ottobock.

TF Design

Clinician training II – Advanced + tips & tricks

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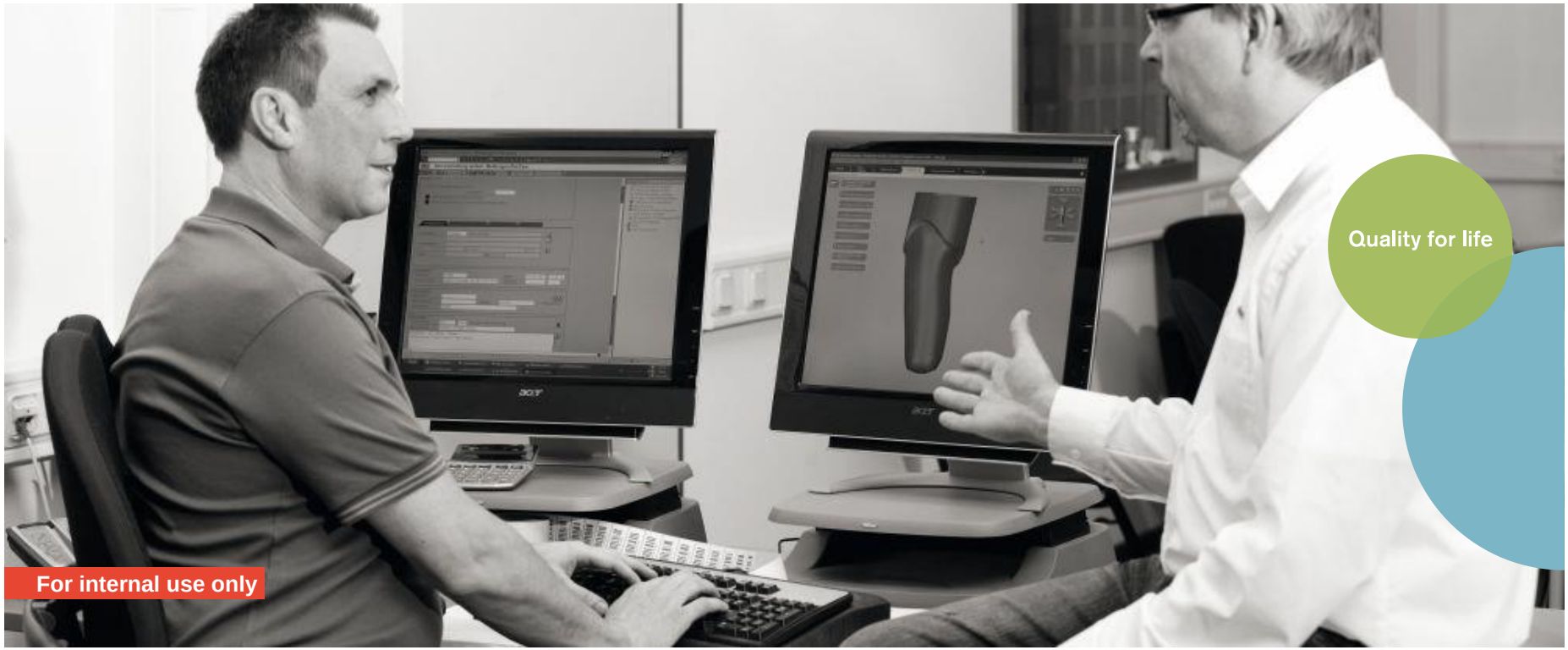


Agenda

1. Measurements
2. Software
3. Socket shapes
4. Software settings
5. Fabrication
6. Fitting

Measurements

Measurements

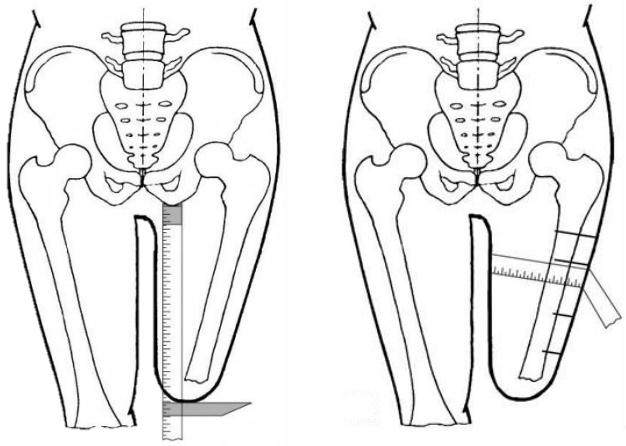
Taking measurements

Minimum

- Residual limb length
- 3 residual limb circumferences

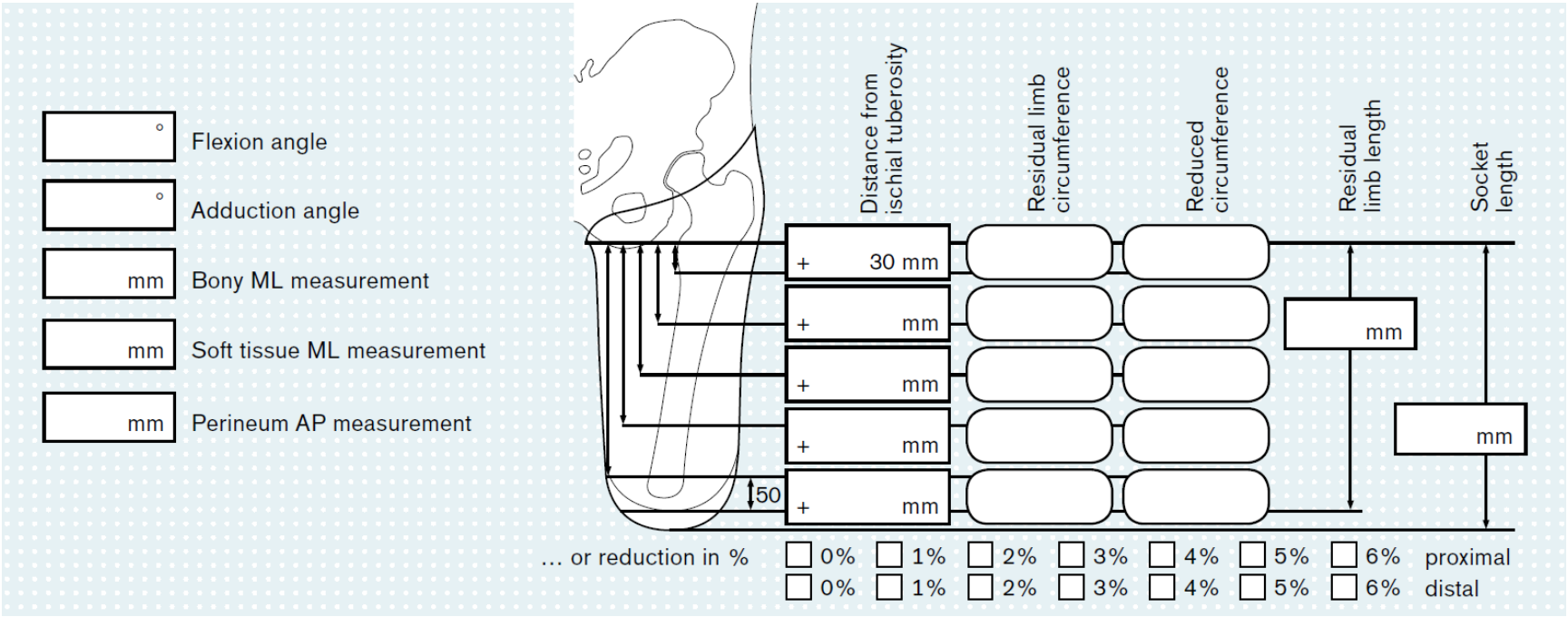
Optional

- 2 more residual limb circumferences
- Perineum AP measurement
- Bony ML measurement
- Soft tissue ML measurement
- Flexion angle
- Adduction angle



