

Alignment Instructions

TF Prostheses

Academy



Quality for life

Agenda

- | | |
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Process of Prosthetic Alignment TF

1. Introduction

Documentation

Assessment Form

Lower Limb Amputation

Prosthetist / Therapist: _____
 Patient name: _____
 Device number: _____ Order number: _____

Weight: _____ Height: _____

☐ Left-handed ☐ Right-handed

Amputation side: ☐ Left ☐ Right ☐ Bilateral, which side: _____

Amputation level: ☐ PF ☐ AD ☐ TF ☐ KD ☐ TH

For PF amputations, which amputation line?
☐ Toe disarticulation ☐ Sharp ☐ Sharp-jäger ☐ L
☐ Bone-jäger ☐ Chopart ☐ Pirogow ☐ Sy

For TF or TF amputations, which residual limb length?
☐ long (>2/3) ☐ medium (1/3 to 2/3) ☐ short (<1/3) ☐ ul

1. General state of health

☐ Cardiovascular diseases
☐ Circulatory disorders
☐ Diabetes ☐ Neuropathy ☐ Coordination disorders / Balance
☐ Infectious diseases
☐ Allergies
☐ Currently taking medication

If medication is being taken, what side effects does it cause?
☐ Affects sensitivity to pain ☐ Swelling ☐ Blood-thin
☐ Affects the sense of balance ☐ Affects sight ☐ _____
☐ Functional limitations / Complaints torso Type: _____
☐ Functional limitations / Complaints upper extremity
 Left ☐ Shoulder ☐ Elbow ☐ Wrist / Hand
 Right ☐ Shoulder ☐ Elbow ☐ Wrist / Hand

Symptoms: _____

☐ Other illness / limitations / pain _____

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Measurement Chart – TF

Lower Limb Amputation

Prosthetist / Therapist: _____ Date: _____
 Patient name: _____ ID: _____
 Device number: _____ Order number: _____

☐ Left ☐ Right ☐ Measurements with Liner ☐ Measure

Comments: _____

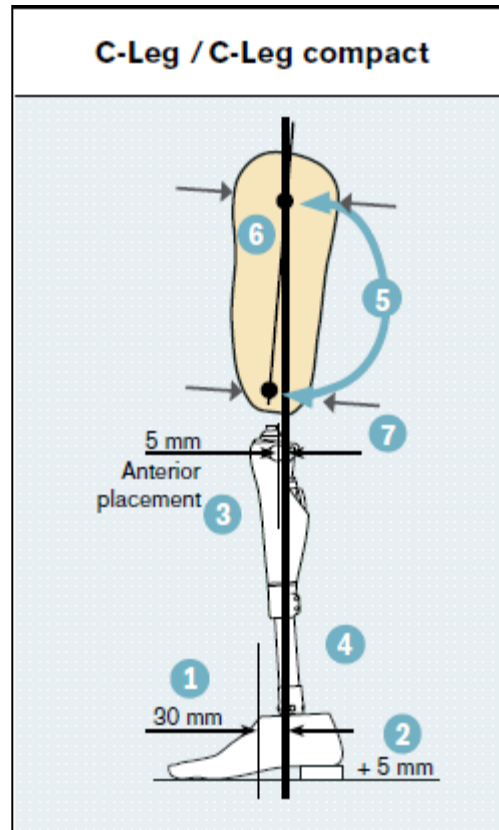
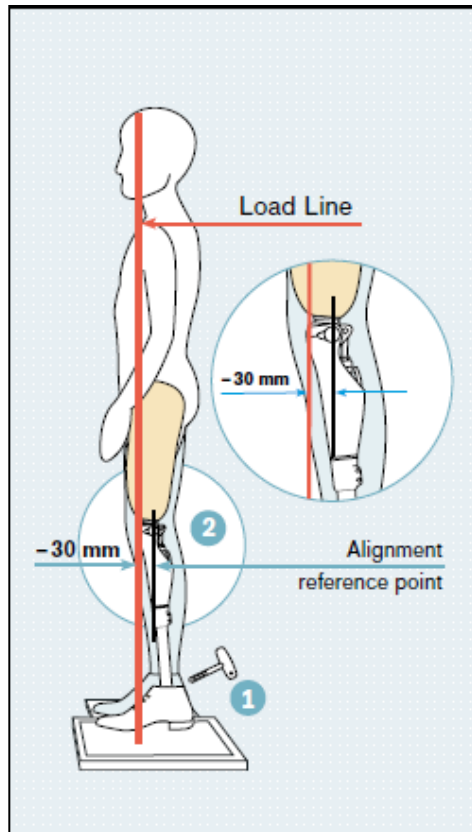
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Bench alignment in the PROS.A. Assembly

Static alignment using L.A.S.A.R. Posture

Process of Prosthetic Alignment TF

1. Introduction



- Systematic prosthetic alignment is essential for correct posture
- Based on Otto Bock instructions for basic alignment
- PROS.A. Assembly used for basic alignment
- L.A.S.A.R. Posture used for static alignment of transfemoral prostheses

Process of Prosthetic Alignment TF

1. Introduction

- **Clinical examination**
- **Basic alignment in PROS.A. Assembly**
- **Trial fitting while seated**
- **Static alignment with L.A.S.A.R. Posture**
- **Dynamic alignment optimisation while walking**
- **Adjusting the knee joint**
- **Checking posture**
- **Patient documentation**

Process of Prosthetic Alignment TF

2. Clinical examination

Mobility grade

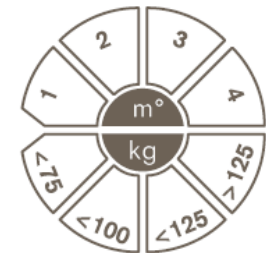
The patient's mobility grade is documented in the upper part of the MOBIS symbol. The weight can also be entered in the lower part.

Mobility Grade 1: Indoor walker

Mobility Grade 2: Restricted outdoor walker

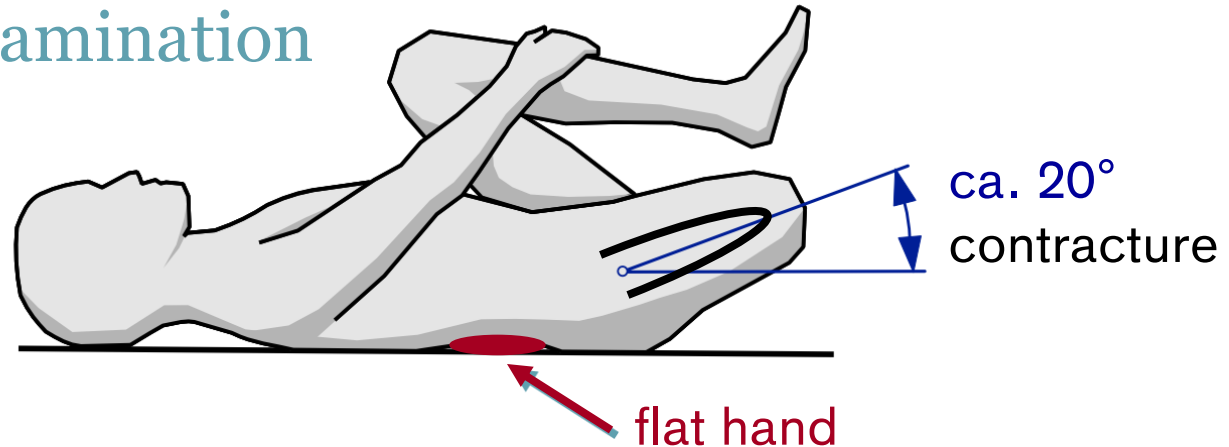
Mobility Grade 3: Unrestricted outdoor walker

