ORTHO SYSTEMS

2000 2026

Years in motion

UNILATERAL THE ORIGINAL ORTHO-SYSTEMS

Excellence in Neuro-Orthopedics

Your Patient – Our Contribution

Catalogue Excerpt

Orthotics 14.0
Valid from July 2026

Orthotic Ankle Joint Placement

The orthotic ankle joint is positioned at the midpoint of the ankle in the sagittal plane and aligned with the line of progression in the transverse plane. The placement height of the mechanical axis is a subject of some debate. We compare three common philosophies, highlighting their respective advantages and disadvantages.

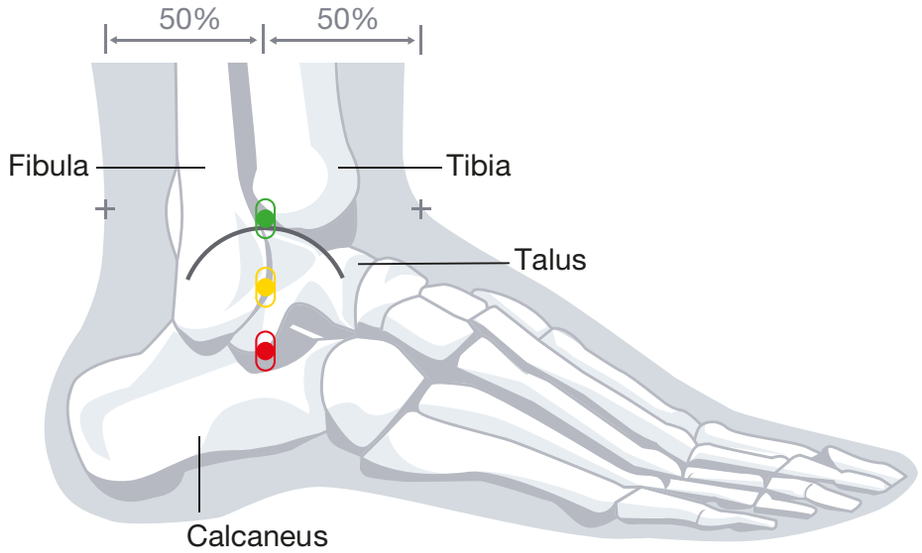


Fig. Right foot lateral view
(neutral position)

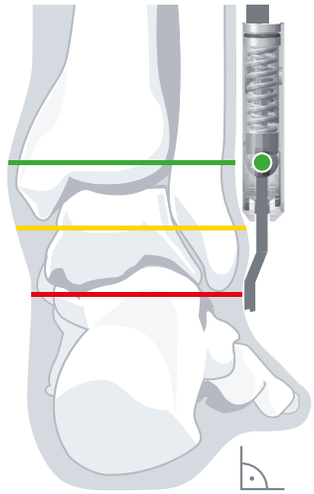


Fig. Right foot posterior view
The ankle joint is aligned parallel to the leg and perpendicular to the ground during midstance.

Axis above lateral malleolus:

This approach presents the lowest risk of incongruency for the skeletal system. In patients who are still growing, the anatomical ankle joint has room to move upwards. Due to the limited range of motion of the orthotic joint, any displacements produced by the higher-situated mechanical axis have proven unproblematic in our experience. Decades of experience with L-shaped carbon spring orthoses confirm this. Slight horizontal displacements are offset by the soft tissue of the calf, and minimal vertical displacements are compensated for by stockings. Additionally, placing the ankle joint above the lateral malleolus enhances cosmetic acceptance, minimizes difficulties in shoe fittings and eases fabrication of the orthosis for the technician.

Axis middle lateral malleolus:

The thickest part of the orthotic joint is positioned at the widest part of the ankle, which is neither cosmetically appealing nor conducive to acceptance. Furthermore, the protruding position of the joint necessitates a sharper bend of the stirrup, which negatively influences the stability of the orthosis. Only minimal vertical displacements are present, and these can be compensated for by stockings. In patients who are still growing, the anatomical ankle joint has limited space to move upwards. Slight horizontal displacements are negligible due to the limited range of motion and can be offset by the soft tissue of the calf.

Axis distal fibular tip:

This positioning orients the mechanical axis on the structure of the talus, but in practice is arbitrarily determined using the external contours of the ankle. There are countless differences in the characteristics of the distal fibula; sometimes it sits higher to the sliding surface of the talus, and sometimes lower. If the orthopedic technician places the orthotic joint even slightly too low, or if the patient has grown since receiving their orthosis, this can quickly lead to a dangerous incongruence with the subtalar joint. Vertical displacements caused by the significant difference between mechanical and anatomical axes increase compression between the tibia and the talus. In this case, horizontal displacements cannot be compensated by soft tissues and instead apply excess stress on the talocalcaneal joint. The low position of the orthotic joint can also cause problems with shoe fittings. Additionally, the joint's placement on the wide part of the ankle is neither cosmetically appealing nor conducive to acceptance.