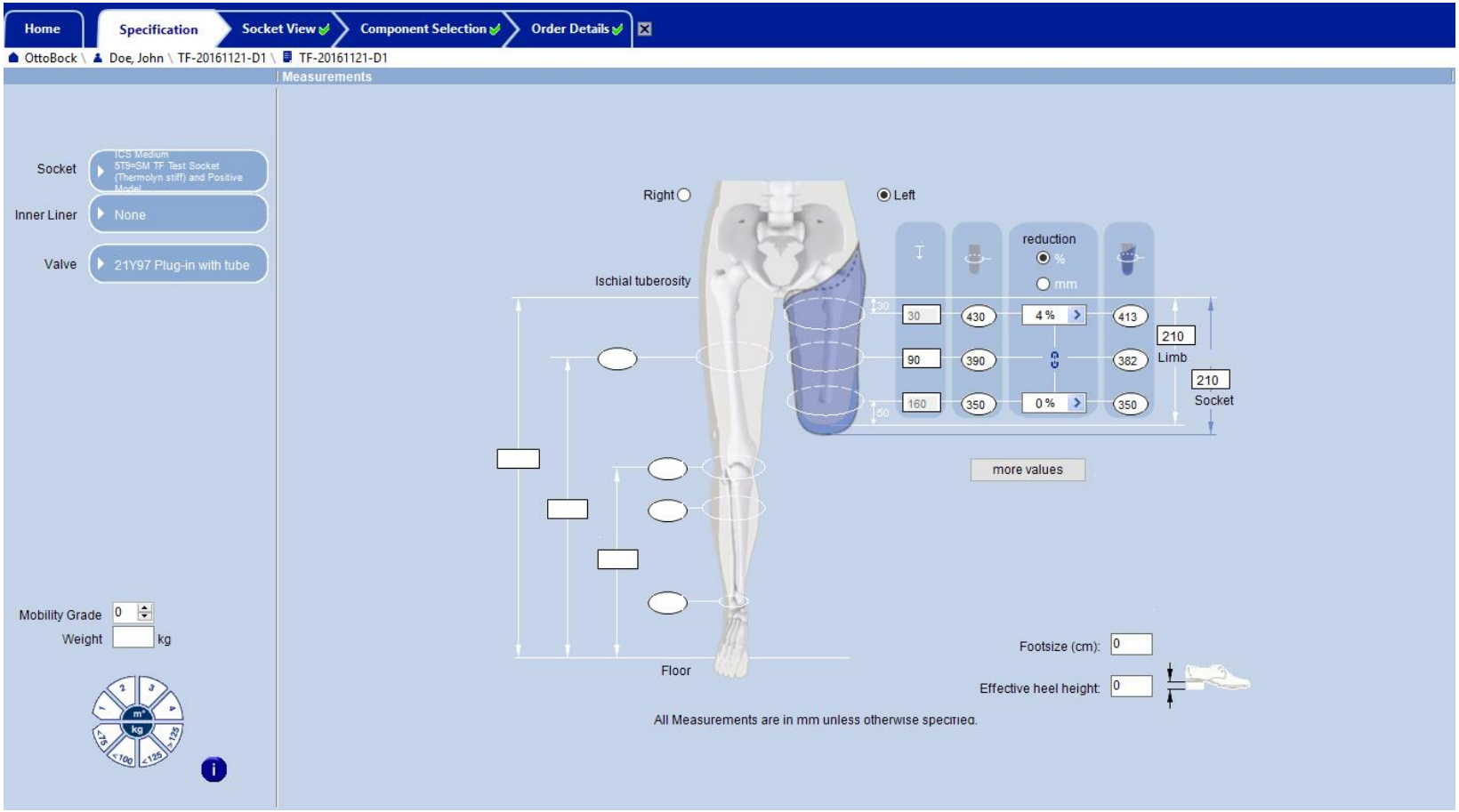
Measurements

Order form



Measurements

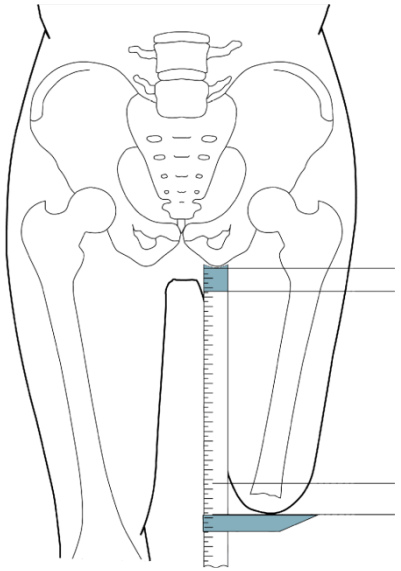
Enter data in software



Measurements

Length measurement

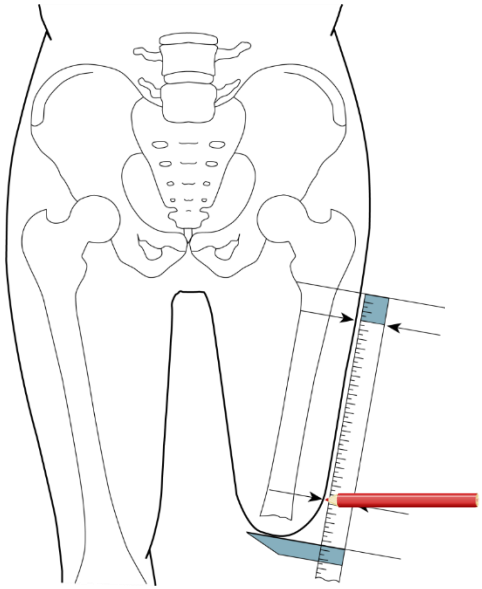
- Involve the user when taking measurements
- Ask whether the callipers are properly positioned under the ischial tuberosity
- Checking measurements
  - If you have measured the distance to the ischial tuberosity correctly, the first circumference measurement (30 mm below the ischial tuberosity) should be at approximately the same height as the perineum
- Do not compress the end of the residual limb while measuring (excess tissue will require space later on)
- A socket that is too short always results in insufficient enclosure of the ischial tuberosity



Measurements

Circumferences and their heights (1/2)

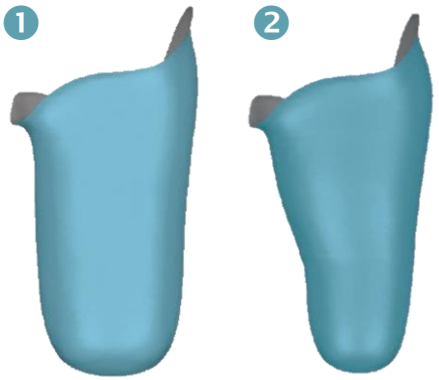
- Position the callipers, with the residual limb length still set, laterally on the residual limb so you can transfer the heights for the circumferences
- Mark the height of the proximal circumference 30 mm below the height of the ischial tuberosity on the residual limb
- Mark the height of the distal circumference 50 mm above the end of the residual limb
- Define at least one more circumference height between these measurements

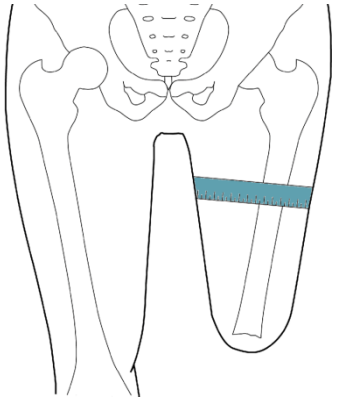


Measurements

Circumferences and their heigths (2/2)

- If the residual limb has a consistent shape (1), three circumferences are sufficient even for longer residual limbs (if too many measurements are taken, the surface of the socket becomes crimped due to the “caterpillar effect”)
- For more complex residual limb shapes (2), four to five circumference measurements may be helpful – e.g. in the case of bulb-shaped residual limbs or if the residual limb circumference decreases abruptly towards the distal end
- Use the 743B4 spring-tensioned measuring tape for measuring
- Position the measuring tape at a 90° angle to the longitudinal axis of the residual limb
- Take the measurement with the muscles tensed and relaxed and use the average of the measurements
- Tip: take as few measurements as possible so the socket wall remains uniform

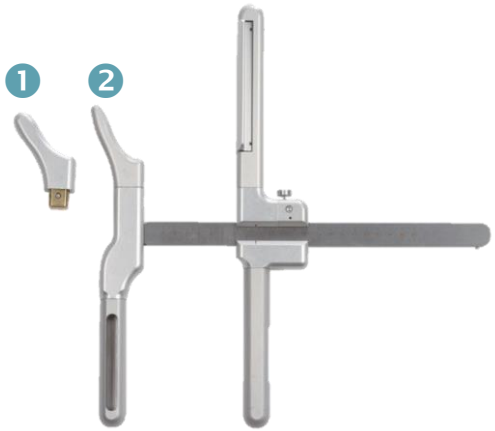


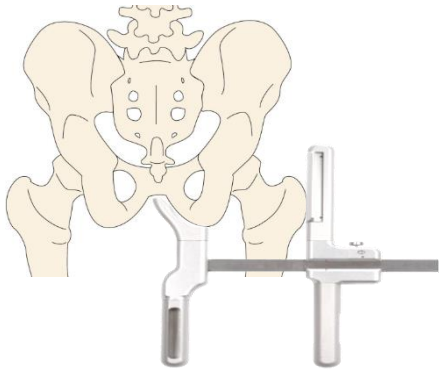


Measurements

Bony ML measurement

- Use the 743S21 or 743S20 callipers
- Select the appropriate angle support for women (❶) or men (❷)
- Position the callipers and angle support under the ischial tuberosity and slide them behind the ramus in the medial direction
- Lock the callipers laterally
- The callipers can be moved horizontally to check that it is positioned correctly – the movement should be transmitted to the patient at a ratio of 1 : 1
- The measurement should be repeated to ensure correct positioning behind the ramus





