FIOR & GENTZ
ORTHOPÄDIETECHNIK MIT SYSTEM

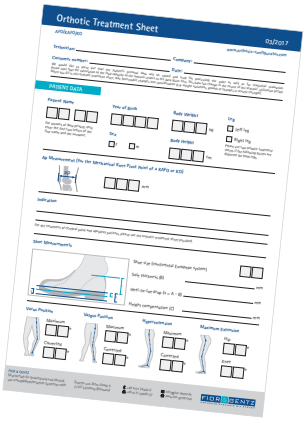
Medical Patient History Guide

for the Orthotic Treatment of the Lower Extremity

Medical Patient History

The First Step towards a Custom-Made Orthosis

An individual AFO, KAFO or KO is exclusively produced for its user. Body measurements and muscle strength are examples for patient related data determined during the medical patient history. Number and accuracy of the gathered data have a great effect on the orthosis. Therefore, all data collected during the medical patient history should be recorded in the orthotic treatment sheet.


Orthotic Treatment Sheet

In this guide, each step of the medical patient history is presented clearly and chronologically. The relevant movements are displayed descriptively. In order to facilitate an interdisciplinary communication, the muscle strength is determined according to Janda. The structure of this guide is based on the orthotic treatment sheet. For the indications apoplexy and cerebral palsy, please see the respective guides and use the orthotic treatment sheets specially designed for these indications.

You can also find the medical patient history among the online tutorials on our website www.fior-gentz.com. All steps for providing orthotic treatment are listed clearly in the form of online tutorials.

We follow this concept of providing orthotic treatment in our workshops at our premises in Lüneburg. During these workshops, theoretical and practical knowledge is imparted conceptionally. Please send us a non-binding request for information materials regarding our workshops:
seminar-info@fior-gentz.de.

Use this guide as a code of practice, reference text, personal check list or as a basis for your medical patient history procedure.

Your FIOR & GENTZ team

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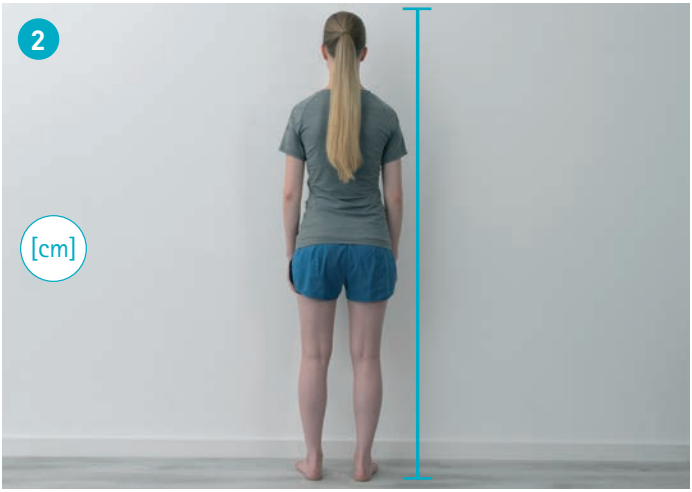
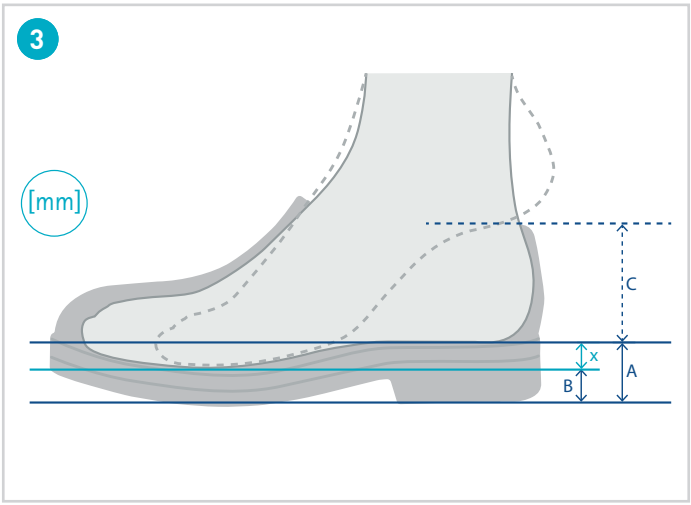
Body Weight

Determine the body weight. Foreseeable changes, like a weight gain due to growth, should be taken into consideration.



