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1B1 Meridium

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Information for practitioners

Reclaim your way.

With the development of the individualized Meridium prosthetic foot, Ottobock has incorporated the latest technology to achieve a particularly close approximation to the anatomy of the human foot.

Where conventional mechanical prosthetic feet have always represented a compromise between flexibility and stability, electronically controlled ankle joints have until now enabled primarily slight, gradual adjustments to the user's current gait behavior.

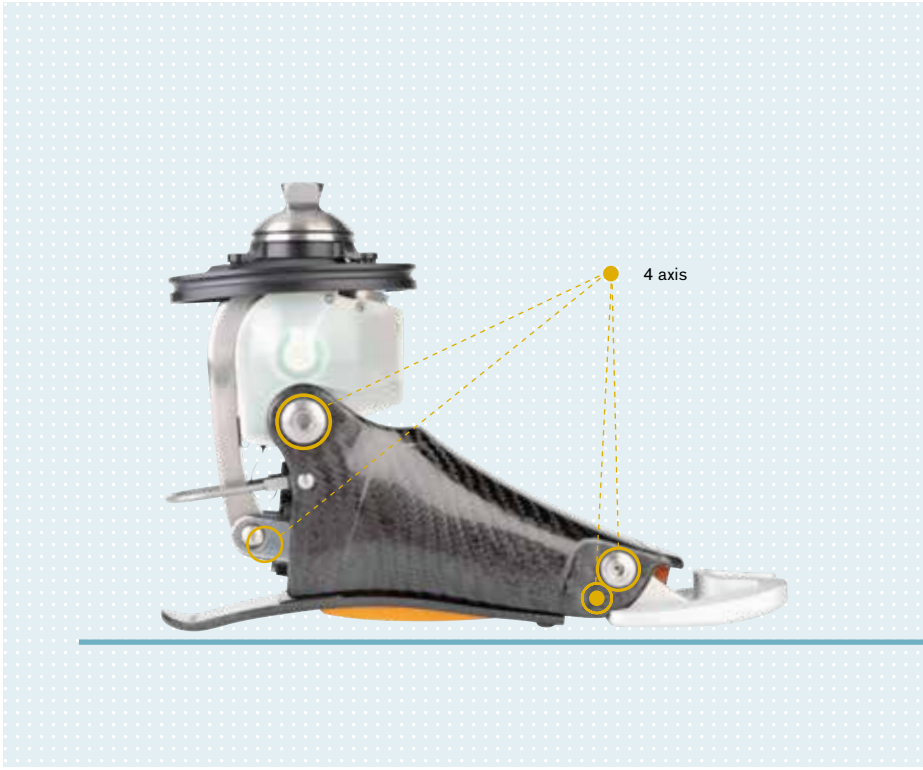
But the new Meridium is completely different, featuring an impressive range of advantages that offer the user a significantly more precise adjustment to the current situation. As a result, the user feels extremely safe and enjoys a more natural pattern of movement.