Orthotic Knee Joint Placement

The knee is the largest joint in the body, and correct placement of the orthotic joint is crucial for the proper fit of the orthosis and the efficiency of the contact points (3-point pressure system). To locate the mechanical axis for the combined sliding and rolling movements of the knee joint, the “compromise axis” method, proposed by M. Nietert in 1975, is used.

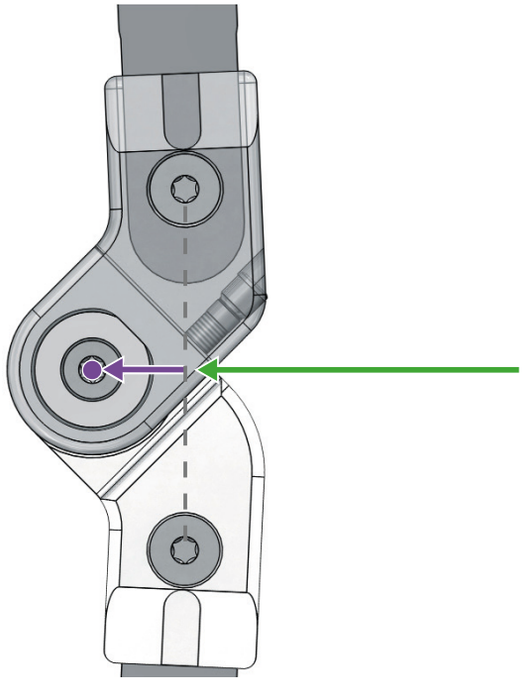


Fig. Posterior offset knee joint

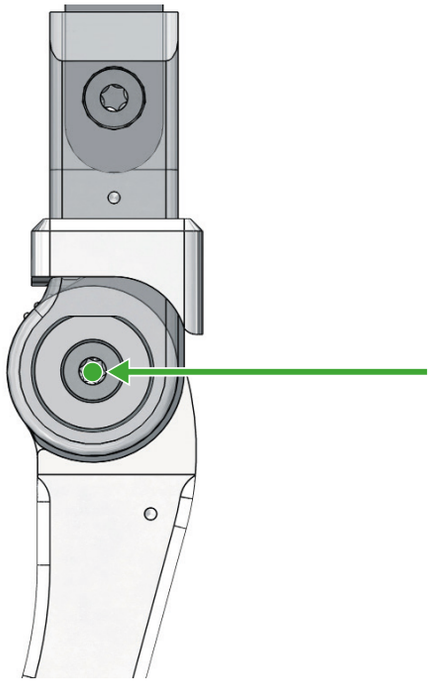


Fig. Locked knee joint

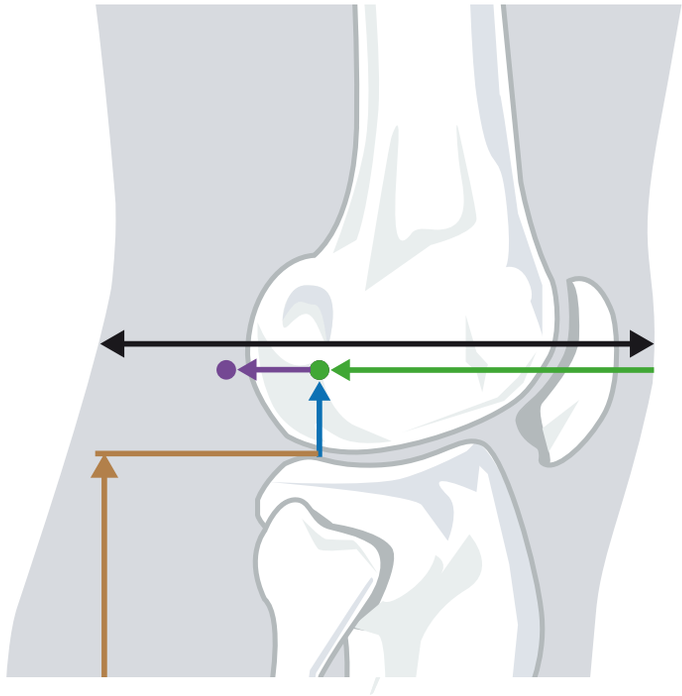


Fig. Right knee joint lateral view

For posterior offset knee joints, the amount of offset must be taken into account and added to the 60% in accordance with the manufacturer’s specifications.

