Installation Guide and User Manual
footscan System
with footscan 9

Materialise Motion

Last revision date: 2024-9-30

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Introduction

Congratulations on your new purchase! Your footscan pressure measurement system was developed to perform state-of-the-art gait recording and analysis. Our user-friendly footscan 9 software accurately records static and dynamic plantar pressure data of subjects in barefoot as well as shod condition.

This document consists of two major parts. The installation guide shows you how to set up the hard- and software correctly to make your first measurement. The user manual provides you with an overview of all functions of the footscan 9 software.

The remainder of this introductory chapter covers general information about Materialise Motion and its products, as well as conventions used throughout this document.

Enjoy your footscan system.

About Materialise Motion

Materialise Motion offers professional solutions for highly accurate dynamic pressure measurements in all kind of set-ups, using our renowned footscan systems. Our primary aim is to offer the customer an affordable pressure measurement system with the best specifications to obtain an accurate result, combined with the clearest and easiest hardware and software user interface.

To reach these goals, our hard- and software developers use state-of-the-art technology resulting in a high quality pressure measurement system for general, clinical, scientific and industrial use. We cooperate with several international universities to validate the hard- and software parameters of the footscan system. To assure customer satisfaction we offer support on all our products.

Support

Materialise Motion offers following support options:

- This Installation Guide and User Manual.
- Materialise Motion on the web: https://www.materialisemotion.com.
- Contact your regional distributor. The full list of distributors is available at https://www.materialisemotion.com.
- If you cannot locate a regional distributor, contact the Materialise Motion support department at support.motion@materialise.be. Please include the product serial numbers, system configuration, screen captures and detailed failure description.
- If you have exhausted the above support options, support by telephone is available from Monday to Friday from 9:00 to 16:00 GMT+1:00.
- In case your product requires repair, contact your regional distributor or the Materialise Motion support department at support.motion@materialise.be to initiate the RMA (Return Material Authorization) process.

Pre-sales and sales

For pre-sales and sales information, contact your regional distributor. If you cannot locate a regional distributor, contact Materialise Motion directly at sales.motion@materialise.be.

Worldwide Headquarters

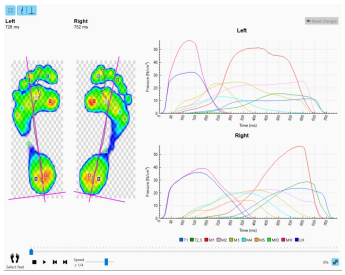
Materialise Motion
De Weven 7
B-3583 Paal
Belgium
Tel. +32 (0) 14 23 20 31
Fax. +32 (0) 14 23 53 90

Products Overview

In general, all footscan systems operate in the same manner:

The footscan plate measures plantar pressure using an X-Y matrix of resistive pressure sensitive sensors that are scanned sequentially. The system registers pressure data when the subject stands on or walks over the plate.

The footscan 9 software processes the data. The result is a pressure image of the foot. The color scale of the image varies from blue (minimum pressure) to red (maximum pressure). Additionally, the system computes a number of physical properties for further analysis of the measurement.



Footscan Entry level systems are available in three sizes: 0.5m, 1m and 1.5m. The plates connect directly to a USB2 port of the computer via the fixed (0.5m and 1m system) or detachable USB cable (1m heavy duty and 1.5m system). No additional power supply unit is required. Appendix 20 provides more technical details.

0.5m entry level system

1m entry level system

1.5m entry level system

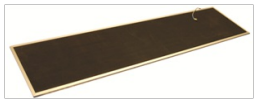
1m entry level heavy duty system

Footscan interface box systems also come in three sizes: 0.5m, 1m and 2m. They consist of a footscan interface box and a plate, as well as the cables to connect them:

0.5m plate

1m plate

2m plate



Interface box

Analog coaxial cable 6m (An optional longer cable is available if required).

USB cable A-B 5m

Power supply unit

Power cord (Specific country version according to order).

A footscan security dongle is a USB2 hardware dongle which can be used to run the footscan 9 software without a footscan plate being plugged in.

The 3D scanners can be used for making a three dimensional representation of a foot, please refer to the manual included with your 3D scanner for more information.

Conventions in this Document

The following typestyle conventions are used throughout this guide:

	Warning. Read these instructions carefully.
	Tip or note.
	The text applies to a specific module.
✕ Button	Refers to a button in the software's user interface.
☑Checkbox	Refers to a checkbox in the software's user interface.
◉Radiobutton	Refers to a radiobutton in the software's user interface.
Text field	Refers to a text field in the software's user interface.
⌄Drop-down	Refers to a drop-down list in the software's user interface.
File	Refers to a file on your computer.
Directory	Refers to a directory on your computer.

PART 1

Installation Guide

Chapter 1

General Information

This chapter provides important information on your footscan product. It contains recommendations for safe usage and maintenance of the product, as well as information about its warranty terms and conditions. The minimum system requirements of the footscan 9 software conclude this chapter.

Please read the following carefully before proceeding to the next chapters.

1.1 Symbols

The following symbols may appear on the product, packaging or documentation:

Caution, read these instructions carefully. If used on the product label: consult accompanying documentation.

Tip or note.

Marking according to the European directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

Serial number.

Manufacturer.

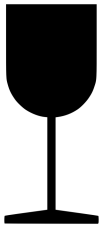
Compliant with European directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

Marking for People's Republic of China pollution control regulation SJ/T11364-2006.

CE mark according to European directives.

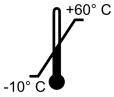
Type B applied parts.

This way up.



Fragile.

Keep away from rain.



Packed storage temperature limitation.

Recyclable packaging.

Recyclable packaging, cardboard material.

Contains or presence of natural rubber latex.

1.2 Intended Use

The footscan state-of-the-art pressure measurement system is intended for human beings, to measure static and dynamic plantar pressure during balance and/or gait (walking/running) exercises.

The CE-marked medical device Materialise footscan 9 software is intended for the visualization of static and dynamic human movement data and parameters derived from this data. The application allows the patient-specific design of an orthotic that can be produced by additive manufacturing.

Operation and interpretation of the measurements as well as prescription of treatment or orthotic corrections should be done by trained professionals.

1.3 Contra-indications

Clients with stability issues when walking or running might require assistance during the measurement.

Patients and users who may have allergic reactions to certain proteins in latex should be made aware that the protective top rubber layer on 1m EL HD, 1.5m EL and 2m Advanced/Hi-end footscan plates contains a mixture of natural dry rubber and synthetic rubber, precautions should be taken to avoid contact with bare skin.

1.4 General Safety Information

This section contains important instructions regarding safety. Please read them carefully.

- All users should read the installation guide and user manual before using the footscan system, the installation guide and user manual should be available to users at all times.
- Prior to the measurement session, the client should be instructed on how to walk or run over the footscan plate.
- Should the client incur injury due to use or malfunction of the footscan system, providing all precautions are taken, the footscan system is well maintained and used as intended, report such an event to the manufacturer Materialise Motion.
- All equipment connected directly or indirectly to the footscan system (PC and peripherals, force plate, trigger device, synchronized camera ...) has to be configured in accordance with the EN 60601-1 standard. Consult a qualified technician when in doubt.
- Ensure a safe distance of 1.5m between the client and any of the above mentioned equipment (except equipment required for the measurement such as a force plate) or other equipment not compliant with the EN 60601-1 standard.
- The PC used should be approved to the appropriate safety standard for non-medical equipment (EN 60950).
- Do not place the footscan system (plate, cable ...) adjacent to equipment or power lines which generate strong electromagnetic or electrostatic fields, relocate if necessary.
- Do not operate or store the footscan system outside the specified environmental temperature and humidity range, do not expose the footscan system to direct sunlight, do not expose the footscan system to moisture.
- Install the footscan plate on a solid, non-skid surface, ensure the plate is fully supported and the entire client runway is non-skid.
- Install the footscan plate in a runway which is long enough to allow the client to walk or run in a natural gait pattern.
- To eliminate the height difference between the floor and the footscan plate, either recess the footscan plate in the floor or use a raised runway (available from Materialise Motion or its local distributors).
- Avoid direct contact between the measurement surface of the footscan plate and damaged skin, use appropriate isolation methods.
- Protect the measurement surface from high impact or sharp objects. Dents or damage to the measurement surface can influence the measurement and can permanently damage the Pressure Sensitive Layer and electronic components. Use a protective cover when performing such measurements, for example a layer of 3-5mm EVA material (Ethylene Vinyl Acetate sheets).
- Protect the footscan plate cable and connectors from accidental damage. Ensure nobody can trip over the cable. Use a cable conduit or other means to cover and protect the cable.
- Do not bend the footscan cable at a sharp angle.
- Do not lift the footscan plate by its cable, never pull the cable.
- Do not extend the footscan plate cable.
- When not in use, store your footscan plate flat (measurement surface up) or in its packaging or flight case. Do not store the footscan plate vertically without adequate support (cable always pointing upwards), do not put any weight on the measurement surface.
- Do not use unsuitable or unapproved third party accessories or non-original spare parts, this can cause malfunctions or incorrect measurements and void warranty.
- The footscan systems are not intended to be used in an oxygen rich environment.

1.5 Safety Inspections

This section contains important instructions regarding safety. Please read them carefully.

- Prior to each measurement session, visually inspect the measurement surface of the footscan plate, do not use the footscan plate if the protective sticker or rubber is loose or damaged to such an extent that the client could trip or get injured. Replacement stickers and rubbers can be ordered from Materialise Motion or its local distributors.
- Prior to each measurement session, visually inspect the cable and client runway, ensuring maximum safety for the client while being measured.
- On a weekly basis, inspect the cable and connection. Do not use the system if the cable is damaged. Detachable cables can be replaced by the user, replacement cables are available from Materialise Motion or its local distributors.

1.6 Care of the Measurement Surface

- To ensure client safety, clean and, if applicable, disinfect the measurement surface of the footscan plate or insole sensor between subsequent clients.
- The measurements surface can be cleaned and disinfected with a suitable disinfectant or a mild detergent.
- Do not pour or spray the cleaning or disinfectant product directly on the footscan plate, use a damp cloth to clean and remove contamination.
- Make sure the measurement surface of the footscan plate is completely dry before use.
- Do not use aggressive cleaning or disinfectant products that are harmful to PVC, polycarbonate plastic, rubber or aluminium.
- Do not use solvent based, flammable or abrasive cleaning or disinfectant products.
- Do not submerge any part of the footscan system into water or other liquids.
- Do not sterilize the footscan plate or any of its components.

1.7 Calibration and Repair

- Materialise Motion recommends to send the footscan system to Materialise Motion yearly for replacement of the Pressure Sensitive Layer (PSL) and calibration. Contact the Materialise Motion support department at support.motion@materialise.be to obtain our RMA (Return Material Authorization) procedure.
- There are no user serviceable parts inside the footscan system. Disassembly of the footscan system will void warranty.
- Repair of the footscan system should only be performed by qualified personnel at the headquarters of Materialise Motion, contact the Materialise Motion support department at support.motion@materialise.be to obtain our RMA (Return Material Authorization) procedure.
- Save the original packaging of the footscan system, it can be used to ship the footscan system to Materialise Motion for repair or replacement of the Pressure Sensitive Layer (PSL).

1.8 European Union (EU) Customer Information

Footscan products are marked according to the European directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

This symbol on the product or the documentation indicates that this product may not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. Disposal must be carried out in accordance with local environmental regulations for waste disposal. For more detailed information about disposal of this product, please contact the distributor where you purchased the product, your household waste disposal service or your local city office.

Alternatively, the product can be sent back to Materialise Motion for disposal or trade-in. Contact the Materialise Motion support department at support.motion@materialise.be to obtain our RMA (Return Material Authorization) procedure.

1.9 Limited Warranty Terms and Conditions

- Materialise Motion products are warranted to be free from defects in materials or workmanship for a period of one year from the date of delivery (the "Warranty Period").
- If the product is determined to be defective during the Warranty Period, Materialise Motion shall repair the product.
- Repair as provided under this warranty is the sole and exclusive remedy of the consumer and Materialise Motion's sole and exclusive liability in respect of defects in your product.
- Any parts replaced under warranty will become the property of Materialise Motion.
- Parts replaced under warranty will be covered by a 90 days repair warranty or the remainder of the product warranty period, whichever period is longer. The product warranty period will not be extended.
- The customer shall exhaust all support options listed in the contact information section before returning a product.
- The customer shall contact Materialise Motion support department (contact information on page 6) prior to returning a product to obtain the Materialise Motion Return Material Authorization (RMA) procedure and form. After receiving and validating the filled-in form from the customer, Materialise Motion customer support shall issue an RMA number. Returned products without a valid RMA number will be rejected.
- The customer shall ship defective product freight prepaid to Materialise Motion. Materialise Motion shall ship the repaired product freight prepaid to the customer. Customers outside of Europe shall issue a pro-forma invoice and declare the shipment as temporary export, contact Materialise Motion customer support for more information on shipments outside of Europe.
- To the extent permitted by applicable law(s) Materialise Motion does not assume any liability for loss of or damage to or corruption of data, for any loss of profit, loss of use of products or functionality, loss of business, loss of contracts, loss of revenues or loss of anticipated savings, increased costs or expenses or for any indirect loss or damage, consequential loss or damage or special loss or damage.
- This Limited Warranty does not affect your legal (statutory) rights under your applicable national laws relating to the sale of products.

The warranty covers:

- The cost of all parts and labor in the repair or replacement of any parts, following mechanical or electrical breakdown, which are shown to the satisfaction of Materialise Motion to be defective due to faulty materials or workmanship.

The warranty does not cover:

- Normal wear and tear, including wearing parts such as fuses, dents, scratched paintwork, interface cables and Pressure Sensitive Layer (PSL).
- The cost of repair following accidental damage, careless operating, unintended use, use or incorrect installation of incompatible third party equipment, negligence, handling damage, transit damage, misuse, non-compliance with the supplied instructions, force majeure, natural forces or damage due to other external causes.
- Unsatisfactory performance caused by non-compliance with the minimum system requirements, the use or attachment of any accessories not produced or authorized by Materialise Motion.
- Use of the footscan system for any purpose other than the intended use.
- Repairs, alterations or disassembly carried out by unauthorized parties or agents.
- Products damaged during transit to Materialise Motion due to insufficient or improper packaging.
- Materialise footscan software.

1.10 Minimum System Requirements

Footscan 9 runs on the following 64-bit versions of Microsoft Windows®: 10.

The minimum system requirements are:

- Microsoft Windows® 10 64-bit.
- An intel i3 series processor of the 7th generation, or similar/newer processor.
- 1GB of free HDD hard disk space.
- 2GB of RAM.
- An integrated graphics card supporting at least OpenGL® 2.1 or OpenGL ES® 3.0.
- Support for a minimum screen resolution of 1920x1080 (also known as Full HD).
- One USB2 port available to connect the footscan plate.

Materialise Motion recommends the following system requirements for maximum user experience:

- Microsoft Windows® 10 64-bit.
- An intel i5 or i7 series processor of the 7th generation, or similar/newer processor.
- 5GB of free SSD hard disk space.
- 4GB of RAM.
- A dedicated graphics card supporting at least OpenGL® 2.1.
- Full HD support corresponding to a screen resolution of 1920x1080.
- Up to four USB2 ports available to connect the footscan plates, boxes, scanners and dongles.
- An active internet connection.

It is not guaranteed that the footscan 9 software runs correctly from within a virtual machine. Running from a virtual machine might cause connection problems with the plate or prevent the software from functioning correctly itself. It is advisable to run the footscan 9 software directly on the native operating system.

It is not guaranteed that the footscan 9 software runs correctly on mobile devices (for example tablets). Running on mobile devices might cause connection problems with the plate or prevent the software from functioning correctly itself. It is advisable to run the footscan 9 software on non-mobile devices.

It is not guaranteed that the footscan 9 software runs correctly on a multiple monitor setup with different screen resolutions. Moving the footscan 9 software from a screen to another with a different resolution may deform the interface making it difficult to use the footscan 9 software.

1.11 Internet Access

Footscan 9 needs an active internet connection for correct operation. So in case of a restricted internet access (firewall, ...), make sure that the following url's are accessible:

- Automatic software updates and migration wizard download:
  - https://downloads.api.materialisemotion.com
  - https://update.api.materialisemotion.com/downloads/footscan9
- Identification of the footscan 9 software:
  - https://identity.materialisemotion.com
- Automatic download of configuration (see chapter 4.2) and calibration files (see chapter 4.3):
  - https://config.api.materialisemotion.com
  - https://calib.api.materialisemotion.com
- Anonymous logging of usage statistics:
  - https://usagestats.api.materialisemotion.com
- Emailing service:
  - https://mailing.api.materialisemotion.com
- Phits™:
  - https://portal.rsprint.com
- Mobile 3D scans and Phits™ mailing service:
  - https://mws-orderingservice.materialise.com
- Customizable branding:
  - https://update.api.materialisemotion.com
  - https://ofm-api.materialise.com

Contact the Materialise Motion support department at support.motion@materialise.be for further assistance.

Chapter 2

Installation

This chapter describes the installation and setup of the footscan system. It guides you through all steps needed to obtain a fully functional footscan system.

Most steps in the installation procedure outlined in this chapter apply to all footscan systems. Sections which apply only to specific systems are marked as such.

If the installation does not proceed as described in this chapter, refer to Chapter 4 for troubleshooting tips.

2.1 Prerequisites

Before proceeding make sure:

- your computer meets the minimum system requirements (Section 1.10).
- to have all necessary hardware parts. For a 1.5m entry level system there should be a detachable USB A-A cable included with the footscan system.
- to have obtained a medium (USB stick) containing the application installer and a license and factory calibration file.
- you are allowed to install software on your computer. In doubt contact your local system administrator for help.

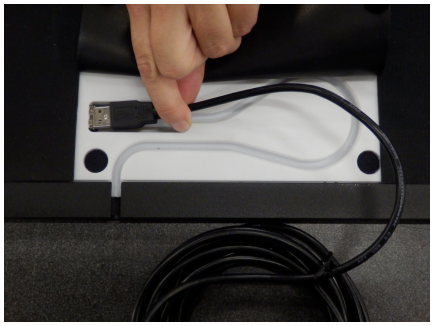
Please contact the Materialise Motion support department at support.motion@materialise.be if any of the hard- and/or software parts are missing.

2.2 Attach the USB Cable to the Device

This section applies only to 1.5m Entry Level Systems. Proceed to Section 2.3 if not applicable.

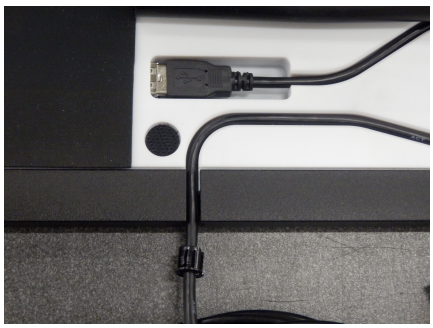
The 1.5 entry level plate uses a detachable USB cable A-A. Flip the rubber lid to access the plate connector.

Position one of the two identical connectors of the supplied USB cable A-A in front of the plate connector. Match the orientation of the connectors.

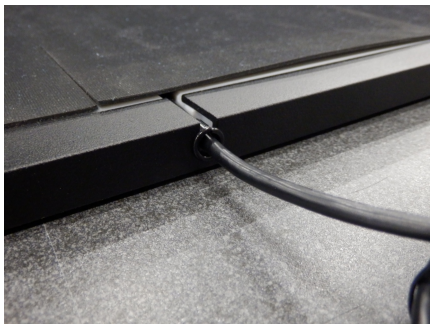


Gently insert the connector of the USB cable A-A in the plate connector.

Route the cable in the strain relief gutter.



Slide the bushing over the cable into the frame and flip the rubber lid back.



The cable can be removed when the system is not in use or has to be transported.

2.3 Install the interface box

This section applies only to interface box systems. Proceed to Section 2.4 if not applicable.

Verify that the power switch on the footscan interface box is in the **OFF** position

Connect the cable from the footscan plate to the analog coaxial cable (mini-din end). Align the positioning notches

Align the connectors in a straight line and insert carefully. Do not use excessive force.

Connect the analog coaxial cable (XLR end) to the analog footscan connector on t h e footscan interface box. Align the positioning key and insert until the latch locks.

Connect the external power supply to the footscan interface box

Connect the mains cable to the external power supply and the mains.

Connect the footscan interface box to your computer using the supplied USB 2.0 compliant cable. Connect the USB-B side of the cable (square connector) to the USB socket on the footscan interface box. Match the orientation of the connectors.

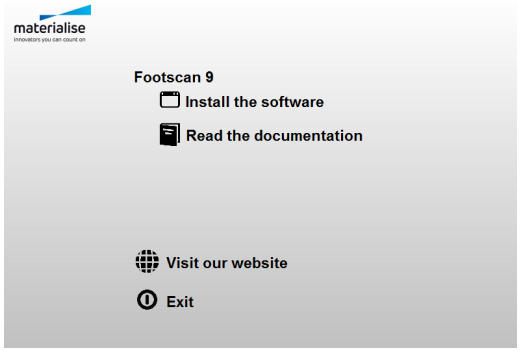
When the hardware setup is completed, switch **ON** the footscan interface box. The green power LED will light up.

2.4 Install the Software

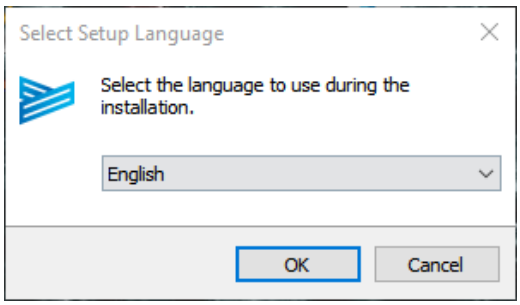
Do not connect the footscan system to your computer yet. This is part of the installation procedure later on in this section.

Insert the installation medium containing the installer in your computer. The installation procedure starts automatically. If not, start autorun.hta manually.

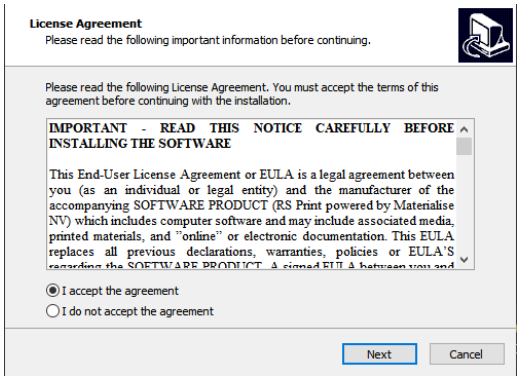
Click Install the software to proceed with the installation. Your computer may need your permission to install footscan 9.



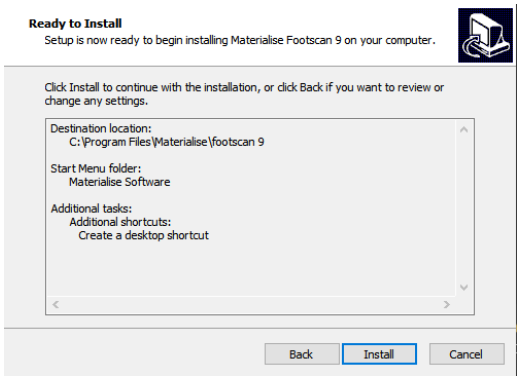
Select your preferred language and click Ok.



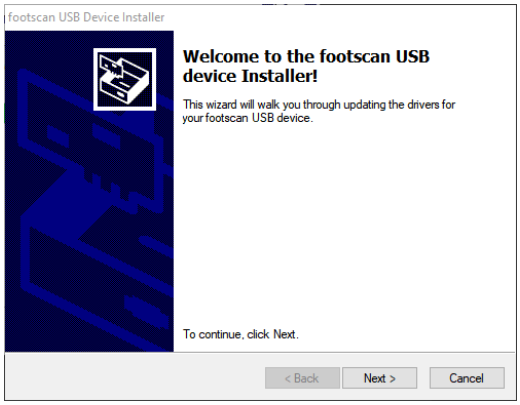
The installer shows the End-User License Agreement of the footscan 9 software. Select ◉I accept the agreement and click Next to continue.



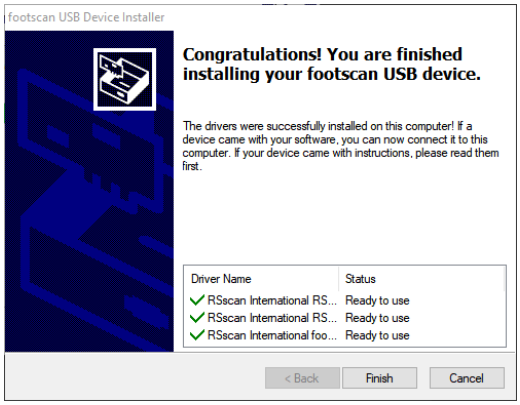
The installer lists details about the installation. Click Install to start the installation. If the installer is accompanied with a license and calibration file, the installer will ask to replace your current one. See section 2.6 for more information. If necessary, an upgrade of the footscan database will be performed. See section 2.5 for more information. If no footscan database is present, a demo database will be installed.



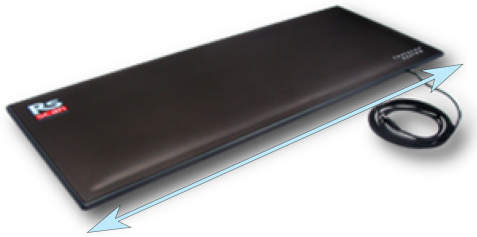
The installer proceeds with the footscan USB device driver. Click Next to continue.



The footscan USB device driver is installed successfully. Click Finish to continue.

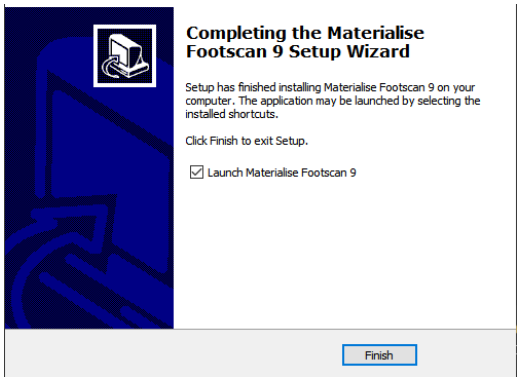


Place the plate on the floor, the measurement surface facing up (serial number label facing down). Align the plate according to the gait direction (see arrow).



Connect the USB cable of the footscan plate or box to a free USB 2.0 compliant port of your computer. After a few moments a notification in the system tray signals that the footscan device driver software has been installed successfully.

Click Finish to finish the software installation. To start footscan 9 after installation leave ☑Launch footscan 9 checked.



The installation of the footscan system is now complete. Proceed to Chapter 3 to perform your first measurement.

2.5 Database upgrade

Some updates of the footscan 9 also require an upgrade of the footscan database. The release notes will help you in identifying which software updates also require a database upgrade. The database upgrade process is completely automatic and will be performed only when needed. The database upgrade check is performed during the installation of the footscan 9 software. During the database upgrade process, you will be informed of its progress trough a progress dialog.

The upgrade may require an extensive amount of time, depending on the size of your database. It is advisable to defer your software update until you are able to wait for the upgrade to finish.

A database upgrade will never remove or alter existing data. The database upgrade will also check for data consistency before trying to upgrade the database itself. If the automated database upgrade detects any problems it cannot resolve, the database upgrade process will be aborted and the database will not be updated. In case of an error, the installation will revert itself to the footscan 9 version from which you were upgrading. If it is not possible to start the footscan 9 software, you can always manually reinstall the footscan 9 version from which you were upgrading to access your data. Please contact support.motion@materialise.be if problems with the database upgrade occur and to help you with installing the previous footscan 9 version.

2.6 Replace the license and calibration file during installation

When the installer includes a new license and calibration file for your footscan system, the installer will ask for confirmation to replace it. Click on Yes to replace the license and calibration file or click on No to keep working with your existing license and calibration file.

2.7 Installing the software on Windows® versions below 10

This section applies only to computers running Microsoft Windows® versions below 10, such as Windows® XP, Vista, 7 or 8.

This version of footscan 9 **cannot** be installed on Windows® versions below 10! The installer will show an error dialog when trying to install. It is suggested to upgrade your operating system to a newer Microsoft Windows® version, see the minimum system requirements (chapter 1.10) for more information.

It is still possible for users with older Windows® versions to update their license and calibration file. This may be required after the footscan pressure plate has received a PSL replacement. The license and calibration file can be installed by executing the installer as follows:

1. Start the installer.
2. Click on the error message stating that the software cannot be installed on Microsoft Windows® versions below 8.
3. A message box will appear asking to replace the existing license and calibration file with a new one.
4. Click on Yes to replace your license and calibration file or click No to keep working with your existing license and calibration file.

Chapter 3

Your First Measurement

This chapter outlines the minimum number of steps from a fresh installation of the footscan system to the first measurement.

Start the software using either the shortcut on your desktop, or the entry in the start menu.

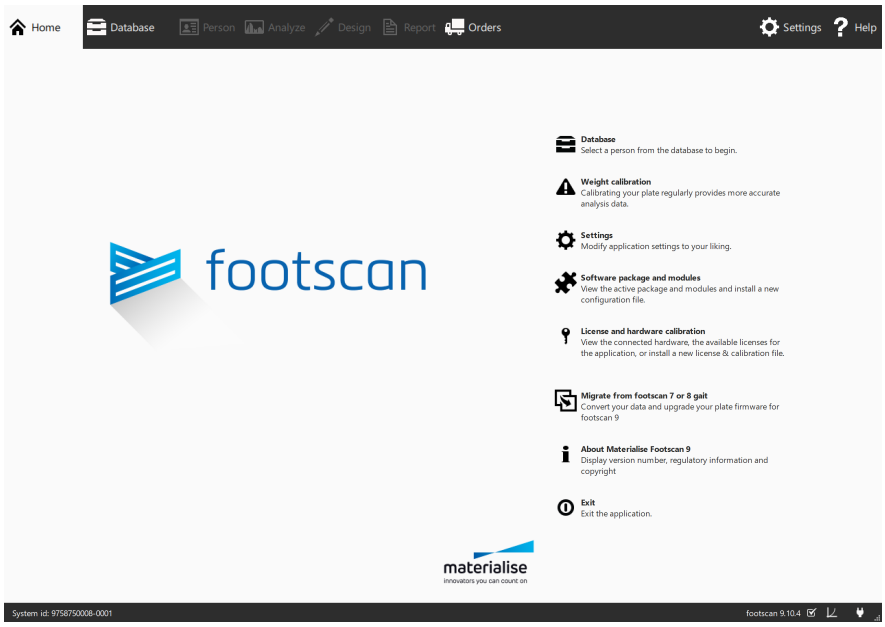


Figure 1: The Home screen is the main access point of footscan 9.

At startup, footscan 9 shows the Home screen (Figure 1).

If you have not already plugged in the footscan system, plug it in now. A notification balloon will pop up, informing you that the footscan device needs weight calibration.

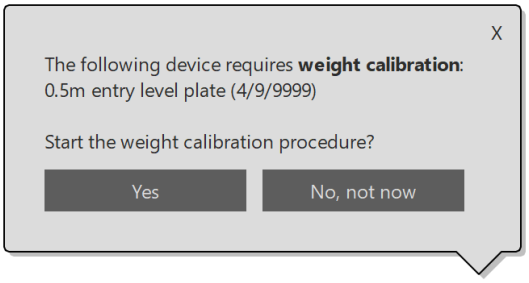


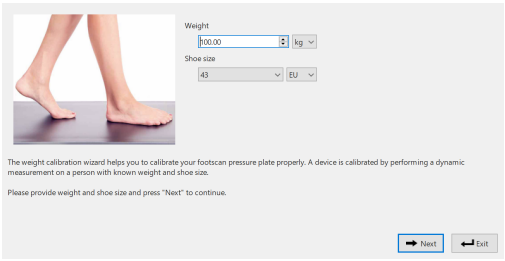
Figure 2: The notification balloon warning you that a footscan device requires weight calibration.

Click Yes to start the weight calibration.

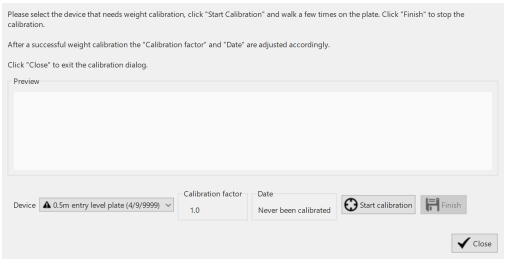
3.1 Weight Calibration

Weight calibration uses a measurement of a subject with known weight to scale the pressure data appropriately. Materialise Motion recommends performing a weight calibration regularly to assure accurate measuring. Refer to Section 6.1 for more information.

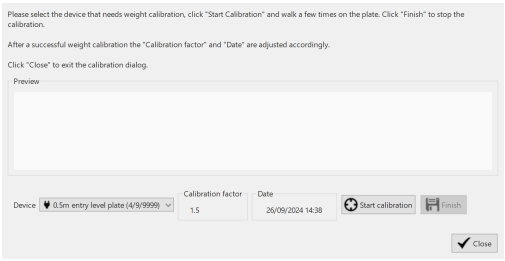
Fill in the Weight and Shoe size of the measurement subject. These are mandatory fields. Choose Next to continue.



The Calibration wizard shows the Calibration factor and Date of the last weight calibration of the selected Device. Click Start calibration. The Preview is enabled and shows the activity on the plate. Walk over the plate 6-8 times in the gait direction (Section 2.4). The wizard estimates a calibration factor based on the feet detected on the device. Click Finish to complete the calibration.



After a successful calibration the wizard shows the updated Calibration factor and Date. Click Close to exit the Calibration wizard and to return to the Home screen.



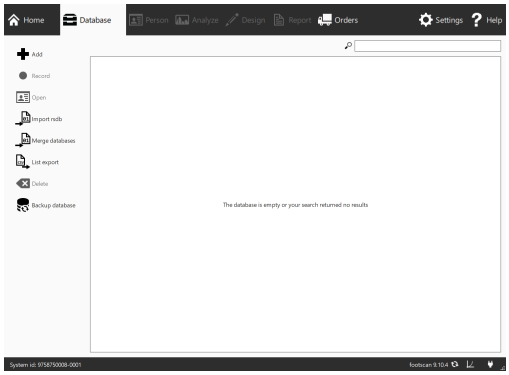
3.2 Create a New Subject

If there was no footscan database present during the installation of footscan 9, the installer has copied a demo database.

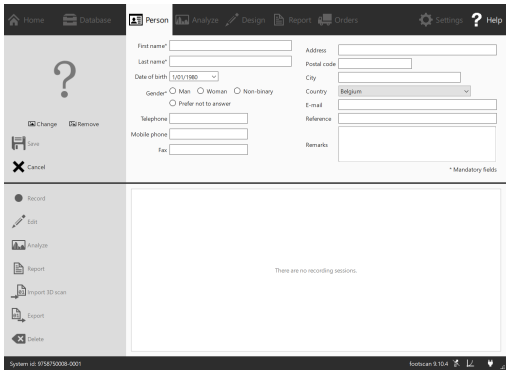
To record a new measurement the application needs information of the subject being measured. footscan 9 provides the Database screen to manage information about measurement subjects.

Click Database in the Home screen to navigate to the Database screen.

Currently there are no measurement subjects in the list. Click ✚ Add to add one. The application navigates to the Client Screen.



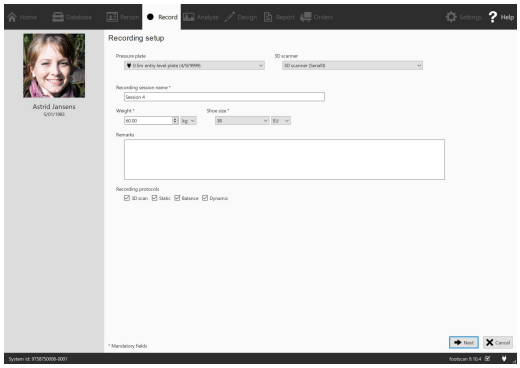
The Client screen provides an interface to edit personal information about a subject. It also lists all measurement sessions of that subject. Fill in the personal information for your newly created subject. First name, Last name and Gender are mandatory fields. Use Save o r ✕ Cancel to proceed after editing the subject's personal information.



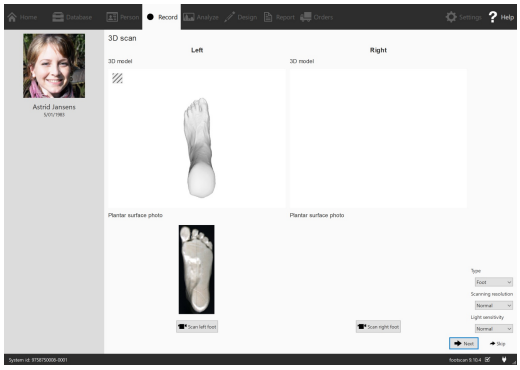
3.3 Create a New Recording

The Record wizard is responsible for creating new measurements. It consists of five stages: Record Setup, 3D Scanner Recording, Static Recording, Balance Recording and Dynamic Recording. Other screens are inactive while going through the Record wizard. Click ● Record in the Client screen to create a measurement.

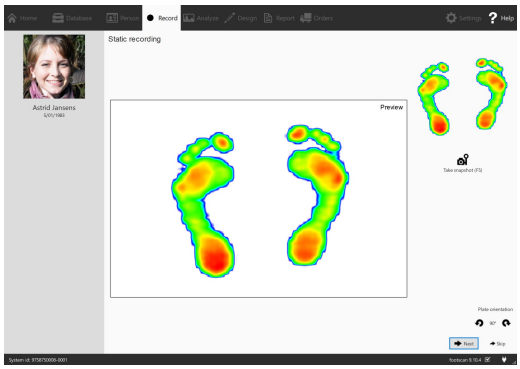
Provide a Recording session name * for the upcoming measurement session, as well as the Weight * and Shoe size * of the subject. Choose which recordings you want to perform by toggling the recording protocol checkboxes. Click Next to proceed.



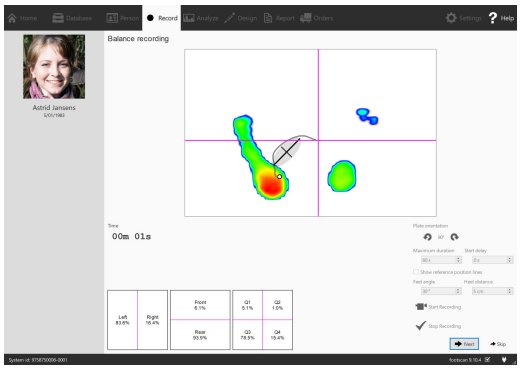
The 3D Scan Recording is performed on each foot separately and can be initiated by clicking the Scan left foot and Scan right foot buttons. For an accurate recording, it is important to stand as still as possible in the center of the 3D scanner while it is scanning. The result of the 3D scan will be shown as a top-down 3D view and plantar surface photo of the scanned foot as soon as the 3D data has been processed.



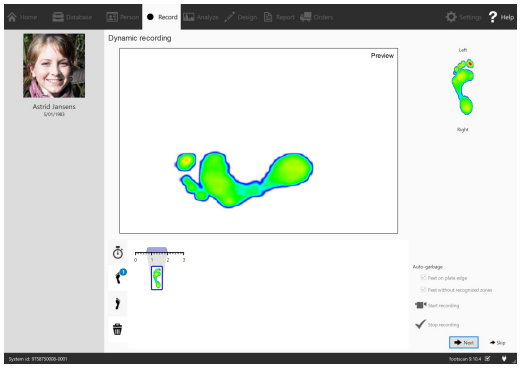
The Static Recording contains a large preview window showing the activity on the plate. Stand on the plate and click Take snapshot (F5) to make a static recording. Retry until you have a satisfactory result. Click Next to continue.



The Balance Recording shows the activity on the plate in a preview. The Start Recording button becomes active when there is pressure on the plate, click this button to start a balance recording. Stand as still as possible on the plate during the recording, the recording stops automatically when the recording duration has elapsed or when the user clicks the ✓ Stop Recording button.



The Dynamic Recording shows the activity on the plate in a preview. The recording is initiated by clicking Start recording. Walk over the plate in the gait direction (Section 2.4). The timeline shows all feet recognized during the measurement as thumbnails. The wizard displays the latest left and right feet on the right. End the recording with ✓ Stop recording.



Click Next to exit the Record wizard. The application navigates to the Analyze screen, where you can review your measurement. Refer to the second part of this Installation Guide and User Manual for an in-depth overview of the Analyze screen.

Chapter 4

Troubleshooting

This chapter discusses details about the footscan system that might be relevant to some users during the installation process. Please refer to this chapter if the installation does not proceed as described in this document. For unforeseen problems please contact the Materialise Motion support department at support.motion@materialise.be.

4.1 Licensing

To prevent unauthorized usage, footscan 9 only runs when a licensed device is plugged into your computer. A licensed device may be either a footscan plate, 3D scanner or a USB2 hardware dongle. License information of the footscan device(s) is present in the configuration file. The installer medium includes a valid configuration file and factory calibration file(s) which covers your footscan device(s). The installer automatically copies these files to your computer. If no licensed device is connected while the application is running the Security dialog (Figure 3) pops up. This dialog disappears once a licensed device is plugged into the computer.

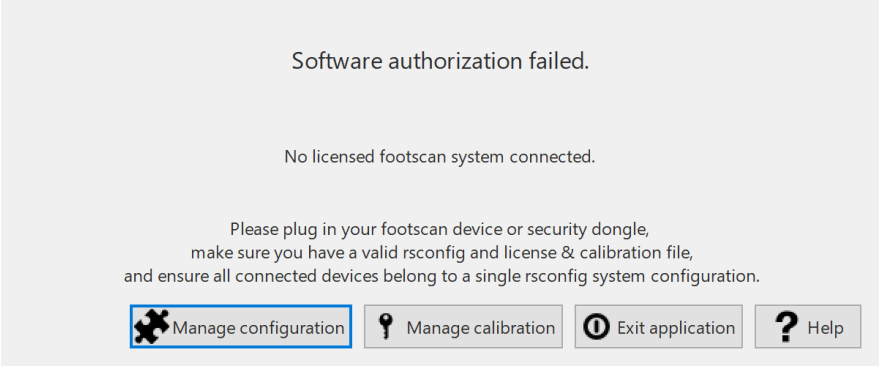


Figure 3: The Security dialog pops up when no licensed device is connected while the application is running. It disappears once a licensed plate or dongle is plugged into the computer.

The Security dialog might appear while the device is connected to the computer. This is the case when the current license does not cover the connected device. Choose Manage calibration to open the license and hardware calibration dialog to review which devices are licensed in your current configuration file (Figure 4).

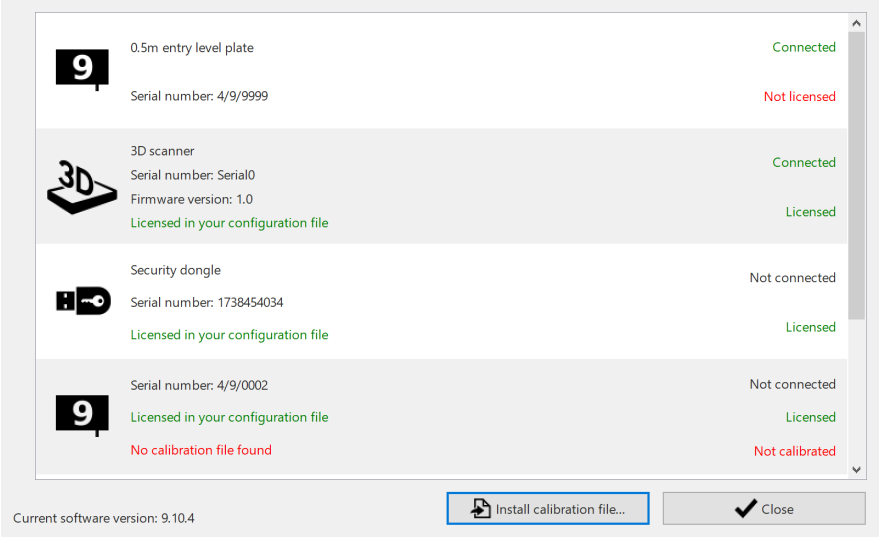


Figure 4: The License and hardware calibration dialog lists all connected footscan devices.

The License and hardware calibration dialog lists the serial numbers of all covered footscan devices, along with their descriptions, license and calibration information. Cross-reference the serial number of the connected device (on the identification plate at the back) with the License and hardware calibration dialog list and contact Materialise Motion's support department at support.motion@materialise.be for further assistance.

Installing a new configuration file and information about your acquired footscan package and modules can be found in the software package and modules dialog,

choose Manage configuration to open the software package and modules dialog. Consult section 6.2 for more information.

4.2 Configuration File

Footscan 9 will try to automatically download the latest configuration file for your system. This is done automatically in the background when the software is starting up. Should a new configuration file be available, footscan 9 will ask you if you want to proceed to replace your current configuration file with the updated version. Depending on your operating system, you may require administrator rights to allow this action.

Only footscan devices belonging to the same configuration may be connected to your system at start-up. Footscan 9 will show an error message if multiple footscan devices belonging to different configurations are connected. Make sure only footscan device(s) of the same configuration are connected and restart footscan 9.

The configuration file holds information about all licensed footscan device(s) for your system. It also contains information about your package and unlocked footscan modules.

A new configuration, for example a new licensed footscan device, newly acquired modules or an upgraded package, can be installed through the software package and modules dialog (Figure 5), more information about the software package and modules dialog can be found in section 6.2.

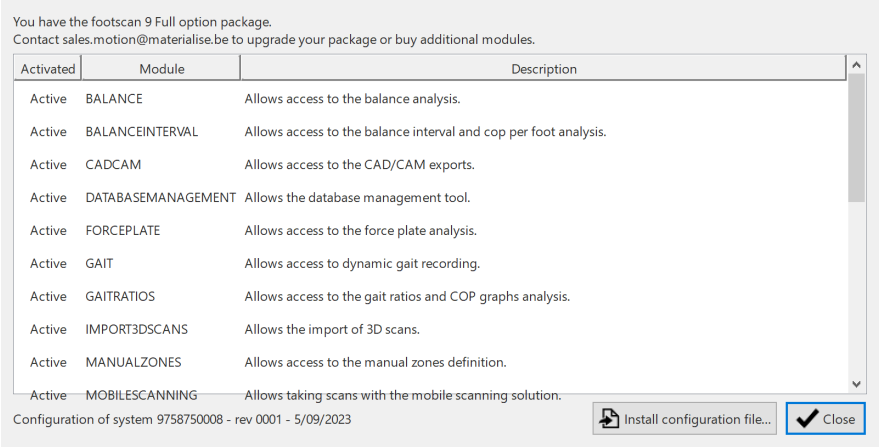


Figure 5: A new configuration file can be installed through the software package and modules dialog.

To activate your new configuration, click on the Install configuration file... button and select the new configuration file in the file dialog.

The software package and modules dialog can be opened in two location:

1. By clicking the Manage configuration button in the Security Dialog (Figure 6). More information about the security dialog can be found in section 4.1.

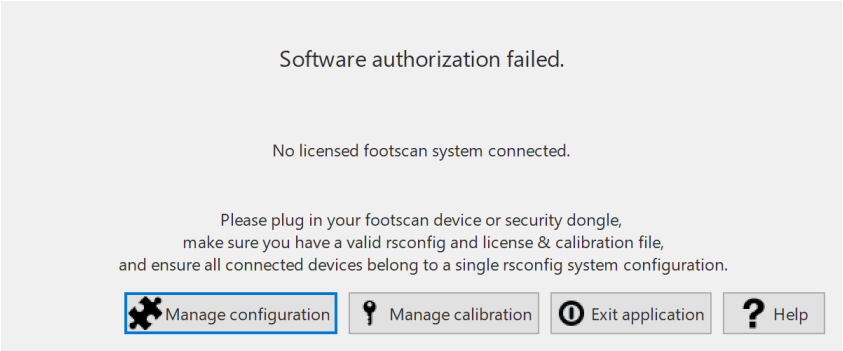


Figure 6: The software package and modules dialog can be opened in the security dialog.

2. By clicking the Software package and modules button in the Homescreen (Figure 7). More information about the home screen can be found in section 6.

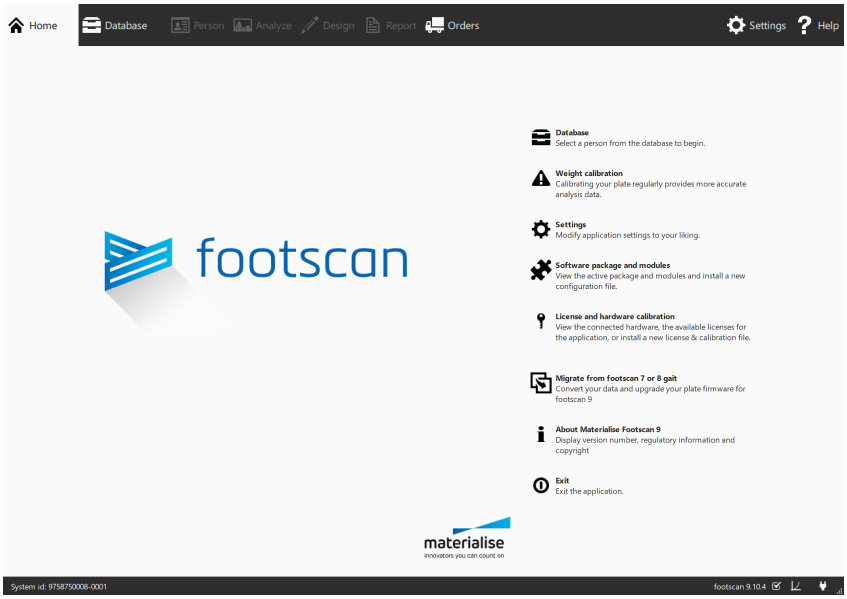


Figure 7: The software package and modules dialog can be opened in the home screen.

4.3 Calibration File

Footscan 9 will try to automatically download the latest calibration file(s) for your system. This is done automatically in the background when the software is starting up. Should a new calibration file be available, footscan 9 will ask you if you want to proceed to replace your current calibration file with the updated version. Depending on your operating system, you may require administrator rights to allow this action.

The calibration file holds the factory calibration information of your footscan device, a new calibration file can be installed through the license and hardware calibration dialog (Figure 8).

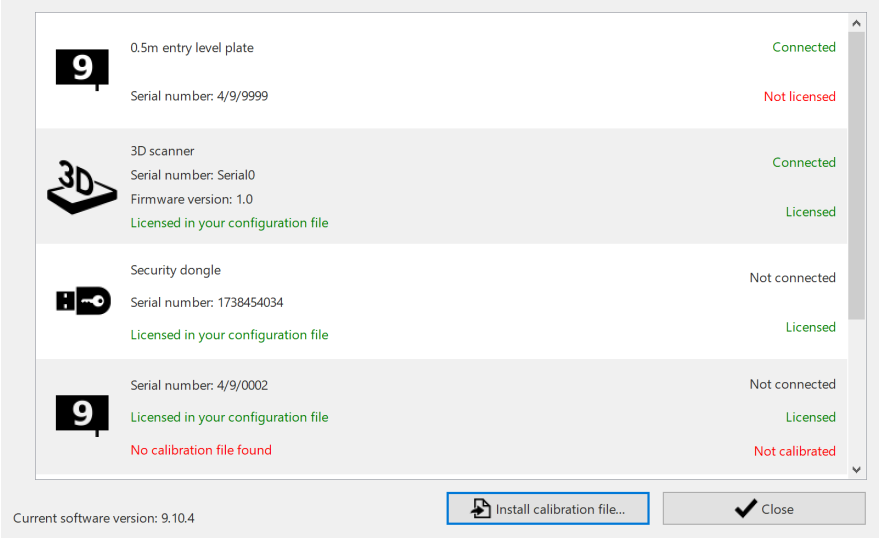


Figure 8: The License and hardware calibration dialog lists all connected footscan devices.

Click Install calibration file... to install a new calibration file. More information about the license and hardware calibration dialog can be found in 6.3

The license and hardware calibration dialog can be opened in two location:

1. By clicking the Manage calibration button in the Security Dialog (Figure 9). More information about the security dialog can be found in section 4.1.