Mobility Grade 4: Unrestricted outdoor walker with especially rigorous demands



Process of Prosthetic Alignment TF

2. Clinical examination



“Thomas test”

Evaluation of ability to extend leg at hip joint

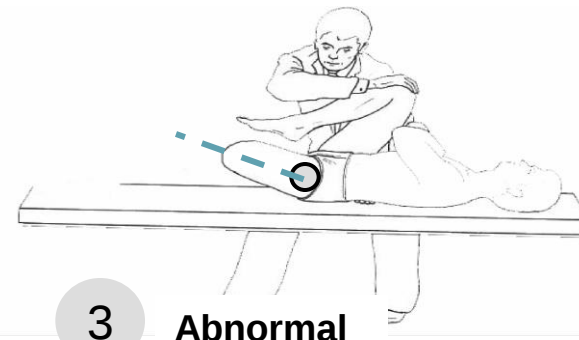
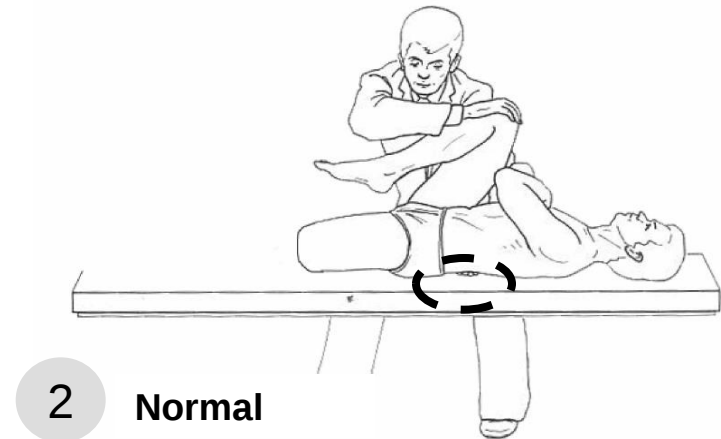
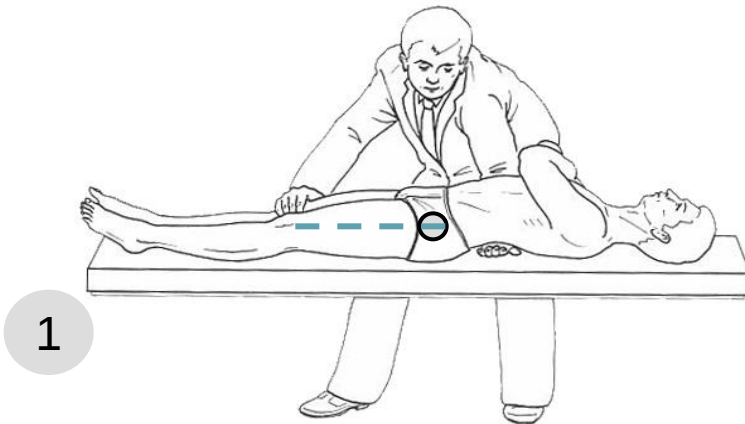
Procedure: (**Supine position**)

- Bend the healthy leg until there is no more lumbar lordosis (check this by placing hand between lumbar spine and examination table)
- In this position, the pelvis is secured in its normal position
- Pelvis tilts forward by approximately 12° -- this causes lumbar lordosis
- Possible to compensate for increased hip flexion contracture by intensifying lumbar lordosis -- patient merely appears to be adopting normal posture

Process of Prosthetic Alignment TF

2. Clinical examination

“Thomas test”



Source: K. Buckup: klinische Teste, Thieme Verlag

Process of Prosthetic Alignment TF

2. Clinical examination

“Thomas test” - Assessment

Normal

- Extension to neutral 0 position is possible, lower leg lies flat on surface
- With further bending, pelvis can be extended further
- If the examined leg remains on the flat surface, the extension angle of the pelvis will correspond to the over-extension ability of the hip joint.

Flexion contracture

- The hip to be examined does not stay extended on the the flat surface
- It follows the continued hip flexion or movement of the pelvis with an increasingly flexed position
- The angle of the flexed, unhealthy leg to the examination table defines the flexion contracture

Process of Prosthetic Alignment TF

3. Basic Alignment

Alignment Recommendations for TF Modular Lower Limb Prostheses according to MOBIS

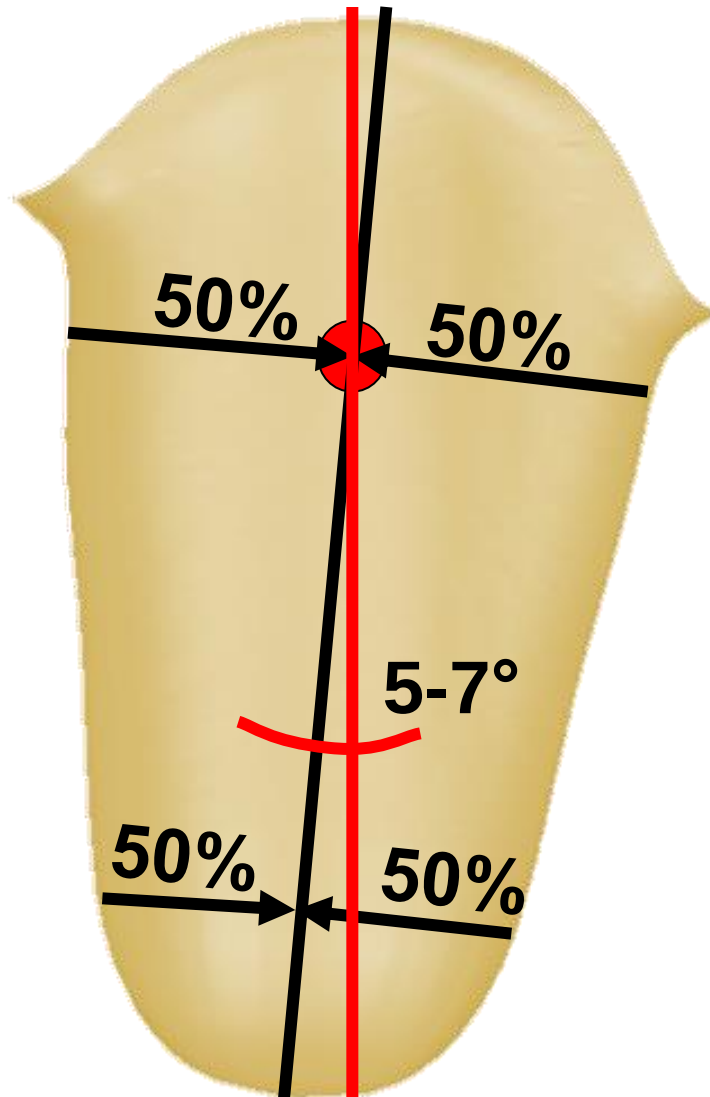
ottobock.