Measurements

Liners

Liners

- For liner treatment, always measure the length and circumference measurements on top of the liner
- Include the liner cap when measuring the socket length

For new treatments

- Carry out compression therapy at least one week in advance
- The user should wear the liner for at least half an hour before measurements are taken

Software

Software

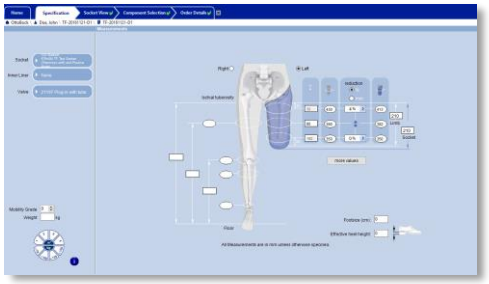
Hardware requirements

	Recommended Specification	Minimum Requirements	
Operating system	Windows 7, 8, 10	Windows 7, 8, 10 32bit	Windows 7, 8, 10 64 bit
CPU	Intel Core2Duo or better	Intel pentium 650/3,4 Ghz	Intel Core2Duo or better
RAM	4 GB or more	1,5 GB	2 GB
Memory	1,5 GB free stor-age space	1,5 GB free storage space	
Display	1024 x 768/32 bit		
Drive	CD/DVD drive	----	----
Input device	mouse/keyboard		

Software
Workflow

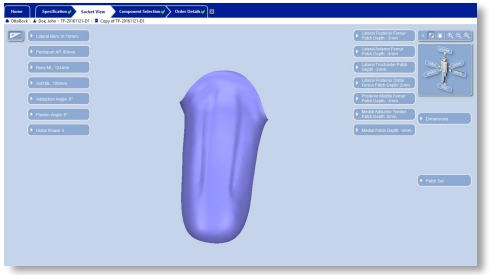
Order Details

- Selection of the socket-specific data and entry of the patient measurements



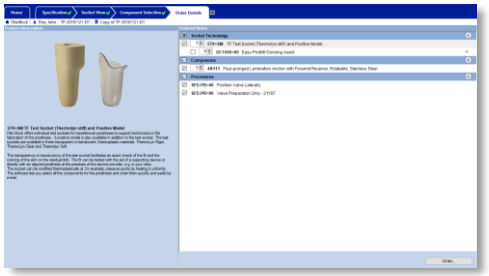
Socket Design

- Three-dimensional view of the prosthetic socket, with the option to make corrections