Offsetting the mechanical axis beyond the 60% compromise axis results in a downward displacement of the lower leg section of the orthosis when sitting. In our view, this displacement is not problematic, and we therefore do not recommend adjusting the height of the mechanical axis accordingly.

Viewed from the side, the pivot point is determined using a 60:40 ratio of the knee’s anterior-posterior measurement, with 60% measured from the front.

Vertical displacement above the tibial plateau ranges from 14% – 17% of the knee‘s anterior-posterior measurement, as measured at the height of the patella.

The A-P measurement is taken at the height of the patella with the knee extended. We recommend taking the tibial plateau to ground measurement on the lateral side of the leg (not weightbearing). If possible, the foot should be positioned at 90 degrees and the calcaneus correctly aligned.

Orthotic Hip Joint Placement

Determining the location of the hip joint axis through palpation can be extremely difficult. The challenge arises due to the variability in hip joint formation, which can be influenced by the specific disorder and level of immobilization. Furthermore, unilateral or bilateral hip dislocation may also be present, e.g. due to muscle imbalance. Given these complexities, we recommend using the sitting measurement technique to calculate the distance between the tibial plateau and the mechanical hip joint axis (the orthosis also fits when sitting).

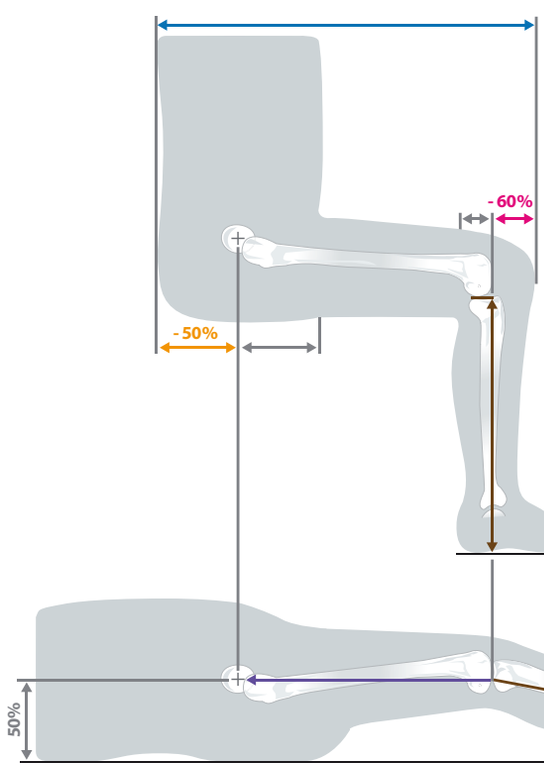


Fig. Sitting measurement, Fig. Plaster cast horizontal

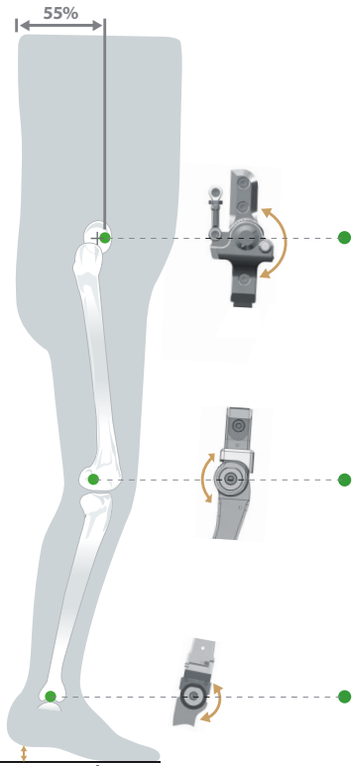


Fig. Positive model bench alignment

Fig. Joint combination

Example RGO

Patient stands with hips extended and thighs vertical.
The knee joint is in 10° flexion and ankle at 90°.

During dynamic fitting, changes to the hip, knee and ankle angles, as well as heel/shoe height optimize the alignment and function of the RGO.

- Seen from the side, hip joint placement is 55% of the pelvic A-P measurement. This anterior offset minimizes pinching when sitting and allows for future increases in volume. By shifting the mechanical axis forwards, the trunk section of the orthosis moves slightly upwards when sitting. From our point of view, this minimal displacement is unproblematic.
- The locked knee joint is placed at 60% of the A-P measurement from the front of the knee and 14%-17% of the A-P measurement above the tibial plateau.
- The double action ankle joint is positioned in the middle of the ankle as viewed in the sagittal plane and above the lateral malleolus.

