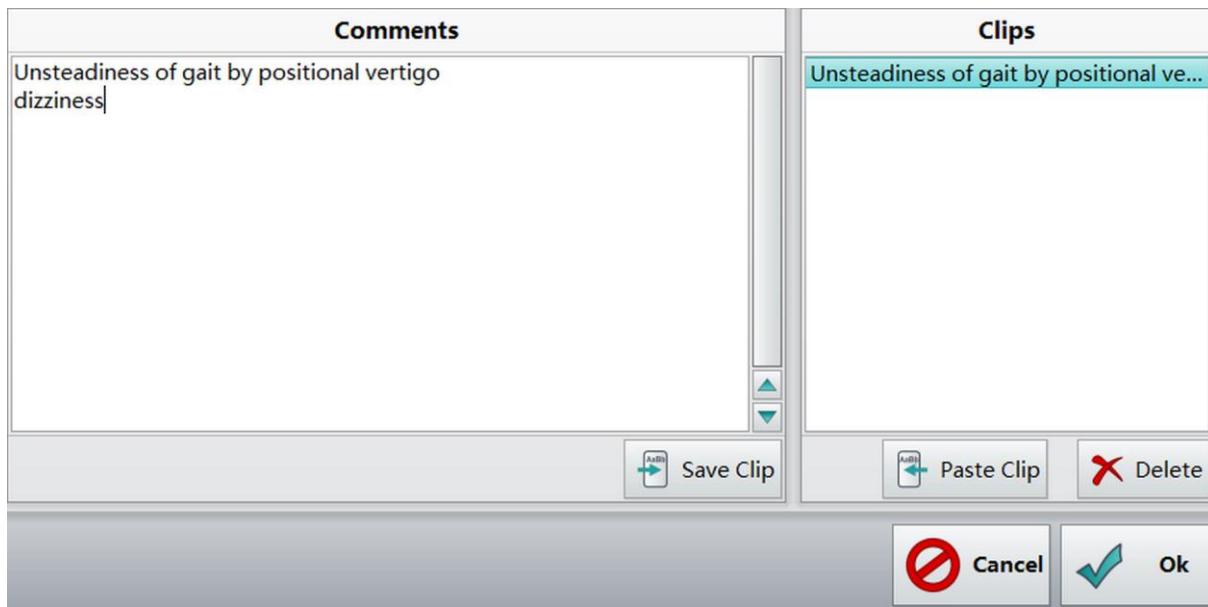


##### 3. Enter designation

*In this dialog you can select a designation for the text clip your chosen designation is then automatically stored as a suggestion.*

*By clicking on **OK** the text clip is created and appears in the list with the chosen designation.*

#### 4.7.4 Inserting the text clip



##### 1. Determining the cursor position

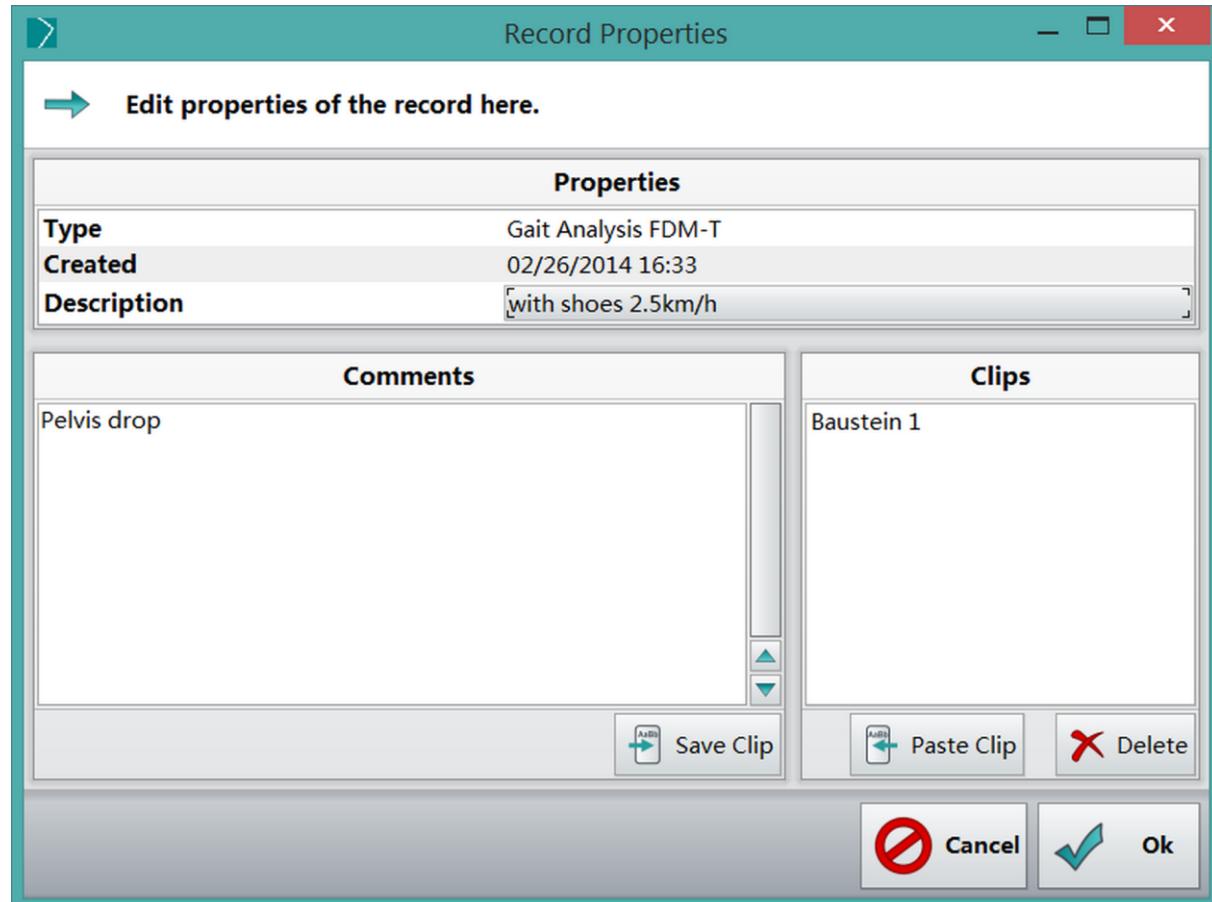
Set the cursor by left-clicking at the position where your text clip is to be inserted.

##### 2. Inserting the selected text clip

Select a clip from the list with a left click. This clip is then taken over to its new position in the Comment box by clicking on **Paste Clip**

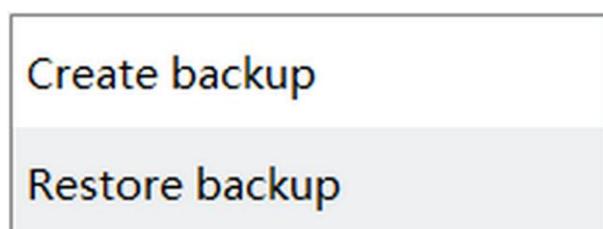
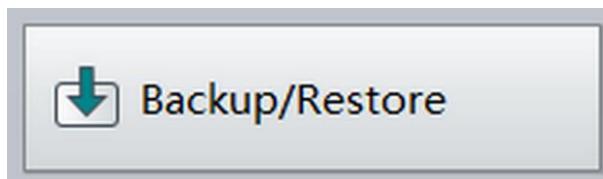
## 4.8 Details of the recording

Call up this dialog by clicking on **Properties** on the right under the list of recordings. You can change the description of the recording and also add a recording comment (see Comments & Clips , p.27). Text modules are stored separately from those in the Patient File.



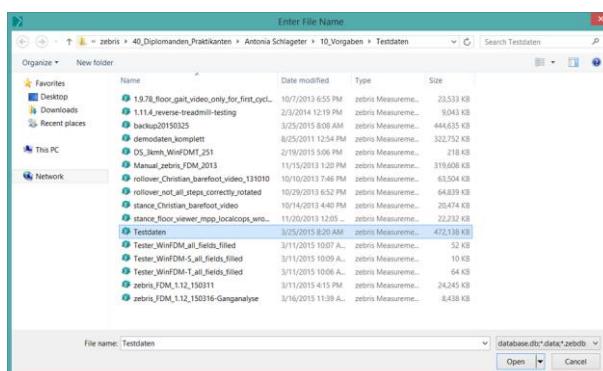
## 4.9 Import of data

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



### 1. Import...

*Click on the button Store/Restore at the bottom right in the toolbar.*

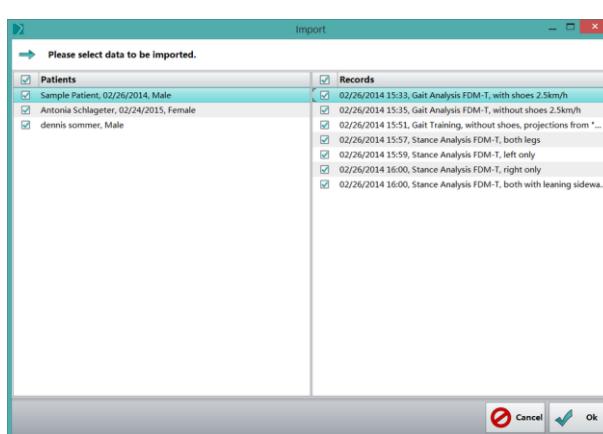


### 2. Restore

Select Restore backup in order to import the desired data to your database.

### 3. Browsing for & selecting data

*Search for data records, that you would like to import, on your hard disk resp. other storage media connected to your computer. It depends on the format which files you have to select. More information (see Data formats, p.31).*

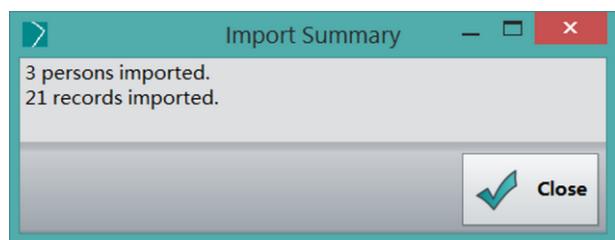


### 4. Select data records

*Place ticks in front of all data records, that you would like to import..*

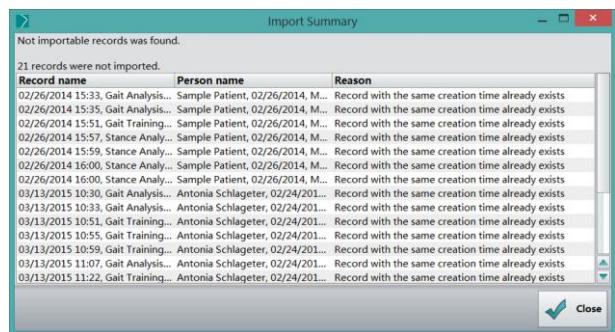
*In order to import all patients of a group or a project, place the tick in the first column. If you would like to import all measurements of a patient, simply click on the tick in front of the patient's name.*

*When clicking in a line with the patient name, all measurements of the patient are displayed on the right. You can then select them individually.*



## 5. Results

After a successful data import the dialog shows you a summary of how many patients and measurements have been imported. Incorrect data records are shown in the list, as well as patients and measurements that have already been created and were therefore not imported. Project names from the old software are allocated to the patients as a group with the prefix "Project".



## Errors/Duplicates

If any errors occur while importing or if you would like to import data records, which already exist in your data base, a summary will be displayed informing you on the corresponding information.

### 4.9.1 Data formats

#### zebris' own data formats (.zebdb/.data)

If you would like to import data from older or new software packages, simply select the corresponding file with the ending .zebdb resp. .data.

#### Old data (WinFDM/Win FDM-T)

You can import old measuring data from the software packages WinFDM and WinFDM-T into this patient database.

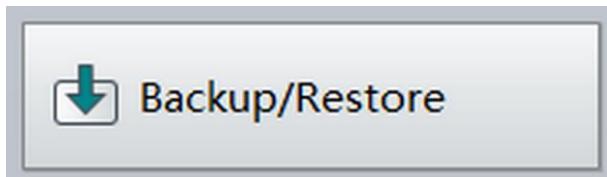
The default paths to the database are

- ...for WinFDM-T „C:\Programs\zebris\WinFDM-T\Data\Database.db“
- ...for WinFDM „C:\Programs\zebris\WinFDM\Data\Database.db“

Alternatively you can also copy the whole folder "Data" from the old software, e.g. onto a USB memory stick, and then import the data from this stick.

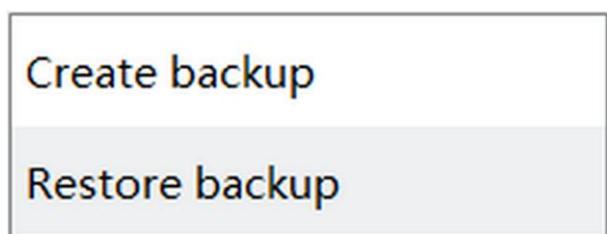
## 4.10 Data Export

You can export patient and measuring data from the database into the zebris' own format „zebdb“. This offers you the opportunity to exchange single data records with colleagues also working with the zebris software. Exported data can be imported again by using the Restore function (see : Old data (WinFDM/Win FDM-T), page.31). Furthermore you can create backups of the database by doing so.



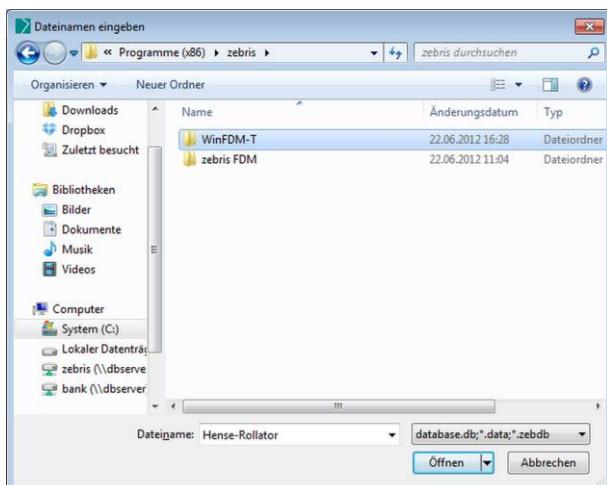
### 1. Export...

Click on the button at the bottom **Store/Restore** right in the toolbar. If several export formats are available, select one from the appearing list.



### 2. Store

Select Create backup in order to export the desired data out of your database.

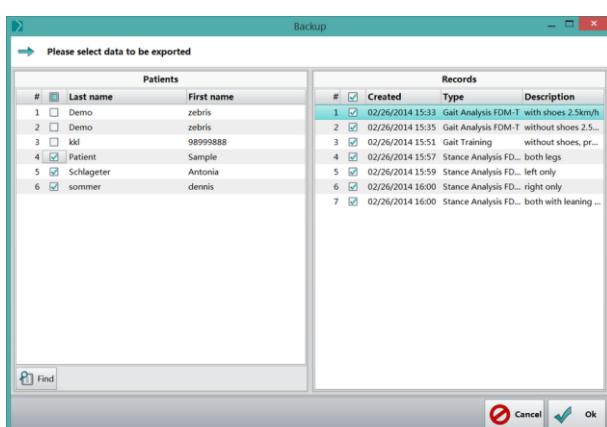


### 3. Select data records

Place ticks in front of all data records that are to be exported.

If you would like to export all measurements of a patient, simply click on the tick in front of the patient's name.

When clicking in a line with patient name, all measurements of the patient are displayed on the right. You can then also select them individually.

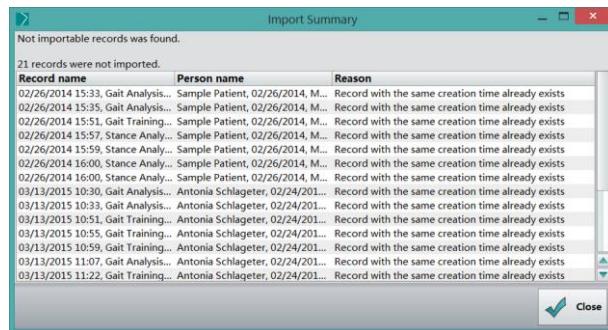


### 4. Select data records

Place ticks in front of all data records, that you would like to import..

In order to import all patients of a group or a project, place the tick in the first column. If you would like to import all measurements of a patient, simply click on the tick in front of the patient's name.

When clicking in a line with the patient name, all measurements of the patient are displayed on the right. You can then select them individually.

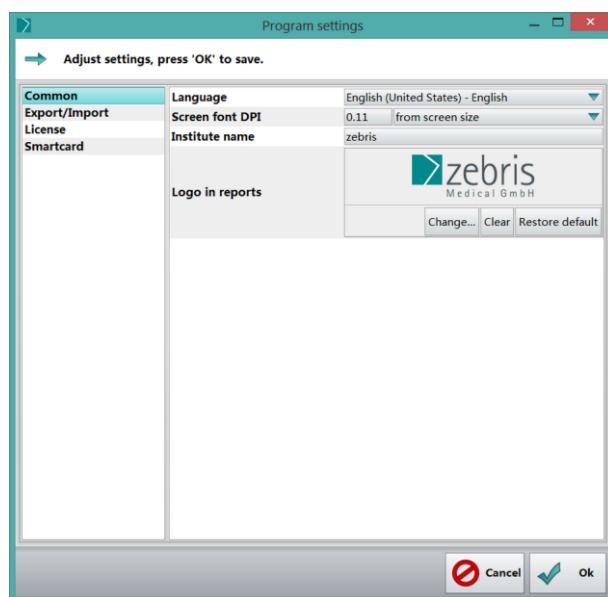
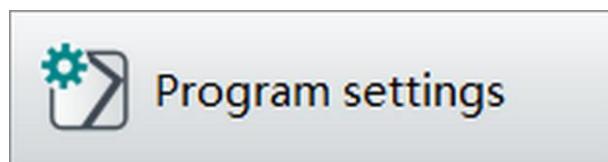


## Errors/Duplicates

If any errors occur while importing or if you would like to import data records, that already exist in your data base, a summary will be displayed informing you on the corresponding information.

## 4.11 Program settings

Here you can amongst others change the language and the settings concerning the card reader.



### Program settings

Click the button at the bottom right in the toolbar.

Click on **Common** on the left-hand side.

### Language

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

### Screen font DPI (Zoom factor)

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

Select **user-defined** in order to enter your own value in dpi.

**Ratio of screen height** can be used as alternative to the dpi setting. Using the **system setting** resets the value to Windows-Standard.

### Logo in Reports

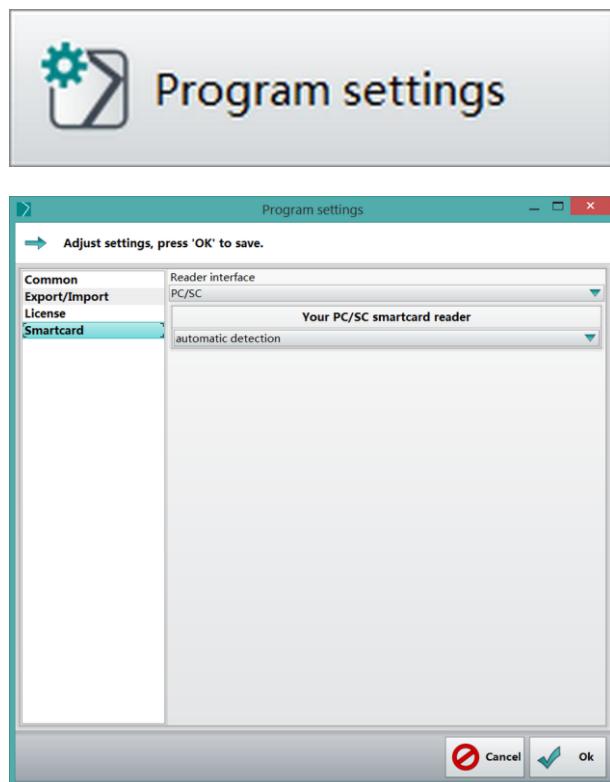
By clicking on Change, you can select a logo graphic which then is displayed in all reports in the header. Click clear in order if you do not wish a logo graphic to be displayed.

#### 4.11.1 Smartcard (Card reader)

Here you can set up your card reader for the use of KVK resp. eGK. This requires a Smartcard-Reader with the eGK resp. special reading devices for the KVK, like e.g. chip card keyboards of the German manufacturer Cherry.

The electronic health card (eGK) works in combination with the card reader that is integrated in the zebris HP notebooks (right-hand side) without any further installation (Standard setting).

The old insurance card (KVK) only works with installed CT-API drivers.



##### 1. Program settings

Click the button at the bottom right in the toolbar.

##### 2. Card reader

Select the entry **cardreader** on the left hand side.

##### 3. Select interface

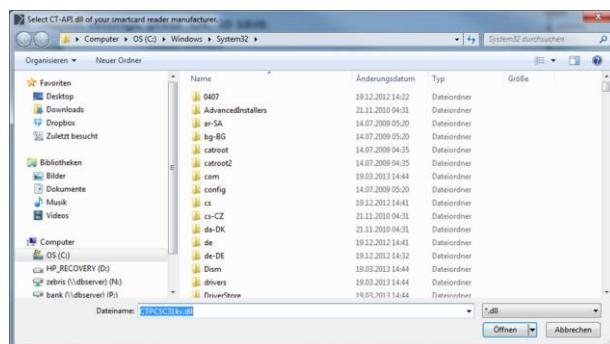
Select the interface resp. the device with which you read in the KVK resp. EGK on the right-hand side:

- PC/SC for eGK
- CT-API for KVK and eGK

If you have selected PC/SC, confirm afterwards with **Close**.

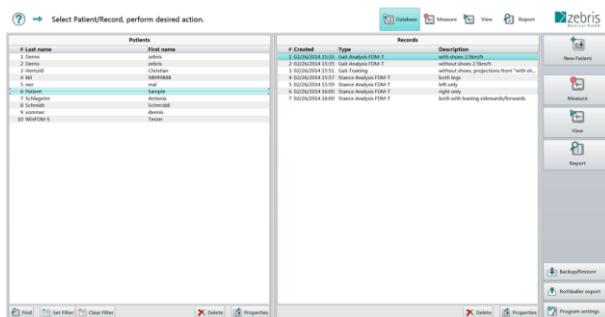
##### 4. CT-API

CT-API can read both KVK and eGK. The preset proposition is the driver of the EHEALTH-BCS keyboardG87-1504 of the manufacturer Cherry. Click on **Browse** afterwards in order to choose the corresponding dll file of your CT-API-drivers.



##### 5. Select dll drivers

Select on your hard disc the corresponding CT-API driver. Please find details in the manual of the cardreader manufacturer.



## 6. Insert card

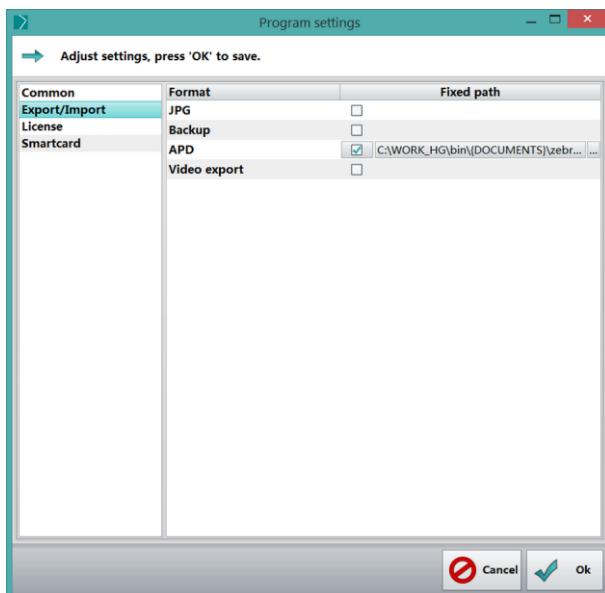
Insert a card into the reading device.

## 7. Create new patient

Click on **New Patient** and the data from the card is pasted automatically.

### 4.11.2 Export (Always export to the same location)

You can set a fixed storage location in **Program Settings** at the database window. When this setting is active, the save dialog will not come up. Instead the export files will automatically be saved to the location you have defined.

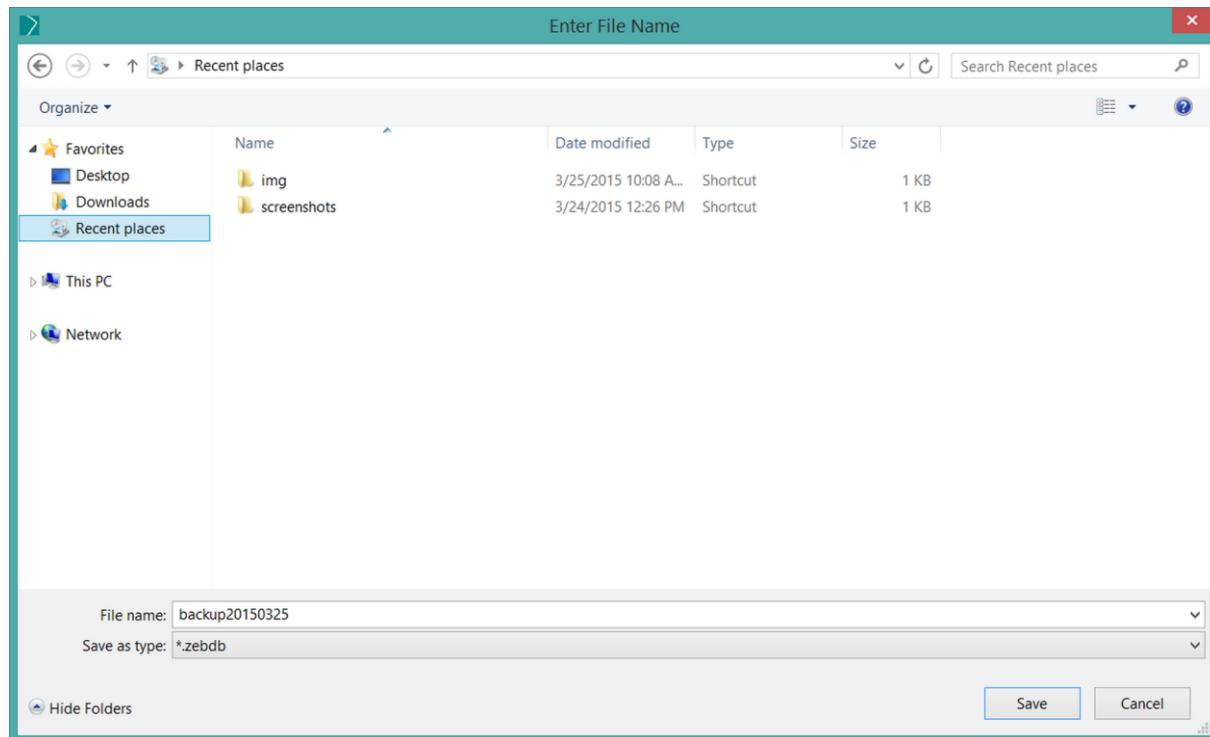


To set a fixed location, go to **Program Settings**, section **Import/Export** and mark the checkbox in the column **Fixed path** after the text "APD".

You can select another location in your storage by pressing ....  
Press Ok to confirm your changes.

No save dialog ("Enter File Name") will be shown as long as the checkbox is marked.

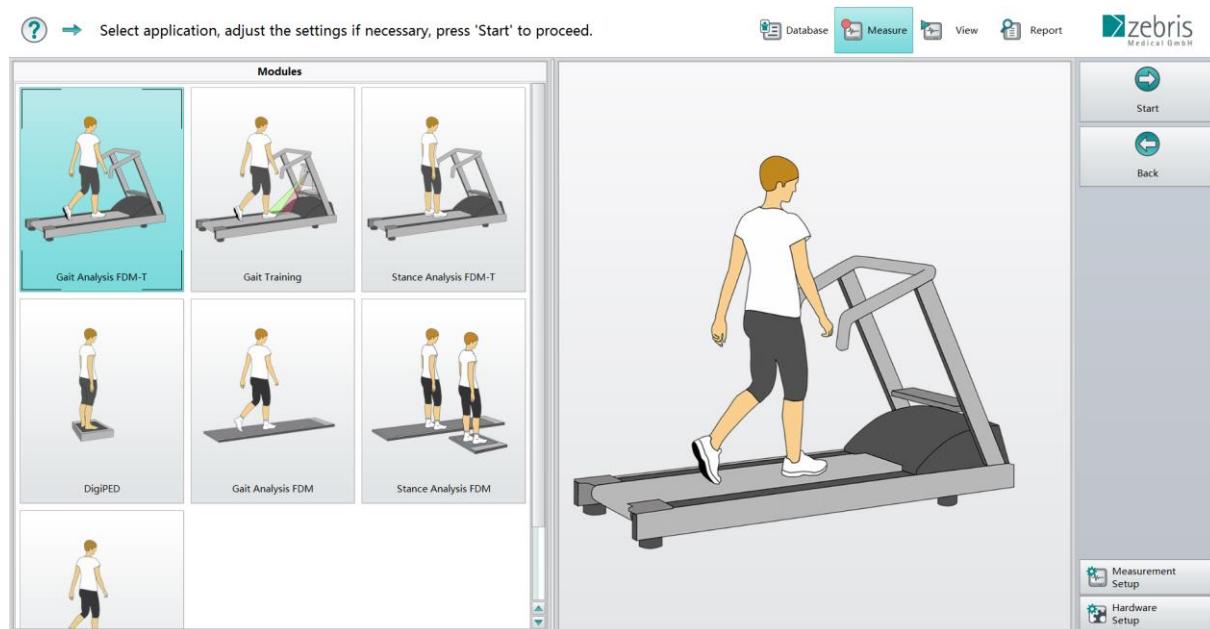
If you do not set fixed paths, a file save dialog comes up. Select the location to save the export files and enter another filename or just hit **save** if you want to confirm the proposal.



## 5 Module selection

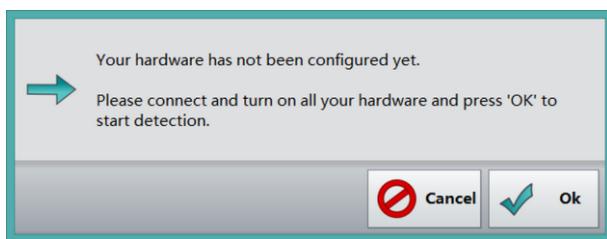
By clicking on **Measure**, you leave the database and the module selection is displayed.

Here you can select the module on the left that you would like to start. Then you can make settings on the right-hand side, according to the respective module. Details on the settings can be found in the respective section on the module.



## 6 Hardware setup (device settings)

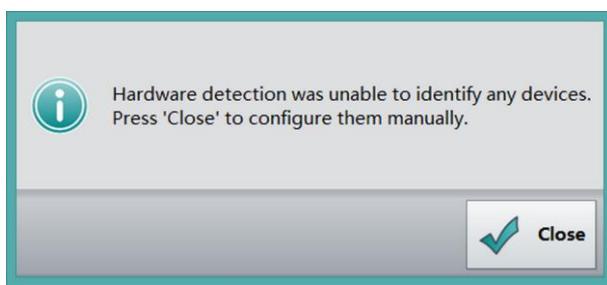
Before using for the first time, some modules need a device profile setup (i.e. one or more devices as a group). This is the case for those modules for which, after selecting the module, the button „**Hardware Setup**“ is shown at the bottom, right-hand side (see Module selection, p. 37).



### Automatic hardware detection

*On first start of the hardware setup, an automatic detection will be performed that inserts all currently connected zebris devices into one profile.*

*To benefit from this automatic process, please plug in the devices you want to use and click **OK***



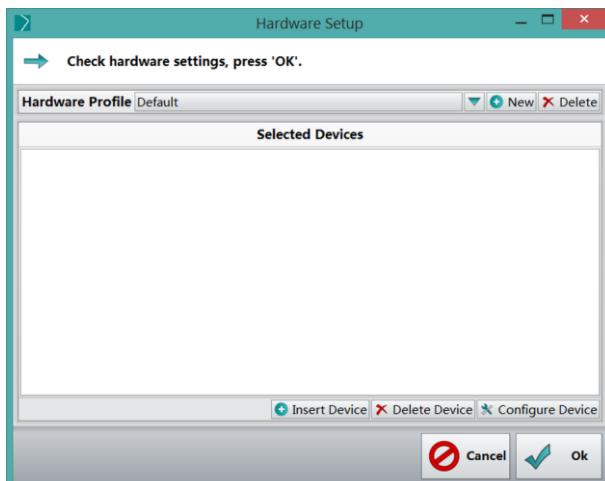
### If automatic detection fails

*No devices could be recognized. If you already plugge in your devices, please check the cable connections and power supply.*

*After clicking on **Close** you can add the devices manually to a profile or trigger the automatic detection again by cancelling and starting the hardware setup again.*

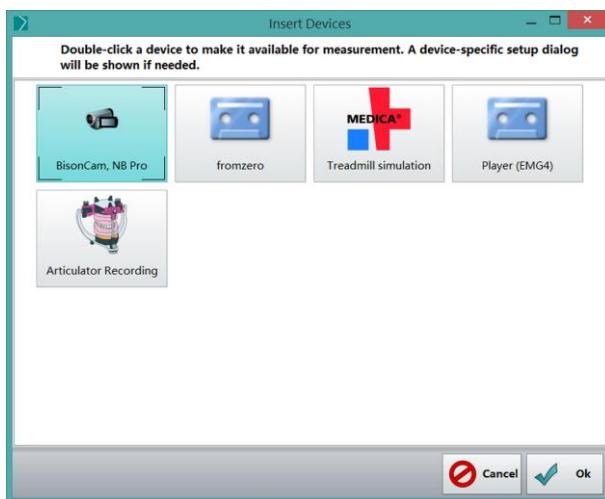
## Hardware setup (device settings)

### Select devices manually



#### 1. Open device selection

Click on "Add device".  
A new window opens.



#### 2. Select device

In this dialog box, all the known devices are shown to you (and enabled according to your license).

Please **select the device** that you would like to add to your profile and click on **OK**. If this should be a camera, its settings dialog will be displayed.

Repeat this step until you have added all the devices that you would like to take your measurements with.



#### 3. Finished profile

After you have added all the devices to the profile that you want to take measurements with, you are able to assign a further designation in the input field next to "Hardware profile".

Finally click on **OK**.

## 6.1 Force measuring platforms, instrumented treadmills

You leave the Hardware setup by clicking on **Configure device**, and the Setting dialog appears.



### Name

If necessary change the designation for your device here. It is not permissible to give several devices the same name.

### Hardware synchronization

If you wish to synchronize your device with cameras, select the mechanism used here according to your camera system. This must similarly be set in the camera settings for the correct function.



Please note that for synchronizing using camera systems, ONLY the cable enclosed with the cameras may be used.

## 6.2 Cameras

In the following, the settings necessary for using and synchronizing the connected cameras are explained. You must carry out these settings once for each camera that is added.

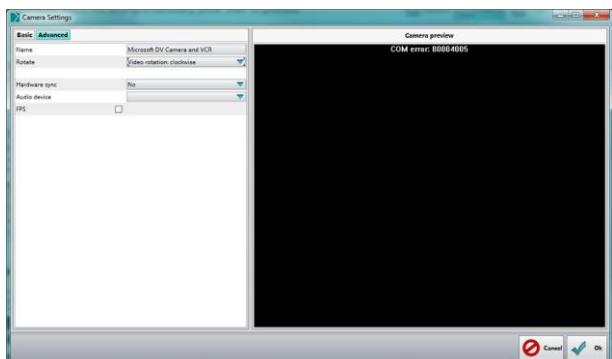
Additional settings are not necessary for the functioning and could, under certain circumstances, have an influence on the picture quality and measuring rate/synchronization. Please only change these if you are very experienced at handling the system.



Please note that the simultaneous use of two different modes for hardware synchronization is not possible (e.g. microphone input and flash).

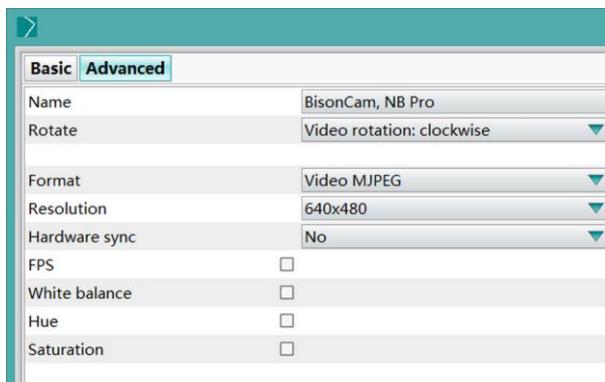
## Hardware setup (device settings)

### 6.2.1 DV-Camcorder (FireWire)



#### Settings dialog

On the right you can see a live picture of the camera and on the left, the possible settings.



#### Recommended settings

##### Name

Enter a unique designation here for your camera. It is not permissible to give several cameras the same name.

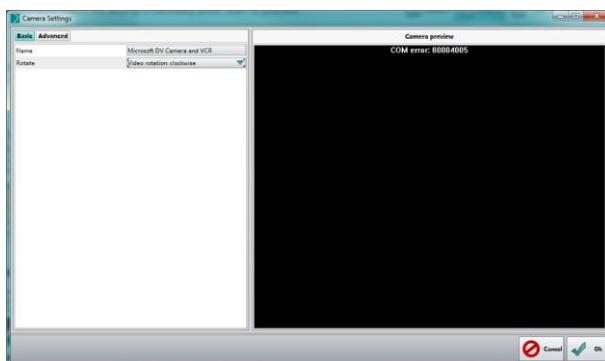
##### Rotate

If necessary you are able to rotate the picture in steps of 90°.

##### Hardware-sync

For using the synchronization via the microphone jack on the camera, set here to "Audio".

Please note that you have to set this also in the device settings of your FDM hardware.

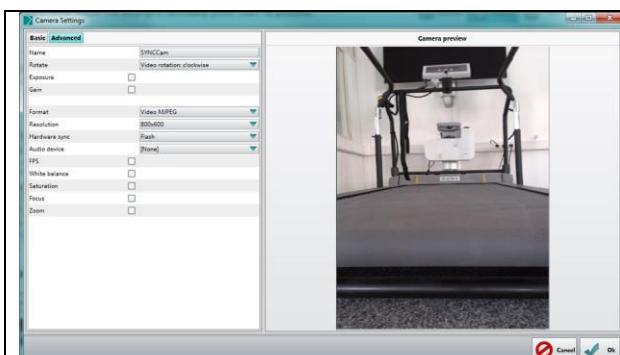


#### Saving the settings

If you have made all the settings according to the recommendation, close the dialog and save it by clicking on **OK**.