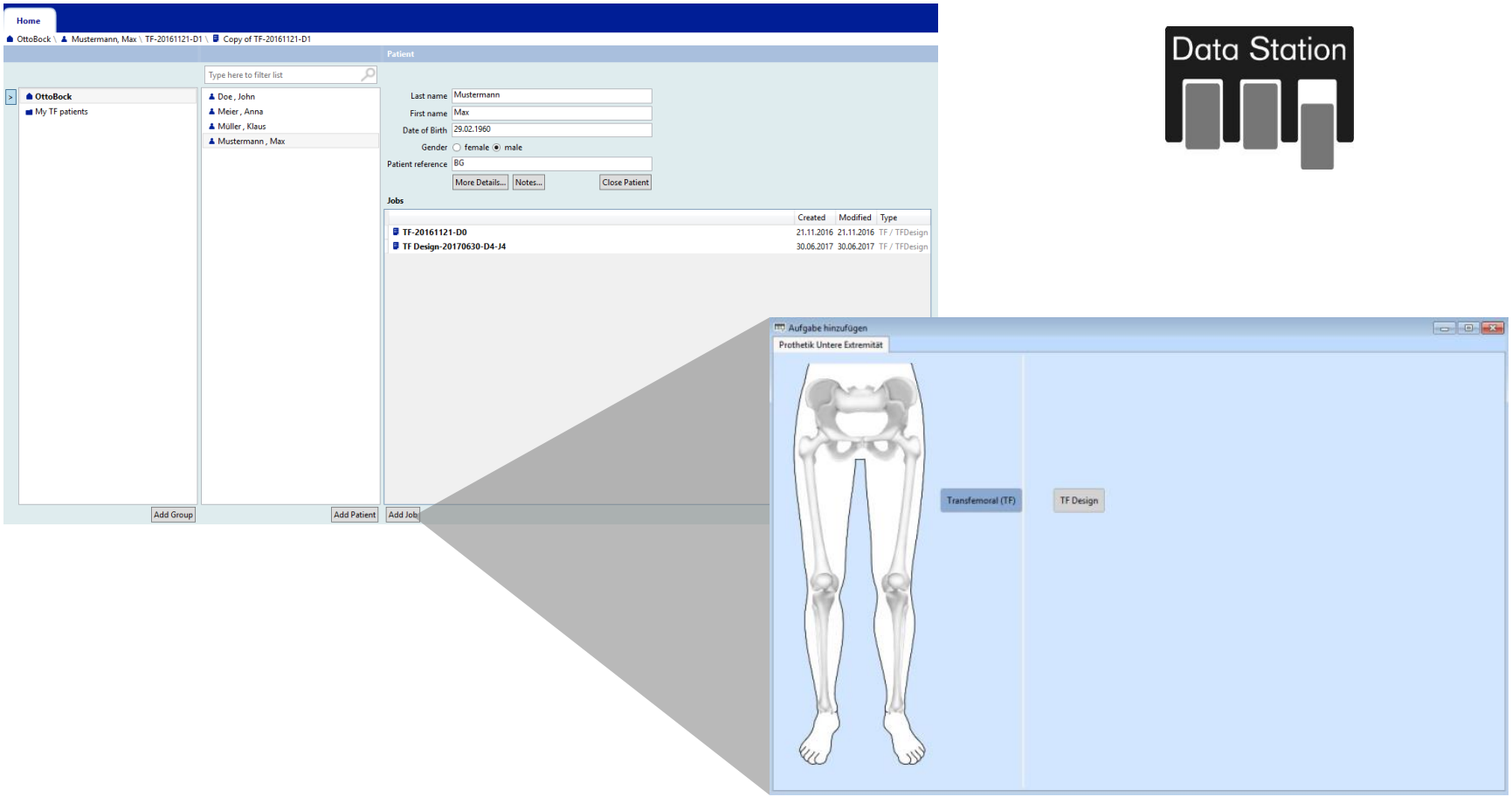
Order

- Display and processing of the purchase order for the current job



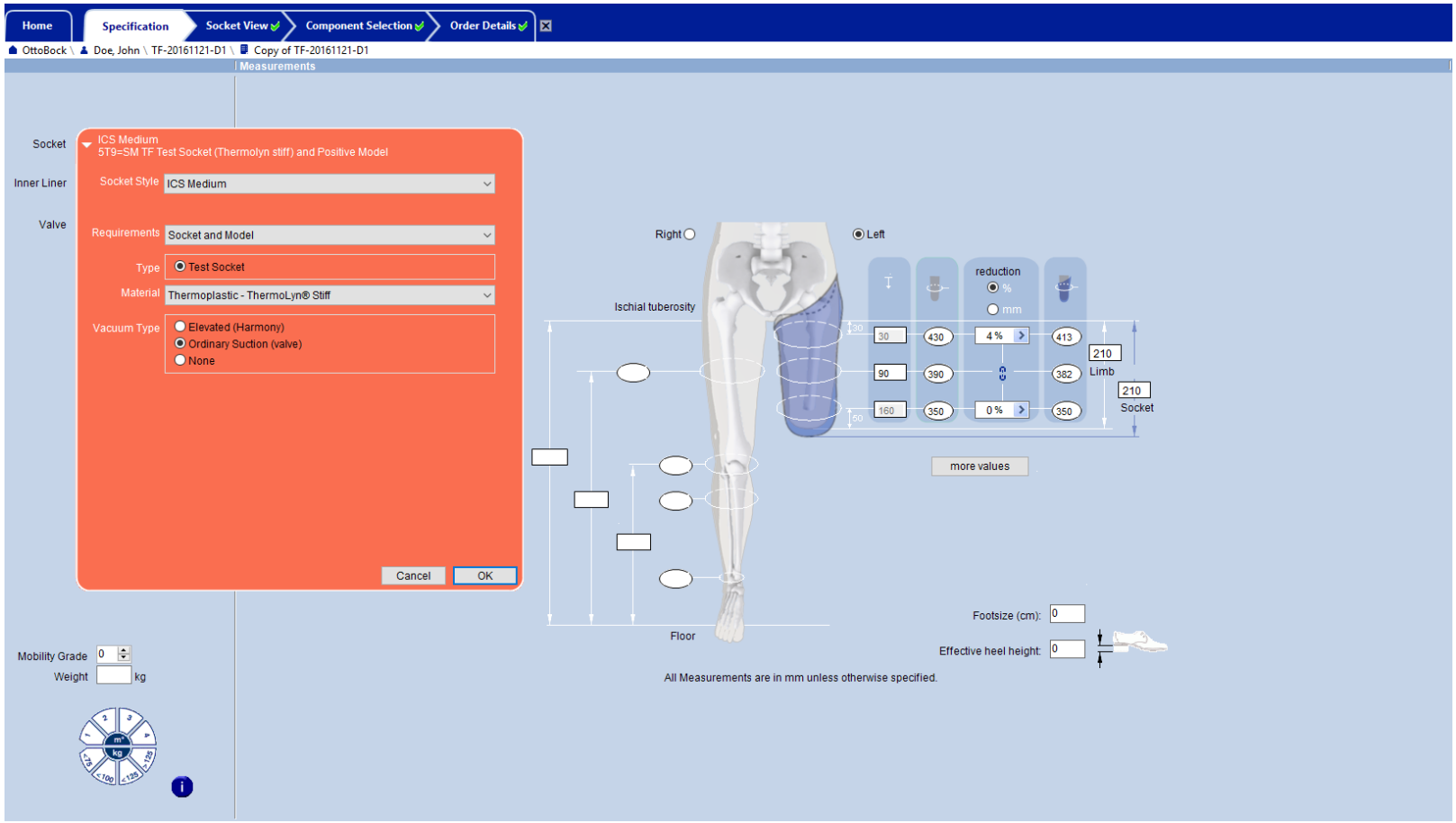
Software

DataStation



Software

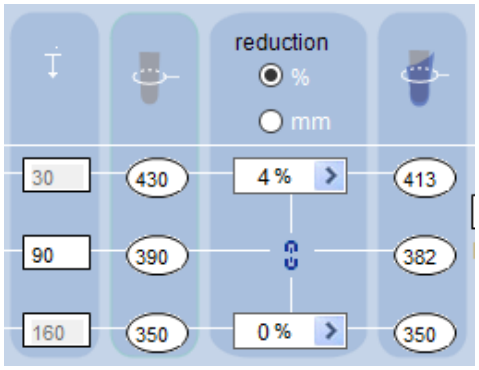
Specification



Software
Reduction

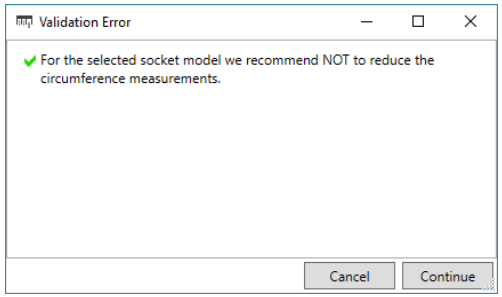
Standard reduction for circumferences

- If there is no liner, reduce by 4% proximally and 0% distally
- If there is a liner, reduce by 2% to 3% proximally and 0% distally
- The intermediate measurements should be reduced equally



Exception

- With the ProSeal socket shape, the measurements should not be further reduced if the measurements are taken with a liner

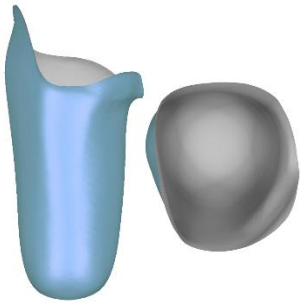


These measurements are recommendations; they must be individually adapted to the residual limb condition for unusual residual limb shapes

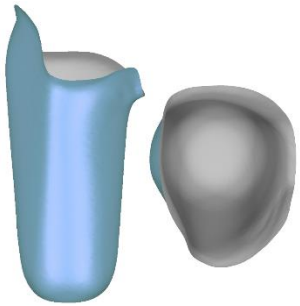
Socket shapes

Socket shapes

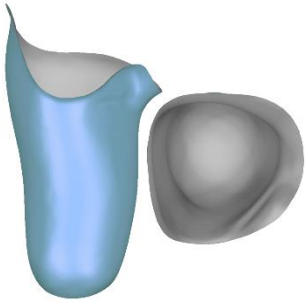
Overview



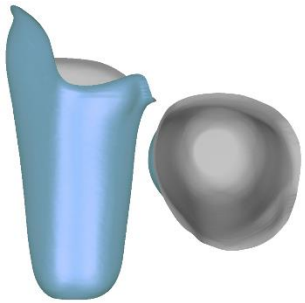
SIT-Cast Medium



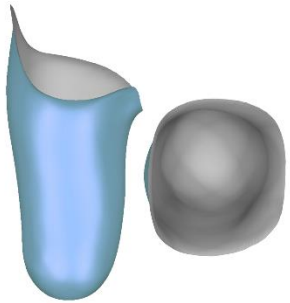
SIT-Cast Contoured



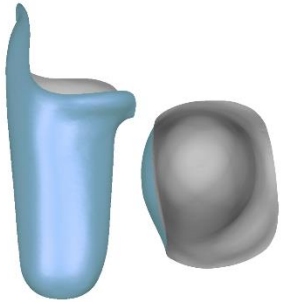
SIT-Cast Advanced



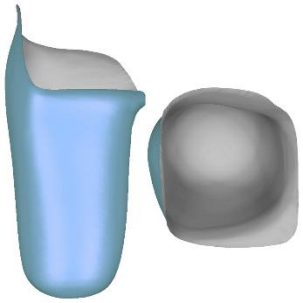
SIT-Cast Feminine Contoured



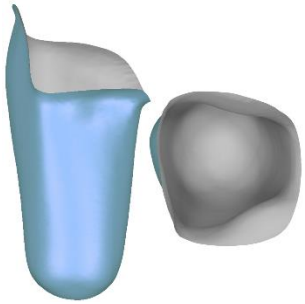
ProSeal



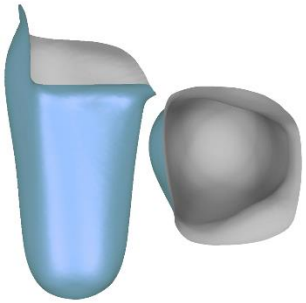
Hybrid



Quadrilateral Medium



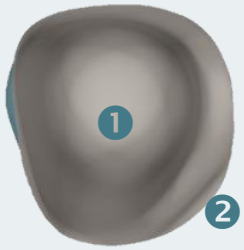
Quadrilateral Contoured



Quadrilateral Feminine Contoured

Socket shapes

SIT-Cast Medium

View				
Proximal	Anterior	Posterior	Lateral	Medial
				

Classic ICS model

❶ Rounded socket entry plane

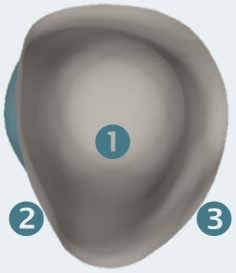
❷ Bevelled ischial tuberosity support (angle not too high)

❸ Straight socket shape with socket brim extended in the medial direction ⇨ more comfortable soft tissue guidance, reduction of edge pressure

❹ Exposed exit for ramus ⇨ prevents pressure problems

Socket shapes

SIT-Cast Contoured

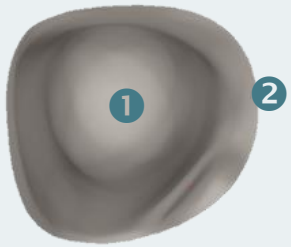
View				
Proximal	Anterior	Posterior	Lateral	Medial
				

Classic ICS model

❶ Contoured socket entry plane (ischial containment)
❷ Better dorsolateral positioning of the support to guide the femur ⇨ improved control of the prosthesis
❸ High-angle support for ischial tuberosity ⇨ provides pronounced enclosure
❹ Straight socket shape
❺ Exposed exit for ramus ⇨ prevents pressure problems

Socket shapes

SIT-Cast Advanced

View				
Proximal	Anterior	Posterior	Lateral	Medial
				

Reworked ICS model

❶ Contour near the point of intersection adjusted

❷ Area of the adductor tendon extended in the medial direction ⇨ prevents pressure problems

❸ Frontal trim line is drawn significantly outwards in the medial direction and given a large radius ⇨ more comfortable soft tissue guidance, reduction of edge pressure during pronounced hip flexion

❹ Dorsal socket brim is anatomically rounded and positioned lower down ⇨ prevents strong pressure on the gluteal musculature

❺+❻ Central socket area is curved in the medial (❺) and frontal (❻) directions ⇨ lateral and dorsal support surface for the femur

❼ End area of the residual limb extended in the distolateral and dorsal directions ⇨ relief for the tip of the femur and more adducted position for the femur due to banana shape