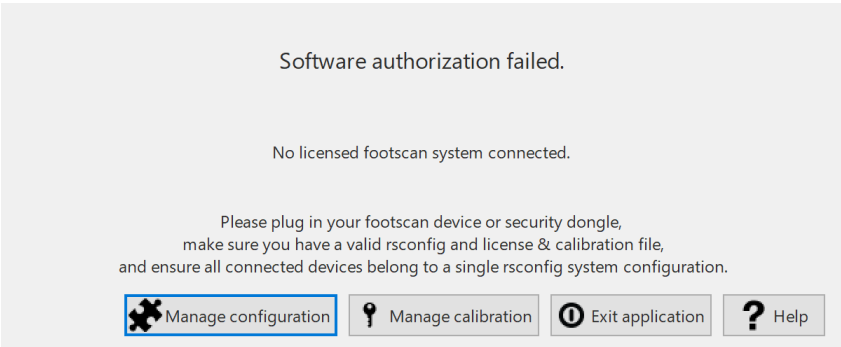


Figure 9: The license and hardware calibration dialog can be opened in the security dialog.

2. By clicking the License and hardware calibration button in the Homescreen (Figure 10). More information about the home screen can be found in section 6.

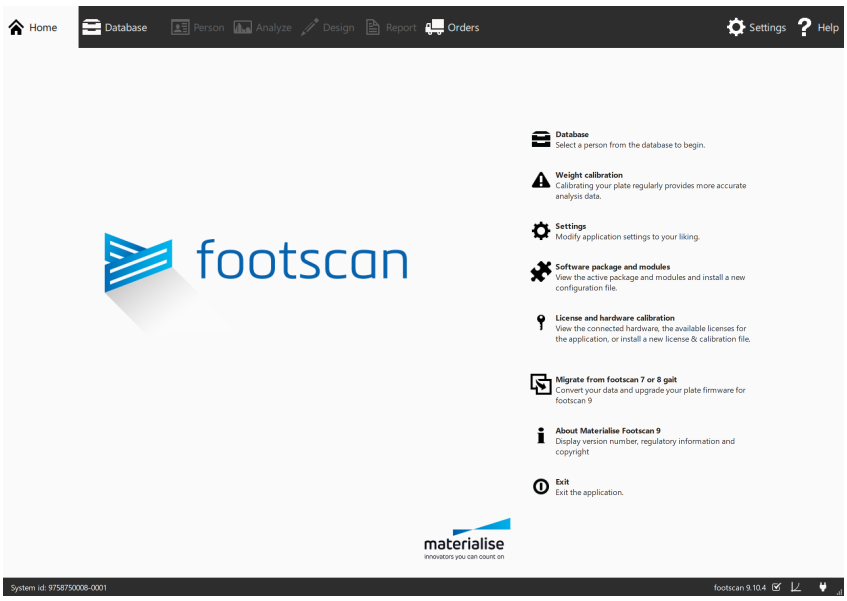


Figure 10: The license and hardware calibration dialog can be opened in the home screen.

4.4 Automatic download of configuration and calibration files fails

Footscan 9 will try to automatically download the latest configuration and calibration file(s) for your system. Check the following should this download fail:

- Make sure there is an active internet connection.
- In case of a restricted internet access (firewall, ...), make sure that the necessary url's are accessible (see chapter 1.11).

Contact the Materialise Motion support department at support.motion@materialise.be for further assistance.

4.5 Pressure Sensitive Layer (PSL) Replacement

Materialise Motion recommends to replace the PSL yearly.

Footscan 9 will try to automatically download the pending PSL replacement list of your footscan device(s). This is done automatically in the background when the software is starting up. Should footscan 9 detect that a PSL replacement file is already present on your computer, then footscan 9 will show a confirmation dialog asking if the PSL was actually replaced on your footscan device.

There are two ways to replace the PSL of your footscan pressure plate:

- Replacement by Materialise Motion: your device is sent back to Materialise Motion through a RMA procedure. The PSL replacement and factory calibration will be performed by Materialise Motion and a new calibration file will be made available on the Materialise Motion calibration server. As soon as you start the footscan 9 software with the pressure plate connected, the footscan 9 software will download and use the new calibration file.
- On-site replacement: a new PSL can be prepared by Materialise Motion and installed on your pressure plate by a distributor. The new calibration file will be made available on the Materialise Motion calibration server with a "pending" flag, this means that it must be signaled to the Materialise Motion calibration server when the PSL is actually replaced. This can be done in the setting dialog, see section 6.4.

Contact the Materialise Motion support department at support.motion@materialise.be for more information about replacing the PSL.

4.6 Important Files

When contacted, Materialise Motion's support department might ask for additional information about the current problem. Such information might include the contents of files of the footscan system. This section includes the location and a description of some of the key files of footscan 9.

All footscan 9 files are located in two directories:

- C:\Program Files\Materialise holds all program files. They are located in the footscan 9 subfolder.
- C:\Users\<you>\footscan holds all data files. It contains the gaitessentials9, config and calib folder.

Refer to the table below for a list of key files of footscan 9.

File	Location	Description
footscan.exe	footscan 9	The footscan 9 executable
*.rsconfig	config	Configuration file holding information about all licensed footscan devices, package and unlocked software modules.
*.rscalib	calib	Calibration file holding factory calibration data for the correct operation of your pressure plate.
footscan.sqlite	gaitessentials9	File holding the database containing all your measurements. The databaseManagement module allows you to change the default location of the database to another path, or to use a different filename.
footscan.log	gaitessentials9	File containing an extensive log of the program's inner workings. Used by the Materialise Motion support department to diagnose problems.
footscanSettings.exe	footscan 9	Graphics setting tool for modifying some OpenGL® settings used by footscan 9 (see Section 4.11).

4.7 Program fails to install

The footscan 9 software installer requires that certain Windows® updates are present on your system. In most cases the required updates will be automatically selected by Windows® before the installation continues. However, some Windows® configurations might have trouble with detecting whether the correct updates are installed.

When your Windows® operating system fails to detect whether the correct updates are installed you can perform the following actions:

Check for updates	In the Windows Update section of the Windows® control panel you can force a re-check for updates. You are adviced to install all updates that are listed as required by Windows®.
Force-install all missing updates	In case Windows® doesn't detect any missing updates on its own, you can use a tool called 'WSUS Offline Update' to download and force-install the updates onto Windows®. Note that this may require some level of computer knowledge.
Contact support	While the root cause of the problem is related to an internal failure of the Windows® update system, we do offer additional support to help you in getting your Windows® system up to date. You can contact support at support.motion@materialise.be.

4.8 Program fails to start

The footscan 9 software depends on external software components in order to function correctly. All necessary components are installed automatically during the installation of the footscan 9 software. In case critical external components are removed afterwards or become corrupted, the software will not function properly. One such component is the Microsoft Visual C++ redistributable package, when this software is missing the program will fail to start. The error message will roughly state the following:

"The program can't start because MSVCP140.dll is missing from your computer. Try reinstalling the program to fix this problem."

This error means that the Microsoft Visual C++ Redistributable Package is missing or corrupt, which version is missing can be determined based on the error message:

MSVCP100.dll	the 'Microsoft Visual C++ 2010 Redistributable Package (x64)' is missing.
MSVCP120.dll	the 'Microsoft Visual C++ 2013 Redistributable Package (x64)' is missing.
MSVCP140.dll	the 'Microsoft Visual C++ 2015 Redistributable Package (x64)' is missing.

You can fix this problem by reinstalling the correct 'Microsoft Visual C++ Redistributable Package (x64)', try to find and download this software for your operating system. After installing the redistributable package, the footscan 9 software should function properly.

4.9 Connection with device is lost

The communication between the footscan plate and the software is established via a USB connection. Because the plate sends large amounts of data in real-time to the software, it might occur that the connection with the device is lost. If this happens frequently, the following may fix the problem:

- Check if the USB connector from the footscan USB device fits correctly into the USB port. Removing and reinserting the USB connector might be enough to resolve the problem
- Try using a different USB port. Switching from a USB port on the front side of the computer to the backside (or vice-versa) will more likely use a different internal USB connection which may be the cause of the problem
- When using a USB hub:
  - Try to use a dedicated USB port directly on the computer
  - When you need to use a hub, try to connect only one USB device to the hub
  - An externally powered hub might help in providing a more stable connection with the USB device
  - Some USB hubs themselves cause problems. Using a different type of USB hub might resolve the problem

If the footscan plate continues to experience USB connection problems, the problem may originate from either your internal USB controller or may indicate a problem with the footscan plate itself. Contact the Materialise Motion support department at support.motion@materialise.be for further assistance.

4.10 Migration from footscan 8 gait to footscan 9 fails

The migration of footscan 8 gait data may fail for certain combinations of footscan 8 gait versions and footscan 9 versions. Please contact support at support.motion@materialise.be if you want to migrate footscan 8 gait data to the new footscan 9 software.

More information about migrating footscan 7 or 8 gait to footscan 9 can be found in section 3.

4.11 footscan 9 graphics settings tool

Making changes with this tool is only possible when the footscan 9 software is closed!

The footscan 9 graphics settings tool can be used to modify some OpenGL® settings used by footscan 9.

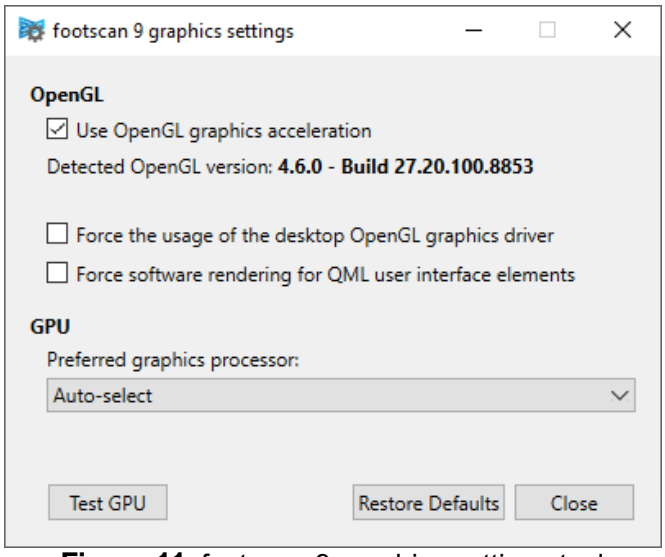


Figure 11: footscan 9 graphics settings tool

The following modifications are possible:

- "Use OpenGL Graphics acceleration"
  Uncheck if your system does not support OpenGL® adequately. Check the minimum software requirements for footscan 9 (see Section 1.10) if unsure. This setting is also available in the settings dialog (see Section 6.4). The footscan 9 graphics settings tool shows the detected OpenGL® version and if it is sufficient for footscan 9 or not.
- "Force the usage of the desktop OpenGL graphics driver"
  When checked the application's rendering backend will be forced to use the desktop OpenGL® driver instead of dynamically choosing which driver to use. This option must be used with care! If footscan 9 doesn't start up after the "Force the usage of the desktop OpenGL graphics driver" checkbox was checked, disable the checkbox again.
- "Force software rendering for QML user interface elements"
  When checked the application's rendering backend will use software rendering for some graphical components instead of OpenGL®. This option must be used with care!
- "Preferred graphics processor"
  In this drop-down list you can select the graphics processor that footscan 9 will use for its 3D rendering. "Auto-select" is the default selection and will pick the most suited available processor on your system.

Click the "Restore Defaults" button to reset the graphics settings to its default values, click the "Close" button to save your settings.

After the changes are made, close the footscan 9 graphics settings tool and start footscan 9 again to see if your problems are resolved.

The footscan 9 graphics settings tool can be found at:

- Windows start menu > Materialise Software > footscan 9 graphics settings tool

- footscanSettings.exe in C:\Program Files\Materialise, subfolder footscan 9

4.12 The program doesn't show any windows at startup

When some graphics settings are changed while the system running footscan 9 doesn't support them, it can happen that there are no windows or error messages shown when footscan 9 is started.

To resolve this issue the graphics settings need to be restored, perform the following steps:

- Close footscan 9, this can be done through the "Task Manager" of Windows®
- Open the footscan 9 graphics settings tool (see Section 4.11)
- Uncheck the option "Force the usage of the desktop OpenGL graphics driver"
- Close the footscan 9 graphics settings tool and open footscan 9 again to see if the problem is resolved

4.13 Some components in footscan 9 are not displayed correctly or are out of proportion

In some rare cases OpenGL® prevent a correct display of some software components like the tabs at the top of the software.

This issue can be resolved by making a change to the footscan 9 graphic settings. Perform the following steps:

- Close footscan 9
- Open the footscan 9 graphics settings tool (see Section 4.11)
- Select the option "Force software rendering for QML user interface elements".
- Close the footscan 9 graphics settings tool and open footscan 9 again to see if the problem is resolved

PART 2

User Manual

Chapter 5

Main Window

The main application window has several fixed parts and a main content area where different screens are shown.

Figure 12: General layout of the main application window

The Help Hints Box shows a brief context-aware help hint. Clicking Read more... will open the help topic on the current screen. The Help Hints Box can be hidden by clicking Hide hints, and re-enabled from the Settings Dialog. (Refer to Section 6.4)

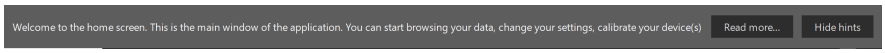


Figure 13: The Help Hints box

The Navigation Bar at the top of the application shows the different stages of the actual workflow. The bar highlights the current stage. Each button corresponds to a screen. Navigating through the application is as simple as clicking the available buttons in the Navigation Bar.

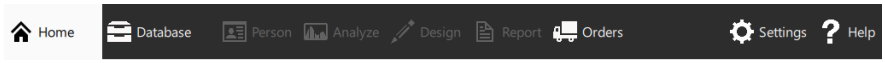


Figure 14: The Navigation Bar shows the workflow of footscan 9.

The Status Bar shows the system id of the currently connected hardware, and the current software version. It holds icons to view and manipulate the state of the software. Next to the full version of your system there is an icon related to automatic updates. footscan 9 automatically checks online for available updates on a daily basis, and will notify you if a newer version of the software is available for download. Such update may contain improvements and bugfixes. Materialise Motion recommends installing updates as soon as they become available.

The connectivity icon on the right shows whether or not a footscan device is connected. Clicking it opens a dialog with detailed information about connected devices and your license.

Figure 15: The Status Bar

A calibration icon and notification balloon will appear when a connected device should be calibrated. Materialise Motion recommends regular weight calibration to maintain optimal accuracy. Go to the Settings dialog to modify the calibration frequency.

Chapter 6

Home Screen

At startup footscan 9 shows the Home screen (Figure 16). The Home screen is the portal from which you can access all functions of the application.

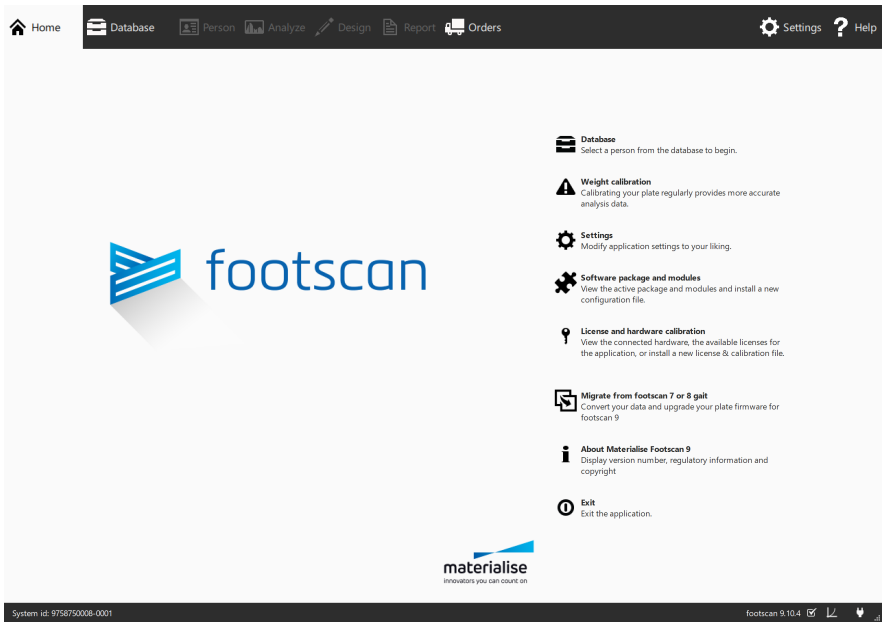


Figure 16: At startup, footscan 9 shows the Home screen. The Home screen guides you to the other screens of the application.

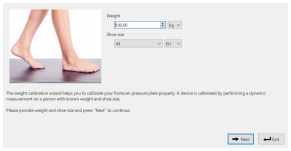
Database	Navigate to the Database screen (Chapter 7).
Weight calibration	Start a weight calibration (Section 6.1).
Settings	Open the Settings dialog (Section 6.4).
Software package and modules	Show available footscan software modules and whether or not they are enabled (Section 6.2).
License and hardware calibration	Show license information and connected hardware (Section 6.3).
Migrate from footscan 7 or 8 gait	Starts the migration wizard (Section 3).
About Materialise Footscan 9	Open the about box (Section 6.5).
Exit	Close footscan 9.

6.1 Weight Calibration

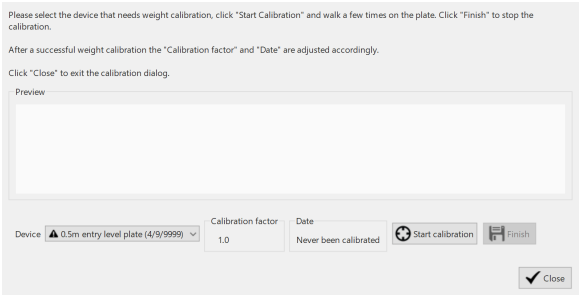
The values of the footscan device are proportionate to the pressure on each sensor, up to a factor. This weight calibration factor is identical for all sensors but might vary in time due to wear. Footscan 9 relies on an up-to-date value of the weight calibration factor to guarantee accurate measurements. Weight calibration recomputes the calibration factor for each device.

Weight calibration uses a measurement of a subject with known weight. Based on such measurement with known characteristics footscan 9 is able to determine the weight calibration factor accurately.

Materialise Motion recommends performing weight calibrations regularly. Set the desired time interval between calibrations in the Settings dialog (Section 6.4).



(a) Set weight and shoe size.



(b) Perform a dynamic measurement to calibrate the device(s).

Figure 17: The weight calibration dialog uses a dynamic measurement with known characteristics to calibrate each device properly.

The weight calibration dialog (Figure 17a) needs the weight and shoe size of the subject performing the calibration measurement. Click ↵ Exit to leave the weight calibration dialog. Click ➡ Next to proceed.

˅Device lists all devices (Figure 17b). Devices marked with a ⚠ need weight calibration. The dialog displays the Calibration factor and Date of the selected device.

Click ⌖ Start calibration to start the weight calibration for the selected device. The preview shows the activity on the plate. Walk over the plate to perform a dynamic measurement and click Finish. The dialog updates Calibration factor and Date. Click ✓ Close to close the weight calibration dialog.

The weight calibration needs to recognize at least one foot to succeed. The accuracy of the weight calibration increases with the number of recognized feet. Generally 6-8 feet suffice to obtain a reliable calibration factor.

Materialise Motion recommends to send the footscan system to Materialise Motion yearly for replacement of the Pressure Sensitive Layer (PSL) and calibration. Contact the Materialise Motion support department at support.motion@materialise.be to obtain our RMA (Return Material Authorization) procedure.

6.2 Software Package and Modules

The software package and modules dialog (Figure 18) shows your current package and all the available footscan software modules.

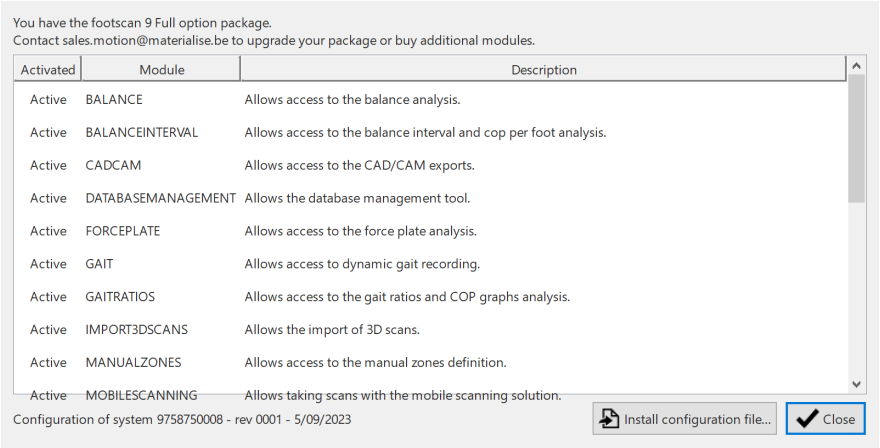


Figure 18: The software package and modules dialog shows your current package and all footscan software modules.

The dialog shows for each footscan module if it is activated and provides a short description of the functionality that they unlock. To upgrade your package or purchase additional footscan modules, contact Materialise Motion's sales department at sales.motion@materialise.be.

Click Install configuration file... to import a new *.rsconfig file containing the package and modules.

6.3 License and hardware calibration

To prevent unauthorized usage footscan 9 only runs when a licensed footscan plate, 3D scanner or hardware dongle is plugged into your computer.

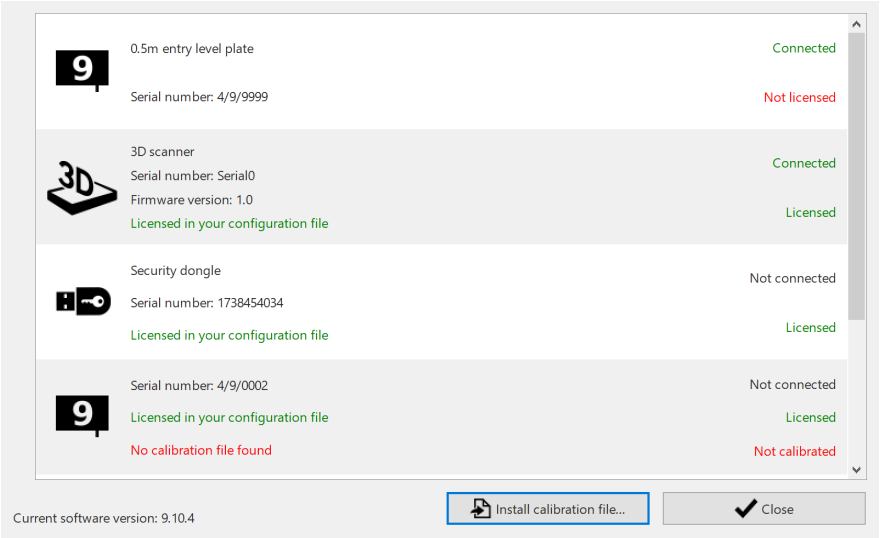


Figure 19: The license and hardware calibration dialog lists all footscan devices connected to your system.

The License and hardware calibration dialog (Figure 19) lists the serial numbers of all connected footscan devices, along with their descriptions, license and calibration information. Devices which are licensed in your configuration file have a green license information line, devices which are not licensed have a red license information line. The calibration information is only shown when there is no valid calibration file found, it is then mentioned in red.

Click Install calibration file... to import new calibration files.

For problems with licensing please contact Materialise Motion's support department at support.motion@materialise.be to obtain a new *.rsconfig file.

6.4 Settings

The Settings dialog holds settings to customize footscan 9. Modify any of these settings and click Save to save or Cancel to discard the changes.

Footscan 9 sorts customizable settings in tabs: Customization, Language & Units, Device, Export, Insoles, Database and System.

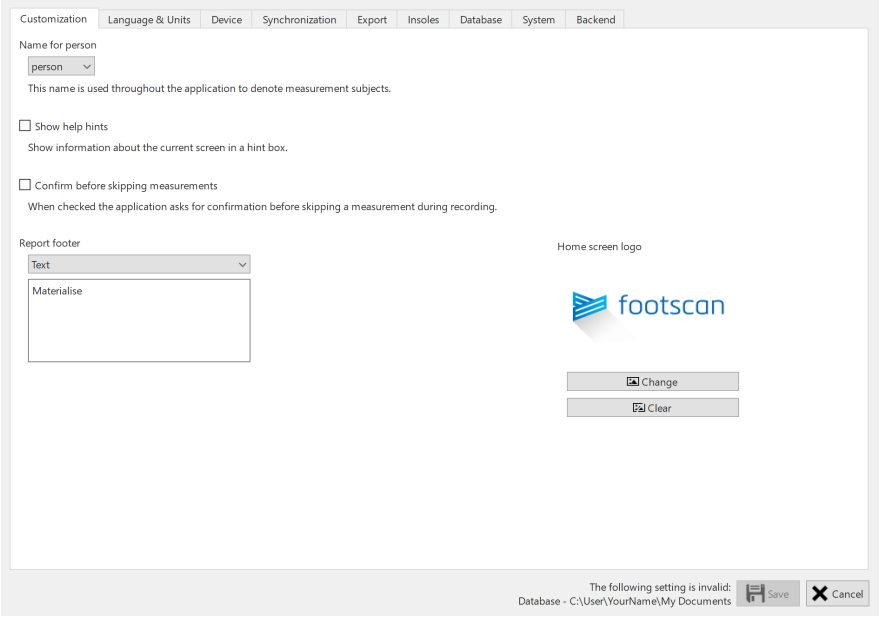


Figure 20: General settings.

Customization holds general settings:

Name for person	Customizes the name for measurement subjects used throughout the application (e.g. the report's header).
Show help hints	Controls whether help balloons appear to assist you.
Confirm before skipping measurements	Toggles whether confirmation dialogs appear in the Record wizard when skipping a measurement (Chapter 9).
Report footer	Modifies the report's footer (see Chapter 17). Choose between plain text and image. By default footscan 9 uses *"Materialise Motion"*.
Home screen logo	Customizes the logo shown in the Home screen (Chapter 6).

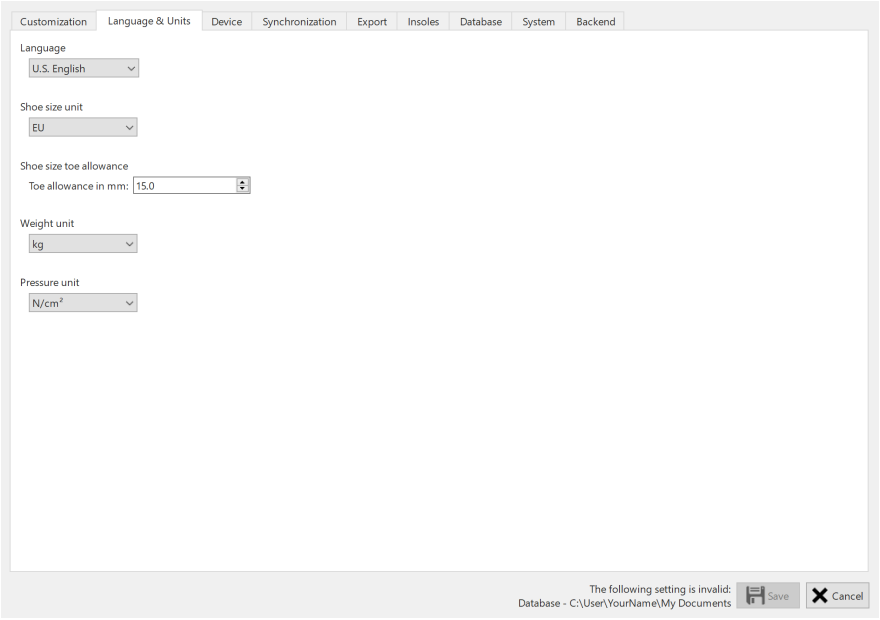


Figure 21: Settings related to language and units.

Language & Units holds settings related to language and units:

Language	Controls the application's language. Changing this setting requires footscan 9 to restart.
Shoe size unit	Controls the unit of the shoe size used in footscan 9.
Toe allowance in mm:	The toe allowance (in millimeter) parameter is used to calculate an estimation of the shoe size of a 3D scanned foot (see 10.6).
Weight unit	Controls the unit of the weight used in footscan 9.
Pressure unit	Controls the unit of pressure used in footscan 9.

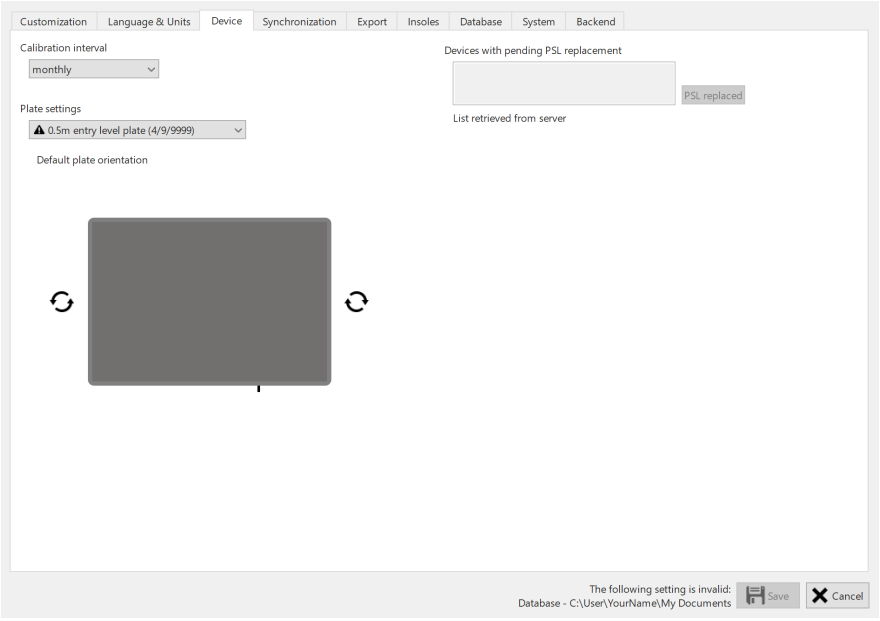


Figure 22: Settings related to footscan devices.

Device holds settings related to footscan devices:

Calibration interval	Updates the time between two calibrations (Section 6.1).
	Changes the orientation of every preview showing the activity on the plate.
PSL replaced	Button to signal the calibration server that the PSL of the selected device has been replaced (Section 4.5).

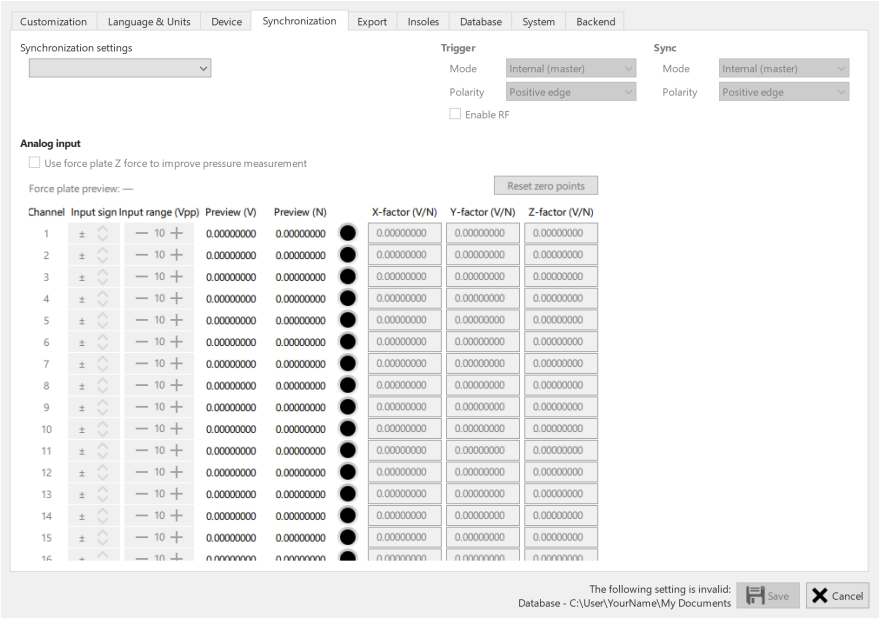


Figure 23: Settings affecting 3D interface box

Synchronization holds settings related to footscan 3D interface box devices:

Synchronization settings	Select the device for which you want to control the synchronization settings.
Mode	Controls the master/slave mode of the trigger signal.
Polarity	Controls the polarity of the trigger signal.
Enable RF	Enables trigger FM option.
Mode	Controls the master/slave mode of the sync signal.
Polarity	Controls the polarity of the sync signal.
Enable RF	Enables sync FM option.
Use force plate Z force to improve pressure measurement	Enables correcting the pressure frame using the z-force from a force plate.
Reset zero points	Resets all analog channels to zero.
Input sign	Specifies the input voltage direction (negative, bipolar, positive).
Input range (Vpp)	Specifies the input voltage range.
Preview (V)	Shows the current channel's voltage.

Preview (N)	Shows the current channel's force summation. This is the sum of all force vector magnitudes.
X-factor (V/N)	Specifies the X force factor in V/N.
Y-factor (V/N)	Specifies the Y force factor in V/N.
Z-factor (V/N)	Specifies the Z force factor in V/N.

Channel force factors can be used to enter a force plate's calibration matrix including cross-talk correction.

Ch.	X-factor (V/N)	Y-factor (V/N)	Z-factor (V/N)
1	k_{x1}	k_{y1}	k_{z1}
2	k_{x2}	k_{y2}	k_{z2}
⋮	⋮	⋮	⋮
16	k_{x16}	k_{y16}	k_{z16}

Given the force factor values are k_{x1}, k_{y1}, ..., k_{z16}. Then the forces will be calculated as follows:

$$F_x = \frac{1}{k_{x1}} \cdot V_{ch1} + \frac{1}{k_{x2}} \cdot V_{ch2} + \cdots + \frac{1}{k_{x16}} \cdot V_{ch16}$$

$$F_y = \frac{1}{k_{y1}} \cdot V_{ch1} + \frac{1}{k_{y2}} \cdot V_{ch2} + \cdots + \frac{1}{k_{y16}} \cdot V_{ch16}$$

$$F_z = \frac{1}{k_{z1}} \cdot V_{ch1} + \frac{1}{k_{z2}} \cdot V_{ch2} + \cdots + \frac{1}{k_{z16}} \cdot V_{ch16}$$

With V_{ch1} the voltage measured on analog channel 1, V_{ch2} the voltage measured on channel 2 and so on.

An example of how to enter the force factors for a particular force plate can be found in the appendix of this manual (see Chapter 22).

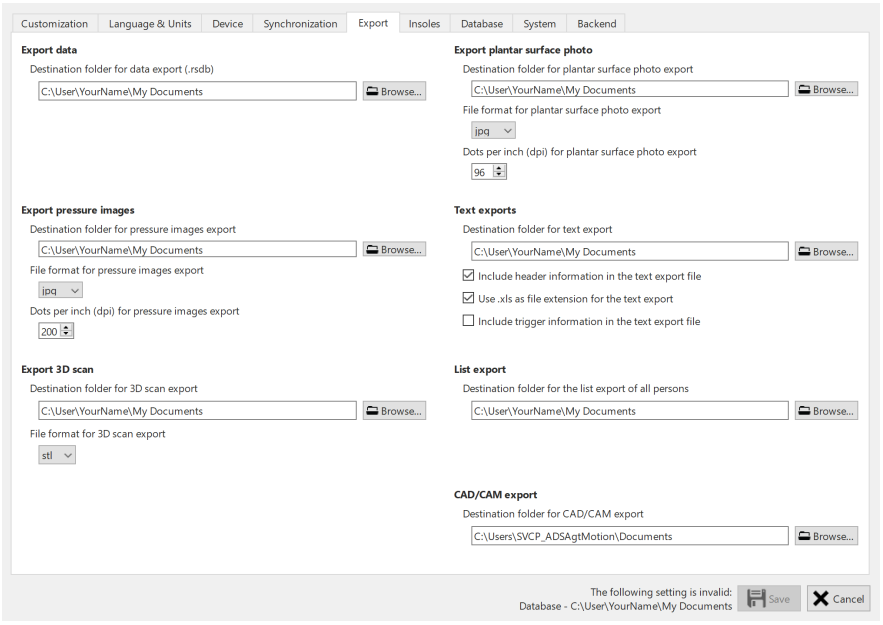


Figure 24: Settings affecting data export

Export holds settings which affect how footscan 9 exports data:

Destination folder for data export (.rsdb)	Displays the folder where footscan 9 saves data from exported sessions (See Chapter 8). Click Browse... to choose a different folder.
Destination folder for pressure images export	Displays the folder where footscan 9 saves exported images (See Chapter 8). Click Browse... to choose a different folder.
File format for pressure images export	Modifies the file format of exported images.
Dots per inch (dpi) for pressure images export	Modifies the dots per inch (dpi) of exported images.
Destination folder for 3D scan export	Displays the folder where footscan 9 saves the exported 3D scan measurements (See Chapter 8). Click Browse... to choose a different folder.
File format for 3D scan export	Modifies the file format of the exported 3d scans.
Destination folder for plantar surface photo export	Displays the folder where footscan 9 saves the exported plantar surface photos (See Chapter 8). Click Browse... to choose a different folder.
File format for plantar surface photo export	Modifies the file format of the exported plantar surface photos.
Dots per inch (dpi) for plantar surface photo export	Modifies the dots per inch (dpi) of the exported plantar surface photos.
Destination folder for text export	Displays the folder where footscan 9 saves the text exports (See Chapter 8.5). Click Browse... to choose a different folder. The text export is available in the Scientific package(s).
Include header information in the text export file	Add header information to the text exports (See Chapter 8.5). The text export is available in the Scientific package(s).
Use .xls as file extension for the text export	Use xls as file extension for the text exports (See Chapter 8.5). The text export is available in the Scientific package(s).
Include trigger information in the text export file	Add trigger information to the text exports (See Chapter 8.5). The text export is available in the Scientific package(s).
Destination folder for the list export of all persons	Displays the folder where footscan 9 saves the list exports (See Chapter 7.1). Click Browse... to choose a different folder.
Destination folder for CAD/CAM export	Displays the folder where footscan 9 saves the CAD/CAM exports (See Chapter 8). Click Browse... to choose a different folder. The CAD/CAM export is available in the Clinical, Scientific package(s).

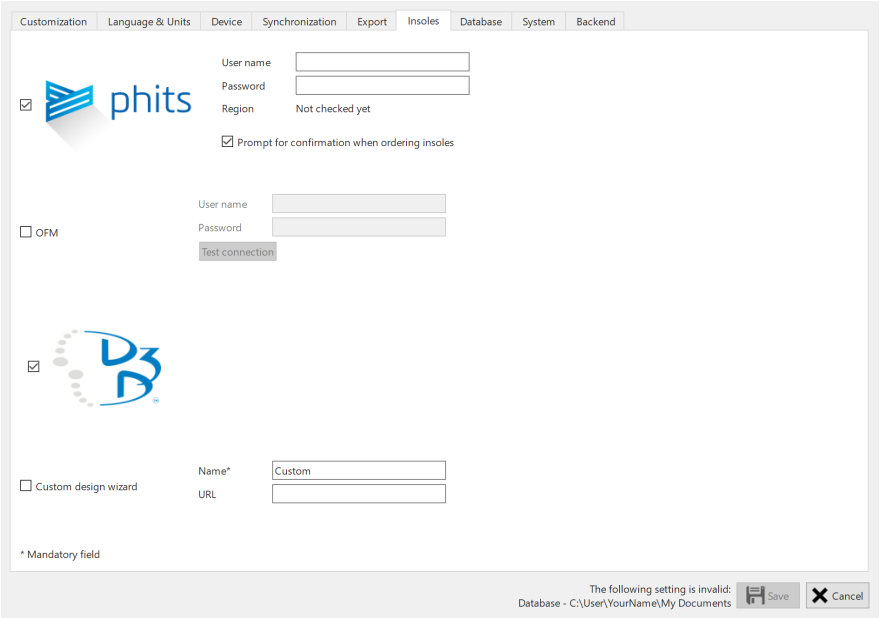


Figure 25: Settings related to insoles.

Insoles holds settings related to insoles:

D3D

Controls whether the D3D insole wizard is selectable as a design option.

Phits™

Controls whether the Phits™ insole wizard is selectable as a design option.

User name	Enter your Phits™ account username here. This account is used to log into the Phits™ web-application for ordering insoles.
Password	Enter your password for the Phits™ account.

Custom design wizard

The custom design wizard is available in the Scientific package(s).

Controls whether a custom design wizard is selectable as a design option.

Name*	Enter the name of the custom design wizard (this is mandatory).
URL	Enter the url of the custom design wizard.

More information about using the custom design wizard can be found in the installation directory of footscan 9 (see 4.6), in the subfolder "webplugin".

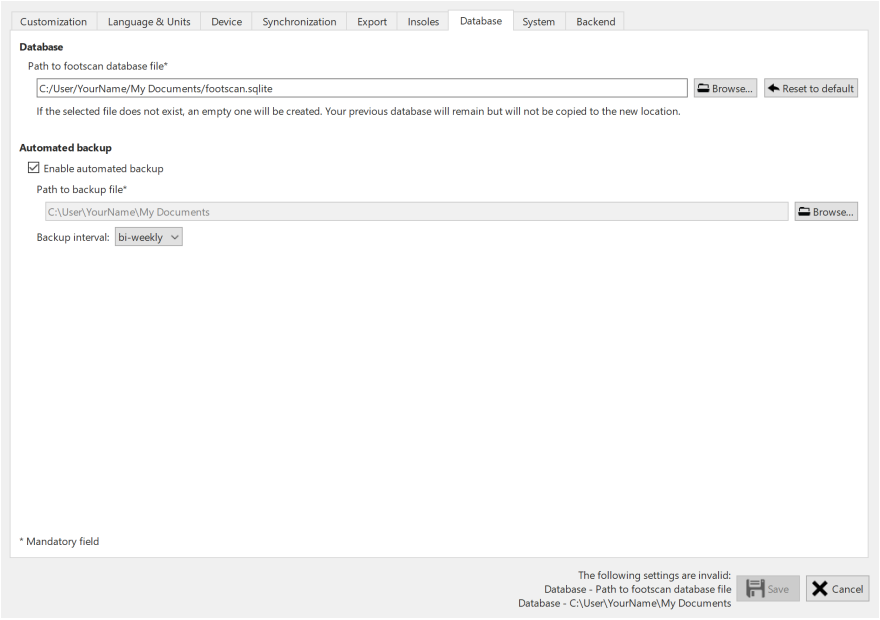


Figure 26: Settings regarding database aspects of footscan 9.

Database holds settings regarding backup functionalities of footscan 9:

Adjusting the database location is available in the DatabaseManagement module or part of the Clinical, Scientific package(s).

Path to footscan database file*

This field displays the file name and location used by footscan 9 as database, where all patient and recording data is stored. Click Browse... to choose a different location or filename.
If the supplied file does not exist, a new empty database will be created. Existing databases will never be deleted. When changing the location the previous database file will not be copied to the new location. Click Reset to default to revert to using the file at the default location.

Note that a path on a network drive can be selected. The network bandwith and number of concurrent users can affect performance. Cloud-based folder syncing services like Dropbox, onedrive or google drive are NOT supported.

Enable automated backup

Uncheck if you don't want to perform database backups on a regular basis. More information about the automated backup can be found here 6.6.

Path to backup file*

This field displays the location where footscan 9 will place it's automated database backup files. Click Browse... to choose a different location.

Backup interval:

Choose the time interval for the automated database backup.

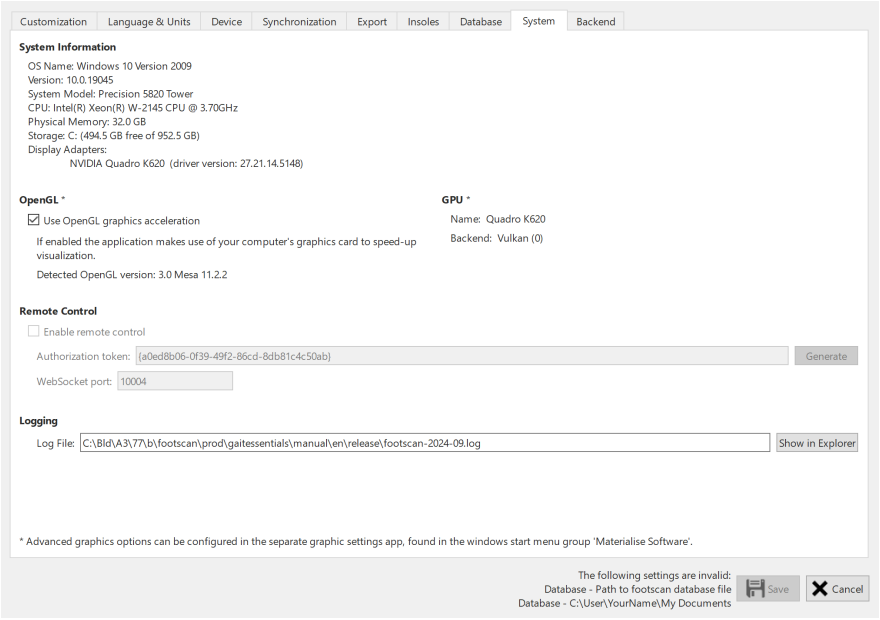


Figure 27: Settings regarding technical aspects of footscan 9.

System holds settings regarding technical aspects of footscan 9:

☑Use OpenGL graphics acceleration	Uncheck if your system does not support OpenGL® adequately. Check the minimum software requirements for footscan 9 (Section 1.10) if unsure. The 3D analysis (Section 10.13) is not available when this setting is disabled.
GPU *	"Name" shows gpu adapter name. "Backend" shows the selected gpu backend.
☑Enable remote control	When checked the footscan 9 software can be controlled remotely by a separate program.
Generate	Pressing this button generates a unique token identifying your footscan 9 software, this token is needed during remote communication.
WebSocket port:	WebSocket port used to listen for incomming connections during remote communication.

A "Remote Control" module is needed to use the remote control functionality, contact Materialise Motion's sales department at sales.motion@materialise.be for more information.

More information about using the remote control can be found in the installation directory of footscan 9, in the subfolder "remote control".

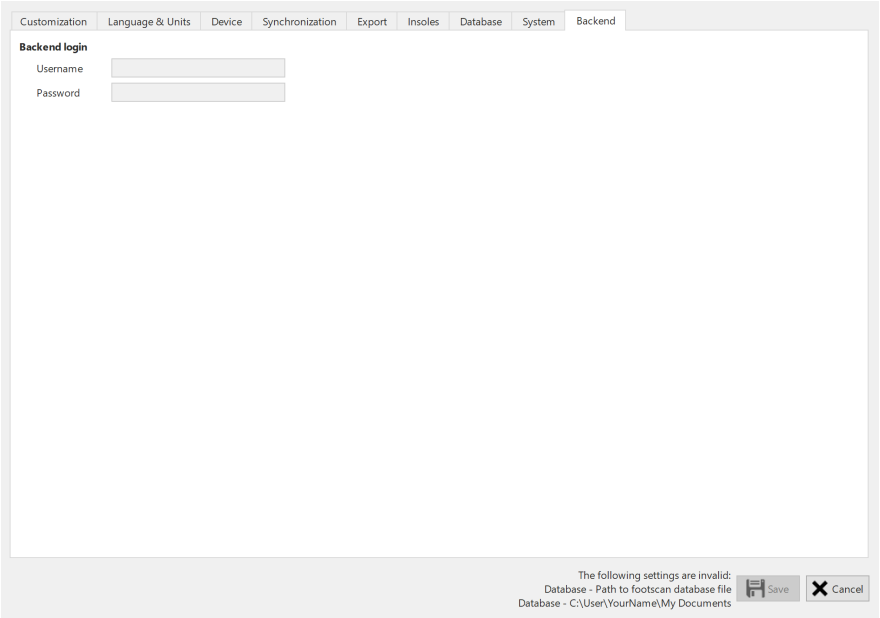


Figure 28: Settings regarding customizable branding.

Backend holds settings related to customizable branding settings:

Username	Enter your branding account username here. This username is used to login to the branding backend services for downloading and setting branding assets.
Password	Enter your branding account password.

6.5 About Box

The About Materialise footscan 9 dialog (Figure 29) displays the version number, date of manufacturing, regulatory information and copyright statements and can be accessed through the home screen.

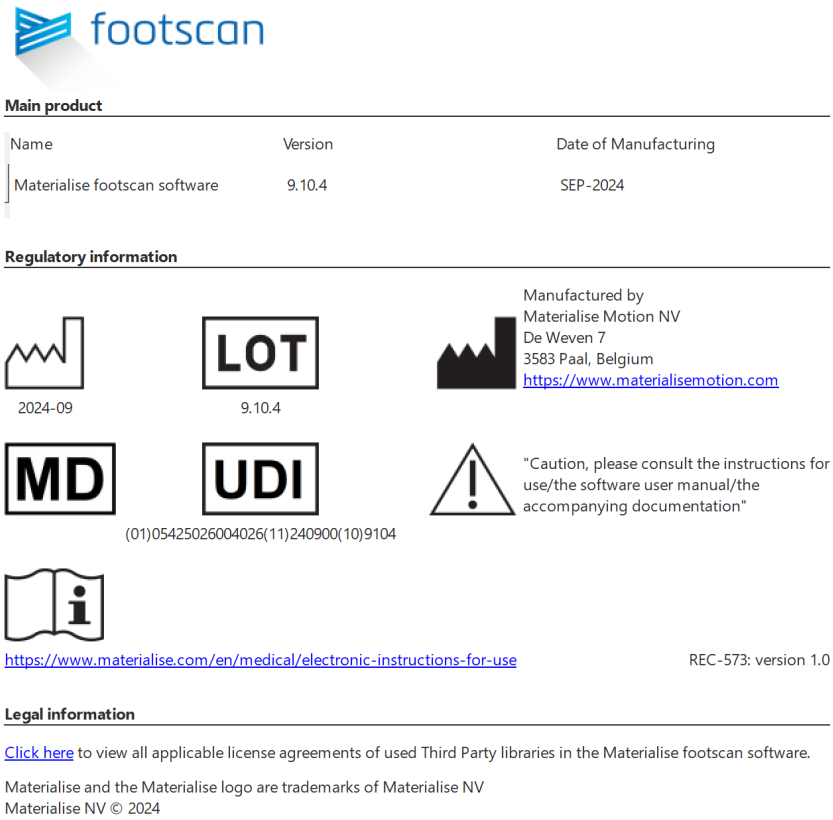


Figure 29: The About Materialise footscan 9 dialog displays the version number, date of manufacturing, regulatory information and copyright statements.

6.6 Database Backup

It is highly recommended to make a backup of the footscan9 database on a regular basis! This to prevent data loss in unforeseen circumstances.

A backup operation can take a long time to finish, depending on the size and location of the database.

The footscan 9 software provides two ways of performing a backup of the database: automatic and manual.

Automated backup

When the automated database backup is enabled (see Advanced Settings Dialog 6.4), the footscan 9 software will ask to perform a database backup when the footscan 9 software closes after the chosen backup interval period (weekly, bi-weekly or monthly) has expired.

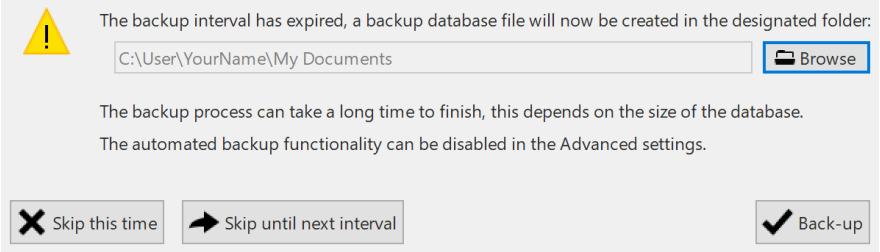


Figure 30: Automated database backup dialog.

The automated database backup will keep a maximum of two backups where the oldest backup will be overwritten with the current one.

Click the Browse to choose the location where the backup will be placed, the name of the backup file is not adjustable and is choosen by footscan 9. The backup can be postponed to a later time by clicking one of the following buttons:

✕ Skip this time	The footscan 9 software will ask to perform the database backup again the next time footscan 9 closes.
➔ Skip until next interval	The footscan 9 software will not ask to perform a database backup until the backup time interval has expired again.

Click on the ✓ Back-up button to start the database backup, a dialog showing the backup progress will be shown. Once the backup is finished the footscan 9 software will not be started again.

The enabling or disabling of the automated backup, along with other settings like the automated backup interval period, can be set in the Advanced Settings Dialog (see 6.4).