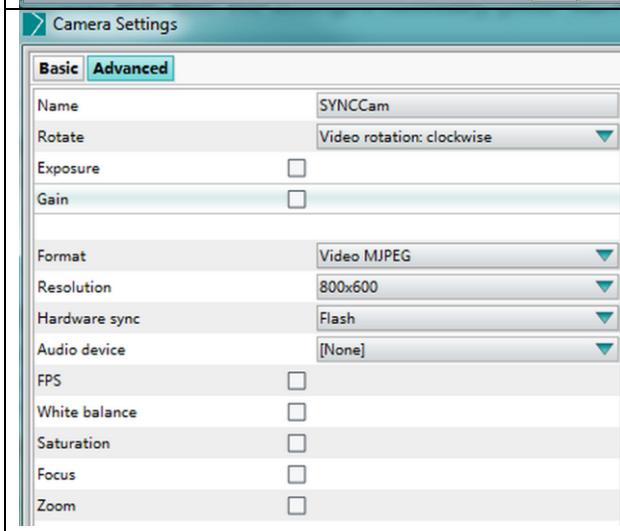
## Hardware setup (device settings)

### 6.2.2 SYNCCam (USB)



#### Settings dialog

On the right you can see a live picture of the camera and on the left, the possible settings.



#### Name

Customize the name of the camera (does not appear anywhere in zebris FDM)

#### Rotate

If necessary you are able to rotate the picture in steps of 90°.

#### Exposure

Adjust the exposure intensity here.

#### Hardware-sync

For using the synchronization via the microphone jack on the camera, set here to "Flash".

#### FPS

Set the desired number of images per second here.

#### White balance

Here you can change the color tint of the camera image.

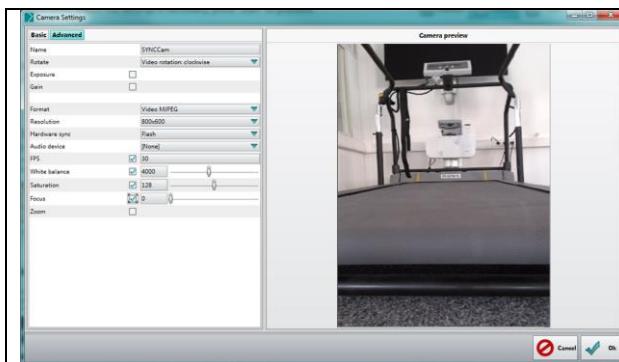
#### Saturation

Here you can adjust the colour saturation.

#### Focus

Set the focus here. The automatic focussing is deactivated through a setting here.

## Hardware setup (device settings)



### Saving the settings

If you have made all the settings according to the recommendation, close the dialog and save it by clicking on **OK**.



The camera provides automatic focus and white balance (for natural colors), but if a tick is set in one of these lines, the function is controlled manually by the slider.



For recording of fast movements, use a separate light source, e.g. the zebris SYNClight.  
Drag the **Exposure** slider until the picture appears darkest, then move the **Gain** slider to make the picture lighter again.

## 7 Gait Analysis

With this module you carry out the gait analyses using a zebris FDM-T System. The single steps of a gait analysis are exemplarily described here on the treadmill (FDM-T), yet function in the exact same manner when using a platform.

### 7.1 Preparing the measurement (Measurement settings)

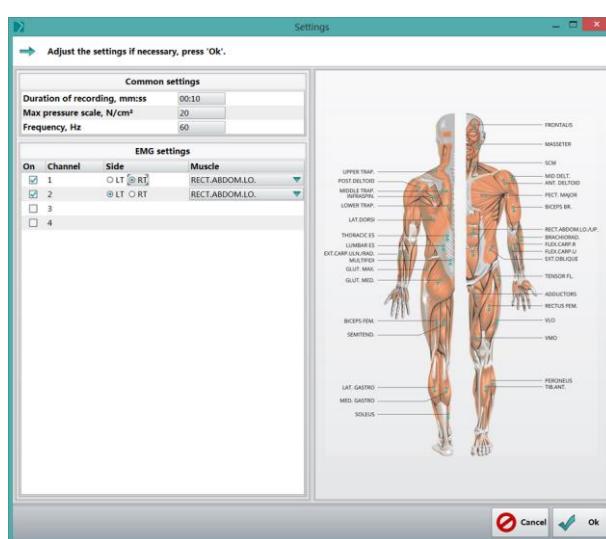


#### Measurement settings

Under **Common Settings** you can specify the measuring duration individually in advance. 30 seconds are given by default.

In addition you can change the maximum of the pressure scale and the measuring frequency of the sensors.

By clicking on **Ok** your changes are saved and you will return to the module selection.



#### Acquisition of analog data

In addition to the gait analysis, analog signals of an external device can be recorded. Described in the following on the example of EMG:

**Prerequisite** is that an EMG device has been added to the device settings

#### EMG settings

Set a tick per channel you would like to use on the left-hand side. As many channels are displayed as are available in the device.

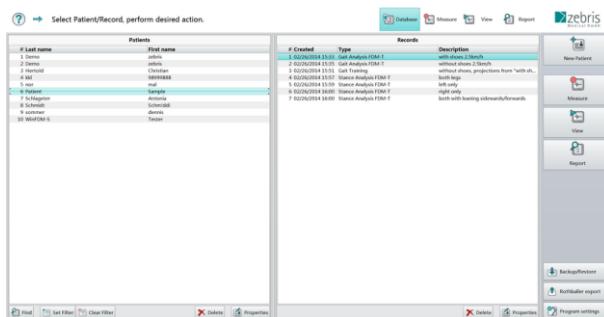
Select per channel, which side of the body you would like to use and on which muscles you would like to record the EMG signal.

The graphic shows the anatomic allocation of the abbreviations used.

By clicking Ok the settings are

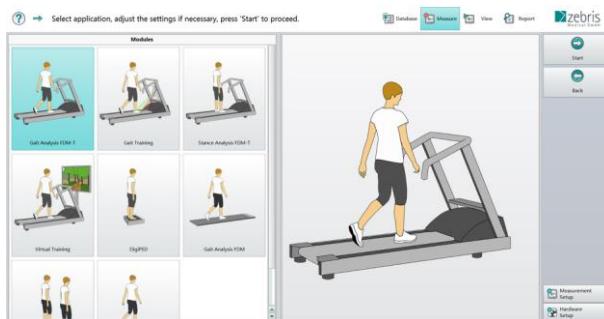
saved and you will be redirected to the module selection.

## 7.2 Carry out measurement (Measuring mode)



### 1. Database

Click on **Measure** in the toolbar on the right.



### 2. Module selection

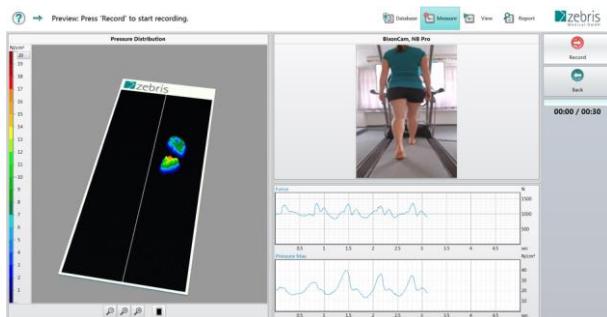
Select the module **Gait Analysis** and then click on **Start**.



### 3. Preparation

Please ask your test person to stand next to the treadmill or on the side bar, so that a zero measurement can be taken in an unloaded state. Then change to the Preview mode by clicking on **Next**.

By clicking on **Back** you will return to the module selection.

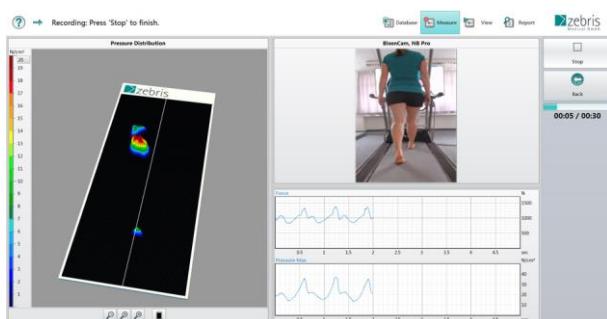


#### 4. Preview/recording

In the Preview mode, the screen alongside appears. Start the treadmill. The patient ought to walk on the treadmill for a few minutes to get used to the feeling.

After this familiarization phase the measurement can be started by clicking on the **Record** button.

By clicking **Back** you will return to the module selection.

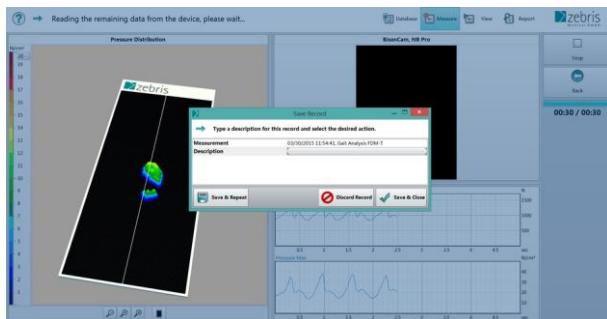


#### 5. Measurement

After Start the recording the measuring signals are recorded over the preset measuring duration. The green progress bar shows the elapsed measuring time. The measurement can be stopped at any time by clicking on the **Stop** button.

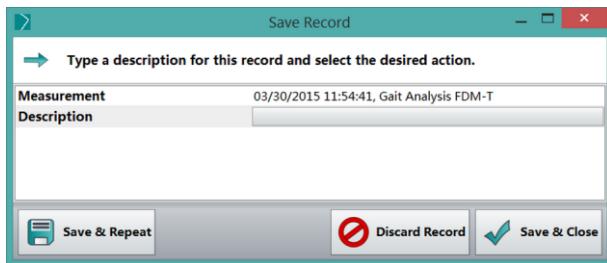
If a video camera is connected, a video display is shown in the upper right-hand part of the measurement screen.

In the lower, right-hand part of the measurement screen, the force and pressure curves are shown in chronological sequence.



#### 6. Save

After clicking on the Stop button, a dialog box appears.



### Save & continue

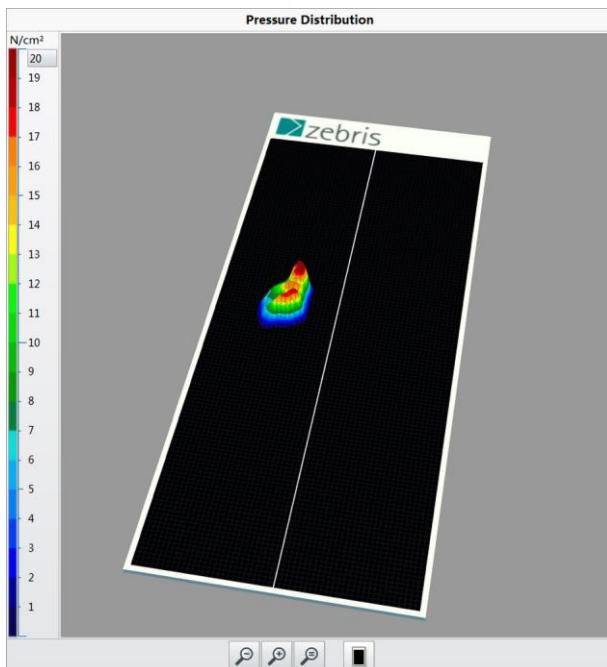
The recording is saved and you return to the Preview mode to carry out a new measurement.

### Discard recording

The recording is discarded and you return to the Preview mode to carry out a new measurement.

### Save & close

The recording is saved and you return to the database.



The **color scale** to the left of this measuring window enables the color assignment of the pressure in  $\text{N}/\text{cm}^2$  exerted on the individual sensors.

The **maximum value** can be stated in the input field, top left. By pressing the **left mouse button and dragging** at the same time on the scale, the scaling can be changed.

In the left measuring window, the load distribution under the feet during the measurement is shown using a color mode, in either 2D or 3D, as required.

In **3D mode**, the view can be turned to the desired position by pressing the left mouse button. By pressing the middle mouse scroll wheel the platform can be moved in 3D.

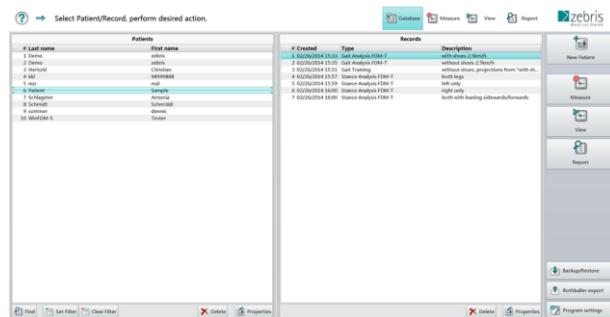
The **zoom** buttons serve for enlarging (+) or reducing (-) the platform presentation. By turning **mouse scroll wheel** it is similarly possible to zoom. Through clicking on **adjusting** the platform in the display mode is centered whereas the zoom factor is determined automatically.

The **3D** button switches between the 2D or 3D presentation of the pressure distribution. The 2D presentation is activated when the button has a colored background.

## 7.3 Processing the measurement (View mode)

In the "View mode" you can view and play the measurements, limit the measuring interval. And when using a camera system, mark single images for the report as well as draw in angles. In the following, the individual functions of the View mode are explained in detail.

### 7.3.1 Basics



#### Opening the measuring dataset

Select a measuring dataset in the database and click on **View** in the toolbar on the right.

#### Play the measurement

Click on **Play** in the toolbar on the right. The time display above the Play button shows the actual time of the measurement in seconds. Click on the box to enter a value

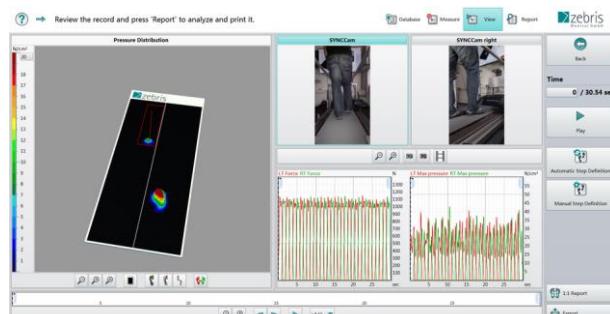
By clicking on **Back** you will return to the database.

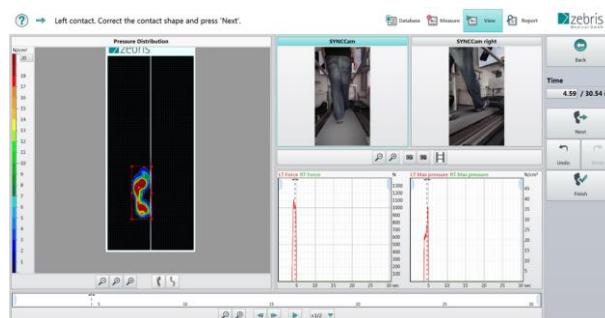
#### Export...

Here you can export a pressure image per foot as jpg graphic. After having selected the desired image, you are asked to assign a saving destination and a name.

#### 1:1 Report

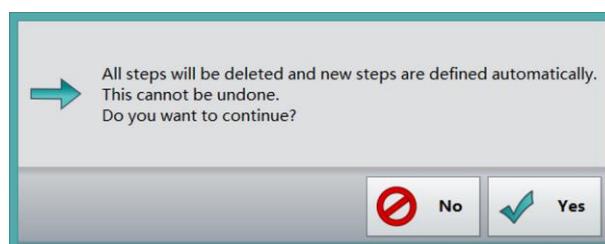
Opens the Report for the 1:1 printout. The data basis is the averaged stance phase of all the steps taken within the marked interval. The average, maximum resp. medium stance phase can be selected.



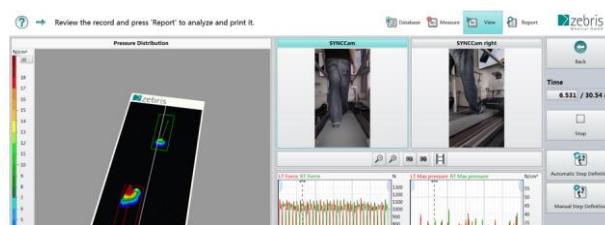


## Automatic step definition

By clicking on the corresponding button, the following dialog window opens (see below).



When clicking **Ok**, all previously defined steps are deleted and the automatic step definition is carried out again.



## Manual step definition

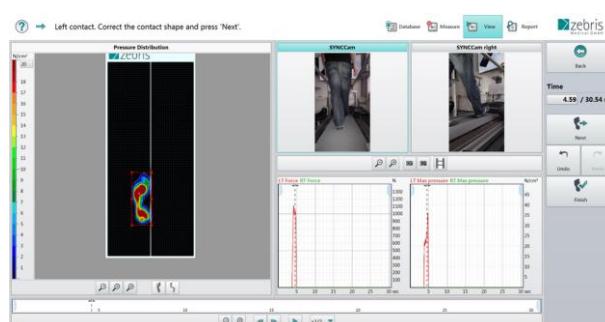
In case that the automatic step definition has not recognized the test person's gait pattern, you can also define the steps manually.

Therefore, click on **Manual Step Definition**.

All steps are deleted and you are redirected to the mode of manual definition.



*The manual step definition for the gait analysis FDM is momentarily not available.*



By holding down **the left mouse button** you can navigate over the timeline with the help of the vertical dashed line (cursor).

By pressing **Undo/Repeat** you can jump back and forth in the work process.

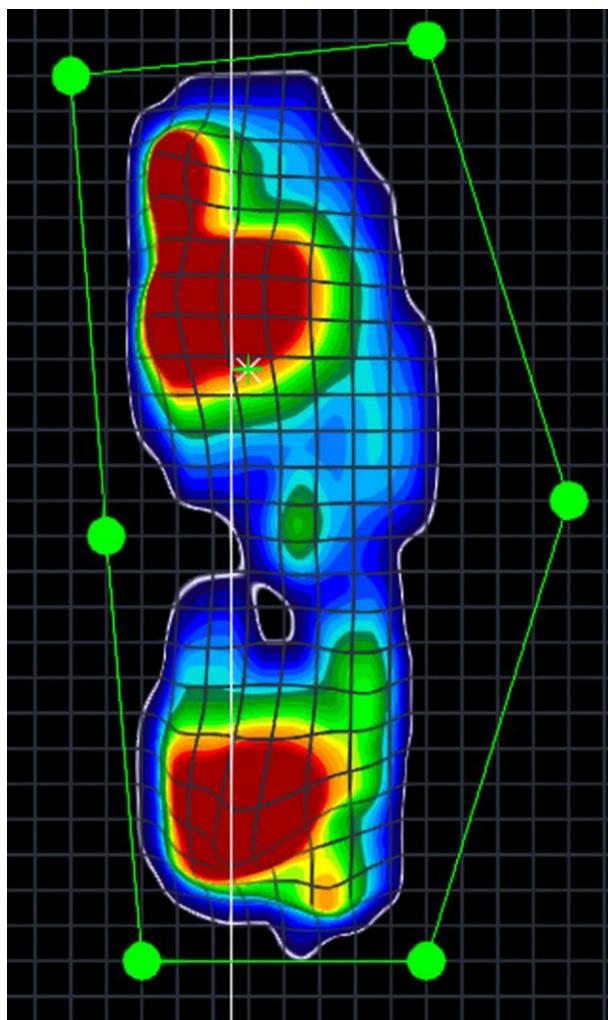
### 1. Navigate to the footprint

Navigate in the time course to the left

footprint, with which you would like to start. If you prefer to start with the right footprint, then click on **Next**.

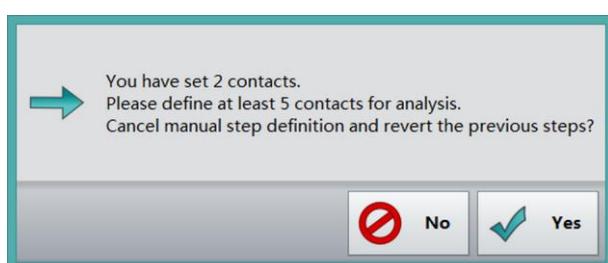
## 2. Click on the footprint

Click on a part of the footprint that is to be defined. A frame around the footprint is then generated automatically.



Now the displayed frame can be adjusted by using the displayed points. If required, shift the points into another position inside the frame by **dragging with the left mouse** button.

After having finished the manual step definition, click the button **Finish** and your changes are saved.



You will have to define at least five steps, as this number is necessary for the evaluation of the report. If you have defined fewer steps, a note appears after clicking Finish. **Close** it and define more steps.

### 7.3.2 Functions

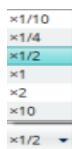


#### Playing the measurement

Automatic playing of the measurement by clicking on the Play button. The measurement recording is played and repeated until the Pause button is pressed.

#### *Image forw./backwards*

The arrows with the line directly next to them take you one image forwards, or backwards, resp.



#### Playing speed

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

#### Zoom



Enlarging or reducing the platform display or the signal curves in the force/time diagram.

***The magnifying glass with a minus sign*** reduces the display by 20%

***The magnifying glass with a plus sign*** enlarges the display by 20%

#### Adjusting

The 3D depiction is centered in the view mode and the zoom factor is automatically determined, so that the model becomes completely visible.



#### MPP

Display of the maximum pressure (Maximum Pressure Plot).



#### Gait line

Display of the COP pattern in the gait phase.



#### Roll-off line

Display of the roll-off line during the stance phase.



#### Swapping left/right side

Here you can swap the side assignment of the foot prints.



#### 3D presentation

Switches the load distribution between the 2D and 3D presentation. The 2D presentation is activated when the button has a colored background.



### Single images

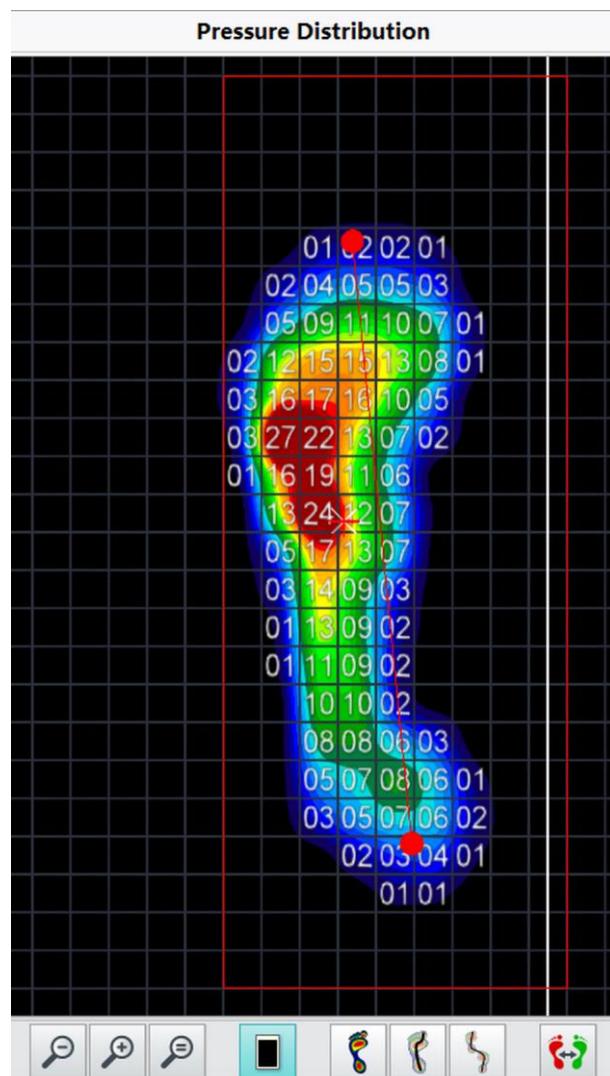
Single images can be marked or deleted with this function. **Marked pictures** are transferred to the report.  
(see 7.3.4)



### Selecting a video sequence of a gait cycle

Select automatically the video sequence of the gait cycle at the current playing position. (see 7.3.4)

### 7.3.3 Visualization of the load distribution



#### Numerical display of the pressure values

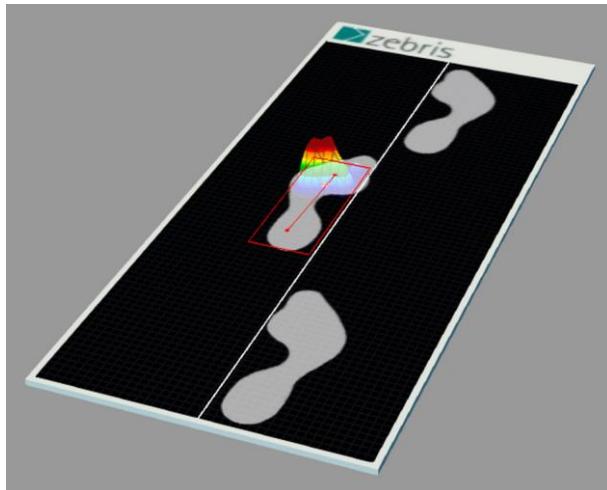
In the 2D presentation, the pressure values of the roll-off pattern can be shown numerically.

To do this, deactivate the 3D mode by clicking on **3D** (if the button is not highlighted in color, the 3D presentation is active.)

By enlarging with the **middle mouse button** or **magnifier tool** the pressure values of the individual sensors and the limiting frame are displayed.



Please note that the presentation here has been smoothed, which can cause inaccuracies and rounding errors in the area at the edges of the pressure image displayed.



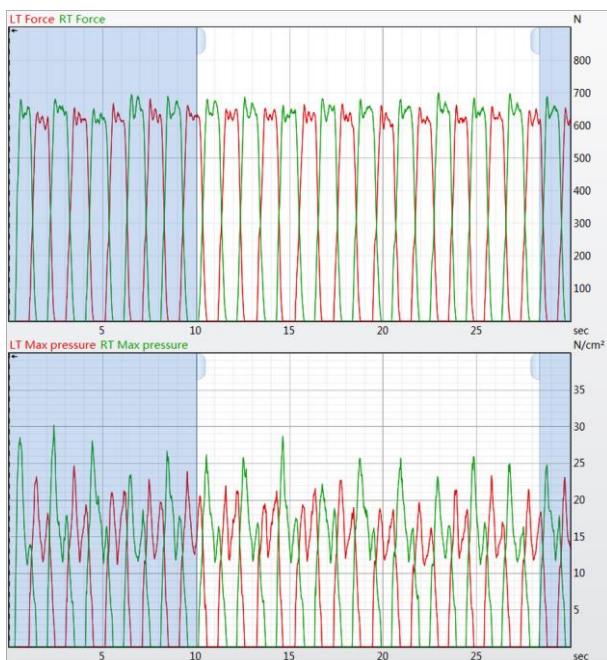
Recordings that are carried out with visual cueing, the projected footprints are shown as a gray shadow.

In this way, it is possible to make a visual assessment of the training in advance.

### 7.3.4 Selecting a certain interval for analysis in the Report

With zebris FDM it is possible to analyze either the total data volume recorded or only a certain interval.

#### Select measuring data



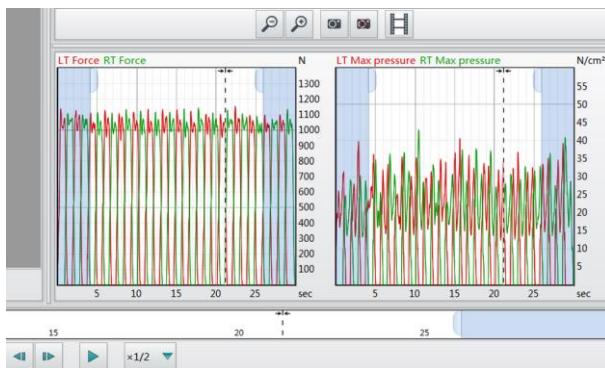
Two **blue limitation lines** in the force/- time diagram mark the area for analysis. For the Report the area with the blue background is discarded and only the data in the white area is evaluated.

#### Customizing the area for analysis

Move the cursor over the limitation line from blue to white. The cursor changes to a double arrow. With the left mouse button pressed you can now **restrict the area for analysis by dragging the limitation lines**.

#### Selecting video sequences

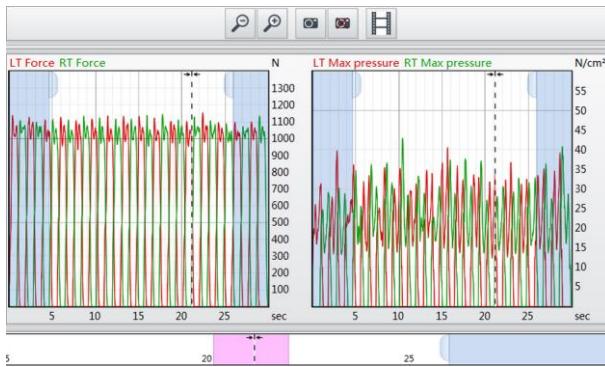
Please note, that the use of video cameras is not available with all modules.



## 1. Define a position

In order to transfer video images to the report, click on the desired position in the time-force diagram. The dotted line (cursor) is shifted to the clicked position.

You can shift the cursor with the left mouse button resp. the image back/forth button to the desired position.



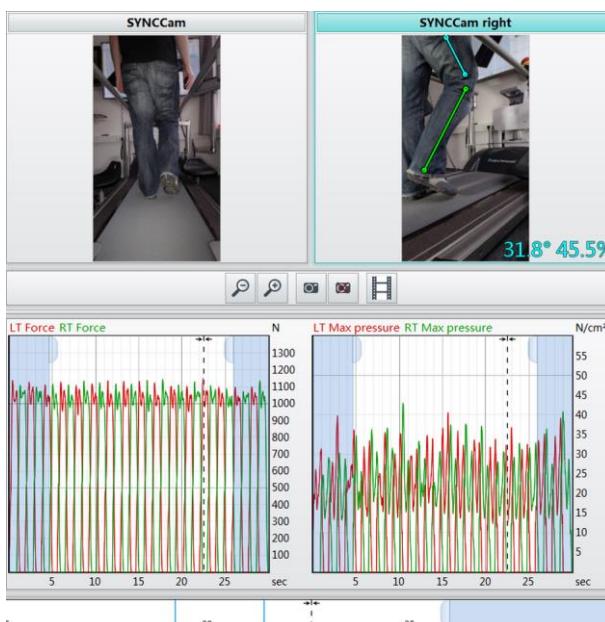
## 2. Define the video interval

By clicking on the **movie symbol**, the gait cycle around the marked position is selected (each one step before/one step after).

In order to select a larger section, move the mouse cursor on a limitation line of the **violet section**, until it becomes a double cursor. While keeping the left mouse button pressed, you can now change the length of the video sequence by drawing the limitation line.

Delete the marking by pulling the limitations together until the marking disappears completely.

## Marking single images in the video, angles and length ratios



Using the magnifying glass, the displayed image section can be enlarged or minimized.

By clicking with the right mouse button on the image section, the following functions in the context menu open: "Copy current image in the clipboard" as well as "Save video under". When it comes to recordings with several cameras, a colored frame marks the currently selected video image.

## Marking a single image

Click on the desired position in the force-time diagram. The dotted line (cursor) is set at the clicked position.

Then click on the camera symbol under the video image. The marking appears as blue line in the bar „single images and video sequences“.

### Deleting a single image

Click on the single image marking in the bar „Single images and video sequence“ (blue line).

Then, click on the crossed out video symbol. In doing so, the marking is deleted. Of course, you can set the marking any time again.

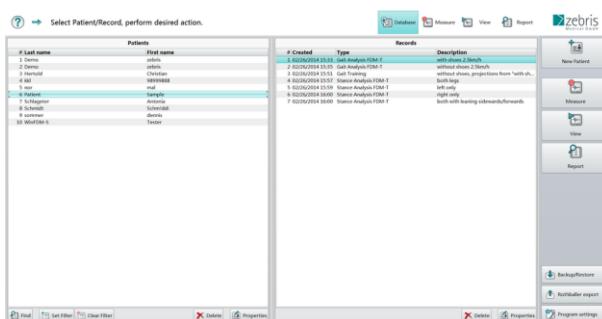
### Angles and Length ratios

Draw two straight lines with the left mouse button directly in the video mode. Then the angles between the straight lines as well as the length ratio to one another are displayed automatically at the right bottom edge of the video image.

The drawn in angles and the length ratios are saved with the single image and displayed in the report.

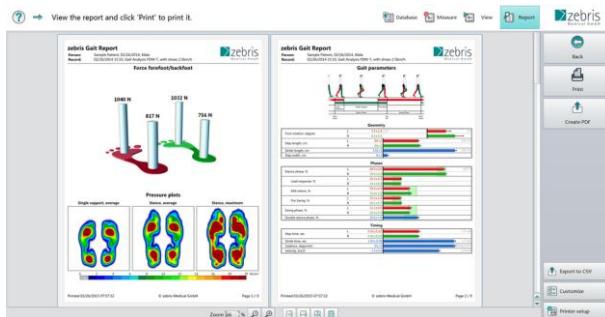
## 7.4 Gait Analysis Report (Report mode)

In the "Report" mode, the gait parameters are assessed and shown which had previously been defined in the "View" mode.



### Selecting the data set

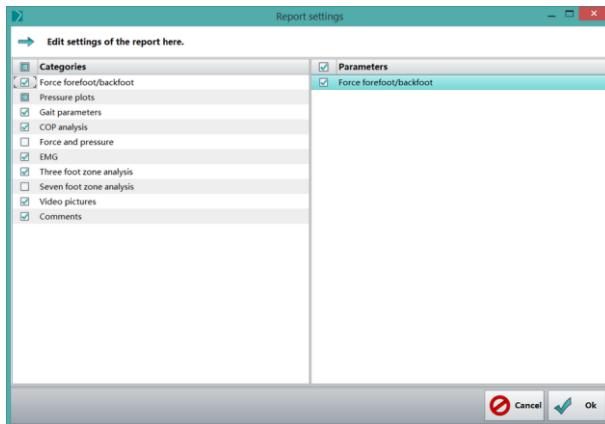
First mark a data set and then click on **Report**.



## Align the Report

For displaying or hiding single parameters of the Report, click on **Customize** and you will be redirected to the report settings.

By clicking on the **OK** button your changes are saved and you will return to the database.



## Report settings

On the left-hand side, categories are displayed. On the right-hand side, the single parameters of the category that has been chosen on the left, are displayed.

## Fade in/fade out of parameters

By **placing a tick** on the right-hand side, the parameter is displayed in the report. Once the tick is removed, the corresponding parameter does not appear in the report.

By placing/removing a tick on the left-hand side, a **whole category** of parameters can be displayed or faded out.



By setting or removing a tick in the drop-down menu the stored data is neither changed nor deleted.

## 7.4.1 Functions

### View

With these buttons you can stipulate how many pages of the Report are to be shown at one time. Alternatively the slide control for reducing/enlarging can be used.

 1:1

Adjusts the display such the entire height of a page height can be displayed.



### Page width

The current page is zoomed to the fully available width.



### Whole page

Shows the pages in the original size. Due to different screen resolutions, the size can deviate from the size of the printer paper.



### Miniature view

Shows all the pages in an overview as small pictograms.



### Printing

The Report is printed out on the printer selected under **printer settings**



### PDF export

PDF export to any directory or, e.g. to external data carriers such as USB sticks.



### Customize

Showing and hiding single report parameters.



### Printer settings

Select printer and change settings for printing (e.g. format, page size, etc.).



### CSV export

Exporting the parameters of the report in a CSV file format (comma separated values).

## 7.4.2 Description of the Report contents

The Report comprises the elements described in the following:

**zebris Gait Report**  
 Person: Sample Patient, 02/26/2014, Male  
 Record: 02/26/2014 15:33, Gait Analysis FDM-T, with shoes 2.5km/h

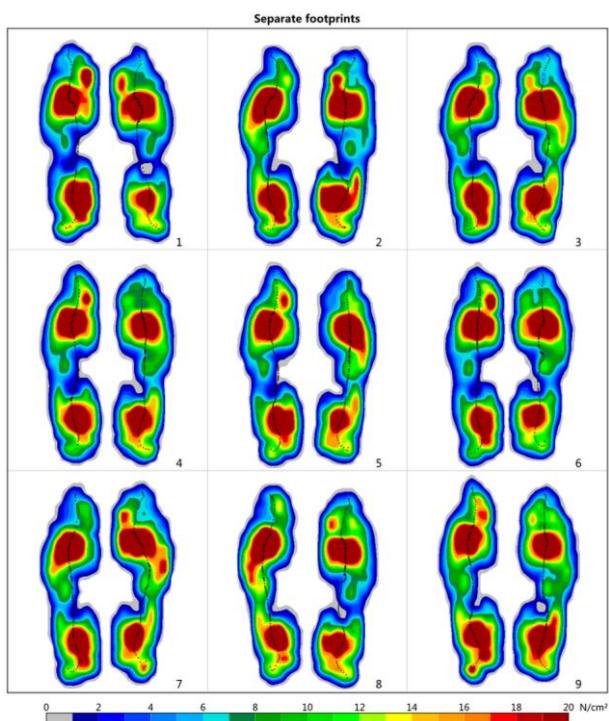


### Header

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

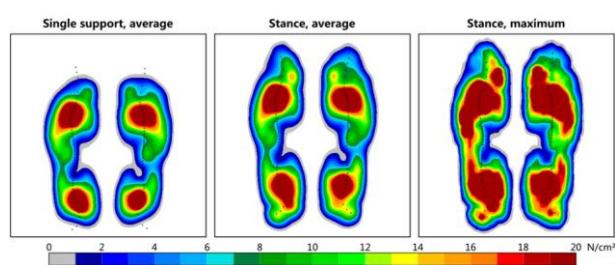
### Force fore foot/rear foot

In this 3D depiction the maximum force for the fore and rear foot is displayed.



### Maximum pressure pictures

In this diagram the maximum pressure pictures are displayed in color. Each maximum pressure picture (MPP) contains the highest pressure values of a complete roll-off pattern.



### Mid-stance phase, average

This diagram shows the average maximum pressure picture of the mid-stance phase of all the maximum pressure pictures recorded.

### Stance phase average

This diagram shows the average of all the maximum pressure pictures recorded.

### Stance phase maximum

This diagram shows the absolute maximum pressure picture of all the maximum pressure pictures recorded.

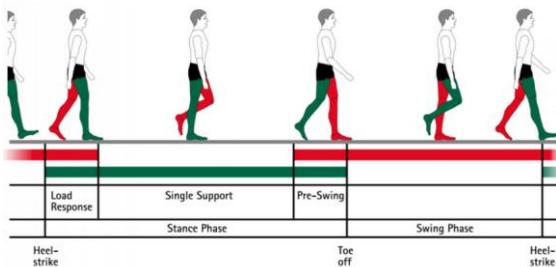
#### Color scale

The color scale enables the load distribution to be quantified.

