Compact Microprocessor Knee
Hydraulic Swing and Stance Phase Knee
Hydraulic swing control allows for adequate resistance to be applied during heel rise, allowing 60-65 degrees of knee flexion. This ensures appropriate toe clearance, reduces the chance of catching the toe in mid-swing, and offers the patient security for the next heel strike (does not leave the patient feeling as if “waiting for the knee to come through”).

Hydraulic swing control also applies during extension of the knee preventing terminal impact by decelerating the limb while restraining the need for further hip flexion. This resistance mimics the eccentric contraction of the anatomical hamstrings and gluteus maximus. Full extension is then reached in preparation for heel strike.

Hydraulic swing control allows patients to vary cadence. The hydraulic fluid flows through narrow channels, providing a frictional resistance, which increases with the speed of compression; a faster gait speed allows quicker knee extension.

With hydraulic stance phase control, resistance occurs automatically when there is a tendency for the knee to buckle. This allows the patient to walk on uneven terrain and results in a more natural step-over-step pattern when descending inclines and stairs. This resistance also contributes to the stance flexion and “stumble recovery.”

Microprocessor Controlled Stance
The microprocessor stance control operates in the same fashion as the C-Leg. The Compact is a default stance control knee, which means that it always has high stance flexion until stance is disengaged.

There are two main sensors in the Compact. The knee angle sensor detects the angle of the knee, monitors whether the knee is flexing or extending, and how fast it is doing so. The ankle moment sensor detects whether there is a dorsiflexion (load on toe) or plantar flexion (load on heel) moment occurring, and whether that moment is increasing or decreasing.

These sensors gather data at a rate of 50 times per second. This information is then sent to the microprocessor, which in turn adjusts the valve position that controls hydraulic fluid release to the flexion valve providing reliable stance stability.

Since the rate of fluid release is controlled by the microprocessor from data that is collected in real time, patients are able to walk more naturally with the knee adapting faster and more accurately than without a microprocessor. During swing phase the resistance is controlled by the hydraulic alone. This means that patients can still successfully vary their gait cadence.

Stance Flexion
When the prosthesis initially contacts the ground, this feature allows the patient to load the knee in a flexed position. Benefits include shock absorption, restoration of sinusoidal pattern of center of gravity throughout the gait cycle, energy efficiency (less energy spent on “pulling back” on hamstrings to lock a fully extended knee), and an overall more natural gait pattern. Hip and lower back stress will also be minimized.

This feature also allows patients to “ride” the knee (the knee supports patients’ weight on flexed knee without buckling and lowers them into desired position) when sitting into a chair, kneeling, and when descending stairs and slopes.

This resistance will also be there for the patient should the toe catch during mid-swing, serving as a “stumble recovery” feature. As soon as the knee stops flexing and maximum heel rise is achieved, this feature is immediately activated; thus, if at any point the toe catches the resistance is available. This allows patients enough time to bring their contralateral side through to catch themselves, thus preventing a fall and keeping it at a controlled “stumble.”

Additional Features:
The Compact Mode allows the user to lock the knee between 0° and 30° when there is a need to securely stand for long periods of time.
The Therapy Mode allows the knee to be locked in full extension while the amputee is learning to use the knee.
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