Alignment Recommendations for TF Modular Lower Limb Prostheses according to MOBIS

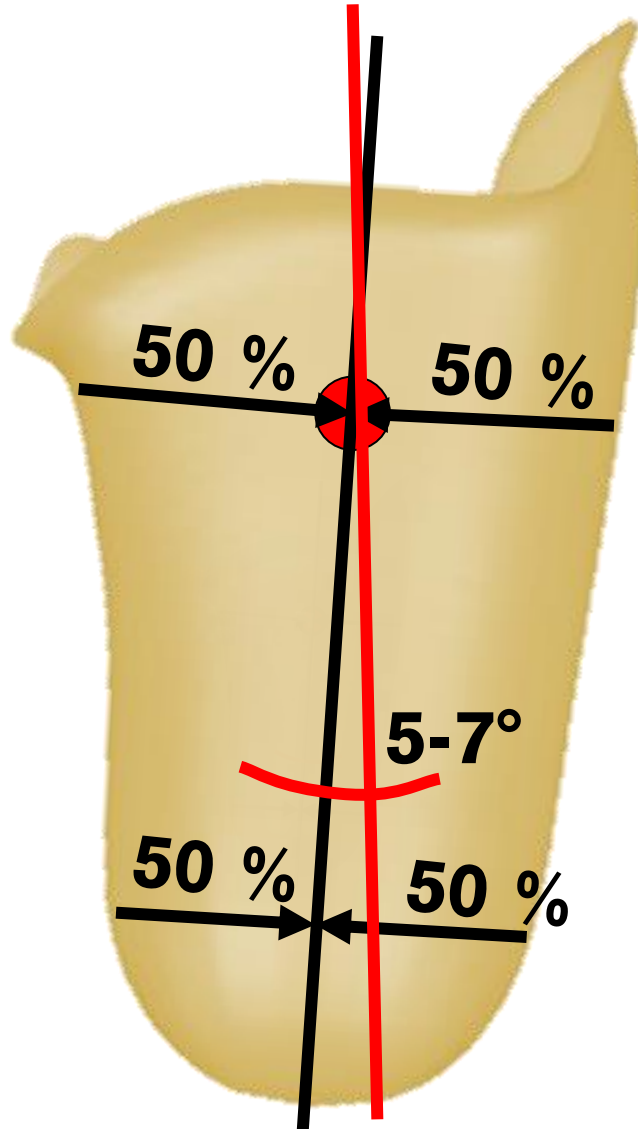
	Polycentric Knee Joints			Monocentric Knee Joints			
	3R60 EBS / 3R60 EBS ^{PRO}	3R106	Bench alignment ¹	3R93	C-Leg / C-Leg compact	Bench alignment ¹	
Bench alignment in the PROS.A. Assembly			3R20 / 3R36 0 mm 3R21 / 3R36 0 mm 3R23 / 3R32 0 mm 3R66 0 mm 3R55 0 mm 3R60 EBS 0 mm 3R60 EBS ^{PRO} 0 mm 3R72 0 mm 3R78 0 mm 3R106 0 mm			3R15 / 3R49 -10 mm 3R17 / 3R33 -15 mm 3R22 / 3R34 -15 mm 3R40 / 3R41 -15 mm 3R80 0 mm 3R90 / 3R90-1 -10 mm 3R92 / 3R92-1 -10 mm 3R93 / 3R93-1 -10 mm 3R95 / 3R95-1 -15 mm C-Leg 5 mm C-Leg compact 5 mm * - Posterior placement	
	Recommended prosthetic foot according to MOBIS: 3R60: Geomagic plus 13.5, Dynamic Motion 13.5, True 3.0, C-Link 3.0, Active 12.0 or Active 12.0 P Selection depends on the Mobility Grade and functional demands of the patient.	Recommended prosthetic foot according to MOBIS: 3R106: Geomagic plus 13.5, Dynamic Motion 13.5, True 3.0, C-Link 3.0, Active 12.0 or Active 12.0 P Selection depends on the Mobility Grade and functional demands of the patient.	Recommended prosthetic foot according to MOBIS: 3R60: Geomagic plus 13.5, Dynamic Motion 13.5, True 3.0, C-Link 3.0, Active 12.0 or Active 12.0 P Selection depends on the Mobility Grade and functional demands of the patient.	Recommended prosthetic foot according to MOBIS: 3R93: Active 12.0, Dynamic Motion 13.5, True 3.0, C-Link 3.0, Active 12.0 or Active 12.0 P Selection depends on the Mobility Grade and functional demands of the patient.	Recommended prosthetic foot according to MOBIS: C-Leg: Geomagic plus 13.5, Dynamic Motion 13.5, True 3.0, C-Link 3.0, Active 12.0 or Active 12.0 P Selection depends on the Mobility Grade and functional demands of the patient.	Recommended prosthetic foot according to MOBIS: Selection depends on the Mobility Grade and functional demands of the patient.	
	1 Position the middle of the foot 30 mm anterior to the alignment reference line (reference the alignment recommendation contained in the instructions for use of the knee joint and foot). 2 Add 5 mm to the required heel height (reference the alignment recommendation contained in the instructions for use of the knee joint and foot) and level the foot. 3 Position the alignment reference point (the movement base) 10 mm anterior to the alignment reference line in accordance with the alignment recommendation of the knee joint. The reference to the knee joint distance and outward rotation of the knee joint (knee joint) provide a visual of support. 3% Recommended sagittal position of the alignment reference point. (Shoe power for manual foot plates). 4 Connect the foot to the knee joint by means of a tube adjuster. 5 Mark the centre of the socket proximal and distal to the lateral side. Draw a line through both marks from socket later to the distal end of the socket. 6 Now position the socket such that the alignment reference line passes through the proximal mark. In the knee joint, the intersection between the reference line and the alignment reference line must be taken into account. Also take into account the individual alignment recommendation. 7 Connect the foot and knee by means of an adjuster.						
	Static alignment² 3R20 / 3R36 -35 mm 3R21 / 3R36 -35 mm 3R23 / 3R32 -35 mm 3R66 -35 mm 3R55 -35 mm 3R60 EBS -10 mm* 3R60 EBS ^{PRO} -10 mm* 3R72 -35 mm 3R78 -35 mm 3R106 -35 mm * - Posterior placement * According to Prof. Blumentritt * * Same as 3R60 and 3R60 EBS alignment reference point						
	Static alignment using L.A.S.A.R. Posture			Static alignment² 3R20 / 3R36 -35 mm 3R21 / 3R36 -35 mm 3R23 / 3R32 -35 mm 3R66 -35 mm 3R55 -35 mm 3R60 EBS -10 mm* 3R60 EBS ^{PRO} -10 mm* 3R72 -35 mm 3R78 -35 mm 3R106 -35 mm * - Posterior placement * According to Prof. Blumentritt * * Same as 3R60 and 3R60 EBS alignment reference point			Static alignment² 3R15 / 3R49 -40 mm 3R17 / 3R33 -45 mm 3R22 / 3R34 -45 mm 3R40 / 3R41 -45 mm 3R80 -35 mm 3R90 / 3R90-1 -40 mm 3R92 / 3R92-1 -40 mm 3R93 / 3R93-1 -40 mm 3R95 / 3R95-1 -45 mm C-Leg -30 mm C-Leg compact -30 mm * - Posterior placement * According to Prof. Blumentritt
		After bench alignment of the transfemoral prosthesis static alignment is made using the L.A.S.A.R. Posture. In order to ensure appropriate stability, equipped with very strong phase initiation, phase proceed in follow:					
		1 To make the load line visible, the reference line should be drawn on the L.A.S.A.R. Posture with the prosthesis on the leg and the other leg on the right compensation panel. The prosthesis side should at least be marked with 10% of the body weight. 2 Now adjust the alignment by adjusting the phase initiation of the foot. The load line (line) should be placed anterior to the alignment reference point (see 3R60, see 3R60 EBS) according to the alignment recommendation of the knee joint. 3 Perform dynamic optimization during the walking. You will often notice the following alignment: 4 After bench alignment by walking step length, necessary sagittal plane 5 Add the position of the knee and the L.L. position of the knee adjuster (distal plane) 6 Position position of the knee joint and take into account the position of the knee joint (distal plane) 7 Finally, document the fitting result using the "L.A.S.A.R. Posture" system and software.					