#### Gait line

The line of the force application points are displayed in the pressure pictures for each foot separately.

## Gait Analysis



### Gait phases

Here you see the individual gait phases illustrated.

Geometry			
Foot rotation, degree	L	5.3±0.7°	13°
	R	8.0±2.1	
Step length, cm	L	64.2	170 cm
	R	67.2	
Stride length, cm	L	131±3	170 cm
	R	85.2	

### Geometry

Here the local gait parameters, i.e. foot rotation, step length, stride length and step width are displayed.

Phases			
Stance phase, %	L	69.0±1.0	100 %
	R	70.7±1.0	
Load response, %	L	20.3±0.9	
	R	19.6±1.0	
Mid stance, %	L	29.0±0.8	
	R	30.9±1.1	
Pre-Swing, %	L	19.7±1.1	
	R	20.2±0.9	
Swing phase, %	L	31.0±1.0	
	R	29.3±1.0	
Double stance phase, %	L	39.8±1.0	

### Phases

Here, the step phases in the two main phases, i.e. the stance phase and swing phase, are shown. The stance phase is divided into the two double-standing phases, i.e. loading response phase and roll-off phase and also the mid-stance phase.

The sections marked in bright green are reference values.

Timing			
Step time, sec	L	0.94±0.03	2.3 sec
	R	0.92±0.02	
Stride time, sec	L	1.86±0.04	2.3 sec
	R	1.86±0.04	
Cadence, steps/min	L	65±1	14 steps/min
	R	65±1	
Velocity, km/h	L	2.5±0.0	4 km/h
	R	2.5±0.0	

### Timing

Includes the time-dependent gait parameters, i.e. step time, stride time, cadence and the average speed of the interval analyzed.

## 7.4.3 Explanation of gait parameters

### Foot rotation, degree

Describes the angle between the longitudinal axis of the foot and the running direction.  
Negative value = inward rotation, positive value = outward rotation

### Step width, cm

Describes the distance between the right and left foot.

### Step length, cm

Describes the distance between the heel contact of one side of the body and the heel contact of the contralateral side.

### Step time, sec.

Describes the phase within a gait cycle between the heel contact of one side of the body and the heel contact of the contralateral side.

**Stance phase, %**

Describes the phase of a gait cycle in which the foot has contact with the ground.

**Loading response phase, %**

Describes the phase between the initial ground contact and contralateral toe off.

**Mid-stance phase, %**

Describes the contralateral toe-off phase and the transfer of the body's center of gravity over the weight-bearing foot.

**Pre-swing phase, %**

Describes the phase during a gait cycle that begins at contralateral initial contact (when the heel of the contralateral side touches the ground) and ends at toe off of the viewed side of the body.

**Swing phase, %**

Describes the phase of a gait cycle during which the foot has no contact with the ground.

**Double-standing phase, %**

Sum of the loading response phase and the pre-swing phase.

**Double-stride length, cm**

Describes the distance between two heel contacts on the same side of the body.

**Double-stride time, sek**

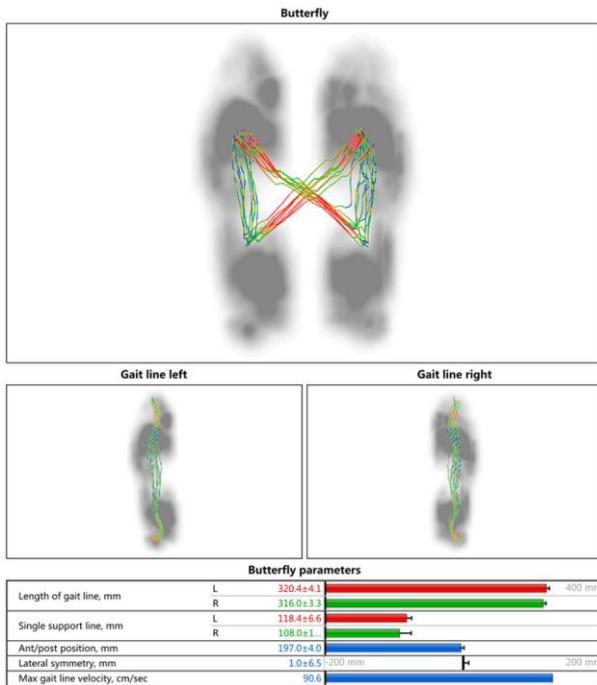
Time span of a stride.

**Cadence, steps/minute**

Step frequency

**Speed, km/hr**

Measured average gait speed during the analyzed measuring interval.



### Butterfly diagram

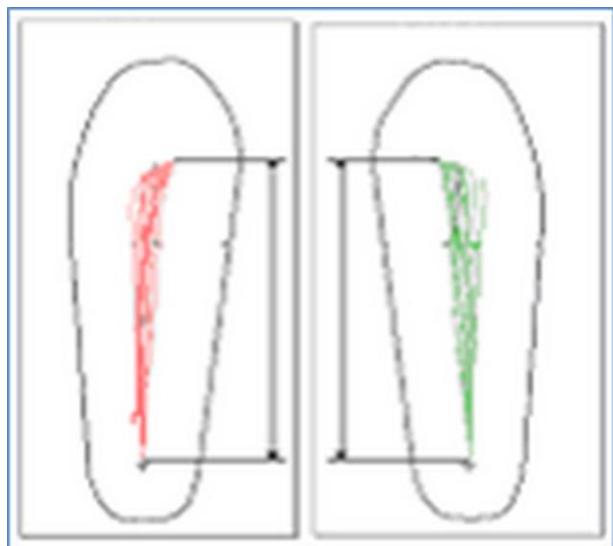
This block analyzes the course of the center of pressure (COP) during the selected step cycles. In doing so the COP tracks that are displayed in color correspond to different levels of speed (red: fast, green: intermediate, blue: slow). When taking the double-standing phase and the load transfer into consideration, the typical butterfly diagram of the force application points is produced.

### Gait line left and right

Here the lines of the force application points are shown separately for each foot.

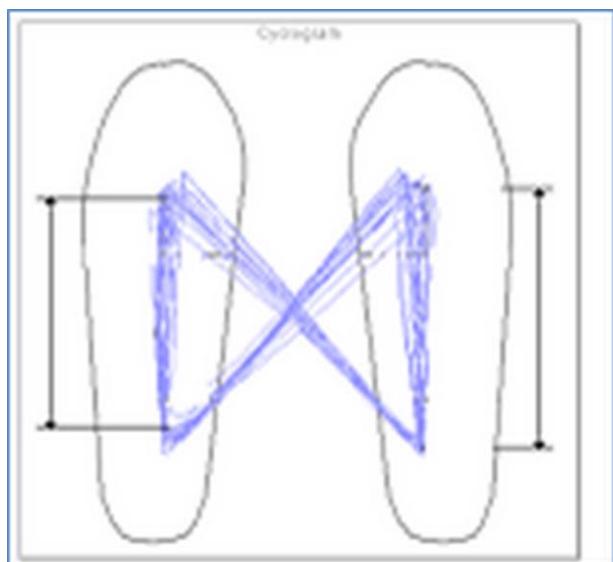
The parameters for the butterfly diagram are described in more detail in the next section.

#### 7.4.4 Explanation of the butterfly diagram



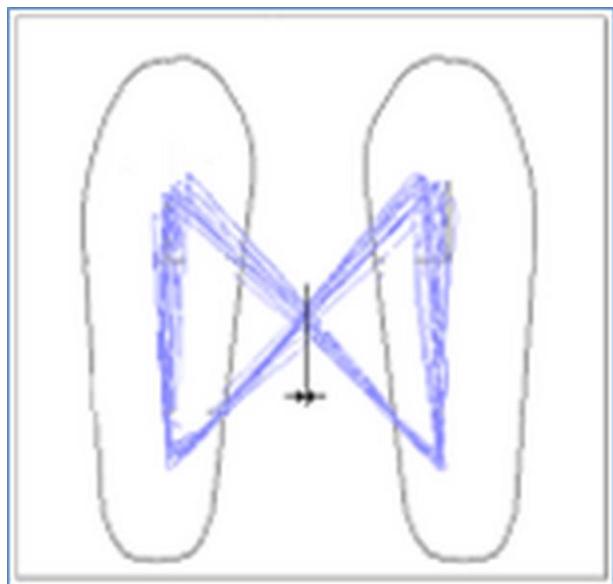
##### Length of the gait line

The parameter "Length of the gait line" is characterized by the position of the center of pressure (COP). Only the ground contacts of one side of the body are taken into account. This parameter covers the progression of the COP of all the steps recorded of one side of the body. All the other parameters can be seen in the cyclograms.



##### Mid-stance phase

This parameter corresponds to the average length of the lines that show the progression of the COP of one side of the body, when all the ground contacts are taken into consideration.

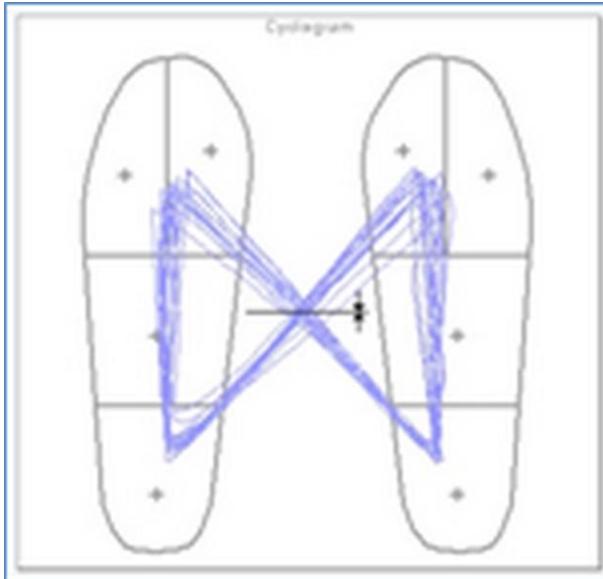


##### Anterior/Posterior Position

This parameter describes the shift forwards or backwards of the COP intersection point in chronological sequence in the cyclogram display, taking all the steps into consideration. The initial or zero position is the rearmost place where the heel contacts the ground.

### Anterior/posterior variability

This describes the standard deviation in the anterior/posterior position that results when taking all the steps into consideration.



### Lateral shift

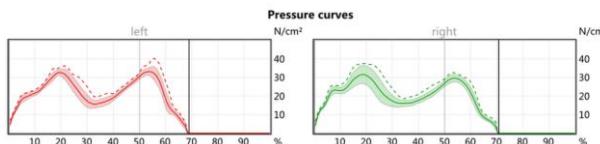
This parameter describes the left /right shift of the COP intersection point in chronological sequence in the cyclogram display, taking all the steps into consideration. A negative value indicates a shift to the left, and a positive value, a shift to the right.

The initial or zero position is shown as the central point of the illustration.

### Lateral deviation

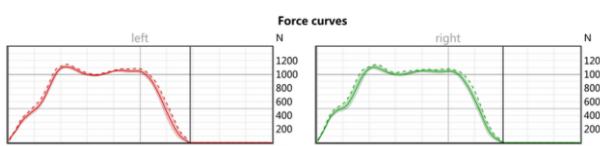
This describes the standard deviation in the lateral shift, which results when taking all the steps into consideration.

## 7.4.5 Force & Pressure



### Average maximum pressure

Presentation of the averaged and normalized pressure curves. The standard deviation is shown as a shaded area, and the dotted line represents the maximum values. The vertical line separates the stance and swing phase.



### Average force

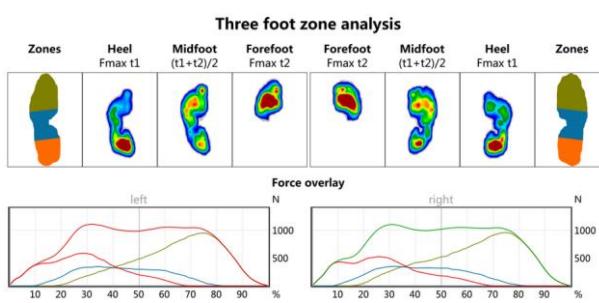
Diagram of the average vertical reaction force. The area of the standard deviation is indicated as a shadowed area. The height of the maximum force and its localization related to the gait cycle are given for the heel and forefoot for the left and right side, respectively. The vertical line separates the stance and swing phase.

Force parameters			
Maximum force1, N	L	1107.8	1400 N
	R	1102.3	100%
Time maximum force1, %	L	21	100%
	R	21	
Maximum force2, N	L	1055.6	1400 N
	R	1049.6	100%
Time maximum force2, %	L	42	100%
	R	41	

### Force parameters

Shown here are the amplitudes recorded in the force curve together with their position in the gait cycle.

## 7.4.6 Three foot zone analysis



Here the load surface area of the left and right side of the body is divided into the zones: forefoot, mid-foot and heel and shown in color. A force curve corresponds in the respective color for each zone.

The maximum pressure pictures of the entire load surface area of the left and right side of the body are shown at three fixed times.

**Fmax t1** Time of the maximum heel force

**Fmax t2** Time of the maximum force on the forefoot

**(t1+t2)/2** Load distribution between the two times t1 and t2



Here the parameters are shown as a bar chart and briefly described the indicator indicates the standard deviation in each case.

### Load change

The absolute load change from the heel to the forefoot during the stance phase given as a percentage.

### Maximum force, N

The average maximum values reached in N/cm<sup>2</sup> for the three zones: toes, mid-foot and heel.

### Maximum pressure, N/cm<sup>2</sup>

The average maximum values reached in N/cm<sup>2</sup> for the three zones: toes, mid-foot and heel.

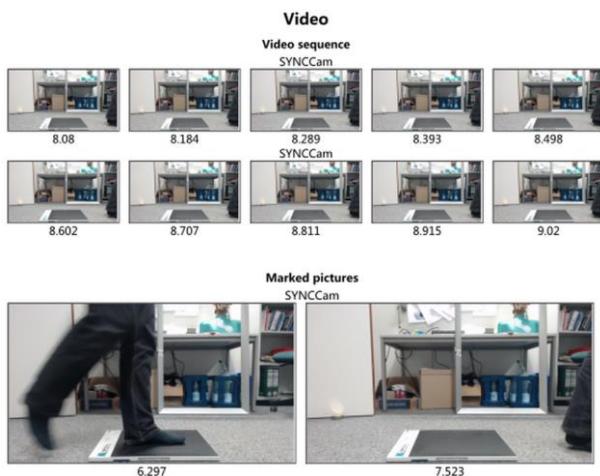
### Time maximum force, % of stance time

The average point in time within a gait cycle where the maximum values for the three zones toes, mid-foot and heel were collected in Newton.

### Contact time, % of stance time

The average contact time of the three zone toes, mid-foot and heel as a percentage.

## 7.4.7 Video



### Camera - Video sequence

Here, the stride phase defined in the View module, is shown as a video sequence of ten images with the same time interval (given in seconds).

### Camera – Marked pictures

Shows the individual images marked in the "View" module, including all the angles and lines defined there. Underneath the image the recording time is shown in seconds.

## 7.4.8 Comments

Patient comments
wearer of glasses
Record comments/Recommendations
Pelvis drop

### Patient comment

Shows the patient comment stored in the database.

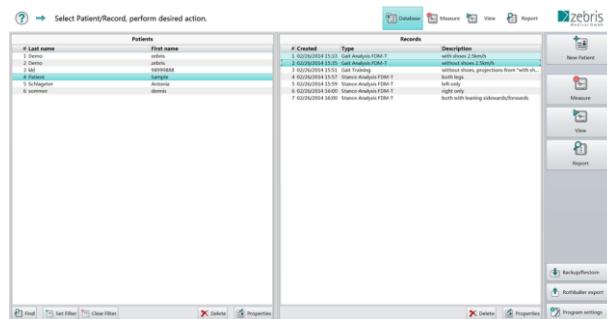
For notes on setting up a patient comment see **Comments & Clips**, p. 27.

### Comment on the recording

Shows the comment on the recording, stored in the database.

For notes on setting up a recording comment see **Details of the recording**, p. 29.

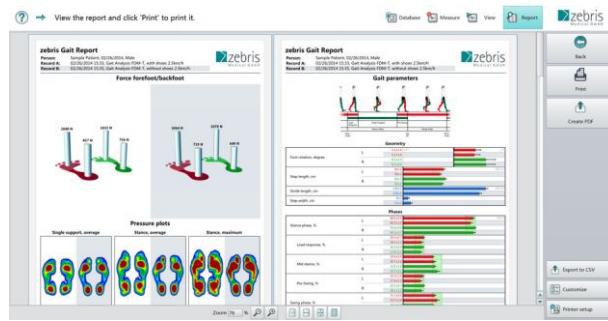
### 7.4.9 Comparing two measurements



### Selecting the data sets

In order to compare two measurements with each other, they are first marked in the database using the **Ctrl key + left mouse button**.

Then the Report can be called up against as usual, by clicking on the Report button.



### Presentation in the Report

In the Comparison Report the results of measurement A are marked with a white background and the results of measurement **B with a grey background**.

The allocation to the respective measurement can also be seen in the header.

### 7.4.10 Help for evaluating the data acquired

For the dynamic measurement, the load distribution under the foot is recorded during gait/running on a force/pressure measuring platform.

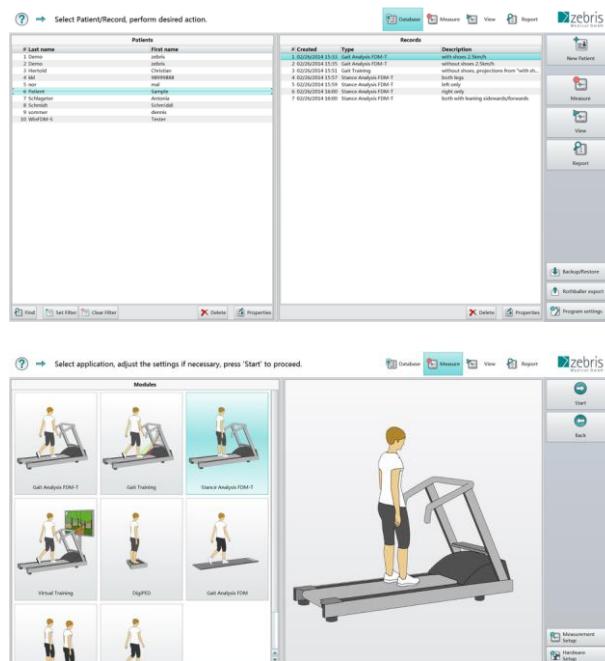
For a healthy foot on which the weight can be exerted in the normal way, the "ideal" load distribution under the foot during gait is shown by a semispherical load distribution under the heel, a contact of the entire foot with the exception of the area of the medial longitudinal arch and an even load distribution under the forefoot (for this, the maximum load may lie both under the ball of the big toe and under the center of the forefoot).

For "normal gait" the following sequence for exerting weight on the foot when contacting the ground is considered "ideal": - heel - mid-foot - forefoot lateral - forefoot central - forefoot medial - toes (I and/or II/III). The maximum load should not exceed 40-N/cm<sup>2</sup> under the heel and 55-N/cm<sup>2</sup> under the forefoot and all the toes should support the force exerted on the foot. The force/time curve should show an M-shaped course (camel's back) For sensitive feet (e.g. of diabetics, etc.), local pressure peaks should be avoided and the maximum pressure load should be less than approx. 25-N/cm<sup>2</sup>, in order to avoid any damage to the sole of the feet.

## 8 Stance analysis

With this module you can carry out the stance analyses using a zebris FDM System. The procedure of a stance analysis measurement is explained here exemplarily on a treadmill (FDM-T), yet functions in the exact same manner when using a platform (FDM).

### 8.1 Carry out measurement (Measuring mode)



#### 1. Database

Click on **Measure** in the toolbar on the right to start taking a measurement.

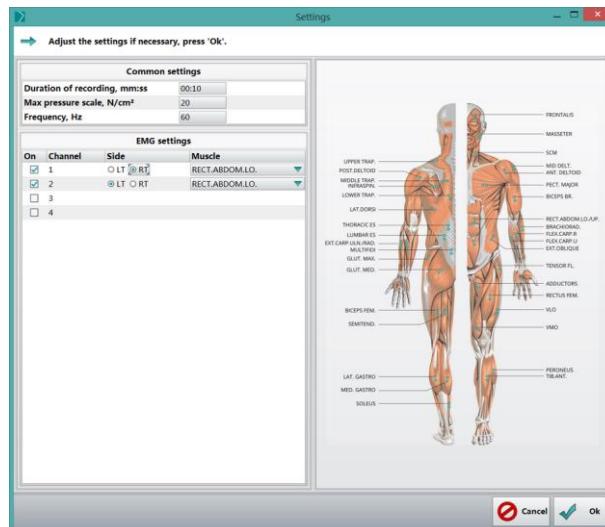
#### 2. Module selection

Select the module **Stance Analysis** and then click on the **Start** button.

Under **Settings** you can specify the measuring duration individually in advance. 30 seconds are given by default.

In addition you can change the maximum value of the pressure scale and the measuring frequency of the sensors.

By clicking on **OK** you will return to the database.





### 3. Preparation

Please ask your test person to stand next to the treadmill or on the side bar, so that a zero measurement can be taken in an unloaded state.

Then change to the Preview mode by clicking on **Next**.

By clicking on **Back** you will return to the module selection.



### 4. Preview/Recording

In the preview mode, the screen alongside appears.

The patient should now stand in the middle of the treadmill facing the arrow that is positioned beside the platform logo. The arrow that stipulates the patient's standing direction can be turned by 90° each through clicking on it.

Subsequently, the green cross for the division of left/right side and fore/back foot is fixed by clicking on **Next**. Thus it is for example possible, to do a one leg stand when the test person only lifts one leg.

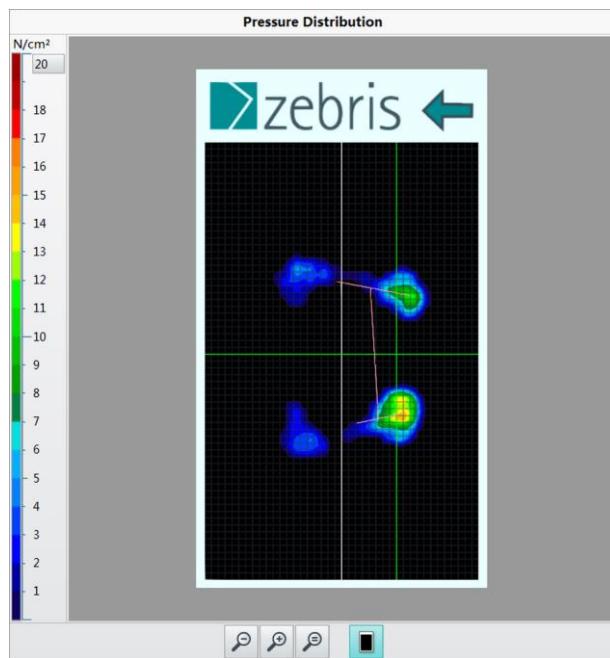


### 5. Measurement

When the recording is started, the measuring signals are recorded over the preset measuring duration. The green progress bar shows the elapsed measuring time. The measurement can be stopped at any time by clicking on the **Stop** button.

If a video camera is connected, a video display is shown in the upper right-hand part of the measurement screen.

In the lower, right-hand part of the measurement screen, the force and pressure curves are shown in chronological sequence. Below the section 3D of the measuring plate is the vertical ground reaction force of the left and right forefoot shown. Below vertical ground reaction force of the left and right heel is displayed.



The color scale to the left of this measuring window enables the color assignment of the pressure in N/cm<sup>2</sup> exerted on the individual sensors.

The maximum value can be stated in the input field, top left. By **dragging on the scale**, its scaling can be changed.

In the left measuring window, the pressure distribution under the feet during the measurement is shown using a color code, in either 2D or 3D, as required. In 3D mode, the **view can be turned** to the desired position by pressing the **left mouse button**.

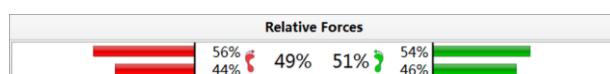
By pressing the **middle mouse button** (scroll wheel), the platform can be **shifted**.

The definition of the forefoot/heel and the left/right contact area is corrected automatically. The green crosshair is automatically positioned as soon as the patient moves. You can shift the crosshair later in the mode view manually.

The zoom buttons serve for **enlarging** (+) or **reducing** (-) the platform presentation. It is also possible to zoom by turning the **mouse scroll wheel**.

The 3D button enables switching between the 2D or 3D presentation of the pressure distribution.

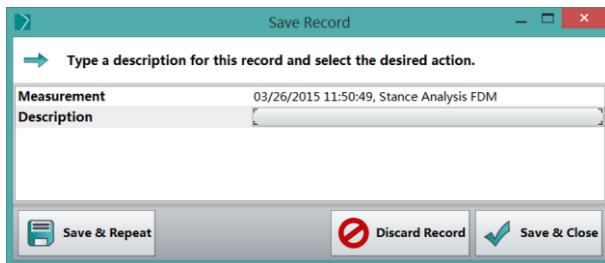
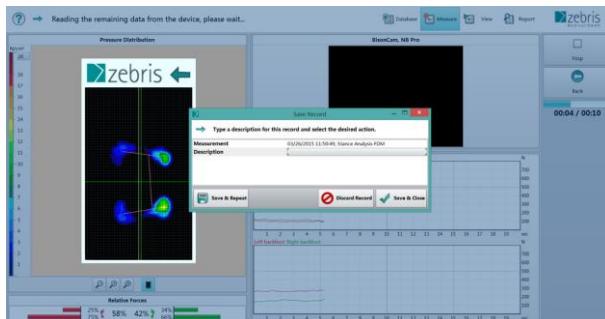
The **2D mode** is activated when the button has a colored background.



#### Load distribution

During the measurement, the bar chart shows the distribution of the relative forces as a percentage, divided between the **left foot (red)/right foot (green)**, and between the forefoot (upper bar) and heel (lower bar)

## Stance analysis



### 6. Save

After clicking on the **Stop** button, a dialog box appears.

#### Discard recording

The recording is discarded and you return to the Preview mode to carry out a new measurement.

#### Save & Close

The recording is saved and you return to the database.

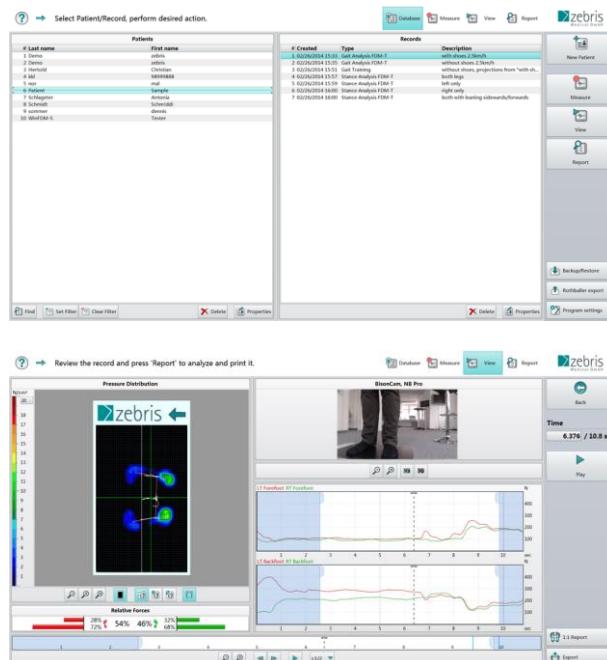
#### Save & Continue

The recording is saved and you return to the Preview mode to carry out a new measurement.

## 8.2 Processing the measurement (View mode)

In the "View" mode, the measurements can be viewed, played, the measuring interval narrowed down and when using a camera system individual images and angles can be defined. In the following, the individual functions of the View mode are explained in detail.

### Basics



#### Select a measuring dataset

Select a measuring dataset in the database and click on **View** in the toolbar on the right.

#### Playing a measurement

Click on **Play** in the toolbar on the right to play the measurement.

The time display above the Play button shows the **actual time** of the measurement in seconds. Click on the box to enter a value or drag the dotted line (cursor) in the time line resp. in the time force diagram.

By clicking on **Back** you will return to the database.

#### 1:1 Printout

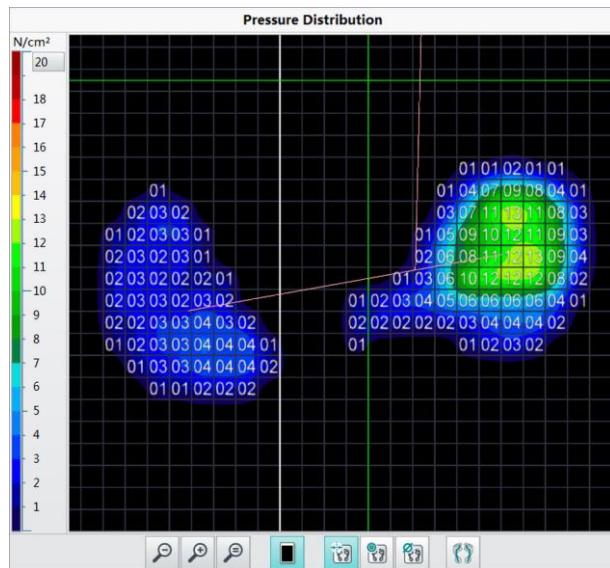
Opens the Report for the 1:1 printout. The data basis is the averaged stance phase of all the steps taken within the marked interval.

#### Exporting footprints

Here you can export one pressure picture per foot as jpg graphics. After having selected the picture, you are demanded to define a storage location and name.

The definition of the forefoot/heel and the left/right contact area can be corrected manually as long as the view from above is active. Therefore move the mouse over the middle of the green crosshair until the cursor becomes a cross. Now position the crosshair by keeping the left mouse button pressed.

### 8.2.1 Visualization of the pressure distribution



#### Numerical display of the pressure values

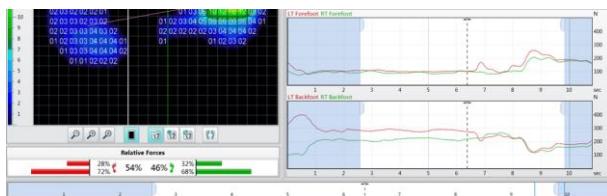
In the 2D presentation, the pressure values of the roll-off pattern can be shown numerically. To do this, **deactivate the 3D mode** by clicking on 3D (when the button is highlighted in color, the 2D presentation is active).

By **enlarging with the middle mouse button** (scroll wheel) or the magnifier tool the pressure values of the individual sensors and the sensor grid is displayed.

Please note that the presentation here has been smoothed, which can cause inaccuracies and rounding errors in the area at the edges of the pressure image displayed.

## 8.2.2 Selecting an interval for analysis in the Report

With zebris FDM it is possible either to analyze the total data volume recorded or only a certain interval.



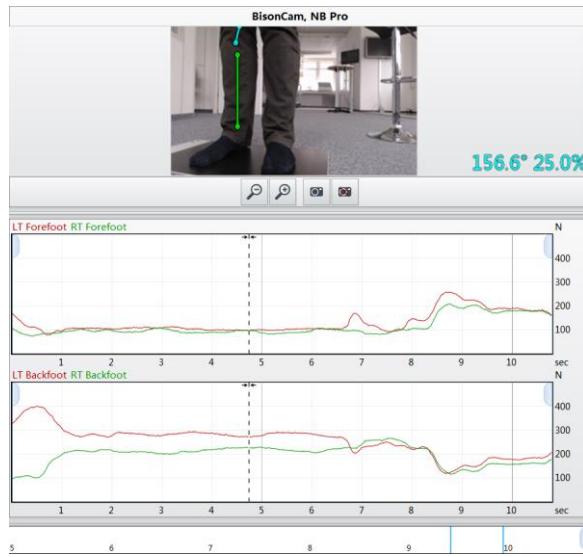
### Selecting measuring data

Two **blue limitation lines** in the force/time diagram mark the area for analysis. For the Report the area with the blue background is discarded and only the data in the white area is evaluated. After each measurement, the entire duration of the measurement is selected automatically.

### Customizing the area for analysis

Move the cursor over the limitation line from blue to white. The cursor changes to a **double arrow**. With the left mouse button pressed you can now restrict the area for analysis by **dragging the limitation line**.

## Individual images and angles/length ratios



Using the magnifying glasses, the displayed image section can be reduced resp. enlarged.

By clicking with the right mouse button on the image section, the following functions open in the context menu: "Copy current image into the clipboard" as well as "Save video under".

With recordings using several cameras, a colored frame marks the currently selected video image.

## Marking individual images

Click on the required position in the force/time diagram. The dashed line (cursor) is set at the clicked position. Then click on the **camera symbol** underneath the video image. The marking appears as a blue line in the bar "Marked images and video sequence".

## Deleting an individual image

Click on an individual image marking (blue line) in the "Marked images and video sequence" bar. Then click on the **crossed-out camera symbol** underneath the video image. The marking is thereby deleted. You can, of course, re-set the marking at any time.

## Angles and length ratios

To do this set two straight lines directly in the video presentation dragging the left mouse button. The angle between the straight lines and the respective length ratio is then automatically shown at the right lower frame next to the video image. **Save** the angles drawn in and the length ratios by clicking on the **camera symbol** underneath the video image. They are saved with the individual image and shown in the Report.

## Setting the video interval

Pressing the **left mouse button**, move the cursor to the desired interval in the bar "Marked images and video sequence".

To change the interval, move the cursor to a limitation line in the **purple area** until it becomes a double arrow. With the left mouse button pressed you can now change the length of the video sequence by **dragging the limitation line**.

Delete the marking by drawing the limitation lines together until the marking completely disappears.

### 8.2.3 Functions

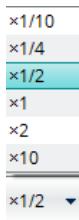
#### Playing the measurement



Automatic playing of the measurement by clicking on the **Play button**. The measurement recording is played and repeated until the **Pause button** is pressed.

#### Image fore/back

The arrows with the line directly next to them take you one image forwards, or backwards, resp.



#### Playing speed

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



#### Zoom

Enlarging or reducing the platform display or the signal curves in the force/time diagram.

**The magnifying glass with a minus sign** reduces the display by 20%

**The magnifying glass with a plus sign** enlarges the display by 20%



#### Customizing

The platform presentation is centered in the view mode, whereby the zoom factor is determined automatically.



#### 3D presentation

Switches the pressure distribution between the 2D and 3D presentation. The 2D presentation is activated when the button has a colored background.



#### Momentary pressure distribution

Shows the pressure distribution at the momentary cursor position. The cursor position is depicted through a dotted line in the timeline.



#### Maximum pressure picture

By clicking on this button, the **maximum pressure** picture is displayed. This setting is only active as long as the measurement is not played. Once the **button Play** is pressed, the setting jumps back to the momentary pressure distribution.



#### Average pressure distribution

This setting displays the average pressure distribution. The setting is only active as long as the measurement is not played. Once the button **Play** is pressed, the setting jumps back to **Current Pressure Distribution**.



### Fading in/out of COP

Shows the Centre of Pressure as white blend line, at the same time, the pressure centre of every individual foot is displayed.

### Individual images



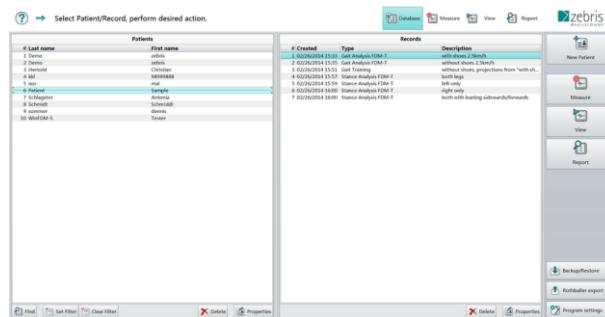
In this way, individual images can be marked or deleted. Marked individual images are taken over into the Report.

For details see "Selecting an interval for analysis in the Report ", p. 75.

## Stance analysis

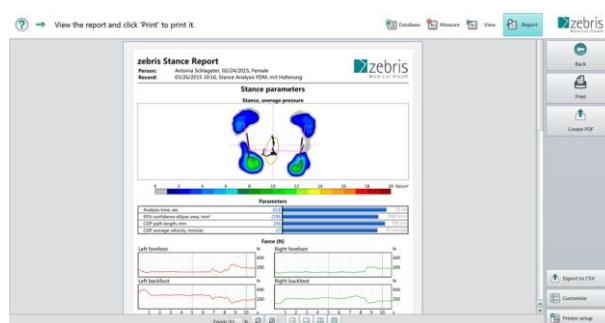
### 8.3 Stance Analysis Report (Report mode)

In the "Report" mode, the stance analysis parameters which had previously been defined in the "View" mode are assessed and shown.



#### Selecting the data set

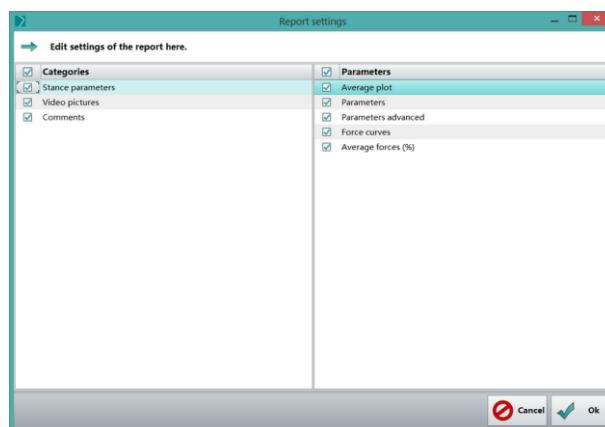
First mark a data set and then click on Report.



#### Customize the Report

For displaying or hiding pages of the Report, click on **Customize** and you will be redirected to the report settings.

By clicking on the **OK** button you will return to the database.



#### Report settings

On the left-hand side the categories are displayed. On the right-hand side the single parameters of the categories selected on the left-hand side are displayed.

#### Showing/Hiding parameters

By setting a tick on the right-hand side, the parameter is shown in the report. By removing the tick, the corresponding parameter does not appear in the report. By setting/removing a tick on the left-hand side, a whole category of parameters can be shown or hidden.



*By setting or removing a tick in the customization menu **Customize** the stored data is neither changed nor deleted.*

### 8.3.1 Functions

#### **View**

With these buttons you can stipulate how many pages of the Report are to be shown at one time. Alternatively the slide control for reducing/enlarging can be used.



#### **Miniature view**

Shows all the pages in an overview as small pictograms.