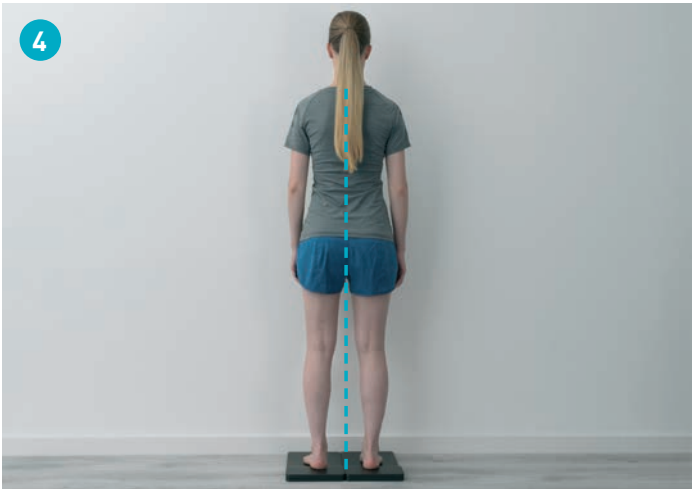
Body Height

Determine the body height. Foreseeable changes, like a change in height due to growth, should be taken into consideration.



Pitch and Height Compensation

Determine the pitch x of the shoe (difference between heel height A and sole thickness B in ball area). Measure A and B and apply the formula x = A - B. Then, transfer the determined pitch to the h-Cast.

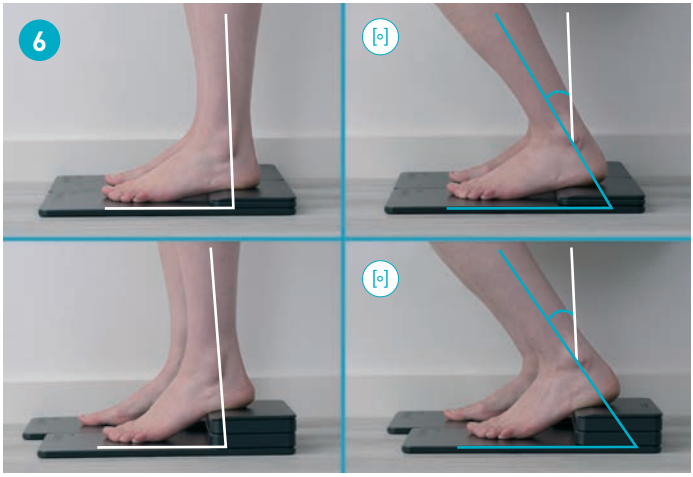


Leg Length/Height Compensation

The patient is standing on the h-Cast. Check if the patient is standing vertically, for example by using a plumb laser. The plumb laser should fall from the 7th cervical vertebra (C7) through the gluteal cleft and the middle of the supportive area of both feet. If this is not the case, the patient needs a height compensation (for example due to a unilateral contracture). Determine the height compensation (see C in fig. 3) and transfer it to the h-Cast. Check the result.