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Process of Prosthetic Alignment TF



Process of Prosthetic Alignment TF



Process of Prosthetic Alignment TF



Alignment Line

socket adduction without contraction

Process of Prosthetic Alignment TF

3. Basic Alignment



743A200 PROS.A. Assembly

1. Mounting plate for adapter inserts
2. Mounting frame for basic alignment of leg prostheses
3. Socket adapter height support
4. Adjustment of socket adapter height support
5. Innovative socket quick-clamping fixture
6. Knee brackets for adapter inserts
7. Knee joint adapter height support
8. Foot support with angular adjustment
9. Heel plate for height adjustment
10. Scale for adjusting knee-floor measurement and the trochanter-floor measurement

Process of Prosthetic Alignment TF

3. Basic Alignment - Foot



Positioning in PROS.A. Assembly

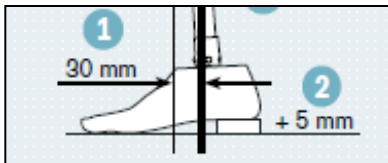
Necessary alignment data:

- Heel height
- Anterior placement
- Outward rotation of the foot



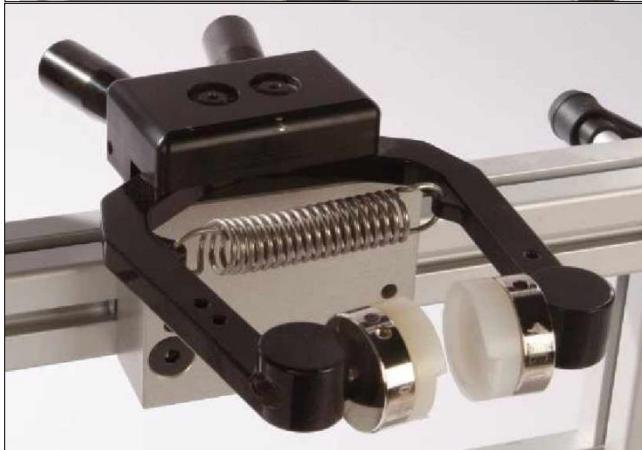
According to the alignment Recommendations, the following adjustments are made on the foot plate (8) for the right and left sides:

- Foot centre = 30 mm anterior to the alignment reference line
- Heel height (9) = Add 5 mm to the required heel height
- Outward rotation of the foot = Customised (approx. 5°)



Process of Prosthetic Alignment TF

3. Basic Alignment – Knee joint



Positioning in PROS.A. Assembly

- When aligning a modular transfemoral prosthesis according to the Otto Bock alignment recommendations, the knee joint is used as the basis in PROS.A. Assembly.
- The knee joint is secured with joint-specific brackets (adapter inserts) directly in the alignment reference point (with single axis joints = rotation axis; with polycentric joints = upper anterior axis).

Process of Prosthetic Alignment TF

3. Basic Alignment – Knee joint



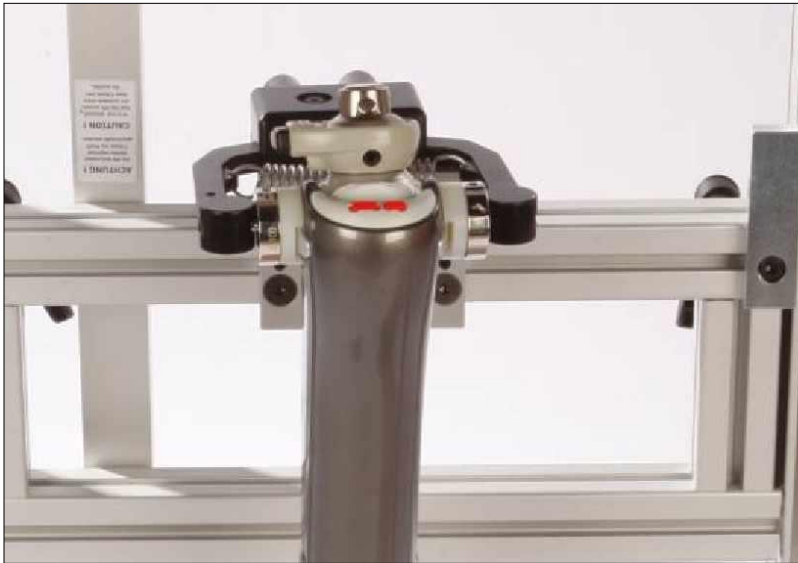
Positioning in PROS.A. Assembly

The adapter inserts in the height support's knee brackets automatically secure the selected modular knee joint in the correct alignment position:

- 5° outward rotation of the knee axis
- as well as the recommended posterior placement

Process of Prosthetic Alignment TF

3. Basic Alignment – Knee joint

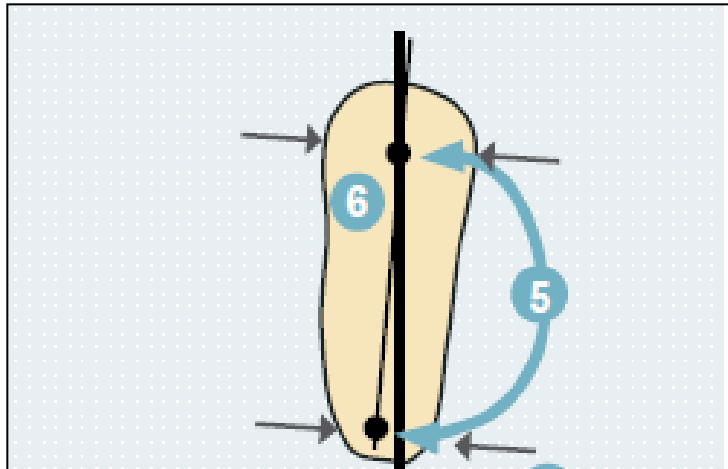


Positioning in PROS.A. Assembly Adjustment of the “knee-floor” measurement

- Release the clamping lever on the height support of the knee joint holder
- Move the height support on the mounting frame to the measured value
- Secure the height support

Process of Prosthetic Alignment TF

3. Basic Alignment – Socket



Positioning in PROS.A. Assembly

Mark the centre of the socket proximal and distal on the lateral side

- Proximal point at the hip joint pivot point (trochanter)
- Distal point at the end of the socket
- Draw a line through both marks from socket brim to the distal end of the socket

Process of Prosthetic Alignment TF

3. Basic Alignment – Socket

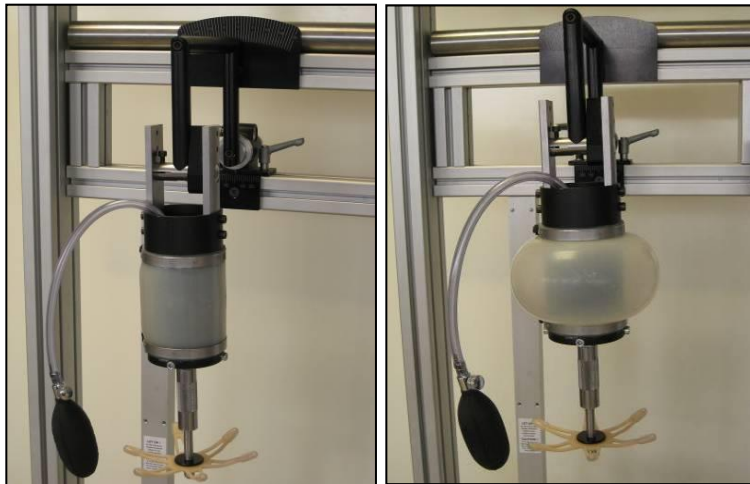


Positioning in PROS.A. Assembly

- To customise the prosthesis to patient requirements, the innovative socket quick-clamping fixture is used to position the socket against the alignment reference line as follows:
 - Medial - lateral/lateral - medial
 - Flexion/extension
 - Anterior/posterior
 - Adduction/abduction
- Connect the socket and knee using the adapter