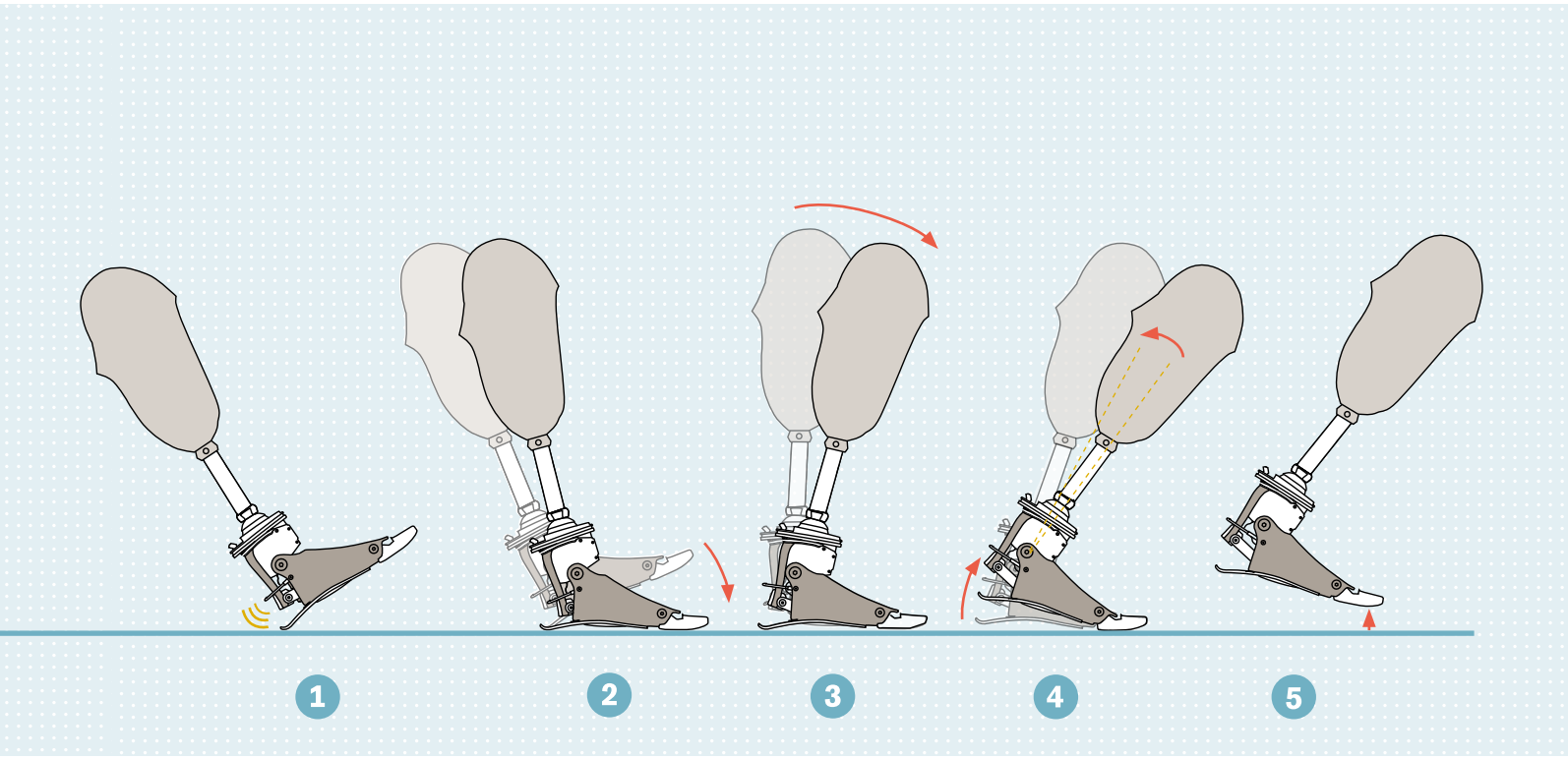
Incorporating intelligent, real-time control, the 4-axis design therefore adjusts itself immediately to the user's walking speed and ground conditions, whether on slopes, stairs, or varying terrain.

Based closely on the natural human anatomy, the Meridium prosthetic foot is movable not only in the ankle area, but also in the midfoot and toe region thanks to its additional axis. This is a big plus for the user during everyday activities, making both greater flexibility and enhanced stability possible.

4-axis kinematics

The polyaxial construction and extensive real-time control, along with a broad range of motion, form the basis for the Meridium's nearly natural replication of the human foot.





Walking on level surfaces

1. The hydraulic resistance is adjusted during initial ground contact to achieve a comfortable heel leverage adapted to the user's stride length.

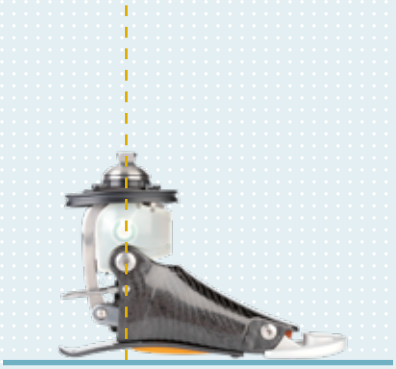
2. Based on the individually adjusted plantar flexion resistance, the foot lowers itself according to the gait situation with every step.