Manual backup

A backup of the database can be initiated by the user at any time, this can de done in the Database Screen (see 7)

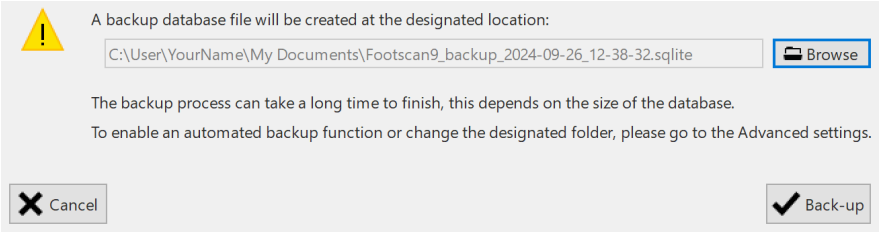


Figure 31: Manual database backup dialog.

Click the Browse button to choose the location and filename of the backup. The backup can be cancelled by clicking the ✕ Cancel button, the backup is started by clicking the ✓ Back-up button.

The backup will be performed the next time footscan 9 starts.

Database Screen

If there was no footscan database present during the installation of footscan 9, the installer has copied a demo database.

The Database screen (Figure 32) lists all clients stored by footscan 9.

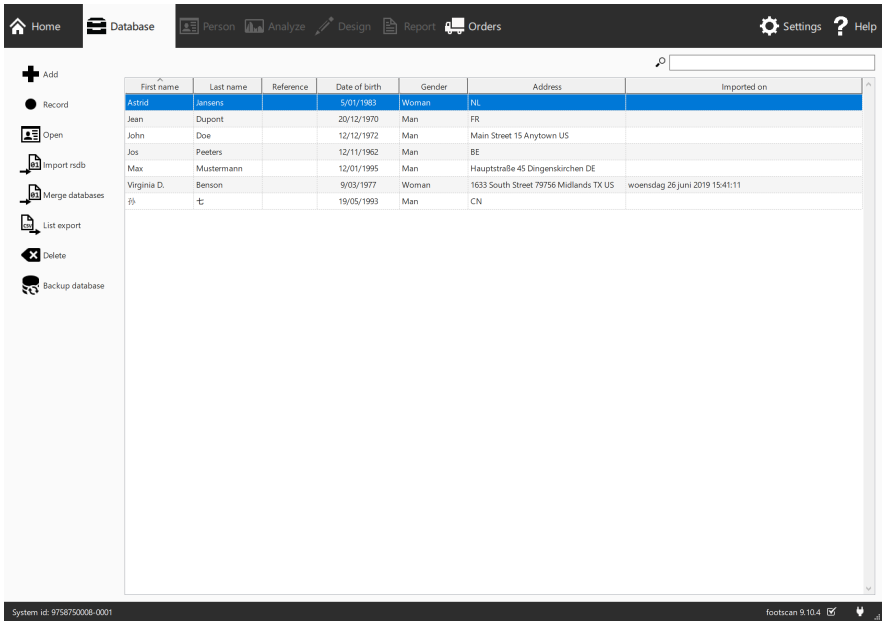


Figure 32: The Database screen lists all clients stored by footscan 9.

At the left there are buttons to edit the contents of the clients table:

✚ Add	Add a client to the table. The application navigates to the Client screen (Chapter 8). The Client screen has the appropriate user interface to complete all relevant personal information about a new client.
● Record	Record a new measurement for the selected client. The application starts the Record wizard (Chapter 9).
Open	Open the Client screen to edit the personal information of the selected client. Alternatively double-click the selected client.
Import rsdb	Import a client and its sessions into the application. Provide footscan 9 with a valid exported database when asked. Upon completion the table shows the newly imported client. Refer to Chapter 8 to learn how to export a client's sessions.
Merge databases	Merge another footscan 9 database into your current database. This operation can take a long time to finish, depending on the size of the database.

We advise to make a backup of your current footscan 9 database before starting the merge.

List export	Exports a list of all clients as text (Chapter 7.1).
Delete	Delete all data of the selected client, including all measurements.

Deleting a client is permanent! Please make 100% sure the selected client's data and measurements are no longer needed.

Backup database	Manual back up of the footscan 9 database (see 6.6)

The search text field at the top right of the client table filters out clients not matching its contents. As a result the table only shows clients passing the filter. A match is possible with any of the personal information stored, even with dates and phone numbers. Clear the filter text to view all clients.

Click a table header to sort its contents in ascending/descending order.

7.1 List Export Dialog

The "ABCD ratios" option in the list export is available in the Scientific package(s). All other list export options don't require a special package.

The list export dialog (Figure 33) allows you to export all clients as text into a csv file.

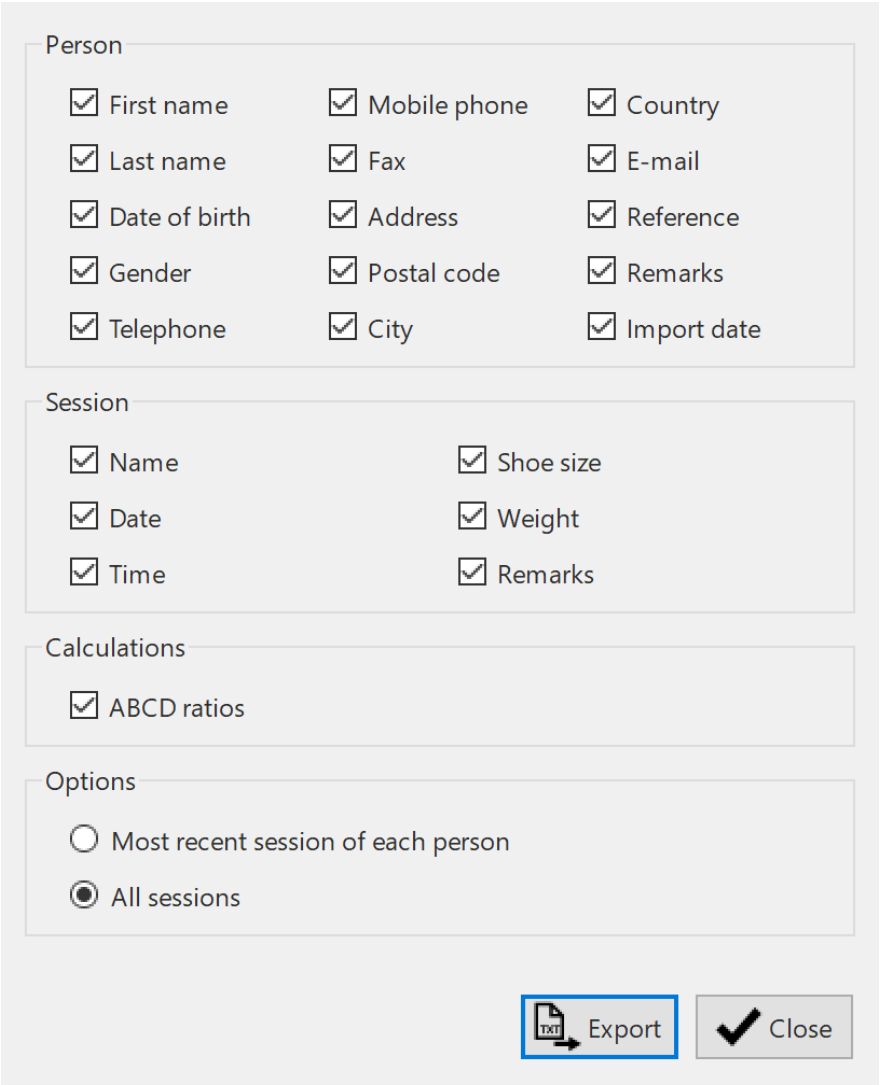


Figure 33: The list export dialog allows exporting all clients as text into a csv file.

Select the checkboxes to choose which data will be exported. The following data is available to include into the list export:

Client data	First name, last name, date of birth, gender, telephone, mobile phone, fax, address, postal code, city, country, e-mail, reference, remarks and import data
Session data	Name, date, time, shoe size, weight and remarks
Calculations	ABCD ratios (this option is available in the Scientific package(s))

Select ◉Most recent session of each person to export the data of only the most recent session of each client or select ◉All sessions to export data from all the sessions of each client.

The exported csv file can easily be imported into any currently available spreadsheet software. The list export takes the user locale of the operating system into account so that there are no conversion errors between footscan 9 and the spreadsheet software.

Click the Export button to start the export. Click the ✔ Close button to close the list export dialog.

Client Screen

The Client screen (Figure 34) displays all information about a single client. The upper half of the screen shows the client's personal information. The remainder of the screen lists all recorded measurements of the client.

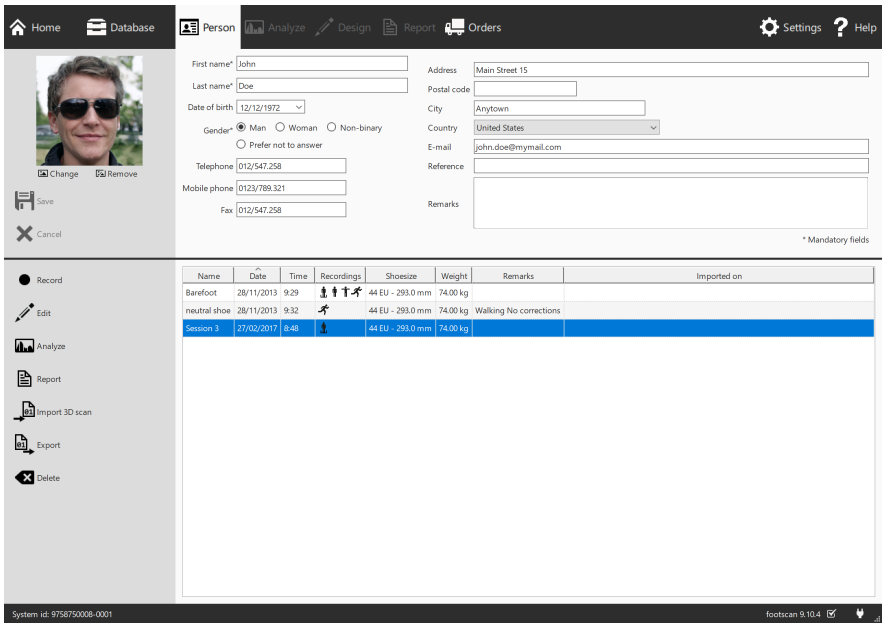


Figure 34: The Client screen displays all personal information about a single client, as well as all measurement sessions belonging to that client.

Drag the dark screen separation line in the middle of the screen up and down to resize the screen's contents.

Personal Information For each client, footscan 9 stores name, address, birth date, gender, phone numbers, e-mail, and free-form remarks. Optionally the application may hold client photographs.

The Client screen displays the personal information for the current client. Modify this information in the appropriate text fields. Note that the fields First name, Last name and Gender are mandatory. Change or Remove the client's photograph to your liking. The application accepts a wide range of image formats. Click Save or ✕ Cancel to finish.

While editing the personal information form the other screens are inactive. click Save or ✕ Cancel to finish editing.

Measurements The lower half of the Client screen lists all the client's measurement session. The listing shows per session its name, date and time when the recording was made, shoe size and weight of the client, a field for additional remarks and if the session was imported, the importation date. The recordings column displays the type of measurements held by the session: 3D scanner and/or static and/or balance and/or dynamic measurements (See Chapter 9).

Record	Create a new measurement session. The application navigates to the Record wizard (Chapter 9).
Edit	Edit the data of the selected session (Chapter 8.3).
Analyze	Open the Analyze screen (Chapter 10) with the selected measurement session. Alternatively double-click a measurement session.
Report	Open the Report screen (Chapter 17) with the selected measurement session.
Import 3D scan	Open the import 3D scan screen to import a left and/or right 3D scan into the selected measurement (Chapter 8.1) or into a newly created session (Chapter 8.2).
Export data	Export the selected session(s). The application saves sessions in a database in a dedicated folder on the computer. Choose this folder in the Settings dialog (Section 6.4). Learn how to import exported sessions in Chapter 7.
Export pressure images/videos	Export images and/or videos of all the recognized feet from the selected session(s) (Chapter 8.4).
Export 3D scan	Export all the 3D scan measurement(s) from the selected session(s) to file. The application saves the export in a dedicated folder on the computer, choose this folder in the Settings dialog (Section 6.4). The names of these files contain the names of the client and session, as well as the date of the session and a foot type (L for left, R for right).
Export plantar surface photo	Export all the plantar surface photo(s) from the selected session(s). The application saves the plantar surface photo in a dedicated folder on the computer, choose this folder in the Settings dialog (Section 6.4). The names of these files contain the names of the client and session, as well as the date of the session and a foot type (L for left, R for right).
Text exports	Footscan 7 gait compatible text exports of the selected session(s) (Chapter 8.5). The text export is available in the Scientific package(s).
CAD/CAM export	Export orthotic support data. Footscan 9 creates .apd files in a dedicated folder on the computer. Choose this folder in the Settings dialog (Section 6.4). The CAD/CAM export is available in the Clinical, Scientific package(s).
Delete	Delete the selected measurement session.

Deleting a measurement session is permanent! Please make 100% sure the selected session is no longer needed.

A client can have a limited number of sessions. This limit is much greater than what can be considered as normal use.

Customize the name of this screen in the Settings dialog (Section 6.4).

8.1 Import 3D scan into selected session

The import 3D scan screen allows to import a left and/or right 3D scan into the measurement.

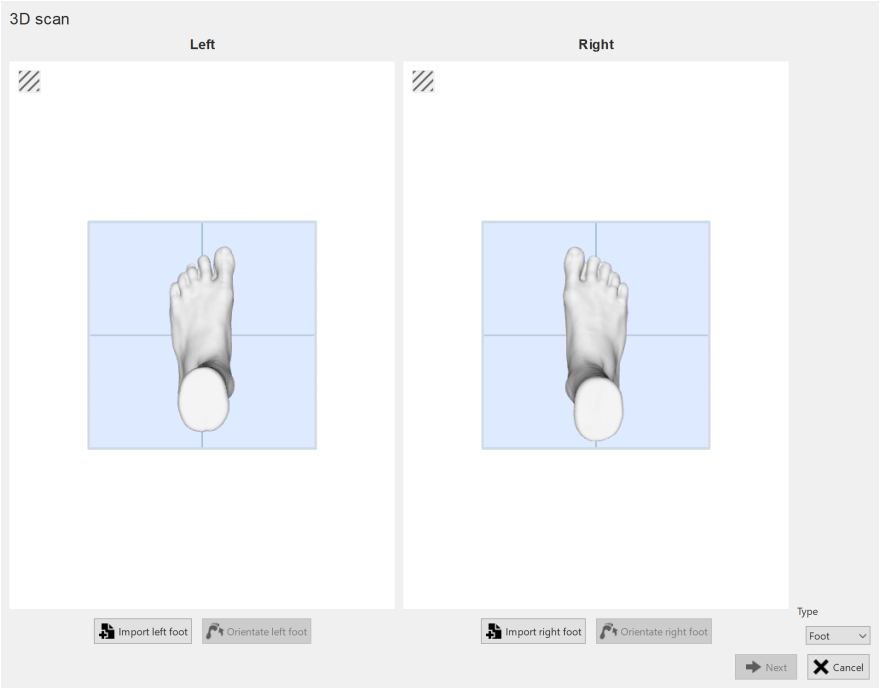


Figure 35: The import 3D scan screen allows to import an 3D scan into the measurement.

Click on the Import left foot or Import right foot button to import a left or right foot scan respectively. A file dialog will appear to browse for a STL- or OBJ-file, containing the 3D scan data. Footscan expect 3D scan data in mm units.

When a file is selected, the 3D scan will be loaded and shown to the user, together with a gray ground plane. Next step is to align the scan, by selecting 3 points on the scan. Choose 3 points located at the plantar surface of the foot, preferable one point at the heel (lowest point in the middle of the heel) and two points at the forefoot, e.g. lowest points near metatarsal head 1 and 5. The mesh can be rotated using the left mouse button, points can be selected by clicking the right mouse button.

Directly after selecting three points, the optimal mesh orientation is determined and showed to the user. Please verify if the calculated position is correct, i.e. ground plane goes through the plantar sole of the foot. If you are not satisfied with the retrieved mesh orientation, you can reorientate the mesh by clicking on the Orientate left foot or Orientate right foot button, depending on which imported foot you want to correct. Three points needs to be selected, as described in previous step.

Repeat the procedure for the other foot if necessary. You can however, also proceed with only 1 left or right scan.

When 3D scans are imported and you are satisfied on the mesh orientation, you can save the scans by clicking on Next button. If you do not want to save the scans, you can click on Cancel button. Before saving the scans, make sure to select the correct type with Type, more information on the scan type can be found in Chapter 9.

When the selected session already contains a 3D scan, a new imported 3D scan will overwrite the existing 3D scan. A warning will be shown to warn the user and make sure the user wants to overwrite the original 3D scan.

8.2 Import 3D scan into new session

Clicking the Create new session button will show a window (Figure 36) in which you are required to enter the name, weight, and shoe size of the person for which you are creating a new session. It is also possible to enter remarks here as well.

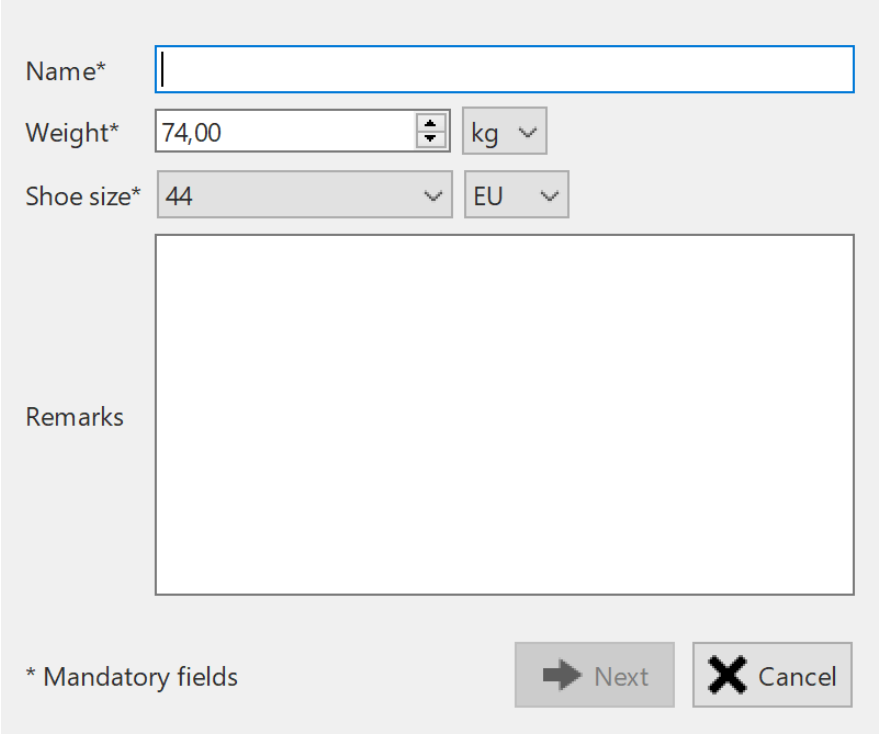


Figure 36: The create new session dialog.

Click Next to continue, click Cancel to return without creating a new session.

After clicking the Next button the same procedure as in chapter 8.1 can be followed.

8.3 Edit Session Dialog

The edit session dialog (Figure 37) allows to change the data of the selected session.

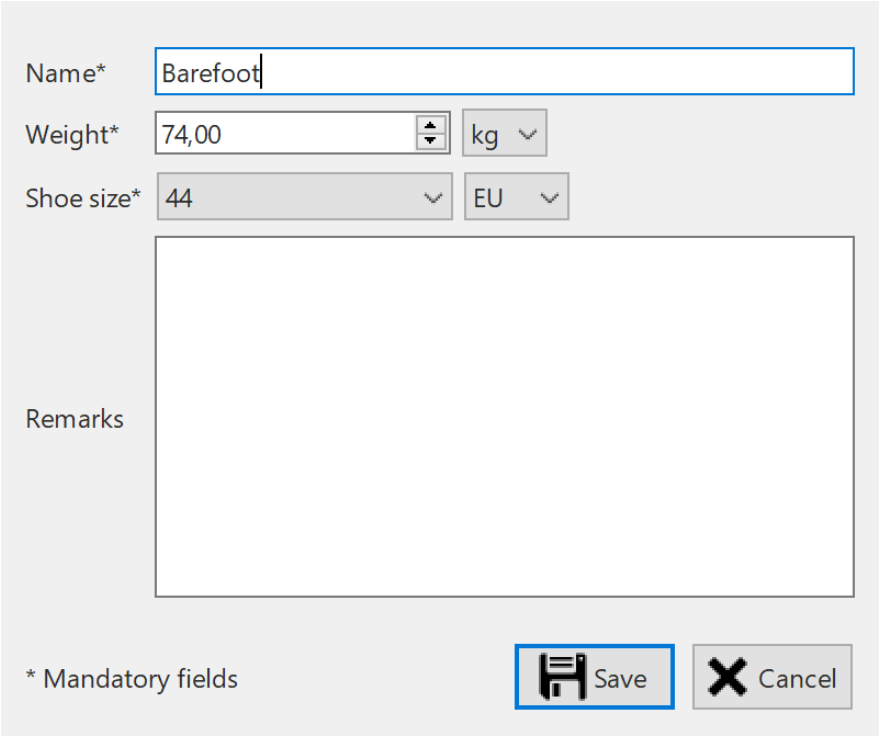


Figure 37: The edit session dialog allows to change the session data.

The following fields can be modified:

- Name
- Weight and weight unit (the selected weight unit will be used in the entire footscan 9 application)
- Shoe size and shoe size unit (the selected shoe size unit will be used in the entire footscan 9 application)
- Remarks

Fields marked with an asterisk (*) are mandatory.

Click the Save button to save the modifications, click the Cancel button to discard the changes.

8.4 Media Export Dialog

The video media export is available in the Clinical, Scientific package(s).

The media export dialog (Figure 38) allows to export all the recognized feet from the selected session(s) as images or videos.

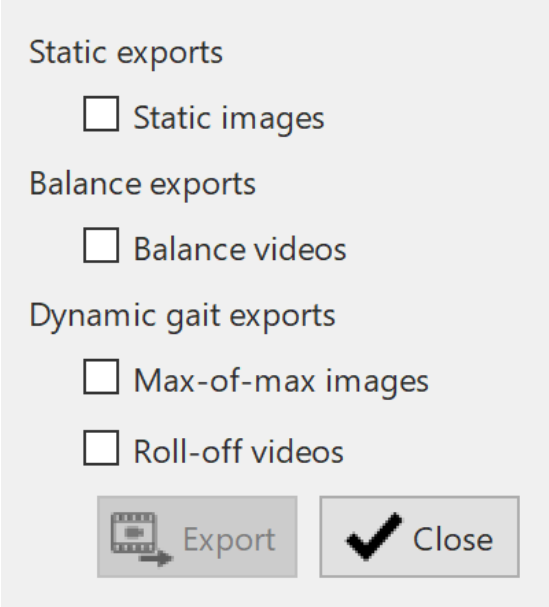


Figure 38: The media export dialog allows to export feet as image and/or video.

Footscan 9 stores all the media export files in a dedicated folder on the computer, this folder can be changed in the Settings dialog (Section 6.4).

The file format and the dpi of the images exports can be changed in the Settings dialog (Section 6.4). The video export is always in mp4 format.

The file names of the media export files contain the names of the client and session, as well as the date of the session. Specific data is added per media export type.

The following media exports are available:

☑Static images	Image export of the static measurement.
☑Balance videos	Video export of the balance measurement.
☑Max-of-max images	Export all footprints of the selected session(s) to image files. More specifically the application saves the maximum sensor values of each foot recognized in the dynamic measurement to file. The names of these image files contain a foot type (L for left, R for right).
☑Roll-off videos	Export the roll off of all the recognized feet of the selected dynamic measurement(s) to video. The names of these image files contain a foot type (L for left, R for right).

click the ✔ Close button to cancel the export(s), click the Export to start the export(s). During the media export(s) a progress dialog is shown (Figure 39), click the ✪ Abort button to cancel the export(s).

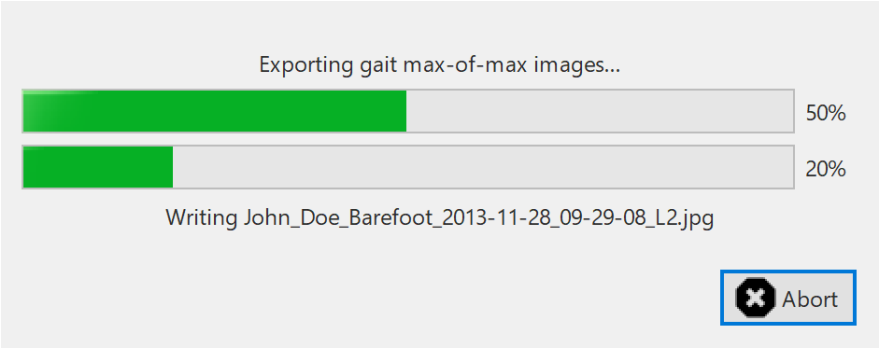


Figure 39: Dialog showing the progress of the media export(s).

When all the media export(s) are finished the progress dialog (Figure 40) allows you to open the folder containing all the export(s) by clicking the Open folder... button. Click the ✓ Close button to close the progress dialog.

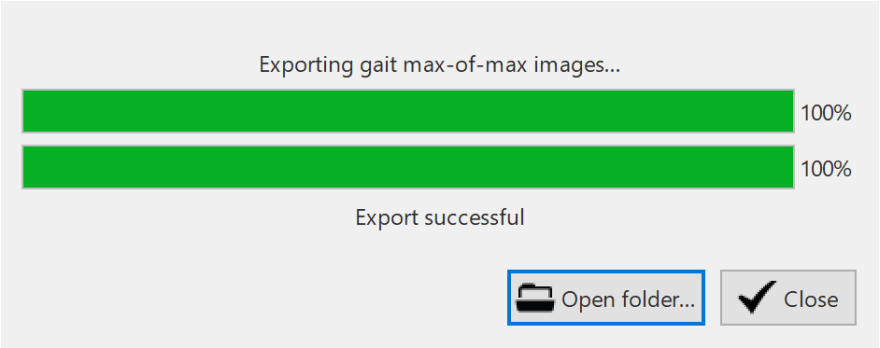


Figure 40: Dialog when the media export(s) are finished.

8.5 Text Export Dialog

The text exports are available in the Scientific package(s).

The text export dialog (Figure 41) allows you to export the measurement data in human readable text format. These text exports are compatible with the footscan 7 gait ASCII exports.

There is an important difference between the footscan 9 text exports and the footscan 7 gait ASCII exports: footscan 9 exports pressure values, while footscan 7 exports force values.

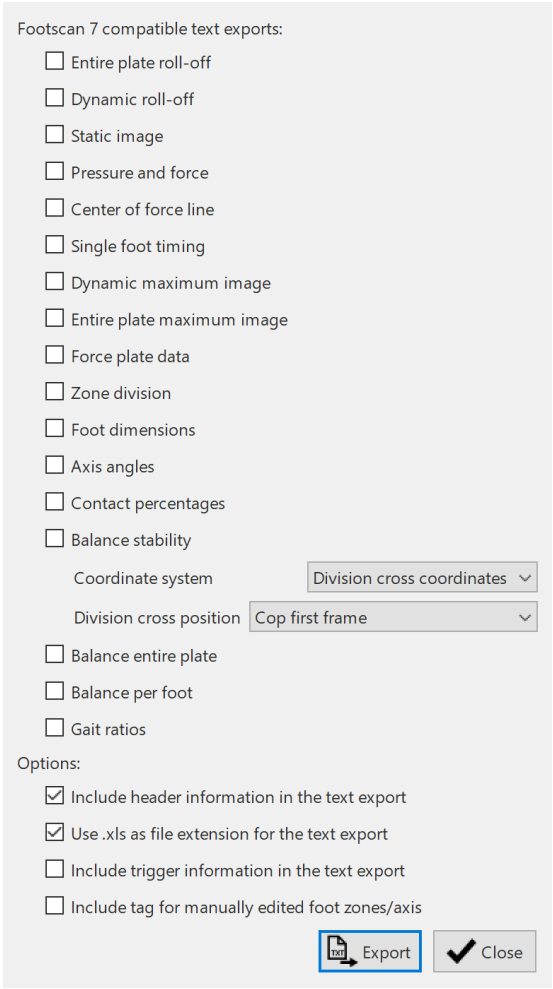


Figure 41: The text export dialog allows to export the data in an ASCII format compatible with footscan 7 gait.

All text export files have a header with the name of the patient, the scanning speed, the date and name of the measurement. Some text exports also include the coordinates of the recognized feet on the pressure plate.

The following text exports are available:

☑Entire plate roll-off	Entire plate roll-off text export of a dynamic measurement: each pressure frame in the measurement will be exported.

☑Dynamic roll-off	Dynamic roll-off text export of a dynamic measurement: all the pressure frames of the recognized feet will be exported.
☑Static image	Static image text export of a static measurement: the pressure frame containing the static measurement will be exported.
☑Pressure and force	Pressure and force text export of a dynamic measurement: pressure and force data of all the recognized feet will be exported. See Section 10.15 for more information.
☑Center of force line	Center of force text export of a dynamic measurement: center of force data of all the recognized feet will be exported.
☑Single foot timing	Single foot timing text export of a dynamic measurement: timing information of the recognized feet will be exported. See Section 10.22 for more information.
☑Dynamic maximum image	Dynamic maximum image text export of a dynamic measurement: the max-of-max images of the recognized feet will be exported.
☑Entire plate maximum image	Entire plate maximum image text export of a dynamic measurement: the max-of-max image of the measurement will be exported.
☑Force plate data	Force plate data text export of a dynamic measurement: force plate data of the recognized feet will be exported. See Section 10.25 for more information.
☑Zone division	Zones division text export of a dynamic measurement: zone division data of the recognized feet will be exported. Each zone has an assigned reference number. See Section 10.15 for more information.
☑Foot dimensions	Foot dimensions text export of a dynamic measurement: foot dimensions of the recognized feet will be exported. See Section 10.18 for more information.
☑Axis angles	Axis angles text export of a dynamic measurement: foot axis angle and the subtalar joint flexibility of the recognized feet will be exported. See Section 10.12 for more information.
☑Contact percentages	Contact percentages text export of a dynamic measurement: contact percentages of the recognized feet will be exported. See Section 10.15 for more information.
☑Balance stability	Stability text export of a balance measurement: interval information, ellipse information, loading distribution percentages and information per frame for force and center of pressure (COP, position and velocity) with respect to the chosen coordinate system. The information per frame is provided for the entire plate measurement as well as for the different selections (left/right, front/rear, and the four quadrants Q1/Q2/Q3/Q4). The coordinate system and division cross position can be selected with the controls ˅Coordinate system and ˅Division cross position. See section 10.9 for more information.

☑Balance entire plate	Entire balance export of a balance measurement: all the pressure frames of the entire balance measurement will be exported using a RLE (Run-length encoding) -like algorithm. The amount of consecutive sensors with zero pressure will be replaced by a negative number of this amount. E.g. [-20 0.31 0.12 -10 0.14 0.1] resamples 20 consecutive zeros, followed by pressure values 0.31 and 0.12, and again 10 consecutive zeros and pressure values 0.14 and 0.1.
☑Balance per foot	Balance measurement per foot text export: interval information, ellipse information per foot and information per frame for the center of pressure (COP, position) with respect to the foot axis, the inter COP angle and the inter COP distance of each foot separately. See section 10.11 for more information.
☑Gait ratios	Gait ratios text export of a dynamic measurement: gait ratios of the recognized feet will be exported. See Section 10.20 for more information.

The corresponding checkboxes will be disabled if a static, dynamic and/or balance measurement is not available in the session(s).

The following options can be selected:

☑Include header information in the text export	Add header information to the text export. This information includes the session name, person name, measurement date and scanning speed.
☑Use .xls as file extension for the text export	Use xls as the file extension for the text export, this allows easy opening in Microsoft Excel. If not chosen, the txt file extension is used.
☑Include trigger information in the text export	Add extra 3D interface box trigger information to the text export. This information includes the frame offset and whether the foot or frame is in an active trigger interval, if it is in an active trigger interval the trigger index is given. The feet are sorted differently when using this option: without this option feet are sorted first left and then right, with this option feet are sorted chronologically. This option results in text export files which are not compatible with footscan 7!

Click the Export button to start the export, each selected export will be run sequentially. Click the ✔ Close button the close the text export dialog.

Chapter 9

Record Wizard

The Record wizard assists you in creating a measurement session. A measurement session may hold four measurements: a 3D scan, a static, a balance and a dynamic measurement.

Note that while in the Record wizard other screens are inaccessible. As a reference the name, picture and birth date of the client is at the left of the screen. At each step in the wizard there is at least a button to skip the current stage.

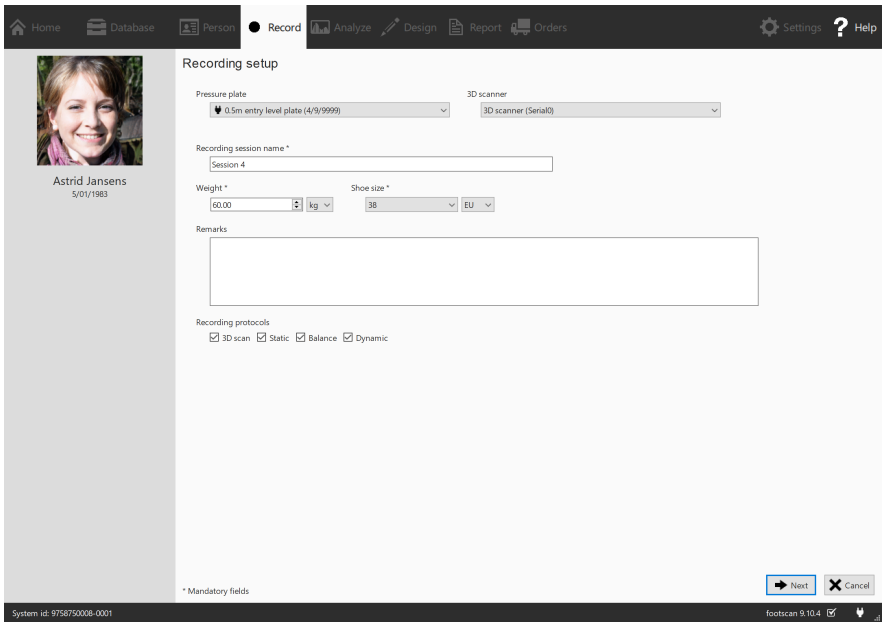


Figure 42: The Record setup asks for information about the client and the session which is required by the Record wizard to proceed.

Recording setup The Recording setup (Figure 42) needs information about the client and session before it can proceed. Fields in the form marked with a * are mandatory.

First of all the Record wizard requires a Pressure plate or 3D scanner with which to record and a Recording session name *. This name is useful to identify the measurement session in the Client screen (Chapter 8). The Recording setup suggests a name when initiating the Record wizard.

Furthermore the foot recognition algorithms used during the measurements need accurate Weight * and Shoe size * of the client for optimal results. footscan 9 remembers the values of the client's latest measurement session and uses them initially.

Optionally, one may add Remarks to the measurement session. These remarks appear in the Client screen's list of sessions (Chapter 8).

By selecting or deselecting the checkboxes 3D scan, Static, Balance and Dynamic one can choose which recording(s) will be performed.

After completing the form click Next to proceed, or Cancel to exit the record wizard without creating a measurement session.

SAM (Scanning App by Materialise) allows you to add a mobile scan of the client's feet.

SAM (Scanning App by Materialise) is a mobile app for Apple iPad® and Apple iPhone® which allows the capturing of 3D scans and pictures. These scans can be imported into footscan for further analyses.

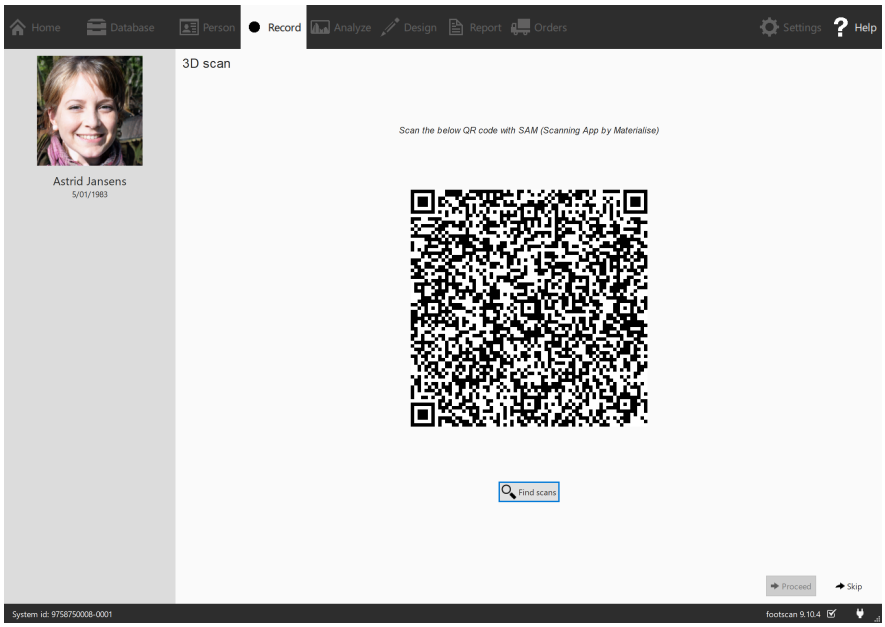


Figure 43: The mobile scanning recording screen shows a QR code that can be scanned within the mobile app.

The mobile recording scanning screen shows a QR code that can be scanned within the mobile app. Footscan searches periodically for the finished mobile scans, you can trigger this search manually by clicking the Find scans button. In case scans are found, the Proceed button will download the scans and show them in the mobile scanning preview page (Figure 44).

Click Skip to cancel the operation and return to the Client screen (Chapter 8).

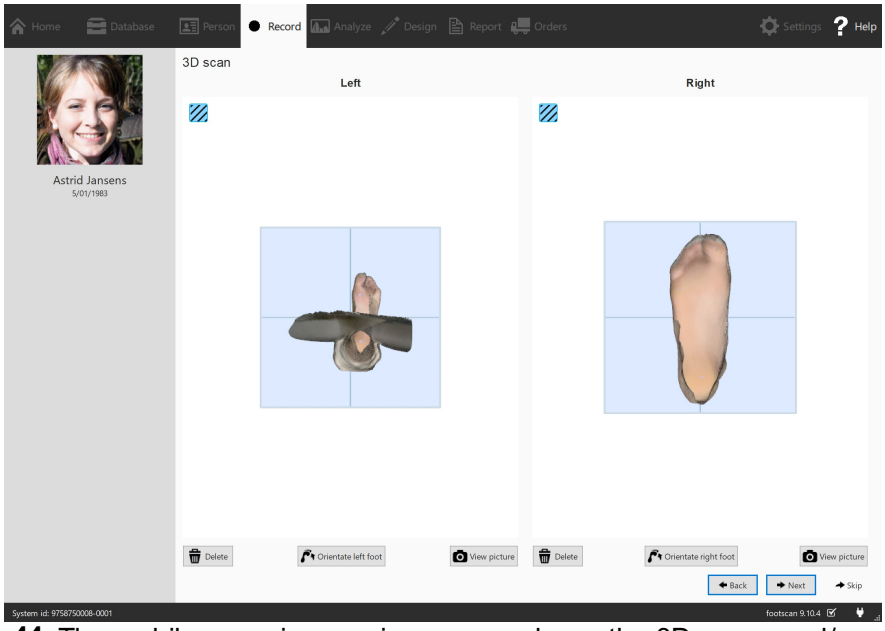


Figure 44: The mobile scanning preview screen shows the 3D scans and/or pictures made with SAM (Scanning App by Materialise).

The mobile scanning preview screen shows the 3D scans and/or pictures made with SAM (Scanning App by Materialise). The preview can be switched between the 3D scan and picture by clicking the View picture button, this is only possible if a picture was made within the mobile app. The 3D scan or picture can be removed by clicking the

Delete button.

If you are not satisfied with the retrieved mesh orientation, you can reorientate the mesh by clicking on the Orientate left foot button. The procedure of orientating a mesh is decriped in Chapter 8.1.

The 3D scan preview can show the mesh in a solid color or with the skin color, this is controled with the button.

Click Next to accept the 3D scans and pictures and proceed to the analysis page (Chapter 10), click Skip to discard them. Click Back to return to the mobile scanning recording screen with the QR code (Figure 43).

3D scanner recording The 3D scanner recording creates a 3D representation of the client's feet.

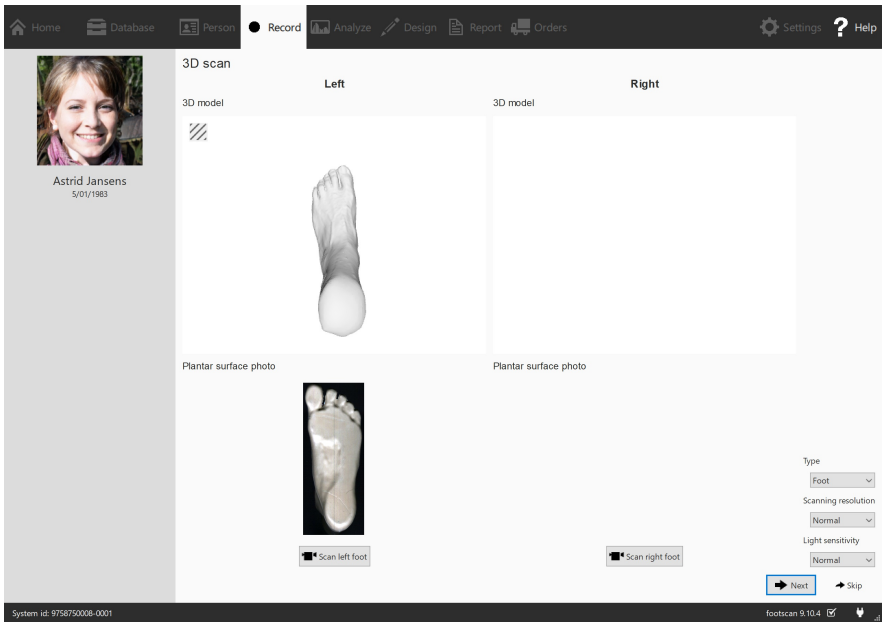


Figure 45: The 3D scanner recording creates a 3D representation and makes a plantar surface photo of the client's feet.

The 3D Scanner Recording stage shows a preview window for the 3D model and plantar surface photo of the scanned left and right foot. The 3D Scan Recording is performed on each foot separately and can be initiated by clicking the Scan left foot and Scan right foot buttons. For an accurate recording, it is important to stand as still as possible in the center of the 3D scanner while it is scanning. The result of the 3D scan will be shown as a top-down 3D view and plantar surface photo of the scanned foot as soon as the 3D data has been processed.

The following scanning options are available:

Type	Controls the type of scan. Can either be "Foot" or "Foambox". Choose "Foot" to scan regular (convex) objects like feet. Choose "Foambox" to scan foam impression boxes or other objects that are concave.
Scanning resolution	Controls the scanning resolution. A higher scanning resolution will result in a more detailed scan, while a lower resolution will result in a faster, but less detailed, scan.

Light sensitivity	Controls the sensitivity to light of the 3d scan. The light sensitivity needs to be increased when scanning dark objects. Also note that when the light sensitivity is higher, the scans will be more affected by the lightning conditions of the room or environment.

Click Next to save the 3D scanner measurement. Click Skip to discard it.

Static recording The static measurement captures a static picture of the pressure distribution under the client's feet while standing on the plate.

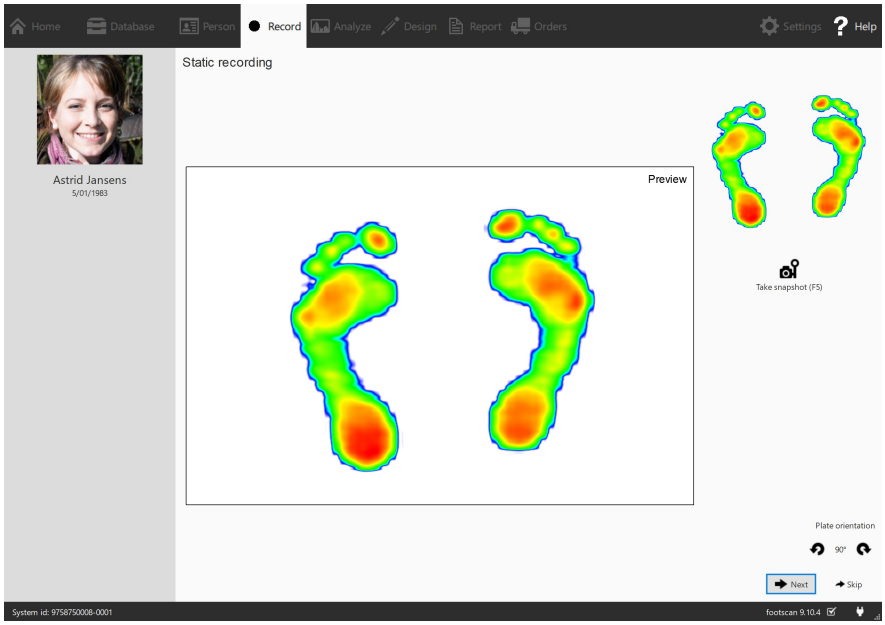


Figure 46: The Static recording takes snapshots of the pressure distribution under the client's feet while standing on the plate.

The Static recording stage (Figure 46) consists of a large canvas displaying the activity on the plate. Click Take snapshot (F5) to make a snapshot of the current pressure distribution. The application keeps the latest snapshot and displays it at the topright. When a 3D interface box is connected, which is set to master mode (see section 6.4), a trigger signal will become active during the snapshot recording.

Click Next to save the last snapshot. Click Skip to discard the static measurement.

To prevent accidental skipping the application guards Skip with a confirmation dialog. To disable this behavior consult the Settings dialog (Section 6.4)

.

Balance recording The balance measurement is a dynamic measurement capturing the pressure distribution under the client's feet and the displacement of the center of pressure (COP) while the client is standing on the plate.

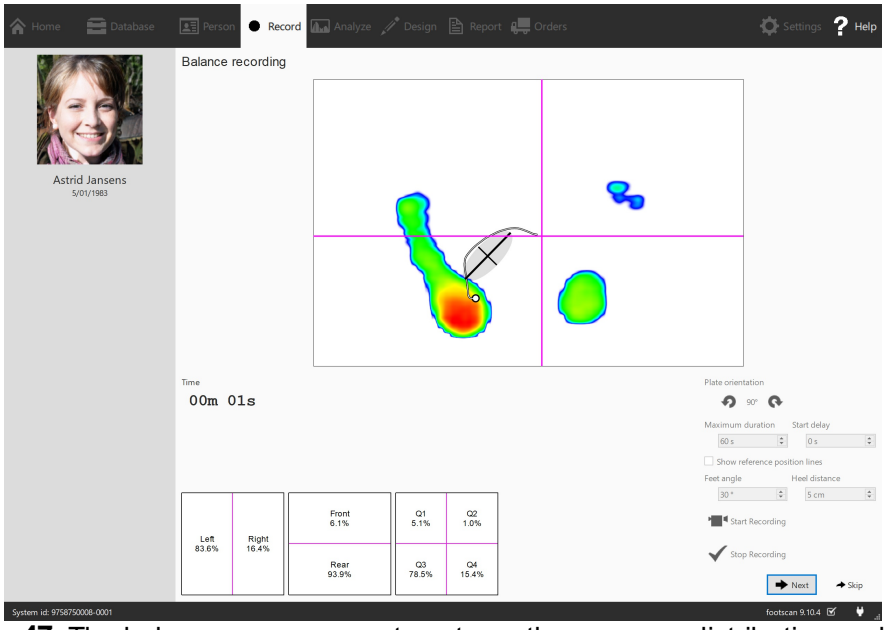


Figure 47: The balance measurement captures the pressure distribution under the client's feet while standing on the plate.

The Balance recording stage (Figure 47) shows a large preview canvas split into four quadrants, marked by the horizontal and vertical magenta lines (frame division cross). During preview, the pressure image with its center of pressure is shown. During recording, the pressure image together with the center of pressure line and ellipse are shown. The ellipse is based on the principal component analysis (PCA) of 70 percent of the center of pressure values, the center of the ellipse is the average of those center of pressure values. The principal and secondary axis of the ellipse are one standard deviation of the center of pressure values in the principal component analysis (PCA), these axes are also visible in the canvas during recording.

The orientation of the plate can be adjusted while previewing by using the ↶ and ↷ buttons.

It is possible to show a set of reference lines during the preview. These reference lines can guide the user to place their feet in the correct position, the heels should be positioned at the intersection of the vertical lines with the slanted reference lines. The reference lines are shown by clicking the ☑Show reference position lines checkbox, when enabled the following parameters can be adjusted:

- Feet angle: the enclosed angle between both feet. It can be adjusted in the Feet angle spinbox and is given in degrees.
- Heel distance: the distance between the heels of both feet. It can be adjusted in the Heel distance spinbox and is given in centimeter.

The Start Recording button becomes active when pressure is detected on the pressure plate, click this button to start a balance recording. It is possible to start the actual measurement after a given delay. This delay can be set using the Start delay spinbox. When using the delayed start, a countdown will be visible in the preview window. The actual recording starts after this countdown is finished. The balance recording will stop automatically when the maximum duration has elapsed or when the ✓ Stop Recording button is pressed. The maximum duration can be set with the Maximum duration spinbox. During the balance recording the elapsed recording time is displayed. When a 3D interface box is connected, which is set to master mode (see section 6.4), a trigger signal will become active during the recording.

It is also possible to remotely start a balance measurement using an external trigger, received by the 3D interface box, by checking ☑Start recording on trigger. This checkbox is only available when a 3D interface box is connected, which is set to slave

mode (see section 6.4). When ☑Start recording on trigger is checked, 📹 Start Recording becomes inactive. The balance measurement will immediately start when a trigger signal is received, even if no pressure is on the plate. The balance recording will stop automatically when the maximum duration has elapsed or when the ✓ Stop Recording button is pressed.

Click ➔ Next to save the balance measurement. Click ➔ Skip to discard it.

Dynamic recording The dynamic measurement captures the pressure distribution under the client's feet over the full duration of a step from initial contact until the end of the foot roll-off. footscan 9 recognizes left and right feet automatically. The client should walk or run in their natural gait pattern. A few practice runs might be useful before taking the final measurement.

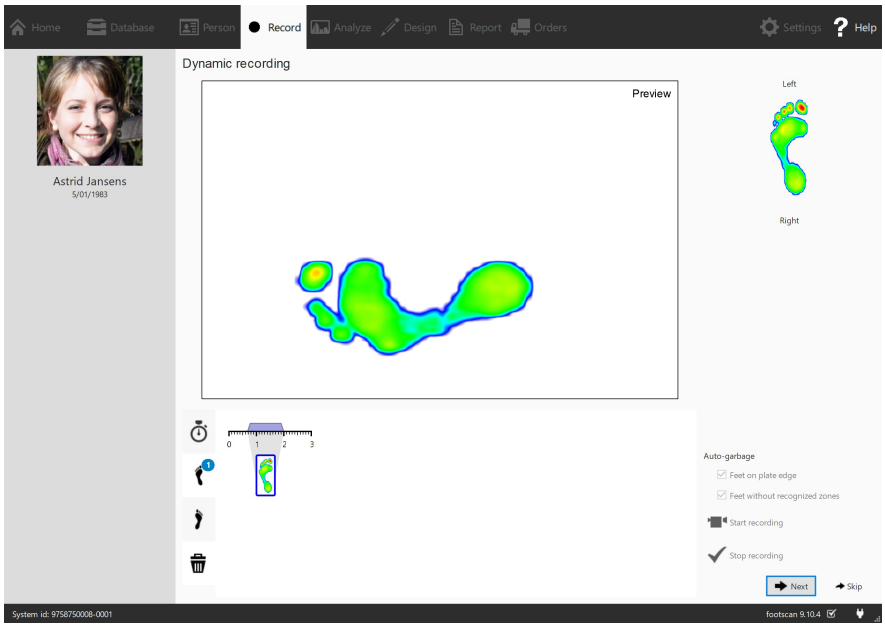


Figure 48: The Dynamic recording captures the dynamic pressure distribution under the client's feet during gait and recognizes left and right feet automatically.

The Dynamic recording stage (Figure 48) shows a large preview canvas. The timeline at the bottom displays all feet detected during the dynamic measurement. It highlights the selected feet in blue. Footscan 9 requires at least one foot for analysis. The D3D analysis (Section 11) even needs two left and two right feet. The Dynamic recording stage displays the selected feet on the right. Click and drag any of the timeline thumbnails to modify its classification or to move it to bin to discard the feet altogether.