Process of Prosthetic Alignment TF

3. Basic Alignment – Socket



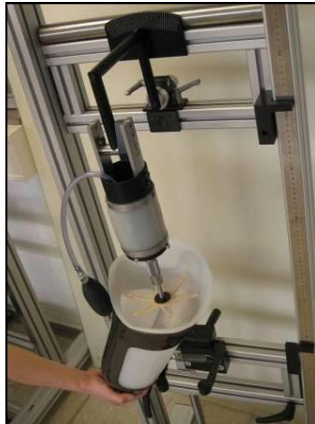
Positioning in PROS.A. Assembly

- Flexion/extension:
 - Adjustment at pivot point of socket quick-clamping fixture
- Adduction/abduction:
 - Adjustment at pivot point of quick-clamping fixture
- Anterior/posterior:
 - Adjustment at pivot point of quick-clamping fixture
- Medial-lateral/lateral-medial:
 - Move the quick-clamping fixture



Process of Prosthetic Alignment TF

3. Basic Alignment – Socket



Positioning in PROS.A. Assembly

Next, position the prosthetic socket on the innovative socket quick-clamping fixture(5)

Regardless of socket material, technique, residual limb length and connection adapters



The socket is centred by the flexible guide (star) at the distal point and the inflatable clamping fixture at the proximal point

Process of Prosthetic Alignment TF

3. Basic Alignment – Socket



Positioning in PROS.A. Assembly

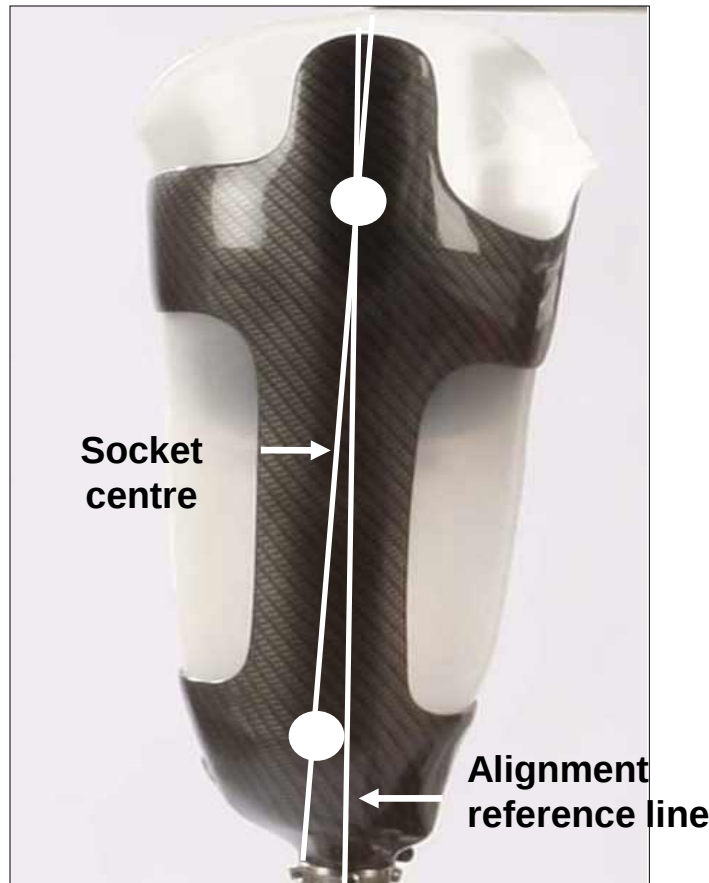
The pivot point of the socket quick-clamping fixture (5) corresponds to the pivot point of the hip joint (trochanter).

Press the socket against the spring force of the flexible guide on the distal end of the socket until the hip joint pivot point (trochanter) marked on the socket meets the pivot point of the quick clamping fixture (5).

Use the hand bellows to pump up the socket quick-clamping fixture at the proximal end of the socket

Process of Prosthetic Alignment TF

3. Basic Alignment – Socket



Positioning in PROS.A. Assembly

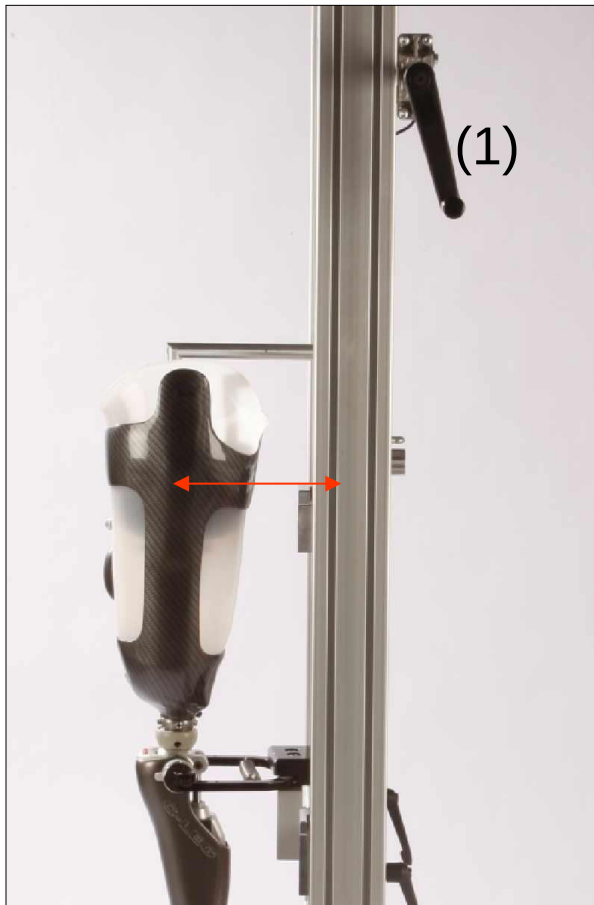
Position the socket such that the alignment reference line passes through the proximal centre mark (50-50 division)

Set the socket flexion to 3° – 5° while considering

- The individual situation (e.g. hip joint contractures).
- Ischial tuberosity to ground distance.

Process of Prosthetic Alignment TF

3. Basic Alignment – Socket



Positioning in PROS.A. Assembly

Adjust the ischial tuberosity to ground distance

To do this, use the integrated socket adapter height support hydraulics, which you set to the measured distance using the integrated crank handle (1).

Process of Prosthetic Alignment TF

4. Static Alignment



Fitting with patient

Trial fitting takes place after basic alignment

- Check the safety settings of the knee (engaged)
- Patient puts on prosthesis while standing
- Check the alignment with patient seated
 - Check the socket position
 - Check the knee position
 - Check the foot position
 - If necessary, make adjustments
- Support the patient while he/she stands up (secure knee)