3. Thanks to the wide range of motion and real-time adaptation, the user benefits from expanded, full-surface contact with the ground for the greatest possible stability and excellent traction.
If the user changes their walking speed, the dorsiflexion resistance automatically adjusts itself to the change in forces. This allows the user to easily vary their speed without feeling any change in the foot's behavior.

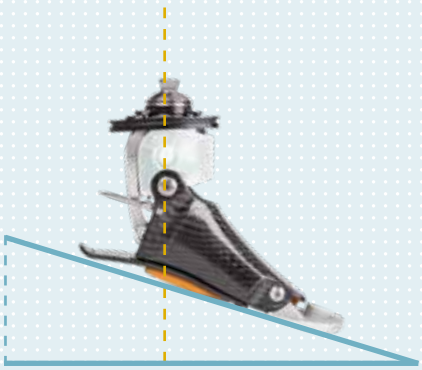
4. The movable toe plate provides a large contact surface and ensures uniform pressure distribution in the forefoot area when rolling over the foot at the end of the stance phase.

   During foot rollover, the Meridium's four axes cause the ankle to plantar flex, which helps keep the body's center of gravity from lowering during walking. The result is a smoother and more natural gait pattern, reducing the need for compensating movements that sap the user's energy.

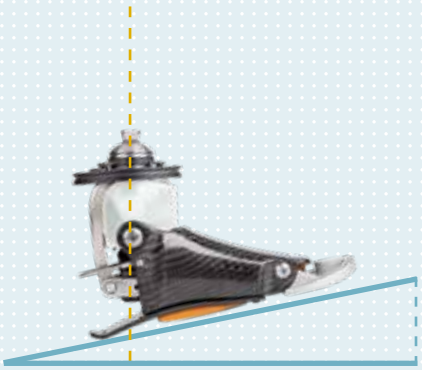
5. If the foot is lifted from the floor, the hydraulics maintain an extended dorsiflexion position in order to allow greater ground clearance in the swing phase, while simultaneously achieving a higher degree of safety.



Standard position on level surfaces



Ramp recognition in real time



Ramp recognition in real time

Master slopes and uneven ground

The Meridium recognizes the current ground conditions and adjusts itself to the new situation in real time. If a slope or change in surface is detected, real-time adaptation already occurs from the very first step.

1 Descending

The possible plantar flexion angle and rollover angle are adjusted in real time according to the incline.

The lowering of the foot prevents undesired acceleration, and the dorsiflexion resistance supports a consistent rollover across a wide range of motion. The user also benefits from secure foot placement, as the foot quickly gains full-surface contact with the ground.

The user also finds it easier to control knee flexion, because less flexion moment occurs. Improved gait symmetry is due to uniform load distribution across both legs, which means the heel is not lifted from the floor as quickly.

2 Ascending

In comparison to the foot's behavior on even surfaces, the rollover angle is increased when walking upwards.

