

# Tech Update

## Selecting the Right Knee For Your Lifestyle

Selecting a computerized knee depends largely on an individual's activity level, age, health and lifestyle. The more active wearer may find that a computerized, or microprocessor knee, is more suitable with his or her activity level, since it provides the correct resistance at the proper time in the gait cycle.

Technology on computerized knees continues to advance and there are several models from which transfemoral, or above-knee, amputees may choose, with others still under development. While computerized knees may be more expensive when compared with mechanical knees, they take less energy to operate and provide an unmatched level of stability to eliminate falls.



Otto Bock C-Leg®

### How Do Microprocessor Knees Work?

Microprocessor knees have sensors that detect real-time movement and timing, and then adjust the control mechanism/cylinder accordingly. The microprocessor-controlled knee lowers the amount of effort wearers must use to control their timing, resulting in a more natural gait.

With all the technological advancements and progress being made with prosthetic knees, researchers can only improve upon the selection that is in the marketplace today, which may eventually include bionic, or neuroprosthetic technology.

### Microprocessor Systems

The state-of-the-art Otto Bock C-Leg®, introduced in 1997, is still considered a benchmark for computerized knees for athletic and very active amputees. The C-Leg is appropriate for transfemoral amputees, including those with bilateral limb deficiencies or hip disarticulation amputations. The C-Leg's multiple sensors relay data, including the precise angle of the knee joint and the loading of the foot and ankle, at a rate of 50 times per second; its on-board microprocessors adapt and compensate for stairs, slopes and irregular terrain, allowing the wearer to walk naturally and not having to think about compensating for different surfaces. With a few taps of the toe, or by pressing a button on the remote, C-Leg wearers can change resistance settings for alternative activities, such as biking or skiing. The C-Leg uses easy-to-charge lithium ion batteries that hold 40 to 45 hours of power.

The Ossur Rheo Knee® promises its wearer less fatigue and more confidence, since it has been billed as the first artificially intelligent knee system that uses a microprocessor to sense the knee's position and load 1,000 times per second, determines the user's gait, and responds with the proper amount of resistance.

The Ossur Rheo Knee is operational with a lithium ion battery that lasts up to 48 hours without needing to be recharged; a power switch allows the user to conserve the battery power when it is not in use. Recharging time is two to four hours. It has the ability to learn and adapt to its user's individual walking styles and keeps pace with changes in speed, load and

terrain, resulting in continually improved and optimized performance. The user can walk longer with less fatigue, and gain increased stability and confidence.

### Mechanical Knees

Ossur's Mauch Knees operate with progressively designed hydraulic systems that provide wearers with a controlled means of ambulation on varied terrains and in sports activities and help to conserve energy for the wearer. From running, to walking step over step down stairs, Mauch Knees offer a smooth, natural gait and a high level of flexibility for more active lifestyles. A new design, introduced recently, includes a heavy-duty aluminum frame and mechanical extension stop. The new and enhanced features improve durability and provide more security for amputees at any activity level. The Mauch Knee is engineered for a 300 lb. weight limit. It's Plus version offers a 365 lb. weight limit. The new advanced connection method between the cylinder, frame and bracket features spherical bearings to protect the cylinder twisting



Ossur Rheo Knee



Ossur Mauch Knee

*continued on back*

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forces, reducing the chance of failure. Side stability is improved with specially designed bushings of all moving parts in the knee.

Reliability and function are the greatest attributes of the TruLife titanium Black Max Short Knee. This prosthesis allows the wearer to kneel and simulates natural knee movement on all types of terrain. This compact, durable device features a two part cover and provides complete control of both stance and swing gait phases. With its short build length, it is



Black Max Short Knee

lightweight and offers a choice of proximal and distal adaptor options. It is perfect for high impact, high activity wearers and also features a very high weight limit.

For a moderately active lifestyle, the Total Knee® 2000 is suitable for light duty workplace, walking on level and uneven ground as well as ramps. It's 3-phase hydraulic swing control accommodates changes in walking speed from walking to shopping to light work. It imitates true knee motion with its natural and fluid movement. Like the Total Knee 1900, it has a geometric lock, which prevents collapse. Its low-build height reduces protrusion of knee when sitting and contributes to a more symmetric, natural gait.

Strong and durable, the Total Knee 2100 is designed for general use for

those who have a highly active lifestyle, with daily activities that include multiple speed walking on level and uneven ground. It's suitable for a multiple speed walker, able to negotiate environmental obstacles, and consistently able to feel that the knee is extended prior to loading weight onto the prosthesis. Plus, its low-build height reduces protrusion of knee when sitting and contributes to a more symmetric, natural gait. All three Total Knee designs have been updated recently for durability and cosmesis.



Total Knee 2100

Otto Bock's lightweight 3R95 knee is a compact, dynamic single-axis modular knee joint with a low-profile design. This knee is ideal for patients who wear a cosmetic cover and are sensitive to appearance. The 3R95 features a unique miniature hydraulic system that offers dynamic movement resistance while supporting the needs of an active user. Swing phase is easy to initiate and



Otto Bock's lightweight 3R95 knees

conserves energy. Flexion degrees are reduced automatically at fast walking speeds. The wearer controls stance phase with easy adjustment options allowing for fine-tuning resistance.

Otto Bock's 3R60 features Ergonomically Balanced Stride (EBS) and is smaller and lighter than its predecessor. The knee offers proximal connections for various amputation levels and an innovative hydraulic system to control knee behavior during swing phase. The knee is easily adjusted to suit the user's individual needs and to initiate swing phase at various walking speeds. Individual adjustments can help to avoid hip hiking and other compensatory movements during the gait cycle minimizing hip and back discomfort.

Consult your practitioner about specific functional characteristics of the different models, and for recommendations for the model that is most appropriate for you, and to teach the proper way to use the prosthetic knees.

**The staff at Mulenburg Prosthetics makes every effort to match our patients' needs with the most appropriate and suitable appliance. We are happy to provide you further information on computerized knee options. Contact our office at 713-524-3949.**



Otto Bock's 3R60 Knee