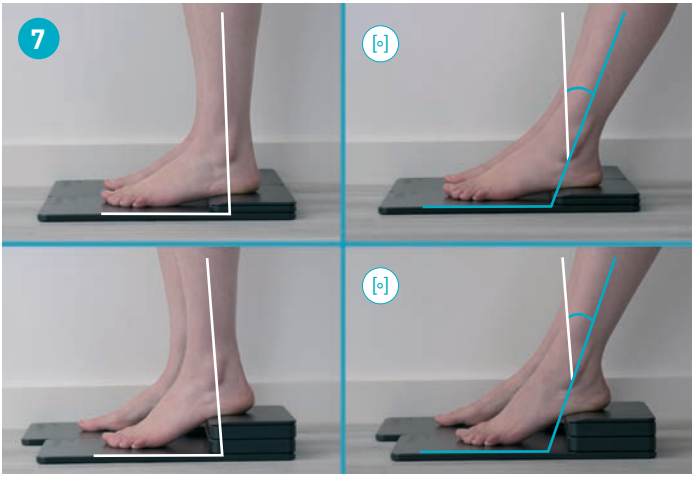
Shoe Size

Determine the shoe size. The rolling off line of the foot shifts posteriorly because of e. g. a unilateral leg length/height compensation which leads to a shortened forefoot lever. In order to achieve an equilateral gait, the same forefoot lever is required. Take this into consideration during the later steps of the casting technique. Write down the bigger shoe size for both sides.



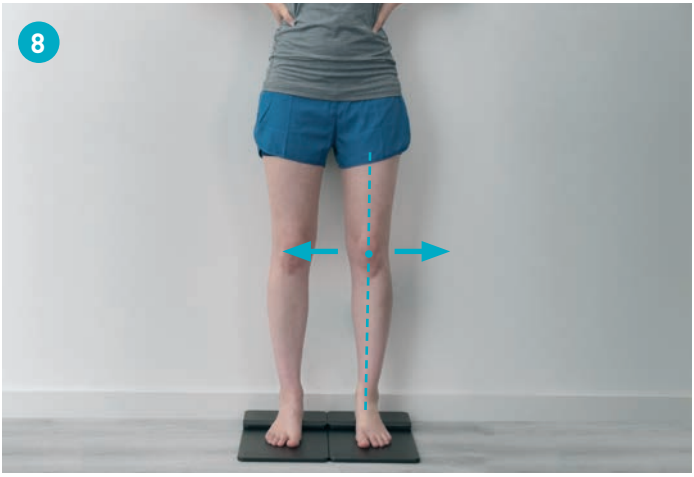
Range of Motion of the Upper Ankle Joint in Dorsiflexion

The range of motion in the upper ankle joint is measured based on the individual normal posture. Place the patient on the h-Cast while taking the leg length/height compensation and the shoe's pitch into account. Measure the range of motion of the upper ankle joint in dorsiflexion based on the individual normal posture.



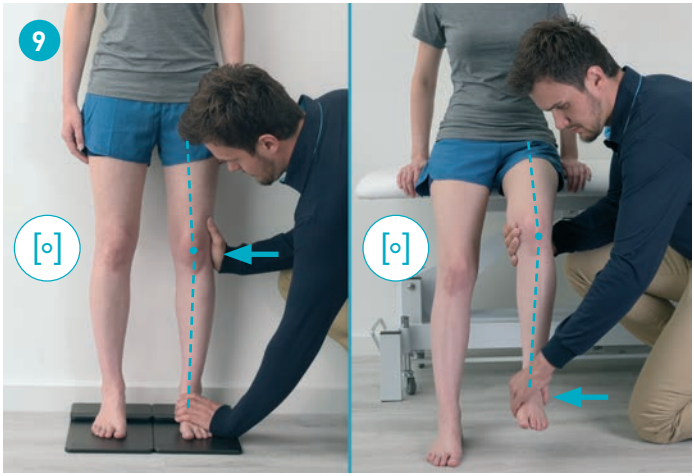
Range of Motion of the Upper Ankle Joint in Plantar Flexion

The range of motion in the upper ankle joint is measured based on the individual normal posture. Place the patient on the h-Cast while taking the leg length/height compensation and the shoe's pitch into account. Measure the range of motion of the upper ankle joint in plantar flexion based on the individual normal posture.