Not suitable for femur lengths below 18 cm: the ICS Medium is an alternative

Socket shapes

SIT-Cast Feminine Contoured

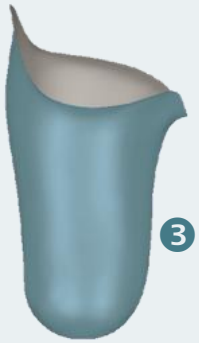
View				
Proximal	Anterior	Posterior	Lateral	Medial
				

ICS model – adapted to feminine anatomy

❶ Rounded socket entry plane
❷ Ischial tuberosity enclosure approx. 45° to medial plane
❸ Straight socket shape
❹ Exposed exit for ramus ⇨ prevents pressure problems

Socket shapes

ProSeal

View				
Proximal	Anterior	Posterior	Lateral	Medial
				

Socket model optimised for ProSeal liner + ProSeal ring (can also be ordered without either)

❶ Rounded socket shape (for ProSeal ring)
❷ Ischial tuberosity support bevelled for comfort
❸ Slight banana shape (similar to ICS Advanced)
❹ Exposed exit for ramus ⇨ prevents pressure problems

Socket shapes

Hybrid

View				
Proximal	Anterior	Posterior	Lateral	Medial
				

ICS model with bevelled “ischial tuberosity slide”

❶ Hybrid between quadrilateral and elliptical socket design

❷ Ischial tuberosity support bevelled for comfort ⇨ prevents pelvis from tipping forwards therefore less pressure on the femoral vessels

❸ Straight socket shape

- Option for mobility grades 1+2 and older patients
- A good option for converting from a quadrilateral to an ischial containment socket

Socket shapes

Quadrilateral Medium

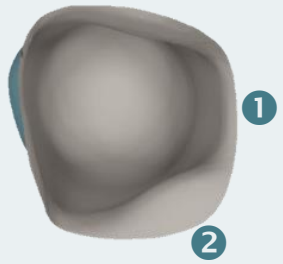
View				
Proximal	Anterior	Posterior	Lateral	Medial
				

Quadrilateral model

1. Round, bevelled socket shape with ischial support
2. Forward tipping of the pelvis reduced with adjustable anterior patch
3. Straight socket shape

Socket shapes

Quadrilateral Contoured

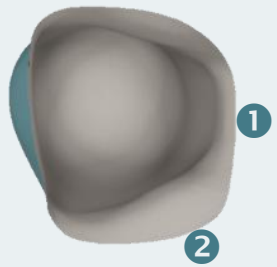
View				
Proximal	Anterior	Posterior	Lateral	Medial
				

Quadrilateral model

❶ Narrow perineum width results in triangular socket shape
❷ Contoured ischial support
❸ Adjustable anterior patch ⇨ reduces forward tipping of the pelvis
❹ Straight socket shape

Socket shapes

Quadrilateral Feminine Contoured

View				
Proximal	Anterior	Posterior	Lateral	Medial
				

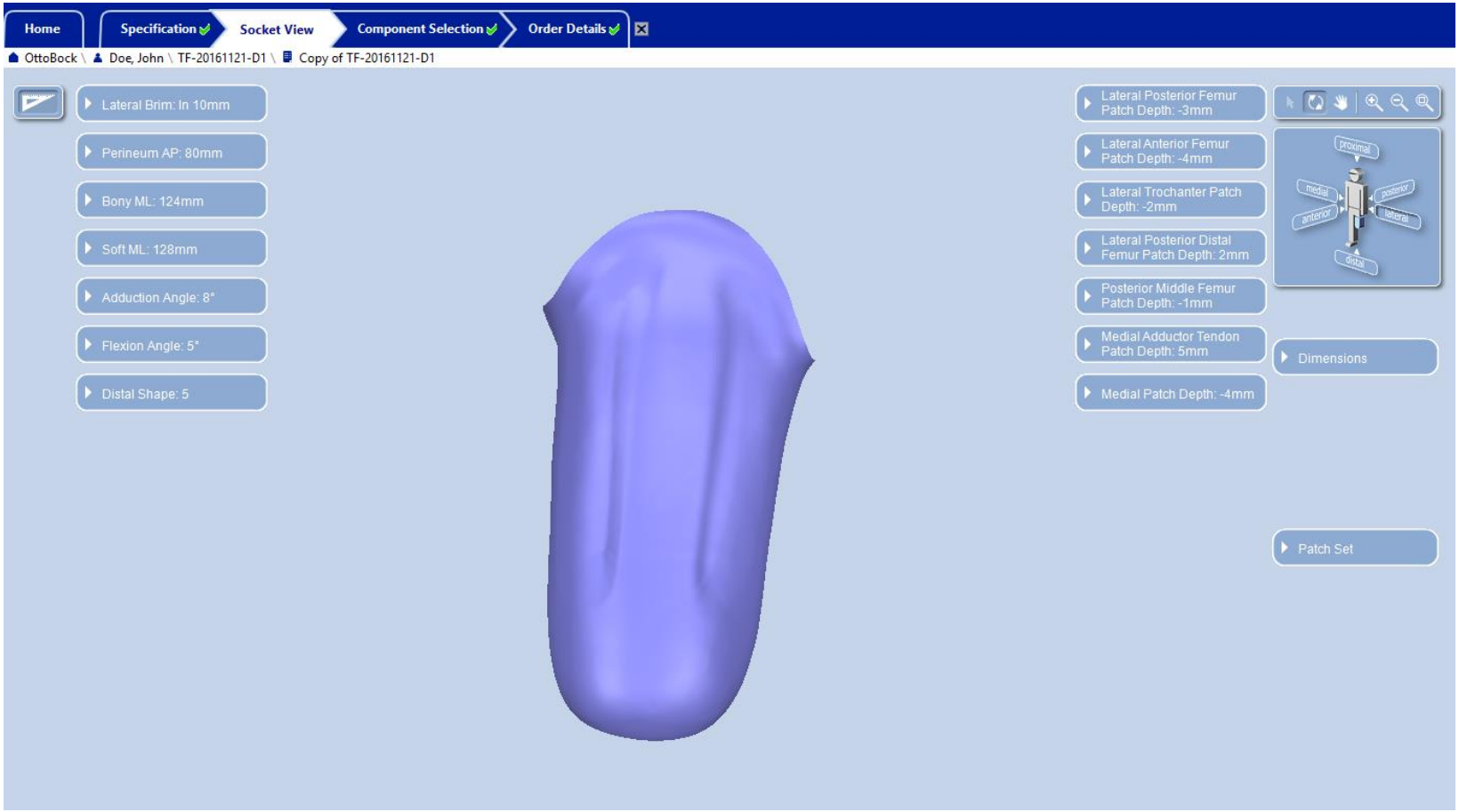
Quadrilateral model especially for women

❶ Narrow perineum width results in triangular socket shape
❷ Ischial support enclosure approx. 45° to medial plane
❸ Adjustable anterior patch ⇨ reduces forward tipping of the pelvis
❹ Straight socket shape

Software settings

Software settings

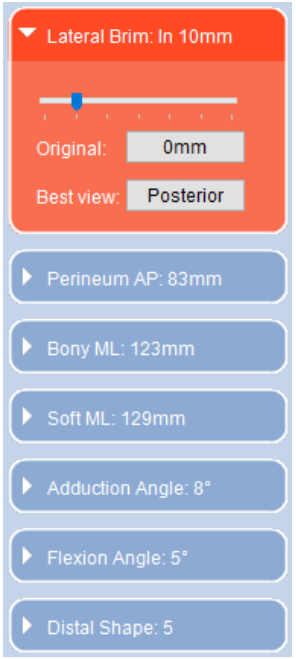
Socket view

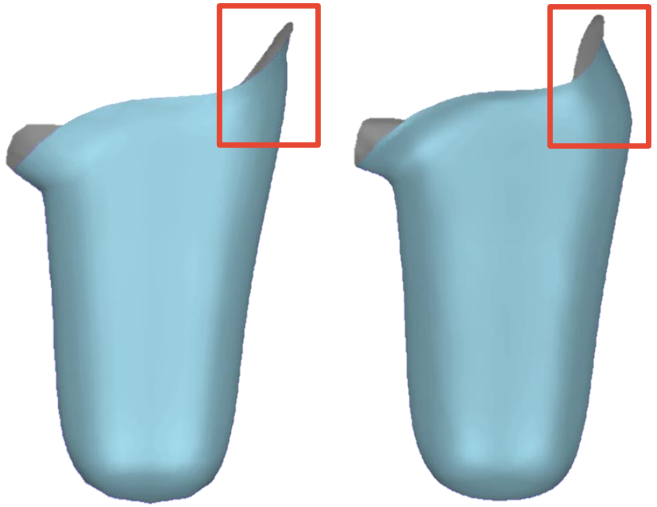


Software settings

Proximal brim adjustment

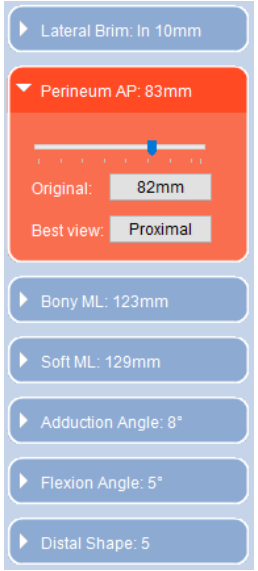
- The proximal brim is the area above the trochanter
- Adjustment of the lateral support for an improved pretension of the gluteal musculature (prevents pelvis from tipping forwards)
- Improved control of the prosthesis