Footscan 9 also saves all discarded feet. You will still be able to restore discarded feet or alter its classification after recording is finished. The Feet Selection panel in the Analyze screen (Chapter 10) provides a timeline on which the feet selection and classification can be modified.

Footscan 9 is able to automatically classify recorded feet while recording. During recording, footscan 9 processes the data and determines whether a recorded foot is a left or right foot. A counter keeps track of the amount of already correctly measured left and right feet.

Recorded feet can also be automatically classified as garbage. If the ☑Feet on plate edge option is checked, feet which were recorded on the edge of the plate are automatically discarded to the bin. Checking the ☑Feet without recognized zones moves feet without recognized zones to the bin (See Section 10.15 for more information about the anatomical zones analysis).

Click 📹 Start recording to start the dynamic recording. footscan 9 recognizes feet

walking in the gait (and opposite) direction. Finish with ✓ Stop recording when satisfied with the current dynamic measurement. When a 3D interface box is connected, which is set to master mode (see section 6.4), a trigger signal will become active during the recording.

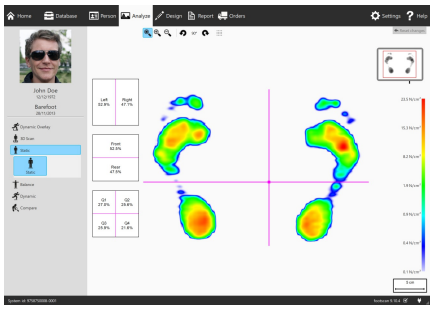
Click ➔ Next to save the dynamic measurement. Click ➔ Skip to discard it.

When there is at least one successful measurement the application creates a measurement session and navigates to the Analyze screen (Chapter 10). Otherwise it returns to the Client screen (Chapter 8).

To prevent accidental skipping, the application guards ➔ Skip with a confirmation dialog. To disable this behavior consult the Settings dialog (Section 6.4).

Analyze Screen

The Analyze screen (Figure 49) shows analyses of the measurement sessions created with the Record wizard. It either analyzes a single measurement session (Figure 49a), or it compares different measurement sessions (Figure 49b).



(a) Single measurement session analysis

(b) Comparison of measurement sessions

Figure 49: The Analyze screen

As a reference the Analyze screen always shows the name, picture and birth date of the client on the left, as well as the name and date of the current measurement session. When comparing, the screen shows the details of the second measurement session on the right. Additionally it lists all clients and their corresponding sessions from which to choose the second session.

The analyses of measurement sessions are situated under the 3D Scan, Static, Balance and Dynamic buttons. Comparing measurement sessions is located under the Compare button. When clicked these buttons fold down all available analyze options.

The following analyses are available:

Both feet	Analysis of the 3D scanned left and/or right foot. (Section 10.6).
Plantar surface photo	Analysis of the plantar surface photo of the 3D scanned left and/or right foot. (Section 10.7).
Static	Relative force distribution of the static measurement (Section 10.8).
Balance	The pressure distribution and the displacement of the center of pressure (COP) of a balance measurement. (Section 10.9).
Interval	Balance analysis divided into different time intervals. (Section 10.10).
COP per foot	Center of pressure (COP) per foot balance analysis divided into different time intervals. (Section 10.11).
2D	2D roll-off of the current foot selection (Section 10.12).
3D	3D roll-off of the current foot selection (Section 10.13).

Impulse	Impulse analysis of the current foot selection (Section 10.14).
Zones	Anatomical zones of the current foot selection (Section 10.15).
Probes	Pressure in user-defined areas of the current foot selection (Section 10.16).
Load rate	Load rate of the current foot selection (Section 10.17).
Footprint size	Footprint size of the current foot selection (Section 10.18).
Risk analysis	Risk analysis gives more information about the risk of the feet in a dynamic measurement (Section 10.19).
Gait Ratios	Gait ratios analysis of the current foot selection (Section 10.20).
COP Graphs	Center of pressure graphs of the current foot selection (Section 10.21).
Foot Timing	Single foot timing analysis of the current foot selection (Section 10.22).
Full plate	Activity on the plate during the entire dynamic measurement (Section 10.23).
Multi step	Multi step analysis of the dynamic measurement (Section 10.24).
Force plate	Force plate analysis of the dynamic measurement (Section 10.25).
Edit zones	Manual zones editing screen (Section 10.26).

The following comparisons are available:

2D	2D roll-off comparison of the foot selections (Section 10.27).
Impulse	Impulse comparison of the foot selections (Section 10.28).
Areas	Comparison of pressure distribution of the foot areas (rearfoot, midfoot, forefoot) of the foot selections (Section 10.29).

Analyze Toolbar Each analysis also features a toolbar. The toolbar lets you control the visualization of the analysis to better suit your needs. Depending on the type of analysis shown, certain actions are made available:

	Zooms the view to fit the center of pressure line tightly.
	Zooms the view to fit its contents tightly.
	Zoom in. Alternatively use the mouse's scroll wheel on the view.
	Zoom out. Alternatively use the mouse's scroll wheel on the view.
	Rotate the view counter clockwise.
	Rotate the view clockwise.

Toggles the sensor grid. The sensor grid shows the location of the plate sensors.

Toggles the display of the center-of-pressure of a pressure distribution.

Toggles the display of the center of pressure ellipse. More information can be found in the Balance recording section (see 9).

Toggles the display of the frame division cross.

Toggles the display of the division marker in the COP per foot balance analysis. More information can be found in the COP per foot balance analysis section (see COP per foot).

Toggles the display of the center-of-pressure separately per foot. More information can be found in the COP per foot balance analysis section (see COP per foot).

Toggles the display of the center of pressure ellipse separately per foot. More information can be found in the COP per foot balance analysis section (see COP per foot).

Toggles the display of foot axes.

Toggles the display of a grayscale foot silhouette underneath the dynamic measurement.

Toggles the display of the subtalar joint angles. More information can be found in the 2D analysis section (see 10.12).

Toggles the display of numerical values. More information can be found in the 2D analysis section (see 10.12).

Toggles the display of multi step annotations. More information can be found in the multi step analysis section (see 10.24).

Toggles the display of foot type and contact percentages. More information can be found in the zones analysis section (see 10.15).

Figure 50: The Replay console controls the roll-off of a dynamic measurement.

Replay Console The Replay console (Figure 50) controls the roll-off of a dynamic measurement. Besides the stop ■, play ▸, rewind ⏮ and forward ⏭ controls it contains a slider to scroll to any frame and a speed multiplier to manipulate the speed of the roll-off.

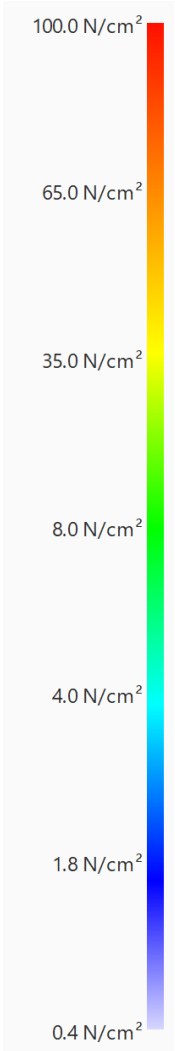
When an analysis shows multiple roll-offs the 🔗 button controls the replay timing. If toggled time is expressed as a percentage of contact duration, otherwise the replay is in real-time.

Footscan 9 saves the state of the 🔗 button, which is shared among all analyses.

Feet Selection Most analyses apply to a single left and/or right foot. To these analyses, the other feet of the dynamic measurement are not relevant. footscan 9 introduces foot selection to decide which pair of feet is best fit for analysis. The application saves this selected pair along with the dynamic measurement. The Record wizard (Chapter 9) sets the initial selection. Feet with modified zones and/or foot axis are indicated with a pencil symbol (see Chapter 10.26).

Click Select feet to modify the current foot selection. A timeline unfolds, highlighting the selected pair. Change the selection by clicking the thumbnails. The Analyze screen updates its analyses instantaneously. Click Select feet again to hide the timeline.

When comparing two pair of feet the Analyze screen also displays a Select feet for the second measurement (Figure 49b). Note that this button only selects the pair of feet with which to compare. It does not affect the foot selection stored for the second measurement.



Color Scale Some analyses display physical quantities as images. The colors in these images relate to the underlying value. The Color scale expresses this relationship between physical quantity and color. The color scale displays the entire color spectrum and some key physical quantity values next to their corresponding colors. The minimum and maximum values are at both ends of the spectrum.

10.1 Dynamic Overlay

Dynamic Overlay is an overview menu consisting of the 2D, 3D and Impulse submenu. These features give a visual overview of a combined pressure measurement and the 3D scanned foot.

Use the mouse's scroll wheel to zoom in and out.

The orientation pointer (positioned in the right bottom corner of each foot) can also be used to change the point of view by clicking and dragging/rotating. The colored triangles can be clicked to directly orientate to the desired point of view:

- Red: frontal plane point of view
- Blue: Transverse plane point of view
- Green: Sagittal plane point of view

Some older computer systems might not support 3D rendering adequately. The 3D analysis is not available on such systems. Review the minimum system requirements of footscan 9 for more information.

10.2 Dynamic Overlay: 2D

The Dynamic Overlay – 2D analysis (Figure 51) shows a combined visualization of the 2D pressure measurement and 3D scanned feet.

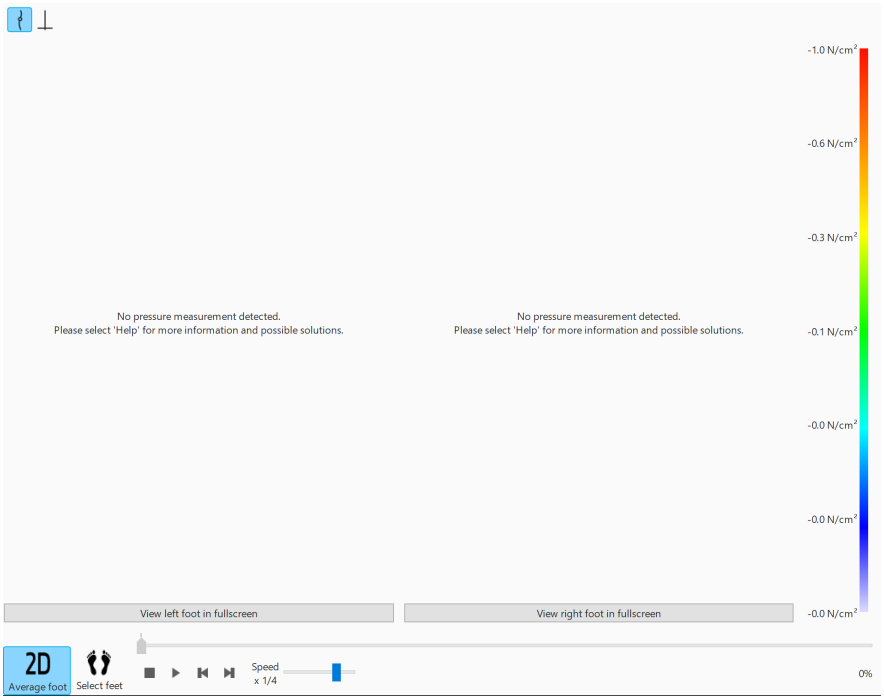


Figure 51: The Dynamic Overlay – 2D analysis shows a combined visualization of the 2D pressure measurement and 3D scanned feet.

The dotted line represents the center-of-pressure of the roll-off. The pink line shows the foot axis connecting the middle of the medial and lateral heel with the middle of metatarsal heads two and three. When playing, the 2D analysis loops through the roll-offs. A large white dot on the center-of-pressure line shows the current center-of-pressure. When stopped the analysis shows the maximum sensor values of both feet. The COP line and Foot axes can be visualized by toggling the toolbar button.

10.3 Dynamic Overlay: 3D

The Dynamic Overlay – 3D analysis (Figure 52) shows the current foot selection as a height map visualized on top of the 3D scan measurement.

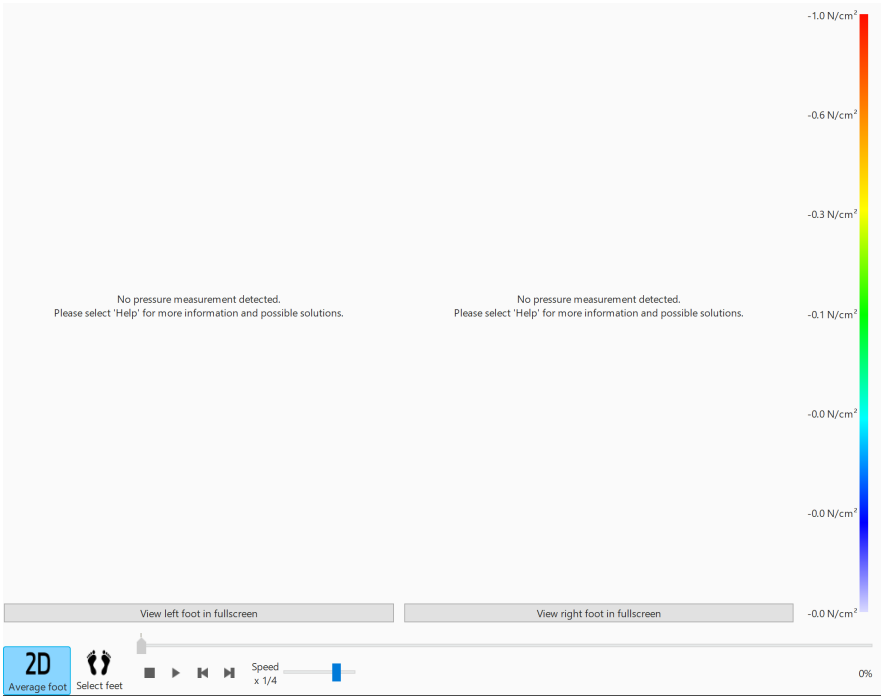


Figure 52: The Dynamic Overlay – 3D analysis shows the current foot selection as a height map visualized on top of the 3D scan measurement.

The height of the map is proportional to the corresponding pressure value.

10.4 Dynamic Overlay: Impulse

The Dynamic Overlay - Impulse analysis (Figure 53) displays the total impulse applied on each sensor of the current foot selection visualized on top of the 3D scan measurement.

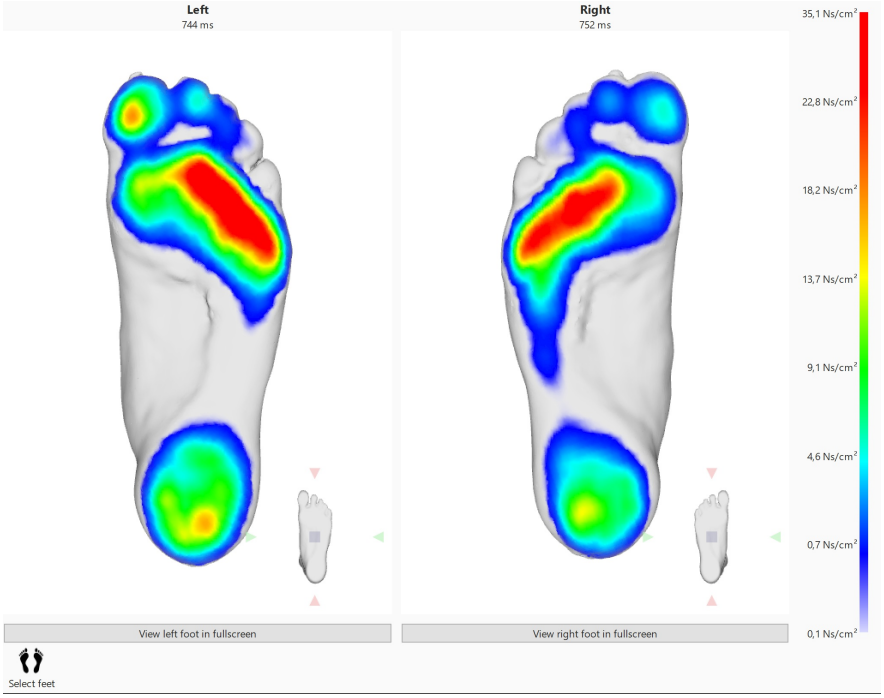


Figure 53: The Dynamic Overlay - Impulse analysis displays the total impulse applied on each sensor of the current foot selection visualized on top of the 3D scan measurement.

The color scale expresses impulse in $^{Ns}/_{cm^2}$. The impulse analysis draws all sensors with impulse values higher than 65% of the maximum value red. Areas of such high pressure may indicate an increased risk (e.g. the risk for ulcers in diabetic patients).

10.5 Dynamic Overlay: Potential mismatch solutions

Potential solutions to fix the mismatch error:

- Select a different foot using the ‘Select feet’ option
- Check the quality (any occurrence of irregularities) of the 3D scan and if necessary:
  - Redo 3D scan measurement
  - Import new STL- or OBJ-file
  - Ensure the 3D data is in mm units
- Make sure that both measurements (3D scan and pressure/impulse measurements) are of the same person in a session
- Mismatch occurred due to partial footprints (e.g. forefoot walking)

10.6 Both Feet 3D Scanner

The both feet 3D scanner analysis (Figure 54) shows the scanned left and/or right foot.

Figure 54: The Both Feet 3D scanner analysis shows the scanned left and/or right foot.

The scanned foot can be manipulated by clicking and dragging inside the view. The orientation pointer (positioned in the right bottom corner of each foot) can be used to change the point of view by clicking and dragging/rotating. The colored triangles can be clicked to directly orientate to the desired point of view:

- Red: frontal plane point of view
- Blue: Transverse plane point of view
- Green: Sagittal plane point of view

A number of predefined measurements are performed and made visible on the 3D scan of each foot and as numerical values (in millimeter) in the measurement table underneath it:

- Arch height: blue line
- Arch length: magenta line
- Foot length: red line
- Foot width: green line

While these predefined measurements are non-modifiably, girth measurements - circumnavigating the 3D foot model - can be added, modified or removed as desired. A new girth measurement can be added by clicking the ✚ button. Removing a girth measurement is done by clicking on the ━ button.

Like the other predefined measurements, girth measurements are shown both on the 3D foot model and in the measurement table underneath it.

A girth measurement can be selected by clicking on it either on the 3D foot model or on its measurement table entry. Selecting a girth measurement in any way will automatically highlight it both on the 3D foot model and in the measurement table.

A selected girth measurement can be modified by using the mouse to drag the girth measurement across the 3D foot model. Using the left mouse button, the girth is moved perpendicular against its axis. Rotating the girth measurement is done by dragging the

girth using the right mouse button.

The measurements table also mentions an estimation of the shoe size, the estimated shoe size is based upon the measured foot length and the toe allowance parameter. The toe allowance (in millimeter) can be set with the Toe allowance in mm: spinbox and in the settings dialog (see 6.4).

Please note that when the object was scanned using scan type "Foambox" girths and other predefined measurements will not be available.

A scanned foot can be shown in full screen by clicking the View left foot in fullscreen or View right foot in fullscreen button (Figure 55). Note that only a selected girth will show up in the measurements overview.

To leave the full screen click the Back button.

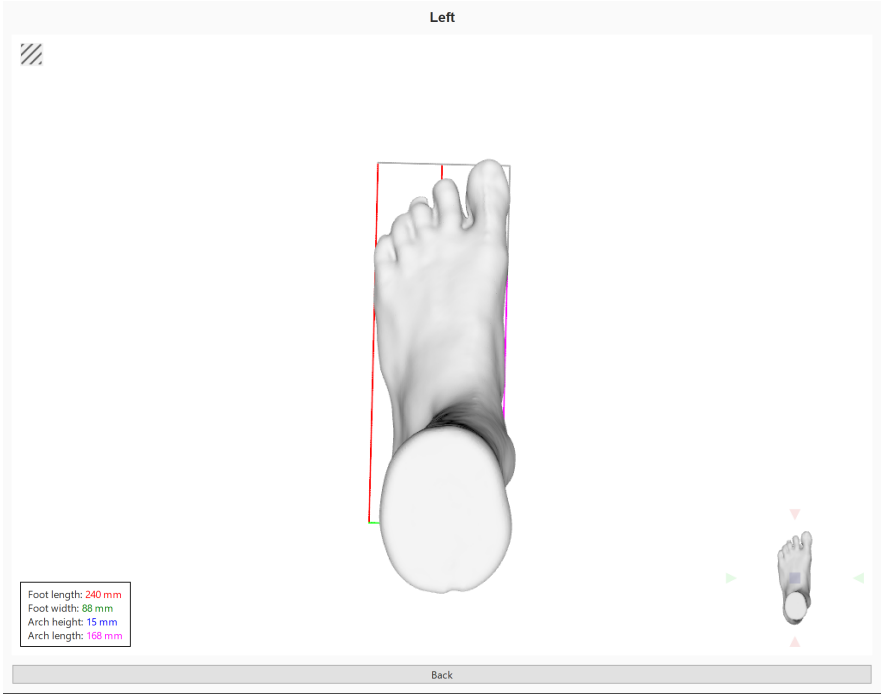


Figure 55: The Both Feet 3D scanner analysis shows the scanned left and/or right foot in full screen.

10.7 Plantar Surface Photo

The plantar surface photo analysis (Figure 56) shows the plantar surface photo of the 3D scanned left and/or right foot.

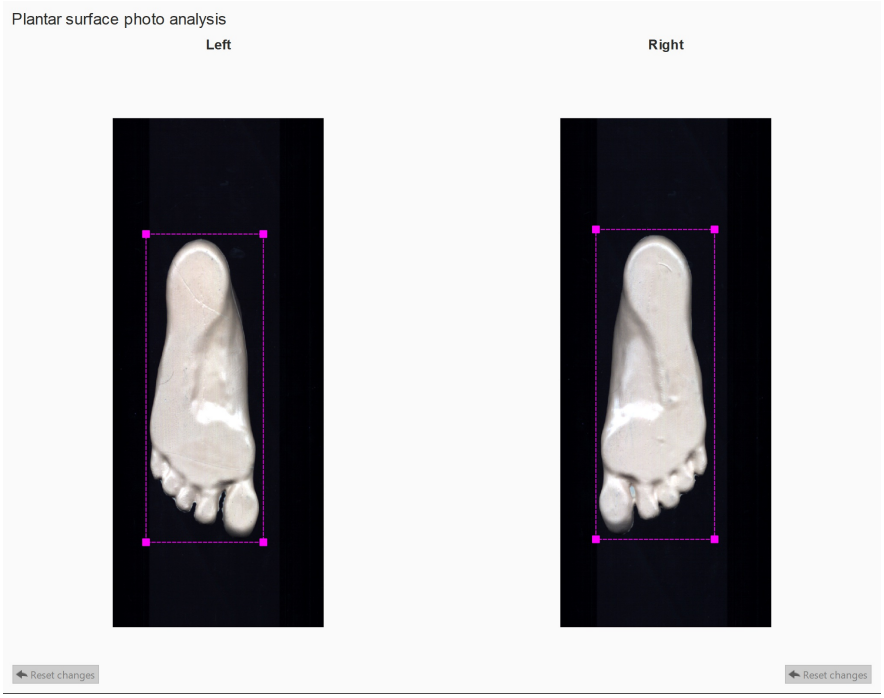


Figure 56: The plantar surface photo analysis shows the left and/or right plantar surface photo.

The plantar surface photo analysis allows to manually adjust the cropping area:

- The size can be changed by clicking and dragging the corner points of the crop rectangle
- The location can be changed by clicking and dragging the center of the crop rectangle

Click the Reset changes button to reset the changes.

10.8 Static

The Static analysis (Figure 57) shows the relative force distribution of the static measurement.

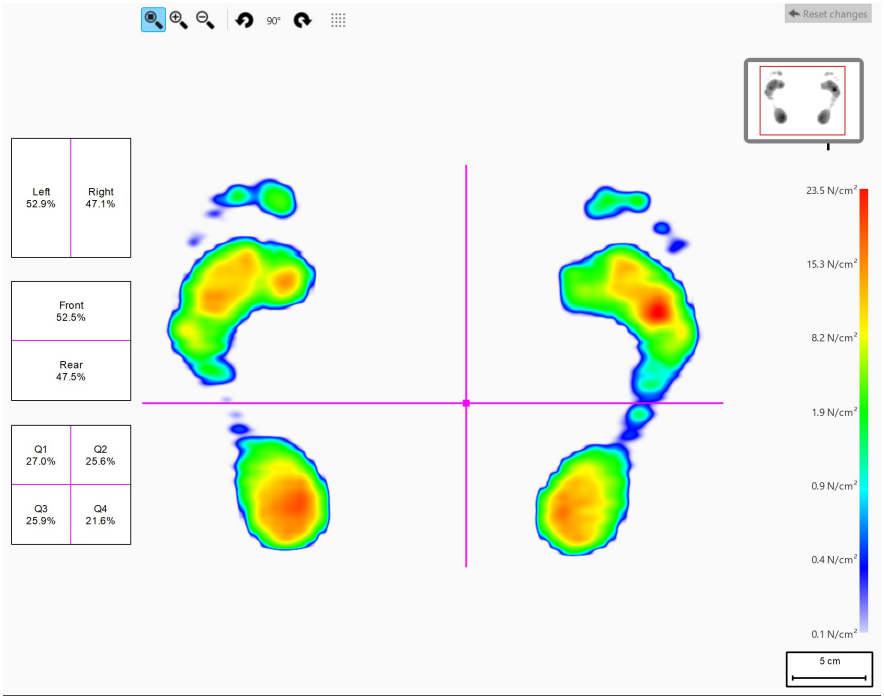


Figure 57: The Static analysis shows the relative pressure distribution of the static measurement. The percentages in the boxes show the spread of the total force on the footscan plate across the quadrants.

The analysis divides the static measurement into four quadrants, marked by pink lines. The center of these quadrants indicates the center-of-pressure of the measurement. The percentages in the boxes on the left express how the pressure on the footscan plate is spread across the different areas defined by the quadrants.

Drag the center and/or lines to modify the relative positions of the quadrants. The analysis updates the percentages in the boxes accordingly. Click Reset changes to reset the changes.

The plate miniature at the top right shows the region of the plate currently displayed by the static analysis. Zooming in and out updates the miniature instantaneously. Use and in the toolbar to modify the orientation of the plate.

10.9 Balance

The Balance analysis (Figure 58) evaluates the pressure distribution and the displacement of the center of pressure (COP) of a balance measurement.

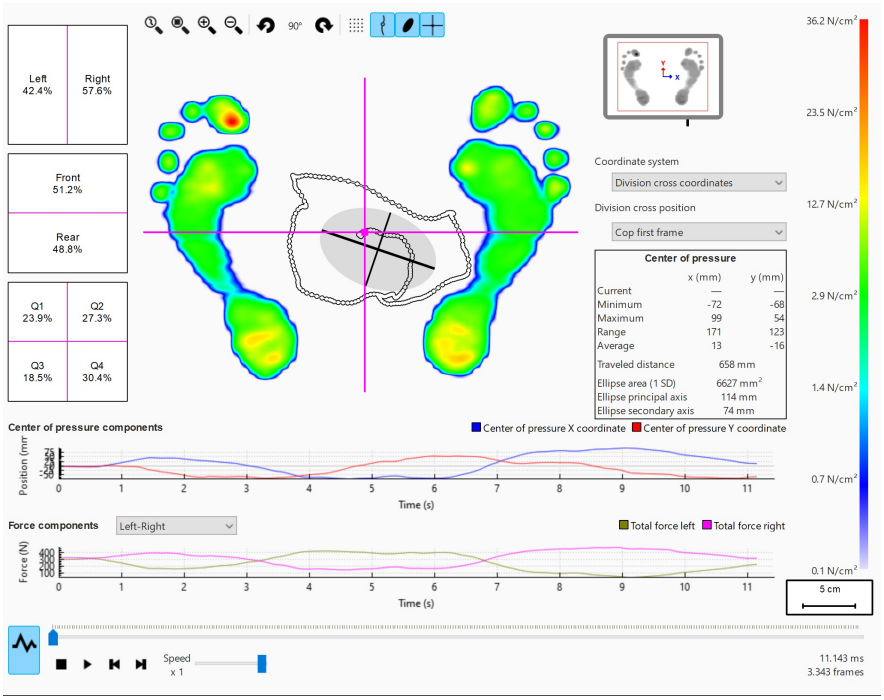


Figure 58: The default balance analysis screen.

When playing, the balance analysis loops through the entire balance measurement. When stopped it shows the maximum pressure values registered during the balance measurement.

There are two graphs in the balance analysis screen:

- Center of pressure graph: this graph shows the displacement of the center of pressure in the x and y directions in millimeter. The x-axis shows the time in seconds.
- Force graph: this graph shows the total vertical force in Newton. Use the Force components drop-down list to select which force components are shown. The x-axis shows the time in seconds.

Both graphs can be hidden or shown by clicking the button.

The balance measurement is split into four quadrants. The division point of these quadrants is marked by the point of intersection of the frame division cross. The percentages in the boxes express how the force on the footscan plate is spread across the different areas defined by the areas (left/right, front/rear and four quadrants).

Numerical information about the center of pressure is shown:

- position: the current, minimum and maximum position in millimeter for the x- and y-coordinate
- range: the spread between the minimum and maximum position in millimeter for the x- and y-coordinate
- travelled distance: the length of the center of pressure line in millimeter
- ellipse area: the area of the calculated center of pressure ellipse in square millimeter

The used coordinate system to perform the calculations is adjustable in the Coordinate system drop-down list and is visualised in the plate miniature (x-axis in blue,

y-axis in red). The possibilities are:

- Division cross coordinates: the coordinate system is centered around the point of intersection of the frame division cross.
- Plate coordinates: the coordinate system uses the same coordinate system as reported by the pressure plate.

The position of the frame division cross is adjustable in the ˅Division cross position drop-down list. The possibilities are:

- Cop first frame: the frame division cross is placed on the COP found in the first frame of the balance measurement.
- Plate center: the frame division cross is placed in the center of the plate.
- Cop average (rounded to sensors): the frame division cross is placed on the average COP of the complete balance measurement. This average is rounded to the nearest sensor.
- Custom: the frame division cross is user defined by clicking and dragging the frame division cross.

10.10 Interval Balance

The interval balance analysis is available in the Clinical, Scientific package(s).

The Interval Balance analysis (Figure 59) evaluates a balance measurement divided into different time intervals.

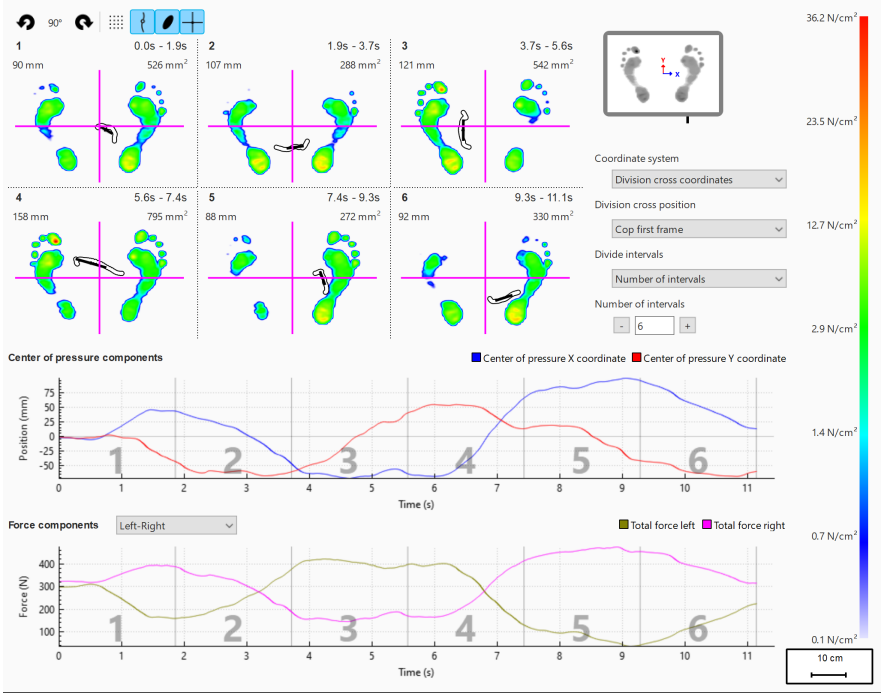


Figure 59: The interval balance analysis screen.

The interval balance analysis shows the balance measurement divided into several intervals, each interval displays the following:

- An image of the maximum pressure values of the balance measurement present in the interval.
- The range of the time interval in seconds.
- The travelled COP distance in millimeter.
- The COP ellipse area in square millimeter.

The number of intervals and how the balance measurement is divided can be set through the Divide intervals drop-down list, the following options are available:

- Number of intervals: the balance measurement is divided into intervals of equal duration. The number of intervals can be set in the Number of intervals spinbox, up to a maximum of twelve intervals.
- Interval duration: the intervals have a fixed duration, this interval duration can be set in the Interval duration spinbox. The last interval can be shorter if the total recording duration is not an exact multiple of the requested interval duration.
- Manual: the user can manually manipulate the intervals through the interval marker lines in the graphs. The following actions can be performed:
  - Add an interval: click on the ✚ button and place the cursor to the desired location in the graph. Click to add the interval.
  - Move an interval: click on the ✛ button and place the cursor on the interval marker line that needs to be moved. Click and drag the interval marker to the desired position.
  - Delete an interval: click on the ━ button and place the cursor on the interval marker line that needs to be removed. Click to delete the interval marker line.

- Clear all intervals: click on the button to remove all the intervals.

It is always possible to manually add, move, delete or remove the intervals. When done the Divide intervals drop-down list will switch to "Manual".

The used coordinate system and the force division cross origin are adjustable by using the drop-down lists Coordinate system and Division cross position. More information can be found in the Balance analysis section (See 10.9).

10.11 Center of Pressure (COP) per Foot Balance

The COP per foot balance analysis is available in the Clinical, Scientific package(s).

The center of pressure (COP) per foot balance analysis (Figure 60) shows the progression of the center of pressure, deconstructed in several detailed analyses.

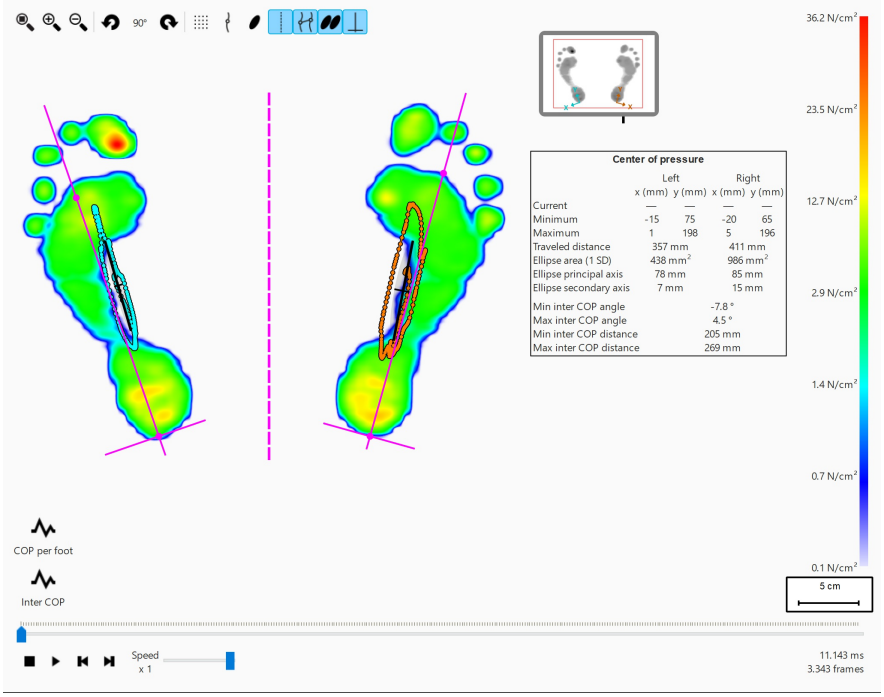


Figure 60: The COP per foot balance analysis screen.

The COP per foot balance analysis provides details about the progression of the center of pressure in time per foot. The progression in time of the COP is displayed in the graphs, while an overview of the most notable values are made available in a textual overview.

The graphs offer the following details:

- Medio-lateral graph: Shows the medio-lateral displacement of the center of pressure, against the foot-axis, for both feet. The displacement is shown over time, in seconds, on the x-axis of the graph, the amount of displacement is shown in millimeters on the y-axis of the graph.
- Anterio-posterior graph: Shows the anterio-posterior displacement of the center of pressure, against the foot-axis, for both feet. The displacement is shown over time, in seconds, on the x-axis of the graph, the amount of displacement is shown in millimeters on the y-axis of the graph.
- Inter COP angle graph: Shows the angle between the line defined by the left and right foot center of pressure to the horizontal of the screen. the change in angle is shown over time, in seconds, on the x-axis on the graph. The angle is shown in degrees on the y-axis of the graph.
- Inter COP distance graph: Shows the distance between the left and right foot center of pressure. The change in distance is shown over time, in seconds, on the x-axis on the graph. The distance is shown in millimeters on the y-axis of the graph.

The textual overview of values offers the following details for the left and right foot:

- Current: The x and y value of the center of pressure position for the left and right foot for the currently selected pressure frame.

- Minimum: The minimum x and y value of the center of pressure position for the left and right foot.
- Maximum: The maximum x and y value of the center of pressure position for the left and right foot.
- Traveled distance: The length of the center of pressure line of the left and right foot in millimeter.
- Ellipse area (1 SD): The area of the calculated center of pressure ellipse for the left and right foot, in square millimeter. The principal and secondary axis of the ellipse are one standard deviation (1 SD) of the center of pressure values.
- Ellipse principal axis: The length of the major axis of the center of pressure ellipse for the left and right foot, measured in millimeters.
- Ellipse secondary axis: The length of the minor axis of the center of pressure ellipse for the left and right foot, measured in millimeters.
- Min Inter COP angle: The minimum angle, in degrees, between the left and right foot center of pressure to the horizontal of the screen.
- Max Inter COP angle: The maximum angle, in degrees, between the left and right foot center of pressure to the horizontal of the screen.
- Min Inter COP distance: The minimum distance, in millimeter, between the left and right foot center of pressure.
- Max Inter COP distance: The maximum distance, in millimeter, between the left and right foot center of pressure.

10.12 2D

Information about the exorotation and subtalar joint angles is available in the Clinical, Scientific package(s).

The 2D analysis replays the roll-offs of the average foot if the 2D Average foot button is enabled (blue highlighted), or of the current foot selection if the 2D Average foot button is disabled.

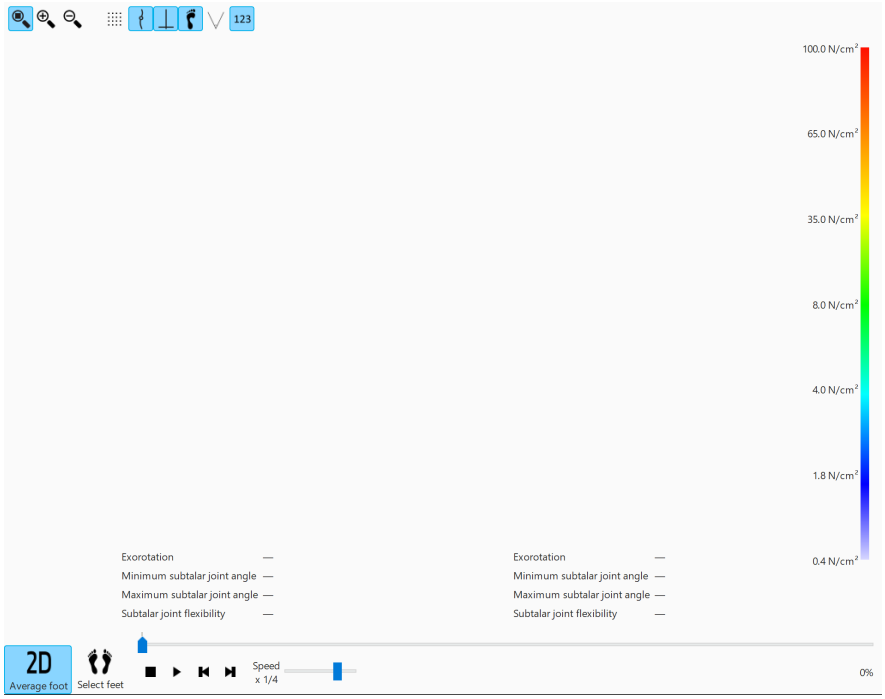


Figure 61: The 2D analysis replays the roll-offs of the current pair of selected feet.

The dotted line represents the center-of-pressure of the roll-off. The pink line shows the foot axis connecting the middle of the medial and lateral heel with the middle of metatarsal heads two and three.

The Clinical, Scientific package(s) provide information about the subtalar joint angles and subtalar joint flexibility:

- **Subtalar joint angle:** provides for an indication of the amount of frontal plane rearfoot motion in relation to the ground during the initial contact phase. A higher value for the subtalar joint angle suggests a more pronated rearfoot. The minimum and maximum values indicate the maximal supination and maximal pronation position of the rearfoot in relationship to the ground for the initial contact phase.
- **Subtalar joint flexibility:** the range between the minimum and maximum subtalar joint angle.

Information about the foot axis exorotation and the subtalar joint angles can be displayed by toggling the 123 toolbar button, the following numerical information is shown:

- the exorotation of the foot axis in degrees
- the minimum subtalar joint angles in degrees
- the maximum subtalar joint angles in degrees
- the subtalar joint flexibility in degrees

The subtalar joint angles can be visualised by toggling the ▽ toolbar button. The brown lines show the minimum and maximum subtalar joint angles. During replay, the red line

will show the current subtalar joint angle.

When playing, the 2D analysis loops through the roll-offs. A large white dot on the center-of-pressure line shows the current center-of-pressure. When stopped the analysis shows the maximum sensor values of both feet.

10.13 3D

The 3D analysis shows the current foot selection as a height map. The height of the map is proportionate to the corresponding pressure value.

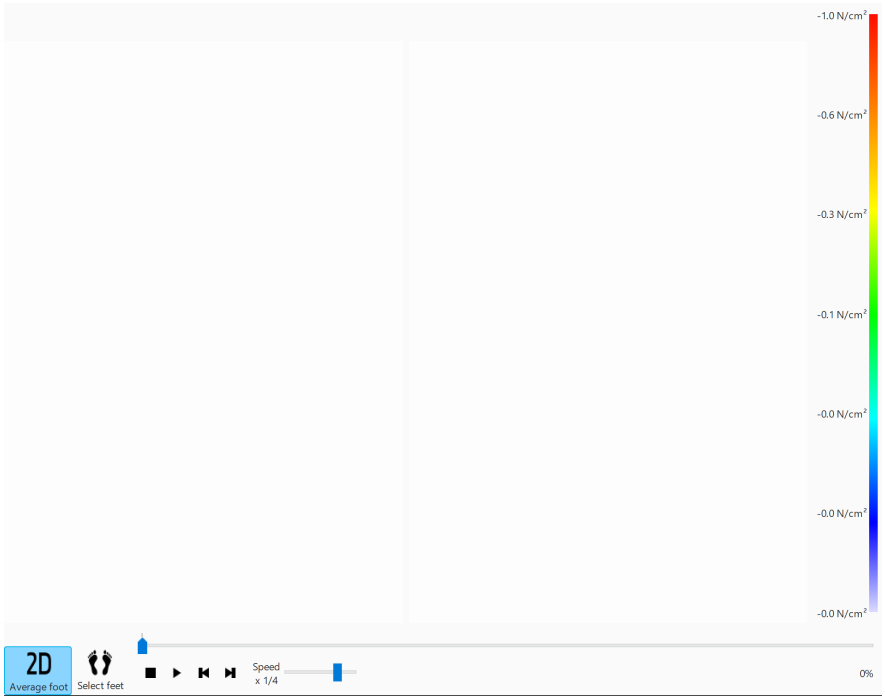


Figure 62: The 3D analysis shows the current foot selection as a height map.

Use the mouse's scroll wheel to zoom in and out. Click and drag the height maps to change the point-of-view.

Some older computer systems might not support 3D rendering adequately. The 3D analysis is not available on such systems. Review the minimum system requirements of footscan 9 for more information.

10.14 Impulse

The Impulse analysis (Figure 63) displays the total impulse applied on each sensor of the current foot selection. The color scale expresses impulse in $^{Ns}/_{cm^2}$.

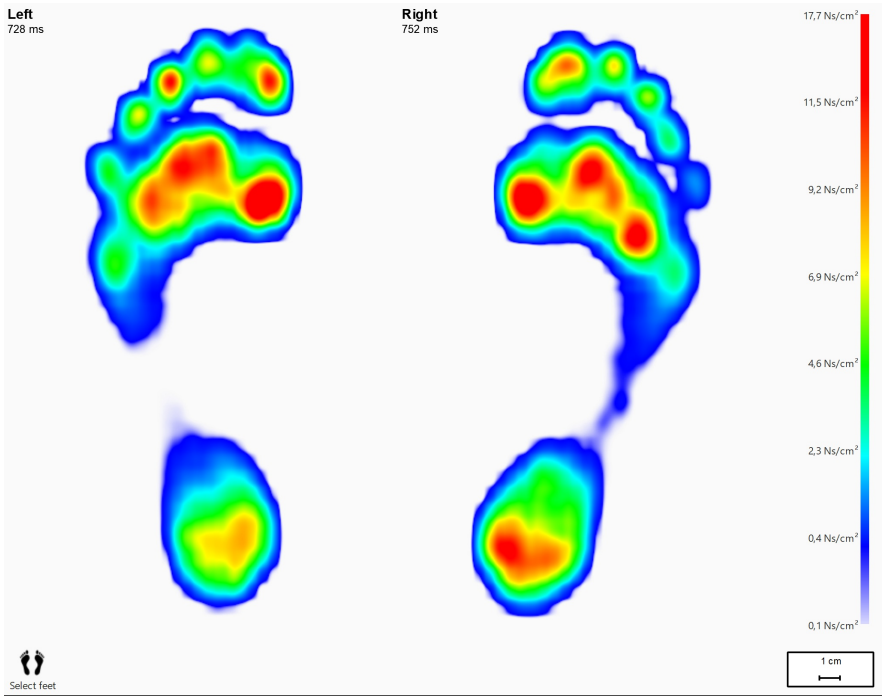


Figure 63: The Impulse analysis shows the total impulse applied on the current foot selection as an image. Red indicates an impulse value higher than 65% of the maximum impulse value.

The impulse analysis draws all sensors with impulse values higher than 65% of the maximum value red. Areas of such high pressure may indicate an increased risk, e.g. the risk for ulcers in diabetic patients.

10.15 Zones

Footscan 9 automatically recognizes feet when recording the dynamic measurement (Chapter 9). During feet detection the application determines the location of ten anatomical zones. Some analyses need these zones to compute parameters, such as the foot axes.

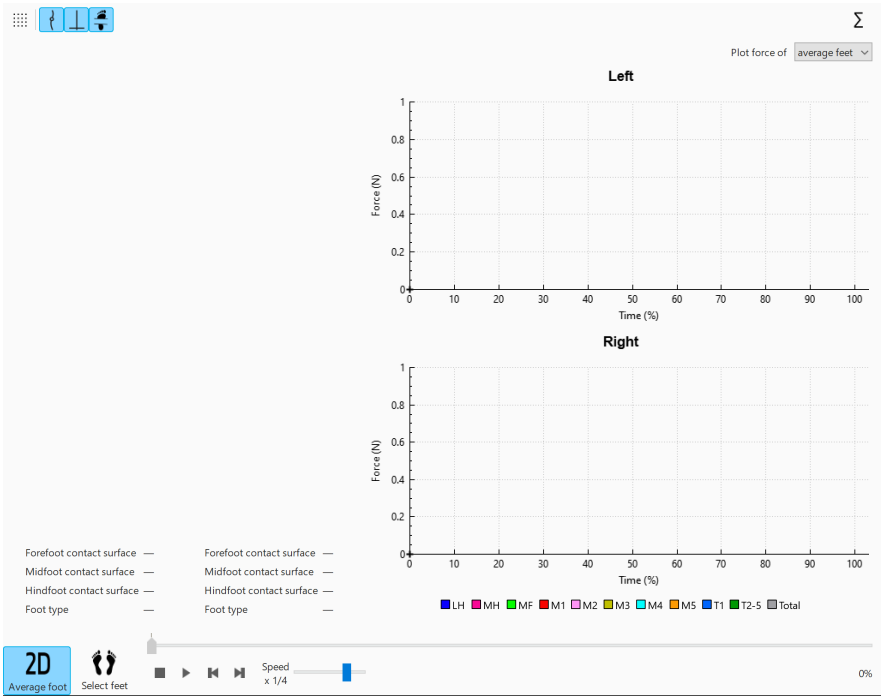


Figure 64: The Zones analysis displays the ten anatomical zones of the current foot selection.

The Zones analysis screen (Figure 64) is divided into two main parts. On the left side of the screen, the selected left and right foot are shown, divided into the ten anatomical zones. The analysis also draws the center-of-pressure and foot axes on top of the zones. The graphs, plotting the applied force per zone progression during the roll-off, make up the right part of the screen. The legend at the bottom depicts the color associated with each zone.

Contact surface percentages and foot type can be displayed by toggling the toolbar button. The loaded contact surfaces under the forefoot, midfoot and hindfoot are shown as a percentage of the total contact surface, based on the zone division.

Information about the foot type and contact percentages is available in the Clinical, Scientific package(s).

Alongside the ten zones, the total of all the zones can also be plotted by clicking on the Σ button.

Additionally, you can select if you want to plot only the selected left and right foot, the average of all measured left and right feet, or a combination of both the selected and average feet by changing the option in the Select force graph drop-down list. The selected left and right foot are displayed as solid lines in the graphs, while the average of all measured left and right feet are displayed as dotted lines in the graphs. When only the selected left and right foot are plotted, the absolute roll-off time (milliseconds) is used. When averaging, the roll-offs are rescaled and the roll-off progression is shown as a relative timing (percentage).

When played, the analysis shows the activity of each zone during the roll-off. Vertical

lines mark the roll-off progress in the graphs.

10.16 Probes

The Probes analysis (Figure 65) displays the pressure applied to ten user-defined rectangular areas or probes of the current foot selection. Each probe represents a pinpoint to the zone with identical color.

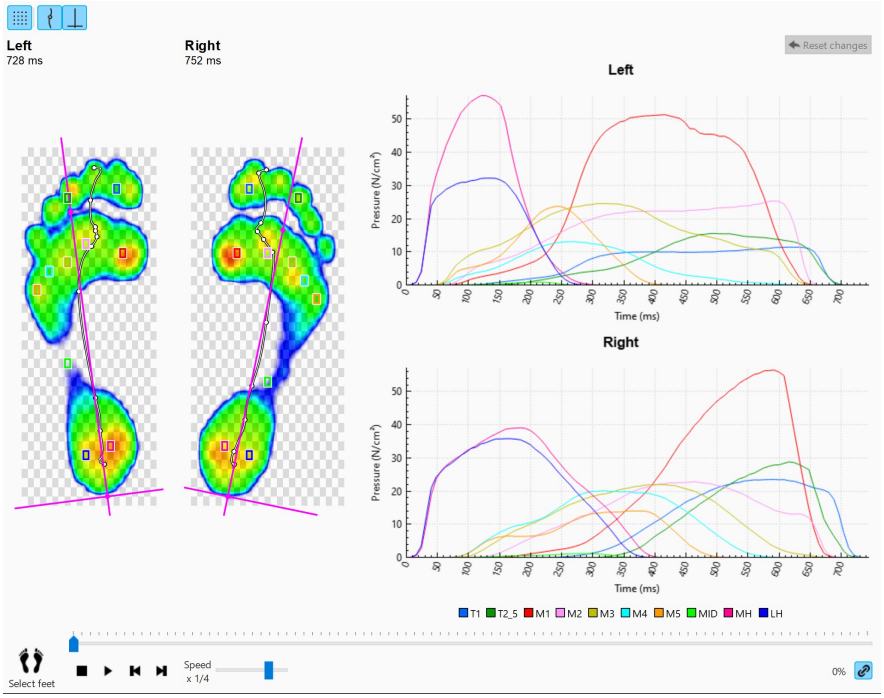


Figure 65: The Probes analysis plots the pressure on ten user-defined probes of the current foot selection.

The Probes analysis plots the pressure for each probe in graphs next to the roll-offs of the current foot selection. When played the graphs dispay vertical marker lines at the current position in time.