Process of Prosthetic Alignment TF

4. Static Alignment



Fitting with patient - Static alignment with L.A.S.A.R. Posture: frontal

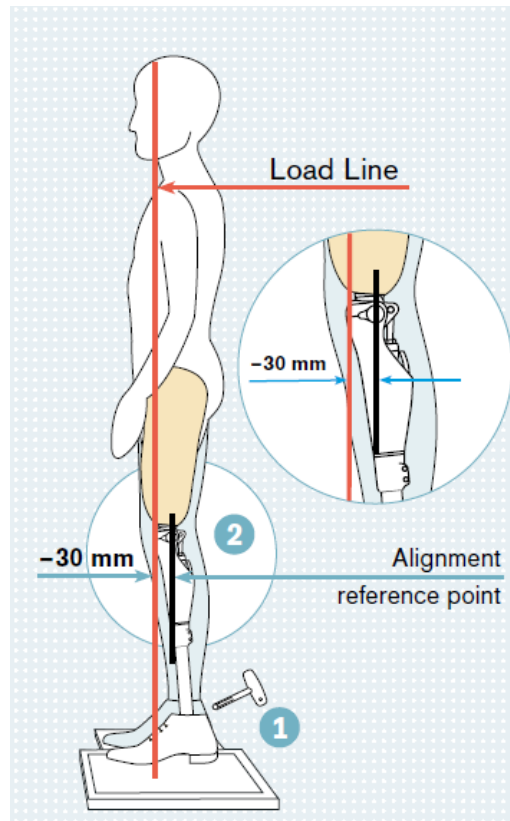
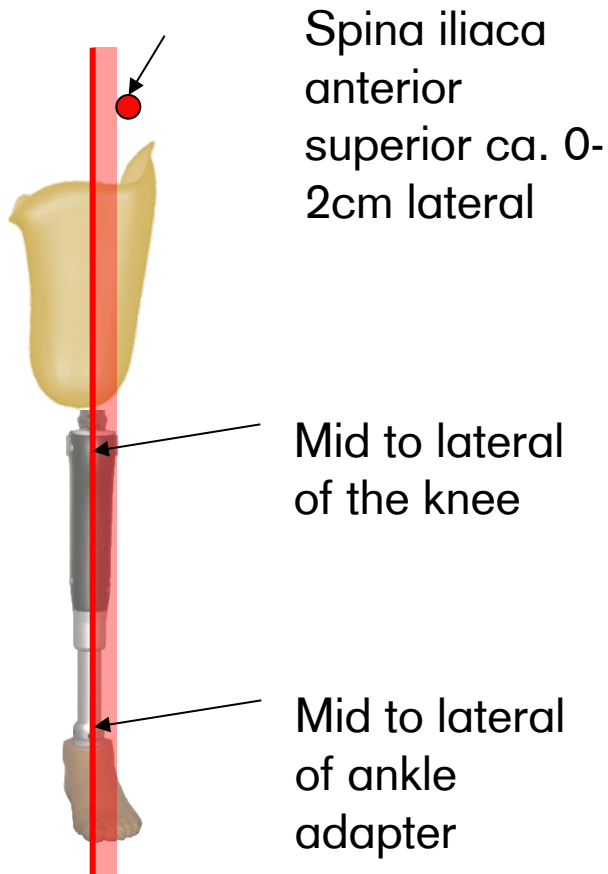
Measuring the weight bearing line

- Patient has **both** legs on the measuring device
- Check length of prosthesis
- Check iliac crest, anterior, superior spine (caution: deformities possible!)

Adjustment

Process of Prosthetic Alignment TF

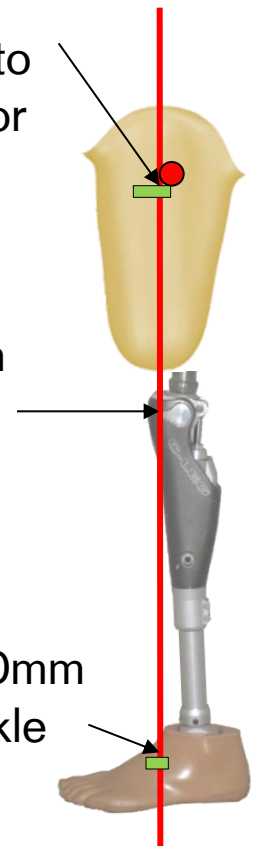
4. Static Alignment



Trochanter major ca. -1 to 3 cm posterior

Depending on knee joint
For example
C-Leg 30 mm

50 mm +/- 10mm
in front of ankle
adapter



Process of Prosthetic Alignment TF

4. Static Alignment



Fitting with patient - Static alignment with the L.A.S.A.R. posture: frontal

Measuring the load line (on prosthesis side)

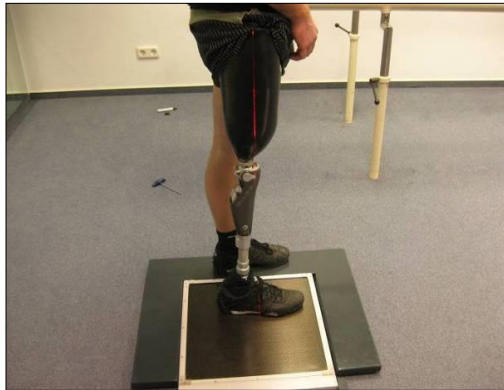
- **Prosthetic side** should be on measuring device
- Other leg should be on height compensation plate
- Goal should be load of **>40%** on prosthetic side
- Course of load line for ischial containment socket
 - Lateral socket region

Adjustment

- If necessary, move the knee joint position mediolaterally

Process of Prosthetic Alignment TF

4. Static Alignment

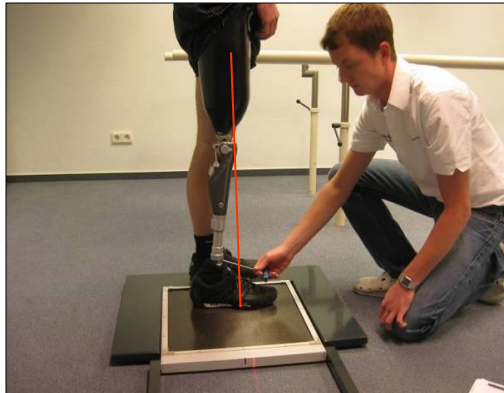


Fitting with patient – Static alignment with the L.A.S.A.R. Posture: sagittal

Measuring the load line

- Prosthetic side should be on measuring device
- Other leg should be on height compensation plate
- Goal should be load of **>40%** on prosthetic side

Adjustment



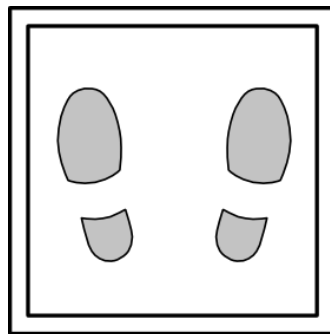
- Change plantar flexion/dorsal extension until
- the load line corresponds with the alignment recommendations for the knee joint

Process of Prosthetic Alignment TF

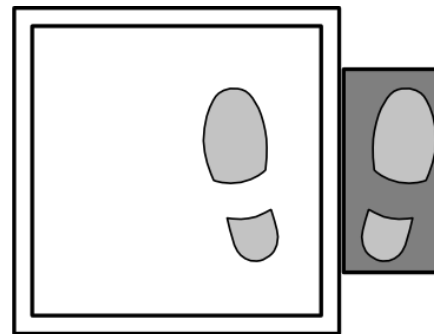
4. Static Alignment

L.A.S.A.R. posture

- The LASAR posture provides a way to check whether significant compensation motions exist
- Knee safety with both feet determine (- -> Heavy Line) and only the prosthetic foot (> load line)
- If the deviation is $< \pm 10$ mm = OK (only small compensation)



Measurement
with both feet



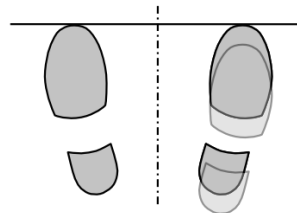
Measurement
with prosthetic foot

Process of Prosthetic Alignment TF

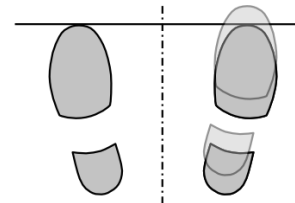
4. Static Alignment

Check the socket flexion angle

- **The patient is in the upright position facing forward**
 - The patient lifts and loaded both sides as mutually
 - As a result, the stump goes into the most comfortable position
 - The prosthetic foot is moved forward (see contralateral) -> socket flexion angle may be too less
 - The prosthetic foot is moved backward (see contralateral) -> socket flexion angle may be too much