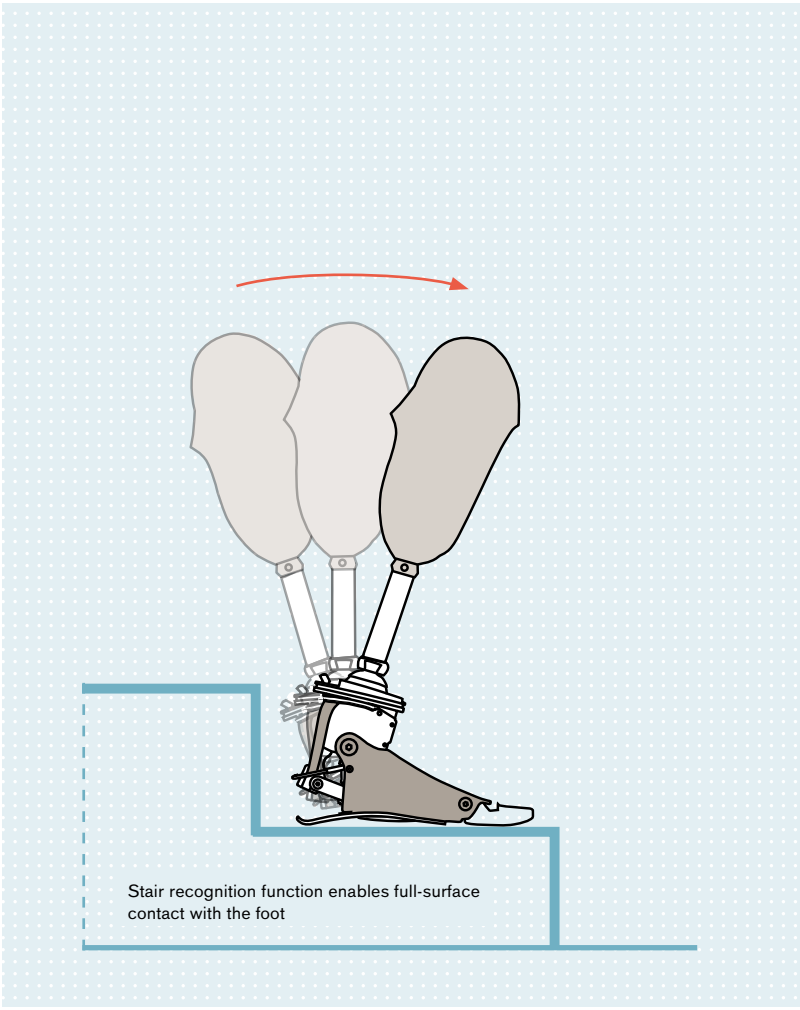
During the swing phase, the foot remains in the dorsiflexion position to provide greater ground clearance. This prevents the tip of the foot from getting caught.

Walking up a ramp or slope becomes significantly easier, so the user needs to place less weight on their forefoot. This allows the user to place an equal load on both legs, and enables a more uniform gait symmetry as well.

Walking on uneven ground

The advantages of real-time adjustment are particularly evident on uneven surfaces such as cobblestones, grass, forest paths, and other similarly structured surfaces. With every step, the dorsiflexion and plantar flexion angles are fully and immediately adapted to the walking surface. The improved contact with the ground increases the user's safety.

Smaller obstacles are therefore no longer perceived as a problem, but rather as if they had been smoothed over.



