



## Hydraulic Ankle Range

Replicating nature to  
support a healthy future

**Blatchford**





# Why hydraulics?

Lower limb amputees can face health issues long after amputation, and it is the consideration and management of these issues that are crucial to the sustained health of every patient.



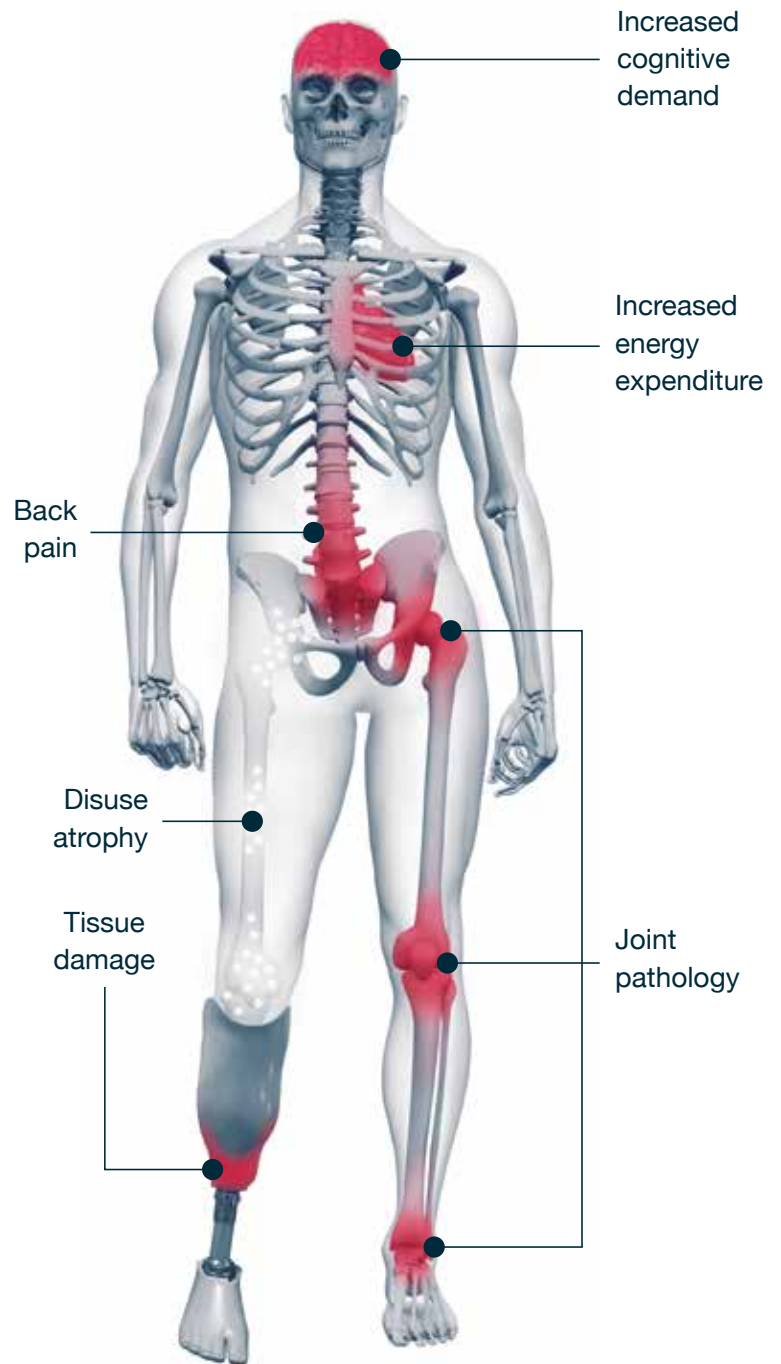
Lower limb amputees have **2-3x** increased risk of osteoarthritis in the knee or hip compared to the general population



**61%** of lower limb amputees experience moderate to severe back pain within 2 years of amputation

Long-term musculoskeletal health depends on the replication of the dynamic and adaptive qualities of natural limb movement and through the use of hydraulic technology, this can be achieved.

The engineering of nature is our prime source of inspiration that is at the heart of our design philosophy which has led to the development of award-winning products with clinical evidence focused on the long-term health and wellbeing of amputees.





# Biomimetic Design Philosophy

The human ankle and foot have four main rocker points that allow us to walk efficiently. By considering these natural movements and replicating its structure using a unique combination of design elements, our hydraulic technology achieves a natural, safe and efficient walking experience.



Heel Rocker



Ankle Rocker



Forefoot Rocker



Medial Lateral Rocker



The human ankle foot complex contains 28 bones and 33 joints that work in sequence to provide balance, stability and a seamless walking experience. Blatchford hydraulic ankles respond to the design specifications that natural movement dictates, fine-tuning joint position to align the body for optimum posture and comfort. By continuously adjusting to absorb and release energy, our hydraulic ankles allow for an efficient roll-over, remaining perfectly aligned with the user for the next step to help reduce the risk of falls.