#### **1:1**

Shows the pages in the original size. Due to different screen resolutions, the size can deviate from the size of the printer paper.



#### **Whole page**

Adjusts the display such that the entire height of a page height can be shown.



#### **Page width**

The current page is zoomed to the fully available width.



#### **Printing**

The Report is printed out on the printer selected under printer settings.



#### **PDF export**

PDF export to any directory or, e.g. to external data carriers such as USB sticks.



#### **Customizing**

Showing and hiding individual pages of the report.



#### **Printer settings**

Select printer and change settings for printing (e.g. format, page size, etc.).



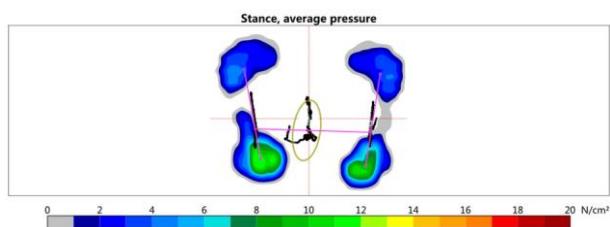
#### **CSV export**

Exporting the report parameters into a CSV file format (Comma separated values).

### 8.3.2 Description of the Report contents

The Report comprises the elements described in the following:

**zebris Standanalyse-Report**  
 Person: Antonia Schlageter, 02/24/2015, Weiblich  
 Aufnahme: 03/26/2015 10:16, Standanalyse FDM, mit Halterung



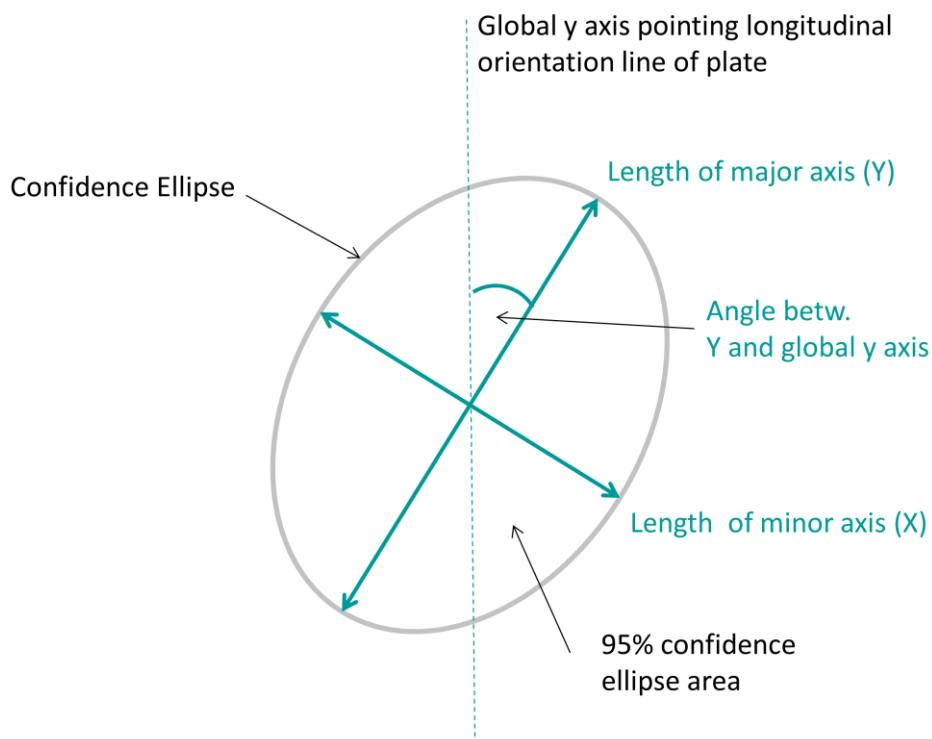
#### Header

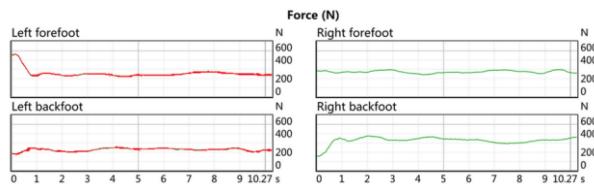
Title, project name, patient name, date of the measurement and the company logo are in the header.

#### Stance phase, average

In this diagram the average load distribution under the feet is displayed in color. The color scale enables the load distribution to be quantified. The central point's show the centers of pressure (COP) over the time. The left and right points are the respective centers of pressure of the left and right contact areas. The area of the displayed confidence ellipse contains 95% of the COP's measuring points.

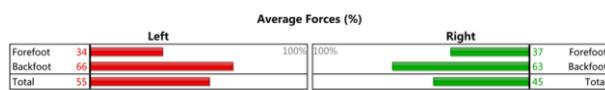
## Explanation of 95% Confidence Ellipse Diagram





### Force (N)

In the four "force versus time" diagrams, the chronological order of the vertical ground reaction forces of the left/right contact areas and of the forefoot and heel are shown.



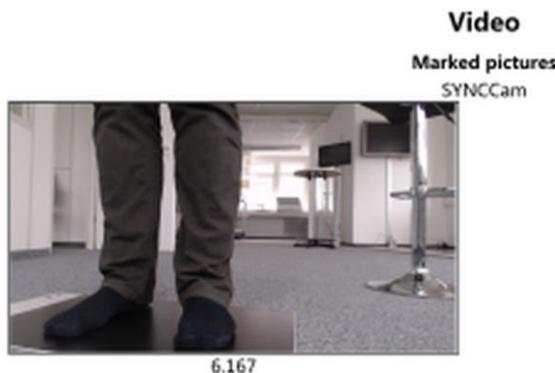
### Average forces (%)

The bar chart shows the averaged load distribution of the left and right forefoot or heel, as well as the load distribution of the left and right contact surface in per cent.



### Camera - Video sequence

Here, the stride phase defined in the View mode is shown as a video sequence of seven images with the same time interval (given in seconds).



### Camera - Marked pictures

Shows the individual images marked in the View module, including all the angles and lines defined there. Underneath the image the recording time is shown in seconds.

**Patient comments**

Lorem ipsum dolor sit amet, consectetur adipiscing elit sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volatpat. Ut wisi enim ad minim veniam, quis nostrud exercitation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissin qui blandit praesent luptatum zzril delenit augue duis dolore te feugait nulla facilisi. Nam liber tempore cum soluta nobis eleifend option congue nihil imperdiet doming id quod mazim placerat facer possim assum. Typi non habent claritatem insitam; est usus legentis in iis, qui facit eorum claritatem. Investigationes demonstraverunt lectores legere me illius quod illegum saepius. Claritas est etiam processus dynamicus, qui sequitur mutationem consuetudium lectorum. Mirum est notare quam littera gothica, quam nunc putamus parum claram, anteposuerit litterarum formas humanitatis per seacula quarta decima et quinta decima. Eodem modo typi, qui nunc nobis videntur parum clari, fiant sollemnes in futurum.

### Patient comment

Shows the patient comment stored in the database.

For notes on setting up a patient comment see “Comments & Clips”, p. 27.

**Patient comments**

wearer of glasses
<b>Record comments/Recommendations</b>
Pelvis drop

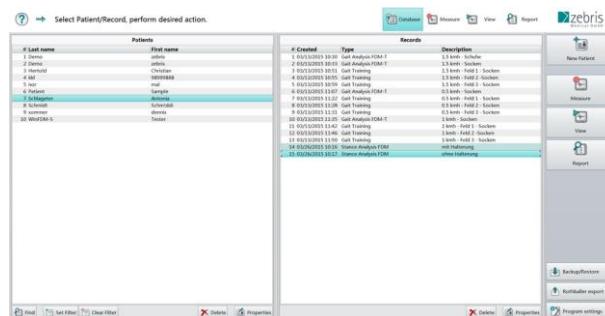
### Comment on the recording

Shows the comment on the recording, stored in the database.

For notes on setting up a recording comment see “Details of the recording”, p. 29.

## Stance analysis

### 8.3.3 Comparing two measurements



#### Selecting the data set

In order to compare two measurements with each other, they are first marked in the database using the **Ctrl key + left mouse**.

Then the Report can be called up again as usual, by clicking on the **Report** button.



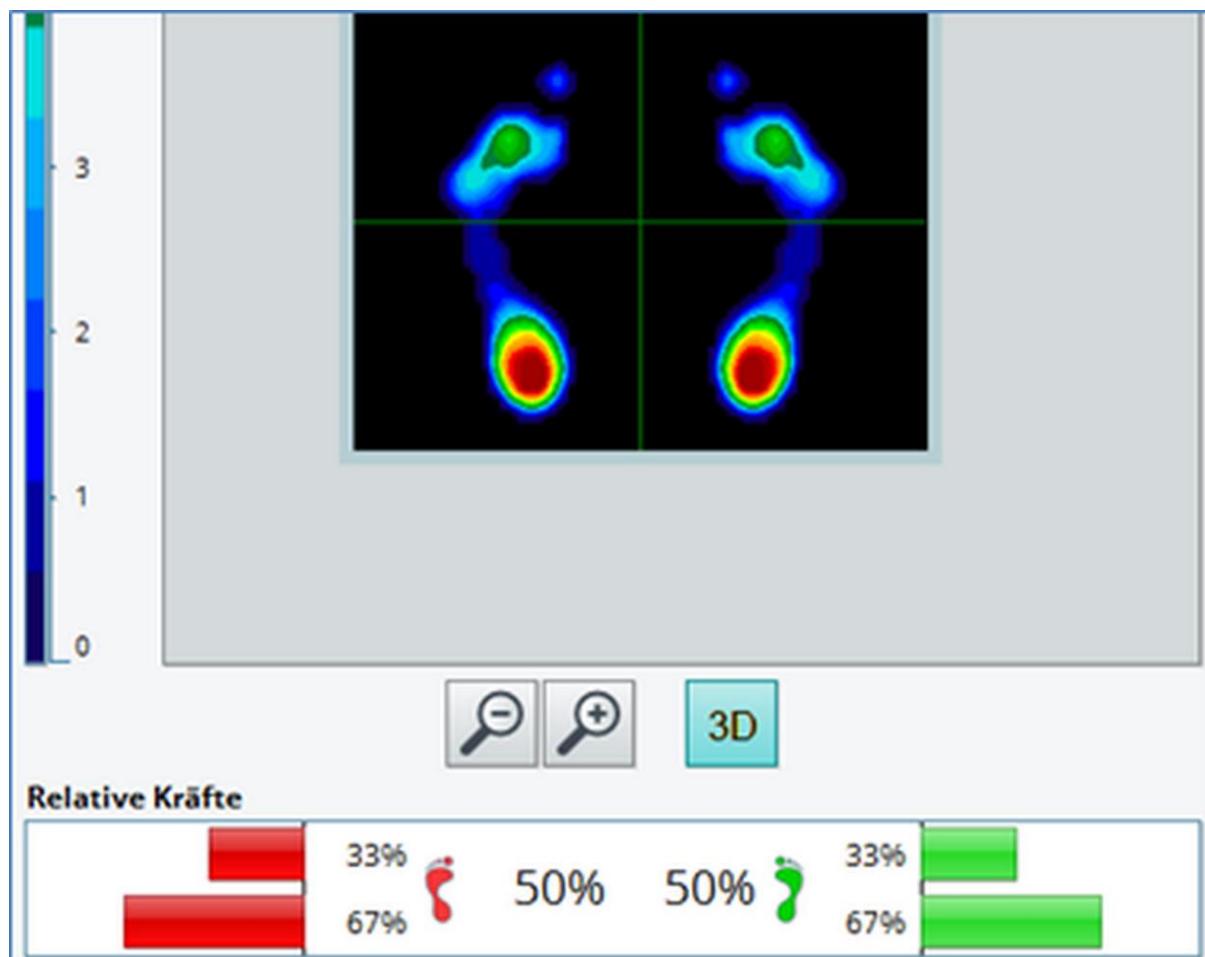
#### Presentation in the Report

In the Comparison Report the results of measurement A are marked with a white background and the results of **measurement B with a gray background**.

The allocation to the respective measurement can also be seen in the header.

### 8.3.4 Help for evaluating the data acquired

In the following a pressure distribution is shown that is considered as ideal. These values are valid for a normal load distribution, during stance, barefoot.



#### Ideal load distribution

An even load distribution of 50% each between the left and right standing surface is considered as ideal.

#### Distribution between the forefoot and heel

There should be a load of approx. 1/3 (33%) on the forefoot and approx. 2/3 (66%) on the heel.

#### Maximum pressure load

Between the forefoot and heel, the pressure should be approx. 1/3 (33%) on the forefoot and approx. 2/3 (66%) on the heel. In the case of sensitive feet (e.g. of diabetics, etc.) the pressure ought not, if possible, to exceed 11~N/cm<sup>2</sup>, to avoid any injury to the foot.

## 9 Visual Cueing

With this module you can carry out gait training using a zebris FDM System and the extension "Visual Stimulation". For installing and setting up the device, or the projection unit (beamer), please see the enclosed Hardware Manual.



Please make sure the beamer is switched off in all other applications than gait training to not endanger the patient with confusing non-moving lights on the running belt.

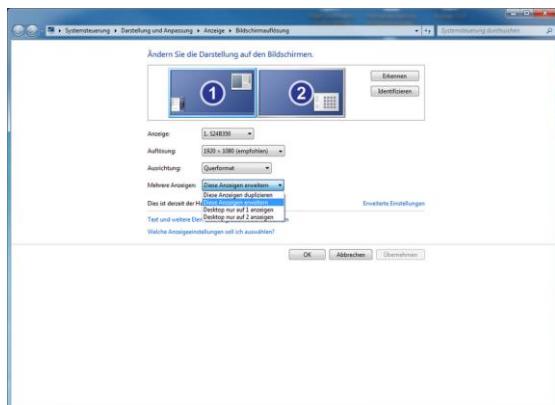
### 9.1 Preparation

Before training can start, you must first configure the screen output and carry out a one-time, static and dynamic calibration of the system.

#### 9.1.1 Setting the screen output

For implementing the gait training, set your screen output as follows:

##### Windows 7



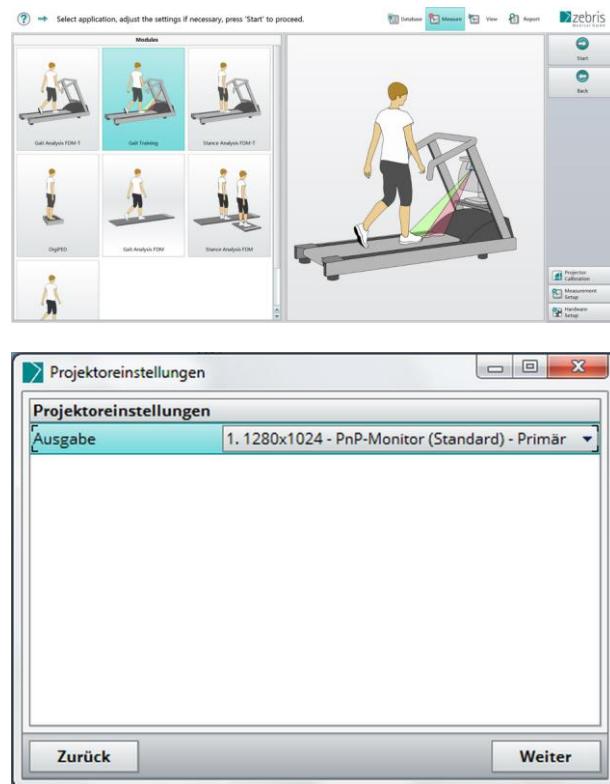
Press and hold down the **Windows key**. By pressing the **P** key again you set the selection to "Double" and then you let go of both keys. All the display units connected should now show the same display.

Alternatively, make a **right click** on the desktop (Windows background) and click on "Screen resolution". Now from the list for **multiple displays** select the entry "Duplicate displays" and click on **OK**.

##### Windows XP

Please find the necessary settings on duplicating, or cloning the display in the manual of your graphics card.

### 9.1.2 Static calibration



#### 1. Start calibration

Click on **Static Calibration** in the toolbar on the right.

#### 2. Selecting the display

When using several monitors/beamers with an extended desktop, the projection unit must be set here.  
If a duplicated or cloned display is used, select the primary display unit.

Then please click on **Next** to start the calibration procedure.

### Calibration procedure

A green point appears on the screen that can be shifted by **pressing the left mouse button**.

1. Focus your eye on the treadmill and shift the point to a corner of the running surface.
2. Once you have placed the point, press with one finger on the center of the white cross without touching any other part of the running surface. The point disappears now and the next appears for positioning. (If the point does not disappear during printing, shift it slightly out of the corner towards the middle and press once more in the middle of the white cross).

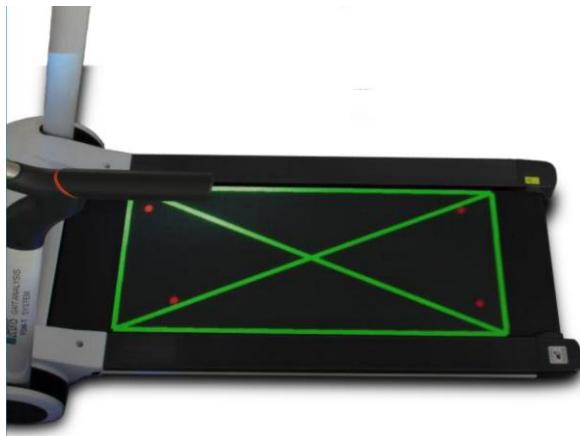
**Repeat these steps for all four points** in the four corners of the running surface. You do not have to keep to any specific order.



Please note that for reasons of stability, the force measuring platform does not stretch underneath the entire running platform. There is a rim running along all the sides, particularly however at the sides in the running direction.



After the fourth point, the result is displayed.



After the calibration, a green rectangle appears on the treadmill as a control, with a diagonal cross and four red points.

The four red points show the places you have pressed on the force measuring platform.

#### Checking the calibration

The green rectangle plays back the position calculated by the calibration of the force measuring platform on the treadmill.

Please check whether the edges of the rectangle run more or less parallel to the outside rims of the treadmill (the presentation on the monitor appears distorted). If this is not the case, please repeat the calibration once again.

You can finish the static calibration by clicking on **Next**.



The static calibration must be carried out again if the screen resolution or the position of the projector has been changed.

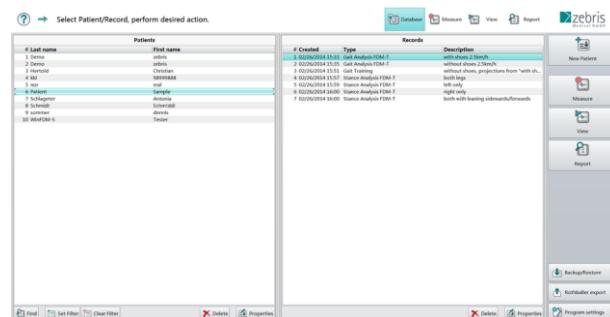
## 9.2 Carrying out the training (Measuring mode)

The gait parameters derived from a gait analysis or gait training already carried out, serve as the basis for any gait training. For taking gait parameters over from existing gait recordings, first open the Report on the selected recording (see **Gait Analysis Report (Report mode)**, p. 55) and verify the plausibility of the gait parameters.



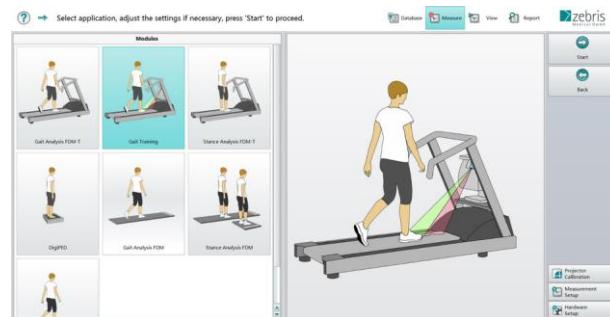
The gait parameters of a patient cannot be used for training with other patients.

After successful verification, close the Report again and proceed as follows:



### 1. Database

Click on **Measure** in the toolbar on the right.



### 2. Module selection

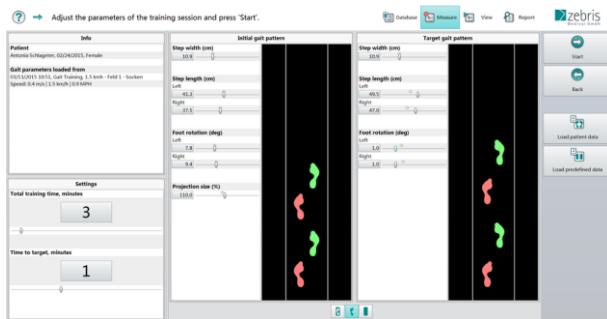
Select the Gait Training module and then click on the **Start** button.



Under **Measurement Setup** you can specify the maximum value of the pressure scale and the measuring frequency of the sensors.

By clicking on **OK** your changes are adopted and you will return to the database.

## Visual Cueing



The duration of the training and the duration of the gait pattern adaptation can be changed on the left-hand side.

### 3. Loading the gait parameters

Load the gait parameters and foot contours from the Report last opened by clicking on **Load patient data**. You can alternatively load pre-defined sample data.

For more details on setting the training parameters, please read in Preparation for training, p. 93

### 9.2.1 Preparation for training

You can define the total duration of the training by using the slide control **total training time**.

The projections appear at the beginning of the training in the setting **Initial gait pattern**. After starting the training, the gait parameters are continuously adapted to the setting under **Target gait pattern**. How long this procedure takes, can be defined under **Time to target**.

Before starting the training, you should decide whether the foot rotation, the step width and length are to remain the same during the training or whether they should be aligned:

- The parameters should stay the same

**Option a:** Adjust the desired gait parameters under **Target gait pattern** and reset the **Time to target** on the left-hand side to zero. You can disregard the settings under Initial gait pattern. Please note that the target gait pattern is only displayed after having started the recording.

**Option b:** Set the same gait parameters under **Initial gait pattern** and **Target gait pattern**. The adjustment for the **Time to target** can be disregarded.

- Parameters are to undergo a linear adjustment.

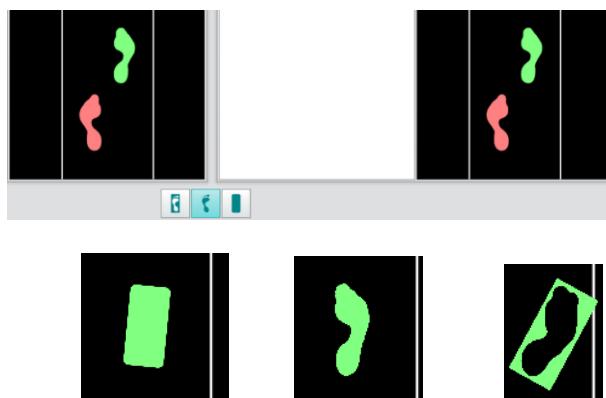
With **Initial gait pattern**, you define the parameters that are active at the beginning, and under **Target gait pattern** the parameters at the end of the training. Then you define the duration of the gait pattern adjustment in minutes at the lower left. A linear transition takes place throughout the entire measuring duration.

## Patient Information and display of the footprints

Info	
<b>Patient</b>	Antonia Schlageter, 02/24/2015, Female
<b>Gait parameters loaded from</b>	03/13/2015 10:51, Gait Training, 1.5 kmh - Feld 1 - Socken
	Speed: 0.4 m/s   1.5 km/h   0.9 MPH

### Information

Shows patient data, description of the recording and the average speed of the downloaded gait analysis.

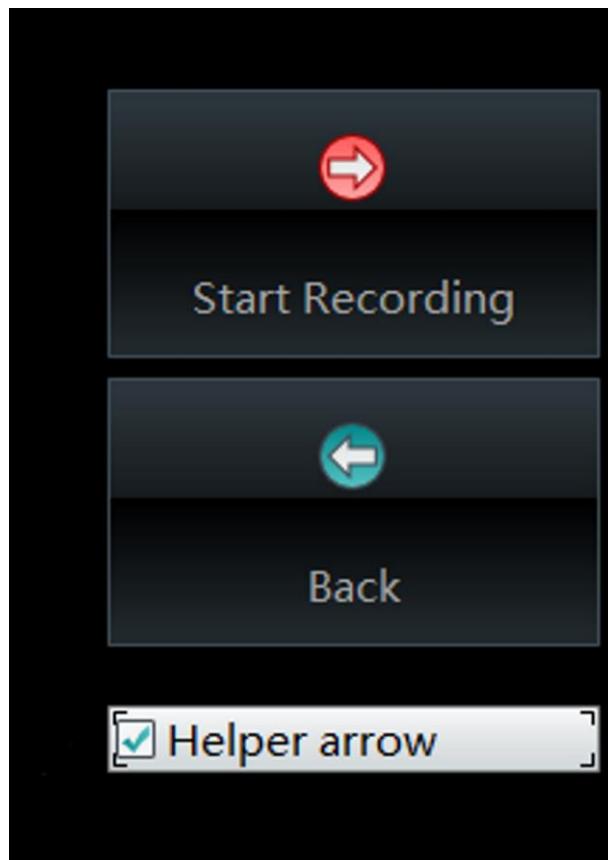


### Changing projection patterns

Display of the target areas as rectangle

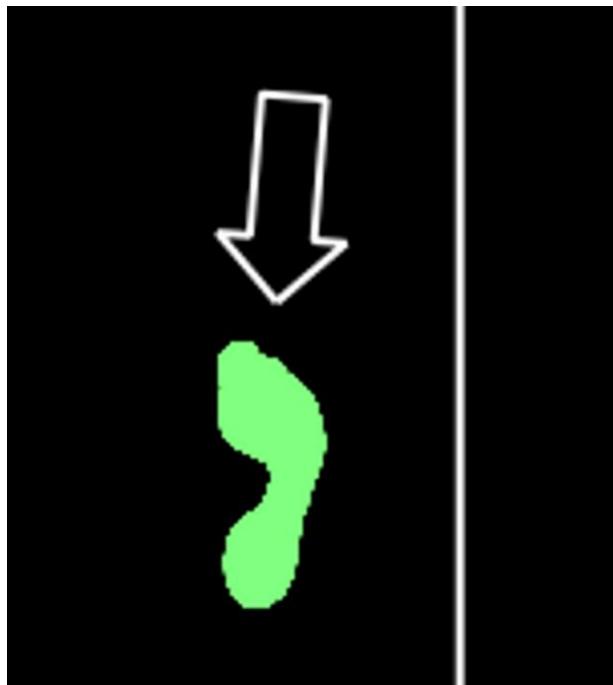
Display as original footprints.

The projection is inverted, so that the displayed area appears bigger, thus making it easier to step on the inside of the footprint.



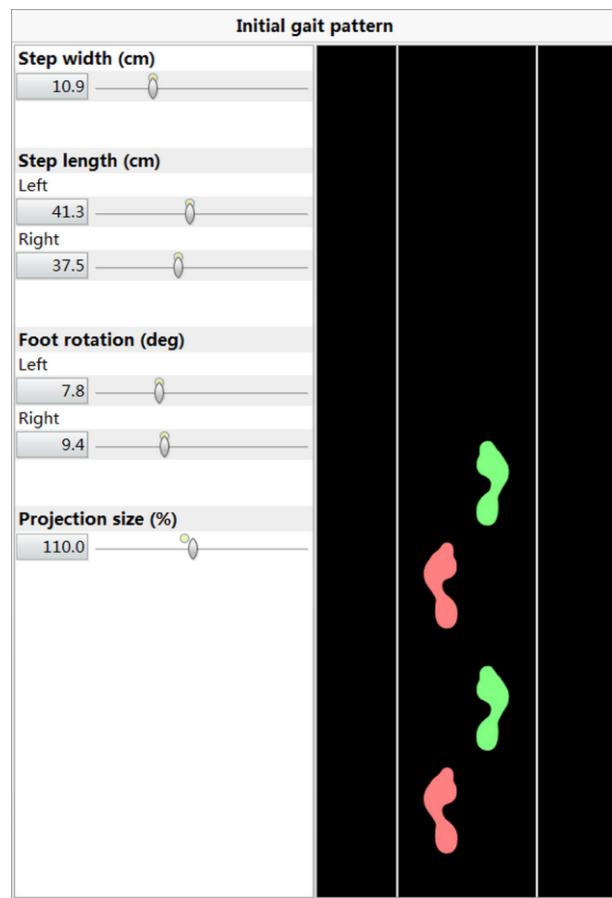
### Helper arrow

In the preview mode, the arrow indication can be faded in or out with the checkbox under the Start **Recording button**.



Arrows appear above the footprints, helping the patient to step on the correct place.

## Initial gait pattern



### Gait parameters

Set the gait parameters for training here. After downloading the footprints, the parameters are set automatically.

By clicking once on the **little circle** above each slider, the original value can be restored.

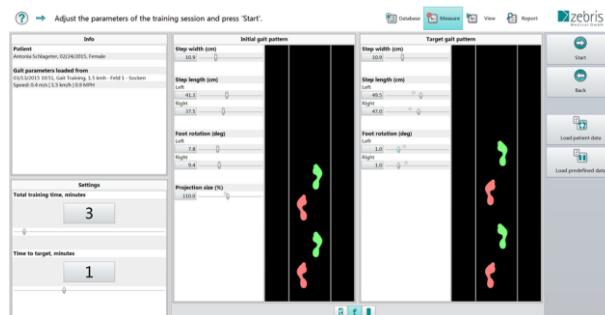
You can alter the parameters either by using the slider or by making an entry directly in the text fields.

In the display area next to the parameters your changes are directly visualized. The **thick white lines** represent the outside edge of the force measuring platform, i.e. the area covered for a recording.

For a correct recording, you should make sure that the footprints do not extend beyond these edges.

## Target gait pattern

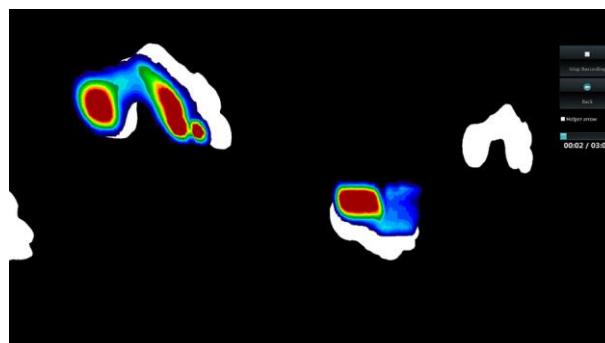
The setting of the parameters works analog to the section “Start Training” described before. Only the setting of the projection size always has effects on both sections.



## 4. Start

After defining the training settings, click on **Start**. The display switches over to the Preview mode.

By clicking on **Back** you will return to the module selection.



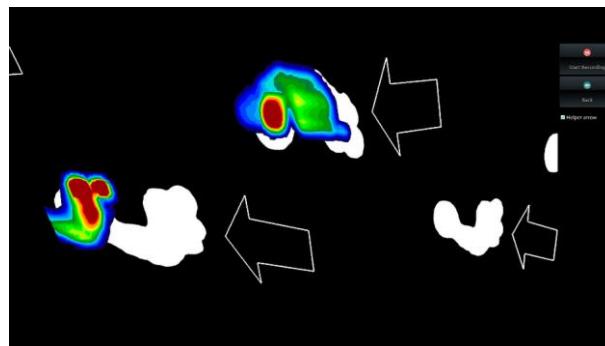
## 5. Preview mode

Now start the treadmill at the desired speed and allow your patients some time to get used to the projected footprints.

The pressure distribution is displayed in real time for better control.

At the beginning of the training, click on **Start recording**. Now, at this point the training time starts and the parameters undergo a linear adjustment, depending on the setting.

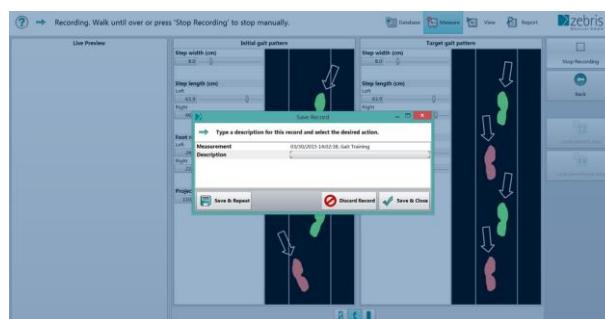
By clicking on **Back** you will return to Preparation for training.



## 6. Measurement

To stop the recording prematurely, click on **Stop recording**.

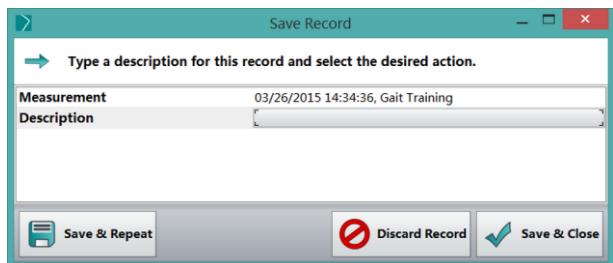
By clicking on **Back** you will return to the Preview mode.



## 7. Save

After clicking on the **Stop** button, a dialog box appears with the functions: save, continue or discard the measurement.

## Visual Cueing



### Discard Record

The recording is discarded and you return to the Preview mode to carry out a new measurement.

### Save & Close

The recording is saved and you return to the database.

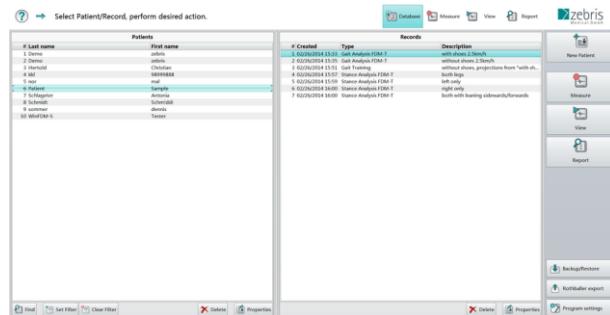
### Save & Repeat

The recording is saved and you return to the Preview mode to carry out a new measurement.

## 9.3 Processing the measurement (View mode)

In the "View mode" you can view and play the measurements, limit the measuring interval. And when using a camera system, mark single images for the report as well as draw in angles. In the following, the individual functions of the View mode are explained in detail.

### 9.3.1 Basics



#### Opening the measuring dataset

Select a measuring dataset in the database and click on **View** in the toolbar on the right.

#### Play the measurement

Click on **Play** in the toolbar on the right. The time display above the Play button shows the actual time of the measurement in seconds. Click on the box to enter a value

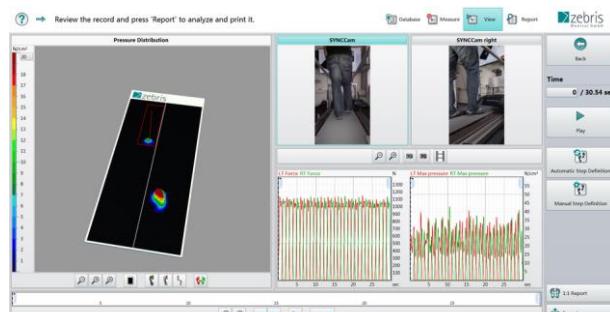
By clicking on **Back** you will return to the database.

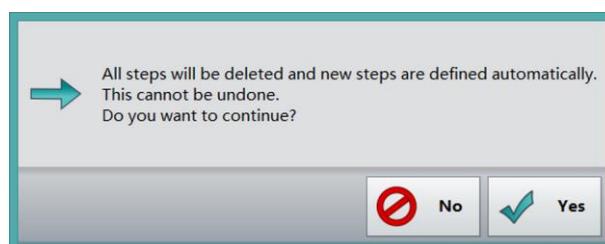
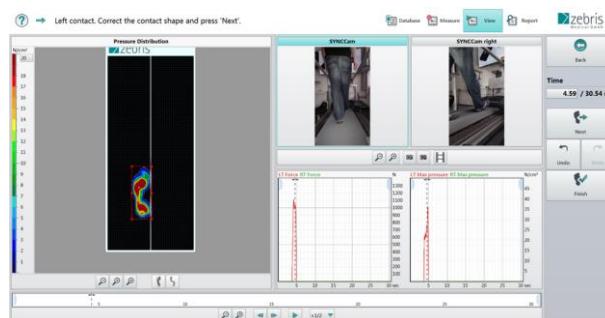
#### Export...

Here you can export a pressure image per foot as jpg graphic. After having selected the desired image, you are asked to assign a saving destination and a name.

#### 1:1 Report

Opens the Report for the 1:1 printout. The data basis is the averaged stance phase of all the steps taken within the marked interval. The average, maximum resp. medium stance phase can be selected.

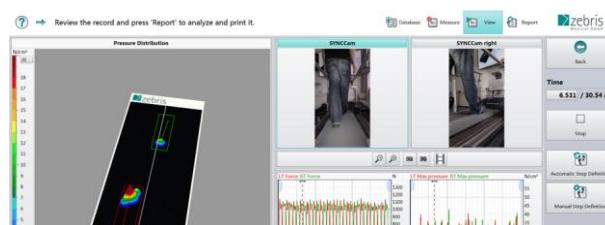




## Automatic step definition

By clicking on the corresponding button, the following dialog window opens (see below).

When clicking **Ok**, all previously defined steps are deleted and the automatic step definition is carried out again.



## Manual step definition

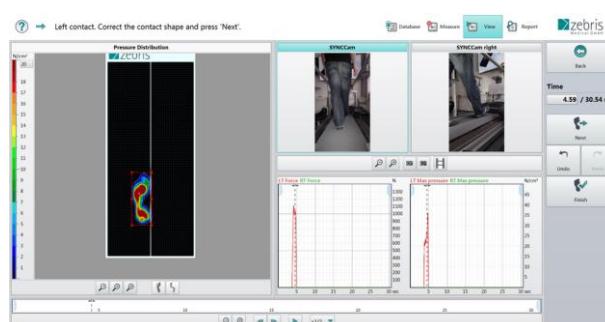
In case that the automatic step definition has not recognized the test person's gait pattern, you can also define the steps manually.

Therefore, click on **Manual Step Definition**.

All steps are deleted and you are redirected to the mode of manual definition.



*The manual step definition for the gait analysis FDM is momentarily not available.*



By holding down **the left mouse button** you can navigate over the timeline with the help of the vertical dashed line (cursor).

By pressing **Undo/Repeat** you can jump back and forth in the work process.