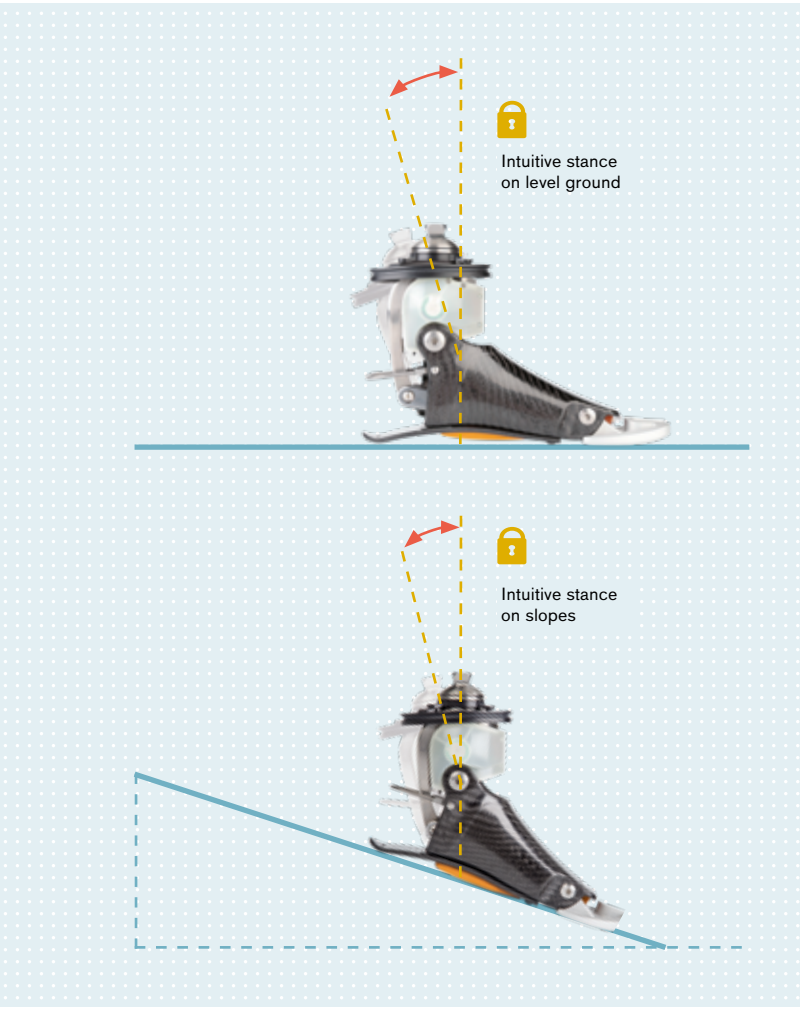
Walking down stairs

The Meridium prosthetic foot enables highly complex patterns of movement such as walking down stairs. While this is only possible with conventional feet by placing half of the foot on the step, the Meridium allows for full-surface, stable contact between the foot and the step.

In addition, both gait patterns can be used alternatively when descending stairs. Among other advantages, this means that uneven steps can also be safely and easily navigated – without the user having to concentrate specifically on each one.

The Meridium prosthetic foot recognizes the movement pattern when walking on stairs and adjusts itself in real time, step by step.

The foot does this by adjusting the dorsiflexion resistance and increasing the rollover angle. As a result, the user gains enhanced safety and stability thanks to maximum ground contact when walking down stairs.



Intuitive stance

Gone are the times when users had to make compromises when switching between walking and standing: The Meridium prosthetic foot can differentiate based on the situation. The foot adjusts itself accordingly and controls dorsiflexion and plantar flexion resistance independently of one another.

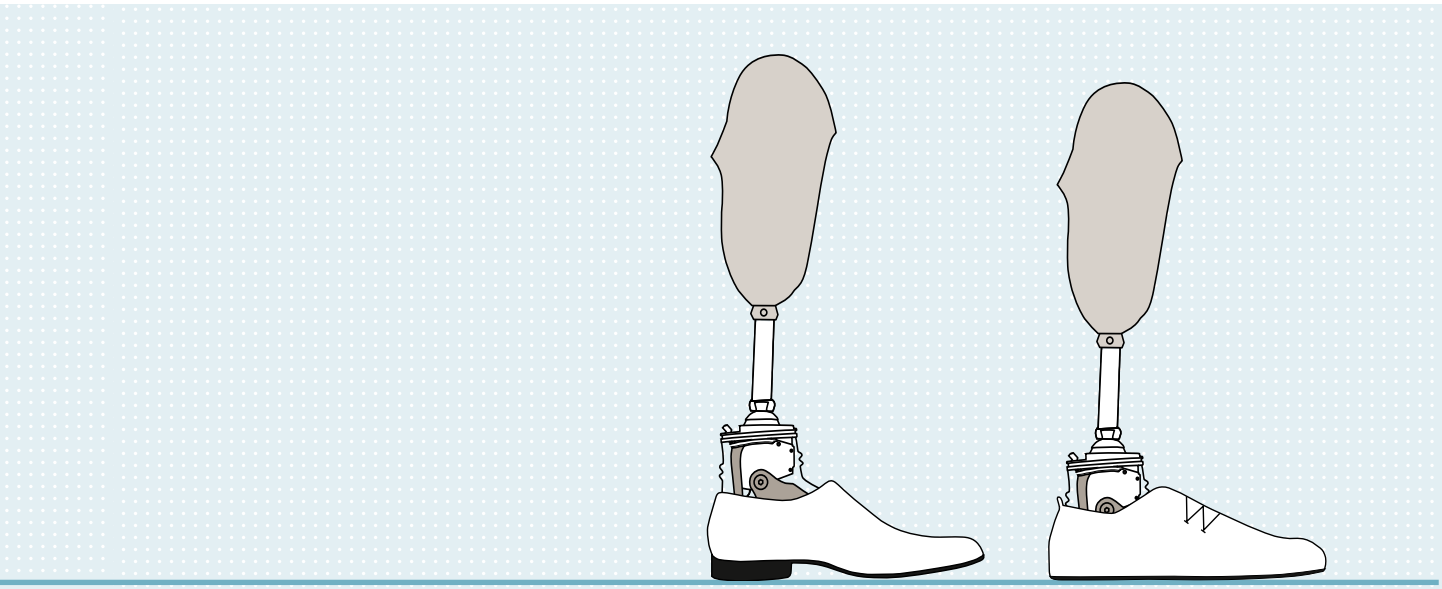
Dorsiflexion is blocked when the user is standing to ensure a stable stance, but plantar flexion is simultaneously maintained so they can continue walking at any time. It doesn't matter whether the surface is flat or sloped, the user maintains the same level of stability in either case.