Initially footscan 9 places each probe on the sensor at the center of its corresponding zone. Click and drag any of the corners of a probe to resize it in that direction. Click and drag the middle of the probe to reposition it. Note that the application updates the graphs instantaneously when the probes change.

10.17 Load rate

The Load rate analysis (Figure 66) evaluates the rate at which the force applied on each anatomical zone changes. More specifically it displays the derivative of the force applied on each zone (expressed in $^{N}/_{s}$).

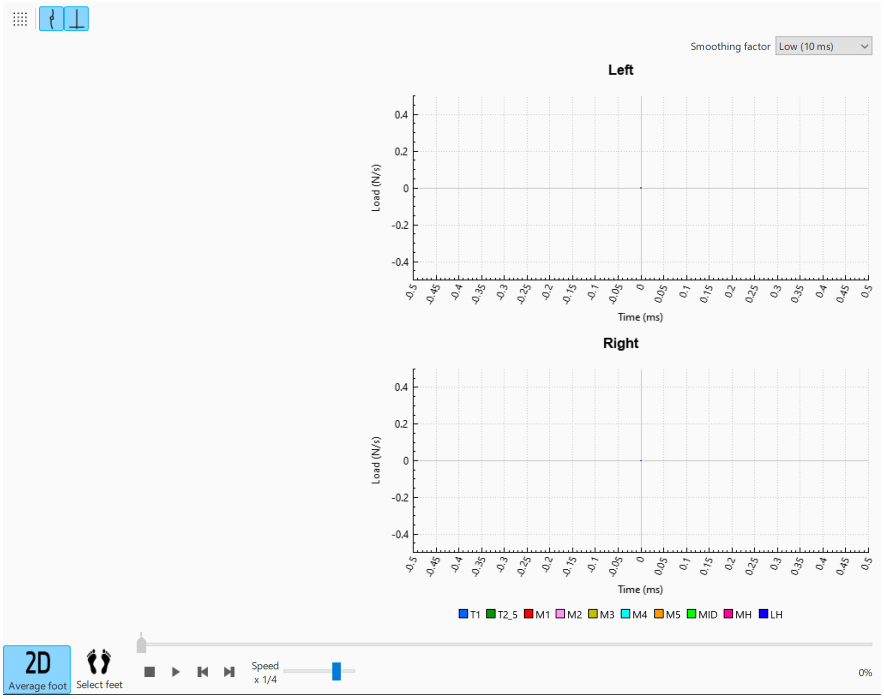


Figure 66: The Load Rate analysis displays the rate of change of the force applied on each anatomical zone.

The Load rate analysis is identical to the Zones analysis (Section 10.15) besides the contents of the graphs, which contain the load rate per zone of the current foot selection.

Keep in mind that computing a derivative numerically is very sensitive to measurement noise. The Load rate analysis filters the load rate graphs with an averaging mask to reduce the influence of such noise. As a result the graphs are smoother. Select the width (in ms) of the averaging mask in the Smoothing factor drop-down list.

10.18 Footprint size

The Footprint size analysis (Figure 67) measures the width and height of the selected pair of feet.

Figure 67: The Footprint Size analysis shows the general dimensions of the current foot selection.

The cyan lines depict the length of each of the footprints. The pink lines span the total width of the metatarsal heads. The legends display the lengths of these lines (in cm).

Click and drag the edges of each line (marked with dots) to move them to other points of interest. Click ← Reset changes to restore the lines' default positions.

10.19 Risk analysis

The Risk analysis (Figure 68) gives more information about the risk of the feet in a dynamic measurement.

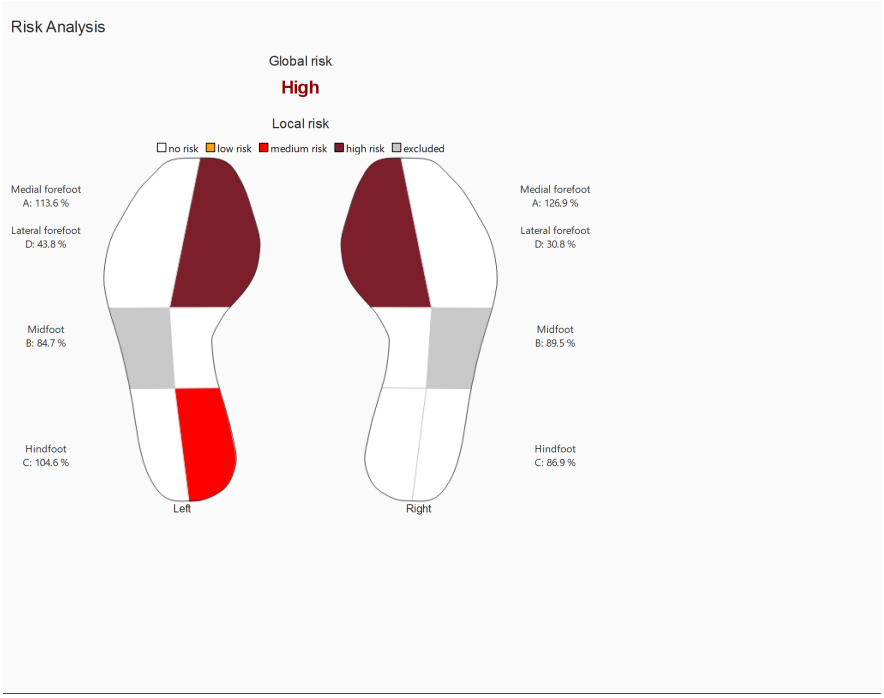


Figure 68: The risk analysis screen.

The Risk analysis screen gives a global and local risk of the feet in a dynamic measurement. The global risk gives a risk for the left and right foot together, the possible global foot risks and their font colors are:

- low: orange color
- medium: red color
- high: dark red color

The local risk is given per foot zone, the following foot zone risks are calculated:

- lateral and medial forefoot
- medial midfoot
- lateral and medial hindfoot

The possible local foot zone risks and their colors used to draw the foot zone in the interface are:

- neutral: white color
- low: orange color
- medium: red color
- high: dark red color

The lateral midfoot risk is not calculated and is greyed out in the foot image in the interface.

More information and references to scientific studies on which these analyses are based, can be found in the appendix of this manual (see 21).

10.20 Gait Ratios analysis

The gait ratios analysis is available in the Clinical, Scientific package(s).

The gait ratios analysis (Figure 69) gives a comparison for the selected left and/or right foot and the average for all measured left and/or right feet for specific calculations.

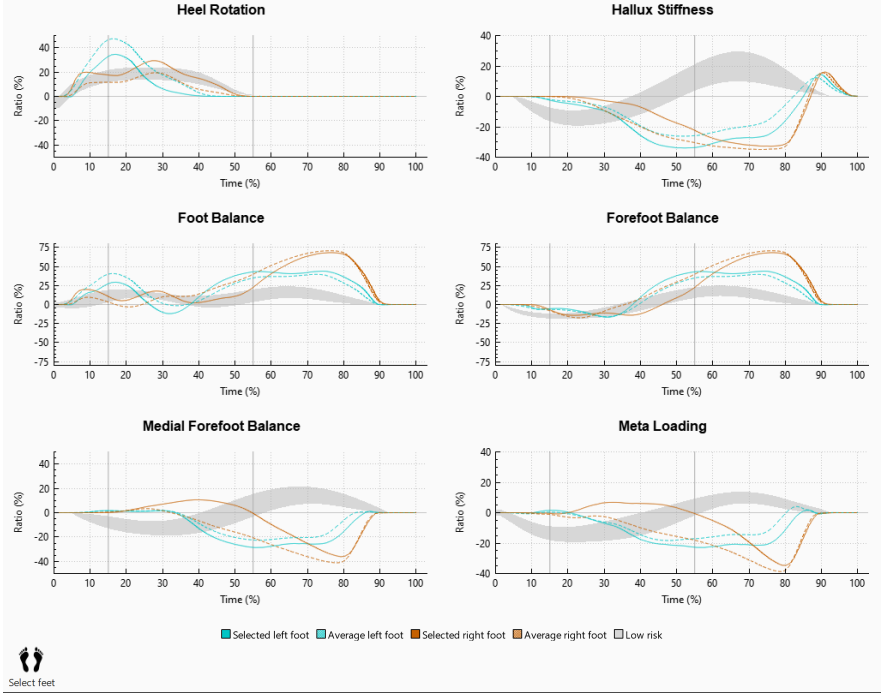


Figure 69: The gait ratios analysis screen.

The gait ratios analysis provides specific calculations about different aspects of the roll-off. The gait ratios are calculated by analyzing the progression of pressure under each of the zones of the feet and by comparing the medial part of the foot with its lateral part. Each graph depicts a gait ratio analysis for the selected feet (left and/or right) and the average for all measured left and/or right feet. The low risk area indicates the area with a low risk of lower limb injuries. More information can be found in the appendix of this manual (see 21).

Each gait ratio analysis focuses on a different and specific property of the roll-off:

Heel rotation

Heel rotation is defined as the mediolateral pressure distribution at the level of the rearfoot during stance phase. The mediolateral pressure distribution at the level of the rearfoot is calculated by comparing the pressure under the medial heel (MH) with the pressure under the lateral heel (LH).

An increased pressure underneath the medial heel suggest an eversion of the rearfoot, an increased pressure underneath the lateral heel suggest an inversion of the rearfoot.

Hallux stiffness

Hallux stiffness is defined as the pressure distribution between the first toe (T1) and the first metatarsal head (M1) during stance phase. Hallux stiffness is calculated by comparing the pressure underneath the first toe with the pressure underneath the first metatarsal head.

A positive value indicates a higher load on the first toe, a negative value indicates a higher load on M1.

Foot balance (Mediolateral foot distribution)

Mediolateral foot balance is defined as the mediolateral pressure distribution of the entire foot during stance phase. The mediolateral foot balance is calculated by comparing the pressure underneath the medial aspect of the foot (M1+M2+MH) with the pressure underneath the lateral aspect of the foot (M3+M4+M5+LH).

A higher pressure underneath the medial aspect of the foot suggests a pronation of the foot, a higher pressure underneath the lateral aspect of the foot suggests a supination of the foot.

Forefoot balance (Mediolateral Forefoot distribution)

Mediolateral forefoot distribution is defined as the pressure distribution at the level of the forefoot during stance phase. The mediolateral forefoot distribution is calculated by comparing the medial aspect of the forefoot (M1 + M2) with the lateral aspect of the forefoot (M3 + M4 + M5).

An increased pressure underneath the medial aspect of the forefoot suggests a pronation of the forefoot, an increased pressure underneath the lateral aspect of the forefoot suggests a supination of the forefoot.

Medial forefoot balance

The medial forefoot balance or distribution is defined as the pressure distribution between metatarsal1 (M1) and metatarsal2 (M2) during stance phase. The medial forefoot distribution is calculated by comparing the pressure underneath M1 and M2.

A positive value indicates a higher load on metatarsal 2, a negative value indicates a higher load on metatarsal 1. A high value indicates a large difference in load between metatarsal 1 and 2.

Meta loading

Meta loading is defined as the pressure distribution between the inner metatarsal heads and the outer metatarsal heads during stance phase. Meta loading is calculated by comparing the inner metatarsals (M2+M3) with the outer metatarsals (M1 + M4 + M5).

A positive value indicates a higher load on the inner metatarsal heads, a negative value indicates a higher load on the outer metatarsal heads. A high value for meta loading indicates a large difference in load on the inner metatarsal heads compared to the outer metatarsals.

The gait ratio calculations are based on the anatomical zones, the used formulas for the different gait ratio calculations are:

- heel rotation: (MH-LH)/Zavrg*100
- hallux stiffness: (T1-M1)/Zavrg*100
- foot balance: ((M1+M2+MH)-(M3+M4+M5+LH))/Zavrg*100
- forefoot balance: ((M1+M2)-(M3+M4+M5))/Zavrg*100
- medial forefoot balance: (M2-M1)/Zavrg*100
- meta loading: ((M2+M3)-(M1+M4+M5))/Zavrg*100

The meaning of the variables (anatomical zones) in the formulas is as follows:

- M*x*: the force under meta *x* zone.
- MH: the force under the medial heel zone.
- LH: the force under the lateral heel zone.

- T1: the force under the toe 1 zone.
- Zavrg: the average total force under the foot.

10.21 Center of pressure graphs

The center of pressure graphs are available in the Clinical, Scientific package(s).

The center of pressure graphs (Figure 70) shows the distance between the center of pressure and the foot axis. The distance is defined as the mediolateral (x) component of the center of pressure expressed in foot axis coordinates.

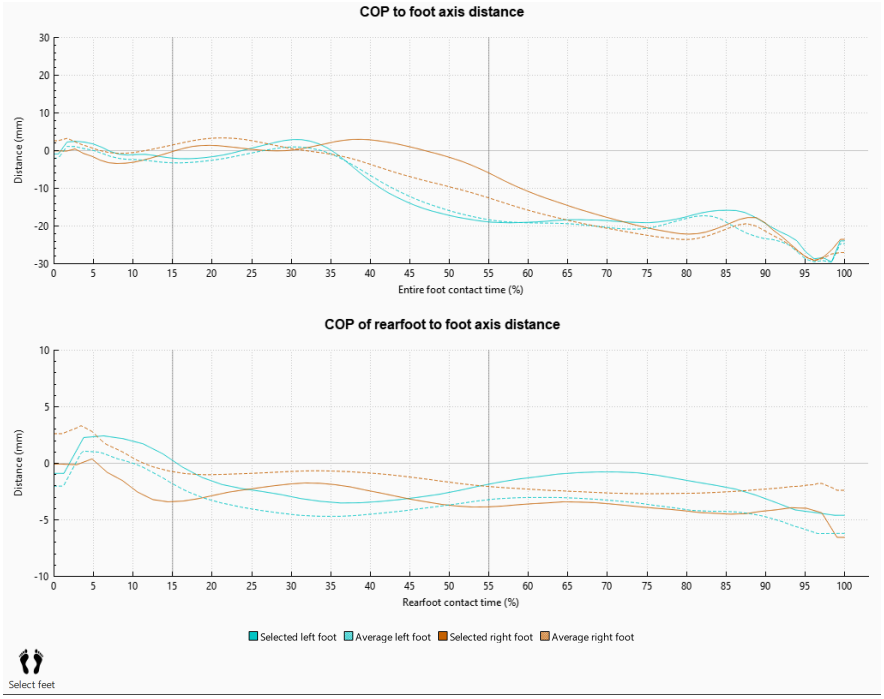


Figure 70: The center of pressure graphs screen.

The distance between the center of pressure (COP) and the foot axis are measured. Each graph depicts the COP to foot axis distance for the selected feet (left and/or right) and the average distance for all measured left and/or rigt feet. Graphs are plotted in time relative to the duration of the measured components.

COP to foot axis distance

The center of pressure of the entire foot is considered. The time is relative to the entire foot contact duration.

COP of rearfoot to foot axis distance

The center of pressure of the rearfoot area only is considered. The time is relative to the rearfoot contact duration.

10.22 Single Foot Timing

The single foot timing analysis is available in the Clinical, Scientific package(s).

The single foot timing analysis (Figure 71) shows the different events and phases during a foot roll-off for the selected left and right foot.

Figure 71: The single foot timing analysis screen.

For each event, the time is displayed both in milliseconds and as a percentage. The percentages are relative to the total roll-off time. The following events are shown:

- Initial Foot Contact: the time when the first pressure is registrated.
- Initial Metatarsal Contact: the time when a metatarsal zone becomes visible.
- Initial Forefoot Contact: the time when all metatarsal zones are visible.
- Heel Off: the time when there is no pressure under the heel.
- Last Foot Contact: the time when there is no pressure under any zone.

For each phase, the duration is displayed both in milliseconds and as a percentage. The following phases are shown:

- Initial Contact Phase: the duration between the Initial Foot Contact event and the Initial Metatarsal Contact event.
- Forefoot Contact Phase: the duration between the Initial Metatarsal Contact event and the Initial Forefoot Contact event.
- Foot Flat Phase: the duration between the Initial Forefoot Contact event and the Heel Off event.
- Forefoot Push Off Phase: the duration between the Heel Off event and the Last Foot Contact event.

10.23 Full Plate

The Full plate analysis (Figure 72) replays the full dynamic measurement, regardless of the foot selection.

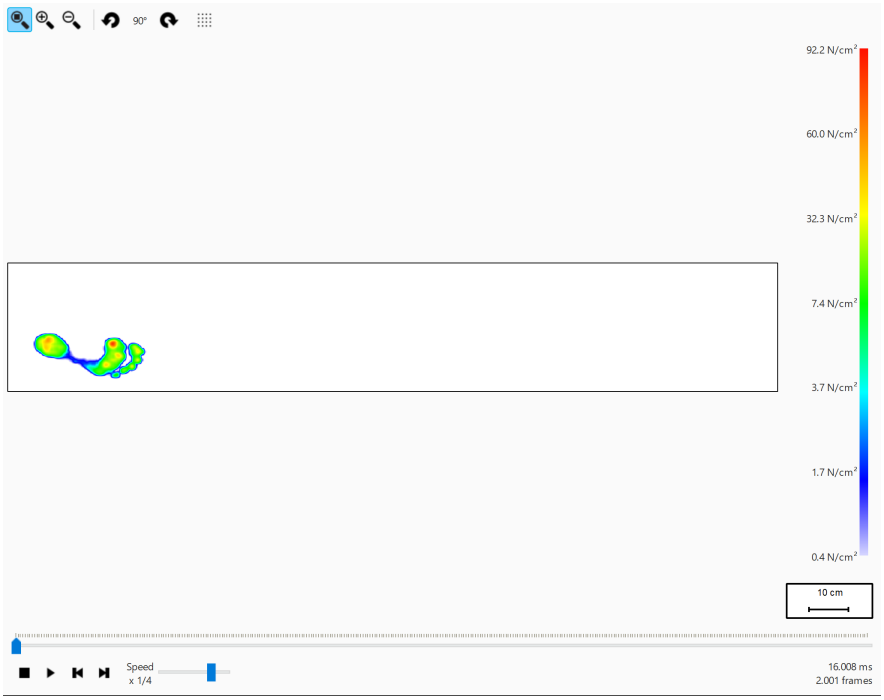


Figure 72: The Full plate analysis replays the full dynamic measurement.

When playing, the analysis loops through the entire dynamic measurement. When stopped it shows the maximum sensor values of the first foot.

10.24 Multi Step

The multi step analysis is available in the Clinical, Scientific package(s).

The multi step analysis (Figure 73) shows information about steps and strides in a dynamic measurement.

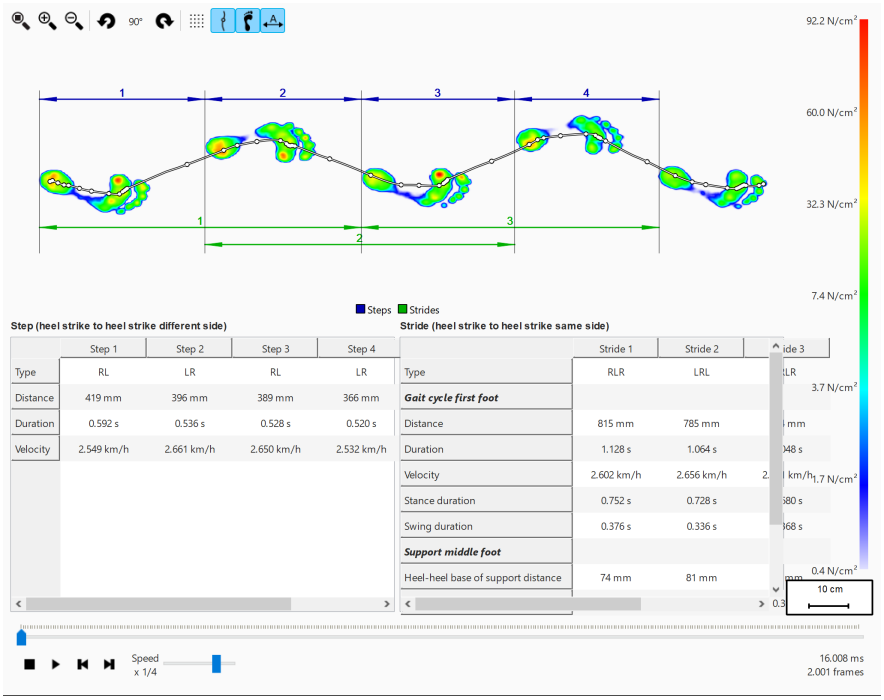


Figure 73: The multi step analysis screen.

All consecutive feet with the same orientation can be divided into steps and strides:

- A step contains two feet of different type. The possibilities are:
  - LR: left - right
  - RL: right - left
- A stride contains feet with alternating types and typically contains three feet. When the middle feet is missing (ex. next to the plate), a stride can contain two feet and those feet need to be of the same type. The possibilities are:
  - LRL: left - right - left
  - RLR: right - left - right
  - LL: left - left (the middle right foot is missing)
  - RR: right - right (the middle left foot is missing)

During replay the current frame is shown in the preview, the step(s) and stride(s) belonging to the current foot are highlighted in a light blue color in both tables. When stopped, the maximum sensor values of the first consecutive feet in the measurement with the same orientation are shown.

It is possible to select a step or stride in any of the tables. The replay console will jump to the first frame belonging to the selected step or stride. When the replay is not playing, the selected step or stride will be shown in a dark blue color, the step(s) or stride(s) belonging to the selected step or stride will be highlighted in a light blue color in the other table. For example:

- A step can occur in multiple strides, so selecting a step can highlight two strides in the stride table
- A stride can contain multiple steps, so selecting a stride can highlight two steps in

the step table.

For each step and stride some parameters are calculated and shown in the corresponding step and stride table.

Steps and strides can be annotated by toggling the  toolbar button. Steps will be shown using dark blue dimension lines, while strides will be shown using dark green dimension lines. Only annotations for the current consecutive feet with the same orientation are visible. During replay steps and strides not belonging to the current foot are annotated in faint colors.

Step

A step is defined from the heel strike of the first foot to the heel strike of the second foot. The following parameters are calculated:

- Distance: the distance in millimeter between the two heel strikes
- Duration: the time in seconds between the two heel strikes
- Velocity: velocity in meter per seconds based on the calculated distance and duration

Stride

A stride is defined from the heel strike of the first foot to the heel strike of the last foot. There are two types of parameters calculated from a stride: gait cycle parameters relative to the first foot and support parameters relative to the middle foot.

The following gait cycle parameters relative to the first foot are calculated:

- Distance: the distance in millimeter between the two heel strikes
- Duration: the time in seconds between the two heel strikes
- Velocity: velocity in meter per seconds based on the calculated distance and duration
- Stance duration: the time in seconds that the first foot makes contact with the floor. This is from the heel strike phase until the toe off phase
- Swing duration: the time in seconds that the first foot doesn't touch the floor. This is from the toe off phase of the first foot until the heel strike phase of the last foot

The following support parameters relative to the middle foot are calculated:

- heel-heel base of support distance: the distance in millimeter from the middle foot to the line determined by the first and last foot
- single support duration: time in seconds that only the middle foot makes contact with the floor
- double support duration: time in seconds that two feet make contact with the floor together. This can happen with the first and middle foot and/or the middle and last foot.
- double float duration: time in seconds that no foot makes contact with the floor. This can happen between the first and middle foot and/or the middle and last foot.

10.25 Force Plate

The force plate analysis is available in the Scientific package(s).

The force plate analysis (Figure 74) shows information about forces and external trigger input captured by a footscan 3D interface box during a dynamic measurement.

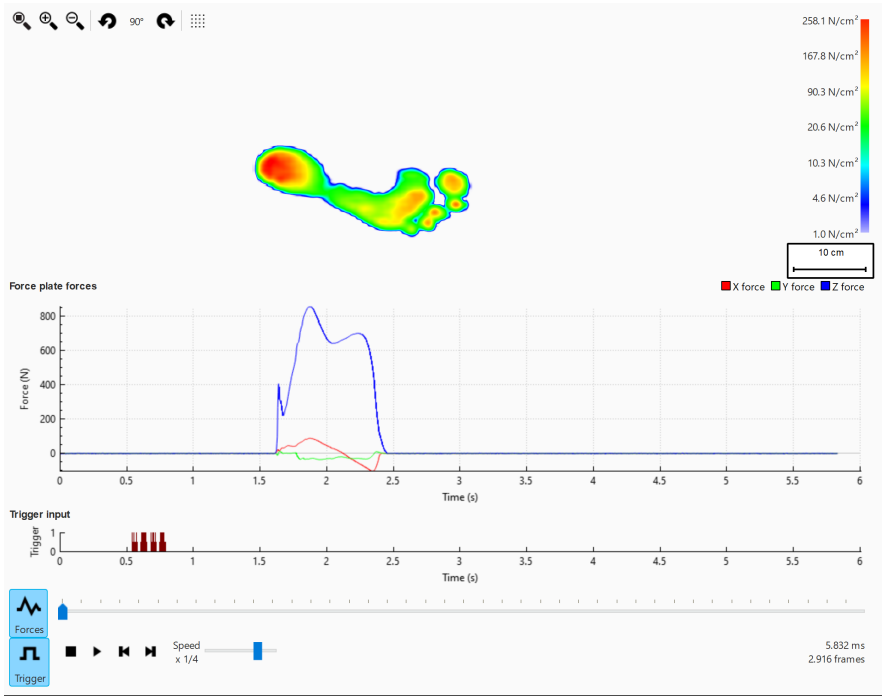


Figure 74: The force plate analysis screen.

There are two graphs in the force plate analysis screen:

- Forces graph: this graph shows the forces registered by a force plate in x, y and z directions in Newton. The x-axis shows the time in seconds.
- Trigger graph: this graph shows the digital trigger input signal registered by a footscan 3D interface box. The x-axis shows the time in seconds.

Forces graph can be hidden or shown by clicking the Forces button. Trigger graph can be hidden or shown by clicking the Trigger button.

10.26 Manual Zones Editing

The manual zones editing screen is available in the Scientific package.

The manual zones editing screen (Figure 75) enables editing of the anatomical zones and the foot axis manually. Modifications will have an impact on all analyses, reports, text exports and insole designs.

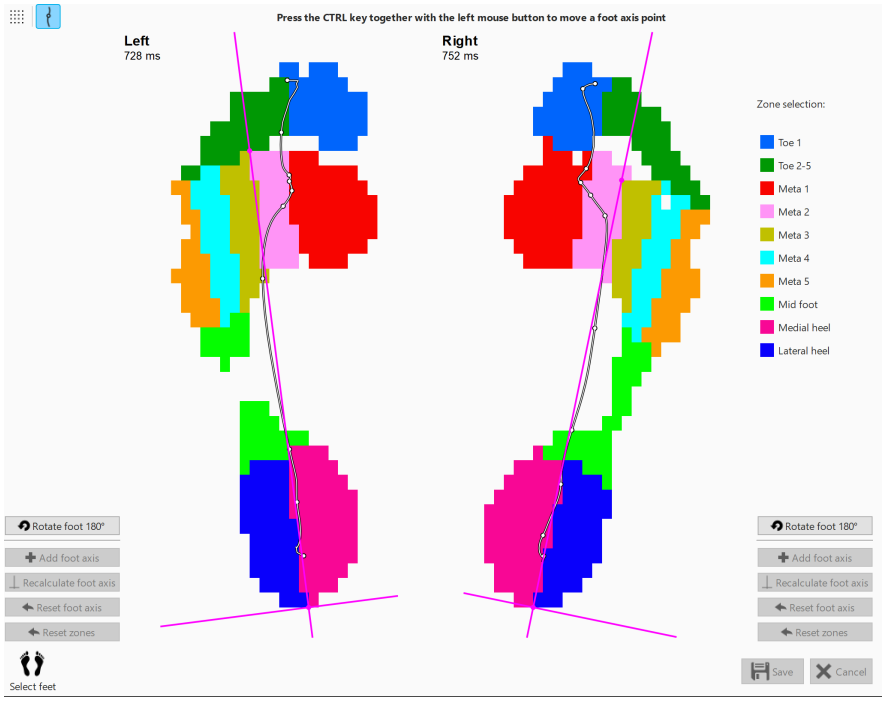


Figure 75: The manual zones editing screen.

Select the left and right foot for which you want to modifiy the zones using the Select feet panel at the bottom (Chapter 10). Choose a zone in the zone selection list (e.g. Toe 1). Start modifiyng the zones by clicking the left mouse (pixel by pixel) or by pressing the left mouse button and dragging the mouse (brush like changes). You can do this for the selected right and left foot simultaneously. You can repeat this process for other zones.

The foot axis can be adapted by pressing the CTRL key together with the left mouse button. By changing the position of two points - the intersection between the medial and the lateral heel zone and the intersection between the metatarsal 2 and 3 zone – the foot axis can be moved.

When no valid foot axis could be calculated by footscan 9, an arbitary foot axis can be added by clicking on ✚ Add foot axis. This foot axis can then be moved to its correct anatomical position.

When satisfied with the modified zones and/or foot axis, these adaptions can be saved by clicking on Save. When you want to discard the changes, you can click ✕ Cancel.

You can always revert back your changes and go back to the calculated zones and/or foot axis as determined by footscan 9, by clicking on ← Reset zones or ← Reset foot axis, respectively. This will discard all your manual changes to the zones and/or foot axis.

The modified zones can be used to recalculate the foot axis by clicking on ⊥ Recalculate foot axis.

Clicking on Rotate foot 180° will rotate the foot with 180 degrees and the zones and foot axis will be recalculated. All manual modifications to the zones and/or foot axis will be discarded. Rotation of the foot with 180 degrees can help the default zone calculation to provide an improved determination of the zones.

For this feature, clinical/biomechanical insight of the user is required as changes in zones might lead to biomechanical incorrect calculation of parameters.

Changing foot side (Left/Right) in the feet selection widget after manual zones and/or foot axis editing will discard the manual modifications and lead to a recalculation of the original zones and foot axis.

10.27 Compare: 2D

The 2D comparison (Figure 76) compares the current foot selection to any other pair of feet.

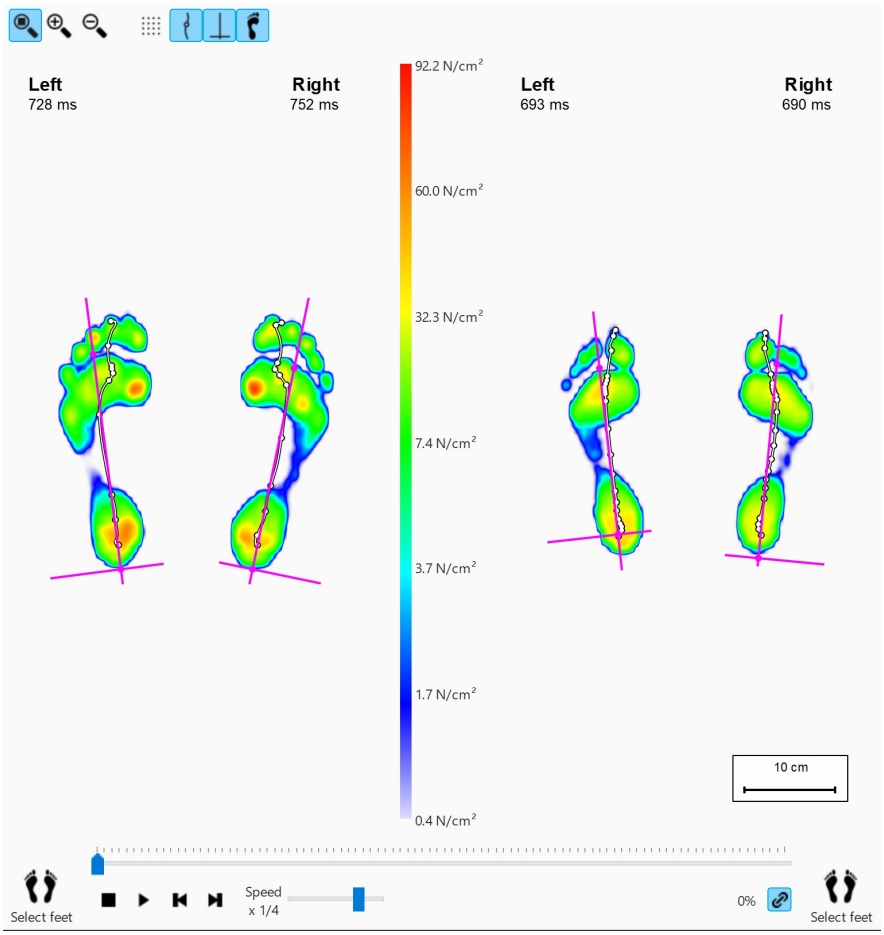


Figure 76: The 2D comparison compares the current foot selection to any other pair of feet.

The comparison draws both pairs with the same color scale, displayed in the middle. The color scale uses the pressure value range of the current dynamic measurement as reference.

10.28 Compare: Impulse

The Impulse comparison (Figure 77) displays two impulse analyses next to each other.

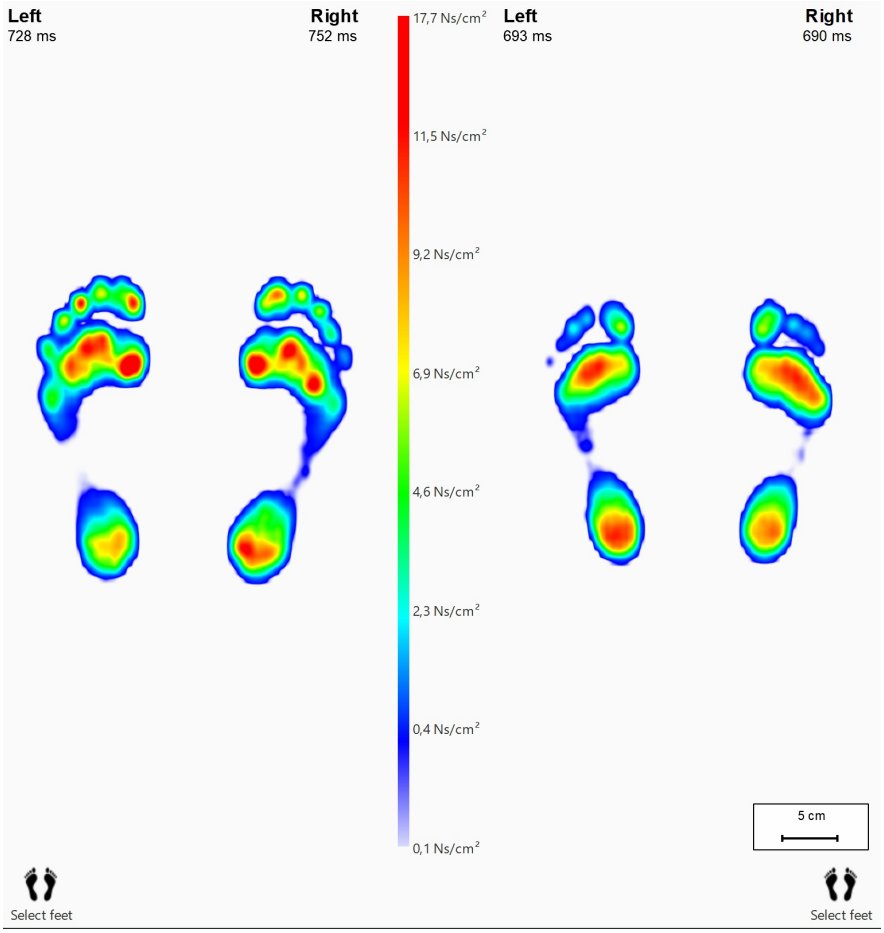


Figure 77: The Impulse comparison compares two impulse analyses.

Both analyses share the same color scale. The comparison sets the minimum- and maximum impulse value of the current foot selection as its value range.

10.29 Compare: Areas

The Areas comparison (Figure 78) compares the pressure applied on the major foot areas (mid-, fore- and rearfoot) of two pairs of feet.

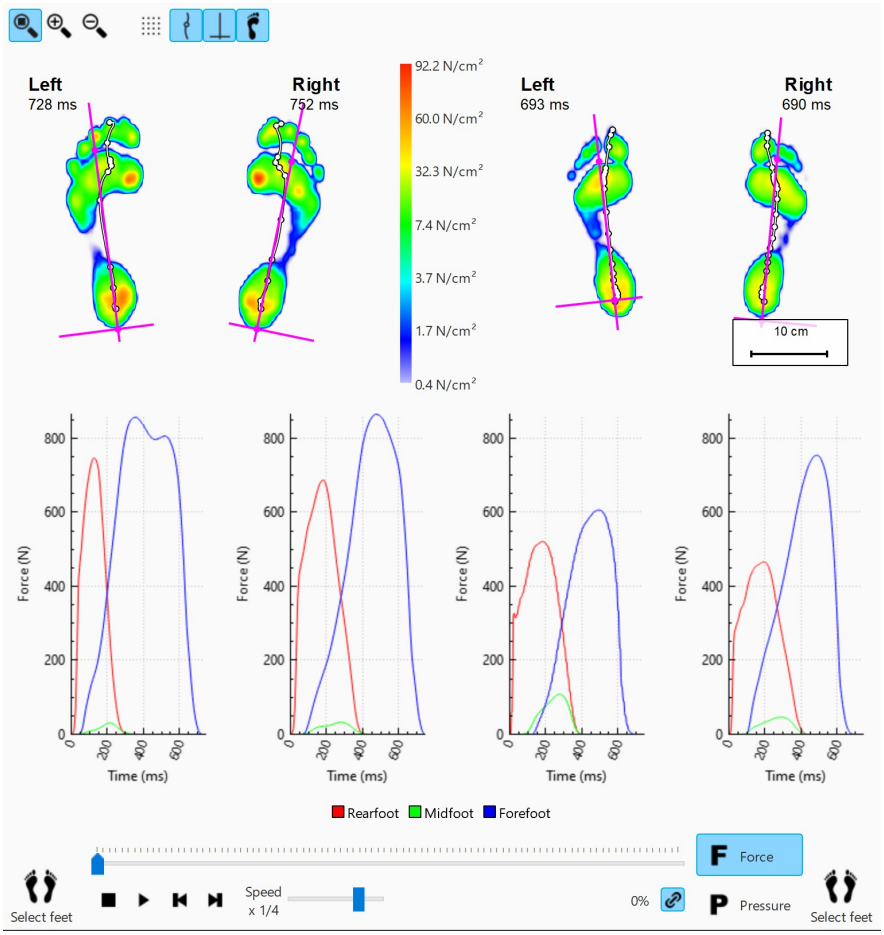


Figure 78: The Areas comparison compares the pressure applied on the major foot areas of two pairs of feet.

The Areas comparison is almost identical to the 2D comparison. It adds two pairs of graphs displaying the force or pressure exerted on each foot area. Click F Force or P Pressure to switch between pressure and force. When played marker lines in the graphs show the roll-off progress.

Design Screen - D3D

The D3D analysis proposes an orthotic support based on the current dynamic measurement. D3D stands for Dynamic three-Dimensional. It is the result of years of extensive pressure measurement research by Materialise Motion.

The D3D analysis needs at least two left and/or right feet to make a reliable proposal.

An assembled D3D orthotic support consists of a base part, correction elements and a top cover. The D3D proposal addresses all of these aspects in the D3D wizard. To start the D3D wizard, click the design tab in the menu bar. You may need to enable the D3D design wizard in the settings dialog. A wizard will appear on the right hand side of the screen, as illustrated in Figure 79. As the D3D wizard only occupies the right side of the screen, interaction with the analysis tools during the D3D wizard is possible. This way, when the user proceeds through the wizard steps, the user is still able to consult all the available data.

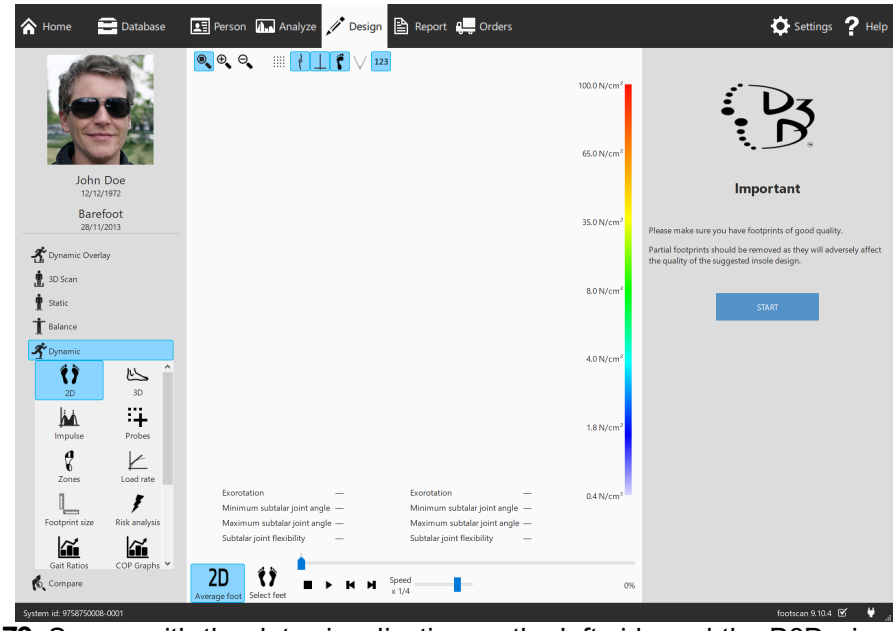


Figure 79: Screen with the data visualization on the left side and the D3D wizard on the right side.

Some D3D choices might affect others, e.g. some base parts do not need a top cover. In that case the D3D analysis restores affected options to their default values. As a general rule of thumb to avoid this situation, review D3D parameters from top to bottom, one stage after another.

11.1 Start panel

The start panel (Figure 80) gives an overview of some important messages the user must read before proceeding.

Click START to initiate the D3D wizard.

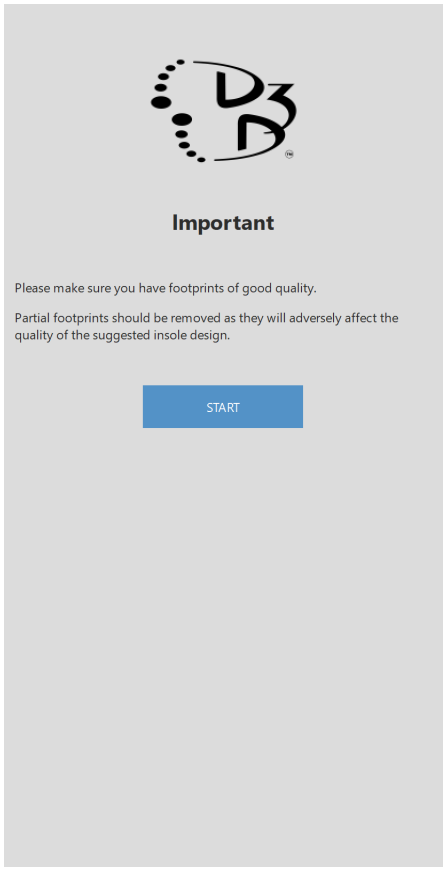


Figure 80: Start panel.

11.2 Usage

The Usage panel allows to choose the main usage for the orthotic support. It is possible to specify a sport if needed.

The Usage controls the main usage for the orthotic support.

The Sport controls the sport, if needed.

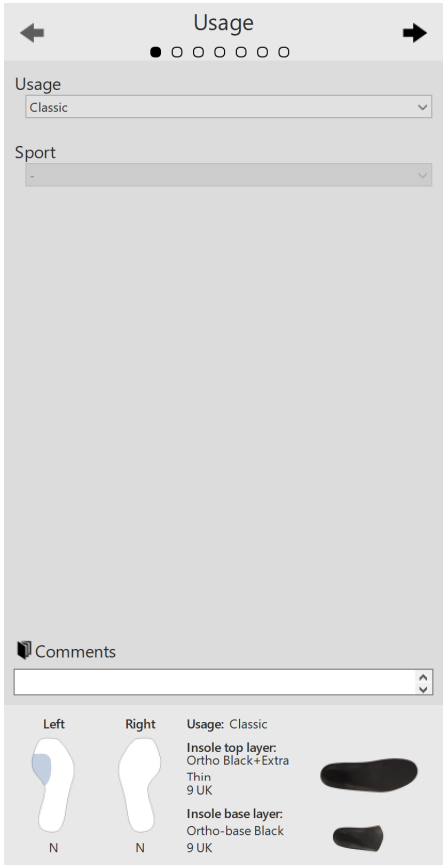


Figure 81: Usage and sport.

Use the ← and → buttons to navigate through the wizard, it is also possible to click on the dots on the top of the wizard.

Click in the Comments text edit to enter additional comments, this is possible in all stages of the D3D wizard.

On the bottom of all the D3D wizard panels is an overview with all the D3D analysis parameters with their current values, this overview is not editable but clicking on a specific part will navigate the wizard to the page on which the selected part can be edited.

11.3 Insole base layer

The insole base layer panel controls the base part of the D3D orthotic support. The D3D analysis makes a base type suggestion, it is possible to modify the proposed values.

Base type — controls the type of the base layer.

Base size — controls the size of the base layer.

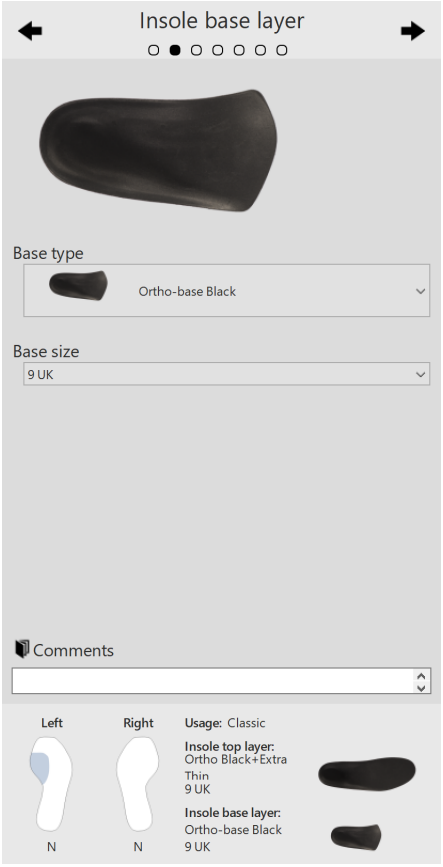


Figure 82: Insole base layer.

11.4 Insole top layer

The insole top layer panel controls the top cover of the D3D orthotic support. The D3D analysis makes a top type suggestion, it is possible to modify the proposed values.

Top type	controls the type of the top layer.
Top size	controls the size of the top layer.

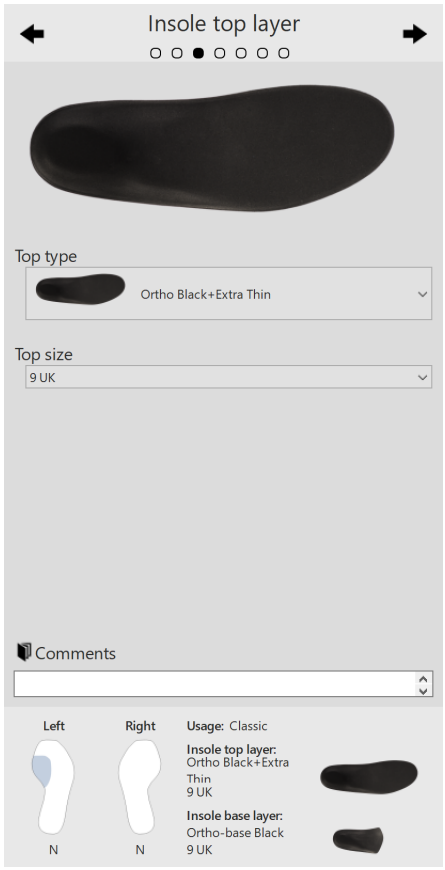


Figure 83: Insole top layer.

11.5 Insole height

The insole height panel controls the the height of the D3D orthotic support. The D3D analysis proposes the heights for the left and the right foot, it is possible to modify these values.

The insole height can adopt to the following values:

- **F**: insole model for flat feet
- **N**: insole model for high arched feet
- **FN**: insole model for normal feet
- **F+B**: insole model for flat feet + B correction. Used for normal feet when no **FN** model is available.

Left foot	controls the insole height of the left foot.
Right foot	controls the insole height of the right foot.

Figure 84: Insole height.

11.6 Left foot correction

The left foot correction page shows the four orthotic parameters computed by footscan 9 next to their corresponding corrections. Select the desired corrections for the left foot. The insole profile on the right depict the current configuration. Specify the thickness or the inclination if checked.

B+ thickness	controls the B+ thickness.
C+/C- inclination	controls the C+/C- inclination.

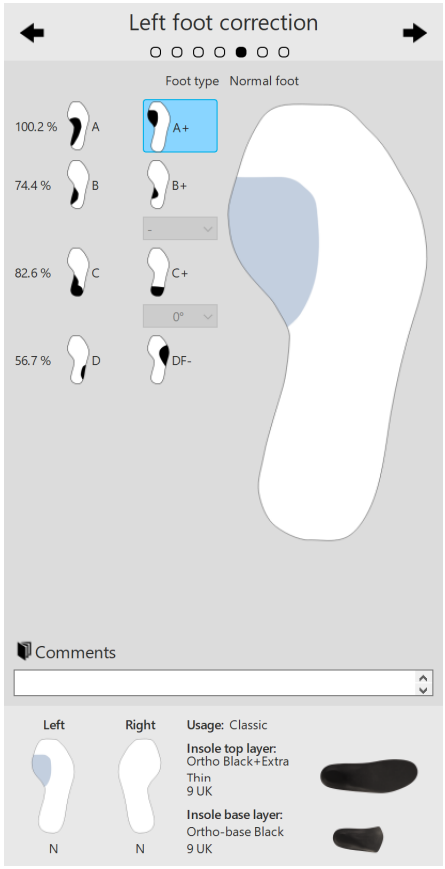


Figure 85: Left foot correction.

11.7 Right foot correction

The right foot correction page shows the four orthotic parameters computed by footscan 9 next to their corresponding corrections. Select the desired corrections for the right foot. The insole profile on the left depict the current configuration. Specify the thickness or the inclination if checked.

B+ thickness	controls the B+ thickness.
C+/C- inclination	controls the C+/C- inclination.

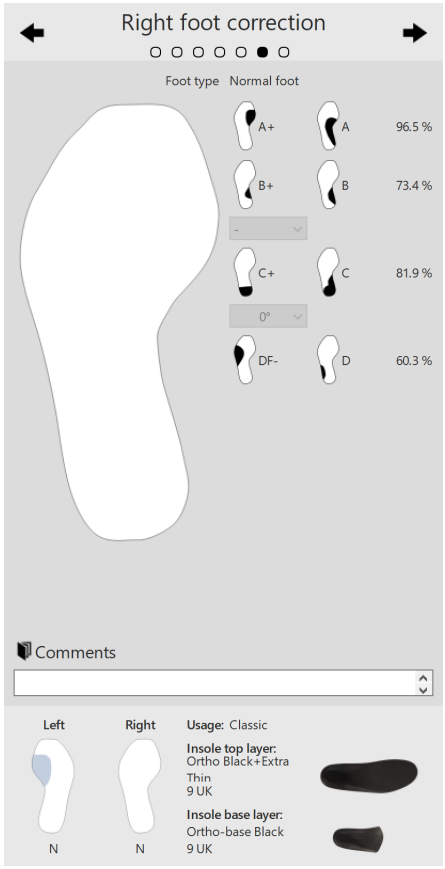


Figure 86: Right foot correction.

11.8 Checkout

Click the PROCEED TO REPORT to advance to the checkout overview.

Figure 87: Checkout.

Chapter 12

Design Screen - Phits™

The Materialise Phits™ wizard calculates and proposes the design of the insoles based on the subject-specific plantar pressure measurements. The underlying mathematical algorithms use the average dynamic pressure profile of each footprint to calculate the foot-specific properties and consequently the foot-specific insole designs. The insole designs are then proposed to the user in the design wizard, but **the user is in full control of the application and is free to modify the proposed design in any way** based on his own expertise and/or experience(s) with the subject.

The mathematical calculation of the Materialise Phits™ application is only a proposal, the user is fully responsible for the design of the insoles.

To start the design of the insole, click the design tab in the menu bar.

12.1 Login page

After clicking the design tab, the user is directed to the Phits™ login page (Figure 88). On this page, the user can enter their Username and Password to log-in as a Phits™ user or freely discover the Phits™ design wizard as a guest user. Note that the discover mode does not allow you to order PHITS insoles.