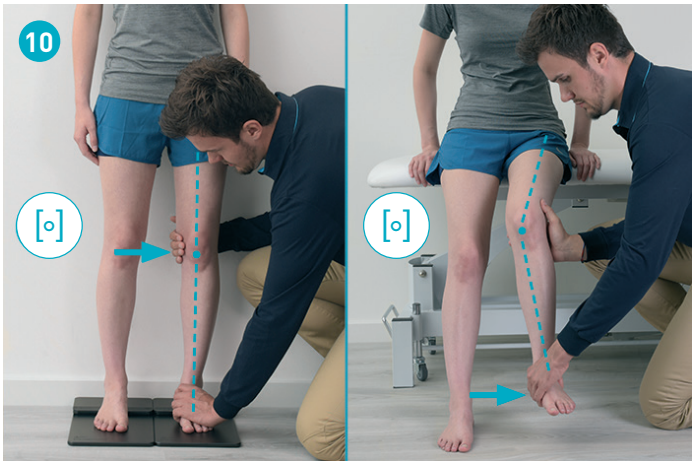
Deformities

The patient is standing on the h-Cast. Determine into which direction the leg axis deviates from the neutral position, if any.



Varus Deformity – Maximum and Corrected

If there is a varus deviation, correct it as far as possible and determine the value of the corrected varus deformity. Is the deformity not correctable, we recommend using the box on the orthotic treatment sheet to document the assessed data nonetheless. Then, determine the maximum varus deformity without load on the leg. If the values coincide, there is a deformity, but no instability.



Valgus Deformity – Maximum and Corrected

If there is a valgus deviation, correct it as far as possible and determine the value of the corrected valgus deformity. Is the deformity not correctable, we recommend using the box on the orthotic treatment sheet to document the assessed data nonetheless. Then, determine the maximum valgus deformity without load on the leg. If the values coincide, there is a deformity, but no instability.

Hyperextension – Maximum and Corrected

Measure the maximum hyperextension in the knee. Correct the position if possible to achieve a physiological knee angle and determine the value. All values above 0°, for example a flexion of 4°, are a resolution of the hyperextension and therefore marked as 0°.

Extension Limitation of the Hip

Apply the Thomas test to assess the extension limitation of the hip. The patient is lying on the back. Place one hand under the lumbar vertebrae to check the delordosing of the lumbar spine. Bring the leg not to be tested into hip flexion with the knee bent. Measure the hip flexion angle on the side to be tested. Please note that the assessed extension limitation of the hip can affect the individual normal posture in the sagittal plane.

Extension Limitation of the Knee

The patient is standing on the h-Cast. Adjust it accordingly to take all influencing factors, like the extension limitation of the hip, into consideration. Measure the knee angle. It deviates from the physiological angle if there is an extension limitation in the knee and/or hip. Pain can also be a factor causing deviations.

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Dorsiflexion

Dorsiflexion – Muscle Strength 5 and 4

The patient is lying on the stomach, the foot of the leg to be tested hangs over the edge of the bed. Fix the lower leg with one hand without restricting the muscle function. Push against the dorsum of the foot with the other hand. Have the patient bring the foot in dorsiflexion. At complete range of motion against gravity with full resistance, the muscle strength is 5. At complete range of motion against gravity with some resistance, the muscle strength is 4.

Dorsiflexion – Muscle Strength 3

The patient is sitting, the lower legs hang over the edge of the bed. Fix the lower leg with one hand without restricting the muscle function. Have the patient bring the foot in dorsiflexion. At complete range of motion against gravity, the muscle strength is 3.

Dorsiflexion – Muscle Strength 2

The patient is lying on the side of the leg to be tested. Place one hand under the foot so that it does not rest on the bed anymore. Have the patient bring the foot in dorsiflexion. At complete range of motion with gravity eliminated, the muscle strength is 2.

Dorsiflexion – Muscle Strength 1 and 0

The patient is lying on the side of the leg to be tested. Place one hand under the foot so that it does not rest on the bed anymore. Have the patient bring the foot in dorsiflexion. Palpate if there is any muscle activity. At slight contraction with no joint motion, the muscle strength is 1. At no evidence of contraction, there is a total paralysis and the muscle strength is 0.