Relief function

Another advantage for the user is the so-called relief function. This function automatically lowers the foot to the floor when a load is placed on the heel for a prolonged period, for example when sitting.

In addition to the purely external, natural-appearing foot position, users enjoy relief in the sitting and standing position. Particularly in areas with little leg room such as public transportation, or theaters, and cinemas. The adjustment offers the user a noticeable degree of relief.

Relief function when sitting



Automatic heel height adjustment

Different occasions call for different shoes, and switching frequently between shoes with varying heel heights is much more than just a matter of fashion for women and men today. Whether it's safety shoes for work, sports and leisure shoes, or elegant footwear for a social occasion – the right shoes are a must in many situations.

Adjusting the heel height of prosthetic feet is in most cases impossible or only possible with considerable effort, but the Meridium prosthetic foot provides simple, convenient heel height adjustments.

The foot allows for heel height adjustment of up to 2 in (5 cm). The adjustment automatically takes effect within the first 10-20 steps after the user changes shoes. Alternatively, an immediate adjustment can be carried out via the smartphone app or a movement pattern. So even changing shoes multiple times is a snap for any user. Walking barefoot is also an option.

Easy-to-use modern technology for experts and users

M-Soft adjustment software

With the help of the M-Soft adjustment software, the Meridium can be simply and clearly configured to suit the relevant requirements and personal needs of the user.

For optimum adaptation, the adjustment software also provides support with integrated alignment recommendations.

Using the wireless Bluetooth® connection, the software makes testing various parameters with the patient easier, so you can quickly identify the ideal setting.

The Cockpit app for easy mobile control

The Meridium adjusts itself automatically to various situations. Using the convenient Cockpit app for Android or iOS, the user can also easily adjust the Meridium via smartphone. The app can be used to individually change the heel height, for example, or to select from a range of optionally preset MyModes.

The app also displays other information such as the charging status of the Meridium. Alternatively, simple motion patterns or the optional remote control can be used to carry out adjustments.

Meridium
Details

1 Electronics and battery
Housed and protected within the ankle area. The integrated microprocessor analyses the sensor data and controls the hydraulics in real time.

2 IMU – Inertial Motion Unit
Inside the IMU, a dedicated microprocessor analyses the data from gyroscopes and acceleration sensors in order to determine the rotational speeds, rotational position, movements, and the distances covered by the prosthesis in space. This enables differentiation between standing and walking on level ground as well as on stairs and ramps and the activation of the energy-saving functions, e.g. when sitting.

3 Hydraulics
Control the plantar flexion and dorsiflexion of the foot independently of one another, thereby uniting flexibility and stability.

4 Toe plate
Made from aluminium with an abducted big toe, the toe plate forms the link between the carbon frame and the frontal rotation point of the hydraulics.

5 4-axis kinematics
Enables an especially close approximation to anatomical movement patterns. Four axes flexibly connect the toe plate, foot, and ankle with one another.

6 Frame and heel spring
Made from carbon fiber, these stand out for their high stability and stiffness and also help to protect the hydraulics.

7 Moment sensor
Measures the force at foot contact in order to adjust the hydraulic resistance to body weight, load capacity, gait type, and gait speed.

8 Angle sensor
Records the current angle and speed of the angle change during walking so the resistance can be adjusted to the gait speed and walking surface.