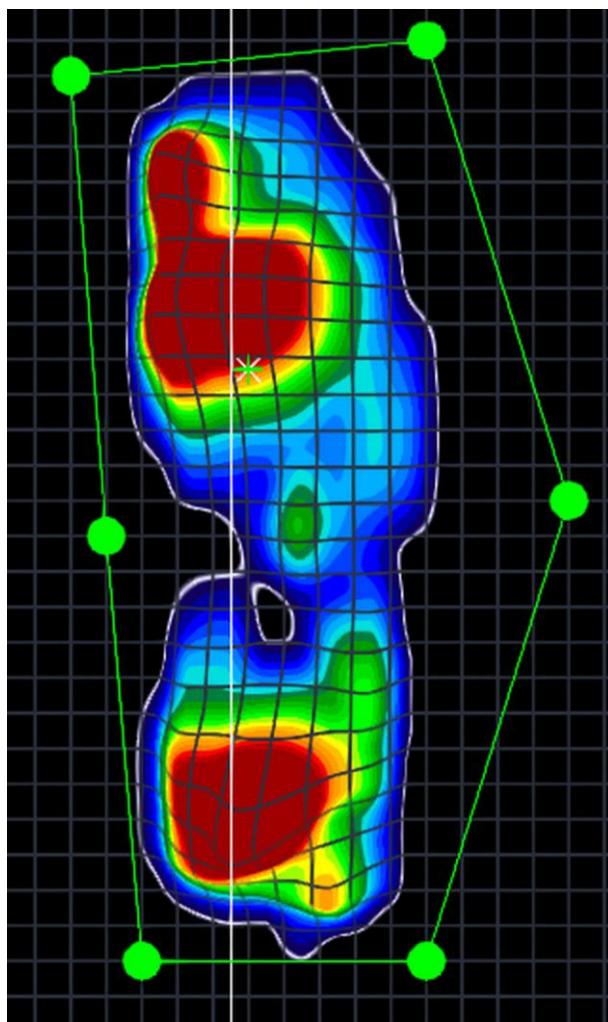
### 1. Navigate to the footprint

Navigate in the time course to the left

footprint, with which you would like to start. If you prefer to start with the right footprint, then click on **Next**.

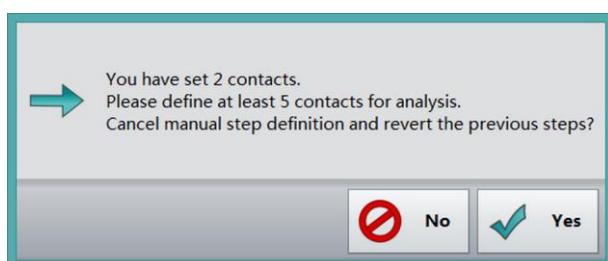
## 2. Click on the footprint

Click on a part of the footprint that is to be defined. A frame around the footprint is then generated automatically.



Now the displayed frame can be adjusted by using the displayed points. If required, shift the points into another position inside the frame by **dragging with the left mouse** button.

After having finished the manual step definition, click the button **Finish** and your changes are saved.



You will have to define at least five steps, as this number is necessary for the evaluation of the report.

If you have defined fewer steps, a note appears after clicking Finish.

**Close** it and define more steps.

### 9.3.2 Functions

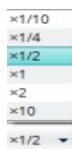


#### Playing the measurement

Automatic playing of the measurement by clicking on the Play button. The measurement recording is played and repeated until the Pause button is pressed.

#### *Image forw./backwards*

The arrows with the line directly next to them take you one image forwards, or backwards, resp.



#### Playing speed

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

#### Zoom



Enlarging or reducing the platform display or the signal curves in the force/time diagram.

***The magnifying glass with a minus sign*** reduces the display by 20%

***The magnifying glass with a plus sign*** enlarges the display by 20%

#### Adjusting

The 3D depiction is centered in the view mode and the zoom factor is automatically determined, so that the model becomes completely visible.



#### MPP

Display of the maximum pressure (Maximum Pressure Plot).



#### Gait line

Display of the COP pattern in the gait phase.



#### Roll-off line

Display of the roll-off line during the stance phase.



#### Swapping left/right side

Here you can swap the side assignment of the foot prints.



#### 3D presentation

Switches the load distribution between the 2D and 3D presentation. The 2D presentation is activated when the button has a colored background.



### Single images

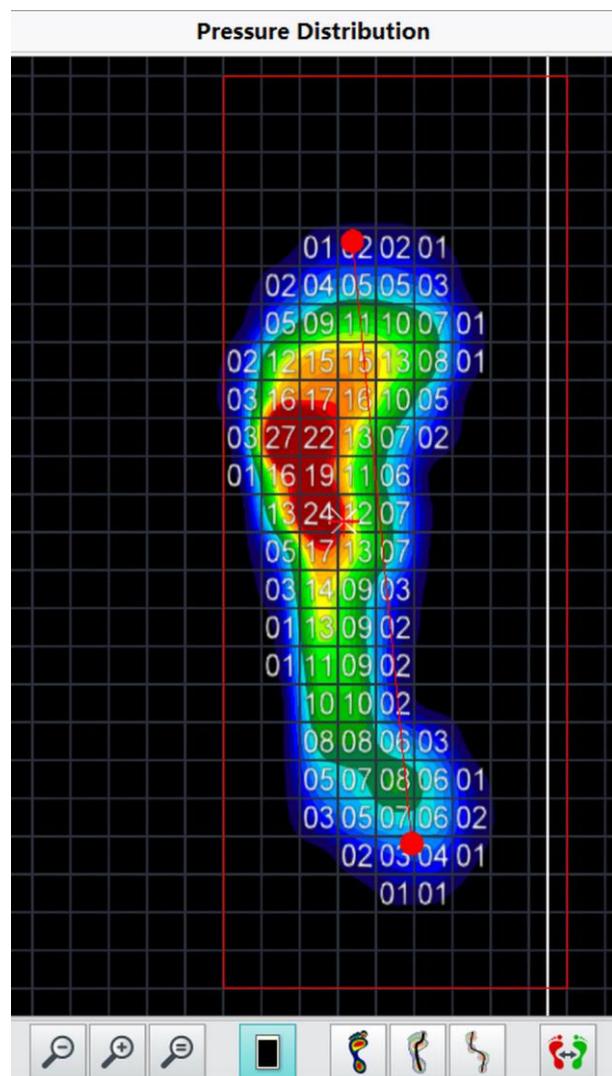
Single images can be marked or deleted with this function. **Marked pictures** are transferred to the report.  
(see 7.3.4)



### Selecting a video sequence of a gait cycle

Select automatically the video sequence of the gait cycle at the current playing position. (see 7.3.4)

### 9.3.3 Visualization of the load distribution



#### Numerical display of the pressure values

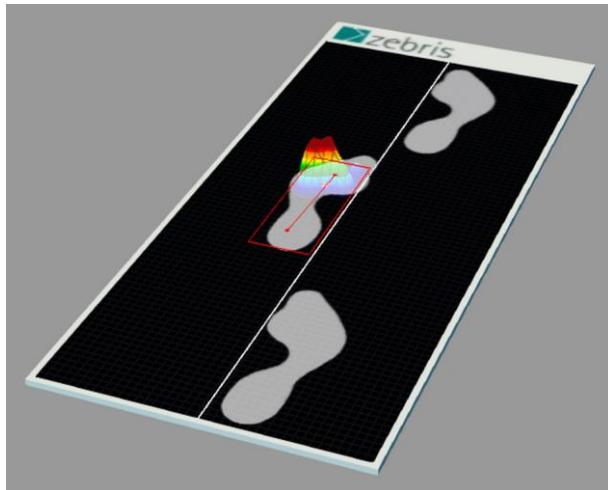
In the 2D presentation, the pressure values of the roll-off pattern can be shown numerically.

To do this, deactivate the 3D mode by clicking on **3D** (if the button is not highlighted in color, the 3D presentation is active.)

By enlarging with the **middle mouse button** or **magnifier tool** the pressure values of the individual sensors and the limiting frame are displayed.



Please note that the presentation here has been smoothed, which can cause inaccuracies and rounding errors in the area at the edges of the pressure image displayed.



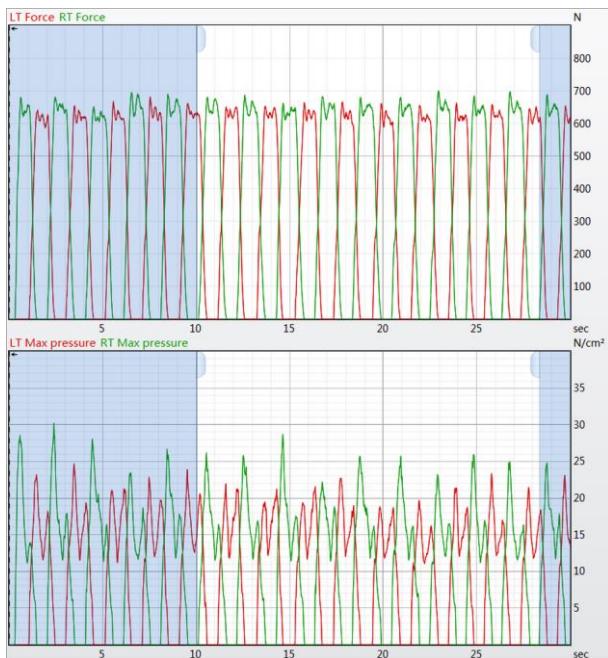
Recordings that are carried out with visual cueing, the projected footprints are shown as a gray shadow.

In this way, it is possible to make a visual assessment of the training in advance.

### 9.3.4 Selecting a certain interval for analysis in the Report

With zebris FDM it is possible to analyze either the total data volume recorded or only a certain interval.

#### Select measuring data



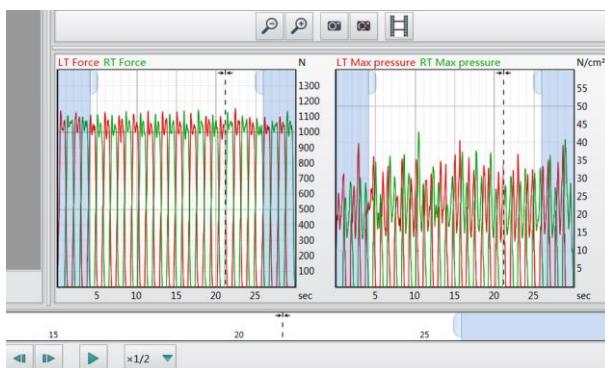
Two **blue limitation lines** in the force/- time diagram mark the area for analysis. For the Report the area with the blue background is discarded and only the data in the white area is evaluated.

#### Customizing the area for analysis

Move the cursor over the limitation line from blue to white. The cursor changes to a double arrow. With the left mouse button pressed you can now **restrict the area for analysis by dragging the limitation lines**.

#### Selecting video sequences

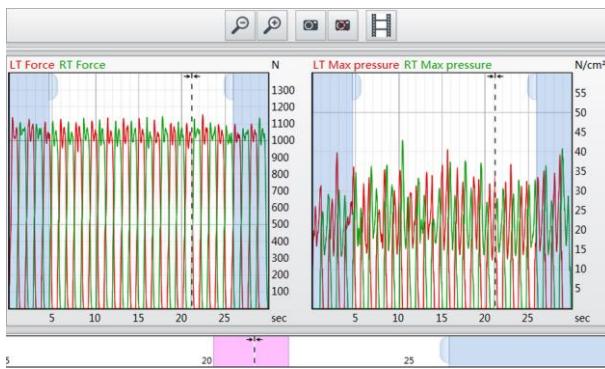
Please note, that the use of video cameras is not available with all modules.



## 1. Define a position

In order to transfer video images to the report, click on the desired position in the time-force diagram. The dotted line (cursor) is shifted to the clicked position.

You can shift the cursor with the left mouse button resp. the image back/forth button to the desired position.



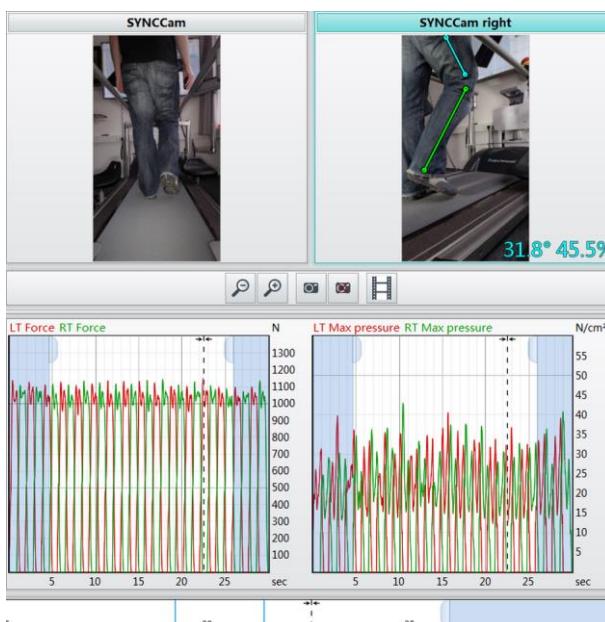
## 2. Define the video interval

By clicking on the **movie symbol**, the gait cycle around the marked position is selected (each one step before/one step after).

In order to select a larger section, move the mouse cursor on a limitation line of the **violet section**, until it becomes a double cursor. While keeping the left mouse button pressed, you can now change the length of the video sequence by drawing the limitation line.

Delete the marking by pulling the limitations together until the marking disappears completely.

## Marking single images in the video, angles and length ratios



Using the magnifying glass, the displayed image section can be enlarged or minimized.

By clicking with the right mouse button on the image section, the following functions in the context menu open: "Copy current image in the clipboard" as well as "Save video under". When it comes to recordings with several cameras, a colored frame marks the currently selected video image.

## Marking a single image

Click on the desired position in the force-time diagram. The dotted line (cursor) is set at the clicked position.

Then click on the camera symbol under the video image. The marking appears as blue line in the bar „single images and video sequences“.

### Deleting a single image

Click on the single image marking in the bar „Single images and video sequence“ (blue line).

Then, click on the crossed out video symbol. In doing so, the marking is deleted. Of course, you can set the marking any time again.

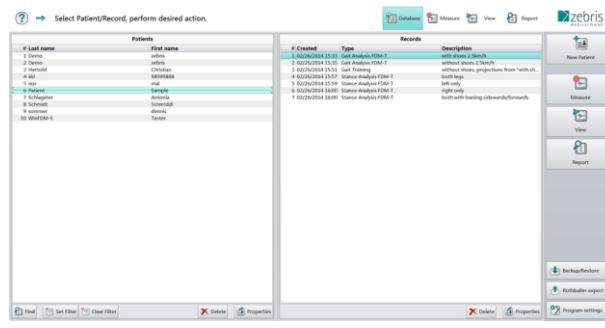
### Angles and Length ratios

Draw two straight lines with the left mouse button directly in the video mode. Then the angles between the straight lines as well as the length ratio to one another are displayed automatically at the right bottom edge of the video image.

The drawn in angles and the length ratios are saved with the single image and displayed in the report.

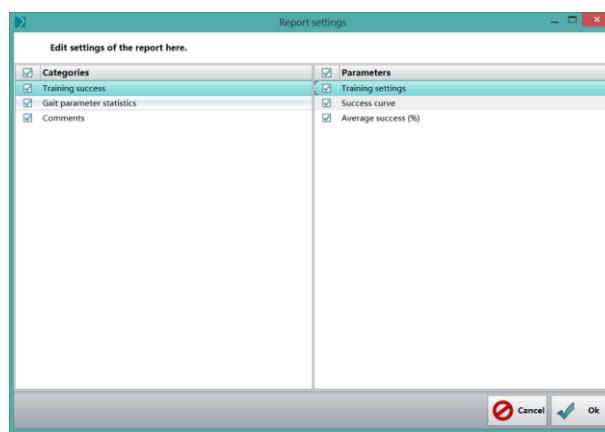
## 9.4 Visual Cueing Report (Report mode)

In the "Report" mode, the gait parameters are assessed and shown which had previously been defined in the "View" mode.



### Selecting the data set

First mark a data set and then click on **Report**.



### Align the Report

For displaying or hiding single parameters of the Report, click on **Customize** and you will be redirected to the report settings.

By clicking on the **Ok** button your changes are saved and you will return to the database.

### Report settings

On the left-hand side, categories are displayed. On the right-hand side, the single parameters of the category that has been chosen on the left, are displayed

### Fade in /fade out of parameters

By placing a tick on the right-hand side, the parameter is displayed in the report. Once the tick is removed, the corresponding parameter does not appear in the report.

By setting/removing a tick on the left-hand side, a whole category of parameters can be displayed or faded out.



By setting or removing a tick in the drop-down menu the stored data is neither changed nor deleted.

### 9.4.1 Functions

#### **View**

With these buttons you can stipulate how many pages of the Report are to be shown at one time. Alternatively the slide control for reducing/enlarging can be used.



#### **Thumbnails**

Shows all the pages in an overview as small pictograms.



#### **1:1**

Shows the pages in the original size. Due to different screen resolutions, the size can deviate from the size of the printer paper.



#### **Whole page**

Adjusts the display such the entire height of a page height can be shown.



#### **Page width**

The current page is zoomed to the full available width.



#### **Printing**

The Report is printed out on the printer selected under **printer settings**.



#### **PDF Export**

PDF export to any directory or, e.g. to external data carriers such as USB sticks.



#### **Customizing**

Showing and hiding individual pages of the Report.



#### **Printer Settings**

Select printer and change settings for printing (e.g. format, page size, etc.).



#### **CSV Export**

Export the parameters of the report in a CSV file format (Comma separated values).

## 9.4.2 Description of the Report contents

The Report comprises the elements described in the following:

### zebris Treadmill Gait Report

Person: Antonia Schlageter, 02/24/2015, Female  
Record: 03/13/2015 10:55, Gait Training, 1.5 kmh - Feld 2 -Socken



### Header

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

### Training success

*Overview of the training parameters you set before. In doing so, a difference is made between the gait pattern and the training objective.*

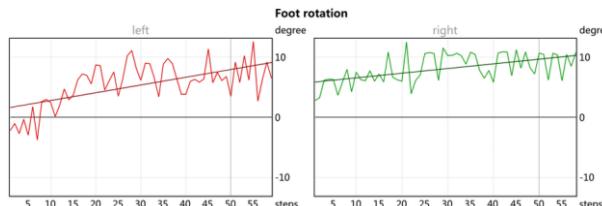


### Success statistics

*In this diagram, the hit rate is shown for each step as a percentage, i.e. the percentage of the patient's footprint that is positioned inside the projected area.*

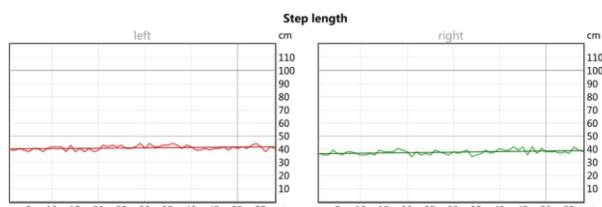
### Success rate

*Presentation of the hit rate as a percentage of all the steps for the left and right foot.*



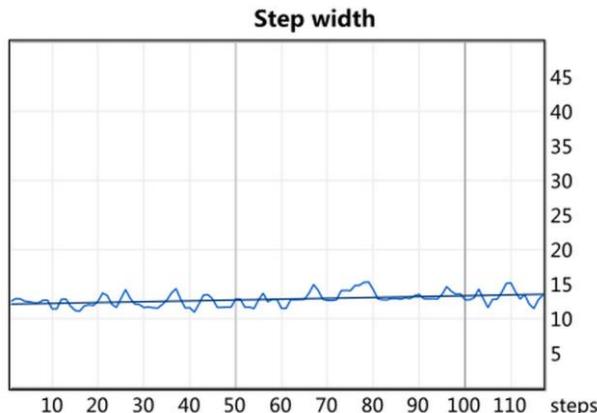
### Foot rotation

*Here the foot rotation to the left and right is shown for each step.*



### Step length

*Presentation of the step length of each step.*

**Step width**

*In this diagram the step width is displayed for each step.*

### 9.4.3 Explanation of gait parameters

**Foot rotation, degree**

*Describes the angle between the longitudinal axis of the foot and the running direction.  
(Negative value = inward rotation, positive value = outward rotation)*

**Step width, cm**

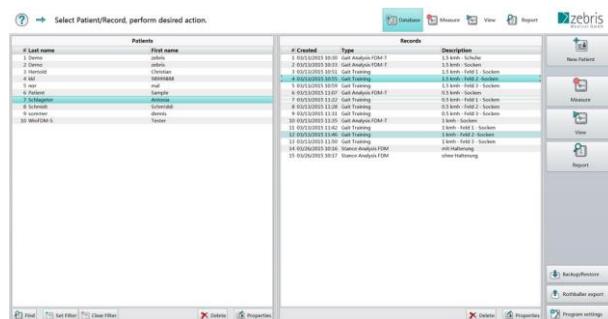
*Describes the distance between the right and left foot.*

**Step length, cm**

*Describes the distance between the heel contact of one side of the body and the heel contact of the contralateral side.*

## Visual Cueing

## 9.4.4 Comparing two measurements



## Selecting the data set

*In order to compare two measurements with each other, they are first marked in the database using the **Ctrl-key + left mouse button**.*

Then the Report can be called up as usual, by clicking on the **Report** button.



## **Presentation in the Report**

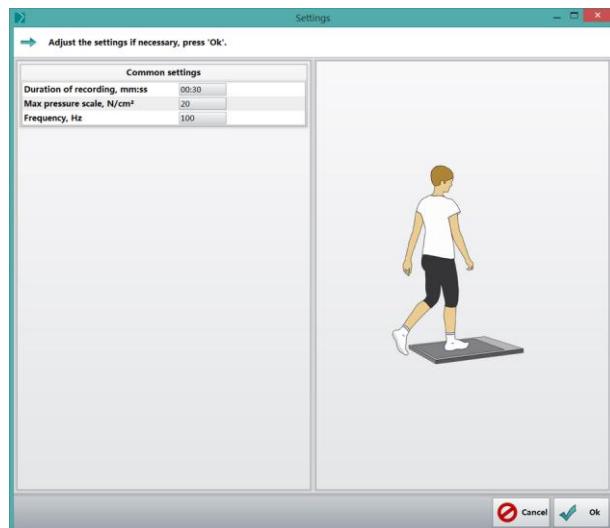
*In the Comparison Report the results of measurement A are marked with a white background and the results of measurement B with a grey background.*

The allocation to the respective measurement can also be seen in the header.

# 10 Roll-off analysis

With this module you carry out the roll-off analysis using a zebris FDM Systemzebris FDM System

## 10.1 Preparing the measurement (Measurement settings)

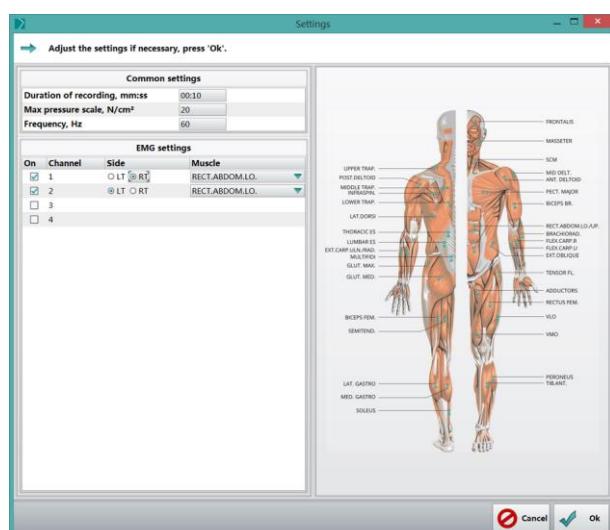


### Measurement settings

Under **Common Settings** you can specify the measuring duration individually in advance. 30 seconds are given by default.

In addition you can change the maximum of the pressure scale and the measuring frequency of the sensors.

By clicking on **Ok** your changes are saved and you will return to the module selection.



### Acquisition of analog data

*In addition to the roll-off analysis, analog signals of an external device can be recorded. Described in the following on the example of EMG:*

**Prerequisite** is that an EMG device has been added to the device settings (see **Hardware setup (device settings)**, p. 38).

### EMG settings

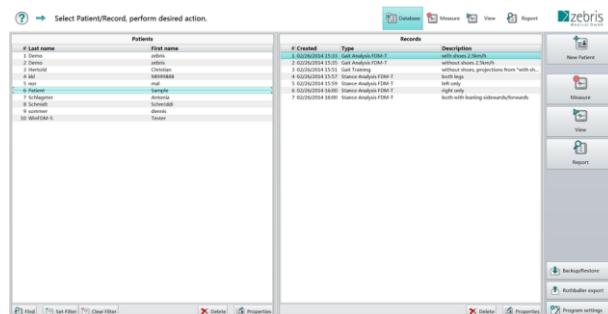
Set a tick per **channel** you would like to use on the left-hand side. As many channels are displayed as are available in the device.

Select per channel, which **side of the body** you would like to use and on which **muscles** you would like to record the EMG signal.

The graphic shows the anatomic allocation of the abbreviations used.

By clicking **Ok** the settings are saved and you will be redirected to the module selection.

## 10.2 Carry out measurement (Measuring mode)



### 1. Database

Click on **Measure** in the toolbar on the right.



### 2. Module selection

Select the module **Roll-off Analysis** and then click on **Start**.

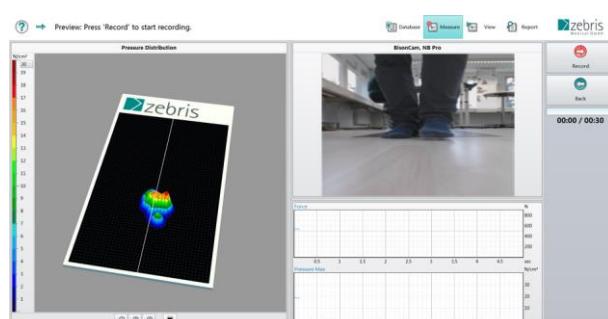


### 3. Preparation

Please ask your test person to stand next to the treadmill or on the side bar, so that a zero measurement can be taken in an unloaded state.

Then change to the Preview mode by clicking on **Next**.

By clicking on **Back** you will return to the module selection.



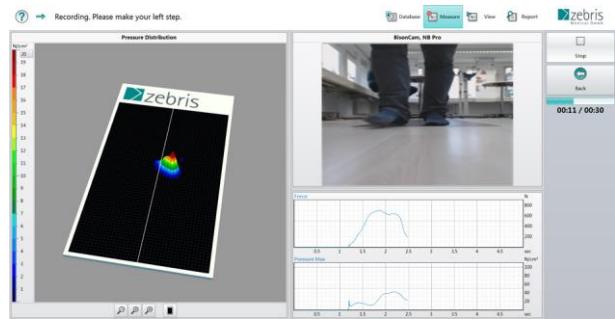
### 4. Preview/recording

In the Preview mode, the screen alongside appears.

The test person can walk over the platform for test purposes, data is only displayed, yet not stored.

The measurement can be started by clicking on **Record**.

By clicking **Back** you will return to the module selection.



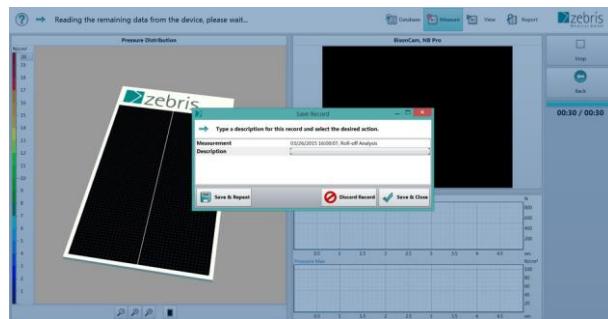
## 5. Measurement

After **Start** the recording the measuring signals are recorded over the preset measuring duration.

Your test person can arbitrarily often walk over the plate in the outlined directions with one foot each. Ideally you start with the left foot, the recommendation changes after each step to the other foot.

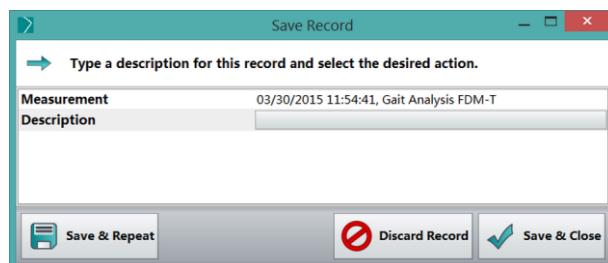
The green progress bar shows the elapsed measuring time. The measurement can be stopped at any time by clicking on the **Stop** button.

In the lower, right-hand part of the measurement screen, the force and pressure curves are shown in chronological sequence.



## 6. Save

After clicking on the **Stop** button, a dialog box appears.



### Save & continue

The recording is saved and you return to the Preview mode to carry out a new measurement.

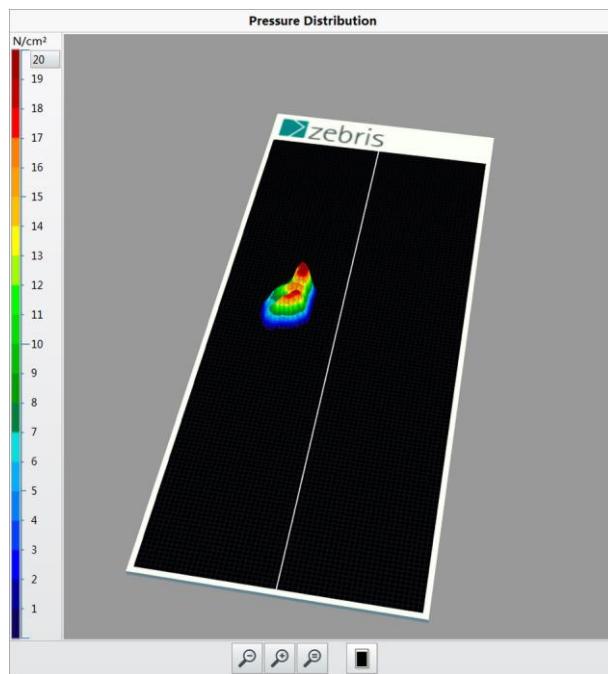
### Discard recording

The recording is discarded and you return to the Preview mode to carry out a new measurement.

### Save & close

The recording is saved and you return to the database.

## Roll-off analysis



The **color scale** to the left of this measuring window enables the color assignment of the pressure in  $N/cm^2$  exerted on the individual sensors.

The **maximum value** can be stated in the input field, top left. By pressing the **left mouse button and dragging** at the same time on the scale, the scaling can be changed.

In the left measuring window, the load distribution under the feet during the measurement is shown using a color mode, in either 2D or 3D, as required.

In **3D mode**, the view can be turned to the desired position by pressing the left mouse button. By pressing the middle mouse scroll wheel the platform can be moved in 3D.

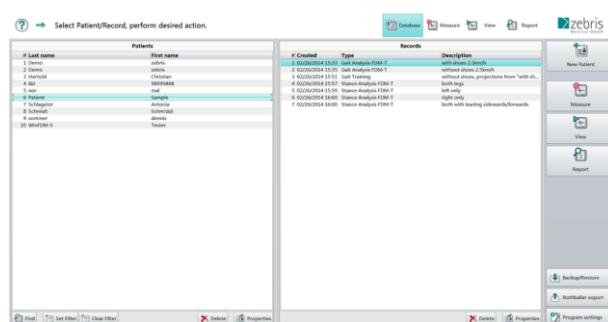
The **zoom** buttons serve for enlarging (+) or reducing (-) the platform presentation. By turning **mouse scroll wheel** it is similarly possible to zoom. With **customize** the platform presentation is centered whereby the zoom factor is determined automatically.

The **3D** button switches between the 2D or 3D presentation of the load distribution. The 2D presentation is activated when the button has a colored background.

## 10.3 Processing the measurement (View mode)

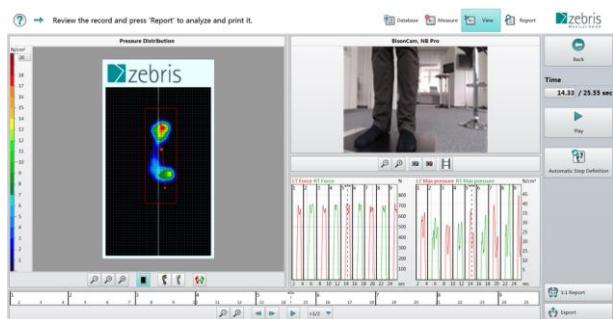
In the "View mode" you can view and play the measurements, limit the measuring interval. And when using a camera system, mark single images for the report as well as draw in angles. In the following, the individual functions of the View mode are explained in detail.

### 10.3.1 Basics



#### Opening the measuring dataset

Select a measuring dataset in the database and click on **View** in the toolbar on the right.



### Play the measurement

Click on **Play** in the toolbar on the right. The time display above the Play button shows the actual time of the measurement in seconds. Click on the box to enter a value

By clicking on **Back** you will return to the database.

### Export...

Here you can select between different export possibilities. For example, you can export a pressure picture per foot as jpg graphics (JPG).

### 1:1 Report

Opens the Report for the 1:1 printout. The data basis is the averaged stance phase of all the steps taken within the marked interval. You can select between the average resp. maximum stance phase.

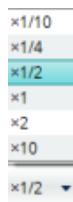
### Automatic step definition

By clicking on the corresponding button all previous steps are deleted and the automatic step definition for recognizing the steps of the test person's gait pattern is carried out again.

### 10.3.2 Functions



#### Playing the measurement



Automatic playing of the measurement by clicking on the Play button. The measurement recording is played and repeated until the Pause button is pressed.



#### Zoom

*Enlarging or reducing the platform display or the signal curves in the force/time diagram.*

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



#### Customizing

*The platform presentation is centered in this view mode, whereby the zoom factor is determined automatically.*



#### MPP

Display of the maximum pressure (Maximum Pressure Plot).



#### Roll-off line

Display of the roll-off line during the stance phase.



#### Change left/right side

*Here you can change the side of the selected footprint.*



#### 3D presentation

Switches the load distribution between the 2D and 3D presentation. The 2D presentation is activated when the button has a colored background.



#### Single images

Single images can be marked or deleted with this function. Marked pictures are transferred to the report.  
(see 7.3.4)

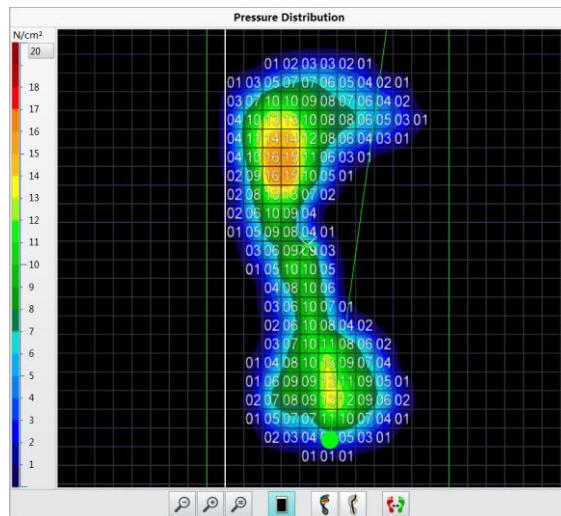


#### Selecting a video sequence of a gait cycle

Select automatically the video sequence of the gait cycle at the current

playing position. (see 7.3.4)

### 10.3.3 Visualization of the load distribution



#### Numerical display of the pressure values

In the 2D presentation, the pressure values of the roll-off pattern can be shown numerically.

To do this, deactivate the 3D mode by clicking on **3D** (if the button is not highlighted in color, the 3D presentation is active.)

By enlarging with the **middle mouse button** or **magnifier tool** the pressure values of the individual sensors and the limiting frame are displayed.



Please note that the presentation here has been smoothed, which can cause inaccuracies and rounding errors in the area at the edges of the pressure image displayed.

### 10.3.4 Selecting a certain interval for analysis in the Report

With zebris FDM it is possible to analyze either the total data volume recorded or only a certain interval.

#### Select measuring data

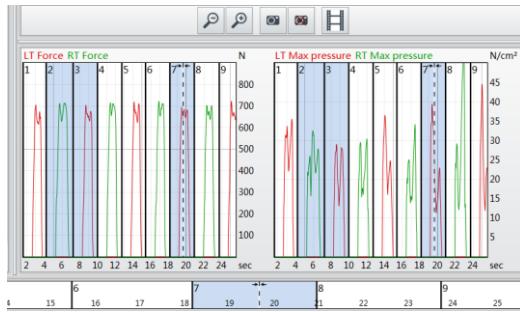


One cycle each marks a roll-off process in the recording. By double clicking the cycle (numbers ease the assignment) in the time line, it can be switched on or off for the report. For the report the area with the blue background is discarded and only the data in the white area is evaluated.

After each measurement all cycles are automatically displayed in the report.

#### Selecting video sequences

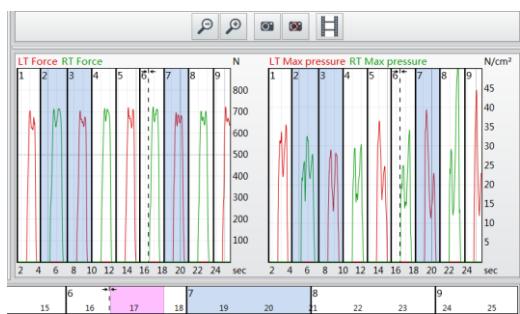
Please note, that the use of video cameras is not available with all modules.



## 1. Define a position

In order to transfer video images to the report, click on the desired position in the time-force diagram. The dotted line (cursor) is shifted to the clicked position.

You can shift the cursor with the left mouse button resp. the image back/forth button to the desired position.



## 2. Define the video interval

By clicking on the **movie symbol**, the gait cycle around the marked position is selected (each one step before/one step after).

In order to select a larger section, move the mouse cursor on a limitation line of the **violet section**, until it becomes a double cursor. While keeping the left mouse button pressed, you can now change the length of the video sequence by drawing the limitation line.

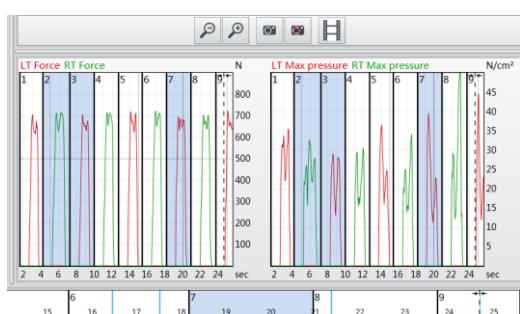
Delete the marking by pulling the limitations together until the marking disappears completely.

## Marking single images in the video, angles and length ratios

The displayed image section can be reduced or enlarged, using the magnifying glasses.