Software settings

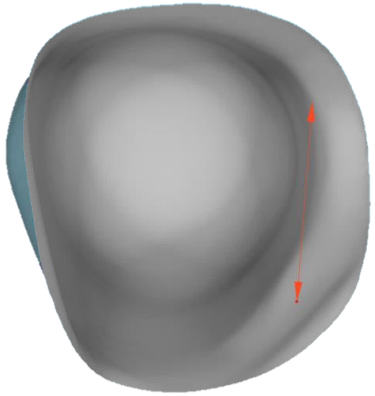
Perineum AP measurement



- The software is designed such that the entered **circumference remains constant**, i.e., if a measurement is changed in the frontal plane, it also changes in the sagittal plane
- The perineum AP measurement **should not be edited in the software if possible**

Reason:

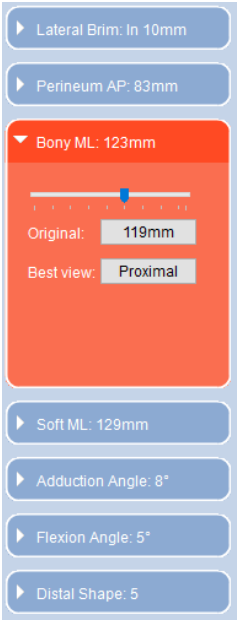
- The perineum AP measurement results from the position of the model reference points of the ischial tuberosity and the adductor tendon (red arrow head) and is calculated by the software
- There is no fixed reference point here due to the individual position of the adductor tendon

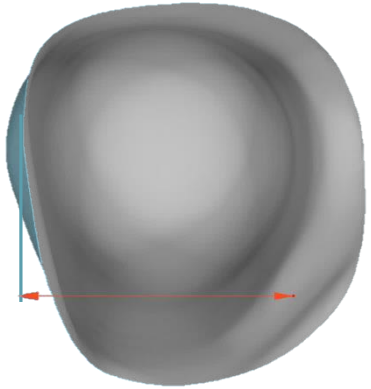


Software settings

Bony ML measurement

- The bony ML measurement is located in the socket entry plane – the dimensions of the socket entry plane are calculated based on the measured circumferences
- Minor adjustments to the ML measurement can be carried out in the software
  - The bony ML measurement results from the position of the model reference points of the ischial tuberosity and the lateral socket wall (red arrow head) and is calculated by the software
    - The measurement is rendered relatively accurately if the circumferences are measured correctly
    - The calculated measurement can be compared with the measured ML measurement

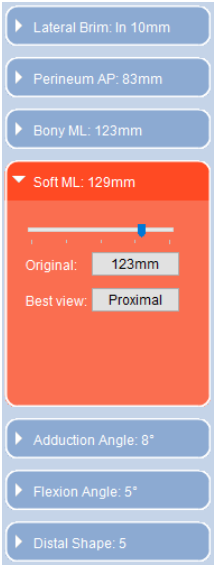


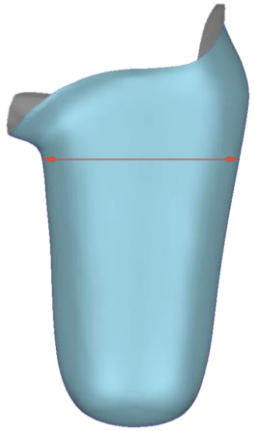


Software settings

Soft tissue ML measurement

- The soft tissue ML measurement is located 30 mm below the tuber ischii, on the level of the first proximal circumference
- Adjustments of the ML measurement are possible but **not necessary**
  - The measurement is reproduced relatively accurately with correctly measured circumferences
  - The calculated measurement can be compared with the measured ML measurement





Software settings

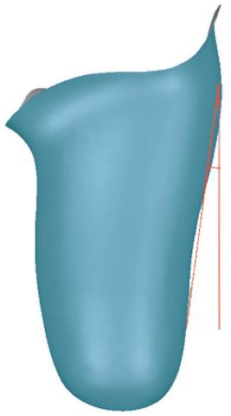
Adduction and flexion

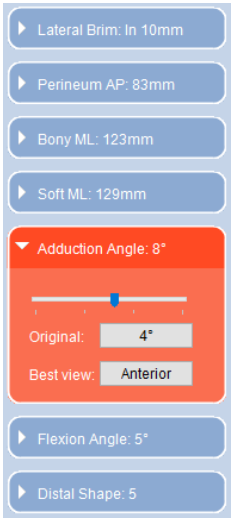
Adduction angle

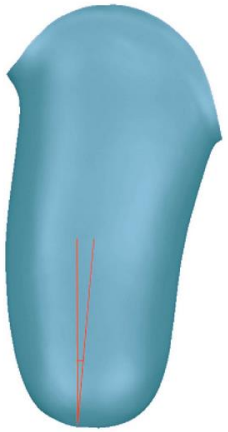
- The adduction angle is determined in relation to the lateral socket wall and not in relation to the longitudinal axis of the residual limb
- For checking purposes, the position of the socket in the 3D view should be examined first and foremost and less focus placed on the value of the displayed adduction angle

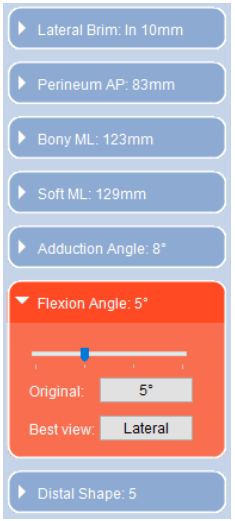
Flexion angle

- The model is always pre-flexed by 5° (default setting in the software)





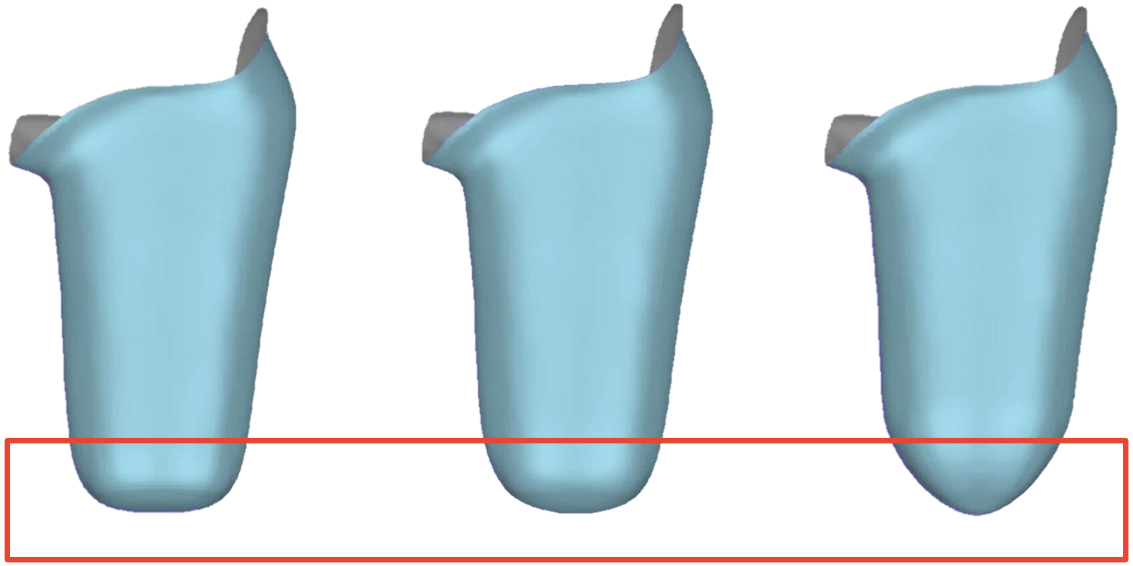




Software settings

Distal shape

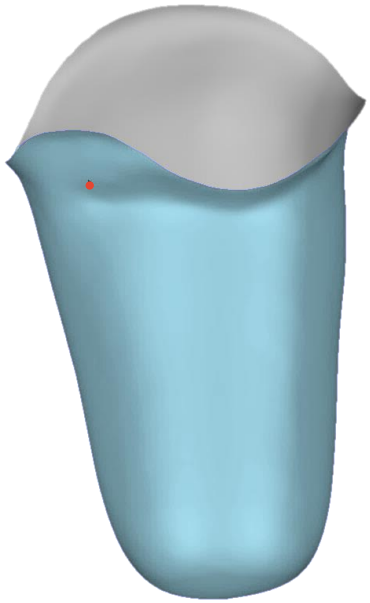
- The shape of the distal end can be adjusted
- When using a liner with pin, the diameter is adapted to the diameter of the distal cap