9 Ankle spring
Made from extremely durable, light titanium, connects the hydraulics in the foot with the pyramid adapter and encloses the electronics and battery in the ankle.

Components and accessories

2C7=* Footshell

4G872=*
Set of cover caps

4E50-2 Battery
charger

757L16-2
AC adapter

2C101
Donning aid

757P48
Y adapter cable

704G30
Clamping tool

4X154=V1.0 M-Soft

60X5
BionicLink PC

Information

647G870
Instructions for use
(practitioners)

647G869
Instructions for use
(user)

The scope of delivery for the Meridium includes the footshell and donning aid as well as the battery charger and AC adapter.

Unique footshell technology

The footshell developed for the Meridium is especially robust.

For the first time, the newly patented footshell combines two areas with different properties in one product. It is extremely stable in the sole and forefoot area, but particularly flexible in the ankle area at the same time.

The footshell adapts itself to the high mobility of the foot with its bellows and also provides reliable protection against splashed water. The footshells are available in a unique translucent version (1) in addition to the standard colors of beige (4) and light brown (15).

1B1 Meridium technical data

K-Level	K3
Amputation level	Transtibial, knee disarticulation, transfemoral, bilateral transtibial
Max. body weight	275 lbs (125 kg)
Weight with footshell	Size 26–27: 53 oz (1500 g)
Structural height	Size: 26–27: 6 7/8 in (175 mm)
Heel height	0-2 in (0-50 mm)
Range of motion for size 27	36.5° (22° PF; 14.5° DF)
Operating time when battery is fully charged	1 day
Approved knee joints	C-Leg®, Compact, Genium, X3

Indications and contraindications

Indications

- People with the following amputation levels: transtibial, knee disarticulation, transfemoral
- K-Level 3
- Max. body weight 275 lbs (125 kg)
- Foot sizes: 24 cm to 29 cm

The Meridium is especially well suited for patients who ...

- frequently walk on uneven ground. The real-time control of the hydraulics enables immediate adaptation to various, changing surfaces such as rough paths, small obstacles, grass, and cobblestones.
- frequently walk on slopes. The flexion and rollover angle are adjusted according to the surface, enabling a smoother gait. The foot remains in a dorsiflexion position when walking upwards to prevent it from getting caught during the swing phase. Quick, full-surface ground contact ensures that the user's foot is securely positioned when walking downwards.
- walk frequently on stairs. When walking down stairs, an increased rollover angle and greater dorsiflexion resistance enable the user to place the entire surface of their foot on the step, thereby giving them greater, stable contact with the ground.
- frequently walk longer distances. The 4-axis design enables a particularly close approximation to the physiological gait. The hydraulic resistance is adjusted during initial ground contact to achieve a comfortable heel leverage adapted to the user's stride length. During the stance phase, the ankle movement and the movable toe plate allow for smooth rollover as well as full-surface contact between the foot and the floor. During the swing phase, the foot remains in the dorsiflexion position and provides greater ground clearance.
- stand frequently and/or for long periods of time. The Meridium automatically detects that the user is standing and adjusts itself accordingly. Dorsiflexion is blocked during standing, granting the user a secure stance – whether on level ground or on slopes.
- primarily work in a seated position or who frequently sit for long periods: The relief function moves the foot to a natural-looking, plantar-flexed position. Above all, this provides relief for the residual limb in addition to full-surface contact between the foot and the floor.
- frequently wear different types of shoes, e.g. work shoes, athletic, or dress shoes. After a few steps, the Meridium automatically adjusts itself in the new shoes to heel heights of up to 5 cm. The dynamics of the prosthesis are not affected by the new heel height.
- want to easily vary their walking speed at any time. When the user slows their walking pace, the microprocessor-controlled hydraulics increase dorsiflexion resistance to provide greater stability. Dorsiflexion resistance is reduced at higher walking speeds to facilitate rollover of the foot.

Contraindications

- Amputees with mobility grade 1 (indoor walker)
- Hip disarticulation amputees and bilateral transfemoral / knee disarticulation amputees
- Cognitive disabilities or life circumstances which contradict the proper handling of the Meridium

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