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Plantar Flexion

Plantar Flexion – Muscle Strength 5 and 4

The patient is lying on the stomach, the foot of the leg to be tested hangs over the edge of the bed. Fix the lower leg with one hand without restricting the muscle function. Push against the forefoot from below with the other hand. Have the patient bring the foot in plantar flexion. At complete range of motion against gravity with full resistance, the muscle strength is 5. At complete range of motion against gravity with some resistance, the muscle strength is 4.

Plantar Flexion – Muscle Strength 3

The patient is lying on the stomach, the leg to be tested is flexed. Have the patient bring the foot in plantar flexion. At complete range of motion against gravity, the muscle strength is 3.

Plantar Flexion – Muscle Strength 2

The patient is lying on the side of the leg to be tested. Place one hand under the foot so that it does not rest on the bed anymore. Have the patient bring the foot in plantar flexion. At complete range of motion with gravity eliminated, the muscle strength is 2.

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Plantar Flexion – Muscle Strength 1 and 0

The patient is lying on the side of the leg to be tested. Place one hand under the foot so that it does not rest on the bed anymore. Have the patient bring the foot in plantar flexion. Palpate if there is any muscle activity. At slight contraction with no joint motion, the muscle strength is 1. At no evidence of contraction, there is a total paralysis and the muscle strength is 0.

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Knee Extension

Knee Extension – Muscle Strength 5 and 4

The patient is sitting, the lower legs hang over the edge of the bed. Fix the lower leg with one hand without restricting the muscle function. Push against the lower leg above the foot with the other hand. Have the patient bring the knee in extension. At complete range of motion against gravity with full resistance, the muscle strength is 5. At complete range of motion against gravity with some resistance, the muscle strength is 4.

Knee Extension – Muscle Strength 3

The patient is sitting, the lower legs hang over the edge of the bed. Fix the lower leg with one hand without restricting the muscle function. Have the patient bring the knee in extension. At complete range of motion against gravity, the muscle strength is 3.

Knee Extension – Muscle Strength 2

The patient is lying on the side of the leg not to be tested. Support and lift the upper leg. Fix the pelvis with one hand without restricting the muscle function. The leg to be tested is slightly flexed. Have the patient bring the knee in extension. At complete range of motion with gravity eliminated, the muscle strength is 2.

Knee Extension – Muscle Strength 1 and 0

The patient is lying on the back, the leg to be tested is slightly flexed in hip and knee. The other leg remains extended. Have the patient bring the knee in extension. Palpate if there is any muscle activity. At slight contraction with no joint motion, the muscle strength is 1. At no evidence of contraction, there is a total paralysis and the muscle strength is 0.

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Knee Flexion

Knee Flexion – Muscle Strength 5 and 4

The patient is lying on the stomach, one foot hangs over the edge of the bed and the leg to be tested is flexed. Fix the lower leg with one hand without restricting the muscle function. Push against the lower leg close to the foot with the other hand. Have the patient bring the knee in flexion. At complete range of motion against gravity with full resistance, the muscle strength is 5. At complete range of motion against gravity with some resistance, the muscle strength is 4.

Knee Flexion – Muscle Strength 3

The patient is lying on the stomach, one foot hangs over the edge of the bed and the leg to be tested is flexed. Fix the lower leg with one hand without restricting the muscle function. Have the patient bring the knee in flexion. At complete range of motion against gravity, the muscle strength is 3.

Knee Flexion – Muscle Strength 2

The patient is lying on the side of the leg not to be tested and the upper leg is slightly flexed. Support and lift the upper leg. Fix the pelvis with one hand without restricting the muscle function. Have the patient bring the knee in flexion. At complete range of motion with gravity eliminated, the muscle strength is 2.

Knee Flexion – Muscle Strength 1 and 0

The patient is lying on the stomach, one foot hangs over the edge of the bed and the leg to be tested is slightly flexed. Support the flexed leg with one hand. Have the patient bring the knee in flexion. With the other hand, palpate if there is any muscle activity. At slight contraction with no joint motion, the muscle strength is 1. At no evidence of contraction, there is a total paralysis and the muscle strength is 0.