**Energy Absorption**  
Hydraulics absorb energy to  
minimise tissue stress

**Biomimetic Self-alignment**  
To fine tune joint position for  
improved posture, gait symmetry and  
reduced socket interface stress

**Adjustment and control**  
Fine tuned to the user's requirements

**Viscoelastic**  
Spring and damper reduce the rate  
of loading, removing force from the  
system and therefore the limb

**Biomimetic Design**



Extensive studies into our biomimetic hydraulic technology show numerous benefits and improvements to quality of life.\*

## Improved Safety

**18%** increase in toe clearance reduces the chance of trips and falls.  
**Reduction** in centre-of-pressure deviation during standing, indicating better balance.



## Greater Control and Stability

**Increased** confidence in walking and negotiating variable terrain.  
**Smoother** motion while walking.



## Greater Comfort

Over **60%** reduction in socket stress.



## Balanced Limb Loading

**Reduced** chance of long term limb disease.  
**Reduced** contralateral foot plantar-pressure.



## Improved Energy Efficiency

**11.8%** reduction in energy cost on level ground.  
**20.2%** reduction in energy cost on slopes.

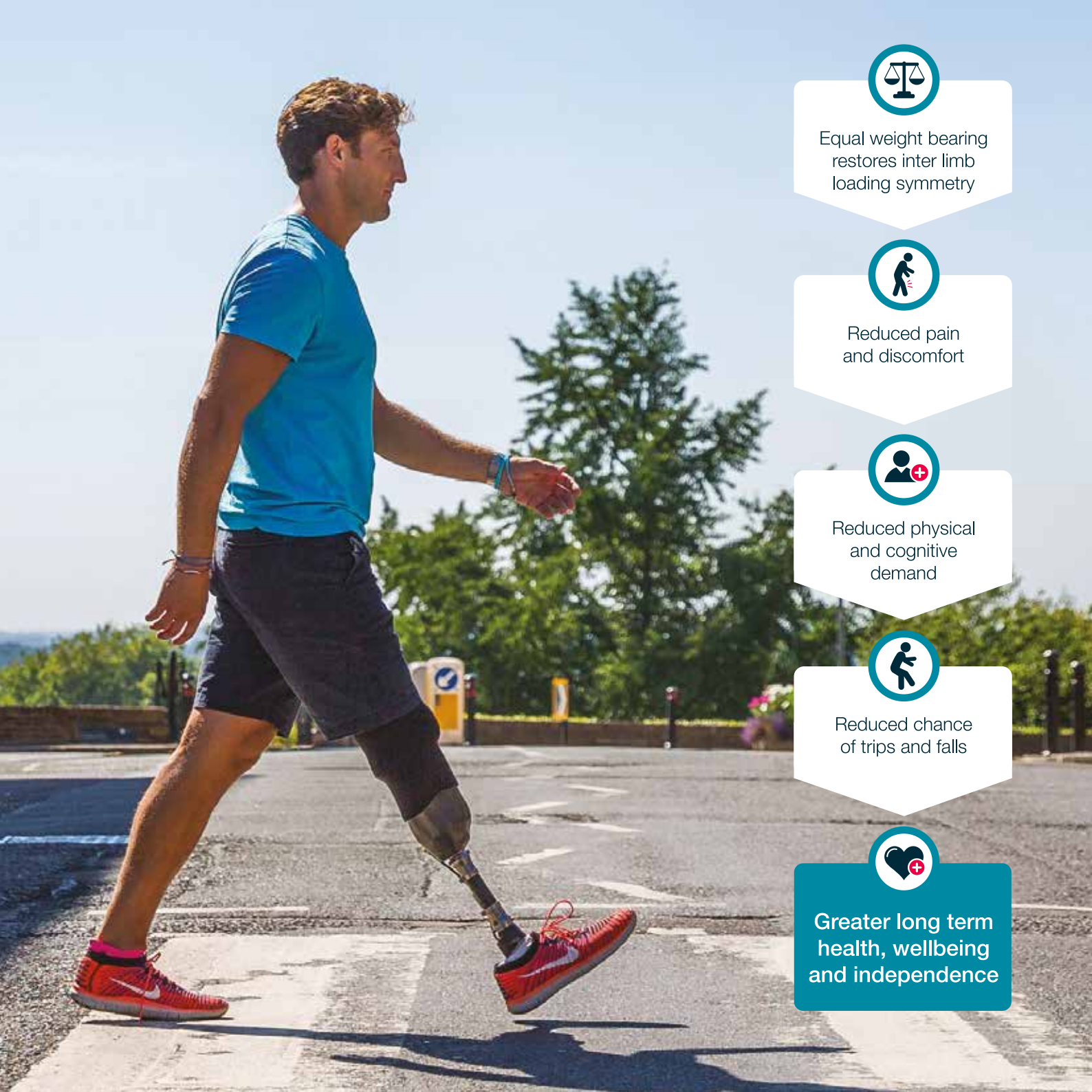


## Patient Satisfaction

**33.4%** increase for bilateral patients.



\*Clinical studies, latest research papers and full references available on our website:  
<https://www.blatchford.co.uk/prosthetics/professionals/clinical-evidence/>



Equal weight bearing  
restores inter limb  
loading symmetry



Reduced pain  
and discomfort



Reduced physical  
and cognitive  
demand



Reduced chance  
of trips and falls



Greater long term  
health, wellbeing  
and independence



# Avalon<sup>K2</sup>



AvalonK2 has been designed specifically for the complex needs of limited community ambulators. It combines hydraulic ankle technology with a unique optimised keel that works with the user to enhance confidence, independence and safety.