Software settings

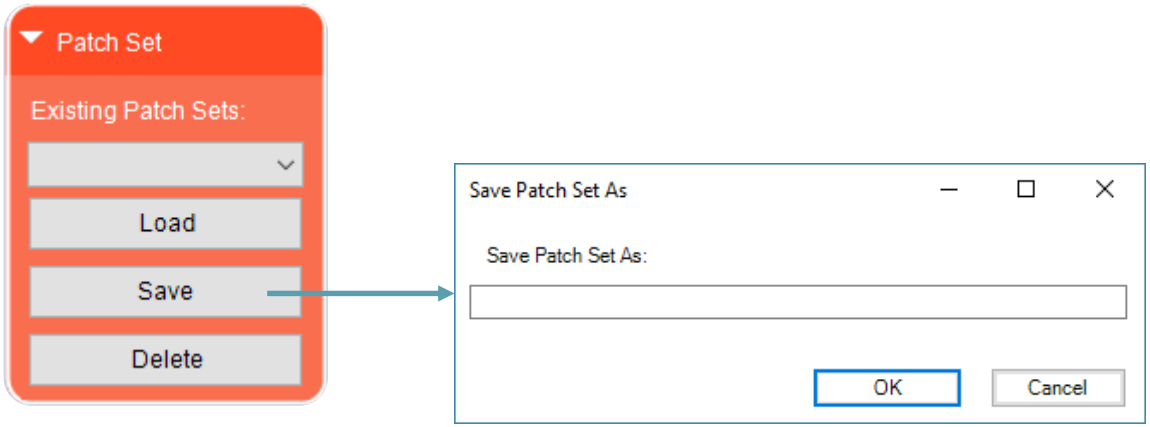
Showing measurements

- X;Y;Z, Circumference and volume can be read at any point below the tuber
- The 0 - point is the tuber ischiadicum



Software settings
Patch groups

- Patch groups can be saved shape specific
- Ability to use a patch configuration for different patients



Software settings

Patches for all socket shapes (1/2)

Lateral view			
Lateral Anterior Femur Patch	Lateral Posterior Femur Patch	Lateral Trochanter Patch	Lateral Posterior Distal Femur Patch
			

Based on experiences with ICS Advanced

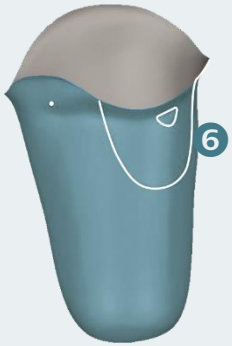
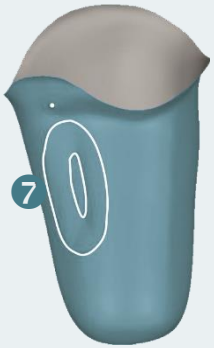
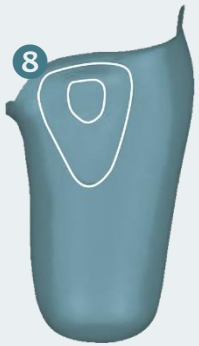
❶+❷ Patches used as frontolaterally and dorsolaterally positioned supports for guiding the femur ⇨ improved control of the prosthesis

❸ Patch used as lateral support surface for the femur ⇨ support below the trochanter and more adducted position for the femur

❹ Patch on distal end of the femur ⇨ relief for the tip of the femur

Software settings

Patches for all socket shapes (2/2)

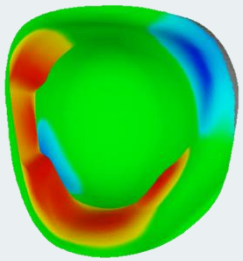
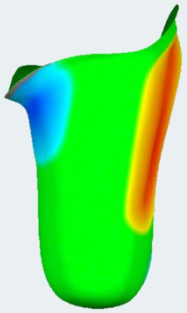
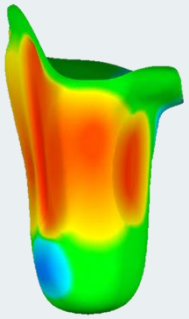
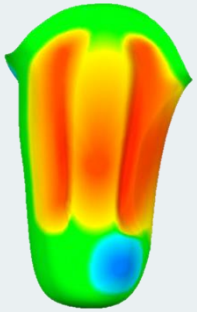
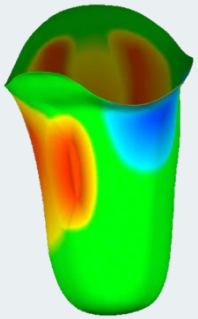
Posterior view	Medial view		Frontal view
Posterior Middle Femur Patch	Medial Adductor Tendon Patch	Medial Patch	Anterior Patch
			

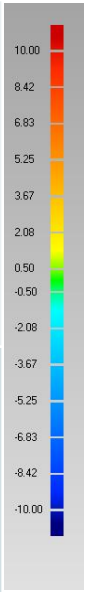
Biomechanically useful positioning of patches

❺ Patch as dorsal element for femur ⇨ dorsal support / prevents formation of pockets
❻ Patch for exposing adductor tendon ⇨ creates space, thereby preventing pressure problems
❼ Patch below the ischial tuberosity ⇨ increases pre-tensioning of the ischiocrural muscle group
❽ Anterior patch ⇨ anterior pad prevents pelvis from tipping forwards due to ischial support

Software settings

Maximum patch settings

View				
Proximal	Anterior	Posterior	Lateral	Medial
				



- Patches change the socket volume!
- Depending on the purpose, patches can be adjusted from 0 mm to ± 6 mm or ±8 mm
- Not all patches can be used for all models

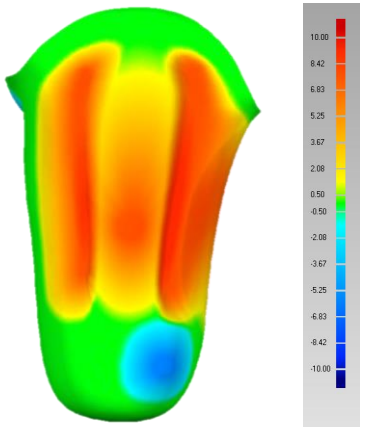
Convex patches
Concave patches
Unmodified socket areas

Software settings

General rule for patches

General use of patches

It is easier to deform patch areas thermically outwards than subsequently reinforcing it



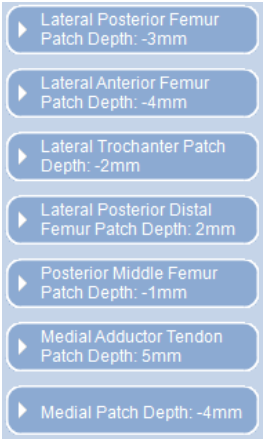
Recommendation

- For adipose residual limbs approx. 6 mm – 8 mm
- For normal residual limbs approx. 4 mm – 6 mm
- For thin residual limbs approx. 2 mm – 4 mm

General rule

If large concave patches are used intensively (e.g. if 75% of the patches are set at 75 % – 100 % of the patch depth): **decrease the reduction of the socket volume by 1 % – 1.5 %**

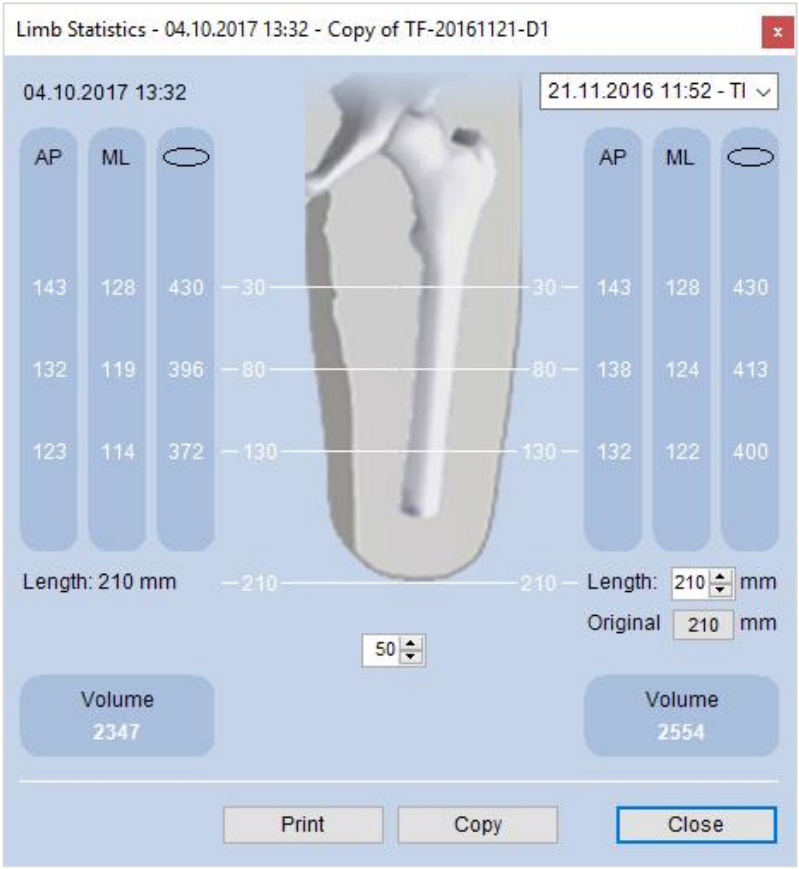
⚠ Using patches influences the socket volume