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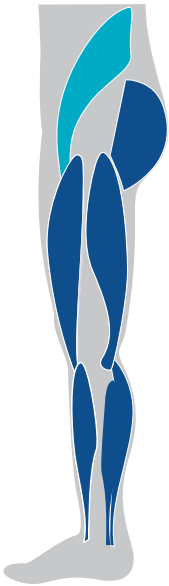
Hip Flexion



Hip Flexion – Muscle Strength 5 and 4

The patient is lying on the back, the lower legs hang over the edge of the bed. Fix the pelvis with one hand without restricting the muscle function. Push against the thigh close to the knee with the other hand. Have the patient bring the hip in flexion. At complete range of motion against gravity with full resistance, the muscle strength is 5. At complete range of motion against gravity with some resistance, the muscle strength is 4.

Hip Flexion – Muscle Strength 3

The patient is lying on the back, the lower legs hang over the edge of the bed. Fix the pelvis with one hand without restricting the muscle function. Have the patient bring the hip in flexion. At complete range of motion against gravity, the muscle strength is 3.

Hip Flexion – Muscle Strength 2

The patient is lying on the side of the leg not to be tested, the leg to be tested is slightly flexed in hip and knee. Support and lift the upper leg with one hand. Fix the pelvis with the other hand without restricting the muscle function. Have the patient bring the hip in flexion. At complete range of motion with gravity eliminated, the muscle strength is 2.

Hip Flexion – Muscle Strength 1 and 0

The patient is lying on the back, hip and knee are slightly flexed. Support the flexed knee with one hand. Have the patient bring the hip in flexion. With the other hand, palpate if there is any muscle activity. At slight contraction with no joint motion, the muscle strength is 1. At no evidence of contraction, there is a total paralysis and the muscle strength is 0.

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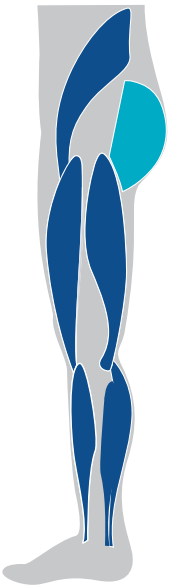
Hip Extension



Hip Extension – Muscle Strength 5 and 4

The patient is lying on the stomach, the feet hang over the edge of the bed. Push against the thigh close to the knee with one hand. Have the patient bring the hip in extension. Make sure that the pelvis stays on the bed. At complete range of motion against gravity with full resistance, the muscle strength is 5. At complete range of motion against gravity with some resistance, the muscle strength is 4.

Hip Extension – Muscle Strength 3

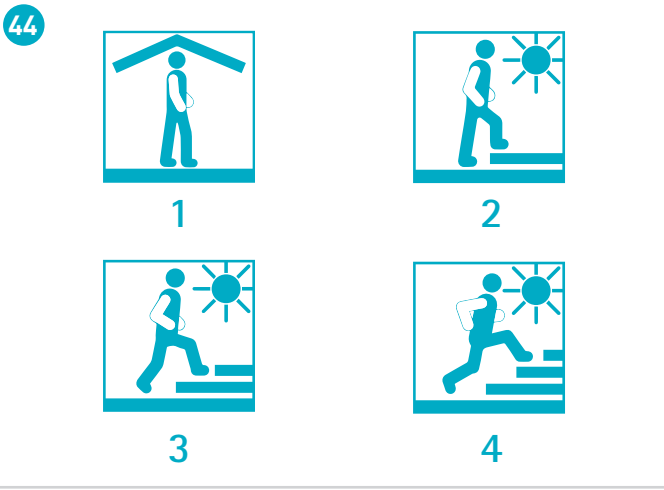
The patient is lying on the stomach, the feet hang over the edge of the bed. Have the patient bring the hip in extension. Make sure that the pelvis stays on the bed. At complete range of motion against gravity, the muscle strength is 3.