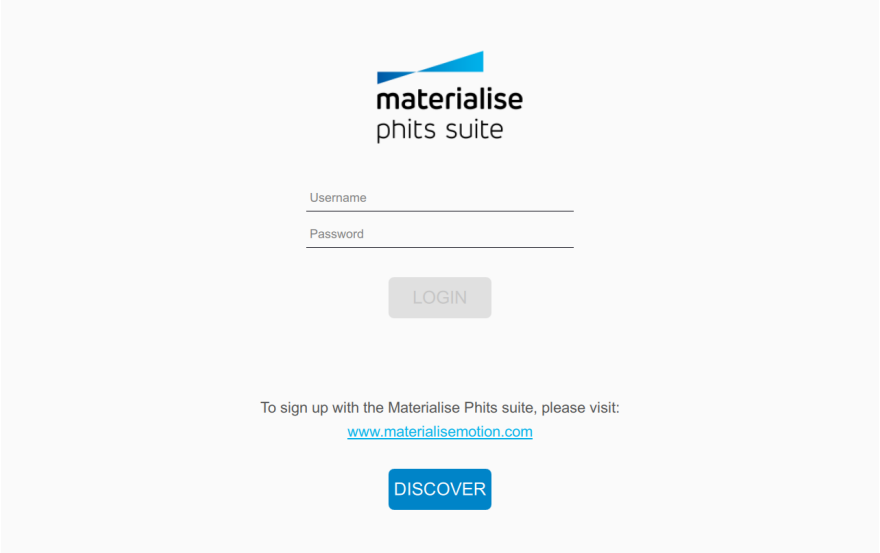


Figure 88: Login page.

In case the user was already logged in, this login page will be skipped and the user will directly be navigated to the Design selection page (section 12.2).

12.2 Design selection

The Design selection page (Figure 89) allows users to start their design from scratch (NEW) or from a premade template design (PRESET). If the user opts to start from a new design selection, they can input four distinct parameters required to initialize the insole design: Insole type, Usage, Shoe type and Assembly.

Type	controls the insole type. The options are Phits+ or Phits.
Usage	controls the usage the insole will be used. The options are Daily use, Sport or Safety.
Shoe type	controls the shoe type. When Daily use or Safety is chosen in Usage, Comfort, Narrow or Wide shoes are available. When Sports is chosen in Usage, the options Running, Cycling, Soccer, Golf are available and for Phits types, there is additionally Cycling, Alpine Ski and Nordic Ski available.
Assembly	controls the finishing of the Phits™ insoles. The options are Assembled Full length and Assembled ¾ length to receive the orthotics ready for delivery. The options Not assembled full length and No top layer are when the user wants to do the assembly themselves.

Additionally for type Phits+, users are able to select if they want to design and order a complete pair or only the left or right insole. This function is not available for type Phits.

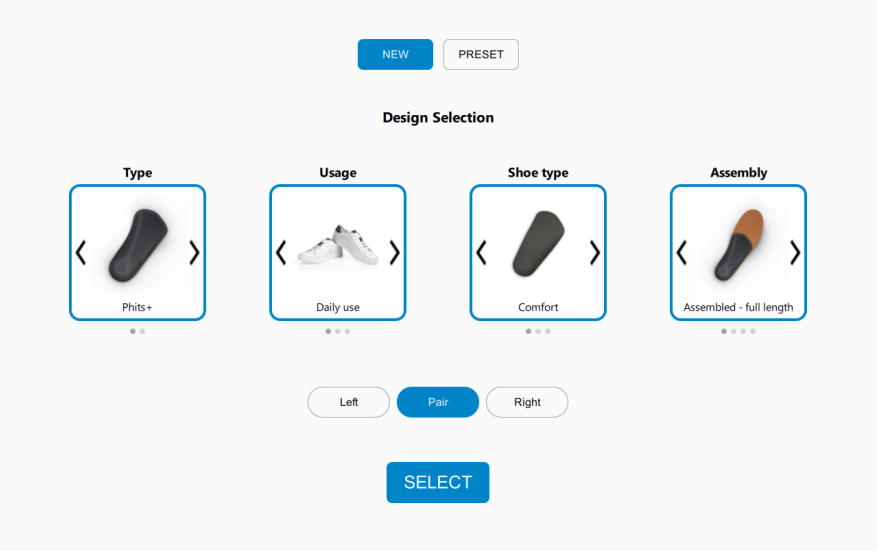


Figure 89: Design selection page.

In case the user opts to design Phits+ insoles, they will be directed to the Phits+ design wizard (see chapter 13). If the user selects type Phits, they will be directed to the Phits design wizard (see chapter 14)

If the user opts to start from a premade template design or preset, they can click on PRESET located at the top of the design selection screen. In this preset screen (Figure 90), you can either ADD, DELETE or EDIT a preset.

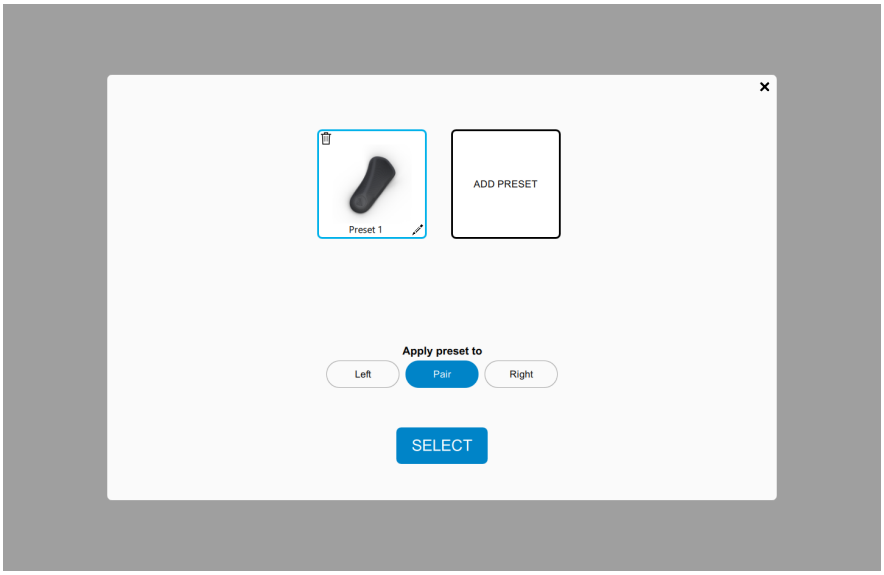


Figure 90: Buttons/tiles showing existing presets and button to add a preset.

ADD

Click the ADD PRESET preset button to start creating a preset (Figure 91). A text field is located at the top where you can freely input a name for your preset. All available corrections can be adjusted to your liking. Please note that only corrections that are fixed and not proposed by calculations are available to adjust (e.g.: heel wedge is a proposed value based on the dynamic 2D measurement and therefore not available). Click to save your preset design. Your newly created preset design will be visible with their name as a tile in the preset screen. Click ✕ CANCEL to abort your preset design and not create it.

DELETE

Clicking the button in the top left corner of the preset tile will delete it. Please note that it will automatically be deleted without a pop-up warning.

EDIT

You can edit an existing preset design by clicking the button located on the right bottom corner of the preset tile.

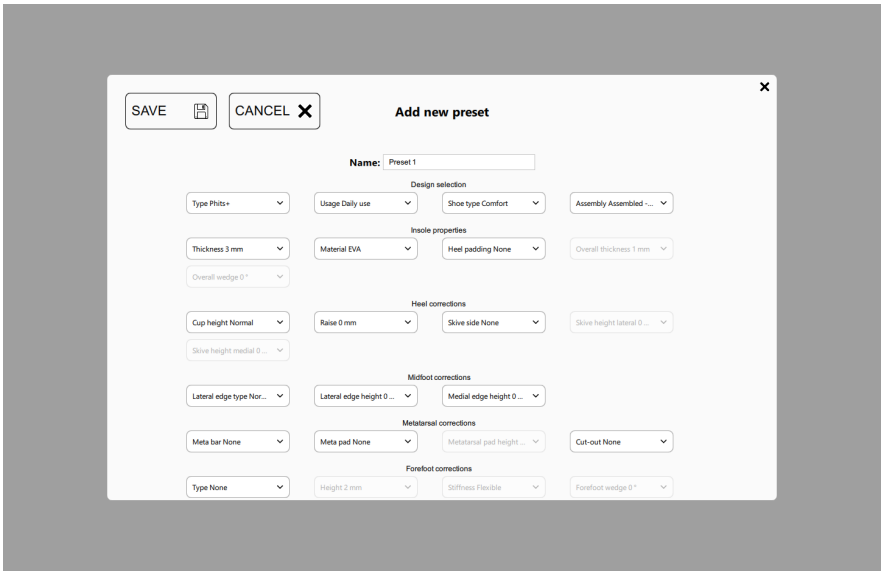


Figure 91: Adding/editing a preset.

The selected preset design is highlighted with a blue edge. The user can choose to

apply this preset to both insoles by selecting the PAIR option, or only to the LEFT or RIGHT insole. The preset design will be applied by clicking the SELECT button.

The applied preset to a design is recognized by their name located in the top middle of the design screen. An Asterix at the end of the name highlights that the user made manual changes to the design that differ from the original preset. A preset can be removed from a design by clicking the  button located in the toolbar (left hand top of screen).

Chapter 13

Phits+ Design Wizard

13.1 Phits+ Design wizard

The general look and feel of the Phits+ design wizard is visualized in 92.

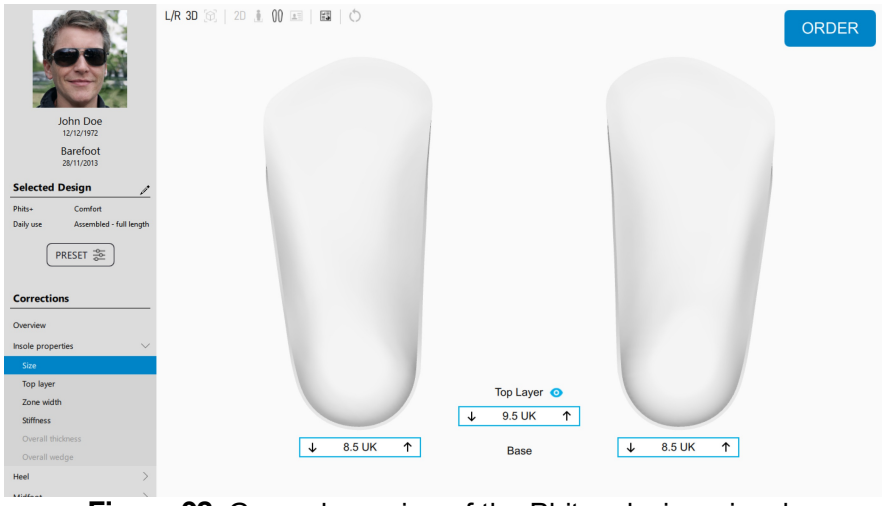


Figure 92: General overview of the Phits+ design wizard.

The **session information** is displayed in the left hand corner of the grey side pane.

Below from the session information, you can find the **selected design** parameters. One can edit these by clicking the button.

A **preset** can be applied to the design by clicking the PRESET button underneath the selected design information. This will guide you to the preset dialog (information can be found in Chapter 12.2).

You can navigate through all the possible **corrections** by clicking the main menu, which will expand the menu and show all correction submenus. Below an overview of each menu (bold) and their submenu's:

- **Overview**
- **Insole properties:** Size, Top layer, Zone width and Stiffness.
- **Heel:** Wedge, Cup height, Heel raise and Heel skive.
- **Midfoot:** Navicular support, Lateral edge and Medial edge.
- **Metatarsal:** Metatarsal bar, Metatarsal pad and cut-outs.
- **Forefoot:** Forefoot corrections, forefoot wedge (only available for full length types)
- **Offloading**

An applied correction is visualized with a blue checkmark. If the user is in a submenu and changed a value, a reset button appears which will reset that specific correction or value back to the default or proposed value.

The ORDER button on the right-hand side of the upper bar directs users to the checkout screen to confirm their order.

In the top-left toolbar of the Phits+ design wizard (Figure 93), users can enable and disable certain operations related to views, analysis or design.

Figure 93: Navigation bar located on the top-left of the Phits+ design wizard.

Left-right view enables users to only view to left, right or both insoles in the wizard.

3D view mode enables users to visualize the insoles in all directions. In this mode, users can freely rotate and zoom.

Default plane view enables users to quickly select a default plane to view the insoles: top, bottom, medial, lateral or heel plane views are available. Note: this feature is only enabled if 3D view mode is active.

2D analysis enables users to overlay the **average** plantar pressure measurement on top of the insole to make informed decisions using the 2D analysis functionality. Note: this feature is only available with following corrections: Size, Zone width, Metatarsal bar, Metatarsal pad, Metatarsal cut-outs and Forefoot corrections.

3D scan analysis enables users to visualize the 3D scan (if present in the measurement session) on top of the insole. Note: this feature is only available with following corrections: Heel wedge, Heel cup height, Heel raise, Heel skive, Navicular support, Lateral edge and Midfoot edge. This feature is further also available when 3D view mode is active.

The **top layer contour** shows the projected outline of the top layer contour on top of the insole base once the insole is finished. This is only available on the overview page and size menu and only if the Assembly option full length is selected.

Patient remarks enables user to quickly show the patient remarks that were noted in the Person module.

Report enables users to open the Phits+ report menu (Figure 111) in which the report can be personalized and edited before sending the report upon ordering.

Overall reset enables users to quickly reset the entire design. When clicking, a pop-up will first appear to make sure if the user confirms with an overall reset.

13.2 Phits+: overview page

The overview page (Figure 94) enables the users to quickly go through all corrections and their values and can even quickly change their value by clicking the drop-down menu. Scrolling down is possible to see all corrections.

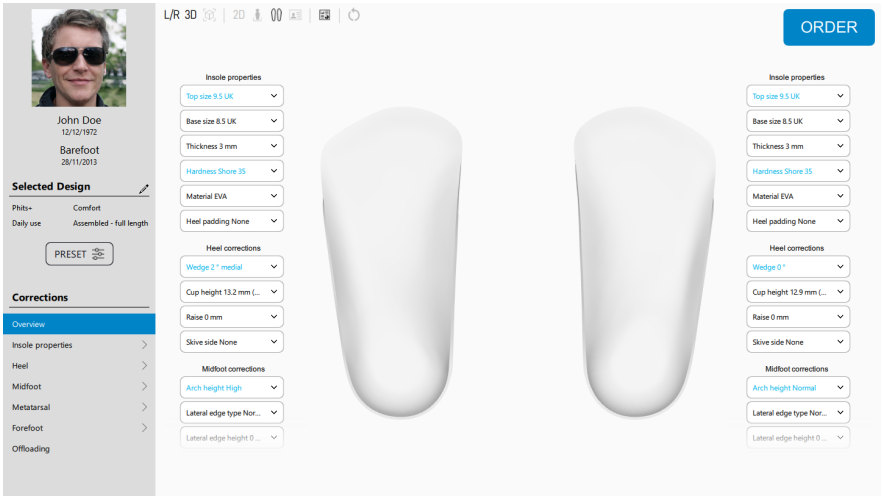


Figure 94: Overview menu of the Phits+ design wizard.

Next to each correction drop-down menu, an icon will appear when hovering over it. Clicking this icon will quickly navigate the user to the corresponding correction menu to make detailed adjustments.

On the other side of each drop-down menu, an applied correction is visualized with a blue checkmark. A reset button appears when hovering over this blue checkmark, clicking this will reset that specific correction or value back to the default or proposed value.

13.3 Phits+: insole properties

The **Size** submenu under insole properties (Figure 95) allows adjustments on the Top layer and Base sizing.

Top layer	controls the shoe size. By default, the value will correspond to the value that was entered in the record wizard. Shoe sizes are in UK sizes. Arrow up/scrolling up will increase size with steps of 0.5UK and arrows down/scrolling down will decrease size with steps of 0.5UK. Note: changing the Top layer size will overwrite the Base size by resetting this to 1UK below Top layer size. You can also visualize the top layer dimensions on top of the printed base by toggling the visibility button on and off. This button is located right next to the correction titled "Top Layer".
Base	controls the size of the printed base layer. By default, the value corresponds to the shoe size minus 1UK. Arrow up/scrolling up will increase size with steps of 0.5UK and arrows down/scrolling down will decrease size with steps of 0.5UK. Note: Base size can never exceed the Top layer size.

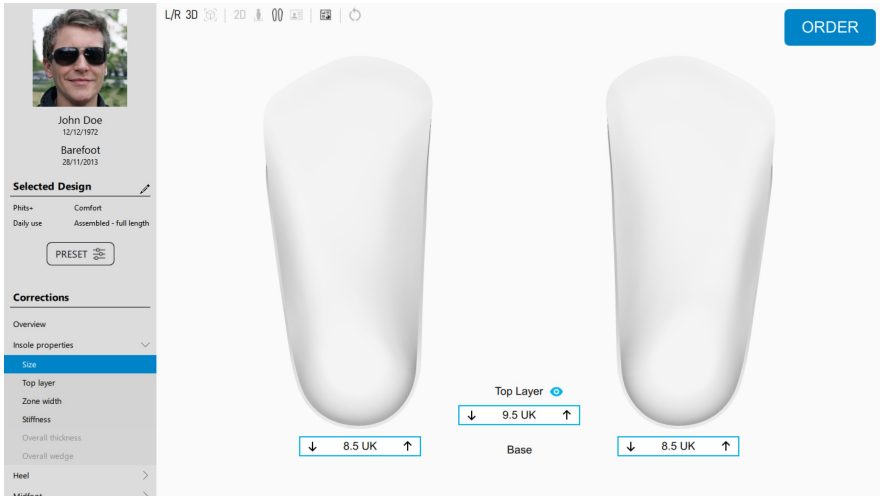


Figure 95: Size menu under Insole properties of the Phits+ design wizard.

The **Top layer** submenu under insole properties (Figure 96) allows setting the properties of the top layer. All options can be controlled by selecting (clicking) the desired option.

Thickness	controls the thickness of the top layer. The default thickness is dependent on the previously chosen Usage in the general info panel. For non-full-length 3D printed insoles, the options are 1 (only for Shore 20 hardness), 2, 3 and 6 mm.
Hardness	controls the shore value of the top layer (20 shore PU soft, 30 shore EVA, 35 shore EVA or 40 shore EVA). The default hardness is dependent on the bodyweight of the subject and will always be EVA (PU soft must be chosen manually).
Material	controls the finishing of the orthotics. With or without synthetic leather finishing.

Heel padding

controls the inclusion of a soft heel pad (PU soft) for fat pad syndrome, heel spur or plantar fasciitis. The heel pad option is only available in combination with a 3 or a 6 mm EVA top layer.

Please note that adding a heel pad will increase the top layer thickness by 2 mm approximately.

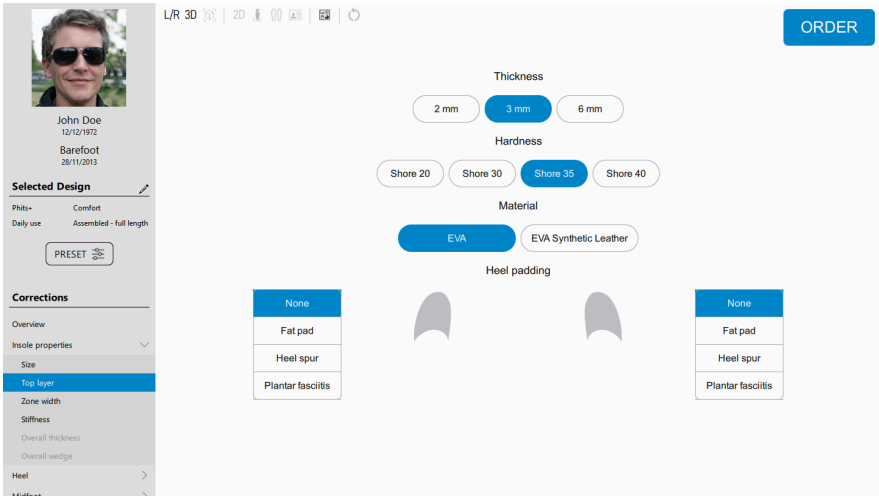


Figure 96: Top layer menu under Insole properties of the Phits+ design wizard.

The **Zone width** menu under insole properties (Figure 97) allows for controlling the width of three different zones (heel, midfoot and metatarsal) and the overall width of the insoles. The heel zone is indicated with a green line, the midfoot zone with a orange line and the metatarsal zone with a blue line.

Zone width

Each zone can be made wider or thinner by respectively clicking the upper or lower arrow beneath the actual width (in mm).

Overall width

The overall width can be increased with steps of 0.5mm by clicking "+" and decreased by clicking "-".

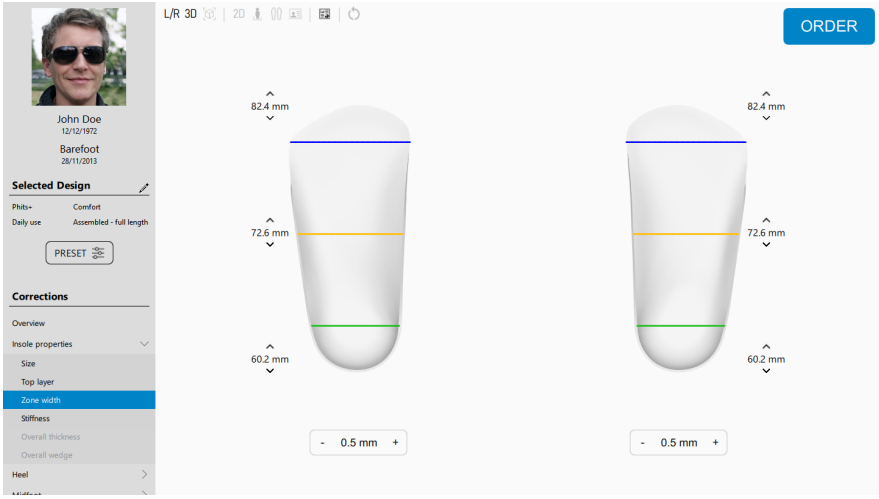


Figure 97: Zone width menu under Insole properties of the Phits+ design wizard.

The **Stiffness** menu under insole properties (Figure 98) allows to control the local stiffness of 5 different zones in the printed base layer. The stiffness ranges from 1 (i.e.

more flexible = light blue) to 5 (i.e. more stiff = dark blue). Hovering over a zone activates the local stiffness controller, which allows the user to set the local stiffness for each zone.

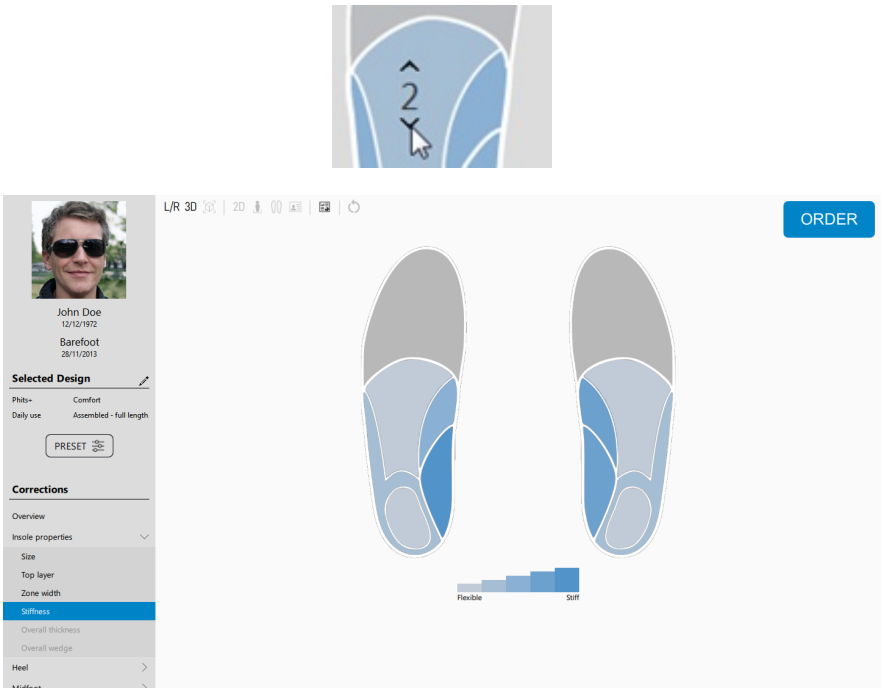


Figure 98: Stiffness menu under Insole properties of the Phits+ design wizard.

13.4 Phits+: heel corrections

The **Wedge** menu (Figure 99) controls the orientation of the heel wedge (ranging from 15 degrees lateral to 15 degrees medial in steps of 1 degree). A zero-degree wedge indicates a neutral orientation.

The slider can be clicked and dragged up/down or scrolled when the mouse is located over the slider.

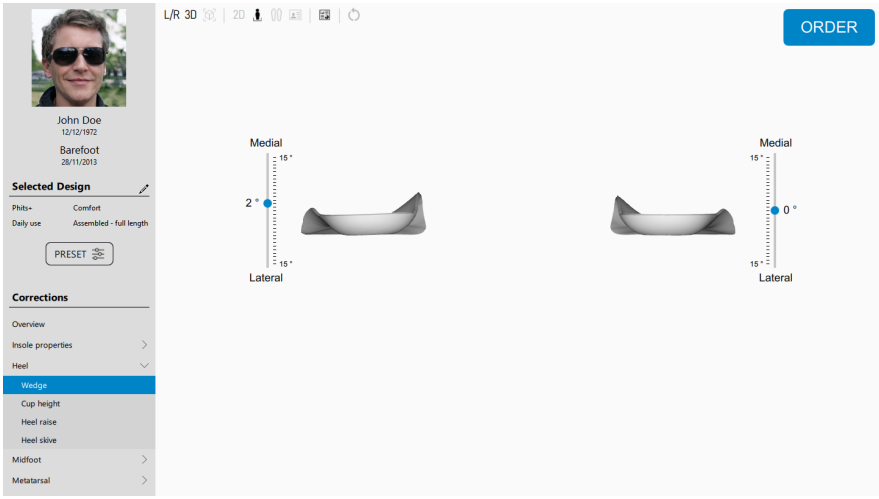


Figure 99: Wedge menu under Heel corrections of the Phits+ design wizard.

The **Cup height** menu (Figure 100) controls the height of the heel edges. These range from low, normal-low, normal, normal-high to high.

The slider can be clicked and dragged up/down or scrolled when the mouse is located over the slider.

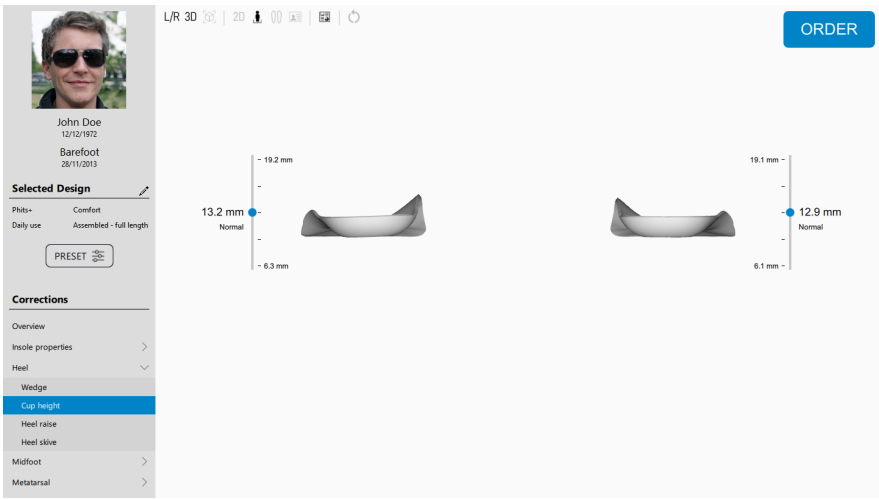


Figure 100: Cup height menu under Heel corrections of the Phits+ design wizard.

The **Heel raise** menu (Figure 101) controls the flat increase of the heel (ranging from 0 to 12 mm in steps of 1 mm).

The slider can be clicked and dragged up/down or scrolled when the mouse is located over the slider.

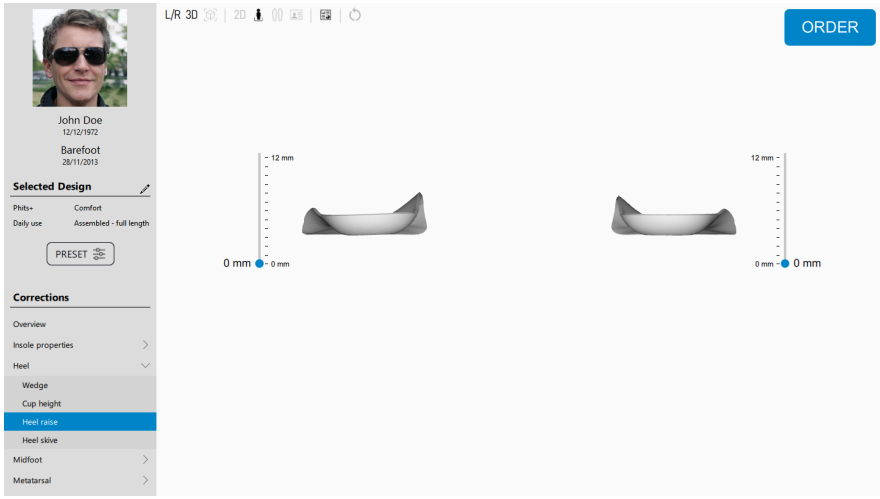


Figure 101: Heel raise menu under Heel corrections of the Phits+ design wizard.

The **Heel skive** menu (Figure 102) allows to apply a skive in the heel zone under an inclination of 15 degrees (fixed), which the user can raise up to 6 mm for a lateral skive and up to 8 mm for a medial skive in steps of 2 mm. Note that it is not possible to apply both a medial and lateral skive in one insole.

Side	controls the location of the skive: medial or lateral. Note that only one side per insole is allowed.
Height	controls the height of the skive: up to 8 mm for a medial and 6 mm for a lateral skive. This slider pops-up after a side is selected.

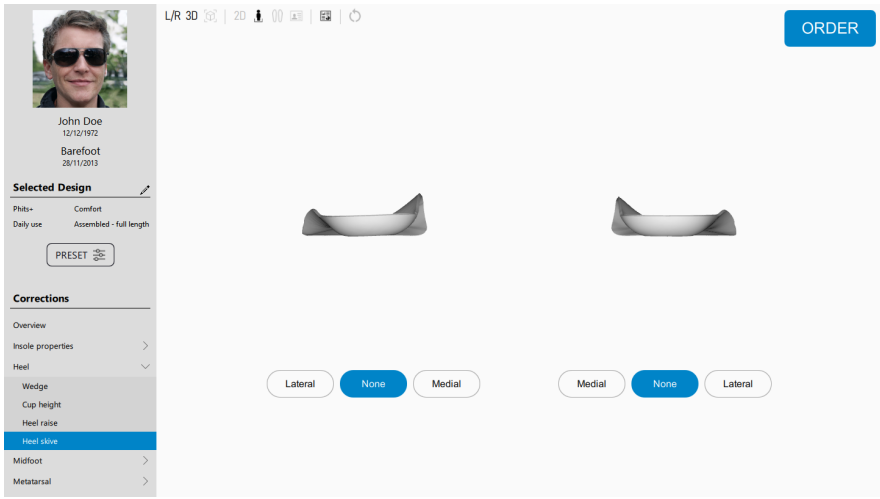


Figure 102: Heel skive menu under Heel corrections of the Phits+ design wizard.

13.5 Phits+: midfoot corrections

The **Navicular support** menu (Figure 103) controls the height and location of the arch support. The highest point of the arch support, visualized with an indicator on the insole, can be raised/lowered and moved anterior and posterior using the sliders or directly by clicking and dragging the indicator.

Height	The vertical slider controls the height of the navicular support, which is indicated in mm (from floor to highest point of arch).
Location	The horizontal slider controls the anterior/posterior location of the highest point (range -20 mm to 20 mm).

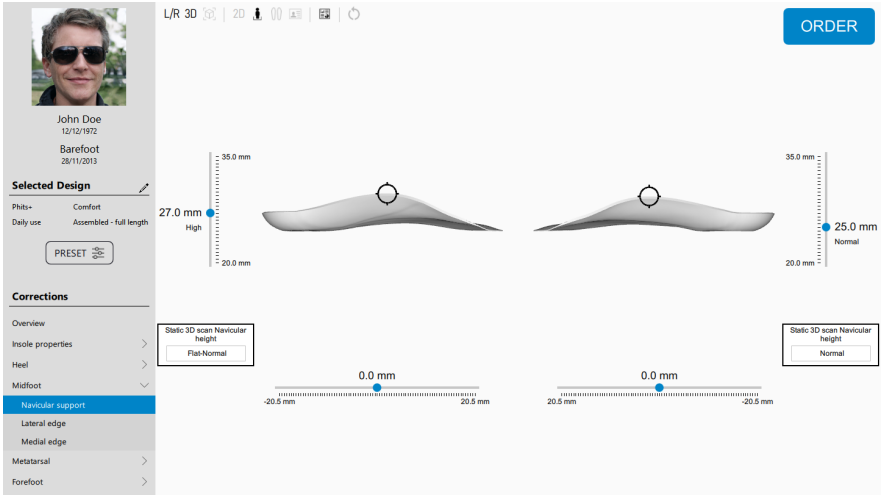


Figure 103: Navicular support menu under midfoot corrections of the Phits+ design wizard.

The **Lateral edge** menu (Figure 104) controls the height and location of the arch support. The highest point of the arch support, visualized with an indicator on the insole, can be raised/lowered and moved anterior and posterior using the sliders or directly by clicking and dragging the indicator.

Type	Controls the type of edge: low or normal (note that only the normal edge allows for a height change).
Height	Controls the height of the normal lateral edge (0 mm to 6 mm).

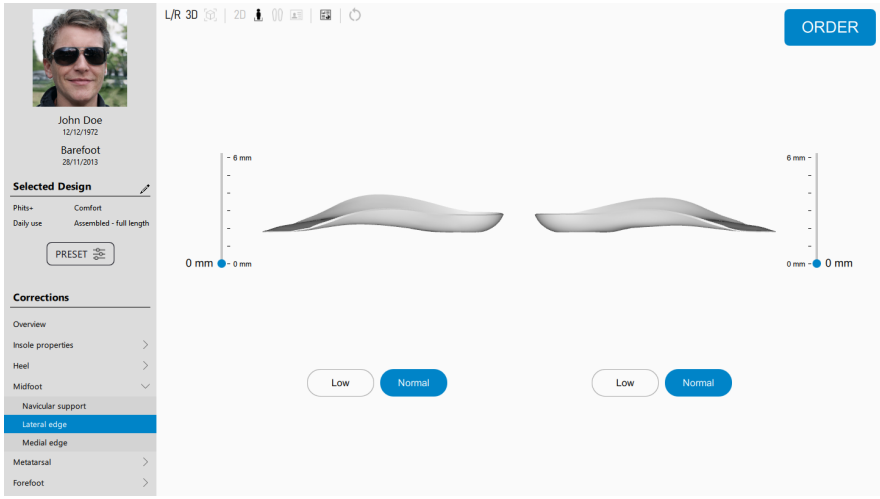


Figure 104: Lateral edge menu under midfoot corrections of the Phits+ design wizard.

The **Medial edge** menu (Figure 105) controls the height and location of the arch support. The highest point of the arch support, visualized with an indicator on the insole, can be raised/lowered and moved anterior and posterior using the sliders or directly by clicking and dragging the indicator.

Height	Controls the height of the medial edge (0 mm to 6 mm).

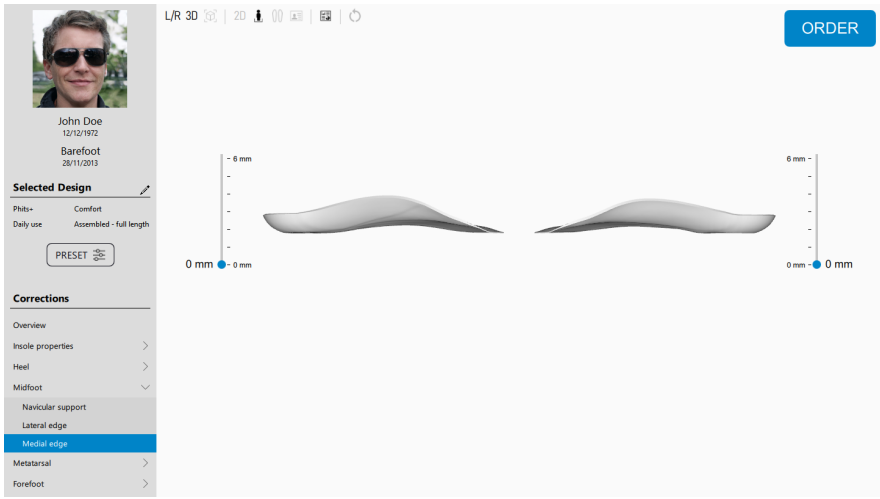


Figure 105: Medial edge menu under midfoot corrections of the Phits+ design wizard.

13.6 Phits+: metatarsal corrections

The **metatarsal bar** menu (Figure 106) enables to include a metatarsal bar. Clicking the desired height of the metatarsal bar will apply it to the insole. It ranges from 1 to 6 mm. Clicking none will remove the metatarsal bar form the insole. The location of the metatarsal bar can be altered – anteriorly or posteriorly - by clicking the arrows (steps of 0.5mm) or by directly clicking and dragging the indicator in the middle of the arrows.

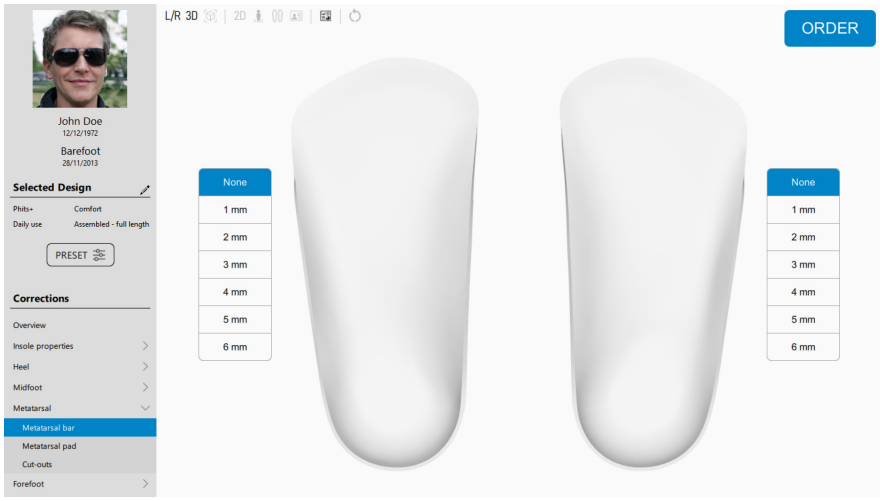


Figure 106: Metatarsal bar menu under metatarsal corrections of the Phits+ design wizard.

The **metatarsal pad** menu (Figure 107) controls the height and location of the arch support. The highest point of the arch support, visualized with an indicator on the insole, can be raised/lowered and moved anterior and posterior using the sliders or directly by clicking and dragging the indicator.

Type	Selects the type of metatarsal pad: T-shape or Teardrop.
Height	In case a type is selected, the desired height can be selected. Ranging from 1 to 6 mm.
Location	the location of the metatarsal pad can be altered by clicking the arrows (steps of 0.5mm) or by directly clicking and dragging the indicator in the middle of the arrows.

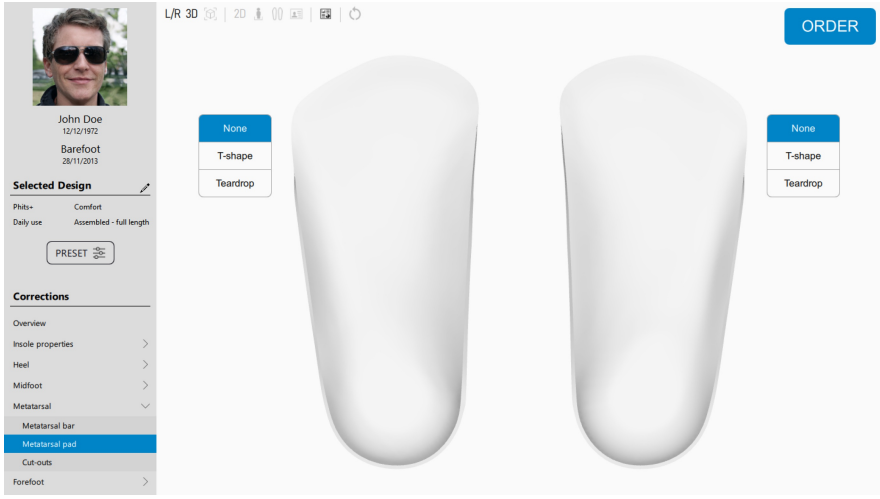


Figure 107: Metatarsal pad menu under metatarsal corrections of the Phits+ design wizard.

The **cut-outs** menu (Figure 108) allows to cut a certain shape out of the insole: first meta, first ray, fifth meta or fifth ray. Selecting a cut-out might affect the forefoot corrections as some of these become unavailable in case a cut-out was selected.

Select a cut-out by clicking the 'remove' icon on the specific zone that needs to be eliminated. Note that a cut-out can only be selected on one side.

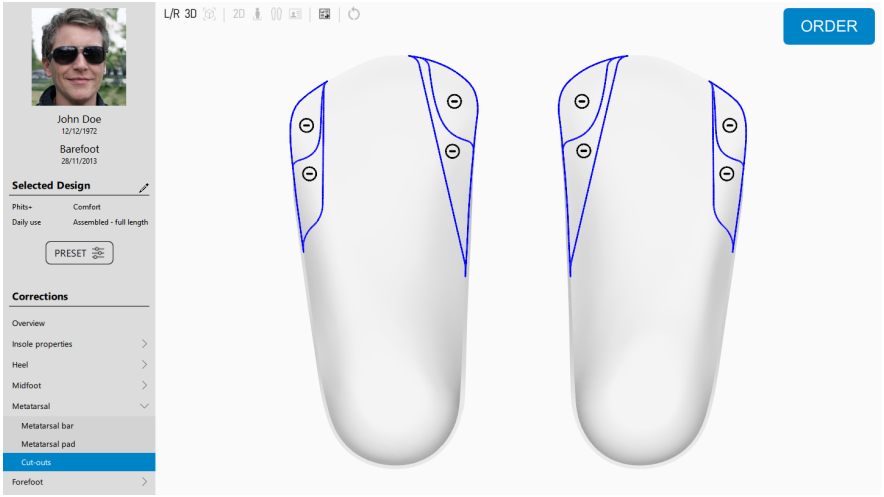


Figure 108: Metatarsal cut-outs menu under metatarsal corrections of the Phits+ design wizard.

13.7 Phits+: forefoot corrections

The **forefoot corrections** menu (Figure 109) allows including additional forefoot corrections.

Shape	Select the shape of the forefoot correction which will be added to the printed base.
Height	If a shape is selected, the height can be chosen between 2 to 4 mm.
Stiffness	Controls the stiffness of the forefoot correction (Flexible or Stiff).

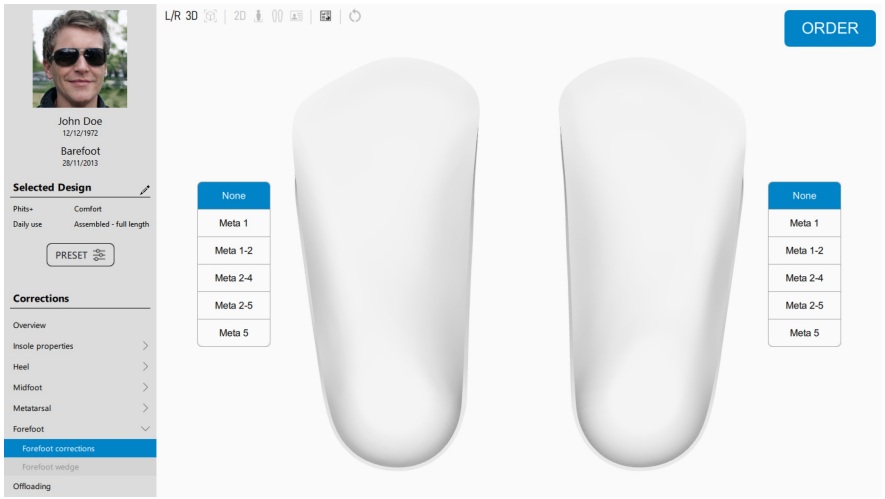


Figure 109: Forefoot corrections in the Phits+ design wizard.

The forefoot wedge menu will be available in case a full length Phits+ type is selected. The sliders can be increased to add a medial forefoot wedge and decreased to add a lateral forefoot wedge.

13.8 Phits+: offloading

The **offloading** menu (Figure 110) allows including offloading zones.

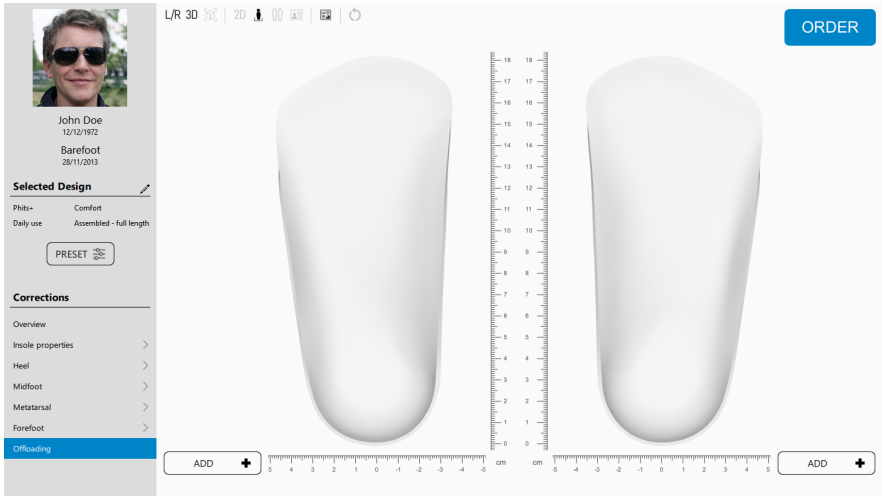


Figure 110: Offloading zones in the Phits+ design wizard.

Clicking the add button generates a circle which the user needs to place and click in the desired location on the insole base. Clicking outside of the insole will not be possible and a stop sign is shown. The escape button will abort the add operation.

Once an offloading zone is added, it can be adjusted by the user with the correction buttons located next to the insoles.

Multiple offloading zones can be added as long as they don't overlap. Once a new offloading zone is added, the user can edit each zone separately by clicking on the Offload button above the add button.

Changing the location of the offload zone can be directly done by clicking and dragging the arrowhead on the insole.

Hovering over the blue dots on the measurement lines will indicate the absolute position of the offloading zone on the X-axis and Y-axis.

13.9 Phits+: report menu

Navigate through the report pages using the arrows below the previewed report.

On the left side of the page, users can edit the e-mail subject and body clicking the pencil icon. After editing, it can be reset to default clicking the reset button.

On the right-hand side of the page, users can personalize the report with following menus:

Add patient feedback	Insert patient feedback into the box. A new page will be added to the report showing the feedback.
Contact information	Insert the contact details in the fields. They will be shown in the paragraph called contact information.
Frontpage	Click Select a new image and select a file from the explorer to add as frontpage.
Images	Click Select a new image and select a file from the explorer to add as new footer image.
Color schema	Click Select color and choose a desired color.

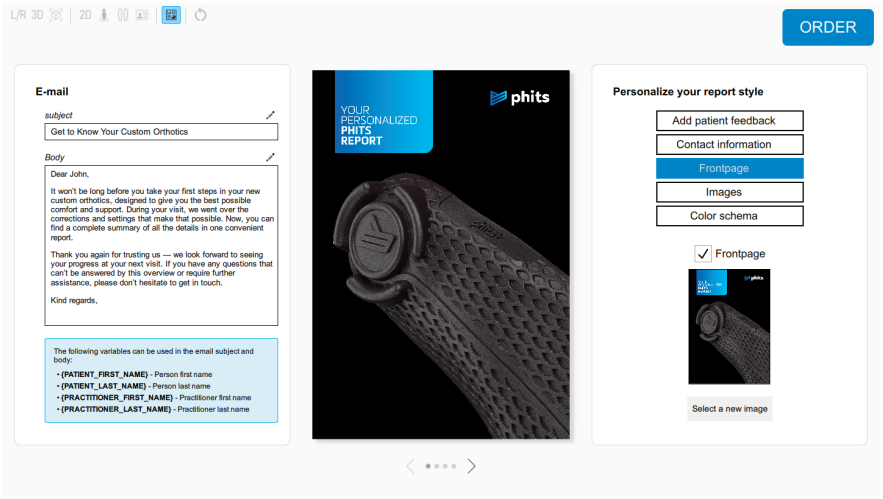


Figure 111: Phits+ report menu.

Chapter 14

Phits Design Wizard

If the user selects Phits as type of insole on the design selection page (see section 12.2), a wizard will appear on the right-hand side of the Analyze screen. As the design wizard only occupies the right side of the screen, interaction with the analysis tools during the insole design is possible. This way, when the user proceeds through the design steps, the user is still able to consult all the available data.

Below an overview of the different screens and their corresponding possible corrections that can be applied to the Phits insoles.

14.1 Phits: insole properties

The insole properties panel allows setting the properties of the size, top layer, and the printed base layer.

The **Size** submenu under insole properties (Figure 112) allows adjustments on the Top layer and Base sizing.

Top layer	controls the shoe size. By default, the value will correspond to the value that was entered in the record wizard. Shoe sizes are in UK sizes. Arrow up/scrolling up will increase size with steps of 0.5UK and arrows down/scrolling down will decrease size with steps of 0.5UK. Note: changing the Top layer size will overwrite the Base size by resetting this to 1UK below Top layer size.
Base	controls the size of the printed base layer. By default, the value corresponds to the shoe size minus 1UK. Arrow up/scrolling up will increase size with steps of 0.5UK and arrows down/scrolling down will decrease size with steps of 0.5UK. Note: Base size can never exceed the Top layer size.

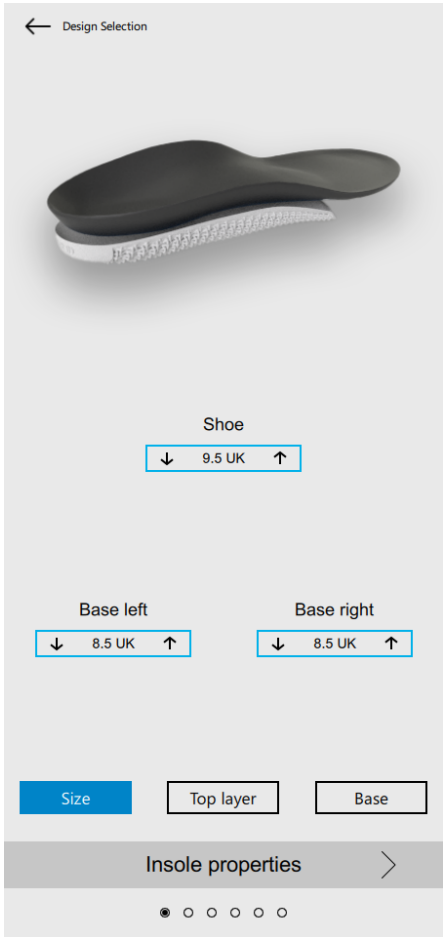


Figure 112: Size menu under Insole properties of the Phits design wizard.

The **Top layer** submenu under insole properties (Figure 113) allows setting the properties of the top layer. All options can be controlled by selecting (clicking) the desired option.

Thickness	controls the thickness of the top layer. The default thickness is dependent on the previously chosen Usage in the general info panel. For non-full-length 3D printed insoles, the options are 3 and 6 mm. For full length insoles, both 1 mm and 2 mm is available.
Hardness	controls the shore value of the top layer (20 shore PU soft, 30 shore EVA, 35 shore EVA or 40 shore EVA). The default hardness is dependent on the bodyweight of the subject and will always be EVA (PU soft must be chosen manually). For cycling insoles, shore 20 is available in EVA or PU material.
Material	controls the finishing of the orthotics. With or without synthetic leather finishing.
Heel padding	controls the inclusion of a soft heel pad (PU soft) for fat pad syndrome, heel spur or plantar fasciitis. The heel pad option is only available in combination with a 3 or a 6 mm EVA top layer.