By clicking with the right mouse button on the image section, the following functions open in the context menu: "Copy current image in the clipboard" as well as "Save video under".

When recording with several cameras, a colored frame marks the currently selected video image.



## Marking a single image

Click on the desired position in the force-time diagram. The dotted line (cursor) is set at the clicked position.

Then click on the camera symbol under the video image. The marking appears as blue line in the bar „single images and video sequences“.

## Deleting a single image

Click on the single image marking in the bar „Single images and video sequence“

(blue line).

Then, click on the crossed out video symbol. In doing so, the marking is deleted. Of course, you can set the marking any time again.

### **Angles and Length ratios**

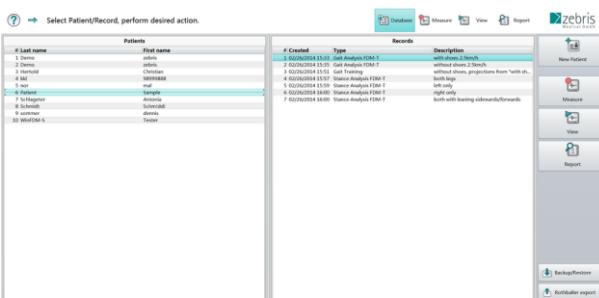
Draw two straight lines with the left mouse button directly in the video mode. Then the angles between the straight lines as well as the length ratio to one another are displayed automatically at the right bottom edge of the video image.

The drawn in angles and the length ratios are saved with the single image and displayed in the report.

## Roll-off analysis

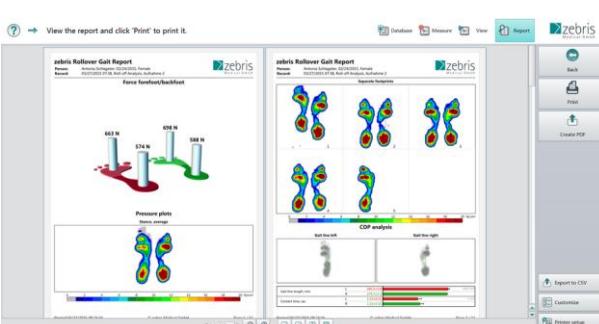
### 10.4 Roll-off analysis Report (Report mode)

In the "Report" mode, the gait parameters are assessed and shown which had previously been defined in the "View" mode.



#### Selecting the data set

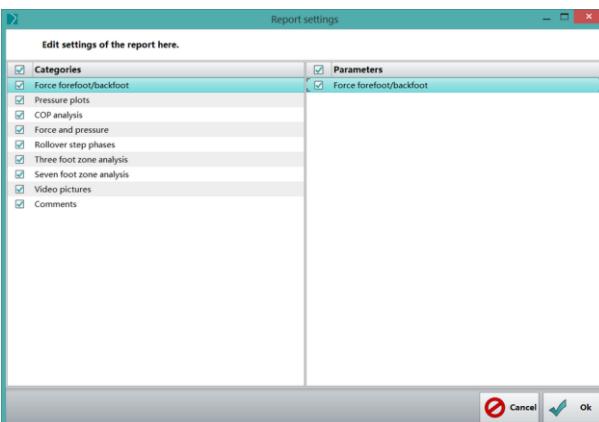
First mark a data set and then click on **Report**.



#### Align the Report

For displaying or hiding single parameters of the Report, click on **Customize** and you will be redirected to the report settings.

By clicking on the **OK** button your changes are saved and you will return to the database.



#### Report settings

On the left-hand side, categories are displayed. On the right-hand side, the single parameters of the category that has been chosen on the left, are displayed.

#### Fade in/fade out of parameters

By **placing a tick** on the right-hand side, the parameter is displayed in the report. Once the tick is removed, the corresponding parameter does not appear in the report.

By placing/removing a tick on the left-hand side, a **whole category** of parameters can be displayed or faded out.

By setting or removing a tick in the drop-down menu the stored data is neither changed nor deleted.



### 10.4.1 Functions

#### View

With these buttons you can stipulate how many pages of the Report are to be shown at one time. Alternatively the slide control for reducing/enlarging can be used.



#### Miniature view

Shows all the pages in an overview as small pictograms.



#### Whole page

Shows the pages in the original size. Due to different screen resolutions, the size can deviate from the size of the printer paper.



#### 1:1

Adjusts the display such the entire height of a page height can be shown.



#### Page width

The current page is zoomed to the full available width



#### Printing

The Report is printed out on the printer selected under [printer settings](#).



#### PDF export

PDF export to any directory or, e.g. to external data carriers such as USB sticks.



#### Customize

Showing and hiding categories of the Report.



#### Printer settings

Select printer and change settings for printing (e.g. format, page size, etc.).



#### CSV export

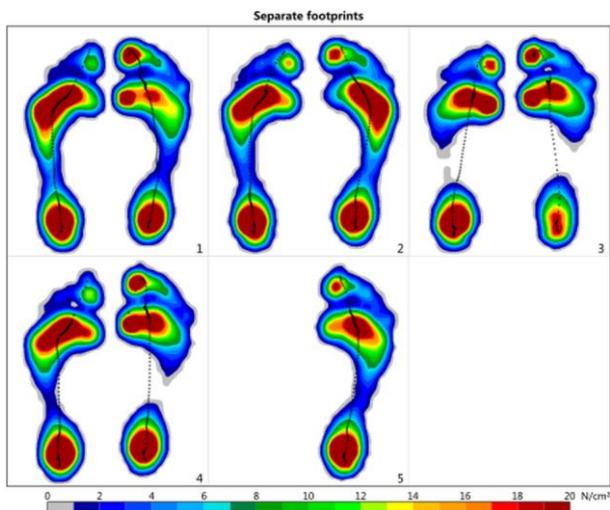
Export of the report parameters in a CSV file format (Comma separated values.).

#### 10.4.2 Description of the Report contents

The Report comprises the elements described in the following:

**zebris Gait Report**  
 Person: Sample Patient, 02/26/2014, Male  
 Record: 02/26/2014 15:33, Gait Analysis FDM-T, with shoes 2.5km/h

 zebris  
Medical GmbH

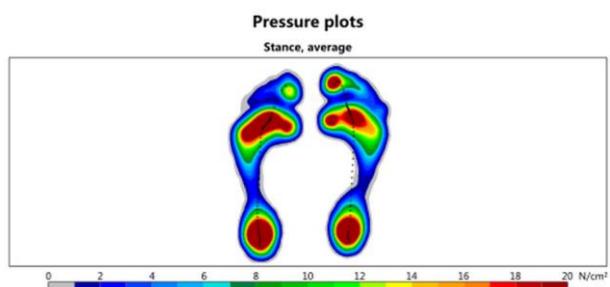


#### Header

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

#### Force fore foot/rear foot

*The maximum force for fore foot and rear foot is displayed in this 3D figure.*



#### Maximum pressure pictures

In this diagram the maximum pressure pictures are displayed in color. Each maximum pressure picture (MPP) contains the highest pressure values of a complete roll-off pattern. The line of the force application points is displayed separately for each foot.

#### Stance phase average

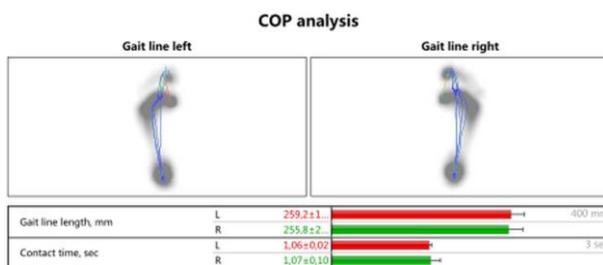
This diagram shows the average of all the maximum pressure pictures recorded.

#### Stance phase maximum

This diagram shows the absolute maximum pressure picture of all the maximum pressure pictures recorded.

#### Color scale

The color scale enables the load distribution to be quantified.



#### COP analysis

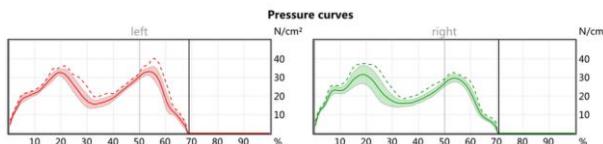
This block analyzes the course of the center of pressure (COP) during the selected step cycles. When taking the double-standing phase and the load transfer into consideration, the typical butterfly diagram of the force application

points is produced.

#### Gait line left and right

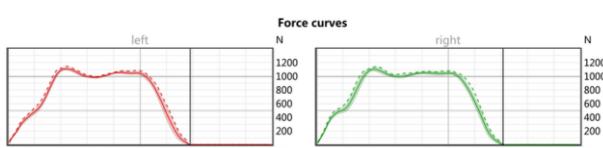
Here the lines of the force application points are shown separately for each foot.

### 10.4.3 Force & Pressure



#### Average maximum pressure

Presentation of the averaged and normalized pressure curves. The standard deviation is shown as a shaded area, and the dotted line represents the maximum values. The vertical line separates the stance and swing phase.



#### Average force

Diagram of the average vertical reaction force. The area of the standard deviation is indicated as a shadowed area. The height of the maximum force and its localization related to the gait cycle are given for the heel and forefoot for the left and right side, respectively. The vertical line separates the stance and swing phase.

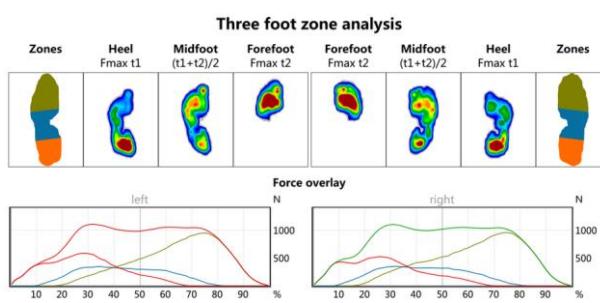
Force parameters			
Maximum force1, N	L	1107.8	1400 N
	R	1102.3	100%
Time maximum force1, %	L	21	
	R	21	100%
Maximum force2, N	L	1055.6	1400 N
	R	1049.6	
Time maximum force2, %	L	42	50
	R	41	100%

#### Force parameters

Shown here are the amplitudes recorded in the force curve together with their position in the gait cycle.

## Roll-off analysis

### 10.4.4 Three foot zone analysis



Here the load surface area of the left and right side of the body is divided into the zones: forefoot, mid-foot and heel and shown in color. A force curve corresponds in the respective color for each zone.

The maximum pressure pictures of the entire load surface area of the left and right side of the body are shown at three fixed times.

**Fmax t1** Time of the maximum heel force

**Fmax t2** Time of the maximum force on the forefoot

**(t1+t2)/2** Load distribution between the two times t1 and t2



Here the parameters are shown as a bar chart and briefly described the indicator indicates the standard deviation in each case.

#### Load change

The absolute load change from the heel to the forefoot during the stance phase given as a percentage.

#### Maximum force, N

The average maximum values reached in N/cm<sup>2</sup> for the three zones: forefoot width, mid-foot and heel.

#### Maximum pressure, N/cm<sup>2</sup>

The average maximum values reached in N/cm<sup>2</sup> for the three zones: forefoot width, mid-foot and heel.

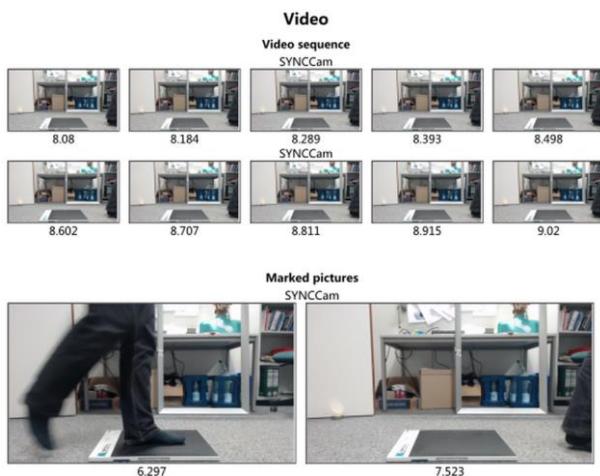
#### Time maximum force, % of stance time

Der durchschnittliche Zeitpunkt im Gangzyklus, bei dem die Maximalwerte in Newton für die drei Zonen Vorfußbreite, Mittelfuß und Ferse erfasst wurden.

#### Contact time, % of stance time

The average contact time of the three zones, forefoot width, mid-foot and heel as a percentage.

### 10.4.5 Video



#### Camera - Video sequence

Here, the stride phase defined in the View module, is shown as a video sequence of ten images with the same time interval (given in seconds).

#### Camera – Marked pictures

Shows the individual images marked in the "View" module, including all the angles and lines defined there. Underneath the image the recording time is shown in seconds.

### 10.4.6 Comments

Patient comments
wearer of glasses
Record comments/Recommendations
Pelvis drop

#### Patient comment

Shows the patient comment stored in the database.

For notes on setting up a patient comment see **Comments & Clips**, p. 27.

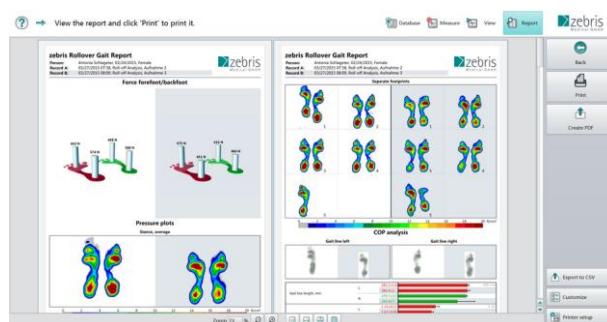
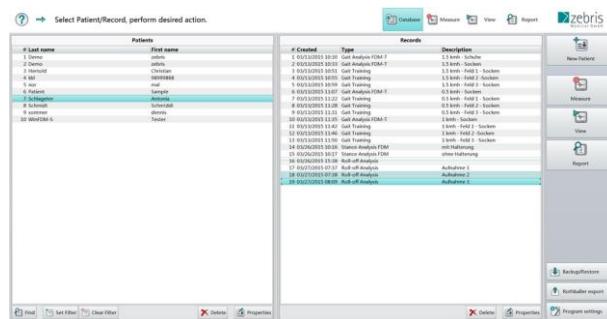
#### Comment on the recording

Shows the comment on the recording, stored in the database.

For notes on setting up a recording comment see **Details of the recording**, p. 29.

## Roll-off analysis

### 10.4.7 Comparing two measurements



### Selecting the data sets

In order to compare two measurements with each other, they are first marked in the database using the **Ctrl key + left mouse button**.

Then the Report can be called up against as usual, by clicking on the Report button.

### Presentation in the Report

In the Comparison Report the results of measurement A are marked with a white background and the results of measurement **B with a grey background**.

The allocation to the respective measurement can also be seen in the header.

### 10.4.8 Help for evaluating the data acquired

For the dynamic measurement, the load distribution under the foot is recorded during gait/running on a force/pressure measuring platform.

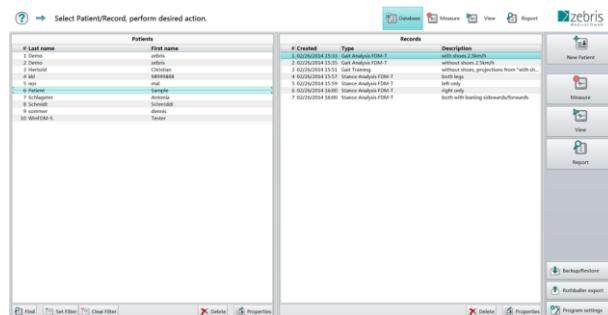
For a healthy foot on which the weight can be exerted in the normal way, the "ideal" load distribution under the foot during gait is shown by a semispherical load distribution under the heel, a contact of the entire foot with the exception of the area of the medial longitudinal arch and an even load distribution under the forefoot (for this, the maximum load may lie both under the ball of the big toe and under the center of the forefoot).

For "normal gait" the following sequence for exerting weight on the foot when contacting the ground is considered "ideal": - heel - mid-foot - forefoot lateral - forefoot central - forefoot medial - toes (I and/or II/III). The maximum load should not exceed 40-N/cm<sup>2</sup> under the heel and 55-N/cm<sup>2</sup> under the forefoot and all the toes should support the force exerted on the foot. The force/time curve should show an M-shaped course (camel's back) For sensitive feet (e.g. of diabetics, etc.), local pressure peaks should be avoided and the maximum pressure load should be less than approx. 25-N/cm<sup>2</sup>, in order to avoid any damage to the sole of the feet.

# 11 Virtual Training

Virtual training can be carried out using this module together with the appropriate zebris FDM System System.

## 11.1.1 Carrying out the Virtual Training (Measuring Mode)



### 1. Database

Click on **Measure** in the toolbar on the right.

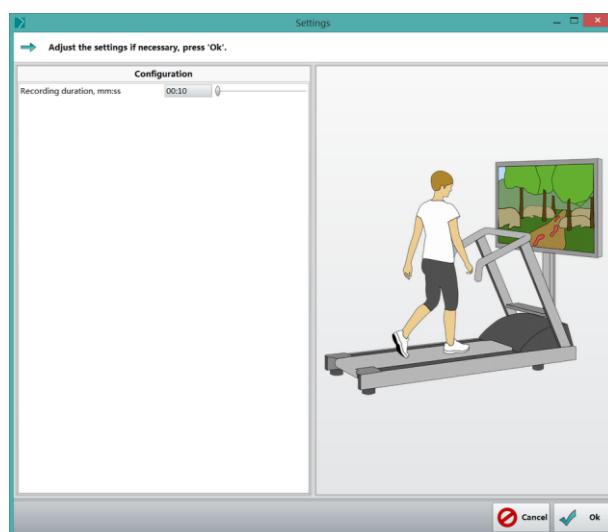


### 2. Module selection

Select the **Virtual Training** module.

Under **Settings** specify the duration of the recording.

By clicking on **Back** you will return to the database.



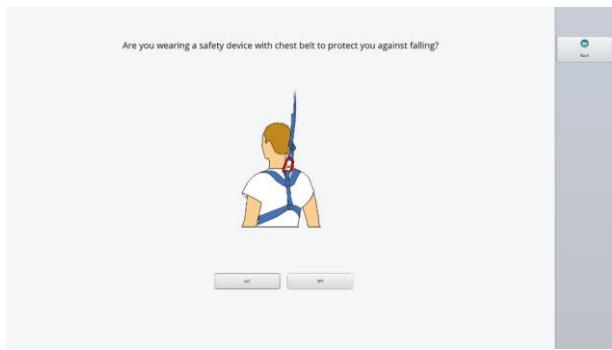


### 3. Preparation

Please ask your patient to stand next to the treadmill or on the side bar, so that a zero measurement can be taken in an unloaded state.

Then select the level that is to be played by clicking on **Next**. The standard duration of the training is set to 1 minute. If you only purchased the demo version of the virtual training you cannot set the duration of the training individually.

By clicking on **Back** you will return to the database.



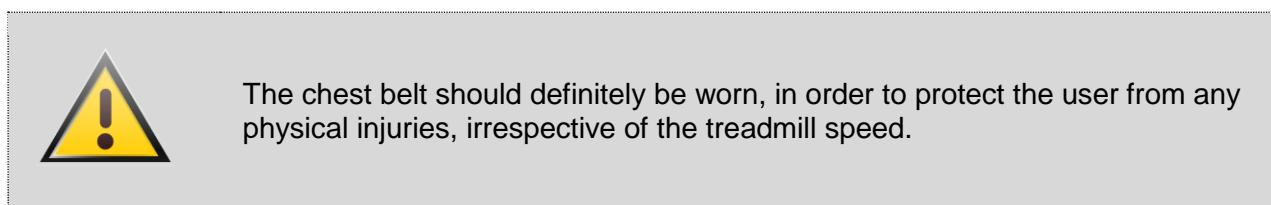
### 4. Safety prompt

After having selected the level and set the training time, the safety prompt appears when clicking on **Next**.

If you have secured your test person with a chest strap, click on **YES**.

If you only have a belt clip on your treadmill as a safeguard, click on **NO**. The maximum training speed is limited in this case to 3 km/h. At a higher speed, a message appears requesting you to reduce the speed.

By clicking on **Back** button you will return to the Module selection.





## 5. Training

At the beginning of the training the screen alongside appears.

Start the treadmill.

The patient ought to walk on the treadmill for a few minutes to get used to the feeling.

By clicking on **Record** a measurement can be carried out during the training. The measuring time was determined before in the measuring settings. The measuring time is set to 10 seconds as a standard.

By clicking on the **Back** button you will return to the level selection.



## 6. Recording

Once the measurement has started, the measuring signals are recorded for 10 seconds as long as the pre-defined measuring time has not been changed. The green progress bar shows the elapsed measuring time.

The measurement can be stopped at any time by clicking on the **Stop** button.

Any number of measurements can be taken one after the other, but only the last will be saved.

By clicking on the **Back** button you will return to the level selection.



## 7. End of the training

After the set training time is over, the training parameters (training time, stretch and points) appear.

By clicking on **Repeat** the training is repeated with the same training duration.

By clicking on **Finish** or **Back** you will return to the database.

### 11.1.2 Explanation of the obstacles



#### **Tree trunk**

Tree trunks should be climbed over or bypassed.



#### **Tree stump**

The tree stumps sink when they are trodden on, as a function of the load exerted. The higher the pressure, the lower the tree stumps sink into the ground in the forest.



#### **Stones**

Here stones are to be found. If the stones are not trodden on but the water instead, the water turns red and points are deducted.



#### **Puddles**

Puddles should be jumped over or run round. If the runner treads in the puddle, one point is subsequently deducted.



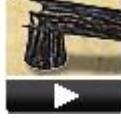
#### **Wooden planks**

Points can be gained by balancing on the wooden planks. If the runner treads to the side of it, one point is deducted.



#### **Parallel planks**

By balancing on two parallel wooden planks, points can be gained.



#### **Falling trees**

Falling trees should be climbed over or bypassed. If the runner treads on a tree trunk, one point is subsequently deducted.



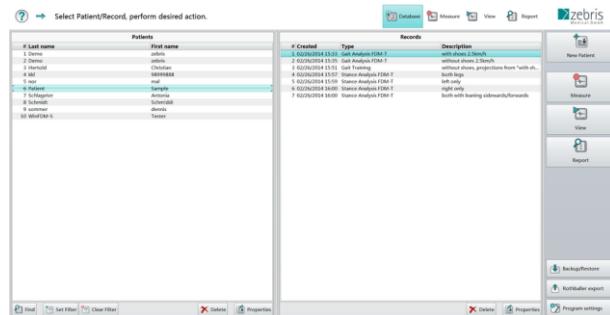
#### **Rolling stones**

Rolling stones should be jumped over or bypassed. If the runner treads on one of the stones, one point is subsequently deducted.

## 11.2 Processing the measurement (View mode)

In the "View mode" you can view and play the measurements, limit the measuring interval. And when using a camera system, mark single images for the report as well as draw in angles. In the following, the individual functions of the View mode are explained in detail.

### 11.2.1 Basics



#### Opening the measuring dataset

Select a measuring dataset in the database and click on **View** in the toolbar on the right.

#### Play the measurement

Click on **Play** in the toolbar on the right. The time display above the Play button shows the actual time of the measurement in seconds. Click on the box to enter a value

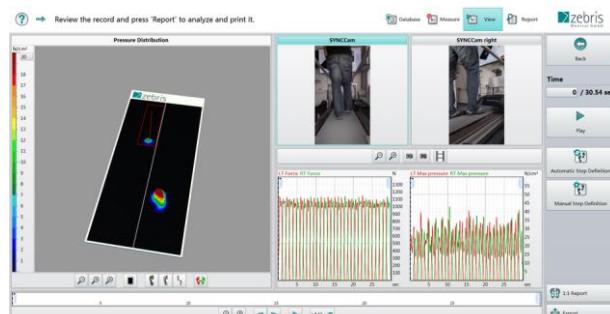
By clicking on **Back** you will return to the database.

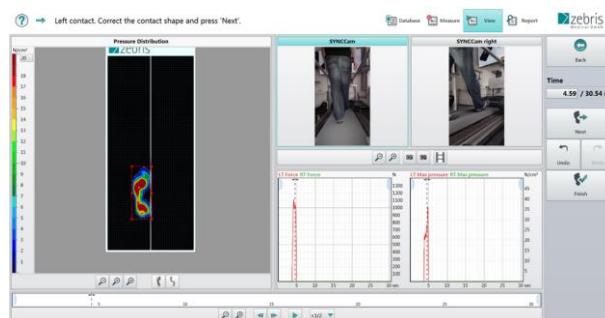
#### Export...

Here you can export a pressure image per foot as jpg graphic. After having selected the desired image, you are asked to assign a saving destination and a name.

#### 1:1 Report

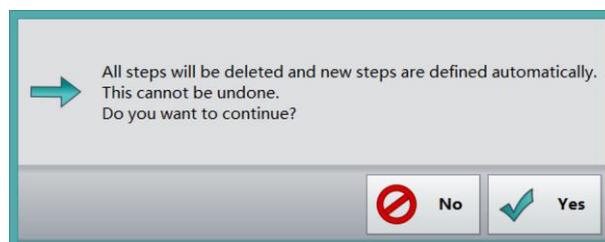
Opens the Report for the 1:1 printout. The data basis is the averaged stance phase of all the steps taken within the marked interval. The average, maximum resp. medium stance phase can be selected.



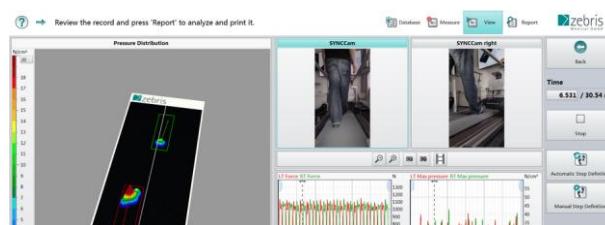


## Automatic step definition

By clicking on the corresponding button, the following dialog window opens (see below).



When clicking **Ok**, all previously defined steps are deleted and the automatic step definition is carried out again.



## Manual step definition

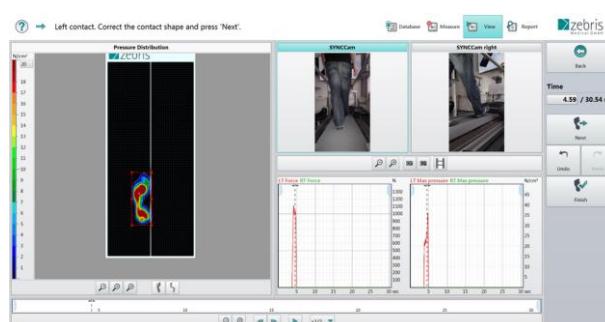
In case that the automatic step definition has not recognized the test person's gait pattern, you can also define the steps manually.

Therefore, click on **Manual Step Definition**.

All steps are deleted and you are redirected to the mode of manual definition.



*The manual step definition for the gait analysis FDM is momentarily not available.*



By holding down **the left mouse button** you can navigate over the timeline with the help of the vertical dashed line (cursor).

By pressing **Undo/Repeat** you can jump back and forth in the work process.

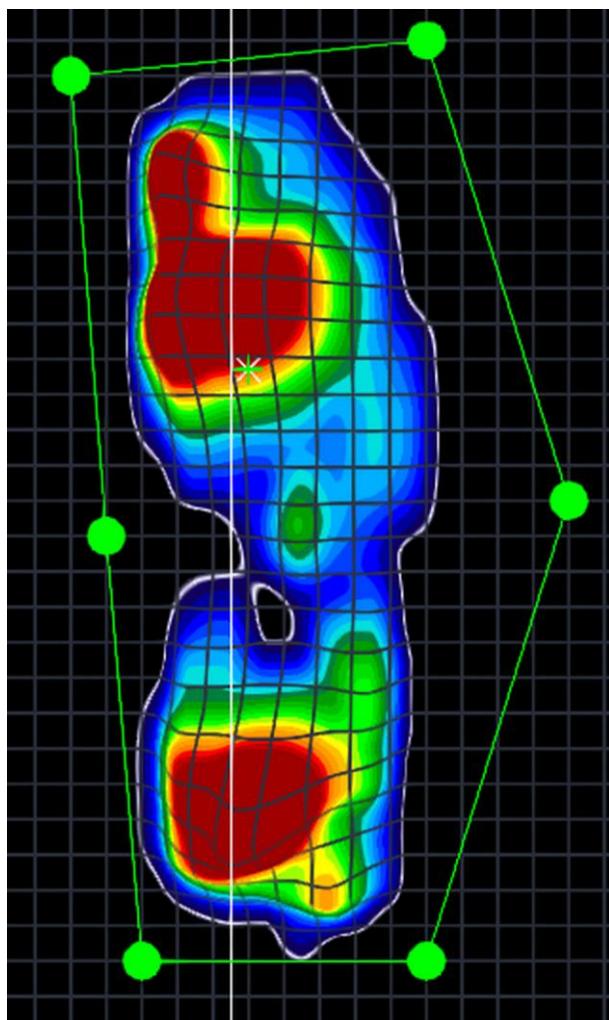
### 1. Navigate to the footprint

Navigate in the time course to the left

footprint, with which you would like to start. If you prefer to start with the right footprint, then click on **Next**.

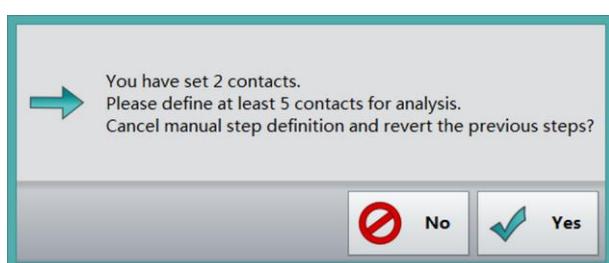
## 2. Click on the footprint

Click on a part of the footprint that is to be defined. A frame around the footprint is then generated automatically.



Now the displayed frame can be adjusted by using the displayed points. If required, shift the points into another position inside the frame by **dragging with the left mouse** button.

After having finished the manual step definition, click the button **Finish** and your changes are saved.



You will have to define at least five steps, as this number is necessary for the evaluation of the report.

If you have defined fewer steps, a note appears after clicking Finish.

**Close** it and define more steps.

## 11.2.2 Functions

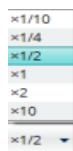


### Playing the measurement

Automatic playing of the measurement by clicking on the Play button. The measurement recording is played and repeated until the Pause button is pressed.

### *Image forw./backwards*

The arrows with the line directly next to them take you one image forwards, or backwards, resp.



### Playing speed

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

### Zoom



Enlarging or reducing the platform display or the signal curves in the force/time diagram.

***The magnifying glass with a minus sign*** reduces the display by 20%

***The magnifying glass with a plus sign*** enlarges the display by 20%

### Adjusting

The 3D depiction is centered in the view mode and the zoom factor is automatically determined, so that the model becomes completely visible.



### MPP

Display of the maximum pressure (Maximum Pressure Plot).



### Gait line

Display of the COP pattern in the gait phase.



### Roll-off line

Display of the roll-off line during the stance phase.



### Swapping left/right side

Here you can swap the side assignment of the foot prints.



### 3D presentation

Switches the load distribution between the 2D and 3D presentation. The 2D presentation is activated when the button has a colored background.



### Single images

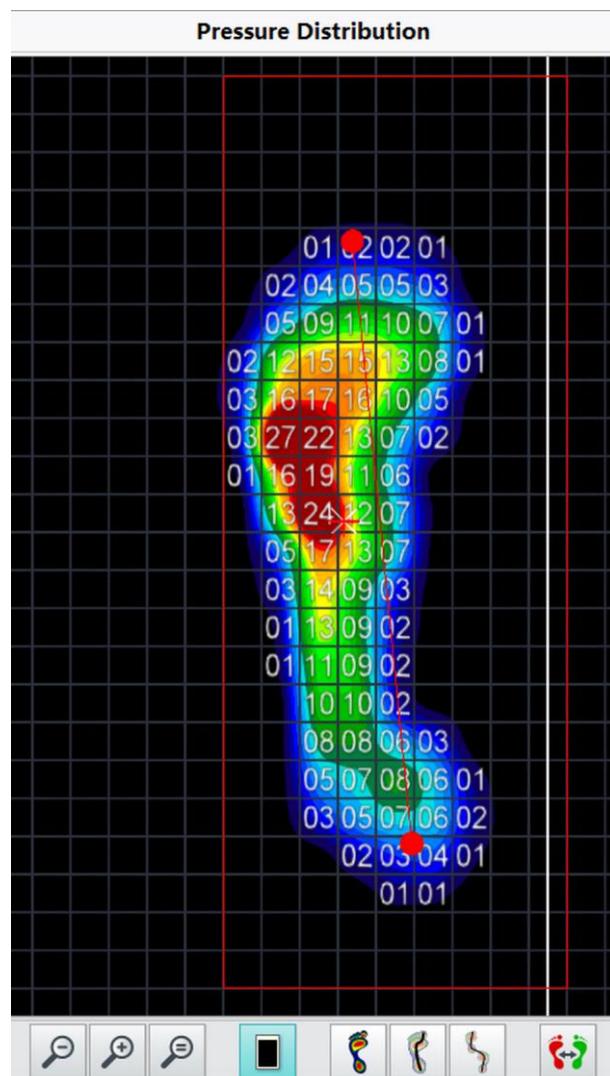
Single images can be marked or deleted with this function. **Marked pictures** are transferred to the report.  
(see 7.3.4)



### Selecting a video sequence of a gait cycle

Select automatically the video sequence of the gait cycle at the current playing position. (see 7.3.4)

## 11.2.3 Visualization of the load distribution



### Numerical display of the pressure values

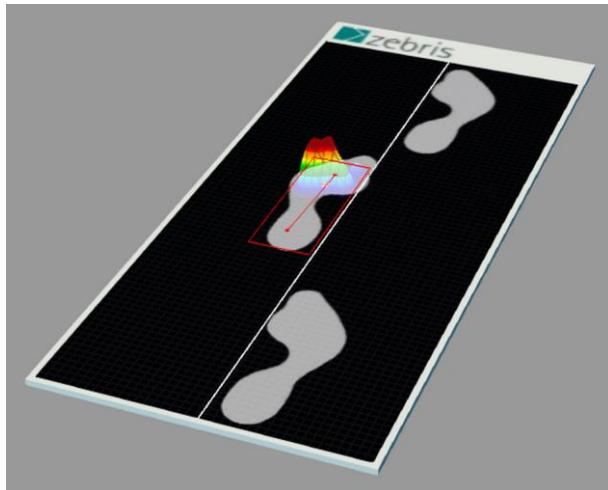
In the 2D presentation, the pressure values of the roll-off pattern can be shown numerically.

To do this, deactivate the 3D mode by clicking on **3D** (if the button is not highlighted in color, the 3D presentation is active.)

By enlarging with the **middle mouse button** or **magnifier tool** the pressure values of the individual sensors and the limiting frame are displayed.



Please note that the presentation here has been smoothed, which can cause inaccuracies and rounding errors in the area at the edges of the pressure image displayed.



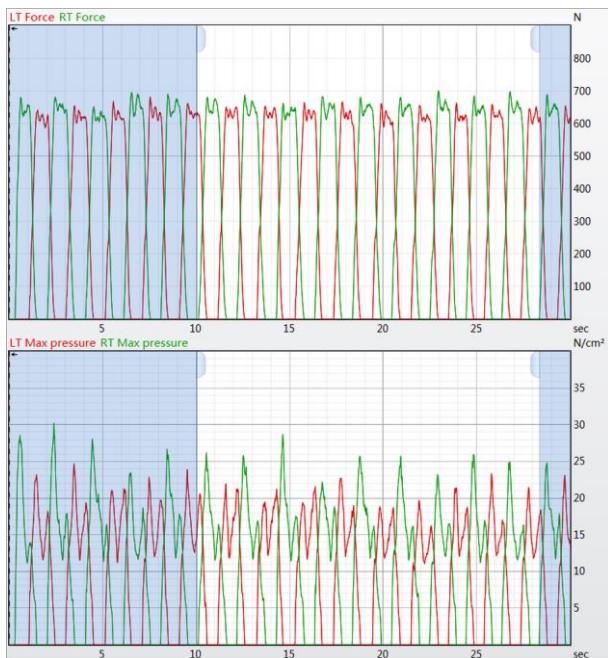
Recordings that are carried out with visual cueing, the projected footprints are shown as a gray shadow.

In this way, it is possible to make a visual assessment of the training in advance.

#### 11.2.4 Selecting a certain interval for analysis in the Report

With zebris FDM it is possible to analyze either the total data volume recorded or only a certain interval.

##### Select measuring data



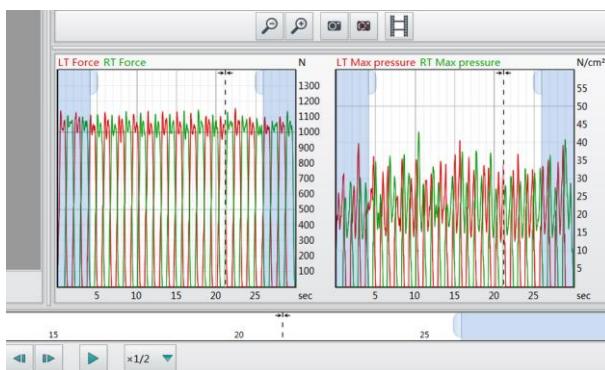
Two **blue limitation lines** in the force/- time diagram mark the area for analysis. For the Report the area with the blue background is discarded and only the data in the white area is evaluated.

##### Customizing the area for analysis

Move the cursor over the limitation line from blue to white. The cursor changes to a double arrow. With the left mouse button pressed you can now **restrict the area for analysis by dragging the limitation lines**.

##### Selecting video sequences

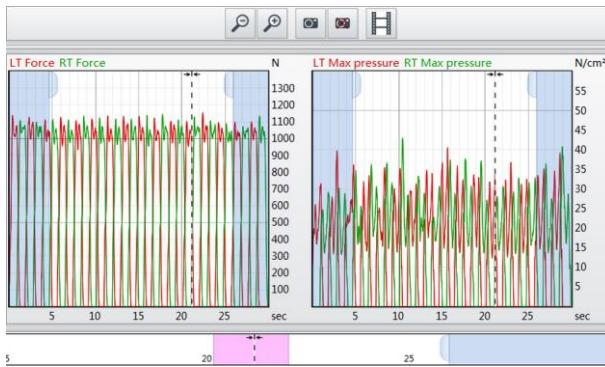
Please note, that the use of video cameras is not available with all modules.



## 1. Define a position

In order to transfer video images to the report, click on the desired position in the time-force diagram. The dotted line (cursor) is shifted to the clicked position.