Hip Extension – Muscle Strength 2

The patient is lying on the side of the leg not to be tested and the upper leg is slightly flexed. Support and lift the upper leg with one hand. Fix the pelvis with the other hand without restricting the muscle function. Have the patient bring the hip in extension. At complete range of motion with gravity eliminated, the muscle strength is 2.

Hip Extension – Muscle Strength 1 and 0

The patient is lying on the stomach. Have the patient bring the hip in extension. Palpate if there is any muscle activity. At slight contraction with no joint motion, the muscle strength is 1. At no evidence of contraction, there is a total paralysis and the muscle strength is 0.



Activity Level

Evaluate the activity level together with your patient while already taking foreseeable changes into consideration:

1. Indoor Walker
The patient has the ability or the potential to make transfers and to move with an orthosis on even surfaces at low walking speed. Ambulation is possible for a very short distance and duration due to the physical condition of the patient.

2. Restricted Outdoor Walker
The patient has the ability or the potential to move with an orthosis at low walking speed and is able to overcome small environmental obstacles such as curbs, single steps or uneven surfaces.

3. Unrestricted Outdoor Walker
The patient has the ability or the potential to move at medium to high and also varying speed and to overcome most environmental obstacles. Additionally, the patient can walk on open terrain and perform professional, therapeutic and other activities which do not apply an above average mechanical load on the orthosis.

4. Unrestricted Outdoor Walker with Especially High Demands
The patient has the ability or the potential to move with an orthosis like the unrestricted outdoor walker. Additionally, the increased functional demands can generate high impact loads, tension and/or deformation on the orthosis. These patients are mainly athletes and children.

ap Measurement at Knee Height

Determine the ap measurement using a calliper. This measurement is required for calculating the position of the mechanical pivot point.

Glossary

AFO
Ankle-foot orthosis.

ap Measurement
(abbrev. of anterior-posterior measurement, from Latin *anterior* = forward, before, *posterior* = coming after): lateral measurement at knee joint space height, which describes the extent of the knee from the patella to the back of the knee.

Contraction
(from Latin *contractio* = drawing together): active shortening of e. g. a muscle.

Delordosing
Temporary or permanent reduction of a ↑lordosis of the spine.

Distal
(from Latin *distare* = to stand away from): denoting a position away from the centre of the body. Counterpart: ↑proximal.

Dorsal
(from Latin: *dorsum* = back): pertaining to the back or to any dorsum. For example, a dorsal shell of an ↑AFO encloses the back side of the lower leg, the calf.

Dorsiflexion
Lifting of the foot. Countermovement: dropping of the foot (↑plantar flexion). Referred to as a "flexion" motion because it reduces the angle between the lower leg and foot, although it is technically a stretching movement in the sense of an ↑extension.

Extension
(from Latin *extendere* = to extend): active or passive straightening of a joint. Straightening is the countermovement of bending (↑flexion) and characteristically increases the joint angle.

Flexion
(from Latin *flectere* = to bend): active or passive straightening of a joint. Bending is the countermovement of straightening (↑extension) and characteristically reduces the joint angle.

Flexion Contracture → Contracutre
(from Latin *contrahere* = to tighten): Tissue shortening or shrinking, e. g. of certain muscles or tendons. It leads to a reversible or irreversible restriction of mobility or fixed deformity of the adjoining joints. There are elastic and rigid contractures.

Height Compensation
Orthopaedic appliance in the form of a shoe modification, an insert, a loose wedge or a construction underneath the foot piece of an orthosis. Independently from the leg length compensation, a height compensation aims to achieve an additional compensation (for example in bilateral contractures).

Individual Normal Posture
Standing position in which the conditions of the pitch and the ankle, knee and hip angles are optimal for the patient. Possible constraints (e. g. contractures) are partially or completely predetermined by these angles. By taking into consideration the individual normal posture, the alignment and biomechanical properties of the orthosis are in accordance with the individual needs of the patient: The individual normal posture ranges from standing with weight either on both legs or one leg, depending on whether the orthosis is designed for a low or high dynamic use. After the individual normal posture of the patient has been determined, the negative cast is produced in that exact position.