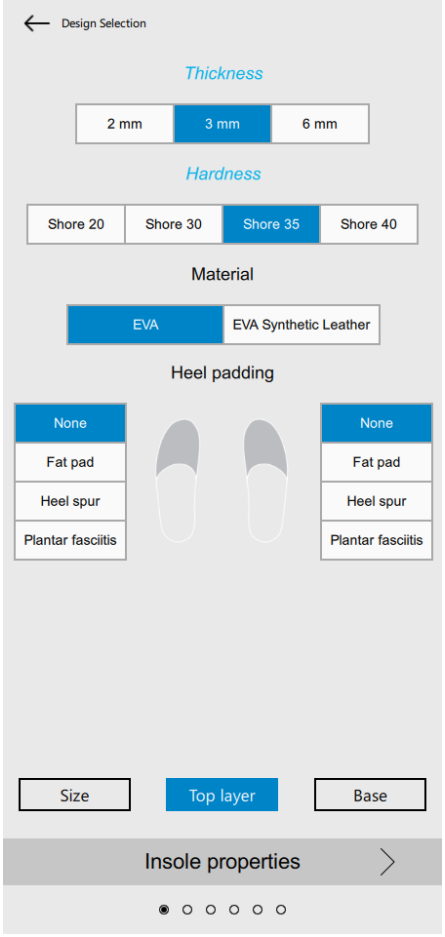


Figure 113: Top layer menu under Insole properties of the Phits design wizard.

The **Base** submenu under insole properties (Figure 114) allows for controlling the width of three different zones (heel, midfoot and metatarsal) and the overall width of the insoles. The heel zone is indicated with a green line, the midfoot zone with a orange line and the metatarsal zone with a blue line.

Type	controls the type of the insole (Normal or Ortho). Selecting Ortho will enable the metatarsal bar option.
Mediolateral support	controls the degree of mediolateral support (Normal or High).

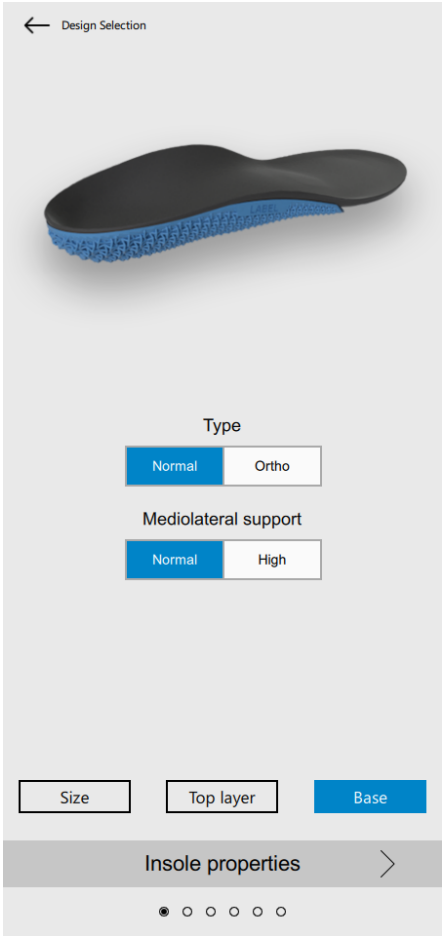


Figure 114: Base menu under insole properties of the Phits design wizard.

14.2 Phits: general corrections

The general corrections panel allows setting the properties of the navicular support, local stiffness, and directional stiffness.

The **Navicular support** submenu under general corrections (Figure 115) allows adjustments on the medial arch support.

Navicular support	controls the height of the arch support (seven different heights ranging from Extremely Flat to Extremely High).

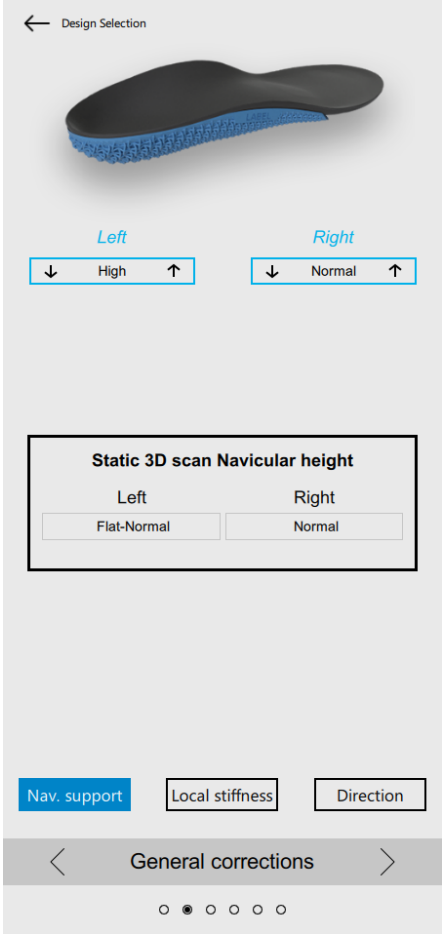
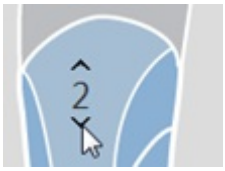


Figure 115: Navicular support menu under general corrections of the Phits design wizard.

The **Local stiffness** menu under insole properties (Figure 116) allows to control the local stiffness of 5 different zones in the printed base layer. The stiffness ranges from 1 (i.e. more flexible = light blue) to 5 (i.e. more stiff = dark blue). Hovering over a zone activates the local stiffness controller, which allows the user to set the local stiffness for each zone.



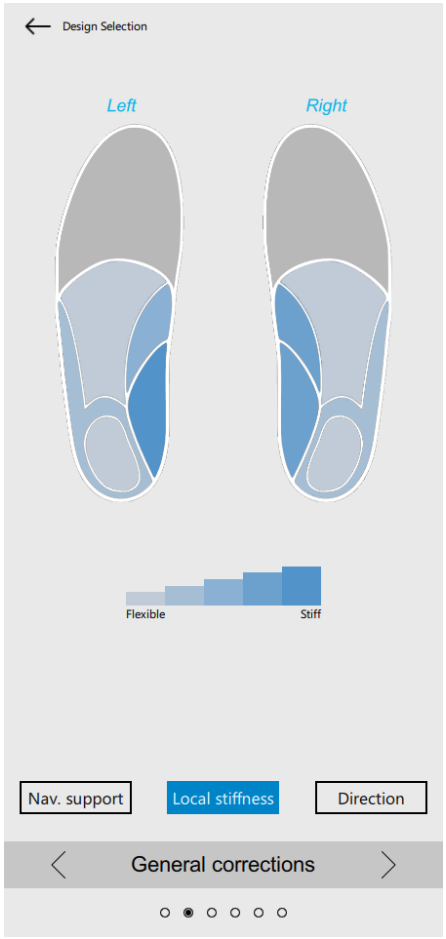


Figure 116: Local stiffness menu under general corrections of the Phits design wizard.

The **Stiffness direction** menu under general corrections (Figure 117) controls the amount of pronation/supination correction. Positive values indicate anti-pronation stiffness. Negative values indicate anti-supination stiffness. Use the arrows to modify the orientation of the stiffness.

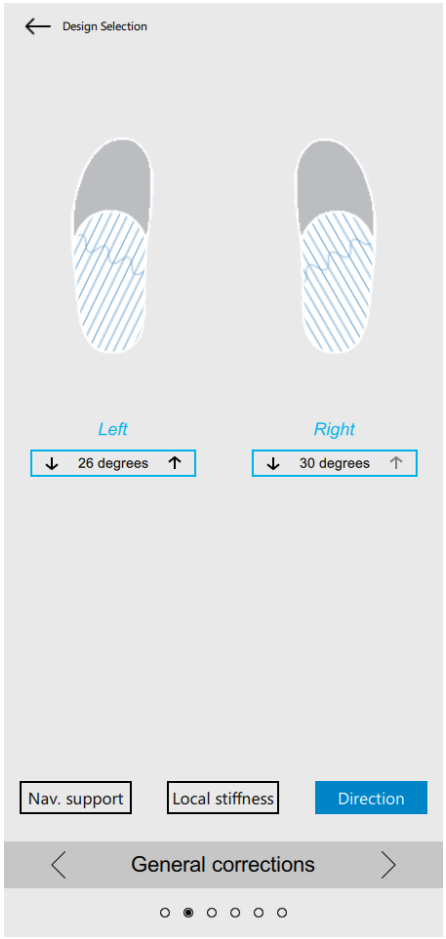


Figure 117: Stiffness direction menu under general corrections of the Phits design wizard.

14.3 Phits: heel corrections

The heel corrections panel allows setting the properties of the heel wedge, heel cup height, and heel raise.

The **heel wedge** submenu under general corrections (Figure 118) controls the orientation of the heel wedge (ranging from -5 to 7 degrees in steps of 1 degree). The heel wedge can be implemented either medially (+) or laterally (-). A zero-degree wedge indicates a neutral orientation.

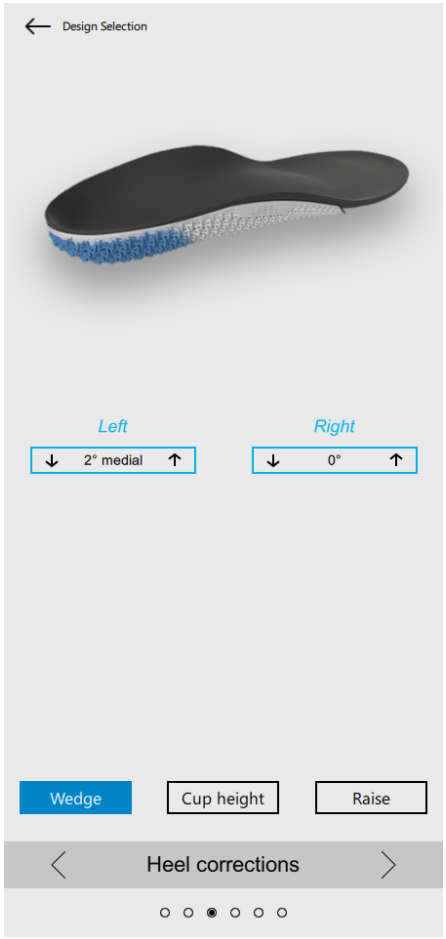


Figure 118: Heel wedge menu under heel corrections of the Phits design wizard.

The **heel cup height** (Figure 119) controls the height of the heel edges. This can be Standard or Low. Note that it is not possible to add a personal ID on an insole with a low heel cup height.

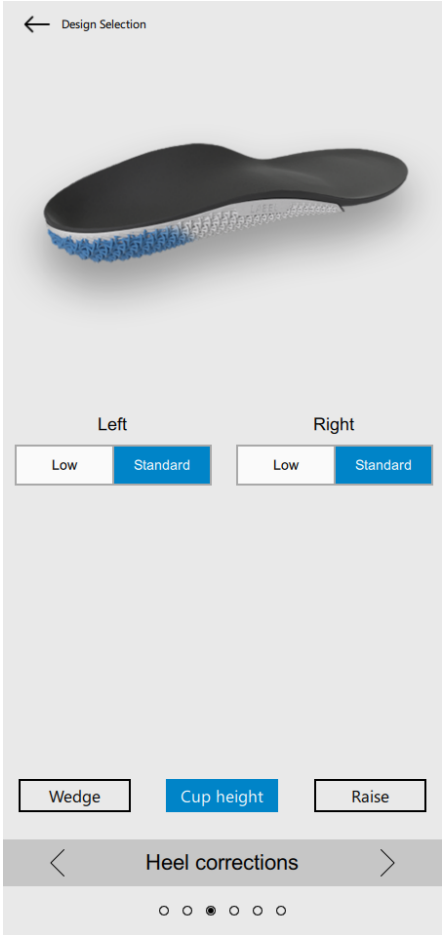


Figure 119: Cup height menu under heel corrections of the Phits design wizard.

The **heel raise** menu (Figure 120) controls the flat increase of the heel (ranging from 1 to 6 mm in steps of 1 mm). Use the arrows to increase/decrease the height or scroll up/down.

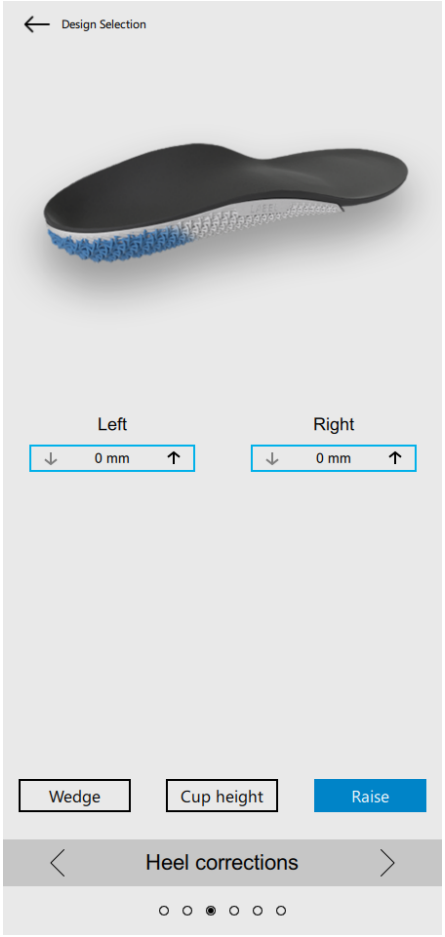


Figure 120: Heel raise menu under heel corrections of the Phits design wizard.

14.4 Phits: metatarsal corrections

The metatarsal corrections panel allows setting the properties of the metatarsal pad, metatarsal bar and the lateral edge.

The **metatarsal pad** menu (Figure 121) controls the shape and height of the metatarsal pad.

Shape	controls the shape of the meta pad (Teardrop and T-shape).
Height	controls the height of the chosen meta pad (ranging from 1 to 5 mm in steps of 1 mm).

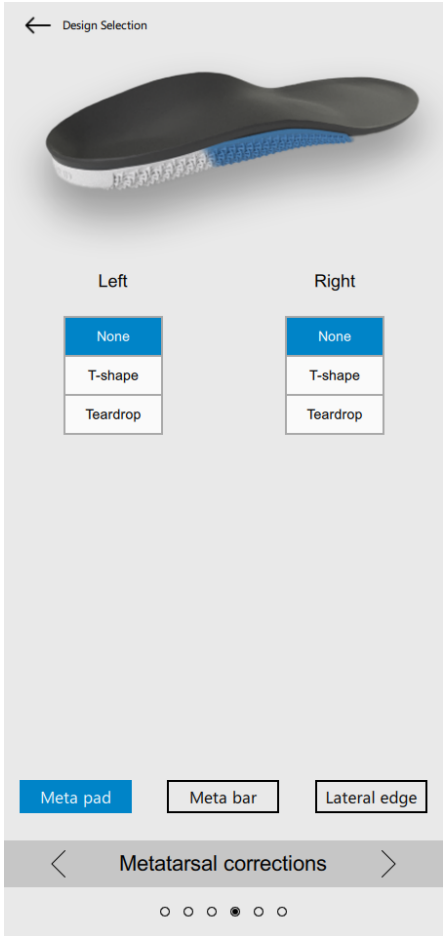


Figure 121: Metatarsal pad menu under metatarsal corrections of the Phits design wizard.

The **metatarsal bar** menu (Figure 122) controls the height of the meta bar (ranging from 1 to 3 mm in steps of 1 mm) in case base type ortho is selected.

Figure 122: Metatarsal bar menu under metatarsal corrections of the Phits design wizard.

The **Lateral edge** menu (Figure 123) controls the height of the lateral edge (Standard and Low).

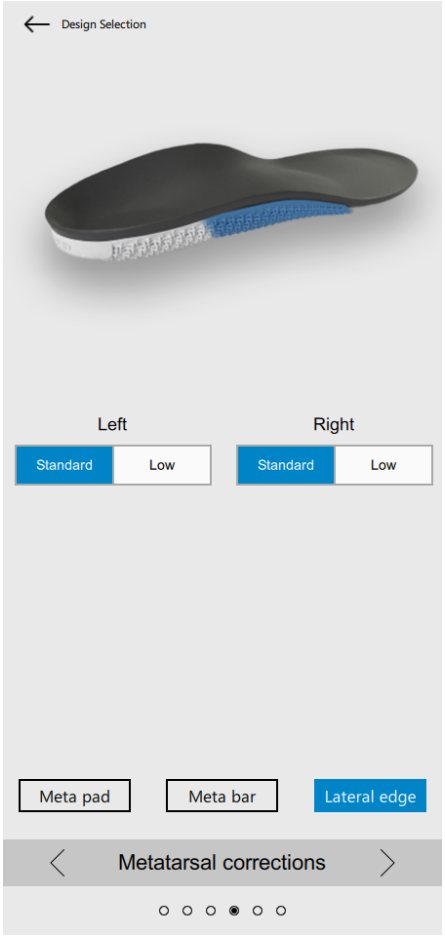


Figure 123: Lateral edge menu under metatarsal corrections of the Phits design wizard.

14.5 Phits: forefoot corrections

The metatarsal corrections panel allows setting the properties of the metatarsal pad, metatarsal bar and the lateral edge.

The **metatarsal pad** menu (Figure 124) controls the shape and height of the metatarsal pad.

Shape	controls the shape of the forefoot correction. For this feature, a differentiation is made between regular insoles (i.e. comfort, narrow, wide, running, soccer and golf) and full length 3D printed insoles. Regular insoles are standard 2/3rd printed insoles and the forefoot correction is printed additionally for a specific zone. Regular insoles have five options available, more specifically Meta 1, Meta 1-2, Meta 2-4, Meta 2-5 and Meta 5. For full length 3D printed insoles, the complete forefoot is printed, and the forefoot corrections is available in the form of a wedge in the forefoot. This wedge can be orientated medially or laterally.
Height	controls the height of the chosen forefoot correction. For regular insoles, the height varies from 2 to 4 mm in steps of 1 mm. For cycling insoles, the wedge varies from 1 to 4 mm in steps of 1 mm.
Stiffness	controls the stiffness of the forefoot correction (Flexible or Stiff). This option is only available for regular insoles. For full-length insoles, Cycling or Ski, the stiffness option is always stiff.

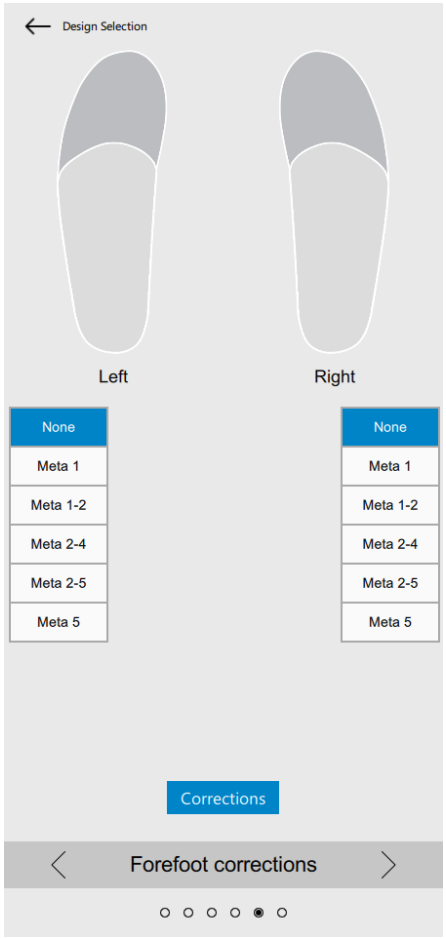


Figure 124: Forefoot corrections in the Phits design wizard.

14.6 Phits: personalization

In the **personalization panel** (Figure 125) controls the shape and height of the metatarsal pad.

Personal ID	controls the personal ID that is added to the rear of the insoles. By default, the personal ID is set to the subject's first name (limited to 8 alphanumerical characters).

Click ORDER to advance to the checkout overview (chapter 15).

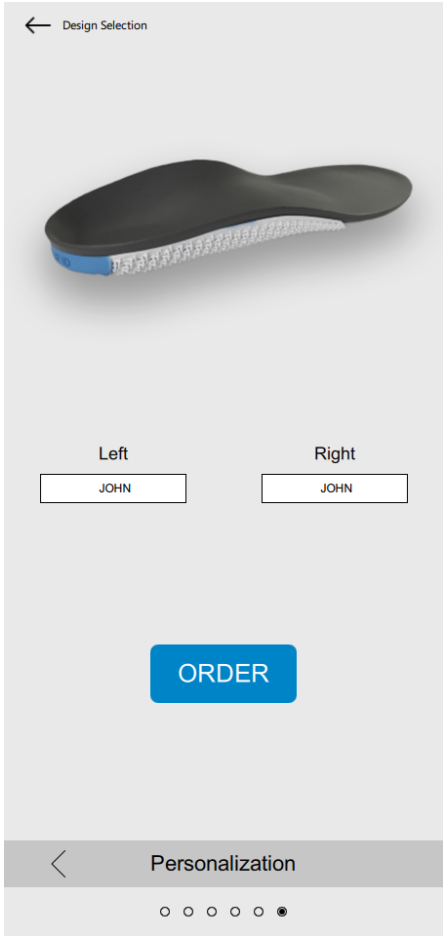


Figure 125: Personalization panel in the Phits design wizard.

Checkout Screen

In the checkout window for Phits+ insoles (Figure 126), a summary of the patient information, order information and design parameters overview are displayed.

Quantity	Under order info, a dropdown box can be opened to select the desired amount (1 to 10) of orders to be placed of the active design. Note: each pair receives a unique order ID and for each order a separate reference ID can be entered.
Delivery Address	controls the desired delivery address.
Reference ID	gives the opportunity to add a reference (i.e. customer number) to the patient, which will be on the label of the Phits™ box.
Remarks	gives the opportunity to add additional comments for your own administration. This will be printed on the paper in the Phits™ box but will not be read by the production teams.

Click confirm order button to submit the order and upload it to the cloud. Once an order is submitted, no changes can be made afterwards nor is it possible to cancel it.

At the bottom of the screen, a render shows the final design of how the insole will be printed. Please note that it could take quite some time to load these. The order can however be placed during the loading.

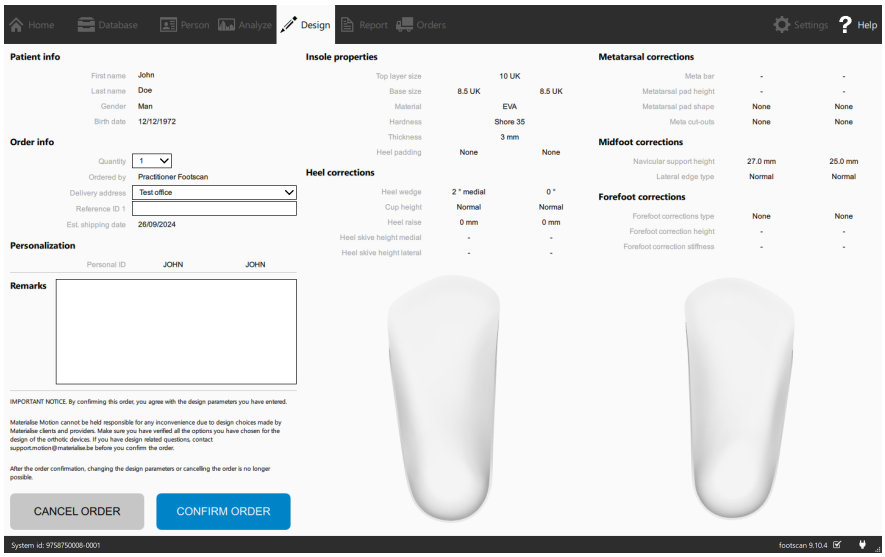


Figure 126: Checkout screen for Phits+ insoles.

The checkout screen for a Phits insole (Figure 127) displays the same information as for Phits+ insoles, except that no final design render is shown.

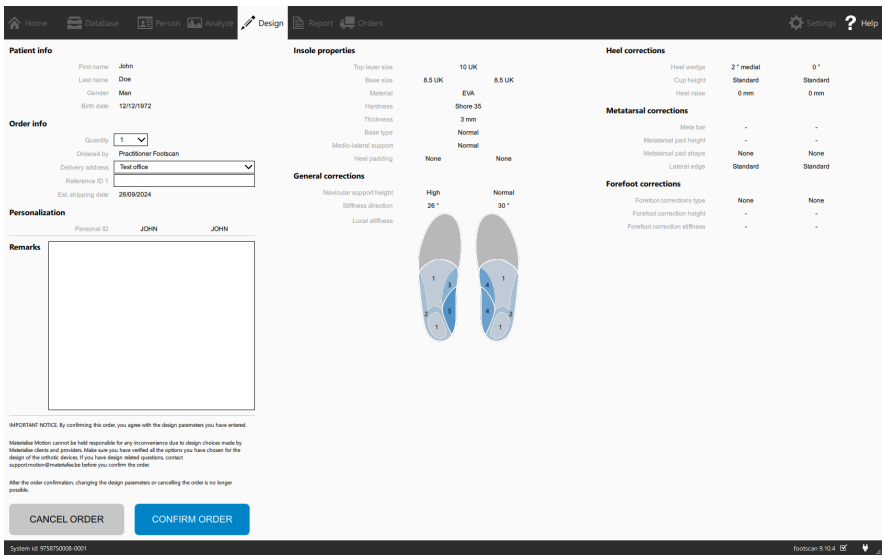


Figure 127: Checkout screen for Phits insoles.

Orders Screen

In the order summary of a Phits+ design (Figure 128) or Phits design (Figure 129), an overview of the essential information of the order is displayed, such as the subject information, unique order ID (e.g. RS22-ACE-XUS), the order status, expected shipping date and delivery address.

Further options to do in this screen are the reorder, print and download functionality and posting comments.

Reorder	clicking this button will initiate the reorder process and direct the user to the checkout screen to order a complete similar insole design as the order overview showed.
Print	this allows the user to download a PDF document of the order overview which will automatically be opened in a browser window from where it can be printed or saved.
Download	this allows user to download the RSDB file containing the original session and design information.

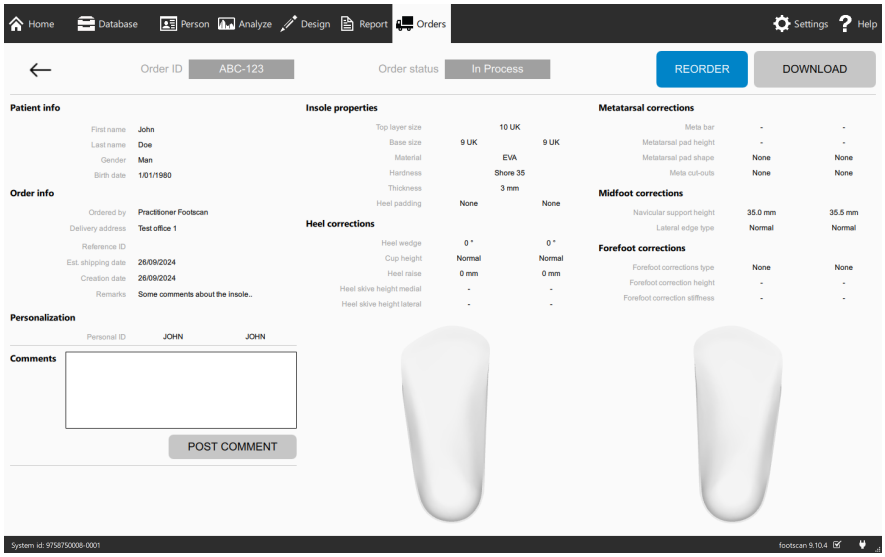


Figure 128: Order screen of a Phits+ design.

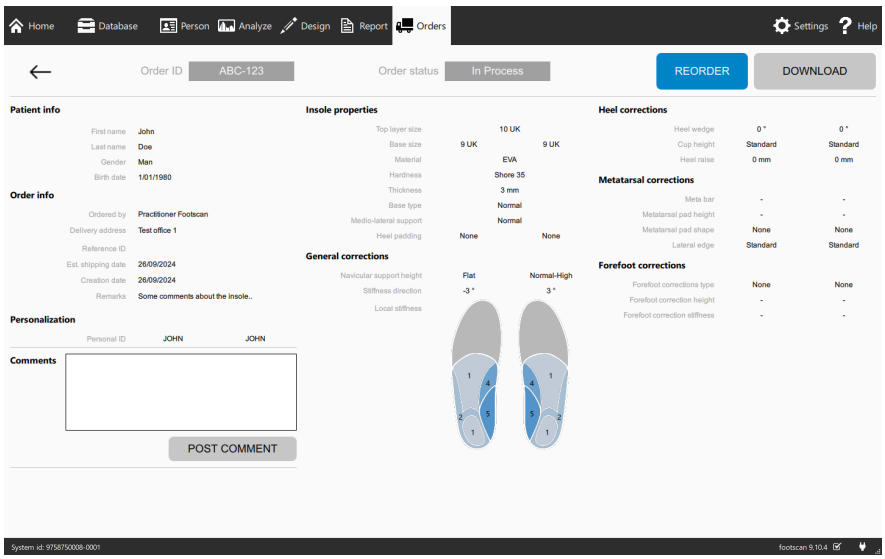


Figure 129: Order screen of a Phits design.

In the orders tab (Figure 130), an overview list of all placed orders are displayed with following information per order: patient name, order id, estimated shipping date, type, shoe type, status, delivery address and reference ID.

By using the Patient, Order Id and Reference ID text fields specific orders can be consulted in the database. The orders can also be tracked online via https://portal.rsprint.com.

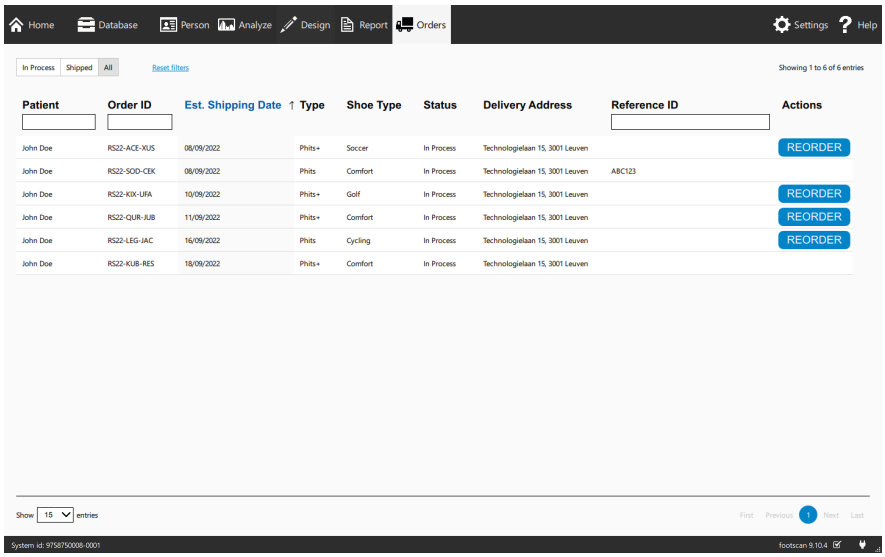


Figure 130: Order management.

Report Screen

The Report screen (Figure 131) creates printable reports of measurement sessions.

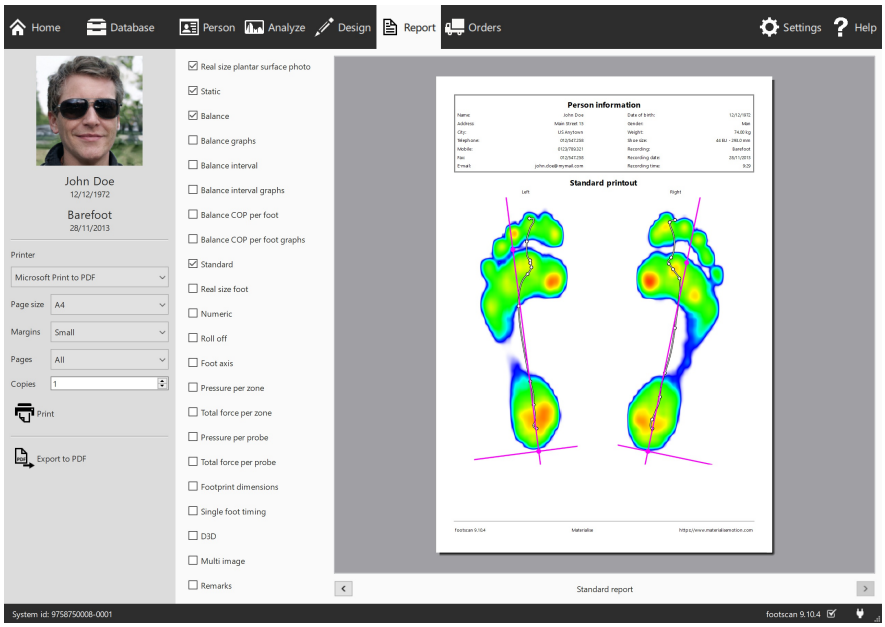


Figure 131: The Report screen creates a report with the results of several analyses (Chapter 10).

The Report screen displays a checklist of report content available for the current measurement session. Such report content reflects the results of some of the session's analyses (Chapter 10). The screen merges all checked content into a single report.

Clicking the Export to PDF button enables you to select a location and filename to save the current report as a PDF file to your preferred location. The PDF file has a fixed margin and page size, namely A4.

The gray bar at the left contains all configurable printer settings. The print preview shows the current report with these printer settings. When satisfied with the print preview click Print to print the report to a printer or to a PDF file.

Printer Settings First choose a Printer. The screen refreshes the Page size list for the selected printer. Select the width of the whitespace Margins of each page. Finally choose the number of Copies and which Page size to print: all or only odd/even pages. This last option is useful for double-sided printing.

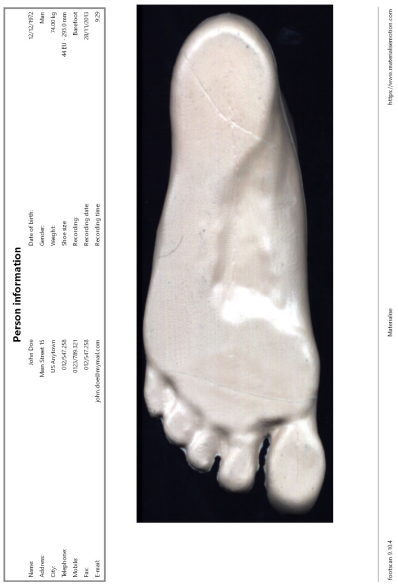
Print Preview The print preview shows the current report contents with the given printer settings. It displays a single page at a time. Use the mouse's scroll wheel or click < > to navigate through the report's contents.

Report Contents The report screen provides content based on the analyses of the current measurement session. Depending on the measurements in that session some report content might not be available.

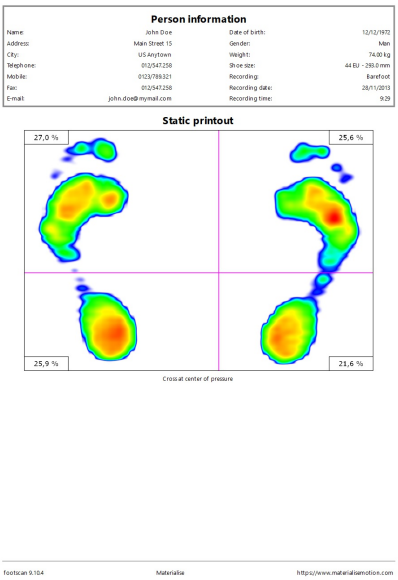
All report content contains a header and a footer section. The header section shows information about the client and measurement session. By default the footer refers to Materialise Motion and footscan 9. Both sections support customization to some degree (Section 6.4).

Check the following boxes to add their corresponding content to the current report:

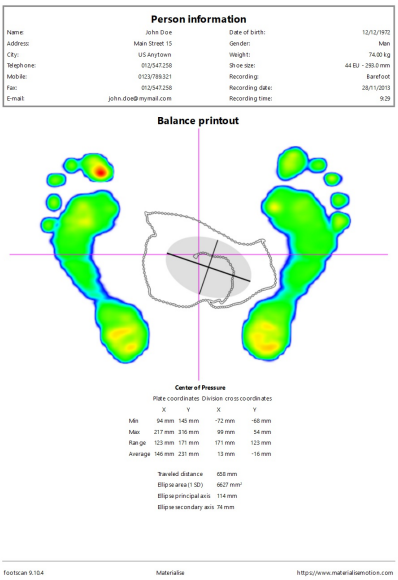
☑Real size plantar surface photo Shows the plantar surface photo scaled 1:1. This content adds one page for each 3D scanned foot to the report.



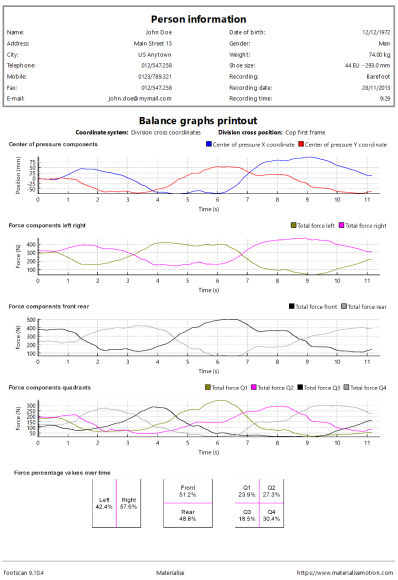
☑Static Adds the results of the static analysis (Section 10.8). Shows the maximum sensor values registered during the static measurement as well as the four quadrants and the relative distribution of force among those quadrants.



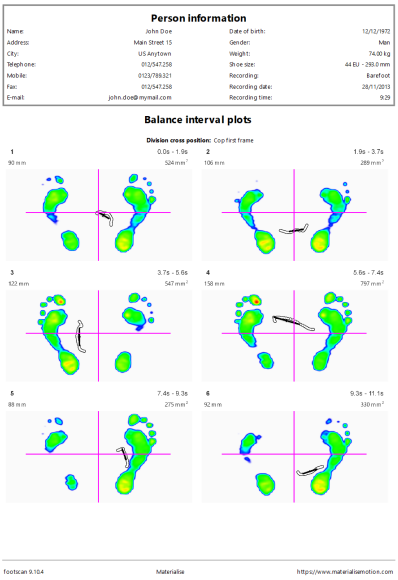
☑Balance Shows the plantar pressure distribution for the entire balance measurement. The visualisation of the max of max image shows the maximum pressure values registered during the balance measurement together with the centre of pressure line. Additionally, it displays numerical information about the centre of pressure (section 10.9).



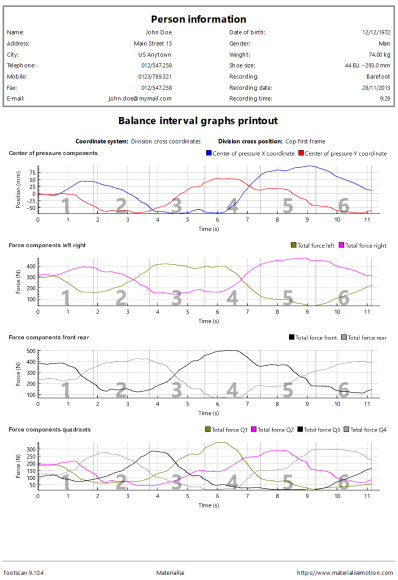
☑Balance graphs Shows the plantar pressure distribution for the entire balance measurement. The graphs represent the position of the centre of force over time and the magnitude of the force components for the selected zones (section 10.9).



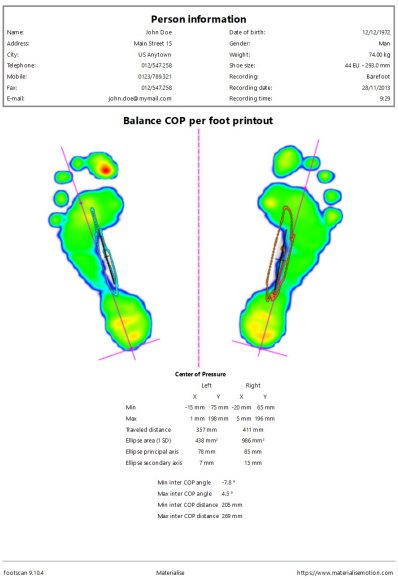
☑Balance interval Shows the plantar pressure distribution for each of the intervals defined within the entire balance measurement. For each interval the visualisation of the max of max image shows the maximum pressure values registered together with the centre of pressure line. Additionally, it displays numerical information about the centre of pressure. (section 10.10)



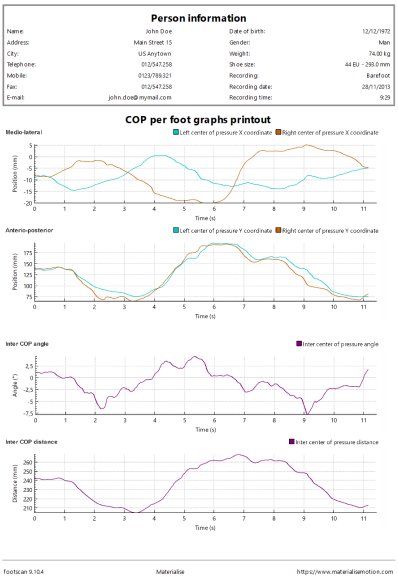
☑Balance interval graphs Shows the plantar pressure distribution for each of the intervals defined within the entire balance measurement. The graphs represent the position of the centre of force over time and the magnitude of the force components for the selected zones. The beginning and end of the selected intervals are indicated in the graphs. (section 10.10)



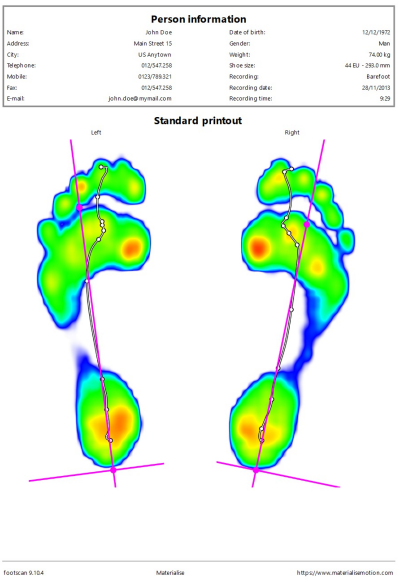
☑Balance COP per foot Shows the plantar pressure distribution for both feet separately. The visualisation of the max of max image shows the maximum pressure values registered during the balance measurement together with the centre of pressure line in relation to the foot axes. Additionally, it displays numerical information about the centre of pressure. (Section 10.11)



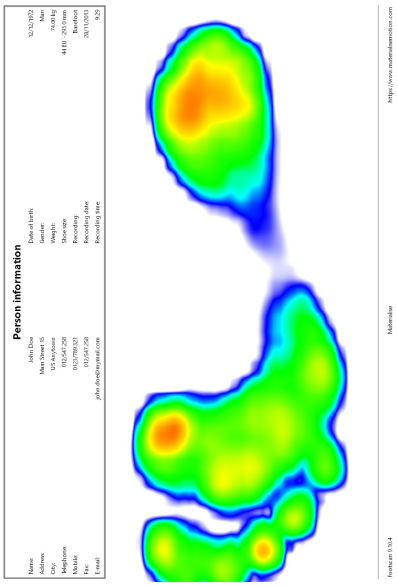
☑Balance COP per foot graphs Shows the plantar pressure distribution for both feet separately. The graphs represent the position of the centre of force for the left and right foot over time as well as the inter center of force angle and distance. (Section 10.11).



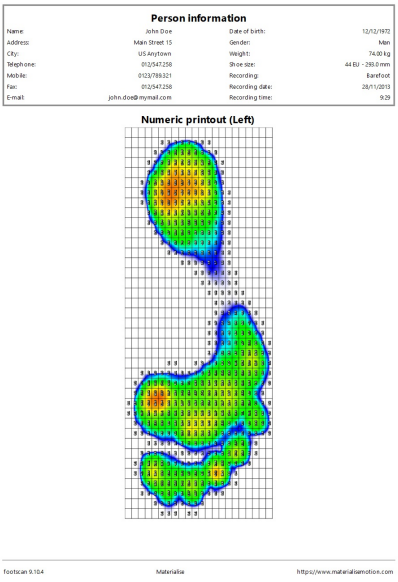
☑Standard Shows the maximum pressure values of the dynamic measurement's foot selection. Additionally it displays the foot axes and center-of-pressure (Section 10.12).



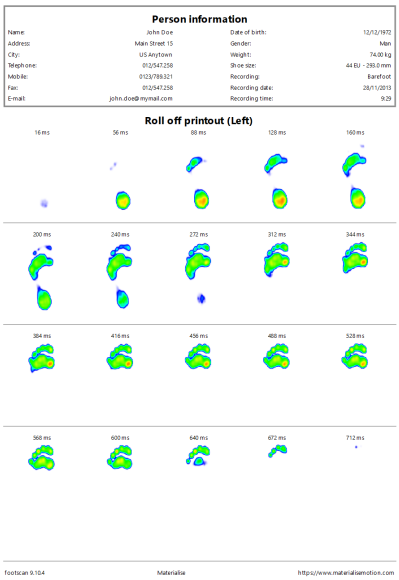
☑Real size foot depicts the maximum pressure measured under the foot selection scaled 1:1. This content adds one page for each foot to the report.



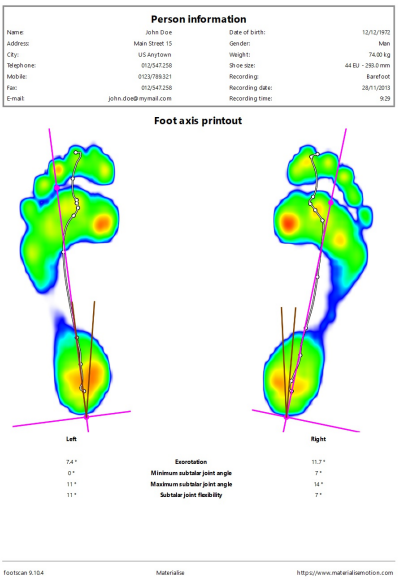
☑Numeric prints the foot selection with the numerical value of the maximum pressure ($^{N}/_{cm^2}$) for each sensor outlined in a grid. Adds one page for each foot to the report.



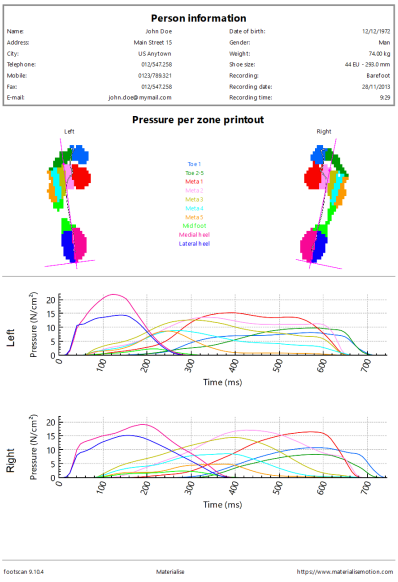
☑Roll off Lists a sequence of images from the roll-offs of the foot selection, the timing for each image is indicated in milliseconds. Adds one page for each foot to the report.



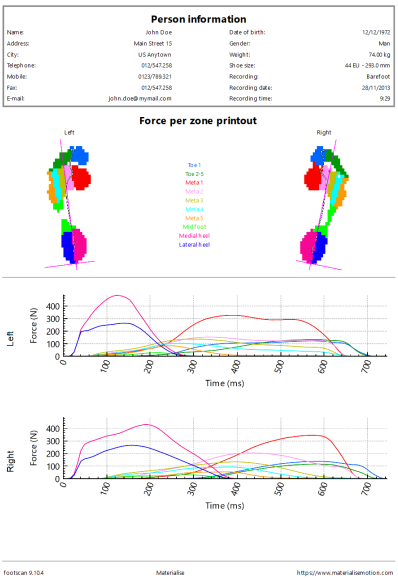
☑Foot axis Shows the maximum pressure values of the dynamic measurement's foot selection with the foot axes, center-of-pressure line and subtalar joint angles. Additionally it displays numerical information about the exorotation and subtalar joint angles (Section 10.12). The foot axis report is available in the Clinical, Scientific package(s).



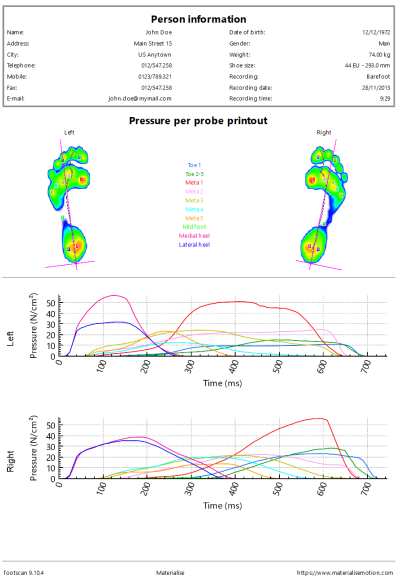
☑Pressure per zone Plots the graphs of the pressure ($^{N}/_{cm^2}$) applied on each zone of the foot selection (Section 10.15).



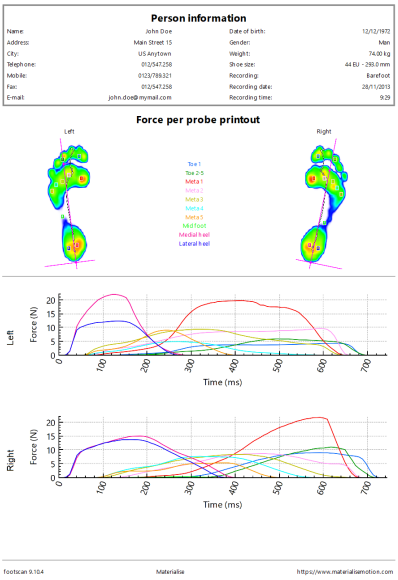
☑Total force per zone Plots the graphs of the force (N) applied on each zone of the foot selection (Section 10.15).



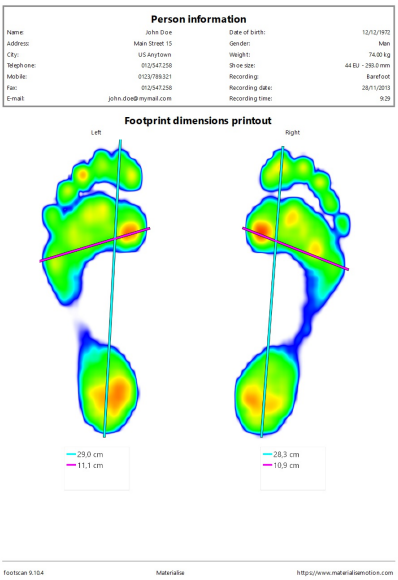
☑Pressure per probe Plots the graphs of the pressure ($^{N}/_{cm^2}$) applied on each probe of the foot selection (Section 10.16).



☑Total force per probe Plots the graphs of the force (N) applied on each probe of the foot selection (Section 10.16).

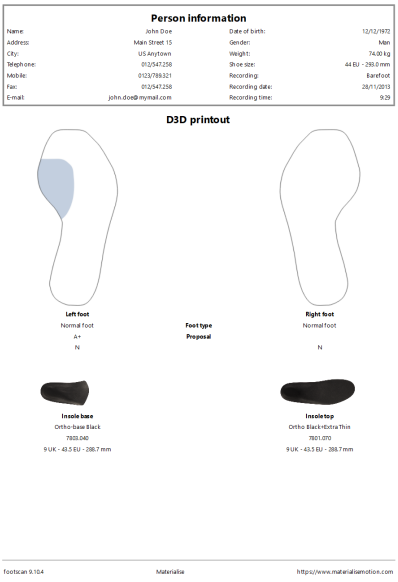


☑Footprint dimensions Adds the results of the Footprint Size analysis to the report (Section 10.18).

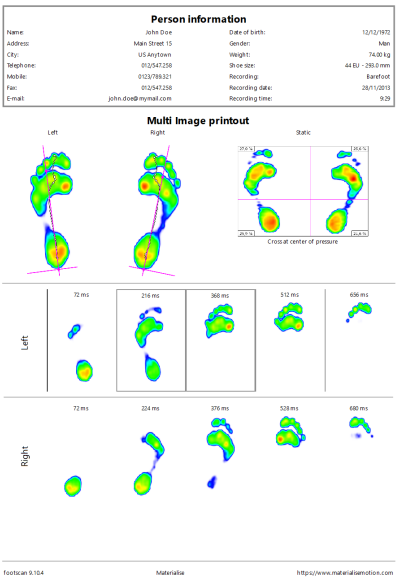


☑Single foot timing Shows the events and phases during the foot roll-off of the foot selection (Section 10.22). The single foot timing report is available in the Clinical, Scientific package(s).