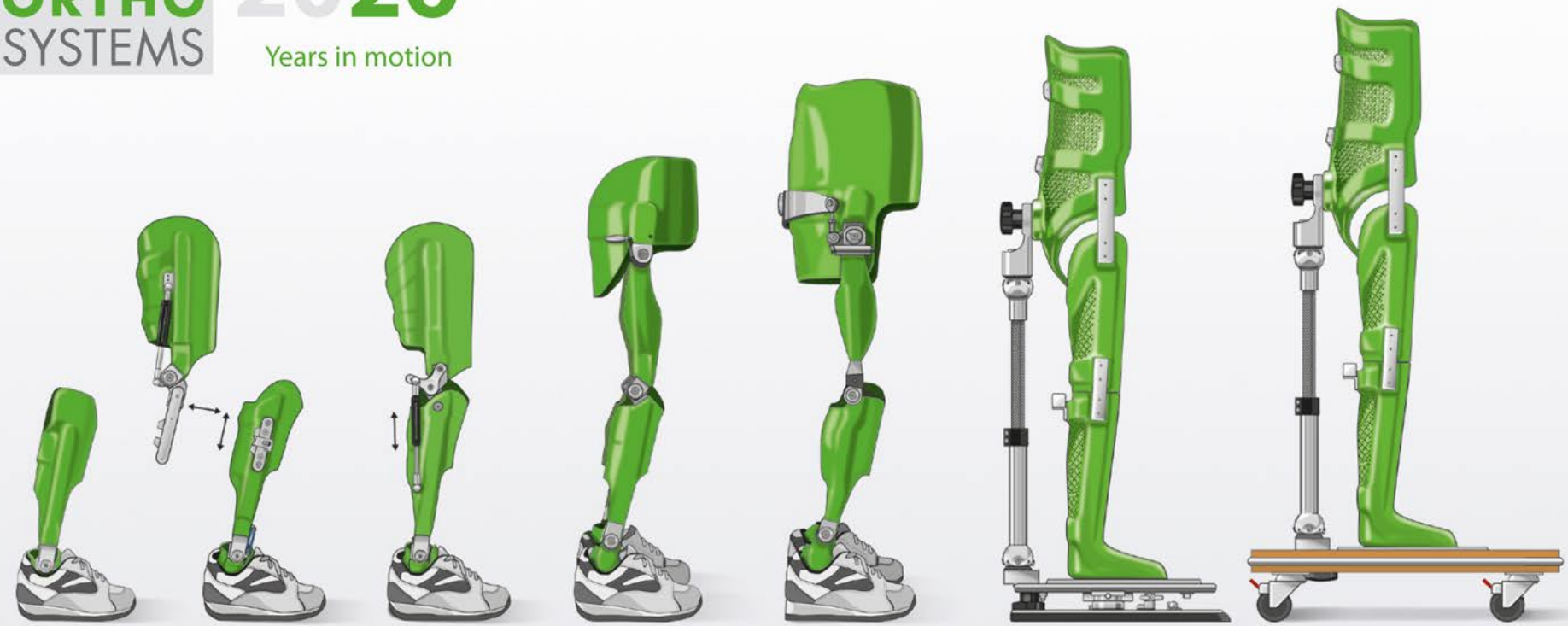
L	R
Sitting Measurement	
- 50% Pelvic A-P	
- 60% Knee A-P	
= Reference Measurement (tibial plateau to hip joint axis with leg extended)	

- The sitting measurement is taken with light contact applied to the sacrum and patella while pulling the thigh forward (pelvis erect, no slouching!). Both legs need to be measured and any differences in thigh length noted. This can be confirmed with the patient lying on his back and the hip and knee joints flexed to 90°.
- Pelvic A-P measurement is taken with the patient lying down at the height of the assumed hip axis.
- Knee A-P measurement is taken at the height of the patella with leg extended.
- There may be discrepancies between the left and right measurements. Ultimately, the mechanical hip joint axis must be horizontal to the ground to ensure a smooth, uniform gait. Any contractures or leg length discrepancies need to be taken into account. Based on our experience, it is not problematic if the mechanical axis is slightly above the anatomical axis. However, placing the mechanical axis below the anatomical axis can result in significant incongruity with the anatomical joint.

ORTHO SYSTEMS

2000 2026

Years in motion



Contact

You can reach us from	9 am to 5 pm (Germany)
by telephone	+49 89 904 7575 0
per Fax	+49 89 904 7575 5
per E-Mail	kontakt@ortho-systems-mail.de
Address	Merowingerstr. 14, 85551 Kirchheim, Germany
Contact persons	Jeff Matwichuk and Thomas Böckh

www.ortho-systems-inmotion.com