KAFO
Knee-ankle-foot orthosis.

KO
Knee orthosis.

Leg Length Compensation
Orthopaedic appliance in the form of a shoe modification, an insert, a loose wedge or a construction underneath the foot piece of an orthosis. A leg length compensation aims to balance out an existing ↑leg length discrepancy.

Leg Length Discrepancy
Measurable length discrepancy between both legs from hip to foot.

Leg Length Shortening
Functional or structural shortening of a leg, which leads to a ↑leg length discrepancy if the contralateral leg is not or not as much affected.

Lordosis
(from Greek *lordós* = bent backward): ↑ventral curvature of the spine. A lordosis of the lumbar spine is also called lumbar lordosis.

Muscle Strength
Muscle strength is an indicator used to evaluate the force exerted by a group of muscles (e. g. knee flexors). This force is determined by the muscle function test (according to V. Janda), which is used to test to what extent it is possible to perform the respective movement with each muscle group. The strength is classified on a six-level scale depending on whether the subject is able to overcome manually applied resistance or gravity.

0 (zero)	total paralysis, no evidence of contraction
1 (trace)	slight contraction, but no joint motion
2 (poor)	complete range of motion with gravity eliminated
3 (fair)	complete range of motion against gravity
4 (good)	complete range of motion against gravity with some resistance
5 (normal)	complete range of motion against gravity with full resistance

Neutral Position
A neutral position is characterised by an upright posture with feet nearly hip width apart. The joint's range of motion can be determined in neutral position.

Pitch
Effective difference between the heel's centre and the ball area. In shoes, this difference is calculated from the heel height and the sole thickness in the ball area.

Physiological
(from Greek *physis* = nature; *logos* = science): concerning natural life processes.

Plantar
(from Latin *planta* = sole of the foot): concerning the sole of the foot.

Plantar Flexion
Dropping of the foot. Countermovement: lifting of the foot (↑dorsiflexion).

Plumb Laser
Tool used to determine a vertical or horizontal reference line using a laser beam. The exact alignment of the desired reference line can be adjusted.

Proximal
(from Latin *proximus* = nearest): denoting a position close to the centre of the body. Counterpart: ↑distal.

Rolling Off Line
Line which passes the ball area and in which a flexion occurs in the metatarsophalangeal joints during the end of stance phase. Analogue to this anatomical rolling off line, there is a mechanical rolling off line in the foot piece of the orthosis.

Thomas Test
Named after the British surgeon Hugh Owen Thomas (1834–1891). This orthopaedic examination method is used to evaluate the ability to extend the leg in the hip joint.

To Palpate
(from Latin *palpare* = to touch, feel): examining the body's structures or functions by touching and feeling with the hand.

Upper Ankle Joint
(Latin *articulatio talocruralis*): The upper ankle joint and the lower ankle joint are the two joints between the lower leg and the tarsus. It is a hinge joint composed of the tibia and calf bone at the lower leg and the ankle bone of the tarsus. It is stabilised by the joint capsule and several ligaments. The upper ankle joint is mainly responsible for the ↑plantar flexion and the ↑dorsiflexion of the foot.

Valgus Deformity
(from Latin *valgus* = twisted): bone and joint deformity in which the ↑distal end of the joint differs outwards from the normal axis. The valgus deformity in the knee is called genu valgum. This axis deviation is also commonly called knock knees.

Glossary

Varus Deformity
(from Latin *varus* = bow legged): Bone and joint deformity in which the ↑distal end of the joint differs from the normal axis towards the body's centre. The varus deformity in the knee is called genu valgum. This axis deviation is also commonly called bandy legs.

Ventral
(from Latin *venter* = belly, body): denoting a position toward the belly surface, abdominal. For example, a ventral shell of an ↑AFO encloses the front side of the lower leg, the tibia.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Orthosis Configurator

PRO233-GB-09/2017

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