☑D3D Adds the D3D proposal for the current dynamic measurement.



☑Multi image combines static, standard and roll-off report content.



☑Remarks Shows the remarks of current session and person.

Footscan 9 saves the last report selection.

Part 3

Migrate from footscan 7 or 8 gait

General Information

During the upgrade from footscan 7 or 8 gait to footscan 9 you need to convert your footscan 7 or 8 gait installation so that it is compatible with footscan 9. This migration consists of two parts: the migration of the footscan 7 or 8 gait measurement data and the upgrade of the used pressure plate(s).

Part 1: footscan 7 or 8 gait measurement data

The migration wizard helps you in migrating all footscan 7 or 8 gait data for use in the footscan 9 series software. There are two scenarios:

- Full migration

  Both the footscan 7 or 8 gait software and the footscan 9 software reside on the same computer.

  When the footscan 7 or 8 gait software has not yet been migrated, the migration process can be initiated by running the footscan 9 software. A migration icon in the status bar ( ) and a balloon message asking to start a full migration will be shown asking you to start, or postpone the full migration process:

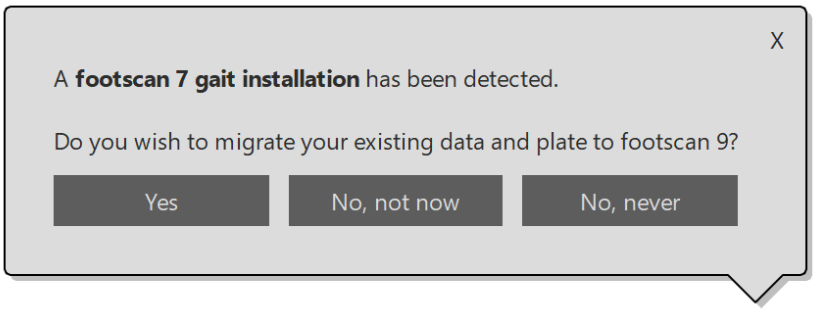


Figure 132: Full migration balloon.

  A full migration can be started by clicking yes in the balloon message or clicking the Migrate from footscan 7 or 8 gait button on the homescreen. A full migration happens in three stages:

  1. The footscan 7 or 8 gait data is exported to an intermediate database file:

     The migration wizard uses a software utility named the footscan 7/8 gait export tool to export the footscan 7 or 8 gait data. If this software is not installed on your computer, footscan 9 will automatically download and install the footscan 7/8 gait export tool for you. If your computer does not have a working internet connection or the download fails, you can manually install the footscan 7/8 gait export tool using its installer. The footscan 7/8 gait export tool installer can be found on the installation medium provided by support.motion@materialise.be.

  2. The intermediate database file is imported into the footscan 9 database
  3. If so desired, you can also upgrade your footscan 7 plate (see 19.7)

- Database import

  The footscan 7 or 8 gait software resides on a different computer than the footscan 9 software.

Using the footscan 7/8 gait export tool software utility on the computer containing the footscan 7 or 8 gait software will prepare the data for migration. The footscan 7/8 gait export tool installer can be found on an installation medium (USB stick) provided by support.motion@materialise.be.

Run the footscan 7/8 gait export tool to export all your footscan 7 or 8 gait data, the result of the export (the intermediate database file) needs to be copied to the computer containing the footscan 9 installation. Depending on where you copied the intermediate file, the footscan 9 software will either detect the intermediate file or will require manual intervention:

- The intermediate file has been copied to C:\Users\<you>\footscan\import.

  Next time you open the footscan 9 software, it will detect the intermediate database file and show the migration icon in the status bar () and a balloon message asking to start the import of the intermediate database. You can choose to start, postpone or never start the database importation.

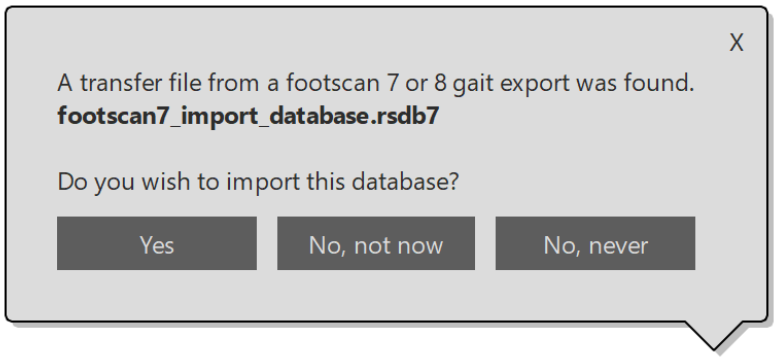


Figure 133: Database import balloon.

- The intermediate file has been copied somewhere else.

  The footscan 9 software won't be able to automatically detect the intermediate file. In order to import the intermediate database file, you need to start the migration wizard yourself by clicking the Migrate from footscan 7 or 8 gait migrate button on the homescreen.

Information about installation of the footscan 7/8 gait export tool software and a step-by-step guide to perform the export can be found in the footscan 7/8 gait export tool manual.

The migration of footscan 8 gait data may fail for certain combinations of footscan 8 gait versions and footscan 9 versions. Please contact support at support.motion@materialise.be if you want to migrate footscan 8 gait data to the new footscan 9 software.

Imported footscan 7 or 8 gait measurements will look different in footscan 9. Improvements in the visualization include a different interpolation, different mapping of pressure to color and a different background color.

Part 2: pressure plate(s)

Pressure plates which were used with the footscan 7 software need to have a firmware update and a new license to be compatible with the footscan 9 series software. More information about the plate conversion can be found in 19.7.

Pressure plates which were used with the footscan 8 software only need a new license to be compatible with the footscan 9 series software.

Once a footscan 7 pressure plate is converted to work with footscan 9, it can no longer be used with your old footscan 7 software!

It is necessary to properly calibrate your device to obtain correct measurement values. If the calibration procedure as described in the footscan 7 manual, was not regularly performed, the absolute pressure values of the footscan 7 data converted to footscan 9 will be wrong. New measurements made with footscan 9 will have correct measurement values, but existing footscan 7 measurements which are imported into footscan 9 will retain their original measurement values, even if they were wrong due to bad calibration.

Migration Wizard

Upon starting the migration, the first screen shown is the introduction page.

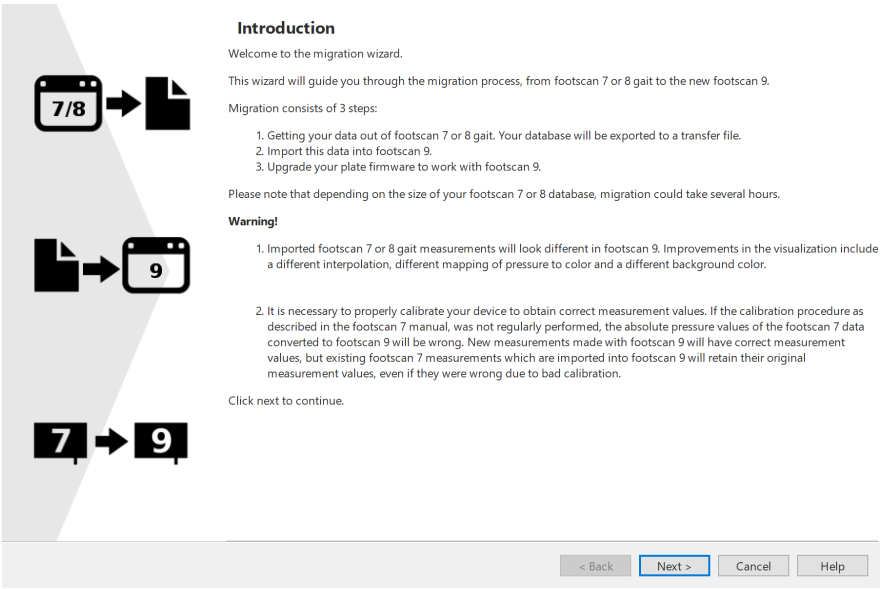


Figure 134: Migration introduction page.

The following buttons may appear on the bottom off the screen, they have the following function:

< Back	Go back to the previous screen.
Next >	Go to the next screen.
✕ Cancel	Cancel the export.
Help	Open the help files.
Finish	Close the wizard when the migration is finished.

Click the Next > button to continue.

19.1 Migration Start Page

Select if you want to perform a full migration, a database import or only upgrade your plate(s).

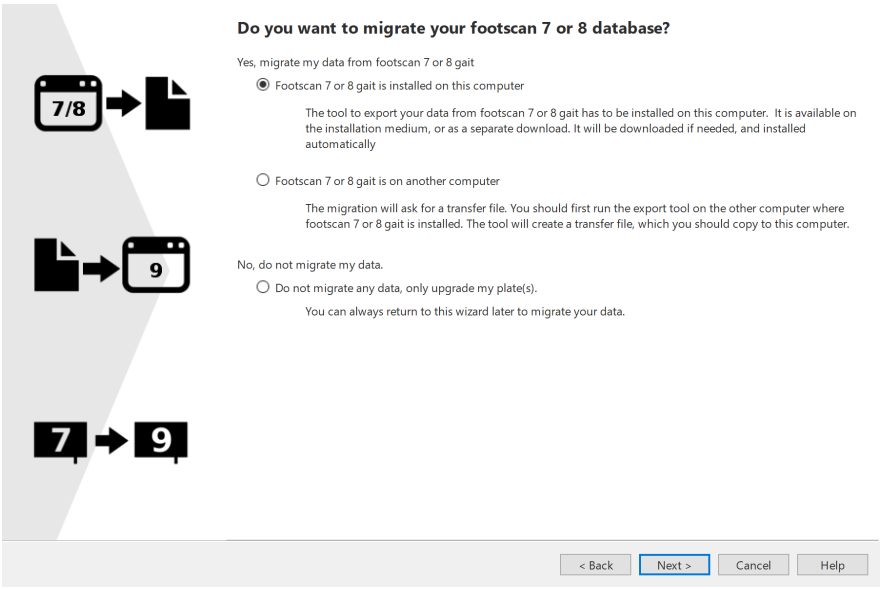


Figure 135: Migration start page.

The following options are available:

1. ◉Footscan 7 or 8 gait is installed on this computer

   This option will start a full migration. By clicking the Next > button, the migration wizard will automatically start the footscan 7/8 gait export tool (see 19.3).

2. ◉Footscan 7 or 8 gait is on another computer

   This option will start a database import. The intermediate database file containing the export of the footscan 7 or 8 gait data needs to be available on your computer, clicking the Next > button will guide you to a page where you can select which intermediate database file you wish to import. (see 19.2).

3. ◉Do not migrate any data, only upgrade my plate(s).

   You can choose to not perform any data migration, but just upgrade your plate(s) to be compatible with the footscan 9 series software. Clicking the Next > button will guide you to the upgrade plate(s) page (see 19.5).

19.2 Select Import File Page

Choose which intermediate database file you want to import.

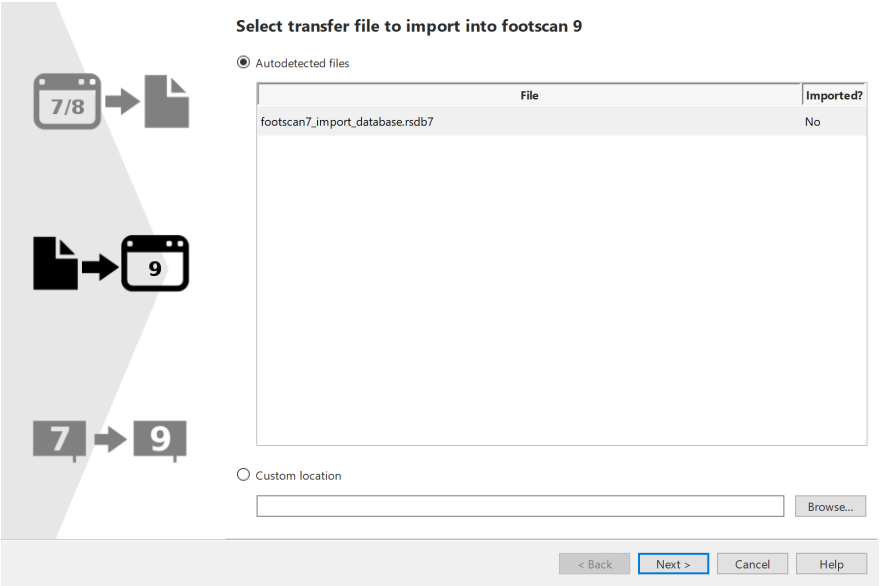


Figure 136: Migration select import file page.

All the intermediate database files located in the import folder of the footscan 9 software will be listed in the autodetected files section of this page. It will show which intermediate database file is found and if it was already imported or not, you can select which database file you would like to import. If there are no intermediate database files found in the footscan 9 import folder, the ◉Autodetected files radio button will be unchecked

If the intermediate database file is not located in the import folder of the footscan 9 software, you can use the Browse... button to select the intermediate database file. When a valid intermediate database file is chosen, the ◉Custom location radio button will be checked.

Click the Next > button to continue.

19.3 Export Tool Disabled Page

The footscan 7/8 gait export tool software is no longer available for download. Please contact support.motion@materialise.be if this problem persists.

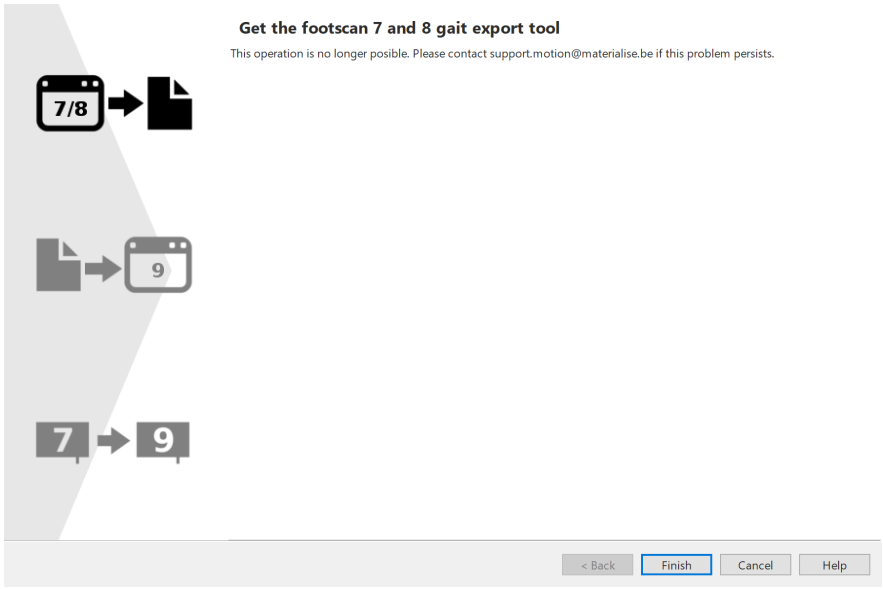


Figure 137: Migration export tool disabled page.

19.4 Importing Page

The following screen will be shown during the import.

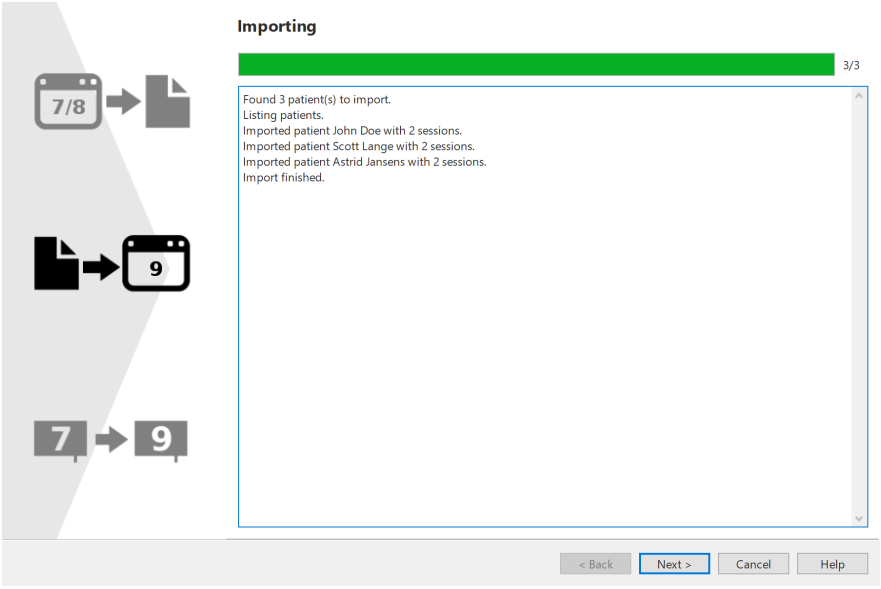


Figure 138: Migration importing page.

Details about the data that is being imported is listed in the screen.

Please note that depending on the size of your footscan 7 or 8 database, migration could take several hours.

After the import is finished the Next > button will be enabled. Click the Next > button to continue.

19.5 Upgrade Plates Page

This screen allows you to upgrade your plate(s) to be compatible with the footscan 9 series software.

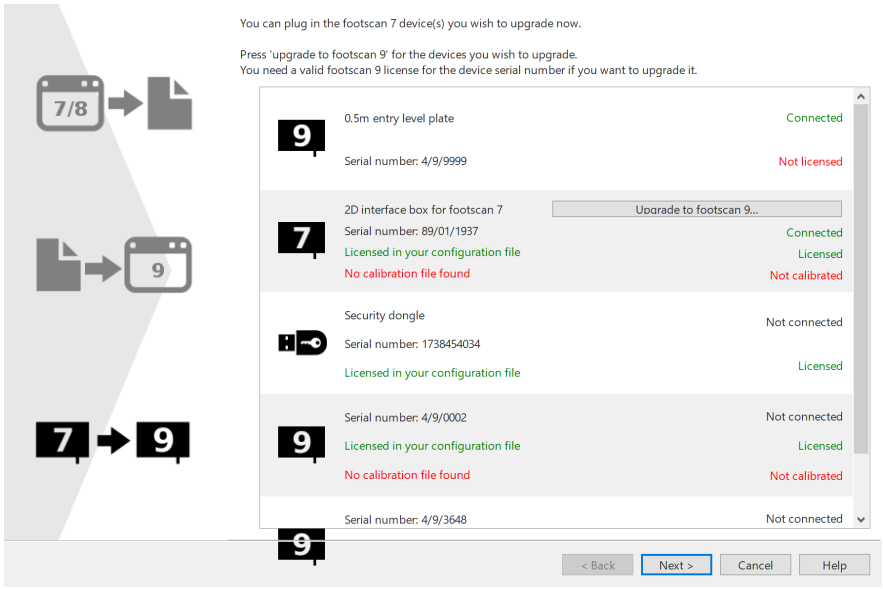


Figure 139: Migration upgrade plates page.

If there is a footscan 7 or 8 device connected to the computer which can be upgraded to be compatible with the footscan 9 software, there will be a Upgrade to footscan 9... button shown next to the device. See 19.7 for more information about upgrading your device.

Click the Next > button to continue.

19.6 Migration Done Page

When the migration is finished, the following screen will be shown.

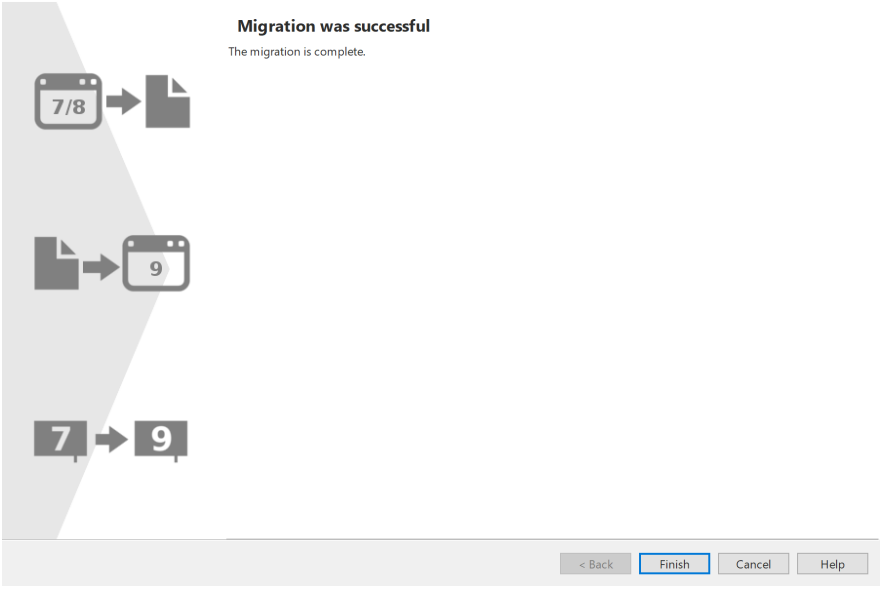


Figure 140: Migration done page.

Click the Finish button to finish the migration and close the wizard.

19.7 Upgrade Plate

A footscan 7 device needs a firmware upgrade, to be licensed in the configuration file and a calibration file to be compatible with the footscan 9 series software.

A footscan 8 device does not need a firmware upgrade to be compatible with footscan 9. It does need to be licensed in the configuration file and a calibration file needs to be present.

There are different ways to start a conversion of your plate:

- When you connect a footscan 7 device to your computer there will be a status button (7) with a balloon message asking to upgrade your device.

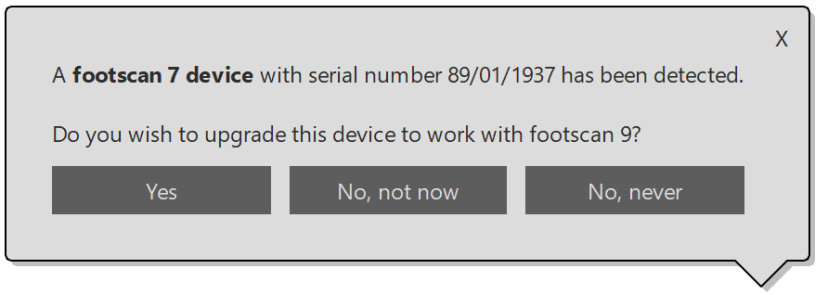


Figure 141: Start upgrade plate balloon message.

- When a footscan 7 device is connected to your computer, there will be a Upgrade to footscan 9... button visible in the license and hardware calibration manager. Clicking this button will start the plate conversion.

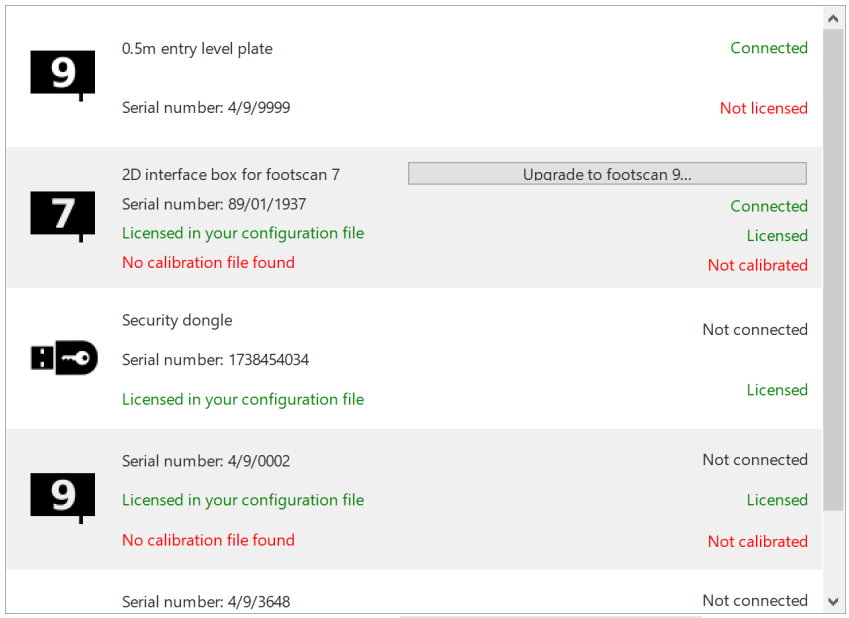


Figure 142: Device list with Upgrade to footscan 9... button.

- You can upgrade your footscan 7 device during the full migration from footscan 7 to footscan 9 (see 19.5).

Before upgrading, ensure your device is licensed in the configuration file and that a calibration file for your device is present. If the software can't detect a valid license or calibration, an error message is shown and the upgrade cannot be completed. Please contact support.motion@materialise.be if you have questions about your license or calibration.

If you start an upgrade and you have a valid footscan 9 license and calibration, then the following screen is shown:

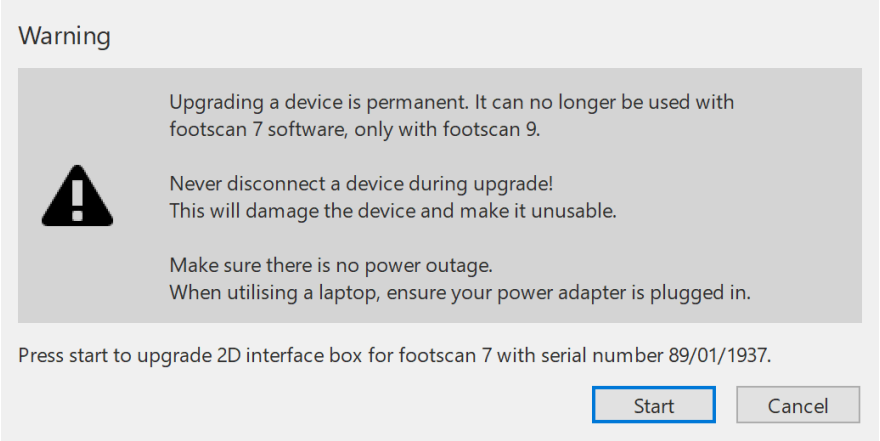


Figure 143: Upgrade plate dialog intro.

Please read the following warnings carefully before upgrading your device:

Upgrading a device is permanent. It can no longer be used with the footscan 7 software, only with footscan 9.

Never disconnect a device during the upgrade! This will damage the device and make it unusable.

Never cut power or shutdown the computer during an upgrade. When utilizing a laptop, ensure its power adapter is plugged in.

Clicking the Start button will start the conversion, the following screen will be shown during the conversion:

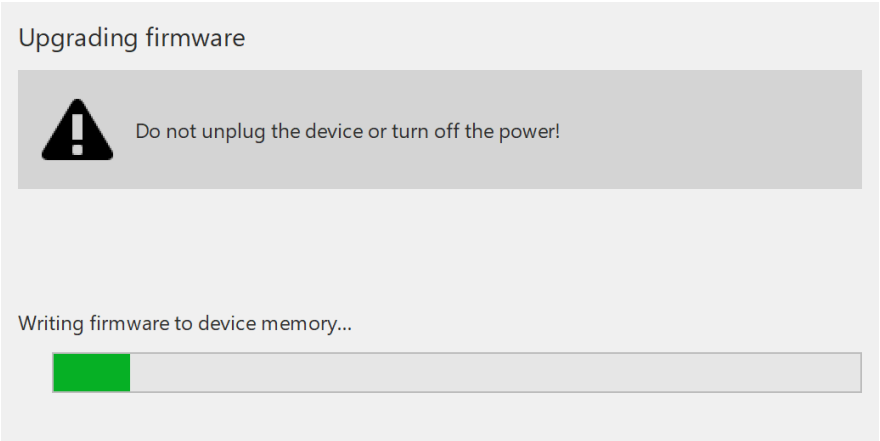


Figure 144: Upgrade plate dialog upgrading.

When the upgrade is finished, the following screen is shown:

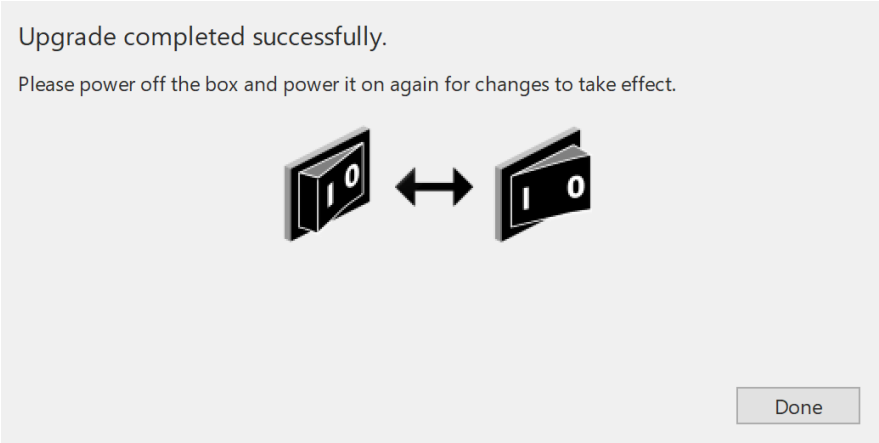


Figure 145: Upgrade plate dialog done.

If your setup contains an interface box, then you need to turn the power of the interface box off and on. If your device is a USB plate, you need to unplug and re-plug the plate.

Click the Done button to finish the upgrade.

If there was an error during the upgrade of your device, there will be an error screen. You need to close the dialog by clicking the Done button. Please contact support.motion@materialise.be if problems during plate conversion persist.

Part 4

Appendices

Chapter 20

System specifications

This appendix contains the technical specifications of all entry level footscan plates, as well as all interface box setups.

20.1 Entry Level 0.5m plate

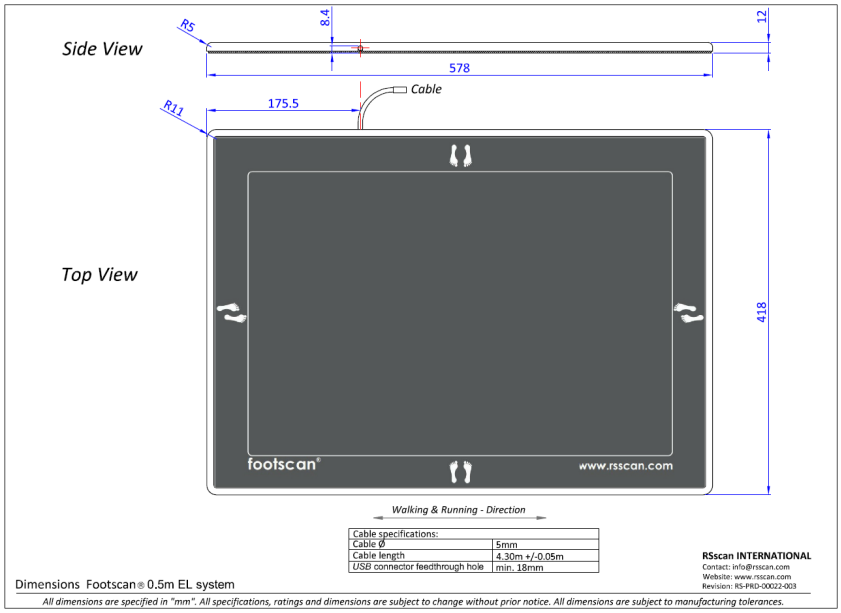


Figure 146: Dimensions entry level 0.5m plate

Dimensions (length x width x height)	578mm x 418 mm x 12mm
Weight	4.2kg
Number of sensors	4096 (arranged in a 64x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	488mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	300Hz
Resolution	10bits
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Connection to PC	USB2.0
Plate cable length	4300mm ± 50mm (integrated cable)
Power consumption	5V @ 500mA maximum
Protection class	I
IP code	IP40

20.2 Entry Level 1m plate

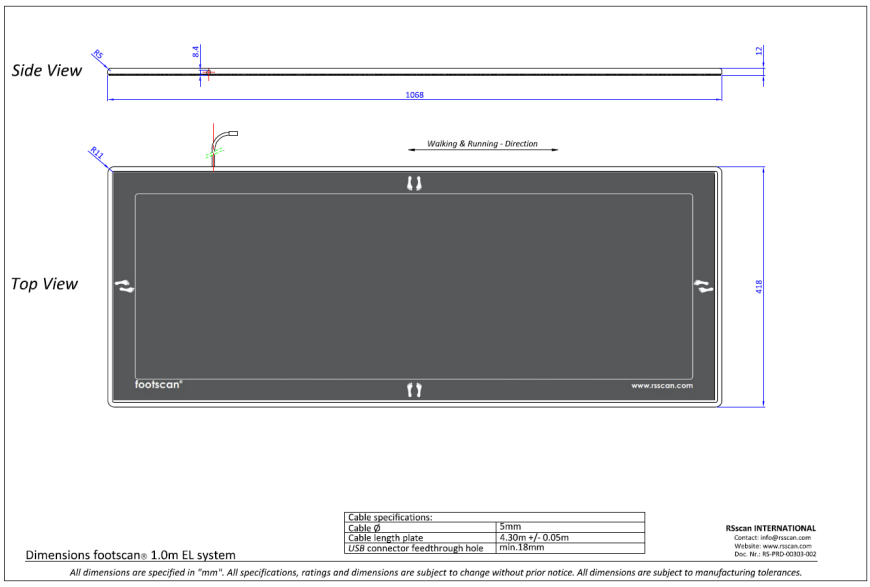


Figure 147: Dimensions entry level 1m plate

Dimensions (length x width x height)	1068mm x 418 mm x 12mm
Weight	8.3kg
Number of sensors	8192 (arranged in a 128x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	975mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	200Hz
Resolution	10bits
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Connection to PC	USB2.0
Plate cable length	4300mm ± 50mm (integrated cable)
Power consumption	5V @ 500mA maximum
Protection class	I
IP code	IP40

20.3 Entry Level 1m heavy duty plate

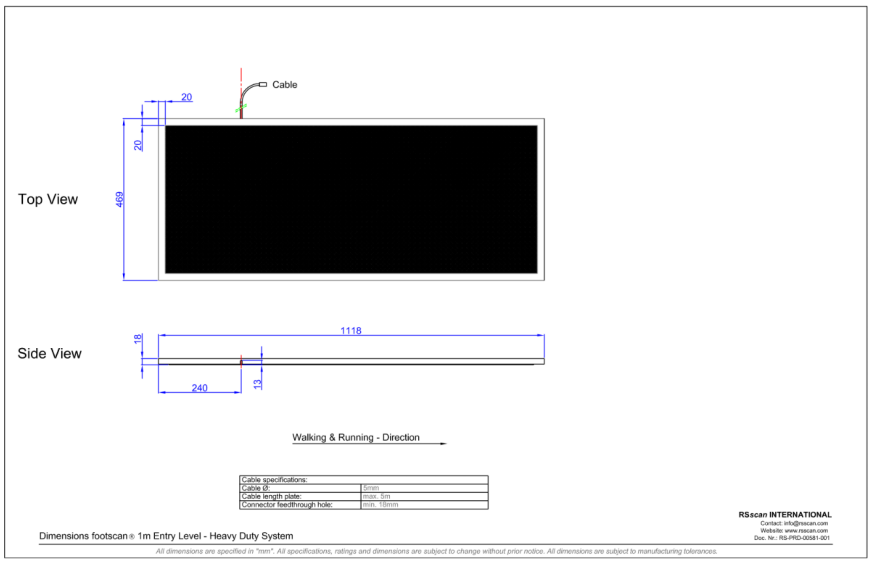


Figure 148: Dimensions entry level 1m heavy duty plate

Dimensions (length x width x height)	1118mm x 469 mm x 18mm
Weight	16.5kg
Number of sensors	8192 (arranged in a 128x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	975mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	200Hz
Resolution	10bits
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Connection to PC	USB2.0
Plate cable length	4600mm ± 50mm (detachable cable)
Power consumption	5V @ 500mA maximum
Protection class	I
IP code	IP40

20.4 Entry Level 1.5m plate

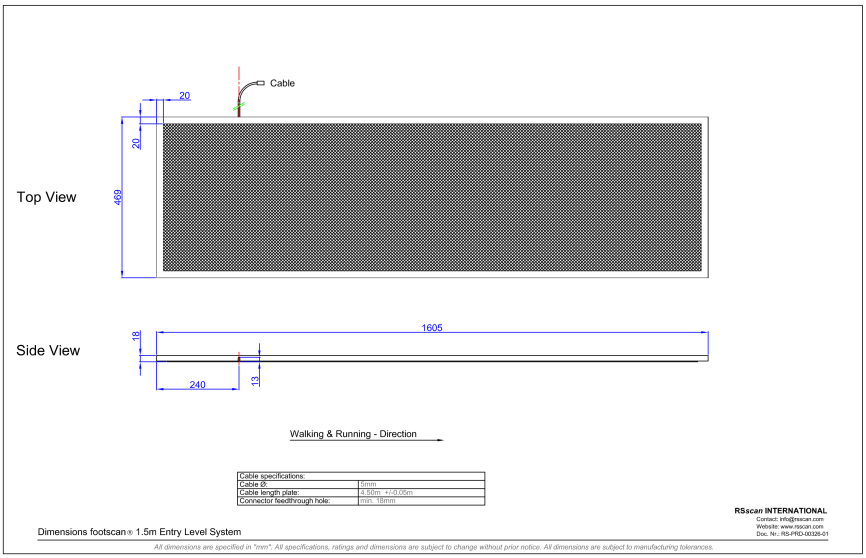


Figure 149: Dimensions entry level 1.5m plate

Dimensions (length x width x height)	1605mm x 469 mm x 18mm
Weight	24kg
Number of sensors	12288 (arranged in a 192x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	1463mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	200Hz
Resolution	10bits
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Connection to PC	USB2.0
Plate cable length	4600mm ± 50mm (detachable cable)
Power consumption	5V @ 500mA maximum
Protection class	I
IP code	IP40

20.5 Interface box

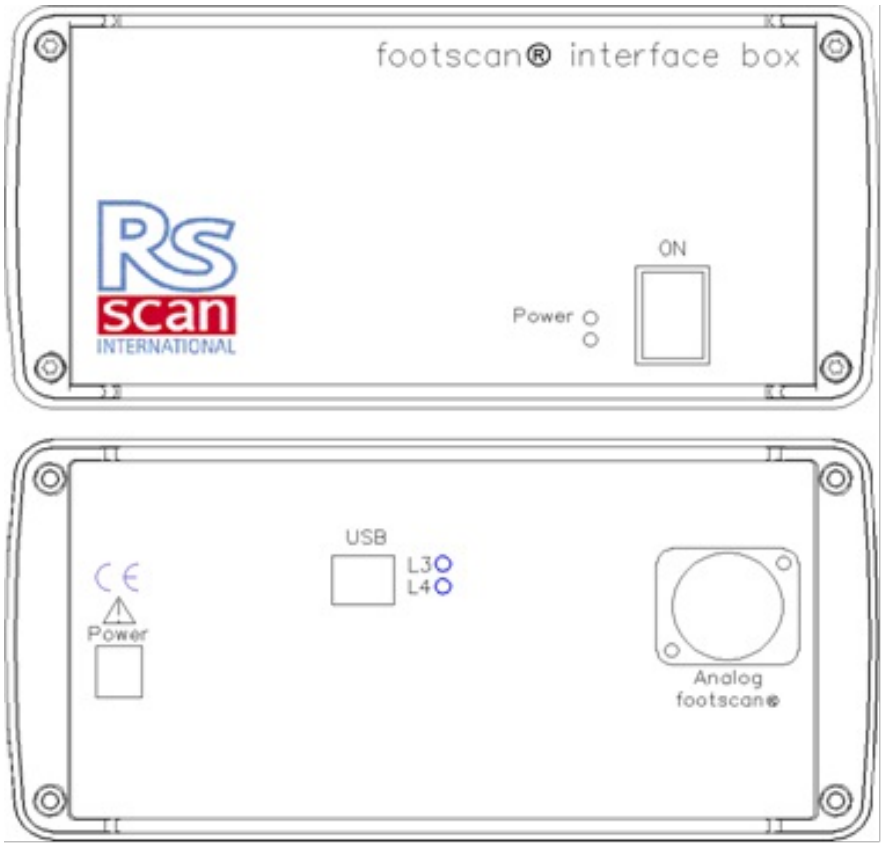


Figure 150: Interface box

Dimensions (length x width x height)	220mm x 190mm x 94mm
Weight	2.2kg
Data acquisition frequency	Up to 500Hz
Resolution	12bits
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Connection to PC	USB2.0 (standard USB cable A-B 5m)
Power	12V DC
Power consumption	with footscan 0.5m plate: 8.24W
	with footscan 1m plate: 10.95W
	with footscan 2m plate: 13.65W
Protection class	I
IP code	IP40

20.6 0.5m footscan plate for interface box

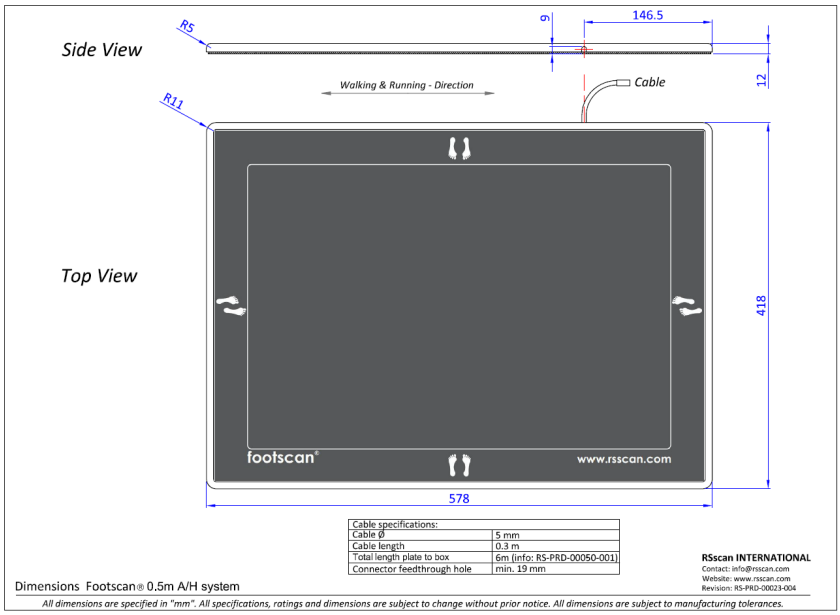


Figure 151: Dimensions 0.5m footscan plate for interface box

Dimensions (length x width x height)	578mm x 418 mm x 12mm
Weight	4.2kg
Number of sensors	4096 (arranged in a 64x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	488mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	500Hz
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Plate cable length	300mm ± 50mm (integrated cable)
Total cable length to footscan interface box	6000mm ± 50mm
Protection class	I
IP code	IP40

20.7 1m footscan plate for interface box

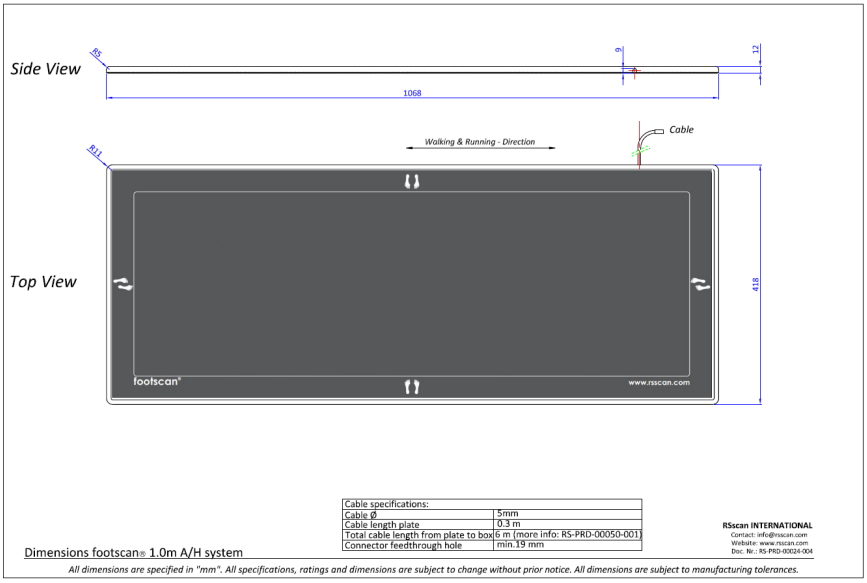


Figure 152: Dimensions 1m footscan plate for interface box

Dimensions (length x width x height)	1068mm x 418 mm x 12mm
Weight	7.7kg
Number of sensors	8192 (arranged in a 128x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	975mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	250Hz
Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Plate cable length	300mm ± 50mm (integrated cable)
Total cable length to footscan interface box	6000mm ± 50mm
Protection class	I
IP code	IP40

20.8 2m footscan plate for interface box

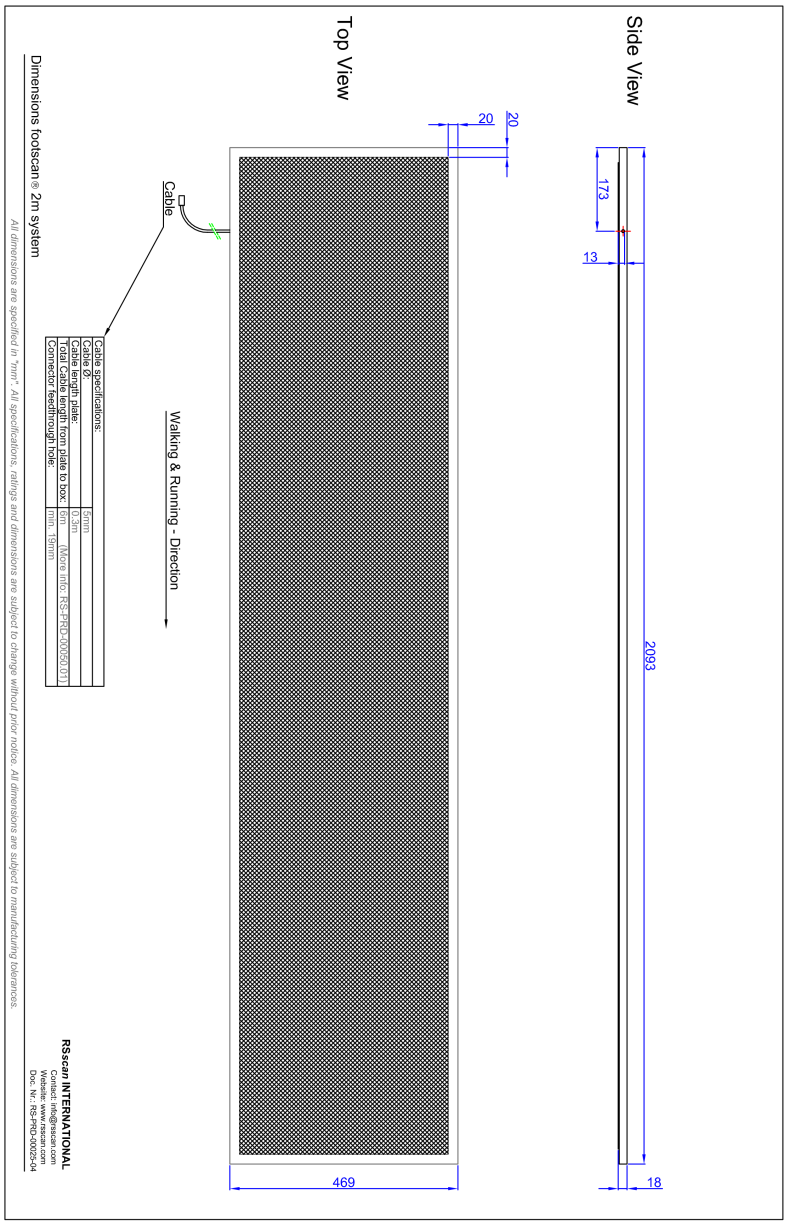


Figure 153: Dimensions 2m footscan plate for interface box

Dimensions (length x width x height)	2093mm x 469 mm x 18mm
Weight	28.8kg
Number of sensors	16384 (arranged in a 256x64 matrix)
Sensor dimensions	7.62mm x 5.08mm
Active sensor area	1950mm x 325mm
Sensor technology	resistive
Pressure range	1-127 $^{N}/_{cm^2}$
Data acquisition frequency	125Hz

Operating temperature range	+15 °C to +30 °C
Storage temperature range	+0 °C to +40 °C
Relative humidity	20% to 80% non-condensing
Plate cable length	300mm ± 50mm (integrated cable)
Total cable length to footscan interface box	6000mm ± 50mm
Protection class	I
IP code	IP40

Chapter 21

Risk analysis and the gait ratios graphs.

References:

[1] Franklyn-Miller A, Bilzon J, Wilson C, McCrory P. Can RSScan footscan D3D software predict injury in a military population following plantar pressure assessment? A prospective cohort study. Foot 2013;24:6–10. doi:10.1016/j.foot.2013.11.002.

[2] Franklyn-Miller A, Wilson C, Bilzon J, McCrory P. Foot orthoses in the prevention of injury in initial military training: a randomized controlled trial. Am J Sports Med 2011;39:30–7. doi:10.1177/0363546510382852.

Description:

The footscan 9 software has the risk analysis and gait ratios graphs as functionality, these were also present in the footscan 7 software, but were named differently. The 'D3D software' in footscan 7 contained the risk analysis and the construction of insoles. In the footscan 9 software this is divided in the risk analysis screen and the construction of insoles is available through the Phits™ and D3D design wizards. The footscan 9 gait ratios graphs were named the 'Balance' graphs in footscan 7.

The risk analysis algorithm used by the footscan 9 software is based on a study of runners' service in which long distance runners (100km/week) that were at least three years pain and injury free (very low injury risk profile) participated as well as knowledge gained from over 25.000 footscan measurements performed by several collaborating universities and internal researchers. As the correlation between static foot posture parameters and dynamics is not confirmed, the aim of this study was to determine relevant parameters to describe the risk on injury as well as the optimal orthotic support for an individual based on dynamic plantar pressure measurements (in contrast to the conventional static techniques used). The relevant parameters derived from this study are balance within one foot (rearfoot balance during heel strike phase, 0-15% stance phase (SP); midfoot balance during midstance, 25-40% SP; forefoot balance during heel off phase, 50-80% SP).

The footscan risk analysis algorithm was scientifically validated in a prospective cohort study [1] that aimed to identify the ability of footscan to predict the injury risk in 200 male subjects from a military population. Participants were graded using the footscan risk analysis as to high (≥ 2 correction), medium (= 1 correction) and low risk (= no corrections) of injury and were followed up for injury through their basic training. Results showed that participants categorized in the high-risk group for injury were significantly more likely to sustain injury than in medium or low groups ($p < 0.001$, OR 5.28 with 95% CI 2.88, 9.70). This proved the predictive value of footscan 9 software in the correct prediction of lower limb injury risk.

The algorithm was furthered to provide advice towards optimal orthoses based on individual dynamic plantar pressure measurements. Both a modular insole (D3D insole) as a 3D printed insole (Phits™ insole) are based on this algorithm. The effectiveness of the modular insoles based on the D3D algorithm is proven within a randomized controlled study [2]. Within this study, 400 male subjects from a military population that presented medium or high risk on injuries participated. Participants were randomized to either receive or not receive D3D orthoses (produced based on footscan analysis) and followed up for injury during their training. Results demonstrated the effectiveness of the D3D orthoses an absolute risk reduction of 49% from the use of D3D orthoses.

Footscan 9 software allows to compare the gait ratios graphs of a new subject to those of the group of subjects with a very low injury risk profile. This low risk injury profile is made visible in the gait ratios graphs as a solid area in the graphs.

Example of 3D interface box settings for a particalur force plate.

As an example lets assume a force plate will be connected to analog channels 1-6 (respectively connecting force plate outputs F_x, F_y, F_z, M_x, M_y, M_z). The force plate manufacturer provides data that describes how the measured values are affected by the applied forces and moments. In this case in the form of two 6x6 sensitivity matrices. We will use the inverted sensitivity matrix, with values in terms of N/(μV/V_{ex}) on rows 1-3 and Nm/(μV/V_{ex}) on rows 4-6:

$$S^{-1} = B = \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} & b_{16} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} & b_{26} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} & b_{36} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} & b_{46} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & b_{56} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} \end{bmatrix}$$

The values on the first 3 rows can be entered into footscan 9 in terms of V/N factors as follows:

Channel	X-factor (V/N)	Y-factor (V/N)	Z-factor (V/N)
1	k/b_{11}	k/b_{21}	k/b_{31}
2	k/b_{12}	k/b_{22}	k/b_{32}
3	k/b_{13}	k/b_{23}	k/b_{33}
4	k/b_{14}	k/b_{24}	k/b_{34}
5	k/b_{15}	k/b_{25}	k/b_{35}
6	k/b_{16}	k/b_{26}	k/b_{36}

$$\text{with } k = \frac{G \cdot E}{10^6}$$

where G is the gain (typically somewhere between 1000 and 2000), E is the excitation voltage (typically 5 or 10 volts).