## Features

- Unique and proven Blatchford hydraulic technology
- Optimised keel shape for improved stability
- Waterproof
- Increased range of motion for greater sit-stand safety

# Echelon



For over a decade, the award-winning Echelon has provided users with clinically proven hydraulic technology and remains a popular choice for clinicians and their patients around the world. Echelon is ideal for lower and more active users wanting all the benefits of hydraulic technology in a lightweight and versatile package. Echelon would also be suitable for those wishing to progress from our AvalonK2 foot.




## Features

- Unique and proven Blatchford hydraulic technology
- Lightweight and waterproof for a versatile package
- Decade of popularity and proven performance
- Suitable for users progressing from lower activity feet







“With  
AvalonK2 I can  
go and do my  
voluntary work  
and I can give it  
my all.”

Jean

# Echelon<sup>ER</sup>



Suitable for submersion

Our latest hydraulic ankle, EchelonER combines hydraulic ankle technology with an extended range of ankle movement. Featuring an all new robust and waterproof design, the extended range provides users with even more ground compliance on steep slopes and uneven terrain.



## Features:

- Unique and proven Blatchford hydraulic technology
- Increased range of movement – 25° compared to Echelon's 9°
- Improved flexibility of footwear choice and the option of barefoot walking
- Robust and waterproof design

# Echelon<sup>VT</sup>



Suitable for outdoor use

EchelonVT combines hydraulic technology with a rotation and vertical shock absorption component which is designed to reduce the forces exerted on the residual limb. This allows the twisting forces to be absorbed by the ankle rather than be transmitted to the socket interface.



## Features:

- Unique and proven Blatchford hydraulic technology
- Increased range of hydraulic movement – 25° compared to Echelon's 9°
- Improved flexibility of footwear choice and the option of barefoot walking
- Robust and waterproof design





A woman with red hair, wearing a black jacket with purple accents and olive shorts, is walking on a grassy path. She has a prosthetic leg on her left side. The background consists of green trees and a cloudy sky.

“EchelonER  
has really improved  
how I walk fundamentally.  
It’s elongated my gait  
and it’s a lot smoother  
when I walk  
onto it.”

Emily



# Echelon<sup>VAC</sup>



EchelonVAC combines hydraulic ankle technology with an elevated vacuum system for optimal socket connection.

With each step, the user presses their weight into the prosthesis, initially expelling air through a one-way valve. Simultaneously the ankle plantarflexes, actively drawing air out of the socket. This air is held in the vacuum chamber and expelled through a secondary one-way valve as the tibia progresses and the ankle dorsiflexes. The elevated vacuum reduces relative movement and helps to maintain limb volume, improving proprioception and control of the prosthesis.



## Features

- Unique and proven Echelon Technology
- Vacuum system for ultimate socket connection throughout the day
- Designed to promote healthier residuum tissue
- No power required, quiet gentle operation







“EchelonVAC gives me a more intimate feel between the prosthesis and me, the way it works by pulling vacuum with every step gives me a much more secure and comfortable fit.”

Dennis



# Introducing Microprocessor Control

By introducing Microprocessor Active Resistance Control to our hydraulic ankle technology, natural muscle resistance can be mimicked by adapting hydraulic resistance levels when standing and walking on slopes and uneven terrain to achieve an advanced level of control.

This encourages more symmetrical limb loading, faster walking speed and reduced compensatory movements. The result is smoother, safer and more natural walking, helping to preserve the body for the long term.







# Elan



Suitable for outdoor use



## Features:

- Microprocessor Active Resistance Control
- Hydraulic Ankle Technology
- Standing support
- Ramp brake and ramp assist
- Weatherproof
- Compact and lightweight

# Elan<sup>IC</sup>



Suitable for submersion



## In addition to Elan features:

- Waterproof
- Induction charging
- Integrated Bluetooth®
- Clinician Programming App

Clinical studies, latest research papers and full references available on our website:  
<https://www.blatchford.co.uk/prosthetics/professionals/clinical-evidence/>



An annual visual inspection is recommended. Check for visual defects that may affect proper function. Maintenance must be carried out by competent personnel. Before carrying out any new activities of daily living, please check with your clinician whether specific training is required.

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**Blatchford** 