The prosthetic foot is moved backward ->
socket flexion angle may be too much



The prosthetic foot is moved forward ->
socket flexion angle may be too less

Process of Prosthetic Alignment TF

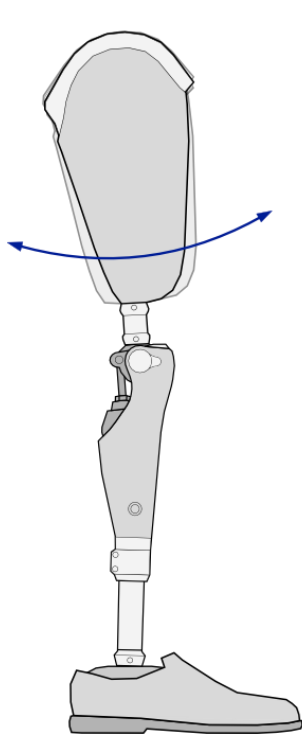
4. Static Alignment



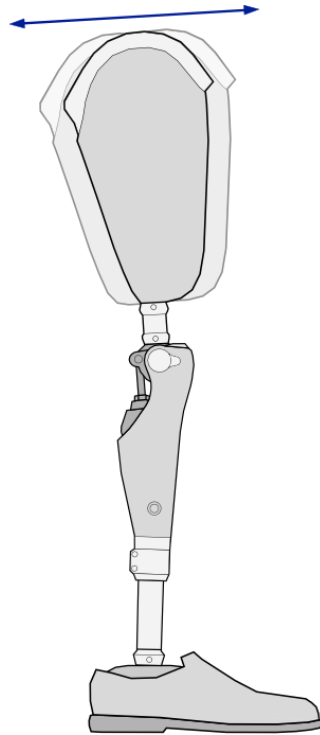
Process of Prosthetic Alignment TF

4. Static Alignment

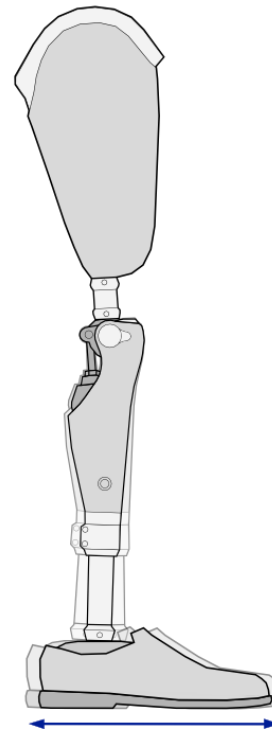
- Additional options:



Socket flexion



Socket position



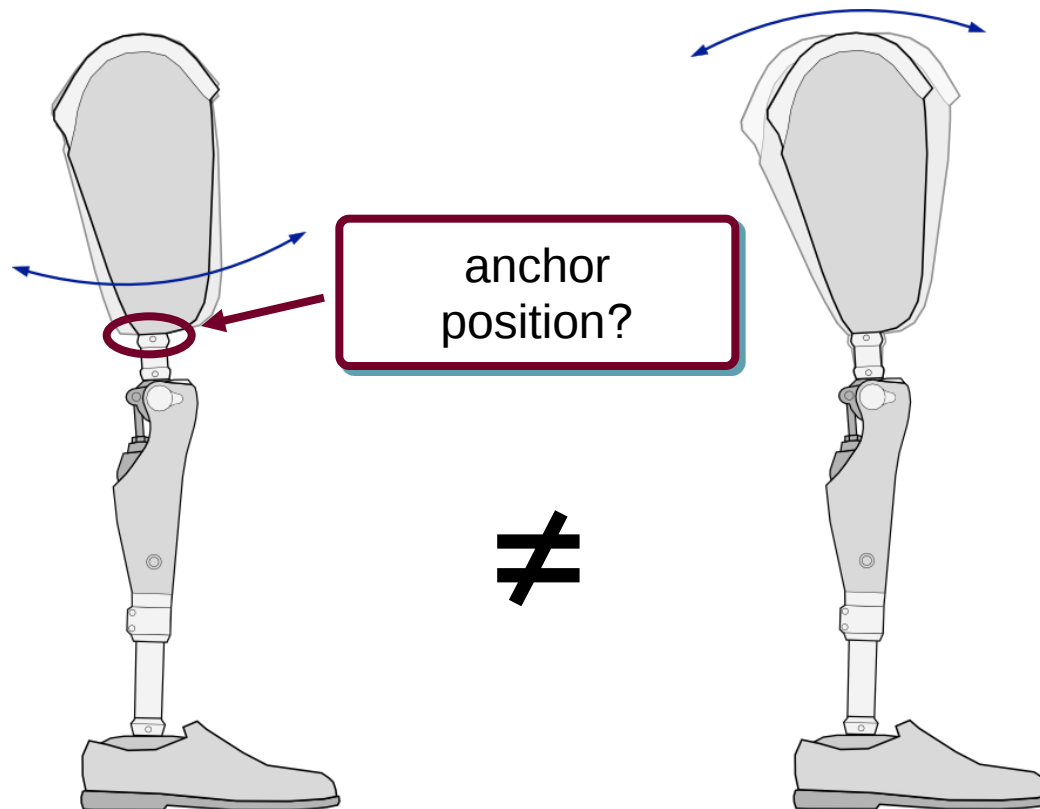
Foot position

Changes always documented (so that they, if necessary, can be undone!)