You can shift the cursor with the left mouse button resp. the image back/forth button to the desired position.



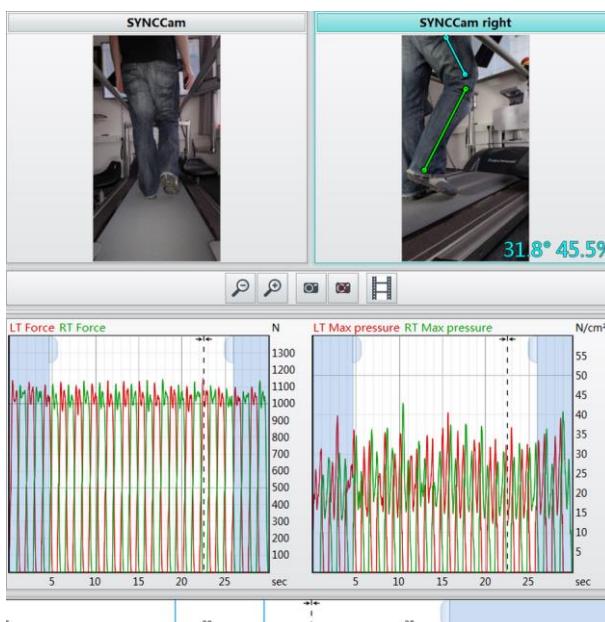
## 2. Define the video interval

By clicking on the **movie symbol**, the gait cycle around the marked position is selected (each one step before/one step after).

In order to select a larger section, move the mouse cursor on a limitation line of the **violet section**, until it becomes a double cursor. While keeping the left mouse button pressed, you can now change the length of the video sequence by drawing the limitation line.

Delete the marking by pulling the limitations together until the marking disappears completely.

## Marking single images in the video, angles and length ratios



Using the magnifying glass, the displayed image section can be enlarged or minimized.

By clicking with the right mouse button on the image section, the following functions in the context menu open: "Copy current image in the clipboard" as well as "Save video under". When it comes to recordings with several cameras, a colored frame marks the currently selected video image.

## Marking a single image

Click on the desired position in the force-time diagram. The dotted line (cursor) is set at the clicked position.

Then click on the camera symbol under the video image. The marking appears as blue line in the bar „single images and video sequences“.

#### **Deleting a single image**

Click on the single image marking in the bar „Single images and video sequence“ (blue line).

Then, click on the crossed out video symbol. In doing so, the marking is deleted. Of course, you can set the marking any time again.

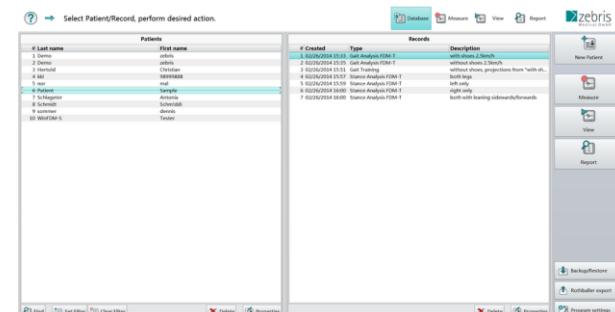
#### **Angles and Length ratios**

Draw two straight lines with the left mouse button directly in the video mode. Then the angles between the straight lines as well as the length ratio to one another are displayed automatically at the right bottom edge of the video image.

The drawn in angles and the length ratios are saved with the single image and displayed in the report.

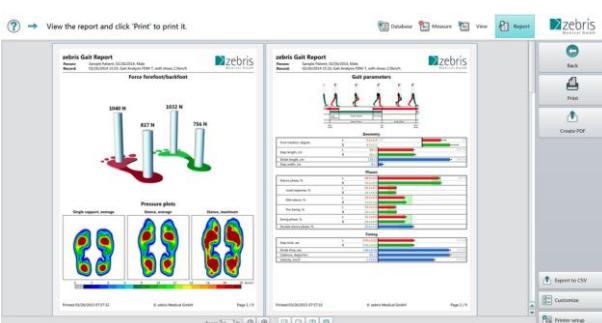
## 11.3 Gait Analysis Report (Report mode)

In the "Report" mode, the gait parameters are assessed and shown which had previously been defined in the "View" mode.



### Selecting the data set

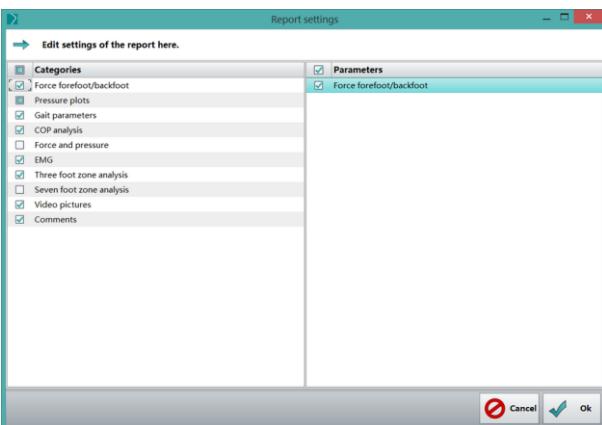
First mark a data set and then click on **Report**.



### Align the Report

For displaying or hiding single parameters of the Report, click on **Customize** and you will be redirected to the report settings.

By clicking on the **OK** button your changes are saved and you will return to the database.



### Report settings

On the left-hand side, categories are displayed. On the right-hand side, the single parameters of the category that has been chosen on the left, are displayed.

### Fade in/fade out of parameters

By **placing a tick** on the right-hand side, the parameter is displayed in the report. Once the tick is removed, the corresponding parameter does not appear in the report.

By placing/removing a tick on the left-hand side, a **whole category** of parameters can be displayed or faded out.



By setting or removing a tick in the drop-down menu the stored data is neither changed nor deleted.

### 11.3.1 Functions

#### View

With these buttons you can stipulate how many pages of the Report are to be shown at one time. Alternatively the slide control for reducing/enlarging can be used.

 1:1

Adjusts the display such the entire height of a page height can be displayed.

#### Page width



The current page is zoomed to the fully available width.

#### Whole page



Shows the pages in the original size. Due to different screen resolutions, the size can deviate from the size of the printer paper.



#### Miniature view

Shows all the pages in an overview as small pictograms.



#### Printing

The Report is printed out on the printer selected under **printer settings**



#### PDF export

PDF export to any directory or, e.g. to external data carriers such as USB sticks.



#### Customize

Showing and hiding single report parameters.



#### Printer settings

Select printer and change settings for printing (e.g. format, page size, etc.).



#### CSV export

Exporting the parameters of the report in a CSV file format (comma separated values).

### 11.3.2 Description of the Report contents

The Report comprises the elements described in the following:

**zebris Gait Report**  
 Person: Sample Patient, 02/26/2014, Male  
 Record: 02/26/2014 15:33, Gait Analysis FDM-T, with shoes 2.5km/h

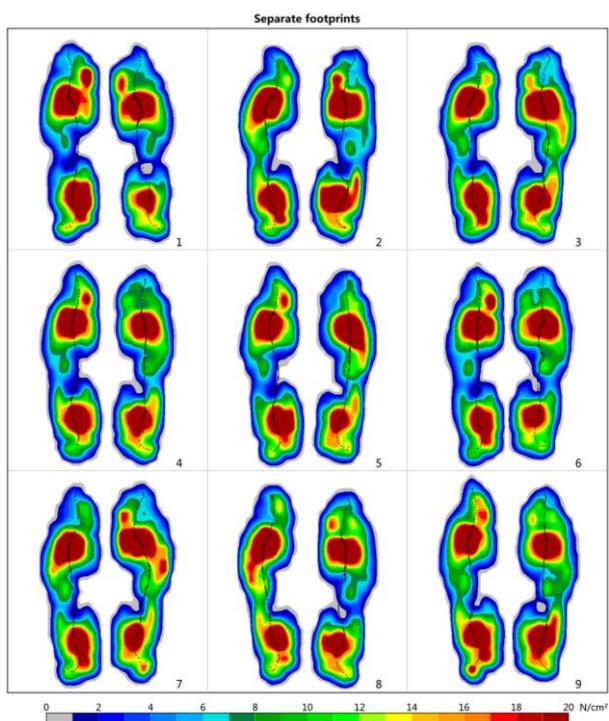


#### Header

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

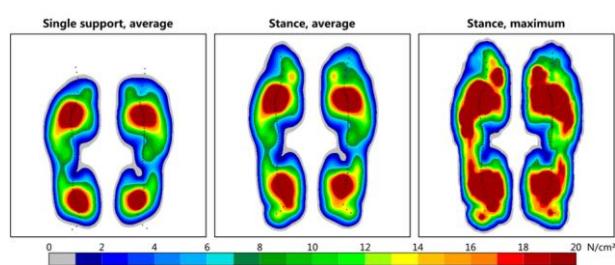
#### Force fore foot/rear foot

In this 3D depiction the maximum force for the fore and rear foot is displayed.



#### Maximum pressure pictures

In this diagram the maximum pressure pictures are displayed in color. Each maximum pressure picture (MPP) contains the highest pressure values of a complete roll-off pattern.



#### Mid-stance phase, average

This diagram shows the average maximum pressure picture of the mid-stance phase of all the maximum pressure pictures recorded.

#### Stance phase average

This diagram shows the average of all the maximum pressure pictures recorded.

#### Stance phase maximum

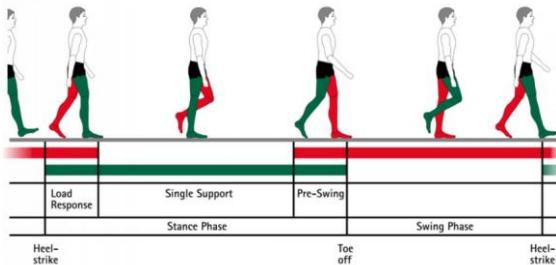
This diagram shows the absolute maximum pressure picture of all the maximum pressure pictures recorded.

### Color scale

The color scale enables the load distribution to be quantified.

### Gait line

The line of the force application points are displayed in the pressure pictures for each foot separately.



### Gait phases

Here you see the individual gait phases illustrated.

Geometry			
Foot rotation, degree	L	5.3±0.7°	13°
	R	8.0±2.1	
Step length, cm	L	64.2	170 cm
	R	67.2	
Stride length, cm	L	131±3	170 cm
	R	85±2	

### Geometry

Here the local gait parameters, i.e. foot rotation, step length, stride length and step width are displayed.

Phases			
Stance phase, %	L	69.0±1.0	100 %
	R	70.7±1.0	
Load response, %	L	20.3±0.9	
	R	19.6±1.0	
Mid stance, %	L	29.0±0.8	
	R	30.9±1.1	
Pre-Swing, %	L	19.7±1.1	
	R	20.2±0.9	
Swing phase, %	L	31.0±1.0	
	R	29.3±1.0	
Double stance phase, %	L	39.8±1.0	

### Phases

Here, the step phases in the two main phases, i.e. the stance phase and swing phase, are shown. The stance phase is divided into the two double-standing phases, i.e. loading response phase and roll-off phase and also the mid-stance phase.

The sections marked in bright green are reference values.

Timing			
Step time, sec	L	0.94±0.03	2.3 sec
	R	0.92±0.02	
Stride time, sec	L	1.86±0.04	2.3 sec
	R	1.86±0.04	
Cadence, steps/min	L	65±1	14 steps/min
	R	65±1	
Velocity, km/h	L	2.5±0.0	4 km/h
	R	2.5±0.0	

### Timing

Includes the time-dependent gait parameters, i.e. step time, stride time, cadence and the average speed of the interval analyzed.

## 11.3.3 Explanation of gait parameters

### Foot rotation, degree

Describes the angle between the longitudinal axis of the foot and the running direction.  
Negative value = inward rotation, positive value = outward rotation

### Step width, cm

Describes the distance between the right and left foot.

### Step length, cm

Describes the distance between the heel contact of one side of the body and the heel contact of the contralateral side.

### Step time, sec.

Describes the phase within a gait cycle between the heel contact of one side of the body and the heel contact of the contralateral side.

**Stance phase, %**

Describes the phase of a gait cycle in which the foot has contact with the ground.

**Loading response phase, %**

Describes the phase between the initial ground contact and contralateral toe off.

**Mid-stance phase, %**

Describes the contralateral toe-off phase and the transfer of the body's center of gravity over the weight-bearing foot.

**Pre-swing phase, %**

Describes the phase during a gait cycle that begins at contralateral initial contact (when the heel of the contralateral side touches the ground) and ends at toe off of the viewed side of the body.

**Swing phase, %**

Describes the phase of a gait cycle during which the foot has no contact with the ground.

**Double-standing phase, %**

Sum of the loading response phase and the pre-swing phase.

**Double-stride length, cm**

Describes the distance between two heel contacts on the same side of the body.

**Double-stride time, sek**

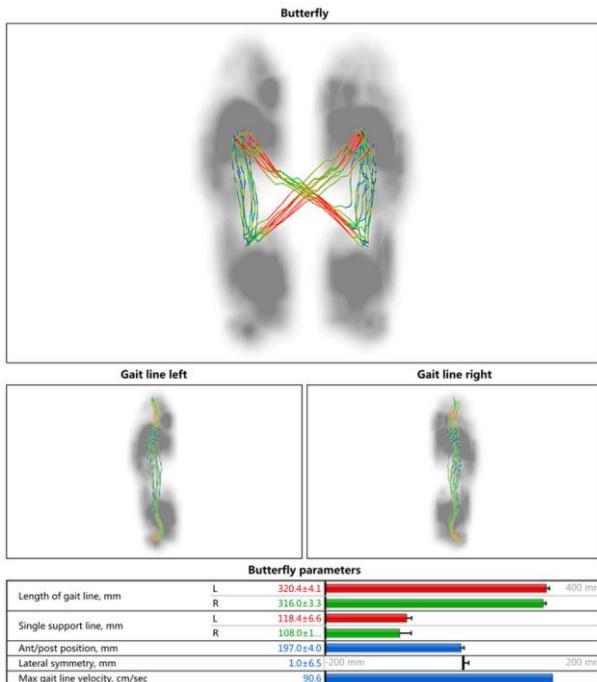
Time span of a stride.

**Cadence, steps/minute**

Step frequency

**Speed, km/hr**

Measured average gait speed during the analyzed measuring interval.



### Butterfly diagram

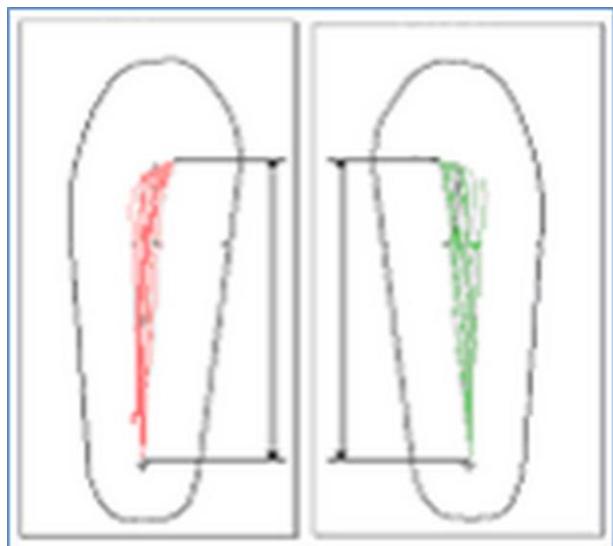
This block analyzes the course of the center of pressure (COP) during the selected step cycles. In doing so the COP tracks that are displayed in color correspond to different levels of speed (red: fast, green: intermediate, blue: slow). When taking the double-standing phase and the load transfer into consideration, the typical butterfly diagram of the force application points is produced.

### Gait line left and right

Here the lines of the force application points are shown separately for each foot.

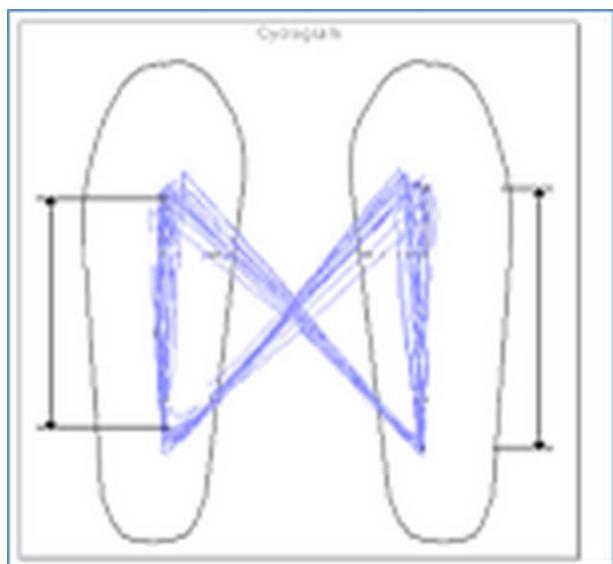
The parameters for the butterfly diagram are described in more detail in the next section.

#### 11.3.4 Explanation of the butterfly diagram



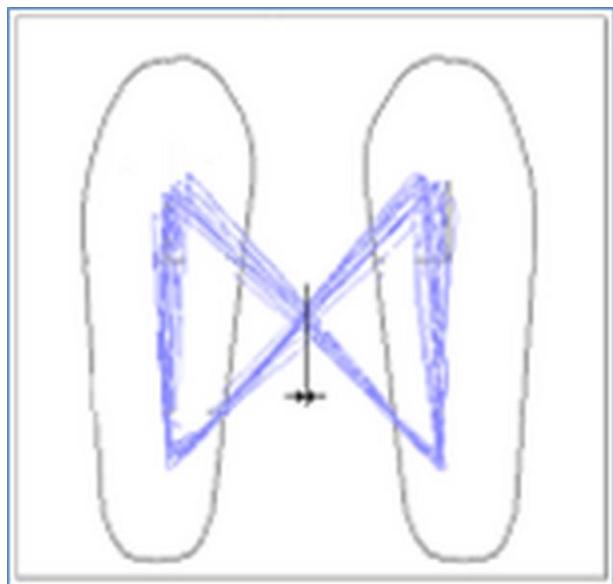
##### Length of the gait line

The parameter "Length of the gait line" is characterized by the position of the center of pressure (COP). Only the ground contacts of one side of the body are taken into account. This parameter covers the progression of the COP of all the steps recorded of one side of the body. All the other parameters can be seen in the cyclograms.



##### Mid-stance phase

This parameter corresponds to the average length of the lines that show the progression of the COP of one side of the body, when all the ground contacts are taken into consideration.

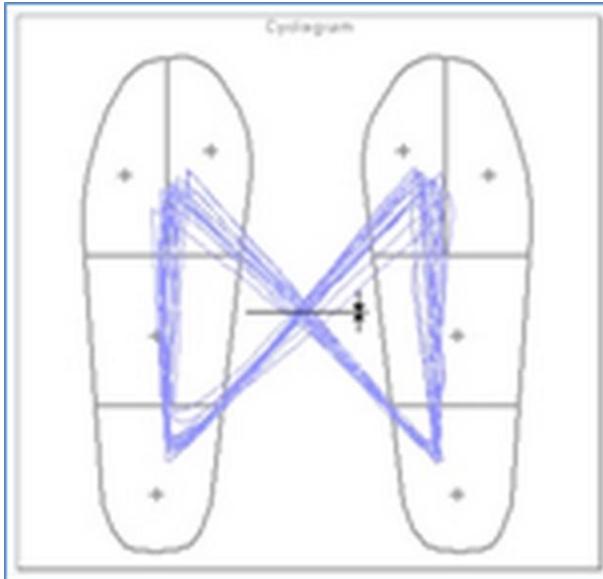


##### Anterior/Posterior Position

This parameter describes the shift forwards or backwards of the COP intersection point in chronological sequence in the cycrogram display, taking all the steps into consideration. The initial or zero position is the rearmost place where the heel contacts the ground.

### Anterior/posterior variability

This describes the standard deviation in the anterior/posterior position that results when taking all the steps into consideration.



### Lateral shift

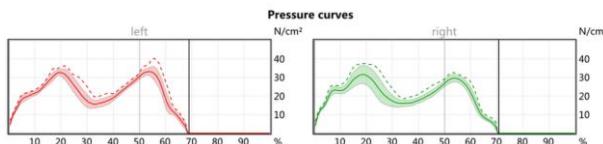
This parameter describes the left /right shift of the COP intersection point in chronological sequence in the cyclogram display, taking all the steps into consideration. A negative value indicates a shift to the left, and a positive value, a shift to the right.

The initial or zero position is shown as the central point of the illustration.

### Lateral deviation

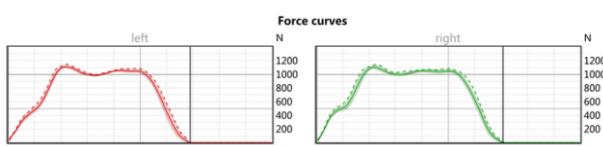
This describes the standard deviation in the lateral shift, which results when taking all the steps into consideration.

### 11.3.5 Force & Pressure



#### Average maximum pressure

Presentation of the averaged and normalized pressure curves. The standard deviation is shown as a shaded area, and the dotted line represents the maximum values. The vertical line separates the stance and swing phase.



#### Average force

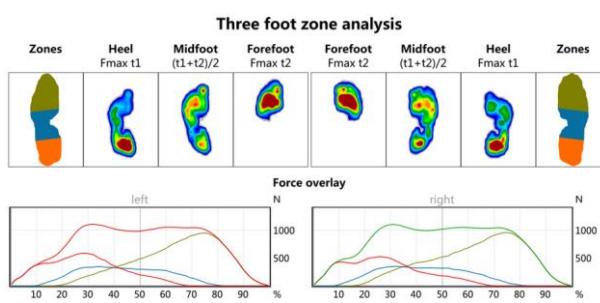
Diagram of the average vertical reaction force. The area of the standard deviation is indicated as a shadowed area. The height of the maximum force and its localization related to the gait cycle are given for the heel and forefoot for the left and right side, respectively. The vertical line separates the stance and swing phase.

Force parameters			
Maximum force1, N	L	1107.8	1400 N
	R	1102.3	
Time maximum force1, %	L	21	100%
	R	21	
Maximum force2, N	L	1055.6	1400 N
	R	1049.6	
Time maximum force2, %	L	42	100%
	R	41	

#### Force parameters

Shown here are the amplitudes recorded in the force curve together with their position in the gait cycle.

### 11.3.6 Three foot zone analysis



Here the load surface area of the left and right side of the body is divided into the zones: forefoot, mid-foot and heel and shown in color. A force curve corresponds in the respective color for each zone.

The maximum pressure pictures of the entire load surface area of the left and right side of the body are shown at three fixed times.

**Fmax t1** Time of the maximum heel force

**Fmax t2** Time of the maximum force on the forefoot

**(t1+t2)/2** Load distribution between the two times t1 and t2



Here the parameters are shown as a bar chart and briefly described the indicator indicates the standard deviation in each case.

#### Load change

The absolute load change from the heel to the forefoot during the stance phase given as a percentage.

#### Maximum force, N

The average maximum values reached in N/cm<sup>2</sup> for the three zones: toes, mid-foot and heel.

#### Maximum pressure, N/cm<sup>2</sup>

The average maximum values reached in N/cm<sup>2</sup> for the three zones: toes, mid-foot and heel.

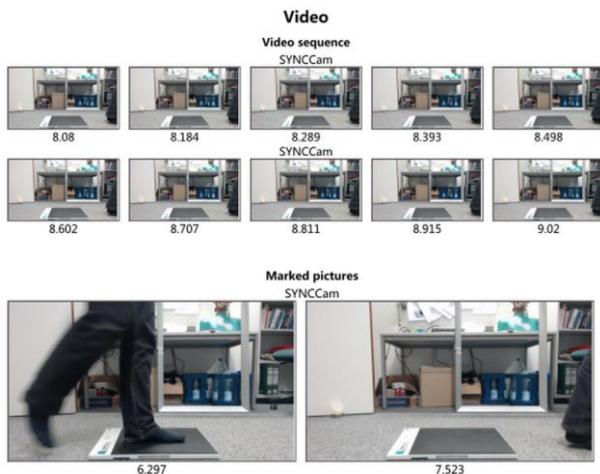
#### Time maximum force, % of stance time

The average point in time within a gait cycle where the maximum values for the three zones toes, mid-foot and heel were collected in Newton.

#### Contact time, % of stance time

The average contact time of the three zone toes, mid-foot and heel as a percentage.

### 11.3.7 Video



#### Camera - Video sequence

Here, the stride phase defined in the View module, is shown as a video sequence of ten images with the same time interval (given in seconds).

#### Camera – Marked pictures

Shows the individual images marked in the "View" module, including all the angles and lines defined there. Underneath the image the recording time is shown in seconds.

### 11.3.8 Comments

Patient comments
wearer of glasses
Record comments/Recommendations
Pelvis drop

#### Patient comment

Shows the patient comment stored in the database.

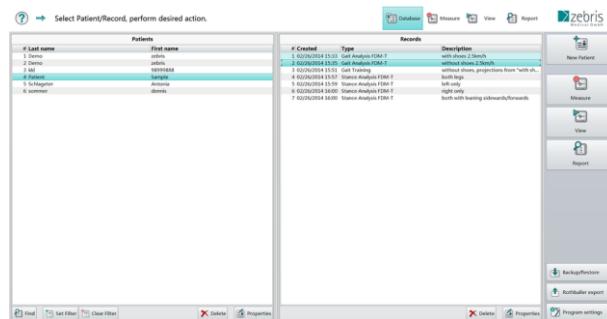
For notes on setting up a patient comment see **Comments & Clips**, p. 27.

#### Comment on the recording

Shows the comment on the recording, stored in the database.

For notes on setting up a recording comment see **Details of the recording**, p. 29.

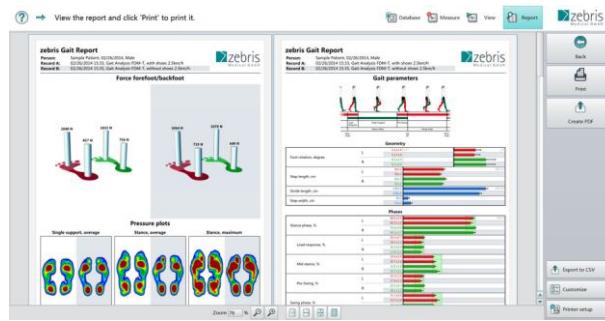
### 11.3.9 Comparing two measurements



#### Selecting the data sets

In order to compare two measurements with each other, they are first marked in the database using the ***Ctrl key + left mouse button***.

Then the Report can be called up against as usual, by clicking on the Report button.



#### Presentation in the Report

In the Comparison Report the results of measurement A are marked with a white background and the results of measurement ***B with a grey background***.

The allocation to the respective measurement can also be seen in the header.

### 11.3.10 Help for evaluating the data acquired

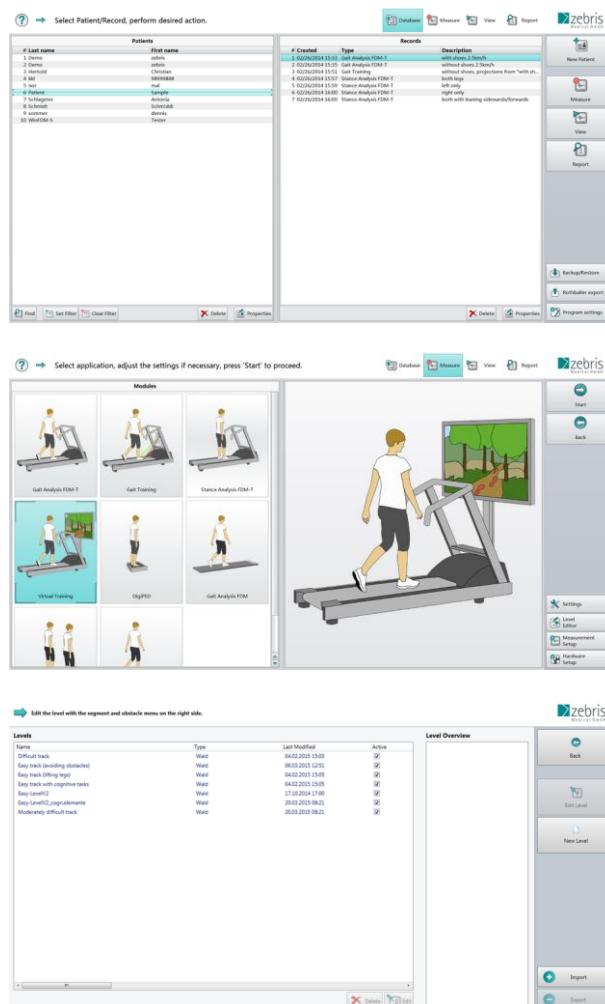
For the dynamic measurement, the load distribution under the foot is recorded during gait/running on a force/pressure measuring platform.

For a healthy foot on which the weight can be exerted in the normal way, the "ideal" load distribution under the foot during gait is shown by a semispherical load distribution under the heel, a contact of the entire foot with the exception of the area of the medial longitudinal arch and an even load distribution under the forefoot (for this, the maximum load may lie both under the ball of the big toe and under the center of the forefoot).

For "normal gait" the following sequence for exerting weight on the foot when contacting the ground is considered "ideal": - heel - mid-foot - forefoot lateral - forefoot central - forefoot medial - toes (I and/or II/III). The maximum load should not exceed 40-N/cm<sup>2</sup> under the heel and 55-N/cm<sup>2</sup> under the forefoot and all the toes should support the force exerted on the foot. The force/time curve should show an M-shaped course (camel's back) For sensitive feet (e.g. of diabetics, etc.), local pressure peaks should be avoided and the maximum pressure load should be less than approx. 25-N/cm<sup>2</sup>, in order to avoid any damage to the sole of the feet.

## 11.4 Level Editor

Using the Level Editor you have the possibility of creating or editing levels for the virtual training yourself.



### 1. Database

Click on **Measure** in the toolbar on the right.

### Open level editor

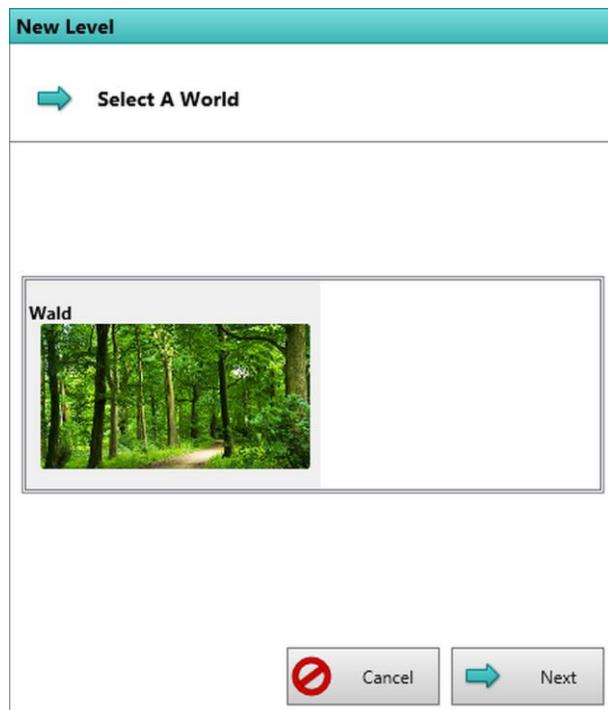
Click on **Level Editor** to open it.

### Set / Edit the level

Click on **File > New** in the toolbar on the right to create a new level with the help of an assistant.

After having marked a listed level and clicking on **Edit Level**, you open a level already available and can then edit this.

By clicking on **Back** you get back to the module selection.

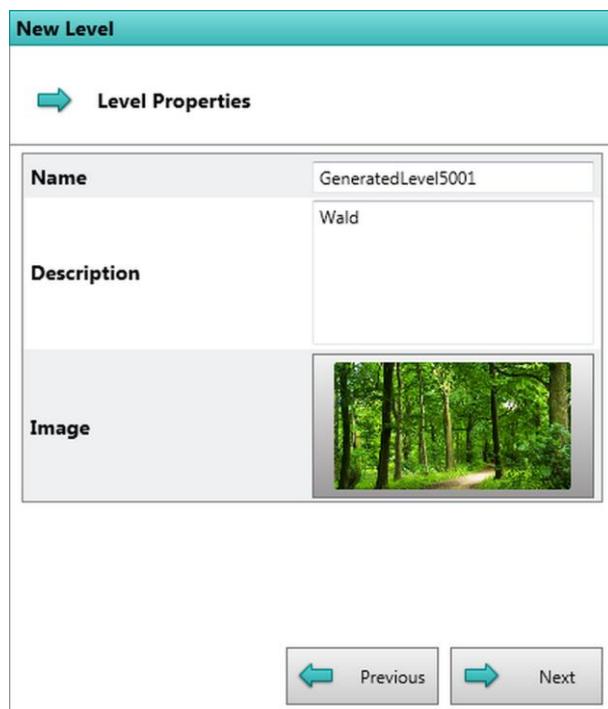


### Selecting the 3D environment

Here you can select the 3D world. At the moment only the "forest environment" is available.

By clicking on **Next**, you then proceed to the level characteristics.

By clicking on **Cancel** you end the assistant and arrive back at the Level Editor again.



### Level characteristics

Please enter the level characteristics here.

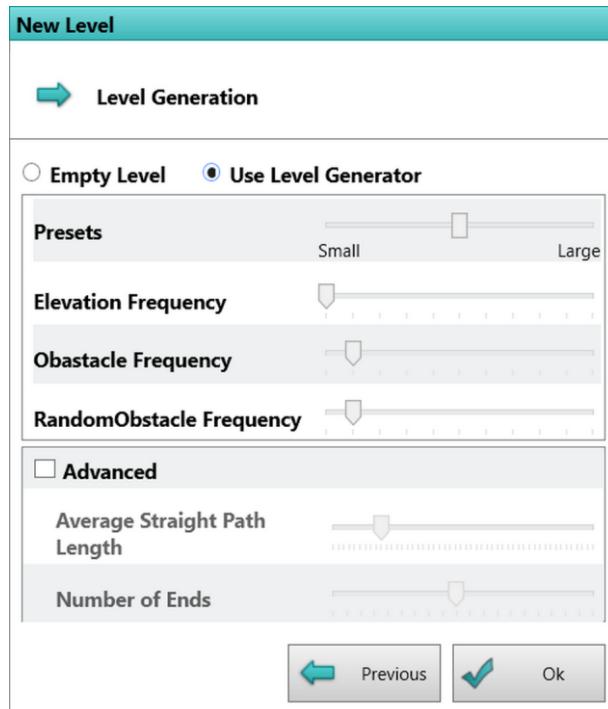
**Obligatory boxes** are "Name of Level" and "Short Description"

By **clicking on the image**, a file selection opens. Here you can select and add any image.

By clicking on **Next** you can then see the Level Generator, and by clicking on **Previous** you return to the Level Information. You can leave the assistant by clicking on **Cancel**.

#### 11.4.1 Automatic setting of a Level

There are two procedures for creating a new Level using the Level Editor. The possibility described here using the Level Generator is the most comfortable method and the faster one.



To activate the automatic creation of a Level, please click on **Use Level Generator**.

By **dragging the sliders** you now have the possibility of setting the following parameters:

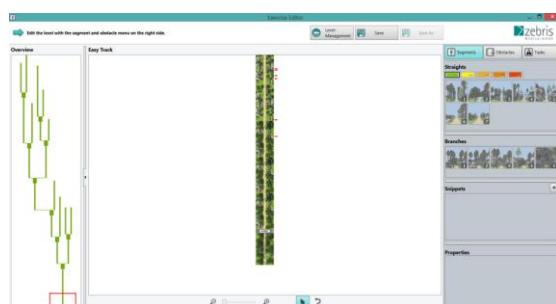
- Track elevation
- Number of obstacles
- Number of random obstacles
- Track length
- Number of branches

By clicking on **OK** you end the Assistant and have the possibility of watching the Level generated in the Level Editor and editing it, if required. By clicking on **Previous** you will return to the previous step.

You can leave the assistant by clicking on **Cancel**.

#### 11.4.2 Basic information on the Level Editor

If you have created a Level using the Level Generator, you have the possibility of editing, adding or deleting individual segments.



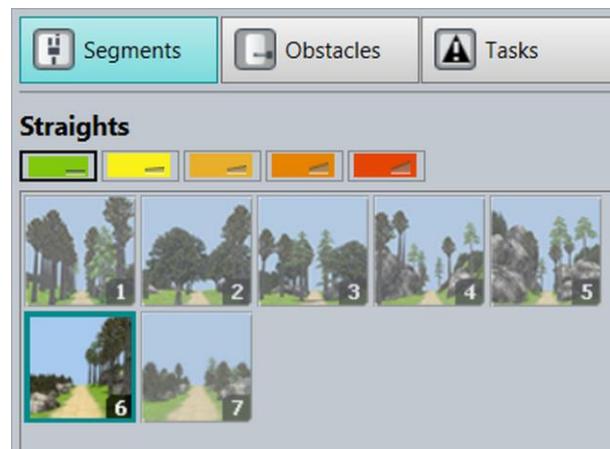
You will see this screen after creating a Level using the Level Generator.

In the left-hand section of the monitor you see an overall overview of the level you created before. The section that is framed by the red rectangle is displayed in a zoomed view in the middle of your monitor. By using the magnifying glasses resp. pressing the middle mouse button this section can be enlarged and reduced. On the right-hand side you will find the elements that you can insert into your level.

## Segments

Here the single track segments are described, that you can add to your level.

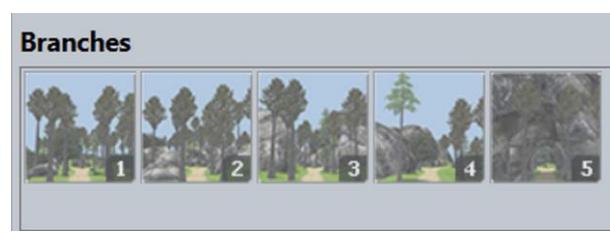
Mark the position in the level, where the segment shall be inserted with one mouse click. By double clicking a single element the segment is positioned.



## Straight Segments

By Straight Segments we mean the individual stages of the path that are run through in the 3D environment.

Here you have seven different elements to choose from and you can also set their elevation.