Software settings

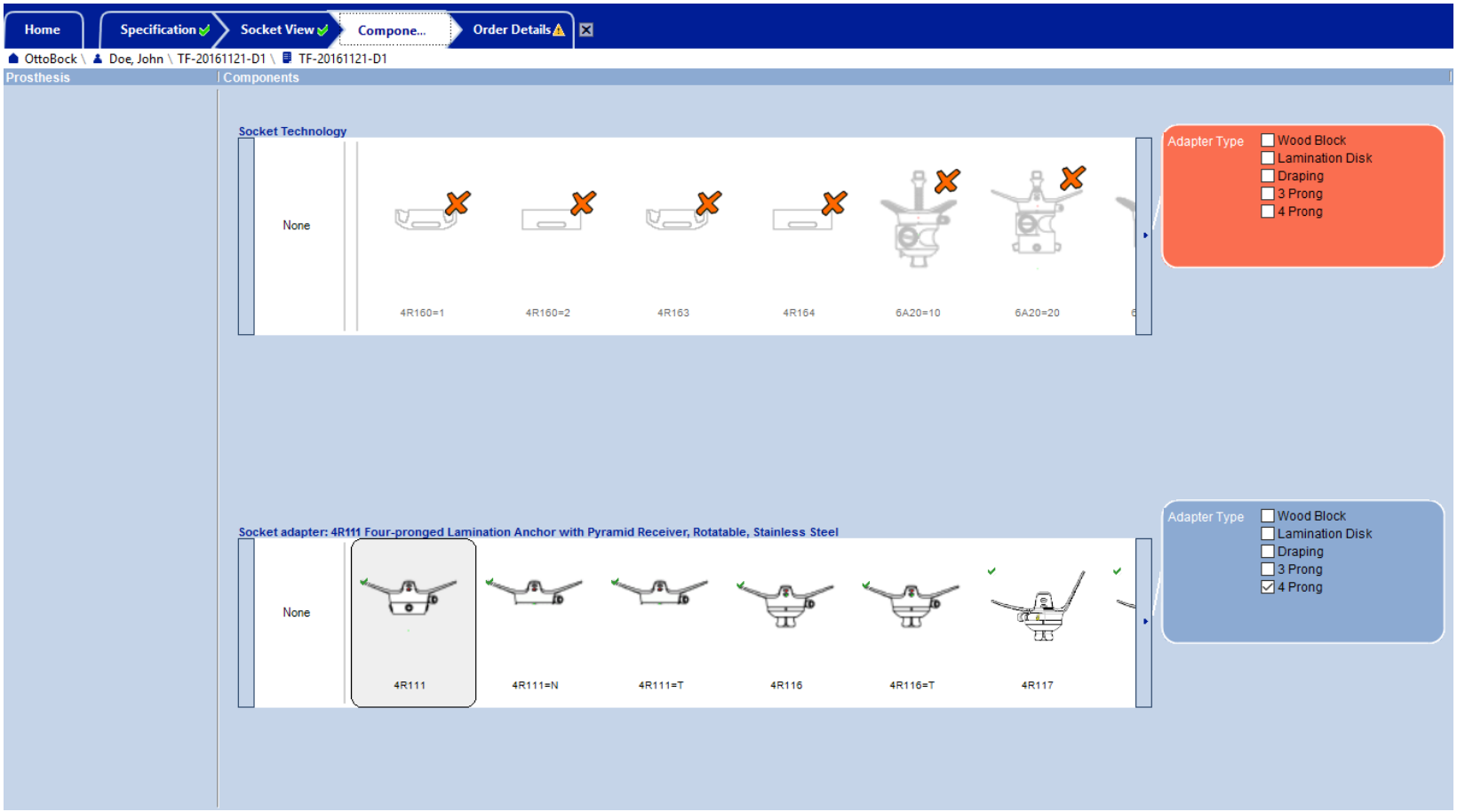
Limb statistics

- Stump dimensions and volume at different points in time can be compared on a patient-specific basis



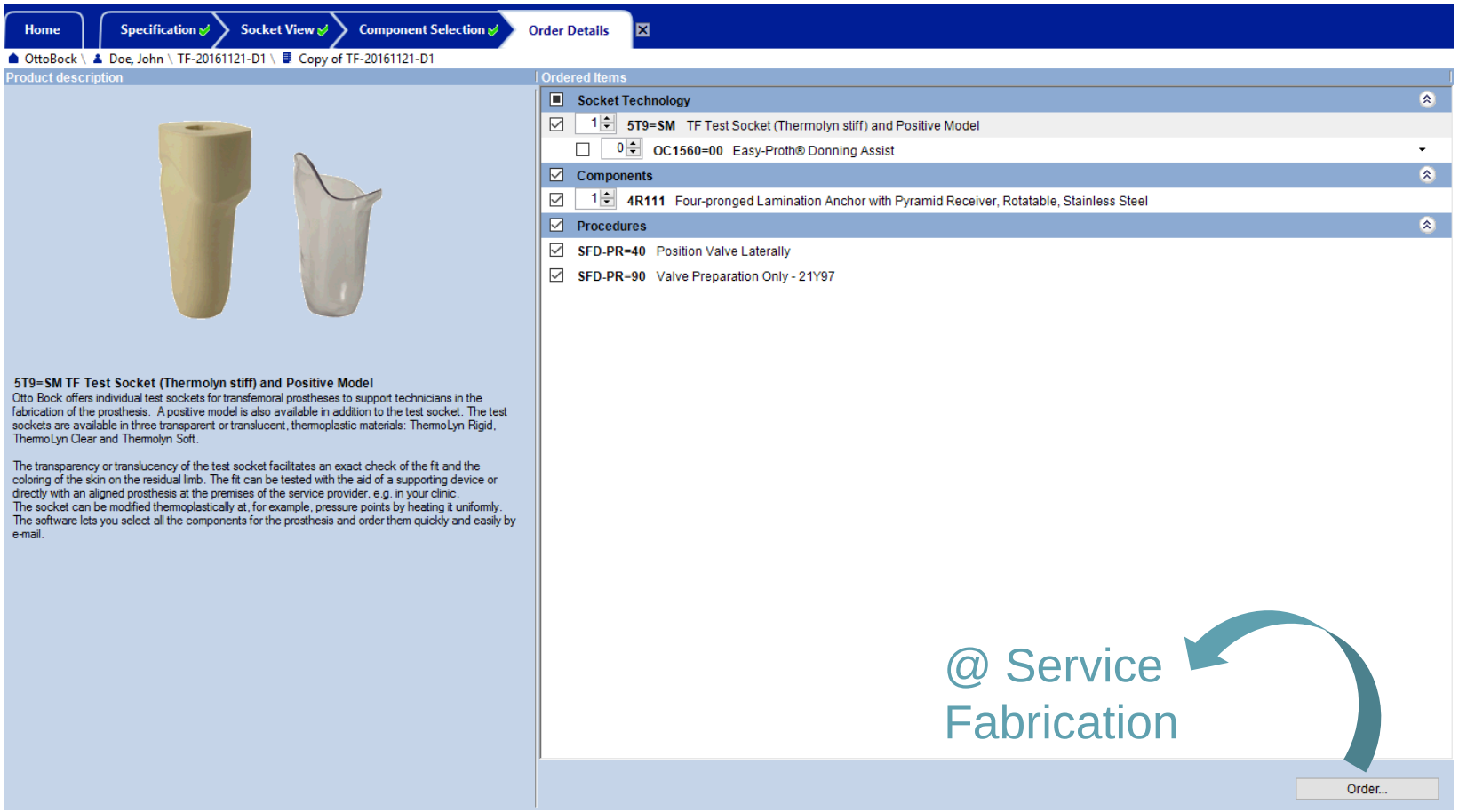
Software settings

Component selection



Software settings

Order



Fabrication

Fabrication

Process at Service Fabrication




Model carving → Vacuum forming → Grinding → Quality control

Fitting

Fitting
Static fitting

Fitting

Dynamic fitting

Fitting

Video of dynamic fitting

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