Process of Prosthetic Alignment TF

4. Static Alignment

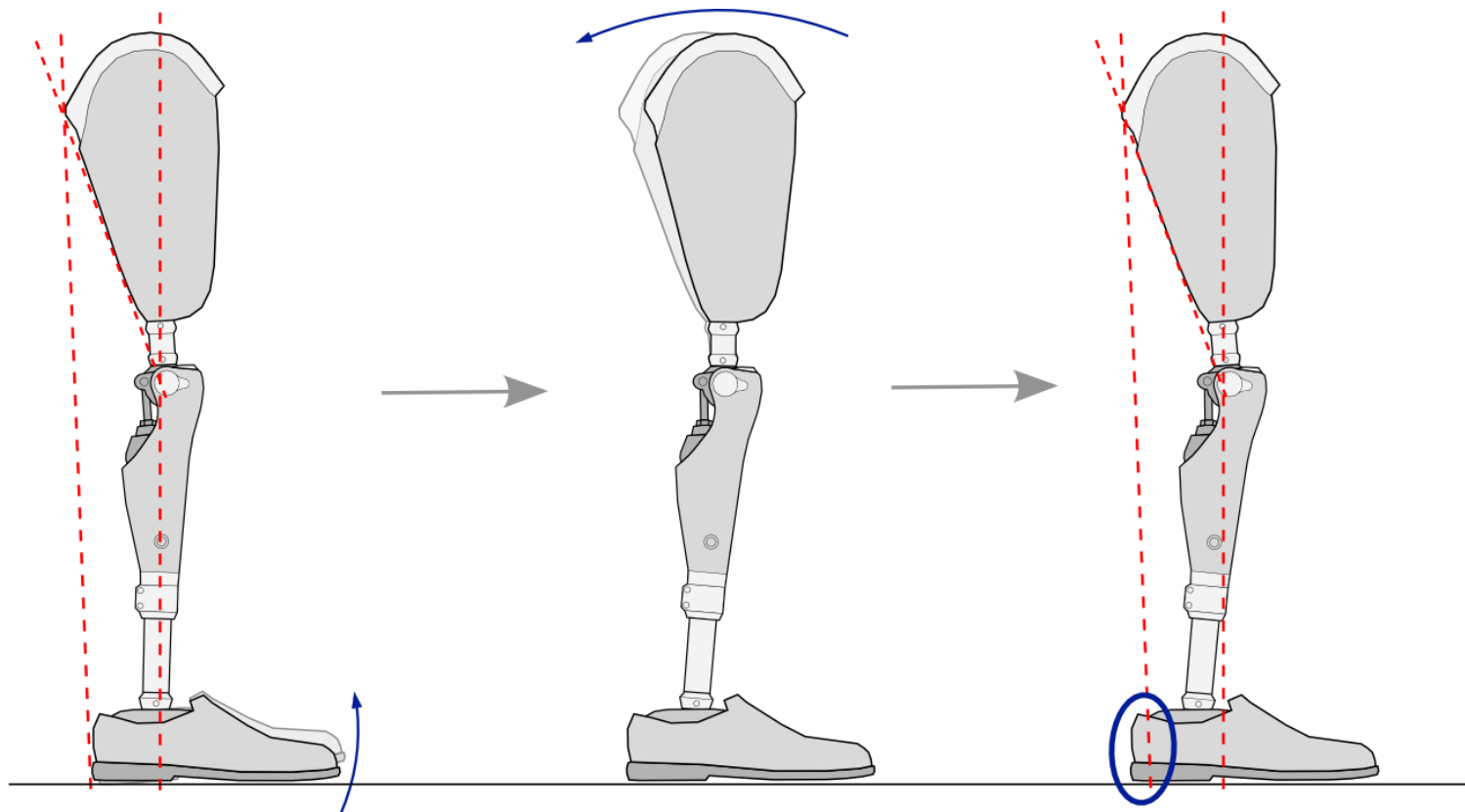
Socket flexion vs. Socket tilt



Process of Prosthetic Alignment TF

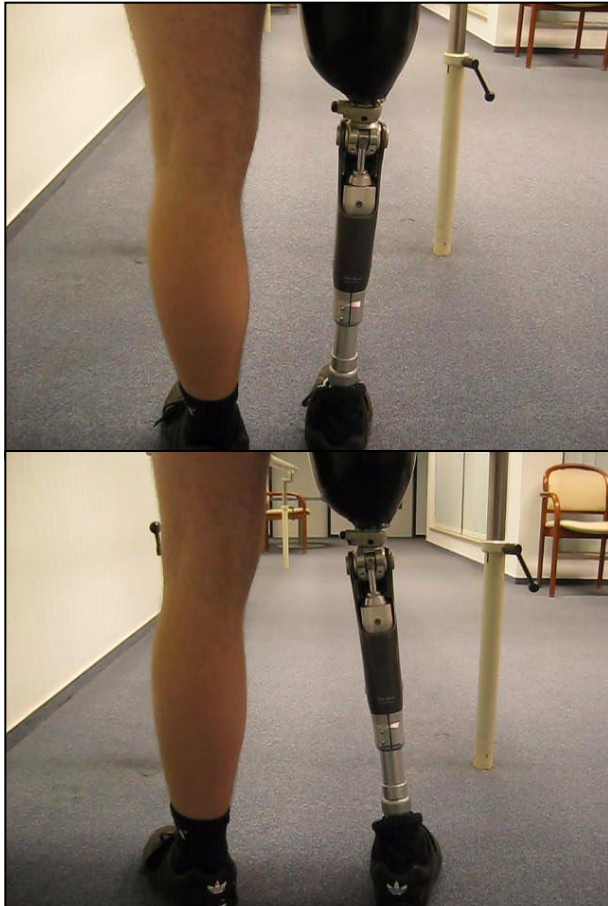
4. Static Alignment

Foot shifting



Process of Prosthetic Alignment TF

5. Dynamic Alignment Optimisation

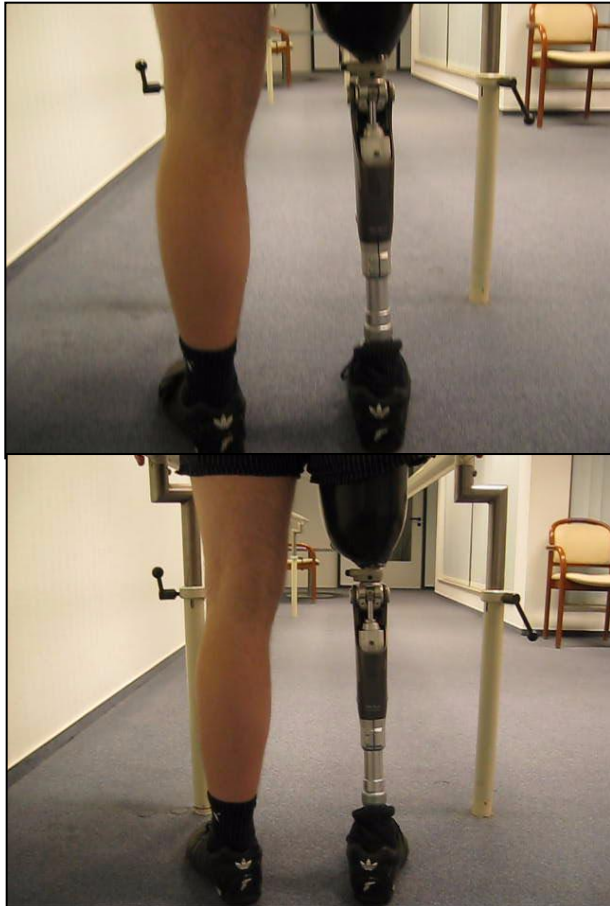


Dynamic alignment with patient

1. Disengage the knee joint
2. Have the patient walk between the parallel bars
3. Adjust the knee joint
4. Check the adjustments by observing the patient's movement patterns while walking
 - Which errors may be visible?
5. Feedback from patient
6. Check posture

Process of Prosthetic Alignment TF

5. Dynamic Alignment Optimisation

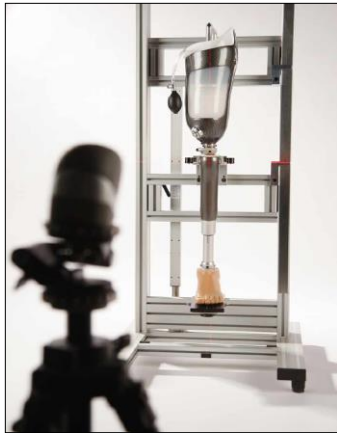


Dynamic alignment with patient

1. Disengage the knee joint
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 - Which errors may be visible?
5. Feedback from patient
6. Check posture

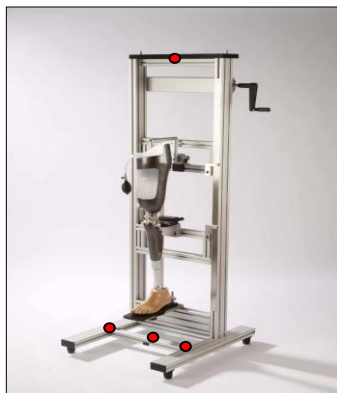
Process of Prosthetic Alignment TF

6. Verification and Documentation



The alignment of a modular leg prosthesis system in reference to the alignment reference line using the PROS.A. Assembly can be verified using an external laser (e.g., 743L5 crosshair laser or 743L20=230 LaserLine).

The three-dimensional alignment of the modular leg prosthesis with the PROS.A. Assembly is measurable and reproducible.



Alignment data can be documented and used for follow up fittings.

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