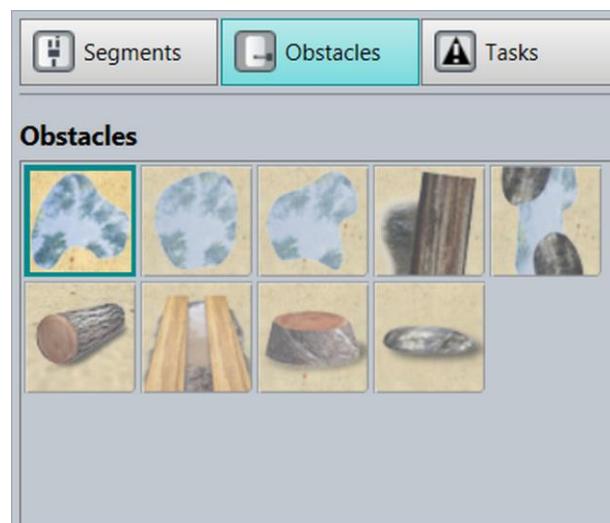
## Branches

Are the segments created when the path splits into two directions.

Here you have five different elements to choose from, and you can add these by clicking on them.

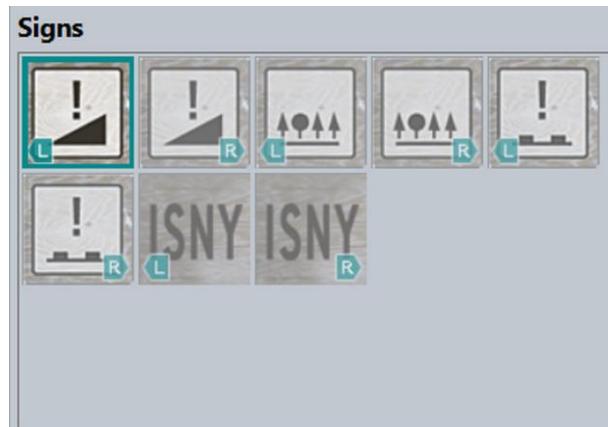
## Elements

Here you will find a description of the individual elements that can be added to the segments. In order to position an obstacle, click on the required one in the obstacles box on the right and drag it into the desired position in the level. Size and position of the placed obstacle can be modified using the mouse and the shown slide control.



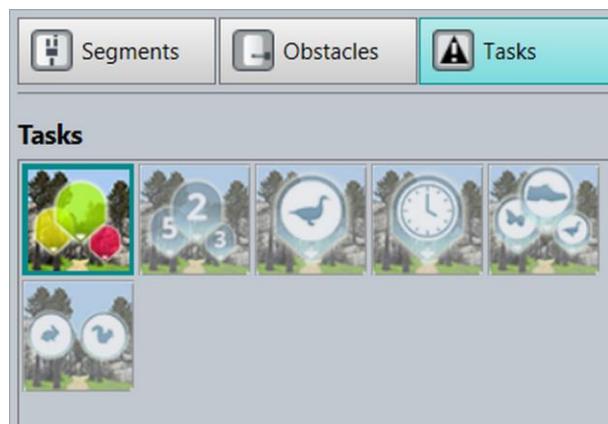
## Obstacles

Obstacles can make a level significantly more difficult training the test person's coordinative and cognitive skills.



### Signs

You add these warning signs analogously to positioning the obstacles. Here the runners are to be informed about upcoming obstacles or gradients.



### Tasks

Here you will find the description of the single tasks which can be added to the segments. These are added analogously to the procedure of using elements. Afterwards the distance of the markers as well as their number can be set.

#### Tasks

*The integrated tasks train the test persons's coordinative and cognitive skills. You can select between six different tasks.*

## 11.5 Setup

In the virtual training setup, specific settings can be made for the graphics card, confirmation prompt and video function. Please change these settings only if asked to do so by a member of the Support.

## 12 Troubleshooting

This chapter presents frequently occurring error messages caused by usage problems and suggests how to deal with them. If you happen to come across an error message, at first please follow the suggestions in this list before you contact our customer support. This list does not claim to be exhaustive.

When you have a suspicion on what device does not work correctly, please go through these instructions one by one and check between each item if the system works again.

### 12.1 SYNCam



1. Check if the USB plug is still connected to the computer (if the green LED is lit, USB is powered) and properly plugged into the camera (there is only one USB socket).
2. Execute the Hardware Setup, check that there is a SYNCam present and double-click it (see chapter Hardware setup (device settings), p.38).

Now a live stream of the camera should show up – if not, unplug the camera and plug it again, then delete the current hardware profile (button delete in the upper right), press ‘Ok’ and start the Hardware Setup again. Automatic detection shows up, confirm and check if the camera has been added.

3. Plug the USB into another port on the computer and repeat step 2.
4. Open the Windows Device Manager and search for an entry Imaging Devices >> “Logitech HD Pro Webcam C920”. If it is not present, unplug and replug the camera. Windows will install the driver and then the device should appear in the list. If this does not help or if the camera’s name is only “HD Pro Webcam C920”, right-click the camera’s entry in the Windows Device Manager and select “Update drivers...”.

Windows will update the driver and may require a restart of the computer.

### 12.2 Forceplate/Treadmill



## Troubleshooting

1. Check if the USB plug is still connected to the computer and also the power supply is plugged in correctly (if you the green LED is lit, power is there, the LED changes to orange while recording).
2. Check the connections to the forceplate (or interface box for treadmills), see your hardware user manual for details.
3. Execute the Hardware Setup, check that there is a forceplate/treadmill present and double-click it (see chapter Hardware setup (device settings), p.38).  
If an error is displayed, delete the current hardware profile (button delete in the upper right), press 'Ok' and start the Hardware Setup again. Automatic detection shows up, confirm and check if the forceplate/treadmill has been added.

## 12.3 General

"Could not create frame buffer."

Possible reason	Solution
OpenGL 3.3 not supported / Display driver has been changed	<p>During the software installation it is checked if your graphics hardware supports OpenGL 3.3, what is needed for proper operation of the software.</p> <p>If you encounter this error message after installation, your display driver or graphics hardware has changed. Systems having two graphics cards usually offer a switching possibility, in case of display driver change please try to update your display driver to the most recent version.</p>

"COM-Error: [...] If you are using multiple USB devices, please try another port."

Possible reason	Solution
Two or more USB cameras on one controller	<p>When using multiple cameras, one controller per camera is necessary depending on the performance of your computer. Try to plug one camera into another USB port until the message disappears.</p> <p>If this does not help, an extension card (e.g. express card) with extra USB ports may be necessary.</p>
USB camera has been unplugged	<p>If you disconnect the USB cord during measurement, this message will also appear. Please reconnect the cord and start a new measurement.</p>

<i>Possible reason</i>	<i>Solution</i>
No web connection available.  (If you would like to carry out the activation of the software via internet, please press the activation button. Then the software tries to establish a connection to the license server.)	<p>Using your internet browser for example, please try if there actually is a connection to the internet.</p> <p>Restart your computer and then try again.</p>

## 12.4 FDM-T System

### "Speed detection hardware failure"

Possible reason	Solution
Speedometer barcode damaged	At the front of the treadmill there is a black-white barcode attached to the deflector roll. It has to be faultless for correct function of the speedometer. Typically, the barcode is being battered if the running belt runs eccentric on the roll because of lacking maintenance. The barcode is available as a spare part.

### "Communication timeout"

Possible reason	Solution
Defective USB cord / USB disconnected	Check if the USB cord is intact, meaning there are no cracks, sharp bends oder crimped sections on it. In case of doubt try again with another USB cord.
Hardware defect	If your USB connection is faultless, the electronics of the forceplate could be damaged. In this case please contact our technical support.

### " Pressure distribution platform not found."

Possible reason	Solution
No hardware profile defined	Check if you created a device profile in the Hardware Setup and added the forceplate.
Not connected / No power supply	Please check your cable connections and power supply.

## 13 Import Interfaces

zebris FDM provides some interfaces for the data exchange with other software packages, e.g. medical office management software. Please consult the software manufacturer's information, whether your software is compatible with one of these interfaces.



Mandatory fields in zebris FDM are the following: first name, last name; and since version 1.10 the birthday.

When measurements from older packages are imported where the birthday field is empty, it is set as empty.

As soon as some action requires a birthday to be set, you get a message about this.



In the following, the installation of the interface as well as the available amount is described. If the interface is supplied by several providers, the software of your third-party supplier is described in the following as ***third-party software***.

## 13.1 GDT

This interface can be used to transfer patient data in the zebris FDM software.

The following sets are supported according to the GDT version 2.1.: 6301, 6302.

Please find details on the sets in the GDT interface specifications of the Quality Association for Medical Software (<http://www.qms-standards.de>).

### Installation

Your third-party software stores the data to be exchanged in a location that you have defined before, e.g. on your hard disk. Afterwards, your third-party software starts the zebris FDM software and transfers a script file and optionally a file path as parameter.

The zebris FDM software then carries out the script file and transfers the existing patient data from the file path that was defined here resp. the transferred file path „Transfer Location“.

### Settings in the third-party software

Please find the settings for data exchange in the information of your third-party software manufacturer.

Calling up the third-party software has to be proceeded as follows (e.g. Win7 64bit):

```
C:\Program Files (x86)\zebris\zebris FDM\zebris.shell.exe execute  
import_gdt.xml -mask "[path to the transfer location and file type]"
```

In doing so, please note:

- the path has to be written with quotation marks and without square brackets
- for the file type you can only use files with a certain name or ending, like e.g. „G\*.txt“ (only searches for txt files, starting with a G), the \* stands for any sign, that means \*. stands for all file names with all endings
- if „-mask“ and the path are not indicated, the software automatically uses „C:\Exchange\GDT\\*.\*“

Files to be imported is searched for at the transfer location. The patient data found, is integrated in the zebris FDM database. If a patient exists there already, you will get a corresponding notification.

### Sample call

```
C:\Program Files (x86)\zebris\zebris FDM\zebris.shell.exe execute  
import_gdt.xml -mask "F:\MyExchangeFolder\*.*"
```

This call starts zebris FDM and searches in the directory „F:\MyExchangeFolder\“ all files (\*.\*) for GDT data to be imported. The patient data found, is transferred automatically.

## 13.2 PAEDUS

This interface can be used to transfer patient data in the zebris FDM software. It only transfers existing patient data information in exactly the same fields of both software packages.

### Installation

PAEDUS stores the data to be exchanged in a location that you have defined before, e.g. on your hard disk. Afterwards, PAEDUS starts the zebris FDM software and transfers a script file and optionally a file path as parameter.

The zebris FDM software then executes the script file and transfers the patient data from the file path that was defined here resp. the transferred file path „Transfer Location“.

### Settings in PAEDUS

Please find the settings for data exchange in the information of the paed software GmbH.

Calling up PAEDUS has to be proceeded as follows (e.g. Win7 64bit):

```
C:\Program Files (x86)\zebris\zebris FDM\zebris.shell.exe execute  
import_paedus.xml -path "[path to the transfer location]"
```

In doing so, please note:

- the path has to be written with quotation marks and without square brackets
- if „-path“ and the path are not indicated, the software automatically uses „C:\Exchange\pae\paedus\_in“

Data to be imported is searched for at the transfer location. The patient data found is integrated in the zebris FDM database. If a patient exists there already, you will get a corresponding notification.

### Sample call

```
C:\Program Files (x86)\zebris\zebris FDM\zebris.shell.exe execute  
import_paedus.xml -path "M:\PAEDUS\YourExchangeFolder"
```

This call starts zebris FDM and searches in the directory „M:\PAEDUS\Datenaustausch“ for PAEDUS patient data to be imported. The patient data found, is transferred automatically.

### 13.3 Rothballer

This interface can be used for the transfer of patient data into the zebris FDM software. With the zebris FDM software called up from the Rothballer software, an automatic transfer of the evaluated data of the selected patient's measurements, that have been carried out since the start, is transferred when closing the zebris FDM software.

The export of the evaluated measuring data can also be done out of the zebris FDM database. Therefore, please see chapter Data Export , p.32.

#### Installation

The Rothballer software stores the data to be exchanged in a location that you have defined before, e.g. on your hard disk. Afterwards, the Rothballer software starts zebris FDM and thus transfers the import and export path as well as the measuring module that is to be called up as parameter.

The zebris FDM software then transfers the existing patient data from the transferred import path, starts the transferred measuring module and exports the measured data in the transferred export path.

#### Settings in Rothballer

Please find the settings for the data exchange in the information of Rothballer electronic systems.

Calling up the Rothballer software has to be proceeded as follows (e.g. Win7 64bit):

```
C:\Program Files (x86)\zebris\zebris FDM\zebris.shell.exe execute
    import_rothballer.xml -import_path "[path to the transfer location]"
    -export_path "[destination path]" -measurement [measuring module]
```

In doing so, please note:

- all three specifications are absolutely obligatory
- paths have to be written with quotation marks and without square brackets
- possible values according to „-measurement“ are
  - gait\_treadmill for the gait analysis
  - stance\_pressure for the stance analysis
...these values have to be written down without quotation marks.

The data transfer path searches for patient data to be imported. The patient data found, is automatically transferred to the zebris FDM database. For already existing patients, you will get a corresponding notification.

#### Sample call

```
C:\Program Files (x86)\zebris\zebris FDM\zebris.shell.exe execute
    import_rothballer.xml
    -import_path "H:\Rothballer\SomeExchangeFolder\patient.ini"
    -export_path "H:\Rothballer\zebris-records" -measurement gait_treadmill
```

This call starts zebris FDM and searches the file „H:\Rothballer\SomeExchangeFolder\patient.ini“ for Rothballer patient data to be

imported. The patient data found, is transferred and the gait analysis for the measuring is started.

After closing zebris FDM, the measurements that were carried out, are exported to the directory „H:\Rothballer\zebris-records“.

# 14 Export Interfaces

zebris FDM provides some interfaces to export the recorded data for processing with other software packages such as statistics software.

Some interfaces are accessible from the **Database** screen, others can be accessed in the **View** mode, further ones in the mode **Report**.



Mandatory fields in zebris FDM are the following: first name, last name; and since version 1.10 the birthday.  
When measurements from older packages are imported where the birthday field is empty, it is set as empty.  
As soon as some action requires a birthday to be set, you get a message about this.

## 14.1 zebris-own formats

### 14.1.1 CSV

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

All numerical values from the parameter charts being visible in the report are here exported into a CSV file (comma separated values). You can easily open and edit this file e.g. in Excel.

The first line contains all designations and start with the patient and recording information. The standard deviation of parameters is output as extra column featuring the parameter's name and the addition „SD“ (standard deviation).

Text qualifiers are the quotation marks ("), separator is the semicolon (;).

## 14.2 JPG

This interface is accessible via the **View** screen.

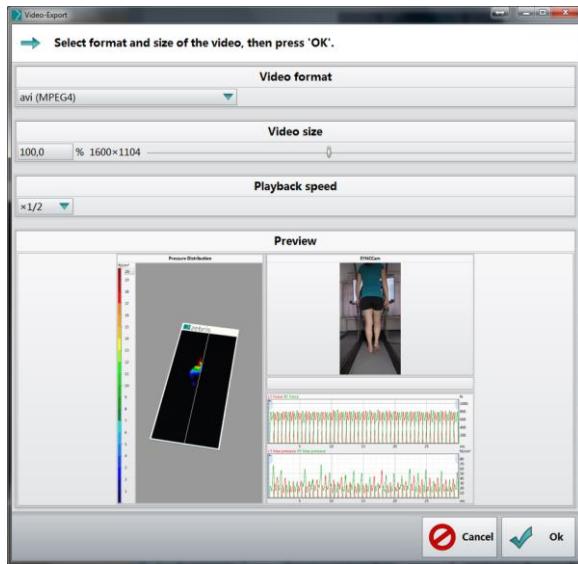
One footprint for each side from the currently opened measurement is saved as a .jpg image @72dpi, white background and 20mm white border. You can select if you want to export the average pressure plot, maximum pressure plot or mid stance plot if available.

These images are the same as the ones which are created in the report.

### 14.2.1 Video export

This function enables you to create a video of the displayed recording in the **View** mode. In the video the complete toolbar is removed, the display elements are displayed according to your setting.

When opening the function, you see a preview image of the video and you can make settings concerning the video you generated before.



#### Video format

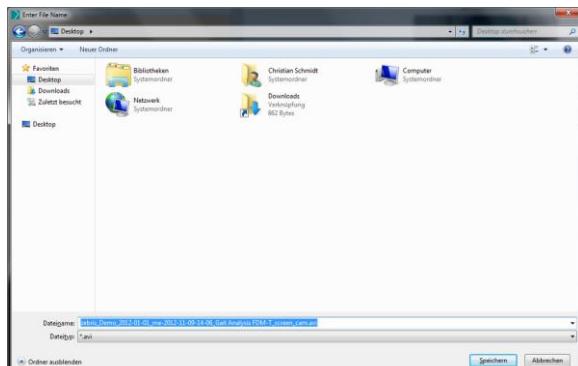
If your video player should have problems playing the video, you can select another file format. Please note that the resulting file size can vary due to different compression.

#### Measurements (resolution)

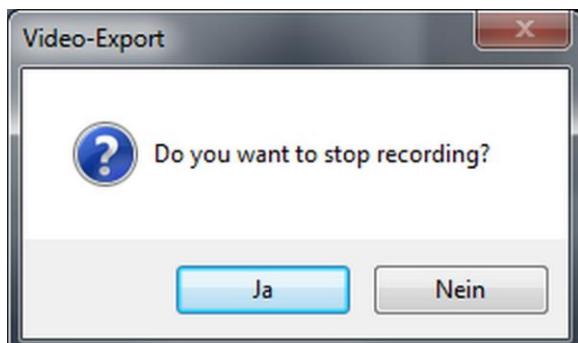
Here you can modify the image size of the video; standard setting is the size that is available on your monitor (100%).

#### Playback speed

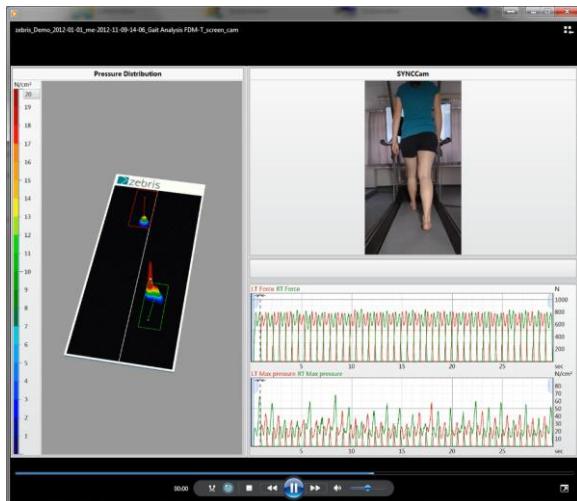
You can set the playback speed here, please note that the export of the measurement at low speed takes longer as more intermediate images have to be generated.



In a second step you can select a storage location as well as a name for the video.



After having confirmed the storage location, the video export runs in the live mode. After clicking in the image, the question appears whether the video recording shall be stopped at this point in time. The display speed can deviate depending on the computing power of your PC, yet the video is generated at the playback speed you defined before.



You can play the final video with every video player supporting the generated format.

If errors occur during playing or it is not possible to play the video at all, please try to generate the video in another format or turn to the manufacturer of your video player.

#### 14.2.2 XML

This export interface is available in the mode **View** with the modules gait analysis FDM/FDM-T as well as stance analysis FDM/FDM-T. The file format is intended for the processing through software packages with XML parser function or self-programmed software.

Besides meta information like patient and recording data, the size of the pressure platform with which the measurement was carried out as well as all pressure plots in the interval of analysis are generated – in case of the gait analysis both the single images and the roll-off processes as well as the corresponding maximum pressure picture.

In the following, the used XML structure is illustrated, relevant tags are commented in the text (please refer to specialist literature when it comes to the structure of an XML file.):

```

<type>gait_treadmill</type>           used measuring module
<program>zebris FDM</program>         name of the software
<program_version>1.12</program_version> version of the software
<format_version>1.0</format_version>      format version
<measuring_system/>                   (used for internal purposes)

```

##### Patient information

```

<patient>
    <first_name>Demo</first_name>
    <last_name>zebris</last_name>
    <born>2012-01-01</born>
    <sex>female</sex>
    <code/>
</patient>

```

##### Recording information

```

<measured>2012-11-09T12:06:06Z</measured>
<description>Demo (FDM-T + SYNClight plus + SYNCam)</description>

```

##### Size of the used measuring matrix used during the measurement

```

<cell_count>
    <x>56</x>
    <y>128</y>
</cell_count>

```

Structural order according to the following content, several sublevels possible

```

<movements>
  <movement>

    <type>gait</type>           type of the recorded data
    <id>gait_1</id>            consecutive numbering

    <clip>                      Classification of measuring cycles, if existing
      <clip>                    (e.g. with the module gait analysis FMD)

        <type>events</type>       type of the recorded data
        <id>events</id>          designation of the data
        <count>47</count>         overall number of similar data

```

blocks

```

      data block
      <data>

        event within a data block
        <event>
          <type>gait_step</type>
          <id>event.1</id>

          <begin>0.250</begin>      startin time
          <end>1.020</end>          end

```

(event)

time (event)

The following information is only available with recordings with visual cueing

```

  <side>left</side>           side of the body

  size of the sensors [mm]
  <cell_size>
    <x>8.464</x>
    <y>8.464</y>
  </cell_size>

```

heel point of the rotation line

```

  <heel>
    <x>38.53</x>
    <y>134.3</y>
  </heel>

```

Forefoot point of the rotation line

```

  <toe>
    <x>40.14</x>
    <y>153.8</y>
  </toe>

```

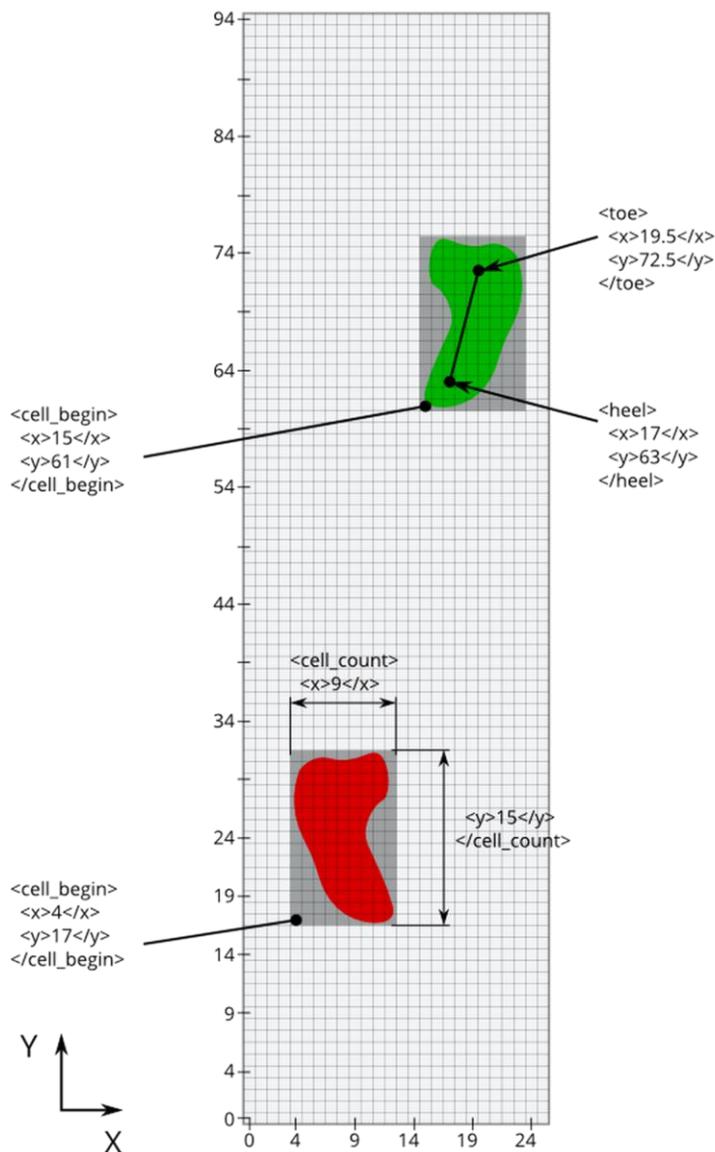
Characterization of the following contents (e.g. maximum pressure picture, average picture, data package "Quant", etc.)

```

  <max>
    Coordinates and matrix
    <cell_begin>
      <x>4</x>
      <y>17</y>
    </cell_begin>
    <cell_count>

```

## zebris XML export: gait



### 14.2.3 XML (raw data)

In contrast to the XML export, here only the data for every single measurement over the whole interval are generated. For recordings with a treadmill, the speed per measuring point in time [m/s] is created at the end of the file:

<clip>

```
<type>analog</type>
<id>velocity.treadmill.1</id>
<begin>0.000</begin>
<frequency>100</frequency>
<count>3012</count>
<units>m/s</units>
<data>
    <quant>0.62</quant>
    <quant>0.84</quant>
    [...]
</data>
```

## 14.3 Formats of third-party providers

### Rothballer

This interface is accessible via the **Database** screen if you additionally purchased this optional software module.

Data is saved in Rothballer format to a user-defined location. Provided that you configured the Rothballer software for this interaction, the data transfer takes place automatically.

#### 14.3.1 APD-Export

This type of export writes data from gait and stance analysis to a storage location. The data format conforms with the specifications of pedcad GmbH.



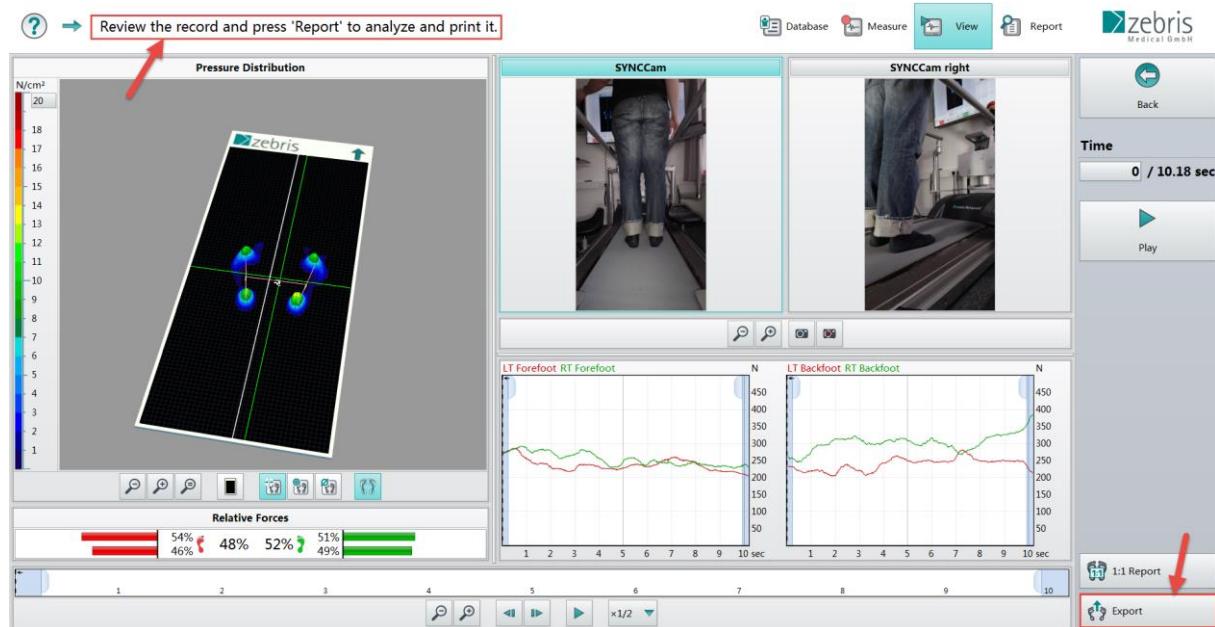
The name of the export files will be generated like this:  
{last name}\_{first name}\_{birthday}\_me-{measurement date}-  
{measurement time}\_{record type}-{AVG for average plot or MPP for Maximum Pressure Plot}\_{L for left or R for right foot}.apd

Example file name:  
Doe\_John\_1983-03-26\_me-2014-01-31-16-03\_Stance Analysis FDM-T-  
AVG\_L.apd

### Stance analysis

When you export from a stance analysis measurement, just press the button **APD Export** in the lower right corner.

## Export Interfaces

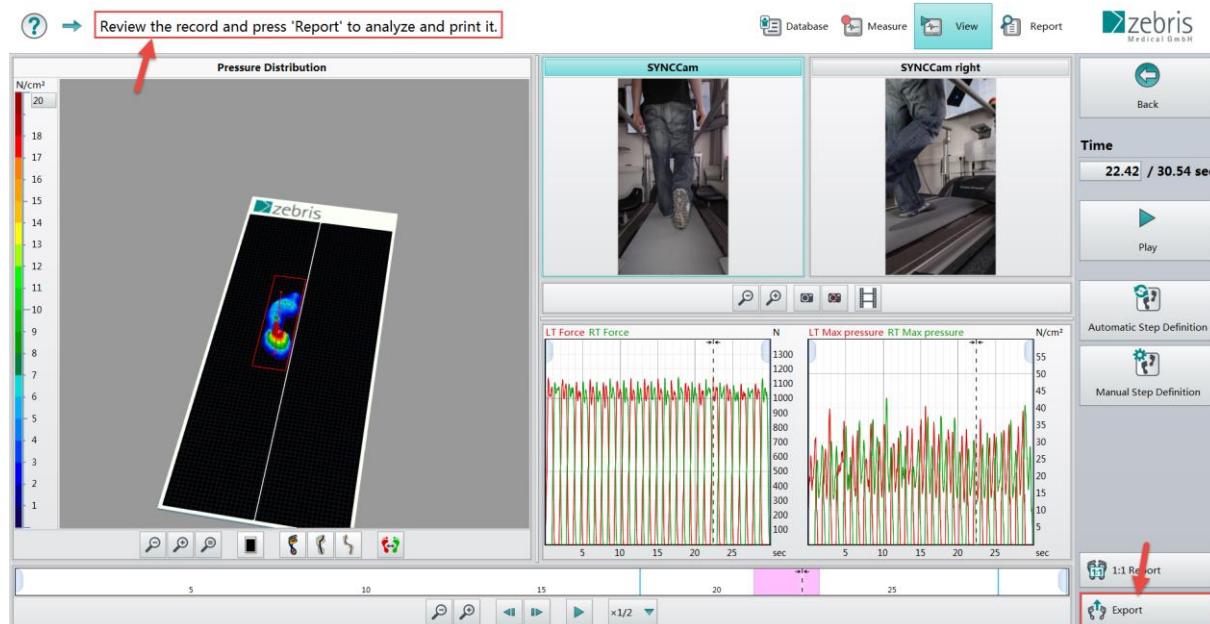


From all data inside your analysis interval, a Maximum pressure plot is exported for each side. Please note that the filename has no “MPP” indicator at the end.

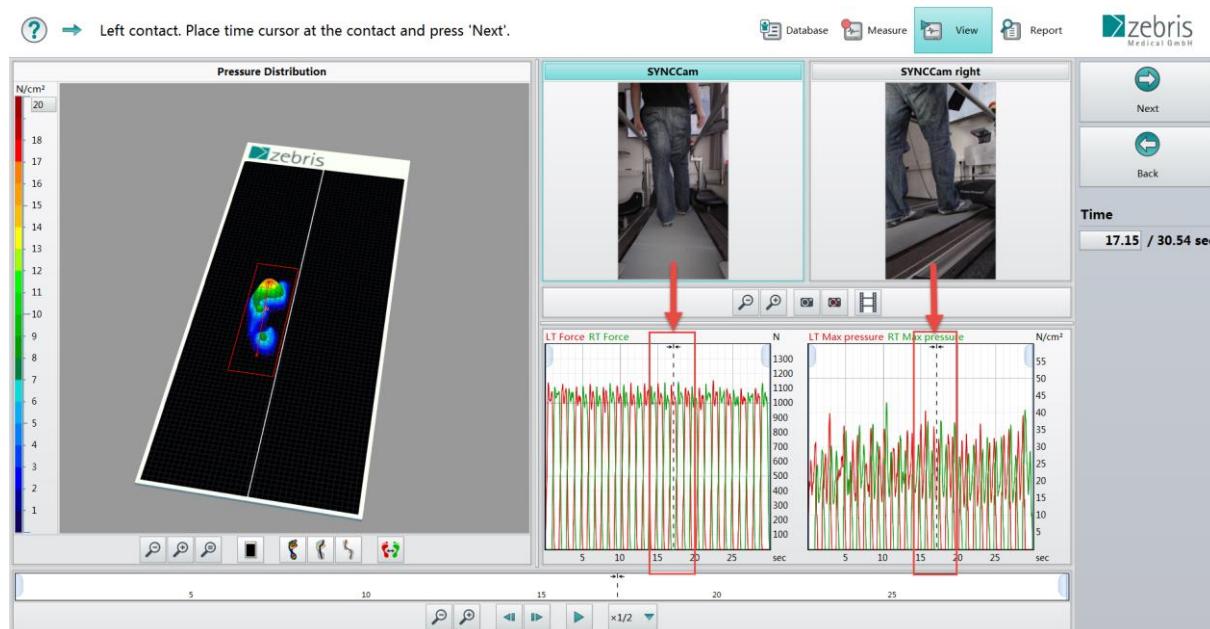
## Export Interfaces

### Gait analysis

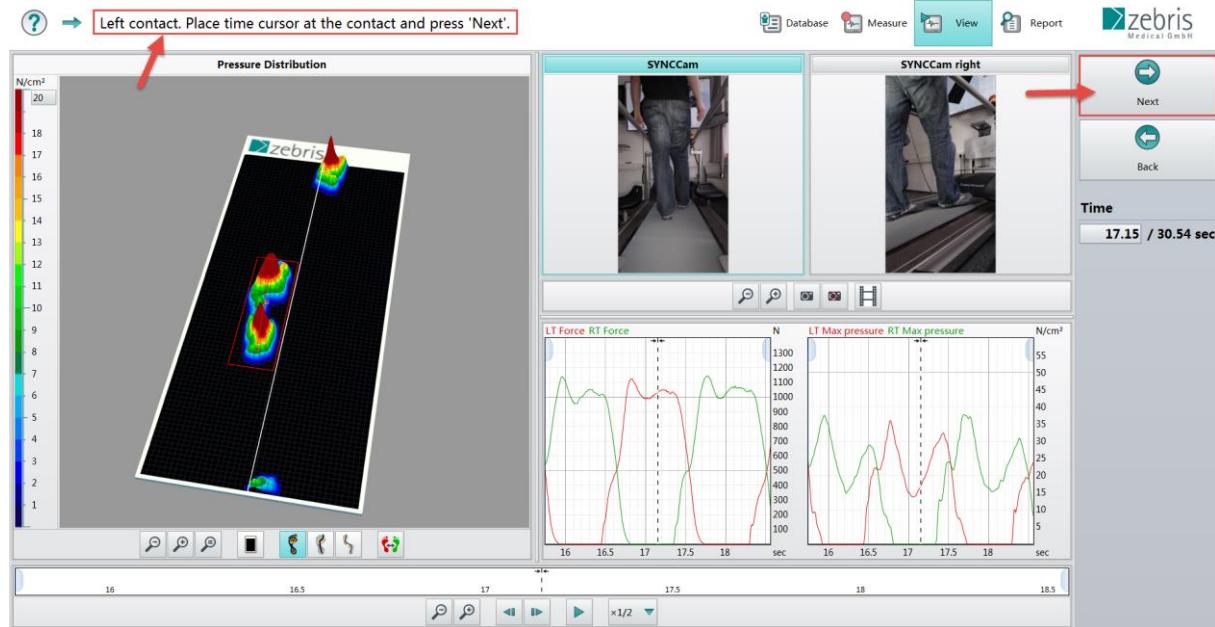
- When you export from a gait analysis measurement, press the button APD Export in the lower right corner:



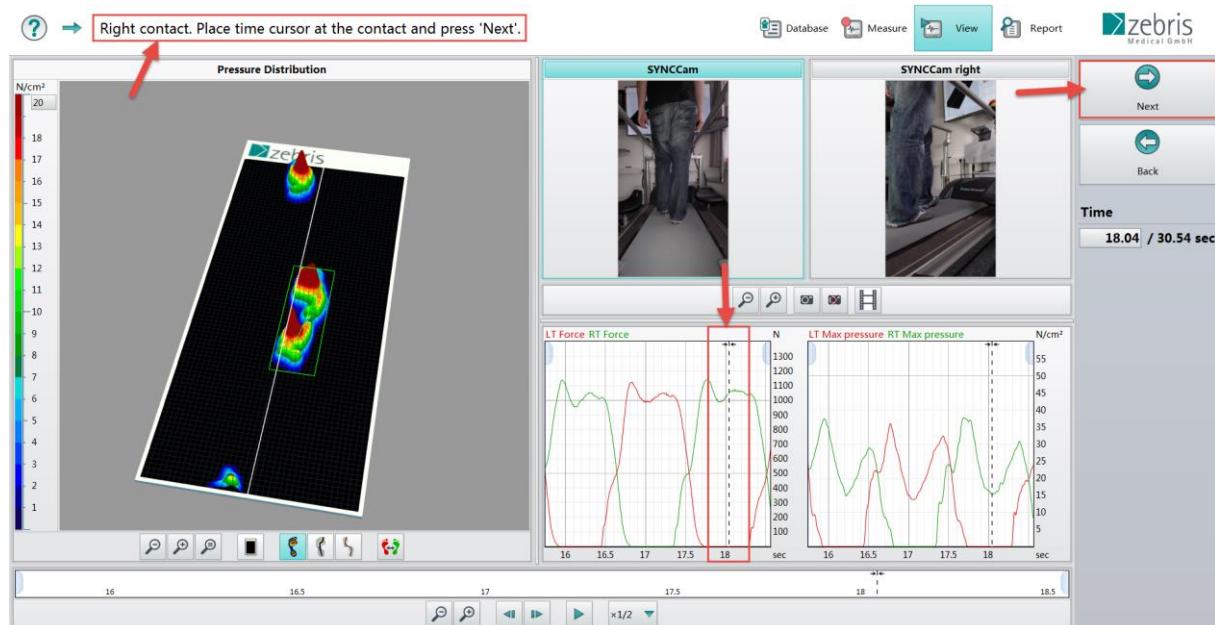
- Now a simple wizard starts and you are prompted to select a left foot. Just set the time cursor to the position where you can see the left foot you want on the left side.



- Often it is useful to **zoom** into the force curves to better see the single steps and activate **maximum pressure plot** in the 3D view.



4. When your wanted step is shown, press 'Next'. Now you have to select a right foot, same procedure as with the left foot.  
Press 'Next' after selecting the right foot - four files will be exported (average and MPP for each foot side).



**Notes**

